IBC - Structural

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2025 GROUP B PROPOSED CHANGES TO THE I-CODES

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2025 GROUP B – PROPOSED CHANGES TO THE INTERNATIONAL BUILDING CODE - STRUCTURAL

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TENTATIVE ORDER OF DISCUSSION
2025 PROPOSED CHANGES TO THE
INTERNATIONAL BUILDING CODE – STRUCTURAL

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 S code change proposals may not be included on this list, as they are being heard by another committee.

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S1-25 Part I

IBC: 1502.4 (New)

Proponents: Emily Lorenz, representing International Institute of Building Enclosure Consultants (IIBEC) (emilyblorenz@gmail.com)

THIS IS A 2 PART CODE CHANGE. PART I WILL BE HEARD BY THE IBC STRUCTURAL CODE COMMITTEE. PART II WILL BE HEARD BY THE IRC-B CODE COMMITTEE. SEE THE TENTATIVE HEARING ORDER FOR THESE COMMITTEES.

2024 International Building Code

Add new text as follows:

1502.4 Drainage of other surfaces. Where balconies, decks, landings, exterior stairways, and similar surfaces exposed to the weather have an impervious layer, the impervious layer shall be sloped to provide positive drainage away from the structure.

S1-25 Part I

S1-25 Part II

IRC: R507.1.1 (New), R903.5 (New)

Proponents: Emily Lorenz, representing International Institute of Building Enclosure Consultants (IIBEC) (emilyblorenz@gmail.com)

2024 International Residential Code

Add new text as follows:

R507.1.1 Impervious layers. Decks with impervious layers shall comply with Section R903.5 for drainage.

R903.5 Drainage of other surfaces. Where balconies, decks, landings, exterior stairways, and similar surfaces exposed to the weather have an impervious layer, the impervious layer shall be sloped to provide positive drainage away from the structure.

Reason: The purpose of this proposal is to ensure life-safety of users of balconies in cold climates, and to promote bulk water flow away from exterior walls or assemblies that adjoin balconies, so that ponding does not occur.

Proper drainage on balconies, decks, etc., is an important performance requirement to aid in draining liquid water away from the building. In cold climates, any ponding that may occur could potentially freeze, causing a safety issue.

Section 1402.3 of the 1997 Uniform Building Code (UBC) is what most waterproofing consultants considered the gold standard for ensuring that architects and builders constructed balcony and stairways with a minimum of 2% slope. The 2% slope requirement referenced in the Section 1402.3 of the 1997 UBC does not exist at any location within any version of IBC from 2000 through 2024. Decks were also listed as an area that should be waterproofed and sloped.During the transition from the UBC to the IBC, this valuable and useful reference to require a minimum 2% surface slope for balconies, landings, and exterior stairways was omitted from the IBC and IRC. There are no referenced statements or definitions anywhere in the current codes on this issue.

This proposal adds modified code language from the 1997 UBC Chapter 14 under the roof drainage sections of IBC Chapter 15 (1502) and IRC Chapter 9 (R903.4). Section 1402.3 of the 1997 Uniform Building Code (UBC) stated:

"1402.3 Waterproofing Weather-exposed Areas. Balconies, landings, exterior stairways, occupied roofs, and similar surfaces exposed to the weather and sealed underneath shall be waterproofed and sloped a minimum of 1/4 unit vertical in 12 units horizontal (2% slope) for drainage."

Additionally, 2024 IBC Section 2304.12.2.4 states, “Wood structural members that support moisture-permeable floors or roofs that are exposed to the weather, such as concrete or masonry slabs, shall be of naturally durable or preservative-treated wood unless separated from such floors or roofs by an impervious moisture barrier. The impervious moisture barrier systems protecting the structure supporting floors shall provide positive drainage of water that infiltrates the moisture-permeable floor topping.” This proposal supports providing drainage required by Section 2304.12.2.4.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

Proper slope of decks and other surfaces may be accommodated in most situations with no additional materials nor labor.

S1-25 Part II

S2-25

IBC: SECTION 1503, 1503.1, 1503.2

Proponents: Mark S. Graham, representing National Roofing Contractors Association (NRCA) (mgraham@nrca.net)

2024 International Building Code

SECTION 1503
WEATHER PROTECTION

1503.1 General. *Roof decks* shall be covered with *approved roof coverings* secured to the *building* or *structure* in accordance with the provisions of this chapter. *Roof coverings* shall be designed in accordance with this code, and installed in accordance with this code and the manufacturer's *approved* instructions.

Revise as follows:

1503.2 Flashing. Flashing shall be designed in accordance with this code and installed in accordance with the *roof covering* manufacturer's approved instructions in such a manner so as to prevent water from entering the wall and roof through joints in copings, through moisture-permeable materials and at intersections with *parapet walls* and other penetrations through the roof plane.

Reason: This proposed code change is intended to clarify the code's requirements regarding to roofing-related flashings by making it clear roofing-reated flashing design and installation need to be according to the roof covering manufacturer's instructions. The previous section, Section 1503.1, already provides a similar requirement for the roof covering itself. Since roofing-related flashings are integral to, but not necessarily always considered a part of the roof covering ("roof covering" is specifically defined in Section 202), this added clarification is appropriate,

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

This proposed change is clarifying in nature and will not increase or decrease the cost of construction. See reason statement.

S2-25

S3-25 Part I

IBC: 1503.2, 1503.2.1

Proponents: John Taecker, Taecker Codes & Technical Services, representing Taecker Codes & Technical Services (john@taeckercodes.com)

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2024 International Building Code

Revise as follows:

1503.2 Flashing. Flashing shall be installed in such a manner so as to prevent water from entering the wall and roof through joints in copings, through moisture-permeable materials and at intersections with *parapet walls*, *rooftop structures* and other penetrations through the roof plane.

1503.2.1 Locations. Flashing shall be installed at wall and roof intersections, at gutters, at *rooftop structures*, wherever there is a change in roof slope or direction and around roof openings. Where flashing is of metal, the metal shall be corrosion resistant with a thickness of not less than 0.019 inch (0.483 mm) (No. 26 galvanized sheet).

S3-25 Part I

S3-25 Part II

IBC: 1511.1.3 (New)

Proponents: John Taecker, Taecker Codes & Technical Services, representing Taecker Codes & Technical Services (john@taeckercodes.com)

2024 International Building Code

Add new text as follows:

1511.1.3 Flashing. Flashing shall be installed at *rooftop structures* in accordance with Section 1503.2 and 1503.2.1.

Reason: The general flashing requirements in Section 1503.2 and 1503.2.1 do not include flashing for rooftop structures. There are no flashing requirements, other than for lightning protection systems, in Section 1511. Flashing should also be required for any rooftop structure.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

Good construction practices would include appropriate flashing for rooftop structures, so the increase has the potential to be minimal. There may be an increase for those installers who have not done this practice.

S3-25 Part II

S4-25 Part I

IBC: 1503.2.1 (New), UL Chapter 35 (New)

Proponents: Larry Sherwood, Sustainable Energy Action Committee, representing IREC (larry@irecusa.org); Dara Yung, representing California Solar & Storage Association (CALSSA) (dara@calssa.org); Joseph H. Cain, P.E., representing Solar Energy Industries Association (SEIA) (joecainpe@gmail.com); Philip Oakes, representing NASFM (phil@browning.red)

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2024 International Building Code

Add new text as follows:

1503.2.1 Attachment of photovoltaic (PV) panel systems. Flashing shall be installed in a manner that prevents water from entering the roof at attachment points for rooftop-mounted *photovoltaic (PV) panel systems* in accordance with one of the following:

1. The roof covering manufacturer's instructions.
2. A metallic or nonmetallic flashing material or system that is *listed* and *labeled* in accordance with UL 2703A and installed in accordance with the flashing manufacturer's installation instructions.

Add new standard(s) as follows:

UL

UL LLC
333 Pfingsten Road
Northbrook, IL 60062

2703A-2022	Outline of Investigation for Flashing Devices and Systems for Rooftop-Mounted Photovoltaics

S4-25 Part I

S4-25 Part II

IRC: R903.2.3 (New), UL Chapter 44 (New)

Proponents: Larry Sherwood, Sustainable Energy Action Committee, representing IREC (larry@irecusa.org); Dara Yung, representing California Solar & Storage Association (CALSSA) (dara@calssa.org); Joseph H. Cain, P.E., representing Solar Energy Industries Association (SEIA) (joecainpe@gmail.com); Philip Oakes, representing NASFM (phil@browning.red)

2024 International Residential Code

Add new text as follows:

R903.2.3 Photovoltaic (PV) panel systems. Flashing shall be installed in a manner that prevents moisture from entering the roof at attachment points for rooftop-mounted *photovoltaic (PV) panel systems* in accordance with one of the following:

1. The roof covering manufacturer's instructions.
2. A metallic or nonmetallic flashing material or system that is *listed* and *labeled* in accordance with UL 2703A and installed in accordance with the flashing manufacturer's installation instructions.

Add new standard(s) as follows:

UL

UL LLC
333 Pfingsten Road
Northbrook, IL 60062

2703A-2022	Outline of Investigation for Flashing Devices and Systems for Rooftop-Mounted Photovoltaics

Reason: While flashing is required for roofing in IBC 1503.2 and IRC R903.2 , this section is silent on specific requirements for rooftop-mounted photovoltaic (PV) panel systems. This proposal clarifies that flashing or weathersealing of rooftop attachments for PV systems can be metallic or nonmetallic, and provides a method for evaluating these alternative methods.

This proposal was prepared by the Sustainable Energy Action Committee (SEAC), a forum for all stakeholders (including, but not limited to, AHJs, designers, engineers, contractors, first responders, manufacturers, suppliers, utilities, and testing labs) to collaboratively identify and find solutions for issues that affect the installation and use of solar energy systems, energy storage systems, demand response, and energy efficiency. The purpose is to facilitate the deployment and use of affordable, clean and renewable energy in a safe, efficient, and sustainable manner.

All recommendations from SEAC are approved by diverse stakeholders through a consensus process. For more information, please visit www.sustainableenergyaction.org

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

The code change proposal will not increase or decrease the cost of construction This proposal does not change cost of construction. It provides clarity, as well as additional alternative methods. This provides an additional option for construction.

Staff Analysis: A review of the standard proposed for inclusion in the code, UL 2703A-2022 Outline of Investigation for Flashing Devices and Systems for Rooftop-Mounted Photovoltaics, with regard to some of the key ICC criteria for referenced standards (Section 4.6 of CP#28) will be posted on the ICC website on or before April 1, 2025.

S4-25 Part II

S5-25 Part I

IBC: 1504.2 (New), 1504.2, TABLE 1504.2, 1504.2.2 (New), 1504.2.2.1 (New), 1504.2.2.2 (New), 1504.4.3, 1504.4.4, 1507.2.5, 1507.16.8, UL Chapter 35 (New)

Proponents: Aaron Phillips, representing Asphalt Roofing Manufacturers Association (aphillips@asphaltroofing.org)

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2024 International Building Code

Add new text as follows:

1504.2 Wind resistance of asphalt shingles, hip shingles, and ridge shingles. Wind resistance of asphalt shingles shall be in accordance with Section 1504.2.1. Wind resistance of hip and ridge shingles shall be in accordance with Section 1504.2.2.

Revise as follows:

~~1504.2~~ 1504.2.1 Wind resistance of asphalt shingles. Asphalt shingles shall be tested in accordance with ASTM D7158. Asphalt shingles shall meet the classification requirements of Table ~~1504.2~~ 1504.2.1 for the appropriate maximum *basic wind speed*. Asphalt shingle packaging shall bear a *label* to indicate compliance with ASTM D7158 and the required classification in Table ~~1504.2~~ 1504.2.1.

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 ~~1504.2~~ 1504.2.1.

TABLE ~~1504.2~~ 1504.2.1 CLASSIFICATION OF STEEP SLOPE ROOF SHINGLES TESTED IN ACCORDANCE WITH ASTM D3161 OR D7158

MAXIMUM BASIC WIND SPEED, *V*, FROM FIGURES 1609.3(1)– (4) OR ASCE 7(mph)	MAXIMUM ALLOWABLE STRESS DESIGN WIND SPEED, V_{asd}, FROM Table 1609.3.1 (mph)	ASTM D7158 [a] CLASSIFICATION	ASTM D3161 or UL 7103 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	H	F
181	140	H	F
194	150	H	F

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

a. The standard calculations contained in ASTM D7158 assume Exposure Category B or C and building height of 60 feet or less. Additional calculations are required for conditions outside of these assumptions.

Add new text as follows:

1504.2.2 Wind resistance of hip and ridge shingles. Hip and ridge shingles shall comply with Section 1504.2.2.1 or 1504.2.2.2.

1504.2.2.1 Testing of hip and ridge shingles. Hip and ridge shingles shall be tested and classified in accordance with the wind test requirements in UL 2375 modified to use a wind speed of 110 mph (177 km/hr). Hip and ridge shingle packaging shall bear a *label* to indicate compliance with the modified version of UL 2375.

1504.2.2.2 Prescriptive alternative for attaching hip and ridge shingles. Prior to installing each hip or ridge shingle, two minimum 1-inch diameter spots of roof cement complying with ASTM D3019 or ASTM D4586 shall be placed on each side of the hip or ridge. The spots shall be placed near the leading edge and fully covered by the exposed portion of the hip or ridge shingle. Each hip or ridge shingle shall be fastened in accordance with the hip or ridge shingle manufacturer's installation instructions.

Revise as follows:

1504.4.3 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 ~~1504.2~~ 1504.2.1 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 ~~1504.2~~ 1504.2.1.

1504.4.4 Slate shingles. Slate shingles shall be tested in accordance with ASTM D3161. Slate packaging shall bear a *label* indicating compliance with ASTM D3161 and the required classification in Table ~~1504.2~~ 1504.2.1.

1507.2.5 Fasteners. Fasteners for asphalt shingles, including hip and ridge shingles, shall be galvanized, stainless steel, aluminum or copper roofing nails, minimum 12-gage [0.105 inch (2.67 mm)] shank with a minimum $^{3}/_{8}$-inch-diameter (9.5 mm) head, complying with ASTM F1667, of a length to penetrate through the roofing materials and not less than $^{3}/_{4}$ inch (19.1 mm) into the roof sheathing. Where the roof sheathing is less than $^{3}/_{4}$ inch (19.1 mm) thick, the nails shall penetrate through the sheathing. ~~Fasteners shall comply with ASTM F1667.~~

1507.16.8 Wind resistance. BIPV shingles shall comply with the classification requirements of Table 1504.2.1 for the appropriate maximum *basic wind speed* .

Add new standard(s) as follows:

UL

UL LLC
333 Pfingsten Road
Northbrook, IL 60062

2375-2006	Outline for Hip and Ridge Shingles

S5-25 Part I

S5-25 Part II

IRC: R905.2.4.2 (New), R905.2.4.2.1 (New), R905.2.4.2.2 (New), R905.2.5, UL Chapter 44 (New)

Proponents: Aaron Phillips, representing Asphalt Roofing Manufacturers Association (aphillips@asphaltroofing.org)

2024 International Residential Code

Add new text as follows:

R905.2.4.2 Wind resistance of hip and ridge shingles. Hip and ridge shingles shall comply with Section R905.2.4.2.1 or R905.2.4.2.2.

R905.2.4.2.1 Testing of hip and ridge shingles. Hip and ridge shingles shall be tested and classified in accordance with the wind test requirements in UL 2375 modified to use a wind speed of 110 mph (177 km/hr). Hip and ridge shingle packaging shall bear a *label* to indicate compliance with the modified version of UL 2375.

R905.2.4.2.2 Prescriptive alternative for attaching hip and ridge shingles. Prior to installing each hip or ridge shingle, two minimum 1-inch diameter spots of roof cement complying with ASTM D3019 or ASTM D4586 shall be placed on each side of the hip or ridge. The spots shall be placed near the leading edge and fully covered by the exposed portion of the hip or ridge shingle. Each hip or ridge shingle shall be fastened in accordance with the hip or ridge shingle manufacturer's installation instructions.

Revise as follows:

R905.2.5 Fasteners. Fasteners for asphalt shingles, including hip and ridge shingles, shall be galvanized steel, stainless steel, aluminum or copper roofing nails, minimum 12-gage [0.105 inch (3 mm)] shank with a minimum $^3/_8$-inch-diameter (9.5 mm) head, complying with ASTM F1667, of a length to penetrate through the roofing materials and not less than $^3/_4$ inch (19.1 mm) into the roof sheathing. Where the roof sheathing is less than $^3/_4$ inch (19.1 mm) thick, the fasteners shall penetrate through the sheathing.

Add new standard(s) as follows:

UL

UL LLC
333 Pfingsten Road
Northbrook, IL 60062

2375-2006	Outline for Hip and Ridge Shingles

Reason: Areas of roofing systems where wind flow is diverted, such as at hips and ridges, may generate larger uplift pressures, making the products installed in these areas more vulnerable to damage in windstorms. Post-storm investigations conducted by the Federal Emergency Management Agency and other stakeholders document the vulnerability of these transition areas. Although post-storm investigations do not identify specific causes for damage to hip and ridge shingles during wind events, the associated observations that products are sometimes damaged in these areas is a reason to consider improved testing or installation options to reduce the likelihood of damage.

This proposal adds a new requirement that hip and ridge shingles used on asphalt shingle roofs either demonstrate compliance to a third-party test that evaluates wind resistance, or be installed using a prescriptive method designed to increase resistance to uplift in wind events. Also, it clarifies that fasteners used to install hip and ridge shingles are to comply with the existing asphalt shingle fastener requirements, and makes an editorial change in the IBC to position the reference to ASTM F1667 with the other fastener requirements instead of as a stand-alone sentence.

UL 2375 is a fan-induced wind resistance test which is modified from ASTM D3161 specifically for testing hip and ridge shingles. Decks are constructed to simulate a roof ridge, and tests are conducted in two orientations (i.e., with fan-induced wind perpendicular or parallel to the ridge). Like ASTM D3161, UL 2375 is conducted at a fixed wind speed for two hours. As written, UL 2375 is performed at 60 mph. Therefore, the proposal modifies the wind test speed to 110 mph to align with the Class F designation associated with ASTM D3161.

In the IBC, renumbering of Table 1504.2 to 1504.2.1 is addressed in all sections which currently reference the table.

Cost Impact: Increase

Estimated Immediate Cost Impact:

A best-case scenario would result in $0 cost impact to the consumer. This would occur if the installer (in the case of the prescriptive option) or the manufacturer (in the case of the testing option) elects not to pass any cost increase along.

Estimated Immediate Cost Impact Justification (methodology and variables):

This proposal introduces new requirements applicable to hip and ridge shingles. The two compliance options may both increase cost of construction, since there will be a cost associated with either conducting the UL 2375 test and managing associated labeling or with the use of roof cement for the prescriptive installation method. However, the actual cost experienced by the consumer is directly related to unknown future behavior of the product manufacturer (in the case of the testing option) and the installer (in the case of the prescriptive option).

Estimate of Material Costs for Prescriptive Installation:

Material cost for the prescriptive installation option may be estimated as follows:

- Assume a roof cement cost of approximately $5 per 10.1 oz. tube (example, based on online search for ASTM D4586 roof cement).
- Assume four spots per shingle of exactly a one-inch diameter and exactly 1/8 inch thickness.
- Assume hip or ridge shingle exposure of five inches, which requires 2.4 shingles per linear foot.
- Estimated volume of roof cement per shingle is 0.5 in. x 0.5 in. x 3.14 x 0.125 in. x 4 spots/shingle, which calculates to 0.3925 cu.in. per shingle.
- Estimated volume of roof cement per linear foot of hip or ridge is 0.3925 cu.in. x 2.4 shingles per linear foot, which calculates as 0.942 cu.in. per linear foot.
- Estimated cost per cubic inch of sealant is $5 per 10.1-ounce tube ÷ 18.23 cu.in. per 10.1 ounces, which calculates as $0.274 per cu.in.
- Estimated cost per linear foot is 0.942 cu.in./linear foot x $0.274 per cu in., which calculates as $0.26 per linear foot.

There may be additional labor costs for this prescriptive installation, but those are not estimated.

Costs Associated with Testing Option:

Two costs are applicable—the cost of obtaining an initial listing and the cost of maintaining that listing. In many cases, hip and ridge products may already have the appropriate listing in place so there will be no additional cost for this option if this proposal is accepted. In cases where a listing does not exist, some additional cost will be incurred, but it is unknown whether those costs will be passed to the consumer.

Staff Analysis: A review of the standard proposed for inclusion in the code, UL 2375-2006 Outline for Hip and Ridge Shingles, with regard to some of the key ICC criteria for referenced standards (Section 4.6 of CP#28) will be posted on the ICC website on or before April 1, 2025.

S5-25 Part II

S6-25

IBC: 1504.2, TABLE 1504.2

Proponents: Mark S. Graham, representing National Roofing Contractors Association (NRCA) (mgraham@nrca.net)

2024 International Building Code

1504.2 Wind resistance of asphalt shingles. Asphalt shingles shall be tested in accordance with ASTM D7158. Asphalt shingles shall meet the classification requirements of Table 1504.2 for the appropriate maximum *basic wind speed*. Asphalt shingle packaging shall bear a *label* to indicate compliance with ASTM D7158 and the required classification in Table 1504.2.

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 1504.2.

Revise as follows:

TABLE 1504.2 CLASSIFICATION OF STEEP SLOPE ROOF SHINGLES TESTED IN ACCORDANCE WITH ASTM D3161 OR D7158

MAXIMUM BASIC WIND SPEED, *V*, FROM FIGURES 1609.3(1)– (4) OR ASCE 7(mph)	MAXIMUM ALLOWABLE STRESS DESIGN WIND SPEED, V_{asd}, FROM Table 1609.3.1 (mph)	ASTM D7158 [a] CLASSIFICATION	ASTM D3161 or UL 7103 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~~ Not permitted
168	130	H	~~F~~ Not permitted
181	140	H	~~F~~ Not permitted
194	150	H	~~F~~ Not permitted

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

a. The standard calculations contained in ASTM D7158 assume Exposure Category B or C and building height of 60 feet or less. Additional calculations are required for conditions outside of these assumptions.

Reason: This proposed code change is intended to correlate maximum allowable wind speeds with the applicable test method's resistances to wind velocities.

ASTM D3161 provides for three classes, as follows:

- Class A--Pass at a test velocity of 60 mph
- Class D--Pass at a test velocity of 90 mph
- Class F--Pass at a test velocity of 110 mph

A copy of ASTM D3161-20, which is referenced in Chapter 35, is attached for reference. The classifications appear in ASTM D3161's Section 4-Classes of Steep Slope Roofing Proeducts.

IBC 2024's Table 1504.2 currently permits shingle-type roof coverings to be used at wind speeds higher than their ASTM D3161 tested classifications. This proposed code changes revises the allowable classifications in the table's ASTM D3161 column to properly correlate with tested the maximum ASD wind speed (V_{asd}).

IBC 2024 Table 1504.2's ASTM D7158 column classifications already properly correlate with ASTM D7158, so no changes are needed in this particular column.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

For asphalt shingles with self-seal strips, while this proposed code change will limit use of allowable wind resistance classifications based on the ASTM D3161 test method, other permissable classifications are already in-place using the ASTM D7158 test method addressing higher wind speeds.

Table 1504.2's ASTM D3161 or UL 7103 Classification column also applies to metal roof shingles (Section 1504.4.3), slate shingles (Section 1504.4.4) and BIPV shingles (Section 1507.16.6). While properly correlating the table with ASTM D3161's classifications will no longer permit use of these particular roof coverings in areas having a maximum basic wind speed, *V*, above 142 mph, or a maxmium allowable ASD wind speed, V_{asd}, above 110 mph, alterantive roof covering types are available at equal or lower costs. Therefore, there is no impact on the cost of construction resulting form this code change proposal.

S6-25

S7-25

IBC: 1504.4.1, SPRI Chapter 35 (New)

Proponents: Amanda Hickman, The Hickman Group, representing Single-Ply Roofing Industry (SPRI) (amanda@thehickmangroup.com)

2024 International Building Code

Revise as follows:

1504.4.1 Other roof systems. Built-up, modified bitumen, ~~fully adhered or mechanically attached~~ single-ply roof systems, metal panel roof systems applied to a solid or closely fitted deck and other types of membrane *roof coverings* shall be tested in accordance with FM 4474, UL 580 or UL 1897 <u>and shall be bonded or mechanically attached in accordance with tested configurations that meet the requirements of this section and ANSI/SPRI WD-1. The wind uplift resistance for base sheets, insulation and membrane shall be as determined by the test methods in accordance with FM 4474, UL 580 or UL 1897</u>.

Add new standard(s) as follows:

SPRI

Single-Ply Roofing Industry
465 Waverly Oaks Road, Suite 421
Waltham, MA 02452

<u>ANSI/SPRI WD-1 2025</u> <u>Wind Design Standard Procedure for Roofing Assemblies</u>

Reason: The current code requirements for wind design uplift lack the specificity and rigor needed to address the vulnerabilities of roofing assemblies. The generalized guidelines in the IBC often fall short when it comes to the demands of critical roof zones—field, perimeter, and corner (Zone 1', Zone1, Zone 2, Zone 3)—leaving gaps in installation to enforce assurance of performance. This lack of requirement can result in underperforming roof assemblies, especially in high wind events, presenting significant risks to building occupants and long-term asset protection.

Incorporating ANSI/SPRI WD-1 into the building code offers a much-needed solution to these limitations. This standard provides a mathematically engineered methodology specifically for roofing systems, ensuring compliance with wind design uplift as referenced in performance requirements of the code. Unlike the generalized guidelines in the IBC, ANSI/SPRI WD-1 delivers actionable guidance, empowering designers to achieve a greater reliability on occupancy's safety and roof assembly performance.

The standard also integrates robust testing protocols, such as FM 4474, UL 580 and UL 1897, that directly evaluate the wind uplift resistance of roofing assemblies. These protocols ensure that tested assemblies are not only compliant with the building code but also proven to perform. Furthermore, ANSI/SPRI WD-1 offering clear instructions for optimizing wind performance in the most vulnerable roof areas.

By requiring compliance with ANSI/SPRI WD-1, the building codes can bridge the gap between missing requirements and the level of safety for occupants and performance demanded by today's roofing challenges. This standard provides the clarity and precision needed to protect lives, reduce property damage, and ensure resilience in the face of increasingly severe wind events.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

Although this code change mandates compliance with ANSI/SPRI WD-1, implementing this methodology will not result in additional costs. The reason compliance with ANSI/SPRI WD-1 will not lead to increased costs lies in the methodology's integration with standard construction practices and materials already in use. ANSI/SPRI WD-1 provides a set of guidelines and calculations for wind design of low-slope roofing systems, which aligns with industry norms. Since most contractors and designers are already familiar with these practices and materials required for compliance, there is no significant deviation from current procedures that would drive up costs. Additionally, the tools and resources needed to implement this standard are readily accessible, minimizing any additional investment.

Staff Analysis: A review of the standard proposed for inclusion in the code, ANSI/SPRI WD-1 2025 Wind Design Standard Procedure for Roofing Assemblies, with regard to some of the key ICC criteria for referenced standards (Section 4.6 of CP#28) will be posted on the ICC website on or before April 1, 2025.

CC # S7-25 and CC # S8-25 addresses requirements in a different or contradicting manner. The committee is urged to make their intensions clear with their actions on these proposals.

S7-25

S8-25

IBC: 1504.4.1, 1504.4.1 (New), 1504.4.1.1 (New), 1504.4.1.2 (New), 1504.4.1.2.1 (New), 1504.4.1.2.2 (New), MCA (New)

Proponents: Robert A. Zabcik, Z-tech Consulting LLC, representing Metal Construction Association (bob@ztech-consulting.com)

2024 International Building Code

Revise as follows:

~~**1504.4.1**~~**1504.4.5 Other roof systems.** Built-up, modified bitumen, fully adhered or mechanically attached single-ply roof systems~~, metal panel roof systems applied to a solid or closely fitted deck~~ and other types of membrane *roof coverings* shall be tested in accordance with FM 4474, UL 580 or UL 1897.

Add new text as follows:

1504.4.1 Metal roof panel systems over deck. *Metal roof panel* systems applied to a solid or closely fitted deck shall be tested in accordance with this section. Wind resistance shall be taken as the average result from a minimum of two tests. A minimum 2 to 1 margin of safety shall apply for *allowable stress design* and a strength reduction factor of no more than 0.7 shall apply for *load and resistance factor design*.

1504.4.1.1 Non-Hurricane-prone regions. *Metal roof panels* in non-hurricane-prone regions shall be tested in accordance with FM 4474, UL 580 or Part I of UL 1897.

1504.4.1.2 Hurricane-prone regions. *Metal roof panels* and related hip, ridge and edge systems in *hurricane-prone* regions shall be tested in accordance with Section 1504.4.1.2.1 and 1504.4.1.2.2.

1504.4.1.2.1 Metal roof panels. *Metal roof panels* shall be tested in accordance with FM 4474 or UL 580. When UL 580 is used and wind resistance in excess of that provided by Class 90 is required for design, UL 1897 Part I shall be used to determine wind resistance as follows:

1. The positive pressure applied below the assembly shall be held at 48.5 psf (240 kPa) throughout the test.
2. The negative pressure applied above the assembly shall be 63.5 psf (310 kPa) initially and increased in intervals of 15 psf (75 kPa). Each interval shall be held for at least one minute.
3. The wind resistance shall be taken as the average of the highest completed interval of no fewer than two samples subsequent to completing Phase 5 of the Class 90 test sequence of UL 580.

1504.4.1.2.2 Metal edge systems. Metal hip, ridge, and edge systems, excluding gutters, shall be tested for uplift resistance in accordance with ANSI/MCA FTS-1.

MCA

Metal Construction Association
1601 American Lane Suite 310
Schaumburg, IL 60631

ANSI/MCA FTS-1 2019	Test Method for Wind Load Resistance of Flashings Used with Metal Roof Systems

Reason: The purpose of this proposal is to clarify existing and add new requirements to determination of wind load resistance values of metal roof panel assemblies over solid or closely fitted deck, especially in hurricane-prone regions. These changes are consistent with the recommendations of FEMA P-2342 and also align with the Florida Building Code (FBC) Test Application Standard TAS-125, which is widely used in the metal roofing industry and is considered the best testing practice of these systems. However, it does NOT require any third-party listing like FBC. It also moves the other roofs section (Currently 1504.4.1) to 1504.4.5 as "other" is typically used at the end of a list, not the beginning. The technical changes fall into four general areas and are discussed in detail as shown below:

1. Stipulations for the required number of tests and applicable margin of safety for allowable stress design.
2. Providing a strength reduction coefficient (a.k.a. phi factor) needed for the application of load and resistance factor design.
3. Introduction of new test requirements for edge, hip and roof systems to address issues observed by FEMA in their Hurricane Ian investigation.
4. Provide a test methodology consistent with TAS-125, addressing limitations of UL 580, which terminates at 105 psf instead of progressing to failure.

Items 1 and 2

Item 1 is self-explanatory. Item 2 is similar to Item 1 and is needed because ASCE 7, the cited load standard in Chapter 16 if IBC, has been positioning to remove allowable stress design provisions for some time and it seems that load and resistance factor design is the future. These items apply in both hurricane prone and non-hurricane prone regions.

Item 3

Item 3 only applies within hurricane-prone regions, as defined by IBC and adds requirements for testing of ridge, hip and edge metal systems similar to those currently in place for low-slope built-up, modified bitumen and single-ply roof systems in Section 1504.6. It is being put forth to address issues observed by the Roofing Industry Committee on Weather Issues (RICOWI) through their Windstorm Investigation Program (WIP) as well as FEMA's Hurricane Ian investigation. The test standard cited, ANSI/MCA FTS-1-2019, was developed by MCA through the Single Ply Roofing Institute’s (SPRI) ANSI-accredited canvassing process. The RICOWI and FEMA WIP field studies revealed instances where metal ridge, hip and/or edge system were torn from the perimeter of a building with a metal roof, exposing a longer leading edge of the incorporated roof panel and initiating a partial failure of the roof system, particularly near the corners and gable edges of the roof. Although the damage was very localized, it did allow water to enter the building and in cases, the edge metal became a wind-borne debris threat. Most commonly, this occurred in two situations:

- Where a multi-piece edge trim assembly incorporating cleats deformed enough to disengage from the cleat.
- Where the metal edge trim assembly was fastened to a non-metal substrate such as wood or masonry, leaving to question the appropriateness of the fastener used since it would often not be provided by the edge system manufacturer for non-metal substrates.

The figures in the attachment depict these conditions. These tendencies were also observed by FEMA in their Mitigation Assessment Team Report for Hurricane Ian. (https://tinyurl.com/mmrstxju.) Section 6.3 of this report includes Conclusion FL-10, recommending that FEMA support industry stakeholders in supporting code change proposals to requiring testing of hip and ridge roof coverings. (FEMA P-2342, Page 6-9 see excerpt)

Item 4

Item 4 also only applies in hurricane-prone regions and clarifies application of UL 580 and UL 1897 to determine appropriate wind load resistance values as represented by common industry practice and in a manner consistent with FBC TAS-125. UL 580 and 1897 are very different tests. UL 1897 utilizes steady-state load sequencing progressing until system failure and often takes less than 20 minutes to complete. However, UL 580 is designed to evaluate overall system integrity using a cyclic load sequence and yields a performance rating (Classification) from a fixed set of options. UL 580 involves two separate hour-long periods of cyclic loading and is generally considered the more rigorous test, but the test standard does not allow for additional testing to failure once the highest classification (Class 90) is achieved. Class 90 provides a net uplift value of 105 psf, which equates to a safe working load of 52.5 psf. With the current version of ASCE 7 Chapter 30, this result is not useful in the extreme edge or corner zones of roofs in hurricane-prone regions of the US. This issue is addressed by the proposed additions, which are based on the Florida Test Application Standard TAS-125. This standard uses UL 580 as a base qualification test but then allows the metal roof panel manufacturer to perform additional testing using a modified UL 1897 sequence until failure is observed. This process is repeated at least once more and a margin of safety of two is applied to the average result for the purposes of allowable stress design. This qualifies the panel for wind load resistance higher than the 105 psf net load given by Class 90 of UL 580 and ensures repeatability. Although TAS-125 listing is only a requirement in the High Velocity Hurricane Zone as defined by the Florida Building Code, the underlying methodology has become the de-facto way to derive allowable design loads within the metal roofing industry for all locales.

This proposal is being brought forward by The Metal Construction Association. (MCA) Founded in 1983, the MCA is a 501(c)(6) organization promoting the use of metal in the building envelope by bringing together manufacturers and suppliers of metal products used in structures throughout the world to collaborate on marketing, education and advocacy. For more information, see the MCA website at www.metalconstruction.org.

- **Figures and Excerpt for Proposal 11122.pdf**
  https://www.cdpaccess.com/proposal/11122/35660/documentation/184858/attachments/download/9755/

Bibliography:

1. Federal Emergency Management Association (FEMA); Mitigation Assess Team Report Hurricane Ian in Florida; FEMA P-2342, December 2023; Page 6-9.
2. Roofing Industry Committee on Weather Issues (RICOWI); Wind Investigation Report: Hurricane Ian; September 2023; Pages 87-90.

Cost Impact: Increase

Estimated Immediate Cost Impact:

This change would increase the cost of construction indirectly as the cost of the testing would presumably be passed to the consumer for those products to be approved for use in hurricane-prone regions of the US. However, the impact is miniscule, conservatively estimated as less than 0.5% of initial building cost. This estimate ignores the benefit of any lowered operating costs, such as insurance, as well as any benefit over time, such as longer asset life.

Estimated Immediate Cost Impact Justification (methodology and variables):

ANSI/MCA FTS-1 testing is estimated to be $1,500/test and most manufacturers carry 4-8 styles of edge metal systems different enough to test separately. Thus, total cost is estimated to be $36,000. Similarly, additional UL 580/1897 testing required for wind resistance of the panel system is estimated as $2,500 per test over a product line of 8 profiles for $40,000. This is a total of $76,000 to carry both. If this cost is accrued over the life of the product lines, assumed to be at least 1,000 buildings, it results in a nominal increase of at most $76 per building. A typical building of this construction is 5,000 square feet of roof area at $6/square foot and 600 lineal feet of edge/hip/ridge materials valued at $5/lineal foot, this represents a total cost of $33,000 installed. At a total cost of $30/square foot, the building would be $150,000, making the roof 22% of the total cost, which is consistent with industry estimation practices. The increase over the total building cost is 76/150,000, or 0.5%.

Note: Cost estimates are based on general experience of industry stakeholders and are not available publicly due to antitrust restrictions.

Staff Analysis: A review of the standard proposed for inclusion in the code, ANSI/MCA FTS-1 2019 Test Method for Wind Load Resistance of Flashings Used with Metal Roof Systems, with regard to some of the key ICC criteria for referenced standards (Section 4.6 of CP#28) will be posted on the ICC website on or before April 1, 2025.

CC # S8-25 and CC # S7-25 addresses requirements in a different or contradicting manner. The committee is urged to make their intensions clear with their actions on these proposals.

S8-25

S9-25

IBC: 1504.4.5 (New)

Proponents: Mark S. Graham, representing National Roofing Contractors Association (NRCA) (mgraham@nrca.net)

2024 International Building Code

Add new text as follows:

1504.4.5 BIPV shingles. BIPV shingles shall be tested for wind resistance and *listed* and *labeled* in accordance with UL 7103 and shall meet the classification requirements of Table 1504.2.

Reason: This code change proposal adds specific requirements for wind resistance of BIPV shingles to IBC 2024's Section 1504-Performance Requirements. Wind resistance testing is already included in UL7103, which is referenced in Sec. 1507.16.6. This proposed code change clarifies the code by including BIPV shingles' wind resitance in the same section as other roof covering types.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

This code change proposal is a clarification and does not increase or decrease the stringency of the code or have an impact on the cost of construction.

S9-25

S10-25

IBC: 1504.6

Proponents: Mark S. Graham, representing National Roofing Contractors Association (NRCA) (mgraham@nrca.net)

2024 International Building Code

Revise as follows:

1504.6 Metal edge ~~Edge~~ systems for low-slope roofs. Metal ~~edge systems, except gutters and counterflashing,~~ coping, fascia and gravel stop at the perimeter edges ~~installed~~ on built-up, modified bitumen and single-ply ~~roof systems on a~~ *low-slope* roofs shall be designed and installed for wind *loads* in accordance with Chapter 16 and tested for resistance in accordance with ~~Test Methods RE-1, RE-2 and RE-3 of~~ ANSI/SPRI/FM 4435/ES-1~~, except *basic wind speed , V*, shall be determined from Figures 1609.3(1)through 1609.3(4), as applicable~~. The wind *loads* shall be determined using *allowable stress design*.

Exceptions:

1. Coping, fascia and gravel stop constructed of cold-formed steel shall be designed and tested in accordance with the applicable reference structural design standard in Section 2204.1.
2. Coping, fascia and gravel stop constructed of aluminum shall be designed and tested in accordance with the applicable referenced structural design standard in Section 2002.1.

Reason: This proposed code change is intended to clarify the code. Section 1504.6, which is a requirement for the design and testing of roofs' metal edge systems, was first added to IBC 2003. Since that time, this section has been modified several times, has gotten a bit confusing and is in need of some clarity. The following changes are proposed here:

- Change the title from "Edge systems..." to "Metal edge systems...". The section's text and referenced standard apply specifically to metal edge systems and not other types of roof edge systems, such as stone or masory copings.
- In the text, instead of indicating "...edge systems, except gutters and counterflashing...", indicate the metal edge types the requirement specifically applies to--that is coping, fascia and gravel stop. Gutters are addressed in Section 1504.6.1.
- Strike the references to ANSI/SPRI ES-1's Test Methods RE-1, RE-2 and RE-3 as these are individual test applicable to specific edge metal profiles. All three test methods (i.e., the "and") do not apply to a specific metal profile. For example, Test Method RE-1 applies to fascia or gravel stop used with dependently terminated roof membranes. Test Method RE-2 applies to fascia and gravel stop used with dependently or independently terminated roof membranes. Test Method RE-1 applies to copings. In some instances, both Test Methods RE-1 and RE-2 will be apply. The ANSI/SPRI ES-1 standard indicates which test methods apply to specific specific metal profiles.
- Change the reference of the standard from "ANSI/SPRI ES-1" to "ANSI/SPRI/FM 4435/ES-1", which is consistent with the current standard designation and reference in IBC Chapter 35.
- The qualifying statement "...except *basic wind speed*...applicable." is no longer needed. Previous editions of ANSI/SPRI ES-1 included its own procedure for determined design wind loads. Design wind load determination is no longer included in the current version of ANSI/SPRI ES-1; the standard now only deals with load resistance. The determination of design wind loads in accordance with Chapter 16 is now required making this qualifying statement unnecessary.
- Add the sentence permitting the use of allowable stress design. This is consistent with Section 1504.4 and Section 1609.3.1.
- Exceptions have been added allowing for design and testing of steel and aluminum coping, fascia and gravel stop in accorance with AISI S100, or AA ASM 35 and AA ADM, respectively. These exceptions are consistent with what already appears in Section 1504.4.2 regarding structural metal panel roofs.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

This code change proposal is clarifying in nature and does not change the stringency of the code. As a result, this code change proposal will not increase or decrease the cost of construction.

S11-25

IBC: 1504.6.1

Proponents: Amanda Hickman, The Hickman Group, representing Single-Ply Roofing Industry (SPRI) (amanda@thehickmangroup.com)

2024 International Building Code

Revise as follows:

1504.6.1 Gutters ~~securement~~ for low-slope roofs. Gutters ~~that are used to secure the perimeter edge of the roof membrane~~ on *low-slope* built-up, modified bitumen, and single-ply roofs, shall be designed, constructed and installed to resist wind loads in accordance with Section 1609 and shall be tested in accordance with ~~Test Methods G-1 and G-2 of~~ ANSI/SPRI GT-1.

Reason: Gutter failures can lead to roof damage, regardless of whether the gutters are directly securing the roof. Such failures can result in costly repairs, water intrusion, and safety hazards. Testing all systems to the GT-1 standard helps mitigate these risks, offering significant long-term savings for building owners.

While GT-1 test methods G-1 and G-2 evaluate horizontal and vertical wind loads, the inclusion of Test Method G-3 completes the performance assessment by addressing static downward forces. This comprehensive testing approach ensures gutters can withstand all critical forces they may face.

Incorporating Test Method G-3 strengthens the reliability of gutter systems, ensuring they perform effectively under the combined stresses of wind, water, snow, and ice.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

When gutters are tested per GT-1 all three tests including G-3 are performed, so there is no additional testing required, or additional expense incurred, to require all three. Requiring gutters to be tested to GT-1 overall is nominal because it's spread over the entire product line and does not result in a cost increase.

S11-25

S12-25

IBC: [BF] 1505.10, 1507.15, 1507.15.1 (New), [BF] 1507.15.1; IFC: 317.1

Proponents: Robert Marshall, representing FCAC (fcac@iccsafe.org); Jeff Grove, Chair, representing Building Code Action Committee (BCAC) (bcac@iccsafe.org)

2024 International Building Code

Revise as follows:

[BF] 1505.10 Landscaped and vegetative roofs. Landscaped and *vegetative roofs* shall comply with Sections 1505.1 and 1507.15. ~~*Vegetative roofs* shall be installed in accordance with ANSI/SPRI VF-1.~~

1507.15 Vegetative roofs and landscaped roofs. *Vegetative roofs* and *landscaped roofs* shall comply with the requirements of this chapter~~,~~and Section 1607.14~~ and the *International Fire Code* ~~. *Vegetative roofs* shall be installed in accordance with ANSI/SPRI VF-1.

Add new text as follows:

1507.15.1 Roof drainage. *Vegetative roofs* and *landscaped roofs* shall be provided with roof drainage in accordance with Section 1502.

Revise as follows:

[BF] ~~1507.15.1~~1507.15.2 Structural fire resistance. The structural frame and roof construction supporting the load imposed on the roof by the *vegetative roof* or *landscaped roofs* shall comply with the *fire-resistance-rating* requirements of Table 601.

2024 International Fire Code

Revise as follows:

317.1 General. Vegetative roofs and landscaped roofs shall ~~comply with Sections 1505 and~~ be installed in accordance with Section 1507.15 of the International Building Code and be ~~installed and~~ maintained in accordance with Sections 317.2 through 317.4.

Reason: IBC Reason Statement: This proposal relocates the reference to the vegetative roof standard ANSI/SPRI VF-1 to the more appropriate section of the code. There is a corresponding IFC proposal that updated the pointer to this section. Additionally, a pointer to the roof drainage section is also being added to make it clear that the roof drainage requirements shall also apply.

IFC Reason Statement: Vegetative roofs are intricate systems that require effective coordination across various disciplines and codes for their proper design, installation, and maintenance. The language in this section was originally taken from a previous edition of ANSI/SPRI VF-1, however the code with respect to vegetative and landscaped roofs has undergone many revisions over the years. This proposal provides the appropriate section in the IBC which references ANSI/SPRI VF-1 (the applicable installation standard) for vegetative roofs.

Link to SPRI VF-1 Standard: https://www.spri.org/download/ansi-spri_standards_2020_restructure/vf-1/ANSI-SPRI-VF-1-2023-External-Fire-Design-Standard-for-Vegetative-Roofs.pdf

This proposal is submitted jointly by the ***ICC Building Code Action Committee (BCAC)*** and the ***ICC Fire Code Action Committee (FCAC)***.

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. In 2023 and 2024 the BCAC has held several virtual meetings open to any interested party. In addition, there were numerous virtual Working Group meetings for the current code development cycle, which included members of the committee as well as interested parties. Related documents and reports are posted on the BCAC website at **BCAC webpage**.

FCAC was established by the ICC Board of Directors in July 2011 to pursue opportunities to improve and enhance assigned

International Codes or portions thereof. In 2023 and early 2024 the FCAC has held several virtual meetings and one in-person meeting open to any interested party. In addition, there were numerous virtual Working Group meetings for the current code development cycle, which included members of the committee as well as interested parties. Related documents and reports are posted on the **FCAC Website**

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

The proposal is editorial and only adds clarity to the appropriate IBC section which address roof installation.

Staff Analysis: CC # S12-25 and CC # S13-25 addresses requirements in a different or contradicting manner. The committee is urged to make their intensions clear with their actions on these proposals.

S12-25

S13-25

IBC: [BF] 1505.10, 1507.15, 1507.15.1 (New), [BF] 1507.15.1; IFC: 317.1

Proponents: Amanda Hickman, The Hickman Group, representing The Single-Ply Roofing Industry (SPRI) (amanda@thehickmangroup.com)

2024 International Building Code

Revise as follows:

[BF] 1505.10 Landscaped and vegetative roofs. *Landscaped* and *vegetative roofs* shall comply with Sections 1505.1 and 1507.15 . ~~*Vegetative roofs* shall be installed in accordance with ANSI/SPRI VF-1.~~

1507.15 Vegetative roofs and landscaped roofs. *Vegetative roofs* and *landscaped roofs* shall comply with the requirements of this chapter~~,~~and Section 1607.14 ~~and the *International Fire Code*~~. *Vegetative roofs* shall be installed in accordance with ANSI/SPRI VF-1.

Add new text as follows:

1507.15.1 Roof drainage. *Vegetative roofs* and *landscaped roofs* shall be provided with roof drainage in accordance with Section 1502.

Revise as follows:

[BF] ~~1507.15.1~~ 1507.15.2 Structural fire resistance. The structural frame and roof construction supporting the load imposed on the roof by the *vegetative roof* or *landscaped roofs* shall comply with the *fire-resistance-rating* requirements of Table 601.

2024 International Fire Code

Revise as follows:

317.1 General. *Vegetative roofs* and *landscaped roofs* shall comply with Sections~~s~~ 1505 and be installed in accordance with Section 1507.15 of the International Building Code and be ~~installed and~~ maintained in accordance with Sections 317.2 through 317.4.

Reason: IBC Reason Statement:

The more appropriate section for the reference to ANSI/SPRI VF-1 is IBC 1507.15. This proposal relocates it to that section. The second part of this proposal addresses the IFC Section 317 to update the pointer to the IBC relocated section. Additionally, a pointer to the roof drainage section is also being added to make it clear that the roof drainage requirements shall also apply.

IFC Reason Statement:

This proposal updates the pointer to the relocated IBC section (1507.15) for ANSI/SPRI VF-1 installation standard for vegetative roofs.

Link to SPRI Standard VF-1:

https://www.spri.org/download/ansi-spri_standards_2020_restructure/vf-1/ANSI-SPRI-VF-1-2023-External-Fire-Design-Standard-for-Vegetative-Roofs.pdf

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

The proposal is editorial and only adds clarity and links to the appropriate IBC sections.

Staff Analysis: CC # S13-25 and CC # S12-25 addresses requirements in a different or contradicting manner. The committee is urged to make their intensions clear with their actions on these proposals.

S14-25 Part I

IBC: TABLE 1507.1.1(2)

Proponents: Aaron Phillips, representing Asphalt Roofing Manufacturers Association (aphillips@asphaltroofing.org)

THIS IS A 2 PART CODE CHANGE. PART I WILL BE HEARD BY THE IBC STRUCTURAL CODE COMMITTEE. PART II WILL BE HEARD BY THE IRC-B CODE COMMITTEE. SEE THE TENTATIVE HEARING ORDER FOR THESE COMMITTEES.

2024 International Building Code

Revise as follows:

TABLE 1507.1.1(2) UNDERLAYMENT APPLICATION

ROOF COVERING	SECTION	MAXIMUM BASIC WIND SPEED, V < 130 MPH IN HURRICANE-PRONE REGIONS OR V < 140 MPH OUTSIDE HURRICANE-PRONE REGIONS	MAXIMUM BASIC WIND SPEED, $V \geq$ 130 MPH IN HURRICANE-PRONE REGIONS OR $V \geq$ 140 MPH OUTSIDE HURRICANE-PRONE REGIONS
Asphalt shingles	1507.2	Underlayment shall be one of the following: 1. For roof slopes from 2 units vertical in 12 units horizontal (2:12) to less than 4 units vertical in 12 units horizontal (4:12), underlayment shall be two layers applied in the following manner: Apply a strip of underlayment for the first course that is half the width of a full sheet parallel to and starting at the eaves, fastened sufficiently to hold in place. Starting at the eaves, apply a full-width sheet~~s~~ of underlayment~~,~~ for the second course. Apply the third course of underlayment, overlapping the second course by half the width of a full sheet plus a minimum of 2 inches. Overlap all successive courses by ~~sheets~~ half the width of a full sheet plus a minimum of 1 inch ~~2 inches~~. End laps shall be a minimum of 4 inches and shall be offset by a minimum of 6 feet. Distortions in the underlayment shall not interfere with the ability of the shingles to seal. 2. For roof slopes of 4 units vertical in 12 units horizontal (4:12) or greater, underlayment shall be one layer applied as follows: Underlayment shall be applied shingle fashion, parallel to and starting from the eaves and lapped a minimum of 2 inches. Distortions in the underlayment shall not interfere with the ability of the shingles to seal. End laps shall be a minimum of 4 inches and shall be offset by a minimum of 6 feet. 3. A single layer of self-adhering polymer modified bitumen underlayment complying with ASTM D1970, installed in accordance with the underlayment manufacturer's and roof covering manufacturer's ~~manufacturers'~~ installation instructions for the deck material, roof ventilation configuration, and climate exposure of the roof covering.	Underlayment shall be one of the following: 1. Two layers of mechanically fastened underlayment applied in the following manner: Apply a strip of underlayment ~~felt~~ for the first course that is half the width of a full sheet parallel to and starting at the eaves, fastened sufficiently to hold in place. Starting at the eaves, apply a full-width sheet~~s~~ of underlayment for the second course. Apply the third course of underlayment, overlapping the second course by half the width of a full sheet plus a minimum of 2 inches. Overlap all successive courses by ~~sheets~~ half the width of a full sheet plus a minimum of 1 inch~~2 inches~~. Distortions in the underlayment shall not interfere with the ability of the shingles to seal. End laps shall be a minimum of 4 inches and shall be offset by a minimum of 6 feet. 2. A strip not less than 4 inches in width of self-adhering polymer modified bitumen underlayment 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 complying with Table 1507.1.1(1) for the applicable roof covering and basic wind speed shall be applied over the entire roof over the 4-inch-wide membrane strips. Underlayment shall be applied in accordance with this table using the application requirements for where the maximum basic wind speed is less than 130 mph. 3. A single layer of self-adhering polymer modified bitumen underlayment complying with ASTM D1970, installed in accordance with the underlayment manufacturer's and roof covering manufacturer's ~~manufacurers'~~ installation instructions for the deck material, roof ventilation configuration and climate exposure of the roof covering.
Clay and concrete tile	1507.3	Underlayment shall be one of the following: 1. For roof slopes from 2 $^1/_2$ units vertical in 12 units horizontal (2 $^1/_2$:12) to less than 4 units vertical in 12 units horizontal (4:12), underlayment shall be not fewer than two layers applied in the following manner: Apply a strip of underlayment for the first course that is half the width of a full sheet parallel to and starting at the eaves , fastened sufficiently to hold in place. Starting at the eaves, apply a full-width sheet ~~strip~~ of underlayment ~~felt~~ for the second course. Apply the third course of underlayment, ~~shall be applied,~~ overlapping the second course by half the width of a full sheet plus a minimum of 2 inches. Overlap all successive courses by ~~sheets~~ half the width of a full sheet plus a minimum of 1 inch~~2 inches~~. End laps shall be a minimum of 4 inches and shall be offset by a minimum of 6 feet. 2. For roof slopes of 4 units vertical in 12 units horizontal (4:12) or greater, underlayment shall be one layer applied as follows: Underlayment shall be applied shingle fashion, parallel to and starting from the eaves and lapped a minimum of 2 inches. End laps shall be a minimum of 4 inches and shall be offset by a minimum of 6 feet. 3. A single layer of self-adhering polymer modified bitumen underlayment complying with ASTM D1970, installed in accordance with the underlayment manufacturer's and roof covering manufacturer's ~~manufacturers'~~ installation instructions for the deck material, roof ventilation configuration, and climate exposure of the roof covering.	Underlayment shall be one of the following: 1. Two layers of mechanically fastened underlayment applied in the following manner: Apply a strip of underlayment for the first course that is half the width of a full sheet parallel to and starting at the eaves, fastened sufficiently to hold in place. Starting at the eaves, apply a full-width sheet~~s~~ of underlayment~~,~~ for the second course. Apply the third course of underlayment, overlapping the second course by half the width of a full sheet plus a minimum of 2 inches. Overlap all successive courses by ~~sheets~~ half the width of a full sheet plus a minimum of 1 inch~~2 inches~~. ~~Distortions in the underlayment shall not interfere with the ability of the shingles to seal.~~ End laps shall be a minimum of 4 inches and shall be offset by a minimum of 6 feet. 2. A strip not less than 4 inches in width of self-adhering polymer modified bitumen underlayment 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 complying with Table 1507.1.1(1) for the applicable roof covering and basic wind speed shall be applied over the entire roof over the 4-inch-wide membrane strips. Underlayment shall be applied in accordance with this table using the application requirements for where the maximum basic wind speed is less than 130 mph. 3. A single layer of self-adhering polymer modified bitumen underlayment complying with ASTM D1970, installed in accordance with the underlayment manufacturer's and roof covering manufacturer's ~~manufacurers'~~ installation instructions for the deck material, roof ventilation configuration, and climate exposure of the roof covering.
Metal roof panels	1507.4		Underlayment shall be one of the following:
Metal roof shingles	1507.5		

Mineral-surfaced roll roofing	1507.6	Apply in accordance with the manufacturer's installation instructions	1. Two layers of mechanically fastened underlayment applied in the following manner: Apply a strip of underlayment for the first course that is half the width of a full sheet parallel to and starting at the eaves, fastened sufficiently to hold in place. Starting at the eaves, apply a full-width shee~~ts~~ of underlayment~~,~~ for the second course. Apply the third couse of underlayment, overlapping the second course by half the width of a full sheet plus a minimum of 2 inches. Overlap all successive courses by ~~successful sheets~~ half the width of a full sheet plus a minimum of 1 inch~~2 inches~~. ~~Distortions in the underlayment shall not interfere with the ability of the shingles to seal.~~ End laps shall be a minimum of 4 inches and shall be offset by a minimum of 6 feet. 2. A strip not less than 4 inches in width of self-adhering polymer modified bitumen underlayment 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 complying with Table 1507.1.1(1) for the applicable roof covering and basic wind speed shall be applied over the entire roof over the 4-inch-wide membrane strips. Underlayment shall be applied in accordance with this table using the application requirements for where the maximum basic wind speed is less than 130 mph. 3. A single layer of self-adhering polymer modified bitumen underlayment complying with ASTM D1970, installed in accordance with the underlayment manufacturer's and roof covering manufacturer's ~~manufacurers'~~ installation instructions for the deck material, roof ventilation configuration, and climate exposure of the roof covering.
Slate shingles	1507.7		
Wood shingles	1507.8		
Wood shakes	1507.9		
BIPV roof coverings	1507.16	Underlayment shall be one of the following: 1. For roof slopes from 3 units vertical in 12 units horizontal (3:12) to less than 4 units vertical in 12 units horizontal (4:12), underlayment shall be two layers applied in the following manner: Apply a strip of underlayment for the first course that is half the width of a full sheet parallel to and starting at the eaves , fastened sufficiently to hold in place. Starting at the eaves, apply a full-width shee~~ts~~ of underlayment~~,~~ for the second course. Apply the third course of underlayment, overlapping the second course by half the width of a full sheet plus a minimum of 2 inches. Overlap all successive courses by~~sheets~~ half the width of a full sheet plus a minimum of 1 inch~~2 inches~~. End laps shall be a minimum of 4 inches and shall be offset by a minimum of 6 feet. ~~Distortions in the underlayment shall not interfere with the ability of the shingles to seal.~~ 2. For roof slopes of 4 units vertical in 12 units horizontal (4:12) or greater, underlayment shall be one layer applied as follows: Underlayment shall be applied shingle fashion, parallel to and starting from the eaves and lapped a minimum of 2 inches. ~~Distortions in the underlayment shall not interfere with the ability of the shingles to seal.~~ End laps shall be a minimum of 4 inches and shall be offset by a minimum of 6 feet. 3. A single layer of self-adhering polymer modified bitumen underlayment complying with ASTM D1970, installed in accordance with the underlayment manufacturer's and roof covering manufacturer's ~~manufacturers'~~ installation instructions for the deck material, roof ventilation configuration, and climate exposure of the roof covering.	Underlayment shall be one of the following: 1. Two layers of mechanically fastened underlayment applied in the following manner: Apply a strip of underlayment for the first course that is half the width of a full sheet parallel to and starting at the eaves, fastened sufficiently to hold in place. Starting at the eaves, apply a full-width shee~~ts~~ of underlayment~~,~~ for the second course. Apply the third course of underlayment, overlapping the second course by half the width of a full sheet plus a minimum of 2 inches. Overlap all successive courses by ~~sheets~~ half the width of a full sheet plus a minimum of 1 inch~~2 inches~~. ~~Distortions in the underlayment shall not interfere with the ability of the shingles to seal.~~ End laps shall be a minimum of 4 inches and shall be offset by a minimum of 6 feet. 2. A strip not less than 4 inches in width of self-adhering polymer modified bitumen underlayment 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 complying with Table 1507.1.1(1) for the applicable roof covering and basic wind speed shall be applied over the entire roof over the 4-inch-wide membrane strips. Underlayment shall be applied in accordance with this table using the application requirements for where the maximum basic wind speed is less than 130 mph. 3. A single layer of self-adhering polymer modified bitumen underlayment complying with ASTM D1970, installed in accordance with the underlayment manufacturer's and roof covering manufacturer's ~~manufacurers'~~ installation instructions for the deck material, roof ventilation configuration, and climate exposure of the roof covering.

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

S14-25 Part I

S14-25 Part II

IRC: TABLE R905.1.1(2)

Proponents: Aaron Phillips, representing Asphalt Roofing Manufacturers Association (aphillips@asphaltroofing.org)

2024 International Residential Code

Revise as follows:

TABLE R905.1.1(2) UNDERLAYMENT APPLICATION

ROOF COVERING	SECTION	AREAS WHERE WIND DESIGN IS NOT REQUIRED IN ACCORDANCE WITH FIGURE R301.2.1.1	AREAS WHERE WIND DESIGN IS REQUIRED IN ACCORDANCE WITH FIGURE R301.2.1.1
Asphalt shingles	R905.2	Underlayment shall be one of the following: 1. For roof slopes from 2 units vertical in 12 units horizontal (2:12)~~, up~~ to less than 4 units vertical in 12 units horizontal (4:12), underlayment shall be two layers applied in the following manner: ~~a~~Apply a strip of underlayment for the first course that is half the width of a full sheet parallel to and starting at the eaves, fastened sufficiently to hold in place. Starting at the eave, apply a full-width shee~~ts~~ of underlayment~~,~~ for the second course. Apply the third course of underlayment, overlapping the second course by half the width of a full sheet plus a minimum of 2 inches. Overlap all successive courses by ~~sheets~~ half the width of a full sheet plus a minimum of 1 inch~~2 inches~~. Distortions in the underlayment shall not interfere with the ability of the shingles to seal. End laps shall be a minimum of 4 inches and shall be offset by a minimum of 6 feet. 2. For roof slopes of 4 units vertical in 12 units horizontal (4:12) or greater, underlayment shall be one layer applied in the following manner: ~~u~~Underlayment shall be applied shingle fashion, parallel to and starting from the eave and lapped a minimum of 2 inches. Distortions in the underlayment shall not interfere with the ability of the shingles to seal. End laps shall be a minimum of 4 inches and shall be offset by a minimum of 6 feet. 3. A single layer of self-adhering polymer modified bitumen underlayment complying with ASTM D1970, installed in accordance with the underlayment manufacturer's and roof covering manufacturer's installation instructions for the deck material, roof ventilation configuration and climate exposure of the roof covering.	Underlayment shall be one of the following: 1. Two layers of mechanically fastened underlayment applied in the following manner: Apply a strip of underlayment for the first course that is half the width of a full sheet parallel to and starting at the eaves, fastened sufficiently to hold in place. Starting at the eave, apply a full-width shee~~ts~~ of underlayment~~,~~ for the second course. Apply the third course of underlayment, overlapping the second course by half the width of a full sheet plus a minimum of 2 inches. Overlap all successive courses by ~~sheets~~ half the width of a full sheet plus a minimum of 1 inch~~2 inches~~. Distortions in the underlayment shall not interfere with the ability of the shingles to seal. End laps shall be a minimum of 4 inches and shall be offset by a minimum of 6 feet. 2. A minimum 4-inch-wide strip of self-adhering polymer modified bitumen underlayment 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 complying with Table R905.1.1(1) for the applicable roof covering shall be applied over the entire roof over the 4-inch- wide membrane strips. 3. A single layer of self-adhering polymer modified bitumen underlayment complying with ASTM D1970, installed in accordance with the underlayment manufacturer's and roof covering manufacturer's installation instructions for the deck material, roof ventilation configuration and climate exposure of the roof covering.
Clay and concrete tile	R905.3	Underlayment shall be one of the following: 1. For roof slopes from 2 1/2 units vertical in 12 units horizontal (2 1/2:12)~~, up~~ to less than 4 units vertical in 12 units horizontal (4:12), underlayment shall be two layers applied in the following manner: ~~a~~Apply a strip of underlayment for the first course that is half the width of a full sheet parallel to and starting at the eaves, fastened sufficiently to hold in place. Starting at the eave, apply a full-width shee~~ts~~ of underlayment~~,~~ for the second course. Apply the third course of underlayment, overlapping the second course by half the width of a full sheet plus a minimum of 2 inches. Overlap all successive courses by ~~sheets~~ half the width of a full sheet plus a minimum of 1 inch~~2 inches~~. End laps shall be a minimum of 4 inches and shall be offset by a minimum of 6 feet. 2. For roof slopes of 4 units vertical in 12 units horizontal (4:12) or greater, underlayment shall be one layer applied in the following manner: ~~u~~Underlayment shall be applied shingle fashion, parallel to and starting from the eave and lapped a minimum of 2 inches. End laps shall be a minimum of 4 inches and shall be offset by a minimum of 6 feet. 3. A single layer of self-adhering polymer modified bitumen underlayment complying with ASTM D1970, installed in accordance with the underlayment manufacturer's and roof covering manufacturer's installation instructions for the deck material, roof ventilation configuration and climate exposure of the roof covering.	Underlayment shall be one of the following: 1. Two layers of mechanically fastened underlayment applied in the following manner: Apply a strip of underlayment ~~felt~~ for the first course that is half the width of a full sheet parallel to and starting at the eaves, fastened sufficiently to hold in place. Starting at the eave, apply a full width shee~~ts~~ of underlayment~~,~~ for the second course. Apply the third course of underlayment, overlapping the second course by half the width of a full sheet plus a minimum of 2 inches. Overlap all successive courses by ~~sheets~~ half the width of a full sheet plus a minimum of 1 inch~~2 inches~~. ~~Distortionsin the underlayment shall not interferewith the ability of the shingles to seal.~~ End laps shall be a minimum of 4 inches and shall be offset by a minimum of 6 feet. 2. A minimum 4-inch-wide strip of self-adhering polymer modified bitumen underlayment 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 complying with Table R905.1.1(1) for the applicable roof covering shall be applied over the entire roof over the 4-inch-wide membrane strips. 3. A single layer of self-adhering polymer modified bitumen underlayment complying with ASTM D1970, installed in accordance with the underlayment manufacturer's and roof covering manufacturer's installation instructions for the deck material, roof ventilation configuration and climate exposure of the roof covering.
Metal roof shingles	R905.4	Apply in accordance with the manufacturer's installation instructions.	Underlayment shall be be one of the following: 1. Two layers of mechanically fastened underlayment applied in the following manner: Apply a strip of underlayment for the first course that is half the width of a full sheet parallel to and starting at the eaves, fastened sufficiently to hold in place. Starting at the eave, apply a full width shee~~ts~~ of underlayment~~,~~ for the second course. Apply the third course of underlayment, overlapping the second course by half the width of a full sheet plus a minimum of 2 inches. Overlap all successive courses by ~~sheets~~ half the width of a full sheet plus a minimum of 1 inch.~~2 inches~~. End laps shall be a minimum of 4 inches and shall be offset by a minimum of 6 feet.
Mineral-surfaced roll roofing	R905.5		
Slate and slate-type shingles	R905.6		
Wood shingles	R905.7		
Wood shakes	R905.8		

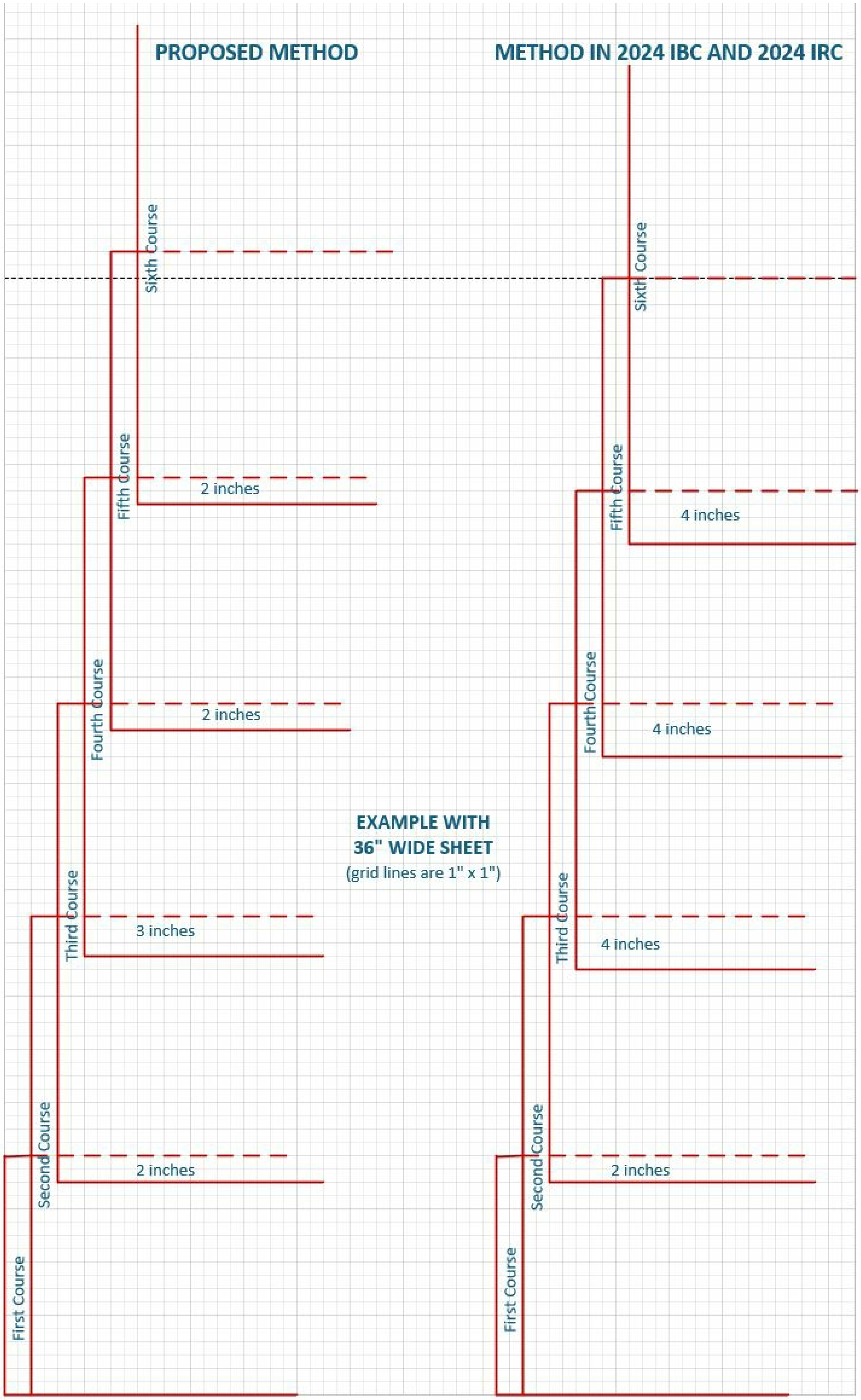
Metal panels	R905.10		2. A minimum 4-inch-wide strip of self-adhering polymer modified bitumen underlayment complying with ASTM D1970, installed in accordance with the manufacturer's installation instructions for the deck material, shall be applied over all joints in the roof decking. An approved underlayment complying with Table R905.1.1(1) for the applicable roof covering shall be applied over the entire roof over the 4-inch-wide membrane strips. 3. A single layer of self-adhering polymer modified bitumen underlayment complying with ASTM D1970, installed in accordance with the underlayment manufacturer's and roof covering manufacturer's installation instructions for the deck material, roof ventilation configuration and climate exposure of the roof covering.
BIPV roof coverings	R905.15	Underlayment shall be one of the following: 1. For roof slopes from 2 units vertical in 12 units horizontal (2:12)~~, up~~ to less than 4 units vertical in 12 units horizontal (4:12), underlayment shall be two layers applied in the following manner: ~~a~~Apply a strip of underlayment for the first course that is half the width of a full sheet parallel to and starting at the eaves, fastened sufficiently to hold in place. Starting at the eave, apply a full width sheet~~s~~ of underlayment~~,~~ for the second course. Apply the third course of underlayment, overlapping the second course by half the width of a full sheet plus a minimum of 2 inches. Overlap all successive courses by ~~sheets~~ half the width of a full sheet plus a minimum of 1 inch~~2 inches~~. ~~Distortions in the underlayment shall not interfere with the ability of the shingles to seal.~~ End laps shall be a minimum of 4 inches and shall be offset by a minimum of 6 feet. 2. For roof slopes of 4 units vertical in 12 units horizontal (4:12) or greater, underlayment shall be one layer applied in the following manner: ~~u~~Underlayment shall be applied shingle fashion, parallel to and starting from the eave and lapped a minimum of 2 inches. Distortions in the underlayment shall not interfere with the ability of the shingles to seal. End laps shall be a minimum of 4 inches and shall be offset by a minimum of 6 feet. 3. A single layer of self-adhering polymer modified bitumen underlayment complying with ASTM D1970, installed in accordance with the underlayment manufacturer's and roof covering manufacturer's installation instructions for the deck material, roof ventilation configuration and climate exposure of the roof covering.	Underlayment shall be one of the following: 1. ~~Two layers of mechanically fastened underlayment applied in the following manner:~~ Apply a strip of underlayment for the first course that is half the width of a full sheet parallel to and starting at the eaves, fastened sufficiently to hold in place. Starting at the eave, apply a full width sheet~~s~~ of underlayment~~,~~ for the second course. Apply the third course of underlayment, overlapping the second course by half the width of a full sheet plus a minimum of 2 inches. Overlap all successive courses by ~~sheets~~ half the width of a full sheet plus a minimum of 1 inch~~2 inches~~. ~~Distortions in the underlayment shall not interfere with the ability of the shingles to seal.~~ End laps shall be a minimum of 4 inches and shall be offset by a minimum of 6 feet. 2. A minimum 4-inch-wide strip of self-adhering polymer modified bitumen underlayment 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 complying with Table R905.1.1(1) for the applicable roof covering shall be applied over the entire roof over the 4-inch-wide membrane strips. 3. A single layer of self-adhering polymer modified bitumen underlayment complying with ASTM D1970, installed in accordance with the underlayment manufacturer's and roof covering manufacturer's installation instructions for the deck material, roof ventilation configuration and climate exposure of the roof covering.

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

Reason: A two-layer installation of mechanically fastened underlayment has been shown to be an effective installation which helps prevent water intrusion if the primary roof covering is compromised in a wind event, thus making the roofing system more resilient. This proposal offers an improved installation method which reduces material usage, providing important stewardship and sustainability enhancements. As is illustrated in the diagram (Example.jpg, shown below and also available via the link), the current method leads to successive courses with an area of triple coverage that is 4 inches wide beginning with installation of the third full width sheet (fourth course). The proposed method ends up with 2-inch-wide triple coverage beginning with the fourth full-width sheet (fifth course). This pattern occurs regardless of the width of the underlayment sheet. Adopting the proposed method will lead to material savings which depend on the width of the underlayment sheet and the number of underlayment courses needed to complete the roof.

In addition to providing an installation method which saves material, this proposal makes several changes to standardize language and clarify requirements:

- Clarifies the requirements associated with a slope of exactly 4:12 by inserting "less than" before 4:12 in appropriate locations.
- Adds "a minimum of" in appropriate locations to clarify that the dimensions are not meant to be exact.
- For the self-adhering polymer modified underlayment options, clarifies that the instructions of both the underlayment and roof covering manufacturer are to be considered.
- Removes "Distortions in the underlayment shall not interfere with the ability of the shingles to seal" from locations where it is not applicable.



Cost Impact: Decrease

Estimated Immediate Cost Impact:

The worst-case scenario if this proposal is accepted will be a $0.00 change in the cost of construction. As is illustrated below, a material cost decrease approaching 5% is a reasonable best case estimate.

Estimated Immediate Cost Impact Justification (methodology and variables):

This proposal is expected to reduce the cost of construction by using less material to create a two-layer mechanically fastened underlayment installation. The amount of material cost reduction is dependent upon the number of courses of underlayment required to cover the roof and the width of the underlayment employed.

Using a 36” wide sheet as an example, installation of the fourth course creates a 3” wide area of triple coverage compared to a 4” wide area for the current method, which amounts to a 1/36 (2.8%) reduction in material. Installation of the fifth course and each successive course creates a 2” wide area of triple coverage compared to a 4” wide area for the current method, which amounts to a 2/36 (5.5%) reduction in material.

These estimated percentage reductions in material usage demonstrate the potential material savings, but creation of an estimate of dollar savings is unrealistic, since each project will have a different combination of width of underlayment employed, number of rows of underlayment installed, size of the installed area, and cost of the material.

By covering a greater area per row of installed material than the current method, the proposed method also has the potential to lead to an incremental reduction in labor cost. The same challenges as mentioned in the paragraph immediately above prevent the calculation of a potential labor cost change estimate beyond what can be deduced using the percentages calculated for material cost reduction.

S14-25 Part II

S15-25

IBC: TABLE 1507.1.1(1), TABLE 1507.1.1(2), TABLE 1507.1.1(3)

Proponents: T. Eric Stafford, representing Insurance Institute for Business and Home Safety (testafford@charter.net); Milad Shabanian, representing Insurance Institute for Business & Home Safety (mshabanian@ibhs.org)

2024 International Building Code

Revise as follows:

TABLE 1507.1.1(1) UNDERLAYMENT TYPES

ROOF COVERING	SECTION	~~MAXIMUM BASIC WIND SPEED, V < 130 MPH IN~~ AREAS OUTSIDE HURRICANE-PRONE REGIONS ~~OR V < 140 MPH OUTSIDE HURRICANE-PRONE REGIONS~~	~~MAXIMUM BASIC WIND SPEED, V ≥ 130 MPH IN~~ AREAS WITHIN HURRICANE-PRONE REGIONS ~~OR V ≥ 140 MPH OUTSIDE HURRICANE-PRONE REGIONS~~
Asphalt shingles	1507.2	ASTM D226 Type I or II ASTM D1970 ASTM D4869 Type I, II, III or IV ASTM D6757 ASTM D8257	ASTM D226 Type II ASTM D1970 ASTM D4869 Type III or IV ASTM D8257
Clay and concrete tiles	1507.3	ASTM D226 Type II ASTM D1970 ASTM D2626 ASTM D6380 Class M ASTM D8257	ASTM D226 Type II ASTM D1970 ASTM D8257
Metal roof panels applied to a solid or closely fitted deck	1507.4	ASTM D226 Type I or II ASTM D1970 ASTM D4869 Type I, II, III or IV ASTM D8257	ASTM D226 Type II ASTM D1970 ASTM D4869 Type III or IV ASTM D8257
Metal roof shingles	1507.5	ASTM D226 Type I or II ASTM D1970 ASTM D4869 Type I, II, III or IV ASTM D8257	ASTM D226 Type II ASTM D1970 ASTM D4869 Type III or IV ASTM D8257
Mineral-surfaced roll roofing	1507.6	ASTM D226 Type I or II ASTM D1970 ASTM D4869 Type I, II, III or IV ASTM D8257	ASTM D226 Type II ASTM D1970 ASTM D4869 Type III or IV ASTM D8257
Slate shingles	1507.7	ASTM D226 Type II ASTM D1970 ASTM D4869 Type III or IV ASTM D8257	ASTM D226 Type II ASTM D1970 ASTM D4869 Type III or IV ASTM D8257
Wood shingles	1507.8	ASTM D226 Type I or II ASTM D4869 Type I, II, III or IV	ASTM D226 Type II ASTM D4869 Type III or IV
Wood shakes applied to a solid sheathing roof deck	1507.9	ASTM D226 Type I or II ASTM D4869 Type I, II, III or IV	ASTM D226 Type II ASTM D4869 Type III or IV
BIPV roof coverings	1507.16	ASTM D226 Type I or II ASTM D1970 ASTM D4869 Type I, II, III or IV ASTM D6757 ASTM D8257	ASTM D226 Type II ASTM D1970 ASTM D4869 Type III or IV ASTM D8257

TABLE 1507.1.1(2) UNDERLAYMENT APPLICATION

ROOF COVERING	SECTION	~~MAXIMUM BASIC WIND SPEED, V < 130 MPH IN~~ AREAS OUTSIDE HURRICANE-PRONE REGIONS ~~OR V < 140 MPH OUTSIDE HURRICANE-PRONE REGIONS~~	~~MAXIMUM BASIC WIND SPEED, V ≥ 130 MPH IN~~ AREAS WITHIN HURRICANE-PRONE REGIONS ~~OR V ≥ 140 MPH OUTSIDE HURRICANE-PRONE REGIONS~~

ROOF COVERING	SECTION	~~MAXIMUM BASIC WIND SPEED, V < 130 MPH IN~~ AREAS OUTSIDE HURRICANE-PRONE REGIONS ~~OR V < 140 MPH OUTSIDE HURRICANE-PRONE REGIONS~~	~~MAXIMUM BASIC WIND SPEED, V ≥ 130 MPH IN~~ AREAS WITHIN HURRICANE-PRONE REGIONS ~~OR V ≥ 140 MPH OUTSIDE HURRICANE-PRONE REGIONS~~
Asphalt shingles	1507.2	Underlayment shall be one of the following: 1. For roof slopes from 2 units vertical in 12 units horizontal (2:12) to 4 units vertical in 12 units horizontal (4:12), underlayment shall be two layers applied in the following manner: Apply a strip of underlayment that is half the width of a full sheet parallel to and starting at the eaves. Starting at the eaves, apply full-width sheets of underlayment, overlapping successive sheets half the width of a full sheet plus 2 inches. End laps shall be 4 inches and shall be offset by 6 feet. Distortions in the underlayment shall not interfere with the ability of the shingles to seal. 2. For roof slopes of 4 units vertical in 12 units horizontal (4:12) or greater, underlayment shall be one layer applied as follows: Underlayment shall be applied shingle fashion, parallel to and starting from the eaves 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. 3. A single layer of self-adhering polymer modified bitumen underlayment complying with ASTM D1970, installed in accordance with the underlayment and roof covering manufacturers' installation instructions for the deck material, roof ventilation configuration, and climate exposure of the roof covering.	Underlayment shall be one of the following: 1. Two layers of mechanically fastened underlayment applied in the following manner: Apply a strip of underlayment felt that is half the width of a full sheet parallel to and starting at the eaves, fastened sufficiently to hold in place. Starting at the eaves, apply full-width sheets of underlayment overlapping successive sheets half the width of a full sheet plus 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. 2. A strip not less than 4 inches in width of self-adhering polymer modified bitumen underlayment 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 complying with Table 1507.1.1(1) for the applicable roof covering and basic wind speed shall be applied over the entire roof over the 4-inch-wide membrane strips. Underlayment shall be applied in accordance with this table using the application requirements for where the maximum basic wind speed is less than 130 mph. 3. A single layer of self-adhering polymer modified bitumen underlayment complying with ASTM D1970, installed in accordance with the underlayment and roof covering manufacurers' installation instructions for the deck material, roof ventilation configuration and climate exposure of the roof covering.
Clay and concrete tile	1507.3	Underlayment shall be one of the following: 1. For roof slopes from 2 1/2 units vertical in 12 units horizontal (2 1/2:12) to 4 units vertical in 12 units horizontal (4:12), underlayment shall be not fewer than two layers applied in the following manner: Apply a strip of underlayment that is half the width of a full sheet parallel to and starting at the eaves. Starting at the eaves, a full-width strip of underlayment felt shall be applied, overlapping successive sheets half the width of a full sheet plus 2 inches. End laps shall be 4 inches and shall be offset by 6 feet. 2. For roof slopes of 4 units vertical in 12 units horizontal (4:12) or greater, underlayment shall be one layer applied as follows: Underlayment shall be applied shingle fashion, parallel to and starting from the eaves and lapped 2 inches. End laps shall be 4 inches and shall be offset by 6 feet. 3. A single layer of self-adhering polymer modified bitumen underlayment complying with ASTM D1970, installed in accordance with the underlayment and roof covering manufacturers' installation instructions for the deck material, roof ventilation configuration, and climate exposure of the roof covering.	Underlayment shall be one of the following: 1. Two layers of mechanically fastened underlayment applied in the following manner: Apply a strip of underlayment that is half the width of a full sheet parallel to and starting at the eaves, fastened sufficiently to hold in place. Starting at the eaves, apply full-width sheets of underlayment, overlapping successive sheets half the width of a full sheet plus 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. 2. A strip not less than 4 inches in width of self-adhering polymer modified bitumen underlayment 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 complying with Table 1507.1.1(1) for the applicable roof covering and basic wind speed shall be applied over the entire roof over the 4-inch-wide membrane strips. Underlayment shall be applied in accordance with this table using the application requirements for where the maximum basic wind speed is less than 130 mph. 3. A single layer of self-adhering polymer modified bitumen underlayment complying with ASTM D1970, installed in accordance with the underlayment and roof covering manufacurers' installation instructions for the deck material, roof ventilation configuration, and climate exposure of the roof covering.
Metal roof panels	1507.4	Apply in accordance with the manufacturer's installation instructions	Underlayment shall be one of the following: 1. Two layers of mechanically fastened underlayment applied in the following manner: Apply a strip of underlayment that is half the width of a full sheet parallel to and starting at the eaves, fastened sufficiently to hold in place. Starting at the eaves, apply full-width sheets of underlayment, overlapping successful sheets half the width of a full sheet plus 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. 2. A strip not less than 4 inches in width of self-adhering polymer modified bitumen underlayment 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 complying with Table 1507.1.1(1) for the applicable roof covering and basic wind speed shall be applied over the entire roof over the 4-inch-wide membrane strips. Underlayment shall be applied in accordance with this table using the application requirements for where the maximum basic wind speed is less than 130 mph. 3. A single layer of self-adhering polymer modified bitumen underlayment complying with ASTM D1970, installed in accordance with the underlayment and roof covering manufacurers' installation instructions for the deck material, roof ventilation configuration, and climate exposure of the roof covering.
Metal roof shingles	1507.5		
Mineral-surfaced roll roofing	1507.6		
Slate shingles	1507.7		
Wood shingles	1507.8		
Wood shakes	1507.9		

ROOF COVERING	SECTION	~~MAXIMUM BASIC WIND SPEED, *V* < 130 MPH IN~~ AREAS OUTSIDE HURRICANE-PRONE REGIONS ~~OR *V* < 140 MPH OUTSIDE HURRICANE-PRONE REGIONS~~	~~MAXIMUM BASIC WIND SPEED, *V* ≥ 130 MPH IN~~ AREAS WITHIN HURRICANE-PRONE REGIONS ~~OR *V* ≥ 140 MPH OUTSIDE HURRICANE-PRONE REGIONS~~
BIPV roof coverings	1507.16	Underlayment shall be one of the following: 1. For roof slopes from 3 units vertical in 12 units horizontal (3:12) to 4 units vertical in 12 units horizontal (4:12), underlayment shall be two layers applied in the following manner: Apply a strip of underlayment that is half the width of a full sheet parallel to and starting at the eaves. Starting at the eaves, apply full-width sheets of underlayment, overlapping successive sheets half the width of a full sheet plus 2 inches. End laps shall be 4 inches and shall be offset by 6 feet. Distortions in the underlayment shall not interfere with the ability of the shingles to seal. 2. For roof slopes of 4 units vertical in 12 units horizontal (4:12) or greater, underlayment shall be one layer applied as follows: Underlayment shall be applied shingle fashion, parallel to and starting from the eaves 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. 3. A single layer of self-adhering polymer modified bitumen underlayment complying with ASTM D1970, installed in accordance with the underlayment and roof covering manufacturers' installation instructions for the deck material, roof ventilation configuration, and climate exposure of the roof covering.	Underlayment shall be one of the following: 1. Two layers of mechanically fastened underlayment applied in the following manner: Apply a strip of underlayment that is half the width of a full sheet parallel to and starting at the eaves, fastened sufficiently to hold in place. Starting at the eaves, apply full-width sheets of underlayment, overlapping successive sheets half the width of a full sheet plus 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. 2. A strip not less than 4 inches in width of self-adhering polymer modified bitumen underlayment 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 complying with Table 1507.1.1(1) for the applicable roof covering and basic wind speed shall be applied over the entire roof over the 4-inch-wide membrane strips. Underlayment shall be applied in accordance with this table using the application requirements for where the maximum basic wind speed is less than 130 mph. 3. A single layer of self-adhering polymer modified bitumen underlayment complying with ASTM D1970, installed in accordance with the underlayment and roof covering manufacturers' installation instructions for the deck material, roof ventilation configuration, and climate exposure of the roof covering.

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

TABLE 1507.1.1(3) UNDERLAYMENTFASTENING

ROOF COVERING	SECTION	~~MAXIMUM BASIC WIND SPEED, *V* < 130 MPH IN~~ AREAS OUTSIDE HURRICANE-PRONE REGIONS ~~OR *V* < 140 MPH OUTSIDE HURRICANE-PRONE REGIONS~~	~~MAXIMUM BASIC WIND SPEED, *V* ≥ 130 MPH IN~~ AREAS WITHIN HURRICANE-PRONE REGIONS ~~OR *V* ≥ 140 MPH OUTSIDE HURRICANE-PRONE REGIONS~~
Asphalt shingles	1507.2	Fastened sufficiently to hold in place	Mechanically fastened underlayment shall be fastened with corrosion-resistant fasteners in a grid pattern of not greater than 12 inches horizontally and vertically between side laps with a 6-inch spacing at side and end laps. Mechanically fastened underlayment shall be fastened using annular ring or deformed shank nails with 1-inch diameter metal or plastic caps. Metal caps shall have a thickness of not less than 32-gage (0.0134 inch) 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. The cap nail shank shall have a length sufficient to penetrate through the roof sheathing or not less than $^3/_4$ inch into the roof sheathing. Self-adhering polymer modified bitumen underlayment shall be installed in accordance with the underlayment and roof covering manufacturers' installation instructions for the deck material, roof ventilation configuration and climate exposure of the roof covering.
Clay and concrete tile	1507.3		
BIPV roof coverings	1507.16		
Metal roof panels	1507.4	Manufacturer's installation instructions	Mechanically fastened underlayment shall be fastened with corrosion-resistant fasteners in a grid pattern of not greater than 12 inches horizontally and vertically between side laps with a 6-inch spacing at side and end laps. Mechanically fastened underlayment shall be fastened using annular ring or deformed shank nails with 1-inch diameter metal or plastic caps. 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. The cap nail shank shall have a length sufficient to penetrate through the roof sheathing or not less than $^3/_4$ inch into the roof sheathing. Self-adhering polymer modified bitumen underlayment shall be installed in accordance with the underlayment and roof covering manufacturers' installation instructions for the deck material, roof ventilation configuration and climate exposure of the roof covering.
Metal roof shingles	1507.5		
Mineral-surfaced roll roofing	1507.6		
Slate shingles	1507.7		
Wood shingles	1507.8		
Wood shakes	1507.9		

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

Reason: This proposal expands the requirements for improved roof covering underlayment from the 130 mph and 140 mph triggers to the Hurricane-prone Region. This effectively expands the secondary roof underlayment strategies recommended by the IBHS Fortified Home - Hurricane program (sealed roof deck) from areas where the design wind speed is 130 mph and greater to areas where the design wind speed is 115 mph and greater.

Damage due to water intrusion continues to be a significant problem for buildings impacted by hurricanes. 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. The roof deck, where the roof covering is lost or damaged, is particularly susceptible. 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.

Tests performed by IBHS at the Research Center have consistently shown that a sealed roof deck as recommended by the IBHS Fortified

Home - Hurricane program consistently show significantly reduced water intrusion rates when one of these strategies was employed. A summary of the results of the demonstration can be viewed at the following link:

http://ibhstest.wpengine.com/ibhsnews- releases/ibhs-hurricane-demonstration-illustrates-importance-of-sealed-roof-deck-3/.

The wind driven rain demonstration can be viewed at the following link:

https://disastersafety.org/thunderstorms/winddriven-rain-demo/.

These underlayment strategies required reduce water entry into the attic space by 70% or more.

This expansion is being proposed primarily for 2 reasons. The adoption of ASCE 7-22 in the 2024 IBC resulted in numerous changes to the wind design requirements including changes to the wind speed maps. While some wind speeds in the hurricane-prone region are increasing, notably, the 130 mph contour, which is the Wind Design Required Region trigger in the Hurricane-prone Region, is being reduced in many areas near the Gulf coast and North Atlantic coast. The following figures overlays the ASCE 7-22 design wind speeds for Risk Category II over the ASCE 7-16 design wind speeds for Risk Category II near the Gulf and Atlantic coasts. The areas shaded in blue indicate where the 130 mph contour has shifted more towards the coast effectively reducing wind speeds in these areas. As shown, the North Atlantic coast has been completely removed from the Wind Design Required Region. Without this proposed expansion, these areas would non longer be required to use the improved underlayment strategies.

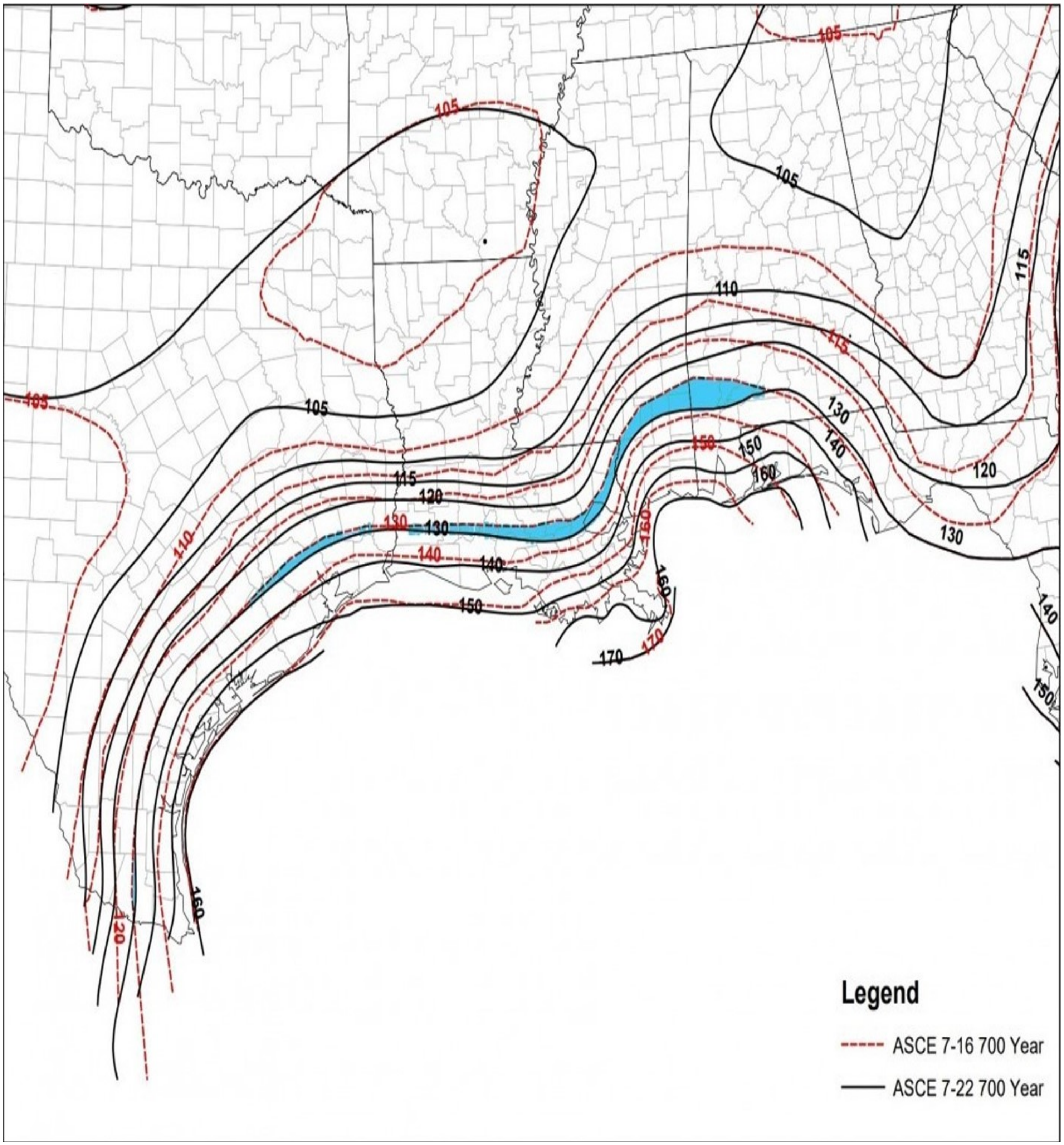


Figure 1
Loss of Wind Design Required Region in the Gulf Region Due to ASCE 7-22 Wind Speed Updates

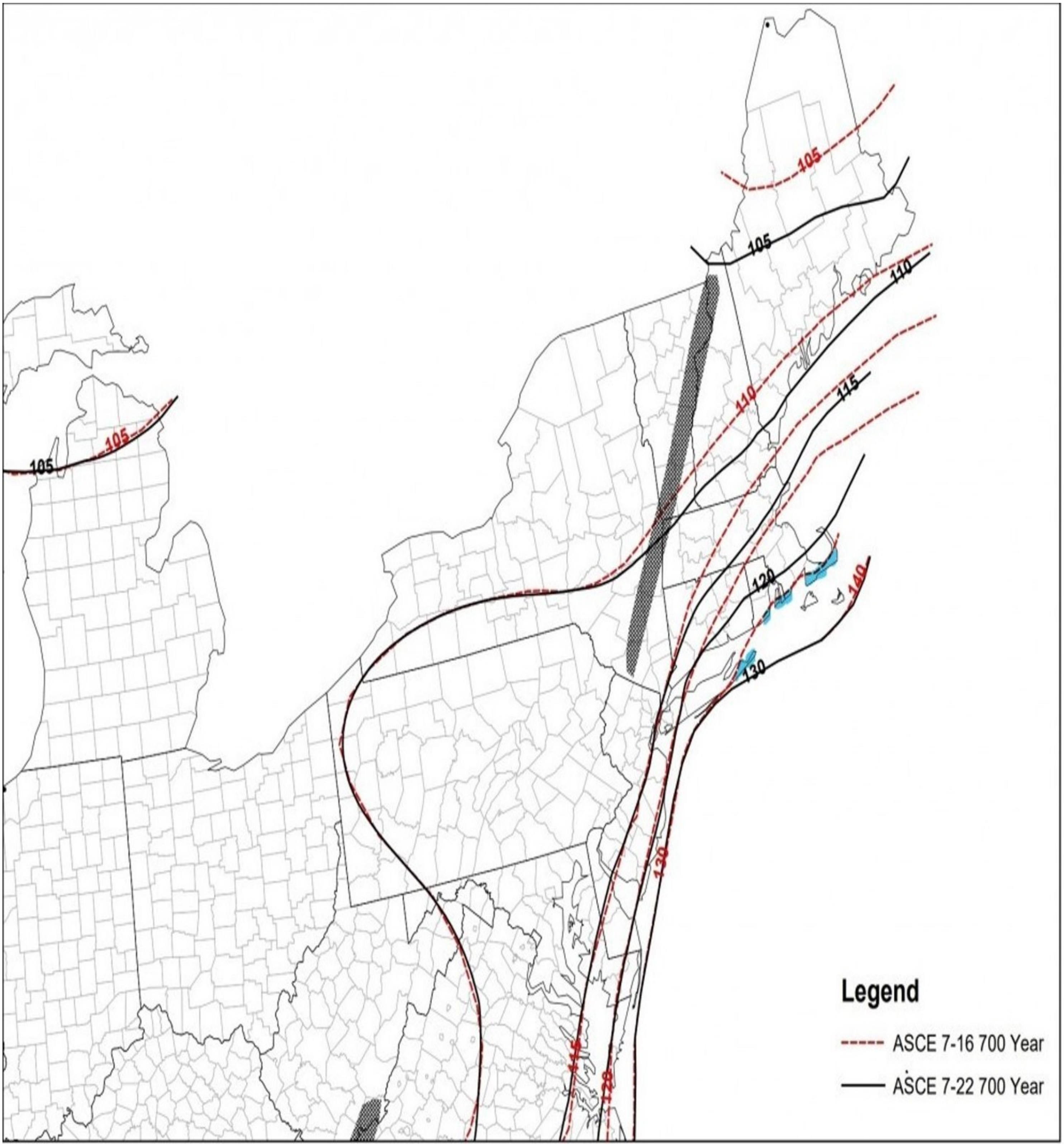


Figure 2
Loss of Wind Design Required Region in the North Atlantic Region Due to ASCE 7-22 Wind Speed Updates

Additionally, a recent report published by David Roueche with Auburn University for Home Innovation Research Labs shows that roof covering damage is by far the most common cladding damage and that even at lower wind speeds roof covering damage is frequently observed. The full report is attached to this proposal. The report is a curation of the windstorm building performance dataset collected by the StEER (Structural Extreme Events Reconnaissance) network. The dataset quantifies common wind damage patterns from recent windstorms. The following windstorm events were included in the dataset:

Joplin Tornado
Garland Tornado
Hurricane Harvey
Hurricane Irma
Hurricane Michael
Nashville/Cookeville Tornadoes
Hurricane Laura

When stratified by hazard intensity, the data shows for wind speeds between 116 mph and 140 mph the frequency of roof covering damage is near 80%. Even for wind speeds between 91 mph and 115 mph the frequency of roof covering damage is near 70%.

The report notes that “considering all hazard intensities and years of construction, 26-50% of the roof cover on a single-family home is typically damaged in an extreme windstorm.”

It should also be noted that the 7th Edition (2020) and the 8th Edition (2023) Florida Building Code adopted these underlayment strategies for the entire state. For Risk Category II buildings, design wind speeds in the state of Florida range from approximately 115 mph to 180 mph.

Installing a sealed roof deck is the most cost-effective method for reducing water intrusion through the roof deck where the primary roof covering has been damaged or lost.

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).

Roueche, D.B., Nakayama, J., Department of Civil Engineering, Auburn University Ginn College of Engineering, "Quantification of Common Wind Damage Patterns in Recent Windstorms." May 202

Cost Impact: Increase

Estimated Immediate Cost Impact:

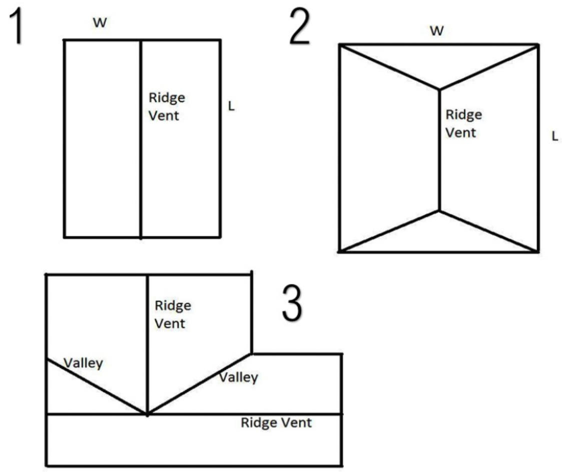
For our cost impact estimates, we used Xactimate which is a construction cost estimating software program. Select markets that would be affected by this code change were analyzed in all the hurricane-prone states.

Two sealed roof deck options were analyzed –

Option 1: Installing 4-inch-wide strips of self-adhering polymer modified bitumen over all joints in the roof deck and covering the strips with a 30# (ASTM D226 Type II, ASTM D4869 Type III or IV) felt underlayment and fastened as specified in the code.

Option 2: Installing a self-adhering polymer modified bitumen underlayment over the entire roof deck.

Three roof configurations were analyzed – 3 gable, 2 gable, and hip. Additionally, we estimated the cost impacts for large roofs (2800 square feet to 3016 square feet) and small roofs (1575 square feet to 1696 square feet). Estimated costs were developed for an asphalt shingle roof.



A copy of the Xactimate report for this analysis is attached to this code change.

The cost for either option varies according to the markets analyzed but are within close ranges.

Option 1 – (taped joints with 30# underlayment over the taped joints)

For large roofs the increased cost for Option 1 ranges from a low of $917.32 in Dothan, AL to a high of $1714.83 on Long Island, NY. For new construction, these costs represent increases of 9.5% and 9.1% respectively of the total cost of the roof (roof covering, underlayment, ventilation components, etc). For reroofing, these costs represent increases of 8.1% and 7.6% respectively of the total cost of the reroofing job.

For small roofs the increased cost for Option 1 ranges from a low of $512.29 in Dothan, AL to a high of $959.66 on Long Island, NY. For new construction, these costs represent increases of 8.9% and 8.3% respectively of the total cost of the roof (roof covering, underlayment, ventilation components, etc). For reroofing, these costs represent increases of 7.6% and 7.6% respectively of the total cost of the reroofing job.

Option 2 – (self-adhering polymer modified bitumen underlayment over the entire roof deck)

For large roofs the increased cost for Option 2 ranges from a low of $1428.39 in Florence, SC to a high of $1909.49 in Stamford, CT. For new construction, these costs represent increases of 13.4% and 10.4% respectively of the total cost of the roof (roof covering, underlayment, ventilation components, etc). For reroofing, these costs represent increases of 11.5% and 8.9% of the total cost of the reroofing job.

For small roofs the increased cost for Option 2 ranges from a low of $793.41 in Dover, DE to a high of $1065.74 in Stamford, CT. For new construction, these costs represent increases of 9.3% and 9.5% respectively of the total cost of the roof (roof covering, underlayment, ventilation components, etc). For reroofing, these costs represent increases of 8.2% and 8.2% respectively of the total cost of the reroofing job.

Estimated Immediate Cost Impact Justification (methodology and variables):

Xactimate, which is a construction cost estimating software program, was used to analyze the cost impacts of this proposal.

S15-25

S16-25

IBC: TABLE 1507.1.1(3)

Proponents: T. Eric Stafford, representing Insurance Institute for Business and Home Safety (testafford@charter.net); Milad Shabanian, representing Insurance Institute for Business & Home Safety (mshabanian@ibhs.org)

2024 International Building Code

Revise as follows:

TABLE 1507.1.1(3) UNDERLAYMENTFASTENING

ROOF COVERING	SECTION	MAXIMUM BASIC WIND SPEED, *V* < 130 MPH IN HURRICANE-PRONE REGIONS OR *V* < 140 MPH OUTSIDE HURRICANE-PRONE REGIONS	MAXIMUM BASIC WIND SPEED, *V* ≥ 130 MPH IN HURRICANE-PRONE REGIONS OR *V* ≥ 140 MPH OUTSIDE HURRICANE-PRONE REGIONS
Asphalt shingles	1507.2	Fastened sufficiently to hold in place	Mechanically fastened underlayment shall be fastened at 6 inches on center 3 inches from the eave and 6 inches on center at all side and end laps. ~~with corrosion-resistant fasteners~~ Underlayment shall be fastened in a grid pattern of not greater than 12 inches on center horizontally and vertically between side laps ~~with a 6-inch spacing at side and end laps~~. Mechanically fastened underlayment shall be fastened using corrosion-resistant annular ring or deformed shank nails with 1-inch diameter metal or plastic caps. Metal caps shall have a thickness of not less than 32-gage (0.0134 inch) 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. The cap nail shank shall have a length sufficient to penetrate through the roof sheathing or not less than $^{3}/_{4}$ inch into the roof sheathing. Self-adhering polymer modified bitumen underlayment shall be installed in accordance with the underlayment and roof covering manufacturers' installation instructions for the deck material, roof ventilation configuration and climate exposure of the roof covering.
Clay and concrete tile	1507.3		
BIPV roof coverings	1507.16		
Metal roof panels	1507.4	Manufacturer's installation instructions	Mechanically fastened underlayment shall be fastened at 6 inches on center 3 inches from the eave and 6 inches on center at all side and end laps. ~~with corrosion-resistant fasteners~~ Underlayment shall be fastened in a grid pattern of not greater than 12 inches on center horizontally and vertically between side laps ~~with a 6-inch spacing at side and end laps~~. Mechanically fastened underlayment shall be fastened using corrosion-resistant annular ring or deformed shank nails with 1-inch diameter metal or plastic caps. 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. The cap nail shank shall have a length sufficient to penetrate through the roof sheathing or not less than $^{3}/_{4}$ inch into the roof sheathing. Self-adhering polymer modified bitumen underlayment shall be installed in accordance with the underlayment and roof covering manufacturers' installation instructions for the deck material, roof ventilation configuration and climate exposure of the roof covering.
Metal roof shingles	1507.5		
Mineral-surfaced roll roofing	1507.6		
Slate shingles	1507.7		
Wood shingles	1507.8		
Wood shakes	1507.9		

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

Reason: This code change proposal intends to clarify fastening requirements for underlayment at eave locations in areas prone to high winds and hurricanes. The code currently requires corrosion-resistant fasteners in a grid pattern no greater than 12 inches horizontally and vertically, with a 6-inch spacing at side and end laps. However, it does not specifically state how to properly fasten the underlayment at the eave edge, where wind pressures can be significantly higher than on the roof field.

The roof underlayment methods required in high wind areas (V ≥ 130 mph in hurricane-prone regions, and V ≥ 140 mph outside hurricane-prone regions) are intended to provide a secondary barrier against water infiltration through the roof deck if the primary roofing material fails. Given its importance, properly securing underlayment is vital to this function. For many roof configurations, wind pressures are highest along the eave edge, particularly the eave edge corners, due to the wind's interaction with the roof structure.

Considering that underlayment is installed shingle fashion, inadequate fastening at the edge can lead to underlayment failure at the eave during high-wind events, potentially causing a cascading failure across other rows of underlayment and compromise the entire underlayment system. This proposal addresses this vulnerability by specifically requiring the first course of underlayment to be fastened at 6 inches on center 3 inches from the eave edge.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

This proposal is primarily a clarification and is not expected to add any meaningful cost to construction.

S16-25

S17-25

IBC: TABLE 1507.1.1(1), TABLE 1507.1.1(2), TABLE 1507.1.1(3), 1507.17.3, 1507.17.4, 1507.17.4.1, 1507.17.4.2

Proponents: T. Eric Stafford, representing Insurance Institute for Business and Home Safety (testafford@charter.net); Milad Shabanian, representing Insurance Institute for Business & Home Safety (mshabanian@ibhs.org)

2024 International Building Code

Revise as follows:

TABLE 1507.1.1(1) UNDERLAYMENT TYPES

ROOF COVERING	SECTION	MAXIMUM BASIC WIND SPEED, *V* < 130 MPH IN HURRICANE-PRONE REGIONS OR *V* < 140 MPH OUTSIDE HURRICANE-PRONE REGIONS	MAXIMUM BASIC WIND SPEED, *V* ≥ 130 MPH IN HURRICANE-PRONE REGIONS OR *V* ≥ 140 MPH OUTSIDE HURRICANE-PRONE REGIONS
Asphalt shingles	1507.2	ASTM D226 Type I or II ASTM D1970 ASTM D4869 Type I, II, III or IV ASTM D6757 ASTM D8257	ASTM D226 Type II ASTM D1970 ASTM D4869 Type III or IV ASTM D8257
Clay and concrete tiles	1507.3	ASTM D226 Type II ASTM D1970 ASTM D2626 ASTM D6380 Class M ASTM D8257	ASTM D226 Type II ASTM D1970 ASTM D8257
Metal roof panels applied to a solid or closely fitted deck	1507.4	ASTM D226 Type I or II ASTM D1970 ASTM D4869 Type I, II, III or IV ASTM D8257	ASTM D226 Type II ASTM D1970 ASTM D4869 Type III or IV ASTM D8257
Metal roof shingles	1507.5	ASTM D226 Type I or II ASTM D1970 ASTM D4869 Type I, II, III or IV ASTM D8257	ASTM D226 Type II ASTM D1970 ASTM D4869 Type III or IV ASTM D8257
Mineral-surfaced roll roofing	1507.6	ASTM D226 Type I or II ASTM D1970 ASTM D4869 Type I, II, III or IV ASTM D8257	ASTM D226 Type II ASTM D1970 ASTM D4869 Type III or IV ASTM D8257
Slate shingles	1507.7	ASTM D226 Type II ASTM D1970 ASTM D4869 Type III or IV ASTM D8257	ASTM D226 Type II ASTM D1970 ASTM D4869 Type III or IV ASTM D8257
Wood shingles	1507.8	ASTM D226 Type I or II ASTM D4869 Type I, II, III or IV	ASTM D226 Type II ASTM D4869 Type III or IV
Wood shakes applied to a solid sheathing roof deck	1507.9	ASTM D226 Type I or II ASTM D4869 Type I, II, III or IV	ASTM D226 Type II ASTM D4869 Type III or IV
BIPV roof coverings	1507.16 <u>1507.17</u>	ASTM D226 Type I or II ASTM D1970 ASTM D4869 Type I, II, III or IV ASTM D6757 ASTM D8257	ASTM D226 Type II ASTM D1970 ASTM D4869 Type III or IV ASTM D8257

TABLE 1507.1.1(2) UNDERLAYMENT APPLICATION

ROOF COVERING	SECTION	MAXIMUM BASIC WIND SPEED, *V* < 130 MPH IN HURRICANE-PRONE REGIONS OR *V* < 140 MPH OUTSIDE HURRICANE-PRONE REGIONS	MAXIMUM BASIC WIND SPEED, *V* ≥ 130 MPH IN HURRICANE-PRONE REGIONS OR *V* ≥ 140 MPH OUTSIDE HURRICANE-PRONE REGIONS

ROOF COVERING	SECTION	MAXIMUM BASIC WIND SPEED, V < 130 MPH IN HURRICANE-PRONE REGIONS OR V < 140 MPH OUTSIDE HURRICANE-PRONE REGIONS	MAXIMUM BASIC WIND SPEED, $V \geq$ 130 MPH IN HURRICANE-PRONE REGIONS OR $V \geq$ 140 MPH OUTSIDE HURRICANE-PRONE REGIONS
Asphalt shingles	1507.2	Underlayment shall be one of the following: 1. For roof slopes from 2 units vertical in 12 units horizontal (2:12) to 4 units vertical in 12 units horizontal (4:12), underlayment shall be two layers applied in the following manner: Apply a strip of underlayment that is half the width of a full sheet parallel to and starting at the eaves. Starting at the eaves, apply full-width sheets of underlayment, overlapping successive sheets half the width of a full sheet plus 2 inches. End laps shall be 4 inches and shall be offset by 6 feet. Distortions in the underlayment shall not interfere with the ability of the shingles to seal. 2. For roof slopes of 4 units vertical in 12 units horizontal (4:12) or greater, underlayment shall be one layer applied as follows: Underlayment shall be applied shingle fashion, parallel to and starting from the eaves 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. 3. A single layer of self-adhering polymer modified bitumen underlayment complying with ASTM D1970, installed in accordance with the underlayment and roof covering manufacturers' installation instructions for the deck material, roof ventilation configuration, and climate exposure of the roof covering.	Underlayment shall be one of the following: 1. Two layers of mechanically fastened underlayment applied in the following manner: Apply a strip of underlayment felt that is half the width of a full sheet parallel to and starting at the eaves, fastened sufficiently to hold in place. Starting at the eaves, apply full-width sheets of underlayment overlapping successive sheets half the width of a full sheet plus 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. 2. A strip not less than 4 inches in width of self-adhering polymer modified bitumen underlayment 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 complying with Table 1507.1.1(1) for the applicable roof covering and basic wind speed shall be applied over the entire roof over the 4-inch-wide membrane strips. Underlayment shall be applied in accordance with this table using the application requirements for where the maximum basic wind speed is less than 130 mph. 3. A single layer of self-adhering polymer modified bitumen underlayment complying with ASTM D1970, installed in accordance with the underlayment and roof covering manufacurers' installation instructions for the deck material, roof ventilation configuration and climate exposure of the roof covering.
Clay and concrete tile	1507.3	Underlayment shall be one of the following: 1. For roof slopes from 2$^1/_2$ units vertical in 12 units horizontal (2$^1/_2$:12) to 4 units vertical in 12 units horizontal (4:12), underlayment shall be not fewer than two layers applied in the following manner: Apply a strip of underlayment that is half the width of a full sheet parallel to and starting at the eaves. Starting at the eaves, a full-width strip of underlayment felt shall be applied, overlapping successive sheets half the width of a full sheet plus 2 inches. End laps shall be 4 inches and shall be offset by 6 feet. 2. For roof slopes of 4 units vertical in 12 units horizontal (4:12) or greater, underlayment shall be one layer applied as follows: Underlayment shall be applied shingle fashion, parallel to and starting from the eaves and lapped 2 inches. End laps shall be 4 inches and shall be offset by 6 feet. 3. A single layer of self-adhering polymer modified bitumen underlayment complying with ASTM D1970, installed in accordance with the underlayment and roof covering manufacturers' installation instructions for the deck material, roof ventilation configuration, and climate exposure of the roof covering.	Underlayment shall be one of the following: 1. Two layers of mechanically fastened underlayment applied in the following manner: Apply a strip of underlayment that is half the width of a full sheet parallel to and starting at the eaves, fastened sufficiently to hold in place. Starting at the eaves, apply full-width sheets of underlayment, overlapping successive sheets half the width of a full sheet plus 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. 2. A strip not less than 4 inches in width of self-adhering polymer modified bitumen underlayment 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 complying with Table 1507.1.1(1) for the applicable roof covering and basic wind speed shall be applied over the entire roof over the 4-inch-wide membrane strips. Underlayment shall be applied in accordance with this table using the application requirements for where the maximum basic wind speed is less than 130 mph. 3. A single layer of self-adhering polymer modified bitumen underlayment complying with ASTM D1970, installed in accordance with the underlayment and roof covering manufacurers' installation instructions for the deck material, roof ventilation configuration, and climate exposure of the roof covering.
Metal roof panels	1507.4	Apply in accordance with the manufacturer's installation instructions	Underlayment shall be one of the following: 1. Two layers of mechanically fastened underlayment applied in the following manner: Apply a strip of underlayment that is half the width of a full sheet parallel to and starting at the eaves, fastened sufficiently to hold in place. Starting at the eaves, apply full-width sheets of underlayment, overlapping successful sheets half the width of a full sheet plus 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. 2. A strip not less than 4 inches in width of self-adhering polymer modified bitumen underlayment 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 complying with Table 1507.1.1(1) for the applicable roof covering and basic wind speed shall be applied over the entire roof over the 4-inch-wide membrane strips. Underlayment shall be applied in accordance with this table using the application requirements for where the maximum basic wind speed is less than 130 mph. 3. A single layer of self-adhering polymer modified bitumen underlayment complying with ASTM D1970, installed in accordance with the underlayment and roof covering manufacurers' installation instructions for the deck material, roof ventilation configuration, and climate exposure of the roof covering.
Metal roof shingles	1507.5		
Mineral-surfaced roll roofing	1507.6		
Slate shingles	1507.7		
Wood shingles	1507.8		
Wood shakes	1507.9		

ROOF COVERING	SECTION	MAXIMUM BASIC WIND SPEED, *V* < 130 MPH IN HURRICANE-PRONE REGIONS OR *V* < 140 MPH OUTSIDE HURRICANE-PRONE REGIONS	MAXIMUM BASIC WIND SPEED, *V* ≥ 130 MPH IN HURRICANE-PRONE REGIONS OR *V* ≥ 140 MPH OUTSIDE HURRICANE-PRONE REGIONS
BIPV roof coverings	1507.16 1507.17	Underlayment shall be one of the following:	Underlayment shall be one of the following:
		1. For roof slopes from 3 units vertical in 12 units horizontal (3:12) to 4 units vertical in 12 units horizontal (4:12), underlayment shall be two layers applied in the following manner: Apply a strip of underlayment that is half the width of a full sheet parallel to and starting at the eaves. Starting at the eaves, apply full-width sheets of underlayment, overlapping successive sheets half the width of a full sheet plus 2 inches. End laps shall be 4 inches and shall be offset by 6 feet. Distortions in the underlayment shall not interfere with the ability of the shingles to seal.	1. Two layers of mechanically fastened underlayment applied in the following manner: Apply a strip of underlayment that is half the width of a full sheet parallel to and starting at the eaves, fastened sufficiently to hold in place. Starting at the eaves, apply full-width sheets of underlayment, overlapping successive sheets half the width of a full sheet plus 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.
		2. For roof slopes of 4 units vertical in 12 units horizontal (4:12) or greater, underlayment shall be one layer applied as follows: Underlayment shall be applied shingle fashion, parallel to and starting from the eaves 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.	2. A strip not less than 4 inches in width of self-adhering polymer modified bitumen underlayment 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 complying with Table 1507.1.1(1) for the applicable roof covering and basic wind speed shall be applied over the entire roof over the 4-inch-wide membrane strips. Underlayment shall be applied in accordance with this table using the application requirements for where the maximum basic wind speed is less than 130 mph.
		3. A single layer of self-adhering polymer modified bitumen underlayment complying with ASTM D1970, installed in accordance with the underlayment and roof covering manufacturers' installation instructions for the deck material, roof ventilation configuration, and climate exposure of the roof covering.	3. A single layer of self-adhering polymer modified bitumen underlayment complying with ASTM D1970, installed in accordance with the underlayment and roof covering manufacturers' installation instructions for the deck material, roof ventilation configuration, and climate exposure of the roof covering.

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

TABLE 1507.1.1(3) UNDERLAYMENTFASTENING

ROOF COVERING	SECTION	MAXIMUM BASIC WIND SPEED, *V* < 130 MPH IN HURRICANE-PRONE REGIONS OR *V* < 140 MPH OUTSIDE HURRICANE-PRONE REGIONS	MAXIMUM BASIC WIND SPEED, *V* ≥ 130 MPH IN HURRICANE-PRONE REGIONS OR *V* ≥ 140 MPH OUTSIDE HURRICANE-PRONE REGIONS
Asphalt shingles	1507.2	Fastened sufficiently to hold in place	Mechanically fastened underlayment shall be fastened with corrosion-resistant fasteners in a grid pattern of not greater than 12 inches horizontally and vertically between side laps with a 6-inch spacing at side and end laps. Mechanically fastened underlayment shall be fastened using annular ring or deformed shank nails with 1-inch diameter metal or plastic caps. Metal caps shall have a thickness of not less than 32-gage (0.0134 inch) 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. The cap nail shank shall have a length sufficient to penetrate through the roof sheathing or not less than $^3/_4$ inch into the roof sheathing. Self-adhering polymer modified bitumen underlayment shall be installed in accordance with the underlayment and roof covering manufacturers' installation instructions for the deck material, roof ventilation configuration and climate exposure of the roof covering.
Clay and concrete tile	1507.3		
BIPV roof coverings	1507.16 1507.17		
Metal roof panels	1507.4	Manufacturer's installation instructions	Mechanically fastened underlayment shall be fastened with corrosion-resistant fasteners in a grid pattern of not greater than 12 inches horizontally and vertically between side laps with a 6-inch spacing at side and end laps. Mechanically fastened underlayment shall be fastened using annular ring or deformed shank nails with 1-inch diameter metal or plastic caps. 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. The cap nail shank shall have a length sufficient to penetrate through the roof sheathing or not less than $^3/_4$ inch into the roof sheathing. Self-adhering polymer modified bitumen underlayment shall be installed in accordance with the underlayment and roof covering manufacturers' installation instructions for the deck material, roof ventilation configuration and climate exposure of the roof covering.
Metal roof shingles	1507.5		
Mineral-surfaced roll roofing	1507.6		
Slate shingles	1507.7		
Wood shingles	1507.8		
Wood shakes	1507.9		

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

1507.17.3 Underlayment. *Underlayment* shall comply with Section 1507.1.1 ~~ASTM D226, ASTM D4869 or ASTM D6757~~.

Delete without substitution:

~~**1507.17.4 Underlayment application.** *Underlayment* shall be applied *shingle fashion*, parallel to and starting from the eave, lapped 2 inches (51 mm) and fastened sufficiently to hold in place.~~

~~**1507.17.4.1 High-wind attachment.** *Underlayment* applied in areas subject to high winds [V_{asd} greater than 110 mph (49 m/s) as determined in accordance with Section 1609.3.1] shall be applied in accordance with the manufacturer's instructions. Fasteners shall be applied along the overlap at not more than 36 inches (914 mm) on center. *Underlayment* installed where V_{asd} is not less than 120 mph (54 m/s) shall comply with ASTM D226, Type III, ASTM D4869, Type IV or ASTM D6757. The *underlayment* shall be attached in a grid pattern of 12 inches (305 mm) between side laps with a 6-inch (152 mm) spacing at the side laps. The *underlayment* shall be applied in~~

~~accordance with Section 1507.1.1 except all laps shall be not less than 4 inches (102 mm). *Underlayment* shall be attached using cap nails or cap staples. Caps shall be metal or plastic with a nominal head diameter of not less than 1 inch (25.4 mm). Metal caps shall have a thickness of not less than 0.010 inch (0.25 mm). Power-driven metal caps shall have a thickness of not less than 0.010 inch (0.25 mm). Thickness of the outside edge of plastic caps shall be not less than 0.035 inch (0.89 mm). 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. Staple gage shall be not less than 21 gage [0.0.2 inch (0.81 mm)]. 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 (19.1 mm) into the roof sheathing.~~

~~**Exception:** As an alternative, adhered *underlayment* complying with ASTM D1970 shall be permitted.~~

Revise as follows:

1507.17.4.~~2~~ Ice barrier. Where required, ice barriers shall comply with Section 1507.1.2. ~~In areas where there has been a history of ice forming along the eaves causing a back-up of water, an ice barrier consisting of not fewer than two layers of *underlayment* cemented together or of a self-adhering polymer modified bitumen sheet shall be used instead of normal *underlayment* and extend from the lowest edges of all roof surfaces to a point not less than 24 inches (610 mm) inside the *exterior wall* line of the *building*.~~

~~**Exception:** Detached accessory *structures* that do not contain conditioned floor area.~~

Reason: This proposal integrates the underlayment requirements for Building-Integrated Photovoltaic (BIPV) roof panels into Section 1507.1.1, aligning them with the underlayment requirements specified for all other roofing materials. The 2018 IBC consolidated the underlayment requrements for roofing materials into Section 1507.1.1 and, at the same time, added specifications for BIPV roof panels. However, the underlayment requirements for BIPV roof panels was not updated to reflect this consolidation and has been overlooked since. Additionally, the current underlayment requirements for high winds areas are outdated and inconsistent with those for other roofing materials, including BIPV shingles. Updates to the wind speed triggers and the application and attachment methods have been made. This proposal seeks to update the underlayment requirements for BIPV roof panels to match those of all other roofing materials.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

This proposal simply consolidates the underlayment requirements for BIPV roof panels into Section 1507.1.1. Underlayment requirements for all other roof covering material is covered under Section 1507.1.1.

S17-25

S18-25

IBC: TABLE 1507.1.1(1)

Proponents: T. Eric Stafford, representing Insurance Institute for Business and Home Safety (testafford@charter.net); Milad Shabanian, representing Insurance Institute for Business & Home Safety (mshabanian@ibhs.org)

2024 International Building Code

Revise as follows:

TABLE 1507.1.1(1) UNDERLAYMENT TYPES

ROOF COVERING	SECTION	MAXIMUM BASIC WIND SPEED, *V* < 130 MPH IN HURRICANE-PRONE REGIONS OR *V* < 140 MPH OUTSIDE HURRICANE-PRONE REGIONS	MAXIMUM BASIC WIND SPEED, *V* ≥ 130 MPH IN HURRICANE-PRONE REGIONS OR *V* ≥ 140 MPH OUTSIDE HURRICANE-PRONE REGIONS
Asphalt shingles	1507.2	ASTM D226 Type I or II ASTM D1970 ASTM D4869 Type I, II, III or IV ASTM D6757 ASTM D8257	ASTM D226 Type II ASTM D1970 ASTM D4869 Type III or IV ASTM D8257 <u>ASTM D6757</u>
Clay and concrete tiles	1507.3	ASTM D226 Type II ASTM D1970 ASTM D2626 ASTM D6380 Class M ASTM D8257	ASTM D226 Type II ASTM D1970 ASTM D8257
Metal roof panels applied to a solid or closely fitted deck	1507.4	ASTM D226 Type I or II ASTM D1970 ASTM D4869 Type I, II, III or IV ASTM D8257	ASTM D226 Type II ASTM D1970 ASTM D4869 Type III or IV ASTM D8257
Metal roof shingles	1507.5	ASTM D226 Type I or II ASTM D1970 ASTM D4869 Type I, II, III or IV ASTM D8257	ASTM D226 Type II ASTM D1970 ASTM D4869 Type III or IV ASTM D8257
Mineral-surfaced roll roofing	1507.6	ASTM D226 Type I or II ASTM D1970 ASTM D4869 Type I, II, III or IV ASTM D8257	ASTM D226 Type II ASTM D1970 ASTM D4869 Type III or IV ASTM D8257
Slate shingles	1507.7	ASTM D226 Type II ASTM D1970 ASTM D4869 Type III or IV ASTM D8257	ASTM D226 Type II ASTM D1970 ASTM D4869 Type III or IV ASTM D8257
Wood shingles	1507.8	ASTM D226 Type I or II ASTM D4869 Type I, II, III or IV	ASTM D226 Type II ASTM D4869 Type III or IV
Wood shakes applied to a solid sheathing roof deck	1507.9	ASTM D226 Type I or II ASTM D4869 Type I, II, III or IV	ASTM D226 Type II ASTM D4869 Type III or IV
BIPV roof coverings	1507.16	ASTM D226 Type I or II ASTM D1970 ASTM D4869 Type I, II, III or IV ASTM D6757 ASTM D8257	ASTM D226 Type II ASTM D1970 ASTM D4869 Type III or IV ASTM D8257 <u>ASTM D6757</u>

Reason: This code change proposal adds an additional underlayment material for use in high wind areas (V ≥ 130 mph in hurricane-prone regions and V ≥ 140 mph outside hurricane-prone regions) of the IBC. Underlayment complying with ASTM D6757 has long been permitted for asphalt shingle roof coverings in the International Codes and is currently permitted to be used in areas where V < 130 mph in hurricane-prone regions and V < 140 mph outside hurricane-prone regions. In the 2024 IBC, the underlayment requirements high wind areas was updated to be consistent with the 2021 IRC and the IBHS Fortified requirements for a sealed roof deck (SRD). Fortified has been updated and now specifically permits the use of underlayment complying with ASTM D6757 to create a SRD. This proposal simply adds underlayment material complying with ASTM D6757 as an option in high wind areas. Support of this proposal will align the underlayment requirements in high wind areas in the IBC with the IBHS Fortified SRD and add an additional underlayment option to be used in these areas.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

This proposal adds an additional underlayment material for use in high wind areas.

S18-25

S19-25

IBC: 1507.1.1.1 (New)

Proponents: T. Eric Stafford, representing Insurance Institute for Business and Home Safety (testafford@charter.net); Milad Shabanian, representing Insurance Institute for Business & Home Safety (mshabanian@ibhs.org)

2024 International Building Code

Add new text as follows:

1507.1.1.1 Underlayment installation at hips and ridges. *Underlayment* shall lap over hips and ridges a minimum of 6 inches.

Exception: Hips and ridges where ventilation openings in accordance with Section 1202 are provided.

Reason: This proposal seeks to provide an additional level of water intrusion protection for minimal effort in the event part of the roof covering is blown off. If approved, this proposal will align the code with IBHS's FORTIFIED Roof™ designation regarding underlayment application at hips and ridges. The FORTIFIED Home™ program was developed to reduce avoidable suffering and financial loss caused by hurricanes, high winds, and hail. The program requirements provide a systems-based, multi tiered approach for improving the resistance of homes and their contents to damage caused by wind, wind-driven rain, and hail. There are three designation levels—FORTIFIED Roof™, FORTIFIED Silver™, and FORTIFIED Gold™—that build on each other and address different systems of the home.

Roof covering damage is typically the most observed damage in post-windstorm investigations. This has been observed in damage investigations by IBHS and FEMA Mitigation Assessment Team (MAT) deployments. While widespread roof covering damage was observed and documented in the Hurricane Ian MAT report, the report noted that the failure of hip and ridge roof coverings was the most common damage observed for all roof covering types. The following paragraph is an excerpt from Section 4.2.4 in the FEMA Hurricane Ian MAT Report (https://www.fema.gov/sites/default/files/documents/fema_rm-hurriance-ian-mat-report-12-2023.pdf):

> "Although roof covering damage was widespread at all sites visited by the MAT, the degree of roof covering damage varied across the sites. The most common damage observed by the MAT for all roof coverings was displacement of hip and ridge roof coverings."

The FEMA Hurricane Michael in Florida MAT Report (https://www.fema.gov/sites/default/files/2020-07/mat-report_hurricane-michael_florida.pdf) also noted that the failure of hip and ridge asphalt shingles was prevalent (see Section 4.2.1.1).

Figure 4-11 (see below) from the FEMA Hurricane Ian in Florida MAT Report shows typical examples of hip and ridge failures observed in Hurricane Ian.

Figure 4-11: Hip and ridge damage on four residences with different roof types: a tile roof (top left), asphalt shingle roof (top right), metal panel roof (bottom left), and cedar shake roof (bottom right)

When hip and ridge roof coverings are blown off, the interior of the building is at risk of water intrusion due to gaps in the roof framing and decking. This water intrusion can result in costly damage to interior contents and furnishings.The observations from the FEMA Hurricane Ian in Florida MAT led to the report recommending the follwing in Recommendation FL-10c:

FEMA should consider submitting code change proposals or supporting code change proposals from other stakeholders—such as IBHS, ARMA, NRCA, and other aligned groups to the IBC, IRC, and the FBC—to require a minimum of 6 inches overlap of the roof underlayment to hip and ridges that do not have ventilation components. Wrapping underlayment over hips and ridges that don't have ventilation components will improve the roof's resistance to water intrusion in the event the hip and ridge coverings are damaged or blown off.

This proposal, if approved, would implement this recommendation by requiring roof underlayment to be lapped over hips and ridges a minimum of 6 inches from both sides and would also be consistent with IBHS requirements for a Fortified Roof designation. An exception to this required lapping is provided for hips and ridges that have ventilation components. According to discussions with the Asphalt Roofing Manufacturer's Association (ARMA), many of its members already recommend this practice in their installation instructions. This proposal would codify this requirement for asphalt shingles and expand this practice to all roof covering types.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

This proposal is not expected to create an increase in construction costs because it is a common practice for many roof coverings and the cost to extend underlayment at hips and ridges for the required 6" lap is negligible.

S19-25

S20-25 Part I

IBC: 1507.1.2

Proponents: Aaron Phillips, representing Asphalt Roofing Manufacturers Association (aphillips@asphaltroofing.org)

THIS IS A 2 PART CODE CHANGE. PART I WILL BE HEARD BY THE IBC STRUCTURAL CODE COMMITTEE. PART II WILL BE HEARD BY THE IRC-B CODE COMMITTEE. SEE THE TENTATIVE HEARING ORDER FOR THESE COMMITTEES.

2024 International Building Code

Revise as follows:

1507.1.2 Ice barriers. In areas where there has been a history of ice forming along the eaves causing a backup of water, an ice barrier shall be installed for asphalt shingles, *metal roof shingles*, mineral-surfaced roll roofing, slate and slate-type shingles, wood shingles, and wood shakes. The ice barrier shall consist of not less than two layers of mechanically fastened *underlayment* cemented together, or a self-adhering polymer modified bitumen sheet complying with ASTM D1970. ~~shall be used in place of normal *underlayment* and~~ The ice barrier shall extend from the lowest edges of all roof surfaces to a point not less than 24 inches (610 mm) inside the *exterior wall* line of the *building*, measured horizontally.

Exception: Detached accessory *structures* that do not contain conditioned floor area.

S20-25 Part I

S20-25 Part II

IRC: R905.1.2

Proponents: Aaron Phillips, representing Asphalt Roofing Manufacturers Association (aphillips@asphaltroofing.org)

2024 International Residential Code

Revise as follows:

R905.1.2 Ice barriers. In areas where there has been a history of ice forming along the eaves causing a backup of water as designated in Table R301.2, an ice barrier shall be installed for asphalt shingles, *metal roof shingles*, mineral-surfaced roll roofing, slate and slate-type shingles, wood shingles and wood shakes. The ice barrier shall consist of not fewer than two layers of mechanically fastened *underlayment* cemented together, or a self-adhering polymer-modified bitumen sheet complying with ASTM D1970. ~~shall be used in place of normal *underlayment* and~~ The ice barrier shall extend from the lowest edges of all roof surfaces to a point not less than 24 inches (610 mm) inside the exterior wall line of the *building*, measured horizontally.

On roofs with slope equal to or greater than 8 units vertical in 12 units horizontal (67-percent slope), the ice barrier shall be applied not less than 36 inches (914 mm) measured along the roof slope from the eave edge of the *building*.

Exception: Detached *accessory structures* not containing *conditioned floor area*.

Reason: This proposal clarifies the materials used for the two ice barrier construction options, adds the appropriate reference standard for self-adhering ice barriers, and clarifies that the measurement for ice barrier placement is meant to be horizontal, not along the roof plane.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

This proposal clarifies existing provisions without making technical changes. Therefore, no change in cost of construction will occur.

S20-25 Part II

S21-25 Part I

IBC: SECTION 1507, 1507.1.2, 1507.17.4.2

Proponents: Larry Sherwood, Sustainable Energy Action Committee, representing IREC (larry@irecusa.org); Dara Yung, representing California Solar & Storage Association (CALSSA) (dara@calssa.org); Joseph H. Cain, P.E., representing Solar Energy Industries Association (SEIA) (joecainpe@gmail.com); Philip Oakes, representing NASFM (phil@browning.red)

THIS IS A 2 PART CODE CHANGE. PART I WILL BE HEARD BY THE IBC STRUCTURAL CODE COMMITTEE. PART II WILL BE HEARD BY THE IRC-B CODE COMMITTEE. SEE THE TENTATIVE HEARING ORDER FOR THESE COMMITTEES.

2024 International Building Code

SECTION 1507 REQUIREMENTS FOR ROOF COVERINGS

Revise as follows:

1507.1.2 Ice barriers. In areas where there has been a history of ice forming along the eaves causing a backup of water, an ice barrier shall be installed for asphalt shingles, *metal roof shingles*, mineral-surfaced roll roofing, slate and slate-type shingles, wood shingles, ~~and~~ wood shakes, and building-integrated photovoltaic (BIPV) roof coverings. The ice barrier shall consist of not less than two layers of *underlayment* cemented together, or a self-adhering polymer modified bitumen sheet shall be used in place of normal *underlayment* and extend from the lowest edges of all roof surfaces to a point not less than 24 inches (610 mm) inside the *exterior wall* line of the *building*.

Exception: Detached accessory *structures* that do not contain conditioned floor area.

1507.17.4.2 Ice barrier. Where required, ice barriers shall comply with Section 1507.1.2. ~~In areas where there has been a history of ice forming along the eaves causing a back-up of water, an ice barrier consisting of not fewer than two layers of *underlayment* cemented together or of a self-adhering polymer modified bitumen sheet shall be used instead of normal *underlayment* and extend from the lowest edges of all roof surfaces to a point not less than 24 inches (610 mm) inside the *exterior wall* line of the *building*.~~

~~**Exception:** Detached accessory *structures* that do not contain conditioned floor area.~~

S21-25 Part I

S21-25 Part II

IRC: R905.1.2, R905.16.4

Proponents: Larry Sherwood, Sustainable Energy Action Committee, representing IREC (larry@irecusa.org); Dara Yung, representing California Solar & Storage Association (CALSSA) (dara@calssa.org); Joseph H. Cain, P.E., representing Solar Energy Industries Association (SEIA) (joecainpe@gmail.com); Philip Oakes, representing NASFM (phil@browning.red)

2024 International Residential Code

Revise as follows:

R905.1.2 Ice barriers. In areas where there has been a history of ice forming along the eaves causing a backup of water as designated in Table R301.2, an ice barrier shall be installed for asphalt shingles, *metal roof shingles*, mineral-surfaced roll roofing, slate and slate-type shingles, wood shingles, ~~and~~ wood shakes, and building-integrated photovoltaic (BIPV) roof coverings. The ice barrier shall consist of not fewer than two layers of *underlayment* cemented together, or a self-adhering polymer-modified bitumen sheet shall be used in place of normal *underlayment* and extend from the lowest edges of all roof surfaces to a point not less than 24 inches (610 mm) inside the exterior wall line of the *building*.

On roofs with slope equal to or greater than 8 units vertical in 12 units horizontal (67-percent slope), the ice barrier shall be applied not less than 36 inches (914 mm) measured along the roof slope from the eave edge of the *building*.

Exception: Detached *accessory structures* not containing *conditioned floor area*.

R905.16.4 Ice barrier. Where required, ice barriers shall comply with Section R905.1.2. ~~In areas where there has been a history of ice forming along the eaves causing a backup of water, as designated in Table R301.2, an ice barrier that consists of not less than two layers of *underlayment* cemented together or of a self-adhering polymer-modified bitumen sheet shall be used in lieu of normal *underlayment* and extend from the lowest edges of all roof surfaces to a point not less than 24 inches (610 mm) inside the exterior wall line of the *building*.~~

~~**Exception:** Detached *accessory structures* that do not contain *conditioned floor area*.~~

Reason: Unlike IBC Section 1507.17.4.2 and IRC Section R905.16.4, other roof covering ice barrier sections simply point to IBC Section 1507.1.2 or IRC Section R905.1.2, respectively. This proposal redirects the ice barrier provisions for building-integrated photovoltaic (BIPV) roof panels to the general ice barrier sections. The proposal also adds "building integrated photovoltaic (BIPV) roof coverings to the list of roof covering types within the general ice barrier sections. These changes will simplify future maintenance of the ice barrier provisions.

This proposal was prepared by the Sustainable Energy Action Committee (SEAC), a forum for all stakeholders (including, but not limited to, AHJs, designers, engineers, contractors, first responders, manufacturers, suppliers, utilities, and testing labs) to collaboratively identify and find solutions for issues that affect the installation and use of solar energy systems, energy storage systems, demand response, and energy efficiency.

The purpose is to facilitate the deployment and use of affordable, clean and renewable energy in a safe, efficient, and sustainable manner. All recommendations from SEAC are approved by diverse stakeholders through a consensus process. For more information, please visit www.sustainableenergyaction.org

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

This proposal consolidates the ice barrier requirements in one location, instead of repeating in other locations.

S21-25 Part II

S22-25

IBC: 1507.2.1, 1507.3.1, 1507.4.1, 1507.5.1, 1507.6.1, 1507.7.1, 1507.8.1, 1507.8.1.1, 1507.9.1, 1507.9.1.1, 2308.11.9, 2308.11.10, TABLE 2304.8(1), TABLE 2304.8(2)

Proponents: David Tyree, representing American Wood Council (dtyree@awc.org)

2024 International Building Code

Revise as follows:

1507.2.1 Deck requirements. Asphalt shingles shall be installed on wood structural panels or closely fitted sawn lumber sheathing ~~fastened to solidly sheathed decks~~.

1507.3.1 Deck requirements. Concrete and clay tile shall be installed ~~only over solid~~ on wood structural panels or closely fitted sawn lumber sheathing.

Exception: Spaced sawn lumber sheathing shall be permitted in *Seismic Design Categories* A, B and C.

1507.4.1 Deck requirements. *Metal roof panel roof coverings* shall be installed on wood structural panels or closely fitted sawn lumber sheathing~~applied to a solid or closely fitted deck~~, except where the *roof covering* is specifically designed to be applied to spaced supports.

1507.5.1 Deck requirements. *Metal roof shingles* shall be installed on wood structural panels or closely fitted sawn lumber sheathing ~~applied to a solid or closely fitted deck~~, except where the *roof covering* is specifically designed to be applied to spaced sawn lumber sheathing.

1507.6.1 Deck requirements. Mineral-surfaced roll roofing shall be installed on wood structural panels or closely fitted sawn lumber sheathing~~fastened to solidly sheathed roofs~~.

1507.7.1 Deck requirements. Slate shingles shall be installed on wood structural panels or closely fitted lumber sheathing~~fastened to solidly sheathed roofs~~.

1507.8.1 Deck requirements. Wood shingles shall be installed on ~~solid~~ wood structural panels, closely fitted sawn lumber sheathing or spaced sawn lumber sheathing. Where spaced sawn lumber 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 from Table 1507.8.7 to coincide with the placement of fasteners. Where 1-inch × 4-inch (25 mm × 102 mm) spaced sawn lumber sheathing is installed at 10 inches (254 mm) on center or greater, additional 1-inch × 4-inch (25 mm × 102 mm) boards shall be installed between the sheathing boards. When wood shingles are installed over spaced sawn lumber sheathing and the underside of the shingles ~~are~~is exposed to the *attic* space, the *attic* shall be ventilated in accordance with Section 1202.2. The shingles shall not be backed with materials that will occupy the required air gap space and prevent the free movement of air on the interior side of the spaced sawn lumber sheathing.

1507.8.1.1 ~~Solid sheathing required~~ Sheathing under ice barrier. ~~Solid~~ Wood structural panel sheathing or closely fitted sawn lumber sheathing shall be provided for portions of the roof deck requiring an ice barrier in accordance with Section 1507.1.2~~is required in areas where the average daily temperature in January is 25°F (-4°C) or less or where there is a possibility of ice forming along the eaves causing a backup of water~~.

1507.9.1 Deck requirements. Wood shakes shall ~~only~~ be ~~used~~ installed on ~~solid~~wood structural panel sheathing, closely fitted sawn lumber sheathing, or spaced sawn lumber sheathing. Where spaced sawn lumber 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 from Table 1507.9.8 to coincide with the placement of fasteners. Where 1-inch by 4-inch (25 mm by 102 mm) spaced sawn lumber 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. Where wood shakes are installed over spaced sawn lumber sheathing and the underside of the shakes ~~are~~ is exposed to the *attic* space, the *attic* shall be ventilated in accordance with Section 1202.2. The shakes shall not be backed with materials that will occupy the required air gap space and prevent the free movement of air on the interior side of the spaced sawn lumber sheathing.

1507.9.1.1 ~~Solid sheathing required~~ Sheathing under ice barrier. ~~Solid~~Wood structural panels or closely fitted sawn lumber sheathing shall be provided for portions of the roof deck requiring an ice barrier in accordance with Section 1507.1.2.~~is required in areas where the average daily temperature in January is 25°F (-4°C) or less or where there is a possibility of ice forming along the eaves causing a backup of water.~~

2308.11.9 Roof sheathing. Roof sheathing shall be in accordance with Tables 2304.8(3) and 2304.8(5) for *wood structural panels*, and Tables 2304.8(1) and 2304.8(2) for sawn lumber and shall comply with Section 2304.8.2.

2308.11.10 Joints. Joints in sawn lumber sheathing shall occur over supports unless *approved* end-matched lumber is used, in which case each piece shall bear on not fewer than two supports.

TABLE 2304.8(1) ALLOWABLE SPANS FOR SAWN LUMBER FLOOR AND ROOF SHEATHING

Portions of table not shown remain unchanged.

SPAN (inches)	MINIMUM NET THICKNESS (inches) OF SAWN LUMBER PLACED			
	Perpendicular to supports		Diagonally to supports	
	Surfaced dry[a]	Surfaced unseasoned	Surfaced dry[a]	Surfaced unseasoned

TABLE 2304.8(2) SAWN LUMBER SHEATHING ~~LUMBER~~, MINIMUM GRADE REQUIREMENTS: BOARD GRADE

Portions of table not shown remain unchanged.

~~SOLID~~ CLOSELY FITTED FLOOR OR ROOF SHEATHING	SPACED SAWN LUMBER ROOF SHEATHING	GRADING RULES

Reason: Code users have questioned if "lumber sheathing" is the same thing as "wood structural panels". This code change is intended to make a clearer distinction between the two by changing "lumber sheathing" to "sawn lumber sheathing" throughout. Sawn lumber is the appropriate terminology that refers to structural wood members that are not a composite and are rather sawn from a log.

Additionally, the phrase "solid sheathing" is misleading where sawn lumber is used as it leaves the code user to question if any gaps are permitted. The code also recognizes "closely fitted" as a phrase to indicate that sawn lumber used as sheathing is permitted to be installed with necessary gaps due to construction tolerances, provided they are closely fitted. Therefore the language has been cleaned up to only refer to "closely fitted" in the context of sawn lumber sheathing.

Lastly, a change has been made to the provisions for decking requirements of wood shakes and shingles to appropriately indicate Section 1507.1.2 for the requirement to install an ice barrier, rather than have duplicated language in that section and the decking sections.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

There are no technical changes proposed in this code change.

S22-25

S23-25 Part I

IBC: 1507.2.2, 1507.3.2

Proponents: Aaron Phillips, representing Asphalt Roofing Manufacturers Association (aphillips@asphaltroofing.org)

THIS IS A 2 PART CODE CHANGE. PART I WILL BE HEARD BY THE IBC STRUCTURAL CODE COMMITTEE. PART II WILL BE HEARD BY THE IRC-B CODE COMMITTEE. SEE THE TENTATIVE HEARING ORDER FOR THESE COMMITTEES.

2024 International Building Code

Revise as follows:

1507.2.2 Slope. Asphalt shingles shall ~~only~~ be used on roof slopes of 2 units vertical in 12 units horizontal (17-percent slope) or greater, in accordance with the *underlayment* requirements of Section 1507.1.1. ~~For roof slopes from 2 units vertical in 12 units horizontal (17-percent slope) up to 4 units vertical in 12 units horizontal (33-percent slope), double *underlayment* application is required in accordance with Section 1507.1.1.~~

1507.3.2 Deck slope. Clay and concrete roof tile shall be installed on roof slopes of $2\frac{1}{2}$ units vertical in 12 units horizontal (21-percent slope) or greater, in accordance with the *underlayment* requirements of Section 1507.1.1. ~~For roof slopes from $2\frac{1}{2}$ units vertical in 12 units horizontal (21-percent slope) to 4 units vertical in 12 units horizontal (33-percent slope), double *underlayment* application is required in accordance with Section 1507.1.1.~~

S23-25 Part I

S23-25 Part II

IRC: R905.2.2, R905.3.2

Proponents: Aaron Phillips, representing Asphalt Roofing Manufacturers Association (aphillips@asphaltroofing.org)

2024 International Residential Code

Revise as follows:

R905.2.2 Slope. Asphalt shingles shall be used only on roof slopes of 2 units vertical in 12 units horizontal (17-percent slope) or greater, in accordance with the *underlayment* requirements of Section R905.1.1. For roof slopes from 2 units vertical in 12 units horizontal (17-percent slope) up to 4 units vertical in 12 units horizontal (33-percent slope), double *underlayment* application is required in accordance with Section R905.1.1.

R905.3.2 Slope. Clay and concrete roof tile shall be installed on roof slopes of 2$^1/_2$ units vertical in 12 units horizontal (25-percent slope) or greater, in accordance with the *underlayment* requirements of Section R905.1.1. For roof slopes from 2$^1/_2$ units vertical in 12 units horizontal (25-percent slope) to 4 units vertical in 12 units horizontal (33-percent slope), double *underlayment* application is required in accordance with Section R905.3.3.

Reason: This proposal corrects errors in the underlayment requirements for asphalt shingles and clay and concrete tile in the IBC and IRC. In prior code development cycles, the underlayment provisions were consolidated into single sections (IBC 1507.1.1 and IRC R905.1.1), which contain options for underlayment installation in IBC Table 1507.1.1(2) and IRC Table R905.1.1(2). Details in the tables establish slope conditions where a double-layer installation of mechanically fastened underlayment is required, slope conditions where a single-layer mechanically fastened underlayment is permitted, and situations where a single layer of self-adhesive underlayment is acceptable. The second sentence in each section of this proposal conflicts with the provisions of the underlayment tables by indicating a double layer installation is required for all underlayment types for lower slopes. This second sentence is not necessary, and its removal is proposed to resolve the existing conflict. An editorial change removes "only" from Sections 1507.2.2 and R905.2.2 since it does not add meaning.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

The proposal resolves an internal conflict in the code, without altering existing technical requirements. Therefore, no change in the cost of construction is expected if this proposal is accepted.

S23-25 Part II

S24-25 Part I

IBC: 1507.2.4, 1507.2.6, 1507.2.6.1 (New)

Proponents: Aaron Phillips, representing Asphalt Roofing Manufacturers Association (aphillips@asphaltroofing.org)

THIS IS A 2 PART CODE CHANGE. PART I WILL BE HEARD BY THE IBC STRUCTURAL CODE COMMITTEE. PART II WILL BE HEARD BY THE IRC-B CODE COMMITTEE. SEE THE TENTATIVE HEARING ORDER FOR THESE COMMITTEES.

2024 International Building Code

Revise as follows:

1507.2.4 Material standards ~~Asphalt shingles~~. Asphalt shingles shall comply with ASTM D3462.

1507.2.6 Fastening ~~Attachment~~. Asphalt shingles shall have the minimum number of fasteners required by the manufacturer's installation instructions, but not less than four fasteners per ~~strip~~ shingle or two fasteners per partial ~~individual~~ shingle. ~~Where the roof slope exceeds 21 units vertical in 12 units horizontal (21:12), shingles shall be installed as required by the manufacturer.~~

Exception: Interlocking asphalt shingles shall have not less than two fasteners per shingle or partial shingle.

Add new text as follows:

1507.2.6.1 Slopes exceeding 21 units vertical in 12 units horizontal. Where the roof slope exceeds 21 units vertical in 12 units horizontal (21:12), asphalt shingles shall be installed in accordance with the manufacturer's installation instructions.

S24-25 Part I

S24-25 Part II

IRC: R905.2.4, R905.2.6, R905.2.6.1 (New)

Proponents: Aaron Phillips, representing Asphalt Roofing Manufacturers Association (aphillips@asphaltroofing.org)

2024 International Residential Code

Revise as follows:

R905.2.4 Material standards ~~Asphalt shingles~~. Asphalt shingles shall comply with ASTM D3462.

R905.2.6 Fastening ~~Attachment~~. Asphalt shingles shall have the minimum number of fasteners required by the manufacturer's ~~*approved*~~ installation instructions, but not less than four fasteners per ~~strip~~ shingle or two fasteners per partial ~~individual~~ shingle. ~~Where the roof slope exceeds 21 units vertical in 12 units horizontal (21:12, 175-percent slope), shingles shall be installed in accordance with the manufacturer's *approved* installation instructions.~~

Exception: Interlocking asphalt shingles shall have not less than two fasteners per shingle or partial shingle.

Add new text as follows:

R905.2.6.1 Slopes exceeding 21 units vertical in 12 units horizontal. Where the roof slope exceeds 21 units vertical in 12 units horizontal (21:12), asphalt shingles shall be installed in accordance with the manufacturer's installation instructions.

Reason: This proposal updates the asphalt shingle attachment sections of the IBC and IRC. The existing requirement for four fasteners per strip shingle and two fasteners per individual shingle harkens back to a day when three-tab strip shingles were the primary asphalt shingle product offering and interlocking shingles, which required only two fasteners per "individual" shingle due to their different width to length proportions, were more common. Today, the dominant asphalt shingle type is a laminated shingle which requires at least four fasteners per shingle. The proposal retains guidance for interlocking shingles via an exception. The changes proposed align better with asphalt shingle products in use today.

The following additional changes are offered:

- In the IBC, installation requirements are clarified by referencing manufacturer's installation instructions rather than the manufacturer. This also makes the section consistent with the existing language of the IRC.
- In the IBC, language in the exception is changed from "as required by" to "in accordance with" to align with language in the parallel section of the IRC.
- In the IRC, the requirement that manufacturer's instructions be "approved" is removed. This makes the section consistent with existing language of the IBC.
- The section titles for 1507.2.4 and R905.2.4 are altered to align with the section content and to differentiate them from the title of Sections 1507.2 and R905.2, respectively.
- Existing provisions for slopes exceeding 21:12 are placed in new subsections 1507.2.6.1 and R905.2.6.1 to improve clarity.
- Titles of Sections 1507.2.6 and R905.2.6 are changed from "Attachment" to "Fastening" to make the titles align better with the content.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

This proposal clarifies existing provisions without making technical changes. Therefore, no change in cost of construction should occur.

S24-25 Part II

S25-25

IBC: 1507.2.8.3

Proponents: Aaron Phillips, representing Asphalt Roofing Manufacturers Association (aphillips@asphaltroofing.org)

2024 International Building Code

Revise as follows:

1507.2.8.3 Drip edge. A drip edge shall be provided at eaves and rake edges of shingle roofs. Adjacent segments of the drip edge shall be lapped not less than 2 inches (51 mm). The vertical leg of drip edges shall be not less than $1^1/_2$ inches (38 mm) in width and shall extend not less than $^1/_4$ inch (6.4 mm) below sheathing. The drip edge shall extend back on the roof not less than 2 inches (51 mm). *Underlayment* shall be installed over drip edges along eaves. Drip edges shall be installed over *underlayment* along rake edges. Drip edges shall be mechanically fastened at intervals not greater than 12 inches (305 mm) on center <u>with fasteners as specified in Section 1507.2.5</u>.

Reason: The International Residential Code establishes minimum requirements for fasteners used to attach drip edge flashing (Section R905.2.8.5) via a pointer to Section R905.2.5. This proposal adds a similar pointer for the same purpose to the International Building Code. In both the IRC and as proposed here for the IBC, the pointer is to the minimum fastener requirements for asphalt shingles. Inclusion of minimum fastener requirements will help reduce the use of improper fasteners.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

Some type of fastener is used to attach drip edge flashing. Use of the proper fastener may slightly decrease or increase the cost of installation, but any difference is expected to be very small.

S25-25

S26-25 Part I

IBC: 1507.2.8.3

Proponents: Aaron Phillips, representing Asphalt Roofing Manufacturers Association (aphillips@asphaltroofing.org)

THIS IS A 2 PART CODE CHANGE. PART I WILL BE HEARD BY THE IBC STRUCTURAL CODE COMMITTEE. PART II WILL BE HEARD BY THE IRC-B CODE COMMITTEE. SEE THE TENTATIVE HEARING ORDER FOR THESE COMMITTEES.

2024 International Building Code

Revise as follows:

1507.2.8.3 Drip edge. A drip edge shall be provided at eaves and rake edges of shingle roofs. Adjacent segments of the drip edge shall be overlapped not less than 2 inches (51 mm). The vertical leg of drip edges shall be not less than 1 $^{1}/_{2}$ inches (38 mm) in width and shall extend not less than $^{1}/_{4}$ inch (6.4 mm) below the roof sheathing. The drip edge shall extend back ononto the roof sheathing not less than 2 inches (51 mm). *Underlayment* shall be installed over drip edges along eaves. Drip edges shall be installed over *underlayment* along rake edges. Drip edges shall be mechanically fastened to the roof sheathing at intervals not greater than 12 inches (305 mm) on center. *Underlayment* shall be installed over the drip edge along eaves and under the drip edge along rake edges.

S26-25 Part I

S26-25 Part II

IRC: R905.2.8.5

Proponents: Aaron Phillips, representing Asphalt Roofing Manufacturers Association (aphillips@asphaltroofing.org)

2024 International Residential Code

Revise as follows:

R905.2.8.5 Drip edge. A drip edge shall be provided at eaves and rake edges of shingle roofs. Adjacent segments of drip edge shall be overlapped not less than 2 inches (51 mm). The vertical leg of drip ~~Drip~~ edges shall extend not less than $^1/_4$ inch (6.4 mm) below the roof sheathing. ~~and~~The drip edge shall extend ~~up back~~ onto the roof sheathing ~~*roof deck*~~not less than 2 inches (51 mm). Drip edges shall be mechanically fastened to the roof sheathing~~*roof deck*~~ at intervals not greater ~~more~~ than 12 inches (305 mm) on center ~~o.c.~~ with fasteners as specified in Section R905.2.5. *Underlayment* shall be installed over the drip edge along eaves and under the drip edge along rake edges.

Reason: Drip edge flashing installed both at roof eaves and rake edges is an important element of the roofing system, contributing to proper water management of the roofing system in these transitional areas. This proposal aligns the drip edge provisions between the IBC and the IRC, since the drip edge requirements should not differ for asphalt shingle roof systems installed on buildings subject to the provisions of these codes. In addition to standardizing the provisions, several improvements are made:

- Removes the unnecessary minimum width requirement for the vertical leg of the drip edge from the IBC. The prescription that the vertical leg extends a minimum of 1/4" below the roof sheathing is sufficient.
- Clarifies the requirement for how far the drip edge must extend back onto the roof by standardizing terminology to "roof sheathing," which is considered a more appropriate term than "roof" in the IBC and *"roof deck"* in the IRC. It requires the drip edge to extend at least two inches onto the roof sheathing. Without this stipulation, nails used for attaching the drip edge may be unintentionally placed in the space between the fascia/sub-fascia and the edge of the roof sheathing, creating a vulnerability to wind induced forces.
- The requirement is clarified to indicate that mechanical fastening is to be into the "roof sheathing" by adding "to the roof sheathing" in the IBC and changing *"roof deck"* to "roof sheathing" in the IRC. Roof sheathing was chosen because sheathing falls within the definition of *nailable substrate,* and the intention is to ensure the drip edge is mechanically fastened into the sheathing.
- Relocates the underlayment provisions in the IBC to the end of the section to mimic the IRC.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

This proposal is a clean up of the existing drip edge provisions without technical changes. Therefore, no change in cost of construction is anticipated.

S26-25 Part II

S27-25

IBC: 1507.3.3

Proponents: Mark S. Graham, representing National Roofing Contractors Association (NRCA) (mgraham@nrca.net); Aaron Phillips, representing Asphalt Roofing Manufacturers Association (aphillips@asphaltroofing.org)

2024 International Building Code

Revise as follows:

1507.3.3 Underlayment. Underlayment shall comply with Section 1507.1.1.~~Unless otherwise noted, required *underlayment* shall conform to: ASTM D226, Type II; ASTM D2626 or ASTM D6380, Class M mineral-surfaced roll roofing.~~

Reason: GRAHAM: This proposed code change is intended to remove unnecessary redundancy in the code.

Section 1507.1.1 Underlayment was added to IBC 2018 and continues in IBC 2021 and IBC 2024. The concept is consolidate all underlayment requirements from each steep-slope roof covering type into a single underlayment section. This current code change proposal is a clean-up from that original effort and replaces the ASTM product standards currently indicated in Section 1507.3.3 with a pointer to Section 1507.1.1, which includes Table 1507.1.1(1)--Underlayment Types indicating the various types of acceptable underlayments.

The specific underlayment standards currently referenced in Section 1507.3.3 are already included in Table 1507.1.1(1).

PHILLIPS: This proposal removes the incomplete list of clay and concrete tile underlayment options in Section 1507.3.3 and points to the underlayment provisions in 1507.1.1, which include a complete list of options. This change will remove confusion about which underlayments are permitted with clay and concrete tile and will simplify future maintenance of underlayment provisions by relying on the consolidated list in Section 1507.1.1.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

GRAHAM: This code change removes redundancy from the code and does not change the code's technical requirements or stringency. As a result, there is no increase or decrease in the cost of construction.
PHILLIPS: This proposal cleans up the underlayment provisions for clay and concrete tile without removing any options. No change in cost of construction is expected if this proposal is approved.

S27-25

S28-25

IBC: 1507.4.6 (New)

Proponents: Kurt Beres, representing MA Design (kurtb@ma-architects.com)

2024 International Building Code

Add new text as follows:

1507.4.6 Snow Guards. *Structures* with snow loads equal to or greater than 15 PSF, with roofs constructed of metal panels sloped greater than four units vertical in twelve units horizontal (33% or 4:12 slope), shall be provided with permanently attached guards sufficient to prevent ice and snow slides. The snow guards shall be installed in the locations and quantity established per the manufacturers recommendations.

Exceptions.

1. On sides of the building without occupiable areas within 6' of the face of the building.
2. When the sloped metal roof has no exposed edge such as with a parapet that would contain the build up of snow and ice.
3. Where approved by the building official.

Reason: With the ICC focus on disaster preparedness codifying good design that protects property and life with minimal cost is good code. Similar code sections have already been adopted in local codes and jurisdictions that have identified the need and simple change these types of measures can have on the protection of property and life such as the state of Kentucky. This proposal widens this to regions of the country by providing language focused on the amount of annual snow fall. Below are a couple links to articles about property and injury loss.

https://www.parkrecord.com/2019/03/05/park-city-roof-sheds-ice-and-snow-smashing-into-a-car/

https://www.nbcdfw.com/news/local/several-people-injured-at-cowboys-stadium/1910289/

Bibliography: 2018mKentucky building code.

Cost Impact: Increase

Estimated Immediate Cost Impact:

Based on the region the proposed code change codifies good design practice and should have minimal impact on cost because it is considered best practice. Any cost increase would be dependent on the means selected, area affected and geographic location. Based on parameters defined below required snow guards should cost less than .50 cents per sf of affected roof area.

Estimated Immediate Cost Impact Justification (methodology and variables):

Methodology:Using available online tools to determine quantity, a model metal roof was used based on adhered snow guards, using a potential 40PSF roof load.

https://sno-safe.com/getLayout.php

Variables:

Size and location of the metal roofing system. Including pitch and snow load.

S28-25

S29-25

IBC: 1507.8.8, 1507.9.9

Proponents: Nav Koonar, representing Cedar Shake and Shingle Bureau, Director of Operations (nav.koonar@cedarbureau.org); David Roodvoets, DLR Consultants, representing Cedar Shake and Shingle Bureau (davelee@ix.netcom.com)

2024 International Building Code

Revise as follows:

1507.8.8 Flashing. At the juncture of the roof and vertical surfaces, flashing and counterflashing shall be provided in accordance with the manufacturer's installation instructions, and where of metal, shall be not less than 0.019-inch (0.48 mm) (No. 26 galvanized sheet gage) corrosion-resistant metal. The valley flashing shall extend not less than 11 inches (279 mm) from the centerline each way and have a splash diverter rib not less than 1 inch (25 mm) high at the flow line formed as part of the flashing. Sections of flashing shall have an end lap of not less than 4 inches (102 mm). For roof slopes of three units vertical in 12 units horizontal (25-percent slope) and over, the valley flashing shall have a 36-inch-wide (914 mm) *underlayment* of either one layer of Type I *underlayment* running the full length of the valley or a self-adhering polymer-modified bitumen sheet bearing a *label* indicating compliance with ASTM D1970, in addition to other required *underlayment*. ~~In areas where the average daily temperature in January is 25°F (-4°C) or less or where there is a possibility of ice forming along the eaves causing a backup of water,~~ Wood structural panels or solid lumber sheathing is required on that portion of the roof deck requiring the application of an ice barrier, the metal valley flashing *underlayment* shall be solidly cemented to the roofing *underlayment* for slopes under seven units vertical in 12 units horizontal (58-percent slope) or self-adhering polymer-modified bitumen sheet shall be installed.

1507.9.9 Flashing. At the juncture of the roof and vertical surfaces, flashing and counterflashing shall be provided in accordance with the manufacturer's installation instructions, and where of metal, shall be not less than 0.019-inch (0.48 mm) (No. 26 galvanized sheet gage) corrosion-resistant metal. The valley flashing shall extend not less than 11 inches (279 mm) from the centerline each way and have a splash diverter rib not less than 1 inch (25 mm) high at the flow line formed as part of the flashing. Sections of flashing shall have an end lap of not less than 4 inches (102 mm). For roof slopes of three units vertical in 12 units horizontal (25-percent slope) and over, the valley flashing shall have a 36-inch-wide (914 mm) *underlayment* of either one layer of Type I *underlayment* running the full length of the valley or a self-adhering polymer-modified bitumen sheet bearing a label indicating compliance with ASTM D1970, in addition to other required *underlayment*. ~~In areas where the average daily temperature in January is 25°F (-4°C) or less or where there is a possibility of ice forming along the eaves causing a backup of water,~~ Wood structural panels or solid lumber sheathing is required on that portion of the roof deck requiring the application of an ice barrier, the metal valley flashing *underlayment* shall be solidly cemented to the roofing *underlayment* for slopes under seven units vertical in 12 units horizontal (58-percent slope) or self-adhering polymer-modified bitumen sheet shall be installed.

Reason: The IBC wood shingle and wood shake sections in this proposal contain a trigger for ice barrier provisions (i.e., average daily temperature in January is 25°F or less) which conflicts with the ice barrier trigger in 1507.1.2. This proposal resolves the conflict by removing the trigger from 1507.8.8 and 1507.9.9.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

Editorial change. See reason statement.

S29-25

S30-25 Part I

IBC: 1509.2, 1507.10.2, ASTM Chapter 35

Proponents: Aaron Phillips, representing Asphalt Roofing Manufacturers Association (aphillips@asphaltroofing.org)

THIS IS A 2 PART CODE CHANGE. PART I WILL BE HEARD BY THE IBC STRUCTURAL CODE COMMITTEE. PART II WILL BE HEARD BY THE IRC-B CODE COMMITTEE. SEE THE TENTATIVE HEARING ORDER FOR THESE COMMITTEES.

2024 International Building Code

Revise as follows:

1509.2 Material standards. *Roof coating* materials shall comply with the standards in Table 1509.2.

TABLE 1509.2ROOF COATING MATERIAL STANDARDS

MATERIAL	STANDARD
Acrylic coating	ASTM D6083
Asphaltic emulsion coating	ASTM D1227
~~Asphalt coating~~	~~ASTM D2823~~
Asphalt roof coating	ASTM D4479
Aluminum-pigmented asphalt coating	ASTM D2824
Silicone coating	ASTM D6694
Moisture-cured polyurethane coating	ASTM D6947

1507.10.2 Material standards. *Built-up roof covering* materials shall comply with the standards in Table 1507.10.2 or UL 55A.

TABLE 1507.10.2BUILT-UP ROOFING MATERIAL STANDARDS

MATERIAL STANDARD	STANDARD
Acrylic coatings used in roofing	ASTM D6083
Aggregate surfacing	ASTM D1863
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 saturated organic felt	ASTM D227
Coal-tar pitch used in roofing	ASTM D450; Type I or II
Coal-tar primer used in roofing, dampproofing and waterproofing	ASTM D43
Glass mat, coal tar	ASTM D4990

MATERIAL STANDARD	STANDARD
Glass mat, venting type	ASTM D4897
Mineral-surfaced inorganic cap sheet	ASTM D3909
Thermoplastic fabrics used in roofing	ASTM D5665, D5726

Delete without substitution:

ASTM

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

~~D2822/D2822M—2005(2011)e1~~ ~~Specification for Asphalt Roof Cement, Asbestos Containing~~
~~D2823/D2823M—05(2011)e1~~ ~~Specification for Asphalt Roof Coatings, Asbestos Containing~~

S30-25 Part I

S30-25 Part II

IRC: R905.9.2, TABLE R909.2, ASTM Chapter 44

Proponents: Aaron Phillips, representing Asphalt Roofing Manufacturers Association (aphillips@asphaltroofing.org)

2024 International Residential Code

Revise as follows:

R905.9.2 Material standards. *Built-up roof covering* materials shall comply with the standards in Table R905.9.2 or UL 55A.

TABLE R905.9.2BUILT-UP ROOFING MATERIAL STANDARDS

MATERIAL STANDARD	STANDARD
Acrylic coatings used in roofing	ASTM D6083
Aggregate surfacing	ASTM D1863
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 D2626
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

TABLE R909.2 ROOF COATING MATERIAL STANDARDS

COATING MATERIAL	STANDARD
Acrylic coating	ASTM D6083
Asphaltic emulsion coating	ASTM D1227
~~Asphalt coating~~	~~ASTM D2823~~
Asphalt roof coating	ASTM D4479
Aluminum-pigmented asphalt coating	ASTM D2824
Silicone coating	ASTM D6694
Moisture-cured polyurethane coating	ASTM D6947

Delete without substitution:

ASTM

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

~~D2822/D2822M—2005(2011)e1~~	~~Specification for Asphalt Roof Cement, Asbestos Containing~~
~~D2823/D2823M—05(2011)e1~~	~~Specification for Asphalt Roof Coatings, Asbestos Containing~~

Reason: ASTM D2822 (Specification for Asphalt Roof Cement, Asbestos Containing) was withdrawn as an ASTM standard in 2016. ASTM D2823 (Specification for Asphalt Roof Coatings, Asbestos Containing) was withdrawn as an ASTM standard in 2014. No products complying with these standards are known, so the standards are proposed for removal from the IBC and the IRC.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

The proposed removal of standards representing materials no longer used will have no impact on cost of construction.

S30-25 Part II

S31-25

IBC: SECTION 202, SECTION 202 (New), SECTION 1510 (New), 1510.1 (New), 1510.2 (New), 1510.3 (New), 1510.4 (New), 1510.4.1 (New)

Proponents: Mike Fischer, Kellen Company, representing Protected Membrane Roofing Institute (mfischer@kellencompany.com)

2024 International Building Code

SECTION 202
DEFINITIONS

Add new definition as follows:

PROTECTED MEMBRANE ROOF ASSEMBLY. A *Roof Assembly* that includes insulation that is installed above a roofing membrane.

Add new text as follows:

SECTION 1510
PROTECTED MEMBRANE ROOF ASSEMBLIES

1510.1 General. *Protected membrane roof assemblies* shall comply with this Chapter. *Roof coverings* in *protected membrane roof assemblies* shall comply with Section 1507.

1510.2 Landscaped roofs and vegetative roofs. *Landscaped roofs* and *vegetative roofs* that include *protected membrane roof assemblies* shall comply with Sections 1505.10 and 1507.15.

1510.3 Foam plastics. Foam plastic insulation in *protected membrane roof assemblies* shall comply with the applicable requirements of Chapter 26.

1510.4 Installation. *Protected membrane roof assemblies* shall be installed in accordance with the manufacturer's *approved* installation instructions.

1510.4.1 Flashing. Flashing for *protected membrane roof assemblies* shall be installed in accordance with Section 1503.2 and the manufacturers *approved* installation instructions.

Reason: Protected membrane roof assemblies (also known as inverted roofs) include insulation that is above the roofing membrane. These assemblies are becoming increasingly popular, particularly as part of landscaped roofs and vegetative roofs. The IBC does not directly address these assemblies. For example, Section 1508 includes specific provisions for roof insulation that presume the insulation is protected by an approved roof covering.

This proposal provides a simple definition for protected membrane roof assemblies (PMRAs) and adds provisions to assist with code enforcement by ensuring that PMRAs meet the requirements for roofing- including wind, fire, weather protection- as well as the provisions for landscaped and vegetative roofs.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

The proposal contains no mandatory provisions.

S31-25

S32-25

IBC: [BG] 1511.2.4

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

THIS CODE CHANGE WILL BE HEARD BY THE IBC GENERAL CODE COMMITTEE. SEE THE TENTATIVE HEARING ORDER FOR THAT COMMITTEE.

2024 International Building Code

Revise as follows:

[BG] 1511.2.4 Type of construction. *Penthouses* shall be constructed of *building element* materials as required for the type of construction of the *building*. Penthouse *exterior walls* and roof construction shall have a *fire-resistance rating* as required for the type of construction of the building. Supporting construction of such *exterior walls* and roof construction shall have a *fire-resistance rating* not less than required for the *exterior wall* or roof supported.

Exceptions:

1. On *buildings* of Type I construction, the *exterior walls* and roofs of *penthouses* with a *fire separation distance* greater than 5 feet (1524 mm) and less than 20 feet (6096 mm) shall be permitted to have not less than a 1-hour *fire-resistance rating*. The *exterior walls* and roofs of *penthouses* with a *fire separation distance* of 20 feet (6096 mm) or greater shall not be required to have a *fire-resistance rating*.
2. On *buildings* of Type I construction two *stories* or less in height above *grade plane* or of Type II construction, the *exterior walls* and roofs of *penthouses* with a *fire separation distance* greater than 5 feet (1524 mm) and less than 20 feet (6096 mm) shall be permitted to have not less than a 1-hour *fire-resistance rating* or a lesser *fire-resistance rating* as required by Table 705.5 and be constructed of *fire-retardant-treated wood*. The *exterior walls* and roofs of *penthouses* with a *fire separation distance* of 20 feet (6096 mm) or greater shall be permitted to be constructed of *fire-retardant-treated wood* and shall not be required to have a *fire-resistance rating*. Interior framing and walls shall be permitted to be constructed of *fire-retardant-treated wood*.
3. On *buildings* of Type III, IV or V construction, the *exterior walls* <u>and roofs</u> of *penthouses* with a *fire separation distance* greater than 5 feet (1524 mm) and less than 20 feet (6096 mm) shall be permitted to have not less than a 1-hour *fire-resistance rating* or a lesser *fire-resistance rating* as required by Table 705.5. On *buildings* of Type III, IV or VA construction, the *exterior walls* <u>and roofs</u> of *penthouses* with a *fire separation distance* of 20 feet (6096 mm) or greater shall be permitted to be of heavy timber construction complying with Sections 602.4 and 2304.11 or noncombustible construction or *fire-retardant-treated wood* and shall not be required to have a *fire-resistance rating*.

Reason: Penthouse exterior walls and roofs are required to meet material and fire-resistance rating requirements for the type of construction of the building. Exceptions to this requirement permit different materials or lesser fire-resistance ratings, with different allowances based on construction type. Exceptions 1 and 2 are for Type I and Type II construction and apply to exterior walls and roofs of penthouses; however, Exception 3 for Type III, IV or V construction only applies to exterior walls. It is believed this is an oversight since it doesn't make sense to give exceptions to the exterior walls without giving the same exceptions to the roofs, as is done in exceptions 1 and 2.

Furthermore, this creates a conflict in the code where an exterior bearing wall could be non-rated as allowed by Exception 3, while the roof is required to have a fire-resistance rating. In this case, the structural member supporting construction requirement of Section 704.1.1 is not met. There doesn't seem to be a reason to have a rated roof supported by a non-rated exterior bearing wall, while interior bearing walls would have to be rated per Sections 1511.2.4 and 704.1.1.

This proposal simply adds roofs to Exception 3 to be consistent with Exceptions 1 and 2, and to prevent a conflict in the code.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

This proposal corrects what is believed to be an oversight in the code for Exception 3, making Exception 3 consistent with Exceptions 1 and 2 and the intent of the code. Since this proposal is consistent with the intent of the code, it is considered to be a clarification with no cost impact.

S32-25

S33-25

IBC: [BG] 1511.2.4, [BG] 1511.3, 2304.11

Proponents: David Tyree, representing American Wood Council (dtyree@awc.org); Shane Nilles, representing American Wood Council (snilles@awc.org)

THIS CODE CHANGE WILL BE HEARD BY THE IBC GENERAL CODE COMMITTEE. SEE THE TENTATIVE HEARING ORDER FOR THAT COMMITTEE.

2024 International Building Code

Revise as follows:

[BG] 1511.2.4 Type of construction. *Penthouses* shall be constructed of *building element* materials as required for the type of construction of the *building*. Penthouse *exterior walls* and roof construction shall have a *fire-resistance rating* as required for the type of construction of the building. Supporting construction of such *exterior walls* and roof construction shall have a *fire-resistance rating* not less than required for the *exterior wall* or roof supported.

Exceptions:

1. On *buildings* of Type I construction, the *exterior walls* and roofs of *penthouses* with a *fire separation distance* greater than 5 feet (1524 mm) and less than 20 feet (6096 mm) shall be permitted to have not less than a 1-hour *fire-resistance rating*. The *exterior walls* and roofs of *penthouses* with a *fire separation distance* of 20 feet (6096 mm) or greater shall not be required to have a *fire-resistance rating*.
2. On *buildings* of Type I construction two *stories* or less in height above *grade plane* or of Type II construction, the *exterior walls* and roofs of *penthouses* with a *fire separation distance* greater than 5 feet (1524 mm) and less than 20 feet (6096 mm) shall be permitted to have not less than a 1-hour *fire-resistance rating* or a lesser *fire-resistance rating* as required by Table 705.5 and be constructed of *fire-retardant-treated wood*. The *exterior walls* and roofs of *penthouses* with a *fire separation distance* of 20 feet (6096 mm) or greater shall be permitted to be constructed of *fire-retardant-treated wood* and shall not be required to have a *fire-resistance rating*. Interior framing and walls shall be permitted to be constructed of *fire-retardant-treated wood*.
3. On *buildings* of Type III, IV or V construction, the *exterior walls* of *penthouses* with a *fire separation distance* greater than 5 feet (1524 mm) and less than 20 feet (6096 mm) shall be permitted to have not less than a 1-hour *fire-resistance rating* or a lesser *fire-resistance rating* as required by Table 705.5. On *buildings* of Type III, IV or VA construction, the *exterior walls* of *penthouses* with a *fire separation distance* of 20 feet (6096 mm) or greater shall be permitted to be of heavy timber ~~construction~~ complying with ~~Sections 602.4 and~~ the minimum dimensions and permitted materials in accordance with Section 2304.11 or noncombustible construction or *fire-retardant-treated wood* and shall not be required to have a *fire-resistance rating*.

[BG] 1511.3 Tanks. Tanks having a capacity of more than 500 gallons (1893 L) located on the *roof deck* of a *building* shall be supported on *masonry*, reinforced concrete, steel or heavy timber ~~construction~~ complying with Section 2304.11 provided that, where such supports are located in the *building* above the lowest *story*, the support shall be fire-resistance rated as required for Type IA construction.

2304.11 Heavy timber ~~construction~~. Where a *structure*, portion thereof or individual structural elements are required by provisions of this code to be of heavy timber, the *building elements* therein shall comply with the applicable provisions of Sections 2304.11.1 through 2304.11.4. Minimum dimensions of heavy timber shall comply with the applicable requirements in Table 2304.11 based on roofs or floors supported and the configuration of each structural element, or in Sections 2304.11.2 through 2304.11.4. Lumber decking shall be in accordance with Section 2304.9.

Reason: "Heavy timber" refers to specific pieces of wood or wood products with large cross-sectional areas meeting the requirements of Table 2304.11. The term "heavy timber construction" refers to an architectural method utilizing heavy timber components for structural purposes. This proposal corrects three locations in the IBC where "heavy timber" more accurately describes the intent of how it's used in the section to be for wood member size requirements and not type of construction.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

There are no technical changes proposed in this code change. The changes are proposed for consistency in the code.

S33-25

S34-25

IBC: [BG] 1511.7.6, 2703.1

Proponents: Amanda Hickman, The Hickman Group, representing Single-Ply Roofing Industry (SPRI) (amanda@thehickmangroup.com)

THIS CODE CHANGE WILL BE HEARD BY THE IBC GENERAL CODE COMMITTEE. SEE THE TENTATIVE HEARING ORDER FOR THAT COMMITTEE.

2024 International Building Code

[BG] 1511.7.6 Lightning protection systems. Where provided, lightning ~~Lightning~~ protection system components shall be installed in accordance with Sections 1511.7.6.1, 1511.7.6.2 and 2703.

2703.1 General. Where provided, lightning protection systems shall comply with Sections 1511.7.6 through 1511.7.6.2 and Sections 2703.2 through 2703.3.

Reason: The proposal clarifies the intent of these sections concerning Lightning Protection Systems. While such systems are not mandatory, when provided, they must comply with the applicable requirements outlined in both Chapter 15 and Chapter 27.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

The proposal only clarifies the intent of the section and provides a pointer to the other applicable section.

S34-25

S35-25

IBC: [BG] 1511.8

Proponents: John Taecker, Taecker Codes & Technical Services, representing Taecker Codes & Technical Services (john@taeckercodes.com)

THIS CODE CHANGE WILL BE HEARD BY THE IBC GENERAL CODE COMMITTEE. SEE THE TENTATIVE HEARING ORDER FOR THAT COMMITTEE.

2024 International Building Code

[BG] ~~1511.8~~ 1511.1.2 Structural fire resistance. The structural frame and roof construction supporting *loads* imposed upon the roof by any *rooftop structure* shall comply with the requirements of Table 601. The fire-resistance reduction permitted by Table 601, Note a, shall not apply to roofs containing *rooftop structures*.

Reason: The structural fire resistance requirements in Section 1511.8 applies to any rooftop structure. Thus, it should be relocated as a subsection to Section 1511.1 so that these requirements are not missed.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

This is already a requirement. This is an editorial relocation.

S35-25

S36-25

IBC: SECTION 1512 (New), 1512.1 (New), 1512.1.1 (New), 1512.1.2 (New), [BG] 1511.3, [BG] 1511.3.1, [BG] 1511.3.2, [BG] 1511.3.3, [BG] 1511.4, [BG] 1511.7.6, [BG] 1511.7.6.1, [BG] 1511.7.6.2, 1512.5 (New), 1512.6 (New), TABLE 1512.6 (New), 1512.7 (New), 1512.7.1 (New), 1512.7.2 (New), 1512.7.3 (New)

Proponents: John Taecker, Taecker Codes & Technical Services, representing Taecker Codes & Technical Services (john@taeckercodes.com)

THIS CODE CHANGE WILL BE HEARD BY THE IBC GENERAL CODE COMMITTEE. SEE THE TENTATIVE HEARING ORDER FOR THAT COMMITTEE.

2024 International Building Code

Add new text as follows:

SECTION 1512
ROOFTOP MOUNTED EQUIPMENT AND SYSTEMS

1512.1 General. Rooftop-mounted equipment and systems shall be installed in accordance with this section and the code applicable to the equipment or system. The installation shall not impact the integrity of the roof assembly or roof covering.

1512.1.1 Structural loads. The structural frame and roof construction supporting loads imposed upon the roof by any rooftop mounted equipment or system shall comply with Chapter 16.

1512.1.2 Flashing. Flashing shall be installed for rooftop-mounted equipment in accordance with Section 1503.2 and 1503.2.1.

Revise as follows:

[BG] ~~1511.3~~ 1512.2 Tanks. Tanks having a capacity of more than 500 gallons (1893 L) located on the *roof deck* of a *building* shall be supported on *masonry*, reinforced concrete, steel or heavy timber construction complying with Section 2304.11 provided that, where such supports are located in the *building* above the lowest *story*, the support shall be fire-resistance rated as required for Type IA construction.

[BG] ~~1511.3.1~~ 1512.2.1 Valve and drain. In the bottom or on the side near the bottom of the tank, a pipe or outlet, fitted with a suitable quick-opening valve for discharging the contents into a drain in an emergency shall be provided.

[BG] ~~1511.3.2~~ 1512.2.2 Location. Tanks shall not be placed over or near a *stairway* or an elevator *shaft*, unless there is a solid roof or floor underneath the tank.

[BG] ~~1511.3.3~~ 1512.2.3 Tank cover. Unenclosed roof tanks shall have covers sloping toward the perimeter of the tanks.

[BG] ~~1511.4~~ 1512.3 Cooling towers. Cooling towers located on the *roof deck* of a *building* and greater than 250 square feet (23.2 m^2) in base area or greater than 15 feet (4572 mm) in height above the *roof deck*, as measured to the highest point on the cooling tower, where the roof is greater than 50 feet (15 240 mm) in height above *grade plane* shall be constructed of noncombustible materials. The base area of cooling towers shall not exceed one-third the area of the supporting *roof deck*.

> **Exception:** Drip boards and the enclosing construction shall be permitted to be of wood not less than 1 inch (25 mm) nominal thickness, provided that the wood is covered on the exterior of the tower with noncombustible material.

[BG] ~~1511.7.6~~ 1512.4 Lightning protection systems. Lightning protection system components shall be installed in accordance with Sections ~~1511.7.6.1, 1511.7.6.2~~ 1512.4.1, 1512.4.2 and 2703.

[BG] ~~1511.7.6.1~~ 1512.4.1 Installation on metal edge systems or gutters. Lightning protection system components attached to

ANSI/SPRI/FM 4435/ES-1 or ANSI/SPRI GT-1 tested metal edge systems or gutters shall be installed with compatible brackets, fasteners or adhesives, in accordance with the metal edge systems or gutter manufacturer's installation instructions. Where the metal edge system or gutter manufacturer is unknown, installation shall be as directed by a *registered design professional*.

[BG] ~~1511.7.6.2~~ 1512.4.2 Installation on roof coverings. Lightning protection system components directly attached to or through the *roof covering* shall be installed in accordance with this chapter and the *roof covering* manufacturer's installation instructions. Flashing shall be installed in accordance with the *roof assembly* manufacturer's installation instructions and Sections 1503.2 and 1507 where the lightning protection system installation results in a penetration through the *roof covering*. Where the *roof covering* manufacturer is unknown, installation shall be as directed by a *registered design professional*.

Add new text as follows:

1512.5 Solar energy systems.. Rooftop-mounted photovoltaic panel systems and solar thermal systems shall be installed in accordance with Section 3111.

1512.6 Mechanical equipment.. Rooftop mounted mechanical equipment shall be mounted on curbs raised a minimum of 8 inches (203 mm) above the roof surface, or where roofing materials extend beneath the equipment, on raised equipment supports providing a minimum clearance height in accordance with Table 1512.6.

> **Exception**: Where the existing rooftop equipment provides sufficient clearance to repair, recover, replace or maintain the roofing system or any of its components, and where approved, such existing equipment need not comply with Table 1512.6.

TABLE 1512.6 CLEARNCE BELOW RAISED ROOFTOP-MOUNTED MECHANICAL EQUIPMENT

Width of Mechanical Equipment	Minimum clearance above roof surface
< 24 inches (610 mm)	14 inches (356 mm)
24 inches (610 mm) < 36 inches (914 mm)	18 inches (457 mm)
36 inches (914 mm) < 48 inches (1219 mm)	24 inches (610 mm)
48 inches (1219 mm) < 60 inches (1525 mm)	30 inches (762 mm)
> 60 inches (1525 mm)	48 inches (1219 mm)

1512.7 Electrical, plumbing and mechanical systems. Electrical, plumbing and mechanical systems shall be installed in accordance with Sections 1512.7.1 through 1512.7.3, and this code.

1512.7.1 Electrical wiring methods. Electrical wiring methods installed on rooftops and not encased in structural concrete shall be installed above the roof system in accordance with all of the following:

1. Electrical wiring methods installed in locations under metal-corrugated sheet roof decking shall be supported so there is not less than 1 ½ inch (38 mm) clearance measured from the lowest surface of the roof covering to the top of the cable or raceway.
2. A cable or raceway shall not be installed in concealed locations in roofs with metal-corrugated sheet roof decks.
3. Support systems for electrical wiring shall not diminish the fire classification of the roofassembly
4. A minimum of 1 ½ inch (38 mm) of clearance shall be provided between the roofassembly and the cable or raceway, or other clearance as required by other sections of this code and NFPA 70.
5. All penetrations of the roof covering shall be flashed in accordance with one of the following methods:
    5.1. The roof covering manufacturer's installation instructions.
    5.2. Where the roof covering manufacturer is unknown, installation shall be as directed by a registered design professional.
    5.3. Listed and labeled flashing materials or systems specific for what is penetrating the roof covering.

1512.7.2 Mechanical and plumbing systems. Mechanical and plumbing system piping and tubing installed on rooftops and not encased in structural concrete shall be supported above the roof system and covering, in accordance with the following:

1. A pipe or tube shall not be installed in concealed locations in roofs with metal-corrugated sheet roof decks.
2. Support systems for piping and tubing shall not diminish the fire classification of the roof assembly
3. A minimum of 1 ½ inch (38 mm) of clearance shall be provided between the roof assembly and the pipe or tube or other clearance as required by other sections of this code and the *International Mechanical Code*, *International Plumbing Code*, or *International Fuel Gas Code*, as applicable.
4. All penetrations of the roof covering shall be flashed in accordance with one of the following methods:
   - 4.1. The roof covering manufacturer's installation instructions.
   - 4.2. Where the roof covering manufacturer is unknown, installation shall be as directed by a registered design professional.
   - 4.3. Listed and labeled flashing materials or systems specific for what is penetrating the roof covering.

1512.7.3 Line sets, piping, tubing, raceways and cables under roof decks. Line sets, piping, tubing, raceways and cables installed below the roof deck shall have a minimum clearance of 1 ½ inch (38 mm) from the lowest surface of the roof deck except where they penetrate the roof deck.

Exception: Line sets, pipes, conduit and cables installed under structural concrete decks.

Reason: A new dedicated section is proposed to address the ever-increasing installation of rooftop-mounted electrical, mechanical and plumbing equipment and systems.

There are no specific requirements in the code to:

1. Ensure that these installations do not impact the integrity of the roof,
2. Provide clearance of obstacles above the finished roof for maintenance or replacement of the roofing materials,
3. Address the potential impact of these installations on firefighting operations, or
4. Address the potential damage to the fire classification of the roof assemblies and roof coverings.

Requirements for clearance of rooftop mounted electrical wiring exist in NFPA 70, however, these requirements are related to temperature and heating of the conductors. There are requirements for some equipment and systems (tanks, cooling towers and lightning protection systems) that are currently located under the section for rooftop structures (Section 1511), even though they are not structures.

This proposal does the following:

- Relocate sections for equipment and systems that are currently within Section 1511, Rooftop Structures
- Use requirements taken from the current edition of the Florida Building code which has had this wording for several code cycles and has been field-proven to be effective and usable.
- Provide additional direction for other equipment and systems mounted on the rooftop not covered by the Florida Building Code.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

Good construction practices would address proper installation of rooftop-mounted equipment and systems to not impact the integrity of the roof, so the increase has the potential to be minimal, if at all. There may be a slight increase for those installers who have not done this practice. Calculating what, if any, additional cost is very difficult due to the location and the environment. For most of the country the cost would be minimal, if at all. Where there might be an increase in cost would be in high wind areas for the additional engineering involved, however engineering is already required in those situations, so the increase in cost would be negligible.

S36-25

S37-25 Part I

IBC: 1512.1; IEBC: [BS] 705.1

Proponents: Daniel Cupit, Professional Construction Services, representing Colorado Chapter International Code Council (dan.c@pcsden.com)

THIS IS A 2 PART CODE CHANGE. PART I WILL BE HEARD BY THE IBC STRUCTURAL CODE COMMITTEE. PART II WILL BE HEARD BY THE IRC-B CODE COMMITTEE. SEE THE TENTATIVE HEARING ORDER FOR THESE COMMITTEES.

2024 International Building Code

Revise as follows:

1512.1 General. Materials and methods of application used for recovering or replacing an existing *roof covering* shall comply with the requirements of Chapter 15 and Section 1202.2.

Exceptions:

1. *Roof replacement* or *roof recover* of existing *low-slope roof coverings* shall not be required to meet the minimum design slope requirement of $^{1}/_{4}$ unit vertical in 12 units horizontal (2-percent slope) in Section 1507 for roofs that provide *positive roof drainage* and meet the requirements of Sections 1608.3 and 1611.2.
2. Recovering or replacing an existing *roof covering* shall not be required to meet the requirement for secondary (emergency overflow) drains or *scuppers* in Section 1502.2 for roofs that provide for *positive roof drainage* and meet the requirements of Sections 1608.3 and 1611.2. For the purposes of this exception, existing secondary drainage or *scupper* systems required in accordance with this code shall not be removed unless they are replaced by secondary drains or *scuppers* designed and installed in accordance with Section 1502.2.

2024 International Existing Building Code

Revise as follows:

[BS] 705.1 General. Materials and methods of application used for recovering or replacing an existing roof covering shall comply with the requirements of Chapter 15 and Section 1202.2 of the *International Building Code*.

Exceptions:

1. *Roof replacement* or *roof recover* of existing low-slope roof coverings shall not be required to meet the minimum design slope requirement of $^{1}/_{4}$ unit vertical in 12 units horizontal (2-percent slope) in Section 1507 of the *International Building Code* for roofs that provide positive roof drainage and meet the requirements of Sections 1608.3 and 1611.2 of the *International Building Code* .
2. Recovering or replacing an existing roof covering shall not be required to meet the requirement for secondary (emergency overflow) drains or scuppers in Section 1502 of the *International Building Code* for roofs that provide for positive roof drainage and meet the requirements of Sections 1608.3 and 1611.2 of the *International Building Code* . For the purposes of this exception, existing secondary drainage or scupper systems required in accordance with this code shall not be removed unless they are replaced by secondary drains or scuppers designed and installed in accordance with Section 1502 of the *International Building Code*.

S37-25 Part II

IRC: R908.1

Proponents: Daniel Cupit, Professional Construction Services, representing Colorado Chapter International Code Council (dan.c@pcsden.com)

2024 International Residential Code

Revise as follows:

R908.1 General. Materials and methods of application used for recovering or replacing an existing *roof covering* shall comply with the requirements of this chapter and Section R806.

Exceptions:

1. *Reroofing* shall not be required to meet the minimum design slope requirement of one-quarter unit vertical in 12 units horizontal (2-percent slope) in Section R905 for roofs that provide *positive roof drainage*.
2. For roofs that provide positive drainage, recovering or replacing an existing *roof covering* shall not require the secondary (emergency overflow) drains or *scuppers* of Section R903.4.1 to be added to an existing roof.

Reason: Roof Ventilation Requirement for Reroofs

There is a strong need for adequate through roof ventilation on new roof structures and even more so on reroofs. Inadequate roof ventilation can lead to condensation at the sheathing and within the roof cavities. It can also lead to ice dams, and premature aging of the roof covering as with asphalt shingles.

Property damage due to inadequate steep slope roof ventilation has increased in recent years as construction materials have changed. This includes reflective "cool roofs", air barriers, and synthetic felt underlayments. The unintended consequences of these changes in construction have caused a considerable amount of property damage in recent years.

The condensation issue occurs In cold climates when the warm moist air inside structures comes into contact with the cool dry air outside. This warm moist air often occurs in the form of vapor drive in and around kitchen and bathroom areas. It also occurs around breaks in air barriers at penetrations, walls and framing structures due to imperfect construction. The condensation issue in under vented steep slope roof systems is not limited to cold climates in the winter as the opposite occurs in warm moist climates in the warm summer months when cool dry conditioned air in the interior of the structure comes into contact with the warm moist air outside.

The problem with reroofing is that less than 5% of all reroofs are designed by experienced design professionals. Most are replaced as is with similar or new materials with no accounting for existing conditions and no dew point calculations being performed as with new construction.

The roofing industry is well informed on the roof condensation issues and there are many types of ventilation materials to allow for the adequate intake and exhaust ventilation of any roof system or other means of moisture mitigation. Most contractors already know how to install new or additional intake and exhaust ventilation as inadequate roof ventilation is a common cause for roof repairs. Manufacturers have made it easy for contractors by providing education literature and online roof venting calculators. Installing the vents themselves is often easier than some roof flashing details.

The roofing industry has been active in dealing with the steep slope roof ventilation issue for many years, however the building codes have lagged behind in dealing with this issue. There are numerous articles and publications by industry professionals on this subject.

Passage of this proposed roof ventilation code change, as will significantly reduce the number of property damage claims from roof condensation. Which is currently the number one cause of steep slope roofing-related defect claims. Once an issue with inadequate steep slope roof ventilation is corrected, there is no need to do so again. Adequate roof ventilation also increases the functional life of the roof system which far outweighs the minimal costs involved.

Most AHJ's already enforce the roof ventilation requirements for new construction and others also do so for reroofs. These AHJ's have methods in place verify compliance. For those that do not, contractors already agree to meet the building code requirements when they pull their permit. There are also building guides available to assist with the installation and verification of roof intake and exhaust ventilation.

This proposed code change is being introduced by the Colorado Chapter of the International Code Council.

- **Articles on Steep Slope Roof Ventilation 2025.01.03.pdf**
  https://www.cdpaccess.com/proposal/12199/35307/documentation/182389/attachments/download/9010/

- **Roof Ventilation For Reroofs 2025.01.07.pdf**
  https://www.cdpaccess.com/proposal/12199/35307/documentation/182389/attachments/download/9230/

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Cost Impact: Decrease

Estimated Immediate Cost Impact:

The proposed code change would result in a minor increase in the cost of construction that would diminish over time as there is only a need to correct the inadequate ventilation issue once. The cost to bring steep slope roof ventilation to meet the referenced code in section R806 is roughly $810 to install on average 6 additional intake and/or exhaust vents on an average sized 25 square residential roof. Or roughly 5.4% of the average $15,000 cost for that 25 square roof. This cost is reduced with each roof replacement as the correction only needs to be installed once. The average addition of 6 additional roof vents per 25 square roof and the associated cost is based on my experience as a Roofing Consultant and Expert having designed, specified, managed, or supervised the installation of over 2,300 reroof projects over the last 24 years. I also put multiple roofing projects out to bid each year and am a roofing cost expert on roof construction, defect claims, and insurance damage claims.

There is no additional cost to the authority having jurisdiction (AHJ) if they rely in the contractors licensing, experience, and guarantee to follow the building codes adopted by the AHJ. There is a minimal cost the AHJ if they choose to verify installation of the required roof ventilation. There are multiple roof ventilation calculators available to the contractor and/or building official to assist with the required ventilation should the AHJ choose to require this. As a member of the Colorado Chapter of the ICC (CCICC) Standardization Committee we publish building guides including one for reroofing. The 2024 edit is to include a diagram for roof ventilation that will allow for the contractor to calculate and fill in the existing and additional roof intake and exhaust vents required to meet section R806. There are jurisdictions already have something similar to this.

Estimated Immediate Cost Impact Justification (methodology and variables):

This code change will correct roof ventilation issues with current single family residential structures that do not meet the requirements for new construction in R806. It will increase the service life of the roofs being adequately vented while reducing the risk of damage to existing structures from condensation, ice dams, and excessive heat and moisture in the roof cavity. This incidence of this type of damage has greatly increased in frequency and cost with recent iterations of the energy code and the use of synthetic felt underlayments. The cost to replace the damage caused to the roof sheathing, structural members, and interior surfaces due to condensation and/or ice dams can range from $1,200 on the low end to over $24,000 for the 25 square roof example. The cost to replace an average 25 square roof with damaged asphalt shingles due to excessive heat and moisture within the roof cavity or attic space from inadequate roof ventilation is the $15,000 for an average reroof.

This increase in the cost of construction is offset by a decrease in the annualized cost of the roof system as the useful or functional life of the roof covering is increased by 10% or more with adequate roof ventilation. This value is greater for asphalt shingles which are negatively affected more by excessive heat and moisture within the roof cavity.

Estimated Life Cycle Cost Impact:

The average useful or functional life of a steep slope roof system varies by region and type of roof covering. This life cycle ranges from as low as 7.8 years in severe hail regions to up to 30years in kore moderate climates for asphalt shingles with an average of roughly 15-years on average which is less than the standard shingle warranty periods currently available. The $810 average cost to bring the roof ventilation to meet the code requirement for new construction is roughly $54 per year. However, this cost also increases the service life of the roof system resulting in no cost or actual savings. An increase of the life of the roof covering by 10% due to adequate roof ventilation would result in a savings of $1,500 which exceeds that of the cost for the added ventilation.

Estimated Life Cycle Cost Impact Justification (methodology and variables):

The methods used to determine the life cycle of a steep slope roof system are based on average values as observed in the extreme climate of Colorado where I have assessed over 1,400 roof systems over the last 24-years. The variables associated with the values provided are as follows: geographic and climatic conditions of the local region, local market conditions, type of roof covering installed, type of construction of the existing structure, existence of an air barrier, insulation inside or the roof cavity or attached to the bottom of the sheathing, internal mechanical systems and airflow, average relative humidity inside the structure, dew point relative to the roof deck, exhaust ventilation in bathrooms and kitchens.

Staff Analysis: Section 1512 or the IBC and Section 705 of the IEBC are currently specifically duplicated and maintained as such between the IBC and IEBC CC # S37-25 Part I and CC # S46-25 addresses requirements in a different or contradicting manner related to Section 1512. The committee is urged to make their intensions clear with their actions on these proposals.

S37-25 Part II

S38-25

IBC: 1512.1; IEBC: [BS] 705.1

Proponents: Daniel Cupit, Professional Construction Services, representing Colorado Chapter International Code Council (dan.c@pcsden.com); Stephen Patterson, representing Rooftech (spatterson@rooftechusa.com)

2024 International Building Code

Revise as follows:

1512.1 General. Materials and methods of application used for recovering or replacing an existing *roof covering* shall comply with the requirements of Chapter 15.

Exceptions:

1. *Roof replacement* or *roof recover* of existing *low-slope roof coverings* shall not be required to meet the minimum design slope requirement of $^1/_4$ unit vertical in 12 units horizontal (2-percent slope) in Section 1507 for roofs that provide *positive roof drainage* and meet the requirements of Sections 1608.3 and 1611.2.
2. Recovering ~~or replacing~~ an existing *roof covering* shall not be required to meet the requirement for secondary (emergency overflow) drains or *scuppers* in Section 1502.2 for roofs that provide for *positive roof drainage* and meet the requirements of Sections 1608.3 and 1611.2. For the purposes of this exception, existing secondary drainage or *scupper* systems required in accordance with this code shall not be removed unless they are replaced by secondary drains or *scuppers* designed and installed in accordance with Section 1502.2.

2024 International Existing Building Code

Revise as follows:

[BS] 705.1 General. Materials and methods of application used for recovering or replacing an existing roof covering shall comply with the requirements of Chapter 15 of the *International Building Code*.

Exceptions:

1. *Roof replacement* or *roof recover* of existing low-slope roof coverings shall not be required to meet the minimum design slope requirement of $^1/_4$ unit vertical in 12 units horizontal (2-percent slope) in Section 1507 of the *International Building Code* for roofs that provide positive roof drainage and meet the requirements of Sections 1608.3 and 1611.2 of the *International Building Code* .
2. Recovering ~~or replacing~~ an existing roof covering shall not be required to meet the requirement for secondary (emergency overflow) drains or scuppers in Section 1502 of the *International Building Code* for roofs that provide for positive roof drainage and meet the requirements of Sections 1608.3 and 1611.2 of the *International Building Code* . For the purposes of this exception, existing secondary drainage or scupper systems required in accordance with this code shall not be removed unless they are replaced by secondary drains or scuppers designed and installed in accordance with Section 1502 of the *International Building Code*.

Reason: There is often a need for overflow drains on reroofs as many existing structures do not have adequate roof drainage. The lack of overflow drains possesses a life safety risk from roof collapse especially on older roofs constructed prior to the adoption of the 2009 IBC that required roof overflow drains of structures without adequate roof drainage and the 2015 IPC that greatly increased the roof drainage requirement by increasing drain sizing. These changes were made to better account for actual roof runoff calculations and prevent the buildup of water on roof sections surrounded by parapet walls or other structures.

Water weighs 62.4 lbs. per cubic foot. A low slope roof with just 12-inch parapet walls and curbs can accumulate water up to 1-foot deep before flowing over the edges or through curbs if the existing drains are backed up or clogged. That load is equivalent to 62.4 psf and is more than double the amount of a common 30-lb snow load or a 20-lb rain load on an older building. This does not account for the dead load of the roof system and roof structure itself. Roofs with perimeter walls higher than 12-inches are common and pose an even greater risk of collapse if undersized roof drains become backed up or clogged.

Replacing a roof membrane requires compliance with the IECC and other energy codes in a large percentage of jurisdictions. The additional insulation and cover board required to meet the energy codes increases the weight of the roof system even if by only a few lbs. per square foot (psf). The requirement to add additional roof insulation is not a life safety issue while inadequate roof drainage and/or the lack of overflow drains is. If the building codes are going to require additional roof insulation it does not make sense to ignore the roof drainage required to ensure a roof system allows for proper drainage to avoid the risk of accumulation that can pose a safety hazard. Especially when this risk is greater on older buildings that were constructed prior to the roof drainage requirements. What is the value of human life put at risk because an existing roof structure does not have adequate roof drainage?

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Cost Impact: Increase

Estimated Immediate Cost Impact:

The average cost for installation of a roof overflow drain is roughly $1,500. The cost to install an overflow scupper is significantly less. For an average 100 Square roof requiring 3 to 4 overflow drains or scuppers that cost would be approximately $4,500 to $6,000 or $5,250 0n average. Whereas the cost for an average reroof is anywhere from $800 to over $1,600 per square or more depending on the region, the existing structure, and other circumstances. That averages out to approximately $1,200 per square which is a fair price to reroof an existing low slope roof with 1 or 2-inches of existing insulation to meet the current energy code requirements. At $1,200 per square the cost to replace a 100 Square roof is $120,000. $5,250 to install overflow drains is equal to only 34.4 % of the cost of the reroof.

Estimated Immediate Cost Impact Justification (methodology and variables):

Many roofs only require existing drains or scuppers to be enlarged or for a smaller portion of additional drains to be added if there are already existing overflow drains in place. The previous example assumes all new overflow drains ae required. Even so at 4.4 % of the cost of the reroof that cost is fairly reasonable compared to the reduction in risk achieved by meeting the drainage requirements in the 2024 IBC. In contrast the portion of the reroof cost to bring this sample roof into compliance with the 2021 IECC energy codes is roughly 35% of the reroof costs or $35,000.

Estimated Life Cycle Cost Impact:

If the typical lifecycle of a commercial building is 60 years and the average life of a low slope membrane is 20-years then the roof would be replaced at least twice before the building is fully remodeled or replaced. If you extend the cost of the additional drains over 2 lifecycles that is roughly 40-years at a cost of $131.25 per year or $262.50 per year over one roof lifecycle of 20-years.

Staff Analysis: Section 1512 or the IBC and Section 705 of the IEBC are currently specifically duplicated and maintained as such between the IBC and IEBC

CC # S38-25 and CC #S46-25 addresses requirements in a different or contradicting manner related to Section 1512. The committee is urged to make their intensions clear with their actions on these proposals.

S38-25

S39-25

IBC: SECTION 1512, 1512.1; IEBC: SECTION 705, [BS] 705.1

Proponents: Mark S. Graham, representing National Roofing Contractors Association (NRCA) (mgraham@nrca.net)

2024 International Building Code

Revise as follows:

SECTION 1512
REROOFING

1512.1 General. Materials and methods of application used for recovering or replacing an existing *roof covering* shall comply with the requirements of Chapter 15.

Exceptions:

1. *Roof replacement* or *roof recover* of existing ~~low-slope~~ asphalt built-up, modified bitumen, single-ply, sprayed polyurethane foam or liquid-applied *roof coverings* shall not be required to meet the minimum design slope requirement of ¼ unit vertical in 12 units horizontal (2-percent slope) in Section 1507 for roofs that provide *positive roof drainage* and meet the requirements of Sections 1608.3 and 1611.2.
2. Recovering or replacing an existing *roof covering* shall not be required to meet the requirement for secondary (emergency overflow) drains or *scuppers* in Section 1502.2 for roofs that provide for *positive roof drainage* and meet the requirements of Sections 1608.3 and 1611.2. For the purposes of this exception, existing secondary drainage or *scupper* systems required in accordance with this code shall not be removed unless they are replaced by secondary drains or *scuppers* designed and installed in accordance with Section 1502.2.

2024 International Existing Building Code

Revise as follows:

SECTION 705
REROOFING

[BS] 705.1 General. Materials and methods of application used for recovering or replacing an existing roof covering shall comply with the requirements of Chapter 15 of the *International Building Code*.

Exceptions:

1. *Roof replacement* or *roof recover* of existing ~~low-slope~~ asphalt built-up, modified bitumen, single-ply, sprayed polyurethane foam or liquid-applied roof coverings shall not be required to meet the minimum design slope requirement of ¼ unit vertical in 12 units horizontal (2-percent slope) in Section 1507 of the *International Building Code* for roofs that provide positive roof drainage and meet the requirements of Sections 1608.3 and 1611.2 of the *International Building Code* .
2. Recovering or replacing an existing roof covering shall not be required to meet the requirement for secondary (emergency overflow) drains or scuppers in Section 1502 of the *International Building Code* for roofs that provide for positive roof drainage and meet the requirements of Sections 1608.3 and 1611.2 of the *International Building Code*. For the purposes of this exception, existing secondary drainage or scupper systems required in accordance with this code shall not be removed unless they are replaced by secondary drains or scuppers designed and installed in accordance with Section 1502 of the *International Building Code*.

Reason: This proposed code change is intended to clarify the code's existing requirements by specifically indicating those roof covering types that have a prescriptive minimum ¼ unit vertical in 12 units horizontal (2-percent) slope in new construciton, where IBC Section

1512-Reroofing's and IEBC Section 705-Reroofing's positve roof drainage exception can apply in reroofing with the indicated additional requirements.

This proposed code change is intended to be clarifying in nature and not change the code's technical requirements.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

This proposed code change is intended to be clarifying in nature and not change the code's technical requirements. Therefore, the cost of construction is not increased or decreased.

Staff Analysis: Section 1512 of the IBC and Section 705 of the IEBC are currently specifically duplicated and maintained as such between the IBC and IEBC

S39-25

S40-25

IBC: SECTION 1512, 1512.1; IEBC: SECTION 705, [BS] 705.1

Proponents: Mark S. Graham, representing National Roofing Contractors Association (NRCA) (mgraham@nrca.net)

2024 International Building Code

Revise as follows:

SECTION 1512
REROOFING

1512.1 General. Materials and methods of application used for recovering or replacing an existing *roof covering* shall comply with the requirements of Chapter 15.

Exceptions:

1. *Roof replacement* or *roof recover* of existing *low-slope roof coverings* shall not be required to meet the minimum design slope requirement of ¼ unit vertical in 12 units horizontal (2-percent slope) in Section 1507 for roofs that provide *positive roof drainage* and meet the requirements of Sections 1608.3 and 1611.2.
2. Recovering or replacing an existing *roof covering* shall not be required to meet the requirement for secondary (emergency overflow) drains or *scuppers* in Section 1502.2 for roofs <u>that meet the minimum design slope requirement in Section 1507 or for roofs</u> that provide for *positive roof drainage* and meet the requirements of Sections 1608.3 and 1611.2. For the purposes of this exception, existing secondary drainage or *scupper* systems required in accordance with this code shall not be removed unless they are replaced by secondary drains or *scuppers* designed and installed in accordance with Section 1502.2.

2024 International Existing Building Code

Revise as follows:

SECTION 705
REROOFING

[BS] 705.1 General. Materials and methods of application used for recovering or replacing an existing roof covering shall comply with the requirements of Chapter 15 of the *International Building Code*.

Exceptions:

1. *Roof replacement* or *roof recover* of existing low-slope roof coverings shall not be required to meet the minimum design slope requirement of ¼ unit vertical in 12 units horizontal (2-percent slope) in Section 1507 of the *International Building Code* for roofs that provide positive roof drainage and meet the requirements of Sections 1608.3 and 1611.2 of the *International Building Code* .
2. Recovering or replacing an existing roof covering shall not be required to meet the requirement for secondary (emergency overflow) drains or scuppers in Section 1502 of the *International Building Code* for roofs <u>that meet the minimum design slope requirement in Section 1507 of the *International Building Code* or for roofs</u> that provide for positive roof drainage and meet the requirements of Sections 1608.3 and 1611.2 of the *International Building Code*. For the purposes of this exception, existing secondary drainage or scupper systems required in accordance with this code shall not be removed unless they are replaced by secondary drains or scuppers designed and installed in accordance with Section 1502 of the *International Building Code*.

Reason: This proposed code change is intended to clarify existing langauge in the IBC and IEBC relateing to reroofing.

IBC Section 1512.1, Exception 2, and similalry IEBC Section 705, Exception 2, address an exception where the codes' existing secondary drainage provisions are permitted to be re-used. As currently worded, Exception 2 could be interepreted to only apply to reroofing of low-slope roofs with *postive roof drainage* (as defined in IBC Sec. 202)--that is when Exception 1 specificly applies. Exception 2 can also apply when Excpetion 1 is not applicable--that is for existing roofs where roof slope greater than the minimium design roof slope from Section 1507 is provided.

The added language in IBC Section 1512.1, Exception 2, and IEBC Section 705.1, Exception 2 clarifies this.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

The proposed code clarifies the codes' existing requirements and does not increase or decrease the stringency of the codes. As a result, there is no cost impact associated with this proposed code change.

Staff Analysis: Section 1512 of the IBC and Section 705 of the IEBC are currently specifically duplicated and maintained as such between the IBC and IEBC

S40-25

S41-25

IBC: 1512.3; IEBC: [BS] 705.3

Proponents: Mark S. Graham, representing National Roofing Contractors Association (NRCA) (mgraham@nrca.net)

2024 International Building Code

Revise as follows:

1512.3 Roof recover. The installation of a new *roof covering* over an existing *roof covering* shall be permitted where any of the following conditions occur:

1. Where the new *roof covering* is installed in accordance with the *roof covering* manufacturer's approved instructions.
2. Complete and separate roofing systems, such as standing-seam *metal roof panel* systems, that are designed to transmit the roof *loads* directly to the *building*'s structural system and that do not rely on existing roofs and *roof coverings* for support, shall not require the removal of existing *roof coverings*.
3. Metal panel, metal shingle and concrete and clay tile *roof coverings* shall be permitted to be installed over existing wood shake roofs when applied in accordance with Section 1512.3.1.
4. The application of a new ~~protective~~ *roof coating* over an existing ~~protective~~ *roof coating*, *metal roof panel*, built-up roof, spray polyurethane foam roofing system, *metal roof shingles*, mineral-surfaced roll roofing, modified bitumen roofing or *thermoset* and *thermoplastic* single-ply roofing shall be permitted without tear off of existing *roof coverings*.

Exception: A roof recover shall not be permitted where any of the following conditions occur:

1. The existing roof or *roof covering* is water-soaked or has deteriorated to the point that the existing roof or *roof covering* is not adequate as a base for additional roofing.
2. The existing *roof covering* is slate, clay, cement or asbestos-cement tile.
3. The existing roof has two or more applications of any type of *roof covering*.

2024 International Existing Building Code

Revise as follows:

[BS] 705.3 Roof recover. The installation of a new roof covering over an existing roof covering shall be permitted where any of the following conditions occur:

1. The new roof covering is installed in accordance with the roof covering manufacturer's *approved* instructions.
2. Complete and separate roofing systems, such as standing-seam metal roof panel systems, that are designed to transmit the roof loads directly to the building's structural system and that do not rely on existing roofs and roof coverings for support, shall not require the removal of existing roof coverings.
3. Metal panel, metal shingle and concrete and clay tile roof coverings shall be peritted to be installed over existing wood shake roofs when applied in accordance with Section 705.3.1.
4. The application of a new ~~protective~~ roof coating over an existing ~~protective~~ *roof coating*, a metal roof panel, built-up roof, spray polyurethane foam roofing system, metal roof shingles, mineral-surfaced roll roofing, modified bitumen roofing or thermoset and thermoplastic single-ply roofing shall be permitted without tear off of existing roof coverings.

Exception: A *roof recover* shall not be permitted where any of the following conditions occur:

1. Where the existing roof or roof covering is water-soaked or has deteriorated to the point that the existing roof or roof covering is not adequate as a base for additional roofing.
2. Where the existing roof covering is slate, clay, cement or asbestos-cement tile.
3. Where the existing roof has two or more applications of any type of roof covering.

Reason: This code change proposal is intended to clarify the existing code.

This code change proposal strikes the word "protective" from references to the term "roof coating" in Section 1512.3.4. The word "protective" is unnecessary as the term "roof coating" is already defined in Section 202-Definitions and specific requirements for roof coatings are provided in Section 1509-Roof Coatings. This change will not have an impact on the stringency of the building code.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

This code change proposal is editorial in nature and will not increase or decrease the cost of cosntruction.

Staff Analysis: Section 1512 of the IBC and Section 705 of the IEBC are currently specifically duplicated and maintained as such between the IBC and IEBC

S41-25

S42-25

IBC: 1512.3; IEBC: [BS] 705.3

Proponents: Bill McHugh, CM Services, Inc., representing Chicago Roofing Contractors Association (bill@mc-hugh.us)

2024 International Building Code

Revise as follows:

1512.3 Roof recover. The installation of a new *roof covering* over an existing *roof covering*,<u>exposed insulation or roof deck</u> shall be permitted where any of the following conditions occur:

1. Where the new *roof covering* is installed in accordance with the *roof covering* manufacturer's approved instructions.
2. Complete and separate roofing systems, such as standing-seam *metal roof panel* systems, that are designed to transmit the roof *loads* directly to the *building*'s structural system and that do not rely on existing roofs and *roof coverings* for support, shall not require the removal of existing *roof coverings*.
3. Metal panel, metal shingle and concrete and clay tile *roof coverings* shall be permitted to be installed over existing wood shake roofs when applied in accordance with Section 1512.3.1.
4. The application of a new protective *roof coating* over an existing protective *roof coating*, *metal roof panel*, built-up roof, spray polyurethane foam roofing system, *metal roof shingles*, mineral-surfaced roll roofing, modified bitumen roofing or *thermoset* and *thermoplastic* single-ply roofing shall be permitted without tear off of existing *roof coverings*.

Exception: A roof recover shall not be permitted where any of the following conditions occur:

1. The existing roof or *roof covering* is water-soaked or has deteriorated to the point that the existing roof or *roof covering* is not adequate as a base for additional roofing.
2. The existing *roof covering* is slate, clay, cement or asbestos-cement tile.
3. The existing roof has two or more applications of any type of *roof covering*.

2024 International Existing Building Code

Revise as follows:

[BS] 705.3 Roof recover. The installation of a new roof covering over an existing roof covering<u>, exposed insulation or roof deck</u> shall be permitted where any of the following conditions occur:

1. The new roof covering is installed in accordance with the roof covering manufacturer's *approved* instructions.
2. Complete and separate roofing systems, such as standing-seam metal roof panel systems, that are designed to transmit the roof loads directly to the building's structural system and that do not rely on existing roofs and roof coverings for support, shall not require the removal of existing roof coverings.
3. Metal panel, metal shingle and concrete and clay tile roof coverings shall be peritted to be installed over existing wood shake roofs when applied in accordance with Section 705.3.1.
4. The application of a new protective roof coating over an existing protective *roof coating*, a metal roof panel, built-up roof, spray polyurethane foam roofing system, metal roof shingles, mineral-surfaced roll roofing, modified bitumen roofing or thermoset and thermoplastic single-ply roofing shall be permitted without tear off of existing roof coverings.

Exception: A *roof recover* shall not be permitted where any of the following conditions occur:

1. Where the existing roof or roof covering is water-soaked or has deteriorated to the point that the existing roof or roof covering is not adequate as a base for additional roofing.
2. Where the existing roof covering is slate, clay, cement or asbestos-cement tile.
3. Where the existing roof has two or more applications of any type of roof covering.

Reason: The reason for this proposal is to provide code officials crystal clear language for what is an important operation for reroofing applications. This roof recover operation takes place frequently, and should be included in the roof recover.

As can be seen from the definition, *roof replacement* indicates the complete *roof covering* is removed down to the roof deck. This assumes the roof vapor retarder, roof insulation, roofing and insulation adhesives or fasteners, roof membrane and roof overburdens such as ballast, pavers or vegetative covering are removed entirely.

The *roof recover* operation assumes the insulation is not wet, a suitable substrate, and not have two or more roofs on the building. See below for full definitions when working on existing buildings.

[BS] ROOF COVERING. The covering applied to the roof deck for weather resistance, fire classification or appearance.
[BS] ROOF REPLACEMENT. The process of removing the existing roof covering, repairing any damaged substrate and installing a new roof covering.

[BS] ROOF RECOVER. The process of installing an additional roof covering over a prepared existing roof covering without removing the existing roof covering.

In a roof recover, there is surface preparation performed prior to application of a recover board, or application of a membrane directly to the existing roof membrane. Gravel and loose debris is swept, vacuumed and removed. Blisters are cut, possibly removed, and repaired.

The operation described in this proposal does exactly what a roof recover intends -- removes the existing membrane completely, prepares the underlying insulation surface to receive a new roof membrane just like a roof recover operation. This might include removing any wet insulation, then reinstalling insulation thickness to match, and then recover with the roof membrane over the prepared insulation surface.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

This type of language does not increase or decrease the cost of a roof recover application.

Staff Analysis: Section 1512 or the IBC and Section 705 of the IEBC are currently specifically duplicated and maintained as such between the IBC and IEBC

CC # S42-25 and CC # S46-25 addresses requirements in a different or contradicting manner related to Section 1512. The committee is urged to make their intensions clear with their actions on these proposals.

S42-25

S43-25

IBC: 1512.3; IEBC: [BS] 705.3

Proponents: Mellisa Mooren, representing Self (mmooren@skyeenv.com); Emily Lorenz, representing International Institute of Building Enclosure Consultants (IIBEC) (emilyblorenz@gmail.com)

2024 International Building Code

Revise as follows:

1512.3 Roof recover. The installation of a new *roof covering* over an existing *roof covering* shall be permitted where any of the following conditions occur:

1. Where the new *roof covering* is installed in accordance with the *roof covering* manufacturer’s approved instructions.
2. Complete and separate roofing systems, such as standing-seam *metal roof panel* systems, that are designed to transmit the roof *loads* directly to the *building*’s structural system and that do not rely on existing roofs and *roof coverings* for support, shall not require the removal of existing *roof coverings*.
3. Metal panel, metal shingle and concrete and clay tile *roof coverings* shall be permitted to be installed over existing wood shake roofs when applied in accordance with Section 1512.3.1.
4. The application of a new protective *roof coating* over an existing protective *roof coating*, *metal roof panel*, built-up roof, spray polyurethane foam roofing system, *metal roof shingles*, mineral-surfaced roll roofing, modified bitumen roofing or *thermoset* and *thermoplastic* single-ply roofing shall be permitted without tear off of existing *roof coverings*.

Exception: A roof recover shall not be permitted where any of the following conditions occur:

1. The existing roof or *roof covering* has been ~~is~~ water damaged ~~soaked~~ or has deteriorated to the point that the existing roof or *roof covering* is not adequate as a base for additional roofing. Where required by the manufacturer of the proposed new roof system used for a *roof recovering*, the existing conditions shall comply with the manufacturer's *approved* instructions.
2. The existing *roof covering* is slate, clay, cement or asbestos-cement tile.
3. The existing roof has two or more applications of any type of *roof covering*.

2024 International Existing Building Code

Revise as follows:

[BS] 705.3 Roof recover. The installation of a new roof covering over an existing roof covering shall be permitted where any of the following conditions occur:

1. The new roof covering is installed in accordance with the roof covering manufacturer’s *approved* instructions.
2. Complete and separate roofing systems, such as standing-seam metal roof panel systems, that are designed to transmit the roof loads directly to the building’s structural system and that do not rely on existing roofs and roof coverings for support, shall not require the removal of existing roof coverings.
3. Metal panel, metal shingle and concrete and clay tile roof coverings shall be peritted to be installed over existing wood shake roofs when applied in accordance with Section 705.3.1.
4. The application of a new protective roof coating over an existing protective *roof coating*, a metal roof panel, built-up roof, spray polyurethane foam roofing system, metal roof shingles, mineral-surfaced roll roofing, modified bitumen roofing or thermoset and thermoplastic single-ply roofing shall be permitted without tear off of existing roof coverings.

Exception: A *roof recover* shall not be permitted where any of the following conditions occur:

1. Where the existing roof or roof covering has been ~~is~~ water damaged ~~soaked~~ or has deteriorated to the point that the existing roof or roof covering is not adequate as a base for additional roofing. Where required by the manufacturer of the proposed new roof system used for a *roof recovering*, the existing conditions shall comply with the manufacturer's *approved* instructions.
2. Where the existing roof covering is slate, clay, cement or asbestos-cement tile.
3. Where the existing roof has two or more applications of any type of roof covering.

Reason: The term "water soaked" is not clearly defined. If the roof or roof covering has been water damaged or has deteriorated to the point that the existing roof or roof covering is not adequate as a base for additional roofing, roof recover shall not be allowed.

Existing roof coverings such as wood shake, slate, clay, cement or asbestos-cement tile historically do not provide an adequate base for new roof coverings and could prevent the new covering from achieving a weather-tight seal. They could also allow penetration of waste, snow, etc. These types of existing coverings must always be removed.

When the existing roof has two or more layers of any type of covering system, all layers need to be removed to enable the inspector and contractor to verify that the existing roof deck or sheathing is not water damaged and still capable of providing an adequate support or basis for fastening new material.

Potential revision to commentary on Section 1512.2.1.1: This section identifies the conditions where a recover is not permitted, and all layers of previously installed roof covering systems must be removed prior to the installation of the new roof covering system. When the existing roof or roof covering ~~is water soaked, it must be allowed to dry completely so as not to trap moisture beneath the new layer of covering. This could cause a rapid deterioration of the new covering material, as well as the existing sheathing. The existing covering is required to be removed if it cannot adequately dry out~~ has been water damaged or deteriorated to the apoint that the existing roof or roof covering is not adequate as a base for additional roofing. If it is still wet or if its physical properties have been permanently altered. Existing roof coverings such as wood shake, slate, clay, cement or asbestos-cement tile historically do not provide an adequate base for new roof coverings and could prevent the new covering from achieving a weather-tight seal. They could also allow penetration of water, snow, etc. These types of existing coverings must always be removed. When the existing roof has two or more layers of any type of covering system, all layers need to be removed to enable the inspector and contractor to verify that the existing sheathing is not water damaged and still capable of providing an adequate nailing base. Guidance on determining substrate material suitability and the physical properties condition can be found in the following consensus standards as follows:

For substrate conditions:

- Infrared testing in accordance with ASTM C1153
- Electrical impedance testing in accordance with ASTM D7954/D7954M-21
- Nuclear testing in accordance with ANSI/SPRI/IIBEC NT-1 2012 (R2022)

For physical properties:

- ANSI/SPRI IA-1 2021 - Standard Field Test Procedure for Verifying the Suitability of Roof Substrates and Adhesives
- ANSI/SPRI FX-1 2021 - Standard Field Test Procedure for Determining the Withdrawal Resistance of Roofing Fasteners

Bibliography: ASTM International. 2015. *Standard Practice for Location of Wet Insulation in Roofing Systems Using Infrared Imaging*. ASTM C1153-10(2015), West Conshohocken, PA: ASTM International.

ASTM International. 2015. *Standard Practice for Moisture Surveying of Roofing and Waterproofing Systems Using Non-Destructive Electrical Impedance Scanners*. ASTM D7954/D7954M-21, West Conshohocken, PA: ASTM International.

Single Ply Roofing Industry (SPRI). 2006 (R2021). *Standard Field Test Procedure for Verifying the Suitability of Roof Substrates and Adhesives.* ANSI/SPRI IA-1 2021, Waltham, MA: SPRI.

Single Ply Roofing Industry (SPRI). 2010 (R2021). *Standard Field Test Procedure for Determining the Withdrawal Resistance of Roofing Fasteners.* ANSI/SPRI FX-1 2021, Waltham, MA: SPRI.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

The code change proposal will not increase the cost of construction. The approval of roof recover project is already required in writing by manufacturers and, while not specific to system or installation, by the National Roof Contractors Association (NRCA).

Staff Analysis: Section 1512 or the IBC and Section 705 of the IEBC are currently specifically duplicated and maintained as such between the IBC and IEBC

CC # S43-25 and CC # S46-25 addresses requirements in a different or contradicting manner related to Section 1512. The committee is urged to make their intensions clear with their actions on these proposals.

S43-25

S44-25

IBC: 1512.4, 1512.4.1 (New); IEBC: [BS] 705.4, 705.4.1 (New)

Proponents: Mark S. Graham, representing National Roofing Contractors Association (NRCA) (mgraham@nrca.net)

2024 International Building Code

1512.4 Reinstallation of materials. Existing slate, clay or cement tile shall be permitted for reinstallation, except that damaged, cracked or broken slate or tile shall not be reinstalled. Existing vent flashing, metal edgings, drain outlets, collars and metal counterflashings shall not be reinstalled where rusted, damaged or deteriorated. Existing *ballast* that is damaged, cracked or broken shall not be reinstalled. Existing aggregate surfacing materials from built-up roofs shall not be reinstalled.

Add new text as follows:

1512.4.1 Above-deck roof insulation. Above-deck thermal roof insulation shall be permitted to be re-used provided it is *approved*, in accordance with Section 1508, not water-soaked and not deteriorated to the point it is not adequate as a base for additional roofing.

2024 International Existing Building Code

[BS] 705.4 Reinstallation of materials. Existing slate, clay or cement tile shall be permitted for reinstallation, except that damaged, cracked or broken slate or tile shall not be reinstalled. Existing vent flashing, metal edgings, drain outlets, collars and metal counterflashings shall not be reinstalled where rusted, damaged or deteriorated. Existing ballast that is damaged, cracked or broken shall not be reinstalled. Existing aggregate surfacing materials from built-up roofs shall not be reinstalled.

Add new text as follows:

705.4.1 Above-deck roof insulation. Above-deck thermal roof insulation shall be permitted to be re-used provided it is *approved*, in accordance with Section 1508 of the *International Building Code*, not water-soaked and not deteriorated to the point it is not adequate as a base for additional roofing.

Reason: This proposed code change adds a provision to Section 1512.4-Reinstallation of Materials allowing above-deck thermal roof insulation to be re-used when it meets certain specific conditions.

Large amounts of above-deck roof insulation are currently disposed of unnecessarily because of strict interpretation of IBC Section 1512.2 and IEBC Section 705.4. Allowing the building official to approve insulation re-use can prevent re-usable insulation material from unnecessarily ending up in landfills.

Cost Impact: Decrease

Estimated Immediate Cost Impact:

This proposed code change can result in construction cost savings on specific reroofing projects where all or a portion of the existing above-deck roof insulation can be re-used. Actual savings will vary greatly based on specific project conditions, insulation type and thickness, and the amount of insulation that can be re-used. See cost impact justification for decrease $ amount.

Estimated Immediate Cost Impact Justification (methodology and variables):

Cost savings in the range of $0.25 per square foot to about $1 per square foot of roof area are possible for specific reroofing projects where all or a portion of the existing above-deck roof insulation can be re-used. Savings in material cost only is calculated in this estimate. The cost savings figures are based on manufacturers' published cost lists for various above-deck roof insulation products applicable at the time of submission. Some minimal labor savings may also be realized on specific projects but are not inlcuded in this estimate range.

Estimated Life Cycle Cost Impact:

NA

Estimated Life Cycle Cost Impact Justification (methodology and variables):

NA

Staff Analysis: Section 1512 or the IBC and Section 705 of the IEBC are currently specifically duplicated and maintained as such between the IBC and IEBC

S44-25

S45-25 Part I

IBC: 1512.5 (New); IEBC: 705.5 (New)

Proponents: Larry Sherwood, Sustainable Energy Action Committee, representing IREC (larry@irecusa.org); Dara Yung, representing California Solar & Storage Association (CALSSA) (dara@calssa.org); Joseph H. Cain, P.E., representing Solar Energy Industries Association (SEIA) (joecainpe@gmail.com); Philip Oakes, representing NASFM (phil@browning.red)

THIS IS A 2 PART CODE CHANGE. PART I WILL BE HEARD BY THE IBC STRUCTURAL CODE COMMITTEE. PART II WILL BE HEARD BY THE IRC-B CODE COMMITTEE. SEE THE TENTATIVE HEARING ORDER FOR THESE COMMITTEES.

2024 International Building Code

Add new text as follows:

1512.5 Reinstallation of PV panel systems. Existing installations of rooftop-mounted *PV panel systems approved* under previous code requirements shall be permitted to be reinstalled after *roof repair* or *roof replacement*, provided all of the following conditions are met:

1. Existing rooftop-mounted *PV panel system*s shall be reinstalled in accordance with the manufacturer's installation instructions and the minimum requirements of the edition of the codes to which it was originally installed.
2. The system shall be reinstalled in the previous location or in an *approved* location.
3. Components of the rooftop mounted *PV panel system* shall not be reused unless such components are in good working condition and *approved*.
4. All single-use components of the PV mounting system shall be replaced in accordance with the manufacturer's installation instructions.

2024 International Existing Building Code

Add new text as follows:

705.5 Reinstallation of PV panel systems. Existing installations of rooftop-mounted *PV panel systems approved* under previous code requirements shall be permitted to be reinstalled after *roof repair* or *roof replacement*, provided all of the following conditions are met:

1. Existing rooftop-mounted *PV panel system*s shall be reinstalled in accordance with the manufacturer's installation instructions and the minimum requirements of the edition of the codes to which it was originally installed.
2. The system shall be reinstalled in the previous location or in an *approved* location
3. Components of the rooftop mounted *PV panel system* shall not be reused unless such components are in good working condition and *approved*.
4. All single-use components of the rack mounting system shall be replaced in accordance with the manufacturer's installation instructions.

S45-25 Part II

IRC: R908.6 (New)

Proponents: Larry Sherwood, Sustainable Energy Action Committee, representing IREC (larry@irecusa.org); Dara Yung, representing California Solar & Storage Association (CALSSA) (dara@calssa.org); Joseph H. Cain, P.E., representing Solar Energy Industries Association (SEIA) (joecainpe@gmail.com); Philip Oakes, representing NASFM (phil@browning.red)

2024 International Residential Code

Add new text as follows:

R908.6 Reinstallation of PV panel systems. Existing installations of rooftop-mounted *PV panel systems approved* under previous code requirements shall be permitted to be reinstalled after *roof repair* or *roof replacement*, provided all of the following conditions are met:

1. Existing rooftop-mounted *PV panel system*s shall be reinstalled in accordance with the manufacturer's installation instructions and the minimum requirements of the edition of the codes to which it was originally installed.
2. The system shall be reinstalled in the previous location or in an *approved* location.
3. Components of the rooftop mounted *PV panel system* shall not be reused unless such components are in good working condition and *approved*.
4. All single-use components of the PV mounting system shall be replaced in accordance with the manufacturer's installation instructions.

Reason: The growing number of re-roofing projects on buildings that have rooftop-mounted photovoltaic panel systems previously installed is prompting code officials to search for sensible guidelines to ensure safety codes are followed. These PV systems often continue to have a useful life after the time that a roof covering or roof assembly is in need of repair or replacement.

This proposal provides direction and reasonable guardrails for the safe reinstallation of the rooftop-mounted PV panel system after reroofing is completed.

1. Condition 1 - If the existing installation of the rooftop mounted PV panel system is considered acceptable, then the system should be able to be returned to the rooftop after the reroofing is completed.
2. Condition 2 – If the system is not reinstalled in its original position, then the code official should determine if the change in location is acceptable.
3. Condition 3 – This correlates with Section 104.9.1 regarding the reuse of materials, equipment and devices.
4. Condition 4 – There are components within some rooftop mounted PV panel systems which can only be used once. Typically, those components are in the rack mounting system, which could include a flashing system or a ground clamp.

The Sustainable Energy Action Committee (SEAC) has prepared a guidance document to address this concern. The following is a link to the document for jurisdictions to use: https://sustainableenergyaction.org/resources/reinstallation-of-pv-system/

This document provides permitting and inspection guidelines in an effort to support the inspection community and the growing number of re-roofing projects that involve an existing photovoltaic panel system. This proposal was prepared by the Sustainable Energy Action Committee (SEAC), a forum for all stakeholders (including, but not limited to, AHJs, designers, engineers, contractors, first responders, manufacturers, suppliers, utilities, and testing labs) to collaboratively identify and find solutions for issues that affect the installation and use of solar energy systems, energy storage systems, demand response, and energy efficiency. The purpose is to facilitate the deployment and use of affordable, clean and renewable energy in a safe, efficient, and sustainable manner.

All recommendations from SEAC are approved by diverse stakeholders through a consensus process. For more information, please visit www.sustainableenergyaction.org

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

The code change proposal simply clarifies the ongoing use of previously approved equipment after roof repair or replacement, so it does not impact the cost of construction.

Staff Analysis: Section 1512 or the IBC and Section 705 of the IEBC are currently specifically duplicated and maintained as such between the IBC and IEBC CC # S45-25 Part I and CC # S46-25 addresses requirements in a different or contradicting manner related to Section 1512. The committee is urged to make their intensions clear with their actions on these proposals.

S45-25 Part II

S46-25

IBC: SECTION 1512, 1512.1, 1512.2, 1512.3, 1512.3.1, 1512.4, 1512.5

Proponents: Mark S. Graham, representing National Roofing Contractors Association (NRCA) (mgraham@nrca.net)

2024 International Building Code

SECTION 1512 REROOFING

Revise as follows:

1512.1 General. Materials and methods of application used for recovering or replacing an existing *roof covering* shall comply with ~~the requirements of Chapter 15~~ Chapter 7 of the *International Existing Building Code*.

~~**Exceptions:**~~

1. ~~*Roof replacement* or *roof recover* of existing *low-slope roof coverings* shall not be required to meet the minimum design slope requirement of $^1/_4$ unit vertical in 12 units horizontal (2-percent slope) in Section 1507 for roofs that provide *positive roof drainage* and meet the requirements of Sections 1608.3 and 1611.2.~~
2. ~~Recovering or replacing an existing *roof covering* shall not be required to meet the requirement for secondary (emergency overflow) drains or *scuppers* in Section 1502.2 for roofs that provide for *positive roof drainage* and meet the requirements of Sections 1608.3 and 1611.2. For the purposes of this exception, existing secondary drainage or *scupper* systems required in accordance with this code shall not be removed unless they are replaced by secondary drains or *scuppers* designed and installed in accordance with Section 1502.2.~~

Delete without substitution:

~~**1512.2 Roof replacement.** *Roof replacement* shall include the removal of all existing layers of *roof assembly* materials down to the *roof deck*.~~

~~**Exceptions:**~~

1. ~~Where the existing *roof assembly* includes an ice barrier membrane that is adhered to the *roof deck* and the existing sheathing is not water-soaked or deteriorated to the point that it is not adequate as a base for additional roofing, the existing ice barrier membrane shall be permitted to remain in place and covered with an additional layer of ice barrier membrane in accordance with Section 1507 where permitted by the *roof covering* manufacturer and new ice barrier *underlayment* manufacturer.~~
2. ~~Where the existing roof includes a self-adhered *underlayment* and the existing sheathing is not water-soaked or deteriorated to the point that it is not adequate as a base for additional roofing, the existing self-adhered *underlayment* shall be permitted to remain in place and covered with an *underlayment* complying with Tables 1507.1.1(1), 1507.1.1(2) and 1507.1.1(3).~~
3. ~~Where the existing roof includes one layer of self-adhered *underlayment* and the existing layer cannot be removed without damaging the *roof deck*, a second layer of self-adhered *underlayment* is permitted to be installed over the existing self-adhered *underlayment* provided that the following conditions are met:~~
   - ~~3.1. It is permitted by the *roof covering* manufacturer and self-adhered *underlayment* manufacturer.~~
   - ~~3.2. The existing sheathing is not water-soaked or deteriorated to the point that it is not adequate as a base for additional roofing.~~
   - ~~3.3. The second layer of self-adhered *underlayment* is installed such that buildup of material at walls, valleys, roof edges, end laps and side laps does not exceed two layers.~~

~~**1512.3 Roof recover.** The installation of a new *roof covering* over an existing *roof covering* shall be permitted where any of the following conditions occur:~~

1. ~~Where the new *roof covering* is installed in accordance with the *roof covering* manufacturer's approved instructions.~~
2. ~~Complete and separate roofing systems, such as standing-seam *metal roof panel* systems, that are designed to transmit the roof *loads* directly to the *building*'s structural system and that do not rely on existing roofs and *roof coverings* for support, shall not require the removal of existing *roof coverings*.~~
3. ~~Metal panel, metal shingle and concrete and clay tile *roof coverings* shall be permitted to be installed over existing wood shake roofs when applied in accordance with Section 1512.3.1.~~
4. ~~The application of a new protective *roof coating* over an existing protective *roof coating*, *metal roof panel*, built-up roof, spray polyurethane foam roofing system, *metal roof shingles*, mineral-surfaced roll roofing, modified bitumen roofing or *thermoset* and *thermoplastic* single-ply roofing shall be permitted without tear off of existing *roof coverings*.~~

~~**Exception:** A roof recover shall not be permitted where any of the following conditions occur:~~

1. ~~The existing roof or *roof covering* is water-soaked or has deteriorated to the point that the existing roof or *roof covering* is not adequate as a base for additional roofing.~~
2. ~~The existing *roof covering* is slate, clay, cement or asbestos-cement tile.~~
3. ~~The existing roof has two or more applications of any type of *roof covering*.~~

~~**1512.3.1 Roof recovering over wood shingles or shakes.** Where the application of a new *roof covering* over wood shingle or shake roofs creates a combustible concealed space, the entire existing surface shall be covered with *gypsum panel products* , *mineral fiber*, glass fiber or other *approved* materials securely fastened in place.~~

~~**1512.4 Reinstallation of materials.** Existing slate, clay or cement tile shall be permitted for reinstallation, except that damaged, cracked or broken slate or tile shall not be reinstalled. Existing vent flashing, metal edgings, drain outlets, collars and metal counterflashings shall not be reinstalled where rusted, damaged or deteriorated. Existing *ballast* that is damaged, cracked or broken shall not be reinstalled. Existing aggregate surfacing materials from built-up roofs shall not be reinstalled.~~

~~**1512.5 Flashings**. Flashings shall be reconstructed in accordance with *approved* manufacturer's installation instructions. Metal flashing to which bituminous materials are to be adhered shall be primed prior to installation.~~

Reason: IBC Section 1512-Reroofing is identical to IEBC Section 705-Reroofing. In the IEBC, reroofing operations, including re-covering or replacing an existing roof covering, are considered Level 1 alterations.

This proposed code change strikes the specific reroofing requirements from IBC Section 1512-Reroofing and replaces these with a pointer to the identical requirements in IEBC Section 705-Reroofing. This proposed change eliminates redundancy in the I-codes and does not change the codes' technical requirements for reroofing.

Similar uses of pointers, instead of redundant requirements, already occur in IBC Chapter 15 in Section 1502.1, where Chapter 11 of the *International Plumbing Code* is referenced and in Section 1507.15 where the *International Fire Code* is referenced.

NOTE: Modifications made by this proponent for 4 other code change proposals related to IBC Section 1512.1 Exception 1, 1512.1 Exception 2, 1512.3, & 1512.4.1, are not required if this proposal is accepted (modifications to the IEBC Section 705.1 Exception 1, 705.1 Exception 2, 705.3, & 705.4.1 are still applicable if this proposal is accepted).

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

This code change proposal strikes redundant text and requirements in the I-codes; it does not change technical requirements. As a result, there is no increase or decrease in the cost of construction as a result of this change.

Staff Analysis: Section 1512 of the IBC and Section 705 of the IEBC are currently specifically duplicated and maintained as such between the IBC and IEBC

CC # S46-25 and CC # S45-25 Part I/ CC # S42-25/CC #S43-25/CC #S38-25/CC #S37-25 Part I addresses requirements in a different or contradicting manner related to Section 1512. The committee is urged to make their intensions clear with their actions on these proposals.

S46-25

S47-25

IBC: CHAPTER 15, SECTION 1501, 1501.1, SECTION 1805, 1805.1, 1805.1.1, 1805.1.2, 1805.1.2.1, 1805.2, 1805.2.1, 1805.2.2, 1805.2.2.1, 1805.3, 1805.3.1, 1805.3.2, 1805.3.2.1, 1805.3.3, 1805.4, 1805.4.1, 1805.4.2, 1805.4.3, 1805.1.3, SECTION 1513 (New), 1513.1 (New), 1513.2 (New), 1513.2.1 (New), 1513.2.2 (New), 1513.2.2.1 (New), 1513.3 (New), 1513.3.1 (New), 1513.3.2 (New), 1513.3.2.1 (New), 1513.3.3 (New)

Proponents: Bill McHugh, CM Services, Inc., representing Chicago Roofing Contractors Association (bill@mc-hugh.us)

2024 International Building Code

Revise as follows:

CHAPTER 15
ROOF ASSEMBLIES, ~~AND~~ ROOFTOP STRUCTURES AND BELOW GRADE WATERPROOFING AND DAMPPROOFING

SECTION 1501
GENERAL

1501.1 Scope. The provisions of this chapter shall govern the design, materials, construction and quality of *roof assemblies*, ~~and~~ *rooftop structures* *and below grade waterproofing and dampproofing*.

SECTION 1805
~~DAMPPROOFING AND WATERPROOFING~~ DRAINAGE SYSTEMS

1805.1 General. Walls or portions thereof that retain earth and enclose interior spaces and floors below grade shall ~~be waterproofed and dampproofed~~ be provided with drainage systems in accordance with this section, with the exception of those spaces containing groups other than residential and institutional where such omission is not detrimental to the *building* or occupancy.

Ventilation for crawl spaces shall comply with Section 1202.4.

1805.1.1 Story above grade plane. Where a *basement* is considered a *story above grade plane* and the finished ground level adjacent to the basement wall is below the basement floor elevation for 25 percent or more of the perimeter, ~~the floor and walls shall be dampproofed in accordance with Section 1805.2 and~~ a foundation drain shall be installed in accordance with Section 1805.4.2. The foundation drain shall be installed around the portion of the perimeter where the basement floor is below ground level. The provisions of Sections 1803.5.4, 1805.3 and 1805.4.1 shall not apply in this case.

1805.1.2 Under-floor space. The finished ground level of an under-floor space such as a crawl space shall not be located below the bottom of the footings. Where there is evidence that the ground-water table rises to within 6 inches (152 mm) of the ground level at the outside *building* perimeter, or that the surface water does not readily drain from the *building* site, the ground level of the under-floor space shall be as high as the outside finished ground level, unless an *approved* drainage system is provided. The provisions of Sections 1803.5.4, 1805.2, 1805.3 and 1805.4 shall not apply in this case.

1805.1.2.1 Flood hazard areas. For *buildings* and *structures* in *flood hazard areas* as established in Section 1612.3, the finished ground level of an under-floor space such as a crawl space shall be equal to or higher than the outside finished ground level on one side or more.

Exception: Under-floor spaces of Group R-3 *buildings* that meet the requirements of FEMA TB 11.

Delete without substitution:

~~**1805.2 Dampproofing.** Where hydrostatic pressure will not occur as determined by Section 1803.5.4, floors and walls for other than~~

~~**1805.2 Dampproofing.** Where hydrostatic pressure will not occur as determined by Section 1803.5.4, floors and walls for other than wood foundation systems shall be dampproofed in accordance with this section. Wood foundation systems shall be constructed in accordance with AWC PWF.~~

~~**1805.2.1 Floors.** Dampproofing materials for floors shall be installed between the floor and the base course required by Section 1805.4.1, except where a separate floor is provided above a concrete slab.~~

~~Where installed beneath the slab, dampproofing shall consist of not less than 6-mil (0.006 inch; 0.152 mm) polyethylene with joints lapped not less than 6 inches (152 mm), or other *approved* methods or materials. Where permitted to be installed on top of the slab, dampproofing shall consist of mopped-on bitumen, not less than 4-mil (0.004 inch; 0.102 mm) polyethylene, or other *approved* methods or materials. Joints in the membrane shall be lapped and sealed in accordance with the manufacturer's installation instructions.~~

~~**1805.2.2 Walls.** Dampproofing materials for walls shall be installed on the exterior surface of the wall, and shall extend from the top of the footing to above ground level.~~

~~Dampproofing shall consist of a bituminous material, 3 pounds per square *yard* (16 N/m^2) of acrylic modified cement, $^1/_8$ inch (3.2 mm) coat of *surface-bonding mortar* complying with ASTM C887, any of the materials permitted for waterproofing by Section 1805.3.2 or other *approved* methods or materials.~~

~~**1805.2.2.1 Surface preparation of walls.** Prior to application of dampproofing materials on concrete walls, holes and recesses resulting from the removal of form ties shall be sealed with a bituminous material or other *approved* methods or materials. Unit *masonry* walls shall be parged on the exterior surface below ground level with not less than $^3/_8$ inch (9.5 mm) of Portland cement *mortar*. The parging shall be coved at the footing.~~

~~**Exception:** Parging of unit *masonry* walls is not required where a material is *approved* for direct application to the *masonry*.~~

~~**1805.3 Waterproofing.** Where the ground-water investigation required by Section 1803.5.4 indicates that a hydrostatic pressure condition exists, and the design does not include a ground-water control system as described in Section 1805.1.3, walls and floors shall be waterproofed in accordance with this section.~~

~~**1805.3.1 Floors.** Floors required to be waterproofed shall be of concrete and designed and constructed to withstand the hydrostatic pressures to which the floors will be subjected.~~

~~Waterproofing shall be accomplished by placing a membrane of rubberized asphalt, butyl rubber, fully adhered/fully bonded HDPE or polyolefin composite membrane or not less than 6-mil [0.006 inch (0.152 mm)] polyvinyl chloride with joints lapped not less than 6 inches (152 mm) or other *approved* materials under the slab. Joints in the membrane shall be lapped and sealed in accordance with the manufacturer's installation instructions.~~

~~**1805.3.2 Walls.** Walls required to be waterproofed shall be of concrete or *masonry* and shall be designed and constructed to withstand the hydrostatic pressures and other lateral *loads* to which the walls will be subjected.~~

~~Waterproofing shall be applied from the bottom of the wall to not less than 12 inches (305 mm) above the maximum elevation of the ground-water table. The remainder of the wall shall be dampproofed in accordance with Section 1805.2.2. Waterproofing shall consist of two-ply hot-mopped felts, not less than 6-mil (0.006 inch; 0.152 mm) polyvinyl chloride, 40-mil (0.040 inch; 1.02 mm) polymer-modified asphalt, 6-mil (0.006 inch; 0.152 mm) polyethylene or other *approved* methods or materials capable of bridging nonstructural cracks. Joints in the membrane shall be lapped and sealed in accordance with the manufacturer's installation instructions.~~

~~**1805.3.2.1 Surface preparation of walls.** Prior to the application of waterproofing materials on concrete or *masonry* walls, the walls shall be prepared in accordance with Section 1805.2.2.1.~~

~~**1805.3.3 Joints and penetrations.** *Joints* in walls and floors, *joints* between the wall and floor and penetrations of the wall and floor~~

~~shall be made watertight utilizing *approved* methods and materials.~~

Revise as follows:

~~1805.4~~ <u>1805.1.3</u> Subsoil drainage system. Where a hydrostatic pressure condition does not exist, dampproofing shall be provided and a base shall be installed under the floor and a drain installed around the foundation perimeter. A subsoil drainage system designed and constructed in accordance with Section <u>1805.1.4.3</u> ~~1805.1.3~~ shall be deemed adequate for lowering the ground-water table.

~~1805.4.1~~ <u>1805.1.4</u> Floor base course. Floors of basements, except as provided for in Section <u>1513.1.1</u> ~~1805.1.1,~~ shall be placed over a floor base course not less than 4 inches (102 mm) in thickness that consists of gravel or crushed stone containing not more than 10 percent of material that passes through a No. 4 (4.75 mm) sieve.

Exception: Where a site is located in well-drained gravel or sand/gravel mixture soils, a floor base course is not required.

~~1805.4.2~~ <u>1805.1.4.1</u> Foundation drain. A drain shall be placed around the perimeter of a foundation that consists of gravel or crushed stone containing not more than 10-percent material that passes through a No. 4 (4.75 mm) sieve. The drain shall extend not less than 12 inches (305 mm) beyond the outside edge of the footing. The thickness shall be such that the bottom of the drain is not higher than the bottom of the base under the floor, and that the top of the drain is not less than 6 inches (152 mm) above the top of the footing. The top of the drain shall be covered with an *approved* filter membrane material. Where a drain tile or perforated pipe is used, the invert of the pipe or tile shall not be higher than the floor elevation. The top of joints or the top of perforations shall be protected with an *approved* filter membrane material. The pipe or tile shall be placed on not less than 2 inches (51 mm) of gravel or crushed stone complying with Section 1805.4.1, and shall be covered with not less than 6 inches (152 mm) of the same material.

~~1805.4.3~~ <u>1805.1.4.2</u> Drainage discharge. The floor base and foundation perimeter drain shall discharge by gravity or mechanical means into an *approved* drainage system that complies with the *International Plumbing Code*.

Exception: Where a site is located in well-drained gravel or sand/gravel mixture soils, a dedicated drainage system is not required.

~~1805.1.3~~ <u>1805.1.4.3</u> Ground-water control. Where the ground-water table is lowered and maintained at an elevation not less than 6 inches (152 mm) below the bottom of the *lowest floor*, the floor and walls shall be dampproofed in accordance with Section <u>1513.2</u> ~~1805.2~~. The design of the system to lower the ground-water table shall be based on accepted principles of engineering that shall consider, but not necessarily be limited to, permeability of the soil, rate at which water enters the drainage system, rated capacity of pumps, head against which pumps are to operate and the rated capacity of the disposal area of the system.

Add new text as follows:

<u>SECTION 1513</u>
<u>DAMPPROOFING AND WATERPROOFING</u>

<u>**1513.1 General.** Walls or portions thereof that retain earth and enclose interior spaces and floors below grade shall be waterproofed and dampproofed in accordance with this section, with the exception of those spaces containing groups other than residential and institutional where such omission is not detrimental to the building or occupancy. Wind and fire rating requirements referenced in this chapter do not apply to dampproofing and waterproofing unless part of a *roof assembly*. Ventilation for crawl spaces shall comply with Section 1202.4.</u>

<u>**1513.2 Dampproofing.** Where hydrostatic pressure will not occur as determined by Section 1803.5.4, floors and walls for other than wood foundation systems shall be dampproofed in accordance with this section. Wood foundation systems shall be constructed in accordance with AWC PWF.</u>

<u>**1513.2.1 Floors.** Dampproofing materials for floors shall be installed between the floor and the base course required by Section 1805.1.4, except where a separate floor is provided above a concrete slab.</u>
<u>Where installed beneath the slab, dampproofing shall consist of not less than 6-mil (0.006 inch; 0.152 mm) polyethylene with joints lapped not less than 6 inches (152 mm), or other approved methods or materials. Where permitted to be installed on top of the slab,</u>

dampproofing shall consist of mopped-on bitumen, not less than 4-mil (0.004 inch; 0.102 mm) polyethylene, or other approved methods or materials. Joints in the membrane shall be lapped and sealed in accordance with the manufacturer’s installation instructions.

1513.2.2 Walls. Dampproofing materials for walls shall be installed on the exterior surface of the wall, and shall extend from the top of the footing to above ground level. Dampproofing shall consist of a bituminous material, 3 pounds per square yard (16 N/m2) of acrylic modified cement, 1/8 inch (3.2 mm) coat of surface-bonding mortar complying with ASTM C887, any of the materials permitted for waterproofing by Section 1513 or other approved methods or materials.

1513.2.2.1 Surface preparation of walls. Prior to application of dampproofing materials on concrete walls, holes and recesses resulting from the removal of form ties shall be sealed with a bituminous material or other approved methods or materials. Unit masonry walls shall be parged on the exterior surface below ground level with not less than 3/8 inch (9.5 mm) of Portland cement mortar. The parging shall be coved at the footing.

Exception: Parging of unit masonry walls is not required where a material is approved for direct application to the masonry.

1513.3 Waterproofing.. Where the ground-water investigation required by Section 1803.5.4 indicates that a hydrostatic pressure condition exists, and the design does not include a ground-water control system as described in Section 1805.1.3, walls and floors shall be waterproofed in accordance with this section.

1513.3.1 Floors. Floors required to be waterproofed shall be of concrete and designed and constructed to withstand the hydrostatic pressures to which the floors will be subjected. Waterproofing shall be accomplished by placing a membrane of rubberized asphalt, butyl rubber, fully adhered/fully bonded HDPE or polyolefin composite membrane or not less than 6-mil [0.006 inch (0.152 mm)] polyvinyl chloride with joints lapped not less than 6 inches (152 mm) or other approved materials under the slab. Joints in the membrane shall be lapped and sealed in accordance with the manufacturer’s installation instructions.

1513.3.2 Walls.. Walls required to be waterproofed shall be of concrete or masonry and shall be designed and constructed to withstand the hydrostatic pressures and other lateral loads to which the walls will be subjected. Waterproofing shall be applied from the bottom of the wall to not less than 12 inches (305 mm) above the maximum elevation of the ground-water table. The remainder of the wall shall be dampproofed in accordance with Section 1513.2.2. Waterproofing shall consist of two-ply hot-mopped felts, not less than 6-mil (0.006 inch; 0.152 mm) polyvinyl chloride, 40-mil (0.040 inch; 1.02 mm) polymer-modified asphalt, 6-mil (0.006 inch; 0.152 mm) polyethylene or other approved methods or materials capable of bridging nonstructural cracks. Joints in the membrane shall be lapped and sealed in accordance with the manufacturer’s installation instructions.

1513.3.2.1 Surface preparation of walls.. Prior to the application of waterproofing materials on concrete or masonry walls, the walls shall be prepared in accordance with Section 1513.2.2.1.

1513.3.3 Joints and penetrations.. *Joints* in walls and floors, *joints* between the wall and floor and penetrations of the wall and floor shall be made watertight utilizing *approved* methods and materials.

Reason: The purpose of this proposal is to separate Chapter 18's wall and foundation drainage systems from the dampproofing and waterproofing sections of Chapter 19, and move it to Chapter 15. Since dampproofing and waterproofing materials are described in detail in Chapter 15, the location of these disciplines belongs with in Chapter 15. Also, roofing, waterproofing and dampproofing are very similar disciplines. The materials, contractors, inspection agencies, manufacturers, distribution are all similar.

This proposal leaves important foundation wall drainage design in Ch. 18, and intact in the code. The only change is to separate the two disciplines - waterproofing and dampproofing from drainage design in the code.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

This proposal does not increase the use of dampproofing or waterproofing in buildings, nor does it reduce usage. It is reorganizing the IBC to recognize the correct location of dampproofing and waterproofing.

S48-25

IBC: SECTION 202, 1602.1

Proponents: Jennifer Goupil, American Society of Civil Engineers and Structural Engineering Institute, representing American Society of Civil Engineers (jgoupil@asce.org)

2024 International Building Code

Revise as follows:

[BS] WIND DESIGN GEODATABASE. The ASCE database (version 2022-1.0) of geocoded wind speed design data. The ASCE Wind Design Geodatabase of geocoded wind speed design data is available at ~~https://asce7hazardtool.online/~~ https://ascehazardtool.org/.
[BS] WINDBORNE DEBRIS REGION. Areas within *hurricane-prone regions* located:

1. Within 1 mile (1.61 km) of the mean high-water line where an Exposure D condition exists upwind at the waterline and the basic wind speed, *V*, is 130 mph (58 m/s) or greater; or

2. In areas where the basic wind speed, *V*, is 140 mph (63 m/s) or greater.

For *Risk Category* II buildings and other structures and Risk Category III buildings and other structures, except health care facilities, the windborne debris region shall be based on ~~Figure 1609.3.(1)~~ Figure 1609.3(2). For *Risk Category* III health care facilities, the windborne debris region shall be based on Figure 1609.3(3). For *Risk Category* IV buildings and other structures ~~and *Risk Category* III health care facilities~~ , the windborne debris region shall be based on ~~Figure 1609.3(2)~~ Figure 1609.3(4).

1602.1 Notations. The following notations are used in this chapter:

D	=	*Dead load.*
D_i	=	Weight of ice in accordance with Chapter 10 of ASCE 7.
E	=	Combined effect of horizontal and vertical earthquake induced forces as defined in Section 12.4 of ASCE 7.
F	=	Load due to fluids with well-defined pressures and maximum heights.
F_a	=	Flood load in accordance with Chapter 5 of ASCE 7.
H	=	Load due to lateral earth pressures, ground water pressure or pressure of bulk materials.
L	=	*Live load.*
L_r	=	*Roof live load.*
$p_{g(asd)}$	=	*Allowable stress design* ground snow load.
p_g	=	Ground snow load determined from Figures 1608.2(1) through 1608.2(4) and Table 1608.2.
R	=	Rain load.
S	=	Snow load.
T	=	Cumulative effects of self-straining load forces and effects.
V_{asd}	=	*Allowable stress design wind speed*, mph (m/s) where applicable.
V	=	Basic wind speed, *V*, mph (m/s) determined from Figures 1609.3(1) through 1609.3(4) or ~~ASCE 7~~ the *Wind Design Geodatabase*.
V_T	=	Tornado speed, mph (m/s) determined from Chapter 32 of ASCE 7.
W	=	Load due to wind pressure.
W_i	=	Wind-on-ice in accordance with Chapter 10 of ASCE 7.

Reason: The proposal includes two changes: i) revises the URL for the ASCE Hazard Tool website; and ii) revises the definition of windborne debris region to align with ASCE/SEI 7-22 Section 26.12.3.1. Further reasoning is below:

For item (i), the ASCE Hazard Tool URL changed from https://asce7hazardtool.online to https://ascehazardtool.org/.

For item (ii), the proposed change revises the windborne debris definition to align with ASCE/SEI 7-22 Section 26.12.3.1. ASCE/SEI 7 Section 26.12.3.1 changed in ASCE/SEI 7-16 and was not incorporated in prior versions of IBC. The changes also include the word “other” in front of the word “structures” to align with the scope and standard title for ASCE/SEI 7.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

Proposed IBC code changes are editorial clarifications that improve the conciseness of IBC for alignment to ASCE/SEI 7.

S49-25 Part I

IBC: 1603.1, 1608.3 (New)

Proponents: John Grenier, representing National Council of Structural Engineers Associations (NCSEA) (jgrenier@greniereng.com); Emily Guglielmo, representing NCSEA (eguglielmo@martinmartin.com)

THIS IS A 2 PART CODE CHANGE. PART I WILL BE HEARD BY THE IBC STRUCTURAL CODE COMMITTEE. PART II WILL BE HEARD BY THE ADMINISTRATIVE (IADMIN) CODE COMMITTEE. SEE THE TENTATIVE HEARING ORDER FOR THESE COMMITTEES.

2024 International Building Code

Revise as follows:

1603.1 General. *Construction documents* shall show the material, size, section and relative locations of structural members with floor levels, column centers and offsets dimensioned. The design *loads* and other information pertinent to the structural design required by Sections 1603.1.1 through 1603.1.9 shall be indicated on the *construction documents*.

Exception: *Construction documents* for *buildings* constructed in accordance with the *conventional light-frame construction* provisions of Section 2308 shall indicate the following structural design information:

1. Floor and roof dead and *live loads*.
2. Ground snow load, p_g , and *allowable stress design* ground snow load, $p_{g(asd)}$.
3. Basic *wind speed* , *V*, mph (m/s), and *allowable stress design* wind speed, V_{asd}, as determined in accordance with Section 1609.3.1 and wind exposure.
4. *Seismic design category* and *site class*.
5. Flood design data, if located in *flood hazard areas* established in Section 1612.3.
6. Design load-bearing values of soils.
7. Rain load data.
8. Designated snow storage area locations, design loads, and maximum design stored snow height.

Add new text as follows:

1608.4 Posting designated snow storage areas. For designated snow storage areas, maximum design loads and maximum design stored snow height shall be posted by the owner or owner's authorized agent in accordance with Section 106.1.

S49-25 Part I

S49-25 Part II

IBC: [A] 106.1

Proponents: John Grenier, representing National Council of Structural Engineers Associations (NCSEA) (jgrenier@greniereng.com); Emily Guglielmo, representing NCSEA (eguglielmo@martinmartin.com)

2024 International Building Code

Revise as follows:

[A] 106.1 ~~Live loads posted~~ Posting of loads. ~~In commercial or industrial *buildings*, for each floor or portion thereof designed for *live loads* exceeding 50 psf (2.40 kN/m^2), such design *live loads* shall be conspicuously posted by the *owner* or the *owner*'s authorized agent in that part of each story in which they apply, using durable signs. It shall be unlawful to remove or deface such notices.~~ The following live loading conditions shall have the loading conditions posted. Loads shall be conspicuously posted by the owner or owner's authorized agent , using durable signs. It shall be unlawful to remove or deface such notices.

1. *Live Loads* in commercial or industrial buildings, for each floor or portion thereof designed for live loads exceeding 50 psf (2.40 kN/m2)
2. At designated snow storage areas, the snow storage area shall be clearly demarcated, and signs shall indicate the allowed maximum stored snow height within the designated snow storage area.

Reason: Large snow loads in excess of roof snow load requirements have resulted in catastrophic collapses. Especially in parking structures in cold climates, where snow removal is required for occupancy during winter months, snow is often moved to a small portion of the structure. Parapet walls can make removing the snow from the elevated portion of the structure challenging and time consuming. Providing a methodology for communicating snow storage area designs and posting requirements in the building code can improve the maintenance operations of structures requiring snow removal and improve public safety where designers elect to consider these additional design load conditions.


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Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

This proposal does not require that snow storage areas be provided, it only provides a methodology for documenting and communicating the design loads if snow storage is elected by the owner. Therefore, there is no cost impact.

Staff Analysis: S49-25 Part II and ADM41-25 Part I address requirements in a different or contradicting manner. The committee is urged to make their intensions clear with their actions on these proposals.

S49-25 Part II

S50-25

IBC: 1603.1.5, 1603.1.6

Proponents: Kelly Cobeen, Wiss Janney Elstner Associates, representing Self (kcobeen@wje.com); Seth Thomas, KPFF Consulting Engineers, representing Self (seth.thomas@kpff.com); Emily Guglielmo, representing NCSEA (eguglielmo@martinmartin.com)

2024 International Building Code

Revise as follows:

1603.1.5 Earthquake design data. The following information related to seismic *loads* shall be shown, regardless of whether seismic *loads* govern the design of the lateral force-resisting system of the *structure*:

1. Project location (latitude/ longitude)

~~1.~~ 2. *Risk category*.

~~2.~~ 3. Seismic importance factor, I_e.

~~3.~~ 4. Spectral response acceleration parameters, S_S and S_1.

~~4.~~ 5. *Site class*.

~~5.~~ 6. Design spectral response acceleration parameters, S_{DS} and S_{D1}, MPRS spectrum or Site-specific response spectrum.

7. Design spectral response acceleration, S_{DS}, for non-structural component bracing.

~~6.~~ 8. *Seismic design category*.

~~7.~~ 9. Basic seismic force-resisting system~~(s).~~ in each direction.

~~8. Design base shear(s).~~

~~9. Seismic response coefficient(s), *CS*.~~

10. ~~Response modification coefficient(s), *R*.~~Seismic force-resisting system factors R, C_d, and Ω_0 in each direction.

11. Seismic response coefficient, C_s, in each direction.

12. Design base shear, V, in each direction.

13. Design earthquake displacement, δ_{DE}, in each direction.

14. Redundancy factor, ρ, in each direction.

~~11.~~ 15. Analysis procedure used.

16. Fundamental period, T, in each direction.

17. Approximate fundamental period, T_a, in each direction.

1603.1.6 Geotechnical information. ~~The design load-bearing values of soils shall be shown on the *construction documents*.~~ The construction documents shall provide a description of the foundation system and the design load-bearing values of soils and/or deep foundations elements. In *Seismic Design Categories* C through F, the capacity of the soil/foundation for seismic load cases shall be included..

Reason: ASCE 7-22 updated the non-structural bracing provisions for equipment and other non-structural components (ASCE 7-22 Equation 13.3-1 though 13.3-6). This equation now requires the building fundamental period of the structure to determine the non-structural component forces. The non-structural equipment designer (either at the time of construction or after) should not have to determine the period of the building, thus this information should be included in the drawings and has been added as item #17. The engineer or record (EOR) will already have this information when they design the structure so there is no additional effort. While reviewing this list several other items were determined to be missing that would be important to document for both future use in an evaluation or renovation or by review of a peer reviewer or plans examiner/building official. A summary of all items and the rationale is provided below.

Item 1: Project location – the exact location of the project is helpful in comparing design forces to those listed on the drawings. This could be an address, but common practice is to list latitude and longitude

Item 2: Risk Category – [Existing requirement #1] and is important item to understand the initial occupancy of the building and influences the seismic design forces selected.

Item 3: Seismic importance factor – [Existing code requirement #2]

Item 4: Site class – [existing requirement #4]

Item 5: Spectral response parameters Ss and S1 [Existing requirement #3]

Item 6: Design spectral response parameters – the existing code requirement notes the SDS and SD1 values used to generate the historical 2-point spectra [Existing requirement #5], however ASCE 7-22 now provides the option for the Multi period response spectra which would be more appropriate to provide in the drawings if used. Additionally, some projects have site specific response spectra which would also be relevant to provide if that is what was used for design.

Item 7: Design spectral response parameters for non-structural bracing. If the multi period or site specific response spectra is used it is not obvious what the SDs value that should be used for non-structural bracing is. This is important for historical documentation and for the delegated designers use.

Item 8: Seismic Design Category [Existing requirement #6]

Item 9: Description of seismic force resisting system – this is an existing requirement, however it has been clarified that it should be listed for each direction as it is common to have different SFRS in each primary direction [Existing requirement #7]

Item 10: Seismic force resisting system factors. This requires the designer to provide the R, Cd, and Ω for each system in each direction used for design. This an expansion of item 10 and Existing requirement #10.

Item 11: Seismic response coefficients [Existing requirement #9] with the clarification to provide in each direction.

Item 12: Design base shear [Existing requirement # 8] with the clarification to provide in each direction.

Item 13: Design earthquake displacement is a new requirement to provide the displacement which is often used for the design of non-structural components. This is also valuable information if a new structure is built adjacent and a building separation joint needs to be sized.

Item 14: Redundancy factor used. This adds a new requirement to provide if the system in each direction was designed using a r = 1.3 or not.

Item 15: Description of analysis procedure used [Existing requirement #11]

Item 16: Fundamental Period of structure in each direction. This is a new requirement providing the fundamental period of the building.

Item 17: Approximate fundamental period of structure in each direction. This value is used by engineers to determine the seismic forces for non-structural anchorage of equipment based on the revisions of ASCE 7-22.
It should be noted that the existing requirements have also been reorganized to a more logical order as well as minor editorial cleanup to use more consistent language as well as matching the symbols used in ASCE 7-22. This change proposals makes zero changes to the design of structures and only expands the required information put on the drawings.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

The proposal does not result in any changes to what is constructed.

S50-25

S51-25

IBC: 1603.1.10 (New)

Proponents: Bonnie Manley, representing AISC (manley@aisc.org); Emily Dunham, Gresham Smith, representing NCSEA Code Advisory Committee Special Inspections/Quality Assurance Subcommittee (emily.dunham@greshamsmith.com)

2024 International Building Code

Add new text as follows:

1603.1.10 Identification and requirements for the design of systems or components by others. Where the *registered design professional* delegates portions of the project design for systems or components to others, the following information shall be shown, as applicable:

1. Identification of the system or component to be designed by others.
2. Design criteria applicable to the system or component to be designed by others, including design standards, special loads, serviceability, and other performance criteria.
3. Configurations and dimensions related to the system or component to be designed by others.
4. Identification of limitations, requirements, and constraints for the system or component to be designed by others, including, but not limited to, supports, anchors, and connections.
5. Requirements for the submission of drawings and calculations.

Reason: This proposal recommends a new subsection in IBC Section 1603.1. This proposal is intended to stand independently; however, it complements our proposal related to IBC Section 1604.1.

This new Section 1603.1.10 is intended to capture the necessary information on construction documents for designs delegated to others. Delegated design is a long-standing practice by which a building's systems and components are designed by the producers of those systems and components and not by the project's registered design professional(s). If the RDP specifies any system or component in the construction documents to be designed by others, then the pertinent information, listed in 1603.1.10, related to the delegated design of these systems or components must be shown in the construction documents along with the information already required in Sections 1603.1.1 through 1603.1.9.

Delegated designs may or may not be "deferred submittals," and vice versa; in fact, delegated designs may even be included in the initial permit package. The documentation for these systems and components can be deferred submittals and, accordingly, would need to meet the requirements of Section 107.3.4. While provisions for deferred submittals have been in IBC for many editions, the additional requirements in this proposal are intended to clarify and strengthen the roles and responsibilities of all those involved in the design process, including those involved in delegated design. (Example: A modification to an existing curtain wall can be deferred and not be delegated. The same modification could be both delegated and deferred.)

Why is this necessary?

The delegation of design work is common in structural engineering practice. In fact, almost all structural materials currently have some elements of work that are delegated by an Engineer of Record (EOR) to a Specialty Structural Engineer (SSE) as directed in the model building code (e.g., IBC) and its reference standards.

From the structural steel perspective, the most common design work delegated is connection design. It is addressed comprehensively in AISC 360, Specification for Structural Steel Buildings, and the AISC 303, Code of Standard Practice for Steel Buildings and Bridges. The requirements in those documents are consistent with those recommended by CASE, NCSEA, and SEI on design responsibility. Additionally, the AISC provisions dovetail with the model building code requirements on deferred submittals.

However, recent real-world examples continue to demonstrate that improper practices still exist because the delegation of design work specified in the model building code is not as clear and robust as it could be and, as a result, does not safeguard the basic intent for life safety in the process.

Example of a Better Way – Missouri

We recently became aware of current Missouri law, which provides straightforward and concise language on delegated design and deferred submittals in 20 CSR 2030-21.020 Engineer of Record and Specialty Engineers. (Available at: https://www.sos.mo.gov/cmsimages/adrules/csr/current/20csr/20c2030-21.pdf) It describes a transparent process for delegating design work to ensure the protection of life safety.

Development of the ICC Proposals

The concepts presented in the MO statute have been distilled down and transitioned into requirements appropriate for adoption in a model building code. This includes utilizing IBC terminology, substituting EOR with registered design professional, and, instead of introducing a defined term for SSE, we've used the general phrase "designed by others." This proposal and its companion proposal clarify the following three fundamental concepts for delegation practice in the IBC:

1. The delegating RDP must state the criteria that the others performing the delegated design work must meet.
2. The others performing the delegated design work must meet those stated criteria and submit their work to the RDP.
3. The RDP must review that submission for conformance to the stated criteria.

Bibliography: AISC (2022), *Specification for Structural Steel Buildings*, ANSI/AISC 360-22, American Institute of Steel Construction, Chicago, Ill., August 1, 2022. Available at: https://www.aisc.org/publications/steel-standards/.
AISC (2022), *Code of Standard Practice for Steel Buildings and Bridges,* ANSI/AISC 303-22, American Institute of Steel Construction, Chicago, Ill., May 9, 2022. Available at: https://www.aisc.org/publications/steel-standards/.
Rules of Department of Commerce and Insurance, Division 2030—Missouri Board for Architects, Professional Engineers, Professional Land Surveyors, and Professional Landscape Architects, Chapter 21—Professional Engineering, 20 CSR 2030-21.020 *Engineer of Record and Specialty Engineers*. Available at: https://www.sos.mo.gov/cmsimages/adrules/csr/current/20csr/20c2030-21.pdf

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

This proposal is a clarification. Should design be delegated to others, then the information recommended in this proposal must be specified in the construction documents.

S51-25

S52-25

IBC: 1604.1, 1604.1.1 (New)

Proponents: Bonnie Manley, representing AISC (manley@aisc.org); Emily Dunham, Gresham Smith, representing NCSEA Code Advisory Committee Special Inspections/Quality Assurance Subcommittee (emily.dunham@greshamsmith.com)

2024 International Building Code

1604.1 General. *Building*, *structures* and parts thereof shall be designed and constructed in accordance with *strength* design, *load and resistance factor* design, *allowable stress design*, empirical design or conventional construction methods, as permitted by the applicable material chapters and referenced standards.

Add new text as follows:

1604.1.1 Delegated design. Delegation of portions of the project design to others by the *registered design professional* shall be in accordance with this section.

1. The *registered design professional* shall show the design and other applicable requirements for the delegated designs on the *construction documents.*
2. The delegated designs shall comply with the requirements of the building code and the requirements specified by the *registered design professional* and shall be submitted to the *registered design professional* for review.
3. The *registered design professional* shall review the delegated designs for general conformance with the *construction documents.*

Reason: This proposal recommends a new subsection in IBC Section 1604.1. This proposal is intended to stand independently; however, it complements our proposal related to IBC Section 1603.1.

This proposal is motivated by our belief that the provisions relating to the role and responsibilities of the registered design professional should be clarified and strengthened as they pertain to the delegated design. Delegated design is a long-standing practice by which a building's systems and components are designed by the producers of those systems and components and not by the project's registered design professional(s). Examples of these components include but are not limited to, hollow-core precast slabs and other precast elements, mass timber systems and elements, structural steel systems and elements, metal plate-connected wood roof trusses, curtain walls, and sprinkler systems.

To ensure proper delegation practice, this proposal distills the role and responsibility of the RDP into the following three fundamental concepts:

1. The delegating RDP must state the criteria that the others performing the delegated design work must meet.
2. The others performing the delegated design work must meet those stated criteria and submit their work to the RDP.
3. The RDP must review that submission for conformance to the stated criteria.

By further clarifying and strengthening the role and responsibilities of the registered design professional, we believe that the chances that some essential design or construction requirement might be overlooked or a responsibility might be unheeded will be significantly reduced and that life safety will be enhanced.

Delegated designs may or may not be “deferred submittals,” and vice versa; in fact, delegated designs may even be included in the initial permit package. If the documentation for these systems and components is deferred, the additional requirements of Section 107.3.4 would also need to be met. While provisions for deferred submittals have been in IBC for many editions, the additional requirements in this proposal are intended to clarify and strengthen the roles and responsibilities of all those involved in the design process, including those involved in delegated design. (Example: A modification to an existing curtain wall can be deferred and not be delegated. The same modification could be both delegated and deferred.)

Why is this necessary?

The delegation of design work is common in structural engineering practice. In fact, almost all structural materials currently have some elements of work that are delegated by an Engineer of Record (EOR) to a Specialty Structural Engineer (SSE) as directed in the model building code (e.g., IBC) and its reference standards.

From the structural steel perspective, the most common design work delegated is connection design. It is addressed comprehensively in AISC 360, *Specification for Structural Steel Buildings*, and the AISC 303, *Code of Standard Practice for Steel Buildings and Bridges*. The requirements in those documents are consistent with those recommended by CASE, NCSEA, and SEI on design responsibility. Additionally, the AISC provisions dovetail with the model building code requirements on deferred submittals.

However, recent real-world examples continue to demonstrate that improper practices still exist because the delegation of design work specified in the model building code is not as clear and robust as it could be and, as a result, does not safeguard the basic intent for life safety in the process.

Example of a Better Way – Missouri

We recently became aware of current Missouri law, which provides straightforward and concise language on delegated design and deferred submittals in 20 CSR 2030-21.020 Engineer of Record and Specialty Engineers. (Available at: https://www.sos.mo.gov/cmsimages/adrules/csr/current/20csr/20c2030-21.pdf) It describes a transparent process for delegating design work to ensure the protection of life safety.

Development of the ICC Proposals

The concepts presented in the MO statute have been distilled down and transitioned into requirements appropriate for adoption in a model building code. This includes utilizing IBC terminology, substituting EOR with *registered design professional*, and, instead of introducing a defined term for SSE, we've used the general phrase "designed by others." This proposal and its companion proposal clarify in the IBC the previously mentioned three fundamental concepts for delegation practice:

1. The delegating RDP must state the criteria that the others performing the delegated design work must meet.
2. The others performing the delegated design work must meet those stated criteria and submit their work to the RDP.
3. The RDP must review that submission for conformance to the stated criteria.

Bibliography: AISC (2022), *Specification for Structural Steel Buildings*, ANSI/AISC 360-22, American Institute of Steel Construction, Chicago, Ill., August 1, 2022. Available at: https://www.aisc.org/publications/steel-standards/.

AISC (2022), *Code of Standard Practice for Steel Buildings and Bridges,* ANSI/AISC 303-22, American Institute of Steel Construction, Chicago, Ill., May 9, 2022. Available at: https://www.aisc.org/publications/steel-standards/.

Rules of Department of Commerce and Insurance, Division 2030—Missouri Board for Architects, Professional Engineers, Professional Land Surveyors, and Professional Landscape Architects, Chapter 21—Professional Engineering, 20 CSR 2030-21.020 *Engineer of Record and Specialty Engineers*. Available at: https://www.sos.mo.gov/cmsimages/adrules/csr/current/20csr/20c2030-21.pdf

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

This proposal clarifies the existing role and responsibilities of the RDP for delegated design in the IBC by reflecting requirements consistent with current industry guidelines promulgated by CASE, NCSEA, and SEI for design responsibility.

S52-25

S53-25 Part I

IBC: SECTION 202 (New), TABLE 1604.3

Proponents: Jennifer Hatfield, J. Hatfield & Associates, representing Fenestration & Glazing Industry Alliance (formerly AAMA) (jen@jhatfieldandassociates.com)

THIS IS A 2 PART CODE CHANGE. PART I WILL BE HEARD BY THE IBC STRUCTURAL CODE COMMITTEE. PART II WILL BE HEARD BY THE IRC-B CODE COMMITTEE. SEE THE TENTATIVE HEARING ORDER FOR THESE COMMITTEES.

2024 International Building Code

Add new definition as follows:

PATIO COVER. A structure with open or glazed walls that is used for recreational, outdoor living purposes associated with a *dwelling unit.*

Revise as follows:

TABLE 1604.3 DEFLECTION LIMITS[a, b, c, h, i]

CONSTRUCTION	L or L_r	S^j or W^f	$D + L^{d, g}$
Roof members:[e]			
Supporting plaster or stucco ceiling	l/360	l/360	l/240
Supporting nonplaster ceiling	l/240	l/240	l/180
Not supporting ceiling	l/180	l/180	l/120
Floor members	l/360	—	l/240
Exterior walls:			
With plaster or stucco finishes	—	l/360	—
With other brittle finishes	—	l/240	—
With flexible finishes	—	l/120	—
Interior partitions:[b]			
With plaster or stucco finishes	l/360	—	—
With other brittle finishes	l/240	—	—
With flexible finishes	l/120	—	—
Farm buildings	—	—	l/180
Greenhouses	—	—	l/120

For SI: 1 foot = 304.8 mm.

a. For structural roofing and siding made of formed metal sheets, the total load deflection shall not exceed *l*/60. For secondary roof structural members supporting formed metal roofing, the live load deflection shall not exceed *l*/150. For secondary wall members supporting formed metal siding, the design wind load deflection shall not exceed *l*/90. For roofs, this exception only applies when the metal sheets have no roof covering.

b. Flexible, folding and portable partitions are not governed by the provisions of this section. The deflection criterion for interior partitions is based on the horizontal load defined in Section 1607.16.

c. See Section 2403 for glass supports.

d. The deflection limit for the $D + (L$ or $L_r)$ load combination only applies to the deflection due to the creep component of long-term dead load deflection plus the short-term live load deflection. For lumber, structural glued laminated timber, prefabricated wood I-joists and structural composite lumber members that are dry at time of installation and used under dry conditions in accordance with the ANSI/AWC NDS, the creep component of the long-term deflection shall be permitted to be estimated as the immediate dead load deflection resulting from $0.5D$. For lumber and glued laminated timber members installed or used at all other moisture conditions or cross laminated timber and wood structural panels that are dry at time of installation and used under dry conditions in accordance with the ANSI/AWC NDS, the creep component of the long-term deflection is permitted to be estimated as the immediate dead load deflection resulting from D. The value of $0.5D$ shall not be used in combination with ANSI/AWC NDS provisions for long-term loading.

e. The preceding deflections do not ensure against ponding. Roofs that do not have sufficient slope or camber to ensure adequate drainage shall be investigated for ponding. See Chapter 8 of ASCE 7.

f. The wind load shall be permitted to be taken as 0.42 times the “component and cladding” loads or directly calculated using the 10-year mean return interval basic wind speed, V, for the purpose of determining deflection limits in Table 1604.3. Where framing members support glass, the deflection limit therein shall not exceed that specified in Section 1604.3.7

g. For steel structural members, the deflection due to creep component of long-term dead load shall be permitted to be taken as zero.

h. For aluminum structural members or aluminum panels used in skylights and sloped glazing framing, roofs or walls of sunroom *additions* or patio covers, and not supporting edge of glass or ~~aluminum~~ 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 the lesser of 3/4 in (19 mm) or $l/175$ for each glass lite or, $l/60$ for the entire length of the member, whichever is more stringent. For ~~aluminum~~ sandwich panels used in roofs or walls of sunroom *additions* or patio covers, the total load deflection shall not exceed $l/120$.

i. l = Length of the member between supports. For cantilever members, l shall be taken as twice the length of the cantilever.

j. The snow load shall be permitted to be taken as 0.7 times the design snow load determined in accordance with Section 1608.1 for the purpose of determining deflection limits in Table 1604.3.

Reason: The term "patio cover" is currently used in the main content of the IBC, in Sections 1202.5.1.1, 1204.2.1, 2606.10 and Table 1604.3. It therefore needs a definition in Section 202. The proposed definition is consistent with the one currently in Appendix I.

This proposal then provides edits to Footnote h of Table 1604.3, for the following reasons:

- The insertion of the word "and" is to clarify that "not supporting edge of glass or sandwich panels" applies to "aluminum structural members of aluminum panels".
- Removes the word "aluminum" in front of "sandwich panels" as they can be constructed of materials other than aluminum. This is also consistent with the same wording in Footnote c of the IRC.
- Insertion of "the lesser of 3/4 in (19 mm) or..." is to provide clarification that aligns with the industry standard, AAMA/NSA 2100-22, Specifications for Sunrooms, as to what is needed when a glass lite span exceeds 11 feet.
- The L/60, L/120, and L/175 are just to correct the capitalization, as it is supposed to be a capital L, which is also reflected in Footnote c of the IRC.

This proposal and its corresponding IRC proposal is editorial in nature by aligning the wording of the footnotes in both codes, as well as making it clear in the definitions what is a "patio cover" versus a "sunroom", the latter already found in Section 202.

Bibliography: Section 6.3.2 of AAMA/NSA 2100-22, Specifications for Sunrooms

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

The changes are editorial and clarifying in nature, and meant to align language in both the IRC and IBC. Therefore, the proposal will not increase or decrease the cost of construction.

S53-25 Part II

IRC: SECTION 202 (New), TABLE R301.7

Proponents: Jennifer Hatfield, J. Hatfield & Associates, representing Fenestration & Glazing Industry Alliance (formerly AAMA) (jen@jhatfieldandassociates.com)

2024 International Residential Code

Add new definition as follows:

PATIO COVER. A structure with open or glazed walls that is used for recreational, outdoor living purposes associated with a *dwelling unit*.

SECTION R301 DESIGN CRITERIA

Revise as follows:

TABLE R301.7 ALLOWABLE DEFLECTION OF STRUCTURAL MEMBERS[b, c]

STRUCTURAL MEMBER	ALLOWABLE DEFLECTION
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 excluding guards and handrails	*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 R301.2.1(1).

b. For cantilever members, *L* shall be taken as twice the length of the cantilever.

c. For aluminum structural members or aluminum panels used in skylights and sloped glazing framing, roofs or walls of sunroom *additions* or patio covers, and 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 the lesser of 3/4 in (19 mm) or *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. The *dead load* of supported materials shall be included when calculating the deflection of these members.

Reason: The term "patio cover" is currently used in the main content of the IRC, in Table R301.7, and needs a definition in Section R202. The proposed definition is consistent with the one currently in Appendix BF.

This proposal then provides edits to Footnote c of Table R301.7, for the following reasons:

- The reference to "aluminum" panels and "skylights and sloped glazing" is editorial and is for consistency with the verbiage used in the same footnote found in the IBC.
- The insertion of the word "and" is to clarify that "not supporting edge of glass or sandwich panels" applies to "aluminum structural

members or aluminum panels."

- Insertion of "the lesser of 3/4 in (19 mm) or..." is to provide clarification that aligns with the industry standard, AAMA/NSA 2100-22, Specifications for Sunrooms, as to what is needed when a glass lite span exceeds 11 feet. Per R301.2.1.1.1, Sunrooms currently must comply with this Standard.

This proposal and its corresponding IBC proposal is editorial in nature by aligning the wording of the footnotes in both codes, as well as making it clear in the definitions what is a "patio cover" versus a "sunroom", the latter already found in Section R202.

Bibliography: Section 6.3.2 of AAMA/NSA 2100-22, Specifications for Sunrooms

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

The changes are editorial and clarifying in nature, and meant to align language in both the IRC and IBC. Therefore, the proposal will not increase or decrease the cost of construction.

S53-25 Part II

S54-25

IBC: TABLE 1604.3

Proponents: John O'Brien, NCSEA Code Advisory Committee Wind Subcommittee Chair, representing NCSEA (jobrien@pesengineers.com); Emily Guglielmo, representing NCSEA (eguglielmo@martinmartin.com)

2024 International Building Code

Revise as follows:

TABLE 1604.3 DEFLECTION LIMITS[a, b, c, h, i]

CONSTRUCTION	L or L_r	S^j or W^f	$D + L^{d, g}$
Roof members:[e]			
Supporting plaster or stucco ceiling	*l*/360	*l*/360	*l*/240
Supporting nonplaster ceiling	*l*/240	*l*/240	*l*/180
Not supporting ceiling	*l*/180	*l*/180	*l*/120
Floor members	*l*/360	—	*l*/240
Exterior walls:			
With plaster or stucco finishes	—	*l*/360	—
With other brittle finishes	—	*l*/240	—
With flexible finishes	—	*l*/120	—
Interior partitions:[b]			
With plaster or stucco finishes	*l*/360	—	—
With other brittle finishes	*l*/240	—	—
With flexible finishes	*l*/120	—	—
Farm buildings	—	—	*l*/180
Greenhouses	—	—	*l*/120

For SI: 1 foot = 304.8 mm.

a. For structural roofing and siding made of formed metal sheets, the total load deflection shall not exceed *l*/60. For secondary roof structural members supporting formed metal roofing, the live load deflection shall not exceed *l*/150. For secondary wall members supporting formed metal siding, the design wind load deflection shall not exceed *l*/90. For roofs, this exception only applies when the metal sheets have no roof covering.

b. Flexible, folding and portable partitions are not governed by the provisions of this section. The deflection criterion for interior partitions is based on the horizontal load defined in Section 1607.16.

c. See Section 2403 for glass supports.

d. The deflection limit for the $D + (L$ or $L_r)$ load combination only applies to the deflection due to the creep component of long-term dead load deflection plus the short-term live load deflection. For lumber, structural glued laminated timber, prefabricated wood I-joists and structural composite lumber members that are dry at time of installation and used under dry conditions in accordance with the ANSI/AWC NDS, the creep component of the long-term deflection shall be permitted to be estimated as the immediate dead load deflection resulting from $0.5D$. For lumber and glued laminated timber members installed or used at all other moisture conditions or cross laminated timber and wood structural panels that are dry at time of installation and used under dry conditions in accordance with the ANSI/AWC NDS, the creep component of the long-term deflection is permitted to be estimated as the immediate dead load deflection resulting from D. The value of $0.5D$ shall not be used in combination with ANSI/AWC NDS provisions for long-term loading.

e. The preceding deflections do not ensure against ponding. Roofs that do not have sufficient slope or camber to ensure adequate drainage shall be investigated for ponding. See Chapter 8 of ASCE 7.

f. The wind load shall be permitted to be taken as 0.42 times the “component and cladding” loads ~~or directly calculated using the 10-year mean return interval basic wind speed, *V*,~~ for the purpose of determining deflection limits in Table 1604.3. Where framing members support glass, the deflection limit therein shall not exceed that specified in Section 1604.3.7

g. For steel structural members, the deflection due to creep component of long-term dead load shall be permitted to be taken as zero.

h. For aluminum structural members or aluminum panels used in skylights and sloped glazing framing, roofs or walls of sunroom *additions* or patio covers not supporting edge of glass or aluminum 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 aluminum sandwich panels used in roofs or walls of sunroom *additions* or patio covers, the total load deflection shall not exceed *l*/120.

i. *l* = Length of the member between supports. For cantilever members, *l* shall be taken as twice the length of the cantilever.

j. The snow load shall be permitted to be taken as 0.7 times the design snow load determined in accordance with Section 1608.1 for the purpose of determining deflection limits in Table 1604.3.

Reason: **Code history:**

The current ratio of 0.42 for serviceability deflections due to wind loads in footnote f was based on an approximate ratio of 10-year mean recurrence interval (MRI) wind pressures to risk category II wind pressures in non-hurricane regions (ASCE 7-05, Equation CC-3 and Table C6-7; ASCE 7-22, Commentary Section CC.2.2). For hurricane regions, the 0.42 ratio was understood to be conservative for 10-year winds, and unconservative for some locations such as Anchorage, Alaska. Using the same ratio for all risk categories resulted in longer serviceability return periods for higher risk categories, but not specific or uniform ones.

In the 2018 IBC, the option was added to use 10-year MRI wind speeds for all locations and all risk categories.

Problems with current requirements:

There are several problems with the current wind load serviceability deflection windspeed requirements, the most notable of which pertains to the use of the 10-year wind speed for all risk categories.   that can be seen in the table in Exhibit 1. Unlike the historic 0.42 reduction factor (IBC 2012 and 2015 for strength-based wind loads) and the 0.7 reduction factor (IBC 2009 and earlier editions), the 10-year MRI wind speed alternative does not increase deflection serviceability wind pressures and achieve the higher performance intended for higher risk categories. This is illustrated in Exhibit 1.

Recommended code change proposal:

This code change proposes to delete the option to utilize the 10-year MRI wind speeds while retaining the historic 0.42 reduction factor.

Potential future considerations:

In 2019 ASCE published the *Prestandard for Performance-Based Wind Design* which addressed the serviceability issue from a performance perspective. The Prestandard recommends that, to remain operational (i.e., serviceable) with the performance objective that the building envelope remain attached to the structure and maintain wind-driven rain resistance, the following MRI’s be utilized:

- Risk Category II 10-year MRI
- Risk Category III 25-year MRI
- Risk Category IV 50-year MRI

As this is only a Prestandard at this time, it could be considered premature to incorporate these deflection limitations in the IBC. As the performance-based standard evolves, the IBC deflection limitations can be reassessed.

2024 IBC - Table 1604.3 - Deflection Limits

Exhibit 1

Footnote f - Comparison Between 0.42 Reduction Factor and 10-year MRI Equivalent Reduction

Municipality	ASCE 7-22 - Basic Design Wind Speed, *V* (mph)			10-year MRI Wind Speed (mph)	RC II / 10-year MRI Comparison		RC III / 10-year MRI Comparison		RC IV / 10-year MRI Comparison	
	Risk Category II	Risk Category III	Risk Category IV		Effective Wind Pressure Reduction Factor	Variation from 0.42	Effective Wind Pressure Reduction Factor	Variation from 0.42	Effective Wind Pressure Reduction Factor	Variation from 0.42
Atlanta, GA	105	113	118	71	0.46	9%	0.39	-6%	0.36	-14%
Denver, CO	107	113	117	77	0.52	23%	0.46	11%	0.43	3%
Orlando, FL	137	144	150	80	0.34	-19%	0.31	-27%	0.28	-32%
Raleigh, NC	115	123	127	75	0.43	1%	0.37	-11%	0.35	-17%
Washington DC	113	120	125	75	0.44	5%	0.39	-7%	0.36	-14%
New York, NY	116	125	130	75	0.42	0%	0.36	-14%	0.33	-21%
Cleveland, OH	109	116	121	75	0.47	13%	0.42	0%	0.38	-9%
Boston, MA	116	124	129	74	0.41	-3%	0.36	-15%	0.33	-22%
Milwaukee, WI	106	114	119	73	0.47	13%	0.41	-2%	0.38	-10%
Chicago, IL	107	114	119	74	0.48	14%	0.42	0%	0.39	-8%
Omaha, NE	111	119	124	77	0.48	15%	0.42	0%	0.39	-8%
Dallas, TX	105	115	117	75	0.51	21%	0.43	1%	0.41	-2%
Phoenix, AZ	101	108	112	71	0.49	18%	0.43	3%	0.40	-4%
Los Angeles, CA	95	101	105	65	0.47	11%	0.41	-1%	0.38	-9%
Seattle, WA	98	104	109	67	0.47	11%	0.42	-1%	0.38	-10%
New Orleans, LA	138	147	153	78	0.32	-24%	0.28	-33%	0.26	-38%
Jacksonville, FL	125	135	143	75	0.36	-14%	0.31	-27%	0.28	-35%
Charleston, SC	147	156	163	78	0.28	-33%	0.25	-40%	0.23	-45%
Savannah, GA	135	147	154	75	0.31	-27%	0.26	-38%	0.24	-44%
Anchorage, AK	128	133	139	90	0.49	18%	0.46	9%	0.42	0%

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

In practice, most designers are defaulting to the 0.42 factor for determining component and cladding deflection. The 10-year mean return period option does not appear to be widely adopted by the industry. Thus, there is no change in practice and construction cost.

S54-25

S55-25

IBC: 1604.5, TABLE 1604.5

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2024 International Building Code

Revise as follows:

1604.5 Risk category. Each *building* and *structure* shall be assigned a *risk category* in accordance with Table 1604.5. Where a referenced standard specifies an occupancy category, the *risk category* shall not be taken as lower than the occupancy category specified therein. Where a referenced standard specifies that the assignment of a *risk category* be in accordance with ASCE 7, Table 1.5-1, Table 1604.5 shall be used in lieu of ASCE 7, Table 1.5-1.

Exceptions:

1. The assignment of *buildings* and *structures* to Tsunami *Risk Categories* III and IV is permitted to be in accordance with Section 6.4 of ASCE 7.
2. Freestanding parking garages not used for the storage of emergency services vehicles or not providing means of egress for *buildings* or *structures* assigned to a higher risk category shall be assigned to Risk Category II.
3. Battery energy storage systems are permitted to be assigned to Risk Category II where the *owner* has submitted and the *building official* has approved a plan to provide an alternative equivalent source of stored energy to the same energy consumers within one hour of the system's failure due to a design level wind, earthquake, snow, flood, or tornado event, considering the regional effects of any such event.

TABLE 1604.5 RISK CATEGORY OF BUILDINGS AND OTHER STRUCTURES

RISK CATEGORY	NATURE OF OCCUPANCY
I	Buildings and other structures that represent a low hazard to human life in the event of failure, including but not limited to: • Agricultural facilities. • Certain temporary facilities. • Minor storage facilities.
II	Buildings and other structures except those listed in Risk Categories I, III and IV.

III	Buildings and other structures that represent a substantial hazard to human life in the event of failure, including but not limited to:
	• Buildings and other structures whose primary occupancy is public assembly with an occupant load greater than 300.
	• Buildings and other structures containing one or more public assembly spaces, each having an occupant load greater than 300 and a cumulative occupant load of these public assembly spaces of greater than 2,500.
	• Buildings and other structures containing Group E or Group I-4 occupancies or combination thereof, with an occupant load greater than 250.
	• Buildings and other structures containing educational occupancies for students above the 12th grade with an occupant load greater than 500.
	• Group I-3, Condition 1 occupancies.
	• Any other occupancy with an occupant load greater than 5,000.[a]
	• Power-generating stations with individual power units rated 75 MW_{AC} (megawatts, alternating current) or greater, water treatment facilities for potable water, wastewater treatment facilities and other public utility facilities not included in Risk Category IV.
	• Buildings and other structures not included in Risk Category IV containing quantities of toxic or explosive materials that:
	  • Exceed maximum allowable quantities per control area as given in Table 307.1(1) or 307.1(2) or per outdoor control area in accordance with the *International Fire Code*; and
	  • Are sufficient to pose a threat to the public if released.[b]

RISK CATEGORY	NATURE OF OCCUPANCY
IV	Buildings and other structures designated as essential facilities and buildings or structures where loss of function represents a substantial hazard to occupants or users, including but not limited to: • Group I-2 occupancies. • Ambulatory care facilities having emergency surgery or emergency treatment facilities. • Group I-3 occupancies other than Condition 1. • Fire, rescue, ambulance and police stations and emergency vehicle garages • Designated earthquake, hurricane or other emergency shelters. • Designated emergency preparedness, communications and operations centers and other facilities required for emergency response. • Public utility facilities providing power generation, potable water treatment, or wastewater treatment. • Power-generating stations and other public utility facilities required as emergency backup facilities for *Risk Category* IV structures. Battery energy storage systems providing ancillary services to a power plant, power-generating station or power generation facility that has a total capacity of 20 MW or more or is assigned to Risk Category IV. Battery energy storage systems for which the system's total energy capable of being stored is 80 MWh or more. Battery energy storage system components, cabinets, containers, enclosures, equipment platforms, foundations, shelters, and sheltering buildings for dedicated-use or nondedicated-use, where the battery energy storage system is assigned to Risk Category IV. Buildings and other structures containing quantities of highly toxic materials that: • Exceed maximum allowable quantities per control area as given in Table 307.1(2) or per outdoor control area in accordance with the *International Fire Code* ; and • Are sufficient to pose a threat to the public if released.[b] • Aviation control towers, air traffic control centers and emergency aircraft hangars. • Buildings and other structures having critical national defense functions. • Water storage facilities and pump structures required to maintain water pressure for fire suppression.

a. For purposes of occupant load calculation, occupancies required by Table 1004.5 to use *gross floor area* calculations shall be permitted to use *net floor areas* to determine the total occupant load. The floor area for vehicular drive aisles shall be permitted to be excluded in the determination of net floor area in parking garages.

b. Where approved by the building official, the classification of buildings and other structures as Risk Category III or IV based on their quantities of toxic, highly toxic or explosive materials is permitted to be reduced to Risk Category II, provided that it can be demonstrated by a hazard assessment in accordance with Section 1.5.3 of ASCE 7 that a release of the toxic, highly toxic or explosive materials is not sufficient to pose a threat to the public.

Reason: This proposal fills a hole in Table 1604.5 related to a relatively new, and increasingly common and newly essential, energy installation: **large-scale battery energy storage systems, or BESS** (see the Terminology section below for precedent definitions).

As illustrated below, BESS installations involve modular units that combine nonstructural components with a non-building structure. BESS are often built as customized containers or equipment frames, filled with batteries and related electrical and HVAC equipment, and mounted on a platform, a slab on ground, or a set of isolated footings. From the structural perspective, a BESS installation is basically a bunch of boxes anchored to a foundation, but these new features of our built environment are as important to our energy future as any piece of high tech public-serving infrastructure.

The proposal does three basic things:

- It adds three line items to Table 1604.5 for two categories of BESS and for their support structures: one item for "ancillary" BESS, paired or co-located with a generator; one for standalone BESS facilities; and one for the support or shelter structures that go with either of the first two.
- It assigns large-scale BESS to Risk Category IV as essential facilities and as structures where loss of function would represent a substantial hazard.
- It allows an alternative means of maintaining BESS' essential functionality through planning, recognizing the interconnectedness and redundancy of large, networked energy grids. This is consistent in principle with footnote b to the current Table 1604.5.

The proposal derives from the following three points. (Details and supplemental information on each of these points is available in the "BESS" pdf in the "2027 I-codes Bonowitz" dropbox link):
https://www.dropbox.com/scl/fo/bsmcosw9sr4bgrxapeg8h/AB5Y1Wb8KbMpz2BUhmPpAT4?rlkey=mj232e5p1nmnpfrqgrw7apd29&dl=0.)

1. Current Table 1604.5 does not give clear guidance about BESS, so current practice is inconsistent. Consider current Table 1604.5:

- BESS is definitely energy infrastructure, but it's not a "power-generating station." It's also not power transmission and distribution, which is explicitly outside the scope of some IBC provisions, including Sec 1613.

- Some BESS (usually on-site) provides direct “emergency backup” to distinct Risk Category IV facilities, in which case it should be clearly designed as RC IV. BESS that supports the grid might indirectly support RC IV facilities in the community, but for these cases, Table 1604.5 is unclear, since off-site BESS is not obviously “required for emergency response.” Even where BESS is meant to assist the “black start” of a downed power station, not all power stations are public utilities currently assigned to RC IV.
- Some BESS facilities are owned, operated, or co-located with a public utility, but many are not.
- Depending on the battery type, BESS can involve toxic or hazardous materials, but not always at RC III or IV levels. Even so, IFC provisions for energy storage focus on fire safety and hazmat containment, not on structural performance or functionality.

Thus, the derivation of proper design criteria, which depends on the Risk Category assignment, is prone to inconsistency. Our review of seven recent BESS installations in California found three that designed for RC IV, each co-located with a gas peaker plant; two assigned to RC III, but using different importance factors; one assigned to RC II; and one that did not report a risk category but used an importance factor of 1.0. (Kimball, 2024). The cases we reviewed were all designed with the 2019 or 2022 *California Building Code*, neither of which included the 2024 IBC’s new provision assigning public utility power generation to RC IV. (For details, see the file at the dropbox link above.)

As new, specialized buildings and structures become common within the built environment, or where the code’s broad categories need more nuance, it is entirely appropriate to add new line items to Table 1604.5. New items have been added, split, and moved in each of the last two code cycles.

Beyond Section 1604.5, I-codes provisions for energy storage systems are found primarily in IFC Section 1207 and IECC Appendix CJ, but those provisions are primarily for “behind-the-meter” systems at residential or commercial scale (discussed in point 2), and they focus primarily on fire and hazmat safety, not on loss of function due to damage from environmental loads. For example, 2024 IFC Section 1207.4.4, regarding seismic and structural design, says only, “Stationary ESS shall comply with the seismic design requirements in Chapter 16 of the *International Building Code*, and shall not exceed the floor loading limitation of the building.”

2. BESS installations have various characteristics and functions, some of which deserve special attention in the code.

BESS facilities can serve multiple functions; typically, the different functions are related to the facility’s size and ownership. (See the examples in photos below.)

Residential and commercial scale BESS are relatively small (storing around 10 kWh for residential, up to about 8 MWh for large commercial) and “behind the meter,” or dedicated to just one or a few buildings. They mostly provide backup power, performing the same role as a traditional battery rack, but they have become more common as a means of managing a facility’s rooftop solar output, allowing energy to be stored during the day and discharged at night. Because of their size and use by specific consumers, residential and commercial-scale BESS are NOT the subject of this proposal.

Large-scale BESS, also called grid-scale or utility-scale, is the subject of this proposal. A large-scale BESS facility is a grouping of modular BESS containers or frames covering an area from a few thousand square feet to several acres. A large-scale BESS facility can store and discharge tens or hundreds of MWh of energy.

The large-scale BESS of interest here are “front of the meter” and have a larger role to play with respect to the regional electricity grid or a community’s micro-grid. Large-scale BESS can be stand-alone facilities connected to the grid, or they can be linked directly, i.e. co-located with, a power generator itself. Over the last few years, the combination of “solar + storage,” meaning a large PV farm combined with a yard of BESS containers and inverters, has become a common project type for independent power producers (IPPs), who then sell the power they generate and store to public utilities, municipal utilities (cities and towns), and sometimes to especially large private power consumers (though customers can switch from private to public and back over time).

Where BESS is part of a larger electricity grid, it has a broader role and importance, beyond merely providing backup power – whether or not the BESS facility or its co-located generator is regulated as a public utility. This is discussed in point 3.

Thus, BESS installations can be categorized by their ownership, by their consumers, by how they are connected to power generators, by their capacity, or in other ways. Current Table 1604.5 distinguishes between power generators that are or are not regulated as public utilities. This distinction indicates a heightened importance for power delivered to and consumed by the general public. But the energy market is far more complex now than it was when the IBC first used the term “public utility.” Now, utilities of many types and sizes can be connected to each other in a variety of ways that change over time (independent BESS facilities can be both energy customers and providers), and in which new technologies at new scales, such as large-scale BESS, can create interdependencies that require designation primarily by size and metering. (EIA stats, 2022; Colthorpe, 2022)

In other words, the importance of reliable power for the general public is now indicated more by the capacity and grid connectivity of generators and BESS, not by public utility status. Therefore, this proposal makes distinctions by BESS size, with an exception that recognizes a well-planned whole-grid response to an unexpected outage.

How large is large? Nearly every week now brings reports of a new large-scale BESS facility that can store 10, 20, 50, or more MW of power, though only the largest ones usually make the news. Some precedents are worth considering.

- The Department of Energy’s (DOE) U.S. Energy Information Administration (EIA) defines “large-scale solar” as “solar thermal and photovoltaic generating units at power plants larger than or equal to one megawatt” (EIA, 2024). DOE also uses this threshold in its study of siting issues for PV installations (DOE, 2025). A 1 MW solar power plant typically covers 5 to 10 acres and can power 100 to 200 homes (SEIA, 2024). Typically, a BESS co-located with a generator would discharge the full generator capacity over about four hours (consistent with IECC Section CJ101.1.1), so at this scale, the BESS would have a capacity of 1 MW or 4 MWh.

- The Federal Energy Regulatory Commission (FERC, an independent agency within DOE) sets different rules for generators of different sizes, drawing a line at 20 MW capacity (FERC, 2024b). The associated BESS would have a capacity of about 80 MWh.
- FERC also sets certain fees based on generator size, drawing lines at 20 MW, 80 MW, and 200 MW. Regional system operators are sometimes allowed to modify these rules; Southwest Power Pool, for example, draws lines at 2 MW, 20 MW, and 75 MW. (FERC, 2024a)
- The benchmark cost study by DOE's National Renewable Energy Laboratory (NREL), cited in our cost impact statement below, assumes a BESS facility of 60 MW or 240 MWh (NREL, 2024).
- While all public utility generators are assigned to RC IV, current Table 1604.5 assigns other generators to RC III if they have a capacity of 75 MW or more (though it dubiously associates that threshold with individual power "units," a separate issue).

These precedents are useful in drawing the kinds of lines the building code needs to draw. Here, there are obvious precedents at 20 MW and 75 MW. The DOE definition set at 1 MW is probably too low to reflect the code's emphasis on public risk. But 75 MW is probably too high, as it would miss an enormous portion of public-serving BESS. In 2019, more than half of solar PV plants in the U.S. were rated between 20 and 75 MW (NERC, 2019). Further, there is evidence that the 75 MW precedent has already influenced how independent power providers plan their facilities (Ludt, 2023; Misbrener, 2025). Therefore, based on these precedents, this proposal draws a line at 20 MW for the capacity of a plant at which the BESS is co-located, or 80 MWh for a stand-alone BESS.

This proposed threshold – 20 MW or 80 MWh – already represents a fairly large BESS facility. For example:

- In 2022, a large PV plant in Florida, built in 2019, added an 18 MW co-located BESS facility (Weaver, 2024), so if built under this proposal, it would still be below the RC IV level.
- The largest "second life" BESS facility in the world, co-located with a wind farm in Texas, has a capacity of 53 MWh, below the proposed RC IV level (Spector, 2024a).
- Microgrids, which DOE calls "essential building blocks" of a strong energy system, will often use BESS below the proposed RC IV level (Sisson, 2024). A microgrid for the 535 residents of Hot Springs, NC provides only 4.4 MWh of backup energy but is sufficient for their needs and helped with recovery after Hurricane Helene (St. John, 2024).
- Rural coops often develop BESS facilities that would fall under the proposed RC IV level. The largest coop in Minnesota is using a federal grant to develop renewable energy and is still planning only a 20 MW BESS (Fischer, 2024).
- A 25 MW (100 MWh) BESS announced last year – thus just over the proposed RC IV level – would be "the largest standalone battery project to date in the Pacific Northwest" (Gerke, 2024).
- A 30 MW BESS in Escondido, CA was "the largest of its kind" when it was built in 2017 (Elmer, 2024).

By comparison, if we were to draw a line at 75 MW (300 MWh), this proposal would apply only to BESS big enough to support a solar plant that covers a full square mile (Electrify America, 2023) or a wind farm with at least 30 large turbines (Certrec, 2025).

3. Large-scale BESS merits assignment to Risk Category IV.

<u>As backup power</u>

. As backup power for a community (or for the community's power provider), large-scale BESS already qualifies for RC IV status because its loss could represent a substantial hazard to users. In addition to meeting energy demands at peak times, BESS "can supply backup power during natural disasters and other emergencies" (NFPA, 2024). Heat is a growing threat nationwide, and an extremely effective solution, air conditioning, requires power. But extreme heat can also cause power outages or require rolling blackouts. BESS helps solve that problem (Spector, 2024b), as long as the BESS components themselves are not knocked out by earthquake or hurricane.

SEIA, the leading trade organization for the solar power industry, recognized the growing importance of BESS to public health and safety in testimony in the last code cycle: "[T]he addition of Energy Storage Systems (ESS) is changing" the degree to which power outages can "cause substantial economic losses and disruption to civilian life." "[W]ith increasing adoption of Energy Storage Systems (ESS), it is conceivable that PV paired with ESS could be a sole source of required backup power. Where PV plus ESS is the only direct source of backup power for an essential services facility [which, with the 2024 IBC, now includes any public utility power provider] ... it shall be assigned as Risk Category IV" (SEIA, 2022).

Backup power provided directly to other RC IV facilities is already assigned to RC IV. To the extent that a BESS installation also provides backup power to the grid, which then serves various RC IV facilities, it should also be considered RC IV. Further, even for uses that are *not* assigned to RC IV, such as housing for vulnerable populations, community-supporting businesses, etc., a prolonged power outage with no backup absolutely represents a substantial hazard to users. If a BESS facility is planned with the goal of providing backup power, then its design criteria, including its risk category assignment, should be suited to that plan.

<u>As grid stabilization and to enable the growth of renewable energy.</u>

Large-scale BESS is more than just backup power. Increasingly, large-scale BESS facilities are being developed to help manage and stabilize the grid itself, as well as the demand and price of the energy it delivers. From this perspective, BESS is (or soon will be) as essential to the overall functioning of a local, regional, or even national grid as a thermostat, pressure release valve, warning system, or auto-shutoff is to an expensive and essential piece of mechanical or electrical equipment.

BESS is particularly important for reaching the full potential of renewable energy sources such as wind and solar. Because these sources are intermittent, and because the demand for power varies throughout the day, wind and solar power generators cannot match demand on their own. They can even *over*-generate, leading to grid volatility and requiring generation to be "curtailed" temporarily. For this reason, the output of large wind and solar generators is typically coordinated with that of a traditional fossil fuel power plant. As we wean ourselves from fossil fuels and come to rely more on renewables, the problem of capacity being out of sync with demand becomes ever more pronounced; the graphic representation of this discrepancy is often called the "duck curve" (because it resembles a duck).

The duck curve is a problem for renewables. But BESS is expected to solve much of it, effectively flattening the duck curve (DOE, 2017; DOE, 2023; SEAM, 2025). As DOE noted eight years ago, "solar coupled with storage technologies could alleviate, and possibly eliminate, the risk of over-generation" (DOE, 2017).

NFPA (2024) is even clearer, noting that the need for storage should also motivate changes in how we design generation and BESS facilities: "Growing concerns about the use of fossil fuels and greater demand for a cleaner, more efficient, and more resilient energy grid has led to the use of energy storage systems, and that use has increased substantially over the past decade. ... However, the rise in the number of [BESS] installations requires the need for a heightened understanding of the hazards involved and more extensive measures to reduce the risks."

Thus, if we want to transition more fully away from fossil fuels, we will need more renewable power generators like wind and solar. But to make those intermittent sources work at large scale, we will need more large-scale BESS just to make the grid function.

To summarize: Large-scale BESS is a relatively new, but increasingly common and increasingly important, addition to the built environment throughout the country, but it is not clearly addressed in the building code. Considering its importance as both backup power and the future of a renewable energy system, large-scale BESS installations should be considered essential facilities and assigned to Risk Category IV.

Finally, we anticipate the opposition of the energy industry – and, it must be said, of industry's well-intentioned cheerleaders in government, who are too slow to get in front of this wave of development already affecting city councils, land use committees, and building officials across the country.

<u>Argument 1: How do we know the benefits exceed the costs?</u>

It's true, we have not produced a comprehensive benefit-cost analysis for this relatively simple proposal. However:

- Practically all of the policy judgments inherent in risk category assignment are just that – judgments, made by the good faith consensus of building officials and stakeholders in the interest of the public. Practically none of the current risk category assignments came into the code with a comprehensive benefit-cost analysis, nor should that be necessary.
- Lack of a comprehensive BCA has not stopped enlightened utilities from voluntarily using RC IV criteria even though the current code is silent (Kimball, 2024). Nor has it stopped the State of Florida, which routinely applies RC IV wind loads – a decision that served it well when its solar facilities recovered quickly after recent hurricanes and even a direct hit from a tornado (Byrd, 2024; Weaver, 2024).
- Even if we wanted to produce a BCA, a DOE-funded study has shown that estimating the benefits of proposed changes to energy infrastructure design is practically impossible (Sanstad et al., 2020).
- If the benefits are hard to quantify, however, the question is largely moot if the cost is extremely low, which it is. As we show in our cost impact statement, the construction cost premium relative to RC II is definitely less than 1% and probably much closer to 0.3%.
- Further, the cost of BESS installation has dropped so much over the last several years (and is projected to continue dropping), that any cost premium due to this proposal is already paid for many times over by savings elsewhere. The price of battery packs (by far the most costly BESS component) dropped over 80 percent from 2013 to 2023, and fell another 20 percent relative to the 2023 price in 2024 alone (Bloomberg, 2024). Overall capital expenditure costs for BESS installations are projected to fall 18 percent between 2025 and 2030 (NREL, 2024).

<u>Argument 2: Any *perceived* increase in cost or disruption to the status quo will stop developers from entering the BESS market.</u>

With respect, this is laughable, given the explosive growth in BESS, both standalone and in "solar + storage" developments. California and Texas are actively encouraging BESS development (even if they have different objectives and are largely silent with respect to design criteria and natural hazards). (ERCOT, 2023; CPUC, 2024).

This trend was foreseeable even five years ago, before any federal or state agencies stepped in: "The electric power grid in North America is undergoing a significant transformation in technology, design, control, planning, and operation, and these changes are occurring more rapidly than ever before" (NERC, 2019). With respect to BESS in particular: "U.S. battery storage capacity will increase significantly by 2025. ... Battery storage capacity in the United States was negligible prior to 2020, when electricity storage capacity began growing rapidly. As of October 2022, 7.8 GW of utility-scale battery storage was operating in the United States; developers and power plant operators expect to be using 1.4 GW more battery capacity by the end of the year. From 2023 to 2025, they expect to add another 20.8 GW of battery storage capacity." (EIA, 2022) This pattern is effectively visualized by Cleveland and Ni (2023): https://visualizingenergy.org/watch-the-history-of-battery-storage-in-the-united-states/

Further, all this growth in renewables has happened despite hurdles thrown up by local regulations, not the building code, related to noise, fire safety, loss of agricultural land, planning and zoning, etc. – hurdles fought and overcome by developers and their expensive lawyers. So a new code provision that costs almost nothing and is already satisfied in many cases is hardly likely to stop this train.

Even if one suspects that the recent growth was only possible with heavy state and federal subsidies, the attitude of the incoming administration, which derides renewable energy at every opportunity, is actually another reason to ramp up design criteria. If subsidies for new installations dry up, so will funds to quickly repair any facilities that happen to be damaged in the near future. If no repair funds are coming, the best strategy is stronger design for those facilities now in the pipeline. (Surprisingly, it's even possible that some in industry are over-relying on government, i.e. all of us, to bail them out when their under-designed products fail. One expert we consulted actually voiced potential opposition to this proposal by saying that they didn't want to require seismic certification testing because the BESS components might fail the test. Let that sink in.)

Bottom line: If this proposal is approved, and BESS development slows down as a result between now and 2030, I will personally propose to undo the proposal for the 2033 code.

Argument 3: Actual power loss from BESS failure can't happen because of grid redundancy.

This is a fair argument about the complex interconnectedness of the electricity grid, something the building code does not account for – or it would be if there were any plans published that explicitly discussed applicable building code provisions, the likelihood of failures, and how the current grid will respond, given how much BESS capacity is newly in place.

Even so, the proposed Exception to Section 1604.5 is meant to acknowledge these circumstances and provide relief to BESS developers who really want to avoid the 0.3% cost premium and the potential damage reduction benefits it buys. Bring your plan – presumably one produced or at least adopted by DOE, FERC, NERC, or your state's PUC, PSC, ISO, or RTO, or even your city's resilience officer or recovery planner – to the building official, and you may design using RC II criteria.

The proposed exception is consistent in principle with footnote b to current Table 1604.5, which allows a lower risk category assignment for certain hazardous materials if an assessment in accordance with ASCE 7 Section 1.5.3 indicates a low risk. The exception proposed here might read as qualitative and open to judgment, but so is ASCE 7 Section 1.5.3.

Argument 4: Even if power loss occurs due to BESS failure, it's not important except for "essential facilities" like hospitals, and they're already assigned to RC IV.

First, this ignores the importance of BESS to an electricity grid that relies on renewable energy sources, an importance recognized by DOE (2017; 2023) and discussed at point 3 above.

Second, even if BESS is primarily about backup power, this attitude represents obsolete thinking about what counts as important, and the role of electric power in restoring normalcy after a damaging event. This attitude effectively says that providing power to your house, your office, your grocery store, you child's school, or your mom's care facility isn't really important. Even if the code does not yet recognize any of those buildings and uses as needing RC IV design criteria, it can still be true that the chief obstacle to their recovery should not be in the power or water service over which they have no control. The electricity grid, with BESS as a critical piece, is still essential to "non-essential" buildings.

A BESS developer, engineer, building official, or recovery planner who does not see the facility as essential is effectively rationalizing its failure by saying at least one of the following:

- The only things that are truly essential are the emergency response and public safety services that have always been assigned to RC IV.
- The failed BESS facility actually performed exactly as expected, incurring substantial damage in a design-level event.
- Repair of this $50-million BESS facility will take weeks and a lot of money (including more tax dollars) because we didn't think it was worth using a slightly bigger $5 rod anchor.

In summary, this proposal comes as close as any to embodying the proverb, "For want of a nail."

Terminology

This proposal uses terminology with precedents in industry publications, the I-codes (especially the IFC), and the Department of Energy's U.S. Energy Information Administration glossary (EIA, 2025).

Battery energy storage system(s), or BESS, has emerged as an industry standard term. It is not yet explicitly defined by the I-codes, but a number of related terms are, and BESS is indirectly defined by them. The following related terms are already defined:

- IFC: "**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 uninterruptible power supply, load shedding, load sharing or similar capabilities."
- IECC, IFC: "**Energy storage system (ESS).** One or more devices, assembled together, capable of storing energy in order to supply electrical energy at a future time."
- IBC, IFC: "**Energy storage system, electrochemical.** An energy storage system that stores energy and produced electricity using chemical reactions. It includes, among others, **battery ESS** and capacitor ESS."

By using "battery," as opposed to just ESS, the proposal distinguishes its scope from capacitor ESS (per the definition of electrochemical ESS above) and from other ESS such as pumped hydro or compressed air. The IFC also defines several "battery types," but the proposal would apply to all types, including some newer types (e.g. sodium-ion or iron-air) not yet defined in the IFC.

Ancillary services is an industry standard term defined by EIA (2025): "Services that ensure reliability and support the transmission of electricity from generation sites to customer loads. Such services may include load regulation, spinning reserve, non-spinning reserve, replacement reserve, and voltage support." By providing load regulation, BESS provides an ancillary service when paired with or co-located with a power generator.

Power plant is used in the following EIA definitions:

- **Electric power plant:** A station containing prime movers, electric generators, and auxiliary equipment for converting mechanical, chemical, and/or fission energy into electric energy.
- **Large-scale solar:** Solar thermal and photovoltaic generating units at power plants larger than or equal to one megawatt.

Power-generating station is not defined in the I-codes, but it has been used in Table 1604.5 since the 2003 edition.

Facilities providing power generation (that is, a power generation facility) was used in a change made to the 2024 code to replace the undefined “station” with the broader (and defined) “facility.”

Total energy capable of being stored is borrowed from IFC Table 1207.1.3, where it is used specifically to denote the capacity of energy storage systems. Other relevant I-code precedents that might apply to BESS capacity or size come from IECC Appendix CJ, which uses, but does not define, the terms “energy capacity” (in kW or MW) and “power capacity” (in kWh or MWh). The EIA glossary contains several terms that define or use capacity in various ways.

The various BESS components, supports, and shelters listed in the third proposed new RC IV line item reference, and are generally consistent with, terms defined or cited in IFC Section 1207:

- **"Energy storage system, walk-in unit.** A prefabricated building that contains energy storage systems. It includes doors that provide walk-in access for personnel to maintain, test and service the equipment, and is typically used in outdoor and mobile ESS applications.”
- **"Energy storage system cabinet.** An enclosure containing an energy storage system and meeting the applicable requirements of the listing for the system. Personnel are not able to enter the enclosure other than reaching in to access components for maintenance purposes.”
- **"Equipment platform.** An unoccupied, elevated platform used exclusively for mechanical systems or industrial process equipment, including the associated elevated walkways, stairways, alternating tread devices and ladders necessary to access the platform (see Section 505.3 of the International Building Code).”

IFC Sections 1207.7.1 and 1207.7.2 provide requirements for “dedicated-use buildings” and “nondedicated-use buildings” that house BESS. Per Section 1207.7.1, a dedicated-use building is effectively defined as one used exclusively for “ESS, electrical energy generation and other electrical grid-related operations.”

Representative BESS examples

The following photographs (sources credited as shown) offer representative examples of BESS installations of different scales. They are provided as background reference for readers not familiar with BESS. Nothing in this proposal, including the reason statement and cost impact data, is necessarily meant to apply to any of the specific cases shown.

<table>
<tr>
<td>Residential-scale


https://www.wsj.com/articles/your-next-home-could-run-on-batteries-1508065205
Typically “behind the meter” (owned and used by a single- or multi-unit building to manage that building’s supply and costs) and installed on or within the building.
These are not the focus of this proposal, and their capacities are well under the threshold capacities proposed for assignment to RC IV.</td>
<td>Facility- or Commercial-scale

https://insideclimatenews.org/news/19052022/inside-clean-energy-flow-battery/
Also “behind the meter,” but typically for a commercial or institutional facility. Often installed on site but in a separate cabinet or enclosure similar to a shipping container. The enclosure is not part of the BESS, but the performance of the BESS and the performance of its container or enclosure are clearly linked.
These are not the focus of this proposal, and their capacities are well under the threshold capacities proposed for assignment to RC IV.</td>
</tr>
<tr>
<td colspan="2">Large-scale (also called Grid-scale or Utility-scale)
Note the variety of facility sizes and types, one- and two-tiered configurations, foundation conditions, outdoor and indoor facilities, etc.</td>
</tr>
<tr>
<td>
https://invinity.com/utility-scale-battery-storage/</td>
<td>
https://www.reuters.com/business/energy/california-battery-plant-is-among-worlds-largest-power-storage-booms-2024-04-12/</td>
</tr>
</table>

 *James Herrera, Monterey Herald. https://www.santacruzsentinel.com/2023/10/12/governor-signs-sen-laird-bill-prompted-by-moss-landing-bess-incidents/*	 *https://solarindustrymag.com/intersect-secures-837m-in-financing-to-build-1-gwh-texas-bess*
 *https://www.energy-storage.news/key-capture-energy-sells-investment-tax-credits-for-120mw-of-new-york-and-texas-bess/* A 20 MW BESS installation in New York State. Inverters in the foreground, batteries in the background.	 *https://www.renewableenergyworld.com/storage/evlo-vermont-utilities-team-up-on-unique-bess/* Installation of BESS containers for a 3MW (12MWh) facility in Vermont. Note the isolated footings.

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Cost Impact: Increase

Estimated Immediate Cost Impact:

Where BESS is already assigned to RC IV, there will be no cost impact.
Where BESS is already conservatively designed to facilitate use at multiple locations subject to a range of wind and earthquake loads, there will be no construction cost impact in many cases, but there could be a one-time design cost (by the manufacturer or vendor) of $30,000 for seismic certification testing of each active component, but this would only apply to installations in locations of moderate or high seismicity, and only where the specific components have not been certified previously.

In other cases, accounting for worst case changes in wind and earthquake loads, inclusion of tornado loads (which only apply to RC III and RC IV), and inclusion of seismic certification, and with additional conservative assumptions and rounding up, assignment to RC IV might raise the cost of BESS development just 0.9% (from $1907/kW to $1924/kW using the NREL benchmark).

More reasonable, but still conservative assumptions (a structural factor of 1.5, indirect cost factors of 1.0, and no seismic testing) would raise the cost only 0.3%.

The NREL (2024) cost data on which this assessment is based do not include the substantial cost of land acquisition or of ongoing operations and maintenance. If those were included in the baseline RC II cost, the impact of a change to RC IV would be even smaller.

Estimated Immediate Cost Impact Justification (methodology and variables):

Cost impacts reflect four main design changes that would apply if a BESS that might otherwise be assigned to RC II is instead required to use design criteria for RC IV:

- Higher earthquake loads, and fewer exemptions for nonstructural protection
- Inclusion of seismic certification testing costs
- Higher straight line wind loads
- Inclusion of tornado loads (which apply only in RC III and RC IV)

Factors for each of these effects were derived for different regions of the U.S. (because no one place has worst-case wind, and seismic, and tornado) through a comprehensive review of current IBC and ASCE 7 provisions for structural design, non-building structure design, and nonstructural component protection. (Details are provided in the supplemental materials available at the dropbox link given above.) Overall, the changes result in a design increase factor of 1.2 to 1.5, plus a cost for seismic certification. These were then *very conservatively* translated into a direct cost increase factors of 2.0 on the structural portion of the BESS benchmark construction cost (NREL, 2024). The NREL benchmark costs were the latest available, reflecting 2023 data, for a BESS system of 60 MW (or 240 MWh) capacity, for which the total cost is $1,907 per kW (or $477/kWh).

In the NREL benchmark, “Structural Balance of System” includes every design and construction hard cost (engineering, foundation, anchorage, etc.), and its total cost is $11/kW, or just 0.6% of the total benchmark cost. We factored this up by the conservative RC IV premium factor of 2.0. Other benchmark costs (taxes, profit, overhead, etc.) are based on the total hard cost, so those were also factored up by the Structural BOS portion with a conservative factor of 1.01. With each benchmark line item thus factored, and a cost for seismic certification added, the total cost increased from $1,907/kW to $1,924/kW.

S55-25

S56-25

IBC: TABLE 1604.5

Proponents: David Bonowitz, representing David Bonowitz, S.E. (dbonowitz@att.net)

2024 International Building Code

Revise as follows:

TABLE 1604.5 RISK CATEGORY OF BUILDINGS AND OTHER STRUCTURES

RISK CATEGORY	NATURE OF OCCUPANCY
I	Buildings and other structures that represent a low hazard to human life in the event of failure, including but not limited to: • Agricultural facilities. • Certain temporary facilities. • Minor storage facilities.
II	Buildings and other structures except those listed in Risk Categories I, III and IV.
III	Buildings and other structures that represent a substantial hazard to human life in the event of failure, including but not limited to: • Buildings and other structures whose primary occupancy is public assembly with an occupant load greater than 300. • Buildings and other structures containing one or more public assembly spaces, each having an occupant load greater than 300 and a cumulative occupant load of these public assembly spaces of greater than 2,500. • Buildings and other structures containing Group E or Group I-4 occupancies or combination thereof, with an occupant load greater than 250. • Buildings and other structures containing educational occupancies for students above the 12th grade with an occupant load greater than 500. • Group I-3, Condition 1 occupancies. • Any other occupancy with an occupant load greater than 5,000.[a] • Power-generating stations with individual power units rated 75 MW_{AC} (megawatts, alternating current) or greater, water treatment facilities for potable water, wastewater treatment facilities and other public utility facilities not included in Risk Category IV. • Buildings and other structures not included in Risk Category IV containing quantities of toxic or explosive materials that: • Exceed maximum allowable quantities per control area as given in Table 307.1(1) or 307.1(2) or per outdoor control area in accordance with the *International Fire Code* ; and • Are sufficient to pose a threat to the public if released.[b]
IV	Buildings and other structures designated as essential facilities and buildings where loss of function represents a substantial hazard to occupants or users, including but not limited to: Group I-1, Condition 2 occupancies • Group I-2 occupancies. • Ambulatory care facilities having emergency surgery or emergency treatment facilities. • Group I-3 occupancies other than Condition 1. • Fire, rescue, ambulance and police stations and emergency vehicle garages • Designated earthquake, hurricane or other emergency shelters. • Designated emergency preparedness, communications and operations centers and other facilities required for emergency response. • Public utility facilities providing power generation, potable water treatment, or wastewater treatment. • Power-generating stations and other public utility facilities required as emergency backup facilities for *Risk Category* IV structures. • Buildings and other structures containing quantities of highly toxic materials that: • Exceed maximum allowable quantities per control area as given in Table 307.1(2) or per outdoor control area in accordance with the *International Fire Code* ; and • Are sufficient to pose a threat to the public if released.[b] • Aviation control towers, air traffic control centers and emergency aircraft hangars. • Buildings and other structures having critical national defense functions. • Water storage facilities and pump structures required to maintain water pressure for fire suppression.

a. For purposes of occupant load calculation, occupancies required by Table 1004.5 to use *gross floor area* calculations shall be permitted to use *net floor areas* to determine the total occupant load. The floor area for vehicular drive aisles shall be permitted to be excluded in the determination of net floor area in parking garages.

b. Where approved by the building official, the classification of buildings and other structures as Risk Category III or IV based on their quantities of toxic, highly toxic or explosive materials is permitted to be reduced to Risk Category II, provided that it can be demonstrated by a hazard assessment in accordance with Section 1.5.3 of ASCE 7 that a release of the toxic, highly toxic or explosive materials is not sufficient to pose a threat to the public.

Reason: Group I-1 Condition 2 facilities are large facilities specially designed for people who need help with everyday tasks (*custodial care*), and even need help evacuating in an emergency (*limited verbal or physical assistance*). Because of the residents' special needs, expected structural damage to one of these buildings will almost certainly lead to a "loss of function [that] represents a substantial hazard," requiring these buildings to be assigned to Risk Category IV.

With the current code, Chapter 4 requires these buildings to have special design features suited to the residents' disabilities. But Chapter 16 assigns them to Risk Category II, just like any market-rate housing, just like any house, condo, or apartment building. Further, because Group I-1 is currently assigned to RC II, it means that even a highly deficient existing building (like an old apartment building) can be converted to one of these facilities with essentially no structural review. This is more of a concern than in the past, as housing shortages throughout the country have led to calls for "adaptive reuse" of market housing, hotels, motels, and even office buildings into Group I-1 care facilities, and in some cases the shortage is acute enough that proponents are willing to overlook existing deficiencies (SFBOS, 2023). The answer is not to look the other way, but to discourage the conversion of deficient buildings unless they're retrofitted and to ensure that new buildings are given as much thought in Chapter 16 as they are in Chapter 4. This proposal does both.

Under current code, if a Group I-1 Condition 2 building is damaged in a design-level hurricane or earthquake – as we structural engineers expect – these vulnerable residents will have nowhere to go that can provide the design features and expert staff care they need.

Instead, assigning these buildings to RC IV will ensure, at minimal additional cost (see below):

- A stronger, more damage-resistant lateral system, and much higher likelihood of immediate reoccupancy
- More complete protection for nonstructural components and systems, including the special conditions and systems required of Group I-1 Condition 2 buildings but not found in normal multi-unit housing.
- Backup utilities, including backup power so necessary for protecting vulnerable seniors against life-threatening power outages.

We know from experience that while developers (or private equity buyers) could provide these RC IV features voluntarily, they won't. On the contrary, assisted living, senior housing, and memory care facilities, all of which could be Group I-1 Condition 2, are a growth industry, and many developers are looking to provide nothing more than what the code requires.

Private equity is increasingly buying and building assisted living (I-1) and nursing home (I-2) facilities (MEDPAC, 2021; Senate Budget Committee, 2025). Nursing homes and assisted living facilities are especially vulnerable to these new market conditions: "The past two decades have seen a rapid increase in Private Equity (PE) investment in healthcare, a sector in which intensive government subsidy and market frictions could lead high-powered **for-profit incentives to be misaligned with the social goal of affordable, quality care**. ... PE's success in other sectors may not be relevant to healthcare, which suffers from unique market frictions. For example, patients cannot accurately assess provider quality, they typically do not pay for services directly, and a web of government agencies act as both payers and regulators (Cutler, 2011; Skinner, 2011). **These features weaken the natural ability of a market to align firm incentives with consumer welfare and could mean that high-powered incentives to maximize profits have detrimental implications for consumer welfare** (Hansmann, 1980; Hart et al., 1997; Chandra et al., 2016)." (Gupta et al., 2021, emphasis added)

If the owners of these vital facilities are now more willing than ever to cut costs, cut care, and walk away from losses – at the direct expense of the vulnerable occupants and at the indirect expense of the community – the least the building code can do is ensure that a major earthquake, hurricane, or winter storm does not add to the problem by giving them yet another excuse. The building code provides essentially one tool to express the importance of natural hazard resistance and recovery through design, and that tool is assignment to Risk Category IV. While design for RC IV can be more expensive than design for RC II, the premium can be surprisingly low -- as little as 1%, or even less for some thoughtfully-designed facilities (see the Cost Impact and Justification statements). Just as important, the design requirements and the needs of tenants in Group I-1 Condition 2 facilities mean that the benefits of a RC IV design are even more likely to outweigh any additional costs. In addition to the normal benefits of reduced damage, which in turn reduces repair costs (which are also at a premium following a natural hazard event) and downtime operating losses, benefits for these special facilities would include reductions in the cost of relocating vulnerable tenants, the premium cost for suitable alternative space (which is rare), the premium cost for specialized staff, and any additional liability for losses by especially vulnerable tenant-clients.

As we consider what the appropriate performance ought to be for a large, new care facility, it might be useful to review actual performance from the last year or two. Consider these examples that demonstrate over and over the difficulty of finding appropriate buildings for care facilities and senior housing among the existing building stock, and the vulnerability that is sure to arise if we don't take the opportunity to make *new* care facilities more damage resistant:

- The country faces a potential "gray wave" of homeless seniors. The solution, of course, is to build more affordable housing, but "that housing will have to be accessible too. Older homeless peoples ... need homes they can safely navigate." (Bolton, 2024)
- If the code doesn't mandate better buildings, including appropriate fire safety for seniors and custodial care recipients, insurers will walk away. "Industry experts say increasing premiums are the result of greater weariness on the part of insurance carriers to take on what they consider to be riskier properties, especially as they also confront higher rebuilding costs, more frequent losses from natural disasters, and other challenges." (Baldassari, 2024)
- If landlords, tenants, city emergency planners, and code officials don't want to see more eviction bans, we need to be designing more damage-resistant housing. (Sisson, 2024)
- Risk Category IV ensures backup power, which might have prevented some deaths linked to power outages. "The deaths could have been caused by many dangers of power outages: people not being able to charge medical equipment, not being able to use air conditioning on hot days, or experiencing increased physical and mental stress and isolation of living without elevators or subways. ... Weather-related power outages are increasing, as climate change brings more frequent, more powerful storms that threaten our power grid and other physical infrastructure." (Siegel, 2012; NYC.gov, 2022)
- Relying on facilities to voluntarily provide backup power for vulnerable residents doesn't work, and state regulation varies considerably. "[W]hile nursing homes face such federal oversight, lower-care-level facilities that provide some medical care — known as assisted living — are regulated at the state level, so the rules for emergency preparedness vary widely. ... Maryland adopted rules for generators in assisted living facilities following Hurricane Isabel, which left more than 1.2 million residents in the state without power in 2003. Florida did so for nursing homes and assisted living facilities in 2018, after Hurricane Irma led to deaths at one facility. But Texas has not. And no requirements for generators exist in Texas for the roughly 2,000 assisted living facilities or the even less regulated independent living sites." (West, 2024)
- Texas will now require backup power, after unacceptable losses in recent years. "[D]uring Winter Storm Uri in February 2021, 10% of nursing homes and 33% of the assisted living facilities in Texas lost power. During Hurricane Beryl in July [2024], 14 nursing homes and 30 assisted living facilities lost power." (Dominguez, 2025)

I made a similar proposal last cycle (S77-22). This proposal has made changes in response to comments offered then. I also respond here to some misunderstandings voiced during last cycle's testimony.

- S77-22 was written to apply only where at least half the care recipients would qualify as Condition 2. That was consistent in concept with the exception in IEBC Sec 1002.3, which waives code upgrades when less than half of the building area is changed to Group I-1. But some felt that the proposal drew an unnecessary line, so I have removed it.
- Some felt that the proposal covered too many types of buildings, but I believe they were misled by the list of uses (mostly undefined) in IBC 308.2. In fact, both S77-22 and this proposal apply to just one type of facility – Condition 2 (Sec 308.2.2), where at least some residents need assistance with egress. ICC's Healthcare Committee already recognizes profound differences between Condition 1 and Condition 2, which is why IEBC Sec 1002.3 waives upgrade for a change from Condition 2 to Condition 1, but not the other way.
- Some were concerned that RC IV was too much to ask of a small care facility. In fact, this proposal only applies to the large care facilities in Group I-1. Smaller facilities are either Group R-3 or R-4 and would not be affected by this proposal.
- Some expressed concern about what would happen if an existing care recipient were to transition over time from Condition 1 to Condition 2, and the feasibility of enforcement. This is a good question, but it's a question for the IEBC, and the IEBC requirements for change of use within Group I-1 already present the same issues (e.g. IEBC Sec 1002.3). If a patient changes from Condition 1 to Condition 2, the IEBC already triggers compliance of egress, smoke and fire safety, room layouts, etc. to meet the IBC *as a new building*. That's already onerous enough to probably discourage the change – but again, that's an IEBC issue. Developers of new care facilities should definitely be thinking about these possibilities during design. This proposal does not change the designer's and developer's interest in looking forward to potential changes in their tenant-client base.

For reference:

Group I-1 Condition 2 buildings include ONLY:

- Buildings designed for more than 16 *custodial care* recipients, plus staff. (The same use with 1 to 5 residents is R-3, not I-1. The same use with 6 to 16 residents is R-4, not I-1.)
- Buildings where at least some of the care recipients require *limited verbal or physical assistance* to respond to an emergency. This is a lower level

of disability than being fully *incapable of self-preservation* (such I-2 facilities are already assigned to RC IV). But its design requirements are still different from even brand new market housing.

This proposal does NOT apply to R-3. Therefore, a converted dwelling or any small building converting to a care facility is not affected.

This proposal does NOT apply to R-4. Therefore, even a smaller care facility that needs flexibility as its residents' care needs change is not affected.

This proposal is only for large buildings intentionally and specifically designed as care facilities.

Compared with a normal R-2 multi-unit building (or even a similar but smaller R-4 care facility), the current code requires Group I-1 Condition 2 buildings to meet special requirements and limits regarding:

- IBC 420.6: Smoke barriers, with refuge areas and limits on smoke compartment size and maximum travel distance.
- IBC 420.7: Walls, ceilings, sprinklers, and space planning related to common areas and activity rooms.
- IBC 420.8: Kitchens and cooking areas.
- IBC 420.9: Kitchen appliances, regarding shutoffs, timers, etc. in shared cooking areas.

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Cost Impact: Increase

Estimated Immediate Cost Impact:

The initial construction cost premium to design for RC IV instead of RC II will vary significantly with the building location, size, architecture, and program. That said, premium is often surprisingly low, between 1% and 2%. Though rare, it can even be zero if the designer is thoughtful about structural system selection and nonstructural system detailing. (If the cost of land acquisition, operations, and maintenance are also considered, the construction cost premium would be even smaller relative to the total project long-term cost.)

For a new assisted living facility, assuming a construction cost between $272/sf and $444/sf (see Justification) and a conservative 1.5% cost premium, the immediate cost impact would range from $4.10/sf to $6.70/sf.

See the reason statement for a brief discussion of likely benefits that would offset any immediate construction cost premium.

Estimated Immediate Cost Impact Justification (methodology and variables):

The construction cost for a new assisted living facility is from Gaivin (2024), citing data from The Weitz Company. For a city index of 100, 2024 construction cost was expected to range from $272/sf to $347/sf for a "mid-level" building (wood-frame) and from $356/sf to $444/sf for a "high-level" building (steel or concrete).

The estimate of 1% to 2% is based on case studies of voluntary design of nominally RC II buildings for RC IV in regions of high seismicity: Almufti (2016), Bade (2014), Berkowitz (2021), Haselton et al. (2021), Lizundia (2021), Mar (2021), Moore (2021), SEFT (2015), Westermeyer (2021), and Zimmerman (2021).

This estimate stands to reason: Wind, snow, and earthquake loads can already vary significantly within a jurisdiction, but the building designs and unit costs don't change wildly from one side of the county to the other. For example, the seismic design force in Berkeley is about 1.5 times that in downtown San Francisco; so with respect to the structure, any care facility you can build as RC II in Berkeley you can also build as RC IV in San Francisco with no change to the design. The same is likely true for snow design, for example, in Vail v. Boulder and for wind design in Galveston v. the west side of Houston. On the nonstructural side, a facility's nonstructural systems might need more bracing or support when assigned to RC IV, but the number and size of the components themselves don't suddenly look

like a hospital just because the risk category has changed.

S56-25

S57-25

IBC: 1604.5, TABLE 1604.5

Proponents: David Bonowitz, representing David Bonowitz, S.E. (dbonowitz@att.net)

2024 International Building Code

Revise as follows:

1604.5 Risk category. Each *building* and *structure* shall be assigned a *risk category* in accordance with Table 1604.5. Where a referenced standard specifies an occupancy category, the *risk category* shall not be taken as lower than the occupancy category specified therein. Where a referenced standard specifies that the assignment of a *risk category* be in accordance with ASCE 7, Table 1.5-1, Table 1604.5 shall be used in lieu of ASCE 7, Table 1.5-1.

Exceptions:

1. The assignment of *buildings* and *structures* to Tsunami *Risk Categories* III and IV is permitted to be in accordance with Section 6.4 of ASCE 7.
2. Freestanding parking garages not used for the storage of emergency services vehicles or not providing means of egress for *buildings* or *structures* assigned to a higher risk category shall be assigned to Risk Category II.
3. Power-generating facilities are permitted to be assigned to Risk Category II where the *owner* has submitted and the *building official* has approved a plan to provide an alternative equivalent source of energy to the same energy consumers within one hour of the facility's outage due to a design level wind, earthquake, snow, flood, or tornado event, considering the regional effects of any such event.

TABLE 1604.5 RISK CATEGORY OF BUILDINGS AND OTHER STRUCTURES

RISK CATEGORY	NATURE OF OCCUPANCY
I	Buildings and other structures that represent a low hazard to human life in the event of failure, including but not limited to: • Agricultural facilities. • Certain temporary facilities. • Minor storage facilities.
II	Buildings and other structures except those listed in Risk Categories I, III and IV.

III	Buildings and other structures that represent a substantial hazard to human life in the event of failure, including but not limited to:
	• Buildings and other structures whose primary occupancy is public assembly with an occupant load greater than 300.
	• Buildings and other structures containing one or more public assembly spaces, each having an occupant load greater than 300 and a cumulative occupant load of these public assembly spaces of greater than 2,500.
	• Buildings and other structures containing Group E or Group I-4 occupancies or combination thereof, with an occupant load greater than 250.
	• Buildings and other structures containing educational occupancies for students above the 12th grade with an occupant load greater than 500.
	• Group I-3, Condition 1 occupancies.
	• Any other occupancy with an occupant load greater than 5,000.[a]
	• ~~Power-generating stations with individual power units rated 75 MW$_{AC}$ (megawatts, alternating current) or greater, water~~ Water treatment facilities for potable water, wastewater treatment facilities and other public utility facilities not included in Risk Category IV.
	• Buildings and other structures not included in Risk Category IV containing quantities of toxic or explosive materials that:
	  • Exceed maximum allowable quantities per control area as given in Table 307.1(1) or 307.1(2) or per outdoor control area in accordance with the *International Fire Code*; and
	  • Are sufficient to pose a threat to the public if released.[b]

RISK CATEGORY	NATURE OF OCCUPANCY
IV	Buildings and other structures designated as essential facilities and buildings or structures where loss of function represents a substantial hazard to occupants or users, including but not limited to: • Group I-2 occupancies. • Ambulatory care facilities having emergency surgery or emergency treatment facilities. • Group I-3 occupancies other than Condition 1. • Fire, rescue, ambulance and police stations and emergency vehicle garages • Designated earthquake, hurricane or other emergency shelters. • Designated emergency preparedness, communications and operations centers and other facilities required for emergency response. Power-generating facilities with total capacity of 20 MW_{AC} or greater. • Public utility facilities providing power generation, potable water treatment, or wastewater treatment. • Power-generating stations and other public utility facilities required as emergency backup facilities for *Risk Category* IV structures. Buildings and other structures containing quantities of highly toxic materials that: • • Exceed maximum allowable quantities per control area as given in Table 307.1(2) or per outdoor control area in accordance with the *International Fire Code* ; and • Are sufficient to pose a threat to the public if released.[b] • Aviation control towers, air traffic control centers and emergency aircraft hangars. • Buildings and other structures having critical national defense functions. • Water storage facilities and pump structures required to maintain water pressure for fire suppression.

a. For purposes of occupant load calculation, occupancies required by Table 1004.5 to use *gross floor area* calculations shall be permitted to use *net floor areas* to determine the total occupant load. The floor area for vehicular drive aisles shall be permitted to be excluded in the determination of net floor area in parking garages.

b. Where approved by the building official, the classification of buildings and other structures as Risk Category III or IV based on their quantities of toxic, highly toxic or explosive materials is permitted to be reduced to Risk Category II, provided that it can be demonstrated by a hazard assessment in accordance with Section 1.5.3 of ASCE 7 that a release of the toxic, highly toxic or explosive materials is not sufficient to pose a threat to the public.

Reason: No doubt some will open this proposal and immediately accuse me of trying to kill the wind and solar industries. Either that, or I am just too stupid for words.

But stay with me. What I'm trying to do is have a conversation about how we are going to ensure the fast recovery of electric power for the general public after a damaging natural hazard event, and the role of the building code and of building officials in doing so. In general, "grid reliability" is an increasingly complex issue, and there are lots of experts doing excellent, good-faith work on it, but they don't read our code, and we don't read their industry standards. But as long as the IBC is going to address "power-generating stations" or "public utilities" (and from what I've seen, it probably shouldn't any more), we need to get some consensus on what we expect this book to deliver.

Some recent history: Everyone agrees that a facility providing backup power to a RC IV building ought to be in RC IV too. That's flawed, but it's easy. Beyond that, the 2021 IBC had one important line about power in Table 1604.5: All other "power-generating stations" were assigned to RC III. No size limits, no distinctions by fuel source or ownership, just one broad rule. Basically it was the code saying "Electric power is important, so we want a little more strength in those structures, but not RC IV-level important."

Now, Section 1604.5 of the 2024 IBC reflects the results of three approved proposals from the last cycle:

- S76-22 (driven by me) said that power produced and delivered to the general public is so important during and after a hurricane, earthquake, or winter storm that the facilities who make and sell it -- presented as "public utility facilities providing power generation" -- need to be in RC IV. The wind and solar industry fought it, but ICC members approved it at every step.
- S81-22 (driven by the solar industry) laid out a set of requirements, now in 1604.5.2, for generally small PV installations (residential and commercial scale). But that general rule from the 2021 code about RC III? Forget it. Industry said "We don't care what the code says, we've been designing for RC II or even RC I for years, and we need the code to let us keep doing that." ICC members said ok.
- S79-22 (driven by the wind industry) said "We want/need to keep ignoring the code too." So at the Public Comment hearing they changed the RC III line to exempt all but the largest generators: 75 MW or bigger. Did any code official or building designer in the room know how big 75 MW is? I sure didn't (and I said so). Well, it turns out that the biggest wind turbine in the world is only 22 MW,

and most of the big on-shore ones are only 2 or 3 MW. So S79 effectively guarantees that no wind turbine will ever be assigned to RC III, meaning that every wind farm that isn't a public utility now defaults to RC II. 2021 IBC we hardly knew ye.

As I said, the energy industry doesn't read our code, so when shown the RC III provision from 2021, they just ignored it. (Interestingly, oil, gas, hydro, and nuclear reps didn't even come to the hearings. They *really* don't care what we do.)

And in all the discussion of those three proposals, nobody from industry came out and said that good performance and fast recovery after nat haz events is bad. They just weren't going to lift a finger to help get there. Solar had to acknowledge that wind actually does rip up solar farms, that FL has voluntarily implemented higher standards that work, that DOE has guidelines for high-wind installations, and that a couple of vendors are now specifically pushing high wind-resistant trackers. But actually require design for functionality and fast recovery? No way. And all Wind kept saying was that they've always done it their way and no turbine has ever had a foundation failure. What they failed to mention is that typical turbines today are twice as big as they were 20 years ago, so the track record for the new stuff is pretty short. Also, a slightly heftier foundation and tower would cost pennies compared with the high-tech nacelle and blades. But no, anything but RC II would kill renewables dead. Come on.

Anyway, here's where things stand:

- Pretty much all solar (unless public utility): RC II
- Pretty much all wind (unless public utility): RC II
- Oil, gas, nuclear, hydro (unless public utility?): RC III, I guess?
- Public utility generators: RC IV.

So at least the big installations, the public utility-owned generators, are designed for low damage and fast recovery. Right? Well, not really, because public utilities for electric power are not what they used to be. They're not even what they were three years ago when we used that term (which has been in Table 1604.5 since 2003) as a proxy for power that normal people and normal buildings use. Yes, the big investor-owned public utilities like PG&E, Duke Energy, and Con Edison are still around, but they all buy power from independent wind and solar providers, to the point where it's nearly impossible to say whether a new proposed wind or solar farm, no matter the size, is regulated as a public utility or not. I was a little naive on this point back in 2022, but in my defense, the web of relationships between the various players is WAY more complicated now, as construction of renewables (boosted even more by post-pandemic Fed subsidies) has really exploded.

Which leaves us with the question S76 was trying to answer: **How do we make sure that the most substantial power providers, the ones normal people absolutely rely on, are properly designing for wind, earthquake, snow, and flood?** (And we should probably throw in high heat, drought, and WUI fire too.)

From a building code perspective, we have a tested, if blunt, tool: Risk Category. Who cares how wind and solar did their work when they were little alternative sources. Now they're the big boys too, and we need them to see their own end product as important, even essential, as we do. It's not about selling panels or turbines, it's about delivering power and keeping the lights, the heat, the food cold chain, and the air conditioning on.

So that's the first part of this surprisingly serious proposal: Put any big power plant in RC IV. (And by the way, the cutoff should be 20 MW, not 75, and it should be based on the whole facility, not "individual power units." The key agencies, FERC and NERC, are actually pretty clear about those metrics.)

But won't that just rehash the arguments from last cycle? Yeah, but I'm acknowledging, as I did then, that their best argument against S76 was that the very nature of the grid provides redundancy and reliability already, so a power outage is not like a building collapse.

I get it, and I accept it, and that's **the second part of this proposal: RC II is fine if there's a real plan, grid-wide as needed, to shorten outages and help the community recover.**

Three years ago, wind and solar industry reps swore this was already doable. Ok, show us the plan. You (and DOE) have until 2028 when states start enforcing this next edition, to get it done.

(The alternative to all this, which maybe someone will propose as a floor mod: Strike all mention of power from Table 1604.5. The grid is not a building, and the building code is just not the right tool for that job.)

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

The proposal is obviously not just editorial or a clarification, but with the proposed Exception, it provides a means for any power industry stakeholder to keep using RC II just as they're doing now, if they just have a plan to keep the energy flowing.

Staff Analysis: CC # S57-25 and CC # 58-25 addresses requirements in a different or contradicting manner. The committee is urged to make their intensions clear with their actions on these proposals.

S57-25

S58-25

IBC: TABLE 1604.5

Proponents: Joseph H. Cain, P.E., representing Solar Energy Industries Association (SEIA) (joecainpe@gmail.com)

2024 International Building Code

Revise as follows:

TABLE 1604.5 RISK CATEGORY OF BUILDINGS AND OTHER STRUCTURES

RISK CATEGORY	NATURE OF OCCUPANCY
I	Buildings and other structures that represent a low hazard to human life in the event of failure, including but not limited to: • Agricultural facilities. • Certain temporary facilities. • Minor storage facilities.
II	Buildings and other structures except those listed in Risk Categories I, III and IV.

III	Buildings and other structures that represent a substantial hazard to human life in the event of failure, including but not limited to:
	• Buildings and other structures whose primary occupancy is public assembly with an occupant load greater than 300.
	• Buildings and other structures containing one or more public assembly spaces, each having an occupant load greater than 300 and a cumulative occupant load of these public assembly spaces of greater than 2,500.
	• Buildings and other structures containing Group E or Group I-4 occupancies or combination thereof, with an occupant load greater than 250.
	• Buildings and other structures containing educational occupancies for students above the 12th grade with an occupant load greater than 500.
	• Group I-3, Condition 1 occupancies.
	• Any other occupancy with an occupant load greater than 5,000.[a]
	• Power-generating stations with individual power units rated 75 MW$_{AC}$ (megawatts, alternating current) or greater, water treatment facilities for potable water, wastewater treatment facilities and other public utility facilities not included in Risk Category IV.
	• Buildings and other structures not included in Risk Category IV containing quantities of toxic or explosive materials that:
	  • Exceed maximum allowable quantities per control area as given in Table 307.1(1) or 307.1(2) or per outdoor control area in accordance with the *International Fire Code* ; and
	  • Are sufficient to pose a threat to the public if released.[b]

IV	Buildings and other structures designated as essential facilities and buildings where loss of function represents a substantial hazard to occupants or users, including but not limited to:
	• Group I-2 occupancies.
	• Ambulatory care facilities having emergency surgery or emergency treatment facilities.
	• Group I-3 occupancies other than Condition 1.
	• Fire, rescue, ambulance and police stations and emergency vehicle garages
	• Designated earthquake, hurricane or other emergency shelters.
	• Designated emergency preparedness, communications and operations centers and other facilities required for emergency response.
	• Public utility facilities providing power generation with individual power units rated 75 MW$_{AC}$ (megawatts, alternating current) or greater, potable water treatment, or wastewater treatment.
	• Power-generating stations and other public utility facilities required as emergency backup facilities for *Risk Category* IV structures.
	• Buildings and other structures containing quantities of highly toxic materials that:
	  • Exceed maximum allowable quantities per control area as given in Table 307.1(2) or per outdoor control area in accordance with the *International Fire Code* ; and
	  • Are sufficient to pose a threat to the public if released.[b]
	• Aviation control towers, air traffic control centers and emergency aircraft hangars.
	• Buildings and other structures having critical national defense functions.
	• Water storage facilities and pump structures required to maintain water pressure for fire suppression.

a. For purposes of occupant load calculation, occupancies required by Table 1004.5 to use *gross floor area* calculations shall be permitted to use *net floor areas* to determine the total occupant load. The floor area for vehicular drive aisles shall be permitted to be excluded in the determination of net floor area in parking garages.

b. Where approved by the building official, the classification of buildings and other structures as Risk Category III or IV based on their quantities of toxic, highly toxic or explosive materials is permitted to be reduced to Risk Category II, provided that it can be demonstrated by a hazard assessment in accordance with Section 1.5.3 of ASCE 7 that a release of the toxic, highly toxic or explosive materials is not sufficient to pose a threat to the public.

Reason: During the Public Comment Hearings for ICC Group B in 2022, Proposal S79-22 was Approved As Modified by Public Comment 1. This public comment created a threshold of 75 MW_{AC} or greater for power-generating stations in Risk Category III.

This proposal seeks to include the same 75 MW_{AC} threshold in Risk Category IV as presently exists in 2024 IBC Table 1604.5 for Risk Category III.

The proponent offers the same reason statement for adding the threshold to RC IV as in the previous cycle for RC III, as in S79-22 Public Comment 1.

"ASCE 7-22 Section 15.5.4 states: “Electrical power-generating facilities are power plants that generate electricity by steam turbines, combustion turbines, diesel generators, or similar turbomachinery.” Commentary to Section 15.5.4 states: “Electrical power plants closely resemble building structures, and their performance in seismic events has been good.” It is clear that IBC Table 1604.5 and ASCE Section 15.5.4 were not written with renewable energy facilities in mind. The term "power generating station" is undefined and ambiguous in the 2021 IBC, and it has no threshold assigned to it. This PC seeks to establish a threshold on the term "power generating station" that is consistent with the original intent of the term in the IBC and in ASCE 7. Note 75 MWac is a better threshold than 100 MW for the smallest power-producing unit of a power generating station, as 75 MW is established in North American Electric Reliability Corporation Docket No. RR15-4-000, Order on Electric Reliability Organization Risk Based Registration Initiative and Requiring Compliance Filing (Issued March 19, 2015). The smallest power-producing unit of a renewable energy facility could be considered as one inverter, or could be one wind turbine."

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

This proposal only seeks to apply the same 75 MWAC threshold to Risk Category IV power generation as was approved for Risk Category III power generation.

Staff Analysis: CC # S58-25 and CC # 57-25 addresses requirements in a different or contradicting manner. The committee is urged to make their intensions clear with their actions on these proposals.

S58-25

S59-25

IBC: TABLE 1604.5

Proponents: Jeff O'Neill, Chair, representing Committee on Healthcare (ahc@iccsafe.org)

2024 International Building Code

Revise as follows:

TABLE 1604.5 RISK CATEGORY OF BUILDINGS AND OTHER STRUCTURES

RISK CATEGORY	NATURE OF OCCUPANCY
I	Buildings and other structures that represent a low hazard to human life in the event of failure, including but not limited to: • Agricultural facilities. • Certain temporary facilities. • Minor storage facilities.
II	Buildings and other structures except those listed in Risk Categories I, III and IV.

III	Buildings and other structures that represent a substantial hazard to human life in the event of failure, including but not limited to:
	• Buildings and other structures whose primary occupancy is public assembly with an occupant load greater than 300.
	• Buildings and other structures containing one or more public assembly spaces, each having an occupant load greater than 300 and a cumulative occupant load of these public assembly spaces of greater than 2,500.
	• Buildings and other structures containing Group E or Group I-4 occupancies or combination thereof, with an occupant load greater than 250.
	• Buildings and other structures containing educational occupancies for students above the 12th grade with an occupant load greater than 500.
	• Group I-3, Condition 1 occupancies.
	Group I-2 Condition 1 occupancies with 50 or more care recipients
	• Any other occupancy with an occupant load greater than 5,000.[a]
	• Power-generating stations with individual power units rated 75 MW_{AC} (megawatts, alternating current) or greater, water treatment facilities for potable water, wastewater treatment facilities and other public utility facilities not included in Risk Category IV.
	• Buildings and other structures not included in Risk Category IV containing quantities of toxic or explosive materials that:
	  • Exceed maximum allowable quantities per control area as given in Table 307.1(1) or 307.1(2) or per outdoor control area in accordance with the *International Fire Code* ; and
	  • Are sufficient to pose a threat to the public if released.[b]

IV	Buildings and other structures designated as essential facilities and buildings where loss of function represents a substantial hazard to occupants or users, including but not limited to:
	• Group I-2, Condition 2 occupancies.
	• Ambulatory care facilities having emergency surgery or emergency treatment facilities.
	• Group I-3 occupancies other than Condition 1.
	• Fire, rescue, ambulance and police stations and emergency vehicle garages
	• Designated earthquake, hurricane or other emergency shelters.
	• Designated emergency preparedness, communications and operations centers and other facilities required for emergency response.
	• Public utility facilities providing power generation, potable water treatment, or wastewater treatment.
	• Power-generating stations and other public utility facilities required as emergency backup facilities for *Risk Category* IV structures.
	• Buildings and other structures containing quantities of highly toxic materials that:
	  • Exceed maximum allowable quantities per control area as given in Table 307.1(2) or per outdoor control area in accordance with the *International Fire Code* ; and
	  • Are sufficient to pose a threat to the public if released.[b]
	• Aviation control towers, air traffic control centers and emergency aircraft hangars.
	• Buildings and other structures having critical national defense functions.
	• Water storage facilities and pump structures required to maintain water pressure for fire suppression.

a. For purposes of occupant load calculation, occupancies required by Table 1004.5 to use *gross floor area* calculations shall be permitted to use *net floor areas* to determine the total occupant load. The floor area for vehicular drive aisles shall be permitted to be excluded in the determination of net floor area in parking garages.

b. Where approved by the building official, the classification of buildings and other structures as Risk Category III or IV based on their quantities of toxic, highly toxic or explosive materials is permitted to be reduced to Risk Category II, provided that it can be demonstrated by a hazard assessment in accordance with Section 1.5.3 of ASCE 7 that a release of the toxic, highly toxic or explosive materials is not sufficient to pose a threat to the public.

Reason: The intent of this proposal is to return Nursing Homes (Group I-2 Condition 1) to Risk Category 3. There is another change to address Hospitals (Group I-2 Condition 2). The description text and Group I-2 occupancies were revised in S74-22.

This proposal has three serious problems.

The added language in the description for Risk Category IV could be read that any of the current occupancies in this list could sustain loss of function as long as that damage did not represent a substantial hazard to the occupants. The list of facilities is a listing of essential facilities that are intended to be operational after an event for the safety and recovery of the entire community. Hospitals that have emergency surgery or emergency treatment facilities are intended to be operational after an emergency. There could be a lot of damage to the building that would not be a substantial hazard to occupants, but would stop impact the functionality of the emergency room. During normal operations there are times that emergency rooms divert additional patients to other facilities that are available hence the true intention of an ER is to address a set amount of emergent patients and not to address every possible patient within the community. It is also common practice within a community to develop emergency operation plans to allow for facilities to coordinate services across the community. Hence hospitals and ER's are expected to be functional during an emergency and to address a set amount of patients and efforts are coordinated across a community to provide essential services as needed.

If all nursing homes and hospitals are relocated to Risk Category IV with the beginning language - how would a 'substantial hazard' to the occupants be determined. Would this require protection for power and water supplies? What if the windows break? Is that a hazard in the summer or winter? That depends on the season and where in the country you are located. This language will not be uniformly understood or enforced.

This language would move all nursing homes and hospitals to Risk Category IV. Currently nursing homes with between 6 and 50 occupants can be Risk Category II; and nursing homes with more than 50 occupants and hospitals without emergency surgery or emergency treatment can be Risk Category III. While these are a vulnerable population., however, there has been no history of issues with these facilities that justifies this increase in design for higher winds, seismic and snow loads for all such facilities. Hospitals and nursing homes already include additional safety features for residents and have a high level of oversite. If the concern is to remain operational as expressed in the proponents' reasons, there are many emergency planning options that can address this outside of a substantial increase in building construction (added cost). These facilities have staff trained in emergency care and operations and have detailed emergency operation plans. If a building has damage, the residents can be relocated to other parts of the building or to another facility. Such facilities typically have emergency generators. Operational plans for emergencies can address early evacuation plans; potable water supplies; etc.

This proposal is submitted by the ICC Committee for Healthcare (CHC). The Committee on Healthcare (CHC) was established by the ICC Board of Directors in 2011 to pursue opportunities to study and develop effective and efficient provisions for Hospital, Nursing Homes, Assisted Living and Ambulatory Care Facilities. This committee was formed in cooperation with the American Society for Healthcare Engineering (ASHE). In July of 2017, the ICC Board made CHC a standing committee. In 2023 and 2024 the CHC has held several virtual meetings open to any interested party. In addition, there were numerous virtual Working Group meetings for the current code development cycle, which included members of the committee as well as interested parties. Related documents and reports are posted on the CHC website at CHC webpage.

Cost Impact: Decrease

Estimated Immediate Cost Impact:

Per RS Means data including the 2024 year, hospital construction is approximately $500 per square foot for hospital construction. This change added 15% to 20% of construction costs, resulting in $575 to $600 per square foot. Reversing this change will reverse this increase.

Estimated Immediate Cost Impact Justification (methodology and variables):

This pricing considers the need to provide N+1 redundancy in a central utility plant for power and full air conditioning, plus additional structural scope. It does not consider premium sits such as California, New York or Gulf Coast, but a national average square footage cost. In these locations, the savings would be more.

S59-25

S60-25

IBC: TABLE 1604.5

Proponents: Jeff O'Neill, Chair, representing Committee on Healthcare (ahc@iccsafe.org)

2024 International Building Code

Revise as follows:

TABLE 1604.5 RISK CATEGORY OF BUILDINGS AND OTHER STRUCTURES

RISK CATEGORY	NATURE OF OCCUPANCY
I	Buildings and other structures that represent a low hazard to human life in the event of failure, including but not limited to: • Agricultural facilities. • Certain temporary facilities. • Minor storage facilities.
II	Buildings and other structures except those listed in Risk Categories I, III and IV.

III	Buildings and other structures that represent a substantial hazard to human life in the event of failure, including but not limited to:
	• Buildings and other structures whose primary occupancy is public assembly with an occupant load greater than 300.
	• Buildings and other structures containing one or more public assembly spaces, each having an occupant load greater than 300 and a cumulative occupant load of these public assembly spaces of greater than 2,500.
	• Buildings and other structures containing Group E or Group I-4 occupancies or combination thereof, with an occupant load greater than 250.
	• Buildings and other structures containing educational occupancies for students above the 12th grade with an occupant load greater than 500.
	Group I-2, Condition 2 occupancies not having emergency surgery or emergency treatment facilities.
	• Group I-3, Condition 1 occupancies.
	• Any other occupancy with an occupant load greater than 5,000.[a]
	• Power-generating stations with individual power units rated 75 MW_{AC} (megawatts, alternating current) or greater, water treatment facilities for potable water, wastewater treatment facilities and other public utility facilities not included in Risk Category IV.
	• Buildings and other structures not included in Risk Category IV containing quantities of toxic or explosive materials that:
	  • Exceed maximum allowable quantities per control area as given in Table 307.1(1) or 307.1(2) or per outdoor control area in accordance with the *International Fire Code* ; and
	  • Are sufficient to pose a threat to the public if released.[b]

IV	Buildings and other structures designated as essential facilities and buildings where loss of function represents a substantial hazard to occupants or users, including but not limited to:
	Group I-2 Condition 1
	• Group I-2, Condition 2 occupancies having emergency surgery or emergency treatment facilites.
	• Ambulatory care facilities having emergency surgery or emergency treatment facilities.
	• Group I-3 occupancies other than Condition 1.
	• Fire, rescue, ambulance and police stations and emergency vehicle garages
	• Designated earthquake, hurricane or other emergency shelters.
	• Designated emergency preparedness, communications and operations centers and other facilities required for emergency response.
	• Public utility facilities providing power generation, potable water treatment, or wastewater treatment.
	• Power-generating stations and other public utility facilities required as emergency backup facilities for *Risk Category* IV structures.
	• Buildings and other structures containing quantities of highly toxic materials that:
	  • Exceed maximum allowable quantities per control area as given in Table 307.1(2) or per outdoor control area in accordance with the *International Fire Code* ; and
	  • Are sufficient to pose a threat to the public if released.[b]
	• Aviation control towers, air traffic control centers and emergency aircraft hangars.
	• Buildings and other structures having critical national defense functions.
	• Water storage facilities and pump structures required to maintain water pressure for fire suppression.

a. For purposes of occupant load calculation, occupancies required by Table 1004.5 to use *gross floor area* calculations shall be permitted to use *net floor areas* to determine the total occupant load. The floor area for vehicular drive aisles shall be permitted to be excluded in the determination of net floor area in parking garages.

b. Where approved by the building official, the classification of buildings and other structures as Risk Category III or IV based on their quantities of toxic, highly toxic or explosive materials is permitted to be reduced to Risk Category II, provided that it can be demonstrated by a hazard assessment in accordance with Section 1.5.3 of ASCE 7 that a release of the toxic, highly toxic or explosive materials is not sufficient to pose a threat to the public.

Reason: The intent of this proposal is to restore the Group I-2 hospitals without emergency surgery or emergency treatment areas to Risk Category 3. The change for Group I-2 Nursing homes is a separate proposal. The description text and Group I-2 occupancies were revised in S74-22.

This proposal has three serious problems.

The added language in the description for Risk Category IV could be read that any of the current occupancies in this list could sustain loss of function as long as that damage did not represent a substantial hazard to the occupants. The list of facilities is a listing of essential facilities that are intended to be operational after an event for the safety and recovery of the entire community. Hospitals that have emergency surgery or emergency treatment facilities are intended to be operational after an emergency. There could be a lot of damage to the building that would not be a substantial hazard to occupants, but would impact the functionality of the emergency room. During normal operations there are times that emergency rooms divert additional patients to other facilities that are available hence the true intention of an ER is to address a set amount of emergent patients and not to address every possible patient within the community. It is also common practice within a community to develop emergency operation plans to allow for facilities to coordinate services across the community. Hence hospitals and ER's are expected to be functional during an emergency and to address a set amount of patients and efforts are coordinated across a community to provide essential services as needed.

If all nursing homes and hospitals are relocated to Risk Category IV with the beginning language - how would a 'substantial hazard' to the occupants be determined. Would this require protection for power and water supplies? What if the windows break? Is that a hazard in the summer or winter? That depends on the season and where in the country you are located. This language will not be uniformly understood or enforced. This language would move all nursing homes and hospitals to Risk Category IV.

Currently nursing homes with between 6 and 50 occupants can be Risk Category II; and nursing homes with more than 50 occupants and hospitals without emergency surgery or emergency treatment can be Risk Category III. While these are a vulnerable population., however, there has been no history of issues with these facilities that justifies this increase in design for higher winds, seismic and snow loads for all such facilities. Hospitals and nursing homes already include additional safety features for residents and have a high level of oversite. If the concern is to remain operational as expressed in the proponents' reasons, there are many emergency planning options that can address this outside of a substantial increase in building construction (added cost). These facilities have staff trained in emergency care and operations and have detailed emergency operation plans. If a building has damage, the residents can be relocated to other parts of the building or to another facility. Such facilities typically have emergency generators. Operational plans for emergencies can address early evacuation plans; potable water supplies; etc.

Note: Group I-2, Condition 1 is addressed by another proposal by this proponent.

This proposal is submitted by the ICC Committee for Healthcare (CHC). The Committee on Healthcare (CHC) was established by the ICC Board of Directors in 2011 to pursue opportunities to study and develop effective and efficient provisions for Hospital, Nursing Homes, Assisted Living and Ambulatory Care Facilities. This committee was formed in cooperation with the American Society for Healthcare Engineering (ASHE). In July of 2017, the ICC Board made CHC a standing committee. In 2023 and 2024 the CHC has held several virtual meetings open to any interested party. In addition, there were numerous virtual Working Group meetings for the current code development cycle, which included members of the committee as well as interested parties. Related documents and reports are posted on the CHC website at CHC webpage.

Cost Impact: Decrease

Estimated Immediate Cost Impact:

Per RS Means data including the 2024 year, hospital construction is approximately $500 per square foot for hospital construction. This change added 15% to 20% of construction costs, resulting in $575 to $600 per square foot. Reversing this change will reverse this increase.

Estimated Immediate Cost Impact Justification (methodology and variables):

This pricing considers the need to provide N+1 redundancy in a central utility plant for power and full air conditioning, plus additional structural scope. It does not consider premium sits such as California, New York or Gulf Coast, but a national average square footage cost. In these locations, the savings would be more.

S60-25

S61-25

IBC: TABLE 1604.5

Proponents: Jeff O'Neill, Chair, representing Committee on Healthcare (ahc@iccsafe.org); Jeff Grove, Chair, representing BCAC (bcac@iccsafe.org)

2024 International Building Code

Revise as follows:

TABLE 1604.5 RISK CATEGORY OF BUILDINGS AND OTHER STRUCTURES

RISK CATEGORY	NATURE OF OCCUPANCY
I	Buildings and other structures that represent a low hazard to human life in the event of failure, including but not limited to: • Agricultural facilities. • Certain temporary facilities. • Minor storage facilities.
II	Buildings and other structures except those listed in Risk Categories I, III and IV.

III	Buildings and other structures that represent a substantial hazard to human life in the event of failure, including but not limited to:
	• Buildings and other structures whose primary occupancy is public assembly with an occupant load greater than 300.
	• Buildings and other structures containing one or more public assembly spaces, each having an occupant load greater than 300 and a cumulative occupant load of these public assembly spaces of greater than 2,500.
	• Buildings and other structures containing Group E or Group I-4 occupancies or combination thereof, with an occupant load greater than 250.
	• Buildings and other structures containing educational occupancies for students above the 12th grade with an occupant load greater than 500.
	• Group I-3, Condition 1 occupancies.
	• Any other occupancy with an occupant load greater than 5,000.[a]
	• Power-generating stations with individual power units rated 75 MW_{AC} (megawatts, alternating current) or greater, water treatment facilities for potable water, wastewater treatment facilities and other public utility facilities not included in Risk Category IV.
	• Buildings and other structures not included in Risk Category IV containing quantities of toxic or explosive materials that:
	  • Exceed maximum allowable quantities per control area as given in Table 307.1(1) or 307.1(2) or per outdoor control area in accordance with the *International Fire Code* ; and
	  • Are sufficient to pose a threat to the public if released.[b]

IV	Buildings and other structures designated as essential facilities ~~and buildings where loss of function represents a substantial hazard to occupants or users~~, including but not limited to:
	• Group I-2 occupancies.
	• Ambulatory care facilities having emergency surgery or emergency treatment facilities.
	• Group I-3 occupancies other than Condition 1.
	• Fire, rescue, ambulance and police stations and emergency vehicle garages
	• Designated earthquake, hurricane or other emergency shelters.
	• Designated emergency preparedness, communications and operations centers and other facilities required for emergency response.
	• Public utility facilities providing power generation, potable water treatment, or wastewater treatment.
	• Power-generating stations and other public utility facilities required as emergency backup facilities for *Risk Category* IV structures.
	• Buildings and other structures containing quantities of highly toxic materials that:
	  • Exceed maximum allowable quantities per control area as given in Table 307.1(2) or per outdoor control area in accordance with the *International Fire Code* ; and
	  • Are sufficient to pose a threat to the public if released.[b]
	• Aviation control towers, air traffic control centers and emergency aircraft hangars.
	• Buildings and other structures having critical national defense functions.
	• Water storage facilities and pump structures required to maintain water pressure for fire suppression.

a. For purposes of occupant load calculation, occupancies required by Table 1004.5 to use *gross floor area* calculations shall be permitted to use *net floor areas* to determine the total occupant load. The floor area for vehicular drive aisles shall be permitted to be excluded in the determination of net floor area in parking garages.

b. Where approved by the building official, the classification of buildings and other structures as Risk Category III or IV based on their quantities of toxic, highly toxic or explosive materials is permitted to be reduced to Risk Category II, provided that it can be demonstrated by a hazard assessment in accordance with Section 1.5.3 of ASCE 7 that a release of the toxic, highly toxic or explosive materials is not sufficient to pose a threat to the public.

Reason: The intent of this proposal is to review the description in Risk Category IV. Revisions to Group I-2 are address in two other code changes. The description text and Group I-2 occupancies were revised in S74-22.

The scope of the Healthcare committee is for healthcare facilities, such as ambulatory care facilities, clinics, nursing homes and hospitals. Therefore, this public comment is limited to the effect of the new language to the description of Risk Category IV and how it would effect the 1st and 2nd item in the list.

- Group I-2 occupancies .
- Ambulatory care facilities having emergency surgery or emergency treatment facilities.

The added language in the description for Risk Category IV could be read that any of the current occupancies in this list could sustain loss of function as long as that damage did not represent a substantial hazard to the occupants. These are a list of essential facilities that must be operational after an event for the safety and recovery of the entire community. Hospitals that have emergency surgery or emergency treatment facilities need to be operational and functional after an emergency. There could be a lot of damage to the building that would not be a substantial hazard to occupants, but would stop the emergency room from functioning. During normal operations there are times that emergency rooms divert additional patients to other facilities that are available hence the true intention of an ER is to address a set amount of emergent patients and not to address every possible patient within the community. It is also common practice within a community to develop emergency operation plans to allow for facilities to coordinate services across the community. Hence hospitals and ER's are expected to be functional during an emergency and to address a set amount of patients and efforts are coordinated across a community to provide essential services as needed.

Additionally, the language in question could also be read to include other buildings that are not considered as essential facilities but when the loss of the function of the building is a substantial hazard to the occupants or users such as a dialysis center which loss could put those users at risk but during an emergency these services could be provided in an alternate facility. This language could cause the mis-application of Risk Category IV to facilities that were not intended to be included.

The Committee on Healthcare (CHC) was established by the ICC Board of Directors in 2011 to pursue opportunities to study and develop effective and efficient provisions for Hospital, Nursing Homes, Assisted Living and Ambulatory Care Facilities. This committee was formed in cooperation with the American Society for Healthcare Engineering (ASHE). In July of 2017, the ICC Board made CHC a standing committee. In 2023 and 2024 the CHC has held several virtual meetings open to any interested party. In addition, there were numerous virtual Working Group meetings for the current code development cycle, which included members of the committee as well as interested parties. Related documents and reports are posted on the CHC website at CHC webpage.

Cost Impact: Decrease

Estimated Immediate Cost Impact:

Per RS Means data including the 2024 year, hospital construction is approximately $500 per square foot for hospital construction. This change added 15% to 20% of construction costs, resulting in $575 to $600 per square foot. Reversing this change will reverse this increase.

Estimated Immediate Cost Impact Justification (methodology and variables):

This pricing considers the need to provide N+1 redundancy in a central utility plant for power and full air conditioning, plus additional structural scope. It does not consider premium sits such as California, New York or Gulf Coast, but a national average square footage cost. In these locations, the savings would be more.

S61-25

S62-25

IBC: 1604.5.1

Proponents: Erik Madsen, representing NCSEA (emadsen@dci-engineers.com); Emily Guglielmo, representing NCSEA (eguglielmo@martinmartin.com)

2024 International Building Code

Revise as follows:

1604.5.1 Multiple occupancies. Where a *building* or *structure* is occupied by two or more occupancies not included in the same *risk category*, it shall be assigned the classification of the highest *risk category* corresponding to the various occupancies. Where *buildings* or *structures* have two or more portions that are structurally separated, each portion shall be separately classified. Where a separated portion of a *building* or *structure* provides required access to, required egress from or shares life safety systems, designated seismic systems, emergency power systems, or emergency and egress lighting systems with another portion having a higher *risk category*, or provides required electrical, communications, mechanical, plumbing or conveying support to another portion assigned to *Risk Category* IV, both portions shall be assigned to the higher *risk category*.

> **Exception:** Where a *storm shelter* designed and constructed in accordance with <u>Section 423 and </u>ICC 500 is provided in a *building*, *structure* or portion thereof normally occupied for other purposes, the *risk category* for the normal occupancy of the *building* shall apply unless the *storm shelter* is a designated emergency shelter in accordance with Table 1604.5.

Reason: There is no pointer connecting the Risk Category section in 1604.5 with the storm shelter designated section of IBC Section 423. In previous code cycles, attempts were made to connect these sections by creating a pointer in the wrong location, sometimes reassigning the Risk Category in Table 1604.5 against the intent of this exception. The multiple occupancy section is clear about the application of the Risk Category. This proposal hopefully clarifies the connection between the sections.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

Change is editorial - pointer added

S62-25

S63-25

IBC: 1604.5.2, 1604.5.3 (New)

Proponents: Joseph H. Cain, P.E., representing Solar Energy Industries Association (SEIA) (joecainpe@gmail.com)

2024 International Building Code

1604.5.2 Photovoltaic (PV) panel systems. Photovoltaic (PV) panel systems and *elevated PV support structures* shall be assigned a *risk category* as follows:

1. *Ground-mounted PV panel systems* serving only Group R-3 *buildings* shall be assigned to *Risk Category* I.
2. *Ground-mounted PV panel systems* other than those described in Items 1 and 5 shall be assigned to *Risk Category* II.
3. *Elevated PV support structures* other than those described in Items 4, 5 and 6 shall be assigned to *Risk Category* II.
4. Rooftop-mounted *PV panel systems* and *elevated PV support structures* installed on top of *buildings* shall be assigned to the same *risk category* as the *risk category* of the *building* on which they are mounted.
5. *PV panel systems* and *elevated PV support structures* paired with energy storage systems (ESS) and serving as a dedicated, stand-alone source of backup power for *Risk Category* IV *buildings* shall be assigned to *Risk Category* IV.
6. *Elevated PV support structures* where the usable space underneath is used for parking of emergency vehicles shall be assigned to *Risk Category* IV.

Add new text as follows:

1604.5.3 Energy storage systems (ESS). *Energy storage systems (ESS)* shall be assigned a risk category as follows:

1. *ESS* serving only Group R-3 *buildings* and installed outdoors on the ground, in detached garages or in detached accessory structures a minimum of 10 feet (3048 mm) away from property lines and *dwellings* shall be assigned to *Risk Category I.*
2. *ESS* serving a bulk-power grid and not associated with occupiable *buildings* other than on-site facilities shall be assigned to *Risk Category II.*
3. *ESS* directly serving *buildings* other than those described in Items 1 and 2 shall be assigned to the same *risk category* as the highest *risk category* of the *buildings* they serve.

Reason: For the 2024 IBC, Proposal S81-22 created new Section 1604.5.2, which establishes structural risk category for a variety of installations and use cases for photovoltaic (PV) panel systems. During the ICC Group B Public Comment Hearings, this proposal was well-received, with a 98% positive vote of the Assembly on the floor prior to the online governmental vote.

This proposal seeks to create new Section 1604.5.3 for energy storage systems (ESS), using the same or similar logic as Proposal S81-22 from last cycle.

Justification is provided here for each of the three line items in this proposal.

1. Item 1 focuses on ESS that serves only Group R-3 buildings, but includes only ESS that is not installed in or on the residence. For example, ESS installed inside the residence in non-habitable space, or inside an attached garage, or mounted on the outside of the residence is not included in Item 1, and must instead comply with Item 3. The terms used in Item 1 are consistent with terms approved during the 2nd Draft meeting for the future 2026 edition of NFPA 855 Standard for the Installation of Stationary Energy Storage Systems. These terms are expected to appear in 2026 NFPA 855 Chapter 15, Table 15.5.2 Maximum Ratings of ESS.

The effect of Item 1 is that ESS serving Group R-3 is assigned to Risk Category I only if installed a minimum of 10 feet away from property lines and dwellings, either outdoors on the ground (presumably on a concrete pad), or in detached garages, or in detached accessory structures. All other ESS serving Group R-3 buildings must comply with Item 3, and therefore must match the risk category of the building, which is Risk Category II.

2. Item 2 for ESS in proposed Section 1604.5.3 is intended to correlate with Item 2 for PV in Section 1604.5.2 for large-scale power facilities. Where ESS is remote and is connected to a bulk-power grid, it does not make any direct contribution as "lifeline infrastructure" to any individual building for which engineers are seeking to achieve functional recovery. It simply provides dispatchable power into the grid, which is managed by grid operators under the rules and standards of the North American Electric Reliability Corporation (NERC). NERC is subject to oversight by the Federal Energy Regulatory Commission (FERC).

As an example, a Risk Category IV building such as a police station, fire station, or hospital -- or any other building for which functional recovery is a goal -- is no more or less likely to experience a grid power outage if a particular ESS facility serving only the bulk-power grid is assigned to a risk category higher than RC II.

Note: In NERC standards, the defined terms "bulk electric system" and "bulk power system" are used. In the IBC, the proponent feels the term "bulk-power grid" would be more intuitive and meaningful to readers of the IBC charged with implementation, interpretation, and enforcement.

3. Item 3 requires that ESS directly serving buildings (primarily ESS installed on-site) must be assigned to a risk category that matches the risk category of the building(s) served. To keep the language simple and unambiguous, where ESS in Item 3 directly serves multiple buildings or multiple risk categories within one building, the ESS is required to be assigned to the highest risk category served.

ESS installed and configured to serve as a source of backup power during periods of grid power outage can directly serve as "lifeline infrastructure" for individual building(s) for which engineers are seeking to achieve functional recovery. This is true whether the ESS is paired with renewable energy systems such solar or wind, or is stand-alone ESS. It is also true regardless of risk category of the building(s) for which functional recovery is a goal. This is also true where ESS is configured to provide backup power to microgrids serving a distinct grouping of buildings during times of outage of a bulk-power grid.

During development of the language for this proposal, the proponent considered distinctions of whether or not a building is an "essential services facility," and whether or not a particular building or facility has a requirement for an emergency power system or standby power system." For simplicity and for clarity, the proponent decided to tie the RC of ESS directly to the RC of the building(s) served. A project engineer might not know whether the ESS is providing legally required backup power, so the proposed language should simplify the determination of risk category by the Engineer of Record for the ESS.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

This proposal seeks to establish structural risk category for a variety of installations of energy storage systems, and is intended to formalize current practice. While there could be certain cost implications up or down for individual projects, there is no trend of increased cost intended by this proposal.

S63-25

S64-25

IBC: 1604.5.3 (New), IEC (New)

Proponents: Paul Armstrong, PACCS, representing Lightning Protection Institute

2024 International Building Code

Add new text as follows:

1604.5.3 Lightning protection assessment. Buildings or structures assigned to Risk Category IV shall have a lightning risk assessment in accordance with NFPA 780 or IEC 62305-2.

Add new standard(s) as follows:

IEC

International Electrotechnical Commission
3, rue de Varembe CH-1211
Geneva,
Switzerland

IEC 62305-2-24	Protection against lightning, Part 2: Risk Management

Reason: The problem:

There is a lack of a standardized, detailed methodology within the IBC to assess and mitigate lightning risks specifically for Risk Category IV buildings and other structures. These buildings contain essential facilities (e.g., hospitals, emergency shelters) and also those buildings where the loss of function is a real hazard to the occupants/users. The assignment in Risk Category IV is to help ensure these buildings maintain functionality and safety during natural hazards; in this case severe weather events. This specialized code language will provide a systematic, accurate, and consistent approach to evaluating lightning risk for these essential uses and recommend protective measures.

Specific example:

Lightning strikes can significantly disrupt hospital operations, affecting both infrastructure and patient care. Key impacts include:

Electrical and Electronic System Failures:

a. Power Supply Disruptions: Lightning can cause power outages, compromising critical systems. For instance, a 2017 lightning strike at a Florida hospital led to a fire and subsequent failure of backup power systems, necessitating the evacuation of 225 patients.

b. Equipment Damage: Sensitive medical devices are vulnerable to voltage spikes from lightning, potentially leading to malfunctions or complete failure. This can impede patient monitoring and treatment.

Communication System Interruptions:

a. Lightning-induced surges can disrupt hospital communication networks, including telephones, intercoms, and internet services, hindering coordination among medical staff and with external emergency services.

Structural Damage:

a. Direct lightning strikes can cause fires or physical damage to hospital buildings, posing safety risks to patients and staff and potentially leading to evacuations.

To safeguard against these risks, hospitals can implement comprehensive lightning protection systems. These mitigation measures include:

- External Protection: Installation of lightning rods and other systems to intercept strikes.
- Surge Protection Devices (SPDs): To shield electrical and electronic equipment from voltage spikes.
- Equipotential Bonding**:** Ensuring all conductive parts within the hospital are at the same electrical potential to prevent dangerous voltage differences during a lightning event.
- Regular Maintenance and Compliance: Adhering to standards such as NFPA 70, NFPA 780, and UL 96A to ensure the effectiveness of lightning protection systems.

Implementing these measures can enhance hospital resilience against lightning-related incidents, ensuring continuity of critical healthcare services.

Historical Losses:

Documented instances of lightning strikes have shown that they can cause fires in critical infrastructure, power outages disrupting emergency operations, and structural damage leading to costly repairs and operational downtime.

The quantification of Impact: The new language can incorporate data from past incidents to model the economic, structural, and human costs of lightning-related failures. This data-driven foundation helps stakeholders understand the necessity of robust lightning protection.

Over the past five years, lightning strikes have significantly impacted commercial properties in the United States, leading to substantial insurance claims and financial losses. Key statistics include:

- Percentage of Claims: Lightning-induced fires account for approximately 3% to 5% of all U.S. commercial property insurance claims annually. (Institute for Intergovernmental Research) https://www.iii.org/press-release/struck-by-lightning-how-businesses-can-become-more-resilient-triple-i-and-lpi
- Annual Financial Impact: These incidents result in over $2 billion in insured losses each year for small and medium-sized businesses. (Institute for Intergovernmental Research) https://www.iii.org/press-release/when-lightning-strikes-how-business-can-protect-its-bottom-line
- Types of Damage: Lightning can cause fires, structural damage, and electrical system failures, leading to significant financial burdens for businesses. (Voss Law Firm) https://www.vosslawfirm.com/blog/a-guide-to-commercial-insurance-claims-for-lightning-strikes.
- While specific annual data for each of the past five years is limited, these figures highlight the consistent and substantial impact of lightning on commercial properties.

Implementing the analysis of the benefits of certified lightning protection systems and then securing appropriate insurance coverage are essential steps for businesses to mitigate these risks.

Lightning strikes have been responsible for several significant power outages. Notable instances include:

1. New York City Blackout (1977)

- **Date:** July 13–14, 1977
- **Cause:** A severe lightning storm led to a series of electrical failures, beginning with a lightning strike on a substation on the Hudson River. This initiated a cascading failure throughout the city's power grid.
- **Impact:** Approximately 9 million people were affected by the power outage, which lasted around 25 hours. The blackout resulted in widespread looting, arson, and significant property damage.

2. Southern Brazil Blackout (1999)

- **Date:** March 11, 1999
- **Cause:** A lightning strike at an electricity substation in Bauru, São Paulo State, caused most of the 440kV circuits at the substation to trip. This led to a chain reaction resulting in a widespread power outage.
- **Impact:** The blackout affected an estimated 75 to 97 million people across multiple states, including São Paulo, Rio de Janeiro, and Minas Gerais.

3. United Kingdom Power Outage (2019):

- **Date:** August 9, 2019
- **Cause:** A lightning strike on a transmission line led to the loss of 500 MW of embedded generation. Subsequently, two large generators, Little Barford Power Station and Hornsea Wind Farm, tripped, causing a significant drop in frequency.
- Impact: Experienced power cuts for 15 to 20 minutes. The outage also caused substantial travel disruption, particularly on the railway network, and affected infrastructure such as Newcastle Airport and Ipswich Hospital.

These events highlight the vulnerability of power grids to lightning strikes and underscore the importance of robust infrastructure and responsive measures to mitigate such risks.

How does this increase protection?

This code change will provide the following safety enhancements:

Reduce risk of structural fires and electrical surges caused by lightning.

Protect occupants and critical assets within the buildings.

Ensure that the functionality of the essential facilities continue.

Failures in electrical systems can affect life-sustaining equipment, such as ventilators and infusion pumps, endangering patient health, especially in intensive care units.

This code change will also provide improvements to functionality that ensures continuity of operations for essential services during severe weather, such as healthcare and emergency response. It will also minimize downtime by integrating resilient design features and protective measures while also facilitating adherence to higher safety standards for critical infrastructure, ensuring alignment with federal or state mandates.

Other Thoughts:

The proposed language can also accommodate different geographic and environmental factors by including variables like regional lightning density, soil conductivity, and building materials to tailor recommendations.

The proposed language could include cost-benefit analyses of different protection systems, enabling informed decisions about resource allocation. The Cost per Square Foot for Low-Rise Buildings is approximately $2.10 to $2.70 per square foot of roof area and Five-Story Buildings is approximately $1.50 to $1.90 per square foot of roof area.

The new language should help streamline assessments to integrate seamlessly into design and approval phases, avoiding delays in the construction timeline.

Cost Impact: Increase

Estimated Immediate Cost Impact:

The proposed language could include cost-benefit analyses of different protection systems, enabling informed decisions about resource allocation. The Cost per Square Foot of such systems for Low-Rise Buildings is approximately $2.10 to $2.70 per square foot of roof area and Five-Story Buildings is approximately $1.50 to $1.90 per square foot of roof area for the installation of such protective systems based on industry studies. It should be noted however that the code change only requires the hazard assessment for Risk Category IV buildings or structures and that is considerably less in cost. The decision to install such a protective system would be a factor in whether or not it was needed for the use.

Estimated Immediate Cost Impact Justification (methodology and variables):

The cost impacts are based on industry studies. It is a simple cost of system over roof area provided. The new language should help streamline assessments to integrate seamlessly into design and approval phases, avoiding delays in the construction timeline.

Estimated Life Cycle Cost Impact:

This proposal only requires an analysis of whether the use needs protection from lightning storms. Therefore it is only a slight increase.

Staff Analysis: A review of the standard proposed for inclusion in the code, IEC 62305-2 Protection against lightning, Part 2: Risk Management 2024, with regard to some of the key ICC criteria for referenced standards (Section 4.6 of CP#28) will be posted on the ICC website on or before April 1, 2025.

S64-25

S65-25

IBC: SECTION 202 (New), 1604.5.2 (New)

Proponents: Tom Vinson, representing American Clean Power Association (tvinson@cleanpower.org)

2024 International Building Code

Add new definition as follows:

WIND TURBINE GENERATOR SYSTEMS (WTGS). A system that incorporates an elevated generator, supported by a tower and its foundation, that converts wind kinetic energy into electrical power.

Add new text as follows:

1604.5.3 Wind Turbine Generating Systems (WTGS). *Wind turbine generating systems* shall be assigned a risk category as follows:

1. WTGS other than those described in Item 2 shall be assigned to *Risk Category* II.
2. WTGS paired with energy storage systems (ESS) and serving as a dedicated, stand-alone source of backup power for *Risk Category* IV *buildings* shall be assigned to *Risk Category* IV.

Reason: This proposal seeks clarity on the risk category of wind turbine generating systems (WTGS) in a way consistent with more than a decade of precedent in permitting such systems by authorities having jurisdiction (AHJs) while also remaining consistent with the intent of certain structural proposals adopted during the last International Building Code (IBC) revision cycle to improve resilience and functional recovery of communities in the wake of natural disasters. This proposal is also consistent with the risk category framework adopted for comparable ground-mounted PV panel systems in items 2 and 5 in 1604.5.2 during the last code revision cycle. For more than a decade, wind turbine generators have been classified as Occupancy Category II, per the *Recommended Practice for Compliance of Large Land-based Wind Turbine Support Structures* (ASCE/AWEA RP2011). This document was co-designated by the American Society of Civil Engineers (ASCE) and the American Wind Energy Association (AWEA),[1] and is used when classifying wind turbines. This has been accepted by AHJs across the country. In 2012 the ICC changed from using Occupancy Category to Risk Category. Classifying a wind turbine as Risk Category II is now equivalent to the previous classification as Occupancy Category II. It is also consistent with the more recently adopted ACP 61400-6-2023, *Wind Energy Generation Systems – Part 6: Tower and foundation design requirements – Modified Adoption of IEC 61400-6*, approved by the American National Standards Institute (ANSI) on June 27, 2023.

Justification by proposal line item is provided as follows:

1. **Wind Turbine Generator Systems (WTGS) – A system that incorporates an elevated generator, supported by a tower and its foundation, that converts wind kinetic energy into electrical power.**

There is currently no definition for wind turbine generating system in the IBC. This change would add a definition for wind turbine generating system. The wording is largely based on ASCE/AWEA RP 2011 and consistent with International Electrotechnical Commission (IEC) standards.[2]

2. **WTGS other than those described in Item 2 shall be assigned to *Risk Category* II.**

AHJs have approved the construction of tens of thousands of wind turbines as Risk Category II using ASCE/AWEA RP2011 over the last thirteen years. ACP is not aware of any increase in grid failure rates, including related to natural disasters and extreme weather, which would justify any need to categorize wind turbines at a level beyond risk category II. In addition, ACP 61400-6-2023, *Wind Energy Generation Systems – Part 6: Tower and foundation design requirements – Modified Adoption of IEC 61400-6*, approved by the American National Standards Institute (ANSI) on June 27, 2023, notes in Section 5.2.1, "WTGS [wind turbine generating systems] may be classified as Risk Category II structures, resulting in normal design importance factors. This approach mirrors implicit structural reliability levels of international wind turbine design standards such as IEC 61400-1 and is consistent with longstanding and contemporary wind industry support structure design practice in the United States and internationally."

The proposed ACP code revision recognizes that geographically dispersed power generation like wind energy improves grid resilience, reliability, and recovery, and that permitting wind turbines consistent with Risk Category II has resulted in wind farms able to withstand natural disasters and contribute to community recovery by continuing to generate electricity.

If an entire wind farm ceases operation, which is rare, geographically diverse wind farms elsewhere across the state or region are still putting electrons on the grid for delivery to homes and businesses.

Further, if a natural disaster contributes to failure at an individual wind turbine or a few turbines within a wind farm that does not mean an entire wind farm stops operating. The remaining turbines generally can continue to generate electricity if the substation and transmission system remains up and running.

We saw this in Turkey following severe earthquakes in 2023. Twenty-one wind power facilities continued operating in seven earthquake hit provinces.[3]Even when there is a direct hit on a few wind turbines from a severe tornado with one of the highest wind speeds in recorded history of at least 309 miles per hour[4] as was experienced in Iowa in May 2024, the geographic dispersion of wind turbines across hundreds or thousands of acres within a facility means that only a small subset of turbines were damaged by the tornado with the remaining turbines remaining structurally sound and able to generate electricity. For example, during the May 2024 series of Iowa tornadoes, three wind farms (out of 140 in Iowa) experienced damaged turbines, but in total only 10 turbines (2.5%) were damaged in those three wind farms with the other 386 turbines still able to generate electricity along with the other more than 6,000 in the State that were built consistent with Risk Category II.[5]'[6]

Specifying wind turbines as Risk Category II is consistent with maintaining community resilience and recovery. Grid reliability, including the performance of power generation facilities, is regulated by the North American Electric Reliability Corporation (NERC), which itself is regulated by the Federal Energy Regulatory Commission (FERC). Various reports on generation outages over the last two decades by FERC and NERC have not identified the structural integrity of wind generation specifically or power generation generally as factors in blackouts. Rather, transmission lines being down is generally the main factor.The U.S.-Canada Power Outage System Task Force Final Report on the August 14, 2003, Blackout in the Eastern United States and Canada[7] identified four major causes all related to improper operation and maintenance of the transmission system by a utility in Ohio.

A joint FERC-NERC staff report[8] on blackouts in Arizona and Southern California on September 8, 2011, found the grid operator failed to maintain the transmission system within its system operation limits, which contributed to cascading outages.

NERC's report on Hurricane Sandy,[9] which made landfall on October 29, 2012, indicated "no damage was reported" to wind turbines in the impact area.

NERC's report on Hurricane Harvey,[10] which made landfall on August 25, 2017, found "only minimal damage" was reported at wind energy facilities and facilities other than one that went offline came back online on the next day or the day after on August 26 or 27.

FERC-NERC issued a joint report[11] in February 2021 regarding an extreme cold and freeze event that led to multiple days of outages in Texas and more limited challenges in other states that identified two major causes: (1) power generation and natural gas pipelines were not adequately winterized which led to frozen equipment and systems and (2) inadequate supplies of natural gas meant there was insufficient gas for power generation as it was being used for home heating.

Even the longest power outage in U.S. history in Puerto Rico after Hurricanes Irma and Maria in September 2017 was due primarily to 80% of the transmission and distribution network being inoperable and difficult to repair given mountainous topography, rather than power generation facilities, including wind farms, being inoperable due to structural deficiencies. As a peer reviewed article[12] in the February 2019 *IEEE Power and Energy Technology Systems Journal* found, "damage to the conventional electric power generation infrastructure was relatively minor…". A 95 MW wind farm, Puerto Rico's largest, suffered "no damage" while at the other wind farm, located near Maria's landfall, the turbine blades were damaged, but only one turbine support structure failed.

Grid operators instantaneously balance generation from various power facilities in their area to match demand. As a part of this balance, the grid operators account for generation or transmission that is offline for maintenance, intermittent by design, or forced offline by a component or system failure or weather. In the U.S., the grid is largely operated on a regional basis, meaning grid operators ramp up and down generation over a geographically diverse area that is not impacted by a weather system the same way. Adding the geographic diversity of wind and solar, with the broad operating areas of the grid operators, supports resilience and recovery.

Further, grid operators require excess generation capacity that is well-beyond (15% or more)[13] demand peaks (i.e. "reserve margins") to facilitate the ability to ramp up generation to meet demand and to address generator outages (both planned an unplanned).

For the reasons above, ACP urges adoption of this proposal to specify that wind turbines are in Risk Category II, consistent with ASCE/AWEA RP 2011, ACP 61400-6-2023, and the treatment of comparable ground-mounted solar PV facilities in the IBC as this designation has been demonstrated based on real world experience to be sufficient to ensure wind energy generation in the wake of natural disasters.

3. **WTGS paired with energy storage systems (ESS) and serving as a dedicated, stand-alone source of backup power for *Risk Category* IV *buildings* shall be assigned to *Risk Category* IV.**

The intermittent nature of WTGS make them an unlikely choice to serve as a dedicated, stand-alone source of backup power for Risk Category IV buildings. But, given the increasing economic competitiveness, availability, and performance of ESS, it is conceivable WTGS could be paired with ESS to power essential facilities. In the instance where a WTGS is paired with an ESS to serve as a dedicated, stand-alone source of backup power for Risk Category IV buildings, ACP believes it makes sense for WTGS to be assigned the same risk category as the building itself.

[1] AWEA merged into the American Clean Power Association (ACP) on January 1, 2021.

[2] IEC definition of WTGS available at: https://www.electropedia.org/iev/iev.nsf/display?openform&ievref=415-01-02

[3]https://www.aa.com.tr/en/energy/regulation-renewable/21-wind-power-plants-in-7-earthquake-hit-provinces-generating-electricity/37527.

[4] https://www.nbcnews.com/science/environment/storm-chasers-catch-tornado-300-mph-winds-rcna158040

[5] https://www.civilrenewables.com/blog/tornados-vs-wind-turbines-a-wake-up-call

[6] The number of projects and turbines in Iowa comes from the CleanPower IQ database: https://cleanpoweriq.cleanpower.org/app/

[7] https://www.ferc.gov/sites/default/files/2020-05/ch1-3_0.pdf

[8]
https://www.nerc.com/pa/rrm/ea/September%202011%20Southwest%20Blackout%20Event%20Document%20L/AZOutage_Report_01M

[9] https://www.nerc.com/pa/rrm/ea/Oct2012HurricanSandyEvntAnlyssRprtDL/Hurricane_Sandy_EAR_20140312_Final.pdf

[10] https://www.nerc.com/pa/rrm/ea/Hurricane_Harvey_EAR_DL/NERC_Hurricane_Harvey_EAR_20180309.pdf

[11]https://www.ferc.gov/media/february-2021-cold-weather-outages-texas-and-south-central-united-states-ferc-nerc-and

[12]https://www.researchgate.net/publication/331214878_Hurricane_Maria_Effects_on_Puerto_Rico_Electric_Power_Infrastructure

[13] https://www.nerc.com/pa/RAPA/ri/Pages/PlanningReserveMargin.aspx

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

Adoption of this amendment is not impact construction costs for wind turbines as they are already designed for Risk Category II per ASCE/AWEA RP2011 and the more recently adopted ACP 61400-6-2023.

S65-25

S66-25

IBC: 1604.8, 1604.8.1, 1604.8.2, 1604.8.3, 1604.8.4 (New)

Proponents: David Cooper, Stair Manufacturing and Design Consultants, representing Stairbuilders and Manufacturers Association (coderep@stairways.org)

2024 International Building Code

1604.8 Anchorage. *Buildings* and *other structures* , and portions thereof, shall be provided with anchorage in accordance with Sections 1604.8.1 through 1604.8.3, as applicable.

1604.8.1 General. Anchorage of the roof to walls and columns, and of walls and columns to foundations, shall be provided to resist the uplift and sliding forces that result from the application of the prescribed *loads*.

1604.8.2 Structural walls. Walls that provide vertical load-bearing resistance or lateral shear resistance for a portion of the *structure* shall be anchored to the roof and to all floors and members that provide lateral support for the wall or that are supported by the wall. The connections shall be capable of resisting the horizontal forces that result from the application of the prescribed *loads*. The required earthquake out-of-plane *loads* are specified in Section 1.4.4 of ASCE 7 for walls of *structures* assigned to *Seismic Design Category* A and to Section 12.11 of ASCE 7 for walls of *structures* assigned to all other *seismic design categories*. Required anchors in *masonry* walls of hollow units or cavity walls shall be embedded in a reinforced grouted structural element of the wall. See Sections 1609 for wind design requirements and 1613 for earthquake design requirements.

1604.8.3 Decks. Where supported by attachment to an *exterior wall*, decks shall be positively anchored to the primary *structure* and designed for both vertical and lateral *loads* as applicable. Such attachment shall not be accomplished by the use of toenails or nails subject to withdrawal. Where positive connection to the primary *building structure* cannot be verified during inspection, decks shall be self-supporting. Connections of decks with cantilevered framing members to *exterior walls* or other framing members shall be designed for both of the following:

1. The reactions resulting from the *dead load* and *live load* specified in Table 1607.1, or the snow *load* specified in Section 1608, in accordance with Section 1605, acting on all portions of the deck.
2. The reactions resulting from the *dead load* and *live load* specified in Table 1607.1, or the snow *load* specified in Section 1608, in accordance with Section 1605, acting on the cantilevered portion of the deck, and no *live load* or snow *load* on the remaining portion of the deck.

Add new text as follows:

1604.8.4 Guards. Floor, deck and wall members that support guard systems shall be designed to resist the forces resulting from the application of the prescribed loads for guard systems.

Reason: Floor, deck and wall members supporting guards are overlooked by designers. The SMA believes this is due to a serious deficit in the building codes. Detailed prescriptive requirements for floor edge members supporting guards were added to the 2024 IRC. The SMA is actively soliciting jurisdictions across the nation for early adoption of these requirements. Although guard systems must support specific live loads the IBC has no requirement to provide the necessary structure to resist the loads transferred from the guard. This simple sentence will add the necessary and much needed performance requirement to the 2027 IBC and affords the opportunity to include walls that we have not been able to date to address with prescriptive requirements in the IRC.

Complete details including drawings and calculations supporting the prescriptive changes to the 2024 IRC are summarized in the document at this link, IRC 2024 - Floor framing supporting guards

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

The change merely provides design guidance for existing requirements and will not affect any change in the cost of construction.

S66-25

S67-25

IBC: 1605.1, 1605.1.1, 1605.2, 1802.1, 1806.1, 1808.3, 1810.3.1.1

Proponents: Emily Guglielmo, representing NCSEA (eguglielmo@martinmartin.com); Jennifer Goupil, American Society of Civil Engineers and Structural Engineering Institute, representing American Society of Civil Engineers (jgoupil@asce.org); Bonnie Manley, representing AISC (manley@aisc.org)

2024 International Building Code

Revise as follows:

1605.1 General. *Buildings* and *other structures* and portions thereof shall be designed to resist the strength load combinations specified in ASCE 7, Section 2.3~~,~~ or the a*llowable stress design* load combinations specified in ASCE 7, Section 2.4~~, or the alternative a*llowable stress design* load combinations of Section 1605.2~~.

Exceptions:

1. The modifications to load combinations of ASCE 7, Section 2.3~~,~~ and ASCE 7, Section 2.4 ~~and Section 1605.2~~ specified in ~~ASCE 7 Chapters~~ Chapter 18 ~~and 19~~ shall apply.
2. Where the *allowable stress design* load combinations of ASCE 7, Section 2.4 are used, flat roof snow *loads* of 45 pounds per square foot (2.15 kN/m^2) and *roof live loads* of 30 pounds per square foot (1.44 kN/m^2) or less need not be combined with seismic load. Where flat roof snow *loads* exceed 45 pounds per square foot (2.15 kN/m^2), 15 percent shall be combined with seismic loads.
3. Where the *allowable stress design* load combinations of ASCE 7 Section 2.4 are used, crane hook loads need not be combined with *roof live loads* or with more than three-fourths of the snow load or one-half of the wind loads.
4. ~~Where design for tornado loads is required, the alternative *allowable stress design* load combinations of Section 1605.2 shall not apply when tornado loads govern the design.~~

1605.1.1 Stability. Regardless of which load combinations are used to design for strength, where overall *structure* stability (such as stability against overturning, sliding, or buoyancy) is being verified, use of the load combinations specified in Section 2.3 or 2.4 of ASCE 7~~, and in Section 1605.2~~ shall be permitted. Where the load combinations specified in ASCE 7, Section 2.3 are used, strength reduction factors applicable to soil resistance shall be provided by a *registered design professional*. The stability of retaining walls shall be verified in accordance with Section 1807.2.3.

Delete without substitution:

~~**1605.2 Alternative allowable stress design load combinations.** In lieu of the load combinations in ASCE 7, Section 2.4, *structures* and portions thereof shall be permitted to be designed for the most critical effects resulting from the following combinations. Where using these alternative allowable stress load combinations that include wind or seismic *loads*, allowable stresses are permitted to be increased or load combinations reduced where permitted by the material chapter of this code or the referenced standards. For load combinations that include the counteracting effects of dead and wind *loads*, only two-thirds of the minimum *dead load* likely to be in place during a design wind event shall be used. Where using these alternative load combinations to evaluate sliding, overturning and soil bearing at the soil-*structure* interface, the reduction of foundation overturning from Section 12.13.4 in ASCE 7 shall not be used. Where using these alternative basic *load* combinations for proportioning foundations for loadings, which include seismic *loads*, the vertical seismic *load effect*, E_v, in Equation 12.4-4 of ASCE 7 is permitted to be taken equal to zero. Where required by ASCE 7, Chapters 12, 13 and 15, the load combinations including overstrength of ASCE 7, Section 2.4.5 shall be used.~~

~~$D + L + (L_r \text{ or } 0.7S \text{ or } R)$~~ ~~**(Equation 16-1)**~~

~~$D + L + 0.6W$~~ ~~**(Equation 16-2)**~~

~~$D + L + 0.6W + 0.7S/2$~~ ~~**(Equation 16-3)**~~

~~$D + L + 0.7S + 0.6(W/2)$~~ ~~**(Equation 16-4)**~~

~~$D + L + 0.7S + E/1.4$~~ **~~(Equation 16-5)~~**

~~$0.9D + E/1.4$~~ **~~(Equation 16-6)~~**

~~Exceptions:~~

1. ~~Crane hook *loads* need not be combined with *roof live loads* or with more than three-fourths of the snow load or one-half of the wind load.~~
2. ~~Flat roof snow *loads* of 45 pounds per square foot (2.15 kN/m^2) or less and *roof live loads* of 30 pounds per square foot (1.44 kN/m^2) or less need not be combined with seismic loads. Where flat roof snow loads exceed 45 pounds per square foot (2.15 kN/m^2), 15 percent shall be combined with seismic loads.~~

Revise as follows:

1802.1 General. Allowable bearing pressures, allowable stresses and design formulas provided in this chapter shall be used with the *allowable stress design* load combinations specified in ASCE 7, Section 2.4 ~~or the alternative *allowable stress design* load combinations of Section 1605.2~~. The quality and design of materials used structurally in excavations and foundations shall comply with the requirements specified in Chapters 16, 19, 21, 22 and 23. Excavations and fills shall comply with Chapter 33.

1806.1 Load combinations. The presumptive load-bearing values provided in Table 1806.2 shall be used with the *allowable stress design* load combinations specified in ASCE 7, Section 2.4 ~~or the alternative *allowable stress design* load combinations of Section 1605.2. The values of vertical foundation pressure and lateral bearing pressure given in Table 1806.2 shall be permitted to be increased by one-third where used with the alternative *allowable stress design* load combinations of Section 1605.2 that include wind or earthquake *loads*~~.

1808.3 Design loads. Foundations shall be designed for the most unfavorable effects due to the combinations of *loads* specified in Section 2.3 or 2.4 of ASCE 7 ~~or the alternative *allowable stress design* load combinations of Section 1605.2~~. The *dead load* is permitted to include the weight of foundations and overlying fill. Reduced *live loads*, as specified in Sections 1607.13 and 1607.14, shall be permitted to be used in the design of foundations.

1810.3.1.1 Design methods for concrete elements. Where concrete *deep foundations* are laterally supported in accordance with Section 1810.2.1 for the entire height and applied forces cause bending moments not greater than those resulting from accidental eccentricities, structural design of the element using the *allowable stress design* load combinations specified in ASCE 7, Section 2.4 ~~or the alternative *allowable stress design* load combinations of Section 1605.2~~ and the allowable stresses specified in this chapter shall be permitted. Otherwise, the structural design of concrete *deep foundation* elements shall use the strength load combinations specified in ASCE 7, Section 2.3 and *approved* strength design methods.

Reason: This change proposal removes the **Alternative** Allowable Stress Design Load Combinations of Section 1605.2, which are not included in ASCE 7 and only exist in the IBC. ASCE/SEI is the ANSI consensus body that develops and maintains the load combinations and believes it is critical that these load combinations be removed from the IBC.

Technical Rationale

The alternative load combinations produce allowable stress design (ASD) loads that are significantly different from Allowable Stress Design Load Combinations of ASCE 7 Section 2.4. A significant non-conservative difference is the larger value of dead load prescribed for resistance to wind or earthquake-induced overturning. While that area of difference could be minimized through targeted changes to Section 1605.2 combinations, there is no compelling need to maintain the alternative ASD combinations in the IBC. Furthermore, the alternative ASD combinations are unused by standards promulgating organizations (such as ICC, AWC, and AISI/SFIA) in the development of prescriptive solutions for required member size/fastening and are also not used as the basis of prescriptive solutions contained in the building code. The combinations are largely unused due to other differences that produce less efficient designs than those associated with the ASD load combinations included in ASCE 7. The combinations of Section 1605.2 are unnecessary to accomplish an ASD design, are non-conservative for cases that involve dead load resistance to overturning (i.e., overturning stability), and are overly conservative in other cases.

Additionally, while there is an industry-wide effort underway to ensure continuing consistency between the ASD and LRFD load combinations in ASCE 7, there is no similar effort to maintain the *alternative* ASD load combinations or to better align them with the ASCE

7 ASD load combinations. Therefore, it is critical they are removed.

Coordination

During the previous code development cycle, Proposal S47-19 removed Basic Allowable Stress Design Load Combinations from the IBC due to their inclusion and ongoing maintenance in ASCE 7. The Basic ASD Load Combinations remain in ASCE 7 and will continue to be maintained. Load combinations of ASCE 7 for both strength design and allowable stress design are the preferred load combinations for design. The combinations of Section 1605.2 are unnecessary and cause confusion in the profession.

Industry Support

NCSEA polls the structural engineering profession routinely to seek feedback on technical provisions in standards and codes. In the 2018 NCSEA Survey of 10,000 practicing engineers, 84% of respondents "never or rarely" use the Alternative Allowable Stress Design Load Combinations contained in Section 1605.2 of the IBC, and 80% of respondents "would not object" to the deletion of them. In addition to design professionals, other standards development organizations support the removal of the Alternative ASD Load Combinations, including the Structural Engineers Association of California and the American Institute of Steel Construction, among others.

Finally, this change proposal also corrects Section 1605.1, Exception 1. ASCE 7-22 Chapters 18 and 19 do not currently contain modifications to the load combinations listed herein. Rather, in reviewing past editions of the IBC, it looks as if a typo occurred, and the reference to ASCE 7 Chapters 18 and 19 should have remained references to IBC Chapters 18 and 19. In the 2024 edition of the IBC, only Chapter 18 includes modifications to the load combinations. Therefore, the references to "ASCE 7" and "Chapter 19" have been deleted.

- **1-s2.0-S0143974X23005540-main.pdf**
  https://www.cdpaccess.com/proposal/11878/35642/documentation/184737/attachments/download/9342/
- **ASD_IBC_Letter.pdf**
  https://www.cdpaccess.com/proposal/11878/35642/documentation/184737/attachments/download/9340/

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

This code change proposal removes the Alt. ASD Load Combinations, which are not compatible with the provisions for load combinations and requirements in ASCE 7-22. The IBC points to the referenced standard for all load combinations and these outdated provisions are no longer relevant and not applicable.

S67-25

S68-25

IBC: SECTION 1606, 1606.1, 1606.2, 1606.3

Proponents: Jennifer Goupil, American Society of Civil Engineers and Structural Engineering Institute, representing American Society of Civil Engineers (jgoupil@asce.org)

2024 International Building Code

SECTION 1606
DEAD LOADS

Revise as follows:

1606.1 General. *Buildings*, *structures,* and parts thereof shall be designed to resist the effects of dead loads.

1606.2 Weights of materials of construction. ~~For~~ <u>In determining dead loads for</u> purposes of design, the actual weights of materials of construction shall be used. In the absence of definite information, values used shall be subject to the approval of the *building official*.

1606.3 Weight of fixed service equipment. In determining dead loads for purposes of design, the weight of fixed service equipment, including the maximum weight of the contents of fixed service equipment, shall be included. The components of fixed service equipment that are variable, such as liquid contents and movable trays, shall not be used to counteract forces causing overturning, sliding, and uplift conditions in accordance with Section 1.3.6 of ASCE 7.

Exceptions:

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

Reason: This proposal is a coordination proposal to bring the 2027 IBC up to date with the provisions of the 2022 edition of ASCE/SEI 7 *Minimum Design Loads and Associated Criteria for Buildings and Other Structures* (ASCE/SEI 7-22). These changes improve the coordination between the IBC and ASCE 7 by adding text in the IBC that appears in the corresponding section in ASCE 7.

Additionally, this change does the following: 1) It revises the section to refer to the weight of materials of construction as dead loads. While this section is a sub-section under 1606 Dead Loads, the section itself does not currently mention dead loads. 2) It aligns the text of the section with the section that follows, Section 1606.3. This section which addresses fixed service equipment starts with “In determining dead loads for purposes of design, the weight of fixed service equipment…”.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

Improving coordination with ASCE 7 and consistency between sections within the IBC is not expected to affect the cost of construction.

S68-25

S69-25

IBC: 1607.1, TABLE 1607.1, 1607.20

Proponents: David Cooper, Stair Manufacturing and Design Consultants, representing Stairbuilders and Manufacturers Association (coderep@stairways.org)

2024 International Building Code

1607.1 General. *Buildings*, *structures*, and parts thereof shall be designed to resist the effects of *live loads*.

Revise as follows:

TABLE 1607.1 MINIMUM UNIFORMLY DISTRIBUTED LIVE LOADS, L_0 , AND MINIMUM CONCENTRATED LIVE LOADS

OCCUPANCY OR USE		UNIFORM (psf)	CONCENTRATED (pounds)	ALSO SEE SECTION
1. Apartments (see residential)		—	—	—
2. Access floor systems	Office use	50	2,000	—
	Computer use	100	2,000	—
3. Armories and drill rooms		150[a]	—	—
4. Assembly areas	Fixed seats (fastened to floor)	60[a]	—	—
	Lobbies	100[a]		
	Movable seats	100[a]		
	Stage floors	150[a]		
	Platforms (assembly)	100[a]		
	Bleachers, folding and telescopic seating and grandstands	100[a] (See Section 1607.18)		
	Stadiums and arenas with fixed seats (fastened to the floor)	60[a] (See Section 1607.18)		
	Other assembly areas	100[a]		
5. Balconies and decks		1.5 times the live load for the area served, not required to exceed 100	—	—
6. Catwalks for maintenance and service access		40	300	—
7. Cornices		60	—	—
8. Corridors	First floor	100	—	—
	Other floors	Same as occupancy served except as indicated		
9. Dining rooms and restaurants		100[a]	—	—
10. Dwellings (see residential)		—	—	—
11. Elevator machine room and control room grating (on area of 2 inches by 2 inches)		—	300	—
12. Finish light floor plate construction (on area of 1 inch by 1 inch)		—	200	—
13. Fire escapes		100	—	—
	On single-family dwellings only	40		
14. Fixed ladders		See Section 1607.10		—
15. Garages and vehicle floors	Passenger vehicle garages	40[c]	See Section 1607.7	—
	Trucks and buses	See Section 1607.8		
	Fire trucks and emergency vehicles	See Section 1607.8		
	Forklifts and movable equipment	See Section 1607.8		
16. Handrails, guards and grab bars		See Section 1607.9		—
17. Helipads	Helicopter takeoff weight 3,000 pounds or less	40[a]	See Section 1607.6.1	Section 1607.6
	Helicopter takeoff weight more than 3,000 pounds	60[a]	See Section 1607.6.1	Section 1607.6
18. Hospitals	Corridors above first floor	80	1,000	—
	Operating rooms, laboratories	60	1,000	
	Patient rooms	40	1,000	
19. Hotels (see residential)		—	—	—
20. Libraries	Corridors above first floor	80	1,000	—
	Reading rooms	60	1,000	—
	Stack rooms	150[b]	1,000	Section 1607.17
21. Manufacturing	Heavy	250[b]	3,000	—
	Light	125[b]	2,000	
22. Marquees, except one- and two-family dwellings		75	—	—

OCCUPANCY OR USE		UNIFORM (psf)	CONCENTRATED (pounds)	ALSO SEE SECTION
23. Office buildings	Corridors above first floor	80	2,000	—
	File and computer rooms shall be designed for heavier loads based on anticipated occupancy	—	—	
	Lobbies and first-floor corridors	100	2,000	
	Offices	50	2,000	
24. Penal institutions	Cell blocks	40	—	—
	Corridors	100		
25. Public restrooms		Same as live load for area served but not required to exceed 60 psf	—	—
26. Recreational uses	Bowling alleys, poolrooms and similar uses	75[a]	—	—
	Dance halls and ballrooms	100[a]		
	Gymnasiums	100[a]		
	Theater projection, control, and follow spot rooms	50		
	Ice skating rinks	250[b]		
	Roller skating rinks	100[a]		
27. Residential	One- and two-family dwellings:		—	Section 1607.21
	Uninhabitable attics without storage	10		
	Uninhabitable attics with storage	20		
	Habitable attics and sleeping areas	30		
	Canopies, including marquees	20		
	All other areas	40		
	Hotels and multifamily dwellings:			
	Private rooms and corridors serving them	40		
	Public rooms	100 [a]		
	Corridors serving public rooms	100		
28. Roofs	Ordinary flat, pitched, and curved roofs (that are not occupiable)	20	—	
	Roof areas used for assembly purposes	100[a]	—	
	Roof areas used for occupancies other than assembly	Same as occupancy served	—	
	Vegetative and landscaped roofs:			
	Roof areas not intended for occupancy	20	—	Section 1607.14
	Roof areas used for assembly purposes	100[a]	—	
	Roof areas used for occupancies other than assembly	Same as occupancy served	—	
	Awnings and canopies:			
	Fabric construction supported by a skeleton structure	5[a]	—	
	All other construction, except one- and two-family dwellings	20	—	
	Primary roof members exposed to a work floor:			
	Single panel point of lower chord of roof trusses or any point along primary structural members supporting roofs over manufacturing, storage warehouses, and repair garages	—	2,000	Section 1607.15
	All other primary roof members	—	300	
	All roof surfaces subject to maintenance workers	—	300	
29. Schools	Classrooms	40	1,000	—
	Corridors above first floor	80	1,000	
	First-floor corridors	100	1,000	
30. Scuttles, skylight ribs and accessible ceilings		—	200	—
31. Sidewalks, vehicular driveways and yards, subject to trucking		250[b]	8,000	Section 1607.19
32. Stairs and exits	One- and two-family dwellings and within dwelling units of R2 and R3 occupancies	40	300	Section 1607.20
	All other	100	300	Section 1607.20
33. Storage areas above ceilings		20	—	—
34. Storage warehouses (shall be designed for heavier loads if required for anticipated storage)	Heavy	250[b]	—	—
	Light	125[b]		
35. Stores	Retail:			—
	First floor	100	1,000	
	Upper floors	75	1,000	
	Wholesale, all floors	125[b]	1,000	
36. Vehicle barriers		See Section 1607.11		—
37. Walkways and elevated platforms (other than exitways)		60	—	—
38. Yards and terraces, pedestrian		100[a]	—	—

For SI: 1 inch = 25.4 mm, 1 square inch = 645.16 mm^2, 1 square foot = 0.0929 m^2, 1 pound per square foot = 0.0479 kN/m^2, 1 pound = 0.004448 kN.

a. Live load reduction is not permitted.

b. Live load reduction is only permitted in accordance with Section 1607.13.1.2 or Item 1 of Section 1607.13.2.

c. Live load reduction is only permitted in accordance with Section 1607.13.1.3 or Item 2 of Section 1607.13.2.

1607.20 Stair treads. The concentrated *load* indicated in Table 1607.1 for *stair* treads shall be applied on an area of 2 inches by 2 inches (51 mm by 51 mm). This *load* need not be assumed to act concurrently with the uniform *load*.

Reason: As in One and two-family dwellings the live loads within R2 and R3 Residential units are considerably lower due to the limited occupancy. Currently the code is contradictive. In Table 1607.1 line 10 Dwellings sends you to line 27 Residential. Line 27 Residential is divided in two sections; One- and two-family dwellings and Hotels and multifamily dwellings. In both “All other areas” of One- and two-family dwellings and “Private rooms and corridors serving them” of Hotels and multifamily dwellings, the same minimum 40 psf load is required. Stairs are listed on line 32 “Stairs and Exits” but only one- and two-family dwellings have the 40 psf load leaving some to interpret that the 100 psf minimum must be applied within R2 and R3 dwellings. Obviously a 100 psf load limit on stairs within any dwelling unit is unnecessary if private rooms and corridors in R2 and R3 occupancies are allowed a 40 psf minimum. I believe this is an unintended oversight in need of the clarification provided in this proposal. The text added to the table clarifies that the 40 psf uniform load would be applicable within the dwelling units of R2 and R3 occupancies with similar occupant limitations.

Cost Impact: Decrease

Estimated Immediate Cost Impact:

$1000 Minimum savings in wood construction could be realized., Clearly a stair designed to meet a 40 psf will be lower in cost compared to a 100 psf design. Regardless of the materials used tread, stringer and riser cross-sections could be reduces significantly.

Estimated Immediate Cost Impact Justification (methodology and variables):

Based on a typical $3000 wood 14 riser staircase built to meet the 100 pond per square foot design load a savings of approximately $1000 in labor and material would be achieved if the design load were reduced to 40 pounds per square foot. Depending upon the materials used a 25% to 50% savings in the cost of stair construction could be achieved. The change in the cost of labor would not be as significant however shipping an handling costs of thinner and lighter materials could represent further cost reductions..

S69-25

S70-25

IBC: TABLE 1607.1

Proponents: Jeff Gonzales, representing Joby Aviation; Chris Hazell, representing Joby Aviation (chris.hazell@jobyaviation.com)

2024 International Building Code

Revise as follows:

TABLE 1607.1 MINIMUM UNIFORMLY DISTRIBUTED LIVE LOADS, L_0 , AND MINIMUM CONCENTRATED LIVE LOADS

OCCUPANCY OR USE		UNIFORM (psf)	CONCENTRATED (pounds)	ALSO SEE SECTION
1. Apartments (see residential)		—	—	—
2. Access floor systems	Office use	50	2,000	—
	Computer use	100	2,000	—
3. Armories and drill rooms		150[a]	—	—
4. Assembly areas	Fixed seats (fastened to floor)	60[a]	—	—
	Lobbies	100[a]		
	Movable seats	100[a]		
	Stage floors	150[a]		
	Platforms (assembly)	100[a]		
	Bleachers, folding and telescopic seating and grandstands	100[a] (See Section 1607.18)		
	Stadiums and arenas with fixed seats (fastened to the floor)	60[a] (See Section 1607.18)		
	Other assembly areas	100[a]		
5. Balconies and decks		1.5 times the live load for the area served, not required to exceed 100	—	—
6. Catwalks for maintenance and service access		40	300	—
7. Cornices		60	—	—
8. Corridors	First floor	100	—	—
	Other floors	Same as occupancy served except as indicated		
9. Dining rooms and restaurants		100[a]	—	—
10. Dwellings (see residential)		—	—	—
11. Elevator machine room and control room grating (on area of 2 inches by 2 inches)		—	300	—
12. Finish light floor plate construction (on area of 1 inch by 1 inch)		—	200	—
13. Fire escapes		100	—	—
	On single-family dwellings only	40		
14. Fixed ladders		See Section 1607.10		—
15. Garages and vehicle floors	Passenger vehicle garages	40[c]	See Section 1607.7	—
	Trucks and buses	See Section 1607.8		
	Fire trucks and emergency vehicles	See Section 1607.8		
	Forklifts and movable equipment	See Section 1607.8		
16. Handrails, guards and grab bars		See Section 1607.9		—
17. Helipads	Helicopter and powered-lift aircrafttakeoff weight ~~3~~6,000 pounds or less	40[~~a~~b]	See Section 1607.6.1	Section 1607.6
	Helicopter and powered-lift aircrafttakeoff weight more than ~~3~~6,000 pounds	60[~~a~~b]	See Section 1607.6.1	Section 1607.6
18. Hospitals	Corridors above first floor	80	1,000	—
	Operating rooms, laboratories	60	1,000	
	Patient rooms	40	1,000	
19. Hotels (see residential)		—	—	—
20. Libraries	Corridors above first floor	80	1,000	—
	Reading rooms	60	1,000	—
	Stack rooms	150[b]	1,000	Section 1607.17
21. Manufacturing	Heavy	250[b]	3,000	—
	Light	125[b]	2,000	
22. Marquees, except one- and two-family dwellings		75	—	—
23. Office buildings	Corridors above first floor	80	2,000	—
	File and computer rooms shall be designed for heavier loads based on anticipated occupancy	—	—	
	Lobbies and first-floor corridors	100	2,000	
	Offices	50	2,000	

OCCUPANCY OR USE		UNIFORM (psf)	CONCENTRATED (pounds)	ALSO SEE SECTION
24. Penal institutions	Cell blocks	40	—	—
	Corridors	100		
25. Public restrooms		Same as live load for area served but not required to exceed 60 psf	—	—
26. Recreational uses	Bowling alleys, poolrooms and similar uses	75[a]	—	—
	Dance halls and ballrooms	100[a]		
	Gymnasiums	100[a]		
	Theater projection, control, and follow spot rooms	50		
	Ice skating rinks	250[b]		
	Roller skating rinks	100[a]		
27. Residential	One- and two-family dwellings:		—	Section 1607.21
	Uninhabitable attics without storage	10		
	Uninhabitable attics with storage	20		
	Habitable attics and sleeping areas	30		
	Canopies, including marquees	20		
	All other areas	40		
	Hotels and multifamily dwellings:			
	Private rooms and corridors serving them	40		
	Public rooms	100 [a]		
	Corridors serving public rooms	100		
28. Roofs	Ordinary flat, pitched, and curved roofs (that are not occupiable)	20	—	Section 1607.14
	Roof areas used for assembly purposes	100[a]	—	
	Roof areas used for occupancies other than assembly	Same as occupancy served	—	
	Vegetative and landscaped roofs:			
	Roof areas not intended for occupancy	20	—	
	Roof areas used for assembly purposes	100[a]	—	
	Roof areas used for occupancies other than assembly	Same as occupancy served	—	
	Awnings and canopies:			
	Fabric construction supported by a skeleton structure	5[a]	—	
	All other construction, except one- and two-family dwellings	20	—	
	Primary roof members exposed to a work floor:			Section 1607.15
	Single panel point of lower chord of roof trusses or any point along primary structural members supporting roofs over manufacturing, storage warehouses, and repair garages	—	2,000	
	All other primary roof members	—	300	
	All roof surfaces subject to maintenance workers	—	300	
29. Schools	Classrooms	40	1,000	—
	Corridors above first floor	80	1,000	
	First-floor corridors	100	1,000	
30. Scuttles, skylight ribs and accessible ceilings		—	200	—
31. Sidewalks, vehicular driveways and yards, subject to trucking		250[b]	8,000	Section 1607.19
32. Stairs and exits	One- and two-family dwellings	40	300	Section 1607.20
	All other	100	300	Section 1607.20
33. Storage areas above ceilings		20	—	—
34. Storage warehouses (shall be designed for heavier loads if required for anticipated storage)	Heavy	250[b]	—	—
	Light	125[b]		
35. Stores	Retail:			—
	First floor	100	1,000	
	Upper floors	75	1,000	
	Wholesale, all floors	125[b]	1,000	
36. Vehicle barriers		See Section 1607.11		—
37. Walkways and elevated platforms (other than exitways)		60	—	—
38. Yards and terraces, pedestrian		100[a]	—	—

For SI: 1 inch = 25.4 mm, 1 square inch = 645.16 mm^2, 1 square foot = 0.0929 m^2, 1 pound per square foot = 0.0479 kN/m^2, 1 pound = 0.004448 kN.

a. Live load reduction is not permitted.

b. Live load reduction is only permitted in accordance with Section 1607.13.1.2 or Item 1 of Section 1607.13.2.

c. Live load reduction is only permitted in accordance with Section 1607.13.1.3 or Item 2 of Section 1607.13.2.

Reason: Overview

This code change proposal focuses on components of IBC Chapter 16 that are related to helicopter and powered-lift infrastructure. The primary intention of this code change submittal is to ensure that emergent aircraft technologies within the advanced air mobility (AAM) sector are accounted for within the IBC prior to widespread adoption of these technologies and the associated buildout of infrastructure. This is accomplished through the following change.

1. Modifying structural live load requirements for helicopters and powered-lift aircraft.

Introduction to Advanced Air Mobility

Per the National Aeronautics and Space Administration (NASA), Advanced Air Mobility (AAM) is a movement within the air travel sector that seeks to provide “safe, accessible, automated, and affordable air transportation system for passengers and cargo capable of serving previously hard-to-reach urban and rural locations.” Emergent technologies that support this mission include electric vertical takeoff and landing (eVTOL) aircraft, which are lithium-ion battery powered aircraft that have been developed by various manufacturers (e.g., Joby Aviation, BETA Technologies, and Archer Aviation) to provide intracity aerial taxi services, cargo transportation, and other air travel needs. In order to facilitate widespread adoption of eVTOL and other powered-lift aircraft, it is necessary to develop a safe and robust infrastructure network. A key component of facilitating this infrastructure development is ensuring that the IBC is updated to account for this emergent technology. The code change proposal below describes an update to Chapter 16 to better account for powered-lift aircraft use of helipads.

Chapter 16: Structural Live Load for Helipads Justification

Live load reduction footnote in Table 1607.1: Helipad live loads (primarily VTOL aircraft taking off and landing) have the similar transient nature of passenger vehicle garages in that local horizontal and vertical support members must be designed to support the full specified live load assuming full occupancy occurs for limited durations at a time. However, for a multi-story structure, it is unlikely that structural members supporting two or more floors will have full occupancy for sustained periods of time simultaneously at every floor. This revision avoids an overly conservative penalty on foundations and lower-level columns supporting multi-story garages and building structures with rooftop helipads.

Helicopter takeoff weights in Table 1607.1: The existing helicopter takeoff weight threshold of 3,000 pounds is outdated when compared to passenger vehicle garage live loads, since many passenger vehicles weigh more than 6,000 pounds with a smaller footprint (and thus closer spacing capability and higher equivalent uniform loading) than helicopters, yet passenger vehicle garage live loads are prescribed as 40 psf. Updating the threshold from 3,000 pounds to 6,000 pounds will enable new and existing helipads to support additional aircraft without the overly conservative current restriction. The footprint of a helicopter weighing 6,000 pounds that is subject to the 40 psf requirement would require a governing rotor diameter of less than 14 ft diameter, which is so extremely small that a helicopter with this rotor size would never get off the ground. As an additional justification for this update, when comparing the ASCE 7 Section 4.11 Helipad Loads for concentrated loads based on the maximum takeoff weight of the aircraft there is parity between an equivalent 40psf live load compared to a 6,000 pound aircraft with a 1.5x dynamic amplification factor applied for peak bending demand in framing members. Assuming a typical 10ft beam spacing and 40ft beam span, 40 psf results in a peak bending demand of 80,000 ft-lbs, which is greater than the two amplified concentrated loads for a 6,000 pound aircraft with 7ft wide landing gear which results in 74,250 ft-lbs. As beam spans go up to 50ft, 60 ft, or longer, the 40 psf live load becomes increasingly conservative.

Bibliography: NASA: Advanced Air Mobility (AAM): An Overview and Brief History

https://ntrs.nasa.gov/api/citations/20210024608/downloads/2021-12-10%20AAM%20for%20PSU%20Tran%20Eng%20and%20Safety%20Conf%20v2%20compressed.pdf

Simple Helipad Cost

https://bjtonline.com/business-jet-news/everything-you-need-to-know-about-adding-a-heliport-to-your-home

Cost Impact: Decrease

Estimated Immediate Cost Impact:

It is estimated that this code change may decrease the cost of construction by a minimum of $0.00.

Estimated Immediate Cost Impact Justification (methodology and variables):

The proposed change suggests an increase in weight of helicopter and powered-lift aircraft from 3,000 pounds to 6,000 pounds while maintaining the same uniform live load requirement (i.e., 40 pounds per square foot) that is currently in Table 1607.1. This may result in a decrease in construction cost since aircraft between 3,000 pounds and 6,000 pounds will now be subject to a lower uniform live load than was previously specified, meaning that less robust, and potentially less costly, construction is required for aircraft of this size as a result of this code change proposal.

This change can be examined using an example case where a heliport is constructed to accommodate a common lightweight helicopter, such as the Bell 206, which is commonly used by news departments and hospitals. The Bell 206 aircraft has a maximum takeoff weight of 3,200 pounds, which would current require a live load rating of 60 pounds per square foot. The new code requirement would require a live load rating of 40 pounds per square foot. Assuming that the the increase in live load also results in a linear increase in construction material required to support the load, the reduction of a 60 psf load to a 40 psf load requirement would decrease the cost of material by 33% for the construction elements used to support the live load, such as columns, beams, and slabs. As such, every new helipad that is constructed to accommodate an aircraft of this type would likely see a decrease in construction costs.

One simple estimate for the construction of a "lighted concrete [heli]pad" is $15,000. Using a 33% reduction in cost based on decreasing the live load from 60 psf to 40 psf may result in the cost of construction decreasing to $10,000 due to the reduction of material required to support the decreased live load requirement.

Staff Analysis: CC # S70-25 and CC # S71-25 addresses requirements in a different or contradicting manner. The committee is urged to make their intensions clear with their actions on these proposals.

S70-25

S71-25

IBC: TABLE 1607.1, 1607.6, 1607.6.1, 1607.13, 1607.13.1, TABLE 1607.13.1, 1607.13.1.1, 1607.13.1.2, 1607.13.1.3, 1607.13.1.4 (New)

Proponents: Jennifer Goupil, American Society of Civil Engineers and Structural Engineering Institute, representing American Society of Civil Engineers (jgoupil@asce.org)

2024 International Building Code

Revise as follows:

TABLE 1607.1 MINIMUM UNIFORMLY DISTRIBUTED LIVE LOADS, L_0, AND MINIMUM CONCENTRATED LIVE LOADS

OCCUPANCY OR USE		UNIFORM (psf)	Live Load Reduction Permitted? (Section No.)	Multiple-Story Live Load Reduction Permitted? (Section No.)	CONCENTRATED (pounds)	ALSO SEE SECTION
1. Apartments (see residential)		—	—	—	—	—
2. Access floor systems	Office use	50	Yes (1607.13.1)	Yes (1607.13.1)	2,000	—
	Computer use	100	Yes (1607.13.1)	Yes (1607.13.1)	2,000	—
3. Armories and drill rooms		150~~a~~	No (1607.13.1.4)	No (1607.13.1.4)	—	—
4. Assembly areas	Fixed seats (fastened to floor)	60~~a~~	No (1607.13.1.4)	No (1607.13.1.4)	—	—
	Lobbies	100~~a~~	No (1607.13.1.4)	No (1607.13.1.4)		—
	Movable seats	100~~a~~	No (1607.13.1.4)	No (1607.13.1.4)		—
	Stage floors	150~~a~~	No (1607.13.1.4)	No (1607.13.1.4)		—
	Platforms (assembly)	100~~a~~	No (1607.13.1.4)	No (1607.13.1.4)		—
	Bleachers, folding and telescopic seating and grandstands	100~~a~~ ~~(See Section 1607.18)~~	No (1607.13.1.4)	No (1607.13.1.4)		1607.18
	Stadiums and arenas with fixed seats (fastened to the floor)	60~~a~~ ~~(See Section 1607.18)~~	No (1607.13.1.4)	No (1607.13.1.4)		1607.18
	Other assembly areas	100~~a~~	No (1607.13.1.4)	No (1607.13.1.4)		
5. Balconies and decks		1.5 times the live load for the area served, not required to exceed 100	Yes (1607.13.1)	Yes (1607.13.1)	—	—
6. Catwalks for maintenance and service access		40	Yes (1607.13.1)	Yes (1607.13.1)	300	—
7. Cornices		60	Yes (1607.13.1)	Yes (1607.13.1)	—	—
8. Corridors	First floor	100	Yes (1607.13.1)	Yes (1607.13.1)	—	—
	Other floors	Same as occupancy served except as indicated				
9. Dining rooms and restaurants		100~~a~~	No (1607.13.1.4)	No (1607.13.1.4)	—	—
10. Dwellings (see residential)		—	—	—	—	—
11. Elevator machine room and control room grating (on area of 2 inches by 2 inches)		—	—	—	300	—
12. Finish light floor plate construction (on area of 1 inch by 1 inch)		—	—	—	200	—
13. Fire escapes		100	Yes (1607.13.1)	Yes (1607.13.1)	—	—
	On single-family dwellings only	40	Yes (1607.13.1)	Yes (1607.13.1)		
14. Fixed ladders		~~See Section 1607.10~~ —	—	—	—	1607.10
15. Garages and vehicle floors	Passenger vehicle garages	40~~e~~	No (1607.13.1.3)	Yes (1607.13.1.3)	See Section 1607.7	—
	Trucks and buses	See Section 1607.8				
	Fire trucks and emergency vehicles	See Section 1607.8				
	Forklifts and movable equipment	See Section 1607.8				
16. Handrails, guards and grab bars		See Section 1607.9				—

OCCUPANCY OR USE		UNIFORM (psf)	Live Load Reduction Permitted? (Section No.)	Multiple-Story Live Load Reduction Permitted? (Section No.)	CONCENTRATED (pounds)	ALSO SEE SECTION
17. Helipads	Helicopter takeoff weight 3,000 pounds or less	40[~~a~~]	No (1607.6)	No (1607.6)	See Section 1607.6.1	~~Section~~ 1607.6
	Helicopter takeoff weight more than 3,000 pounds	60[~~a~~]	No (1607.6)	No (1607.6)	See Section 1607.6.1	~~Section~~ 1607.6
18. Hospitals	Corridors above first floor	80	Yes (1607.13.1)	Yes (1607.13.1)	1,000	—
	Operating rooms, laboratories	60	Yes (1607.13.1)	Yes (1607.13.1)	1,000	
	Patient rooms	40	Yes (1607.13.1)	Yes (1607.13.1)	1,000	
19. Hotels (see residential)		—	—	—	—	—
20. Libraries	Corridors above first floor	80	Yes (1607.13.1)	Yes (1607.13.1)	1,000	—
	Reading rooms	60	Yes (1607.13.1)	Yes (1607.13.1)	1,000	—
	Stack rooms	150[~~b~~]	No (1607.13.1.2)	Yes (1607.13.1.2)	1,000	~~Section~~ 1607.17
21. Manufacturing	Heavy	250[~~b~~]	No (1607.13.1.2)	Yes (1607.13.1.2)	3,000	—
	Light	125[~~b~~]	No (1607.13.1.2)	Yes (1607.13.1.2)	2,000	
22. Marquees, except one- and two-family dwellings		75	Yes (1607.13.1)	Yes (1607.13.1)	—	—
23. Office buildings	Corridors above first floor	80	Yes (1607.13.1)	Yes (1607.13.1)	2,000	—
	File and computer rooms shall be designed for heavier loads based on anticipated occupancy	—	—	—	—	
	Lobbies and first-floor corridors	100	Yes (1607.13.1)	Yes (1607.13.1)	2,000	
	Offices	50	Yes (1607.13.1)	Yes (1607.13.1)	2,000	
24. Penal institutions	Cell blocks	40	Yes (1607.13.1)	Yes (1607.13.1)	—	—
	Corridors	100	Yes (1607.13.1)	Yes (1607.13.1)		
25. Public restrooms		Same as live load for area served but not required to exceed 60 psf	Yes (1607.13.1)	Yes (1607.13.1)	—	—
26. Recreational uses	Bowling alleys, poolrooms and similar uses	75[~~a~~]	No (1607.13.1.4)	No (1607.13.1.4)	—	—
	Dance halls and ballrooms	100[~~a~~]	No (1607.13.1.4)	No (1607.13.1.4)		
	Gymnasiums	100[a]	No (1607.13.1.4)	No (1607.13.1.4)		
	Theater projection, control, and follow spot rooms	50	Yes (1607.13.1)	Yes (1607.13.1)		
	Ice skating rinks	250[~~b~~]	No (1607.13.1.4)	No (1607.13.1.4)		
	Roller skating rinks	100[~~a~~]	No (1607.13.1.4)	No (1607.13.1.4)		
27. Residential	One- and two-family dwellings:				—	~~Section~~ 1607.21
	Uninhabitable attics without storage	10	Yes (1607.13.1)	Yes (1607.13.1)		
	Uninhabitable attics with storage	20	Yes (1607.13.1)	Yes (1607.13.1)		
	Habitable attics and sleeping areas	30	Yes (1607.13.1)	Yes (1607.13.1)		
	Canopies, including marquees	20	Yes (1607.13.1)	Yes (1607.13.1)		
	All other areas	40	Yes (1607.13.1)	Yes (1607.13.1)		
	Hotels and multifamily dwellings:					
	Private rooms and corridors serving them	40	Yes (1607.13.1)	Yes (1607.13.1)		
	Public rooms	100[~~a~~]	No (1607.13.1.4)	No (1607.13.1.4)		
	Corridors serving public rooms	100	Yes (1607.13.1)	Yes (1607.13.1)		

	OCCUPANCY OR USE		UNIFORM (psf)	Live Load Reduction Permitted? (Section No.)	Multiple-Story Live Load Reduction Permitted? (Section No.)	CONCENTRATED (pounds)	ALSO SEE SECTION
28.	Roofs	Ordinary flat, pitched, and curved roofs (that are not occupiable)	20	Yes (1607.14.1)	—	—	
		Roof areas used for assembly purposes	100~~[a]~~	No (1607.13.1.4)	—	—	
		Roof areas used for occupancies other than assembly	Same as occupancy served	Yes (1607.14.2)	—	—	
		Vegetative and landscaped roofs:					
		Roof areas not intended for occupancy	20	Yes (1607.14.1)	—	—	~~Section~~ 1607.14
		Roof areas used for assembly purposes	100~~[a]~~	No (1607.13.1.4)	—	—	
		Roof areas used for occupancies other than assembly	Same as occupancy served	Yes (1607.14.2)	—	—	
		Awnings and canopies:					
		Fabric construction supported by a skeleton structure	5~~[a]~~	No (1607.14.1)	—	—	
		All other construction, except one- and two-family dwellings	20	Yes (1607.14.1)	—	—	
		Primary roof members exposed to a work floor:					
		Single panel point of lower chord of roof trusses or any point along primary structural members supporting roofs over manufacturing, storage warehouses, and repair garages	—	—	—	2,000	~~Section~~ 1607.15
		All other primary roof members	—	—	—	300	
		All roof surfaces subject to maintenance workers	—	—	—	300	
29.	Schools	Classrooms	40	Yes (1607.13.1)	Yes (1607.13.1)	1,000	—
		Corridors above first floor	80	Yes (1607.13.1)	Yes (1607.13.1)	1,000	
		First-floor corridors	100	Yes (1607.13.1)	Yes (1607.13.1)	1,000	
30.	Scuttles, skylight ribs and accessible ceilings		—	—	—	200	—
31.	Sidewalks, vehicular driveways and yards, subject to trucking		250~~[b]~~	No (1607.13.1.2)	Yes (1607.13.1.2)	8,000	~~Section~~ 1607.19
32.	Stairs and exits	One- and two-family dwellings	40	Yes (1607.13.1)	Yes (1607.13.1)	300	~~Section~~ 1607.20
		All other	100	Yes (1607.13.1)	Yes (1607.13.1)	300	~~Section~~ 1607.20
33.	Storage areas above ceilings		20	Yes (1607.13.1)	Yes (1607.13.1)	—	—
34.	Storage warehouses (shall be designed for heavier loads if required for anticipated storage)	Heavy	250~~[b]~~	No (1607.13.1.2)	Yes (1607.13.1.2)	—	—
		Light	125~~[b]~~	No (1607.13.1.2)	Yes (1607.13.1.2)		
35.	Stores	Retail:					—
		First floor	100	Yes (1607.13.1)	Yes (1607.13.1)	1,000	
		Upper floors	75	Yes (1607.13.1)	Yes (1607.13.1)	1,000	
		Wholesale, all floors	125~~[b]~~	No (1607.13.1.2)	Yes (1607.13.1.2)	1,000	
36.	Vehicle barriers		—	—	—	See Section 1607.11	—
37.	Walkways and elevated platforms (other than exitways)		60	Yes (1607.13.1)	Yes (1607.13.1)	—	—
38.	Yards and terraces, pedestrian		100~~[a]~~	No (1607.13.1.4)	No (1607.13.1.4)	—	—

For SI: 1 inch = 25.4 mm, 1 square inch = 645.16 mm^2, 1 square foot = 0.0929 m^2, 1 pound per square foot = 0.0479 kN/m^2, 1 pound = 0.004448 kN.

~~a. Live load reduction is not permitted.~~

~~b. Live load reduction is only permitted in accordance with Section 1607.13.1.2 or Item 1 of Section 1607.13.2.~~

~~c. Live load reduction is only permitted in accordance with Section 1607.13.1.3 or Item 2 of Section 1607.13.2.~~

1607.6 Helipads. Helipad live loads shall not be reduced. *Helipads* shall be marked to indicate the maximum takeoff weight. The takeoff weight limitation shall be indicated in units of thousands of pounds and placed in a box that is located in the bottom right corner of the landing area as viewed from the primary approach path. The box shall be not less than 5 feet (1524 mm) in height.

1607.6.1 Concentrated loads.. *Helipads* shall be designed for the following concentrated *live loads* :

1. A single concentrated *live load*, *L*, of 3,000 pounds (13.35 kN) applied over an area of 4.5 inches by 4.5 inches (114 mm by 114 mm) and located so as to produce the maximum *load effects* on the structural elements under consideration. The concentrated load is not required to act concurrently with other uniform or concentrated *live loads*.
2. Two single concentrated *live loads*, *L*, 8 feet (2438 mm) apart applied on the landing pad (representing the helicopter's two main landing gear, whether skid type or wheeled type), each having a magnitude of 0.75 times the maximum takeoff weight of the helicopter, and located so as to produce the maximum *load effects* on the structural elements under consideration. The concentrated loads shall be applied over an area of 8 inches by 8 inches (203 mm by 203 mm) and are not required to act concurrently with other uniform or concentrated *live loads*.

1607.13 Reduction in uniform live loads. Except for uniform roof live loads, all other minimum uniformly distributed *live loads*, L_o, in Table 1607.1 are permitted to be reduced in accordance with Section 1607.13.1 or 1607.13.2. Uniform roof *live loads* are permitted to be reduced in accordance with Section 1607.14.

1607.13.1 Basic uniform live load reduction. Subject to the limitations of Sections 1607.13.1.1 through 1607.13.1.3 and Table 1607.1, members for which a value of $K_{LL}A_T$ is 400 square feet (37.16 m^2) or more are permitted to be designed for a reduced uniformly distributed *live load*, *L*, in accordance with the following equation:

$$L = L_o\left(0.25 + \frac{15}{\sqrt{K_{LL}A_T}}\right)$$ **(Equation 16-7)**

$$L = L_o\left(0.25 + \frac{15}{\sqrt{K_{LL}A_T}}\right)$$

where:

L = Reduced design *live load* per square foot (m^2) of area supported by the member. L_o = Unreduced design *live load* per square foot (m^2) of area supported by the member (see Table 1607.1). K_{LL} = *Live load* element factor (see Table 1607.13.1). A_T = Tributary area, in square feet (m^2).

L shall be not less than $0.50L_o$ for members supporting one floor and L shall be not less than $0.40L_o$ for members supporting two or more floors.

TABLE 1607.13.1 LIVE LOAD ELEMENT FACTOR, K_{LL}

ELEMENT	K_{LL}
Interior columns	4
Exterior columns without cantilever slabs	4
Edge columns with cantilever slabs	3
Corner columns with cantilever slabs	2
Edge beams without cantilever slabs	2
Interior beams	2
Members not previously identified including: Edge beams with cantilever slabs Cantilever beams One-way slabs Two-way slabs Members without provisions for continuous shear transfer normal to their span	1

1607.13.1.1 One-way slabs. The tributary area, A_T, for use in Equation 16-7 for one-way slabs shall not exceed an area defined by the slab span times a width normal to the span of 1.5 times the slab span.

1607.13.1.2 Heavy live loads. *Live loads* that exceed 100 psf (4.79 kN/m^2) shall not be reduced.

Exceptions:

1. The *live loads* for members supporting two or more floors are permitted to be reduced by not greater than 20 percent, but the reduced *live load* shall be not less than *L* as calculated in Section 1607.13.1.
2. For uses other than storage, where *approved*, additional *live load* reductions shall be permitted where shown by the *registered design professional* that a rational approach has been used and that such reductions are warranted.

1607.13.1.3 Passenger vehicle garages. The *live loads* shall not be reduced in passenger vehicle garages.

Exception: The *live loads* for members supporting two or more floors are permitted to be reduced by not greater than 20 percent, but the reduced *live load* shall be not less than *L* as calculated in Section 1607.13.1.

Add new text as follows:

1607.13.1.4 Assembly Area Loads. Live loads shall not be reduced in assembly areas.

Reason: This proposal is a coordination proposal to bring the 2027 IBC up to date with the provisions of the 2022 edition of ASCE/SEI 7 Minimum Design Loads and Associated Criteria for Buildings and Other Structures (ASCE/SEI 7-22). This proposal improves the coordination between the IBC and ASCE 7 by aligning the format of the Live Load Table in the IBC with the format of the ASCE 7 Live Load Table. Specifically two columns are added to the IBC table and three footnotes are removed. No requirements are changed, only the way in which the requirements are presented are changed.

This proposal completes the format alignment of the live load tables which was started, and mostly accomplished, in the 2021 IBC. The tables were not completely aligned in the 2021 IBC due to the existence of the Alternative Live Load Reduction provisions in the IBC (which are not in ASCE 7). With the removal of the Alternative Live Load Reduction provisions, which is proposed in a separate ASCE sponsored code change proposal, the format alignment of the IBC and ASCE 7 tables can now be completed.

Ultimately these changes go back to the removal of the sixteen footnotes to the live load table, which occurred for the 2016 edition of ASCE 7. In general having this many footnotes to a single table was unwieldy and resulted in requirements being difficult to find. The footnote information was either moved into the table itself or into new live load sections. However when this update was attempted in the IBC, for the 2021 edition, the existence of the Alternative Live Load Reduction provisions made the table changes related to live load reduction more complicated as two methods needed to be addressed. Therefore the footnotes related to live load reduction were left in place and the new columns related to live load reduction were not added.

The new text that is added in 1607.6 and 1607.13.1.4 mirrors text in ASCE 7 and is necessary to provide the reason why live load reduction is, or is not, permitted for certain uses and to provide a section to reference in the new columns. Again, no technical requirements are changed by this proposal.

The layout and look of the table was difficult to work with in cdpAccess as the column widths and text positioning do not look the same in the website preview mode and the downloaded/printed PDF version. ICC staff indicated that this is a limitation of the cdpAccess website. The existing text indents and centering/justification of text within cells are not changed by this proposal. In addition the column widths should be such that all text is readable.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

The modification to the live load table is a clarification that is not expected to impact the cost of construction.

Staff Analysis: CC # S71-25 and CC # S70-25 addresses requirements in a different or contradicting manner. The committee is urged to make their intensions clear with their actions on these proposals.

S71-25

S72-25

IBC: 1607.3

Proponents: Jennifer Goupil, American Society of Civil Engineers and Structural Engineering Institute, representing American Society of Civil Engineers (jgoupil@asce.org)

2024 International Building Code

Revise as follows:

1607.3 Uniform live loads. The *live loads* used in the design of *buildings* and *other structures* shall be the maximum loads expected by the intended use or occupancy but shall not be less than the minimum uniformly distributed *live loads* given in Table 1607.1.*Roof live* ~~*Live*~~ *loads* acting on a sloping surface shall be assumed to act vertically on the horizontal projection of that surface.

Reason: This proposal corrects an inadvertent change made by an ASCE sponsored proposal in the last code change cycle. S92-22 moved the sentence “Live loads acting on a sloping surface shall be assumed to act vertically on the horizontal projection of that surface.” from a section labeled Roof Loads (1607.14) to a section with the more general label of Uniform Live Loads (1607.3). Section 1607.14 and the majority of the text within it was deleted, however this sentence needed to be kept, and as such it was moved. However, as S92-22 did not edit the sentence to specify **roof live loads**, it inadvertently expanded the scope of the provision from roof live loads to live loads in general. This proposal corrects the inadvertent change.

Refer to the highlighted portions of S92-22 shown in the graphic below.

S92-22

IBC: 1507.15, 1603.1.2, SECTION 1607, 1607.1, 1607.2, 1607.3, 1607.13, 1607.14.1, 1607.12, 1607.14, 1607.14.2, 1607.14.2.1, 1607.14.2.2, 1607.14.3, 1607.14.4, 1607.14.4.1, 1607.14.4.2, 1607.14.4.3, 1607.14.4.4, 1607.14.4.5, 1808.3, 3111.1, 3111.1.1, 3111.1.2

Proponents: Jennifer Goupil, representing Structural Engineering Institute of ASCE (jgoupil@asce.org)

2021 International Building Code

Revise as follows:

1507.15 Vegetative roofs and landscaped roofs. *Vegetative roofs* and landscaped roofs shall comply with the requirements of this chapter, Section ~~1607.14.2.2~~ 1607.13.2 and the *International Fire Code*.

1603.1.2 Roof live load. The *roof live load* used in the design shall be indicated for roof areas ~~(Section 1607.14)~~.

SECTION 1607
LIVE LOADS

1607.1 General. *Live loads* are those loads defined in Chapter 2 of this code.

1607.2 Loads not specified. For occupancies or uses not designated in Section 1607, the *live load* shall be determined in accordance with a method *approved* by the *building official*.

Revise as follows:

1607.3 Uniform live loads. The *live loads* used in the design of buildings and *other structures* shall be the maximum loads expected by the intended use or occupancy but shall not be less than the minimum uniformly distributed *live loads* given in Table 1607.1. *Live loads acting on a* sloping surface shall be assumed to act vertically on the horizontal projection of that surface.

~~1607.13~~ 1607.3.1 ~~Distribution of floor loads.~~ Partial loading of floors. Where uniform floor *live loads* are involved in the design of structural members arranged so as to create continuity, the minimum applied loads shall be the full *dead loads* on all spans in combination with the floor *live loads* on spans selected to produce the greatest *load effect* at each location under consideration. ~~Floor~~ Uniform floor *live loads* applied to selected spans are permitted to be reduced in accordance with Section 1607.12 .

~~1607.14.1~~ 1607.3.2 ~~Distribution of roof loads~~ Partial loading of roofs. Where uniform roof *live loads* are reduced to less than 20 psf (0.96 kN/m^2) in accordance with Section ~~1607.14.2.1~~ 1607.13.1 and are applied to the design of structural members arranged so as to create continuity, the reduced roof *live load* shall be applied to adjacent spans or to alternate spans, whichever produces the most unfavorable *load effect*. ~~See Section 1607.14.2 for reductions in minimum roof *live loads* and Section 7.5 of ASCE 7 for partial snow loading.~~

1607.12 Reduction in uniform live loads. Except for uniform *live loads* at roofs, all other minimum uniformly distributed *live loads*, L_o, in Table 1607.1 are permitted to be reduced in accordance with Section 1607.12.1 or 1607.12.2. Uniform *live loads* at roofs are permitted to be reduced in accordance with Section ~~1607.14.2~~ 1607.13.

~~**1607.14 Roof loads.** The structural supports of roofs and *marquees* shall be designed to resist wind and, where applicable, snow and earthquake *loads*, in addition to the *dead load* of construction and the appropriate *live loads* as prescribed in this section, or as set forth in Table 1607.1. The *live loads* acting on a sloping surface shall be assumed to act vertically on the horizontal projection of that surface.~~

- **SlopingSurfaceBackground_S92-22.pdf**
  https://www.cdpaccess.com/proposal/11329/35245/documentation/181953/attachments/download/9206/

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

The clarification is not expected to impact the cost of construction. See reason statement.

S73-25

IBC: 1607.8, 1607.8.1, 1607.8.2, 1607.8.3

Proponents: Jennifer Goupil, American Society of Civil Engineers and Structural Engineering Institute, representing American Society of Civil Engineers (jgoupil@asce.org)

2024 International Building Code

Revise as follows:

1607.8 Heavy vehicle loads. Floors and other surfaces that are intended to support ~~vehicle *loads*~~ vehicles with a gross vehicle weight rating greater than ~~a~~ 10,000-pounds (4536 kg) ~~gross vehicle weight rating~~ shall comply with Sections 1607.8.1 through 1607.8.5.

1607.8.1 Loads. Where a ~~any~~ *structure* does not restrict access for vehicles that exceed a 10,000-pound (4536 kg) gross vehicle weight rating, those portions of the *structure* subject to such ~~*loads*~~ vehicles shall be designed using the vehicular *live loads*, including consideration of impact and fatigue, in accordance with the codes and specifications required by the *jurisdiction* having authority for the design and construction of the roadways and bridges in the same location of the *structure*.

1607.8.2 Fire truck and emergency vehicles. Where a *structure* or portions of a *structure* are accessed by fire department vehicles and other ~~similar~~ emergency vehicles, those portions of the *structure* subject to such *loads* shall be designed for the greater of the following *loads*:

1. The actual operational *loads*, including outrigger reactions and contact areas of the vehicles as stipulated and *approved* by the *building official*.
2. The live loading specified in Section 1607.8.1.

Emergency vehicle *loads* need not be assumed to act concurrently with other uniform *live loads*.

1607.8.3 Heavy vehicle garages. Garages and portions of a building used for ~~designed to accommodate~~ vehicles ~~that exceed a~~ with a gross vehicle weight rating greater than 10,000-pounds (4536 kg) ~~gross vehicle weight rating,~~ shall be designed using the live loading specified by Section 1607.8.1; ~~. For garages the design~~ however provisions for impact and fatigue ~~is~~ are not required.

Exception: The vehicular *live loads* and *load* placement are allowed to be determined using the actual vehicle weights for the vehicles allowed onto the garage floors, provided that such *loads* and placement are based on rational engineering principles and are *approved* by the *building official*, but shall be not less than 50 psf (2.39 kN/m^2). This *live load* shall not be reduced.

Reason: The proposal makes changes to Section 1607.8 and the associated sub-sections.

1) The use of the term Gross Vehicle Weight Rating (GVWR) is revised. GVWR is not a load, it is vehicle rating. GVWR is the maximum weight a vehicle is designed for. It includes the self-weight of the vehicle (curb weight) and the weight of the passengers and cargo. The proposed wording more clearly distinguishes between vehicle weight ratings and loads.

2) Section 1607.8.3 is expanded to include “portions of a building” as there are buildings with limited heavy vehicle parking inside the footprint of the building that are not always called a garage space (loading docks, etc.). This change coordinates with the scope and phrasing used for passenger vehicle garages in IBC Section 1607.7 as well as the corresponding Truck & Bus section in ASCE 7-22.

3) The proposal changes the beginning of the first sentence of 1607.8.3 Heavy Vehicle Garages to use “used for” rather than “designed to accommodate” to be consistent with Section 1607.7 Passenger Vehicle Garages as well as the ASCE 7 section on Truck and Bus Garages.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

The changes made are for consistency between IBC sections and better use of existing terminology and are not expected to affect the cost of construction.

S74-25

IBC: 1607.9, TABLE 1607.9 (New), 1607.9.1, 1607.9.1.1, 1607.9.1.2

Proponents: Richard Green, representing Green Facades PLLC (richard@greenfacadesllc.com); R. Scott Douglas, Douglas Engineering, representing Structural Engineers Association of Washington (sdouglasscott@gmail.com)

2024 International Building Code

Revise as follows:

1607.9 Loads on handrails, guards, grab bars and seats. *Handrails* and *guards* shall be designed and constructed for the structural loading conditions set forth in Section 1607.9.1. Grab bars, shower seats and *accessible* benches shall be designed and constructed for the structural loading conditions set forth in Section 1607.9.2. Glass *handrail* assemblies and guards shall also comply with Section 2407.

Add new text as follows:

TABLE 1607.9 LIVE LOAD TO HANDRAILS AND GUARDS

Handrail and Guard Design Category	Occupancy	Use examples	Handrail, top rail and guards		Components
			Concentrated Load (Pounds)	Uniform Load (plf)	Concentrated Load (Pounds)
A Limited access	Areas with limited or controlled access	Group I-3, F, H and S occupancies, for areas that are not accessible to the general public and have an occupancy load less than 50	200	20	50
B Basic	Areas not subject to assembly or overcrowding	Areas and occupancies not in Categories A, C or D.	200	50	50
C Assembly	Areas where assembly and congregation may be anticipated and are not subject to over-crowding	Occupancies A-1, A-2, A-3, A-4, and public assembly areas including areas of banks/credit unions, shopping malls, restaurants, bars, theatres, cinemas, night clubs etc. (See also D for areas where over-crowding is reasonably anticipated); and assembly egress paths less than 9ft wide adjacent to sunken areas.	200	100	100
D Crowd	Areas susceptible to over-crowding.	All A-5 occupancy areas including, Amusement park structures, Bleachers, Grandstands, and Stadiums; and the following where subject to over-crowding is reasonably anticipated: Theaters, cinemas, night clubs, bars, auditoria, assembly areas, schools, universities, studios, shopping malls (see also C); and assembly egress paths exceeding 9ft width (perpendicular to the direction of handrail or guard) adjacent to sunken areas.	300	200	100

Revise as follows:

1607.9.1 Concentrated load. *Handrails* and *guards* shall be designed to resist ~~a concentrated *load* of 200 pounds (0.89 kN) in accordance with Section 4.5.1 of ASCE 7. Glass *handrail* assemblies and guards shall comply with Section 2407.~~ the maximum loads expected by the intended use or occupancy but shall not be less than the minimum concentrated *live loads* given in Table 1607.9. This load need not be assumed to act concurrently with the uniform load specified in Sections 1607.9.1.1 and guard component load in Section 1607.9.1.2.

1607.9.1.1 Uniform load. *Handrails* and *guards* shall be designed to resist the maximum loads expected by the intended use or occupancy but shall not be less than the minimum uniformly distributed *live loads* given in Table 1607.9.~~a linear *load* of 50 pounds per linear foot (plf) (0.73 kN/m) in accordance with Section 4.5.1.1 of ASCE 7.~~ This load need not be assumed to act concurrently with the concentrated load specified in Sections 1607.9.1.1 or the guard component load specified in 1607.9.1.2.

Exceptions:

1. For one- and two-family *dwellings*, only the single concentrated *load* required by Section 1607.9.1 shall be applied.

~~2. In Group I-3, F, H and S occupancies, for areas that are not accessible to the general public and that have an *occupant load* less than 50, the minimum *load* shall be 20 pounds per foot (0.29 kN/m).~~

2 ~~3.~~ For roofs not intended for occupancy, only the single concentrated load required by Section 1607.9.1 shall be applied.

1607.9.1.2 Guard component loads. Balusters, panel fillers and guard infill components, including all rails except the *handrail, post* and the top rail, shall be designed to resist ~~a concentrated load of 50 pounds (0.22 kN) in accordance with Section 4.5.1.2 of ASCE 7.~~ the maximum loads expected by the intended use or occupancy but shall not be less than the component concentrated *live loads* given in Table 1607.9. This load need not be assumed to act concurrently with the concentrated load specified in Sections 1607.9.1 or uniform load specified in Section 1607.9.1.1.

Reason: 1607.9: Reference to 2407 for glass rails is moved up a level from 1607.9.1 because it applies to all load types, not just concentrated load. (Glass handrails and components are also used in occupancies that require uniform load.) The word "also" was added because 2407 does not replace these load requirements, it has additional requirements.

1607.9.1:Prior to 1985, guard loading criteria were consistent between the US and other international codes with uniform lateral loads of ~50lbf/ft (~0.75 kN/m). However, following a number of stadium and crowd disasters with multiple fatalities, guard design load for areas of public assembly was researched. This research included post-failure analysis and full-scale human testing, and concluded that loads on guards in areas of public assembly should be increased.

This recommendation for increased guard loading in areas of public assembly was widely adopted and is part of the following international standards and codes:

- National Building Code of Canada (for grandstands and stadiums),
- Eurocode EN 1991-1,
- Australian and New Zealand Standards AS 1170.1,
- British Standard BS6399 ,
- Brazilian Standard ABNT NBR 6120
- Indian Standard IS 875 pt 2
- etc.

Research has also been undertaken in 'crowd crush' and the resulting loads. Barrier collapse is a known cause of crowd collapse. The work of Prof G. Keith Still is available at Crowdrisks.com.

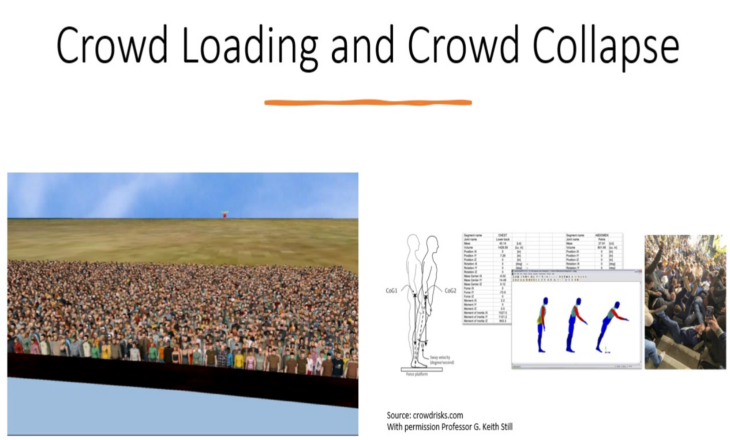


Figure 1: source https://www.crowdrisks.com/research.html

Behaviour and Mechanics of Crowd Crush Disasters - RISK FRONTIERS

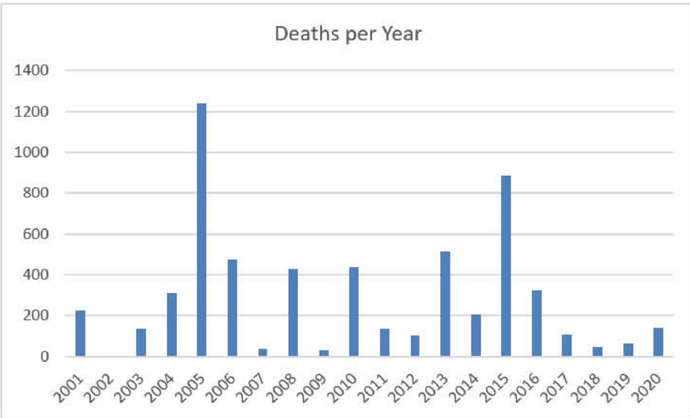


Figure 2. Crowd crush deaths per year from Wikipedia (2021) catalogue

Figure 2: source https://riskfrontiers.com/insights/behaviour-and-mechanics-of-crowd-crush-disasters/

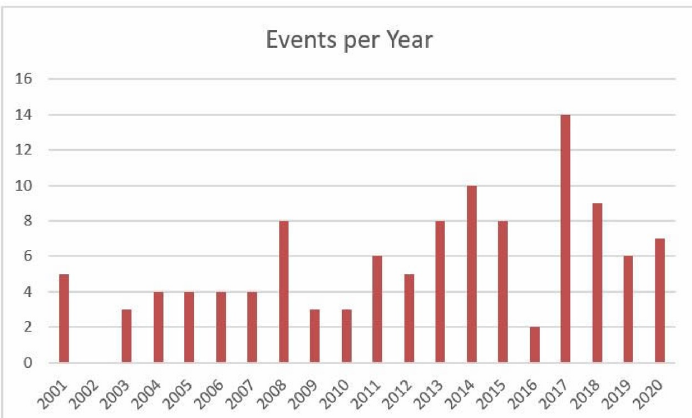


Figure 3. Crowd crush events per year from Wikipedia (2021) catalogue

Figure 3: source https://riskfrontiers.com/insights/behaviour-and-mechanics-of-crowd-crush-disasters/

Loads to guards have been validated by full-scale testing in the following study (by Styan, Masia and Kleeman 2007, Australian Journal of Structural Engineering.)

Are the Loads Valid?

Full-scale testing by Styan, Masia and Kleeman

- **Single Person**
- Design loads
  - **0.6 (AS/NZS)**
  - 0.75 (EN non assembly)
  - 0.89 kN (ASCE)

Table 1: Summary of maximum values attained for individual tests – single rail barrier.

Subject No.	Mass (kg)	Peak values atttained (N)							
		A1	B1	C1	D1	E1	F1	G1	H1
1	71	623	1090	313	222	604	–	590	378
2	72	553	790	170	300	339	–	410	487
3	72	358	712	196	170	429	–	390	436
4	75	706	860	287	248	300	–	604	500
5	76	693	1025	481	339	623	–	751	584
6	84	429	667	196	118	345	–	765	718
7	96	783	886	326	294	417	–	590	693
8	97	559	725	468	449	351	2450	707	770
9	106	539	999	287	157	332	–	840	527
10	107	*1032*	*1411*	*384*	*378*	*313*	–	*1102*	*1298*
11	109	436	718	209	300	293	–	507	410
	Average	610	898	302	270	395	2450	660	618
	Maximum	**1032**	**1411**	**481**	**449**	**623**	**2450**	**1102**	**1298**

Source: Styan, C.T., Masia, M.J., Kleeman, P.W., (2007) **Human Loadings on Handrails**, Australian Journal of Structural Engineering

Figure 5: Typical subject configuration for individual test: (a) A1, (b) B1 and (c) C1.

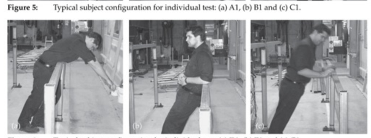


Figure 6: Typical subject configuration for individual test: (a) D1, (b) E1 and (c) G1.

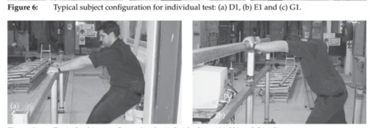


Figure 7: Typical subject configuration for individual test: (a) H1 and (b) A2.

Note: 200 lbf = 890N

Figure 4 - Single Person Loading

Are the Loads Valid?

- Full-scale testing
- **Line Loading - Single row**
- Design Load
  - 1500 N/m (AS/NZS, EN)
  - ~750 N/m (50 lbf/ft) (ASCE)

Table 2: Summary of maximum values attained for single row group tests – single rail barrier.

Description		Test value (N/m) 1	2	3	4	Average (N/m)	Maximum (N/m)
A1	Push	1476	1398	1453	1453	1445	1476
C1b	Lean sideways with push	650	862	812	–	775	862
A1	Push	1287	1328	1259	–	1291	1328
A1	Push	1266	1210	1301	–	1259	1301
C1a	Lean sideways	387	436	472	–	432	472
C1b	Lean sideways with push	726	797	790	–	771	797
D1	Lean forwards	428	578	428	–	478	578
E1a	Lean backwards	435	443	727	–	535	727
E1b	Lean backwards with push	1129	1213	1338	–	1227	1338
H1	Pull	1716	1210	1175	–	1367	1716

Source: Styan, C.T., Masia, M.J., Kleeman, P.W., (2007) **Human Loadings on Handrails**, Australian Journal of Structural Engineering

Figure 8: Typical subject configuration for group test C1.

Figure 5: Single Row Loading

Are the Loads Valid?

- Full-scale testing
- **Line Loading – Multiple rows of people**
- Design Load
  - 3000 N/m (AS/NZS, EN)
  - ~750 N/m (50 lbf/ft) (ASCE)

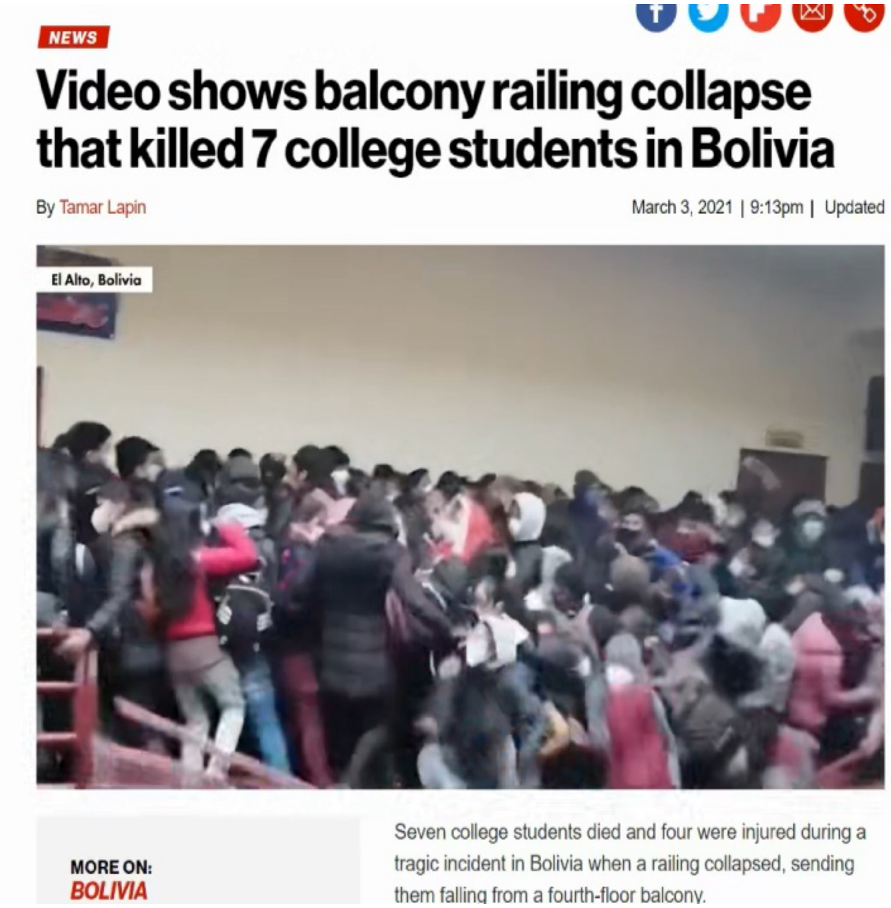
Table 4: Summary of maximum values attained for multiple row group test A1.

Description	Test value (N/m) 1	2	3	4	Average (N/m)	Maximum (N/m)
1 Deep – 72 kg average	1265	1279	1286	–	1277	1286
1 Deep – 78 kg average	1429	1268	1212	–	1303	1429
1 Deep – 85 kg average	1323	1426	1399	–	1383	1426
2 Deep – 100 & 78 kg	2121	2052	1914	1849	1984	2121
2 Deep – 78 & 72 kg	1914	1887	1883	–	1895	1914
3 Deep – 100, 78 & 85 kg	2342	2657	2379	–	2459	2657
4 Deep – 100, 85, 78 & 72 kg	2244	2430	–	–	2337	2430

Source: Styan, C.T., Masia, M.J., Kleeman, P.W., (2007) **Human Loadings on Handrails**, Australian Journal of Structural Engineering

Figure 9: Typical subject configuration for multiple row group test for (a) two deep and (b) three deep.

Figure 6: Crowd Loading - Multiple rows


NEWS

Video shows balcony railing collapse that killed 7 college students in Bolivia

By Tamar Lapin

March 3, 2021 | 9:13pm | Updated

El Alto, Bolivia

MORE ON: BOLIVIA

Seven college students died and four were injured during a tragic incident in Bolivia when a railing collapsed, sending them falling from a fourth-floor balcony.

Figure 7: Fatal railing collapse at university https://nypost.com/2021/03/03/video-shows-balcony-railing-collapse-that-killed-7-bolivian-students/

In crowd collapse, the push of the crowd behind the row at the handrail results in multiple people loading the guard rail, resulting in over-loading the guard. Then multiple people are pushed over the failed guard.

Design loading for balustrades in this jurisdiction is 1 kN/m = ~70lbf/ft or ***33% greater** t**han currently in IBC***. Research predicts design loads 3kN/m which is 3x the regional design load for this circumstance (4x the current IBC design load) and when the loading occurred the guard failed.**It appears evident that crowd loading on guards is greater than typical residential and office loading, thus justifying additional categories specifying greater design loads.**

Figure 8: FedEx Field Barrier Collapse 2022

Railing collapse at Lists of fatalities do not include other serious injuries, such as broken necks, which can occur, such as at the Army-Navy game at Veterans Stadium in 1998. (Styan, et.al 2007)

The changes and research that began in England following Hillsborough Disaster in 1989, where 96 people died and many more injured following the collapse of a crowd control barrier. Post-failure analysis reported by RA Smith in "Engineering Failure Analysis", found failure of the system under extreme crowding to be at
8kN/m (550 lbf/ft), so the proposed design load of 200 lbf/ft is not extreme and is reasonable. EN 1991-1 suggests a range of 3-5 kN/m (~200-340kN/m)

Figure 8: Hillsborough Braced railing collapse (Smith Report 1994)
IBC is not just used in the United States, and these failures do not just happen in 'other jurisdictions'.

THE UNIVERSITY OF TENNESSEE KNOXVILLE

Journal of Applied Sport Management

Volume 15
Issue 4 *Sport Facilities Planning, Design, Operation, and Management Trends* Article 5

History of Railing Dangers

From 1969 to 2011, there were 22 fall-related fatalities at major league ballparks (Gorman & Weeks, 2015); Dunne et al. (2019) identified 20 incidents and 12 deaths between 1981 and 2017. More specifically, Steinbach (2009) highlighted three deaths and eight serious injuries associated with railing-related incidents from 2000 to 2009. The injuries primarily involved men in their early 20s, but some people who were injured in these incidents were those on a level below who had no warning someone might fall on them. Incidents included five falls at professional baseball games, one each at college and professional football games, one at a professional hockey game, as well as during two concerts staged at sports venues (Steinbach, 2009).

Parting Thoughts – Smith Report

Lord Justice Taylor [5] drew attention to the fact that prior to his report there had been eight official reports covering crowd safety and control at football grounds. These include the Shorth Report of 1924 (following disorder at the 1923 Cup Final), the Moelwyn Hughes Report of 1946 (following 33 deaths at Bolton Wanderers' ground), Lord Wheatley's Report of 1972 (66 deaths at Ibrox) and the Popplewell Report of 1986 (after a fire caused 56 deaths at the Bradford City ground). Taylor drew attention to the fact that 'previous reports went unheeded' and management complacency caused the attitude 'it couldn't happen here'. Certainly, after the initial reactions of horror after a disaster have subsided, there is a tendency to forget the lessons which should have been learned.

The proposed changes for assembly and crowd guard loading reflect international common practice based on a clear need and well researched science of human loading for specific occupancies that include assembly and areas with a potential for over-crowding.

- **Appendices - International Balustrade Loading-sml.pdf**
  https://www.cdpaccess.com/proposal/11759/35934/documentation/186794/attachments/download/9100/
- **Balustrade Pages from Structure August2024.pdf**
  https://www.cdpaccess.com/proposal/11759/35934/documentation/186794/attachments/download/9099/
- **Crowd Risks - Research Projects-sml.pdf**
  https://www.cdpaccess.com/proposal/11759/35934/documentation/186794/attachments/download/9096/

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National Building Code of Canada, 2015

NB 1225002-1 Norma Boliviana - Actions on Structures - Part 1(translated)

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Rogers Arena collapse June 2023: https://globalnews.ca/video/9761158/railing-collapse-at-ufc-289-caught-on-video; https://www.youtube.com/watch?v=_tg0_23SgkI

"Off the Rails" National Center for Spectator Sports Safety and Security- Dr Gil Fried, Dr Aneurin Grant Dr Salih Kocak: https://ncs4.usm.edu/research/research-seminar-series/#popup-2

El Alto University balustrade collapse:

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https://metro.co.uk/2021/03/03/seven-students-dead-and-five-injured-after-university-railing-collapses-14182288/

Cost Impact: Increase

Estimated Immediate Cost Impact:

For typical use categories without assembly or over-crowding there is no cost impact and the changes are editorial in nature to account for assembly categories.

In major cities, the total cost of guard railing is approximately $550 per linear foot, being approximately 15% materials ($82.50), 30% fabrication ($165) and 45% site installation ($247.50).

For Category C, areas subject to assembly +3%

For Category D, areas subject to overcrowding +8%

Estimated Immediate Cost Impact Justification (methodology and variables):

Basis of Design - Steel balustrade post

Current load = 50 lbf/ft

$w := 50 \, \frac{lbf}{ft}$ Uniform Load to Guard/Handrail

$s := 5 \, ft$ Spacing of posts

$h := 42 \, in$ Height of posts

$M := w \cdot s \cdot h = 10.5 \, kip \cdot in$ Base moment

$M_u := M \cdot 1.5 = 15.75 \, kip \cdot in$ Ultimate Design Moment (Required)

$F_y := 36 \, ksi$ Yield Strength - Assuming a steel post

$b := 0.75 \, in$ $d := 1.625 \, in$ Assumed post size

$S_x := b \cdot \frac{d^2}{6} = 0.33 \, in^3$

$\phi_b M_n := 0.9 \cdot 1.6 \cdot F_y \cdot S_x = 17.111 \, kip \cdot in$ Capacity greater than demand OK

Category C, areas subject to assembly Assembly load = 100lbf/ft

$w := 100 \, \frac{lbf}{ft}$ Uniform Load to Guard/Handrail

$s := 5 \, ft$ Spacing of posts

$h := 42 \, in$ Height of posts

$M := w \cdot s \cdot h = 21 \, kip \cdot in$ Base moment

$M_u := M \cdot 1.5 = 31.5 \, kip \cdot in$ Ultimate Design Moment (Required)

$F_y := 36 \, ksi$ Yield Strength - Assuming a steel post

$b := 0.75 \, in$ $d := 2.25 \, in$ Assumed post size

$S_x := b \cdot \frac{d^2}{6} = 0.633 \, in^3$

$\phi_b M_n := 0.9 \cdot 1.6 \cdot F_y \cdot S_x = 32.805 \, kip \cdot in$ Capacity greater than demand OK

Material ratio relative to 50 lbf/ft $\frac{b \cdot d}{0.75 \, in \cdot 1.625 \, in} = 1.385$

Assume top rail and anchors increases by a similar proportion while infill elements remain unchanged.

Post, top rail and anchors as portion of materials 50%
(Post at 5ft on center, infill at 4in on center.)

Materials cost $82.50 \cdot 0.5 \cdot 1.385 + 82.50 \cdot 0.5 \cdot 1.0 = 98.381$

Materials increase $98.381 - 82.50 = 15.881$

Site Labor assumed to be similar and fabrication assumed to be similar

$New\_Cost := 550 + 15.88 = 565.88$

$Increase := \frac{New\_Cost}{550} = 1.029$ approx 3% increase.

Material

Category D, areas subject to assembly Crowd load = 200lbf/ft

$w := 200 \frac{lbf}{ft}$	Uniform Load to Guard/Handrail
$s := 5\ ft$	Spacing of posts
$h := 42\ in$	Height of posts
$M := w \cdot s \cdot h = 42\ kip \cdot in$	Base moment
$M_u := M \cdot 1.5 = 63\ kip \cdot in$	Ultimate Design Moment (Required)
$F_y := 36\ ksi$	Yield Strength - Assuming a steel post
$b := 0.75\ in \quad d := 3.25\ in$	Assumed post size
$S_x := b \cdot \frac{d^2}{6} = 1.32\ in^3$	
$\phi_b M_n := 0.9 \cdot 1.6 \cdot F_y \cdot S_x = 68.445\ kip \cdot in$	Capacity greater than demand OK
Material ratio relative to 50 lbf/ft	$\frac{b \cdot d}{0.75\ in \cdot 1.625\ in} = 2$

Assume top rail and anchors increases by a similar proportion while infill elements remain unchanged.

Post, top rail and anchors as portion of materials 50%
(Post at 5ft on center, infill at 4in on center.)

Materials cost $82.50 \cdot 0.5 \cdot 2.0 + 82.50 \cdot 0.5 \cdot 1.0 = 123.75$

Materials increase $123.75 - 82.50 = 41.25$

Site Labor assumed to be similar and fabrication assumed to be similar

$$New\_Cost := 550 + 41.25 = 591.25$$

$$Increase := \frac{New\_Cost}{550} = 1.075$$ approx 8% increase.

Estimated Life Cycle Cost Impact:

Maintenance is unchanged.

For typical use categories without assembly or over-crowding there is no cost impact and the changes are editorial in nature to account for assembly categories.

For Category C, areas subject to assembly +3%

For Category D, areas subject to overcrowding +8%

Estimated Life Cycle Cost Impact Justification (methodology and variables):

The changes are consistent with changes made in Canada (crowd loading) and Europe, Britain, Australasia, Brazil, India and many other parts of the world (assembly and crowd loading.) In each case code boards, with similar cost objectives ("one added dollar of cost is one less person that can afford a home") found that the type of applications that this applies to do not affect typical construction and that the loadings are based on significant research into actual loads and were found to be necessary by many events resulting in multiple deaths and injuries.

Injury events result in extensive cost to the facility operator (often hundreds of thousands of dollars or millions of dollars per event.) Insurance costs affect the entire community. Injuries to the victims may be permanent.

Codes should provide realistic loads based on best knowledge to facilitate appropriate design and prevent catastrophic collapse.

Staff Analysis: CC # S76-25/CC #S77-25, CC S80-25 and CC # S74-25 addresses requirements in a different or contradicting manner.

The committee is urged to make their intensions clear with their actions on these proposals.

S74-25

S75-25

IBC: 1607.9, 1607.9.1

Proponents: John Grenier, representing National Council of Structural Engineers Associations (NCSEA) (jgrenier@greniereng.com); Emily Guglielmo, representing NCSEA (eguglielmo@martinmartin.com)

2024 International Building Code

Revise as follows:

1607.9 Loads on handrails, guards, grab bars and seats. *Handrails* and *guards* shall be designed and constructed for the structural loading conditions set forth in Section 1607.9.1. Glass handrail assemblies and guards shall comply with Section 2407. Grab bars, shower seats and *accessible* benches shall be designed and constructed for the structural loading conditions set forth in Section 1607.9.2.

1607.9.1 Concentrated load. *Handrails* and *guards* shall be designed to resist a concentrated *load* of 200 pounds (0.89 kN) in accordance with Section 4.5.1 of ASCE 7. ~~Glass *handrail* assemblies and guards shall comply with Section 2407.~~

Reason: This proposal is editorial in nature. The proposal is relocating the pointer to glass assemblies from 1607.9.1 to section 1607.9. Having the pointer in the section only for the concentrated load may give the false impression that the glass assemblies do not need to also comply with the uniform load in section 1607.9.2.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

The cost of construction will not be impacted. The proposal is to clarify the existing provisions.

S75-25

S76-25

IBC: 1607.9.1.1

Proponents: Jennifer Goupil, American Society of Civil Engineers and Structural Engineering Institute, representing American Society of Civil Engineers (jgoupil@asce.org)

2024 International Building Code

Revise as follows:

1607.9.1.1 Uniform load. *Handrails* and *guards* shall be designed to resist a linear *load* of 50 pounds per linear foot (plf) (0.73 kN/m) in accordance with Section 4.5.1.1 of ASCE 7. This load need not be assumed to act concurrently with the concentrated load specified in Section 1607.9.1.

Exceptions: The uniform load need not be considered for the following occupancies:

1. ~~For one~~ One- and two-family *dwellings*~~, only the single concentrated *load* required by Section 1607.9.1 shall be applied~~.
2. In Group I-3, F, H and S occupancies, for areas that are not accessible to the general public and that have an *occupant load* less than 50~~, the minimum *load* shall be 20 pounds per foot (0.29 kN/m)~~.
3. ~~For roofs~~ Roofs not intended for occupancy ~~, only the single concentrated load required by Section 1607.9.1 shall be applied~~.

Reason: This proposal is a coordination proposal to bring the 2027 IBC up to date with the provisions of the 2022 edition of ASCE/SEI 7 *Minimum Design Loads and Associated Criteria for Buildings and Other Structures* (ASCE/SEI 7-22). This change improves the coordination between the IBC and ASCE 7 by reducing the uniform load required by Exception 2 from 20 plf to zero to match the requirements of ASCE 7.

Removing the 20 plf load for guards and handrails in the limited occupant areas of Exception 2 means that only the 200 lb concentrated load applies to these guards and handrails. A uniform load on guards and handrails represents a load due to a group of people acting in unison, which is not expected in Group I-3, F, H and S occupancies with limited occupant loads.

Additionally, the concentrated load is deemed sufficient for guard and handrail designs in these occupancies as:

* Per the current exception (w/ the 20 plf load), the guard post design is controlled by the 200 lb load up to a post spacing of 10 feet. Guard post spacings of greater than 10 feet are not common. The horizontal rails strength demands are a function of the length squared ($M - wl^2/8$) and post spacings of 4 to 8 feet are typical in part due to the increased strength/member size required for horizontal rails with longer spans.

In researching this proposal, it was found that the 20 plf load for I-3, F, H, and S uses has been in the IBC since the inaugural 2000 edition. However, none of the three legacy codes contained this specific exception. As such the IBC rationale for requiring 20 plf for I-3, F, H, and S uses but allowing a zero uniform load for dwellings is not known. The limited occupant load and the factory/industrial use of the areas both support not requiring any uniform load resulting from a group of people acting in unison.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

There is a small potential for this change to decrease the cost of construction due to reducing the load in Exception 2, however as noted above the concentrated load, not the uniform load, likely control the design of the majority of guards and handrails using this exception.

Staff Analysis: CC # S76-25 and CC # S74-25 addresses requirements in a different or contradicting manner. The committee is urged to make their intensions clear with their actions on these proposals.

S76-25

S77-25

IBC: 1607.9.1.1

Proponents: Jennifer Goupil, American Society of Civil Engineers and Structural Engineering Institute, representing American Society of Civil Engineers (jgoupil@asce.org)

2024 International Building Code

Revise as follows:

1607.9.1.1 Uniform load. *Handrails* and *guards* shall be designed to resist a linear *load* of 50 pounds per linear foot (plf) (0.73 kN/m) in accordance with Section 4.5.1.1 of ASCE 7. This load need not be assumed to act concurrently with the concentrated load specified in Section 1607.9.1.

Exceptions:

1. For one- and two-family *dwellings*, only the single concentrated *load* required by Section 1607.9.1 shall be applied.
2. In Group I-3, F, H and S occupancies, for areas that are not accessible to the general public and that have an *occupant load* ~~less than~~ of 50 or less, the minimum *load* shall be 20 pounds per foot (0.29 kN/m).
3. For roofs not intended for occupancy, only the single concentrated load required by Section 1607.9.1 shall be applied.

Reason: This proposal is a coordination proposal to bring the 2027 IBC up to date with the provisions of the 2022 edition of ASCE/SEI 7 *Minimum Design Loads and Associated Criteria for Buildings and Other Structures* (ASCE/SEI 7-22). These changes improve the coordination between the IBC and ASCE 7 by adding text in the IBC that appears in the corresponding section in ASCE 7.

This change improves the coordination between the IBC and ASCE 7 by changing the allowable occupant load from 49 to 50 which matches the occupant load permitted by ASCE 7.In researching the reason for the difference between the IBC and ASCE 7, it was noticed that the 2000 and 2003 editions of the IBC permitted an occupant load of 50, see the 2003 IBC text shown below (the text was "have an occupant load no greater than 50"). In the 2006 edition of the IBC the text was changed such that the permitted occupant load was reduced to 49 (changed to "have an occupant load less than 50"). However there is no margin marking in the 2006 edition to indicate a code change and a review of the code development archives did not find a code change proposal containing this change. In discussing the change to this section in the 2006 edition with ICC staff, it appears that the text was changed as part of an editorial effort by staff to remove the phrase “no greater than”. However the change inadvertently changed the meaning.

2003 IBC

1607.7.1 Handrails and guards. Handrail assemblies and guards shall be designed to resist a load of 50 plf (0.73 kN/m) applied in any direction at the top and to transfer this load through the supports to the structure.

Exceptions:

1. For one- and two-family dwellings, only the single, concentrated load required by Section 1607.7.1.1 shall be applied.
2. In Group I-3, F, H and S occupancies, for areas that are not accessible to the general public and that have an occupant load no greater than 50, the minimum load shall be 20 pounds per foot (0.29 kN/m).

1607.7.1.1 Concentrated load. Handrail assemblies and guards shall be able to resist a single concentrated load of 200 pounds (0.89 kN), applied in any direction at any point along the top, and have attachment devices and supporting structure to transfer this loading to appropriate structural elements of the building. This load need not be assumed to act concurrently with the loads specified in the preceding paragraph.

1607.7.1.2 Components. Intermediate rails (all those except the handrail), balusters and panel fillers shall be designed to withstand a horizontally applied normal load of 50 pounds (0.22 kN) on an area equal to 1 square foot (0.093m^2), including openings and space between rails. Reactions due to this loading are not required to be superimposed with those of Section 1607.7.1 or 1607.7.1.1.

1607.7.1.3 Stress increase. Where handrails and guards are designed in accordance with the provisions for allowable stress design (working stress design) exclusively for the loads specified in Section 1607.7.1, the allowable stress for the members and their attachments are permitted to be increased by one-third.

1607.7.2 Grab bars, shower seats and dressing room bench seats. Grab bars, shower seats and dressing room bench seat systems shall be designed to resist a single concentrated load of 250 pounds (1.11 kN) applied in any direction at any point.

1607.7.3 Vehicle barriers. Vehicle barrier systems for passenger cars shall be designed to resist a single load of 6,000 pounds (26.70 kN) applied horizontally in any direction to

2003 INTERNATIONAL BUILDING CODE®

- **2006IBC-1607.pdf**
  https://www.cdpaccess.com/proposal/11230/34960/documentation/179953/attachments/download/8695/

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

The slight increase in permitted occupant load, from 49 to 50, is not expected to affect most designs.

Staff Analysis: CC # S77-25 and CC # S74-25 addresses requirements in a different or contradicting manner. The committee is urged to make their intensions clear with their actions on these proposals.

S77-25

S78-25

IBC: 1607.9, 1607.9.1, 1607.9.1.1, 1607.9.1.2

Proponents: David Cooper, Stair Manufacturing and Design Consultants, representing Stairbuilders and Manufacturers Association (coderep@stairways.org)

2024 International Building Code

1607.9 Loads on handrails, guards, grab bars and seats. *Handrails* and *guards* shall be designed and constructed for the structural loading conditions set forth in Section 1607.9.1. Grab bars, shower seats and *accessible* benches shall be designed and constructed for the structural loading conditions set forth in Section 1607.9.2.

Revise as follows:

1607.9.1 Concentrated load. *Handrails* and *guards* shall be designed to resist a concentrated *load* of 200 pounds (0.89 kN) in accordance with Section 4.5.1 of ASCE 7. Glass *handrail* assemblies and guards shall comply with Section 2407.

Exception: For one- and two-family dwellings and within dwelling units, where the top of a guard system is not required to serve as a handrail, the single concentrated load shall be applied at any point along the top, in the vertical downward direction and in the horizontal direction away from the walking surface. Where the top of a guard is also serving as the handrail, a single concentrated load shall be applied in any direction at any point along the top. Concentrated loads shall not be applied concurrently.

1607.9.1.1 Uniform load. *Handrails* and *guards* shall be designed to resist a linear *load* of 50 pounds per linear foot (plf) (0.73 kN/m) in accordance with Section 4.5.1.1 of ASCE 7. This load need not be assumed to act concurrently with the concentrated load specified in Section 1607.9.1.

Exceptions:

1. For one- and two-family *dwellings*, only the single concentrated *load* required by Section 1607.9.1 shall be applied.
2. In Group I-3, F, H and S occupancies, for areas that are not accessible to the general public and that have an *occupant load* less than 50, the minimum *load* shall be 20 pounds per foot (0.29 kN/m).
3. For roofs not intended for occupancy, only the single concentrated load required by Section 1607.9.1 shall be applied.

1607.9.1.2 Guard component loads. Balusters, panel fillers and guard infill components, including all rails except the *handrail* and the top rail, shall be designed to resist a concentrated load of 50 pounds (0.22 kN) in accordance with Section 4.5.1.2 of ASCE 7.

Reason: This exception for residential dwelling units is verbatim from the IRC. It was added to the 2021 IRC and is proposed here to provide correlation between the IRC and IBC for certain residential applications and promote consistent interpretation and enforcement.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

This change will not increase the cost of construction and is a clarification in nature as the current requirement is not being enforced in the residential applications cited and will not affect a measurable decrease in the cost of construction

S78-25

S79-25

IBC: 1607.9, 1607.9.1, 1607.9.1.1, 1607.9.1.2

Proponents: David Cooper, Stair Manufacturing and Design Consultants, representing Stairbuilders and Manufacturers Association (coderep@stairways.org)

2024 International Building Code

1607.9 Loads on handrails, guards, grab bars and seats. *Handrails* and *guards* shall be designed and constructed for the structural loading conditions set forth in Section 1607.9.1. Grab bars, shower seats and *accessible* benches shall be designed and constructed for the structural loading conditions set forth in Section 1607.9.2.

1607.9.1 Concentrated load. *Handrails* and *guards* shall be designed to resist a concentrated *load* of 200 pounds (0.89 kN) in accordance with Section 4.5.1 of ASCE 7. Glass *handrail* assemblies and guards shall comply with Section 2407.

Revise as follows:

1607.9.1.1 Uniform load. *Handrails* and *guards* shall be designed to resist a linear *load* of 50 pounds per linear foot (plf) (0.73 kN/m) in accordance with Section 4.5.1.1 of ASCE 7. This load need not be assumed to act concurrently with the concentrated load specified in Section 1607.9.1.

Exceptions:

1. For one- and two-family *dwellings*, and within individual dwelling units in R2 and R3 occupancies only the single concentrated *load* required by Section 1607.9.1 shall be applied.
2. In Group I-3, F, H and S occupancies, for areas that are not accessible to the general public and that have an *occupant load* less than 50, the minimum *load* shall be 20 pounds per foot (0.29 kN/m).
3. For roofs not intended for occupancy, only the single concentrated load required by Section 1607.9.1 shall be applied.

1607.9.1.2 Guard component loads. Balusters, panel fillers and guard infill components, including all rails except the *handrail* and the top rail, shall be designed to resist a concentrated load of 50 pounds (0.22 kN) in accordance with Section 4.5.1.2 of ASCE 7.

Reason: Throughout the IBC the requirements for stairs and guards within R-2 and R-3 dwelling units have been justified as similar and in most cases are exactly the same as those in One- and Two-family dwellings. We believe that the load requirements should also change to reflect the considerable difference between these residential and public/commercial applications where large numbers of occupants prevail.

Cost Impact: Decrease

Estimated Immediate Cost Impact:

This will provide for a decrease in the cost of guard construction as the guards in question will not be required to resist the more stringent uniform 50 lb per linear foot point load. See cost impact justification below for $ amount.

Estimated Immediate Cost Impact Justification (methodology and variables):

A typical example of a residential 6foot long wood guard system comprised of commodity stair parts found in one and two family homes would be the most most economical and likely represent a minimum saving s of $300 in materials alone. Materials using 3 inch posts, 2.25 inch rail and 1,25 inch balusters for a 6 foot long guard would be ~$350. When compared to the same length guard with larger section components, e.g. increased post, rail and baluster sections to 3.5, 2.75, and 1.75 inches respectively to resist the 50 lb/ft load the cost is ~$650. This represents an minimal savings of $50/linear foot. This does not include any potential changes to the building structure which could represent additional savings.

S80-25

IBC: 1607.9, 1607.9.1, 1607.9.1.1, 1607.9.1.2, 1607.9.1.2.1 (New), 1607.9.1.2.2 (New)

Proponents: Thomas Zuzik Jr, Railingcodes.com, representing Feeney Inc. - Oakland, CA (https://feeneyinc.com) (coderep@railingcodes.com); Brad Adsit, representing Feeney, Inc. (badsit@feeneyinc.com)

2024 International Building Code

1607.9 Loads on handrails, guards, grab bars and seats. *Handrails* and *guards* shall be designed and constructed for the structural loading conditions set forth in Section 1607.9.1. Grab bars, shower seats and *accessible* benches shall be designed and constructed for the structural loading conditions set forth in Section 1607.9.2.

1607.9.1 Concentrated load. *Handrails* and *guards* shall be designed to resist a concentrated *load* of 200 pounds (0.89 kN) in accordance with Section 4.5.1 of ASCE 7. Glass *handrail* assemblies and guards shall comply with Section 2407.

1607.9.1.1 Uniform load. *Handrails* and *guards* shall be designed to resist a linear *load* of 50 pounds per linear foot (plf) (0.73 kN/m) in accordance with Section 4.5.1.1 of ASCE 7. This load need not be assumed to act concurrently with the concentrated load specified in Section 1607.9.1.

Exceptions:

1. For one- and two-family *dwellings*, only the single concentrated *load* required by Section 1607.9.1 shall be applied.
2. In Group I-3, F, H and S occupancies, for areas that are not accessible to the general public and that have an *occupant load* less than 50, the minimum *load* shall be 20 pounds per foot (0.29 kN/m).
3. For roofs not intended for occupancy, only the single concentrated load required by Section 1607.9.1 shall be applied.

Revise as follows:

1607.9.1.2 Guard infill component loads. All guard infill components except for the top rail and handrail shall meet the requirements in 1607.9.1.2.1 and 1607.9.1.2.2. These loads shall not be applied concurrently.~~Balusters, panel fillers and guard infill components, including all rails except the *handrail* and the top rail, shall be designed to resist a concentrated load of 50 pounds (0.22 kN) in accordance with Section 4.5.1.2 of ASCE 7.~~

Add new text as follows:

1607.9.1.2.1 Horizontally applied concentrated load. A horizontally applied concentrated load of 50 pounds (0.22 kN) designed in accordance with Section 4.5.1.2 of ASCE 7.

1607.9.1.2.2 Horizontally applied sphere penetration load. A horizontally applied concentrated load of 12 pounds (.0534kN) from a sphere shall not pass through the guard where openings greater than 1.25-inches (31.75 mm) exist in a guard's infill. The sphere shall have a diameter equal to the applicable infill opening limitation in Section 1015.4.

Attached Files

- **ICC Test Rail Pic S.png**
  https://www.cdpaccess.com/proposal/11752/35617/files/download/9261/
- **ICC Test Rail Pic C.png**
  https://www.cdpaccess.com/proposal/11752/35617/files/download/9260/
- **ICC Test Rail Pic A.png**
  https://www.cdpaccess.com/proposal/11752/35617/files/download/9259/

- **ICC Test Rail Pic B.png**
  https://www.cdpaccess.com/proposal/11752/35617/files/download/9258/

Reason: For over 30-years building officials, engineers, designers, contractors, manufactures and fabricators have been debating whether or not the sphere measurements delineated for guard opening limitations, currently in the 2024 IBC Section 1015.4 and prior editions, is simply a opening size measurement or is it an opening size measurement combined with a measured force load, citing "openings that allow passage". With a lack of language delineating no force load be applied, then the opposite is to define a specific infill penetration spread load in the model codes to cover this conflict with inspectors who routinely use many different non-codified techniques to determine if a guard meets a requirement that is not in the ICC-IBC model code.
This proposal is based on testing research done by the proponent to correlate a pound-force load on a sphere in relation to ASTM E935-00 "Test Method D - Application of horizontal static load to determine resistance to cone penetration by infill area of picket and panel railing systems", first published by ASTM in the designation: E 935 - 91 "Standard Test Methods for Performance of Permanent Metal Railing Systems and Rails for Buildings[1]", and then include this corelated cone load to a sphere load as a specific design load for infill spread for the model 2027 IBC. For those of you who are not familiar with this "Test Method" it was developed by the same group who also developed the method for testing the 1sqft area load test, published in one form or another, in every published model IBC since 2000, to the current 2024 in section "1607.9.1.2 Guard component loads", and pointing to ASCE 7 Section 4.5.1.2.

The information for this reason statement in the monograph is limited to the very basic's. For those parties interested in more detailed information on this proposal beyond the summary, we are publishing on going information though out the 2025 group "B" process at (https://railingcodes.com/infill/) to provide more up to date information and details, as this proposal progresses through the 2027 code cycle process.

ESTABLISHED ASTM TESTING METHOD HISTORY
The initial publication of ASTM E935 in 1983 included 2 test methods, "Test Method A - Horizontal Static Load Application" and "Test Method B - Vertical Static Load Application". Two additional test methods were then added to E935 in the 1991 publication of ASTM E935-91, which also includes the title changes to Test Methods A and B. In the 1991 publication, Test Method A was renamed "Application of Horizontal Static Load to Top Rail" and Test Method B was renamed "Application of Vertical Static Load to Top Rail", and the first of the 2 new test methods added in 1991 was "Test Method C - Application of Horizontal Static Load to Infill Areas of Picket and Panel Railing Systems", and the second was “Test Method D – Application of Horizontal Static Load to Determine Resistance to Cone Penetration by Infill Area of Baluster and Panel Railing Systems.”, Test Method D was specifically developed to be able to test the spread between infill elements in guard systems. ASTM E935-91 cites ASTM E985 "Specifications for Permanent Metal Railing Systems and Rails for Buildings" for the specific loads to be used for each test method in E935.
ASTM E935-00 was Reapproved in 2006 and

- is the latest edition which included the test method for guard infill deflection as; “Test Method D – Application of Horizontal Static Load to Determine Resistance to Cone Penetration by Infill Area of Baluster and Panel Railing Systems”.
- E935-00 also cites, as did the 1991 test method, to use
  - E985-00 for the load that will be applied for Test Method D, and
  - in section 7.1.8 "The minimum horizontal test load to be applied by a penetration cone to the infill area of a baluster or panel railing system (see Test Method D of Test Methods E935) shall be 220 N (50 lbf)."

Specifics of importance in ASTM E935-00, in Test Method D

- Test Method D specifies when testing to use a cone that is 1.25% the size of the opening limitation.
  - This translates to using a 5-inch Cone for testing an opening limitation of 4-inches in guard infill.
- The test method specifies that the cone's point be truncated to 1-inch in diameter.
  - For this reason we have limited the load requirement in this proposal to openings that allow a sphere 1.25-inches in diameter to pass through.
  - Openings smaller than the 1.25-inch sphere are exempt from this requirement

The current edition of ASTM E935-21 does not include "Test Method D". E935 was re-written to be more inline with only the sections of the "code" which were being used and removed sections that were never adopted and published as E935-13. The revisions in E935-13 of the Test Method Document outlined the test methods in Section 10 Procedure. Though some may argue that a lack of adoption means that "Test Method D" is not valid, we believe and present the fact that 3 of the 4 test methods first developed over 40 and 30 years ago are still used and that it took 30 years to add the 4th test method to clarify minimum compliance for infill spreading when the building code industry see's the need for the code to clarify the detail.

Identifying openings in Guard Infill most vulnerable to Spreading through Penetration

To simplify this code submittal which will apply to guard infill, the proposal will be focusing on wire cables as they are the most vulnerable and scrutinized type of guard infill for opening spreading/deflection concerns. Furthermore, we are narrowing the monograph reason statement even further to focus on the most vulnerable common wire cable used in the built environment, imported 1/8-inch diameter 1x19 type 316 stainless steel, arguably the most flexible type of infill commonly used in guard systems. Even though this proposal adds the requirement to all types of guard infill, and we are researching and testing different types of guard materials and construction, the ongoing results will be being published on the proponents website for public review. We stipulate for this proposal that the minimum required by code language should be based on the results of the most vulnerable and with wire cable guard infill being the most scrutinized by code officials and is likely the most affected by the addition of this proposed new model code requirement, we focused on finding this infill types pass/fail point for Test Method D of ASTM E935-00.

SAFE INFILL – SAFE CABLE DESIGN LOADS

The tensioning, stiffness and resistance that the guard infill preforms to is directly related to the material, and with wire cable this is directly related to safe cable design loads. Per industry manufacture Loos & Co. Inc., 1/8-inch diameter, 1x19 type 316 stainless steel imported wire cable, lists the minimum break point at 1,780lbf on their website. The cable's minimum break point is applied to the industry-based safety factors for designated Safe Workload and the Maximum Cable Pretension load for Cable Rail Installations. This results in a safe workload limit of 356lbf, based on 20% of the cable's minimum break load and a Maximum Cable Pretension limit of 445lbf which is 25% of the cable's minimum break load.

TRANSLATING THE ASTM E935-00 Test Method D PENETRATION CONE TEST METHOD TO SPHERE CODE

The proponent of this proposal erected a guard section 28 feet long, with cable infill and installed load cells to measure the lbf for each cable's tension that the cone and sphere were pulled between. The wire infill cables were tensioned uniformly until the infill met enough tension so the 50lbf on the cone's load cell sensor was met, (minus the drag load), without exceeding the cables work load maximum limit and pretension load. Once the guard's infill section met the Part D Test Method of E935-00, the proponent changed out the 5-inch cone designated in ASTM E935-00 with a 4-inch sphere. The 4-inch sphere was then pulled logging the tension through to failure while recording the results. Those results produced data which was then used to establish the proposed pound-force load to be applied to the sphere for the requirements listed in the code proposal.

There will be questions for how code officials might be able to verify that the infill will meet the designated new load. To start with, how are code officials inspecting the current loads for guards in IBC Section 1607.9? There are more than a few ways this can be done, of which one is manufactures specifications for guard systems. As for guards with cable infill, some cable fitting manufactures already publish charts in their installation instructions for tensioning based on cable construction, size, length, clear span, and centerline vertical spacing. There are a few ways that verifying these parameters are met if the field with simple hand tools. However, this information is different based on more than a few parameters as our research through testing is showing.

The amount of work product, information and documentation for this proposal has been document for public viewing with information, pictures and videos of the results and testing done to correlate the proposed code change on the proponents website at https://railingcodes.com/infill/

Of Note the proponent will begin holding monthly or bi-monthly working sessions, though zoom in the middle of February 2025, to discuss the proposal and the on going research as this proposal progresses through the 2027 code cycle. Those interested in joining in the group meetings can fill out a form on the proponents website.

Bibliography: ASTM Editions:

- ASTM E935-83 Initial edition Standard Test Methods for Performance of Permanent Metal Railing Systems and Rails for buildings[1]A
- ASTM E935-91 Standard Test Methods for Performance of Permanent Metal Railing Systems and Rails for buildings[1]
- ASTM E935-00ε1 Standard Test Methods for Performance of Permanent Metal Railing Systems and Rails for buildings[1]
- ASTM E935-13 Standard Test Methods for Performance of Permanent Metal Railing Systems and Rails for buildings[1]
- ASTM E985-91 Standard Specification for Performance of Permanent Metal Railing Systems and Rails for Buildings[1]
- ASTM E985-00 Standard Specification for Performance of Permanent Metal Railing Systems and Rails for Buildings[1]

ICC Evaluation Service:

- ICC ES-AC273 Acceptance Criteria for Handrails and Guards.
  - Originally approved 2004.
  - Last Approved 2017
  - Editorially revised May 2021

Websites:

- Loos & Co. Inc - Stainless Steel Strand, Bare 1x19, Import
  - https://loosco.com/product/cable/stainless-steel-strand-bare-1x19-import/
- Railingcodes.com - Proponent Research & Testing Information
  - https://railingcodes.com/infill/
- Feeney Inc. - Guard system for Testing Provided by
  - https://feeneyinc.com/product/metal/

Cost Impact: Increase

Estimated Immediate Cost Impact:

The estimated cost impact is between $0.00 & $320.00

Estimated Immediate Cost Impact Justification (methodology and variables):

The proponent of this proposal does not believe that there will be a cost increase, let alone any significant increase in cost because we believe that an estimated 98%, if not higher, of the guards being installed today are being built to comply and all ready meet or exceed the minimum requirements set forth in this code change proposal. However, per ICC requirements if we see any possible increase we need to provide justification of that cost increase in details.

So for those guards that possibly don't meet the minimums proposed can do so at minimum cost with minor changes to the design and installation of the guard system.

As stipulated in the proposal's main reason statement the most affected type of guard infill is, imported 1x19 1/8-inch diameter stainless steel cable, and the following examples are based on an installation of the cable infill guard system on an exterior deck 24 feet wide by 15 feet projection of 2 sides, and the other 24 foot side being a building.

The following summaries are supported by the breakdowns that follow after the summary examples.

- WOOD POST GUARD INSTALLATION:
  - The 24ft guard section is divided by 4ft, this equals 6 sections, which then translates to 7 support posts.
    - Next if we divide the same 24ft section by 3ft we now have 8 sections, which translates to 9 support posts.
      - This is an additional 2 posts at an estimated $80.00 each
  - Then if we look at the 2 sides being 15ft and divide that by 4ft, this equals 4 sections, which translates to 5 support posts
    - Next is we divide the same 15ft section by 3ft we now have 5 sections, which translates to 6 support posts per side.
      - This is an additional 2 posts at an estimated $80.00 each
  - This example summary produces (4) posts at $80.00 each for a estimated total of $320.00

- WIDE SPAN POST GUARD INSTALLATION:
  - The 24ft section is divided by 5ft, this equals 5 sections, which then translates to 6 support posts.
    - Next we add a midspan vertical tension baluster into each of the 5 sections
      - This is an additional 5 balusters estimated at $47.49 each
      - This minuses 1 post at an estimated $80.00 each
  - Then if we look at the 2 sides being 15ft and divide that by 5ft, this equals 3 sections, which translates to 4 support posts
    - Next we add a midspan vertical tension baluster into each of the 3 sections on each side
      - This is an additional 6 balusters estimated at $47.49 each
      - This minuses 2 posts at an estimated $80.00 each
  - This example summary produces
    - (3) less posts at $80.00 each and equals a credit of $240.00
    - and adds (11) balusters at $47.49 each and equals a total of $522.39

This equals $522.39 - $240.00 for an additional estimated cost of $282.39
The $282.39 is less than the $320.00 estimated cost increase

Cost Reference Supporting Documentation:

- Wood post costs
    - Wood Post Added to Wood Deck Estimated Cost
      Wood post prices pulled from lowes.com at the time of code proposals submittal.
      Severe Weather 4-in x 4-in x 6-ft 2 Southern yellow pine
      Ground contact pressure treated lumber
      Lowe's Item #312530 | Model #Y240406-GC $9.18 each
      Simpson Strong-Tie 2-in x 4-in 14-gauge ZMAX Tension tie
      Lowe's Item #2132165 | Model #DTT2Z $10.88 each
      Deck Plus 1/2-in x 7-in Coated Coarse Thread Hex Bolt
      Lowe's Item #756045 | Model #260735 $4.05 each x (2) = $8.10
      Deck Plus 1/2-in Coated Standard Washer
      Lowe's Item #756041 | Model #260724 $0.49 each x (4) = $1.96
      Deck Plus 1/2-in x 13 Coated Steel Hex Nut
      Lowe's Item #756033 | Model #260704 $4.05 each x (2) = $0.59
      Per post estimated added cost:
      Material Estimated at $31.30 plus local sales tax
      $25.00 Installation Labor cost
      Combined Estimate of $56.30 Each Post
      Misc. Contingency labor/materials $23.70
      Proposal Budget per post $80.00
- Option for keeping wide metal or wood post spans:
    - Adding Vertical Mid-Span Baluster based on Feeney Inc. Retail Pricing
      Feeney 42-in-level baluster $40.00 each
      Mounting Hardware estimated at $2.49 each
      Labor cost added per baluster for installation $5.00
      Estimated $47.49 added for each baluster.

Labor costs will vary depending on the area of the country the work is being done.

Estimated Life Cycle Cost Impact:

We estimate no increase in life cycle cost

Estimated Life Cycle Cost Impact Justification (methodology and variables):

Guards are a fixed building material that requires no change in the cost of the life cycle with this type of requirement.

Staff Analysis: CC # S80-25 and CC # S74-25 addresses requirements in a different or contradicting manner. The committee is urged to make their intensions clear with their actions on these proposals.

S80-25

S81-25

IBC: 1607.12.4

Proponents: Jennifer Goupil, American Society of Civil Engineers and Structural Engineering Institute, representing American Society of Civil Engineers (jgoupil@asce.org)

2024 International Building Code

Revise as follows:

1607.12.4 Fall arrest, lifeline, and rope descent system anchorages. In addition to any other applicable *live loads*, fall arrest, lifeline, and rope descent system anchorages and structural elements that support these anchorages shall be designed for a *live load* of ~~not less than~~ 3,100 pounds (13.8 kN) for each attached line, in any direction that the *load* can be applied.

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

Reason: This proposal is a coordination proposal to bring the 2027 IBC up to date with the provisions of the 2022 edition of ASCE/SEI 7 *Minimum Design Loads and Associated Criteria for Buildings and Other Structures* (ASCE/SEI 7-22).

These changes improve the coordination between the IBC and ASCE 7 by removing text in the IBC that does not appear in the corresponding section in ASCE 7.

The phrase “not less than” is unnecessary as the live loads provided in Section 1607 are minimum design loads. There is no reason for this particular section to specifically reiterate that the provided live load is a minimum load.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

This proposal is a clarification which does not change the required load and is not expected to affect the cost of construction.

S81-25

S82-25

IBC: 1607.13, 1607.13.1.2, 1607.13.2

Proponents: Jennifer Goupil, American Society of Civil Engineers and Structural Engineering Institute, representing American Society of Civil Engineers (jgoupil@asce.org)

2024 International Building Code

1607.13 Reduction in uniform live loads. Except for uniform roof live loads, all other minimum uniformly distributed *live loads*, L_o, in Table 1607.1 are permitted to be reduced in accordance with Section 1607.13.1 or 1607.13.2. Uniform roof *live loads* are permitted to be reduced in accordance with Section 1607.14.

Revise as follows:

1607.13.1.2 Heavy live loads. *Live loads* that exceed 100 psf (4.79 kN/m^2) shall not be reduced.

Exceptions:

1. The *live loads* for members supporting two or more floors are permitted to be reduced by not greater than 20 percent, but the reduced *live load* shall be not less than *L* as calculated in Section 1607.13.1.
2. For uses other than storage, where *approved* by the *building official*, ~~additional *live load* reductions shall be permitted~~ the *live load* is permitted to be reduced where shown by the *registered design professional* that a rational approach has been used and that such reductions are warranted. The reduced live load shall not be less than L as calculated in Section 1607.13.1. A member shall only be permitted to have its live load reduced where the full live load will not be applied to the member's entire influence area.

1607.13.2 Alternative uniform live load reduction. As an alternative to Section 1607.13.1 and subject to the limitations of Table 1607.1, uniformly distributed *live loads* are permitted to be reduced in accordance with the following provisions. Such reductions shall apply to slab systems, beams, girders, columns, piers, walls and foundations.

1. For *live loads* not exceeding 100 pounds per square foot (4.79 kN/m^2), the design *live load* for structural members supporting 150 square feet (13.94 m^2) or more is permitted to be reduced in accordance with Equation 16-8.

$$R = 0.08(A - 150) \quad \textbf{(Equation 16-8)}$$

For SI: $R = 0.861(A - 13.94)$

where:

A = Area of floor supported by the member, square feet (m^2).

R = Reduction in percent.Such reduction shall not exceed the smallest of:

1.1. 40 percent for members supporting one floor.

1.2. 60 percent for members supporting two or more floors.

1.3. R as determined by the following equation:

$$R = 23.1(1 + D/L_o) \quad \textbf{(Equation 16-9)}$$

where:

D = *Dead load* per square foot (m^2) of area supported.

L_o = Unreduced *live load* per square foot (m^2) of area supported.

2. A reduction shall not be permitted where the *live load* exceeds 100 pounds per square foot (4.79 kN/m^2) except that the design *live load* for members supporting two or more floors is permitted to be reduced by not greater than 20 percent.

   Exception: For uses other than storage, where *approved* <u>by the *building official*</u>, ~~additional *live load* reductions shall be permitted~~ <u>the *live load* is permitted to be reduced</u> where shown by the *registered design professional* that a rational approach has been used and that such reductions are warranted. <u>The reduction shall not be greater than permitted by Item 1. A member shall only be permitted to have its live load reduced where the full live load will not be applied to the member's entire influence area.</u>

3. A reduction shall not be permitted in passenger vehicle parking garages except that the *live loads* for members supporting two or more floors are permitted to be reduced by not greater than 20 percent.
4. For one-way slabs, the area, *A*, for use in Equation 16-8 shall not exceed the product of the slab span and a width normal to the span of 0.5 times the slab span.

Reason: This proposal helps to clarify the intended use of the exceptions that permit reduction of heavy live loads. The changes make it clear that 1) heavy live loads can not be reduced more than would be permitted by the equations for reducing all other live loads, and that 2) the reduction approach must consider whether the heavy live load occurs over the member's entire influence area. Additionally, adding the phrase "by the building official" makes the text consistent with the typical way that Chapter 16 refers to code official approval.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

This proposal provides clarification on the use of the heavy live load reduction exceptions and is not expected to impact the cost of construction.

S82-25

S83-25

IBC: 1607.13.2

Proponents: Jennifer Goupil, American Society of Civil Engineers and Structural Engineering Institute, representing American Society of Civil Engineers (jgoupil@asce.org)

2024 International Building Code

Delete without substitution:

~~**1607.13.2 Alternative uniform live load reduction.** As an alternative to Section 1607.13.1 and subject to the limitations of Table 1607.1, uniformly distributed *live loads* are permitted to be reduced in accordance with the following provisions. Such reductions shall apply to slab systems, beams, girders, columns, piers, walls and foundations.~~

1. ~~For *live loads* not exceeding 100 pounds per square foot (4.79 kN/m^2), the design *live load* for structural members supporting 150 square feet (13.94 m^2) or more is permitted to be reduced in accordance with Equation 16-8.~~

   ~~$R = 0.08(A - 150)$~~ ~~**(Equation 16-8)**~~

   ~~For SI: $R = 0.861(A - 13.94)$~~

   ~~where:~~

   ~~A = Area of floor supported by the member, square feet (m^2).~~

   ~~R = Reduction in percent.Such reduction shall not exceed the smallest of:~~

   1.1. ~~40 percent for members supporting one floor.~~

   1.2. ~~60 percent for members supporting two or more floors.~~

   1.3. ~~R as determined by the following equation:~~

   ~~$R = 23.1(1 + D/L_o)$~~ ~~**(Equation 16-9)**~~

   ~~where:~~

   ~~D = *Dead load* per square foot (m^2) of area supported.~~

   ~~L_o = Unreduced *live load* per square foot (m^2) of area supported.~~

2. ~~A reduction shall not be permitted where the *live load* exceeds 100 pounds per square foot (4.79 kN/m^2) except that the design *live load* for members supporting two or more floors is permitted to be reduced by not greater than 20 percent.~~

   ~~**Exception:** For uses other than storage, where *approved*, additional *live load* reductions shall be permitted where shown by the *registered design professional* that a rational approach has been used and that such reductions are warranted.~~

3. ~~A reduction shall not be permitted in passenger vehicle parking garages except that the *live loads* for members supporting two or more floors are permitted to be reduced by not greater than 20 percent.~~

4. ~~For one-way slabs, the area, A, for use in Equation 16-8 shall not exceed the product of the slab span and a width normal to the span of 0.5 times the slab span.~~

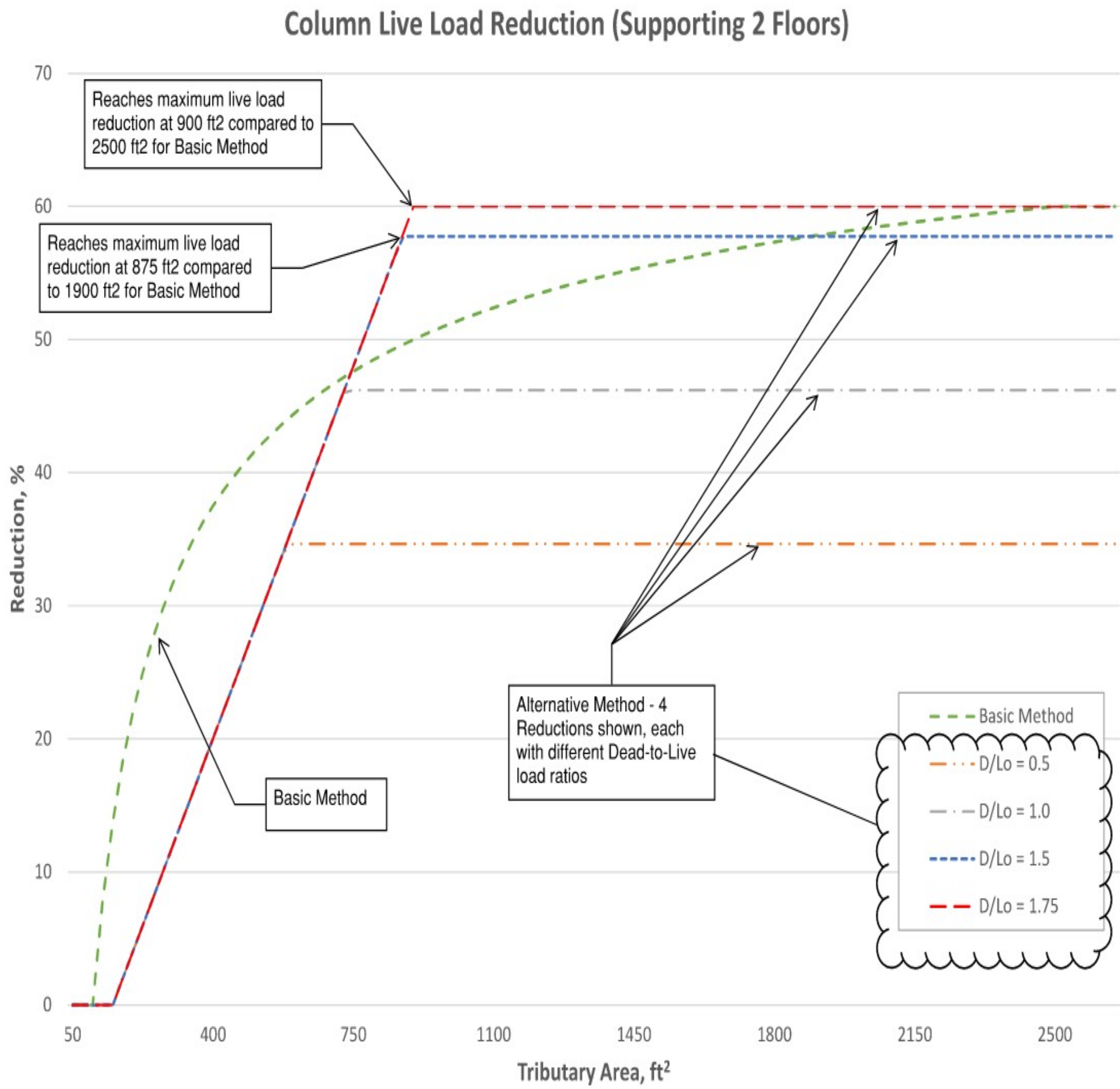
Reason: This proposal is a coordination proposal to bring the 2027 IBC up to date with the provisions of the 2022 edition of ASCE/SEI 7 Minimum Design Loads and Associated Criteria for Buildings and Other Structures (ASCE/SEI 7-22). This proposal improves the coordination between the IBC and ASCE 7 by removing a provision in the IBC that does not appear in ASCE 7. The IBC contains two methods to reduce the live load on a structural member, the Basic method (1607.13.1) and the Alternative method (1607.13.2). However ASCE 7 only contains one method to reduce live loads which corresponds to the IBC Basic method.

The Alternative method used to be in ASCE 7, however it was replaced by the Basic method in the 1982 edition. The Alternative method was developed in the late 1940's and was based on value judgements and the professional experience available at that time. It allows the live load to be reduced at a flat rate of 0.08% per square foot of area up to the maximum permitted reduction, see attached chart. The maximum permitted reduction is limited by the Dead to Live Load ratio (as well as the number of floors supported by the structural member).

The Basic method was developed approximately 30 years after the Alternative method and is based on statistical analysis and modeling considering structural reliability theory to approximate the probability of structural failure. The analysis and modeling incorporated load surveys of actual buildings, some which were available when the Alternative method was formulated, but some which were newer and not available at that time. Many of the newer surveys were also more extensive, collecting more data then had been done in the past.

The Basic method is reported to give more consistent structural reliability across the range of structural members to which live load reduction is applied (columns, beams, slabs). The attached chart shows that the rate of live load reduction is similarly steep for both the Basic and Alternative methods at relatively low tributary areas. However the rate of live load reduction for the Basic method reduces at higher areas, meaning that it takes much larger areas to achieve the largest live load reduction compared to the Alternative method. This behavior is preferred from a reliability perspective.

The Basic method also does not depend upon on the Dead to Live load ratio. This is more logical as the statistical likelihood of having the full design live load on a structural member has nothing to do with the weight of the structural member. Heavier structural framing (think concrete or masonry) is not more likely to have less live load than comparatively lighter framing (think wood or cold-formed steel). This appears to have been an value judgement applied at the time the Alternative method was developed, however structural reliability theory showed that this was not relevant. Removing the Dead to Live load ratio from the calculations also makes the live load reduction easier to calculate.In discussions within the ASCE 7 Dead & Live Load Subcommittee and with the NCSEA General Requirements Subcommittee, it does not appear that the Alternative method is widely used and thus removing it is not likely to have a significant affect on the structural design profession. However removing it will ensure that where live load reduction is applied, is it applied consistently and with consideration of modern day structural reliability concepts.



Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

Based on feedback from the ASCE 7 Dead and Live Load Subcommittee and the NCSEA General Requirements Subcommittee the Alternative Live Load Reduction provisions are not widely used and therefore removing them from the IBC would have very little impact on structural design.

S84-25

IBC: 1607.13.2

Proponents: Jennifer Goupil, American Society of Civil Engineers and Structural Engineering Institute, representing American Society of Civil Engineers (jgoupil@asce.org)

2024 International Building Code

Revise as follows:

1607.13.2 Alternative uniform live load reduction. As an alternative to Section 1607.13.1 and subject to the limitations of Table 1607.1, uniformly distributed *live loads* are permitted to be reduced in accordance with the following provisions. Such reductions shall apply to slab systems, beams, girders, columns, piers, walls and foundations.

1. For *live loads* not exceeding 100 pounds per square foot (4.79 kN/m^2), the design *live load* for structural members supporting 150 square feet (13.94 m^2) or more is permitted to be reduced in accordance with Equation 16-8.

   $R = 0.08(A_T - 150)$ **(Equation 16-8)**

   For SI: $R = 0.861(A_T - 13.94)$
   where:
   A_T = ~~Area of floor~~ Tributary area supported by the member, square feet (m^2).
   R = Reduction in percent. Such reduction shall not exceed the smallest of:

   1.1. 40 percent for members supporting one floor.

   1.2. 60 percent for members supporting two or more floors.

   1.3. R as determined by the following equation:

   $R = 23.1(1 + D/L_o)$ **(Equation 16-9)**

   where:
   D = *Dead load* per square foot (m^2) of area supported.
   L_o = Unreduced *live load* per square foot (m^2) of area supported.

2. A reduction shall not be permitted where the *live load* exceeds 100 pounds per square foot (4.79 kN/m^2) except that the design *live load* for members supporting two or more floors is permitted to be reduced by not greater than 20 percent.

   Exception: For uses other than storage, where *approved*, additional *live load* reductions shall be permitted where shown by the *registered design professional* that a rational approach has been used and that such reductions are warranted.

3. A reduction shall not be permitted in passenger vehicle parking garages except that the *live loads* for members supporting two or more floors are permitted to be reduced by not greater than 20 percent.

4. For one-way slabs, the area, *A*, for use in Equation 16-8 shall not exceed the product of the slab span and a width normal to the span of 0.5 times the slab span.

Reason: Both "tributary area" and "influence area" are common terms in building design. This proposal makes it clear which area is intended to be used in the Alternative live load reduction method. The basic live load reduction provisions clearly indicate that the area is the tributary area, however the alternative live load reduction provisions are not currently clear. This is likely because the Alternative live load reduction method predates common usage of the term influence area in structural design. At that time the term influence area was not commonly used. Now that tributary area, A_T, and influence area, $K_{LL}A_T$, are in common usage it is necessary to more clearly describe the intended area in the alternative live load reduction provisions.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

The clarification contained in this proposal is not likely have an impact on the cost of construction.

S84-25

S85-25

IBC: 1607.14.3, 1607.14.3.1, 1607.14.3.2, 1607.14.3.3, 1607.14.3.4, 1607.14.3.5, 1607.14.4 (New)

Proponents: Julie C. Furr, PE, Smith Seckman Reid, Inc, representing Self (jcfurr@ssr-inc.com)

2024 International Building Code

Revise as follows:

1607.14.3 Photovoltaic panel systems. Roof structures that provide support for *photovoltaic panel systems* shall be designed in accordance with <u>this code, as modified by </u>Sections 1607.14.3.1 through 1607.14.3.5~~, as applicable~~.

1607.14.3.1 Roof live load. Roof structures that support *photovoltaic panel systems* shall be designed to resist each of the following conditions:

1. Applicable uniform and concentrated roof *loads* with the *photovoltaic panel system dead loads*.

   Exception<u>s</u>: *Roof live loads* need not be applied to the area covered by *photovoltaic panels* where<u>:</u> ~~the vertical clear space between the panels and the roof surface is 24 inches (610 mm) or less.~~

   <u>1.</u> ~~the~~ <u>The vertical </u>clear space between the panels and the roof surface is 24 inches (610 mm) or less.

   2. <u>The horizontal clear space between the panel supports is 12 inches (305 mm) or less.</u>

2. Applicable uniform and concentrated roof loads without the *photovoltaic panel system* present.

1607.14.3.2 Photovoltaic panels or modules. The *structure* of a roof that supports solar *photovoltaic panels* or modules shall be designed to accommodate the full solar *photovoltaic panels* or modules and ballast *dead load*, including concentrated *loads* from support frames in combination with the *loads* from Section 1607.14.3.1 and other applicable *loads*. Where applicable, snow drift *loads* created by the *photovoltaic panels* or modules shall be included.

1607.14.3.3 <u>Photovoltaic panels installed on open grid roof structures</u> ~~Elevated photovoltaic (PV) support structures with open grid framing~~. ~~Elevated photovoltaic (PV) support structures~~ <u>Structures </u>with open grid framing and without a *roof deck* or sheathing <u>supporting photovoltaic panel systems </u>shall be designed to support the uniform and concentrated *roof live loads* specified in Section 1607.14.3.1, except that the uniform *roof live load* shall be permitted to be reduced to 12 psf (0.57 kN/m^2).

1607.14.3.4 Ground-mounted photovoltaic (PV) panel systems. Ground-mounted photovoltaic (PV) panel systems <u>that are independent structures and do not have accessible/occupied space underneath</u> are not required to accommodate a *roof photovoltaic live load*. Other *loads* and combinations in accordance with Section 1605 shall be accommodated.

1607.14.3.5 Ballasted photovoltaic panel systems. Roof structures that provide support for ballasted *photovoltaic panel systems* shall be designed, or analyzed, in accordance with <u>Chapter 16, except as modified by Section 1607.14.3. </u>~~Section 1604.4; checked in accordance with Section 1604.3.6 for deflections; and checked in accordance with Section 1611 for ponding.~~

Add new text as follows:

<u>**1607.14.4**</u> <u>**Uncovered open-frame roof structures**</u>**.** <u>Uncovered open-frame roof structures shall be designed for a vertical live load of not less than 10 psf (0.48 kN/m^2) of the total area encompassed by the framework.</u>

Attached Files

- **PV California Solar News and Statistics for 2025 – Forbes Home.pdf**
  https://www.cdpaccess.com/proposal/12150/35887/files/download/9481/

Reason: This proposal aligns IBC design criteria for structures supporting photovoltaic panel systems with the 2022 California Building Code (July 2024 Supplement). Additional clarification has been added to 1607.14.3.1 to identify that supporting structures must still be designed to include typical roof live loads, unless aisles between panel support groups are too narrow to allow maintenance access.

Having experienced strong growth in solar power over the last decade, California has been afforded ample opportunity to implement, evaluate, and revise PV building code requirements. It is reasonable to expect that current CBC PV building code requirements which have already been implemented in the "nation's top solar producer" (Forbes, *California Solar Statistics for 2025,* 08-28-2024), have achieved the balance between public safety and allowing innovation within the industry.

- **CA PV IR_16-8_2022 CBC.pdf**
  https://www.cdpaccess.com/proposal/12150/35887/documentation/186459/attachments/download/9469/

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

The revisions clarify code language to match the prevailing standard of practice in California (largest solar producer) and as asserted by the industry.

S85-25

S86-25

IBC: 1607.16.2

Proponents: Jennifer Goupil, American Society of Civil Engineers and Structural Engineering Institute, representing American Society of Civil Engineers (jgoupil@asce.org)

2024 International Building Code

Revise as follows:

1607.16.2 Fire walls. In order to meet the structural stability requirements of Section 706.2 where the *structure* on either side of the wall has collapsed, *fire walls* and their supports shall be designed to withstand a minimum horizontal ~~allowable stress~~ *load* of 5 psf (0.240 kN/m^2).

Reason: Currently Section 1607.16.2 specifies an allowable stress load, however structural loads in the IBC are not classified as allowable stress loads or strength loads. Loads are classified as live loads, snow loads, wind loads, etc. The loads are then required to be combined (Section 1605) and the required combinations vary depending upon whether LRFD design or ASD design is utilized. Therefore the term “allowable stress” is struck from this section for consistency with the rest of Chapter 16.

While a similar section is not contained within ASCE 7, the changes in this proposal are consistent with how loads are classified in ASCE 7.

As an example, the proposed revisions make the text of this section consistent with the text in the similar Section 1607.16, which is shown below:

1607.16 Interior walls and partitions. Interior walls and partitions that exceed 6 feet (1829 mm) in height, including their finish materials, shall have adequate strength and stiffness to resist the loads to which they are subjected but not less than a horizontal load of 5 psf (0.240 kN/m2).

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

The clarification made in the proposal does not change existing requirements and will not affect the cost of construction.

S86-25

S87-25

IBC: 1607.16, 1607.16.3 (New)

Proponents: John Grenier, representing National Council of Structural Engineers Associations (NCSEA) (jgrenier@greniereng.com); Emily Guglielmo, representing NCSEA (eguglielmo@martinmartin.com)

2024 International Building Code

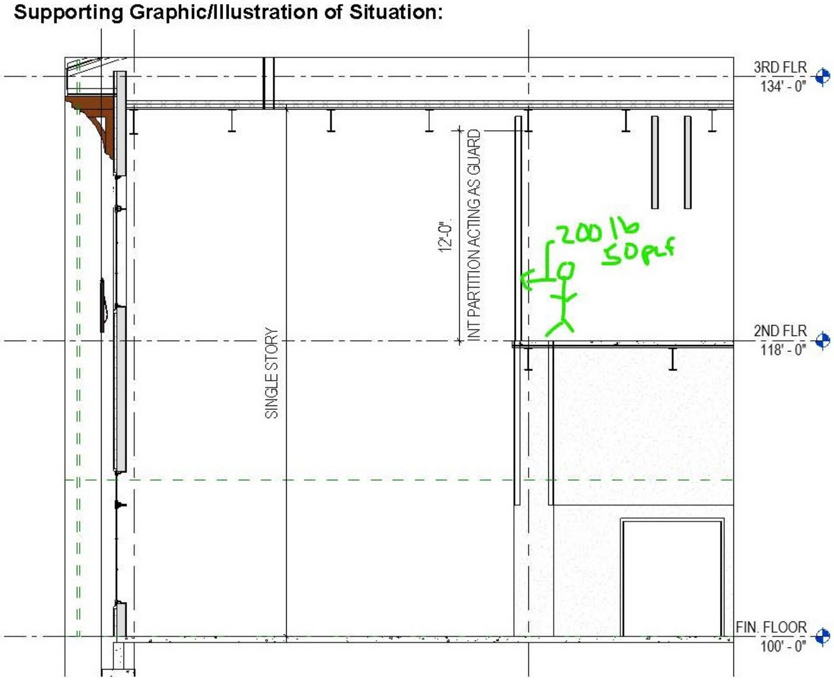
1607.16 Interior walls and partitions. Interior walls and partitions that exceed 6 feet (1829 mm) in height, including their finish materials, shall have adequate strength and stiffness to resist the *loads* to which they are subjected but not less than a horizontal *load* of 5 psf (0.240 kN/m^2).

Add new text as follows:

1607.16.3 Guards. Interior walls and partitions separating a floor or walking surface located more than 30 inches measured vertically to the floor below shall serve as *guards* in accordance with section 1015.1. For the design of interior walls and partitions serving as *guards*, loading set forth in section 1607.9 shall be applied at any location along the wall length at a height of 42" above the floor or walking surface.

Reason: There are instances in which light framed interior partitions or insulated metal panel walls (IMP) separate a multistory section from a single-story section (i.e. an interior partition in an industrial building that separates a multistory office space from a single-story warehouse/production space). In these cases, the interior partition will need to have adequate strength and stiffness to be able to support guard loads to prevent a potential failure of the light framed wall or its connection to the structure and prevent the fall of a person off what would then become an open-sided walking surface that is located more than 30 inches above the level or ground below. There are instances of light framed walls or insulated metal panels with common inter-story heights of 10 to 12 feet in which the 200 pound concentrated load will exceed the loading and stiffness demands of the 5 psf horizontal load of section 1607.16.

Supporting Graphic/Illustration of Situation:



Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

The new text is a clarification for the proper design of an interior partition / wall for the condition mentioned. The criteria is currently in the code, but this addition provides clarity.

S87-25

S88-25

IBC: 1609.1.1, 1609.4, 1609.4.1, 1609.4.2, 1609.4.3

Proponents: Jennifer Goupil, American Society of Civil Engineers and Structural Engineering Institute, representing American Society of Civil Engineers (jgoupil@asce.org)

2024 International Building Code

Revise as follows:

1609.1.1 Determination of wind loads. Wind *loads* on every *building* or *structure* shall be determined in accordance with Chapters 26 to 30 of ASCE 7. The type of opening protection required, the basic wind speed, *V*, and the exposure category for a *site* <u>shall</u> ~~is permitted to~~ be determined in accordance with Section 1609 ~~or ASCE 7~~. Wind shall be assumed to come from any horizontal direction and wind pressures shall be assumed to act normal to the surface considered.

Exceptions:

1. Subject to the limitations of Section 1609.1.1.1, the provisions of ICC 600 shall be permitted for applicable Group R-2 and R-3 *buildings*.
2. Subject to the limitations of Section 1609.1.1.1, residential *structures* using the provisions of AWC WFCM.
3. Subject to the limitations of Section 1609.1.1.1, residential *structures* using the provisions of AISI S230.
4. Designs using NAAMM FP 1001.
5. Designs using TIA-222 for antenna-supporting *structures* and antennas, provided that the horizontal extent of Topographic Category 2 escarpments in Section 2.6.6.2 of TIA-222 shall be 16 times the height of the escarpment.
6. Wind tunnel tests in accordance with ASCE 49 and Sections 31.4 and 31.7 of ASCE 7.
7. *Temporary structures* complying with Section 3103.6.1.2.

The wind speeds in Figures 1609.3(1) through 1609.3(4) are basic wind speeds, *V*, and shall be converted in accordance with Section 1609.3.1 to *allowable stress design* wind speeds, V_{asd}, when the provisions of the standards referenced in Exceptions 4 and 5 are used.

1609.4 Exposure category. For each wind direction considered, an exposure category that adequately reflects the characteristics of ground surface irregularities shall be determined for the *site* at which the *building* or *structure* is to be constructed <u>in accordance with Section 26.7 of ASCE 7.</u> Account shall be taken of variations in ground surface roughness that arise from natural topography and vegetation as well as from constructed features.

Delete without substitution:

~~**1609.4.1 Wind directions and sectors.** For each selected wind direction at which the wind *loads* are to be evaluated, the exposure of the *building* or *structure* shall be determined for the two upwind sectors extending 45 degrees (0.79 rad) either side of the selected wind direction. The exposures in these two sectors shall be determined in accordance with Sections 1609.4.2 and 1609.4.3 and the exposure resulting in the highest wind *loads* shall be used to represent winds from that direction.~~

~~**1609.4.2 Surface roughness categories.** A ground surface roughness within each 45-degree (0.79 rad) sector shall be determined for a distance upwind of the *site* as defined in Section 1609.4.3 from the following categories, for the purpose of assigning an exposure category as defined in Section 1609.4.3. **Surface Roughness B.** Urban and suburban areas, wooded areas or other terrain with numerous closely spaced obstructions having the size of single-family *dwellings* or larger. **Surface Roughness C.** Open terrain with scattered obstructions having heights generally less than 30 feet (9144 mm). This category includes flat open country, and grasslands. **Surface Roughness D.** Flat, unobstructed areas and water surfaces. This category includes smooth mud flats, salt flats and unbroken ice.~~

~~**1609.4.3 Exposure categories.** An exposure category shall be determined in accordance with the following: **Exposure B.** For *buildings* with a mean roof height of less than or equal to 30 feet (9144 mm), Exposure B shall apply where the ground surface roughness, as defined by Surface Roughness B, prevails in the upwind direction for a distance of not less than 1,500 feet (457 m). For *buildings* with a mean roof height greater than 30 feet (9144 mm), Exposure B shall apply where Surface Roughness B prevails in the upwind direction for a distance of not less than 2,600 feet (792 m) or 20 times the height of the *building*, whichever is greater. **Exposure C.** Exposure C shall apply for all cases where Exposure B or D does not apply. **Exposure D.** Exposure D shall apply where the ground surface roughness, as defined by Surface Roughness D, prevails in the upwind direction for a distance of not less than 5,000 feet (1524 m) or 20 times the height of the building, whichever is greater. Exposure D shall apply where the ground surface roughness immediately upwind of the *site* is B or C, and the *site* is within a distance of 600 feet (183 m) or 20 times the *building height*, whichever is greater, from an Exposure D condition as defined in the previous sentence.~~

Reason: The proposal includes modification to Section 1609.4. The modification to Section 1609.4 strikes out the detailed language and provisions for determining Exposure Category in IBC and requires use of Section 26.7 of ASCE/SEI 7. The IBC 2024 1609.4 language for Exposure Category is identical to ASCE/SEI 7-22 Section 26.7. The proposed removal of exposure classifications would verify that exposure classifications are always consistent between the building code and the standard. This approach is consistent with all other wind design parameters (wind speed, elevator factor, topographic factor, directionality factor, etc.).

The change to Section 1609.1 modifies the optional language (i.e., “permitted to be”) to be charging language (i.e., “shall be”) and removed the reference to ASCE 7 as this is now referenced in Section 1609.4.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

Proposed IBC code changes are generally editorial clarifications that improve the thoroughness of IBC for alignment to ASCE 7.

S88-25

S89-25

IBC: 1609.2

Proponents: Jennifer Goupil, American Society of Civil Engineers and Structural Engineering Institute, representing American Society of Civil Engineers (jgoupil@asce.org)

2024 International Building Code

Revise as follows:

1609.2 Protection of openings. In *windborne debris regions*, glazing in *buildings* shall be impact resistant or protected with an impact-resistant covering meeting the requirements of an *approved* impact-resistant standard or ASTM E1996 referenced herein as follows:

1. Glazed openings located within 30 feet (9144 mm) of grade shall meet the requirements of the large missile test of ASTM E1996.
2. Glazed openings located more than 30 feet (9144 mm) above grade shall meet the provisions of the small missile test of ASTM E1996.

<u>In the tornado-prone region, glazed openings shall be protected as required by Chapter 32 of ASCE/SEI 7.</u>

Exceptions:

1. *Wood structural panels* with a minimum thickness of $^{7}/_{16}$ inch (11.1 mm) and maximum panel span of 8 feet (2438 mm) shall be permitted for opening protection in *buildings* with a mean roof height of 33 feet (10 058 mm) or less that are classified as a Group R-3 or R-4 occupancy. Panels shall be precut so that they shall be attached to the framing surrounding the opening containing the product with the glazed opening. Panels shall be predrilled as required for the anchorage method and shall be secured with the attachment hardware provided. Attachments shall be designed to resist the components and cladding *loads* determined in accordance with the provisions of ASCE 7, with corrosion-resistant attachment hardware provided and anchors permanently installed on the *building*. Attachment in accordance with Table 1609.2 with corrosion-resistant attachment hardware provided and anchors permanently installed on the *building* is permitted for *buildings* with a mean roof height of 45 feet (13 716 mm) or less where V_{asd} determined in accordance with Section 1609.3.1 does not exceed 140 mph (63 m/s).
2. Glazing in *Risk Category* I *buildings*, including *greenhouses* that are occupied for growing plants on a production or research basis, without public access shall be permitted to be unprotected.
3. Glazing in *Risk Category* II, III or IV *buildings* located over 60 feet (18 288 mm) above the ground and over 30 feet (9144 mm) above *aggregate* surface roofs located within 1,500 feet (457 m) of the *building* shall be permitted to be unprotected.

Reason: ASCE 7-22 introduced Chapter 32 Tornado Loads and related provisions in Chapter 1 General, Chapter 2 Combination of Loads, and Chapter 26 Wind Loads: General Requirements. While IBC 2024 generally adopted and incorporated the new ASCE/SEI 7-22 provisions, several sections of IBC 2024 do not adequately clarify the tornado design requirements in ASCE/SEI 7-22. This proposal includes adding language to Section 1609.2 that clarifies the opening protection requirements in the tornado-prone region in ASCE 7, in addition to windborne debris region requirements. This language is consistent with the requirements of ASCE/SEI 7.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

Proposed IBC code changes aligns the IBC 2027 requirements with pre-existing ASCE/SEI 7-22 requirements.

S89-25

S90-25

IBC: 1609.2.1

Proponents: Amanda Hickman, The Hickman Group, representing AMCA International (amanda@thehickmangroup.com)

2024 International Building Code

Revise as follows:

1609.2.1 Louvers. Louvers protecting intake and exhaust ventilation ducts not assumed to be open that are located within 30 feet (9144 mm) of grade shall ~~meet the requirements of~~ be listed to indicate compliance with AMCA 540.

Reason: The IBC already requires louvers to comply with AMCA 540. However, to ensure code officials are able to enforce this provision, the revised language to require a *listing* is being proposed. Additionally, including a *listing* requirement will ensure that products will perform as rated and meet the performance requirements for the specified application.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

Because listing is common practice and that the cost to list/certify a product is incurred by the manufacturer and divided across multiple projects, there is no cost increase associated with this proposal.

S90-25

S91-25

IBC: 1609.8 (New), Figure 1609.8 (New), TABLE 1609.8 (New)

Proponents: Jay Crandell, P.E., ABTG / ARES Consulting, representing Self (jcrandell@aresconsulting.biz); Art DeGaetano, representing Northeast Regional Climate Center, Cornell University (atd2@cornell.edu)

2024 International Building Code

Add new text as follows:

1609.8 Wind-driven rain. Minimum design wind pressures used to evaluate the wind-driven rain resistance of building assemblies and components shall be permitted to be determined in accordance with Figure 1609.8 and Table 1609.8.

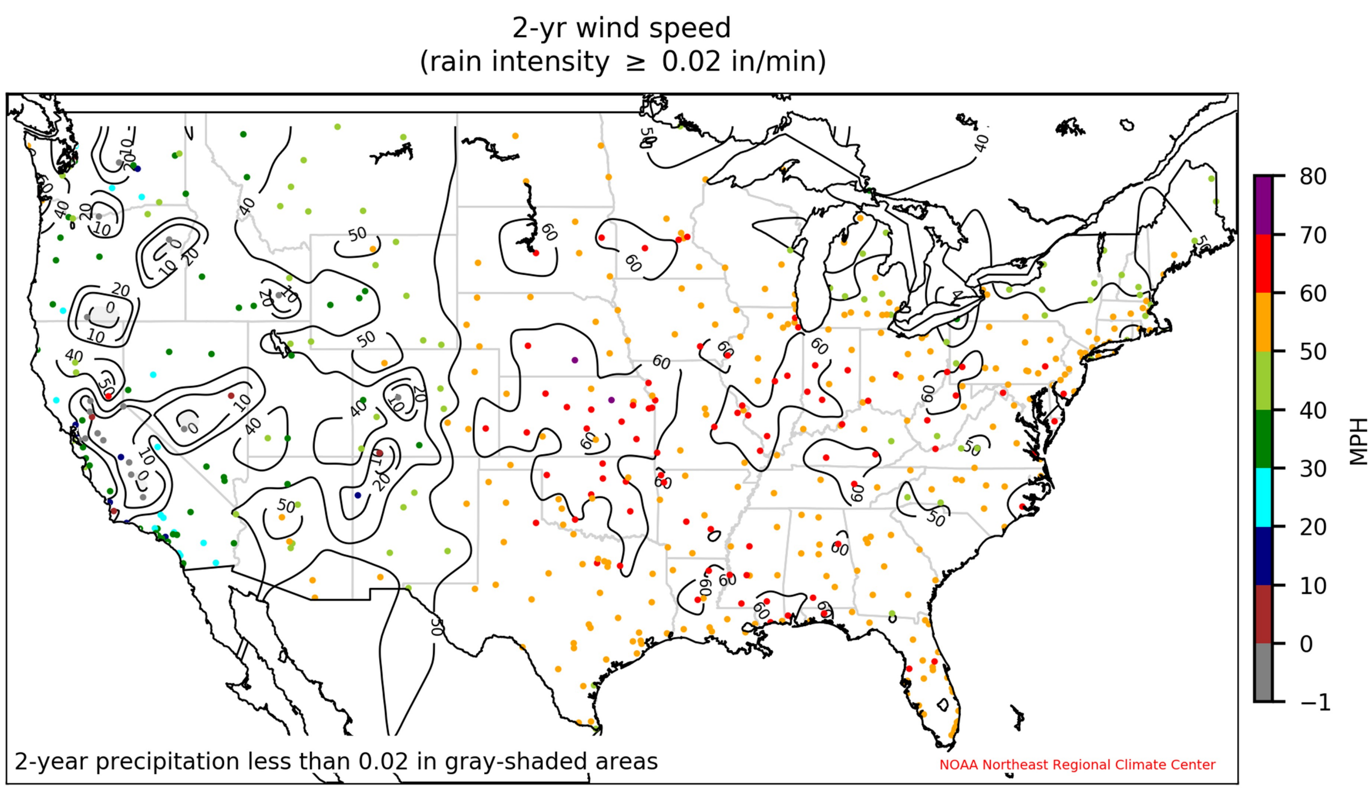


Figure 1609.8 Wind-driven rain wind speed (mph, 3 sec gust)
[For SI: 1 mph = 0.447 m/s]

TABLE 1609.8 MINIMUM WIND-DRIVEN RAIN DESIGN PRESSURE (PSF)[a,b]

Wind Exposure	Mean Roof Height (ft)	Wind-driven Rain Wind Speed (mph, 3-sec gust) from Figure 1609.8					
		≤ 30	40	50	60	70	80

	15	2.86	2.86	2.86	3.21	4.37	5.71
	20	2.86	2.86	2.86	3.50	4.76	6.21
	25	2.86	2.86	2.86	3.72	5.06	6.61
B	30	2.86	2.86	2.86	3.95	5.37	7.02
	40	2.86	2.86	2.98	4.28	5.83	7.62
	50	2.86	2.86	3.17	4.57	6.22	8.12
	60	2.86	2.86	3.33	4.79	6.52	8.52
	15	2.86	2.86	4.01	5.77	7.85	10.3
	20	2.86	2.86	4.24	6.11	8.31	10.9
	25	2.86	2.86	4.43	6.38	8.68	11.3
C	30	2.86	2.96	4.62	6.65	9.05	11.8
	40	2.86	3.14	4.90	7.06	9.61	12.6
	50	2.86	3.29	5.14	7.40	10.1	13.2
	60	2.86	3.41	5.33	7.67	10.4	13.6
	15	2.86	3.35	5.23	7.53	10.3	13.4
	20	2.86	3.51	5.48	7.90	10.8	14.0
	25	2.86	3.64	5.69	8.19	11.2	14.6
D	30	2.86	3.77	5.89	8.48	11.6	15.0
	40	2.86	3.96	6.20	8.92	12.1	15.0
	50	2.86	4.13	6.45	9.29	12.6	15.0
	60	2.86	4.26	6.65	9.58	13.0	15.0

For SI: 1 psf = 47.9 Pa; 1 mph = 0.447 m/s; 1 ft = 0.305 m

a. Wind-driven rain wind speed is to be obtained from Figure 1609.8 which provides 3-second gust wind speeds at standard conditions of wind exposure C (open, flat terrain) at a height of 33 ft (10m) above ground.

b. The tabulated pressures are positive components and cladding pressures calculated in accordance with ASCE 7 for a windward wall for the indicated exposure condition and building mean roof height. Wind directionality is not used to reduce the wind-driven rain pressure. The wind speed obtained from Figure 1609.8 used for this pressure calculation is adjusted from a 3-sec gust basis to a 1-min average wind speed using the following wind speed averaging time conversion factors: 0.72 (Exposure B), 0.79 (Exposure C), and 0.82 (Exposure D). Wind-driven rain pressures for different exposure and mean roof height conditions shall be permitted to be calculated in a consistent manner in accordance with ASCE 7 and Figure 1609.8. The calculated pressure shall not be less than 2.86 psf and need not exceed 15.0 psf.

Reason: The code lacks a risk-consistent basis for addressing wind-driven rain and resistance to water intrusion. This proposal provides a wind-driven rain hazard map (i.e., annual extreme 3-sec gust wind speeds coincidental with a minimum rainfall rate threshold) to properly characterize the hazard as it varies across wind-driven rain climatology of the U.S. Coordinating proposals have been submitted for the IBC and IRC.

First, the proposal “permits” and does not mandate use of these wind-driven rain wind speeds and associated minimum design pressures for evaluation water penetration resistance. This approach is necessary because various other code referenced product standards will need time to consider and re-align with this new hazard-based approach to wind-driven rain resistance. The proposed map and table requirements are somewhat more conservative than, but generally consistent with, current industry minimum and maximum pressure values used in practice. But now the selection of a design pressure for specification of water penetration resistance is properly related to variation in actual hazard across the US (and variation in fundamental wind load parameters such as exposure and building height).

The two key components of this proposal are further explained as follows:

Figure 1609.8 / R301.2.1.6 - The wind-driven rain wind speed map is based on the JAMC article referenced in the Bibliography as a joint effort of the University of Florida and Cornell University's Northeast Climate Data Center with support from other interested parties, including the Insurance Institute for Business and Home Safety (IBHS). Additional work to extend the research to develop a US map was funded by NOAA at Cornell University. The climatology of wind-driven rain is developed from recently available 1-min weather observations from National Weather Service Automated Surface Observing Systems (ASOS). One-minute data better represent the joint occurrence of the extremes that define wind-driven rain occurrence than hourly data, which previously was the shortest available temporal resolution. After adjusting the winds speeds to standardize for exposure and anemometer type, the wind data corresponding to specific rainfall thresholds were fit to a statistical distribution to obtain estimates of the recurrence of wind speeds associated with different rainfall intensities. The values serve as the basis for a wind-driven rain climatology for the United States that is analogous to climatologies that exist and inform building codes in Europe and Canada. The wind-driven rain map represents a 3-sec gust wind speed (miles per hour) for a 2-yr mean recurrence interval with a threshold coincidental rainfall rate of 0.02 in/min (0.5 mm/min). For additional information, refer to the JAMC article referenced in Bibliography.

Table 1609.8 / **R301.2.1.6** - The main purpose of the mapped wind-driven rain hazard is to provide a wind-driven rain wind speed from which an appropriate, risk-consistent pressure differential can be determined as a means to specify or evaluate water-resistance of wall assemblies and exterior wall covering assemblies or components. The pressure differential may be determined in two ways. One way is to use pre-calculated values as shown in the table. The other way is to calculate the pressure using the ASCE 7 provisions for wind loads, but substituting the appropriate wind-driven rain wind speed from Figure 1609.8 / R301.2.1.6 for the basic wind speed used for structural design purposes in ASCE 7.

The latter method was how the table values were generated (as detailed for transparency and repeatability in the table footnotes). An example of calculating the wind-driven rain wind pressure using Figure 1609.8 / R301.2.1.6 and the wind load provisions of ASCE 7 is as follows:

Wind-driven rain wind speed: 60 mph, 3sec gust (Figure 1609.8 / R301.2.1.6)

Wind Exposure: B (suburban/wooded)

Building Height: 30 feet

Wall Pressure coefficients – GCp = 1.0 (positive); GCpi = -0.18 (negative internal pressure)

Kz = 0.7 (exposure B, 30' height)

Kd = 1.0 (directionality not considered)

Kzt = 1.0 (no topographic wind speed up effects considered)

Ke = 1.0 (no elevation effects considered w/r to lower density of air at higher elevations)

V1-min/V3-sec conversion factor: 0.72

$p = [0.00256\ Kz\ Kzt\ Kd\ Ke\ (0.72 \times V)^2] \times [GCp - GCpi]$

$= 0.00256(0.7)(1.0)(1.0)(1.0)(0.72 \times 60)^2 \times [1.0 + 0.18]$

= (3.34 psf) x [1.18] = **3.95 psf**

The range of calculated pressures are shown in the following supplemental table without inclusion of the minimum and maximum pressure values consistent with the extremes of current practice as discussed later below. This table is provided for transparency and informational purposes.

Pressures (psf) for Water Resistance Evaluation (based on conversion to 1-min average wind speed)											
Wind Exposure	Mean Roof Height (ft)	WDR Wind Speed (MPH - 3 sec gust)									
		10	20	30	40	50	60	70	80	90	100
B	15	0.09	0.36	0.80	1.43	2.23	3.21	4.37	5.71	7.23	8.93
	20	0.10	0.39	0.87	1.55	2.43	3.50	4.76	6.21	7.86	9.71
	25	0.10	0.41	0.93	1.65	2.58	3.72	5.06	6.61	8.37	10.34
	30	0.11	0.44	0.99	1.75	2.74	3.95	5.37	7.02	8.88	10.96
	40	0.12	0.48	1.07	1.90	2.98	4.28	5.83	7.62	9.64	11.90
	50	0.13	0.51	1.14	2.03	3.17	4.57	6.22	8.12	10.27	12.68
	60	0.13	0.53	1.20	2.13	3.33	4.79	6.52	8.52	10.78	13.31
C	15	0.16	0.64	1.44	2.56	4.01	5.77	7.85	10.26	12.98	16.02
	20	0.17	0.68	1.53	2.71	4.24	6.11	8.31	10.86	13.74	16.97
	25	0.18	0.71	1.59	2.84	4.43	6.38	8.68	11.34	14.35	17.72
	30	0.18	0.74	1.66	2.96	4.62	6.65	9.05	11.82	14.97	18.48
	40	0.20	0.78	1.76	3.14	4.90	7.06	9.61	12.55	15.88	19.61
	50	0.21	0.82	1.85	3.29	5.14	7.40	10.07	13.15	16.65	20.55
	60	0.21	0.85	1.92	3.41	5.33	7.67	10.44	13.63	17.26	21.30
D	15	0.21	0.84	1.88	3.35	5.23	7.53	10.25	13.39	16.95	20.92
	20	0.22	0.88	1.97	3.51	5.48	7.90	10.75	14.04	17.77	21.94
	25	0.23	0.91	2.05	3.64	5.69	8.19	11.15	14.56	18.43	22.75
	30	0.24	0.94	2.12	3.77	5.89	8.48	11.55	15.08	19.09	23.56
	40	0.25	0.99	2.23	3.96	6.20	8.92	12.14	15.86	20.07	24.78
	50	0.26	1.03	2.32	4.13	6.45	9.29	12.64	16.51	20.89	25.80
	60	0.27	1.06	2.39	4.26	6.65	9.58	13.04	17.03	21.55	26.61

Second, it is important to note that the failure mode that this proposal addresses is the initiation of a leak (onset of water intrusion) at the most extreme (worst) 1-minute of coincidental wind and rain that would typically occur in a given year on average. Therefore, it provides protection for routine and lesser extreme events that have equal or lower wind-driven rain wind speed (even if the rainfall rate is substantially greater than the threshold used to develop the map). Events that exceed the wind-driven rain wind speed tend to have lower coincidental rainfall rates as based on the natural tendency or shape of the hazard curves in the climatological data (see JAMC article referenced in Bibliography).

Finally, as shown in the tabulated pressure values in the proposal, the lower limit of 2.86 psf (137 Pa) for test pressure is used to correspond with the minimum test pressure used in recognized standards addressing wind-driven rain resistance (e.g., ASTM E331) despite the table above showing that lower pressure could be justified in regions of low wind-driven rain hazard. The upper limit of 15.0 psf (718 Pa) also is based on current accepted practice for worst-case wind-driven rain climate conditions in the U.S. and ensures the availability of solutions (it also ensures equivalency with current accepted practices for regions or conditions considered to have high wind-driven rain hazard). This range of WDR pressures also is consistent with that used in Canada. These limits ensure that this new approach is “calibrated” to accepted practice and that solutions are available while also better aligning solutions with actual variation in U.S. wind-driven rain hazard. Even so, the 15 psfcap will provide substantial protection against significant water intrusion and contents damage in greater wind-driven rain hazard conditions or events (higher wind speed at greater return periods) up to the point where structural failures begin to occur and the general integrity of the building envelope is compromised. Such extreme structural safety-level events are beyond the scope of a serviceability concern underlying the current and proposed approach to water resistance. Regardless, the proposed approach deals with the matter of wind-driven rainwater resistance in a much more risk-consistent fashion based on the variation in hazard across the U.S. (wind-driven rain wind speed) and for different building conditions (e.g., wind exposure and building height).

Bibliography: Belcher, B.N., DeGaetano, A.T., Masters, F.J., Crandell, J., and Morrison, M.J. (2023). Development of an Extreme Wind-Driven Rain Climatology for the Southeastern United States Using 1-Min Rainfall and Peak Wind Speed Data. Journal of Applied Meteorology and Climatology, American Meteorological Society, DOI: https://doi.org/10.1175/JAMC-D-22-0156.1

Cost Impact: Increase

Estimated Immediate Cost Impact:

$0 - While the cost impact indicates “increased cost” (there was no suitable default answer in cdpACCESS), the proposal does not mandate any new requirements. It provides a new means or option to evaluate building wall assemblies and components for water resistance using an improved methodology based on actual wind-driven rain hazard. If voluntarily used, it could result in an increase or decrease cost for material or assembly qualification purposes relative to existing practices. But, the increase or decrease in cost to the end user may be very small. This proposal also does not require any existing materials or methods recognized in the code to alter current requirements, methods, or standards. So, it should be considered cost neutral.

Estimated Immediate Cost Impact Justification (methodology and variables):

$0 - see cost impact statement above.

Estimated Life Cycle Cost Impact:

$0 - see cost impact statement above (although improved risk-consistency of wind-driven rain performance can result in improved durability and reduced life-cycle cost impacts).

Estimated Life Cycle Cost Impact Justification (methodology and variables):

See cost impact statement.

S91-25

S92-25

IBC: 1609.8 (New), TABLE 1609.8(1) (New), TABLE 1609.8(2) (New)

Proponents: Dave Monsour, THOMAS ASSOCIATES, INC. (DASMA), representing DASMA (Door & Access Systems Manufacturers Assoc.) (dmonsour@thomasamc.com)

2024 International Building Code

Add new text as follows:

1609.8 Vehicle Access Doors. For buildings designed as enclosed, design wind pressures for vehicle access doors shall be obtained using Table 1609.8(1). Table values shall be adjusted for height and exposure by multiplying by the adjustment coefficient in Table 1609.8(2). The resulting positive and negative design wind pressures shall not be less than 10 psf.

TABLE 1609.8(1) VEHICLE ACCESS DOOR WIND LOADS FOR AN ENCLOSED BUILDING WITH A MEAN ROOF HEIGHT OF 30 FEET LOCATED IN EXPOSURE B (ASD) (psf)[a, b, c, d, e, f, g]

DOOR SIZE		DOOR AREA (ft^2)	BASIC DESIGN WIND SPEED, V (mph)																							
WIDTH (ft)	HEIGHT (ft)		90		100		110		120		130		140		150		160		170		180		190		200	
			Pos	Neg	Pos	Neg	Pos	Neg	Pos	Neg	Pos	Neg	Pos	Neg	Pos	Neg	Pos	Neg	Pos	Neg	Pos	Neg	Pos	Neg	Pos	Neg
ROOF ANGLE 0-10 DEGREES																										
8	8	64	6.9	-7.9	8.6	-9.7	10.4	-11.7	12.3	-14.0	14.5	-16.4	16.8	-19.0	19.3	-21.8	21.9	-24.8	24.8	-28.0	27.8	-31.4	30.9	-35.0	34.3	-38.8
10	10	100	6.7	-7.5	8.3	-9.3	10.0	-11.2	11.9	-13.4	14.0	-15.7	16.2	-18.2	18.6	-20.9	21.2	-23.8	24.0	-26.9	26.9	-30.1	29.9	-33.6	33.2	-37.2
14	14	196	6.4	-7.1	7.9	-8.8	9.5	-10.6	11.3	-12.6	13.3	-14.8	15.4	-17.2	17.7	-19.7	20.1	-22.4	22.7	-25.3	25.5	-28.4	28.4	-31.6	31.5	-35.1
ROOF ANGLE > 10 DEGREES																										
9	7	63	7.6	-8.6	9.3	-10.6	11.3	-12.8	13.5	-15.2	15.8	-17.9	18.3	-20.7	21.0	-23.8	23.9	-27.0	27.0	-30.5	30.3	-34.2	33.7	-38.1	37.4	-42.3
16	7	112	7.2	-8.1	9.0	-10.0	10.8	-12.1	12.9	-14.4	15.1	-16.9	17.5	-19.6	20.1	-22.5	22.9	-25.5	25.9	-28.8	29.0	-32.3	32.3	-36.0	35.8	-39.9

For SI: 1 foot = 304.8 mm, 1 mile per hour = 0.447 m/s, 1 pound per square foot = .0479 kPa

a. Interpolation shall be permitted for door areas or basic design wind speeds between those given above. For larger door areas, the values in this table shall be used.

b. Positive and negative values signify, respectively, pressures acting toward and away from the exterior surface of the door

c. Negative pressures assume the door overlaps the building's end zone by 2 feet. For overlaps less than 2 feet, the values in this table shall be used.

d. For Risk Category III and IV structures in the tornado prone region, the door shall meet the load requirements of this table or the design tornado pressure determined in accordance with Section 1609.5, whichever is greater

e. Tabulated values are calculated in accordance with ASCE 7 using the 0.6 factor for ASD and an elevation factor of 1.0. Lower elevation factors shall be permitted to be used in accordance with ASCE 7 Table 26.9-1.

f. Design wind pressures shall be determined in accordance with ASCE 7 in the following cases:

   1. Buildings designed as open, partially open, or partially enclosed.
   2. Door areas less than 63 ft^2.
   3. Basic wind speeds greater than 200 mph.
   4. Doors overlapping the building end zone more than 2 feet.
   5. Building mean roof height greater than 60 feet.
   6. Building types and conditions not within the scope (Section 30.1) of Chapter 30 of ASCE 7.

g. Topographic Factor, Kzt, is taken as 1. Determine design wind pressure in accordance with ASCE 7 where the topographic conditions of ASCE 7 Section 26.8 apply.

TABLE 1609.8(2) ADJUSTMENT FACTOR FOR BUILDING HEIGHT AND EXPOSURE

MEAN ROOFHEIGHT (ft)	EXPOSURE CATEGORY		
	B	C	D
15	0.82	1.21	1.47
20	0.89	1.29	1.55
25	0.94	1.35	1.61
30	1.00	1.40	1.66
35	1.05	1.45	1.70
40	1.06	1.49	1.74
45	1.10	1.53	1.78
50	1.13	1.56	1.81
55	1.16	1.59	1.84
60	1.19	1.62	1.87

For SI:1 foot= 304.8 mm

Reason: Vehicle access doors (e.g., sectional garage doors, rolling doors, and high-speed doors) are critical in maintaining building structural integrity during windstorms. If a vehicle access door gives way, internal pressure can build up on the roof, leading to building collapse. This phenomenon has been demonstrated in many field and laboratory studies over the years by NIST, IBHS, FEMA, and others. Yet these same organizations, as well as DASMA, report a general lack of wind-rated doors being specified and enforced in many regions throughout the country. This proposal requests a new table for vehicle access door design wind pressures. The table highlights and simplifies existing design wind pressure requirements for vehicle access doors, currently subsumed under “wall components & cladding.” The new table does not create any new requirements. We believe this new table will foster greater compliance with existing provisions of the code. A version of this table has been used for the past several editions of the Florida Building Code and in several residential codes, such as ICC 600-2020 Standard for Residential Construction in High-Wind Regions.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

This proposal only clarifies existing requirements, and does not change them. The tabulated pressures are calculated in accordance with existing IBC requirements.

S92-25

S93-25

IBC: SECTION 1610, 1610.1

Proponents: Jennifer Goupil, American Society of Civil Engineers and Structural Engineering Institute, representing American Society of Civil Engineers (jgoupil@asce.org)

2024 International Building Code

SECTION 1610
SOIL LOADS AND HYDROSTATIC PRESSURE

Revise as follows:

1610.1 Lateral pressures. *Structures* below grade shall be designed to resist lateral soil *loads* from adjacent soil. The lateral soil ~~Soil~~ *loads* specified in Table 1610.1 shall be used as the minimum design lateral soil *loads* unless determined otherwise by a geotechnical investigation in accordance with Section 1803. Foundation walls and other walls in which horizontal movement is restricted at the top shall be designed for at-rest pressure. Walls that are free to move and rotate at the top, such as retaining walls, shall be permitted to be designed for active pressure.

Where applicable, lateral pressure from fixed or moving surcharge *loads* shall be added to the lateral soil *load*. Lateral pressure shall be increased if expansive soils are present at the *site*. Foundation walls shall be designed to support the weight of the full hydrostatic pressure of undrained backfill unless a drainage system is installed in accordance with Sections 1805.4.2 and 1805.4.3.

Exception: Foundation walls extending not more than 8 feet (2438 mm) below grade and laterally supported at the top by flexible *diaphragms* shall be permitted to be designed for active pressure.

Reason: This proposal is a coordination proposal to bring the 2027 IBC up to date with the provisions of the 2022 edition of ASCE/SEI 7 Minimum Design Loads and Associated Criteria for Buildings and Other Structures (ASCE/SEI 7-22). This proposal improves the coordination between the IBC and ASCE 7 by changing text in the IBC to match text in ASCE 7. Specifically the subject of the sentence is made more clear by stating "lateral soil loads" rather than "soil loads". Table 1610.1 and the corresponding ASCE 7 table provide only lateral soil loads.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

Clarification change that will not impact the cost of construction. See reason statement.

S93-25

S94-25

IBC: 1610.2

Proponents: Jennifer Goupil, American Society of Civil Engineers and Structural Engineering Institute, representing American Society of Civil Engineers (jgoupil@asce.org)

2024 International Building Code

Revise as follows:

1610.2 Uplift loads on floor and foundations. Basement floors, slabs on ground, foundations, and similar approximately horizontal elements below grade shall be designed to resist uplift *loads* where applicable. The upward pressure of water shall be taken as the full hydrostatic pressure applied over the entire area. The hydrostatic *load* shall be ~~measured from~~ determined based on the elevation of the underside of the element being evaluated. The design for upward *loads* caused by expansive soils shall comply with Section 1808.6.

Reason: This proposal is a coordination proposal to bring the 2027 IBC up to date with the provisions of the 2022 edition of ASCE/SEI 7 *Minimum Design Loads and Associated Criteria for Buildings and Other Structures* (ASCE/SEI 7-22).

These changes improve the coordination between the IBC and ASCE 7 by changing text in the IBC to match text that appears in ASCE 7. IBC Section 1610.2 states that the hydrostatic load shall be measured from the underside of the element, however what is measured is actually the difference in height between the underside of the element and the water level. The hydrostatic load is calculated based on the measured difference in height. The proposed change more closely aligns with how the load is determined.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

The clarification contained in the proposal, which also improves coordination with ASCE 7, is not expected to affect the cost of construction.

S94-25

S95-25

IBC: 1611.1, 1611.2 (New); IPC: [BS] 1101.7

Proponents: Andrew Bevis, Chair, representing Plumbing, Mechanical and Fuel Gas Code Action Committee (pmgcac@iccsafe.org); Jeff Grove, Chair, representing BCAC (bcac@iccsafe.org)

2024 International Building Code

1611.1 Design rain loads. Each portion of a roof shall be designed to sustain the *load* of rainwater as per the requirements of Chapter 8 of ASCE 7. Rain loads shall be based on the summation of the static head, d_s, hydraulic head, d_h, and ponding head, d_p, using Equation 16-20. The hydraulic head shall be based on hydraulic test data or hydraulic calculations assuming a flow rate corresponding to a rainfall intensity equal to or greater than the 15-minute duration storm with return period given in Table 1611.1. Rainfall intensity shall be determined in inches per hour for 15-minute duration storms for the risk categories given in Table 1611.1. The ponding head shall be based on structural analysis as the depth of water due to deflections of the roof subjected to unfactored rain load and unfactored *dead load*.

$$R = 5.2(d_s + d_h + d_p)$$ **(Equation 16-20)**

For SI: $R = 0.0098(d_s + d_h + d_p)$ where:

d_h = Hydraulic head equal to the depth of water on the undeflected roof above the inlet of the secondary drainage system for structural loading (SDSL) required to achieve the design flow, in inches (mm). d_p = Ponding head equal to the depth of water due to deflections of the roof subjected to unfactored rain load and unfactored *dead load*, in inches (mm). d_s = Static head equal to the depth of water on the undeflected roof up to the inlet of the secondary drainage system for structural loading (SDSL), in inches (mm). R = Rain load, in pounds per square foot (kN/m^2).

SDSL is the roof drainage system through which water is drained from the roof when the drainage systems listed in ASCE 7 Section 8.2 (a) through (d) are blocked or not working.

Add new text as follows:

1611.2 Design of roof drains. The design of the roof drainage system shall comply with the requirements of the *International Plumbing Code* based on the rainfall rates specified in the *International Plumbing Code*.

2024 International Plumbing Code

Revise as follows:

[BS] 1101.7 Roof design. Roofs shall be designed for the rain load in accordance with the *International Building Code*.~~maximum possible depth of water that will pond thereon as determined by the relative levels of roof deck and overflow weirs, scuppers, edges or serviceable drains in combination with the deflected structural elements. In determining the maximum possible depth of water, all primary roof drainage means shall be assumed to be blocked. The maximum possible depth of water on the roof shall include the height of the water required above the inlet of the secondary roof drainage means to achieve the required flow rate of the secondary drainage means to accommodate the design rainfall rate as required by Section 1106.~~

Reason: This change will clarify that there is a difference in rainfall rates between the Building Code and the Plumbing Code, however, each code needs to apply the rainfall rates specified in that particular code. The concern with the Building Code is the structural loading from the ponding of water on the roof. The Plumbing Code is concerned with the drainage of the water from the roof.

A more conservative rainfall rate is selected in the Building Code which will result in a greater structural loading on the roof. The Building Code rainfall rate is considered a microburst. This heavy rainfall in a short period of time, can result in a greater amount of water ponding near the roof drain when compared to the rainfall rates used in the Plumbing Code.

The Plumbing Code rainfall rates are designed for a greater overall amount of water during the storm incident. Hence, if there is a microburst, the plumbing storm drainage system can still drain the water within a reasonable period of time, there just may be a greater amount of ponding on the roof for a short duration.

PMGCAC was established by the ICC Board of Directors in July 2011 to pursue opportunities to improve and enhance assigned International Codes or portions thereof. In 2023 and 2024 the BCAC has held numerous virtual meetings open to any interested party. Related documents and reports are posted on the PMGCAC website at PMGCAC webpage.

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. In 2023 and 2024 the BCAC has held several virtual meetings open to any interested party. In addition, there were numerous virtual Working Group meetings for the current code development cycle, which included members of the committee as well as interested parties. Related documents and reports are posted on the BCAC website at BCAC webpage.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

This proposed change is editorial without any change in the technical requirements of either code.

Staff Analysis: CC # S95-25 and CC # P1-25 addresses requirements in a different or contradicting manner. The committee is urged to make their intensions clear with their actions on these proposals.

S95-25

S96-25

IBC: 1611.1, 1611.1.1 (New)

Proponents: Erik Madsen, representing NCSEA (emadsen@dci-engineers.com); John Grenier, representing National Council of Structural Engineers Associations (NCSEA) (jgrenier@greniereng.com); Emily Guglielmo, representing NCSEA (eguglielmo@martinmartin.com)

2024 International Building Code

1611.1 Design rain loads. Each portion of a roof shall be designed to sustain the *load* of rainwater as per the requirements of Chapter 8 of ASCE 7. Rain loads shall be based on the summation of the static head, d_s, hydraulic head, d_h, and ponding head, d_p, using Equation 16-20. The hydraulic head shall be based on hydraulic test data or hydraulic calculations assuming a flow rate corresponding to a rainfall intensity equal to or greater than the 15-minute duration storm with return period given in Table 1611.1. Rainfall intensity shall be determined in inches per hour for 15-minute duration storms for the risk categories given in Table 1611.1. The ponding head shall be based on structural analysis as the depth of water due to deflections of the roof subjected to unfactored rain load and unfactored *dead load*.

$$R = 5.2(d_s + d_h + d_p)$$ **(Equation 16-20)**

For SI: $R = 0.0098(d_s + d_h + d_p)$ where:

d_h = Hydraulic head equal to the depth of water on the undeflected roof above the inlet of the secondary drainage system for structural loading (SDSL) required to achieve the design flow, in inches (mm). d_p = Ponding head equal to the depth of water due to deflections of the roof subjected to unfactored rain load and unfactored *dead load*, in inches (mm). d_s = Static head equal to the depth of water on the undeflected roof up to the inlet of the secondary drainage system for structural loading (SDSL), in inches (mm). R = Rain load, in pounds per square foot (kN/m^2).

SDSL is the roof drainage system through which water is drained from the roof when the drainage systems listed in ASCE 7 Section 8.2 (a) through (d) are blocked or not working.

Add new text as follows:

1611.1.1 Vertical walls. In determining the hydraulic head, d_h, one-half of the vertical surface area of any wall that diverts rainwater onto the roof shall be added to the projected roof area.

Reason: The requirement to include a portion of the vertical wall area in the rain tributary area is specified in the IPC Section 1106.4 and in the ASCE 7 Commentary Section C8.1.2, but not in the IBC or ASCE 7 provisions. It should be added to IBC for clarity and consistency.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

This requirement exists in ASCE 7 and IPC but is not formally identified in IBC. This proposal clarifies that.

S96-25

S97-25 Part I

IBC: [A] 104.2.4.1, [A] 107.2.6, [A] 107.2.6.1, SECTION 202 (New), 802.4, 1108.7.5, 1202.4.4, [BS] 1402.9, [BS] 1402.10, 1603.1, 1603.1.7, 1612.1, 1612.2, 1612.3, 1612.3.1 (New), 1612.3.1, 1612.3.2, 1612.4, 1804.5, 1805.1.2.1, [F] 2702.1.8, CHAPTER 35

Proponents: Jennifer Goupil, American Society of Civil Engineers and Structural Engineering Institute, representing American Society of Civil Engineers (jgoupil@asce.org); Chad Berginnis, representing Association of State Floodplain Managers (cberginnis@floods.org); Roderick Scott, Board Chair, representing Flood Mitigation Industry Association (roderick.scott75@aol.com); Natalie Enclade, representing BuildStrong America; Jiqiu yuan, representing National Institute of Building Sciences (jyuan@nibs.org); Joel Scata, representing NRDC (jscata@nrdc.org)

THIS IS A 7 PART CODE CHANGE. PART I, II, III, IV, & V WILL BE HEARD BY THE IBC STRUCTURAL CODE COMMITTEE. PART VI & VII WILL BE HEARD BY THE IRC-B CODE COMMITTEE. SEE THE TENTATIVE HEARING ORDER FOR THESE COMMITTEES.

2024 International Building Code

SECTION 202 DEFINITIONS

Add new definition as follows:

500-YEAR FLOODPLAIN. Land in the *floodplain* subject to a 0.2% or greater chance of *flooding* in any given year; area delineated on the *Flood Insurance Rate Map* (FIRM) as Shaded Zone X or Zone B.

[BS] BASE FLOOD. The *flood* having a 1-percent chance of being equaled or exceeded in any given year.

Revise as follows:

[BS] BASE FLOOD ELEVATION. The elevation of the *base flood*, including wave height, relative to the National Geodetic Vertical Datum (NGVD), North American Vertical Datum (NAVD) or other datum specified on the *Flood Insurance Rate Map* (*FIRM*). In areas designated on the *Flood Insurance Rate Map* as Zone AO, the *base flood elevation* is the elevation of the highest existing grade of the building's perimeter plus the depth number (in feet) specified on the flood hazard map. In areas designated as Zone AO where a depth number is not specified on the map, the depth number is taken as being equal to 2 feet (610 mm).

[BS] COASTAL A ZONE. Area within a *special flood hazard area*, landward of a V zone or landward of an open coast without mapped *coastal high-hazard areas*. In a *coastal A zone*, the principal source of *flooding* must be astronomical tides, storm surges, seiches or tsunamis, not riverine *flooding* . During the *base flood* conditions, ~~the potential for breaking~~ wave heights ~~shall be~~ are greater than or equal to $1^1/_2$ feet (457 mm). The inland limit of the *coastal A zone* is (a) the *Limit of Moderate Wave Action* if delineated on a *FIRM*, or (b) designated by the authority having *jurisdiction*.

[BS] DESIGN FLOOD. Flood corresponding to the elevations specified in Section 1.5.2 of ASCE 24 and acting over the *flood hazard area* specified in Section 1.3 of ASCE 24 or otherwise legally designated. ~~The *flood* associated with the greater of the following two areas:~~

1. ~~Area with a flood plain subject to a 1-percent or greater chance of *flooding* in any year.~~
2. ~~Area designated as a *flood hazard area* on a community's flood hazard map, or otherwise legally designated.~~

[BS] DESIGN FLOOD ELEVATION. The elevation of the "*design flood*," including wave height, relative to the datum specified on the community's legally designated flood hazard map. ~~In areas designated as Zone AO, the *design flood elevation* shall be the elevation of the highest existing grade of the building's perimeter plus the depth number (in feet) specified on the flood hazard map. In areas designated as Zone AO where a depth number is not specified on the map, the depth number shall be taken as being equal to 2 feet (610 mm).~~

[BS] FLOOD HAZARD AREA. The greater of the following ~~two~~ three areas:

1. The area within a flood plain subject to a 1-percent or greater chance of *flooding* in any year, including *special flood hazard areas* delineated on the *Flood Insurance Rate Map.*

2. The 500-year floodplain, when delineated on the *Flood Insurance Rate Map*.

~~2~~ 3. The area designated as a flood hazard area on a community's flood hazard map, or otherwise legally designated.

[BS] SPECIAL FLOOD HAZARD AREA. ~~The land area subject to flood hazards and shown on a~~ Land in the *floodplain* subject to a 1% or greater chance of *flooding* in any given year; area delineated on the *Flood Insurance Rate Map* ~~or other flood hazard map~~ as Zone A, AE, A1-30, A99, AR, AO, AH, V, VO, VE or V1-30.

2024 International Existing Building Code

Revise as follows:

[BS] FLOOD HAZARD AREA. The greater of the following ~~two~~three areas:

1. The area within a flood plain subject to a 1-percent or greater chance of flooding in any year~~.~~ , including special flood hazard areas delineated on the Flood Insurance Rate Map.

2. The 500-year floodplain, when delineated on the Flood Insurance Rate Map.

~~2.~~ 3. The area designated as a *flood hazard area* on a community's flood hazard map, or otherwise legally designated.

2024 International Mechanical Code

Revise as follows:

[BS] DESIGN FLOOD ELEVATION. The elevation of the "design flood," including wave height, relative to the datum specified on the community's legally designated flood hazard area map. ~~In areas designated as Zone AO, the *design flood elevation* shall be the elevation of the highest existing grade of the *building 's* perimeter plus the depth number, in feet (mm), specified on the flood hazard map. In areas designated as Zone AO where a depth number is not specified on the map, the depth number shall be taken as being equal to 2 feet (610 mm).~~

2024 International Plumbing Code

Revise as follows:

[BS] BASE FLOOD ELEVATION. ~~A reference point, determined in accordance with the building code, based on the depth or peak elevation of flooding, including wave height, which has a 1-percent (100-year flood) or greater chance of occurring in any given year.~~ The elevation of the*base flood*, including wave height, relative to the National Geodetic Vertical Datum (NGVD), North American Vertical Datum (NAVD) or other datum specified on the*Flood Insurance Rate Map*(*FIRM*). In areas designated on the*Flood Insurance Rate Map*as Zone AO, the*base flood elevation*is the elevation of the highest existing grade of the building's perimeter plus the depth number (in feet) specified on the flood hazard map. In areas designated as Zone AO where a depth number is not specified on the map, the depth number is taken as being equal to 2 feet (610 mm).

[BS] DESIGN FLOOD ELEVATION. The elevation of the "design flood," including wave height, relative to the datum specified on the community's legally designated flood hazard map. ~~In areas designated as Zone AO, the design flood elevation shall be the elevation of the highest existing grade of the building's perimeter plus the depth number (in feet) (mm) specified on the flood hazard map. In areas designated as Zone AO where a depth number is not specified on the map, the depth number shall be taken as being equal to 2 feet (610 mm).~~

[BS] FLOOD HAZARD AREA. The greater of the following ~~two~~three areas:

1. The area within a flood plain subject to a 1-percent or greater chance of flooding in any given year~~.~~ , including special flood hazard areas delineated on the Flood Insurance Rate Map.

2. The 500-year floodplain, when delineated on the*Flood Insurance Rate Map*.

~~2.~~3. The area designated as a *flood hazard area* on a community's flood hazard map or as otherwise legally designated.

2024 International Fuel Gas Code

Revise as follows:

[BS] DESIGN FLOOD ELEVATION. The elevation of the "design flood," including wave height, relative to the datum specified on the community's legally designated flood hazard map. ~~In areas designated as Zone AO, the *design flood elevation* shall be the elevation of the highest existing grade of the *building's* perimeter plus the depth number (in feet) specified on the flood hazard map. In areas designated as Zone AO where a depth number is not specified on the map, the depth number shall be taken as being equal to 2 feet (610 mm).~~

[BS] FLOOD HAZARD AREA. The greater of the following ~~two~~three areas:

1. The area within a floodplain subject to a 1 percent or greater chance of flooding in any given year~~.~~ , including special flood hazard areas delineated on the Flood Insurance Rate Map.

2. The 500-year floodplain, when delineated on the *Flood Insurance Rate Map*.

~~2.~~3. The area designated as a *flood hazard area* on a community's flood hazard map, or otherwise legally designated.

2024 International Residential Code

CHAPTER 24
FUEL GAS

SECTION G2403 (202)
GENERAL DEFINITIONS

Revise as follows:

DESIGN FLOOD ELEVATION. The elevation of the "design flood," including wave height, relative to the datum specified on the community's legally designated flood hazard map. ~~In areas designated as Zone AO, the design flood elevation shall be the elevation of the highest existing grade of the *building's* perimeter plus the depth number (in feet) specified on the flood hazard map. In areas designated as Zone AO where a depth number is not specified on the map, the depth number shall be taken as being equal to 2 feet (610 mm).~~

FLOOD HAZARD AREA. The greater of the following ~~two~~ three areas:

1. The area within a floodplain subject to a 1 percent or greater chance of flooding in any given year

   ~~.~~ , including special flood hazard areas delineated on the Flood Insurance rate Map.

2. The 500-year floodplain, when delineated on the Flood Insurace Rate Map.

~~2.~~ 3. The area designated as a *flood hazard area* on a community's flood hazard map, or otherwise legally designated.

2024 International Private Sewage Disposal Code

Revise as follows:

[BS] DESIGN FLOOD ELEVATION. The elevation of the "design flood," including wave height, relative to the datum specified on the community's legally designated flood hazard map. ~~In areas designated as Zone AO, the design flood elevation shall be the elevation of the highest existing grade of the *building's* perimeter plus the depth number (in feet) specified on the flood hazard map. In areas designated as Zone AO where a depth number is not specified on the map, the depth number shall be taken as being equal to 2 feet~~

~~(610 mm).~~

[BS] FLOOD HAZARD AREA. The greater of the following ~~two~~three areas:

1. The area within a flood plain subject to a 1-percent or greater chance of flooding in any given year~~.~~ , including special flood hazard areas delineated on the Flood Insurance Rate Map.

2. The 500-year floodplain, when delineated on the Flood Insurance Rate Map.

~~2.~~3. The area designated as a flood hazard area on a community's flood hazard map or as otherwise legally designated.

2024 International Swimming Pool and Spa Code

Revise as follows:

[BS] FLOOD HAZARD AREA. The greater of the following ~~two~~three areas:

1. The area within a flood plain subject to a 1-percent or greater chance of flooding in any year~~.~~ , including speical flood hazard areas delineated on the Flood Insruance Rate Map.

2. The 500-year floodplain, when delineated on the Flood Insurance Rate Map.

~~2.~~3. The area designated as a *flood hazard area* on a community's flood hazard map, or otherwise legally designated.

Reason: This proposal is a coordination proposal to bring the 2027 edition of the I-Codes up to date with the provisions in the 2022 edition of *ASCE/SEI 7 Minimum Design Loads and Associated Criteria for Buildings and Other Structures, Supplement 2* (ASCE/SEI 7-22, Supplement 2) as well as the 2024 edition of *ASCE/SEI 24 Flood Resistant Design and Construction* (ASCE/SEI 24-24) --- specifically for the codes primarily affected such as the International Building Code (IBC), the International Residential Code (IRC), and the International Existing Building Code (IEBC), in Group B, but also every I-Code affected by a coordinating code change that will need to be updated. ASCE/SEI 7-22 is the current reference in 2024 I-Codes and Supplement 2 has been submitted as an Administrative Update. ASCE/SEI 24-24 has also been submitted as an Administrative Update to the 2027 I-Codes.

This proposal has been organized into Part I to Part VII and includes technical updates as well as editorial coordination. The specific changes to each section included in this proposal are outlined in Overview below, and a detailed summary of the technical updates are explained in Technical Rationale below that. In addition to the strike out/underline for the code change proposals , the MS Word documents for each affected I-Code have been provided as Attached Files for clarity.

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Overview:

All Codes, All Chapter: Add phase "including special flood hazard areas and 500-year floodplain" following flood area for clarity. And change to clarify term definitions and when "base flood" applies and when "design flood" applies. Also aligns definitions of "base flood elevation" and "design flood elevations". "Flood Hazard Area" is updated with a new definition. These two changes are carried out throughout the series of these comprehensive code change proposal for clarification and consistency.

Since many of the I-Codes point back to the IBC for the definition, Part I has been organized to include all of the proposed changes to all of the definitions in all of the affected I-Codes.

PART I:

Section 202 Definitions: Adds a new definition for "500-year Floodplain" to distinguish it from the existing definition. While "Base Flood" remains the same, "Base Flood Elevation" is updated along with "Design Flood" and "Design Flood Elevation". "Flood Hazard Area" is updated and a new definition for "Special Flood Hazard Area" is added.

PART II:

Section 104, 107 Scope: Add phase "including special flood hazard areas" for clarity. And change to "base flood elevations" from "design flood elevations" to clarify the applicable requirements for the two separate terms. See Section 202 for the updated definitions. These two changes are carried out throughout the code change proposal for clarification and consistency.

Section 202 Definitions: Adds a new definition for "500-year Floodplain" to distinguish it from the existing definition. While "Base Flood" remains the same, "Base Flood Elevation" is updated along with "Design Flood" and "Design Flood Elevation". "Flood Hazard Area" is updated and a new definition for "Special Flood Hazard Area" is added.

Section 802 Interior Finishes: Removes the pointer that is too specific.

Section 1108 Accessibility: Add phase "including special flood hazard areas" for clarity.

Section 1202 Interior Environment: Removes the pointer that is too specific.

Section 1402 Exterior Walls: Removes the pointer that is too specific.

Section 1603 General Structural Loads: Add phase "including special flood hazard areas" for clarity. Add pointers to ASCE/SEI 24.

Section 1612 Flood Loads: Add phase "including special flood hazard areas" for clarity. Removes the pointer that is too specific. Clarifies and aligns "Establishing the Flood Hazard Area" and the "Design Flood Elevation" with the standards. Clarifies where the requirements are for the Base Flood versus the Design Flood Elevation. Also clarifies and aligns what is required for the documentation.

Section 1804, 1805 Soils and Foundations: Add phase "including special flood hazard areas" for clarity. Removes the pointer that is too specific.

Section 2702 Electrical: Add phase "including special flood hazard areas" for clarity. Removes the pointer that is too specific. [NOTE - This will need to be updated in the International Fire Code. If this section falls in Group A Hearings, this will need to be coordinated next cycle.]

Chapter 35: Update references for ASCE/SEI 7-22 and ASCE/SEI 24.

Appendix G and J: These changes are provided in a separate Code Change Proposal but must be included for a comprehensive proposal.

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Technical Rationale:

The American Society of Civil Engineers (ASCE) is proposing revisions to the International Code Council's I-Codes for the 2027 Cycle to align the national codes with the current ASCE/SEI design standards including:

ASCE/SEI 7 Minimum Design Loads and Associated Criteria for Buildings and Other Structures, 2022 edition; Supplement 2 (ASCE/SEI 7-22 S2)

ASCE/SEI 24 Flood Resistant Design and Construction, 2024 edition (ASCE/SEI 24-24)

The loading standard ASCE/SEI 7-22 S2 and the design standard ASCE/SEI 24-24 work together – these documents have been developed to be consistent and coordinated so they can be required and used together. There are three significant changes in the national loading standard ASCE/SEI 7-22 S2 including (1) an extension of the defined Flood Hazard Area to the 500-year floodplain for Rick Category II, III, and IV structures, (2) an inclusion of risk-based design for loads, and (3) requirements to include relative sea level change into design load calculations for coastal sites; see below for more technical details. There are three significant changes in the national design standard ASCE/SEI 24-24 including (1) alignment with ASCE/SEI 7-22 S2, (2) alignment with FEMA Technical Bulletins, and (3) updates for elevations, materials, and floodproofing.

Both ASCE/SEI Standards are available for purchase and the Supplement available as a free download from the ASCE Library:

ASCE/SEI 7-22 (https://doi.org/10.1061/9780784415788)

ASCE/SEI 7-22 Supplement 2 (https://doi.org/10.1061/9780784415788.sup2)

ASCE/SEI 24-24 (https://doi.org/10.1061/9780784485781)

Flood Hazard:

The ASCE 7-22 S2 updates the design requirements to define the flood hazard area for the given Risk Category of structure. Addionally, the flood hazard depth is tied to the mean recurrence interval for a given Risk Category of structure. The design flood hazard is related to Risk Category (e.g., RC II will be designed to 500-year MRI), which is consistent with the way other environmental hazards (such as wind and snow loads) relate the hazard to Risk Category. This is in contrast to the current code requirements, which only considers only 100-year MRI flood for all structures regardless of Risk Category. In some areas in the U.S., the Authority Having Jurisdiction is already requiring a higher design requirement for the flood hazard. The city of Houston, for example, moved to requiring use of the 500-year MRI as the design basis for flood following the devastation from Hurricane Harvey. At a national level, FEMA is considering the use of the 500-year flood as the basis for floodplain management.

The coordinated code change proposals submitted for Group B are drafted to bring the IBC, IRC, and IEBC into alignment with the recent changes in ASCE 7-22 Supplement 2 and ASCE 24-24. The significant changes from the updates to these standards are to differentiate between the base flood (also described as the 100-year flood, or the 1% or greater chance of flooding in any given year) and the design flood, which could be different, and is defined in the standards for each Risk Category. The design flood must include considerations for loading specified in ASCE/SEI 7-22 S2 and design specified in ASCE/SEI 24-24.

Flood damage, and associated loss dollars, has significantly expanded since the last major updates of ASCE 7 Chapter 5 and ASCE 24. Their revisions attempt to close that gap and align the risks across other hazards.

FEMA cites that flood damage cost approximately $17 billion each year between 2010 and 2018, and with rising sea levels and extreme weather could cause $20 billion of flood damage to at-risk US homes this year, rising to $32 billion by 2051. Data from 2018 Hurricane Michael shows that 42% of claimed damage amounts were in the Shaded X-Zone (500-year floodplain), exceeding the amounts in both the A and V-Zones. (FEMA. Mitigation Assessment Team Report Hurricane Michael in Florida (FEMA P-2077), February 2020).

This is further supported by FEMA's recent report "A Cost and Benefits Analysis of Increased Elevation Requirements for Public and Nonresidential Buildings in Riverine and Coastal Floodplains," which evaluated the potential avoided losses (benefits) for 8 building types in 19 coastal floodplains and 14 riverine floodplains in the 100-year floodplain and the Shaded X Zone. The report shows that there are significant benefits to most buildings in the 100-year floodplain, particularly in steep/narrow floodplains. There were also significant benefits to buildings in the Shaded X Zone where there are currently no elevation requirements. These findings are supported by evidence from the National Flood Insurance Program (NFIP), which stated, "People outside of high-risk areas file more than 25 percent of NFIP claims and receive one-third of disaster assistance for flooding. The NFIP's preferred risk policies are designed for residential properties located in low- to moderate-risk flood zones." Additional reports from the NFIP indicate that 40% of companies fail to reopen after a disaster, with another 25% closing within a year. These problems are only further exacerbated by the influence of development and associated runoff, changes in precipitation rates, local subsidence, and sea level change. All of which are not accounted for by FEMA's flood maps, which only account for historic flood data and not future projections. All of this data supports the need to move from a fixed freeboard approach to a risk-based elevation approach that provides consistent protection from flat/wide floodplains to steep/narrow floodplains and more appropriately addresses the influence of wave action in coastal floodplains. This recognizes that true resiliency for communities is continuity of local businesses and making sure that public services are maintained and that adaptation to changes in precipitation, development, and sea level change must be incorporated into new buildings rather than relying on often prohibitively expensive retrofit options.

The ASCE changes consider the frequency of recent and predicted events and the significant damage recorded in the Shaded X-Zone. But, while significant, the addition of the Shaded X-Zone to the standards represents a change to only 4% of the U.S. population.

This proposal reflects the latest flood hazard science, but in general does not represent a fundamental increase in loads, resulting in higher construction costs. However, with the introduction of a higher flood design return period and future considerations for Sea Level Change, the design flood loads have increased for structures currently located in a designated flood hazard area. The ASCE revisions do not add structures to the currently defined flood hazard area, but do add small-depth flood loads for new construction in the Shaded X-Zone where there currently are none.

ASCE Consensus Process:

ASCE established and maintains an ANSI-accredited, consensus process for standard development. The open process includes selection of a balanced committee, including representation of all affected stakeholders, and public review of the draft standard prior to publication. The ASCE consensus process follows the *ASCE Rules for Standards Committees*, which is published on the ASCE website. The ASCE/SEI 7-22 S2 was developed by the ASCE 7-22 Standard Committee, which included approximately 50 voting members and hundreds more associate members. The ASCE/SEI 24-24 standard was developed by the ASCE 24-24 Standard Committee, which included approximately 25 voting members and 15 associate members.

Supporting Organizations:

This code change proposal has many supporters, included but not limited to the following organizations:

American Flood Coalition

Association of State Flood Plain Managers (ASFPM)

BuildStrong America

Federal Emergency Management Association

Flood Mitigation Industry Association (FMIA)

National Institute of Building Science (NIBS)

Registered Designer Professionals and planners of buildings and other infrastructure projects, Code Officials, and Authorities Having Jurisdiction owe it to the public and have an ethical obligation to provide a framework for safe, reliable structures. The public expects that the buildings in which they live, work, and play are designed consistently, with the same risk approach for all environmental hazards. Flooding is disruptive to families, businesses, and communities and it takes years to recover from these devastating disasters and overcome the losses incurred. The flood hazard must be taken seriously and incorporated into our design standards and building codes in a manner that is consistent with all of the other environmental hazards.

Bibliography: FEMA. A Cost and Benefits Analysis of Increased Elevation Requirements for Public and Nonresidential Buildings in Riverine and Coastal Floodplains. January 2025 (https://www.researchgate.net/publication/388556202_A_Cost_and_Benefits_Analysis_of_Increased_Elevation_Requirements_for_Publ

FEMA. Mitigation Assessment Team Report Hurricane Michael in Florida, February 2020 (https://www.fema.gov/sites/default/files/2020-07/mat-report_hurricane-michael_florida.pdf)

Cost Impact: Increase

- **2025 Cost and Benefit Analysis for ASCE 24-24.PDF**
  https://www.cdpaccess.com/proposal/11717/35911/documentation/186635/attachments/download/9868/

Estimated Immediate Cost Impact:

ASCE 7 and ASCE 24 are national minimum design standards. The effects will vary depending upon the local flood conditions and flood risk across the country and among building types. For nearly 90% of all affected structures in Numbered A Zones, the estimated immediate costs impact can be understood in analysis of the mitigation cost as a percentage of building replacement value from 0.2-6.6% for coastal sites and 0.0-4.0% for riverine sites. Additionally, average benefits per square foot range from $51-$336 for both riverine and coastal flooding, which are dependent on building type and location. See the attached “Cost and Benefits Analysis” for additional information.

This proposal reflects the latest flood hazard science, but in general does not represent a fundamental increase in loads, resulting in higher construction costs. However, with the introduction of a higher flood design return period and future considerations for Sea Level Change, the design flood loads have increased for structures currently located in a designated flood hazard area. The ASCE revisions do not add structures to the currently defined flood hazard area, but do add small-depth flood loads for new construction in the Shaded X-Zone where there currently are none.

Estimated Immediate Cost Impact Justification (methodology and variables):

A building cost study was considered for 14 riverine locations and 19 coastal locations. Examples consider A Zone and X Zone conditions to understand how the ASCE changes impact the overall cost. However, since most buildings are riverine, the study focused there, but similar trends appear in coastal buildings.

Table 1 is a summary of the buildings that were considered in the study, accounting for the building type, building sizes (and average), and Flood Design Classes. The difference between a commercial and government office building plays a larger role in the losses avoided portion of the study. The cost analysis is grouped by Flood Design Class since this is the grouping used in ASCE 24 for elevation criteria.

Table 1 - Building Types Considered in Study

Building Type	Flood Design Class	Small SF	Medium SF	Large SF	Average SF
Hospital 2-3 Stories	4	25,000	70,000	145,000	80,000
Elementary School	3	25,000	40,000	65,000	43,333
Police Station	4	7,000	13,000	23,000	14,333
Office 1-Story (Government)	2	2,000	7,000	25,000	11,333
Office 3-Story (Government)	2	5,000	16,000	80,000	33,667
Office 1-Story (Commercial)	2	2,000	7,000	25,000	11,333
Office 3-Story (Commercial)	2	5,000	16,000	80,000	33,667
Retail Store	2	4,000	10,000	22,000	12,000

Table 2 provides an overview of A Zone conditions for increased building costs within the 100-yr floodplain. The values represent the breakdown of example floodplains using the numbered A Zone range to categorize how much rise there is between the various flood events. A low numbered A Zone represents a flat floodplain and a high number represents a steeper floodplain where there can be a large difference in flood elevations. The percent of numbered A Zones throughout the country based on an NFIP flood insurance policy analysis per census tract.

This provides a breakdown of how various floodplains impact the increased building cost. It's important to note that in A01-A03 the freeboard requirements equal or exceed the MRI based design flood event. Since ASCE did not change the minimum freeboard requirements for FDC 2 and FDC 4, those values are the same for ASCE 24-14 and ASCE 24-24 and therefore there is no cost increase. Additionally, for FDC 4 the analysis selected the higher of the 500-yr and BFE+2, so the delta between the ASCE 24-14 and ASCE 24-24 wasn't as high in the higher numbered A Zones as it would have been with FDC 2 and 3 where they were locked with ASCE 24-14 at BFE+1.

Table 2 - Average Building Cost Increase Percentage for Riverine A Zones Per Numbered A Zone

Numbered A Zone	Percentile of Numbered A Zones	FDC 2	FDC3	FDC4
A01-A03	26%	0.00%	1.20%	0.00%
A04-A06	41%	1.50%	1.90%	0.50%
A07-A10	20%	2.40%	2.90%	0.60%
A11-A14	9%	4.80%	5.50%	1.00%
A15-A17	2%	8.90%	10.00%	1.60%
A18-A30	2%	11.90%	13.20%	2.10%
	Weighted Average:	1.97%	2.65%	0.49%

Table 3 provides an overview of X Zone conditions for increased building costs within the 500-yr floodplain. The 500-year floodplain represents the area between the 100-year floodplain and the 500-year flood extent, this therefore represents protection from the 101-year to the 500-year flood. In X Zones it is assumed that buildings are built on the ground as compared to elevated foundations in Zone

A. Since the X Zone represents the difference between the 100-year and the 500-year flood, the 300-year flood elevation was used as an average ground elevation. The ASCE 24-24 elevations represent the minimum required elevations required per the standard. The increased elevation is therefore the difference between ground (at the 300-year flood elevation) and the ASCE 24-24 elevation requirements. Similar to Table 2, Table 3 data is provided per Flood Design Class per grouped numbered A Zone designation.

Table 3 - Average Building Cost Increase Percentage for Riverine X Zones Per Numbered A Zone

Numbered A Zone	Percentile of Numbered A Zones	FDC 2	FDC 3	FDC 4
A01-A03	26%	0.60%	1.70%	0.70%
A04-A06	41%	1.00%	1.50%	0.80%
A07-A10	20%	1.20%	1.80%	1.00%
A11-A14	9%	1.90%	3.00%	1.70%
A15-A17	2%	3.20%	5.00%	2.80%
A18-A30	2%	4.40%	6.70%	3.70%
	Weighted Average:	1.14%	1.93%	1.00%

It is believed that the presentation of percent increase in building cost provided a better representation of the overall cost impacts rather than providing dollar values. While the percent increase does get rather large in those areas with high numbered A Zones, this is a much smaller overall percentage of land area, so this represents a smaller portion of the floodplains in the US. However, recent events have shown that when these areas experience a flood event above the 100-year or 1% annual chance flood, that they often experience deep flooding. Experience from Western NC following Hurricane Helene demonstrated that when floods occur in areas with high numbered A Zones that significant flood damage occurs in the X Zone. There were examples of buildings elevated in the X Zone that performed very well in Hurricane Helene and had little to no observed damage. But many buildings in the X Zone that were constructed at grade were severely damaged or destroyed. While this is observational, there is substantial evidence to suggest that the percent cost increase is offset by the avoided losses. Two key factors that impact the avoided loss calculation is the impact of when the original flood insurance studies and associated maps were created (older mapping data), which can mean that the mapped risk is underestimated (increased runoff due to development and updated precipitation data) and then looking forward the impact of future changes in precipitation rates over the 50-year life of riverine buildings. Similarly, these impacts can impact coastal flooding heights as well as the impact of sea level change.

Attached Files

- **ATT - IEBC and OTHER I-Codes.docx**
  https://www.cdpaccess.com/proposal/11717/35911/files/download/9500/
- **ATT - IBC APP G J.docx**
  https://www.cdpaccess.com/proposal/11717/35911/files/download/9453/
- **ATT - IBC.docx**
  https://www.cdpaccess.com/proposal/11717/35911/files/download/9452/

Staff Analysis: Chapter 24 of the IRC is copied from the IFGC, therefore, everything in that Chapter is controlled by the scoping in the IFGC.

CC # G9-25 and CC # S97-25 Part I addresses requirements in a different or contradicting manner. The committee is urged to make their intensions clear with their actions on these proposals.

S97-25 Part I

S97-25 Part II

IBC: [A] 104.2.4.1, [A] 107.2.6, [A] 107.2.6.1, SECTION 202 (New), 802.4, 1108.7.5, 1202.4.4, [BS] 1402.9, [BS] 1402.10, 1603.1, 1603.1.7, 1612.1, 1612.2, 1612.3, 1612.3.1 (New), 1612.3.1, 1612.3.2, 1612.4, 1804.5, 1805.1.2.1, [F] 2702.1.8, CHAPTER 35

Proponents: Jennifer Goupil, American Society of Civil Engineers and Structural Engineering Institute, representing American Society of Civil Engineers (jgoupil@asce.org); Chad Berginnis, representing Association of State Floodplain Managers (cberginnis@floods.org); Roderick Scott, Board Chair, representing Flood Mitigation Industry Association (roderick.scott75@aol.com); Natalie Enclade, representing BuildStrong America; Jiqiu yuan, representing National Institute of Building Sciences (jyuan@nibs.org); Joel Scata, representing NRDC (jscata@nrdc.org)

2024 International Building Code

CHAPTER 1
SCOPE AND ADMINISTRATION

Revise as follows:

[A] 104.2.4.1 Flood hazard areas. The *building official* shall not grant modifications to any provision required in *flood hazard areas*, including special flood hazard areas, as established by Section 1612.3 unless a determination has been made that:

1. A showing of good and sufficient cause that the unique characteristics of the size, configuration or topography of the *site* render the elevation standards of Section 1612 inappropriate.
2. A determination that failure to grant the variance would result in exceptional hardship by rendering the *lot* undevelopable.
3. A determination that the granting of a variance will not result in increased flood heights, additional threats to public safety or extraordinary public expense; cause fraud on or victimization of the public; or conflict with existing laws or ordinances.
4. A determination that the variance is the minimum necessary to afford relief, considering the *flood* hazard.
5. Submission to the applicant of written notice specifying the difference between the ~~*design*~~ base *flood elevation* and the elevation to which the building is to be built, stating that the cost of flood insurance will be commensurate with the increased risk resulting from the reduced floor elevation, and stating that construction below the ~~*design*~~ base *flood elevation* increases risks to life and property.

[A] 107.2.6 Site plan. The *construction documents* submitted with the application for *permit* shall be accompanied by a site plan showing to scale the size and location of new construction and *existing structures* on the *site*, distances from *lot lines*, the established street grades and the proposed finished grades and, as applicable, *flood hazard areas*, including *special flood hazard areas* and *500-year floodplains*, *floodways*, and ~~*design*~~ base *flood elevations*; and it shall be drawn in accordance with an accurate boundary line survey. In the case of demolition, the site plan shall show construction to be demolished and the location and size of *existing structures* and construction that are to remain on the *site* or plot. The *building official* is authorized to waive or modify the requirement for a site plan where the application for *permit* is for *alteration* or *repair* or where otherwise warranted.

[A] 107.2.6.1 ~~Design~~ Base flood elevations. Where ~~*design*~~ base *flood elevations* are not specified, they shall be established in accordance with Section 1612.3.~~1~~2.

CHAPTER 8
INTERIOR FINISHES

802.4 Applicability. For *buildings* in *flood hazard areas* ~~as established in Section 1612.3~~, *interior finishes*, *trim* and *decorative materials* below the elevation required by Section 1612 shall be *flood-damage-resistant materials*.

CHAPTER 11

ACCESSIBILITY

1108.7.5 Flood hazard areas. *Type A units* and *Type B units* shall not be required for *buildings* without elevator service that are located in *flood hazard areas*, including *special flood hazard areas* and *500-year floodplains* ~~as established in Section 1612.3~~, where the minimum required elevation of the *lowest floor* or lowest supporting horizontal structural member, as applicable, results in all of the following:

1. A difference in elevation between the minimum required floor elevation at the primary entrances and vehicular and pedestrian arrival points within 50 feet (15 240 mm) exceeding 30 inches (762 mm).
2. A slope exceeding 10 percent between the minimum required floor elevation at the primary entrances and vehicular and pedestrian arrival points within 50 feet (15 240 mm).

Where such arrival points are not within 50 feet (15 240 mm) of the primary entrances, the closest arrival points shall be used.

CHAPTER 12 INTERIOR ENVIRONMENT

1202.4.4 Flood hazard areas. For *buildings* in *flood hazard areas* ~~as established in Section 1612.3~~, the openings for under-floor ventilation shall be deemed as meeting the flood opening requirements of ASCE 24 provided that the ventilation openings are designed and installed in accordance with ASCE 24.

CHAPTER 14 EXTERIOR WALLS

[BS] 1402.9 Flood resistance. For *buildings* in *flood hazard areas* ~~as established in Section 1612.3~~, *exterior walls* extending below the elevation required by Section 1612 shall be constructed with *flood-damage-resistant materials*.

[BS] 1402.10 Flood resistance for coastal high-hazard areas and coastal A zones. For *buildings* in *coastal high-hazard areas* and coastal A zones ~~as established in Section 1612.3~~, electrical, mechanical and plumbing system components shall not be mounted on or penetrate through *exterior walls* that are designed to break away under *flood loads*.

CHAPTER 16 STRUCTURAL DESIGN

1603.1 General. *Construction documents* shall show the material, size, section and relative locations of structural members with floor levels, column centers and offsets dimensioned. The design *loads* and other information pertinent to the structural design required by Sections 1603.1.1 through 1603.1.9 shall be indicated on the *construction documents*.

Exception: *Construction documents* for *buildings* constructed in accordance with the *conventional light-frame construction* provisions of Section 2308 shall indicate the following structural design information:

1. Floor and roof dead and *live loads*.
2. Ground snow load, p_g , and *allowable stress design* ground snow load, $p_{g(asd)}$.
3. Basic *wind speed* , V, mph (m/s), and *allowable stress design* wind speed, V_{asd}, as determined in accordance with Section 1609.3.1 and wind exposure.
4. *Seismic design category* and *site class*.
5. Flood design data, if located in *flood hazard areas*, including *special flood hazard areas* and *500-year floodplains* ~~established in Section 1612.~~3.

6. Design load-bearing values of soils.
7. Rain load data.

1603.1.7 Flood design data. For *buildings* located in whole or in part in *flood hazard areas*, including *special flood hazard areas* and *500-year floodplains* ~~as established in Section 1612.3~~, the documentation pertaining to design, if required in Section 1612.4, shall be included and the following information, referenced to the datum on the community's *Flood Insurance Rate Map* (*FIRM*), shall be shown, regardless of whether *flood loads* govern the design of the *building*:

1. *Flood design* class assigned according to ASCE 24.
2. In *flood hazard areas* other than *coastal high hazard areas* or *coastal A zones*, the elevation of the proposed *lowest floor*, including the basement, determined in accordance with ASCE 24.
3. In *flood hazard areas* other than *coastal high hazard areas* or *coastal A zones*, the elevation to which any nonresidential *building* will be dry floodproofed, determined in accordance with ASCE 24.
4. In *coastal high hazard areas* and *coastal A zones*, the proposed elevation of the bottom of the lowest horizontal structural member of the *lowest floor*, including the basement, determined in accordance with ASCE 24.

SECTION 1612
FLOOD LOADS

1612.1 General. Within *flood hazard areas,* including *special flood hazard areas* and *500-year floodplains* ~~as established in Section 1612.3~~, all new construction of *buildings*, *structures* and portions of *buildings* and *structures*, including *substantial improvement* and restoration of *substantial damage* to *buildings* and *structures*, shall be designed and constructed to resist the effects of flood hazards and *flood loads*. For *buildings* that are located in more than one *flood hazard area*, the provisions associated with the most restrictive *flood hazard area* shall apply.

1612.2 Design and construction. The design and construction of *buildings* and *structures* located in *flood hazard areas*, including *special flood hazard areas* and *500-year floodplains* ~~*coastal high hazard areas* and *coastal A zones*~~, shall be in accordance with Chapter 5 of ASCE 7 and ASCE 24. Elevators, escalators, conveying systems and their components shall conform to ASCE 24 and ASME A17.1/CSA B44 as applicable.

Exception: *Temporary structures* complying with Section 3103.6.1.3.

1612.3 Establishment of flood hazard areas. ~~To establish *flood hazard areas*, the~~ The applicable governing authority shall adopt a flood hazard map and supporting data. The flood hazard map shall include, at a minimum, ~~areas of~~ special flood hazard areas and *500-year floodplains* as identified by the Federal Emergency Management Agency in an engineering report entitled "The *Flood Insurance Study* for **[INSERT NAME OF JURISDICTION]**," dated **[INSERT DATE OF ISSUANCE]**, as amended or revised with the accompanying *Flood Insurance Rate Map* (*FIRM*) and Flood Boundary and *Floodway* Map (FBFM) and related supporting data along with any revisions thereto. The adopted flood hazard map and supporting data are hereby adopted by reference and declared to be part of this section.

Add new text as follows:

1612.3.1 Establishing the design flood elevations. Within *special flood hazard areas* and *500-year floodplains*, the elevation of the *design flood* determined in accordance with ASCE 24 is the *design flood elevation* that determines elevation requirements as a function of Flood Design Class assigned according to ASCE 24. In no case shall the elevation of the *design flood* be taken as lower than the elevation of the *base flood.*

Revise as follows:

1612.3.~~1~~2 ~~Design~~ Base flood elevations. Where ~~*design*~~ *base flood elevations* are not ~~included in~~ determined for the *special flood hazard areas* established in Section 1612.3, or where *floodways* are not designated, the *building official* is authorized to require the applicant to do one of the following and use the resulting *base flood elevation* in the design and construction requirements of Section 1612.2:

1. Obtain and reasonably utilize any ~~*design*~~ base *flood elevation* and *floodway* data available from a federal, state or other source.
2. Determine the ~~*design*~~ base *flood elevation* or *floodway* in accordance with accepted hydrologic and hydraulic engineering practices used to define special *flood hazard areas*. Determinations shall be undertaken and sealed by a *registered design professional* who shall document that the technical methods used reflect currently accepted engineering practice. Studies, analyses and computations shall be submitted in sufficient detail to allow review and *approval.*

1612.3.~~2~~3 Determination of impacts. In riverine *special flood hazard areas* where ~~*design*~~ *base flood elevations* are specified but *floodways* have not been designated, the applicant shall provide a *floodway* analysis that demonstrates that the proposed work will not increase the ~~*design*~~ *base flood elevation* more than 1 foot (305 mm) at any point within the *jurisdiction* of the applicable governing authority.

1612.4 Flood hazard documentation. The following documentation shall be prepared and sealed by a *registered design professional* and submitted to the *building official*:

1. For construction in *flood hazard areas,* including *special flood hazard areas* and *500-year floodplains,* other than *coastal high hazard areas* or *coastal A zones*:
   - 1.1. The elevation of the *lowest floor*, including the basement, as required by the *lowest floor* elevation inspection in Section 110.3.3 and for the final inspection in Section 110.3.12.1.
   - 1.2. For fully enclosed areas below the lowest floor elevation required by ASCE 24 ~~*design flood elevation*~~ where provisions to allow for the automatic entry and exit of floodwaters do not meet the minimum requirements in Section 2.~~7~~ 8.2.1 of ASCE 24, *construction documents* shall include a statement that the design will provide for equalization of hydrostatic flood forces in accordance with Section 2.~~7~~ 8.2.2 of ASCE 24.
   - 1.3. For *dry floodproofed* nonresidential *buildings*, *construction documents* shall include a statement that the *dry floodproofing* is designed in accordance with ASCE 24 and shall include the ~~*flood* emergency~~ Inspection, Maintenance, and Operations plans specified in Chapter 6 of ASCE 24.
   - 1.4. For dry floodproofed nonresidential buildings, the elevation to which the building is dry floodproofed as required for the final inspection in Section 110.3.12.1.
2. For construction in *coastal high hazard areas* and *coastal A zones*:
   - 2.1. The elevation of the bottom of the lowest horizontal structural member as required by the *lowest floor* elevation inspection in Section 110.3.3 and for the final inspection in Section 110.3.12.1.
   - 2.2. *Construction documents* shall include a statement that the *building* is designed in accordance with ASCE 24, including that the pile or column foundation and *building* or *structure* to be attached thereto is designed to be anchored to resist flotation, collapse and lateral movement due to the effects of wind and *flood loads* acting simultaneously on all building components, and other *load* requirements of Chapter 16.
   - 2.3. For breakaway walls designed to have a resistance of more than ~~20~~ 16 psf (~~0.96~~ 0.76 kN/m^2) determined using *allowable stress design* or a resistance to an ultimate load of more than ~~33 pounds per square foot~~ 26 psf (~~1.58~~ 1.24 kN/m^2) *, construction documents shall include a statement that the breakaway wall is designed in accordance with ASCE 24.*
   - 2.4 For breakaway walls where provisions to allow for the automatic entry and exit of floodwaters do not meet the minimum requirements in Section 2.~~7~~ 8.2.1 of ASCE 24, *construction documents* shall include a statement that the design will provide for equalization of hydrostatic flood forces in accordance with Section 2.~~7~~ 8.2.2 of ASCE 24.

CHAPTER 18
SOILS AND FOUNDATIONS

1804.5 Grading and fill in flood hazard areas. In *flood hazard areas,* including *special flood hazard areas* and *500-year floodplains* ~~established in Section 1612.3~~, grading, fill, or both, shall not be *approved*:

1. Unless such fill is placed, compacted and sloped to minimize shifting, slumping and erosion during the rise and fall of *flood* water and, as applicable, wave action.
2. In *floodways*, unless it has been demonstrated through hydrologic and hydraulic analyses performed by a *registered design professional* in accordance with standard engineering practice that the proposed grading or fill, or both, will not result in any increase in *flood* levels during the occurrence of the ~~*design*~~ *base flood.*
3. In *coastal high hazard areas,* unless such fill is used for minimal site grading, landscaping, or to meet local drainage requirements and is conducted or placed to avoid diversion of water and waves toward any *building* or *structure*.
4. Where ~~*design*~~ *base flood elevations* are specified but *floodways* have not been designated, unless it has been demonstrated that the cumulative effect of the proposed *flood hazard area* encroachment, when combined with all other existing and anticipated *flood hazard area* encroachment, will not increase the ~~*design*~~ *base flood elevation* more than 1 foot (305 mm) at any point.

1805.1.2.1 Flood hazard areas. For *buildings* and *structures* in *flood hazard areas,* including *special flood hazard areas* and *500-year floodplains* ~~as established in Section 1612.3~~, the finished ground level of an under-floor space such as a crawl space shall be equal to or higher than the outside finished ground level on one side or more.

Exception: Under-floor spaces of Group R-3 *buildings* that meet the requirements of FEMA TB 11.

CHAPTER 27
ELECTRICAL

[F] 2702.1.8 Group I-2 occupancies. In Group I-2 occupancies located in *flood hazard areas,* including *special flood hazard areas* and *500-year floodplains* ~~established in Section 1612.3~~, where new essential electrical systems are installed, and where new essential electrical system generators are installed, the systems and generators shall be located and installed in accordance with ASCE 24. Where connections for hookup of temporary generators are provided, the connections shall be located at or above the elevation required in ASCE 24.

CHAPTER 35
REFERENCED STANDARDS

ASCE/SEI

American Society of Civil Engineers Structural Engineering Institute
1801 Alexander Bell Drive
Reston, VA 20191

Update standard(s) as follows:

7—22, including Supplements 1, 2, and 3	Minimum Design Loads and Associated Criteria for Buildings and Other Structures
24~~—14~~ 24	Flood Resistant Design and Construction

Reason: REASON STATEMENT:

This proposal is a coordination proposal to bring the 2027 edition of the I-Codes up to date with the provisions in the 2022 edition of *ASCE/SEI 7 Minimum Design Loads and Associated Criteria for Buildings and Other Structures, Supplement 2* (ASCE/SEI 7-22, Supplement 2) as well as the 2024 edition of *ASCE/SEI 24 Flood Resistant Design and Construction* (ASCE/SEI 24-24) --- specifically for the codes primarily affected such as the International Building Code (IBC), the International Residential Code (IRC), and the International Existing Building Code (IEBC), in Group B, but also every I-Code affected by a coordinating code change that will need to be updated. ASCE/SEI 7-22 is the current reference in 2024 I-Codes and Supplement 2 has been submitted as an Administrative Update. ASCE/SEI 24-24 has also been submitted as an Administrative Update to the 2027 I-Codes.

This proposal has been organized into Part I to Part VII and includes technical updates as well as editorial coordination. The specific changes to each section included in this proposal are outlined in Overview below, and a detailed summary of the technical updates are explained in Technical Rationale below that. In addition to the strike out/underline for the code change proposals, the MS Word documents for each affected I-Code have been provided as Attached Files for clarity.

Overview:

All Codes, All Chapter: Add phase "including special flood hazard areas and 500-year floodplain" following flood area for clarity. And change to clarify term definitions and when "base flood" applies and when "design flood" applies. Also aligns definitions of "base flood elevation" and "design flood elevations". "Flood Hazard Area" is updated with a new definition. These two changes are carried out throughout the series of these comprehensive code change proposal for clarification and consistency.

Since many of the I-Codes point back to the IBC for the definition, Part I has been organized to include all of the proposed changes to all of the definitions in all of the affected I-Codes.

PART I:

Section 202 Definitions: Adds a new definition for "500-year Floodplain" to distinguish it from the existing definition. While "Base Flood" remains the same, "Base Flood Elevation" is updated along with "Design Flood" and "Design Flood Elevation". "Flood Hazard Area" is updated and a new definition for "Special Flood Hazard Area" is added.

PART II:

Section 104, 107 Scope: Add phase "including special flood hazard areas" for clarity. And change to "base flood elevations" from "design flood elevations" to clarify the applicable requirements for the two separate terms. See Section 202 for the updated definitions. These two changes are carried out throughout the code change proposal for clarification and consistency.

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Section 802 Interior Finishes: Removes the pointer that is too specific.

Section 1108 Accessibility: Add phase "including special flood hazard areas" for clarity.

Section 1202 Interior Environment: Removes the pointer that is too specific.

Section 1402 Exterior Walls: Removes the pointer that is too specific.

Section 1603 General Structural Loads: Add phase "including special flood hazard areas" for clarity. Add pointers to ASCE/SEI 24.

Section 1612 Flood Loads: Add phase "including special flood hazard areas" for clarity. Removes the pointer that is too specific. Clarifies and aligns "Establishing the Flood Hazard Area" and the "Design Flood Elevation" with the standards. Clarifies where the requirements are for the Base Flood versus the Design Flood Elevation. Also clarifies and aligns what is required for the documentation.

Section 1804, 1805 Soils and Foundations: Add phase "including special flood hazard areas" for clarity. Removes the pointer that is too specific.

Section 2702 Electrical: Add phase "including special flood hazard areas" for clarity. Removes the pointer that is too specific. [NOTE - This will need to be updated in the International Fire Code. If this section falls in Group A Hearings, this will need to be coordinated next cycle.]

Chapter 35: Update references for ASCE/SEI 7-22 and ASCE/SEI 24.

Appendix G and J: These changes are provided in a separate Code Change Proposal but must be included for a comprehensive proposal.

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Technical Rationale:

The American Society of Civil Engineers (ASCE) is proposing revisions to the International Code Council's I-Codes for the 2027 Cycle to align the national codes with the current ASCE/SEI design standards including:

ASCE/SEI 7 Minimum Design Loads and Associated Criteria for Buildings and Other Structures, 2022 edition; Supplement 2

(ASCE/SEI 7-22 S2)

ASCE/SEI 24 Flood Resistant Design and Construction, 2024 edition (ASCE/SEI 24-24)

The loading standard ASCE/SEI 7-22 S2 and the design standard ASCE/SEI 24-24 work together – these documents have been developed to be consistent and coordinated so they can be required and used together. There are three significant changes in the national loading standard ASCE/SEI 7-22 S2 including (1) an extension of the defined Flood Hazard Area to the 500-year floodplain for Rick Category II, III, and IV structures, (2) an inclusion of risk-based design for loads, and (3) requirements to include relative sea level change into design load calculations for coastal sites; see below for more technical details. There are three significant changes in the national design standard ASCE/SEI 24-24 including (1) alignment with ASCE/SEI 7-22 S2, (2) alignment with FEMA Technical Bulletins, and (3) updates for elevations, materials, and floodproofing.

Both ASCE/SEI Standards are available for purchase and the Supplement available as a free download from the ASCE Library:

ASCE/SEI 7-22 (https://doi.org/10.1061/9780784415788)

ASCE/SEI 7-22 Supplement 2 (https://doi.org/10.1061/9780784415788.sup2)

ASCE/SEI 24-24 (https://doi.org/10.1061/9780784485781)

Flood Hazard:

The ASCE 7-22 S2 updates the design requirements to define the flood hazard area for the given Risk Category of structure. Addionally, the flood hazard depth is tied to the mean recurrence interval for a given Risk Category of structure. The design flood hazard is related to Risk Category (e.g., RC II will be designed to 500-year MRI), which is consistent with the way other environmental hazards (such as wind and snow loads) relate the hazard to Risk Category. This is in contrast to the current code requirements, which only considers only 100-year MRI flood for all structures regardless of Risk Category. In some areas in the U.S., the Authority Having Jurisdiction is already requiring a higher design requirement for the flood hazard. The city of Houston, for example, moved to requiring use of the 500-year MRI as the design basis for flood following the devastation from Hurricane Harvey. At a national level, FEMA is considering the use of the 500-year flood as the basis for floodplain management.

The coordinated code change proposals submitted for Group B are drafted to bring the IBC, IRC, and IEBC into alignment with the recent changes in ASCE 7-22 Supplement 2 and ASCE 24-24. The significant changes from the updates to these standards are to differentiate between the base flood (also described as the 100-year flood, or the 1% or greater chance of flooding in any given year) and the design flood, which could be different, and is defined in the standards for each Risk Category. The design flood must include considerations for loading specified in ASCE/SEI 7-22 S2 and design specified in ASCE/SEI 24-24.

Flood damage, and associated loss dollars, has significantly expanded since the last major updates of ASCE 7 Chapter 5 and ASCE 24. Their revisions attempt to close that gap and align the risks across other hazards.

FEMA cites that flood damage cost approximately $17 billion each year between 2010 and 2018, and with rising sea levels and extreme weather could cause $20 billion of flood damage to at-risk US homes this year, rising to $32 billion by 2051. Data from 2018 Hurricane Michael shows that 42% of claimed damage amounts were in the Shaded X-Zone (500-year floodplain), exceeding the amounts in both the A and V-Zones. (FEMA. Mitigation Assessment Team Report Hurricane Michael in Florida (FEMA P-2077), February 2020).

This is further supported by FEMA's recent report "A Cost and Benefits Analysis of Increased Elevation Requirements for Public and Nonresidential Buildings in Riverine and Coastal Floodplains," which evaluated the potential avoided losses (benefits) for 8 building types in 19 coastal floodplains and 14 riverine floodplains in the 100-year floodplain and the Shaded X Zone. The report shows that there are significant benefits to most buildings in the 100-year floodplain, particularly in steep/narrow floodplains. There were also significant benefits to buildings in the Shaded X Zone where there are currently no elevation requirements. These findings are supported by evidence from the National Flood Insurance Program (NFIP), which stated, "People outside of high-risk areas file more than 25 percent of NFIP claims and receive one-third of disaster assistance for flooding. The NFIP's preferred risk policies are designed for residential properties located in low- to moderate-risk flood zones." Additional reports from the NFIP indicate that 40% of companies fail to reopen after a disaster, with another 25% closing within a year. These problems are only further exacerbated by the influence of development and associated runoff, changes in precipitation rates, local subsidence, and sea level change. All of which are not accounted for by FEMA's flood maps, which only account for historic flood data and not future projections. All of this data supports the need to move from a fixed freeboard approach to a risk-based elevation approach that provides consistent protection from flat/wide floodplains to steep/narrow floodplains and more appropriately addresses the influence of wave action in coastal floodplains. This recognizes that true resiliency for communities is continuity of local businesses and making sure that public services are maintained and that adaptation to changes in precipitation, development, and sea level change must be incorporated into new buildings rather than relying on often prohibitively expensive retrofit options.

The ASCE changes consider the frequency of recent and predicted events and the significant damage recorded in the Shaded X-Zone. But, while significant, the addition of the Shaded X-Zone to the standards represents a change to only 4% of the U.S. population.

This proposal reflects the latest flood hazard science, but in general does not represent a fundamental increase in loads, resulting in higher construction costs. However, with the introduction of a higher flood design return period and future considerations for Sea Level Change, the design flood loads have increased for structures currently located in a designated flood hazard area. The ASCE revisions do not add structures to the currently defined flood hazard area, but do add small-depth flood loads for new construction in the Shaded X-Zone where there currently are none.

ASCE Consensus Process:

ASCE established and maintains an ANSI-accredited, consensus process for standard development. The open process includes selection of a balanced committee, including representation of all affected stakeholders, and public review of the draft standard prior to publication. The ASCE consensus process follows the *ASCE Rules for Standards Committees*, which is published on the ASCE website. The ASCE/SEI 7-22 S2 was developed by the ASCE 7-22 Standard Committee, which included approximately 50 voting members and hundreds more associate members. The ASCE/SEI 24-24 standard was developed by the ASCE 24-24 Standard Committee, which included approximately 25 voting members and 15 associate members.

Supporting Organizations:

This code change proposal has many supporters, included but not limited to the following organizations:

American Flood Coalition

Association of State Flood Plain Managers (ASFPM)

BuildStrong America

Federal Emergency Management Association

Flood Mitigation Industry Association (FMIA)

National Institute of Building Science (NIBS)

Registered Designer Professionals and planners of buildings and other infrastructure projects, Code Officials, and Authorities Having Jurisdiction owe it to the public and have an ethical obligation to provide a framework for safe, reliable structures. The public expects that the buildings in which they live, work, and play are designed consistently, with the same risk approach for all environmental hazards. Flooding is disruptive to families, businesses, and communities and it takes years to recover from these devastating disasters and overcome the losses incurred. The flood hazard must be taken seriously and incorporated into our design standards and building codes in a manner that is consistent with all of the other environmental hazards.

Bibliography: FEMA. A Cost and Benefits Analysis of Increased Elevation Requirements for Public and Nonresidential Buildings in Riverine and Coastal Floodplains. January 2025 (https://www.researchgate.net/publication/388556202_A_Cost_and_Benefits_Analysis_of_Increased_Elevation_Requirements_for_Publ

FEMA. Mitigation Assessment Team Report Hurricane Michael in Florida, February 2020 (https://www.fema.gov/sites/default/files/2020-07/mat-report_hurricane-michael_florida.pdf)

Cost Impact: Increase

- **2025 Cost and Benefits Analysis of ASCE 24-24.PDF**
  https://www.cdpaccess.com/proposal/12229/36061/documentation/187648/attachments/download/9869/

Estimated Immediate Cost Impact:

ASCE 7 and ASCE 24 are national minimum design standards. The effects will vary depending upon the local flood conditions and flood risk across the country and among building types. For nearly 90% of all affected structures in Numbered A Zones, the estimated immediate costs impact can be understood in analysis of the mitigation cost as a percentage of building replacement value from 0.2-6.6% for coastal sites and 0.0-4.0% for riverine sites. Additionally, average benefits per square foot range from $51-$336 for both riverine and coastal flooding, which are dependent on building type and location. See the attached "Cost and Benefits Analysis" for additional information.

This proposal reflects the latest flood hazard science, but in general does not represent a fundamental increase in loads, resulting in higher construction costs. However, with the introduction of a higher flood design return period and future considerations for Sea Level Change, the design flood loads have increased for structures currently located in a designated flood hazard area. The ASCE revisions do not add structures to the currently defined flood hazard area, but do add small-depth flood loads for new construction in the Shaded X-Zone where there currently are none.

Estimated Immediate Cost Impact Justification (methodology and variables):

A building cost study was considered for 14 riverine locations and 19 coastal locations. Examples consider A Zone and X Zone conditions to understand how the ASCE changes impact the overall cost. However, since most buildings are riverine, the study focused there, but similar trends appear in coastal buildings.

Table 1 is a summary of the buildings that were considered in the study, accounting for the building type, building sizes (and average), and Flood Design Classes. The difference between commercial and government office building plays a larger role in the losses avoided portion of the study. The cost analysis is grouped by Flood Design Class since this is the grouping used in ASCE 24 for elevation criteria.

Table 1 - Building Types Considered in Study

Building Type	Flood Design Class	Small SF	Medium SF	Large SF	Average SF
Hospital 2-3 Stories	4	25,000	70,000	145,000	80,000
Elementary School	3	25,000	40,000	65,000	43,333
Police Station	4	7,000	13,000	23,000	14,333
Office 1-Story (Government)	2	2,000	7,000	25,000	11,333
Office 3-Story (Government)	2	5,000	16,000	80,000	33,667
Office 1-Story (Commercial)	2	2,000	7,000	25,000	11,333
Office 3-Story (Commercial)	2	5,000	16,000	80,000	33,667
Retail Store	2	4,000	10,000	22,000	12,000

Table 2 provides an overview of A Zone conditions for increased building costs within the 100-yr floodplain. The values represent the breakdown of example floodplains using the numbered A Zone range to categorize how much rise there is between the various flood events. A low numbered A Zone represents a flat floodplain and a high number represents a steeper floodplain where there can be a large difference in flood elevations. The percent of numbered A Zones throughout the country based on an NFIP flood insurance policy analysis per census tract.

This provides a breakdown of how various floodplains impact the increased building cost. It's important to note that in A01-A03 the freeboard requirements equal or exceed the MRI based design flood event. Since ASCE did not change the minimum freeboard requirements for FDC 2 and FDC 4, those values are the same for ASCE 24-14 and ASCE 24-24 and therefore there is no cost increase. Additionally, for FDC 4 the analysis selected the higher of the 500-yr and BFE+2, so the delta between the ASCE 24-14 and ASCE 24-24 wasn't as high in the higher numbered A Zones as it would have been with FDC 2 and 3 where they were locked with ASCE 24-14 at BFE+1.

Table 2 - Average Building Cost Increase Percentage for Riverine A Zones Per Numbered A Zone

Numbered A Zone	Percentile of Numbered A Zones	FDC 2	FDC3	FDC4
A01-A03	26%	0.00%	1.20%	0.00%
A04-A06	41%	1.50%	1.90%	0.50%
A07-A10	20%	2.40%	2.90%	0.60%
A11-A14	9%	4.80%	5.50%	1.00%
A15-A17	2%	8.90%	10.00%	1.60%
A18-A30	2%	11.90%	13.20%	2.10%
	Weighted Average:	1.97%	2.65%	0.49%

Table 3 provides an overview of X Zone conditions for increased building costs within the 500-yr floodplain. The 500-year floodplain represents the area between the 100-year floodplain and the 500-year flood extent, this therefore represents protection from the 101-year to the 500-year flood. In X Zones it is assumed that buildings are built on the ground as compared to elevated foundations in Zone A. Since the X Zone represents the difference between the 100-year and the 500-year flood, the 300-year flood elevation was used as an average ground elevation. The ASCE 24-24 elevations represent the minimum required elevations required per the standard. The increased elevation is therefore the difference between ground (at the 300-year flood elevation) and the ASCE 24-24 elevation requirements. Similar to Table 2, Table 3 data is provided per Flood Design Class per grouped numbered A Zone designation.

Table 3 - Average Building Cost Increase Percentage for Riverine X Zones Per Numbered A Zone

Numbered A Zone	Percentile of Numbered A Zones	FDC 2	FDC 3	FDC 4
A01-A03	26%	0.60%	1.80%	0.70%
A04-A06	41%	1.00%	1.50%	0.80%
A07-A10	20%	1.20%	1.80%	1.00%
A11-A14	9%	1.90%	3.00%	1.70%
A15-A17	2%	3.20%	5.00%	2.80%
A18-A30	2%	4.40%	6.70%	3.70%
	Weighted Average:	1.14%	1.93%	1.00%

It is believed that the presentation of percent increase in building cost provided a better representation of the overall cost impacts rather than providing dollar values. While the percent increase does get rather large in those areas with high numbered A Zones, this is a much smaller overall percentage of land area, so this represents a smaller portion of the floodplains in the US. However, recent events have shown that when these areas experience a flood event above the 100-year or 1% annual chance flood, that they often experience deep flooding. Experience from Western NC following Hurricane Helene demonstrated that when floods occur in areas with high numbered A Zones that significant flood damage occurs in the X Zone. There were examples of buildings elevated in the X Zone that performed very well in Hurricane Helene and had little to no observed damage. But many buildings in the X Zone that were constructed at grade were severely damaged or destroyed. While this is observational, there is substantial evidence to suggest that the percent cost increase is offset by the avoided losses. Two key factors that impact the avoided loss calculation is the impact of when the original flood insurance studies and associated maps were created (older mapping data), which can mean that the mapped risk is underestimated (increased runoff due to development and updated precipitation data) and then looking forward the impact of future changes in precipitation rates over the 50-year life of riverine buildings. Similarly, these impacts can impact coastal flooding heights as well as the impact of sea level change.

Attached Files

- **ATT - IBC.docx**
  https://www.cdpaccess.com/proposal/12229/36061/files/download/9716/

Staff Analysis: This proposal includes technical revisions to the code text to coordinate with an update of an existing referenced standard. This standard must be completed and readily available prior to the Public Comment Hearing. See CP28 Section 4.6.3.1.2.
CC # S97-25 Part II and CC # S99-25 Part I addresses requirements in a different or contradicting manner. The committee is urged to make their intensions clear with their actions on these proposals.

S97-25 Part II

S97-25 Part III

IBC: G101.1, G101.2, G101.3, G103.1, G103.2, G104.3, G104.4, G104.8, G104.9, G104.10, G105.1, G105.2, G106.4, G107.1, G107.2, G109.1, G109.3, G109.4, G110.2, G112.1, G112.3, G114.2, G114.4, G114.5, G114.6, TABLE G115.1, J101.2

Proponents: Jennifer Goupil, American Society of Civil Engineers and Structural Engineering Institute, representing American Society of Civil Engineers (jgoupil@asce.org); Chad Berginnis, representing Association of State Floodplain Managers (cberginnis@floods.org); Natalie Enclade, representing BuildStrong America (natalie@buildstrongamerica.com); Jiqiu yuan, representing National Institute of Building Sciences (jyuan@nibs.org); Joel Scata, representing NRDC (jscata@nrdc.org)

2024 International Building Code

APPENDIX G FLOOD-RESISTANT CONSTRUCTION

SECTION G101 ADMINISTRATION

Revise as follows:

G101.1 Purpose. The purpose of this appendix is to promote the public health, safety and general welfare and to minimize public and private losses due to *flood* conditions in specific *flood hazard areas*, including *special flood hazard areas* and *500-year floodplains*, through the establishment of comprehensive regulations for management of *flood hazard areas* designed to:

1. Prevent unnecessary disruption of commerce, access and public service during times of *flooding*.
2. Manage the alteration of natural flood plains, stream channels and shorelines.
3. Manage filling, grading, dredging and other *development* that may increase flood damage or erosion potential.
4. Prevent or regulate the construction of flood barriers that will divert floodwaters or that can increase flood hazards.
5. Contribute to improved construction techniques in the flood plain.

G101.2 Objectives. The objectives of this appendix are to protect human life, minimize the expenditure of public money for flood control projects, minimize the need for rescue and relief efforts associated with *flooding*, minimize prolonged business interruption, minimize damage to public *facilities* and utilities, help maintain a stable tax base by providing for the sound use and *development* of flood-prone areas, contribute to improved construction techniques in the flood plain and ensure that potential *owners* and occupants are notified that property is within *flood hazard areas*, including *special flood hazard areas* and *500-year floodplains*.

G101.3 Scope. The provisions of this appendix shall apply to all proposed *development* in ~~a~~ *flood hazard areas*, including *special flood hazard areas* and *500-year floodplains*, established in Section 1612 of this code, including certain building work exempt from *permit* under Section 105.2.

SECTION G103 APPLICABILITY

G103.1 General. This appendix, in conjunction with this code, provides minimum requirements for *development* located in *flood hazard areas*, including *special flood hazard areas* and *500-year floodplains*,including:

1. The subdivision of land.
2. Site improvements and installation of utilities.
3. Placement and replacement of *manufactured homes*.

4. Placement of *recreational vehicles*.
5. New construction and *repair*, reconstruction, rehabilitation or *additions* to new construction.
6. *Substantial improvement* of *existing buildings* and *structures*, including restoration after damage.
7. Installation of tanks.
8. *Temporary structures*.
9. Temporary or permanent storage, utility and miscellaneous Group U *buildings* and *structures*.
10. Certain building work exempt from *permit* under Section 105.2 and other *buildings* and *development* activities.

G103.2 Establishment of flood hazard areas. *Flood hazard areas*, including *special flood hazard areas* and *500-year floodplains*, are established in Section 1612.3 of this code, adopted by the applicable governing authority on **[INSERT DATE]**.

SECTION G104
POWERS AND DUTIES

G104.3 Determination of ~~design~~ base flood elevations. If ~~*design*~~ *base flood elevations* are not specified for *special flood hazard areas* , the floodplain administrator is authorized to require the applicant to ~~meet~~ do one of the following:

1. Obtain, review and reasonably utilize *base flood elevation* data available from a federal, state or other source.
2. Determine the ~~*design*~~ *base flood elevation* in accordance with accepted hydrologic and hydraulic engineering ~~techniques~~ practices used to define *special flood hazard areas*. Such analyses shall be performed and sealed by a *registered design professional*. Studies, analyses and computations shall be submitted in sufficient detail to allow review and approval by the floodplain administrator. The accuracy of data submitted for such determination shall be the responsibility of the applicant.

G104.4 Activities in riverine flood hazard areas. In riverine *special flood hazard areas* where ~~*design*~~ *base flood elevations* are specified but *floodways* have not been designated, the floodplain administrator shall not permit any new construction, *substantial improvement* or other *development*, including fill, unless the applicant submits an engineering analysis prepared by a *registered design professional*, demonstrating that the cumulative effect of the proposed *development*, when combined with all other existing and anticipated *special flood hazard area* encroachment, will not increase the ~~*design*~~ *base flood elevation* more than 1 foot (305 mm) at any point within the community.

G104.8 Records. The floodplain administrator shall maintain a permanent record of all *permits* issued in *flood hazard areas*, including *special flood hazard areas* and *500-year floodplains*, including supporting certifications and documentation required by this appendix and copies of inspection reports, design certifications and documentation of elevations required in Section 1612 of this code and Section R306of the *International Residential Code*.

G104.9 Inspections. *Development* for which a *permit*under this appendix is required shall be subject to inspection. The floodplain administrator or the floodplain administrator's designee shall make, or cause to be made, inspections of all *development* in *flood hazard areas*, including *special flood hazard areas* and *500-year floodplains*, authorized by issuance of a *permit*under this appendix.

G104.10 Use of changed technical data. The floodplain administrator and the applicant shall not use changed *flood hazard area* boundaries, or changed *base flood elevations* or 500-year flood elevations, for proposed *buildings* or *developments* unless the floodplain administrator or applicant has applied for a conditional *Flood Insurance Rate Map* (*FIRM*) revision and has received the approval of the Federal Emergency Management Agency (FEMA).

SECTION G105
PERMITS

G105.1 Required. Any *person*, *owner* or *owner*'s authorized agent who intends to conduct any *development* in a *flood hazard area*, including *special flood hazard areas* and *500-year floodplains*, shall first make application to the floodplain administrator and shall obtain the required *permit*.

G105.2 Application for permit. The applicant shall file an application in writing on a form furnished by the floodplain administrator. Such application shall:

1. Identify and describe the *development* to be covered by the *permit*.
2. Describe the land on which the proposed *development* is to be conducted by legal description, street address or similar description that will readily identify and definitely locate the *site*.
3. Include a site plan showing the delineation of *special flood hazard areas*, *500-year floodplains*, *floodway* boundaries, *flood* zones, ~~*design*~~ *base flood elevations*, ground elevations, proposed fill and excavation and drainage patterns and *facilities*.
4. Include in subdivision proposals and other proposed *developments* with more than 50 *lots* or larger than 5 acres (20 234 m^2), *base flood elevation* data in accordance with Section 1612.3.~~1~~ 2 if such data are not identified for the *flood hazard areas* established in Section G103.2.
5. Indicate the use and occupancy for which the proposed *development* is intended.
6. Be accompanied by *construction documents*, grading and filling plans and other information deemed appropriate by the floodplain administrator.
7. State the valuation of the proposed work.
8. Be signed by the applicant or the applicant's authorized agent.

SECTION G106
VARIANCES

G106.4 Functionally dependent facilities. A *variance* is authorized to be issued for the construction or *substantial improvement* of a *functionally dependent facility* provided that the criteria in Section 1612.1 are met and the *variance* is the minimum necessary to allow the construction or *substantial improvement*, and that all due consideration has been given to methods and materials that minimize *flood* damages during the ~~*design*~~ *base flood* and do not create additional threats to public safety.

SECTION G107
SUBDIVISIONS

G107.1 General. Any subdivision proposal, including proposals for manufactured home parks and subdivisions, or other proposed new *development* in a *flood hazard area*, including *special flood hazard areas* and *500-year floodplains*, shall be reviewed to verify all of the following:

1. Such proposals are consistent with the need to minimize *flood* damage.
2. Public utilities and *facilities*, such as sewer, gas, electric and water systems, are located and constructed to minimize or eliminate *flood* damage.
3. Adequate drainage is provided to reduce exposure to *flood* hazards.

G107.2 Subdivision requirements. The following requirements shall apply in the case of any proposed subdivision, including proposals for manufactured home parks and subdivisions, any portion of which lies within a *flood hazard area*, including *special flood hazard areas* and *500-year floodplains*:

1. The *special flood hazard area* and *500-year floodplain*, including *floodways*, *coastal high-hazard areas* and coastal A zones, as appropriate, shall be delineated on tentative and final subdivision plats.

2. ~~*Design*~~ *Base flood elevations* and flood elevations in *500-year floodplains* shall be shown on tentative and final subdivision plats.
3. Residential *building lots* shall be provided with adequate buildable area outside the *floodway*.
4. The design criteria for utilities and *facilities* set forth in this appendix and appropriate International Codes shall be met.

SECTION G109 MANUFACTURED HOMES

G109.1 Required elevation ~~Elevation~~. All new and replacement *manufactured homes* to be placed or substantially improved in a *flood hazard area*, including *special flood hazard areas* and *500-year floodplains*, shall be elevated such that the top of the foundation for the *manufactured home* is at or above the ~~*design*~~ *base flood elevation* plus 2 feet.

G109.3 Anchoring. All new and replacement *manufactured homes* to be placed or substantially improved ~~in a *flood hazard area*~~ shall be installed using methods and practices that minimize *flood* damage. *Manufactured homes* shall be securely anchored to an adequately anchored foundation system to resist flotation, collapse and lateral movement. Methods of anchoring are authorized to include, but are not limited to, use of over-the-top or frame ties to ground anchors. This requirement is in addition to applicable state and local anchoring requirements for resisting wind forces.

G109.4 Protection of mechanical equipment and outside appliances. Mechanical equipment and outside appliances shall be elevated to or above the required elevation. ~~*design flood elevation*.~~

> **Exception:** Where such equipment and appliances are designed and installed to prevent water from entering or accumulating within their components and the systems are constructed to resist hydrostatic and hydrodynamic *loads* and stresses, including the effects of buoyancy, during the occurrence of *flooding* up to the elevation required by Section R306 of the *International Residential Code*, the systems and equipment shall be permitted to be located below the elevation required by Section R306 of the *International Residential Code*. Electrical wiring systems shall be permitted below the required elevation ~~design *flood* elevation~~ provided that they conform to the provisions of NFPA 70.

SECTION G110 RECREATIONAL VEHICLES

G110.2 Temporary placement. *Recreational vehicles* ~~in *flood hazard areas*~~ shall be fully licensed and ready for highway use, or shall be placed on a *site* for less than 180 consecutive days.

SECTION G112 OTHER BUILDING WORK

G112.1 Garages and accessory structures. Garages and accessory *structures* shall be designed and constructed in accordance with ASCE 24, subject to the following limitations:

1. In *special flood hazard areas* and *500-year floodplains* other than *coastal high-hazard areas* and coastal A Zones, the floors of detached garages and detached accessory storage *structures* are permitted below the elevations specified in ASCE 24, provided that such *structures* are used solely for parking or storage, are one *story* and not larger than 600 square feet (55.75 m^2).
2. In *coastal high-hazard areas* and coastal A Zones, the floors of detached garages and detached accessory storage *structures* are permitted below the elevations specified in ASCE 24, provided that such *structures* are used solely for parking or storage, are one *story* and are not larger than 100 square feet (9.29 m^2). Such *structures* shall not be required to have breakaway walls or flood openings.

G112.3 Oil derricks. Oil derricks l~~ocated in~~ ~~*flood hazard areas*~~ shall be designed in conformance with the *flood loads* in Sections 1603.1.7 and 1612.

SECTION G114
UTILITY AND MISCELLANEOUS GROUP U

G114.2 Flood loads. Utility and miscellaneous Group U *buildings* and *structures*, including *substantial improvement* of such *buildings* and *structures*, shall be anchored to prevent flotation, collapse or lateral movement resulting from *flood loads*, including the effects of buoyancy, during conditions of the ~~*design*~~ base *flood.*

G114.3 Required elevation ~~Elevation~~. Utility and miscellaneous Group U *buildings* and *structures*, including *substantial improvement* of such *buildings* and *structures*, shall be elevated such that the *lowest floor*, including *basement*, is elevated to or above the elevation required by ASCE 24 ~~*design flood elevation* in accordance with Section 1612 of this code~~.

G114.4 Enclosures below ~~design flood~~ the required elevation. Fully enclosed areas below the required elevation ~~*design flood elevation*~~ shall be constructed in accordance with ASCE 24.

G114.5 Flood-damage-resistant materials. *Flood-damage-resistant materials* shall be used below the required elevation ~~*design flood elevation*~~.

G114.6 Protection of mechanical, plumbing and electrical systems. Mechanical, plumbing and electrical systems, including plumbing fixtures, shall be elevated to or above the required elevation ~~*design flood elevation*~~.

Exception: Electrical systems, equipment and components; heating, ventilating, air conditioning and plumbing appliances; plumbing fixtures, duct systems and other service equipment shall be permitted to be located below the required elevation ~~*design flood elevation*~~ 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 required elevation ~~*design flood elevation*~~ in compliance with the flood-resistant construction requirements of this code. Electrical wiring systems shall be permitted to be located below the required elevation ~~*design flood elevation*~~ provided that they conform to the provisions of NFPA 70.

SECTION G115
REFERENCED STANDARDS

G115.1 General. See Table G115.1 for standards that are referenced in various sections of this appendix. Standards are listed by the standard identification with the effective date, standard title, and the section or sections of this appendix referenced in the standard.

TABLE G115.1 REFERENCED STANDARDS

STANDARD ACRONYM	STANDARD NAME	SECTIONS HEREIN REFERENCED
ASCE 24— ~~14~~ 24	*Flood Resistant Design and Construction*	G104.1, G108.3, G108.4, G111.1, G112.1, G112.5, G112.6, G112.7, G113.1, G114.4
HUD 24 CFR Part 3285 (2008)	*Manufactured Home Construction and Safety Standards*	G102
IBC—24	*International Building Code®*	G103.2, G114.1, G114.3
IRC—24	*International Residential Code®*	G109.2, G109.4, G109.5
NFPA 70—23	*National Electric Code®*	G109.4, G114.6

APPENDIX J
GRADING

SECTION J101
GENERAL

J101.2 Flood hazard areas. Unless the applicant has submitted an engineering analysis, prepared in accordance with standard engineering practice by a *registered design professional*, that demonstrates the proposed work will not result in any increase in the level of the *base flood*, *grading*, *excavation* and earthwork construction, including fills and embankments, shall not be permitted in *floodways* that are in *flood hazard areas* established in Section 1612.3 or in *flood hazard areas* where ~~design~~ base *flood elevations* are specified but *floodways* have not been designated.

Reason: REASON STATEMENT:

This proposal is a coordination proposal to bring the 2027 edition of the I-Codes up to date with the provisions in the 2022 edition of *ASCE/SEI 7 Minimum Design Loads and Associated Criteria for Buildings and Other Structures, Supplement 2* (ASCE/SEI 7-22, Supplement 2) as well as the 2024 edition of *ASCE/SEI 24 Flood Resistant Design and Construction* (ASCE/SEI 24-24) --- specifically for the codes primarily affected such as the International Building Code (IBC), the International Residential Code (IRC), and the International Existing Building Code (IEBC), in Group B, but also every I-Code affected by a coordinating code change that will need to be updated. ASCE/SEI 7-22 is the current reference in 2024 I-Codes and Supplement 2 has been submitted as an Administrative Update. ASCE/SEI 24-24 has also been submitted as an Administrative Update to the 2027 I-Codes.

This proposal has been organized into Part I to Part VII and includes technical updates as well as editorial coordination. The specific changes to each section included in this proposal are outlined in Overview below, and a detailed summary of the technical updates are explained in Technical Rationale below that. In addition to the strike out/underline for the code change proposals, the MS Word documents for each affected I-Code have been provided as Attached Files for clarity.

Overview:

All Codes, All Chapter: Add phase “including special flood hazard areas and 500-year floodplain” following flood area for clarity. And change to clarify term definitions and when “base flood” applies and when “design flood” applies. Also aligns definitions of “base flood elevation” and “design flood elevations”. “Flood Hazard Area” is updated with a new definition. These two changes are carried out throughout the series of these comprehensive code change proposal for clarification and consistency.

Appendix G and J: These changes are provided in a separate Code Change Proposal but must be included for a comprehensive proposal. The proposed changes align with the IBC proposed changes including the following: differentiate between base and desgin flood; specifying that the flood hazard area includes the special flood hazard areas and the 500-year floodplain; and updates to pointers.

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Technical Rationale:

The American Society of Civil Engineers (ASCE) is proposing revisions to the International Code Council’s I-Codes for the 2027 Cycle to align the national codes with the current ASCE/SEI design standards including:

ASCE/SEI 7 Minimum Design Loads and Associated Criteria for Buildings and Other Structures, 2022 edition; Supplement 2 (ASCE/SEI 7-22 S2)

ASCE/SEI 24 Flood Resistant Design and Construction, 2024 edition (ASCE/SEI 24-24)

The loading standard ASCE/SEI 7-22 S2 and the design standard ASCE/SEI 24-24 work together – these documents have been developed to be consistent and coordinated so they can be required and used together. There are three significant changes in the national loading standard ASCE/SEI 7-22 S2 including (1) an extension of the defined Flood Hazard Area to the 500-year floodplain for Rick Category II, III, and IV structures, (2) an inclusion of risk-based design for loads, and (3) requirements to include relative sea level change into design load calculations for coastal sites; see below for more technical details. There are three significant changes in the national design standard ASCE/SEI 24-24 including (1) alignment with ASCE/SEI 7-22 S2, (2) alignment with FEMA Technical Bulletins, and (3) updates for elevations, materials, and floodproofing.

Both ASCE/SEI Standards are available for purchase and the Supplement available as a free download from the ASCE Library:

ASCE/SEI 7-22 (https://doi.org/10.1061/9780784415788)

ASCE/SEI 7-22 Supplement 2 (https://doi.org/10.1061/9780784415788.sup2)

ASCE/SEI 24-24 (https://doi.org/10.1061/9780784485781)

Flood Hazard:

The ASCE 7-22 S2 updates the design requirements to define the flood hazard area for the given Risk Category of structure. Addionally, the flood hazard depth is tied to the mean recurrence interval for a given Risk Category of structure. The design flood hazard is related to Risk Category (e.g., RC II will be designed to 500-year MRI), which is consistent with the way other environmental hazards (such as wind and snow loads) relate the hazard to Risk Category. This is in contrast to the current code requirements, which only considers only 100-year MRI flood for all structures regardless of Risk Category. In some areas in the U.S., the Authority Having Jurisdiction is already requiring a higher design requirement for the flood hazard. The city of Houston, for example, moved to requiring use of the 500-year MRI as the design basis for flood following the devastation from Hurricane Harvey. At a national level, FEMA is considering the use of the 500-year flood as the basis for floodplain management.

The coordinated code change proposals submitted for Group B are drafted to bring the IBC, IRC, and IEBC into alignment with the recent changes in ASCE 7-22 Supplement 2 and ASCE 24-24. The significant changes from the updates to these standards are to differentiate between the base flood (also described as the 100-year flood, or the 1% or greater chance of flooding in any given year) and the design flood, which could be different, and is defined in the standards for each Risk Category. The design flood must include considerations for loading specified in ASCE/SEI 7-22 S2 and design specified in ASCE/SEI 24-24.

Flood damage, and associated loss dollars, has significantly expanded since the last major updates of ASCE 7 Chapter 5 and ASCE 24. Their revisions attempt to close that gap and align the risks across other hazards.

FEMA cites that flood damage cost approximately $17 billion each year between 2010 and 2018, and with rising sea levels and extreme weather could cause $20 billion of flood damage to at-risk US homes this year, rising to $32 billion by 2051. Data from 2018 Hurricane Michael shows that 42% of claimed damage amounts were in the Shaded X-Zone (500-year floodplain), exceeding the amounts in both the A and V-Zones. (FEMA. Mitigation Assessment Team Report Hurricane Michael in Florida (FEMA P-2077), February 2020).

This is further supported by FEMA's recent report "A Cost and Benefits Analysis of Increased Elevation Requirements for Public and Nonresidential Buildings in Riverine and Coastal Floodplains," which evaluated the potential avoided losses (benefits) for 8 building types in 19 coastal floodplains and 14 riverine floodplains in the 100-year floodplain and the Shaded X Zone. The report shows that there are significant benefits to most buildings in the 100-year floodplain, particularly in steep/narrow floodplains. There were also significant benefits to buildings in the Shaded X Zone where there are currently no elevation requirements. These findings are supported by evidence from the National Flood Insurance Program (NFIP), which stated, "People outside of high-risk areas file more than 25 percent of NFIP claims and receive one-third of disaster assistance for flooding. The NFIP's preferred risk policies are designed for residential properties located in low- to moderate-risk flood zones." Additional reports from the NFIP indicate that 40% of companies fail to reopen after a disaster, with another 25% closing within a year. These problems are only further exacerbated by the influence of development and associated runoff, changes in precipitation rates, local subsidence, and sea level change. All of which are not accounted for by FEMA's flood maps, which only account for historic flood data and not future projections. All of this data supports the need to move from a fixed freeboard approach to a risk-based elevation approach that provides consistent protection from flat/wide floodplains to steep/narrow floodplains and more appropriately addresses the influence of wave action in coastal floodplains. This recognizes that true resiliency for communities is continuity of local businesses and making sure that public services are maintained and that adaptation to changes in precipitation, development, and sea level change must be incorporated into new buildings rather than relying on often prohibitively expensive retrofit options.

The ASCE changes consider the frequency of recent and predicted events and the significant damage recorded in the Shaded X-Zone. But, while significant, the addition of the Shaded X-Zone to the standards represents a change to only 4% of the U.S. population.

This proposal reflects the latest flood hazard science, but in general does not represent a fundamental increase in loads, resulting in higher construction costs. However, with the introduction of a higher flood design return period and future considerations for Sea Level Change, the design flood loads have increased for structures currently located in a designated flood hazard area. The ASCE revisions do not add structures to the currently defined flood hazard area, but do add small-depth flood loads for new construction in the Shaded X-Zone where there currently are none.

ASCE Consensus Process:

ASCE established and maintains an ANSI-accredited, consensus process for standard development. The open process includes selection of a balanced committee, including representation of all affected stakeholders, and public review of the draft standard prior to publication. The ASCE consensus process follows the *ASCE Rules for Standards Committees*, which is published on the ASCE website. The ASCE/SEI 7-22 S2 was developed by the ASCE 7-22 Standard Committee, which included approximately 50 voting members and hundreds more associate members. The ASCE/SEI 24-24 standard was developed by the ASCE 24-24 Standard Committee, which included approximately 25 voting members and 15 associate members.

Supporting Organizations:

This code change proposal has many supporters, included but not limited to the following organizations:

American Flood Coalition

Association of State Flood Plain Managers (ASFPM)

BuildStrong America

Federal Emergency Management Association

Flood Mitigation Industry Association (FMIA)

National Institute of Building Science (NIBS)

Registered Designer Professionals and planners of buildings and other infrastructure projects, Code Officials, and Authorities Having Jurisdiction owe it to the public and have an ethical obligation to provide a framework for safe, reliable structures. The public expects that the buildings in which they live, work, and play are designed consistently, with the same risk approach for all environmental hazards. Flooding is disruptive to families, businesses, and communities and it takes years to recover from these devastating disasters and overcome the losses incurred. The flood hazard must be taken seriously and incorporated into our design standards and building codes in a manner that is consistent with all of the other environmental hazards.

- **2025 Cost and Benefits Analysis for ASCE 24-24**
  https://www.cdpaccess.com/proposal/11724/35914/documentation/186653/attachments/download/9870/

Bibliography: FEMA. A Cost and Benefits Analysis of Increased Elevation Requirements for Public and Nonresidential Buildings in Riverine and Coastal Floodplains. January 2025 (https://www.researchgate.net/publication/388556202_A_Cost_and_Benefits_Analysis_of_Increased_Elevation_Requirements_for_Publ
FEMA. Mitigation Assessment Team Report Hurricane Michael in Florida (FEMA P-2077), February 2020 (https://www.fema.gov/sites/default/files/2020-07/mat-report_hurricane-michael_florida.pdf)

Cost Impact: Increase

- **2025 Cost and Benefits Analysis for ASCE 24-24.PDF**
  https://www.cdpaccess.com/proposal/11724/35914/documentation/186656/attachments/download/9871/

Estimated Immediate Cost Impact:

ASCE 7 and ASCE 24 are national minimum design standards. The effects will vary depending upon the local flood conditions and flood risk across the country and among building types. For nearly 90% of all affected structures in Numbered A Zones, the estimated immediate costs impact can be understood in analysis of the mitigation cost as a percentage of building replacement value from 0.2-6.6% for coastal sites and 0.0-4.0% for riverine sites. Additionally, average benefits per square foot range from $51-$336 for both riverine and coastal flooding, which are dependent on building type and location. See the attached “Cost and Benefits Analysis” for additional information.

This proposal reflects the latest flood hazard science, but in general does not represent a fundamental increase in loads, resulting in higher construction costs. However, with the introduction of a higher flood design return period and future considerations for Sea Level Change, the design flood loads have increased for structures currently located in a designated flood hazard area. The ASCE revisions do not add structures to the currently defined flood hazard area, but do add small-depth flood loads for new construction in the Shaded X-Zone where there currently are none.

Estimated Immediate Cost Impact Justification (methodology and variables):

A building cost study was considered for 14 riverine locations and 19 coastal locations. Examples consider A Zone and X Zone conditions to understand how the ASCE changes impact the overall cost. However, since most buildings are riverine, the study focused there, but similar trends appear in coastal buildings.

Table 1 is a summary of the buildings that were considered in the study, accounting for the building type, building sizes (and average), and Flood Design Classes. The difference between commercial and government office building plays a larger role in the losses avoided portion of the study. The cost analysis is grouped by Flood Design Class since this is the grouping used in ASCE 24 for elevation criteria.

Table 1 - Building Types Considered in Study

Building Type	Flood Design Class	Small SF	Medium SF	Large SF	Average SF
Hospital 2-3 Stories	4	25,000	70,000	145,000	80,000
Elementary School	3	25,000	40,000	65,000	43,333
Police Station	4	7,000	13,000	23,000	14,333
Office 1-Story (Government)	2	2,000	7,000	25,000	11,333
Office 3-Story (Government)	2	5,000	16,000	80,000	33,667
Office 1-Story (Commercial)	2	2,000	7,000	25,000	11,333
Office 3-Story (Commercial)	2	5,000	16,000	80,000	33,667
Retail Store	2	4,000	10,000	22,000	12,000

Table 2 provides an overview of A Zone conditions for increased building costs within the 100-yr floodplain. The values represent the breakdown of example floodplains using the numbered A Zone range to categorize how much rise there is between the various flood events. A low numbered A Zone represents a flat floodplain and a high number represents a steeper floodplain where there can be a large difference in flood elevations. The percent of numbered A Zones throughout the country based on an NFIP flood insurance policy analysis per census tract.

This provides a breakdown of how various floodplains impact the increased building cost. It's important to note that in A01-A03 the freeboard requirements equal or exceed the MRI based design flood event. Since ASCE did not change the minimum freeboard requirements for FDC 2 and FDC 4, those values are the same for ASCE 24-14 and ASCE 24-24 and therefore there is no cost increase. Additionally, for FDC 4 the analysis selected the higher of the 500-yr and BFE+2, so the delta between the ASCE 24-14 and ASCE 24-24 wasn't as high in the higher numbered A Zones as it would have been with FDC 2 and 3 where they were locked with ASCE 24-14 at BFE+1.

Table 2 - Average Building Cost Increase Percentage for Riverine A Zones Per Numbered A Zone

Numbered A Zone	Percentile of Numbered A Zones	FDC 2	FDC3	FDC4
A01-A03	26%	0.00%	1.20%	0.00%
A04-A06	41%	1.50%	1.90%	0.50%
A07-A10	20%	2.40%	2.90%	0.60%
A11-A14	9%	4.80%	5.50%	1.00%
A15-A17	2%	8.90%	10.00%	1.60%
A18-A30	2%	11.90%	13.20%	2.10%
	Weighted Average:	1.97%	2.65%	0.49%

Table 3 provides an overview of X Zone conditions for increased building costs within the 500-yr floodplain. The 500-year floodplain represents the area between the 100-year floodplain and the 500-year flood extent, this therefore represents protection from the 101-year to the 500-year flood. In X Zones it is assumed that buildings are built on the ground as compared to elevated foundations in Zone A. Since the X Zone represents the difference between the 100-year and the 500-year flood, the 300-year flood elevation was used as an average ground elevation. The ASCE 24-24 elevations represent the minimum required elevations required per the standard. The increased elevation is therefore the difference between ground (at the 300-year flood elevation) and the ASCE 24-24 elevation requirements. Similar to Table 2, Table 3 data is provided per Flood Design Class per grouped numbered A Zone designation.

Table 3 - Average Building Cost Increase Percentage for Riverine X Zones Per Numbered A Zone

Numbered A Zone	Percentile of Numbered A Zones	FDC 2	FDC 3	FDC 4
A01-A03	26%	0.60%	1.80%	0.70%
A04-A06	41%	1.00%	1.50%	0.80%
A07-A10	20%	1.20%	1.80%	1.00%
A11-A14	9%	1.90%	3.00%	1.70%
A15-A17	2%	3.20%	5.00%	2.80%
A18-A30	2%	4.40%	6.70%	3.70%
	Weighted Average:	1.14%	1.93%	1.00%

It is believed that the presentation of percent increase in building cost provided a better representation of the overall cost impacts rather than providing dollar values. While the percent increase does get rather large in those areas with high numbered A Zones, this is a much smaller overall percentage of land area, so this represents a smaller portion of the floodplains in the US. However, recent events have shown that when these areas experience a flood event above the 100-year or 1% annual chance flood, that they often experience deep flooding. Experience from Western NC following Hurricane Helene demonstrated that when floods occur in areas with high numbered A Zones that significant flood damage occurs in the X Zone. There were examples of buildings elevated in the X Zone that performed very well in Hurricane Helene and had little to no observed damage. But many buildings in the X Zone that were constructed at grade were severely damaged or destroyed. While this is observational, there is substantial evidence to suggest that the percent cost increase is offset by the avoided losses. Two key factors that impact the avoided loss calculation is the impact of when the original flood insurance studies and associated maps were created (older mapping data), which can mean that the mapped risk is underestimated (increased runoff due to development and updated precipitation data) and then looking forward the impact of future changes in precipitation rates over the 50-year life of riverine buildings. Similarly, these impacts can impact coastal flooding heights as well as the impact of sea level change.

Staff Analysis: CC # S97-25 Part III and CC # S180-25 Part I/CC #S181-25 addresses requirements in a different or contradicting manner. The committee is urged to make their intensions clear with their actions on these proposals.

S97-25 Part III

S97-25 Part IV

IEBC: [A] 104.2.4.1, [A] 104.3.1, [A] 109.3.3, [A] 109.3.10, SECTION 202, 301.3, [BS] 401.3, BS] 405.2.6, [BS] 502.2, [BS] 503.2, [BS] 507.3, [BS] 701.3, [BS] 1103.3, [BS] 1201.4, [BS] 1303.1.3, [BS] 1402.6

Proponents: Jennifer Goupil, American Society of Civil Engineers and Structural Engineering Institute, representing American Society of Civil Engineers (jgoupil@asce.org); Chad Berginnis, representing Association of State Floodplain Managers (cberginnis@floods.org); Jiqiu yuan, representing National Institute of Building Sciences (jyuan@nibs.org); Roderick Scott, Board Chair, representing Flood Mitigation Industry Association (roderick.scott75@aol.com); Joel Scata, representing NRDC (jscata@nrdc.org); Natalie Enclade, representing BuildStrong America (natalie@buildstrongamerica.com)

2024 International Existing Building Code

CHAPTER 1
SCOPE AND ADMINISTRATION

SECTION 104
DUTIES AND POWERS OF CODE OFFICIAL

Revise as follows:

[A] 104.2.4.1 Flood hazard areas. For *existing buildings* located in *flood hazard areas*, including special flood hazard areas and 500-year floodplains, for which *repairs*, *alterations* and *additions* constitute *substantial improvement*, the *code official* shall not grant modifications to provisions related to flood resistance unless a determination is made that:

1. The applicant has presented good and sufficient cause that the unique characteristics of the size, configuration or topography of the site render compliance with the flood-resistant construction provisions inappropriate.
2. Failure to grant the modification would result in exceptional hardship.
3. The granting of the modification will not result in increased flood heights, additional threats to public safety or extraordinary public expense; create nuisances; cause fraud on or victimization of the public; or conflict with existing laws or ordinances.
4. The modification is the minimum necessary to afford relief, considering the flood hazard.
5. A written notice will be provided to the applicant specifying, if applicable, the difference between the design flood elevation and the elevation to which the building is to be built, stating that the cost of flood insurance will be commensurate with the increased risk resulting from the reduced floor elevation and that construction below the design flood elevation increases risks to life and property.

[A] 104.3.1 Determination of substantially improved or substantially damaged existing buildings and structures in flood hazard areas. For applications for reconstruction, rehabilitation, *repair*, *alteration*, *addition* or other improvement of *existing buildings* or structures located in *flood hazard areas*, including special flood hazard areas and 500-year floodplains, the *code official* shall determine where the proposed work constitutes *substantial improvement* or *repair* of *substantial damage*. Where the *code official* determines that the proposed work constitutes *substantial improvement* or *repair* of *substantial damage*, and where required by this code, the *code official* shall require the building to meet the requirements of Section 1612 of the *International Building Code,* or Section R306 of the *International Residential Code*, as applicable.

SECTION 109
INSPECTIONS

[A] 109.3.3 Lowest floor elevation. For *additions* and *substantial improvements* to *existing buildings* in *flood hazard areas*, including special flood hazard areas and 500-year floodplains, on placement of the *lowest floor*, including basement, and prior to further vertical construction, the elevation documentation required in the *International Building Code*, or the *International Residential Code*, as applicable, shall be submitted to the *code official*.

[A] 109.3.10 Flood hazard documentation. Where a building is located in a *flood hazard area*, including special flood hazard areas and 500-year floodplains, documentation of the elevation of the *lowest floor* or the elevation of dry floodproofing, if applicable, as required in the International Building Code or the International Residential Code, as applicable, shall be submitted to the *code official*prior to the final inspection.

CHAPTER 3
PROVISIONS FOR ALL COMPLIANCE METHODS

SECTION 301
ADMINISTRATION

301.3 Alteration, addition or change of occupancy. The *alteration*, *addition* or *change of occupancy* of all *existing buildings* shall comply with one of the methods listed in Section 301.3.1, 301.3.2 or 301.3.3 as selected by the applicant. Sections 301.3.1 through 301.3.3 shall not be applied in combination with each other.

Exception: Subject to the approval of the *code official*, *alterations* complying with the laws in existence at the time the building or the affected portion of the building was built shall be considered in compliance with the provisions of this code. New structural members added as part of the *alteration* shall comply with the *International Building Code*. This exception shall not apply to the following:

1. *Alterations* for accessibility required by Section 306.
2. *Alterations* that constitute *substantial improvement* in *flood hazard areas*, including special flood hazard areas and 500-year floodplains, which shall comply with Sections 503.2, 701.3 or 1303.1.3.
3. Structural provisions of Section 304, Chapter 5 or to the structural provisions of Sections 706, 805 and 906.

CHAPTER 4
REPAIRS

SECTION 401
GENERAL

[BS] 401.3 Flood hazard areas. In *flood hazard* areas, including special flood hazard areas and 500-year floodplains, *repairs* that constitute *substantial improvement* shall require that the building comply with Section 1612 of the *International Building Code*, or Section R306 of the *International Residential Code*, as applicable.

SECTION 405
STRUCTURAL

[BS] 405.2.6 Flood hazard areas. In *flood hazard* areas, including special flood hazard areas and 500-year floodplains,buildings that have sustained *substantial damage* shall be brought into compliance with Section 1612 of the *International Building Code* or Section R306 of the *International Residential Code*, as applicable.

CHAPTER 5
PRESCRIPTIVE COMPLIANCE METHOD

SECTION 502
ADDITIONS

[BS] 502.2 Flood hazard areas. For buildings and structures in *flood hazard* areas, including special flood hazard areas and 500-year floodplains, ~~established in Section 1612.3 of the *International Building Code*~~, ~~or Section R322 of the *International Residential Code*~~, ~~as applicable,~~ any *addition* that constitutes *substantial improvement* of the *existing structure* shall comply with the flood design requirements for new construction, and all aspects of the *existing structure* shall be brought into compliance with the requirements for new construction for flood design. For new foundations, foundations raised or extended upward, and replacement foundations, the foundations shall be in compliance with the requirements for new construction for flood design.

For buildings and structures in *flood hazard areas*, including special flood hazard areas and 500-year floodplains, ~~established in Section 1612.3 of the *International Building Code*~~, ~~or Section R322 of the *International Residential Code*~~, ~~as applicable~~, any *additions* that do not constitute *substantial improvement* of the *existing structure* are not required to comply with the flood design requirements for new construction, provided that both of the following apply:

1. The *addition* shall not create or extend a nonconformity of the *existing building* or structure with the flood-resistant construction requirements.
2. The *lowest floor* of the *addition* shall be at or above the lower of the *lowest floor* of the *existing building* or structure or the *lowest floor* elevation required in Section 1612 of the *International Building Code* or Section R306 of the *International Residential Code*, as applicable.

SECTION 503
ALTERATIONS

[BS] 503.2 Flood hazard areas. For buildings and structures in *flood hazard areas*, including special flood hazard areas and 500-year floodplains, ~~established in Section 1612.3 of the *International Building Code*~~, ~~or Section R306 of the *International Residential Code*~~, ~~as applicable~~, any *alteration* that constitutes *substantial improvement* of the *existing structure* shall comply with the flood design requirements for new construction, and all aspects of the *existing structure* shall be brought into compliance with the requirements for new construction for flood design.

For buildings and structures in *flood hazard areas,* including special flood hazard areas and 500-year floodplains, ~~established in Section 1612.3 of the *International Building Code*~~, ~~or Section R306 of the *International Residential Code*~~, ~~as applicable~~, any *alterations* that do not constitute *substantial improvement* of the *existing structure* are not required to comply with the flood design requirements for new construction.

SECTION 507
HISTORIC BUILDINGS

[BS] 507.3 Flood hazard areas. Within *flood hazard areas,* including special flood hazard areas and 500-year floodplains, ~~established in accordance with Section 1612.3 of the *International Building Code*~~, ~~or Section R306 of the *International Residential Code*~~, ~~as applicable~~, where the work proposed constitutes *substantial improvement,* the building shall be brought into compliance with Section 1612 of the *International Building Code*, or Section R306 of the *International Residential Code*, as applicable.

Exception: *Historic buildings* meeting any of the following criteria need not be brought into compliance:

1. Listed or preliminarily determined to be eligible for listing in the National Register of Historic Places.
2. Determined by the Secretary of the US Department of Interior as contributing to the historical significance of a registered historic district or a district preliminarily determined to qualify as an historic district.
3. Designated as historic under a state or local historic preservation program that is approved by the Department of Interior.

CHAPTER 7

ALTERATIONS—LEVEL 1

SECTION 701 GENERAL

[BS] 701.3 Flood hazard areas. In *flood hazard areas*, including special flood hazard areas and 500-year floodplains, *alterations* that constitute *substantial improvement* shall require that the building comply with Section 1612 of the *International Building Code*, or Section R306 of the *International Residential Code*, as applicable.

SECTION 1103 STRUCTURAL

CHAPTER 11 ADDITIONS

[BS] 1103.3 Flood hazard areas. *Additions* and *foundations* in *flood hazard areas*, including special flood hazard areas and 500-year floodplains, shall comply with the following requirements:

1. For horizontal *additions* that are structurally interconnected to the *existing building*:
   - 1.1. If the *addition* and all other proposed work, when combined, constitute *substantial improvement*, the *existing building* and the *addition* shall comply with Section 1612 of the *International Building Code*, or Section R306 of the *International Residential Code*, as applicable.
   - 1.2. If the *addition* constitutes *substantial improvement*, the *existing building* and the *addition* shall comply with Section 1612 of the *International Building Code*, or Section R306 of the *International Residential Code*, as applicable.
   - 1.3. If the *addition* does not constitute *substantial improvement*, the *addition* is not required to comply with the flood design requirements for new construction, provided that both of the following apply:
     - 1.3.1. The *addition* shall not create or extend any nonconformity of the *existing building* with the flood-resistant construction requirements.
     - 1.3.2. The *lowest floor* of the *addition* shall be at or above the lower of the *lowest floor* of the *existing building* or the *lowest floor* elevation required in Section 1612 of the *International Building Code*, or Section R306 of the *International Residential Code*, as applicable.
2. For horizontal *additions* that are not structurally interconnected to the *existing building*:
   - 2.1. The *addition* shall comply with Section 1612 of the *International Building Code*, or Section R306 of the *International Residential Code*, as applicable.
   - 2.2. If the *addition* and all other proposed work, when combined, constitute *substantial improvement*, the *existing building* and the *addition* shall comply with Section 1612 of the *International Building Code*, or Section R306 of the *International Residential Code*, as applicable.
3. For vertical *additions* and all other proposed work that, when combined, constitute *substantial improvement*, the *existing building* shall comply with Section 1612 of the *International Building Code*, or Section R306 of the *International Residential Code*, as applicable.
4. For a new foundation, replacement foundation or a foundation raised or extended upward, the foundation shall comply with Section 1612 of the *International Building Code,* or Section R306 of the *International Residential Code*, as applicable.

CHAPTER 12
HISTORIC BUILDINGS

SECTION 1201
GENERAL

[BS] 1201.4 Flood hazard areas. In *flood hazard areas*, including special flood hazard areas and 500-year floodplains, if all proposed work, including *repairs*, work required because of a *change of occupancy*, and *alterations*, constitutes *substantial improvement*, then the *existing building* shall comply with Section 1612 of the *International Building Code*, or Section R306 of the *International Residential Code*, as applicable.

Exception: If a *historic building* will continue to be a *historic building* after the proposed work is completed, then the proposed work is not considered a *substantial improvement*. For the purposes of this exception, a *historic building* is any of the following:

1. Listed or preliminarily determined to be eligible for listing in the National Register of Historic Places.
2. Determined by the Secretary of the US Department of Interior to contribute to the historical significance of a registered historic district or a district preliminarily determined to qualify as a historic district.
3. Designated as historic under a state or local historic preservation program that is approved by the Department of Interior.

CHAPTER 13
PERFORMANCE COMPLIANCE METHODS

SECTION 1303
ACCEPTANCE

[BS] 1303.1.3 Compliance with flood hazard provisions. In *flood hazard areas*, including special flood hazard areas and 500-year floodplains, buildings that are evaluated in accordance with this section shall comply with Section 1612 of the *International Building Code*, or Section R306 of the *International Residential Code*, as applicable, if the work covered by this section constitutes *substantial improvement*. If the work covered by this section is a structurally connected horizontal *addition* that does not constitute *substantial improvement*, the *addition* is not required to comply with the flood design requirements for new construction, provided that both of the following apply.

1. The *addition* shall not create or extend any nonconformity of the *existing building* with the flood-resistant construction requirements.
2. The *lowest floor* of the *addition* shall be at or above the lower of the *lowest floor* of the *existing building* or the *lowest floor* elevation required in Section 1612 of the *International Building Code* or Section R306 of the *International Residential Code*, as applicable.

CHAPTER 14
RELOCATED OR MOVED BUILDINGS

SECTION 1402
REQUIREMENTS

[BS] 1402.6 Flood hazard areas. If relocated or moved into a *flood hazard area*, including special flood hazard areas and 500-year floodplains, structures shall comply with Section 1612 of the *International Building Code*, or Section R306 of the *International Residential Code*, as applicable.

Reason: This proposal is a coordination proposal to bring the 2027 edition of the I-Codes up to date with the provisions in the 2022 edition of *ASCE/SEI 7 Minimum Design Loads and Associated Criteria for Buildings and Other Structures, Supplement 2* (ASCE/SEI 7-22, Supplement 2) as well as the 2024 edition of *ASCE/SEI 24 Flood Resistant Design and Construction* (ASCE/SEI 24-24) --- specifically for the codes primarily affected such as the International Building Code (IBC), the International Residential Code (IRC), and the International Existing Building Code (IEBC), in Group B, but also every I-Code affected by a coordinating code change that will need to be updated. ASCE/SEI 7-22 is the current reference in 2024 I-Codes and Supplement 2 has been submitted as an Administrative Update. ASCE/SEI 24-24 has also been submitted as an Administrative Update to the 2027 I-Codes.

This proposal has been organized into Part I to Part VII and includes technical updates as well as editorial coordination. The specific changes to each section included in this proposal are outlined in Overview below, and a detailed summary of the technical updates are explained in Technical Rationale below that. In addition to the strike out/underline for the code change proposals, the MS Word documents for each affected I-Code have been provided as Attached Files for clarity.

Overview:

These changes for the IEBC provide similar updates to the IBC and IEBC, just provided in a separate Code Change Proposal. However, all changes must be included across all I-Codes for a comprehensive proposal - IBC, IRC and IEBC are included in Group B; the others will need to be addressed in the next Group A cycle.

All Chapters: Add phase “including special flood hazard areas and 500-year flood” following "flood hazard area" for clarity. These changes are carried out throughout the code change proposal for clarification and consistency.**Chapter 2:** Include the 500-year flood in definition of "Flood Hazard Area"

Chapter 5: Remove unnecessary pointers

Technical Rationale:

The American Society of Civil Engineers (ASCE) is proposing revisions to the International Code Council’s I-Codes for the 2027 Cycle to align the national codes with the current ASCE/SEI design standards including:

ASCE/SEI 7 Minimum Design Loads and Associated Criteria for Buildings and Other Structures, 2022 edition; Supplement 2 (ASCE/SEI 7-22 S2)

ASCE/SEI 24 Flood Resistant Design and Construction, 2024 edition (ASCE/SEI 24-24)

The loading standard ASCE/SEI 7-22 S2 and the design standard ASCE/SEI 24-24 work together – these documents have been developed to be consistent and coordinated so they can be required and used together. There are three significant changes in the national loading standard ASCE/SEI 7-22 S2 including (1) an extension of the defined Flood Hazard Area to the 500-year floodplain for Rick Category II, III, and IV structures, (2) an inclusion of risk-based design for loads, and (3) requirements to include relative sea level change into design load calculations for coastal sites; see below for more technical details. There are three significant changes in the national design standard ASCE/SEI 24-24 including (1) alignment with ASCE/SEI 7-22 S2, (2) alignment with FEMA Technical Bulletins, and (3) updates for elevations, materials, and floodproofing.

Both ASCE/SEI Standards are available for purchase and the Supplement available as a free download from the ASCE Library:

ASCE/SEI 7-22 (https://doi.org/10.1061/9780784415788)

ASCE/SEI 7-22 Supplement 2 (https://doi.org/10.1061/9780784415788.sup2)

ASCE/SEI 24-24 (https://doi.org/10.1061/9780784485781)

Flood Hazard:

The ASCE 7-22 S2 updates the design requirements to define the flood hazard area for the given Risk Category of structure. Addionally, the flood hazard depth is tied to the mean recurrence interval for a given Risk Category of structure. The design flood hazard is related to Risk Category (e.g., RC II will be designed to 500-year MRI), which is consistent with the way other environmental hazards (such as wind and snow loads) relate the hazard to Risk Category. This is in contrast to the current code requirements, which only considers only 100-year MRI flood for all structures regardless of Risk Category. In some areas in the U.S., the Authority Having Jurisdiction is already requiring a higher design requirement for the flood hazard. The city of Houston, for example, moved to requiring use of the 500-year MRI as the design basis for flood following the devastation from Hurricane Harvey. At a national level, FEMA is considering the use of the

500-year flood as the basis for floodplain management.

The coordinated code change proposals submitted for Group B are drafted to bring the IBC, IRC, and IEBC into alignment with the recent changes in ASCE 7-22 Supplement 2 and ASCE 24-24. The significant changes from the updates to these standards are to differentiate between the base flood (also described as the 100-year flood, or the 1% or greater chance of flooding in any given year) and the design flood, which could be different, and is defined in the standards for each Risk Category. The design flood must include considerations for loading specified in ASCE/SEI 7-22 S2 and design specified in ASCE/SEI 24-24.

Flood damage, and associated loss dollars, has significantly expanded since the last major updates of ASCE 7 Chapter 5 and ASCE 24. Their revisions attempt to close that gap and align the risks across other hazards.

FEMA cites that flood damage cost approximately $17 billion each year between 2010 and 2018, and with rising sea levels and extreme weather could cause $20 billion of flood damage to at-risk US homes this year, rising to $32 billion by 2051. Data from 2018 Hurricane Michael shows that 42% of claimed damage amounts were in the Shaded X-Zone (500-year floodplain), exceeding the amounts in both the A and V-Zones. (FEMA. Mitigation Assessment Team Report Hurricane Michael in Florida (FEMA P-2077), February 2020).

This is further supported by FEMA's recent report "A Cost and Benefits Analysis of Increased Elevation Requirements for Public and Nonresidential Buildings in Riverine and Coastal Floodplains," which evaluated the potential avoided losses (benefits) for 8 building types in 19 coastal floodplains and 14 riverine floodplains in the 100-year floodplain and the Shaded X Zone. The report shows that there are significant benefits to most buildings in the 100-year floodplain, particularly in steep/narrow floodplains. There were also significant benefits to buildings in the Shaded X Zone where there are currently no elevation requirements. These findings are supported by evidence from the National Flood Insurance Program (NFIP), which stated, "People outside of high-risk areas file more than 25 percent of NFIP claims and receive one-third of disaster assistance for flooding. The NFIP's preferred risk policies are designed for residential properties located in low- to moderate-risk flood zones." Additional reports from the NFIP indicate that 40% of companies fail to reopen after a disaster, with another 25% closing within a year. These problems are only further exacerbated by the influence of development and associated runoff, changes in precipitation rates, local subsidence, and sea level change. All of which are not accounted for by FEMA's flood maps, which only account for historic flood data and not future projections. All of this data supports the need to move from a fixed freeboard approach to a risk-based elevation approach that provides consistent protection from flat/wide floodplains to steep/narrow floodplains and more appropriately addresses the influence of wave action in coastal floodplains. This recognizes that true resiliency for communities is continuity of local businesses and making sure that public services are maintained and that adaptation to changes in precipitation, development, and sea level change must be incorporated into new buildings rather than relying on often prohibitively expensive retrofit options.

The ASCE changes consider the frequency of recent and predicted events and the significant damage recorded in the Shaded X-Zone. But, while significant, the addition of the Shaded X-Zone to the standards represents a change to only 4% of the U.S. population.

This proposal reflects the latest flood hazard science, but in general does not represent a fundamental increase in loads, resulting in higher construction costs. However, with the introduction of a higher flood design return period and future considerations for Sea Level Change, the design flood loads have increased for structures currently located in a designated flood hazard area. The ASCE revisions do not add structures to the currently defined flood hazard area, but do add small-depth flood loads for new construction in the Shaded X-Zone where there currently are none.

ASCE Consensus Process:

ASCE established and maintains an ANSI-accredited, consensus process for standard development. The open process includes selection of a balanced committee, including representation of all affected stakeholders, and public review of the draft standard prior to publication. The ASCE consensus process follows the *ASCE Rules for Standards Committees*, which is published on the ASCE website. The ASCE/SEI 7-22 S2 was developed by the ASCE 7-22 Standard Committee, which included approximately 50 voting members and hundreds more associate members. The ASCE/SEI 24-24 standard was developed by the ASCE 24-24 Standard Committee, which included approximately 25 voting members and 15 associate members.

Supporting Organizations:

This code change proposal has many supporters, included but not limited to the following organizations:

American Flood Coalition

American Institute of Architects (AIA)

Association of State Flood Plain Managers (ASFPM)

BuildStrong America

Federal Emergency Management Association

Flood Mitigation Industry Association (FMIA)

National Institute of Building Science (NIBS)

Registered Designer Professionals and planners of buildings and other infrastructure projects, Code Officials, and Authorities Having Jurisdiction owe it to the public and have an ethical obligation to provide a framework for safe, reliable structures. The public expects that the buildings in which they live, work, and play are designed consistently, with the same risk approach for all environmental hazards. Flooding is disruptive to families, businesses, and communities and it takes years to recover from these devastating disasters and overcome the losses incurred. The flood hazard must be taken seriously and incorporated into our design standards and building codes in a manner that is consistent with all of the other environmental hazards.

- **2025 Cost and Analysis Benefits for ASCE 24-24.PDF**
  https://www.cdpaccess.com/proposal/11726/35918/documentation/186680/attachments/download/9872/

Bibliography: FEMA. A Cost and Benefits Analysis of Increased Elevation Requirements for Public and Nonresidential Buildings in Riverine and Coastal Floodplains. January 2025
(https://www.researchgate.net/publication/388556202_A_Cost_and_Benefits_Analysis_of_Increased_Elevation_Requirements_for_Publ
FEMA. Mitigation Assessment Team Report Hurricane Michael in Florida (FEMA P-2077), February 2020
(https://www.fema.gov/sites/default/files/2020-07/mat-report_hurricane-michael_florida.pdf)

Cost Impact: Increase

- **2025 Cost and Benefits Analysis for ASCE 24-24.PDF**
  https://www.cdpaccess.com/proposal/11726/35918/documentation/186683/attachments/download/9873/

Estimated Immediate Cost Impact:

ASCE 7 and ASCE 24 are national minimum design standards. The effects will vary depending upon the local flood conditions and flood risk across the country and among building types. For nearly 90% of all affected structures in Numbered A Zones, the estimated immediate costs impact can be understood in analysis of the mitigation cost as a percentage of building replacement value from 0.2-6.6% for coastal sites and 0.0-4.0% for riverine sites. Additionally, average benefits per square foot range from $51-$336 for both riverine and coastal flooding, which are dependent on building type and location. See the attached “Cost and Benefits Analysis” for additional information.

This proposal reflects the latest flood hazard science, but in general does not represent a fundamental increase in loads, resulting in higher construction costs. However, with the introduction of a higher flood design return period and future considerations for Sea Level Change, the design flood loads have increased for structures currently located in a designated flood hazard area. The ASCE revisions do not add structures to the currently defined flood hazard area, but do add small-depth flood loads for new construction in the Shaded X-Zone where there currently are none.

Estimated Immediate Cost Impact Justification (methodology and variables):

A building cost study was considered for 14 riverine locations and 19 coastal locations. Examples consider A Zone and X Zone conditions to understand how the ASCE changes impact the overall cost. However, since most buildings are riverine, the study focused there, but similar trends appear in coastal buildings.

Table 1 is a summary of the buildings that were considered in the study, accounting for the building type, building sizes (and average), and Flood Design Classes. The difference between commercial and government office building plays a larger role in the losses avoided portion of the study. The cost analysis is grouped by Flood Design Class since this is the grouping used in ASCE 24 for elevation criteria.

Table 1 - Building Types Considered in Study

Building Type	Flood Design Class	Small SF	Medium SF	Large SF	Average SF

Hospital 2-3 Stories	4	25,000	70,000	145,000	80,000
Elementary School	3	25,000	40,000	65,000	43,333
Police Station	4	7,000	13,000	23,000	14,333
Office 1-Story (Government)	2	2,000	7,000	25,000	11,333
Office 3-Story (Government)	2	5,000	16,000	80,000	33,667
Office 1-Story (Commercial)	2	2,000	7,000	25,000	11,333
Office 3-Story (Commercial)	2	5,000	16,000	80,000	33,667
Retail Store	2	4,000	10,000	22,000	12,000

Table 2 provides an overview of A Zone conditions for increased building costs within the 100-yr floodplain. The values represent the breakdown of example floodplains using the numbered A Zone range to categorize how much rise there is between the various flood events. A low numbered A Zone represents a flat floodplain and a high number represents a steeper floodplain where there can be a large difference in flood elevations. The percent of numbered A Zones throughout the country based on an NFIP flood insurance policy analysis per census tract.

This provides a breakdown of how various floodplains impact the increased building cost. It's important to note that in A01-A03 the freeboard requirements equal or exceed the MRI based design flood event. Since ASCE did not change the minimum freeboard requirements for FDC 2 and FDC 4, those values are the same for ASCE 24-14 and ASCE 24-24 and therefore there is no cost increase. Additionally, for FDC 4 the analysis selected the higher of the 500-yr and BFE+2, so the delta between the ASCE 24-14 and ASCE 24-24 wasn't as high in the higher numbered A Zones as it would have been with FDC 2 and 3 where they were locked with ASCE 24-14 at BFE+1.

Table 2 - Average Building Cost Increase Percentage for Riverine A Zones Per Numbered A Zone

Numbered A Zone	Percentile of Numbered A Zones	FDC 2	FDC3	FDC4
A01-A03	26%	0.00%	1.20%	0.00%
A04-A06	41%	1.50%	1.90%	0.50%
A07-A10	20%	2.40%	2.90%	0.60%
A11-A14	9%	4.80%	5.50%	1.00%
A15-A17	2%	8.90%	10.00%	1.60%
A18-A30	2%	11.90%	13.20%	2.10%
	Weighted Average:	1.97%	2.65%	0.49%

Table 3 provides an overview of X Zone conditions for increased building costs within the 500-yr floodplain. The 500-year floodplain represents the area between the 100-year floodplain and the 500-year flood extent, this therefore represents protection from the 101-year to the 500-year flood. In X Zones it is assumed that buildings are built on the ground as compared to elevated foundations in Zone A. Since the X Zone represents the difference between the 100-year and the 500-year flood, the 300-year flood elevation was used as an average ground elevation. The ASCE 24-24 elevations represent the minimum required elevations required per the standard. The increased elevation is therefore the difference between ground (at the 300-year flood elevation) and the ASCE 24-24 elevation requirements. Similar to Table 2, Table 3 data is provided per Flood Design Class per grouped numbered A Zone designation.

Table 3 - Average Building Cost Increase Percentage for Riverine X Zones Per Numbered A Zone

Numbered A Zone	Percentile of Numbered A Zones	FDC 2	FDC 3	FDC 4
A01-A03	26%	0.60%	1.80%	0.70%
A04-A06	41%	1.00%	1.50%	0.80%
A07-A10	20%	1.20%	1.80%	1.00%
A11-A14	9%	1.90%	3.00%	1.70%
A15-A17	2%	3.20%	5.00%	2.80%
A18-A30	2%	4.40%	6.70%	3.70%
	Weighted Average:	1.14%	1.93%	1.00%

It is believed that the presentation of percent increase in building cost provided a better representation of the overall cost impacts rather than providing dollar values. While the percent increase does get rather large in those areas with high numbered A Zones, this is a much smaller overall percentage of land area, so this represents a smaller portion of the floodplains in the US. However, recent events have shown that when these areas experience a flood event above the 100-year or 1% annual chance flood, that they often experience deep flooding. Experience from Western NC following Hurricane Helene demonstrated that when floods occur in areas with high numbered A Zones that significant flood damage occurs in the X Zone. There were examples of buildings elevated in the X Zone that performed very well in Hurricane Helene and had little to no observed damage. But many buildings in the X Zone that were constructed at grade were severely damaged or destroyed. While this is observational, there is substantial evidence to suggest that the percent cost increase is offset by the avoided losses. Two key factors that impact the avoided loss calculation is the impact of when the original flood insurance studies and associated maps were created (older mapping data), which can mean that the mapped risk is underestimated (increased runoff due to development and updated precipitation data) and then looking forward the impact of future changes in precipitation rates over the 50-year life of riverine buildings. Similarly, these impacts can impact coastal flooding heights as well as the impact of sea level change.

S97-25 Part IV

S97-25 Part V

IMC®: [A]104.2.4.1, [A]104.3.1, [BS] 301.16, 401.4, 501.3.1, [BS] 602.4, [BS] 603.13, 1206.9.1, 1210.8.6, 1305.2.1; IPC: [A] 104.2.4.1, [A]104.3.1, 309.1, [BS] 309.2; IFGC: [A] 104.2.4.1, [A]104.3.1, [BS] 301.11; IRC: G2404.7 (301.11); IFC: 1203.1.8; ISPSC: [A] 104.2.4.1, [A]104.3.1, 304.1, [BS]304.2; IPSDC: [A] 104.2.4.1, [A]104.3.1, 301.1, [BS]303.1, [BS]303.2, [BS]303.3, 401.2, 406.1.1

Proponents: Jennifer Goupil, American Society of Civil Engineers and Structural Engineering Institute, representing American Society of Civil Engineers (jgoupil@asce.org); Chad Berginnis, representing Association of State Floodplain Managers (cberginnis@floods.org); Roderick Scott, Board Chair, representing Flood Mitigation Industry Association (roderick.scott75@aol.com); Jiqiu yuan, representing National Institute of Building Sciences (jyuan@nibs.org); Natalie Enclade, representing BuildStrong America (natalie@buildstrongamerica.com); Joel Scata, representing NRDC (jscata@nrdc.org)

2024 International Mechanical Code

CHAPTER 1
SCOPE AND ADMINISTRATION

SECTION 104
DUTIES AND POWERS OF THE CODE OFFICIAL

Revise as follows:

[A] 104.2.4.1 Flood hazard areas. The code official shall not grant modifications to any provision required in flood hazard areas, <u>including special flood hazard areas and 500-year floodplains,</u> as established by Section 1612.3 of the *International Building Code*, unless a determination has been made that:

1. A showing of good and sufficient cause that the unique characteristics of the size, configuration or topography of the site render the elevation standards of Section 1612 of the *International Building Code* inappropriate.
2. A determination that failure to grant the variance would result in exceptional hardship by rendering the lot undevelopable.
3. A determination that the granting of a variance will not result in increased flood heights, additional threats to public safety or extraordinary public expense; cause fraud on or victimization of the public; or conflict with existing laws or ordinances.
4. A determination that the variance is the minimum necessary to afford relief, considering the flood hazard.
5. Submission to the applicant of written notice specifying the difference between the design flood elevation and the elevation to which the *building* is to be built, stating that the cost of flood in-surance will be commensurate with the increased risk resulting from the reduced floor elevation, and stating that construction below the design flood elevation increases risks to life and property.

[A] 104.3.1 Determination of substantially improved or substantially damaged existing buildings and structures in flood hazard areas. For applications for reconstruction, rehabilitation, repair, *alteration*, addition or other improvement of existing *buildings* or structures located in flood hazard areas, <u>including special flood hazard areas and 500-year floodplains,</u> the code official shall determine if the proposed work constitutes substantial improvement or repair of substantial damage. Where the code official determines that the proposed work constitutes substantial improvement or repair of substantial damage, and where required by this code, the code official shall require the *building* to meet the requirements of Section 1612 of the *International Building Code* or Section R306 of the *International Residential Code*, as applicable.

CHAPTER 3
GENERAL REGULATIONS

SECTION 301

GENERAL

[BS] 301.16 Flood hazard. For structures located in flood hazard areas, including special flood hazard areas and 500-year floodplains, mechanical systems, *equipment* and *appliances* shall be located at or above the elevation required by Section 1612 of the *International Building Code* for utilities and attendant *equipment*.

> **Exception:** Mechanical systems, *equipment* and *appliances* are permitted to be located below the elevation required by Section 1612 of the *International Building Code* for utilities and attendant equipment 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 up to such elevation.

CHAPTER 4
VENTILATION

SECTION 401
GENERAL

401.4 Intake opening location. Air intake openings shall comply with all of the following:

1. Intake openings shall be located not less than 10 feet (3048 mm) from lot lines or buildings on the same lot.
2. Mechanical and gravity outdoor air intake openings shall be located not less than 10 feet (3048 mm) horizontally from any hazardous or noxious contaminant source, such as vents, streets, alleys, parking lots and loading docks, except as specified in Item 3 or Section 501.3.1. Outdoor air intake openings shall be permitted to be located less than 10 feet (3048 mm) horizontally from streets, alleys, parking lots and loading docks provided that the openings are located not less than 25 feet (7620 mm) vertically above such locations. Where openings front on a street or public way, the distance shall be measured from the closest edge of the street or public way.
3. Intake openings shall be located not less than 3 feet (914 mm) below contaminant sources where such sources are located within 10 feet (3048 mm) of the opening. Separation is not required between intake air openings and living space *exhaust air* openings of an individual *dwelling unit* or *sleeping unit* where a factory-built intake/exhaust combination termination fitting is used to separate the air streams in accordance with the fan manufacturer's instructions.
4. Intake openings on structures in flood hazard areas, including special flood hazard areas and 500-year floodplains, shall be at or above the elevation required by Section 1612 of the *International Building Code* for utilities and attendant equipment.

CHAPTER 5
EXHAUST SYSTEMS

SECTION 501
GENERAL

501.3.1 Location of exhaust outlets.. The termination point of exhaust outlets and ducts discharging to the outdoors shall be located with the following minimum distances:

1. For ducts conveying explosive or flammable vapors, fumes or dusts: 30 feet (9144 mm) from property lines; 10 feet (3048 mm) from operable openings into buildings; 6 feet (1829 mm) from exterior walls and roofs; 30 feet (9144 mm) from combustible walls and operable openings into buildings that are in the direction of the exhaust discharge; 10 feet (3048 mm) above adjoining grade.
2. For other product-conveying outlets: 10 feet (3048 mm) from the property lines; 3 feet (914 mm) from exterior walls and roofs; 10 feet (3048 mm) from operable openings into buildings; 10 feet (3048 mm) above adjoining grade.

3. For all *environmental air* exhaust: 3 feet (914 mm) from property lines; 3 feet (914 mm) from operable openings, except where the exhaust opening is located not less than 1 foot (305 mm) above the gravity air intake opening into buildings for all *occupancies* other than Group U; and 10 feet (3048 mm) from mechanical air intakes. Such exhaust shall not be considered hazardous or noxious. Separation is not required between intake air openings and living space *exhaust air* openings of an individual *dwelling unit* or *sleeping unit* where a factory-built intake/exhaust combination termination fitting is used to separate the air streams in accordance with the fan manufacturer's instructions.
4. Exhaust outlets serving structures in flood hazard areas, including special flood hazard areas and 500-year floodplains, shall be installed at or above the elevation required by Section 1612 of the *International Building Code* for utilities and attendant equipment.
5. For specific systems, see the following sections:
   5.1. Clothes dryer exhaust, Section 504.4.
   5.2. Kitchen hoods and other kitchen exhaust *equipment*, Sections 506.3.13, 506.4 and 506.5.
   5.3. Dust, stock and refuse conveying systems, Section 510.2.
   5.4. Subslab soil exhaust systems, Section 511.4.
   5.5. Smoke control systems, Section 512.10.3.
   5.6. Refrigerant discharge, Section 1105.7.
   5.7. *Machinery room* discharge, Section 1105.6.1.

CHAPTER 6
DUCT SYSTEMS

SECTION 602
PLENUMS

[BS] 602.4 Flood hazard. For structures located in flood hazard areas, including special flood hazard areas and 500-year floodplains, *plenum* spaces shall be located above the elevation required by Section 1612 of the *International Building Code* for utilities and attendant equipment or shall be designed and constructed to prevent water from entering or accumulating within the *plenum* spaces during floods up to such elevation. If the *plenum* spaces are located below the elevation required by Section 1612 of the *International Building Code* for utilities and attendant equipment, they shall be capable of resisting hydrostatic and hydrodynamic loads and stresses, including the effects of buoyancy, during the occurrence of flooding up to such elevation.

SECTION 603
DUCT CONSTRUCTION AND INSTALLATION

[BS] 603.13 Flood hazard areas. For structures in flood hazard areas, including special flood hazard areas and 500-year floodplains, ducts shall be located above the elevation required by Section 1612 of the *International Building Code* for utilities and attendant equipment or shall be designed and constructed to prevent water from entering or accumulating within the ducts during floods up to such elevation. If the ducts are located below the elevation required by Section 1612 of the *International Building Code* for utilities and attendant equipment, the ducts shall be capable of resisting hydrostatic and hydrodynamic loads and stresses, including the effects of buoyancy, during the occurrence of flooding up to such elevation.

CHAPTER 12
HYDRONIC PIPING

SECTION 1206
PIPING INSTALLATION

1206.9.1 Flood hazard. Piping located in a flood hazard area, including special flood hazard areas and 500-year floodplains, shall be capable of resisting hydrostatic and hydrodynamic loads and stresses, including the effects of buoyancy, during the occurrence of flooding to the *design flood elevation*.

SECTION 1210
PLASTIC PIPE GROUND-SOURCE HEAT PUMP LOOP SYSTEMS

1210.8.6 Flood hazard. Piping located in a flood hazard area, including special flood hazard areas and 500-year floodplains, shall be capable of resisting hydrostatic and hydrodynamic loads and stresses, including the effects of buoyancy, during the occurrence of flooding to the *design flood elevation*.

CHAPTER 13
FUEL OIL PIPING AND STORAGE

SECTION 1305
FUEL OIL SYSTEM INSTALLATION

1305.2.1 Flood hazard. Fuel oil pipe, *equipment* and *appliances* located in flood hazard areas, including special flood hazard areas and 500-year floodplains, shall be located above the elevation required by Section 1612 of the *International Building Code* for utilities and attendant equipment or shall be capable of resisting hydrostatic and hydrodynamic loads and stresses, including the effects of buoyancy, during the occurrence of flooding up to such elevation.

2024 International Plumbing Code

CHAPTER 1
SCOPE AND ADMINISTRATION

SECTION 104
DUTIES AND POWERS OF THE CODE OFFICIAL

Revise as follows:

[A] 104.2.4.1 Flood hazard areas. The code official shall not grant modifications to any provision required in flood hazard areas, including special flood areas and 500-year floodplains. as established by Section 1612.3 of the *International Building Code* unless a determination has been made that:

1. A showing of good and sufficient cause that the unique characteristics of the size, configuration or topography of the site render the elevation standards of Section 1612 of the *International Building Code* inappropriate.
2. A determination that failure to grant the variance would result in exceptional hardship by rendering the lot undevelopable.
3. A determination that the granting of a variance will not result in increased flood heights, additional threats to public safety or extraordinary public expense; cause fraud on or victimization of the public; or conflict with existing laws or ordinances.
4. A determination that the variance is the minimum necessary to afford relief, considering the flood hazard.

5. Submission to the applicant of written notice specifying the difference between the design flood elevation and the elevation to which the building is to be built, stating that the cost of flood insurance will be commensurate with the increased risk resulting from the reduced floor elevation, and stating that construction below the design flood elevation increases risks to life and property.

[A] 104.3.1 Determination of substantially improved or substantially damaged existing buildings and structures in flood hazard areas. For applications for reconstruction, rehabilitation, repair, alteration, addition or other improvement of existing buildings or structures located in flood hazard areas, including special flood hazard areas and 500-year floodplains, the code official shall determine if the proposed work constitutes substantial improvement or repair of substantial damage. Where the code official determines that the proposed work constitutes substantial improvement or repair of substantial damage, and where required by this code, the code official shall require the building to meet the requirements of Section 1612 of the *International Building Code* or Section R306 of the *International Residential Code*, as applicable.

CHAPTER 3
GENERAL REGULATIONS

SECTION 309
FLOOD HAZARD RESISTANCE

309.1 General. Plumbing systems and equipment in structures erected in *flood hazard areas*, including special flood hazard areas and 500-year floodplains, shall be constructed in accordance with the requirements of this section and the *International Building Code*.

[BS] 309.2 Flood hazard. For structures located in *flood hazard areas*, including special flood hazard areas and 500-year floodplains, the following systems and equipment shall be located and installed as required by Section 1612 of the *International Building Code*.

1. Water service pipes.
2. Pump seals in individual water supply systems where the pump is located below the *design flood elevation*.
3. Covers on potable water wells shall be sealed, except where the top of the casing well or pipe sleeve is elevated to not less than 1 foot (305 mm) above the *design flood elevation*.
4. Sanitary drainage piping.
5. Storm drainage piping.
6. Manhole covers shall be sealed, except where elevated to or above the *design flood elevation*.
7. Other plumbing fixtures, faucets, fixture fittings, piping systems and equipment.
8. Water heaters.
9. Vents and vent systems.

2024 International Fuel Gas Code

CHAPTER 1
SCOPE AND ADMINISTRATION

SECTION 104 (IFGC)
DUTIES AND POWERS OF THE CODE OFFICIAL

Revise as follows:

[A] 104.2.4.1 Flood hazard areas.. The *code official* shall not grant modifications to any provision required in *flood hazard areas*, including special flood hazard areas and 500-year floodplains, as established by Section 1612.3 of the *International Building Code* unless a determination has been made that:

1. A showing of good and sufficient cause that the unique characteristics of the size, configuration or topography of the site render the elevation standards of Section 1612 of the *International Building Code* inappropriate.
2. A determination that failure to grant the variance would result in exceptional hardship by rendering the lot undevelopable.
3. A determination that the granting of a variance will not result in increased flood heights, additional threats to public safety or extraordinary public expense; cause fraud on or victimization of the public; or conflict with existing laws or ordinances.
4. A determination that the variance is the minimum necessary to afford relief, considering the flood hazard.
5. Submission to the applicant of written notice specifying the difference between the design flood elevation and the elevation to which the building is to be built, stating that the cost of flood insurance will be commensurate with the increased risk resulting from the reduced floor elevation, and stating that construction below the design flood elevation increases risks to life and property.

[A] 104.3.1 Determination of substantially improved or substantially damaged existing buildings and structures in flood hazard areas. For applications for reconstruction, rehabilitation, repair, *alteration*, addition or other improvement of existing buildings or structures located in *flood hazard areas*, including special flood hazard areas and 500-year floodplains, the *code official* shall determine if the proposed work constitutes substantial improvement or repair of substantial damage. Where the *code official* determines that the proposed work constitutes substantial improvement or repair of substantial damage, and where required by this code, the *code official* shall require the building to meet the requirements of Section 1612 of the *International Building Code* or Section R306 of the *International Residential Code*, as applicable.

CHAPTER 3
GENERAL REGULATIONS

SECTION 301 (IFGC)
GENERAL

[BS] 301.11 Flood hazard. For structures located in *flood hazard areas*, including special flood hazard areas and 500-year floodplains, the *appliance*, *equipment* and system installations regulated by this code shall be located at or above the elevation required by Section 1612 of the *International Building Code* for utilities and attendant equipment.

Exception: The *appliance*, *equipment* and system installations regulated by this code are permitted to be located below the elevation required by Section 1612 of the *International Building Code* for utilities and attendant equipment 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 such elevation.

2024 International Residential Code

CHAPTER 24
FUEL GAS

SECTION G2404 (301)
GENERAL

Revise as follows:

G2404.7 (301.11) Flood hazard. For structures located in *flood hazard areas*, including special flood hazard areas and 500-year

G2404.7 (301.14) Flood hazard. For structures located in *flood hazard areas*, including special flood hazard areas and 500-year floodplains, the *appliance*, *equipment* and system installations regulated by this code shall be located at or above the elevation required by Section R306 for utilities and attendant equipment.

Exception: The *appliance*, *equipment* and system installations regulated by this code are permitted to be located below the elevation required by Section R306 for utilities and attendant equipment 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 such elevation.

2024 International Fire Code

CHAPTER 12 ENERGY SYSTEMS

SECTION 1203 EMERGENCY AND STANDBY POWER SYSTEMS

Revise as follows:

1203.1.8 Group I-2 occupancies. In Group I-2 occupancies located in flood hazard areas, including special flood hazard areas and 500-year floodplains, established in Section 1612.3 of the *International Building Code* where new essential electrical systems are installed, and where new essential electrical system generators are installed, the systems and generators shall be located and installed in accordance with ASCE 24. Where connections for hook up of temporary generators are provided, the connections shall be located at or above the elevation required in ASCE 24.

2024 International Swimming Pool and Spa Code

CHAPTER 1 SCOPE AND ADMINISTRATION

SECTION 104 DUTIES AND POWERS OF THE CODE OFFICIAL

Revise as follows:

[A] 104.2.4.1 Flood hazard areas. The code official shall not grant modifications to any provision required in flood hazard areas, including special flood hazard areas and 500-year floodplains, as established by Section 1612.3 of the *International Building Code* unless a determination has been made that:

1. A showing of good and sufficient cause that the unique characteristics of the size, configuration or topography of the site render the elevation standards of Section 1612 of the *International Building Code* inappropriate.
2. A determination that failure to grant the variance would result in exceptional hardship by rendering the lot undevelopable.
3. A determination that the granting of a variance will not result in increased flood heights, additional threats to public safety or extraordinary public expense; cause fraud on or victimization of the public; or conflict with existing laws or ordinances.
4. A determination that the variance is the minimum necessary to afford relief, considering the flood hazard.
5. Submission to the applicant of written notice specifying the difference between the design flood elevation and the elevation to which the building is to be built, stating that the cost of flood insurance will be commensurate with the increased risk resulting from the reduced floor elevation, and stating that construction below the design flood elevation increases risks to life and property.

[A] 104.3.1 Determination of substantially improved or substantially damaged existing buildings and structures in flood hazard areas. For applications for reconstruction, rehabilitation, repair, alteration, addition or other improvement of existing buildings or structures located in flood hazard areas, including special flood hazard areas and 500-year floodplains, the code official shall determine if the proposed work constitutes substantial improvement or repair of substantial damage. Where the code official determines that the proposed work constitutes substantial improvement or repair of substantial damage, and where required by this code, the code official shall require the building to meet the requirements of Section 1612 of the *International Building Code* or Section R306 of the *International Residential Code*, as applicable.

CHAPTER 3
GENERAL COMPLIANCE

SECTION 304
FLOOD HAZARD AREAS

304.1 General. The provisions of Section 304 shall control the design and construction of pools and spas installed in *flood hazard areas*, including special flood hazard areas and 500-year floodplains.

[BS] 304.2 Determination of impacts based on location. Pools and spas located in *flood hazard areas*, including special flood hazard areas and 500-year floodplains, indicated within the *International Building Code* or the *International Residential Code* shall comply with Section 304.2.1 or 304.2.2.

Exception: Pools and spas located in riverine *flood hazard areas* that are outside of designated floodways and pools and spas located in *flood hazard areas* where the source of flooding is tides, storm surges or coastal storms.

2024 International Private Sewage Disposal Code

CHAPTER 1
SCOPE AND ADMINISTRATION

SECTION 104
DUTIES AND POWERS OF THE CODE OFFICIAL

Revise as follows:

[A] 104.2.4.1 Flood hazard areas. The code official shall not grant modifications to any provision required in flood hazard areas, including special flood hazard areas and 500-year floodplains, as established by Section 1612.3 of the *International Building Code*, unless a determination has been made that:

1. A showing of good and sufficient cause that the unique characteristics of the size, configuration or topography of the site render the elevation standards of Section 1612 of the *International Building Code* inappropriate.
2. A determination that failure to grant the variance would result in exceptional hardship by rendering the lot undevelopable.
3. A determination that the granting of a variance will not result in increased flood heights, additional threats to public safety or extraordinary public expense; cause fraud on or victimization of the public; or conflict with existing laws or ordinances.
4. A determination that the variance is the minimum necessary to afford relief, considering the flood hazard.
5. Submission to the applicant of written notice specifying the difference between the design flood elevation and the elevation to which the building is to be built, stating that the cost of flood insurance will be commensurate with the increased risk resulting from the reduced floor elevation, and stating that construction below the design flood elevation increases risks to life and property.

[A] 104.3.1 Determination of substantially improved or substantially damaged existing buildings and structures in flood hazard areas. For applications for reconstruction, rehabilitation, repair, alteration, addition or other improvement of existing buildings or structures located in flood hazard areas, including special flood hazard areas and 500-year floodplains, the code official shall determine if the proposed work constitutes substantial improvement or repair of substantial damage. Where the code official determines that the proposed work constitutes substantial improvement or repair of substantial damage, and where required by this code, the code official shall require the building to meet the requirements of Section 1612 of the *International Building Code* or Section R306 of *the International Residential Code*, as applicable.

CHAPTER 3
GENERAL REGULATIONS

SECTION 301
GENERAL

301.1 Scope. The provisions of this chapter shall govern the general regulations of *private sewage disposal systems*, including specific limitations and *flood hazard areas*, including special flood hazard areas and 500-year floodplains.

SECTION 303
FLOOD HAZARD AREAS

[BS] 303.1 General. Soil absorption systems shall be located outside of *flood hazard areas*, including special flood hazard areas and 500-year floodplains.

> **Exception:** Where suitable soil absorption sites outside of the *flood hazard area* are not available, the soil absorption site is permitted to be located within the *flood hazard area*. The soil absorption site shall be located to minimize the effects of inundation under conditions of the design flood.

[BS] 303.2 Tanks. In *flood hazard areas*, including special flood hazard areas and 500-year floodplains,tanks shall be anchored to counter buoyant forces during condition of the design flood. The vent termination and service manhole of the tank shall be not less than 2 feet (610 mm) above the *design flood elevation* or fitted with covers designed to prevent the inflow of floodwater or outflow of the contents of the tanks during conditions of the design flood.

[BS] 303.3 Mound systems. Mound systems shall be prohibited in *flood hazard areas*, including special flood hazard areas and 500-year floodplains.

CHAPTER 4
SITE EVALUATION AND REQUIREMENTS

SECTION 401
GENERAL

401.2 Site evaluation. Site evaluation shall include soil conditions, properties and permeability, depth to zones of soil saturation, depth to bedrock, slope, landscape position, all setback requirements and the presence of *flood hazard areas*, including special flood hazard areas and 500-year floodplains. Soil test data shall relate to the undisturbed elevations, and a vertical elevation reference point or benchmark shall be established. Evaluation data shall be reported on approved forms. Reports shall be filed within 30 days of the completion of testing for all sites investigated.

SECTION 406

SITE REQUIREMENTS

406.1.1 Flood hazard areas. The site shall be located outside of *flood hazardareas*, including special flood hazard areas and 500-year floodplains.

Exception: Where suitable sites outside of the *flood hazard area* are not available, it is permitted for the site to be located within the *flood hazard area*. The site shall be located to minimize the effects of inundation under conditions of the design flood.

Attached Files

- **ATT - IEBC and OTHER I-Codes.docx**
  https://www.cdpaccess.com/proposal/12153/35919/files/download/9507/

Reason: REASON STATEMENT:

This proposal is a coordination proposal to bring the 2027 edition of the I-Codes up to date with the provisions in the 2022 edition of *ASCE/SEI 7 Minimum Design Loads and Associated Criteria for Buildings and Other Structures, Supplement 2* (ASCE/SEI 7-22, Supplement 2) as well as the 2024 edition of *ASCE/SEI 24 Flood Resistant Design and Construction* (ASCE/SEI 24-24) --- specifically for the codes primarily affected such as the International Building Code (IBC), the International Residential Code (IRC), and the International Existing Building Code (IEBC), in Group B, but also every I-Code affected by a coordinating code change that will need to be updated. ASCE/SEI 7-22 is the current reference in 2024 I-Codes and Supplement 2 has been submitted as an Administrative Update. ASCE/SEI 24-24 has also been submitted as an Administrative Update to the 2027 I-Codes.

This proposal has been organized into Part I to Part VII and includes technical updates as well as editorial coordination. The specific changes to each section included in this proposal are outlined in Overview below, and a detailed summary of the technical updates are explained in Technical Rationale below that. In addition to the strike out/underline for the code change proposals, the MS Word documents for each affected I-Code have been provided as Attached Files for clarity.

Overview:

These changes provide similar updates to the IBC, IRC, and IEBC, just provided in a separate Code Change Proposal. However, all changes must be included across all I-Codes for a comprehensive proposal - IBC, IRC and IEBC are included in Group B; the others will need to be addressed in the next Group A cycle.

All Codes, All Chapter: Add phase “including special flood hazard areas and 500-year floodplain” following flood area for clarity. And change to clarify term definitions and when “base flood” applies and when “design flood” applies. Also aligns definitions of “base flood elevation” and “design flood elevations”. “Flood Hazard Area” is updated with a new definition. These two changes are carried out throughout the series of these comprehensive code change proposal for clarification and consistency.

Technical Rationale:

The American Society of Civil Engineers (ASCE) is proposing revisions to the International Code Council’s I-Codes for the 2027 Cycle to align the national codes with the current ASCE/SEI design standards including:

ASCE/SEI 7 Minimum Design Loads and Associated Criteria for Buildings and Other Structures, 2022 edition; Supplement 2 (ASCE/SEI 7-22 S2)

ASCE/SEI 24 Flood Resistant Design and Construction, 2024 edition (ASCE/SEI 24-24)

The loading standard ASCE/SEI 7-22 S2 and the design standard ASCE/SEI 24-24 work together – these documents have been developed to be consistent and coordinated so they can be required and used together. There are three significant changes in the national loading standard ASCE/SEI 7-22 S2 including (1) an extension of the defined Flood Hazard Area to the 500-year floodplain for Rick Category II, III, and IV structures, (2) an inclusion of risk-based design for loads, and (3) requirements to include relative sea level change into design load calculations for coastal sites; see below for more technical details. There are three significant changes in the national design standard ASCE/SEI 24-24 including (1) alignment with ASCE/SEI 7-22 S2, (2) alignment with FEMA Technical Bulletins, and (3) updates for elevations, materials, and floodproofing.

Both ASCE/SEI Standards are available for purchase and the Supplement available as a free download from the ASCE Library:

ASCE/SEI 7-22 (https://doi.org/10.1061/9780784415788)

ASCE/SEI 7-22 Supplement 2 (https://doi.org/10.1061/9780784415788.sup2)

ASCE/SEI 24-24 (https://doi.org/10.1061/9780784485781)

Flood Hazard:

The ASCE 7-22 S2 updates the design requirements to define the flood hazard area for the given Risk Category of structure. Addionally, the flood hazard depth is tied to the mean recurrence interval for a given Risk Category of structure. The design flood hazard is related to Risk Category (e.g., RC II will be designed to 500-year MRI), which is consistent with the way other environmental hazards (such as wind and snow loads) relate the hazard to Risk Category. This is in contrast to the current code requirements, which only considers only 100-year MRI flood for all structures regardless of Risk Category. In some areas in the U.S., the Authority Having Jurisdiction is already requiring a higher design requirement for the flood hazard. The city of Houston, for example, moved to requiring use of the 500-year MRI as the design basis for flood following the devastation from Hurricane Harvey. At a national level, FEMA is considering the use of the 500-year flood as the basis for floodplain management.

The coordinated code change proposals submitted for Group B are drafted to bring the IBC, IRC, and IEBC into alignment with the recent changes in ASCE 7-22 Supplement 2 and ASCE 24-24. The significant changes from the updates to these standards are to differentiate between the base flood (also described as the 100-year flood, or the 1% or greater chance of flooding in any given year) and the design flood, which could be different, and is defined in the standards for each Risk Category. The design flood must include considerations for loading specified in ASCE/SEI 7-22 S2 and design specified in ASCE/SEI 24-24.

Flood damage, and associated loss dollars, has significantly expanded since the last major updates of ASCE 7 Chapter 5 and ASCE 24. Their revisions attempt to close that gap and align the risks across other hazards.

FEMA cites that flood damage cost approximately $17 billion each year between 2010 and 2018, and with rising sea levels and extreme weather could cause $20 billion of flood damage to at-risk US homes this year, rising to $32 billion by 2051. Data from 2018 Hurricane Michael shows that 42% of claimed damage amounts were in the Shaded X-Zone (500-year floodplain), exceeding the amounts in both the A and V-Zones. (FEMA. Mitigation Assessment Team Report Hurricane Michael in Florida (FEMA P-2077), February 2020).

This is further supported by FEMA's recent report "A Cost and Benefits Analysis of Increased Elevation Requirements for Public and Nonresidential Buildings in Riverine and Coastal Floodplains," which evaluated the potential avoided losses (benefits) for 8 building types in 19 coastal floodplains and 14 riverine floodplains in the 100-year floodplain and the Shaded X Zone. The report shows that there are significant benefits to most buildings in the 100-year floodplain, particularly in steep/narrow floodplains. There were also significant benefits to buildings in the Shaded X Zone where there are currently no elevation requirements. These findings are supported by evidence from the National Flood Insurance Program (NFIP), which stated, "People outside of high-risk areas file more than 25 percent of NFIP claims and receive one-third of disaster assistance for flooding. The NFIP's preferred risk policies are designed for residential properties located in low- to moderate-risk flood zones." Additional reports from the NFIP indicate that 40% of companies fail to reopen after a disaster, with another 25% closing within a year. These problems are only further exacerbated by the influence of development and associated runoff, changes in precipitation rates, local subsidence, and sea level change. All of which are not accounted for by FEMA's flood maps, which only account for historic flood data and not future projections. All of this data supports the need to move from a fixed freeboard approach to a risk-based elevation approach that provides consistent protection from flat/wide floodplains to steep/narrow floodplains and more appropriately addresses the influence of wave action in coastal floodplains. This recognizes that true resiliency for communities is continuity of local businesses and making sure that public services are maintained and that adaptation to changes in precipitation, development, and sea level change must be incorporated into new buildings rather than relying on often prohibitively expensive retrofit options.

The ASCE changes consider the frequency of recent and predicted events and the significant damage recorded in the Shaded X-Zone. But, while significant, the addition of the Shaded X-Zone to the standards represents a change to only 4% of the U.S. population.

This proposal reflects the latest flood hazard science, but in general does not represent a fundamental increase in loads, resulting in higher construction costs. However, with the introduction of a higher flood design return period and future considerations for Sea Level Change, the design flood loads have increased for structures currently located in a designated flood hazard area. The ASCE revisions do not add structures to the currently defined flood hazard area, but do add small-depth flood loads for new construction in the Shaded X-Zone where there currently are none.

ASCE Consensus Process:

ASCE established and maintains an ANSI-accredited, consensus process for standard development. The open process includes selection of a balanced committee, including representation of all affected stakeholders, and public review of the draft standard prior to publication. The ASCE consensus process follows the *ASCE Rules for Standards Committees*, which is published on the ASCE website. The ASCE/SEI 7-22 S2 was developed by the ASCE 7-22 Standard Committee, which included approximately 50 voting members and hundreds more associate members. The ASCE/SEI 24-24 standard was developed by the ASCE 24-24 Standard Committee, which included approximately 25 voting members and 15 associate members.

Supporting Organizations:

This code change proposal has many supporters, included but not limited to the following organizations:

American Flood Coalition

American Institute of Architects (AIA)

Association of State Flood Plain Managers (ASFPM)

BuildStrong America

Federal Emergency Management Association

Flood Mitigation Industry Association (FMIA)

National Institute of Building Science (NIBS)

Registered Designer Professionals and planners of buildings and other infrastructure projects, Code Officials, and Authorities Having Jurisdiction owe it to the public and have an ethical obligation to provide a framework for safe, reliable structures. The public expects that the buildings in which they live, work, and play are designed consistently, with the same risk approach for all environmental hazards. Flooding is disruptive to families, businesses, and communities and it takes years to recover from these devastating disasters and overcome the losses incurred. The flood hazard must be taken seriously and incorporated into our design standards and building codes in a manner that is consistent with all of the other environmental hazards.

- **2025 Cost and Analysis Benefits for ASCE24-24.PDF**
  https://www.cdpaccess.com/proposal/12153/35919/documentation/186688/attachments/download/9874/

Bibliography: FEMA. A Cost and Benefits Analysis of Increased Elevation Requirements for Public and Nonresidential Buildings in Riverine and Coastal Floodplains. January 2025
(https://www.researchgate.net/publication/388556202_A_Cost_and_Benefits_Analysis_of_Increased_Elevation_Requirements_for_Publ
FEMA. Mitigation Assessment Team Report Hurricane Michael in Florida (FEMA P-2077), February 2020
(https://www.fema.gov/sites/default/files/2020-07/mat-report_hurricane-michael_florida.pdf)

Cost Impact: Increase

- **2025 Cost and Benefits Analysis for ASCE 24-24.PDF**
  https://www.cdpaccess.com/proposal/12153/35919/documentation/186691/attachments/download/9875/

Estimated Immediate Cost Impact:

ASCE 7 and ASCE 24 are national minimum design standards. The effects will vary depending upon the local flood conditions and flood risk across the country and among building types. For nearly 90% of all affected structures in Numbered A Zones, the estimated immediate costs impact can be understood in analysis of the mitigation cost as a percentage of building replacement value from 0.2-6.6% for coastal sites and 0.0-4.0% for riverine sites. Additionally, average benefits per square foot range from $51-$336 for both riverine and coastal flooding, which are dependent on building type and location. See the attached “Cost and Benefits Analysis” for additional information.

This proposal reflects the latest flood hazard science, but in general does not represent a fundamental increase in loads, resulting in higher construction costs. However, with the introduction of a higher flood design return period and future considerations for Sea Level Change, the design flood loads have increased for structures currently located in a designated flood hazard area. The ASCE revisions do not add structures to the currently defined flood hazard area, but do add small-depth flood loads for new construction in the Shaded X-Zone where there currently are none.

Estimated Immediate Cost Impact Justification (methodology and variables):

A building cost study was considered for 14 riverine locations and 19 coastal locations. Examples consider A Zone and X Zone conditions to understand how the ASCE changes impact the overall cost. However, since most buildings are riverine, the study focused there, but similar trends appear in coastal buildings.

Table 1 is a summary of the buildings that were considered in the study, accounting for the building type, building sizes (and average), and Flood Design Classes. The difference between commercial and government office building plays a larger role in the losses avoided portion of the study. The cost analysis is grouped by Flood Design Class since this is the grouping used in ASCE 24 for elevation criteria.

Table 1 - Building Types Considered in Study

Building Type	Flood Design Class	Small SF	Medium SF	Large SF	Average SF
Hospital 2-3 Stories	4	25,000	70,000	145,000	80,000
Elementary School	3	25,000	40,000	65,000	43,333
Police Station	4	7,000	13,000	23,000	14,333
Office 1-Story (Government)	2	2,000	7,000	25,000	11,333
Office 3-Story (Government)	2	5,000	16,000	80,000	33,667
Office 1-Story (Commercial)	2	2,000	7,000	25,000	11,333
Office 3-Story (Commercial)	2	5,000	16,000	80,000	33,667
Retail Store	2	4,000	10,000	22,000	12,000

Table 2 provides an overview of A Zone conditions for increased building costs within the 100-yr floodplain. The values represent the breakdown of example floodplains using the numbered A Zone range to categorize how much rise there is between the various flood events. A low numbered A Zone represents a flat floodplain and a high number represents a steeper floodplain where there can be a large difference in flood elevations. The percent of numbered A Zones throughout the country based on an NFIP flood insurance policy analysis per census tract.

This provides a breakdown of how various floodplains impact the increased building cost. It's important to note that in A01-A03 the freeboard requirements equal or exceed the MRI based design flood event. Since ASCE did not change the minimum freeboard requirements for FDC 2 and FDC 4, those values are the same for ASCE 24-14 and ASCE 24-24 and therefore there is no cost increase. Additionally, for FDC 4 the analysis selected the higher of the 500-yr and BFE+2, so the delta between the ASCE 24-14 and ASCE 24-24 wasn't as high in the higher numbered A Zones as it would have been with FDC 2 and 3 where they were locked with ASCE 24-14 at BFE+1.

Table 2 - Average Building Cost Increase Percentage for Riverine A Zones Per Numbered A Zone

Numbered A Zone	Percentile of Numbered A Zones	FDC 2	FDC3	FDC4
A01-A03	26%	0.00%	1.20%	0.00%
A04-A06	41%	1.50%	1.90%	0.50%
A07-A10	20%	2.40%	2.90%	0.60%
A11-A14	9%	4.80%	5.50%	1.00%
A15-A17	2%	8.90%	10.00%	1.60%
A18-A30	2%	11.90%	13.20%	2.10%
	Weighted Average:	1.97%	2.65%	0.49%

Table 3 provides an overview of X Zone conditions for increased building costs within the 500-yr floodplain. The 500-year floodplain represents the area between the 100-year floodplain and the 500-year flood extent, this therefore represents protection from the 101-year to the 500-year flood. In X Zones it is assumed that buildings are built on the ground as compared to elevated foundations in Zone A. Since the X Zone represents the difference between the 100-year and the 500-year flood, the 300-year flood elevation was used as an average ground elevation. The ASCE 24-24 elevations represent the minimum required elevations required per the standard. The increased elevation is therefore the difference between ground (at the 300-year flood elevation) and the ASCE 24-24 elevation requirements. Similar to Table 2, Table 3 data is provided per Flood Design Class per grouped numbered A Zone designation.

Table 3 - Average Building Cost Increase Percentage for Riverine X Zones Per Numbered A Zone

Numbered A Zone	Percentile of Numbered A Zones	FDC 2	FDC 3	FDC 4
A01-A03	26%	0.60%	1.80%	0.70%
A04-A06	41%	1.00%	1.50%	0.80%
A07-A10	20%	1.20%	1.80%	1.00%
A11-A14	9%	1.90%	3.00%	1.70%
A15-A17	2%	3.20%	5.00%	2.80%
A18-A30	2%	4.40%	6.70%	3.70%
	Weighted Average:	1.14%	1.93%	1.00%

It is believed that the presentation of percent increase in building cost provided a better representation of the overall cost impacts rather than providing dollar values. While the percent increase does get rather large in those areas with high numbered A Zones, this is a much smaller overall percentage of land area, so this represents a smaller portion of the floodplains in the US. However, recent events have shown that when these areas experience a flood event above the 100-year or 1% annual chance flood, that they often experience deep flooding. Experience from Western NC following Hurricane Helene demonstrated that when floods occur in areas with high numbered A Zones that significant flood damage occurs in the X Zone. There were examples of buildings elevated in the X Zone that performed very well in Hurricane Helene and had little to no observed damage. But many buildings in the X Zone that were constructed at grade were severely damaged or destroyed. While this is observational, there is substantial evidence to suggest that the percent cost increase is offset by the avoided losses. Two key factors that impact the avoided loss calculation is the impact of when the original flood insurance studies and associated maps were created (older mapping data), which can mean that the mapped risk is underestimated (increased runoff due to development and updated precipitation data) and then looking forward the impact of future changes in precipitation rates over the 50-year life of riverine buildings. Similarly, these impacts can impact coastal flooding heights as well as the impact of sea level change.

Staff Analysis: Chapter 24 of the IRC is copied from the IFGC, therefore, everything in that Chapter is controlled by the scoping in the IFGC.

S97-25 Part V

S97-25 Part VI

IRC: SECTION 202 (New),

Proponents: Jennifer Goupil, American Society of Civil Engineers and Structural Engineering Institute, representing American Society of Civil Engineers (jgoupil@asce.org); Chad Berginnis, representing Association of State Floodplain Managers (cberginnis@floods.org); Natalie Enclade, representing BuildStrong America (natalie@buildstrongamerica.com); Jiqiu yuan, representing National Institute of Building Sciences (jyuan@nibs.org); Joel Scata, representing NRDC (jscata@nrdc.org); Roderick Scott, Board Chair, representing Flood Mitigation Industry Association (roderick.scott75@aol.com)

2024 International Residential Code

SECTION R202 DEFINITIONS

Add new definition as follows:

500-YEAR FLOODPLAIN. Land in the *floodplain* subject to a 0.2% or greater chance of *flooding* in any given year; area delineated on the *Flood Insurance Rate Map* (FIRM) as Shaded Zone X or Zone B.
BASE FLOOD. The flood having a 1-percent chance of being equaled or exceeded in any given year.
BASE FLOOD ELEVATION. The elevation of the base flood, including wave height, relative to the National Geodetic Vertical Datum (NGVD), North American Vertical Datum (NAVD) or other datum specified on the Flood Insurance Rate Map (FIRM). In areas designated on the Flood Insurance Rate Map as Zone AO, the base flood elevation is the elevation of the highest existing grade of the building’s perimeter plus the depth number (in feet) specified on the flood hazard map. In areas designated as Zone AO where a depth number is not specified on the map, the depth number is taken as being equal to 2 feet (610 mm).
DESIGN FLOOD. Flood corresponding to the elevations specified in Section R306.1.4 and acting over the *flood hazard area*.
DESIGN FLOOD ELEVATION. The elevation of the "design flood", including wave height, releative to the datum specified on the community's legally desingated flood hazard map.
FLOOD HAZARD AREA. The greater of the following three areas:

1. The area within a floodplain subject to a 1 percent or greater chance of flooding in any given year, including special flood hazard areas delineated on the Flood Insurance Rate Map.
2. The 500-year floodplain, when delineated on the *Flood Insurance Rate Map*.
3. The area designated as a *flood hazard area* on a community's flood hazard map, or otherwise legally designated.

SPECIAL FLOOD HAZARD AREA. Land in the *floodplain* subject to a 1% or greater chance of *flooding* in any given year; area delineated on the *Flood Insurance Rate Map* as Zone A, AE, A1-30, A99, AR, AO, AH, V, VO, VE or V1-30.

Attached Files

- **ATT - IRC.docx**
  https://www.cdpaccess.com/proposal/11725/35915/files/download/9503/

S97-25 Part VI

S97-25 Part VII

IRC: R104.2.3.1, R104.3.1, R106.1.4, R109.1.3, R301.2.4, R306.1, R306.1.4, R306.1.4 (New), R306.1.4.1, R306.1.4.2, R306.1.9, R306.2, R306.2.1, R306.2.2, R306.2.2.1, R306.2.4, R306.3.2, R306.3.7, R317.3, R401.1, R404.1.9.5, R408.7, M1301.1.1, M1401.5, M1601.4.10, M1701.2, M2001.4, M2101.29.1, M2201.6, P2601.3, P2602.2, P2705.1, P3001.3, P3101.5, CHAPTER 44 ASCE/SEI, BA101.2, BI101.2, BJ101.3, BO102.7,

Proponents: Jennifer Goupil, American Society of Civil Engineers and Structural Engineering Institute, representing American Society of Civil Engineers (jgoupil@asce.org); Chad Berginnis, representing Association of State Floodplain Managers (cberginnis@floods.org); Natalie Enclade, representing BuildStrong America (natalie@buildstrongamerica.com); Jiqiu yuan, representing National Institute of Building Sciences (jyuan@nibs.org); Joel Scata, representing NRDC (jscata@nrdc.org); Roderick Scott, Board Chair, representing Flood Mitigation Industry Association (roderick.scott75@aol.com)

2024 International Residential Code

SECTION R104
DUTIES AND POWERS OF THE BUILDING OFFICIAL

Revise as follows:

R104.2.3.1 Flood hazard areas. The *building official* shall not grant modifications to any provisions required in flood hazard areas as established ~~by~~ <u>in the flood hazard maps identified</u> Table R301.2 unless a determination has been made that:

1. There is good and sufficient cause showing that the unique characteristics of the size, configuration or topography of the site render the elevation standards of Section R306 inappropriate.
2. Failure to grant the modification would result in exceptional hardship by rendering the lot undevelopable.
3. The granting of modification will not result in increased flood heights, additional threats to public safety or extraordinary public expense; cause fraud on or victimization of the public; or conflict with existing laws or ordinances.
4. The modification is the minimum necessary to afford relief, considering the flood hazard.
5. Written notice specifying the difference between the ~~design~~ <u>base</u> flood elevation and the elevation to which the building is to be built, stating that the cost of flood insurance will be commensurate with the increased risk resulting from the reduced floor elevation and stating that construction below the ~~design~~ <u>base</u> flood elevation increases risks to life and property, has been submitted to the applicant.

R104.3.1 Determination of substantially improved or substantially damaged existing buildings in flood hazard areas. For applications for reconstruction, rehabilitation, *addition, alteration*, *repair* or other improvement of *existing buildings* or structures located in a flood hazard ~~area~~ <u>areas, including special flood hazard areas and 500-year floodplains,</u> as established ~~by~~ <u>in the flood hazard maps identified in</u> Table R301.2, the *building official* shall examine or cause to be examined the *construction documents* and shall make a determination with regard to the value of the proposed work. For *buildings* that have sustained damage of any origin, the value of the proposed work shall include the cost to *repair* the *building* or structure to its predamaged condition. If the *building official* finds that the value of proposed work equals or exceeds 50 percent of the market value of the building or structure before the damage has occurred or the improvement is started, the proposed work is a *substantial improvement* or *repair* of *substantial damage* and the *building official* shall require existing portions of the entire building or structure to meet the requirements of Section R306.

SECTION R106
CONSTRUCTION DOCUMENTS

R106.1.4 Information for construction in flood hazard areas. For *buildings* and structures located in whole or in part in flood hazard areas<u>, including special flood hazard areas and 500-year floodplains,</u> as established ~~by~~ <u>in the flood hazard maps identified</u> Table R301.2, *construction documents* shall include:

1. Delineation of flood hazard areas<u>, including special flood hazard areas and 500-year floodplains</u>, floodway boundaries, ~~and~~ flood zones <u>, base flood elevations,</u> and the design flood elevation, as appropriate.
2. The elevation of the proposed lowest floor, including *basement*; in areas of shallow flooding (AO Zones), the height of the proposed lowest floor, including *basement*, above the highest adjacent *grade*.
3. The elevation of the bottom of the lowest horizontal structural member in coastal high-hazard areas (V Zone) and in Coastal A Zones where such zones are delineated on flood hazard maps identified in Table R301.2 or otherwise delineated by the *jurisdiction*.
4. If ~~design~~ <u>base</u> flood elevations are not included on the community's Flood Insurance Rate Map (FIRM), the *building official* and the applicant shall obtain and reasonably utilize any ~~design~~ <u>base</u> flood elevation and floodway data available from other sources.

SECTION R109
INSPECTIONS

R109.1.3 Floodplain inspections. For construction in flood hazard areas as established ~~by~~ <u>on the flood hazard maps identified in Table</u> Table R301.2, upon placement of the lowest floor, including *basement*, and prior to further vertical construction, the *building official* shall require submission of documentation, prepared and sealed by a *registered design professional*, of the elevation of the lowest floor, including *basement*, required in Section R306.

SECTION R301
DESIGN CRITERIA

R301.2.4 Floodplain construction. *Buildings* and structures constructed in whole or in part in flood hazard areas<u>, including special flood hazard areas and 500-year floodplains,</u> as established <u>on the flood hazard maps identified</u> Table R301.2, and *substantial improvement* and *repair* of *substantial damage* of *buildings* and structures located in whole or in part in flood hazard areas<u>, including special flood hazard areas and 500-year floodplains</u>, shall be designed and constructed in accordance with Section R306. *Buildings* and structures that are located in more than one flood hazard area, including A Zones, Coastal A Zones and V Zones, shall comply with the provisions associated with the most restrictive flood hazard area. *Buildings* and structures located in whole or in part in identified floodways shall be designed and constructed in accordance with ASCE 24.

SECTION R306
FLOOD-RESISTANT CONSTRUCTION

R306.1 General. *Buildings* and structures constructed in whole or in part in flood hazard areas<u>, including special flood hazard areas and 500-year floodplains,</u> established <u>on the flood hazard maps identified</u> in Table R301.2, and *substantial improvement* and *repair* of *substantial damage* of *buildings* and structures located in whole or in part in flood hazard areas<u>, including special flood hazard areas and 500-year floodplains</u>, shall be designed and constructed in accordance with the provisions contained in this section. *Buildings* and structures that are located in more than one flood hazard area, including A Zones, Coastal A Zones and V Zones, shall comply with the provisions associated with the most restrictive flood hazard area. *Buildings* and structures located in whole or in part in identified floodways shall be designed and constructed in accordance with ASCE 24.

R306.1.4 Establishing the design flood elevation. The design flood elevation shall be used to define flood hazardareas<u>, including special flood hazard areas and 500-year floodplains</u>. At a minimum, the design flood elevation shall be the higher of the following:

1. The base flood elevation at the depth of peak elevation of flooding, including wave height, that has a 1-percent (100-year flood) or greater chance of being equaled or exceeded in any given year.

2. The elevation of the design flood associated with the area designated on a flood hazard map adopted by the community, or otherwise legally designated.
3. The 500-year flood elevation determined in accordance with Table R306.1.4 or ASCE 24.

In no case shall the elevation of the design flood be lower than the elevation of the base flood.

Add new text as follows:

Table R306.1.4 Determination of 500-Year Flood Elevations

Flood Data Provided for Project Location	FIRM shows riverine cross sections[a] for the flood source	FIRM does not show riverine cross sections[a] for the flood source	FIRM shows coastal transects[b] for the flood source	FIRM shows riverine cross sections[a] and coastal transects[b] for the flood source
The FIRM shows a Shaded Zone X[e] and 500-year Flood Data is provided	Use the elevation for 500-year flood provided in the FIS Flood Profile[e].	Not Applicable	Use the 500-year wave envelope elevation.	Use the more restrictive of the 500-year flood profile elevation or the 500-year wave envelope elevation.
The FIRM shows a Shaded Zone X[e] and only a 500-year stillwater elevation is provided	Not Applicable to Riverine Conditions	Not Applicable to Riverine Conditions	For A Zones[d], use the higher of BFE plus 2.1 feet or the 500-year stillwater elevation for the nearest transect. For CHHA[f] and CAZ[g], use the higher of BFE plus 2.6 feet or the 500-year stillwater elevation for the nearest transect.	Use the more restrictive of the 500-year flood profile or: - For A Zones[d], use the higher of BFE plus 2.1 feet or the 500-year stillwater elevation for the nearest transect. - For CHHA[f] and CAZ[g], use the higher of BFE plus 2.6 feet or the 500-year stillwater elevation for the nearest transect.
The FIRM does not show a Shaded Zone X[e] and 500-year flood elevation is provided	Use the elevation for 500-year flood provided in the FIS Flood Profile[3]	Not Applicable	Not Applicable	Use the more restrictive of the 500-year flood profile or: - For A Zones[d], use the higher of BFE plus 2.1 feet. - For CHHA[f] and CAZ[g], use the higher of BFE plus 2.6 feet.
The FIRM does not show a Shaded Zone X[e] and only Base Flood Elevation is provided	Use the BFE plus 2.1 feet.	Use the BFE plus 2.1 feet.	For A Zones[d], use the BFE plus 2.1 feet. For CHHA[f] and CAZ[g], use the BFE plus 2.6 feet.	For A Zones[d], use the BFE plus 2.1 feet. For CHHA[f] and CAZ[g], use the BFE plus 2.6 feet.

a. Riverine cross sections are shown on Flood Insurance Rate Maps (FIRMs) using a line and a number or letter surrounded by a hexagon to indicate the cross section along the flood source. The same designations are used on Flood Profiles included in Flood Insurance Studies (FISs).

b. Coastal transect lines are shown on FIRMs using a line and a number surrounded by a circle, which indicates the transect number on the FIRM. The same designations are used in Stillwater Tables and Wave Envelope Profiles in FISs.

c. Flood profiles are provided in FISs for riverine flood sources studied using detailed methods. Project locations are identified by measuring up or downstream from the nearest cross section along the centerline of the flood source.

d. A Zones refer to those areas identified on FIRMs as Zone A, AE, A1-A30, A99, AR, AO and AH. Areas identified as A Zones that are located seaward of the Limit of Moderate Wave Action (LiMWA) are Coastal A Zones (CAZs).

e. Shaded Zone X includes those areas within 500-year floodplains identified on FIRMs as Zone X with shading. Shaded Zone X includes Zone B shown on older FIRMs.

f. Coastal High Hazard Areas (CHHAs) include those areas identified on FIRMS as Zone V.

g. Coastal A Zones (CAZs) include A Zones on FIRMS that are seaward of the LiMWA or otherwise designated by the jurisdiction.

Revise as follows:

R306.1.4.1 Determination of ~~design~~ base flood elevations. ~~If design~~ Where base flood elevations are not specified, the *building official* is authorized to require the applicant to comply with either of the following:

1. Obtain and reasonably use data available from a federal, state or other source.

2. Determine the ~~design~~ base flood elevation in accordance with accepted hydrologic and hydraulic engineering practices used to define special flood hazard areas. Determinations shall be undertaken by a *registered design professional* who shall document that the technical methods used reflect currently accepted engineering practice. Studies, analyses and computations shall be submitted in sufficient detail to allow thorough review and *approval*.

R306.1.4.2 Determination of impacts. In riverine special flood hazard areas where ~~design~~ base flood elevations are specified but floodways have not been designated, the applicant shall demonstrate that the effect of the proposed *buildings* and structures on ~~design~~ baseflood elevations, including fill, when combined with other existing and anticipated special flood hazard area encroachments, will not increase the ~~design~~ base flood elevation more than 1 foot (305 mm) at any point within the *jurisdiction*.

R306.1.9 Manufactured homes. The bottom of the frame of new and replacement *manufactured homes* on foundations that conform to the requirements of Section R306.2 or R306.3, as applicable, shall be elevated to or above the elevations specified in Section R306.2 (flood hazard areas including A Zones and the 500-year floodplain) or R306.3 in coastal high-hazard areas (V Zones and Coastal A Zones). The anchor and tie-down requirements of the applicable state or federal requirements shall apply. The foundation and anchorage of *manufactured homes* to be located in identified floodways shall be designed and constructed in accordance with ASCE 24.

R306.2 Flood hazard areas ~~(including A Zones)~~. Areas that have been determined to be prone to flooding and that are not subject to high-velocity wave action shall be designated as flood hazard areas. Flood hazard areas that have been delineated as subject to wave heights between 1$^{1}/_{2}$ feet (457 mm) and 3 feet (914 mm) or otherwise designated by the *jurisdiction* shall be designated as Coastal A Zones and are subject to the requirements of Section R306.3. *Buildings* and structures constructed in whole or in part in flood hazard areas, including special flood hazard areas and 500-year floodplains, but not including coastal high hazard areas and Coastal A Zones shall be designed and constructed in accordance with Sections R306.2.1 through R306.2.4.

R306.2.1 Elevation requirements.

1. Buildings and structures in flood hazard areas, not 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 determined in Section R306.1.4, 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.
4. Attached garages and carports shall comply with one of the following:
   - 4.1. The floors shall be elevated to or above the elevations required in Item 1 or Item 2, as applicable.
   - 4.2. The floors shall be at or above *grade* on not less than one side. Where an attached garage or carport is enclosed by walls, the walls shall have flood openings that comply with Section R306.2.2 and the attached garage or carport shall be used only for parking, building access or storage.

5. Detached *accessory structures* and detached garages shall comply with one of the following:
   5.1. The floors shall be elevated to or above the elevations required in Item 1 or Item 2, as applicable.
   5.2. Floors below the elevations required in Item 1 or 2, as applicable, must be:
      5.2.1. Used only for parking or storage.
      5.2.2. One story and not larger than 600 square feet (55.74 m^2).
      5.2.3. Anchored to resist flotation, collapse or lateral movement resulting from design flood loads.
      5.2.4. Equipped with flood openings that comply with Section R306.2.2.
      5.2.5. Constructed of flood-damage-resistant materials that comply with Section R306.1.8. Have mechanical, plumbing and electrical systems, if applicable, that comply with Section R306.1.6.

Exception: Enclosed areas below the elevation required in this section, including *basements* with floors that are not below *grade* on all sides, shall meet the requirements of Section R306.2.2.

R306.2.2 Enclosed area below required elevation. Enclosed areas, including *crawl spaces*, that are below the elevation required in Section R306.2.1 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 R306.2.2.1:
   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.
3. An exterior door that meets the requirements of Section R609 shall be installed at the top of *stairs* that provide access to the *building.*

Exceptions: The following shall not be required to comply with this section:

1. Elevator shafts.
2. Utility chases that protect utility lines from freezing, provided that the utility chases are the minimum size necessary to protect the utility lines and do not provide access for a *person* to enter the space.

R306.2.2.1 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, 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.

Exception:

1. For enclosed areas with only one exterior wall, flood openings in only that one exterior wall shall be permitted.

2. For buildings on sloped sites where the exterior grade is below the elevation required in Section R306.2.1 on only one exterior wall, the flood openings required for the enclosed area shall be located on that exterior wall.

R306.2.4 Tanks. Underground tanks shall be anchored to prevent flotation, collapse and lateral movement under conditions of the base flood. Above-ground tanks shall be installed at or above the elevation required in Section R306.2.1 or shall be anchored to prevent flotation, collapse and lateral movement under conditions of the design ~~base~~ flood.

R306.3.2 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 determined in Section R306.1.4 , whichever is higher. Where stem wall foundations are permitted in Coastal A Zones in accordance with Section R306.3.3, the bottom of the lowest horizontal structural member supporting the lowest floor is the top of the foundation wall, or top of the portion of the foundation wall, supporting the slab.
2. *Basement* floors that are below *grade* on all sides are prohibited.
3. Attached garages used only for parking, building access or storage, and carports shall comply with Item 1 or shall be at or above *grade* on not less than one side and, if enclosed with walls, such walls shall comply with Item 7.
4. Detached *accessory structures* and detached garages shall comply with either of the following:
    - 4.1. The bottom of the lowest horizontal structural member supporting the floors shall be elevated to or above the elevation required in Item 1.
    - 4.2. Floors below the elevations required in Item 1 must be:
        - 4.2.1. Used only for parking or storage.
        - 4.2.2. One *story* and not larger than 100 square feet (9.29 m^2).
        - 4.2.3. Anchored to resist flotation, collapse or lateral movement resulting from design flood loads.
        - 4.2.4. Constructed of flood damage-resistant materials that comply with Section R306.1.8.
        - 4.2.5. Equipped with mechanical, plumbing and electrical systems, if applicable, that comply with Section R306.1.6.
5. The use of fill for structural support is prohibited.
6. 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.
7. Walls and partitions enclosing areas below the elevation required in this section shall meet the requirements of Sections R306.3.5 and R306.3.6.

R306.3.7 Stairways and ramps. *Stairways* and *ramps* that are located below the lowest floor elevations specified in Section R306.3.2 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 and the stairs and ramps are capable of resisting code-required wind loads in the retracted or raised position.
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 elevation required in Section R306.3.2 unless such walls are constructed in accordance with Section R306.3.5.

SECTION R317
GARAGES AND CARPORTS

R317.3 Flood hazard areas. Garages and carports located in flood hazard areas, including special flood hazard areas and 500-year floodplains, as established ~~by~~ on the flood hazard maps identified in Table R301.2 shall be constructed in accordance with Section R306.

SECTION R401
GENERAL

R401.1 Application. The provisions of this chapter shall control the design and construction of the foundation and foundation spaces for *buildings*. In addition to the provisions of this chapter, the design and construction of foundations in flood hazard areas, including special flood hazard areas and 500-year floodplains, as established ~~by~~ on the flood hazard maps identified in Table R301.2 shall meet the provisions of Section R306. Wood foundations shall be designed and installed in accordance with AWC PWF.

Exception: The provisions of this chapter shall be permitted to be used for wood foundations only in the following situations:

1. In *buildings* that have not more than two floors and a roof.
2. Where interior *basement* and foundation walls are constructed at intervals not exceeding 50 feet (15 240 mm).

Wood foundations in *Seismic Design Category* D_0, D_1 or D_2 shall be designed in accordance with accepted engineering practice.

SECTION R404
FOUNDATION AND RETAINING WALLS

R404.1.9.5 Masonry piers in flood hazard areas. Masonry piers for *dwellings* in flood hazard areas, including special flood hazard areas and 500-year floodplains, shall be designed in accordance with Section R306.

SECTION R408
UNDER-FLOOR SPACE

R408.7 Flood resistance. For *buildings* located in flood hazard areas, including special flood hazard areas and 500-year floodplains, as established on the flood hazard maps identified in Table R301.2:

1. Walls enclosing the under-floor space shall be provided with flood openings in accordance with Section R306.2.2.
2. The finished ground level of the under-floor space shall be equal to or higher than the outside finished ground level on at least one side.

Exception: Under-floor spaces that meet the requirements of FEMA TB 11.

CHAPTER 13
GENERAL MECHANICAL SYSTEM REQUIREMENTS

SECTION M1301
GENERAL

M1301.1.1 Flood-resistant installation. In flood hazard areas, including special flood hazard areas and 500-year floodplains, as established ~~by~~ on the flood hazard maps identified in Table R301.2, mechanical *appliances, equipment* and systems shall be located or installed in accordance with Section R306.1.6.

CHAPTER 14
HEATING AND COOLING EQUIPMENT AND APPLIANCES

SECTION M1401
GENERAL

M1401.5 Flood hazard. In flood hazard areas, including special flood hazard areas and 500-year floodplains, as established ~~by~~ on the flood hazard maps identified in Table R301.2, heating and cooling *equipment* and *appliances* shall be located or installed in accordance with Section R306.1.6.

CHAPTER 16
DUCT SYSTEMS

SECTION M1601
DUCT CONSTRUCTION

M1601.4.10 Flood hazard areas. In flood hazard areas, including special flood hazard areas and 500-year floodplains, as established ~~by~~ on the flood hazard maps identified in Table R301.2, *duct systems* shall be located or installed in accordance with Section R306.1.6.

CHAPTER 17
COMBUSTION AIR

SECTION M1701
GENERAL

M1701.2 Opening location. In flood hazard areas, including special flood hazard areas and 500-year floodplains, as established on the flood hazard maps identified in Table R301.2, *combustion air* openings shall be located at or above the elevation required in Section R306.2.1 or R306.3.2.

CHAPTER 20
BOILERS AND WATER HEATERS

SECTION M2001
BOILERS

M2001.4 Flood-resistant installation. In flood hazard areas, including special flood hazard areas and 500-year floodplains, established on the flood hazard maps identified in Table R301.2, boilers, water heaters and their control systems shall be located or installed in accordance with Section R306.1.6.

CHAPTER 21
HYDRONIC PIPING

SECTION M2101
HYDRONIC PIPING SYSTEMS INSTALLATION

M2101.29.1 Flood hazard. Piping located in ~~a~~ flood hazard areas, including special flood hazard areas and 500-year floodplains, shall be capable of resisting hydrostatic and hydrodynamic loads and stresses, including the effects of buoyancy, during the occurrence of flooding to the design flood elevation.

CHAPTER 22
SPECIAL PIPING AND STORAGE SYSTEMS

SECTION M2201
OIL TANKS

M2201.6 Flood-resistant installation. In flood hazard areas, including special flood hazard areas and 500-year floodplains, as established ~~by~~ on the flood hazard maps identified in Table R301.2, tanks shall be installed in accordance with Section R306.2.4 or R306.3.10.

CHAPTER 26
GENERAL PLUMBING REQUIREMENTS

SECTION P2601
GENERAL

P2601.3 Flood hazard areas. In flood hazard areas, including special flood hazard areas and 500-year floodplains, as established ~~by~~ on the flood hazard maps identified in Table R301.2, plumbing fixtures, drains, and *appliances* shall be located or installed in accordance with Section R306.1.6.

SECTION P2602
INDIVIDUAL WATER SUPPLY AND SEWAGE DISPOSAL

P2602.2 Flood-resistant installation. In flood hazard areas, including special flood hazard areas and 500-year floodplains, as established ~~by~~ on the flood hazard maps identified in Table R301.2:

1. Water supply systems shall be designed and constructed to prevent infiltration of floodwaters.
2. Pipes for sewage disposal systems shall be designed and constructed to prevent infiltration of floodwaters into the systems and discharges from the systems into floodwaters.

CHAPTER 27
PLUMBING FIXTURES

SECTION P2705

INSTALLATION

P2705.1 General. The installation of fixtures shall conform to the following:

1. Floor-outlet or floor-mounted fixtures shall be secured to the drainage connection and to the floor, where so designed, by screws, bolts, washers, nuts and similar fasteners of copper, copper alloy or other corrosion-resistant material.
2. Wall-hung fixtures shall be rigidly supported so that strain is not transmitted to the plumbing system.
3. Where fixtures come in contact with walls and floors, the contact area shall be watertight.
4. Plumbing fixtures shall be usable.
5. Water closets, lavatories and bidets. A water closet, lavatory or bidet shall not be set closer than 15 inches (381 mm) from its center to any side wall, partition or vanity or closer than 30 inches (762 mm) center-to-center between adjacent fixtures. There shall be a clearance of not less than 21 inches (533 mm) in front of a water closet, lavatory or bidet to any wall, fixture or door.
6. The location of piping, fixtures or equipment shall not interfere with the operation of windows or doors.
7. In flood hazard areas, including special flood hazard areas and 500-year floodplains, as established ~~by~~ on the flood hazard maps identified in Table R301.2, plumbing fixtures shall be located or installed in accordance with Section R306.1.6.
8. Integral fixture-fitting mounting surfaces on manufactured plumbing fixtures or plumbing fixtures constructed on site, shall meet the design requirements of ASME A112.19.2/CSA B45.1 or ASME A112.19.3/CSA B45.4.

CHAPTER 30
SANITARY DRAINAGE

SECTION P3001
GENERAL

P3001.3 Flood-resistant installation. In flood hazard areas, including special flood hazard areas and 500-year floodplains, as established ~~by~~ on the flood hazard maps identified in Table R301.2, drainage, waste and vent systems shall be located and installed to prevent infiltration of floodwaters into the systems and discharges from the systems into floodwaters.

CHAPTER 31
VENTS

SECTION P3101
VENT SYSTEMS

P3101.5 Flood resistance. In flood hazard areas, including special flood hazard areas and 500-year floodplains, as established ~~by~~ on the flood hazard maps identified in Table R301.2, vents shall be located at or above the elevation required in Section R306.2 (flood hazard areas including A Zones and 500-year floodplains) or R306.3 (coastal high-hazard areas including V Zones and Coastal A Zones, where designated).

CHAPTER 44
REFERENCED STANDARDS

ASCE/SEI

American Society of Civil Engineers
Structural Engineering Institute
Reston, VA 20191-4400

7—2022 Supplement 1, 2, 3	Minimum Design Loads and Associated Criteria for Buildings and Other Structures
24—~~14~~ 24	Flood Resistant Design and Construction

APPENDIX BA
MANUFACTURED HOUSING USED AS DWELLINGS

SECTION BA101
SCOPE

BA101.2 Flood hazard areas. New and replacement *manufactured homes* to be installed in flood hazard areas, including special flood hazard areas and 500-year floodplains as established on the flood hazard maps identified in Table R301.2 shall meet the applicable requirements of Section R306.

APPENDIX BI
LIGHT STRAW-CLAY CONSTRUCTION

SECTION BI101
GENERAL

BI101.2 Flood hazard areas. In flood hazard areas, including special flood hazard areas and 500-year floodplains, established on the flood hazard maps identified in Table R301.2, *buildings* using *light* straw-clay *infill* shall meet the requirements of Section R306.

APPENDIX BJ
STRAWBALE CONSTRUCTION

SECTION BJ101
GENERAL

BJ101.3 Flood hazard areas. In flood hazard areas, including special flood hazard areas and 500-year floodplains established on the flood hazard maps identified in Table R301.2, *buildings* using *strawbale* wall systems shall meet the requirements of Section R306.

APPENDIX BO
EXISTING BUILDINGS AND STRUCTURES

SECTION BO102
COMPLIANCE

BO102.7 Flood hazard areas. Work performed in existing buildings located in a flood hazard area, including special flood hazard areas and 500-year floodplains, as established ~~by~~ on the flood hazard maps identified in Table R301.2 shall be subject to the provisions of Section R104.3.1.

Attached Files

- **ATT - IRC.docx**

https://www.cdpaccess.com/proposal/12230/36062/files/download/9719/

Reason: This proposal is a coordination proposal to bring the 2027 edition of the I-Codes up to date with the provisions in the 2022 edition of *ASCE/SEI 7 Minimum Design Loads and Associated Criteria for Buildings and Other Structures, Supplement 2* (ASCE/SEI 7-22, Supplement 2) as well as the 2024 edition of *ASCE/SEI 24 Flood Resistant Design and Construction* (ASCE/SEI 24-24) --- specifically for the codes primarily affected such as the International Building Code (IBC), the International Residential Code (IRC), and the International Existing Building Code (IEBC), in Group B, but also every I-Code affected by a coordinating code change that will need to be updated. ASCE/SEI 7-22 is the current reference in 2024 I-Codes and Supplement 2 has been submitted as an Administrative Update. ASCE/SEI 24-24 has also been submitted as an Administrative Update to the 2027 I-Codes.

This proposal has been organized into Part I to Part VII and includes technical updates as well as editorial coordination. The specific changes to each section included in this proposal are outlined in Overview below, and a detailed summary of the technical updates are explained in Technical Rationale below that. In addition to the strike out/underline for the code change proposals, the MS Word documents for each affected I-Code have been provided as Attached Files for clarity.

Overview:

IRC Sections: These changes for the IRC provide similar updates to the IBC and IEBC, just provided in a separate Code Change Proposal. However, all changes must be included across all I-Codes for a comprehensive proposal - IBC, IRC and IEBC are included in Group B; the others will need to be addressed in the next Group A cycle.

Chapter 1 Scope: Add phase “including special flood hazard areas” for clarity. And change to “base flood elevations” from “design flood elevations” to clarify the applicable requirements for the two separate terms. See Section 202 for the updated definitions. These two changes are carried out throughout the code change proposal for clarification and consistency.

Chapter 2 Definitions: Adds a new definition for “500-year Floodplain” to distinguish it from the existing definition. While “Base Flood” remains the same, “Base Flood Elevation” is updated along with “Design Flood” and “Design Flood Elevation”. “Flood Hazard Area” is updated and a new definition for “Special Flood Hazard Area” is added.

Chapter 3: changes included to align with standards including add phase “including special flood hazard areas” following flood hazard area for clarity.

Table R306.1.4 Determination of 500-Year Flood Provisions: This new Table is added to provide a prescriptive method for determining the elevation of the 500-year flood given the scenarios of how the flood data is provided for the flood location.

Section 306.2.2.1: Provides a clarification to the requirement and clear exceptions for how requirements are applied.

Chapter 4: changes included to align with standards including add phase “including special flood hazard areas” following flood hazard area for clarity.
Chapter 44: Illustrates the updates that will be made to the reference standards ASCE 7-22 and ASCE/SEI 24-24; updates to reference standards have been submitted to Group B Admin. **Appendix BA, BI, BJ, BO:** Consistent updates made throughout these relevant Appendices.

Mechanical: changes included to align with standards including add phase “including special flood hazard areas and 500-year floodplains” following flood hazard area for clarity.

Plumbing: changes included to align with standards including add phase “including special flood hazard areas and 500-year floodplains” following flood hazard area for clarity.

Technical Rationale:

The American Society of Civil Engineers (ASCE) is proposing revisions to the International Code Council’s I-Codes for the 2027 Cycle to align the national codes with the current ASCE/SEI design standards including:

ASCE/SEI 7 Minimum Design Loads and Associated Criteria for Buildings and Other Structures, 2022 edition; Supplement 2 (ASCE/SEI 7-22 S2)

ASCE/SEI 24 Flood Resistant Design and Construction, 2024 edition (ASCE/SEI 24-24)

The loading standard ASCE/SEI 7-22 S2 and the design standard ASCE/SEI 24-24 work together – these documents have been developed to be consistent and coordinated so they can be required and used together. There are three significant changes in the national loading standard ASCE/SEI 7-22 S2 including (1) an extension of the defined Flood Hazard Area to the 500-year floodplain for Rick Category II, III, and IV structures, (2) an inclusion of risk-based design for loads, and (3) requirements to include relative sea level change into design load calculations for coastal sites; see below for more technical details. There are three significant changes in the national design standard ASCE/SEI 24-24 including (1) alignment with ASCE/SEI 7-22 S2, (2) alignment with FEMA Technical Bulletins, and (3) updates for elevations, materials, and floodproofing.

Both ASCE/SEI Standards are available for purchase and the Supplement available as a free download from the ASCE Library:

ASCE/SEI 7-22 (https://doi.org/10.1061/9780784415788)

ASCE/SEI 7-22 Supplement 2 (https://doi.org/10.1061/9780784415788.sup2)

ASCE/SEI 24-24 (https://doi.org/10.1061/9780784485781)

Flood Hazard:

The ASCE 7-22 S2 updates the design requirements to define the flood hazard area for the given Risk Category of structure. Addionally, the flood hazard depth is tied to the mean recurrence interval for a given Risk Category of structure. The design flood hazard is related to Risk Category (e.g., RC II will be designed to 500-year MRI), which is consistent with the way other environmental hazards (such as wind and snow loads) relate the hazard to Risk Category. This is in contrast to the current code requirements, which only considers only 100-year MRI flood for all structures regardless of Risk Category. In some areas in the U.S., the Authority Having Jurisdiction is already requiring a higher design requirement for the flood hazard. The city of Houston, for example, moved to requiring use of the 500-year MRI as the design basis for flood following the devastation from Hurricane Harvey. At a national level, FEMA is considering the use of the 500-year flood as the basis for floodplain management.

The coordinated code change proposals submitted for Group B are drafted to bring the IBC, IRC, and IEBC into alignment with the recent changes in ASCE 7-22 Supplement 2 and ASCE 24-24. The significant changes from the updates to these standards are to differentiate between the base flood (also described as the 100-year flood, or the 1% or greater chance of flooding in any given year) and the design flood, which could be different, and is defined in the standards for each Risk Category. The design flood must include considerations for loading specified in ASCE/SEI 7-22 S2 and design specified in ASCE/SEI 24-24.

Flood damage, and associated loss dollars, has significantly expanded since the last major updates of ASCE 7 Chapter 5 and ASCE 24. Their revisions attempt to close that gap and align the risks across other hazards.

FEMA cites that flood damage cost approximately $17 billion each year between 2010 and 2018, and with rising sea levels and extreme weather could cause $20 billion of flood damage to at-risk US homes this year, rising to $32 billion by 2051. Data from 2018 Hurricane Michael shows that 42% of claimed damage amounts were in the Shaded X-Zone (500-year floodplain), exceeding the amounts in both the A and V-Zones. (FEMA. Mitigation Assessment Team Report Hurricane Michael in Florida (FEMA P-2077), February 2020).

This is further supported by FEMA's recent report "A Cost and Benefits Analysis of Increased Elevation Requirements for Public and Nonresidential Buildings in Riverine and Coastal Floodplains," which evaluated the potential avoided losses (benefits) for 8 building types in 19 coastal floodplains and 14 riverine floodplains in the 100-year floodplain and the Shaded X Zone. The report shows that there are significant benefits to most buildings in the 100-year floodplain, particularly in steep/narrow floodplains. There were also significant benefits to buildings in the Shaded X Zone where there are currently no elevation requirements. These findings are supported by evidence from the National Flood Insurance Program (NFIP), which stated, "People outside of high-risk areas file more than 25 percent of NFIP claims and receive one-third of disaster assistance for flooding. The NFIP's preferred risk policies are designed for residential properties located in low- to moderate-risk flood zones." Additional reports from the NFIP indicate that 40% of companies fail to reopen after a disaster, with another 25% closing within a year. These problems are only further exacerbated by the influence of development and associated runoff, changes in precipitation rates, local subsidence, and sea level change. All of which are not accounted for by FEMA's flood maps, which only account for historic flood data and not future projections. All of this data supports the need to move from a fixed freeboard approach to a risk-based elevation approach that provides consistent protection from flat/wide floodplains to steep/narrow floodplains and more appropriately addresses the influence of wave action in coastal floodplains. This recognizes that true resiliency for communities is continuity of local businesses and making sure that public services are maintained and that adaptation to changes in precipitation, development, and sea level change must be incorporated into new buildings rather than relying on often prohibitively expensive retrofit options.

The ASCE changes consider the frequency of recent and predicted events and the significant damage recorded in the Shaded X-Zone. But, while significant, the addition of the Shaded X-Zone to the standards represents a change to only 4% of the U.S. population. The additional elevation requirements to raise homes within the special flood hazard area to above the 500-year flood elevation will affect an additional 3% of the US population. The total US population affected by the flood resistant construction requirements in this proposal would be 7% per FEMA estimates. The NYU Furman Center estimates that nearly 10% of the nation's population live in the combined 100-year and 500-year floodplain. A study from the University of Bristol argues that outdated FEMA maps underestimate the flood risk and pin the percent of the US population who reside in the 100-year floodplain to as high as 13%.

This proposal reflects the latest flood hazard science, but in general does not represent a fundamental increase in loads, resulting in higher construction costs. However, with the introduction of a higher flood design return period and future considerations for Sea Level Change, the design flood loads have increased for structures currently located in a designated flood hazard area. The ASCE revisions do not add structures to the currently defined flood hazard area, but do add small-depth flood loads for new construction in the Shaded X-Zone where there currently are none.

ASCE Consensus Process:

ASCE established and maintains an ANSI-accredited, consensus process for standard development. The open process includes selection of a balanced committee, including representation of all affected stakeholders, and public review of the draft standard prior to publication. The ASCE consensus process follows the *ASCE Rules for Standards Committees*, which is published on the ASCE website. The ASCE/SEI 7-22 S2 was developed by the ASCE 7-22 Standard Committee, which included approximately 50 voting members and hundreds more associate members. The ASCE/SEI 24-24 standard was developed by the ASCE 24-24 Standard Committee, which included approximately 25 voting members and 15 associate members.

Supporting Organizations:

This code change proposal has many supporters, included but not limited to the following organizations:

American Flood Coalition

Association of State Flood Plain Managers (ASFPM)

BuildStrong America

Federal Emergency Management Association

Flood Mitigation Industry Association (FMIA)

National Institute of Building Science (NIBS)

Registered Designer Professionals and planners of buildings and other infrastructure projects, Code Officials, and Authorities Having Jurisdiction owe it to the public and have an ethical obligation to provide a framework for safe, reliable structures. The public expects that the buildings in which they live, work, and play are designed consistently, with the same risk approach for all environmental hazards. Flooding is disruptive to families, businesses, and communities and it takes years to recover from these devastating disasters and overcome the losses incurred. The flood hazard must be taken seriously and incorporated into our design standards and building codes in a manner that is consistent with all of the other environmental hazards.

- **2025 Cost and Benefit Analysis for ASCE 24-24.PDF**
  https://www.cdpaccess.com/proposal/12230/35915/documentation/186660/attachments/download/9877/

Bibliography: Cited references:

Kodavatiganti Y, Rahim MA, Friedland CJ, Mostafiz RB, Taghinezhad A and Heil S (2023), Material quantities and estimated construction costs for new elevated IRC 2015-compliant single-family home foundations. Front. Built Environ. 9:1111563. doi: 10.3389/fbuild.2023.1111563

Al Assi A, Mostafiz RB, Friedland CJ, and Rohli, RV (2024). Theoretical Boundaries of Annual Flood Risk for Single-Family Homes Within the 100-Year Floodplain. Int J Environ Res. 18:29. https://doi.org/10.1007/s41742-024-00577-7.

Al Assi A, Mostafiz RB, Friedland CJ, Rohli RV, and Rahim MA (2023). Homeowner flood risk and risk reduction from home elevation between the limits of the 100- and 500- year floodplains. Front. Earth Sci. 11:1051546. Doi: 10.3389/feart.2023.1051546.Estimated Flood Loss Potential. National Flood Services, https://www.floodsmart.gov/sites/default/files/flood-loss-potential_jul19.pdf

FEMA. A Cost and Benefits Analysis of Increased Elevation Requirements for Public and Nonresidential Buildings in Riverine and Coastal Floodplains. January 2025

(https://www.researchgate.net/publication/388556202_A_Cost_and_Benefits_Analysis_of_Increased_Elevation_Requirements_for_Publ

FEMA. Mitigation Assessment Team Report Hurricane Michael in Florida (FEMA P-2077), February 2020 (https://www.fema.gov/sites/default/files/2020-07/mat-report_hurricane-michael_florida.pdf)

Cost Impact: Increase

- **2025 Cost and Benefits Analysis for ASCE 24-24.PDF**
  https://www.cdpaccess.com/proposal/12230/35915/documentation/186663/attachments/download/9878/

Estimated Immediate Cost Impact:

ASCE 7 and ASCE 24 are national minimum design standards. The effects will vary depending upon the local flood conditions and flood risk across the country and among building types. For nearly 90% of all affected structures in Numbered A Zones, the estimated immediate costs impact can be understood in analysis of the mitigation cost as a percentage of building replacement value from 0.2-6.6% for coastal sites and 0.0-4.0% for riverine sites. Additionally, average benefits per square foot range from $51-$336 for both riverine and coastal flooding, which are dependent on building type and location. See the attached "Cost and Benefits Analysis" for additional information.

This proposal reflects the latest flood hazard science, but in general does not represent a fundamental increase in loads, resulting in higher construction costs. However, with the introduction of a higher flood design return period and future considerations for Sea Level Change, the design flood loads have increased for structures currently located in a designated flood hazard area. The ASCE revisions do not add structures to the currently defined flood hazard area, but do add small-depth flood loads for new construction in the Shaded X-Zone where there currently are none.

Estimated Immediate Cost Impact Justification (methodology and variables):

The following analysis was conducted using the cost data from the attached peer reviewed journal paper ***Material quantities and estimated construction costs for new elevated IRC 2015-compliant single-family home foundations*** (published in 2023) and using a national NFIP flood dataset to approximate the average freeboard height for all A Zones in the US.

The increase in foundation height was calculated using the NFIP flood dataset that provides the average numbered A Zone per US census tract. Numbered A Zones represent groupings of floodplains that are sorted based on the average height difference between the 10-year flood and the 100-year flood. The floodplains are sorted into categories from A01 through A30. Each increment A01 through A20 are differentiated by 6-inch increments, meaning that the difference between the 10-year flood and the 100-year flood is 6 inches for an A01 and the difference between the 10-year flood and 100-year flood is 10 feet for an A20. Between A20 and A30 the difference between the 10-year and 100-year flood is differentiated by 1-foot increments, meaning that an A30 has a difference of 20 feet between the 10-year flood and the 100-year flood.

For A Zones, calculations were done to determine the difference between the 2024 IRC requirement of BFE+1 foot and the proposed ASCE 24-24 elevation requirements for Flood Design Class 2. In situations where the 2024 IRC and ASCE 24-24 were the same a value of 0 was assigned. For each numbered A Zone where ASCE 24-24 exceeded the 2024 IRC the difference in elevation was calculated. A weighting factor was assigned to each numbered A Zone based on the US census tract data and represented as a percentage value of how many times that numbered A Zone is the most likely A Zone across the US. This provided a percentage breakdown for all numbered A Zones. This weighting factor was then applied to the difference in elevation between the ASCE 24-24 elevation and the 2024 IRC elevation values. The national average of increased elevation between the 2024 IRC and ASCE 24-24 compliance was approximately **1.2 feet** of additional elevation.

For Shaded X Zones (the 500-year floodplain) the same weighting factor for each numbered A Zone was applied. This is applicable because the numbered A Zones can roughly represent the overall floodplain cross section rather than just the cross section in the Special Flood Hazard Area (100-year floodplain). Since Shaded X Zones represent the land area between the 100-year flood elevation and the 500-year flood elevation a different technique for calculating elevation needed to be applied. In these areas there has historically been no elevation requirements. Since buildings could be constructed anywhere between the 101-year flood elevation and the 500-year flood elevation the mid-point was selected as the most likely elevation for the hypothetical building. In the Shaded X Zone this would be the ground elevation for the 300-year flood elevation. For each numbered A Zone the 300-year flood elevation was calculated to represent the ground elevation. A comparison was conducted to determine the greater of BFE+1 or the 500-year flood elevation for each numbered A Zone. The larger elevation was then subtracted from the 300-year flood elevation (ground elevation). The weighting factors for each numbered A Zone were then applied to the calculated elevation and a national average for compliance with ASCE 24-24 was determined to be approximately **0.74 feet** of additional elevation.

Data was pulled from **Table 6. Unit foundation cost increase with elevation** of the journal article in order to approximate the increase in foundation costs. Costs were provided on a $/m^2 basis for a variety of building sizes, aspect ratios of foundations and unit foundation costs for multiple heights of foundation. The costs, areas, and heights were adjusted from metric to US customary units. Within each aspect ratio the unit costs for a range of heights were compiled to create a line equation to approximate the cost between foundation heights. For A Zones and Shaded X Zones a square foot cost was calculated for each foundation type at the national average height of foundation (1.2 feet for A Zones and 0.74 feet for Shaded X Zones). The increase in foundation costs were the averaged across the different aspect ratios for each foundation type for each building size. An additional average was created across the four crawlspace foundation types represented in the journal article. This provides an approximate cost increase for three different size buildings for two different foundation types (slab on fill and crawlspace) for A Zones and Shaded X Zones. The 2,002 square foot building is indicated in the journal article to best represent the national average size single family house. According to the journal article the costs represent 2022 dollars.

	A Zone		Shaded X Zone	
Building Area (SF)	Slab On Fill Foundation	Crawlspace Foundation	Slab On Fill Foundation	Crawlspace Foundation
1496	$ 2,721	$ 2,903	$ 1,412	$ 1,761
2002	$ 3,087	$ 3,581	$ 1,526	$ 2,170
2497	$ 3,702	$ 3,981	$ 1,887	$ 2,406

Avoided Loses:

The increase in foundation cost due to additional elevation helps to avoid losses due to flooding for homes in special flood hazard areas and Shaded Zone X. It also avoids costs associated with displacement and temporary housing following storm damage. Additional elevation increases the likelihood that a home is liveable after a storm, decreases property damage and the need for replacement, and reduces risk. There is no FDIC or federally regulated lender requirement to maintain flood insurance in the Shaded Zone X. This lack of requirements to maintain an NFIP policy is coupled with high losses in the Shaded Zone X. Homeowners within the 500-year floodplain that don't add the optional cost of a policy are left with little support when flood events exceed a Base Flood (100-year) event which has a 26 percent chance of being exceeded over a 30 year mortgage.

Staff Analysis: This proposal includes technical revisions to the code text to coordinate with an update of an existing referenced standard. This standard must be completed and readily available prior to the Public Comment Hearing. See CP28 Section 4.6.3.1.2.
CC # S97-25 Part VII and CC # S99-25 Part II addresses requirements in a different or contradicting manner. The committee is urged to make their intensions clear with their actions on these proposals.

S97-25 Part VII

S98-25

IBC: 1612.1, G103.1; IEBC: [BS] 401.3

Proponents: Rebecca Quinn, RCQuinn Consulting, representing Association of State Floodplain Managers (rebecca@rcquinnconsulting.com); Chad Berginnis, representing Association of State Floodplain Managers (cberginnis@floods.org)

2024 International Building Code

Revise as follows:

1612.1 General. Within *flood hazard areas* as established in Section 1612.3, all new construction of *buildings*, *structures* and portions of *buildings* and *structures*, including *substantial improvement* and repair~~restoration~~ of *substantial damage* to *buildings* and *structures*, shall be designed and constructed to resist the effects of flood hazards and *flood loads*. For *buildings* that are located in more than one *flood hazard area*, the provisions associated with the most restrictive *flood hazard area* shall apply.

G103.1 General. This appendix, in conjunction with this code, provides minimum requirements for *development* located in *flood hazard areas*, including:

1. The subdivision of land.
2. Site improvements and installation of utilities.
3. Placement and replacement of *manufactured homes*.
4. Placement of *recreational vehicles*.
5. New construction and *repair*, reconstruction, rehabilitation or *additions* to new construction.
6. *Substantial improvement* of *existing buildings* and *structures*, including ~~restoration after~~ repair of substantial damage.
7. Installation of tanks.
8. *Temporary structures*.
9. Temporary or permanent storage, utility and miscellaneous Group U *buildings* and *structures*.
10. Certain building work exempt from *permit* under Section 105.2 and other *buildings* and *development* activities.

2024 International Existing Building Code

Revise as follows:

[BS] 401.3 Flood hazard areas. In *flood hazard areas*, buildings that have sustained *substantial damage* shall be brought into compliance~~*repairs* that constitute *substantial improvement* shall require that the building comply~~ with Section 1612 of the *International Building Code*, or Section R306 of the *International Residential Code*, as applicable.

Reason:
"Substantial damage" is a defined term. Buildings in flood hazard areas that are damaged by any cause must be examined to determine whether the cost to repair the damage to pre-damage conditions meets a specific test. Damage is repaired, not "restored." In previous code cycles the phrase "restore substantial damage" was replaced with "repair of substantial damage."

For the IBC, this proposal completes the editorial adjustments for consistency throughout the codes. For the IRC, the proposal results in consistency in phrasing between Sec. 401.3 and Sec. 405.2.6.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

This proposal is editorial to make the phrase "repair of substantial damage" consistent across codes. There is no change to the technical content of the provisions. By making similar language more consistent there will be no cost impact when approving this proposal.

S99-25 Part I

IBC: 1612.3.1, 1612.3.2

Proponents: Rebecca Quinn, RCQuinn Consulting, representing Association of State Floodplain Managers (rebecca@rcquinnconsulting.com); Chad Berginnis, representing Association of State Floodplain Managers (cberginnis@floods.org)

THIS IS A 2 PART CODE CHANGE. PART I WILL BE HEARD BY THE IBC STRUCTURAL CODE COMMITTEE. PART II WILL BE HEARD BY THE IRC-B CODE COMMITTEE. SEE THE TENTATIVE HEARING ORDER FOR THESE COMMITTEES.

2024 International Building Code

Revise as follows:

1612.3.1 Determination of design Design flood elevations. Where *design flood elevations* are not included onin the flood hazard map adopted by the community*areas* established in Section 1612.3, or where *floodways* are not designated, the *building official* is authorized to require the applicant to comply withdo one of the following:

1. Obtain and reasonably utilize any *design flood elevation* and *floodway* data available from a federal, state or other source.
2. Determine the *design flood elevation* or *floodway* in accordance with accepted hydrologic and hydraulic engineering practices used to define special *flood hazard areas*. Determinations shall be undertaken by a *registered design professional* who shall document that the technical methods used reflect currently accepted engineering practice. Studies, analyses and computations shall be submitted in sufficient detail to allow thorough review and approval.

1612.3.2 Determination of impacts. In riverine *flood hazard areas* where *design flood elevations* are specified but *floodways* have not been designated, the applicant shall provide a *floodway* analysis that demonstrates that the proposed work buildings and structures, including fill, when combined with other existing and anticipated flood hazard area encroachments, will not increase the *design flood elevation* more than 1 foot (305 mm) at any point within the *jurisdiction* of the applicable governing authority.

S99-25 Part I

S99-25 Part II

IRC: R106.1.4, R306.1.4.1, R306.1.4.2

Proponents: Rebecca Quinn, RCQuinn Consulting, representing Association of State Floodplain Managers (rebecca@rcquinnconsulting.com); Chad Berginnis, representing Association of State Floodplain Managers (cberginnis@floods.org)

2024 International Residential Code

Revise as follows:

R106.1.4 Information for construction in flood hazard areas. For *buildings* and structures located in whole or in part in flood hazard areas as established by Table R301.2, *construction documents* shall include:

1. Delineation of flood hazard areas, floodway boundaries and flood zones and the design flood elevation, as appropriate.
2. The elevation of the proposed lowest floor, including *basement*; in areas of shallow flooding (AO Zones), the height of the proposed lowest floor, including *basement*, above the highest adjacent *grade*.
3. The elevation of the bottom of the lowest horizontal structural member in coastal high-hazard areas (V Zone) and in Coastal A Zones where such zones are delineated on flood hazard maps identified in Table R301.2 or otherwise delineated by the *jurisdiction*.
4. ~~If~~ Where design flood elevations are not included on the community's Flood Insurance Rate Map (FIRM) and where floodways are not designated in riverine flood hazard areas, they shall be determined in accordance with Section R306.1.4.1. ~~, the *building official* and the applicant shall obtain and reasonably utilize any design flood elevation and floodway data available from other sources.~~

R306.1.4.1 Determination of design flood elevations. ~~If~~ Where design flood elevations are not included in the flood hazard map adopted by the community~~specified~~, or where floodways are not designated, the *building official* is authorized to require the applicant to comply with one~~either~~ of the following:

1. Obtain and reasonably use design flood elevation and floodway data available from a federal, state or other source.
2. Determine the design flood elevation in accordance with accepted hydrologic and hydraulic engineering practices used to define special flood hazard areas. Determinations shall be undertaken by a *registered design professional* who shall document that the technical methods used reflect currently accepted engineering practice. Studies, analyses and computations shall be submitted in sufficient detail to allow thorough review and *approval*.

R306.1.4.2 Determination of impacts. In riverine flood hazard areas where design flood elevations are specified but floodways have not been designated, the applicant shall provide a floodway analysis that demonstrates~~demonstrate~~ that the ~~effect of the~~ proposed *buildings* and structures ~~on design flood elevations~~, including fill, when combined with other existing and anticipated flood hazard area encroachments, will not increase the design flood elevation more than 1 foot (305 mm) at any point within the *jurisdiction*.

Reason:
The primary purpose of this proposal is to achieve consistency between similar sections in the IBC and IRC for floodway impacts. The proposal also improves grammar and simplifies the reference to the community's adopted flood map. The proposal is editorial in nature. The sections address two scenarios: (1) when special flood hazards areas do not have base flood elevations, and (2) when riverine waterway floodplains have base flood elevations, but do not have designated floodways. These requirements have been in the National Flood Insurance Program regulations for decades, which means they are not new to the nearly 24,000 local governments that participate in the NFIP.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

This proposal makes editorial changes primarily to make similar sections consistently written across the IBC and IRC and to improve readability. There is no change to the technical content of the provisions. Improving consistency creates no cost impact when approving this proposal.

Staff Analysis: CC # S97-25 Part VII and CC # S99-25 Part II addresses requirements in a different or contradicting manner. The committee is urged to make their intensions clear with their actions on these proposals.

S99-25 Part II

S100-25

IBC: 1613.1

Proponents: David Bonowitz, representing David Bonowitz, S.E. (dbonowitz@att.net)

2024 International Building Code

Revise as follows:

1613.1 Scope. Every structure, and portion thereof, including nonstructural components that are permanently attached to *structures* and their supports and attachments, shall be designed and constructed to resist the effects of earthquake motions in accordance with Chapters 11, 12, 13, 15, 17 and 18 of ASCE 7, as applicable. The *seismic design category* for a *structure* is permitted to be determined in accordance with Section 1613 or ASCE 7. For purposes of satisfying Chapter 13 of ASCE 7, any building or structure assigned to Risk Category IV for reasons unrelated to quantities of highly toxic or other hazardous materials shall be considered an Essential Facility within the ASCE 7 definition of that term.

Exceptions:

1. Detached one- and two-family *dwellings*, assigned to *Seismic Design Category* A, B or C.
2. The *seismic force-resisting system* of wood-frame *buildings* that conform to the provisions of Section 2308 are not required to be analyzed as specified in this section.
3. Agricultural storage *structures* intended only for incidental human occupancy.
4. *Structures* that require special consideration of their response characteristics and environment that are not addressed by this code or ASCE 7 and for which other regulations provide seismic criteria, such as vehicular bridges, electrical transmission towers, hydraulic *structures*, buried utility lines and their appurtenances and nuclear reactors.
5. References within ASCE 7 to Chapter 14 shall not apply, except as specifically required herein.
6. *Temporary structures* complying with Section 3103.6.1.4.

Reason: This proposal fixes a coordination snafu between the IBC and ASCE 7 with respect to the assignment of importance factors for the seismic design of nonstructural components.

Here's the problem:

- Any building or structure assigned to Risk Category IV in the IBC is meant to have an I_p factor of 1.5, which also makes many of its nonstructural components subject to seismic certification.
- With the 2024 IBC, the overall description of RC IV was expanded to include not only *essential facilities* but also certain other buildings where failure would represent a substantial hazard. The code does not say whether these other buildings (or any building, for that matter) is or is not officially designated as an *essential facility*. In any case, it was always the clear intent of this change that any building in the latter sub-category would then also have I_p = 1.5 and be subject to all the provisions for RC IV.
- However, while we were making that change to the IBC, ASCE 7 was separately revising its Section 13.1.3 (item 3) to say that a RC IV facility only gets to I_p = 1.5 if it also affects what ASCE 7 calls (capitalized) an Essential Facility.

The unintended effect is that any building not specifically "designated" as an *essential facility* by the IBC or as an Essential Facility by ASCE 7 will fall into a crack. As it happens, the IBC doesn't actually designate *essential facilities* anywhere, except by implication if they're otherwise assigned to RC IV. But in particular, the expanded description of RC IV now raises questions about whether any building in the RC IV box is there because it's *essential* or because it's a potential substantial hazard.

Consulting with members of the ASCE 7 committee, it turns out that the change in ASCE 7 was meant to distinguish the buildings assigned to RC IV only because of hazmat issues. Those buildings, per the ASCE 7 intent, should have adequate hazmat safety and containment but do not necessarily need to remain operational -- something *essential facility* or other RC IV status implies.

This proposal seals the crack. By designating all RC IV buildings as Essential Facilities for purposes of ASCE 7 Chapter 13 -- EXCEPT those assigned to RC IV only for hazmat reasons -- all the RC IV facilities will be handled by ASCE 7 as the IBC Structural Committee intended.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

The proposal restores the intent of the IBC Structural Committee and ICC membership from the last code cycle, closing an unintended gap with ASCE 7. If this proposal is approved, compliance with the Sec 1613 will require exactly what it was always intended to require.

S100-25

S101-25

IBC: 1613.1, 1613.1.1 (New)

Proponents: Kelly Cobeen, Wiss Janney Elstner Associates, representing Self (kcobeen@wje.com); Seth Thomas, KPFF Consulting Engineers, representing Self (seth.thomas@kpff.com)

2024 International Building Code

Revise as follows:

1613.1 Scope. Every structure, and portion thereof, including nonstructural components that are permanently attached to *structures* and their supports and attachments, shall be designed and constructed to resist the effects of earthquake motions in accordance with Chapters 11, 12, 13, 15, 17 and 18 of ASCE 7, as applicable, as amended by Section 1613.1.1 of this code. The *seismic design category* for a *structure* is permitted to be determined in accordance with Section 1613 or ASCE 7.

Exceptions:

1. Detached one- and two-family *dwellings*, assigned to *Seismic Design Category* A, B or C.
2. The *seismic force-resisting system* of wood-frame *buildings* that conform to the provisions of Section 2308 are not required to be analyzed as specified in this section.
3. Agricultural storage *structures* intended only for incidental human occupancy.
4. *Structures* that require special consideration of their response characteristics and environment that are not addressed by this code or ASCE 7 and for which other regulations provide seismic criteria, such as vehicular bridges, electrical transmission towers, hydraulic *structures*, buried utility lines and their appurtenances and nuclear reactors.
5. References within ASCE 7 to Chapter 14 shall not apply, except as specifically required herein.
6. *Temporary structures* complying with Section 3103.6.1.4.

Add new text as follows:

1613.1.1 ASCE 7 Section 12.8.1.1. ASCE 7 Section 12.8.1.1 shall be modified as follows.

1. Strike the following from Section 12.8.1.1, Method 1:Where Equation (12.8-2) is used and the period T is less than the period at which S_a is maximum, the maximum value of S_a shall be used.
2. Replace with the following:
   Where Equation (12.8-2) is used two conditions apply:
   2.1. S_a need not be larger than S_{DS}., and
   2.2. Where the period is less than that at which S_a is maximum, the value of S_a used shall not be taken as less than S_{DS}.
   where S_{DS} = Design spectral response acceleration parameter in the short period range as determined from Section 11.4.4 or 11.4.7

-

Reason: This proposal introduces an amendment to the seismic provisions of ASCE 7-22. It is intended that the amendment be in place for the 2027 IBC for use with ASCE 7-22 and be removed from the 2030 IBC as ASCE 7-28 is adopted. The amendment format mirrors that currently used in IBC concrete Sections 1901.2 and 1905 to amend ACI 318. The wording of the amendment is based on recent work of the ASCE 7-28 Seismic Subcommittee.

The Section 12.8.1.1 provisions up to the last paragraph are the same as published in ASCE 7-22 and provided here for context. The last paragraph starting with "Where Equation (12.8-1) is used" revises the published ASCE 7-22 provisions. The balance of ASCE 7-22 provisions are intended to remain unchanged.

With increased use of ASCE 7-22 seismic provisions, it has been identified that the new multi-period response spectra (MPRS) in some geographic locations reach peak design spectral response accelerations, S_a, larger than S_{DS}, and in some cases significantly larger than both S_{DS} and what has been used in past design. This is seen rather broadly in the Central and Eastern US, where S_a often spikes at very short periods (on the order of 0.075 seconds), as seen in Figure 1. It is understood that these spectral acceleration spikes had been known of in the past, but had by specific decision of the committees involved, not influenced assignment of the short-period spectral response acceleration, S_{DS}, used in design. With full multi-period spectra now readily available to designers, design guidance relative to this very short-period spike is needed.

This proposal modifies ASCE 7-22 equivalent lateral force (ELF) design provisions, giving specific design directions in response to the short-period spikes. Two rules are provided.

1. It is not intended that design be based on the S_a spike. It is instead permitted that S_a be capped at S_{DS} for very short periods for ELF analysis.
2. The minimum spectral response acceleration, S_a, at very short periods is not to be less than S_{DS} for purposes of ELF analysis.

In this proposal, these rules are provided at the end of Method 1 provisions in Section 12.8.1.1. Figure 2 illustrates these rules for a Charleston site. It is noted that the proposed capping of MPRS is applicable to ELF design at all geographic locations.

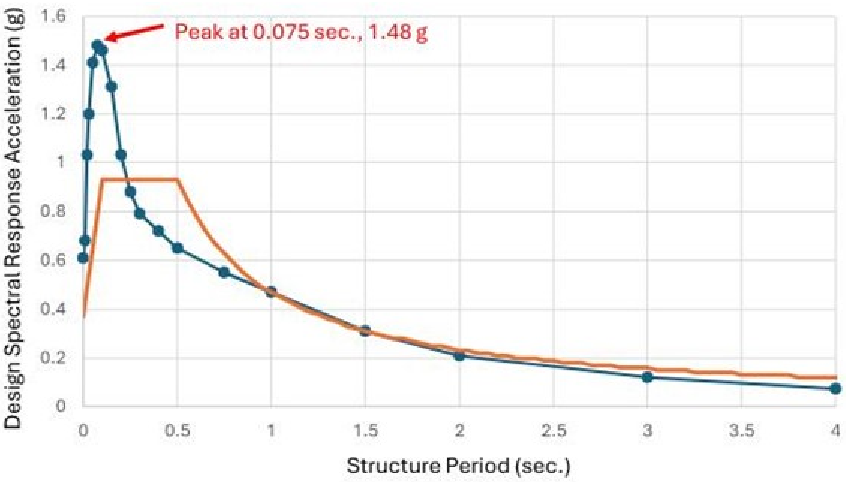

Figure 1. ASCE 7-22 design-level multi-period and two-period response spectra for Charleston, South Carolina using default site class. The short-period spike in the multi-period response spectrum is noted.

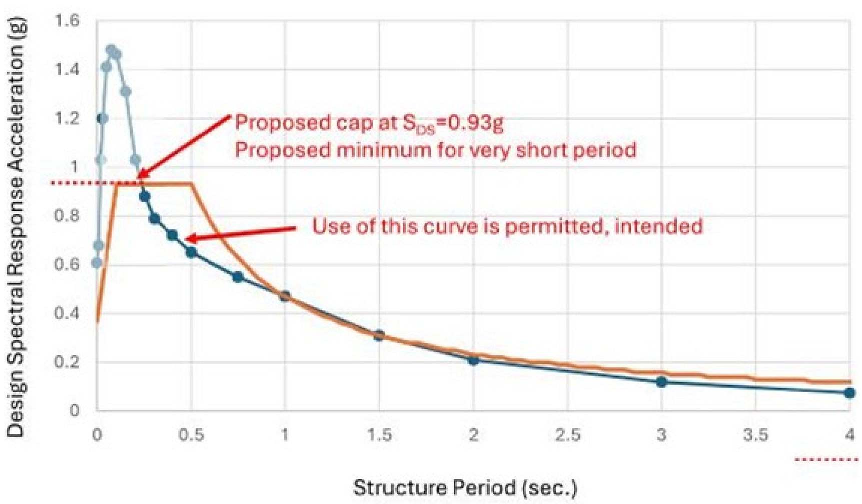

Figure 2. ASCE 7-22 design-level multi-period and two-period response spectra for Charleston, South Carolina illustrating the proposed cap for the multi-period response spectrum.

For ELF design it is also still permitted to use the traditional two-period design spectrum using the parameters S_{DS} and S_{D1}. The traditional method makes use of five equations for determining C_S. Equations (12.8-3), (12.8-4), and (12.8-5) are illustrated in ASCE 7-22 Figure C12.8-1a.

It is important that this guidance be adopted into the IBC to give a clear indication of intent to designers and plan reviewers. Within the ASCE standards process it has been determined that the modified language does not qualify as an erratum, nor does it qualify for consideration as a supplement. As a result, ASCE 7 will likely take action on this issue in the publication of ASCE 7-28. Until ASCE 7-28 is adopted, this IBC proposal is the best available method of making this information available to code users. The following provides further background on the spectral response acceleration spikes. The decision to ignore high spectral response accelerations at periods less than 0.2 seconds goes at least back to the 1997 NEHRP Provisions and the seismic provisions of ASCE 7-98. At that time the spectral acceleration spikes at short periods were identified but were judged to not be meaningful for building design. The spikes were identified to represent free-field ground motion (ground motions transmitted to the site soils). It was felt, however, that typical buildings themselves would not respond to these spikes. Commentary to the 1997 NEHRP Provisions (Appendix A, page 279) recognizes that the high peak acceleration "…has very little effect on the response of interest in ordinary structures." The concept also has a precedent in the definition of the effective peak response acceleration defined in the ATC-3 report, a precursor to the NEHRP Provisions. More recently, the commentary to ASCE 7-16 Section 21.4 included: "Periods less that 0.2 s are excluded for consistency with the parameter S_S, recognizing that certain sites, such as the (CEUS) sites, could have peak acceleration response at very short periods that would be inappropriate for defining the value S_{DS}." While the soil-structure interaction provisions of ASCE 7 Section 19.4 play a role in the translation of free-field ground motions to the base of structure ground motions that are needed for building design, the full translation is larger, more complex, and not currently laid out in design provisions. For this reason, the practical and appropriate approach remains to cap the MPS at S_{DS}.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

This proposal is clarification to maintain past practice, with no substantive cost effect.

S101-25

S102-25

IBC: 1613.2

Proponents: Kelly Cobeen, Wiss Janney Elstner Associates, representing Self (kcobeen@wje.com)

2024 International Building Code

Revise as follows:

1613.2 Determination of seismic design category. *Structures* shall be assigned to a S*eismic Design Category* based on one of the following methods unless the authority having *jurisdiction* or geotechnical data determines that *Site Class* DE, E or F soils are present at the site:

1. Based on the structure *risk category* using Figures 1613.2(1) through 1613.2(7).
2. Determined in accordance with ASCE 7.

Where *Site Class* DE, E or F soils are present and the site is located in the conterminous United States east of -105 degrees longitude, the *Seismic Design Category* shall be determined in accordance with ASCE 7-16.

Where *Site Class* DE, E or F soils are present and the site is not located in the conterminous United States east of -105 degrees longitude, the S*eismic Design Category* shall be determined in accordance with ASCE 7-22.

Reason: With increased use of ASCE 7-22, as adopted in the 2024 IBC, it has been identified that significant reductions in Seismic Design Category have occurred for structures on soft soil sites in a number of locations in the Central and Eastern United States between ASCE 7-16 and ASCE 7-22. The following table prepared by S.K. Ghosh and Bodhi Rudra summarizes these changes for 32 selected locations. As part of the transition from ASCE 7-16 to ASCE 7-22 there have been a number of changes in seismic hazard information that effect the assignment of Seismic Design Category. One of the many has been the deletion of specific assigned Site Coefficients F_a and F_v, which have been replaced by reliance on US Geological Survey databases that characterize Site Class effects in a more detailed fashion. It is understood that the affect of this change has been more dramatic in the Central and Eastern US than at other locations.

At the time of writing of this proposal, the changes that have impacted assignment of Seismic Design Category are still being discussed; there is a pressing concern that significant drops in Seismic Design Category would allow construction using less ductile seismic force-resisting systems at soft soil sites in the Central and Eastern United States. This change proposal is being submitted with the hope that more complete information will be available for discussion in time for the code development hearings. It is hoped that this change proposal will provide guidance not only for users of the 2027 IBC, but also to jurisdictions adopting the 2024 IBC. It is also hoped that the issues addressed in this proposal will be addressed in ASCE 7-28, permitted this revision to be deleted from the 2030 IBC.

Table 1: Seismic Design Categories of ASCE 7-10, 7-16, and 7-22 for Site Classes D and E

City	Site Class D			Site Class E		
	ASCE 7-10	ASCE 7-16	ASCE 7-22	ASCE 7-10	ASCE 7-16	ASCE 7-22
Savannah, GA	C	C	C	D	D	C
Atlanta, GA	C	C	B	D	D	B
Greenville, SC	C	C	C	D	D	B
Columbia, SC	D	C	C	D	D	C
Charlotte, NC	C	B	B	D	D	B
Raleigh, NC	B	B	B	C	C	B
Norfolk, VA	B	A	A	B	B	A
Richmond, VA	B	B	B	C	C	B
Washington, DC	B	B	A	B	B	A
Philadelphia, PA	B	B	A	C	B	A
Harrisburg, PA	B	B	A	B	B	A
Pittsburgh, PA	B	B	B	B	B	B

City	Site Class D			Site Class E		
	ASCE 7-10	ASCE 7-16	ASCE 7-22	ASCE 7-10	ASCE 7-16	ASCE 7-22
Albany, NY	B	B	B	C	C	B
Buffalo, NY	B	B	A	C	B	A
Hartford, CT	B	B	B	C	C	A
Boston, MA	B	B	B	C	C	B
Manchester, NH	B	C	B	C	D	B
Portland, ME	B	B	B	C	D	B
Providence, RI	B	B	B	C	C	A
New York, NY	B	B	B	C	C	B
Chicago, IL	B	B	B	C	C	B
Charleston, SC	D	D	D	D	D	D
Memphis, TN	D	D	D	D	D	D
St. Louis, MO	D	D	D	D	D	D
Cincinnati, OH	B	B	B	C	D	B
Las Vegas, NV	D	D	D	D	D	D
Salt Lake City, UT	D	D	D	D	D	D
Seattle, WA	D	D	D	D	D	D
Los Angeles, CA	E	D	D	E	D	D
San Francisco, CA	D	D	D	D	D	D
San Diego, CA	D	D	D	D	D	D
Knoxville, TN	C	D	C	D	D	C

Blue highlighting indicates one SDC downgrade.

Yellow highlighting indicates two SDC downgrade.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

The intent of this change proposal is to maintain past practice with regard to Seismic Design Category assignment. With no change in assignment, there is no change in cost.

S102-25

S103-25

IBC: 1613.5 (New), 1613.5, 1613.6

Proponents: Joseph H. Cain, P.E., representing Solar Energy Industries Association (SEIA) (joecainpe@gmail.com)

2024 International Building Code

Add new text as follows:

1613.5 Energy storage systems. Where *energy storage systems (ESS)* are configured to supply backup power to an *emergency power system* or *standby power system* required by Section 2702, the ESS shall be designed and installed in accordance with NFPA 70, NFPA 110 and NFPA 111. ESS shall be assigned a component importance factor I_p of 1.5 in any of the following cases:

1. Where ESS is configured to supply backup power to an *emergency power system* or *standby power system* required by Section 2702.
2. Where required by Chapter 13 of ASCE 7.
3. Where required by relevant equipment and system safety standards.

Revise as follows:

~~**1613.5**~~1613.6 **Elevators, escalators and other conveying systems.** Elevators, escalators and other conveying systems and their components shall satisfy the seismic requirements of ASCE 7 and ASME A17.1/CSA B44 as applicable.

~~**1613.6**~~1613.7 **Automatic sprinkler systems.** Where required, automatic sprinkler systems, including anchorage and bracing, shall comply with ASCE 7 and Section 903.3.1.1.

Reason: With the increase in deployment of energy storage systems (ESS), especially battery energy storage systems (BESS), there has been increased attention given to seismic considerations.

While component importance factor, I_p, is primarily assigned in ASCE 7-22 Section 13.1.3, there are other cases in addition to Section 13.1.3 where I_p is specifically assigned as 1.5 in other standards. A variety of standards applicable to BESS include provisions for mechanical and seismic safety.

For example, NFPA 855 Standard for the Installation of Stationary Energy Storage Systems addresses seismic hazards.

UL 9540 Energy Storage Systems and Equipment requires mechanical tests and includes a full section on "Installation in seismic environments" that refers to additional standards for seismic evaluation and seismic testing.

While reviewing NFPA 110 Standard for Emergency and Standby Power Systems and NFPA 111 Standard on Stored Electrical Energy Emergency and Standby Power Systems, we see 2025 NFPA 111 Section 7.4.5 Seismic Risk includes specific language in Section 7.4.5.2 to state: "Components of an SEPSS shall be assigned a component importance factor of 1.5, per ASCE/SEI 7, Minimum Design Loads for Buildings and Other Structures."

SEIA is preparing to conduct a comprehensive review of all applicable standards for ESS that reference seismic hazards, seismic analysis & testing, and mitigation strategies, and will be prepared to summarize these standards prior to Committee Action Hearings #1.

The proponent wishes for this new subsection to be Section 1613.5, immediately following existing Section 1613.4 for ballasted PV systems, with the other subsections renumbered as shown.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

This proposal is intended to identify and clarify cases where energy storage systems (ESS) are already required to use seismic component importance factor I_p equal to 1.5.

S104-25

IBC: 1613.6

Proponents: Jeffrey Hugo, NFSA - National Fire Sprinkler Association, representing NFSA (hugo@nfsa.org)

2024 International Building Code

Revise as follows:

1613.6 ~~Automatic sprinkler systems~~ Water-based fire protection systems. Where required, ~~automatic sprinkler systems,~~ water-based fire protection systems, including anchorage and bracing, shall comply with ASCE 7 and Section 903.3.1.1.

Reason: NFPA 13, referenced by 903.3.1.1 is the hanging and bracing standard for other water-based fire protection systems, such as NFPA 14 for standpipes. This means NFPA 14 refers to NFPA 13 for hanging, or more importantly for this context, for Currently, NFPA 13 (referenced in IBC 903.3.1.1) serves as the hanging and bracing standard for all water-based fire protection systems, including standpipes (NFPA 14) and water mist systems (NFPA 750). However, the IBC only references automatic sprinkler systems for seismic bracing, creating an inconsistent and incomplete approach to seismic protection across different water-based fire suppression systems.

The National Fire Protection Association (NFPA) is developing NFPA 200, a dedicated standard for hanging and bracing of all fire suppression systems. While NFPA 200 will not be ready for the 2027 IBC cycle, it is anticipated for inclusion in the 2030 edition, at which point IBC Chapter 16 can reference NFPA 200 to provide uniform seismic bracing requirements for all water-based systems.

Since NFPA 14 already defers to NFPA 13 for hanging and bracing, including seismic requirements, the IBC should replace the term "automatic sprinkler system" with "water-based fire protection system" to accurately reflect current industry practice. This change ensures all water-based fire suppression systems receive consistent seismic protection, aligning with existing NFPA standards and eliminating ambiguity in enforcement.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

This language does not change the application of the code and NFPA 13.

S104-25

S105-25

IBC: 1613.7 (New)

Proponents: David Bonowitz, representing David Bonowitz, S.E. (dbonowitz@att.net); Robert Bachman, RE Bachman Consulting Structural Engineer, representing Myself (rebachmanse@aol.com); Chris Kimball, Building Code Solutions, representing Self (chris@bcscodegroup.com)

2024 International Building Code

Add new text as follows:

1613.7 Battery energy storage systems. Components of battery energy storage systems shall satisfy the seismic requirements of ASCE 7 Chapter 13 based on the *risk category* assigned by Section 1604.5. Battery energy storage systems assigned to Risk Category IV shall be considered *designated seismic systems* and shall have the component seismic importance factor, I_p, taken as 1.5. Buildings or non-building structures, including containers and walk-in units, that house, shelter, or support battery energy storage systems shall satisfy the requirements of ASCE 7 Chapter 12 or 15 as applicable using the same *risk category* to which the battery energy storage system itself is assigned.

Attached Files

- **Photos for BESS DSS.pdf**
  https://www.cdpaccess.com/proposal/12040/35909/files/download/9266/

Reason: This proposal clarifies and simplifies the application of the code and of ASCE 7 to battery energy storage systems (BESS; see the terminology section below). BESS are a relatively new, and increasingly important, combination of non-building structures and nonstructural components. As illustrated below, BESS are often built as customized containers or equipment frames, filled with batteries and related electrical and HVAC equipment, and mounted on a platform, a slab on ground, or a set of isolated footings.

This proposal applies only to those BESS components already assigned to Risk Category IV in Section 1604.5. These might include BESS ancillary to a power plant assigned to RC IV or BESS serving a RC IV facility as backup power. The proposal does not change any of the RC IV design criteria.

The gist of the proposal is this: BESS components assigned to RC IV should have I_p = 1.5 and should be certified for seismic application. In most cases, the current code *should* already reach this result, but because BESS involve combinations of active, nonactive, heavy, and lightweight nonstructural components, some containing hazardous materials, and all interconnected within a container or frame that constitutes a non-building structure, application of the code and ASCE 7 provisions can be convoluted. This proposal improves the code's usability by making the necessary designations explicit for this defined category of components.

The proposed new section simplifies the derivation of design criteria for BESS components assigned to RC IV. To explain why this simplification is useful, consider how the current IBC and ASCE 7 work together:

- IBC Sec 1613.1 requires compliance with ASCE 7 Chapters 12, 13, and 15.
- Then, ASCE 7 Sec 13.2.3 requires seismic certification for *designated seismic systems* (DSS) in Seismic Design Category C-F.
- That relies on a definition of DSS in IBC Sec 202: "Those nonstructural components that require design in accordance with Chapter 13 of ASCE 7 and for which the component importance factor, I_p, is greater than 1 in accordance with Section 13.1.3 of ASCE 7."
- Which components are those? Back to ASCE 7 Sec 13.1.3, which sets I_p = 1.5 for any of 4 cases:

  1. "The component is required to function for life-safety purposes after an earthquake." Possibly BESS could be construed to be part of a life safety system if it provides power to a RC IV building, but maybe not; in any case, whether this condition applies to BESS is unclear.

  2. The component handles "toxic, highly toxic, or explosive substances." This could apply to parts of a BESS installation, but not to every component within or attached to the container.

  3. "The component is in or supported by a Risk Category IV structure ... and the component is required for the continued operation of a structure designated an Essential Facility, or its failure would impair the continued operation of a structure designated an Essential Facility." This is the most likely current basis for setting I_p > 1 for BESS assigned to RC IV. However, it's somewhat circular, or redundant, in that it relies on designation of an RC IV facility as an Essential Facility (wording that is new in ASCE 7-22). So, back to IBC for the definition of Essential Facility: "Buildings and other structures that are intended to remain operational in the event of extreme environmental loading from flood, wind, snow or earthquakes." (ASCE 7 has its own definition, which is identical to the IBC's except that ASCE 7 adds tornado to the list of perils ... as IBC should too.)

4. The component handles “hazardous substances ... and is attached to a structure ... classified ... as a hazardous occupancy.” Like item 2, this could apply to parts of a BESS installation, but only if the BESS container or frame is considered a structure so classified.

- Finally, ASCE 7 Sec 13.1.4 exempts certain lightweight components even if $I_p > 1.0$. Some components within a BESS container might thus appear exempt by weight, but insofar as the components comprise one integrated system, the functionality objective implied by the RC IV assignment should apply to all of them.

Thus, assignment of a BESS to RC IV *should* be sufficient to result in $I_p = 1.5$ and classification as a DSS. But the code path is complicated, and some of the code and ASCE 7 wording is less than clear with respect to typical BESS construction. Therefore, this proposal cuts through that uncertainty by stating simply the criteria and designations that apply where BESS is assigned to RC IV. Specifically:

- The first sentence treats typical BESS equipment – the battery racks, HVAC units, fire suppression, etc., but not the walk-in containers themselves – as nonstructural components covered by ASCE 7 Chapter 13.
- The second sentence clarifies and simplifies application of ASCE 7 Section 13.1.3, making it unnecessary to parse the ASCE wording described above. Specification of $I_p = 1.5$ also simplifies application of the exemptions in Section 13.1.4.
- The third sentence covers the design of the BESS container itself, as well as any separate shelters, enclosures, or buildings, with the intent that BESS function should not be impaired by damage to an adjacent or enclosing structure.

Notes on terminology:

- **Walk-in unit** is used consistent with the term *energy storage system, walk-in unit*, defined in the IFC and used in IFC Sec 1207: “A prefabricated building that contains energy storage systems. It includes doors that provide walk-in access for personnel to maintain, test and service the equipment, and is typically used in outdoor and mobile ESS applications.”
- **Battery energy storage system(s)**, or BESS, has emerged as an industry standard term. It is not yet explicitly defined by the I-codes, but a number of related terms are, and BESS is indirectly defined by them. The following related terms are already defined:
- IFC: “**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 uninterruptible power supply, load shedding, load sharing or similar capabilities.”
- IECC, IFC: “**Energy storage system (ESS).** One or more devices, assembled together, capable of storing energy in order to supply electrical energy at a future time.”
- IBC, IFC: “**Energy storage system, electrochemical.** An energy storage system that stores energy and produced electricity using chemical reactions. It includes, among others, **battery ESS** and capacitor ESS.”

By using “battery,” as opposed to just ESS, the proposal distinguishes its scope from capacitor ESS (per the definition of electrochemical ESS above) and from other ESS such as pumped hydro or compressed air. The IFC also defines several “battery types,” but the proposal would apply to all types, including some newer types (e.g. sodium-ion or iron-air) not yet defined in the IFC.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

The proposal merely clarifies and simplifies the current expectation with respect to certain components already assigned to RC IV.

S105-25

S106-25

IBC: 1704.2.1, 1704.3, 1704.3.1, TABLE 1705.7, 1705.9

Proponents: Emily Dunham, Gresham Smith, representing NCSEA Code Advisory Committee Special Inspections/Quality Assurance Subcommittee (emily.dunham@greshamsmith.com); Emily Guglielmo, representing NCSEA (eguglielmo@martinmartin.com)

2024 International Building Code

Revise as follows:

1704.2.1 Special inspector qualifications. Prior to the start of the construction, the *approved agencies* shall provide written documentation to the *building official* demonstrating the competence and relevant experience or training of the *special inspectors* who will perform the *special inspections* and tests during construction. Experience or training shall be considered to be relevant where the documented experience or training is related in complexity to the same type of *special inspection* or testing activities for projects of similar complexity and material qualities. These qualifications are in addition to qualifications specified in other sections of this code.

The *registered design professional*<u>*s*</u> ~~*in responsible charge*~~ ~~and engineers of record~~ involved in the design of the project are permitted to act as an *approved agency* and their personnel are permitted to act as *special inspectors* for the work designed by them, provided they qualify as *special inspectors*.

1704.3 Statement of special inspections. Where *special inspections* or tests are required by Section 1705, the *registered design professional in responsible charge* shall ~~prepare~~ <u>review and coordinate</u> a statement of *special inspections* <u>prepared by one or more *registered design professionals*</u> in accordance with Section 1704.3.1 for submittal by the applicant in accordance with Section 1704.2.3.

Exception: The statement of *special inspections* is permitted to be prepared by a qualified *person approved* by the *building official* for construction not designed by a *registered design professional*.

1704.3.1 Content of statement of special inspections. The statement of *special inspections* shall identify the following:

1. The materials, systems, components and work required to have *special inspections* or tests by the *building official* or by the *registered design professional* responsible for each portion of the work.
2. The type and extent of each *special inspection*.
3. The type and extent of each test.
4. Additional requirements for *special inspections* or tests for seismic or wind resistance as specified in Sections 1705.12, 1705.13 and 1705.14.
5. For each type of *special inspection*, identification as to whether it will be continuous *special inspection*, periodic *special inspection* or performed in accordance with the notation used in the referenced standard where the inspections are defined.
6. *Deferred submittal* items that require a supplemental statement of special inspections.

TABLE 1705.7 REQUIRED SPECIAL INSPECTIONS AND TESTS OF DRIVEN DEEP FOUNDATION ELEMENTS

TYPE	CONTINUOUS SPECIAL INSPECTION	PERIODIC SPECIAL INSPECTION
1. Verify element materials, sizes and lengths comply with the requirements.	X	—
2. Determine capacities of test elements and conduct additional load tests, as required.	X	—
3. Inspect driving operations and maintain complete and accurate records for each element.	X	—
4. Verify placement locations and plumbness, confirm type and size of hammer, record number of blows per foot of penetration, determine required penetrations to achieve design capacity, record tip and butt elevations and document any damage to foundation element.	X	—
5. For steel elements, perform additional special inspections in accordance with Section 1705.2.	In accordance with Section 1705.2	
6. For concrete elements and concrete-filled elements, perform tests and additional special inspections in accordance with Section 1705.3.	In accordance with Section 1705.3	
7.For specialty elements, perform additional inspections as determined by the registered design professional ~~in responsible charge~~.	In accordance with Statement of Special Inspections	

1705.9 Helical pile foundations. *Continuous special inspections* shall be performed during installation of *helical pile* foundations. The information recorded shall include installation equipment used, pile dimensions, tip elevations, final depth, final installation torque and other pertinent installation data as required by the *registered design professional* ~~*in responsible charge*~~. The *approved* geotechnical report and the *construction documents* prepared by the *registered design professional* shall be used to determine compliance.

Reason: This proposal is intended to clarify the role of the registered design professional in responsible charge (RDPIRC), the individual who coordinates the design team and liaises with the building official, and the role of the registered design professionals (RDP), those individuals whose technical expertise contribute to the project. The revisions in this proposal place the administrative tasks on the registered design professional in responsible charge and technical related tasks on the registered design professional.

1704.2.1: RDP's may serve as approved agencies for work they designed. However "engineers of record" is not an IBC term and reference to "RDPIRC" contributes to confusion regarding roles and responsibilities. It is more straightforward to simply say that RDP's may serve as an approved agency for work they designed subject to the noted qualifications, so text is proposed for deletion.

1704.3: Structural engineers often mistakenly equate the "RDPIRC" code language to the commonly used term structural "Engineer of Record," which is a contractual or project team role - not a role recognized by the IBC. The IBC does not specifically define or assign disciplinary roles because practice laws vary between jurisdictions. The IBC uses the generic term "registered design professional" in reference to any licensed/registered/certified/etc. entity that is responsible for a certain aspect of work. A structural engineer, a mechanical engineer, an architect, and a geotechnical engineer are all examples of "registered design professionals." A structural engineer who is responsible for the structural design aspects of a project is not necessarily the "registered-design-professional-in-responsible-charge."

As proposed, 1704.3 clarifies and differentiates three distinct roles and responsibilities:

1. The RDP (one or more), who authors portions of the statement of special inspections related to their work per 1704.3.1
2. The RDPIRC, who reviews and coordinates all of those portions in accordance with their duties defined in 107.3.4 and the Chapter 2 definition.
3. The applicant, who submits the statement of special inspections to the building official per their responsibility identified in 1704.2.3

1704.3.1 is included for context.

Table 1705.7 - Item 7: RDP's are responsible for specifying special inspection tasks, but those RDP's are not necessarily the RDPIRC. Thus the table should reference a "RDP," not the "RDPIRC."

1705.9: RDP's are responsible for specifying special inspection tasks, but those RDP's are not necessarily the RDPIRC. Thus the section should reference a "RDP," not the "RDPIRC."

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

The tasks will still be performed, the proposal is clarifying which individual will be performing the task.

S106-25

S107-25

IBC: 1704.2.5, 1704.2.5.1, 1704.2.5.2 (New)

Proponents: Jeff Grove, Chair, representing BCAC (bcac@iccsafe.org)

2024 International Building Code

Revise as follows:

1704.2.5 Special inspection of fabricated items. Where fabrication of structural, load-bearing or lateral load-resisting members or assemblies is being conducted on the premises of a fabricator's shop, *special inspections* of the *fabricated items* shall be performed during fabrication, except where the fabricator has been *approved* to perform work without *special inspections* in accordance with Section 1704.2.5.1 or the manufacturing plant has been approved in accordance with Section 1704.2.5.2.

1704.2.5.1 Fabricator approval. *Special inspections* during fabrication are not required where the work is done on the premises of a fabricator *approved* to perform such work without *special inspection*. Approval shall be based on review of the fabricator's written fabrication procedures and quality control manuals that provide a basis for control of materials and workmanship, with periodic auditing of fabrication and quality control practices by an *approved agency* or the *building official*. At completion of fabrication, the *approved fabricator* shall submit a *certificate of compliance* to the *owner* or the *owner 's* authorized agent for submittal to the *building official* as specified in Section 1704.5 stating that the work was performed in accordance with the *approved construction documents* .

Add new text as follows:

1704.2.5.2 Modular construction. Special inspections during the manufacture of modular components or modules are not required where the work is done on the premises of a manufacturing plant approved to perform such work without special inspection. The approved manufacturing plant shall demonstrate compliance with the quality control and quality assurance provisions of ICC 1200 and ICC 1205. At completion of fabrication, the approved fabricator shall submit a certificate of compliance to the owner or the owner's authorized agent for submittal to the building official as specified in Section 1704.5 stating that the work was performed in accordance with the approved construction documents.

Reason: This proposal adds an option to permit manufacturers of modular components to comply with the ICC 1200 and ICC 1205 standards as one means of compliance with this section. The requirements in the ICC 1205 Standard for Off-site Construction: Inspection and Regulatory Compliance provides clear guidelines and standardized procedures that focus on inspections and regulatory compliance in off-site construction, thereby reducing the administrative burden on Code Officials. The structure of ICC 1205 ensures strict compliance with the construction standards. Ultimately, the ICC 1205 standard ensures regulatory objectives are met with fewer resources and less time, creating a more effective regulatory environment.

Some structural assemblies have concealed elements such as reinforcing or embed plates in a precast concrete wall panel or are even fabricated with embedded mechanical, electrical or plumbing components. These assemblies would fall within the definition of a modular component or panelized construction under ICC 1200 and ICC 1205 and a fabricator's shop could be required to comply with those standards under a state's modular and industrialized building program. Building officials who participated in the development of the ICC off-site construction standards indicated they would consider going through their program as an option for such assemblies rather than an explicit requirement and would accept other methods of compliance such as an industry QA/QC certification program or a traditional program of special inspections. Adding a reference to the ICC standards as a new section alongside the existing requirements for fabricated items allows for owners, registered design professionals and fabricators to select their preferred avenue for compliance.

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. In 2023 and 2024 the BCAC has held several virtual meetings open to any interested party. In addition, there were numerous virtual Working Group meetings for the current code development cycle, which included members of the committee as well as interested parties. Related documents and reports are posted on the BCAC website at BCAC webpage.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

This proposal is not expected to increase or decrease the costs of construction but rather it provides another means for off-site manufacturing or construction to comply with the code.

S107-25

S108-25

IBC: SECTION 1705, 1705.1, 1705.1.1, 1705.1.2 (New), 1705.2.4, TABLE 1705.2.4, 1705.5.3, TABLE 1705.5.3, 1705.12, 1705.12.1, 1705.12.2, 1705.12.3, 1705.13.2, 1705.13.3, 1705.13.4, 1705.13.5, 1705.13.5.1, 1705.13.6

Proponents: Emily Dunham, representing NCSEA Code Advisory Committee Special Inspections/Quality Assurance Subcommittee (emily.dunham@greshamsmith.com); Emily Guglielmo, representing NCSEA (eguglielmo@martinmartin.com)

2024 International Building Code

SECTION 1705
REQUIRED SPECIAL INSPECTIONS AND TESTS

1705.1 General. *Special inspections* and tests of elements and nonstructural components of *buildings* and *structures* shall meet the applicable requirements of this section.

1705.1.1 Special cases. *Special inspections* and tests shall be required for proposed work that is, in the opinion of the *building official*, unusual in its nature, such as, but not limited to, the following examples:

1. Construction materials and systems that are alternatives to materials and systems prescribed by this code.
2. Unusual design applications of materials described in this code.
3. Materials and systems required to be installed in accordance with additional manufacturer’s instructions that prescribe requirements not contained in this code or in standards referenced by this code.

Add new text as follows:

1705.1.2 Special inspection of connections, fastening, and anchorages. Where this section is specified in Section 1705, s*pecial inspection* of connections, fastening, and anchorages shall be performed in accordance with this section. The following applicable items shall be verified to comply with *construction documents*, valid evaluation reports and manufacturer’s printed installation instructions.

1. Materials of members being connected.
2. Component materials, coatings, and surface preparation.
3. Component geometry, thicknesses, clearances, and material cover.
4. Fastener type, quantity, layout, size, length, edge distances, critical spacing, seating or bearing conditions, and embedment depths or thread engagement.
5. Fastener installation torques, pre-tension loads, or other special procedures.
6. Accommodation of specified allowable movements including length, direction, freedom of slip, and clearances.
7. Pretensioned bolts and other similar connectors achieve specified contact between connected members.

1705.2.4 Open-web steel joists and joist girders. *Special inspections* of open-web *steel joists* and joist girders in *buildings*, *structures* and portions thereof shall be in accordance with Table 1705.2.4.

Revise as follows:

TABLE 1705.2.4 REQUIRED SPECIAL INSPECTIONS OF OPEN-WEB STEEL JOISTS AND JOIST GIRDERS

TYPE	CONTINUOUS SPECIAL INSPECTION	PERIODIC SPECIAL INSPECTION	REFERENCED STANDARD[a]
1. Installation of open-web steel joists and joist girders.			

TYPE	CONTINUOUS SPECIAL INSPECTION	PERIODIC SPECIAL INSPECTION	REFERENCED STANDARD
a. End connections – welding or bolted.	—	X	~~SJI specifications listed in Section 2207.1.~~ 1705.1.2
b. Bridging – horizontal or diagonal.	—	—	—
1.Standard bridging.	—	X	SJI specifications listed in Section 2207.1.
2.Bridging that differs from the SJI specifications listed in Section 2207.1.	—	X	—

a. Where applicable, see Section 1705.13.

1705.5.3 Mass timber construction. *Special inspections* of *mass timber* elements in Types IV-A, IV-B and IV-C construction shall be in accordance with Table 1705.5.3.

TABLE 1705.5.3 REQUIRED SPECIAL INSPECTIONS OF MASS TIMBER CONSTRUCTION

TYPE		CONTINUOUS SPECIAL INSPECTION	PERIODIC SPECIAL INSPECTION
1. Inspection of anchorage and connections of mass timber construction to timber deep foundation systems. Inspect per section 1705.1.2.		—	X
2. Inspect erection of mass timber construction.		—	X
3. Inspection of connections where installation methods are required to meet design loads.			
Threaded fasteners.	Verify use of proper installation equipment.	—	X
	Verify use of pre-drilled holes where required.	—	X
	Inspect screws, including diameter, length, head type, spacing, installation angle and depth.	—	X
Adhesive anchors installed in horizontal or upwardly inclined orientation to resist sustained tension loads. Inspect per section 1705.1.2.		X	—
Adhesive anchors not defined in preceding cell. Inspect per section 1705.1.2.		—	X
Bolted connections. Inspect per section 1705.1.2.		—	X
Concealed connections. Inspect per section 1705.1.2.		—	X

1705.12 Special inspections for wind resistance. *Special inspections* for wind resistance specified in Sections 1705.12.1 through 1705.12.3, unless exempted by the exceptions to Section 1704.2, are required for *buildings* and *structures* constructed in the following areas:

1. In wind Exposure Category B, where *basic wind speed*, *V,* is 150 mph (67 m/sec) or greater.
2. In wind Exposure Category C or D, where *basic wind speed*, *V,* is 140 mph (62.6 m/sec) or greater.

1705.12.1 Structural wood. *Continuous special inspection* is required during field gluing operations of elements of the *main windforce-resisting system*. *Periodic special inspection* per section 1705.1.2 is required for nailing, bolting, anchoring and other fastening of elements of the *main windforce-resisting system*, including wood shear walls, wood *diaphragms*, *drag struts*, braces and *hold-downs*.

Exception: *Special inspections* are not required for wood shear walls, shear panels and *diaphragms*, including nailing, bolting, anchoring and other fastening to other elements of the *main windforce-resisting system*, where the lateral resistance is provided by structural sheathing and the specified fastener spacing at panel edges is more than 4 inches (102 mm) on center.

1705.12.2 Cold-formed steel light-frame construction. *Periodic special inspection* is required for welding operations of elements of the *main windforce-resisting system*. *Periodic special inspection* is required for screw attachment, bolting, anchoring and other fastening of elements of the *main windforce-resisting system*, including shear walls, braces, *diaphragms*, *collectors* (*drag struts*) and *hold-downs*. Inspection tasks shall be as follows:

1. Special inspections for screw and bolt attachments to the items above shall be per the quality assurance inspector tasks listed in AISI S240 Section D6.10.
2. Special inspections for welding operations to fasten the items above shall be per the quality assurance inspector tasks listed in AISI S240 Tables D6.7-2 and D6.7-3.

Exception: *Special inspections* are not required for cold-formed steel light-frame shear walls and *diaphragms*, including screwing, bolting, anchoring and other fastening to components of the windforce-resisting system, where either of the following applies:

1. The sheathing is *gypsum board* or *fiberboard*.
2. The sheathing is *wood structural panel* or steel sheets on only one side of the shear wall, shear panel or *diaphragm* assembly and the specified fastener spacing at the panel or sheet edges is more than 4 inches (102 mm) on center (o.c.).

1705.12.3 Wind-resisting components. *Periodic special inspection* per section 1705.1.2 is required for fastening of the following systems and components:

1. *Roof covering*, *roof deck* and roof framing connections.
2. *Exterior wall covering* and wall connections to roof and floor *diaphragms* and framing.

Exceptions: Special inspections for the following items shall be performed in accordance with the referenced section rather than section 1705.1.2.

1. *Special inspections* for sidelaps of cold-formed steel deck panels and for fastening of cold-formed steel decks to roof framing and to exterior wall framing shall be performed in accordance with section 1705.2.3.
2. *Special inspections* for structural steel connections shall be performed in accordance with section 1705.2.1.
3. *Special inspections* for concrete roof deck, concrete roof framing connections, and concrete wall connections to roof and floor diaphragms and framing shall be performed in accordance with section 1705.3.
4. *Special inspections* for connections of high-load wood roof *diaphragms* to roof framing shall be performed in accordance with section 1705.5.1.
5. *Special inspections* for threaded fastener *mass timber* connections shall be performed in accordance with Table 1705.5.3.

1705.13.2 Structural wood. For the *seismic force-resisting systems* of *structures* assigned to *Seismic Design Category* C, D, E or F:

1. *Continuous special inspection* shall be required during field gluing operations of elements of the *seismic force-resisting system*.
2. *Periodic special inspection* per section 1705.1.2 shall be required for nailing, bolting, anchoring and other fastening of elements of the *seismic force-resisting system*, including wood shear walls, wood *diaphragms*, *drag struts*, braces, shear panels and *hold-downs*.

Exception: *Special inspections* are not required for wood shear walls, shear panels and *diaphragms*, including nailing, bolting, anchoring and other fastening to other elements of the *seismic force-resisting system*, where the lateral resistance is provided by structural sheathing, and the specified fastener spacing at the panel edges is more than 4 inches (102 mm) on center.

1705.13.3 Cold-formed steel light-frame construction. For the *seismic force-resisting systems* of *structures* assigned to *Seismic Design Category* C, D, E or F, *periodic special inspection* shall be required for both:

1. Welding operations of elements of the *seismic force-resisting system*.
2. Screw attachment, bolting, anchoring and other fastening of elements of the *seismic force-resisting system*, including shear walls, braces, *diaphragms*, *collectors* (*drag struts*) and *hold-downs*.

Inspection tasks shall be as follows:

1. Special inspections for screw and bolt attachments to the items above shall be per the quality assurance inspector tasks listed in AISI S240 Section D6.10.
2. Special inspections for welding operations to fasten the items above shall be per the quality assurance inspector tasks listed in AISI S240 Tables D6.7-2 and D6.7-3.

Exception: *Special inspections* are not required for cold-formed steel light-frame shear walls and *diaphragms*, including screw installation, bolting, anchoring and other fastening to components of the *seismic force-resisting system*, where either of the following applies:

1. The sheathing is *gypsum board* or *fiberboard*.
2. The sheathing is *wood structural panel* or steel sheets on only one side of the shear wall, shear panel or *diaphragm* assembly and the specified fastener spacing at the panel or sheet edge is more than 4 inches (102 mm) on center.

1705.13.4 Designated seismic systems. For *structures* assigned to *Seismic Design Category* C, D, E or F, the *special inspector* shall examine *designated seismic systems* requiring seismic qualification in accordance with Section 13.2.3 of ASCE 7 and verify that the *label*, anchorage and mounting conform to the *certificate of compliance*.

1705.13.5 Architectural components. *Periodic special inspection* per section 1705.1.2 is required for the erection and fastening of exterior cladding, interior and exterior nonbearing walls and interior and exterior *veneer* in structures assigned to *Seismic Design Category* D, E or F.

Exception: *Periodic special inspection* is not required for the following:

1. Exterior cladding, interior and exterior nonbearing walls and interior and exterior *veneer* 30 feet (9144 mm) or less in height above grade or walking surface.
2. Exterior cladding and interior and exterior *veneer* weighing 5 psf (0.24 kN/m^2) or less.
3. Interior nonbearing walls weighing 15 psf (0.72 kN/m^2) or less.

1705.13.5.1 Access floors. Periodic *special inspection* per section 1705.1.2 is required for the anchorage of access floors in *structures* assigned to *Seismic Design Category* D, E or F.

1705.13.6 Plumbing, mechanical and electrical components. *Periodic special inspection* of plumbing, mechanical and electrical components shall be required for the following:

1. Anchorage of electrical equipment for emergency and *standby power systems* in *structures* assigned to *Seismic Design Category* C, D, E or F shall be inspected per section 1705.1.2.
2. Anchorage of other electrical equipment in *structures* assigned to *Seismic Design Category* E or F shall be inspected per section 1705.1.2.
3. Installation and anchorage of piping systems designed to carry *hazardous materials* and their associated mechanical units in *structures* assigned to *Seismic Design Category* C, D, E or F shall be inspected per section 1705.1.2.
4. Installation and anchorage of ductwork designed to carry *hazardous materials* in *structures* assigned to *Seismic Design Category* C, D, E or F shall be inspected per section 1705.1.2.
5. Installation and anchorage of vibration isolation systems in *structures* assigned to *Seismic Design Category* C, D, E or F where the *approved construction documents* require a nominal clearance of $^1/_4$ inch (6.4 mm) or less between the equipment support frame and restraint shall be inspected per section 1705.1.2.
6. Installation of mechanical and electrical equipment, including duct work, piping systems and their structural supports, where *automatic sprinkler systems* are installed in *structures* assigned to *Seismic Design Category* C, D, E or F to verify one of the following:
   - 6.1. Minimum clearances have been provided as required by Section 13.2.4 ASCE/SEI 7.
   - 6.2. A nominal clearance of not less than 3 inches (76 mm) has been be provided between *automatic sprinkler system* drops and sprigs and: structural members not used collectively or independently to support the sprinklers; equipment attached to the *building structure*; and other systems' piping.

Where flexible sprinkler hose fittings are used, *special inspection* of minimum clearances is not required.

Reason: This proposal does not add any new special inspections to Chapter 17, nor does it override inspection tasks that are already defined in referenced standards. Special inspections of certain connections specified in Chapter 17 do not take the place of the building official's framing inspections. The building official has authority to determine the acceptable qualifications for the special inspector.

The proposed language for these connection, anchorage and fastening special inspection requirements strives to clarify the following:

Identify a required task,

Identify a procedure to complete that task (whether by description or by referenced standard),

Define a frequency for the task (continuous vs periodic), and

Identify a standard by which to verify compliance (construction documents, evaluation reports, ASTM standard, etc.).

This proposal reduces room for interpretation, helps with enforceability of the provisions, and results in a more consistent levels of quality assurance. The descriptions of the items are written generally to include a broad range of materials, but the requirements only apply when proposed section 1705.1.2 is specifically invoked within the detailed requirements of section 1705, as indicated in this proposal.

Table 1705.2.4 Item 1a – “End connections” calls for periodic special inspection of open web steel joist end connections per SJI 100 or 200. However, those standards do not contain any special inspection requirements for member end connections. Therefore, the proposed revision clarifies what items need to be considered by the special inspector to verify that the completed end connection is compliant, and references proposed section 1705.1.2 in lieu of SJI specifications since there are no tasks for inspection of end connections defined in SJI 100/200.

Table 1705.5.3 calls for special inspection of mass timber connections and anchorages. Required tasks related to inspection of threaded fastener items are clearly identified in the table. However, inspection tasks related to adhesive anchors, bolted connections, and concealed connections are not specified. There are no referenced standards that detail inspection tasks for these items so the proposed language clarifies what items need to be considered when inspecting connections per the noted line items of the table.

Sections 1705.12.1 and 1705.13.2 call for periodic special inspection of nailing, bolting, anchoring, and other fastening of certain lateral force resisting systems but the specific inspection tasks are not identified and the NDS referenced standard does not include special inspection provisions. The proposed language in this section adds a reference to 1705.1.2 as a means for verifying compliance.

Sections 1705.12.2 and 1705.13.3 call for periodic special inspection of nailing, bolting, anchoring, and other fastening of certain lateral force resisting systems. Tasks necessary to complete these inspections are specified in AISI S240. The applicable section number of the referenced standard is provided. QAI tasks for welding elements of the of the lateral force resisting system are not provided in Section D6.10, but IBC requires special inspection of welding operations. Therefore, Tables D6.7-2 and D6.7-2 are used to define the inspection tasks to comply with the IBC requirement.

Section 1705.12.3 requires special inspections of certain roof framing connections, wall connections to diaphragms and framing, roof covering, roof deck, roof framing connections, exterior wall covering, and exterior wall framing. Exceptions have been listed for referenced standards that already specify special inspection tasks. Proposed section 1705.1.2 covers conditions that are not already addressed preexisting code provisions.

Section 1705.13.5 requires special inspection of fastening of certain instances of exterior cladding, nonbearing walls, and veneer. The proposed section 1705.1.2 provides a list of items to be referenced when verifying compliance.

Section 1705.13.5.1 requires special inspection of the anchorage of access floors. Specific inspection tasks are not identified in this section. The proposed language in this section adds a reference to proposed section 1705.1.2 as a means of verifying compliance.

Section 1705.13.6 requires special inspection of the anchorage of electrical equipment for emergency and standby power systems, anchorage of piping systems designed to carry hazardous materials and their associated mechanical units, anchorage of ductwork designed to carry hazardous materials, and anchorage of vibration isolation systems. Specific inspection tasks are not identified in this section. The proposed language in this section adds a reference to proposed section 1705.1.2 as a means of verifying compliance.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

Proposal does not add cost because it does not add work scope, it clarifies the tasks necessary to verify compliance when special inspections for connections are required.

S108-25

S109-25

IBC: 1705.1, 1705.1.1, 1705.1.2 (New)

Proponents: Joseph H. Cain, P.E., representing Solar Energy Industries Association (SEIA) (joecainpe@gmail.com)

2024 International Building Code

1705.1 General. *Special inspections* and tests of elements and nonstructural components of *buildings* and *structures* shall meet the applicable requirements of this section.

1705.1.1 Special cases. *Special inspections* and tests shall be required for proposed work that is, in the opinion of the *building official*, unusual in its nature, such as, but not limited to, the following examples:

1. Construction materials and systems that are alternatives to materials and systems prescribed by this code.
2. Unusual design applications of materials described in this code.
3. Materials and systems required to be installed in accordance with additional manufacturer's instructions that prescribe requirements not contained in this code or in standards referenced by this code.

Add new text as follows:

1705.1.2 Ground-mounted photovoltaic (PV) panel systems. For *deep foundation* elements for *ground-mounted PV panel systems*, continuous *special inspection* need not be provided where the *building official* has determined that periodic *special inspection* or inspection by an *approved agency* is acceptable.

Reason: A requirement for continuous Special Inspection for every foundation pile for ground-mounted photovoltaic (PV) panel systems is overly restrictive. The language proposed for new Section 1705.1.2 seeks to formalize inspection practice that is commonly applied to ground-mounted PV panel systems.

Large-scale (often called "utility scale") PV facilities often have tens of thousands of small piles, and cover hundreds, or even thousands of acres. For example, a 150 MegaWatt PV facility might cover approximately 900 to 1200 acres of land. Large-scale PV facilities can be fixed-tilt, but Single Axis Trackers (SAT) are more common.

For SATs, the most common foundation type is driven steel piles. SATs usually have a torque tube supported by a central drive pile and a series of bearing piles. As these nonbuilding structures are small, the piles are small. It is common for bearing piles to be W6x9 wide-flange beams, driven to a depth of approximately 6 to 8 feet below the soil surface. These small piles are often driven into Earth using specialized equipment such as a Vermeer PD10 pile driver. These drivers are usually operated by a 2-person crew. For large projects, it is not uncommon to have about ten to twelve pile drivers and crews operating simultaneously in different "blocks" of a project.

By a strict reading of 2024 IBC Table 1705.7, this would require 10 to 12 Special Inspectors to be retained full time for 1 to 3 months, as they provide continuous special inspection of 10 to 12 two-person crews operating track-mounted, GPS locating, self-plumbing, specialized pile drivers, as they drive tens of thousands of piles. It should not be surprising that Building Officials are not enforcing continuous special inspection as indicated in Table 1705.7.

As project financing often involves third-party investors, existing measures of quality control are already in place. The developer and/or EPC (Engineer, Procure, Construct) contractor typically use a rigorous design and testing process to optimize pile specifications, as part of value engineering. As part of their risk-management process, it is common for project financiers to use third-party Independent Engineers (IEs) to ensure quality controls are in place. Under current practice, it is extremely uncommon for local Building Officials to require continuous Special Inspection for "deep" foundations for PV panel systems.

Large-scale photovoltaic power facilities typically incorporate rigorous design and quality control steps, as follows:
1. Foundation elements designed by analysis, based on geotechnical investigation.
2. As thousands of small piles are used in a PV power facility, optimization of design typically includes preconstruction pile load testing conducted on site. Independent Engineers (IE's) typically review test reports.
3. EPC contractor has their own internal quality control and reporting system, including daily logs.

4. A representative sample of production piles (for example, 1 percent) are typically proof-tested during construction, to ensure adequate pile capacities are being achieved. Adjustments are made if necessary to meet the demand.
5. County/AHJ inspectors typically conduct periodic observation of pile installation. For large-scale PV facilities, these inspectors are typically third-party inspectors.
6. IE's typically conduct site visits to observe installation methods and review inspection reports and production pile load test reports. A final report is prepared by the IE.

Owing to this rigorous program of quality control, continuous special inspection of "deep" foundations is highly redundant. A team of Special Inspectors could be required to be on-site for one to three months watching piles being installed, even though the same piles are already being observed and monitored by the Developer, the EPC Contractor, the AHJ/County inspector, and an Independent Engineer. The language proposed for new Section 1705.1.2 seeks to allow the Building Official the flexibility to allow modifications to special inspection requirements, without taking away any such authority. For example, a Building Official could require an agreed-upon frequency of periodic special inspection, or might be satisfied with quality controls in place on behalf of the owner or EPC, in addition to the inspector from the AHJ.

In the 2024 IBC, "Approved Agency" is defined as: An established and recognized organization that is regularly engaged in conducting tests, furnishing inspection services or furnishing product evaluation or certification where such organization has been approved by the *building official.*

For smaller installations -- such as residential ground-mounted PV panel systems -- continuous special inspection beyond the AHJ/County inspection adds project cost disproportionate to the risk to the project. Most AHJ/County Building Officials have agreed that special inspection is not necessary or reasonable for these small systems.

This proposal follows Proposal S140-22, so video testimony from the prior cycle might be helpful to interested parties. During testimony and Committee discussion, there was attention drawn to Section 1704.2, Exception 1: "Special inspections and tests are not required for construction of a minor nature or as warranted by conditions in the jurisdiction as approved by the building official." Some testifiers and at least one Committee member expressed a belief that Exception 1 of Section 1704.2 already covers the residential case, at a minimum.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

This proposal only seeks to formalize existing practice.

S109-25

S110-25

IBC: 1705.2.5

Proponents: Emily Dunham, representing NCSEA Code Advisory Committee Special Inspections/Quality Assurance Subcommittee (emily.dunham@greshamsmith.com); Emily Guglielmo, representing NCSEA (eguglielmo@martinmartin.com)

2024 International Building Code

Revise as follows:

1705.2.5 Cold-formed steel trusses spanning 60 feet or greater. Where a cold-formed steel truss designed in accordance with section 2204 has a clear span ~~is~~ 60 feet (18 288 mm) or greater, the *special inspector* shall verify that the temporary installation restraint/bracing and the permanent individual truss member restraint/bracing are installed in accordance with the ~~*approved* truss submittal package~~ design prepared in accordance with section 2206.1.3.2.

Reason: Section 2206.1.3.2 requires a truss plan to be developed by a registered design professional for truss bracing in trusses 60 feet or greater. Special inspections of the truss bracing should be performed in reference to this document rather than a truss submittal as the truss submittal may not include the specific bracing plan. For example, this bracing design could be provided as part of the construction documents, as a deferred submittal, or as a delegated design. The 2204 pointer clarifies that this section does not apply to steel joists in section 2207 (joist designed per SJI 100 and 200).

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

This is a clarification of which document should be referenced during the special inspection process.

S110-25

S111-25

IBC: 1705.2.5, 1705.2.6 (New), 1705.5.2, 1705.5.3 (New)

Proponents: Emily Dunham, representing NCSEA Code Advisory Committee Special Inspections/Quality Assurance Subcommittee (emily.dunham@greshamsmith.com); Emily Guglielmo, representing NCSEA (eguglielmo@martinmartin.com)

2024 International Building Code

1705.2.5 Cold-formed steel trusses spanning 60 feet or greater. Where a cold-formed steel truss clear span is 60 feet (18 288 mm) or greater, the *special inspector* shall verify that the temporary installation restraint/bracing and the permanent individual truss member restraint/bracing are installed in accordance with the *approved* truss submittal package.

Add new text as follows:

1705.2.6 Cold-formed Steel Trusses Without Wood or Gypsum Panels on the Top or Bottom Chord. *Special inspections* of cold-formed steel truss permanent individual truss member restraint and individual truss member bracing shall be required where all of the following are true:

1. The truss clear span is 40 feet or greater
2. Truss chords are not sheathed with gypsum panel product fastened per table 2508.1, wood structural panels fastened per table 2304.10.2, or steel roof deck fastened per ANSI/SDI SD Section J1.
3. Truss member lateral restraint and truss diagonal bracing design *prepared by a registered design professional* is required

The *special inspector* shall verify that the permanent individual truss member restraint and permanent individual truss member bracing is installed in accordance with the *design prepared by a registered design professional.*

1705.5.2 Metal-plate-connected wood trusses spanning 60 feet or greater. Where a truss clear span is 60 feet (18 288 mm) or greater, the *special inspector* shall verify that the temporary installation restraint/bracing and the permanent individual truss member restraint/bracing are installed in accordance with the *approved* truss submittal package.

1705.5.3 Wood Trusses Without Wood or Gypsum Panels on the Top or Bottom Chord. *Special inspections* of wood truss permanent individual truss member restraint and individual truss member bracing shall be required where all of the following are true:

1. The truss clear span is 40 feet or greater.
2. A design prepared by a registered design professional is required in accordance with 2303.4.1.2.1

The *special inspector* shall verify that the permanent individual truss member restraint and permanent individual truss member bracing is installed in accordance with the *design prepared by a registered design professional.*

Reason: This provision is being updated to address longer spanning trusses that do not have sheathing bracing the top or bottom chord. Wood and cold formed steel trusses are designed to be efficient, often relying on short sections without bracing. Ceiling and roof sheathing typically provide bracing for the chord sections. However, when this sheathing is absent, the design and installation of bracing becomes crucial to prevent truss members from failing and causing collapse. The collapses can be extensive and dangerous given the large expanse of areas covered by trusses.

The 40 foot truss threshold is aligned with the prescriptive allowable roof span in 2308.2.5 and AISI 230 tables.

Additional information about the sheathing is provided in cold formed steel section in comparison to the wood truss section because AISI 202-20 does not address trusses without sheathing bracing the chords. NCSEA is working with AISI/SFIA to incorporate similar provisions to 2303.4.1.4.1 in the next revision of AISI202.

Installing this bracing is not standardized and requires specialized knowledge and skills. However, the skills required for truss bracing inspection include identification of lumber sizes, configurations and number of nails/screws. Personnel with these skills are likely already employed at most approved agencies. Building officials also have these skills but the time it takes to inspect this is more than what is typically allotted for in a building frame inspection. Consider a relatively simple 100ft x 50 ft retail building supporting 4 tenants with 3 parapet heights, a mechanical unit for each tenant, a roof access hatch, and wall and beam support conditions. This could lead to 20 truss types with 20 different configurations and bracing conditions to inspect. Inspecting these requires review of all 20 truss design drawings and bracing details. If this takes 5 minutes per truss type this duration is over 90 minutes for a single building component, this time likely exceeds time allotted by many code official for an entire frame inspection in a simple wood building. Education of officials on this topic will help the matter and may increase inspection efficiency but likely will not eliminate this issue of time constraints.

Additionally, the attached references that range in date from the early 1990s to present show that this issue has been understood for over 30 years and continues to be an issue despite the efforts of industry organizations to provide information such as articles in trade publications such as Structure Magazine, Journal of Light Frame Construction, and the Building Safety Journal.

Furthermore, the inspection of bracing of trusses is not unique to wood or cold formed steel trusses. Requirements for bracing special inspections are already required for structural steel per ASC 360 section N5.7, steel joists per IBC table 1705.2.4, and metal building systems per 1705.2.6.

This code change proposal does not alter the requirements for special inspections for all trusses. This proposal adds a small group of trusses that are very susceptible to buckling due to the lack of sheathing on the top or bottom chord**s** and proposed changes to 2303.4.1.2.1 exclude floor trusses without compression forces in the bottom chord and Group U structures. It is well understood in the industry that those types of trusses are highly susceptible to bucking when they are not sheathed. This also includes insufficient bracing at piggy back trusses. There are a few news article link examples of this at the end of this section.

To ensure the safety and integrity of these structures, special inspections should be mandated to verify that the bracing is installed correctly and securely. This inspection requirement would have the added benefit of encouraging awareness between the builder, designer and engineer of the requirements of the truss bracing for these specific projects that are vulnerable to collapse.

See the following for references to wood trusses that have collapsed without sheathing installed and additional information on common causes, including lack of bracing, for wood truss collapse:

References on causes of Wood Truss Failures

Common Causes of Collapse of Metal-Plate—Connected Wood Roof Trusses Journal of Performance of Constructed Facilities Volume 7, Issue 4, https://ascelibrary.org/doi/10.1061/%28ASCE%290887-3828%281993%297%3A4%28225%29

Major Causes of Wood Truss Failures - Southern Loss Association, Inc.

Cases Where Trusses Collapsed Without Sheathing Installed

https://www.osha.gov/ords/imis/accidentsearch.accident_detail?id=129983.015

https://www.ky3.com/2024/12/02/5-injured-after-home-under-construction-collapses-strafford-mo/

https://turnto10.com/news/local/two-hurt-in-roof-collapse-in-acushnet

(enter attachment Picture_1.png here)

by NBC 10 NEWS | Tue, June 7th 2022 at 10:30 PM

Updated Tue, June 7th 2022 at 11:29 PM

Cost Impact: Increase

Estimated Immediate Cost Impact:

$0.06 per square foot

Estimated Immediate Cost Impact Justification (methodology and variables):

A parametric method of cost estimating was utilized.

Inspections for truss bracing will never be the only inspections performed on a structure making cost of mobilization a non-issue. An example of a relatively simple retail building was considered.. The space is 100 ft by 50 ft = 5,000 sq ft. There are 4 mechanical units and 3 parapet heights, a roof hatch, and wall and beam support conditions. Inspection of bracing in this space would conservatively take about 1 hour 40 minutes. Writing up a list of deficiencies would take another 30 minutes. Assuming an hourly rate of $125 at 2.25 hours, the inspections at this location would cost $270. $270/5000 sq ft results in a cost of approximately 6 cents per square foot.

S111-25

S112-25

IBC: TABLE 1705.3

Proponents: Emily Dunham, representing NCSEA Code Advisory Committee Special Inspections/Quality Assurance Subcommittee (emily.dunham@greshamsmith.com); Emily Guglielmo, representing NCSEA (eguglielmo@martinmartin.com)

2024 International Building Code

Revise as follows:

TABLE 1705.3 REQUIRED SPECIAL INSPECTIONS AND TESTS OF CONCRETE CONSTRUCTION

TYPE	CONTINUOUS SPECIAL INSPECTION	PERIODIC SPECIAL INSPECTION	REFERENCED STANDARD[a]	IBC REFERENCE
1. Inspect reinforcement, including prestressing tendons, and verify placement.	—	-~~X~~	ACI 318: Ch. 26 ~~20, 25.2, 25.3, 26.6.1-26.6.3~~	1908.1
a. Reinforcement in special moment frames, boundary elements of special structural walls and coupling beams.	X	-	ACI 318: Ch. 26	
b. All other reinforcement.	-	X	ACI 318: Ch. 26	
2. Reinforcing bar welding:				
a. Verify weldability of reinforcing bars other than ASTM A706.	—	X	AWS D1.4 ACI 318: Ch. 26~~.13.1.4~~	
b. Inspect welding of reinforcement for intermediate and special moment frames, boundary elements of special structural walls, ~~and~~ coupling beams and shear reinforcement.	X	—	AWS D1.4 ACI 318: Ch. 26~~.13.3~~	1705.3.1
c. Inspect welded reinforcement splices.	X	—	—	
d. Inspect welding of primary tension reinforcement in corbels.	X	—	—	
e. Inspect single-pass fillet welds, maximum $^{5}/_{16}$″, not defined in 2.b.	—	X	AWS D1.4 ACI 318: Ch. 26~~.13.3~~	
f. Inspect all other welds.	~~—~~X	~~X~~-	AWS D1.4 ACI 318: Ch. 26~~.13.3~~	
3. Inspect anchors cast in concrete.	—	X	ACI 318: Ch. 26~~.13.3.3~~	—
4. Inspect anchors post-installed in hardened concrete members.[b]				—
a. Adhesive anchors installed in horizontally or upwardly inclined orientations to resist sustained tension loads.	X	—	ACI 318: Ch. 26~~.13.3.2~~	
b. Mechanical anchors and adhesive anchors not defined in 4.a.	—	X	ACI 318: Ch. 26~~.13.3~~	
5. Verify use of required design mix.	X	~~X~~	ACI 318: Ch. ~~19,~~ 26 ~~.4.3, 26.4.4~~	1904.1, 1904.2
6. Prior to and during concrete placement, fabricate specimens for strength tests, perform slump and air content tests, and determine the temperature of the concrete.	X	—	ASTM C31 ASTM C172 ACI 318: Ch. 26~~.5, 26.12~~	—
7. Inspect concrete and shotcrete placement for proper application techniques.	X	—	ACI 318: Ch. 26~~.5~~	—
8. Verify maintenance of specified curing temperature and techniques.	—	X	ACI 318: Ch. 26~~.5.3-26.5.5~~	—
9. Inspect prestressed concrete for:				
a. Application of prestressing forces.	X	—	ACI 318: Ch. 26~~.10~~	—
b. Grouting of bonded prestressing tendons.	X	—		
10. Inspect erection of precast concrete members.	—	X	ACI 318: Ch. 26~~.9~~	—
11. For precast concrete diaphragm connections or reinforcement at joints classified as moderate or high deformability elements (MDE or HDE) in structures assigned to Seismic Design Category C, D, E or F, inspect such connections and reinforcement in the field for:			ACI 318: Ch. 26~~.13.1.3~~	
a. Installation of the embedded parts.	X	—		—
b. Completion of the continuity of reinforcement across joints.	X	—	ACI 550.5	
c. Completion of connections in the field.	X	—		
12. Inspect installation tolerances of precast concrete diaphragm connections for compliance with ACI 550.5.	—	X	ACI 318: Ch. 26~~.13.1.3~~	—
13. Verify in-situ concrete strength, prior to stressing of tendons in posttensioned concrete and prior to removal of shores and forms from beams and structural slabs.	—	X	ACI 318: Ch. 26~~.11.2~~	—
14. Inspect formwork for shape, location and dimensions of the concrete member being formed.	—	X	ACI 318: Ch. 26 ~~.11.1.2(b)~~	—

For SI: 1 inch = 25.4 mm.

a. Where applicable, see Section 1705.13.

b. Specific requirements for special inspection shall be included in the research report for the anchor issued by an approved source in accordance with 26.13 in ACI 318, or other qualification procedures. Where specific requirements are not provided, special inspection requirements shall be specified by the registered design professional and shall be approved by the building official prior to the commencement of the work.

Reason: Coordination between special inspection requirements in ACI 318 Ch. 26 and Table 1705.3 is consistently out of sync. By changing the reference standard pointer to just be Chapter 26: Construction Documents and Inspection (the only chapter directed at construction, all other chapters are directed to the designer), issues with 1705.3 not being aligned with ACI 318 is removed.

Items 1a and 1b: Amend required special inspections and tests of concrete construction table to include inspection of reinforcement in special moment frames, boundary elements of special structural walls and coupling beams as required by ACI 318-19 Section 26.13.1.3. This proposal corrects the exclusion of the required special inspections table for concrete construction of special structural systems. The proposal amends the table to include continuous inspections of reinforcement in special moment frames, boundary elements of special structural walls and coupling beams.

Item 2b: Amend to include intermediate moment frames and shear reinforcement for special structural walls to require continuous (rather than periodic) welding special inspection given the critical design role of such reinforcement.

Item 2e: Clarifying that 5/16” or less fillet welds associated with those critical elements in item 2b are to receive continuous rather than periodic welding special inspection.

Item 2f: Proposal to change back to previous continuous special inspection requirement since welds not addressed by other items should receive continuous rather than periodic special inspection, such as for common concrete tilt-up wall panel-to-panel chord bar connections. Item 2.e. addresses welds that should receive periodic special inspection. Further information and background were provided during the 2022 ICC public comment period for the 2024 IBC by Stephen Kerr and Roy Lobo, both representing the Structural Engineers Association of California (SEAOC) in response to the change from continuous to periodic in the IBC model code:

> The proposed modification is intended to preserve the "all other welds" as continuous. The proponent of S143 is correct that back in 2012 the change did modify the inspection requirements shifting the other welds to continuous. However, the change S148-12 was clear that the modifications in the change were not just organizational. The original reason statement from S148-12:
>
> > "... The purpose for this proposal is to simplify the required extent (continuous or periodic) of special inspection for the welding of reinforcing bars, which is currently based on the structural design (e.g., resisting flexural, axial or shear forces). The proposal changes the extent to continuous special inspection of all welding of reinforcing bars except for single-pass fillet welds that are a maximum of 5/16-inch where periodic special inspection is permitted. This will also be consistent with the historical approach taken by the building code for the extent of special inspections related to welding."
>
> The change to limit the periodic welding was clearly spelled out in the S148-12 change. This has been argued in subsequent code cycles with proposals S136-16 and S96-19. The code has still maintained that "all other welds" as continuously inspected. If item f "all other welds" are considered to be periodically inspected, then there is a conflict with item e for fillet welds a maximum of 5/16". Larger multi-pass fillet welds do not fall under items a - e, therefore would be considered an "all other weld" and would be periodically inspected. The larger multi-pass welds should continue to be continuously inspected.
>
> There are some additional welds that could reasonably be periodically inspected, rather than continuous. However these welds should be clearly spelled out, similar to the item e 5/16" fillet welds.

Item 5: Proposal aligns inspection requirements with reference standard ACI 318-19 Section 26.13.3.2(a) requirements.

Item 6: Proposal adding “and during” ensures concrete sampling complies with ASTM C172 requirements including sampling during placement. Sampling only prior to placement could lead to substantial delays between sampling and placement, which can lead to concrete curing or other detrimental effects not being captured by samples taken only prior to placement.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

This proposal brings alignment between ACI 318 and IBC.

Staff Analysis: CC # S112-25 and CC # S113-25 addresses requirements in a different or contradicting manner. The committee is urged to make their intensions clear with their actions on these proposals.

S113-25

IBC: TABLE 1705.3

Proponents: Stephen Szoke, representing American Concrete Institute (steve.szoke@concrete.org)

2024 International Building Code

Revise as follows:

TABLE 1705.3 REQUIRED SPECIAL INSPECTIONS AND TESTS OF CONCRETE CONSTRUCTION

Portions of table not shown remain unchanged.

TYPE	CONTINUOUS SPECIAL INSPECTION	PERIODIC SPECIAL INSPECTION	REFERENCED STANDARD[a]	IBC REFERENCE
1. Inspect reinforcement, and verify placement				
~~1.~~ ~~Inspect~~ a. Steel reinforcement, including prestressing tendons~~, and verify placement.~~	—	X	ACI 318: Ch. 20, 25.2, 25.3, 26.6.1-26.6.3	—
b. GFRP reinforcement	--	X	ACI CODE 440.11: Ch 26	
2. Reinforcing bar welding:				
a. Verify weldability of reinforcing bars other than ASTM A706.	—	X	AWS D1.4 ACI 318: 26.13.1.4	
b. Inspect welding of reinforcement for special moment frames, boundary elements of special structural walls and coupling beams.	X	—	AWS D1.4 ACI 318: 26.13.3	—
c. Inspect welded reinforcement splices.	X	—	—	
d. Inspect welding of primary tension reinforcement in corbels.	X	—	—	
e. Inspect single-pass fillet welds, maximum $^5/_{16}$″.	—	X	AWS D1.4 ACI 318: 26.13.3	
f. Inspect all other welds.	—	X	AWS D1.4 ACI 318: 26.13.3	
3. Inspect anchors cast in concrete.	—	X	ACI 318: 26.13.3.3	—
4. Inspect anchors post-installed in hardened concrete members.[b]				—
a. Adhesive anchors installed in horizontally or upwardly inclined orientations to resist sustained tension loads.	X	—	ACI 318: 26.13.3.2	
b. Mechanical anchors and adhesive anchors not defined in 4.a.	—	X	ACI 318: 26.13.3	
5. Verify use of required design mix.	—	X	ACI 318: Ch. 19, 26.4.3, 26.4.4	1904.1, 1904.2
6. Prior to concrete placement, fabricate specimens for strength tests, perform slump and air content tests, and determine the temperature of the concrete.	X	—	ASTM C31 ASTM C172 ACI 318: 26.5, 26.12	—
7. Inspect concrete and shotcrete placement for proper application techniques.	X	—	ACI 318: 26.5	—
8. Verify maintenance of specified curing temperature and techniques.	—	X	ACI 318: 26.5.3-26.5.5	—
9. Inspect prestressed concrete for:				
a. Application of prestressing forces.	X	—	ACI 318: 26.10	—
b. Grouting of bonded prestressing tendons.	X	—		
10. Inspect erection of precast concrete members.	—	X	ACI 318: 26.9	—
11. For precast concrete diaphragm connections or reinforcement at joints classified as moderate or high deformability elements (MDE or HDE) in structures assigned to Seismic Design Category C, D, E or F, inspect such connections and reinforcement in the field for:			ACI 318: 26.13.1.3	
a. Installation of the embedded parts.	X	—		—
b. Completion of the continuity of reinforcement across joints.	X	—	ACI 550.5	
c. Completion of connections in the field.	X	—		
12. Inspect installation tolerances of precast concrete diaphragm connections for compliance with ACI 550.5.	—	X	ACI 318: 26.13.1.3	—
13. Verify in-situ concrete strength, prior to stressing of tendons in posttensioned concrete and prior to removal of shores and forms from beams and structural slabs.	—	X	ACI 318: 26.11.2	—
14. Inspect formwork for shape, location and dimensions of the concrete member being formed.	—	X	ACI 318: 26.11.1.2(b)	—

For SI: 1 inch = 25.4 mm.

a. Where applicable, see Section 1705.13.

b. Specific requirements for special inspection shall be included in the research report for the anchor issued by an approved source in accordance with 26.13 in ACI 318, or other qualification procedures. Where specific requirements are not provided, special inspection requirements shall be specified by the registered design professional and shall be approved by the building official prior to the commencement of the work.

Reason: This code change proposal provides a pointer to the requirements of special inspection of structural concrete reinforced with GFRP bars. While the inspection requirements are maintained as mandatory requirements in ACI CODE 440.11, code officials in jurisdictions where GFRP bars are being accepted recommended adding this pointer to Table 1705.3. This language is informative and consistent with current inspection criteria for steel reinforcement, directing users to ACI 318.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

This code change proposal has no impact on cost. ACI CODE 440.11 referenced in the IBC requires inspection. This proposal simply is a pointer to the inspection requirements ACI CODE 440.11

Staff Analysis: CC # S113-25 and CC # S112-25 addresses requirements in a different or contradicting manner. The committee is urged to make their intensions clear with their actions on these proposals.

S113-25

S114-25

IBC: SECTION 1705, 1705.5.2

Proponents: Emily Dunham, representing NCSEA Code Advisory Committee Special Inspections/Quality Assurance Subcommittee (emily.dunham@greshamsmith.com); Emily Guglielmo, representing NCSEA (eguglielmo@martinmartin.com)

2024 International Building Code

SECTION 1705 REQUIRED SPECIAL INSPECTIONS AND TESTS

Revise as follows:

1705.5.2 Metal-plate-connected wood trusses spanning 60 feet or greater. Where a truss clear span is 60 feet (18 288 mm) or greater, the *special inspector* shall verify that the temporary installation restraint/bracing and the permanent individual truss member restraint/bracing are installed in accordance with the ~~*approved* truss submittal package~~ <u>design prepared in accordance with section 2303.4.1.3</u>.

Reason: Section 2303.4.1.3 requires a truss plan to be developed by a registered design professional for truss bracing in trusses 60 feet or greater. Special inspections of the truss bracing should be performed in reference to this document rather than a truss submittal as the truss submittal may not include the specific bracing plan. For example, this bracing design could be provided as part of the construction documents, as a deferred submittal, or as a delegated design.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

No cost impact is anticipated. This is a clarification of where to find specifications for the bracing that needs to be inspected.

S114-25

S115-25

IBC: 1705.10, SECTION 1708, 1708.1, 1708.2, 1708.3 (New)

Proponents: Emily Dunham, Gresham Smith, representing NCSEA Code Advisory Committee Special Inspections/Quality Assurance Subcommittee (emily.dunham@greshamsmith.com); Emily Guglielmo, representing NCSEA (eguglielmo@martinmartin.com)

2024 International Building Code

Delete without substitution:

~~**1705.10 Structural integrity of deep foundation elements.** . Whenever there is a reasonable doubt as to the structural integrity of a *deep foundation* element, an engineering assessment shall be required. The engineering assessment shall include tests for defects performed in accordance with ASTM D4945, ASTM D5882, ASTM D6760 or ASTM D7949, or other *approved method*.~~

Revise as follows:

SECTION 1708
IN-SITU LOAD AND INTEGRITY TESTS

1708.1 General. Whenever there is a reasonable doubt as to the structural integrity, stability or load-bearing capacity of a completed *building*, *structure* or portion thereof for the expected *loads*, an engineering assessment shall be required. The engineering assessment shall involve ~~either~~ a structural analysis, ~~or an~~ in-situ load tests, or both. The structural analysis shall be based on actual material properties and other as-built conditions that affect stability or load-bearing capacity, and shall be conducted in accordance with the applicable design standard. The in-situ ~~load~~ tests shall be conducted in accordance with Section 1708.2 or 1708.3.

If the *building*, *structure* or portion thereof is found to have inadequate stability or load-bearing capacity for the expected *loads*, modifications to ensure structural adequacy or the removal of the inadequate construction shall be required.

1708.2 In-situ load tests. In-situ load tests shall be conducted in accordance with Section 1708.2.1 or 1708.2.2 and shall be supervised by a *registered design professional*. The test shall simulate the applicable loading conditions specified in Chapter 16 as necessary to address the concerns regarding structural stability of the *building*, *structure* or portion thereof.

Add new text as follows:

1708.3 In-situ structural integrity testing of deep foundation elements. In-situ structural integrity tests of deep foundation elements shall be conducted in accordance with ASTM D4945, ASTM D5882, ASTM D6760, ASTM D7949, or other *approved methods* and shall be supervised by a *registered design professional*.

Reason: Structural integrity testing where there is a reasonable doubt of deep foundation integrity was added to section 1705, Required Special Inspections and Tests, in 2021. Unlike the rest of section 1705, section 1705.10 does not ensure compliance with the code and approved construction documents, but rather are tests to evaluate deep foundations suspected to be out of compliance. These tests would not typically be part of a special inspection and testing program developed prior to construction and therefore should not be included in section 1705. The requirements for integrity testing should be moved to section 1708 where, along with in-situ load testing and structural analysis of as-built conditions, they would be used to evaluate questionable as-built construction.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

The proposal is an editorial change moving the clause out of a section intended for special inspections and into a section about in-situ testing.

S116-25

IBC: SECTION 1705, 1705.13

Proponents: Jeff Grove, Chair, representing BCAC (bcac@iccsafe.org)

2024 International Building Code

SECTION 1705
REQUIRED SPECIAL INSPECTIONS AND TESTS

Revise as follows:

1705.13 Special inspections for seismic resistance. *Special inspections* for seismic resistance shall be required as specified in Sections 1705.13.1 through 1705.13.9, unless exempted by the exceptions of Section 1704.2.

Exception: The *special inspections* specified in Sections 1705.13.1 through 1705.13.9 are not required for *structures* designed and constructed in accordance with one of the following:

1. The *structure* consists of *light-frame construction*; the design spectral response acceleration at short periods, S_{DS}, as determined in Chapter 11 of ASCE/SEI 7 ~~Section 1613.2.4~~, does not exceed 0.5; and the *building height* of the *structure* does not exceed 35 feet (10 668 mm).
2. The *seismic force-resisting system* of the *structure* consists of *reinforced masonry* or reinforced concrete; the design spectral response acceleration at short periods, S_{DS}, as determined in Chapter 11 of ASCE/SEI 7 ~~Section 1613.2.4~~, does not exceed 0.5; and the *building height* of the *structure* does not exceed 25 feet (7620 mm).
3. The *structure* is a detached one- or two-family *dwelling* not exceeding two *stories above grade plane* and does not have any of the following horizontal or vertical irregularities in accordance with Section 12.3 of ASCE 7:
   - 3.1. Torsional or extreme torsional irregularity.
   - 3.2. Nonparallel systems irregularity.
   - 3.3. Stiffness-soft story or stiffness-extreme soft story irregularity.
   - 3.4. Discontinuity in lateral strength-weak story irregularity.

Reason: Section 16.13.2.4, Design spectral response acceleration parameters, was eliminated from the 2024 IBC by S128-22, by removing the equation for SDS. S128-22 simplified IBC Section 1613 by replacing ground motion acceleration maps with Seismic Design Category (SDC) maps based on default site conditions. Chapter 11 of ASCE 7 provides equation 11.4-1 for SDS. Without this proposed change, the exception will reference a code section and equation that is not contained 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. In 2023 and 2024 the BCAC has held several virtual meetings open to any interested party. In addition, there were numerous virtual Working Group meetings for the current code development cycle, which included members of the committee as well as interested parties. Related documents and reports are posted on the BCAC website at BCAC webpage.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

No cost – the proposal is editorial in that it cleans up reorganization of Section 1613.

S116-25

S117-25 Part I

IBC: 1803.5.3, ASTM Chapter 35 (New)

Proponents: David Sparks, Felten Group, Inc., representing Post-Tensioning Institute (PTI) DC10.5 Slab-on-ground Committee (david.sparks@feltengroup.com)

THIS IS A 2 PART CODE CHANGE. PART I WILL BE HEARD BY THE IBC STRUCTURAL CODE COMMITTEE. PART II WILL BE HEARD BY THE IRC-B CODE COMMITTEE. SEE THE TENTATIVE HEARING ORDER FOR THESE COMMITTEES.

2024 International Building Code

Revise as follows:

1803.5.3 Expansive soil. In areas likely to have expansive soil, the *building official* shall require soil tests to determine where such soils do exist.Soils meeting all four of Items 1 through 3 or Item 4 of the following provisions shall be considered to be expansive, except that tests to show compliance with Items 1, 2 and 3 shall not be required if the test prescribed in Item 4 is conducted:

1. Plasticity Index (PI) of 15 or greater, determined in accordance with ASTM D4318.
2. More than 10 percent of the soil particles pass a No.200 sieve (75 µm), determined in accordance with ASTM D6913 .
3. More than 10 percent of the soil particles are less than 5 micrometers in size, determined in accordance with ASTM D6913 D7928 .
4. Expansion Index greater than 20, determined in accordance with ASTM D4829.

Add new standard(s) as follows:

ASTM

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

D7928-21E1	Standard Test Method for Particle-Size Distribution (Gradation) of Fine-Grained Soils Using the Sedimentation (Hydrometer) Analysis

S117-25 Part I

S117-25 Part II

IRC: R403.1.8.1, ASTM Chapter 44, ASTM Chapter 44 (New)

Proponents: David Sparks, Felten Group, Inc., representing Post-Tensioning Institute (PTI) DC10.5 Slab-on-ground Committee (david.sparks@feltengroup.com)

2024 International Residential Code

Revise as follows:

R403.1.8.1 Expansive soils classifications. Soils meeting all of Items 1 through 3 or Item 4 of the following provisions shall be considered to be expansive~~, except that tests to show compliance with Items 1, 2 and 3 shall not be required if the test prescribed in Item 4 is conducted~~:

1. Plasticity Index (PI) of 15 or greater, determined in accordance with ASTM D4318.
2. More than 10 percent of the soil particles pass a No. 200 sieve (75 µm), determined in accordance with ASTM ~~D422~~ D6913.
3. More than 10 percent of the soil particles are less than 5 micrometers in size, determined in accordance with ASTM ~~D422~~ D7928.
4. Expansion Index greater than 20, determined in accordance with ASTM D4829.

Delete without substitution:

ASTM

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

~~D422—63(2007)E2~~	~~Test Method for Particle-Size Analysis of Soils~~

Add new standard(s) as follows:

D6913/D6913M - 17	Standard Test Methods for Particle-Size Distribution (Gradation) of Soils Using Sieve Analysis
D7928-21E1	Standard Test Method for Particle Size Distribution (Gradation) of Fine-Grained Soils Using the Sedimentation (Hydrometer) Analysis

Reason: For both the IBC and IRC, the language in the existing code was not clear and/or direct in identifying that two conditions exist. Either you comply with all of items 1 through 3 or you comply with item 4 alone. The revised language is used to simplify and clearly indicate what is required without confusion to the reader. So instead of using the original language which started out stating that a soils is considered expansive when it meets all of the 4 requirements with an exception excluding items 1, 2 and 3 if the user performs testing that meets item 4 requirements, this simplification creates a direct path with the two choices. It does not change the code intent.

1803.5.3 and R403.1.8.1 should match. They describe exactly the same thing, but for some reason they were not aligned. This proposed change brings the two into alignment with all the current testing method standards referenced.

For the IBC:

ASTM D6913 is not the correct standard for item 3. The correct standard is actually ASTM D7928. The correction to the referenced ASTM standard also requires the addition of ASTM D7928 within Chapter 35.

For the IRC:

ASTM D422 is no longer used and instead items 2 and 3 should reference ASTM D6913 and D7928 respectively to be correct and consistent with the IBC. This requires the deletion of the reference to ASTM D422 as well as the addition of D6913 and D7928 within Chapter 44.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

This is merely clarifying existing language to make the code path clear and also to reference the correct standard for the testing required for compliance with item 3.

Staff Analysis: Part I: A review of the standard proposed for inclusion in the code, ASTM D7928-21E1 Standard Test Method for Particle-Size Distribution (Gradation) of Fine-Grained Soils Using the Sedimentation (Hydrometer) Analysis, with regard to some of the key ICC criteria for referenced standards (Section 4.6 of CP#28) will be posted on the ICC website on or before April 1, 2025.

Part II: A review of the standard proposed for inclusion in the code, ASTM D7928-21E1 Standard Test Method for Particle-Size Distribution (Gradation) of Fine-Grained Soils Using the Sedimentation (Hydrometer) Analysis, with regard to some of the key ICC criteria for referenced standards (Section 4.6 of CP#28) will be posted on the ICC website on or before April 1, 2025.

The proposed referenced standard, ASTM D6913/D6913M – 17 Standard Test Methods for Particle-Size Distribution (Gradation) of Soils Using Sieve Analysis, is currently referenced in the IBC.

S117-25 Part II

S118-25

IBC: SECTION 202 (New), 1803.5.6 (New), 1803.6

Proponents: Lori Simpson, Langan, representing Geocoalition (lsimpson@langan.com); Daniel Stevenson, Berkel and Company Contractors, Inc., representing GeoCoalition (dstevenson@berkelapg.com)

2024 International Building Code

Add new text as follows:

GROUND *IMPROVEMENT*. A technique which modifies the existing ground to improve the load bearing capacity of foundations, control settlement, and/or improve stability.

1803.5.6 *Ground improvement*. Where shallow foundations will bear on *improved* ground, a geotechnical investigation shall be conducted and shall include the following as applicable:

1. Recommended *ground improvement* methods.
2. Required improvement depth and horizontal extent.
3. *Ground improvement* installation procedures.
4. Required testing to confirm design assumptions.
5. Special inspection requirements.
6. Suitability of *ground improvement* materials for the intended environment.
7. Acceptance criteria.
8. Requirements for preparation of construction documents by delegated designer, as appropriate.

Revise as follows:

1803.6 Reporting. Where geotechnical investigations are required, a written report of the investigations shall be submitted to the *building official* by the *permit* applicant at the time of *permit* application. This geotechnical report shall include, but need not be limited to, the following information:

1. A plot showing the location of the soil investigations.
2. A complete record of the soil boring and penetration test logs and soil samples.
3. A record of the soil profile.
4. Elevation of the water table, if encountered.
5. Recommendations for foundation type and design criteria, including but not limited to: bearing capacity of natural or compacted soil; provisions to mitigate the effects of expansive soils; mitigation of the effects of liquefaction, differential settlement and varying soil strength; and the effects of adjacent *loads*.
6. Expected total and differential settlement.
7. *Deep foundation* information in accordance with Section 1803.5.5.
8. Special design and construction provisions for foundations of *structures* founded on expansive soils, as necessary.
9. Compacted fill material properties and testing in accordance with Section 1803.5.8.
10. *Controlled low-strength material* properties and testing in accordance with Section 1803.5.9.
11. *Ground improvement* system information in accordance with Section 1803.5.6.

Reason: Ground Improvement systems are methods which can enhance the load-bearing capacity of the ground below shallow foundations and/or control total and differential settlements within the zone of influence of the foundations. Ground improvement systems are most often used as an alternative to deep foundations (i.e., pile foundations). There is no established standard for the design or installation of ground improvement systems.

Failures of ground improvement systems can have significant impact on the structural integrity of a building. The objective of this proposal is to provide consistent requirements for a geotechnical investigation where ground improvement is recommended.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

Ground improvement is commonly used; this code addition does not cause a cost impact, but provides consistent requirements for the geotechnical investigation report.

S118-25

S119-25

IBC: 1806.2

Proponents: John-Jozef Proczka, representing City of Phoenix Planning and Development Department (john-jozef.proczka@phoenix.gov)

2024 International Building Code

Revise as follows:

1806.2 Presumptive load-bearing values. The load-bearing values used in design for undisturbed supporting soils, compacted fill per the exception to Section 1804.6, and rock near the surface shall not exceed the values specified in Table 1806.2 unless data to substantiate the use of higher values are submitted and *approved*. Where the *building official* has reason to doubt the classification, strength or compressibility of the soil or rock, the requirements of Section 1803.5.2 shall be satisfied.

Presumptive load-bearing values shall apply to materials with similar physical and engineering characteristics. Mud, organic silt and organic clays (OL, OH), peat (Pt) and undocumented fill shall not be assumed to have a presumptive load-bearing capacity unless data to substantiate the use of such a value are submitted.

Exception: A presumptive load-bearing capacity shall be permitted to be used where the *building official* deems the load-bearing capacity is adequate for the support of lightweight or *temporary structures*.

Reason: The presumptive load-bearing values of soils are associated with undisturbed soils. This is present in this section in a round-about way already by indicating that undocumented fill shall not be assumed to have a presumptive capacity, but soil that is disturbed becoming the category of undocumented fill is not a leap that is readily made without this clarification. Additionally, this is already present as a requirement in Section 1809.2 that is specific to shallow foundations, however it should be placed in the presumptive load-bearing section to ensure these presumptive values are not misused and it clarifies the presumptive capacities for embedded posts and poles and deep foundations are not used with disturbed soil.

Section 1804.6 exempts compacted fill material less than 12 inches in depth from requiring a geotechnical report, and without a geotechnical report the only possible source of load bearing values for that fill is contained in these presumptive provisions. This will clarify this path for the code user.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

This is a clarification of requirements already present to make them more obvious.

S119-25

S120-25

IBC: 1807.1.1

Proponents: Kelly Cobeen, Wiss Janney Elstner Associates, representing Self (kcobeen@wje.com); Seth Thomas, KPFF Consulting Engineers, representing Self (seth.thomas@kpff.com); Emily Guglielmo, representing NCSEA (eguglielmo@martinmartin.com)

2024 International Building Code

Revise as follows:

1807.1.1 Design lateral soil loads. Foundation walls shall be designed for the lateral soil *loads* set forth in Section 1610. For structures assigned to *Seismic Design Category* D, E or F, the design of foundation walls supporting more than 6 ft. (1829 mm.) of backfill shall incorporate the additional seismic lateral earth pressure in accordance with the geotechnical investigation, where required by Section 1803.2.

Reason: This proposal is intended as a clarification of current design practice, making the seismic lateral earth pressure requirements of Section 1807.1 (foundation walls) consistent with Section 1807.2 (retaining walls). We believe this to be editorial clarification, because we believe that engineers implementing these provisions would consider a foundation wall that retains soil to also be a retaining wall and thus required to meet applicable Section 1807.2 provisions. This clarification is being made in part because the terms foundation wall and retaining wall are used differently in the IRC and could provide confusion for IBC users.

The additional lateral loading from seismic generated earth pressures is an important factor for performance in high seismic hazard areas, particularly in Seismic Design Categories (SDCs) D, E and F. Several studies show, however, that when the peak ground acceleration is below 0.3-0.4g (roughly corresponding to SDC A, B and C) there is an adequate factor of safety built into the static earth pressures, so the additional seismic lateral pressure need not be included.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

This proposal provides editorial clarification consistent with current practice, with no substantive change.

S120-25

S121-25

IBC: 1807.3, 1807.3.1, 1807.3.2.3

Proponents: John-Jozef "JJ" Proczka, City of Phoenix, representing City of Phoenix Planning and Development Department (john-jozef.proczka@phoenix.gov)

2024 International Building Code

1807.3 Embedded posts and poles. Designs to resist both axial and lateral *loads* employing posts or poles as columns embedded in earth or in concrete footings in earth shall be in accordance with Sections 1807.3.1 through 1807.3.3 or ASABE EP 486.3.

Revise as follows:

1807.3.1 Limitations. The design procedures outlined in this section are subject to the following limitations:

1. The frictional resistance for structural walls and slabs on silts and clays shall be limited to one-half of the normal force imposed on the soil by the weight of the footing or slab.
2. Posts embedded in earth shall not be used to provide lateral support for structural or nonstructural materials such as plaster, masonry or concrete unless bracing is provided that develops the limited deflection required.
3. The embedded post or pole shall follow the provisions of this section without being required to follow the *deep foundation* provisions if the ratio of the depth of embedment to the least horizontal dimension of the part embedded in earth is less than or equal to six.
4. The depth of embedment shall not exceed 12 feet for the purpose of calculating lateral pressure.

Wood poles shall be treated in accordance with AWPA U1 for sawn timber posts (Commodity Specification A, Use Category 4B) and for round timber posts (Commodity Specification B, Use Category 4B).

1807.3.2.3 Vertical load. The resistance to vertical *loads* shall be determined using the vertical foundation pressure set forth in Table 1806.2, the downward shaft resistance of Section 1810.3.3.1.4, or as determined in a geotechnical report for this type of foundation..

Reason: *Shallow foundations* and *deep foundations* are defined. With a straight reading, all embedded posts and poles are deep foundations. As such, all of the deep foundation provisions would need to be followed and these embedded post and pole provisions just become poorly located deep foundation provisions in the code. This is not the intent of the code. These embedded posts and poles are intended to be their own category before reaching the nonlinear interaction of soil and foundation for lateral loads that characterizes truly deep foundations.

The primary change in this proposal is to apply the ratio of embedment to least horizontal dimension and apply it to these basic provisions so that all of the deep foundation provisions do not need to be followed, as this will limit the behavior to behave rigidly with respect to the soil.

The 12 foot depth item is already present in the code in the definition of "d" used in the equations. It is a difficult to find/easy to miss item, and is really a limitation, so this proposal brings more prominence to it by placing it in the limitations section.

The shaft resistance provisions for axial loads are brought in as an option to resist downward loading, as they are prescriptive and there is no reason not to allow their use for this type of foundation as an option to the end bearing resistance that is currently the only option. Note that uplift loads are not included as there is a separate deep foundation section for those.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

This proposal could increase or could decrease the cost of construction depending on the interpretation that is currently being enforced, due to the current conflict between code intent and code wording. Based upon the intent of the code there would be no cost impact.

S122-25 Part I

IBC: 1808.1, 1808.2.1 (New), PTI Chapter 35 (New)

Proponents: David Sparks, representing Post-Tensioning Institute (PTI) DC10.5 Slab-on-ground Committee (david.sparks@feltengroup.com)

THIS IS A 2 PART CODE CHANGE. PART I WILL BE HEARD BY THE IBC STRUCTURAL CODE COMMITTEE. PART II WILL BE HEARD BY THE IRC-B CODE COMMITTEE. SEE THE TENTATIVE HEARING ORDER FOR THESE COMMITTEES.

2024 International Building Code

Revise as follows:

1808.1 General. Foundations shall be designed and constructed in accordance with Sections 1808.2 through 1808.9. *Shallow foundations* shall satisfy the requirements of Section 1809. *Deep foundations* shall satisfy the requirements of Section 1810.

Exception: Design of post-tensioned slabs-on-ground need not comply with the requirements of Sections 1808.8, 1809, and 1810. Materials and construction of post-tensioned slabs-on-ground shall comply with PTI DC10.5 and PTI M10.6.

Add new text as follows:

1808.2.1 Post-tensioned slabs-on-ground.. Post-tensioned slabs-on-ground shall be designed in accordance with PTI DC10.5.

Add new standard(s) as follows:

PTI

Post-Tensioning Institute
38800 Country Club Drive
Farmington Hills, MI 48331

M10.6-15 Specification for Unbonded Single Strand Tendons for Slab-on-Ground Construction

S122-25 Part I

S122-25 Part II

IRC: R402.5 (New), R403.6 (New), PTI Chapter 44 (New)

Proponents: David Sparks, representing Post-Tensioning Institute (PTI) DC10.5 Slab-on-ground Committee (david.sparks@feltengroup.com)

2024 International Residential Code

Add new text as follows:

R402.5 **Post-tensioned slabs-on-ground..** Post-tensioned slabs-on-ground materials and installation shall be in accordance with PTI DC10.5 and PTI M10.6.

R403.6 **Post-tensioned slabs-on-ground..** Post-tensioned slabs-on-ground constructed on soil not classified as expansive in accordance with Section R403.1.8.1 shall be designed in accordance with PTI DC10.5.

Add new standard(s) as follows:

PTI

Post-Tensioning Institute
38800 Country Club Drive
Farmington Hills, MI 48331

M10.6-15	Specification for Unbonded Single Strand Tendons for Slab-on-Ground Construction

Reason: Currently, the IBC only contains a reference to the PTI DC10.5 standard for Post-Tensioned Slabs-On-Ground (PTSOG) within chapter 1808.6.2 (which is under expansive soils). The title of the PTI DC10.5 standard does include soils that are not considered expansive as defined by 1803.5.3. Without a reference to the PTI DC10.5 standard from a section of 1808 that is not exclusive to expansive soils, there is currently no path from the IBC to the PTI DC10.5 document for the design of PTSOG on stable soils. Because the PTI DC10.5 standard contains stand-alone provisions for concrete specifications and shallow foundation design methodologies, it is necessary to add an exception in 1808.1 indicating that PTSOG need not comply with 1808.8, 1809, and because it is not a deep foundation 1810. Additionally, since all foundations must be designed for capacity and settlement including non-expansive and expansive soils, the reference for non-expansive soils can be inserted into a subsection of 1808.2 - 1808.2.1. This will direct PTSOG design for non-expansive soils to the DC10.5 standard.

Although the 2024 IRC added a reference to the DC10.5 standard in Chapter 5 (Floors), this did not address the need for a reference to the standard under Chapter 4 (Foundations) beyond Section R403.1.8 for expansive soils which refers back to 1808.6 in the IBC. In order to better define the PTSOG as a foundation, we suggest adding section R402.5 for the materials and installation of PTSOG directing scope to DC10.5 and additionally the M10.6 document. Once that is in place, then a new section under R403 for PTSOG (R403.6) which will indicate that PTSOG on soils not classified as expansive per R403.1.8.1 shall be designed per the DC10.5 standard, with a reference to R403.1.8 for expansive soils).

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

These changes to the IBC and IRC are meant to clarify the scope of the DC10.5 document as it pertains to non-expansive soils. As such, there is no cost increase or decrease associated with the changes.

Staff Analysis: A review of the standard proposed for inclusion in the code, PTI M10.6-15 Specification for Unbonded Single Strand Tendons for Slab-on-Ground Construction, with regard to some of the key ICC criteria for referenced standards (Section 4.6 of CP#28) will be posted on the ICC website on or before April 1, 2025.

S122-25 Part II

S123-25

IBC: SECTION 202 (New), 1705.6.1 (New), TABLE 1705.6.1 (New), 1809.15 (New), 1809.15.1 (New), 1809.15.1.1 (New), 1809.15.2 (New), 1809.15.3 (New), 1809.15.4 (New)

Proponents: Lori Simpson, Langan, representing Geocoalition (lsimpson@langan.com); Daniel Stevenson, Berkel and Company Contractors, Inc., representing GeoCoalition (dstevenson@berkelapg.com)

2024 International Building Code

Add new definition as follows:

LOAD TRANSFER LAYER. Granular or cementitious materials placed between ground improvement elements and shallow foundations.

Add new text as follows:

1705.6.1 Ground improvement. Special Inspections and tests shall be performed during installation of *ground improvement* as specified in Table 1705.6.1. The approved geotechnical report and *construction documents* prepared by the *registered design professional* shall be used to determine compliance.

TABLE 1705.6.1 REQUIRED SPECIAL INSPECTIONS AND TESTS OF GROUND IMPROVEMENT

TYPE	CONTINUOUS SPECIAL INSPECTION	PERIODIC SPECIAL INSPECTION
1. Inspect implementation and verification procedures and maintain complete accurate records for each application of *ground improvement* systems.	X	-
2. Verify *ground improvement* equipment, materials, locations, diameters, and plumbness, as applicable.	X	-
3. Verify embedment into bearing strata, as applicable. Record relevant ground effects.	X	-
4. Verify working grade elevation	-	X
5. Verify material quantities used, as applicable.	X	-
6. Verify improvement using methods specified in geotechnical report.	-	X

1809.15 Ground improvement. *Ground improvement* shall be in accordance with this section.

1809.15.1 General. *Ground improvement* shall be designed, detailed, and constructed in accordance with sections 1809.15.1 through 1809.15.3.

1809.15.1.1 Geotechnical Investigation. *Ground improvement* shall be designed and installed on the basis of a geotechnical investigation and written report as set forth in Section 1803.

1809.15.2 Design. *Ground Improvement* for shallow foundation support shall be designed by a *registered design professional.* The *registered design professional* shall provide construction documents and calculations that include all of the following:

1. Structural loads, including vertical, lateral, and rotational, and maximum permissible total and differential settlements as provided by the *registered design professional in responsible charge* for the structure being supported.
2. Cut and fill heights, as shown on the site plan.
3. Geotechnical and structural capacity analyses.
4. Where required, thickness and characteristics of the load transfer layer.
5. Allowable bearing pressures.
6. Minimum safety factor used to determine the allowable bearing pressure. Where ground improvement includes individual elements, provide separate factors of safety for the individual elements and the overall system.
7. Predicted maximum total and differential settlements.

8. Recommended testing and acceptance criteria for the installation of the *ground improvement.*
9. Plans and specifications necessary for the completion of the work.

1809.15.3 Installation. *Ground improvement* shall be installed in accordance with construction documents provided by the *registered design professional.*

1809.15.4 Special inspection. Special inspections in accordance with 1705.6.1 shall be provided for *ground improvement.*

Reason: Ground Improvement systems are *methods which* can enhance the load-bearing capacity of the ground below shallow foundations and/or control total and differential settlements within the zone of influence of the foundations. Ground improvement systems are most often used as an alternative to deep foundations (i.e., pile foundations). There is no established standard for the design or installation of ground improvement.

Failures of ground improvement systems can have significant impact on the structural integrity of a building. The objective of this proposal is to provide consistent requirements for the design, construction, and inspection of ground improvement systems.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

Ground improvement is commonly used; this code addition does not cause a cost impact, but provides consistent requirements for design, construction, and inspection of ground improvement systems.

S123-25

S124-25

IBC: SECTION 202 (New), 1705.6.2 (New), TABLE 1705.6.2 (New), 1809.16 (New), 1809.16.1 (New), 1809.16.2 (New), 1809.16.2.1 (New), 1809.16.2.2 (New), 1809.16.2.3 (New), 1809.16.2.4 (New), 1809.16.2.4.1 (New), 1809.16.2.4.2 (New), 1809.16.2.4.2.1 (New), 1809.16.2.4.2.2 (New), 1809.16.2.4.2.3 (New), 1809.16.3 (New), 1809.16.4 (New)

Proponents: Lori Simpson, Langan, representing Geocoalition (lsimpson@langan.com); Daniel Stevenson, Berkel and Company Contractors, Inc., representing GeoCoalition (dstevenson@berkelapg.com)

2024 International Building Code

Add new definition as follows:

RIGID INCLUSIONS. Vertical elements within the ground consisting of timber, steel, *concrete*, grout, or other combination of cementitious materials mixed with aggregates, or other materials that are significantly stiffer than the ground in which they are installed and do not require lateral confinement of the surrounding soil for internal stability. Rigid inclusions are not connected directly to foundations.
RIGID INCLUSION SYSTEMS. *Rigid inclusions*, the strata and materials in which they are installed, and a *load transfer layer*.

Add new text as follows:

1705.6.2 Rigid inclusion systems. Special Inspections and tests shall be performed during installation of rigid inclusion systems as specified in Tables 1705.6.1 and 1705.6.2. The approved geotechnical investigation and *construction documents* prepared by the *registered design professional(s)* shall be used to determine compliance.

TABLE 1705.6.2 REQUIRED SPECIAL INSPECTIONS AND TESTS OF RIGID INCLUSION SYSTEMS

TYPE	CONTINUOUS SPECIAL INSPECTION	PERIODIC SPECIAL INSPECTION
1. Inspect installation and load testing operations, and maintain complete and accurate records for each *rigid inclusion*	X	-
2. Verify *rigid inclusion* materials, placement locations, diamters, and plubness. Verify embedment into bearing strata and adequate end-bearing strata capacity. Record concrete or grout volumes. Verify top of *rigid inclusions* elevations.	X	-
3. Perform test and *special inspections* on *concrete* or grout in accordance with applicable requirements of Section 1705.3	In accordance with Section 1705.3	
4. During *rigid inclusion* load transfer/layer installation, verify use of proper materials, procedures, material densities, and lift thicknesses.	X	-

1809.16 Rigid inclusions. *Rigid inclusions* shall be in accordance with this section.

1809.16.1 General. Where *ground improvement systems* use *rigid inclusions*, *rigid inclusion systems* shall be designed, detailed and installed in accordance with sections 1809.16.2 through 1809.16.1.3.

1809.16.2 Design and detailing. *Rigid inclusion systems* shall be designed and detailed in accordance with sections 1809.16.2.1 through 1809.16.2.4.

1809.16.2.1 Design requirements. In addition to the requirements of Section 1809.15.1, the *registered design professional* shall provide construction documents and calculations that include all of the following:

1. The load distribution and strain compatibility between the *rigid inclusions* and surrounding strata.
2. The structural compatibility between the *rigid inclusions* and the shallow foundations including impacts of concentrated reaction loads imposed by the *rigid inclusions* on shallow foundations.
3. Minimum number and configuration of *rigid inclusions* to establish vertical, lateral, and rotational stability of foundations.

1809.16.2.2 Allowable stresses. The allowable stresses for materials used in *rigid inclusions* shall be in accordance with section

1810.3.2.6. Allowable stresses for materials not included in section 1810.3.2.6 shall be approved by the *building official.*

1809.16.2.3 Load Test. Where *rigid inclusions* are used to increase bearing capacity, or where predicted settlements without *rigid inclusions* would cause harmful distortion or instability in the structure, control test elements shall be tested in accordance with ASTM D1143 or ASTM D4945. One or more load tests shall be conducted in each area of similar subsurface conditions. The resulting allowable load shall be not more than one-half of the ultimate load bearing capacity as assessed by one of the published methods listed in section 1810.3.3.1.3.

1809.16.2.4 Seismic Design Categories C through F. For structures assigned to *seismic design category* C, D, E or F, materials used in *rigid inclusions* shall comply with section 1809.16.2.4.1, and reinforcement shall be provided in accordance with section 1809.16.2.4.2.

1809.16.2.4.1 Materials. For structures assigned to *seismic design category* C, D, E or F, materials used in rigid inclusions shall comply with one of the following:

1. Steel elements meeting the requirements of 1810.3.2.3.
2. Timber elements meeting the requirements of 1810.3.2.4.
3. Concrete elements meeting the requirements of 1808.8.1.
4. Other *approved* materials, which have adequate strength and ductility to resist imposed ground curvatures.

1809.16.2.4.2 Seismic reinforcement for concrete rigid inclusions. Where a *structure* is assigned to *Seismic Design Category* C, reinforcement shall be provided in accordance with Section 1809.16.2.4.2.1. Where a *structure* is assigned to *Seismic Design Category* D, E or F, reinforcement shall be provided in accordance with Sections 1809.16.2.4.2.2 and 1809.16.2.4.2.3.

1809.16.2.4.2.1 Seismic reinforcement in Seismic Design Category C. For *structures* assigned to *Seismic Design Category* C, concrete *rigid inclusions* shall be reinforced as specified in this section. Reinforcement shall be provided where required by analysis. At least one longitudinal bar, with a minimum longitudinal reinforcement ratio of 0.002, shall be provided throughout the minimum reinforced length of the element as defined in this section starting at the top of the element. The minimum reinforced length of the *rigid inclusion* shall be taken as the greatest of the following:

1. One-third of the element length.
2. A distance of 10 feet (3048 mm).
3. Three times the least element dimension.
4. Three times the least element dimension below the interfaces of strata that are hard or stiff and strata that are liquefiable or are composed of soft- to medium-stiff clay.

Exception: The requirements of this section shall not apply to concrete *rigid inclusions* cast in structural steel pipes or tubes.

1809.16.2.4.2.2 Seismic reinforcement in Seismic Design Categories D through F. For *structures* assigned to *Seismic Design Category* D, E or F, concrete *rigid inclusions* shall be reinforced as specified in this section. Reinforcement shall be provided where required by analysis. For *Site Class* A, B, BC, C, CD, D or DE sites, not less than one longitudinal bar, with a minimum longitudinal reinforcement ratio of 0.003, shall be provided throughout the minimum reinforced length of the *rigid inclusion*. For *Site Class* E and F sites, not less than four longitudinal bars, with a minimum longitudinal reinforcement ratio of 0.005, shall be provided throughout the minimum reinforced length of the *rigid inclusion*. The minimum reinforced length of the *rigid inclusion* is defined in this section as starting at the top of the element. The minimum reinforced length of the *rigid inclusion* shall be taken as the greatest of the following:

1. One-half of the element length.

2. A distance of 10 feet (3048 mm).

3. Three times the least element dimension.

4. Seven times the least element dimension below the interfaces of strata that are hard or stiff and strata that are liquefiable or are composed of soft- to medium-stiff clay.

Exceptions: The requirements of this section shall not apply to concrete cast in structural steel pipes or tubes.

1809.16.2.4.2.3 Transverse Confinement for Site Classes E and F. For *Site Class* E or F sites, transverse confinement reinforcement shall be provided in the rigid inclusion in accordance with Section 1810.3.9.4.2.2.

1809.16.3 Installation. The *rigid inclusion systems* shall be installed in accordance with construction documents provided by the *rigid inclusion systems* designer.

1809.16.4 Special inspection. *Special Inspections* in accordance with 1705.6.1 and 1705.6.2 shall be provided for *rigid inclusion systems*.

Reason: Ground Improvement systems are *methods which* can enhance the load-bearing capacity of the ground below shallow foundations and/or control total and differential settlements within the zone of influence of the foundations. Ground improvement systems are most often used as an alternative to deep foundations (i.e., pile foundations). Rigid inclusions are not presently addressed in the IBC. There is no established standard for the design or installation of rigid inclusion systems.

Failures of ground improvement systems can have significant impact on the structural integrity of a building. The objective of this proposal is to provide consistent requirements for the design, construction, and inspection of rigid inclusions systems.

Graphical comparison of different foundation systems:

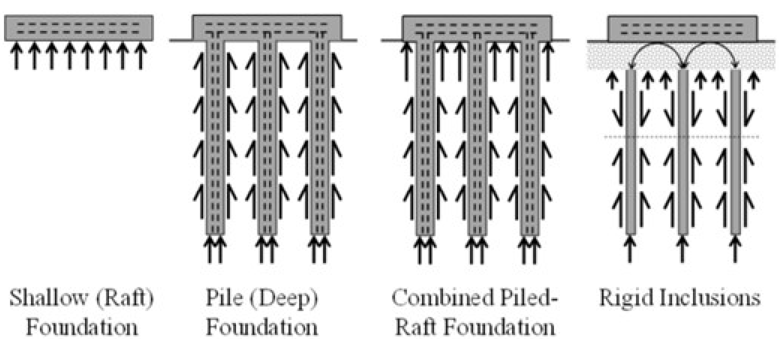

Figure 1. Generalized load path diagrams for typical foundation systems.

Cost Impact: Increase

Estimated Immediate Cost Impact:

Cost impact is the cost of reinforcement in each rigid inclusion, where it will be required and has not been previously used in design. The increase could be on the order of $3 to $16 per foot of length of rigid inclusions.

Estimated Immediate Cost Impact Justification (methodology and variables):

Where reinforcement will be required to be used in a rigid inclusion, there may be a cost increase, as not all designers are including it now. Where reinforcement is required, the cost increase will depend on:

- the amount of steel needed - from a single bar to a full cage
- the length the reinforcement is needed - a single bar will likely be for the full length, but a cage might only be needed in the upper 10 to 20 feet.

Estimated Life Cycle Cost Impact:

This proposal will not impact life cycle cost.

Estimated Life Cycle Cost Impact Justification (methodology and variables):

Once constructed, there is no cost change over the life cycle of the structure.

S124-25

S125-25

IBC: 1810.2.2

Proponents: Daniel Stevenson, Berkel and Company Contractors, Inc., representing GeoCoalition (dstevenson@berkelapg.com); Lori Simpson, Langan, representing Geocoalition (lsimpson@langan.com)

2024 International Building Code

Revise as follows:

1810.2.2 Stability. *Deep foundation* elements shall be braced to provide lateral stability in all directions. Three or more elements connected by a rigid cap shall be considered to be braced, provided that the elements are located in radial directions from the centroid of the group not less than 60 degrees (1 rad) apart. A two-element group in a rigid cap shall be considered to be braced along the axis connecting the two elements. Isolated cast-in-place *deep foundation* elements without lateral bracing shall be considered braced where adequate lateral support in accordance with Section 1810.2.1 is provided for the entire height and analysis demonstrates that the element can support the required loads, including mislocations required by Section 1810.3.1.3, with neither harmful distortion nor instability in the *structure*. ~~Methods used to brace *deep foundation* elements shall be subject to the approval of the *building official*.~~

Deep foundation elements supporting walls shall be placed alternately in lines spaced not less than 1 foot (305 mm) apart and located symmetrically under the center of gravity of the wall load carried, unless effective measures are taken to provide for eccentricity and lateral forces, or the foundation elements are adequately braced to provide for lateral stability. Methods used to brace *deep foundation* elements shall be subject to the approval of the *building official*.

Exception~~s~~: A single row of *deep foundation elements* without lateral bracing is permitted for one- and two-family *dwellings* and lightweight construction not exceeding two *stories above grade plane* or 35 feet (10 668 mm) in *building height*, provided that the centers of the elements are located within the width of the supported wall.

~~1. Isolated cast-in-place *deep foundation* elements without lateral bracing shall be permitted where the least horizontal dimension is not less than 2 feet (610 mm), adequate lateral support in accordance with Section 1810.2.1 is provided for the entire height and analysis demonstrates that the element can support the required loads, including mislocations required by Section 1810.3.1.3, with neither harmful distortion nor instability in the *structure*.~~

~~2. A single row of *deep foundation* elements without lateral bracing is permitted for one- and two-family *dwellings* and lightweight construction not exceeding two *stories above grade plane* or 35 feet (10 668 mm) in *building height*, provided that the centers of the elements are located within the width of the supported wall.~~

Reason: This section has been reformatted for clarity. The first exception has been slightly reworded and moved into the main section, as this exception is actually an example of acceptably braced elements and not an exception to the bracing requirement. It follows the given “deemed to comply” bracing examples of a group of 3 piles and a group of 2 piles. The “not less than 2 feet” requirement has been removed, as the analysis required makes the current 2 feet limit unnecessary. The 2 feet limit can increase costs on projects where analysis shows smaller shafts are acceptable.

Cost Impact: Decrease

Estimated Immediate Cost Impact:

This proposal will decrease the cost of construction. The expected cost savings range from $0 to $3500 per foundation. These cost savings are based in a unit rate basis.

Estimated Immediate Cost Impact Justification (methodology and variables):

The current 2 feet size limit for isolated deep foundation elements can increase costs where analysis shows that smaller shafts are acceptable. Deleting this limit will reduce costs on some projects. For example, a 24-inch diameter concrete deep foundation element that is 50 feet deep will have a volume of 5.82 cubic yards. A 16-inch diameter concrete deep foundation element that is 50 feet deep will have a volume of 2.59 cubic yards. The unit cost of concrete deep foundation elements can vary greatly. However, a unit cost of $1000/CY can be considered a reasonable value. If analysis can demonstrate that a 16-inch diameter deep foundation element can be used where the code currently requires a 24-inch diameter element, the expected savings per element would be $1000 x (5.82-2.59) =

$3230.

Estimated Life Cycle Cost Impact:

This proposal will have no impact on the estimated life cycle cost.

Estimated Life Cycle Cost Impact Justification (methodology and variables):

This proposal does not impact the durability or the expected maintenance costs of deep foundations.

S125-25

S126-25

IBC: 1810.3.1.4, 1810.3.1.5

Proponents: Nathalie Boeholt, Seattle Dept. of Construction and Inspections (SDCI), representing Washington Association of Building Officials Technical Code Development Committee (WABO TCD) (nathalie.boeholt@seattle.gov); Julius Carreon, City of Bellevue, representing Washington Association of Building Officials Technical Code Development Committee (jcarreon@bellevuewa.gov); Micah Chappell, Seattle Dept. of Construction and Inspections (SDCI), representing Washington Association of Building Officials Technical Code Development Committee (WABO TCD) (micah.chappell@seattle.gov)

2024 International Building Code

Revise as follows:

1810.3.1.4 Driven piles. Driven piles shall be designed and manufactured in accordance with accepted engineering practice to resist all stresses induced by handling, driving, ~~and~~ service, and design loads.

1810.3.1.5 Helical piles. *Helical piles* shall be designed and manufactured in accordance with accepted engineering practice to resist all stresses induced by installation into the ground and service and design loads.

Reason: The proposed change is a clarification to add the term "design loads" to the list of design conditions. It seems obvious that driven piles and helical piles should be designed for "design loads" and not just "service loads" but the term "service loads", even though it is not defined in the IBC, was added as a new definition in ASCE 7-16. Its definition includes the following: "...Service live loads and environmental loads for a particular limit state are permitted to be less than the design loads specified in the standard...". The words "less than the design loads" could add confusion and create situations where driven piles and helical piles are under designed. This change will avoid this potential confusion.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

No impact to cost, this is simply a code language clarification. Most designers should already know and do this.

S126-25

S127-25

IBC: 1810.3.3.1.2, CHAPTER 35, ASTM Chapter 35 (New)

Proponents: Daniel Stevenson, Berkel and Company Contractors, Inc., representing GeoCoalition (dstevenson@berkelapg.com); Lori Simpson, Langan, representing Geocoalition (lsimpson@langan.com)

2024 International Building Code

Revise as follows:

1810.3.3.1.2 Load tests. Where design compressive *loads* are greater than those determined using the allowable stresses specified in Section 1810.3.2.6, where the design *load* for any *deep foundation* element is in doubt, or where cast-in-place *deep foundation* elements have an enlarged base formed either by compacting concrete or by driving a precast base, control test elements shall be tested in accordance with ASTM D1143, ~~or~~ ASTM D4945, or ASTM D8169. One element or more shall be load tested in each area of uniform subsoil conditions. Where required by the *building official*, additional elements shall be load tested where necessary to establish the safe design capacity. The resulting allowable *loads* shall not be more than one-half of the ultimate axial load capacity of the test element as assessed by one of the published methods listed in Section 1810.3.3.1.3 with consideration for the test type, duration and subsoil. The ultimate axial load capacity shall be determined by a *registered design professional* with consideration given to tolerable total and differential settlements at design *load* in accordance with Section 1810.2.3. In subsequent installation of the balance of *deep foundation* elements, all elements shall be deemed to have a supporting capacity equal to that of the control element where such elements are of the same type, size and relative length as the test element; are installed using the same or comparable methods and equipment as the test element; are installed in similar subsoil conditions as the test element; and, for driven elements, where the rate of penetration (for example, net displacement per blow) of such elements is equal to or less than that of the test element driven with the same hammer through a comparable driving distance.

CHAPTER 35
REFERENCED STANDARDS

Add new standard(s) as follows:

ASTM

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

ASTM D8169/D8169M-18 Standard Test methods for Deep Foundations Under Bi-Directional Static Axial Compressive Load

Reason: ASTM D8169 is the standard test method for deep foundations under bi-directional static axial compressive load. Bi-directional load tests have been routinely used for decades and are becoming increasingly common. For elements with high ultimate capacities, especially drilled shafts, bi-directional tests can be the only practical option to conduct a static load test. Adding this test method to the Code will allow building officials, engineers, and contractors to better characterize the response of deep foundation elements under load. These tests can increase safety and reduce costs, both for the test and the foundation.

Cost Impact: Decrease

Estimated Immediate Cost Impact:

Top-down tests conducted in accordance with ASTM D1143 are generally more economical than bi-directional tests conducted in accordance with ASTM D8169. However, for high-capacity load tests bi-directional tests can be more cost effective than traditional top-down tests (ASTM D1143). Expected savings could range from $0 to $40,000 per test. This cost was calculated on a unit rate basis.

Bi-directional tests can also be performed for relatively high loads where top-down tests are not practical. Because bi-directional load tests can be conducted at higher loads than top-down tests, they can be used to justify higher allowable loads for deep foundations. Higher allowable loads will decrease the overall cost of construction.

Estimated Immediate Cost Impact Justification (methodology and variables):

The costs of load test are project specific and vary considerably. A high-capacity (e.g. 1000 tons) top-down load test may cost as much as $100,000, whereas a comparable bi-directional load test would cost approximately $60,000. This would produce a net savings of $40,000 per test. In addition, bi-directional load tests can be used to confirm tension capacity, which would eliminate the need to perform separate tension load tests. This could save an additional $50,000 per tension test.

Because of the multiple variables involved, it is difficult to assess the potential cost decrease which could be realized from the higher allowable foundation loads justified from bi-directional load tests. These savings can potential far exceed the potential decrease in the cost of the tests.

Estimated Life Cycle Cost Impact:

This proposal will not impact life cycle cost.

Staff Analysis: A review of the standard proposed for inclusion in the code, ASTM D8169/D8169M-18 Standard Test Methods for Deep Foundations Under Bi-Directional Static Axial Compressive Load, with regard to some of the key ICC criteria for referenced standards (Section 4.6 of CP#28) will be posted on the ICC website on or before April 1, 2025.

S127-25

S128-25

IBC: 1810.3.3.1.2

Proponents: Daniel Stevenson, Berkel and Company Contractors, Inc., representing GeoCoalition (dstevenson@berkelapg.com); Lori Simpson, Langan, representing Geocoalition (lsimpson@langan.com)

2024 International Building Code

Revise as follows:

1810.3.3.1.2 Load tests. Where design compressive *loads* are greater than those determined using the allowable stresses specified in Section 1810.3.2.6, where the ultimate axial load capacity~~design *load*~~ for any *deep foundation* element is in doubt, or where cast-in-place *deep foundation* elements have an enlarged base formed either by compacting concrete or by driving a precast base, control test elements shall be tested in accordance with ASTM D1143 or ASTM D4945. One element or more shall be load tested in each area of ~~uniform subsoil~~similar subsurface conditions. Where required by the *building official*, additional elements shall be load tested where necessary to establish the allowable loads~~safe design capacity~~. The resulting allowable *loads* shall not be more than one-half of the ultimate axial load capacity of the test element as assessed by one of the published methods listed in Section 1810.3.3.1.3 with consideration for the test type, duration and subsoil. The ultimate axial load capacity shall be determined by a *registered design professional* with consideration given to tolerable total and differential settlements at design *load* in accordance with Section 1810.2.3. In subsequent installation of the balance of *deep foundation* elements, all elements shall be deemed to have an ultimate axial load capacity ~~supporting capacity~~ equal to that of the control element where such elements are of the same type, size and relative length as the test element; are installed using the same or comparable methods and equipment as the test element; are installed in similar ~~subsoil~~ subsurface conditions as the test element; and, for driven elements, where the rate of penetration (for example, net displacement per blow) of such elements is equal to or less than that of the test element driven with the same hammer through a comparable driving distance.

Reason: The purpose of this proposal is to clarify the code by using more consistent and accurate terminology. Current code language in this section uses the terms "design load", "safe design capacity", "supporting capacity", and "allowable load" interchangeably. This inconsistent terminology can be confusing, as it is sometimes difficult to tell if the current terminology is referring to the allowable load or the ultimate load capacity.

To be consistent with the title of the parent section 1810.3.3 (Determination of allowable loads), the term "allowable load" will be used when referring to the maximum load that is permitted to be applied to a deep foundation element. When referring to the load which would cause failure, the term "ultimate axial load capacity" will be used. Also, the term "subsoil" will be replaced with the more accurate term "subsurface", to add consistency with previous sections in chapter 18 (1803.3).

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

This proposal clarifies the code by using more consistent terminology. It does not change code requirements.

S128-25

S129-25

IBC: 1810.3.3.1.5, ASTM Chapter 35 (New)

Proponents: Daniel Stevenson, Berkel and Company Contractors, Inc., representing GeoCoalition (dstevenson@berkelapg.com); Lori Simpson, Langan, representing Geocoalition (lsimpson@langan.com)

2024 International Building Code

Revise as follows:

1810.3.3.1.5 ~~Uplift capacity~~Allowable uplift load of a single deep foundation element. Where required by the design, the uplift capacity of a single *deep foundation* element shall be determined by an *approved* method of analysis based on a minimum safety factor~~ of safety~~ of three or by load tests conducted in accordance with ASTM D1143, ASTM D3689, ASTM D4945, or ASTM D8169. Where uplift capacity is determined by load tests conducted in accordance with ASTM D1143, the test element shall be instrumented to determine load transfer response. The maximum allowable uplift *load* shall not exceed the ultimate load capacity ~~as determined in Section 1810.3.3.1.2, using the results of load tests conducted in accordance with ASTM D3689, divided by a factor of safety of two.~~ evaluated in accordance with one of the following methods divided by a safety factor of two:

1. The test load which produces a net upward movement equal to the theoretical elastic lengthening plus 0.15 inch (4 mm).
2. Other method *approved* by the *building official*.

Exception: Where uplift is due to wind or seismic loading, the minimum safety factor~~ of safety~~ shall be two where capacity is determined by an analysis and one and one-half where capacity is determined by load tests.

Add new standard(s) as follows:

ASTM

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

D8169/D8169M-18 Standard Test Methods for Deep Foundations Under Bi-Directional Static Axial Compressive Load

Reason: Terminology has been revised to be more consistent with other code sections. The title of the parent Section 1810.3.3 is “Allowable axial load,” and the title of the following Section 1810.3.3.6 is “Allowable uplift load of grouped deep foundation elements.” The title of this section has been changed to “Allowable uplift load of a single deep foundation element” for consistency.

Current code states that the ultimate load capacity shall be as determined in Section 1810.3.3.1.2. However, Section 1810.3.3.1.2 addresses only compressive load tests. Section 1810.3.3.1.2 does not say how to determine the ultimate load capacity for compressive or tensile loads. For compressive load tests, Section 1810.3.3.1.2 refers to Section 1810.3.3.1.3 for load test evaluation methods. The evaluation methods given in 1810.3.3.1.3 (with the possible exception of #4, “Other methods approved by the building official”) are not applicable for tension load tests. For these reasons, the reference to Section 1810.3.3.1.2 has been removed, and replaced with criteria appropriate for tension load tests.

Load tests conducted in accordance with ASTM D4945, ASTM D8169, and ASTM D1143 (when elements are properly instrumented) are frequently used to evaluate tensile capacity of deep foundation elements. Therefore, we have added these standards as acceptable test methods for the determination of allowable uplift loads.

The proposed method #1 for evaluating the ultimate tension load capacity is the same as given in AASHTO specifications.

Cost Impact: Decrease

Estimated Immediate Cost Impact:

This proposal will decrease the cost of construction. Expected cost decrease ranges from $0 to $30,000 per load test. This cost was calculated on a unit rate basis.

Estimated Immediate Cost Impact Justification (methodology and variables):

In some cases, this proposal would decrease the cost of construction by permitting more economical load test methods. The cost of a standard tension load test conducted in accordance with ASTM D3689 can vary greatly. However, most tests can be conducted for $50,000 or less. Load tests conducted in accordance with ASTM D4945 and D8169 can assess both the compression and tension capacity of deep foundation elements, negating the need for a separate tension load test. The potential savings are therefore up to $50,000 per test.

Estimated Life Cycle Cost Impact:

There is no impact on estimated life cycle cost impact.

Estimated Life Cycle Cost Impact Justification (methodology and variables):

This proposal will not impact the life cycle cost of buildings. It does not impact the durability of foundations nor the expected maintenance cost.

Staff Analysis: A review of the standard proposed for inclusion in the code, ASTM D8169/D8169M-18 Standard Test Methods for Deep Foundations Under Bi-Directional Static Axial Compressive Load, with regard to some of the key ICC criteria for referenced standards (Section 4.6 of CP#28) will be posted on the ICC website on or before April 1, 2025.

S129-25

S130-25

IBC: 1810.3.3.2, ASTM Chapter 35 (New)

Proponents: Daniel Stevenson, Berkel and Company Contractors, Inc., representing GeoCoalition (dstevenson@berkelapg.com); Lori Simpson, Langan, representing Geocoalition (lsimpson@langan.com)

2024 International Building Code

Revise as follows:

1810.3.3.2 Allowable lateral load. Where required by the design, the allowable lateral load~~ capacity~~ of a single *deep foundation* element or a group thereof shall be determined by an *approved* method of analysis. ~~to not less than twice the proposed design working *load*. *The* resulting~~ allowable lateral *load* shall not be more than ~~one-half of~~ the *load* that produces a gross lateral movement of 1/2 ~~1~~ inch (~~25~~13 mm) at the lower of the top of the foundation element and the ground surface. ~~, unless it can be shown that the predicted lateral movement shall cause neither harmful distortion of, nor instability in, the *structure*, nor cause any element to be loaded beyond its capacity.~~ Group effects shall be evaluated where required by Section 1810.2.5.

> **Exception:** Lateral movements exceeding 1/2 inch shall be permitted where the *registered design professional in responsible charge* determines that the predicted lateral movement shall cause neither harmful distortion of, nor instability in, the *structure*, nor cause any element to be loaded beyond its capacity.

Where lateral load tests are performed, elements shall be tested in accordance with ASTM D3966. Load tests shall be evaluated considering pile head fixity, soil stratification, and group effects.

Add new standard(s) as follows:

ASTM

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

D3966/D3966M Standard Test Methods for Deep Foundation Elements Under Static Lateral Load

Reason: The section has been reorganized for clarity. An implied exception "…the predicted lateral movement shall cause neither harmful distortion of, nor instability in, the structure, nor cause any element to be loaded beyond its structural capacity" has been moved to an explicit exception. It has been clarified that it is the registered design professional in responsible charge who shall be able to invoke this exception.

An analysis should always be performed to determine the allowable lateral load of a deep foundation element. A load test alone is not a reliable method of determining the allowable lateral load of a deep foundation element. Load tests are usually conducted with different boundary conditions than those deep foundation elements used for support of actual structures. Conventional load tests do not provide information regarding moments and shears along the length of the deep foundation element, which is needed to design the element structurally. Only an analysis will provide this information.

The acceptance criterion has been changed from "not be more than one-half of the *load* that produces a gross lateral movement of 1 inch" to "not be more than the load that produces a gross lateral movement of 1/2 inch." The movement response of deep foundation members subjected to lateral loads is nonlinear. The current code provision produces inconsistent movement at the allowable lateral loads. Allowable movements for serviceability are evaluated at the allowable ASD loads. The proposed change creates consistency with current engineering practice.

Where lateral load tests are performed, it has been clarified that lateral load tests shall be conducted in accordance with ASTM D3966.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

This proposed change clarifies the code and makes code more consistent with current engineering practice. On some projects, there could be a slight decrease in construction costs due to the revised movement criteria. However, the overall impact on construction cost will be insignificant.

Staff Analysis: A review of the standard proposed for inclusion in the code, ASTM D3966/D3966M Standard Test Methods for Deep Foundation Elements Under Static Lateral Load, with regard to some of the key ICC criteria for referenced standards (Section 4.6 of CP#28) will be posted on the ICC website on or before April 1, 2025.

S130-25

S131-25

IBC: SECTION 1810, 1810.3.9.4.1, 1810.3.9.4.2

Proponents: Jeff Grove, Chair, representing BCAC (bcac@iccsafe.org)

2024 International Building Code

SECTION 1810 DEEP FOUNDATIONS

Revise as follows:

1810.3.9.4.1 Seismic reinforcement in Seismic Design Category C. For *structures* assigned to *Seismic Design Category* C, cast-in-place *deep foundation* elements shall be reinforced as specified in this section. Reinforcement shall be provided where required by analysis.

Not fewer than four longitudinal bars, with a minimum longitudinal reinforcement ratio of 0.0025, shall be provided throughout the minimum reinforced length of the element as defined in this section starting at the top of the element. The minimum reinforced length of the element shall be taken as the greatest of the following, <u>but need not exceed the length of the member</u>:

1. One-third of the element length.
2. A distance of 10 feet (3048 mm).
3. Three times the least element dimension.
4. The distance from the top of the element to the point where the design cracking moment determined in accordance with Section 1810.3.9.1 exceeds the required moment strength determined using the load combinations of ASCE 7, Section 2.3.

Transverse reinforcement shall consist of closed ties or spirals with a minimum $^3/_8$ inch (9.5 mm) diameter. Spacing of transverse reinforcement shall not exceed the smaller of 6 inches (152 mm) or 8-longitudinal-bar diameters, within a distance of three times the least element dimension from the bottom of the pile cap. Spacing of transverse reinforcement shall not exceed 16 longitudinal bar diameters throughout the remainder of the reinforced length.

Exceptions:

1. The requirements of this section shall not apply to concrete cast in structural steel pipes or tubes.
2. A spiral-welded metal casing of a thickness not less than the manufacturer's standard No. 14 gage (0.068 inch) is permitted to provide concrete confinement in lieu of the closed ties or spirals. Where used as such, the metal casing shall be protected against possible deleterious action due to soil constituents, changing water levels or other factors indicated by boring records of site conditions.

1810.3.9.4.2 Seismic reinforcement in Seismic Design Categories D through F. For *structures* assigned to *Seismic Design Category* D, E or F, cast-in-place *deep foundation* elements shall be reinforced as specified in this section. Reinforcement shall be provided where required by analysis.

Not fewer than four longitudinal bars, with a minimum longitudinal reinforcement ratio of 0.005, shall be provided throughout the minimum reinforced length of the element as defined in this section starting at the top of the element. The minimum reinforced length of the element shall be taken as the greatest of the following<u>, but need not exceed the length of the member:</u>

1. One-half of the element length.
2. A distance of 10 feet (3048 mm).
3. Three times the least element dimension.
4. The distance from the top of the element to the point where the design cracking moment determined in accordance with Section 1810.3.9.1 exceeds the required moment strength determined using the load combinations of ASCE 7, Section 2.3.

Transverse reinforcement shall consist of closed ties or spirals not smaller than No. 3 bars for elements with a least dimension up to 20 inches (508 mm), and No. 4 bars for larger elements. Throughout the remainder of the reinforced length outside the regions with transverse confinement reinforcement, as specified in Section 1810.3.9.4.2.1 or 1810.3.9.4.2.2, the spacing of transverse reinforcement shall not exceed the least of the following:

1. 12 longitudinal bar diameters.
2. One-half the least dimension of the element.
3. 12 inches (305 mm).

Exceptions:

1. The requirements of this section shall not apply to concrete cast in structural steel pipes or tubes.
2. A spiral-welded metal casing of a thickness not less than manufacturer's standard No. 14 gage (0.068 inch) is permitted to provide concrete confinement in lieu of the closed ties or spirals. Where used as such, the metal casing shall be protected against possible deleterious action due to soil constituents, changing water levels or other factors indicated by boring records of site conditions.

Reason: Clarifies requirements for deep foundations less than 10 feet in depth, (or the depth is less than 3 times the least element dimension) and provides consistency with the reference standard. Avoids interpretations that imply deep foundations under these conditions would need to be a minimum of 10 feet deep (or 3 times the least dimension in depth).

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

No cost – the proposal is a clarification of the depth of foundation and does not contain any new requirements.

S131-25

S132-25

IBC: 1810.3.11.2, 1810.3.11.2.1 (New)

Proponents: Nathalie Boeholt, representing Seattle Dept. of Construction and Inspections (SDCI) (nathalie.boeholt@seattle.gov); Micah Chappell, representing Seattle Dept. of Construction and Inspections (SDCI) (micah.chappell@seattle.gov)

2024 International Building Code

Revise as follows:

1810.3.11.2 Seismic Design Categories D through F. For *structures* assigned to *Seismic Design Category* D, E or F, *deep foundation* element resistance to uplift forces or rotational restraint shall be provided by anchorage into the pile cap, designed considering the combined effect of axial forces due to uplift and bending moments due to fixity to the pile cap. ~~Anchorage shall develop not less than 25 percent of the strength of the element in tension~~. Anchorage of deep foundation elements into the pile cap shall comply with the following:

1. The anchorage shall be designed to resist a tensile force of not less than 25 percent of the strength of the element in tension. In addition, in the case of steel H-piles or unfilled steel pipe piles, the anchorage shall be designed to resist a tensile force of not less than 10 percent of the pile compression capacity.

~~1~~ 2. In the case of uplift, the anchorage shall be ~~capable of developing~~ designed to resist a tensile force of not less than the least of the following:

- ~~1.1~~ 2.1. The nominal tensile strength of the longitudinal reinforcement in a concrete element.
- ~~1.2~~ 2.2. The nominal tensile strength of a steel element.
- ~~1.3~~ 2.3. The frictional force developed between the element and the soil multiplied by 1.3.
- 2.4 The axial tension force resulting from load combinations with the seismic *load effects* including overstrength factor in accordance with Section 2.3.6 or 2.4.5 of ASCE 7.

~~**Exception:** The anchorage is permitted to be designed to resist the axial tension force resulting from the seismic *load effects* including overstrength factor in accordance with Section 2.3.6 or 2.4.5 of ASCE 7.~~

~~2~~ 3. In the case of rotational restraint, the anchorage shall be designed to resist the axial and shear forces, and moments resulting from not less than the least of the following:

- 3.1 The load combinations with the seismic *load effects* including overstrength factor in accordance with Section 2.3.6 or 2.4.5 of ASCE 7.~~ or~~
- 3.2 The ~~anchorage shall be capable of developing the~~ full axial, bending and shear nominal strength of the element.

~~3. The connection between the pile cap and the steel H-piles or unfilled steel pipe piles in *structures* assigned to *Seismic Design Category* D, E or F shall be designed for a tensile force of the least of the following not less than 10 percent of the pile compression capacity.~~

~~**Exceptions:**~~

~~1. Connection tensile capacity need not exceed the strength required to resist seismic *load effects* including overstrength of ASCE 7 Section 12.4.3 or 12.14.3.2.~~

~~2. Connections need not be provided where the foundation or supported *structure* does not rely on the tensile capacity of the piles for stability under the design seismic force.~~

Exception: Anchorage of steel H-piles or unfilled steel pipe piles into the pile cap need not be provided where the foundation or supported structure does not rely on the tensile capacity of the piles for stability under the design seismic force.

Where the vertical lateral-force-resisting elements are columns, the pile cap flexural strengths shall exceed the column flexural strength. ~~The connection between batter piles and pile caps shall be designed to resist the nominal strength of the pile acting as a short column. Batter piles and their connection shall be designed to resist forces and moments that result from the application of seismic *load effects* including overstrength factor in accordance with Section 2.3.6 or 2.4.5 of ASCE 7.~~

Add new text as follows:

1810.3.11.2.1 Batter Piles. The anchorage between batter piles and piles caps shall be designed to resist the greatest of the following:

1. The nominal strength of the pile acting as a short column.
2. The axial and shear forces, and moments resulting from the load combinations with seismic *load effects* including overstrength factor in accordance with Section 2.3.6 or 2.4.5 of ASCE 7.

Reason: Section 1810.3.11.2 concerns the anchorage of pile caps to deep foundation elements (i.e. piles) in seismic design categories D, E and F. It was amended by proposal S132-19 in the 2021 IBC to add sub-section 3 related specifically to steel H-piles and unfilled steel pipe piles. This proposal does not remove the content of sub-section 3 but rather reorganizes the whole section to make it clearer and more homogeneous rather than a piece-mealed section. There were already requirements for steel piles in sub-section 1, so it makes sense to combine these requirements. This proposal is editorial and does not change the technical intent of this section.

The sentence "anchorage shall develop not less than 25 percent of the strength of the element in tension" has moved to a new sub-section 1 and the next sub-sections have moved down, 1 has become 2 and 2 has become 3. The reason for this move is that it represents a minimum load the anchorage must be designed for and should not get lost in the first paragraph. The other minimum anchorage requirement is specific to steel piles where the anchorage must be designed for 10% of the pile compression capacity; this minimum has been moved from section 3 to the new sub-section 1. These changes allow the minimum requirements to be together in the same sub-section and clearly noted in the overall section.

The existing exceptions related to using the seismic load effects including overstrength are deleted and moved to 2.4 and 3.1 in the requirements for "the case of uplift" (sub-section 2) and "the case of rotational restraint" (sub-section 3) respectively. They were not really exceptions since the language was already listing minimum design loads ("the least of"), but rather another lower threshold the anchorage can be designed for.

As explained above, previous sub-section 3 related to steel piles is deleted and its requirements are moved as such:

- The requirement for 10% of the pile compression capacity has moved to sub-section 1.
- Previous sub-section 3 exception 1, concerning the option to design for a tensile force including overstrength, was repetitive and already included in the uplift case requirements (new sub-section 2.4).
- Previous sub-section 3 exception 2, concerning an exception in the case where there is no uplift, has been moved into a single exception located after the three sub-sections and has been kept to only apply to steel piles.

The last reorganization is the creation of section 1810.3.11.2.1 where the requirements specific for batter piles have been relocated. Their anchorage requirements were located in the last paragraph, the same paragraph as an unrelated requirement for pile cap design where the LFRS is columns, so it makes sense to separate them. For added clarity, batter piles now get their own section, so that their anchorage requirements are not missed, and are clear and separate from the general anchorage requirements above. No technical change is proposed, the technical content is simply moved. Two new sub-items are created, one for each requirement, and the language "the greatest of the following" is added to clarify the apparent original intent of this language: since it didn't include "the least of", it was assumed the intent was to design for the maximum of the two load cases.

Throughout this section, this proposal replaces the term "connection" with the term "anchorage". The term "connection" was imported from ASCE 7 in the 2021 code and was not coordinated with the terminology previously used in this code section. This proposal resolves this inconsistency in code language.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

This code change proposal is a re-organization of section 1810.3.11.2 and does not increase the cost of construction. The technical requirements for the anchorage of deep foundation elements to pile caps do not change.

Staff Analysis: CC # S132-25 and CC # S133-25 addresses requirements in a different or contradicting manner. The committee is urged to make their intensions clear with their actions on these proposals.

S132-25

S133-25

IBC: 1810.3.11.2, 1810.3.11.2.1 (New), 1810.3.11.2.2 (New)

Proponents: Daniel Stevenson, Berkel and Company Contractors, Inc., representing GeoCoalition (dstevenson@berkelapg.com); Lori Simpson, Langan, representing Geocoalition (lsimpson@langan.com)

2024 International Building Code

Revise as follows:

1810.3.11.2 Seismic Design Categories D through F. For *structures* assigned to *Seismic Design Category* D, E or F, connection of *deep foundations* to pile caps shall be designed in accordance with 1810.3.11.2.1 and 1810.3.11.2.2. Where the vertical lateral-force-resisting elements are columns, the pile cap flexural strengths shall exceed the column flexural strength.~~*deep foundation* element resistance to uplift forces or rotational restraint shall be provided by anchorage into the pile cap, designed considering the combined effect of axial forces due to uplift and bending moments due to fixity to the pile cap. Anchorage shall develop not less than 25 percent of the strength of the element in tension. Anchorage into the pile cap shall comply with the following:~~

1. ~~In the case of uplift, the anchorage shall be capable of developing the least of the following:~~
   - ~~1.1. The nominal tensile strength of the longitudinal reinforcement in a concrete element.~~
   - ~~1.2. The nominal tensile strength of a steel element.~~
   - ~~1.3. The frictional force developed between the element and the soil multiplied by 1.3.~~

   ~~**Exception:** The anchorage is permitted to be designed to resist the axial tension force resulting from the seismic *load effects* including overstrength factor in accordance with Section 2.3.6 or 2.4.5 of ASCE 7.~~
2. ~~In the case of rotational restraint, the anchorage shall be designed to resist the axial and shear forces, and moments resulting from the seismic *load effects* including overstrength factor in accordance with Section 2.3.6 or 2.4.5 of ASCE 7 or the anchorage shall be capable of developing the full axial, bending and shear nominal strength of the element.~~
3. ~~The connection between the pile cap and the steel H-piles or unfilled steel pipe piles in *structures* assigned to *Seismic Design Category* D, E or F shall be designed for a tensile force of not less than 10 percent of the pile compression capacity.~~

   ~~**Exceptions:**~~
   1. ~~Connection tensile capacity need not exceed the strength required to resist seismic *load effects* including overstrength of ASCE 7 Section 12.4.3 or 12.14.3.2.~~
   2. ~~Connections need not be provided where the foundation or supported *structure* does not rely on the tensile capacity of the piles for stability under the design seismic force.~~

~~Where the vertical lateral-force-resisting elements are columns, the pile cap flexural strengths shall exceed the column flexural strength. The connection between batter piles and pile caps shall be designed to resist the nominal strength of the pile acting as a short column. Batter piles and their connection shall be designed to resist forces and moments that result from the application of seismic *load effects* including overstrength factor in accordance with Section 2.3.6 or 2.4.5 of ASCE 7.~~

Add new text as follows:

1810.3.11.2.1 Connections. *Deep foundation* element resistance to uplift forces or rotational restraint shall be provided by connection to the pile cap, designed considering the combined effect of axial forces due to uplift and bending moments due to fixity to the pile cap. Connections shall develop not less than 25 percent of the strength of the element in tension. For elements required to resist uplift forces, provide rotational restraint, or both, connection to the pile cap shall comply with the following:

1. In the case of uplift, the connection shall be capable of developing the least of the following:
    1.1. The nominal tensile strength of the longitudinal reinforcement in a concrete element.
    1.2. The nominal tensile strength of a steel element.
    1.3. The frictional force developed between the element and the soil multiplied by 1.3.

    Exception: The connection is permitted to be designed to resist the axial tensile force resulting from the seismic *load effects* including overstrength factor in accordance with Section 2.3.6 or 2.4.5 of ASCE 7.

2. In the case of rotational restraint, the connection shall be designed to resist the axial and shear forces, and moments resulting from the seismic *load effects* including overstrength factor in accordance with Section 2.3.6 or 2.4.5 of ASCE 7 or the connection shall be capable of developing the full axial, bending and shear nominal strength of the element.
3. The connection between the pile cap and the steel H-piles or unfilled steel pipe piles in *structures* assigned to *Seismic Design Category* D, E or F shall be designed for a tensile force of not less than 10 percent of the pile compression capacity.

    Exceptions:

    1. Connection tensile capacity need not exceed the strength required to resist seismic *load effects* including overstrength of ASCE 7 Section 12.4.3 or 12.14.3.2.
    2. Connections need not be provided where the foundation or supported *structure* does not rely on the tensile capacity of the piles for stability under the design seismic force.

1810.3.11.2.2 Batter Piles. The connection between batter piles and pile caps shall be designed to resist the nominal strength of the pile acting as a short column. Batter piles and their connection shall be designed to resist axial forces and moments that result from the application of seismic *load effects* including overstrength factor in accordance with Section 2.3.6 or 2.4.5 of ASCE 7.

Reason: Section 1810.3.11.2 has been reorganized for clarity. Terminology has been revised for clarity and accuracy. Current code language uses the terms "anchorage" and "connection" interchangeably. While the term "anchorage" is generally considered to apply only to tensile forces, the more general term "connection" is considered to apply to tensile, compressive, and shear forces. This section has requirements for resistance of tension, compression, and shear loads. Therefore, the term "anchorage" has been replaced with the more inclusive term "connection".

Also, the existing code language is sometimes confusing and can appear contradictory. The requirements of " ...not less than 25 percent of the strength of the element intension.", and then later "The nominal tensile strength..." appear contradictory if one does not realize that the more restrictive requirement is only required for piles required to resist uplift forces. The added phrase "For elements required to resist uplift forces or provide rotational restraint" clarifies that the intent of the code is that the more restrictive requirements apply only to elements required to resist uplift forces or provide rotational restraint. This added phrase is taken verbatim from ASCE-7 section 12.13.6.5, except that the word “pile” has been changed to “element”. ASCE section 12.13.6.5 contains the same requirements as IBC section 1810.3.11.2. Adding this phrase into 1810.3.11.2 will provide more consistency between IBC and referenced standard ASCE-7.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

This proposal does not change any code requirement, it only clarifies the code. Therefore there is no cost impact.

Staff Analysis: CC # S133-25 and CC # S132-25 addresses requirements in a different or contradicting manner. The committee is urged to make their intensions clear with their actions on these proposals.

S134-25

IBC: 1901.2, 1901.2.2 (New), 1901.2.2.1 (New), 1901.2.2.2 (New), 1901.2.2.3 (New), 1901.2.2.4 (New), ASTM Chapter 35 (New)

Proponents: David Fanella, representing Concrete Reinforcing Steel Institute (dfanella@crsi.org); Michael Ugalde, representing nVent - Director (michael.ugalde@nvent.com)

2024 International Building Code

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

Add new text as follows:

1901.2.2 Structural concrete with mechanical splices of deformed steel reinforcing bars in tension or compression. Mechanical splices shall satisfy the requirements of ASTM A1034. Mechanical splices classified as Type 1, 2, or 3 in accordance with ASTM A1034 shall be permitted in accordance with this section.

1901.2.2.1 Type 1 mechanical splices. Type 1 mechanical splices shall not be permitted for the following:

1. In locations where yielding of reinforcement is expected under applicable strength design load combinations specified in Section 1605.
2. For splicing the following reinforcement: (a) integrity reinforcement, (b) reinforcement in regions where moment redistribution has been applied in design, (c) reinforcement in regions where moments are determined using the simplified method of analysis, and (d) reinforcement in two-way slabs where moments are determined using the direct design method of analysis.

1901.2.2.2 Type 3 mechanical splices. Reinforcing bars in a Type 3 mechanical splice shall conform to ASTM A706 and shall be longitudinally aligned.

1901.2.2.3 Mechanical splices in special moment frames and special structural walls. Mechanical splices in special moment frames and special structural walls shall satisfy this section:

1. Mechanical splices shall be Type 2 or Type 3.
2. Type 3 mechanical splices shall be permitted at any location for cast-in-place construction.
3. Type 2 mechanical splices in special moment frames are prohibited within joints, within a distance equal to twice the member depth from the column or beam face, and within a distance equal to twice the member depth from critical sections where yielding of the reinforcement is likely to occur as a result of lateral displacements beyond the linear range of behavior.
4. Type 2 mechanical splices in special structural walls are prohibited within the following:
    - 4.1. Boundary regions over a height h_{sx} above and l_d below critical sections where yielding of the longitudinal reinforcement is likely to occur as a result of lateral displacements where h_{sx} need not exceed 20 ft (6.1 m). Boundary regions shall include those with lengths that extend horizontally from the extreme compression fiber a distance at least the greater of $c – 0.1l_w$ and $c/2$ and within a length equal to the wall thickness measured beyond the intersecting region(s) of connected walls.
    - 4.2. Coupling beams
    - 4.3. A distance equal to twice the member depth from critical sections where yielding of the reinforcement is likely to occur as a result of lateral displacements beyond the linear range of behavior.

1901.2.2.4 Mechanical splices in diaphragms and collectors assigned to Seismic Design Category D, E, or F. Type 2 or Type 3 mechanical splices are required where mechanical splices are used in the region of the connection between the diaphragm and the vertical elements of the seismic force-resisting system.

Add new standard(s) as follows:

ASTM

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

A1034/A1034M-24 Standard Specification for Mechanical Splices for Steel Reinforcing Bars

Reason: This proposal requires that mechanical splices of deformed steel reinforcing bars in tension or compression conform with the requirements in ASTM A1034/A1034M—Standard Specification for Mechanical Splices for Steel Reinforcing Bars. This standard is proposed as a referenced standard in this code change proposal. A new type of mechanical splice is included that can be used within any region of a structural member assigned to any seismic design category.

The acceptance criteria in ASTM A1034/A1034M were created with significant input and collaboration amongst mechanical splice producers. The latest results from an on-going joint CRSI, ACI, and Pankow Foundation-sponsored research project that addresses the use of mechanical splices with high-strength reinforcement in the potential flexural yielding regions of special structural systems formed the basis of the acceptance criteria in this standard.
Three types of mechanical splices are defined in ASTM A1034/A1034M: Type 1, Type 2, and Type 3. The Type 1 and Type 2 mechanical splice nomenclature is the same as the industry has relied on for decades. The new Type 3 mechanical splice can be utilized within any region of a structural member assigned to any seismic design category; this type of mechanical splice will substantially improve constructability of structural members in seismic design category D and above, especially for special reinforced concrete structural walls. Referencing ASTM A1034/A1034M provides an opportunity to revise the mechanical splice requirements, if required, in a timely fashion as new test data become available compared to having to wait for changes to be introduced in the 2031 edition of ACI 318.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

- The cost of construction will not increase for Type 1 and Type 2 mechanical splices because reference to these types is well known in the reinforced concrete industry and because mechanical splice producers have test data based on the acceptance criteria requirements in ASTM A1034/A1034M.
- Additional testing for Type 3 mechanical splices may be required based on the ASTM A1034/A1034M acceptance criteria requirements; however, this testing will be required regardless of which code or standard requirements take precedence, which means there is no impact on cost.

Staff Analysis: A review of the standard proposed for inclusion in the code, ASTM A1034/A1034M-24 Standard Specification for Mechanical Splices for Steel Reinforcing Bars, with regard to some of the key ICC criteria for referenced standards (Section 4.6 of CP#28) will be posted on the ICC website on or before April 1, 2025.

S134-25

S135-25

IBC: 1901.2, 1901.2.2 (New), ASTM Chapter 35 (New)

Proponents: David Fanella, representing Concrete Reinforcing Steel Institute (dfanella@crsi.org); Michael Ugalde, representing nVent - Director (michael.ugalde@nvent.com); Robbie Hall, Headed Reinforcement Corp. (HRC), representing HRC / Concrete Reinforcing Steel Institute (robbie.hall@hrc-usa.com)

2024 International Building Code

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

Add new text as follows:

1901.2.2 Development of headed deformed bars in tension. Use of a head to develop a deformed bar in tension shall be permitted if conditions (1) through (6) are satisfied:

1. Headed deformed bar conforms to ASTM A970 including Annex A1 requirements for Class HA heads.
2. Bar size does not exceed No. 11.
3. Net bearing area of head A_{brg} is at least $4A_b$ for Grade 60 and Grade 80 bars.
4. Concrete is normal weight.
5. Clear cover for bar is at least $2d_b$.
6. Center-to-center spacing between bars is at least $3d_b$.

Add new standard(s) as follows:

ASTM

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

A970/A970M-24 Standard Specification for Headed Steel Bars for Concrete Reinforcement

Reason: This proposal provides minimum conditions for the use of Grade 60 and Grade 80 headed deformed bars in tension. The basis of the proposal is on the findings of recent research that examines the impact of the net bearing area on the tension development length of the deformed headed bar as a function of steel grade.

Grade 60 and Grade 80 headed bars with bearing areas of $4A_b$ are well-researched and well-established within the industry with demonstrated successful in-service performance in reinforced concrete structures. The term A_b is the area of the deformed reinforcing bar. Research of headed deformed bars conducted and published by the University of Kansas over the last 8 years has confirmed the implementation of a minimum bearing area equal to $4A_b$ in ACI 318 and ASTM A970/A970M Annex A1 for headed bars. The following two University of Kansas reports are of particular interest with respect to head size (see attached reports):

- SMR Report No. 117, *Anchorage of Conventional and High-Strength Headed Reinforcing Bars*. The main conclusion of this report is that there are no clear differences in anchorage strength associated with head size ranging from 3.8 to $9.5A_b$ for both Grade 60 and Grade 80 bars.
- SMR Report No. 127, *Anchorage of Headed Reinforcing Bars in Concrete*. The report states that an increase in net bearing area of the head from 4 to $9.5A_b$ has no effect on the anchorage strength.

The standard ASTM A970/A970M—Standard Specification for Headed Steel Bars for Concrete Reinforcement is proposed as a referenced standard in this code change proposal.

Grade 80 headed bars with $4A_b$ have been prevalent since headed bar applications were first adopted, and are commonly used across the United States, especially in areas where seismic detailing is required. Grade 80 headed bars are commonly used to reduce reinforcement congestion and enhance constructability. In many cases, designs are so complex, and reinforcement arrangements are so congested, that Grade 80 headed bars are an absolute necessity for the physical installation of reinforcing bars and placement/consolidation of concrete in accordance with ACI 318 requirements and project documents. The industry is not aware of any concerns or issues with in-service performance of Grade 80 headed reinforcing bars with net bearing areas of $4A_b$.

- **SM Report No. 127_R.pdf**
  https://www.cdpaccess.com/proposal/11553/35471/documentation/183531/attachments/download/8864/
- **SM_Report_No_117_R.pdf**
  https://www.cdpaccess.com/proposal/11553/35471/documentation/183531/attachments/download/8863/

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

Based on the findings from substantial research projects, Grade 60 and Grade 80 headed reinforcing bars have been successfully used in many types of building projects for many years, especially in projects where constructability issues must be addressed. Thus, this proposal results in no impact on the cost of construction.

Staff Analysis: A review of the standard proposed for inclusion in the code, ASTM A970/A970M-24 Standard Specification for Headed Steel Bars for Concrete Reinforcement, with regard to some of the key ICC criteria for referenced standards (Section 4.6 of CP#28) will be posted on the ICC website on or before April 1, 2025.

S135-25

S136-25

IBC: 1901.2, 1901.2.1 (New), ACI Chapter 35 (New)

Proponents: Edith Gallandorm, PCI, representing Precast/Prestressed Concrete Institute (egallandorm@pci.org); Stephen Skalko, Stephen V. Skalko, P.E. & Associates LLC, representing Precast/Prestressed Concrete Institute (svskalko@svskalko-pe.com); Stephen Szoke, representing American Concrete Institute (steve.szoke@concrete.org)

2024 International Building Code

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

Add new text as follows:

1901.2.1 Precast pretensioned concrete. Precast pretensioned concrete members and connections shall be permitted to be designed in accordance with ACI/PCI CODE 319.

Add new standard(s) as follows:

ACI

American Concrete Institute
38800 Country Club Drive
Farmington Hills, MI 48331-3439

ACI/PCI CODE 319-25

Structural Precast Concrete - Code Requirements

Reason: ACI/PCI CODE 319 is a new standard jointly developed through a consensus process compliant with ICC's Council Policy 28. It contains methodologies, alternative systems, and specialized construction requirements unique to precast, and precast, pretensioned concrete. ACI/PCI CODE 319 does not address the design of cast-in-place. Design of precast members or structures will require the use of both ACI 318 and ACI-PCI CODE 319. Code provisions relating to both cast-in-place and precast concrete have not been repeated where not necessary. Requirements concerning cover over reinforcement and design load combinations are examples of non-repetition. Section numbering for ACI/PCI CODE 319 follows the format of ACI 318 for easy referencing between the two documents. Where new items occur, they have been placed with new section numbers in the appropriate location.

The process for developing ACI-PCI CODE 319 code was composed of two primary activities. First, sections of ACI 318 applicable to precast, pretensioned concrete were identified, which would be used in ACI-PCI CODE 319. The committee voted first on which sections should be included and which would be either out-of-scope or referenced directly to ACI 318. Language of duplicated sections was adjusted to narrow the scope to precast concrete.

Secondly, PCI's Design Standard Committee (PCI-DSC) developed and incorporated new precast, pretensioned provisions into ACI/PCI CODE 319. A list of items that needed to be in the new precast code was developed. Items with completed research were prioritized and balloted within the PCI-Design Standard Committee (DSC), reviewed/approved by PCI TAC and submitted to the ACI-PCI 319 Committee for review and balloting before inclusion in ACI-PCI CODE 319. Examples include intermediate precast structural walls, precast diaphragms with cast-in-place pour strips, and torsion design of compact sections.

Both organizations and committees worked collaboratively to coordinate the development of this document.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

This document provides additional design methodologies typically used in Precast concrete construction. There are no signifcant changes that would increase or decreease the cost of using precst concrete as a building material.

Staff Analysis: A review of the standard proposed for inclusion in the code, ACI/PCI CODE 319-25 Structural Precast Concrete - Code Requirements, with regard to some of the key ICC criteria for referenced standards (Section 4.6 of CP#28) will be posted on the ICC website on or before April 1, 2025.

S137-25

IBC: 1901.2.1

Proponents: Stephen Szoke, representing American Concrete Institute (steve.szoke@concrete.org); Jerzy Zemajtis, NEx, An ACI Center of Excellence for Nonmetallic Building Materials, representing Jerzy Zemajtis, NEx (jerzy.zemajtis@nonmetallic.org); Doug Gremel, representing Owens Corning (douglas.gremel@owenscorning.com); Shamim Rashid-Sumar, representing National Ready Mixed Concrete Association (ssumar@nrmca.org); Dr. Julian Mills-Beale, representing National Ready Mixed Concrete Association (jmills-beale@nrmca.org); Vicki Brown, Widener University, representing American Concrete Institute (vlbrown@widener.edu); John Busel, representing American Composites Manufacturers Association (jbusel@acmanet.org)

2024 International Building Code

Revise as follows:

1901.2.1 Structural concrete with GFRP reinforcement. Cast-in-place structural concrete internally reinforced with glass fiber reinforced polymer (GFRP) reinforcement conforming to ASTM D7957 and designed in accordance with ACI CODE 440.11 shall be permitted where fire-resistance ratings are not required, and ~~only for~~

1. In any structural elements of buildings ~~*structures*~~ assigned to *Seismic Design Category* A, or
2. In structural elements not part of the seismic force resisting system in buildings assigned to SDC B or C.

Reason: This proposal aligns the limitations in the IBC for the use of glass fiber reinforced polymer reinforcement with the limitations in ACI CODE 440.11-22 Building Code Requirements for Structural Concrete Reinforced with Glass Fiber-Reinforced Polymer (GFRP) Bars. When initially introduced into the IBC, to avoid confusion, the permissible use was presented as overly conservative with regard to use in structural elements. This proposal does retain restrictions for use in structural elements that are part of the seismic force resisting system in buildings assigned to SDC B or C. This alignment will expand the acceptable use the IBC by aligning with the requirements of ACI CODE 440.11 increasing applications where non-corrosive GFRP may be used to enhance building safety and durability. Further the alignment will avoid possible confusion by eliminating differences between the provisions of the IBC and ACI CODE 440.11.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

There is no cost impact as this proposal only expands the permissible use of GRFP reinforcement, furthering options for alternative design and construction.

S137-25

S138-25

IBC: 1901.3, ACI Chapter 35 (New)

Proponents: Michael Brown, representing Simpson Strong-Tie Company (mibrown@strongtie.com); Tarek Alkhrdaji, representing Structural Technologies; Anthony Lamanna, representing Arizona State University (drtony@asu.edu); David Ojala, Thornton Tomasetti, Inc., representing Self (dojala@thorntontomasetti.com); Ricky Bagby, representing Pullman SST Inc. (r.bagby@hotmail.com); Mark Ziegler, representing DEWALT (mark.ziegler@sbdinc.com); Chris Kimball, Building Code Solutions, representing Self (chris@bcscodegroup.com)

2024 International Building Code

Revise as follows:

1901.3 Anchoring to concrete. Anchoring to concrete shall be in accordance with ACI 318 as supplemented in Section 1905, and applies to cast-in (headed bolts, headed studs and hooked J- or L-bolts), post-installed expansion (torque-controlled and displacement-controlled), undercut, screw, and adhesive anchors.

Exception: Seismic qualification of post-installed concrete anchors shall be permitted to be in accordance with ACI 355.2 for post-installed expansion, undercut, and screw anchors and in accordance with ACI 355.4 for post-installed adhesive anchors.

Add new standard(s) as follows:

ACI

American Concrete Institute
38800 Country Club Drive
Farmington Hills, MI 48331-3439

355.2-22	Post-Installed Mechanical Anchors in Concrete - Qualification Requirements
355.4-19 (21)	Qualification of Post-Installed Adhesive Anchors in Concrete

Attached Files

- **C1 v. C2 European Capacity Comparisons.pdf**
  https://www.cdpaccess.com/proposal/11491/35946/files/download/9480/
- **ASPC 1 vs ASPC 2 - Design Example.pdf**
  https://www.cdpaccess.com/proposal/11491/35946/files/download/9479/
- **DEWALT_letter_IBC2027_SeismicAnchorQualification_2025.01.09.pdf**
  https://www.cdpaccess.com/proposal/11491/35946/files/download/9478/
- **Code Change Support Letter_TT.pdf**
  https://www.cdpaccess.com/proposal/11491/35946/files/download/9477/
- **CodeChangeSupportLetter_M.LIM.pdf**
  https://www.cdpaccess.com/proposal/11491/35946/files/download/9476/
- **Code Change Support Letter_J.Tehaney.pdf**
  https://www.cdpaccess.com/proposal/11491/35946/files/download/9475/
- **CodeChangeSupportLetter_T.Alkhrdaji.pdf**
  https://www.cdpaccess.com/proposal/11491/35946/files/download/9474/
- **CodeChangeSupportLetter_Gouvis.Engineering.Group.pdf**
  https://www.cdpaccess.com/proposal/11491/35946/files/download/9473/
- **Code Change Support Letter_KDG.pdf**
  https://www.cdpaccess.com/proposal/11491/35946/files/download/9472/

- **CodeChangeSupportLetter_BSB.Design.pdf**
  https://www.cdpaccess.com/proposal/11491/35946/files/download/9326/
- **CodeChangeSupportLetter_Meghan.Halligan.pdf**
  https://www.cdpaccess.com/proposal/11491/35946/files/download/9201/
- **CodeChangeSupportLetter_TG ENGINEERING.pdf**
  https://www.cdpaccess.com/proposal/11491/35946/files/download/9133/
- **CodeChangeSupportLetter_Option One.pdf**
  https://www.cdpaccess.com/proposal/11491/35946/files/download/9131/
- **CodeChangeSupportLetter_Felten Group.pdf**
  https://www.cdpaccess.com/proposal/11491/35946/files/download/9129/
- **Code Change Support Letter_WA.Lopez.SE.pdf**
  https://www.cdpaccess.com/proposal/11491/35946/files/download/9128/
- **Code Change Support Letter_United.Structural.Design.pdf**
  https://www.cdpaccess.com/proposal/11491/35946/files/download/9127/
- **Code Change Support Letter_CS Design Group.pdf**
  https://www.cdpaccess.com/proposal/11491/35946/files/download/9126/

Reason: The purpose of this code change is to counteract new overly conservative requirements for seismic testing and load-rating of post-installed concrete anchors. These conservative and stringent seismic qualification protocols were added into the most recent versions of ACI 355.2 and ACI 355.4, which were published in November of 2024. The ACI 355.2 standard governs the qualification of post-installed mechanical anchors, while the ACI 355.4 standard governs the qualification of post-installed adhesive anchors. The new 2024 versions of the ACI 355 testing standards have also **eliminated** the current simulated seismic testing regime that has been successfully used by these standards for the last two decades to load-rate anchors that resist earthquake-induced forces. The revisions made to the seismic testing regime within these standards have been shown to significantly reduce the capacity of post-installed anchors. ACI 355.2 and ACI 355.4 are currently not referenced directly by the IBC, but they are instead referenced by ACI 318, which is referenced directly by the IBC for concrete design, including anchorage to concrete. This code change will directly reference the previous versions of the ACI 355 testing standards in the IBC, specifically for the seismic qualification of post-installed anchors in concrete.

The following are specific reasons that the new criteria should not be adopted into the IBC:

1. The revised seismic testing parameters included within the new ACI 355 qualification standards are overly restrictive due to the reasons below.

   a. **Incorrect application:** The wider concrete cracks specified in the new ACI 355 standards are only considered to occur right at the edges of plastic hinge zones within lateral-force resisting systems in concrete frame buildings, yet they will be applied to all post-installed anchors within any concrete element located anywhere in the structure.

   b. **Testing representativeness**: The new standards mandate testing for wider crack widths of 0.032” for 25 cycles. This is not representative of real data from earthquake responses of buildings, which typically result in maximum shaking for only 4-5 cycles.

   c. **Misaligned with the original intent of the testing regime:** The new testing protocols come from European design methodology and anchor qualification methods. In Europe, a three-tier seismic qualification exists. Low hazard and risk structures do not require any cyclic testing (the lowest tier), in the US this has been called *ASPC0*. ASPC stands for ‘Anchor Seismic Performance Category’. The middle tier is called “C1” in Europe (*ASPC1* in the US), which corresponds to the current seismic testing regime used in US building codes today. The most severe tier in Europe is called “C2” (*ASPC2* in the US) and has rigorous testing requirements that are required for a limited subset of buildings that are under higher seismic hazard and risk levels only. However, this highest tier, *ASPC2*, has been implemented within the new ACI test standards as the **only** method for seismic qualification, and is required in all structures Seismic Design Category C and above.

Proponents and researchers involved with developing the *ASPC2* testing regime integrated into the new ACI 355 qualification standards never intended this protocol to 'replace' the *ASPC1* regime. Per Marhenholtz and Wood, "*Principally, the integration of the C2 performance category in the U.S. design standards is feasible. However, one critical issue to be discussed and further explored is when is it appropriate to use C1 or C2 anchors. To date, the European approach is inconclusive in this sense…*" and "*The European design requirements can be considered very stringent due to the generally lower peak ground acceleration requiring C1 or even C2 qualified anchors*"(*Reference 1*). As such, the *ASPC2*-only approach within the new ACI 355 standards is not appropriate, overly conservative, and uncalibrated to the design standards referenced in the US model building code, which have yet to adopt this three-tier approach.

d. **Not driven by a real-world need:** There does not appear to be a demand from industry, designers, owners, or building officials for a change in the seismic qualification of post-installed anchors in the United States. Marhenholtz and Wood, who were researchers involved in the development of the C2 testing protocols in Europe, state in their ACI Structural Journal article, "*On the other hand, the current ACI 355 seismic qualification is generally perceived to be sufficient as United States building authorities did not ask for more rigorous qualification requirements, and it is used by many U.S. and international designers and specifiers*" (*Reference 1*).

2. It is inappropriate to apply the new seismic qualification testing protocols to a wide range of building types and anchor applications.

   a. **Based on simulation of one type of building:** The justification of the cyclic loading and crack width protocols in the new qualification standards were derived from 2D-frame analytical models of concrete special moment frames and ordinary moment frames coupled with concrete shearwalls (*Reference 2*). Other building types like steel-framed structures, light-framed construction, metal building systems, or low-rise pre-cast or tilt-up structures were not considered. Yet, the new testing requirements will be applied to all anchor applications in all building types.

   b. **Based on simulation of one seismic hazard:** The selected seismic hazard assumed in the research used to develop the new seismic testing protocols was located in the Los Angeles basin with comparatively high spectral acceleration values of 2.01g for S_S and 0.61g for S_1. Per Marenholtz et al., "*While it is recognized that a variety of seismic conditions exist throughout the world, the significant seismic hazard of the selected site is anticipated to conservatively represent demands at many locations*" (*Reference 2*). The application of this hazard to all sites in Seismic Design Categories C and above is too broad and overly conservative.

   c. **Large cracks only occur in limited locations:** The research simulations showed that large cracks of 0.032" only occur in or near plastic hinge zones in these concrete buildings (*Reference 2*). But even within concrete frame buildings, the vast majority of anchors are installed away from plastic hinge zones, and ACI 318 already excludes the use of anchors within plastic hinge zones. Per Marhenholtz and Wood, "*However, it is noted that the 0.8 mm (0.032") width crack represents a maximum value not generally to be anticipated and the structural analysis may result in smaller crack widths*" (*Reference 1*). Therefore, the wider crack width criteria is not appropriate in most applications.

3. There will be a significant reduction in the capacity of post-installed concrete anchors, which will result in increased construction costs and potentially impractical design solutions.

   a. **Reduced Capacities:** Application of the new seismic testing requirements will result in a reduction in capacity of post-installed concrete anchors in all buildings that are Seismic Design Category C and above, regardless of the application.

   While there is currently no published data in the United States of new capacities tested to the 2024 versions of the ACI 355 standards, equivalent capacity reductions in Europe shed light on what reductions to expect. Please refer *Reference 1* and the "*C1 v. C2 European Capacity Comparisons*" document attached to this proposal for additional information.

A design example based on a US-sold adhesive anchor product that has completed third-party testing with both the previous version of ACI 355.4 and the new 2024 version has been developed to provide a US-product based data point. Please refer to the attached document "*ASPC 1 vs ASPC 2 – Design Example*" for this information.

b. **Increased costs:** This reduced anchor capacity will result in increased costs of anchorage construction, due to both a reduced supply of available anchors that meet the new requirements, and a need to install larger, longer, and/or a higher quantity of anchors compared to what would be required under current qualification standards.

c. **Impact on current design practices:** The reduction in the capacity of anchors that have been successfully used for years will require designers to revise existing anchor solutions due to the overly conservative qualifications. In some cases, the new solutions may be impractical or inappropriate due to other design and construction constraints. Refer to the multiple letters of support from practicing engineers and engineering firms attached to this proposal to appreciate the impact this will have on designers.

4. A 3-tiered system has not been adopted in the U.S.: While a 3-tiered approach including this more conservative testing regime was proposed to the ASCE 7-22 Seismic Subcommittee last cycle, the ASCE 7-22 standard only references existing seismic qualification and design standards (namely ACI 355.2-19 and ACI 318-19) that align with *ASPC1* level qualification testing.

5. The ACI 355 standards are referenced in ACI 318. Since these new test requirements are located in standards that were part of ACI 318-25 by reference only, the full ACI 318 committee may not have considered the effects that the revisions to the newly published ACI 355 standards would have on the industry, and how they might need to be coordinated with the existing seismic requirements for concrete anchorage design within Chapter 17 of ACI 318. Due to the late publication of the ACI 355 standards, there was not adequate time for the ACI 318-25 committee to deliberate on these matters, and as such, the design assumptions within ACI 318 are not currently aligned with the 2024 versions of the ACI 355 testing standards.

6. The requirements are not based on real-world observations. Oftentimes, building code changes typically occur due to examples of failures in the field, or when recurring substandard conditions are found in the industry. The proponents are not aware of real-world failures of currently qualified, properly installed anchors that would justify the need for these new severe qualification requirements. Refer to the Thornton Tomasetti letter of support, authored by Ojala and Cochran, as well as other letters that are attached to this proposal, for additional commentary and perspective in this regard.

7. There will be effects on published documents that will require revisions: ICC and FEMA documents, among others, will be required to be revised because any anchor selections will likely have to be changed due to the decreased anchor capacities under the new qualification protocols.

a. One example is the soon-to-be-published ICC 1300, Vulnerability-Based Seismic Assessment and Retrofit of One- and Two-Family Dwellings, which in turn is based on FEMA P1100. These documents give prescriptive solutions for seismic retrofitting. Some of the anchorage specified uses post-installed concrete anchors, and the spacing is based on current capacities, which were presumably considered adequate.

b. Another example of prescriptive anchorage that may be affected is Appendix A, Chapter A3 of the IEBC (Guidelines for the Seismic Retrofit of Existing Buildings).

In summary, the implementation of the severe seismic testing regime within the 2024 versions of the ACI 355 standards is unnecessarily conservative and is not implemented in a way that is compatible with other design standards that are referenced in the building code. For this code cycle, it is strongly recommended to keep the seismic qualification of post-installed concrete anchors the same as it currently is, to allow for a rational and compatible 3-tiered approach that will apply the highest level of testing only where necessary, as well as be calibrated to the design assumptions within ACI 318 and ASCE 7, in a future code cycle.

Bibliography: 1. Philipp Mahrenholtz, Richard L. Wood, *European Seismic Performance Categories C1 and C2 for Post-Installed Anchors*, ACI Structural Journal, Volume 117, Issue 6 (2020). 10.14359/51728071.
https://www.concrete.org/publications/internationalconcreteabstractsportal/m/details/id/51728071

2. Philipp Mahrenholtz, Richard L. Wood, Rolf Eligehausen, Tara C. Hutchinson, Matthew S. Hoehler, *Development and validation of European guidelines for seismic qualification of post-installed anchors*, Engineering Structures, Volume 148 (2017). ISSN 0141-0296. https://pmc.ncbi.nlm.nih.gov/articles/PMC5714297/

Cost Impact: Decrease

Estimated Immediate Cost Impact:

If this code change is not approved, costs of post-installed anchor solutions within Seismic Design Category C and above will increase significantly. If this code change is approved, costs will remain the same as previous versions of the code; but since this proposal prevents an otherwise increase in costs, the proponents consider this proposal to result in a cost decrease ($0 minimum decrease).

Estimated Immediate Cost Impact Justification (methodology and variables):

A design example was performed using a 1/2" diameter adhesive anchor in 5000 psi concrete, having a tension load of 6500 lbs and a shear load in one direction of 1000 lbs. In this case the 1/2" anchor would require an embedment of 8" under current code requirements. Under the new requirements that would be in place were this code change **not** approved, the 1/2" anchor with 8" embedment would be overstressed by 300%, and instead a 3/4" anchor with 5.25" embedment would be required to achieve the same capacity. This will require a 100% increase in adhesive volume for the larger diameter anchor, along with a 60% increase in steel threaded rod material. If this code change were **not** approved, additional labor (installed) costs and construction time will also apply in most cases, due to a combination of larger holes and/or deeper embedment depths to drill, or an increase in the quantity of anchors required to achieve sufficient design capacity. Also, refer to the Design Example attached to this proposal for additional details and information.

Overall Interaction Comparison Case 1 vs Case 2				
	ASPC1- 1/2" GR55 at 8" Embedment		ASPC2 - 3/4" GR55 at 5.25" Embed	
Loading Case	Capacity	DCR	Capacity	DCR
Steel Tension	7988 lbf	0.814	8830 lbf	0.7361
Breakout Tension	13260 lbf	0.490	7049 lbf	0.9221
Bond Tension	7185 lbf	**0.905**	6756 lbf	**0.9621**
Steel Shear	3115 lbf	**0.321**	5569 lbf	**0.1796**
Pryout Shear	24384 lbf	0.041	19403 lbf	0.0515
Interaction		**99.67%**	**Interaction**	**99.47%**

Estimated Life Cycle Cost Impact:

No life cycle impact. Initial cost only.

Estimated Life Cycle Cost Impact Justification (methodology and variables):

No life cycle impact. Initial cost only.

Staff Analysis: A review of the following standards proposed for inclusion in the code regarding some of the key ICC criteria for referenced standards (Section 4.6 of CP#28) will be posted on the ICC website on or before April 1, 2025:

ACI 355.2-22 Post-Installed Mechanical Anchors in Concrete - Qualification Requirements

ACI 355.4-19 (21) Qualification of Post-Installed Adhesive Anchors in Concrete

S138-25

S139-25

IBC: CHAPTER 19, SECTION 1901, 1901.7, 1901.7.1, 1901.7.2, ACI Chapter 35

Proponents: Edith Gallandorm, representing Precast/Prestressed Concrete Institute (egallandorm@pci.org); Kerry Sutton, representing ACI (kerry.sutton@concrete.org); Stephen Szoke, representing American Concrete Institute (steve.szoke@concrete.org); Stephen Skalko, Stephen V. Skalko, P.E. & Associates LLC, representing Precast/Prestressed Concrete Institute (svskalko@svskalko-pe.com)

2024 International Building Code

CHAPTER 19
CONCRETE

SECTION 1901
GENERAL

Delete without substitution:

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

Revise as follows:

1901.7 ~~**1901.7.1 Cast-in-place concrete tolerances**~~ **Tolerances for structural concrete.** Where not indicated in *construction documents,* ~~Structural~~ structural tolerances for ~~cast-in-place~~ concrete structural elements shall be in accordance with ACI 117.

Exceptions:

1. Group R-3 detached one- or two-family *dwellings* are not required to comply with this section.
2. Shotcrete is not required to comply with this section.

Delete without substitution:

~~**1901.7.2 Precast concrete tolerances.** Structural tolerances for precast concrete structural elements shall be in accordance with ACI ITG-7.~~

~~**Exception:** Group R-3 detached one- or two-family *dwellings* are not required to comply with this section.~~

ACI

American Concrete Institute
38800 Country Club Drive
Farmington Hills, MI 48331-3439

~~ITG—7-09~~ ~~Specification for Tolerances for Precast Concrete~~

Reason: ACI ITG-7 is no longer being updated and will be added to ACI 117.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

There is no change to existing requirements.

S139-25

S140-25

IBC: CHAPTER 19, SECTION 1905, 1905.1, 1905.3, 1905.3.1, ACI Chapter 35 (New)

Proponents: Edith Gallandorm, representing Precast/Prestressed Concrete Institute (egallandorm@pci.org); Stephen Skalko, Stephen V. Skalko, P.E. & Associates LLC, representing Precast/Prestressed Concrete Institute (svskalko@svskalko-pe.com)

2024 International Building Code

CHAPTER 19
CONCRETE

SECTION 1905
SEISMIC REQUIREMENTS

1905.1 General. In addition to the provisions of ACI 318, structural concrete shall comply with the requirements of Section 1905.

Revise as follows:

1905.3 Intermediate precast structural walls. Intermediate precast structural walls shall comply with Section 18.5 of ~~ACI 318~~ ACI/PCI CODE 319 ~~and this section~~.

Delete without substitution:

~~**1905.3.1 Connections designed to yield.** Connections that are designed to yield shall be capable of maintaining 80 percent of their *design strength* at the deformation induced by the design displacement or shall use Type 2 mechanical splices.~~

Add new standard(s) as follows:

ACI

American Concrete Institute
38800 Country Club Drive
Farmington Hills, MI 48331-3439

ACI/PCI CODE 319-25

Structural Precast Concrete - Code Requirements

Reason: Reference to ACI/PCI 319 aligns with current industry requirements for the design of this type of lateral systems. The document clarifies requirements of design of strong and ductile connections between precast concrete components. The refernce to ACI/PCI 319 allows the subsection, 1905.3.1 to be deleted.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

There is no substantiave change in requirements that would have a cost implication.

Staff Analysis: A review of the standard proposed for inclusion in the code, ACI/PCI CODE 319-25 Structural Precast Concrete - Code Requirements, with regard to some of the key ICC criteria for referenced standards (Section 4.6 of CP#28) will be posted on the ICC website on or before April 1, 2025.

S140-25

S141-25

IBC: CHAPTER 19, SECTION 1909 (New), 1909.1 (New), CHAPTER 35, PCI Chapter 35 (New)

Proponents: Edith Gallandorm, representing Precast/Prestressed Concrete Institute (egallandorm@pci.org); Stephen Skalko, Stephen V. Skalko, P.E. & Associates LLC, representing Precast/Prestressed Concrete Institute (svskalko@svskalko-pe.com)

2024 International Building Code

CHAPTER 19
CONCRETE

Add new text as follows:

<u>SECTION 1909</u>
<u>PRECAST CONCRETE INSULATED WALL PANELS</u>

<u>**1909.1** **General.** Precast concrete insulated wall panels shall be in accordance with the requirements of ANSI/PCI 150.</u>

CHAPTER 35
REFERENCED STANDARDS

Add new standard(s) as follows:

PCI

Precast Prestressed Concrete Institute
8770 West Bryn Mawr, Suite 1150
Chicago, IL 60631-3517

<u>ANSI/PCI 150</u> <u>Specification for the Design of Precast Concrete Insulated Wall Panels</u>

Reason: This change introduces a special methodology of construction. Historically this type of construction was addressed in State-of-the-art documents or proprietary information. The document was developed through a consensus process compliant with ICC's Council Policy 28.

Bibliography: *ANSI/PCI 150-24 Specification for the Design of Precast concrete Insulated Wall Panels*

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

Procedure in new document is comparable to current design and construction methodology. There may be minor to insignificant cost increase due to clarification of minimum reinforcement requirements, potentially 0-2% of insulated precast concrete panel cost.

Staff Analysis: A review of the standard proposed for inclusion in the code, ANSI/PCI 150 Specification for the Design of Precast Concrete Insulated Wall Panels, with regard to some of the key ICC criteria for referenced standards (Section 4.6 of CP#28) will be posted on the ICC website on or before April 1, 2025.

S141-25

S142-25

IBC: CHAPTER 19, SECTION 1909 (New), 1909.1 (New), 1909.1.1 (New), 1909.1.2 (New), 1909.1.3 (New), 1909.2 (New), 1909.2.1 (New), 1909.3 (New), 1909.4 (New), 1909.5 (New), 1909.6 (New), 1909.7 (New), 1909.8 (New), 1909.9 (New), 1909.10 (New), ASTM Chapter 35 (New)

Proponents: Jennifer Hatfield, J. Hatfield & Associates, representing National Roof Deck Contractors Association (jen@jhatfieldandassociates.com)

2024 International Building Code

CHAPTER 19
CONCRETE

Add new text as follows:

SECTION 1909
LIGHTWEIGHT INSULATING CONCRETE ROOF INSULATION

1909.1 Lightweight insulating concrete. Material produced with or without aggregate additions to hydraulic cement, water and air to form a hardened material possessing insulating qualities, which, when oven dried shall have a unit weight no greater than 50 pcf (801 kg/m^3).

1909.1.1 Lightweight cellular insulating concrete. Insulating concrete formulated by mixing a hydrated cementitious matrix around discrete air cells created by the addition of preformed foam formed from surfactants. The cured cellular lightweight insulating concrete shall have minimum compressive strength of 160 psi (1103 kPa) when tested in accordance with ASTM C495 and C796.

1909.1.2 Lightweight aggregate insulating concrete. Insulating concrete formulated by mixing lightweight aggregates such as Vermiculite or Perlite. The cured lightweight aggregate insulating concrete shall have minimum compressive strength of 160 psi (1103 kPa) when tested in accordance with ASTM C495.

1909.1.3 Lightweight cellular/aggregate (hybrid) insulating concrete. Insulated concrete formulated by combining preformed foam with lightweight aggregates to impart properties of both lightweight aggregate and cellular lightweight insulating concrete. It shall have a minimum compressive strength of 200 psi (1379 kPa) when tested in accordance with ASTM C495.

1909.2 Materials. Lightweight insulating concrete may be poured over galvanized metal decks vented and nonvented, cementitious wood fiber acoustical decks, structural concrete slabs, lightweight structural concrete slabs, precast concrete, prepared structural wood decks, and existing roof systems. Where manufacturer installation instructions require, lightweight insulating concrete over structural concrete slabs, twin tees, precast units or other nonventing substrate shall be vented.

1909.2.1 Limitations of use. Lightweight insulating concrete, in conjunction with galvanized formed steel sheets, shall not be used as a roof deck in areas where highly corrosive chemicals are used or stored. Lightweight insulating concrete shall not be poured directly over a painted or nongalvanized steel deck.

1909.3 Minimum thickness. Minimum thickness of lightweight insulating concrete shall be 2 inches (51 mm) over the top plane of the substrate unless otherwise specified in the product approval. Lightweight insulating concrete shall be of sufficient thickness to receive the specified base ply fastener length.

1909.4 Galvanized coatings. Galvanized coatings of formed steel sheets shall be in accordance with ASTM A525. Base steel shall be in accordance with ASTM A446, Grade A, B, C, D or greater and ASTM A1008 C, D or E.

1909.5 Vermiculite or perlite. Vermiculite or perlite shall be in accordance with ASTM C332, Group I.

1909.6 Preformed foam. Preformed foam surfactants shall be in accordance with ASTM C869.

1909.7 Base ply fasteners. All base ply fasteners for use with a specific lightweight insulating concrete roof deck system shall be approved for use in the manufacturer's installation instructions and the design pressure requirements of Section 1609.

1909.8 Fastener withdrawal. The lightweight insulating concrete fastener withdrawal shall have a minimum resistance of 40 pounds (178 N) at time of roofing.

1909.9 Insulation board. Insulation board shall comply with the following:

1. When used with lightweight insulating concrete, insulation board shall conform to Type I expanded polystyrene insulation density or greater, as defined in ASTM C578 or as approved for use in the manufacturer's installation instructions.
2. Packaged insulation board delivered to the job site shall comply with the provisions of Section 2603.2.
3. Installation of insulating board in conjunction with lightweight insulating concrete shall comply with the uplift requirements in Section 1609.
4. Insulation panels shall be placed in a minimum $^{1}/_{8}$-inch (3.2 mm) slurry of insulating concrete while the material is still in a plastic state. The insulating concrete shall be cast over the insulation boards according to the insulating concrete manufacturer's installation instructions. Insulation panels shall be provided with holes and/or slots for keying and venting.

1909.10 Reinforcing mesh. Reinforcing mesh shall be provided as required to meet fire-rating and/or special structural design requirements, and follow the manufacturer's installation instructions. Fiber reinforcement may be used.

Add new standard(s) as follows:

ASTM

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

A446-76(1981)e1	Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) By The Hot-Dip Process, Structural (Physical) Quality
A525-91be1	Standard Specification for General Requirements for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process
A1008/A1008M-24	Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Required Hardness, Solution Hardened, and Bake Hardenable
C332-17	Standard Specification for Lightweight Aggregates for Insulating Concrete
C495-12 (2019)	Standard Test Method for Compressive Strength of Lightweight Insulating Concrete
C618-22	Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete
C796/C796M-19	Standard Test Method for Foaming Agents for Use in Producing Cellular Concrete Using Preformed Foam
C869/C869M-11(2016)	Standard Specification for Foaming Agents Used in Making Preformed Foam for Cellular Concrete

Reason: Currently, the IBC has no requirements for lightweight insulating concrete (LWIC) roof insulation, a type of roofing system that has been successfully applied throughout the country for over 70 years. This system combines lightweight concrete and expanded polystyrene (EPS) insulation to create a durable, energy efficient roof insulation.

This proposal creates a new section under Chapter 19 for LWIC roof insulation, providing requirements to assist code officials and contractors on proper application. This language stems directly from LWIC roof insulation requirements that have been in the Florida Building Code since its inception in 2001. Those provisions also fall within Chapter 19 of the Florida Building Code.

Many other states have looked to Florida's LWIC concrete provisions for guidance on LWIC installation. This proposal improves the code by ensuring requirements exist within the IBC, eliminating the need to look to Florida's code for direction. The proposal relies both on Florida provisions and industry best practices, and will ensure LWIC roof systems are installed properly by giving code users the requirements to reference when addressing LWIC roof insulation systems.

Bibliography: Florida Building Code, Building, Section 1917

Cost Impact: Decrease

Estimated Immediate Cost Impact:

Minimum decrease would be $0.

The addition of lightweight insulating concrete installation requirements will bring clarity to both industry and code officials by having a clear set of requirements within the code. Having clear provisions, rather than relying on guidelines and best practices that may sometimes conflict, will eliminate confusion and lessen permitting and inspection time. Thereby, resulting in a decrease in time and cost.

Estimated Immediate Cost Impact Justification (methodology and variables):

The methodology used is based on no current I-code requirements existing for LWIC roof insulation systems. Although industry best practices, product manufacturer guidelines, and Florida code provisions do exist, conflicting information could cause confusion in the field. It is not possible to put an exact figure on any possible decrease, as it could vary widely, but clarity for industry and code officials should lessen cost.

Staff Analysis: A review of the following standards proposed for inclusion in the code regarding some of the key ICC criteria for referenced standards (Section 4.6 of CP#28) will be posted on the ICC website on or before April 1, 2025:

ASTM A446-76(1981)e1 Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) By The Hot-Dip Process, Structural (Physical) Quality

ASTM A525-91be1 Standard Specification for General Requirements for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process

ASTM A1008/A1008M-24 Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Required Hardness, Solution Hardened, and Bake Hardenable

ASTM C332-17 Standard Specification for Lightweight Aggregates for Insulating Concrete

ASTM C495-12 (2019) Standard Test Method for Compressive Strength of Lightweight Insulating Concrete

ASTM C618-22 Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete

ASTM C796/C796M-19 Standard Test Method for Foaming Agents for Use in Producing Cellular Concrete Using Preformed Foam

ASTM C869/C869M-11(2016) Standard Specification for Foaming Agents Used in Making Preformed Foam for Cellular Concrete

S142-25

S143-25

IBC: SECTION 2103, 2103.1

Proponents: Nicholas Lang, Concrete Masonry & Hardscapes Association, representing Masonry Alliance for Codes & Standards (nlang@masonryandhardscapes.org)

2024 International Building Code

SECTION 2103
MASONRY CONSTRUCTION MATERIALS

Revise as follows:

2103.1 Masonry units. Concrete *masonry units*, clay or shale *masonry units*, stone *masonry units*, *glass unit masonry* ~~and~~ *AAC masonry* units <u>and manufactured stone veneer units</u> shall comply with Article 2.3 of TMS 602. Architectural *cast stone* shall conform to TMS 504.

> **Exception:** *Structural clay tile* for nonstructural use in fireproofing of structural members and in wall furring shall not be required to meet the compressive strength specifications. The *fire-resistance rating* shall be determined in accordance with ASTM E119 or UL 263 and shall comply with the requirements of Table 705.5.

Reason: Section 2103.1 references The Masonry Society (TMS) 602 for requirements for various masonry units. It lists the types of units that are covered in the reference section. Missing from this list is manufactured stone veneer units. This change proposes to add that so the list of materials encompasses those in Article 2.3 of TMS 602.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

This proposal simply aligns the list of materials with the reference standard included.

S143-25

S144-25

IBC: 2103.2.3, 2103.2.3.1, 2103.2.3.2, 2103.2.3.7, ANSI Chapter 35 (New)

Proponents: Shamim Rashid-Sumar, representing National Ready Mixed Concrete Association (ssumar@nrmca.org); James Farny, Portland Cement Association, representing US cement manufacturers (jfarny@cement.org); Dr. Julian Mills-Beale, representing National Ready Mixed Concrete Association (jmills-beale@nrmca.org); Nicholas Lang, representing Concrete Masonry & Hardscapes Association (nlang@masonryandhardscapes.org); Ryan marino, representing Tile Council of North America (rmarino@tileusa.com)

2024 International Building Code

Revise as follows:

2103.2.3 Mortars for ceramic wall and floor tile. ~~Portland~~ Cement *mortars* for installing ceramic wall and floor tile shall comply with ANSI A108.1A and ANSI A108.1B and be of the compositions indicated in Table 2103.2.3.

2103.2.3.1 Dry-set ~~Portland~~ cement mortars. Premixed prepared ~~Portland~~ cement *mortars*, which require only the addition of water and are used in the installation of ceramic tile, shall comply with ANSI A118.1. The shear bond strength for tile set in such *mortar* shall be as required in accordance with ANSI A118.1. Tile set in dry-set ~~Portland~~ cement *mortar* shall be installed in accordance with ANSI A108.5.

2103.2.3.2 ~~Latex-modified~~ Modified ~~Portland~~ dry-set cement mortar. ~~Latex-modified~~ Modified ~~Portland~~ dry-set cement ~~thin-set~~ *mortars* in which ~~latex is added to~~ additives have been incorporated to improve performance above an ANSI A118.1 dry-set *mortar* ~~as a replacement for all or part of the gauging water~~ that are used for the installation of ceramic tile shall comply with ANSI A118.4 or ANSI A118.15. Tile set in ~~latex-~~modified ~~Portland~~ dry-set cement *mortar* shall be installed in accordance with ANSI A108.5.

2103.2.3.7 ~~Portland cement~~ Cement grouts. ~~Portland cement~~ Cement grouts used for the installation of ceramic tile shall comply with ANSI A118.6 or A118.7. ~~Portland cement~~ Cement grouts for tile work shall be installed in accordance with ANSI A108.10.

Add new standard(s) as follows:

ANSI

American National Standards Institute
25 West 43rd Street, Fourth Floor
New York, NY 10036

A118.7-19	Standard Specifications for High Performance Cement Grouts for Tile Installation
A118.15-23	Specifications for Improved Modified Dry-Set Cement Mortar

Reason: This proposal is part of a series of proposals to the IBC and IRC to update cement terminology in the building codes.

The proposed revisions reflect current cement technology and market conditions, which can vary across regions. Nationally, the market is no longer dominated by portland cement. More than sixty percent of the current cement market consists of blended cement, including portland-limestone cement (PLC) and other blended cements that meet the requirements of ASTM C595/C595M, Specification for Blended Hydraulic Cements (Portland Cement Association, 2025). ASTM C595/C595M is referenced in the International Building Code/ International Residential Code.

This specific proposal also updates terminology based on standards currently referenced related to dry-set cement mortars.

The revised terminology in the proposal is consistent with ANSI A118.1. ANSI A118.1 no longer uses the term portland in its title, and instead refers to dry-set cement. The standard also allows for types of cement other than portland cement.

In ANSI A118.4, the terms portland and latex are no longer used, and instead refer to “modified dry-set cement mortars.”

Finally, the proposal adds reference to ANSI A118.7 and A118.15 for high performance cement grouts for tile installation and modified dry-set cement mortars.

Bibliography: Portland Cement Association, 2025. Reducing Carbon at the Cement Plant. https://cementprogress.com/reducing-carbon-at-the-cement-plant/

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

This editorial code change will not impact the cost of construction. See reason statement.

Staff Analysis: A review of the following standards proposed for inclusion in the code regarding some of the key ICC criteria for referenced standards (Section 4.6 of CP#28) will be posted on the ICC website on or before April 1, 2025:

ANSI A118.7-19 Standard Specifications for High Performance Cement Grouts for Tile Installation

ANSI A118.15-23 Specifications for Improved Modified Dry-Set Cement Mortar

S144-25

S145-25

IBC: CHAPTER 21, SECTION 2107, 2107.3

Proponents: Nicholas Lang, Concrete Masonry & Hardscapes Association, representing Masonry Alliance for Codes & Standards (nlang@masonryandhardscapes.org); Charles Clark Jr, Brick Industry Association, representing Masonry Alliance for Codes and Standards (cclark@bia.org)

2024 International Building Code

CHAPTER 21
MASONRY

SECTION 2107
ALLOWABLE STRESS DESIGN

Delete without substitution:

~~**2107.3 TMS 402, Section 6.1.7, splices of reinforcement.** Add to Section 6.1.7 as follows:~~

> ~~6.1.7 – Splices of reinforcement. Lap splices, welded splices or mechanical splices are permitted in accordance with the provisions of this section. Welding shall conform to AWS D1.4. Welded splices shall be of ASTM A706 steel reinforcement. Reinforcement larger than No. 9 (M #29) shall be spliced using mechanical connections in accordance with Section 6.1.7.2.~~

Reason: ASCE 7-02 added Chapter 14, which modified the various material standard's seismic design criteria. Since then, several of the materials standard's development organizations have been working with ASCE 7's seismic committee to reconcile the differences between these documents. TMS is one of them. TMS 402 has revised their provisions and subsequently removed almost all of the masonry provisions from recent editions of ASCE 7.

The 2003 IBC code development process considered the provisions of ASCE 7 Chapter 14, and placed some, but not all of those provisions in the material chapters of the IBC. This provision was one of them. In the ensuing twenty-plus years this provision has been revised and adopted into the current masonry standard, TMS 402, and removed from ASCE 7. Now it is time to remove it from the IBC to avoid an archaic conflict.

TMS 402-22 Section 6.1.7.3 deals with welded splices, and is identical to this IBC revision, except it goes further and allows welding of other grades of reinforcing bars, if a carbon equivalent is provided. This is in accordance with AWS D1.4. The TMS Standard improves on this portion of the IBC.

TMS 402-22 Section 6.1.7.2 deals with mechanical splices and is much more specific than the IBC. It includes provisions for size and placement of mechanical splices in Section 6.1.7.2.3 (a) through (e). Subsequent to these changes, the ASCE 7 seismic and main committees removed this provision from Section 14.4 of ASCE 7. It now needs to be removed from the IBC.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

This change aligns the IBC with current versions of TMS 402 and ASCE 7.

S145-25

S146-25

IBC: CHAPTER 21, SECTION 2108, 2108.3

Proponents: Nicholas Lang, Concrete Masonry & Hardscapes Association, representing Masonry Alliance for Codes & Standards (nlang@masonryandhardscapes.org); Charles Clark Jr, Brick Industry Association, representing Masonry Alliance for Codes and Standards (cclark@bia.org)

2024 International Building Code

CHAPTER 21
MASONRY

SECTION 2108
STRENGTH DESIGN OF MASONRY

Revise as follows:

2108.3 TMS 402, Section 6.1.7, splices. Add to Section~~s~~ 6.1.7.2.1 ~~and 6.1.7.3.1~~ as follows:

~~6.1.7.3.1 – Welded splices shall not be permitted in plastic hinge zones of intermediate or special reinforced walls.~~

6.1.7.2.1 – Mechanical splices shall be classified as Type 1 or 2 in accordance with Section 18.2.7.1 of ACI 318. Type 1 mechanical splices shall not be used within a plastic hinge zone or within a beam-column joint of intermediate or special *reinforced masonry* shear walls. Type 2 mechanical splices are permitted in any location within a member.

Reason: ASCE 7-02 added Chapter 14, which modified the various material standard's seismic design criteria. Since then, several of the materials standard's development organizations have been working with ASCE 7's seismic committee to reconcile the differences between these documents. TMS is one of them. TMS 402 has revised their provisions and subsequently removed almost all of the masonry provisions from recent editions of ASCE 7.

The 2003 IBC code development process considered the provisions of ASCE 7 Chapter 14, and placed some, but not all of those provisions in the material chapters of the IBC. This provision was one of them. In the ensuing twenty-plus years this provision has been revised and adopted into the current masonry standard, TMS 402, and removed from ASCE 7. Now it is time to remove it from the IBC to avoid an archaic conflict.

TMS 402-22 Section 6.1.7.3 deals with welded splices. The TMS Standard does not permit welded splices to be in the plastic hinge zones, which makes this IBC modification no longer necessary.

Subsequent to this change in TMS 402-22, the ASCE 7 seismic and main committees removed this provision from Section 14.4 of ASCE 7. It now needs to be removed from the IBC.

NOTE: A separate proposal has been submitted to remove the modification to TMS 402 Section 6.1.7.2.1 from this section. If both proposals are approved, it is the intent that all of Section 2108.3 be deleted.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

This change aligns the IBC with current versions of TMS 402 and ASCE 7.

S146-25

S147-25

IBC: CHAPTER 21, SECTION 2108, 2108.3

Proponents: Nicholas Lang, Concrete Masonry & Hardscapes Association, representing Masonry Alliance for Codes & Standards (nlang@masonryandhardscapes.org); Charles Clark Jr, Brick Industry Association, representing Masonry Alliance for Codes and Standards (cclark@bia.org)

2024 International Building Code

CHAPTER 21 MASONRY

SECTION 2108 STRENGTH DESIGN OF MASONRY

Revise as follows:

2108.3 TMS 402, Section 6.1.7, splices. Add to Sections~~s 6.1.7.2.1 and~~ 6.1.7.3.1 as follows:

6.1.7.3.1 – Welded splices shall not be permitted in plastic hinge zones of intermediate or special reinforced walls.

~~6.1.7.2.1 – Mechanical splices shall be classified as Type 1 or 2 in accordance with Section 18.2.7.1 of ACI 318. Type 1 mechanical splices shall not be used within a plastic hinge zone or within a beam-column joint of intermediate or special *reinforced masonry* shear walls. Type 2 mechanical splices are permitted in any location within a member.~~

Reason: ASCE 7-02 added Chapter 14, which modified the various material standard's seismic design criteria. Since then, several of the materials standard's development organizations have been working with ASCE 7's seismic committee to reconcile the differences between these documents. TMS is one of them. TMS 402 has revised their provisions and subsequently removed almost all of the masonry provisions from recent editions of ASCE 7.

The 2003 IBC code development process considered the provisions of ASCE 7 Chapter 14, and placed some, but not all of those provisions in the material chapters of the IBC. This provision was one of them. In the ensuing twenty-plus years this provision has been revised and adopted into the current masonry standard, TMS 402, and removed from ASCE 7. Now it is time to remove it from the IBC to avoid an archaic conflict.

TMS Section 6.1.7.2.1 requires all mechanical splices to develop 125% of f_y, and thus be Type 2 splices. That eliminates the need for this provision.

Subsequent to this change, the ASCE 7 seismic and main committees removed this provision from Section 14.4 of ASCE 7. It now needs to be removed from the IBC.

NOTE: A separate proposal has been submitted to remove the modification to TMS 402 Section 6.1.7.3.1 from this section. If both proposals are approved, it is the intent that all of Section 2108.3 be deleted.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

This change aligns the IBC with current versions of TMS 402 and ASCE 7.

S147-25

S148-25

IBC: 2111.12

Proponents: Charles Clark Jr, Brick Industry Association, representing Masonry Alliance for Codes and Standards (cclark@bia.org)

2024 International Building Code

Revise as follows:

2111.12 Fireplace clearance. ~~Any portion of a *masonry* fireplace located in the interior of a *building* or within the *exterior wall* of a *building* shall have a clearance to combustibles of not less than 2 inches (51 mm) from the front faces and sides of *masonry* fireplaces and not less than 4 inches (102 mm) from the back faces of *masonry* fireplaces. The airspace shall not be filled, except to provide *fireblocking* in accordance with Section 2111.13.~~ Wood beams, joists, studs and other combustible materials shall have a clearance of not less than 2 inches (51 mm) from the front faces and sides of masonry fireplaces and not less than 4 inches (102 mm) from the back faces of masonry fireplaces. The airspace shall not be filled except for non combustible material or to provide fire blocking in accordance with Section 2111.13.

Exceptions:

1. *Masonry* fireplaces *listed* and *labeled* for use in contact with combustibles in accordance with UL 127 and installed in accordance with the manufacturer's instructions are permitted to have combustible material in contact with their *exterior surfaces*.
2. ~~Where *masonry* fireplaces are constructed as part of *masonry* or concrete walls, combustible materials shall not be in contact with the *masonry* or concrete walls less than 12 inches (306 mm) from the inside surface of the nearest firebox lining.~~ Masonry fireplaces with walls at least 12 inches 305 mm) thick are permitted to have combustible material in contact with their exterior surface.
3. Exposed combustible *trim* and the edges of sheathing materials, such as wood siding, flooring and drywall, are permitted to abut the *masonry* fireplace sidewalls and hearth extension, in accordance with Figure 2111.12, provided that such combustible *trim* or sheathing is not less than ~~12 inches (306 mm)~~ 8 inches (203 mm) from the inside surface of the nearest firebox lining. Where the fireplace opening is 6 square feet (0.6 m2) or larger such combustible or sheathing shall be permitted to abut the masonry fireplace sidewalls and hearth extension provided such combustible or sheathing is not less than 12 inches (305 mm) from the inside surface of the nearest firebox lining.
4. Exposed combustible mantels or *trim* is permitted to be placed directly on the *masonry* fireplace front surrounding the fireplace opening, provided that such combustible materials shall not be placed within 6 inches (153 mm) of a fireplace opening. Combustible material directly above and within 12 inches (305 mm) of the fireplace opening shall not project more than $^{1}/_{8}$ inch (3.2 mm) for each 1-inch (25 mm) distance from such opening. Combustible materials located along the sides of the fireplace opening that project more than $1^{1}/_{2}$ inches (38 mm) from the face of the fireplace shall have an additional clearance equal to the projection.

Reason: This code change is editorial to align the IBC fireplace clearance provisions with those in the IRC.

Referring to "masonry or concrete walls" in Exception 2 can be ambiguous and confusing. What matters is that combustible materials should not be less than 12 inches (305 mm) from the inside surface of the nearest firebox lining. The change in Exception 3 is to be consistent with Section 2111.11 allowing small fireplaces with openings under 6 square feet to have hearth extensions 8 inches beyond the fireplace opening,

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

The code change proposal will not increase or decrease the cost of construction. This change is just a clarification. Refer to reason statement.

S149-25

IBC: 2113.19

Proponents: Charles Clark Jr, Brick Industry Association, representing Masonry Alliance for Codes and Standards (cclark@bia.org)

2024 International Building Code

Revise as follows:

2113.19 Chimney clearances. Any portion of a *masonry* chimney located in the interior of the *building* or within the *exterior wall* of the *building* shall have a minimum airspace clearance to combustibles of 2 inches (51 mm). Chimneys located entirely outside the *exterior walls* of the *building*, including chimneys that pass through the soffit or *cornice*, shall have a minimum airspace clearance of 1 inch (25 mm). The airspace shall not be filled, except to provide *fireblocking* in accordance with Section 2113.20.

Exceptions:

1. *Masonry* chimneys equipped with a chimney lining system *listed* and *labeled* for use in chimneys in contact with combustibles in accordance with UL 1777, and installed in accordance with the manufacturer's instructions, are permitted to have combustible material in contact with their exterior surfaces.
2. ~~Where *masonry* chimneys are constructed as part of *masonry* or concrete walls, combustible materials shall not be in contact with the *masonry* or concrete wall less than 12 inches (305 mm) from the inside surface of the nearest flue lining.~~ Masonry chimneys with chimney walls at least 8 inches (203 mm) thick are permitted to have combustible material in contact with their exterior surface.
3. ~~Exposed combustible *trim* and the edges of sheathing materials, such as wood siding, are~~ Combustible materials shall be permitted to abut the *masonry* chimney sidewalls, in accordance with Figure 2113.19, provided that such combustible ~~*trim* or sheathing~~ material is not less than ~~12 inches (305 mm)~~ 8 inches (203 mm) from the inside surface of the nearest flue lining. ~~Combustible material and *trim* shall not overlap the corners of the chimney by more than 1 inch (25 mm).~~

Reason: This code change proposal is primarily to align the IBC chimney clearances with those in the IRC Section R1003.18.

Referring to "masonry or concrete walls" can be ambiguous and confusing. What matters is that combustible materials should not be less than 8 inches (203 mm) from the inside surface of the nearest flue lining. Since we determined that an 8 inch thick masonry wall in contact with combustible framing was safer than a 4 inch wall and 2 inches of airspace, there is no reason to limit the requirement for 8 inch thick chimney walls to "Exposed combustible trim and the edges of sheathing materials, such as wood siding and flooring."

Bibliography: The engineering study at https://www.rumford.com/code/EightInchThickTestReport.pdf supports changing the provisions in this Section as shown in this proposal.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

The code change proposal will not increase or decrease the cost of construction. This change is just a clarification. Refer to reason statement.

S149-25

S150-25

IBC: 2201.3

Proponents: Bonnie Manley, representing AISC (manley@aisc.org)

2024 International Building Code

Revise as follows:

2201.3 Protection <u>against corrosion</u>. ~~The protection of steel~~ <u>Steel</u> members shall be <u>protected against corrosion</u> in accordance with the applicable referenced standards within this chapter.

Reason: Last cycle, Proposal S187-22 successfully reorganized and streamlined Chapter 22. Recent questions received by the AISC Steel Solution Center have indicated some confusion about the simple reference to "protection." Rather than leave it vague and open to interpretation, this proposal clarifies that the steel is to be “protected against corrosion,” which is in keeping with the provision in previous editions of the IBC (specifically, IBC-21 Section 2203.1).

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

This proposal is intended to be an editorial clarification of the existing provisions and is not intended to impact the cost of construction.

S150-25

S151-25

IBC: 2203.1

Proponents: Bonnie Manley, representing AISC (manley@aisc.org)

2024 International Building Code

Revise as follows:

2203.1 General. The design, fabrication, and erection of ~~austenitic and duplex~~ structural stainless steel shall be in accordance with AISC 370.

Reason: This proposal fixes the charging language for the adoption of AISC 370. Specifically, AISC 370 includes precipitation hardening stainless steel for tension members in addition to austenitic and duplex stainless steels. Rather than have IBC include a laundry list of the various types of structural stainless steel, it would be more appropriate to point to AISC 370, where detailed limits on alloys are provided.

The change from “manufacture” to "fabrication" returns the language to that approved in Proposal S187-22 Section 2203.1. AISC 370, Section A1 states that AISC 370 “shall apply to the design, fabrication, and erection of structural stainless steel systems…” The use of “manufacture” is inappropriate in this instance. Please note, this portion of the change has been submitted as possible errata on the 2024 IBC.

AISC makes its standards available to all free of charge at https://www.aisc.org/publications/steel-standards/.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

This proposal is intended to be an editorial clarification of the existing provisions and is not intended to impact the cost of construction.

Staff Analysis: Note: This proposal reflects staff identified errata for Section 2203.1 (correction of "fabrication" to replace "manufacture")

S151-25

S152-25

IBC: 2303.1.1

Proponents: David Tyree, representing American Wood Council (dtyree@awc.org); Shane Nilles, representing American Wood Council (snilles@awc.org)

2024 International Building Code

Revise as follows:

2303.1.1 Sawn lumber. Sawn lumber used for load-supporting purposes, including end-jointed<u>, face-glued</u> or edge-glued lumber, machine stress-rated or machine-evaluated lumber, shall be identified by the grade *mark* of a lumber grading or inspection agency that has been *approved* by an *accreditation body* that complies with DOC PS 20 or equivalent. Grading practices and identification shall comply with rules published by an agency approved in accordance with the procedures of DOC PS 20 or equivalent procedures.

Reason: DOC PS 20 establishes the grading and inspection standards for various sawn wood products, which includes face-glued lumber in addition to end-jointed and edge-glued lumber. IBC 2303.1.1 currently refers to end-jointed and edge-glued lumber and does not mention face-glued lumber. This omission may cause confusion regarding its acceptance under the IBC. This proposal aims to clarify that face-glued lumber is indeed permitted alongside the other glued lumber products identified in DOC PS 20.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

There are no technical changes proposed in this code change. Face-glued lumber is already included in DOC PS 20. This change only adds it to a list of sawn lumber products in Section 2303.1.1 to avoid confusion.

S152-25

S153-25

IBC: SECTION 202 (New), 2303.1.1.3 (New), 2303.1.1.3.1 (New), ASTM Chapter 35 (New)

Proponents: Garian Cika, representing City of Eugene

2024 International Building Code

Add new definition as follows:

SALVAGE LUMBER. Sawn lumber that has been previously used in buildings or other structures.

Add new text as follows:

2303.1.1.3 Salvage lumber. *Salvage lumber* shall be free of areas of decay and insect damage. *Salvage lumber* shall be permitted for use in structural applications in accordance with Section 2303.1.1.3.1. *Salvage lumber* that does not meet the provisions of Section 2303.1.1.3.1 shall be permitted for use in non-structural applications.

2303.1.1.3.1 Salvage lumber in structural applications. *Salvage lumber* used in structural applications shall be free of locations where net section has been reduced. Each piece of salvage lumber to be used in structural applications shall be proof loaded in flat-wise, third-point bending in accordance with ASTM D4761 to 2.1 times the reference bending design value, adjusted by the flat use factor, assigned to the selected grade of lumber in the AWC NDS. Pieces of *salvage lumber* that do not exhibit structural failure at a load corresponding to 2.1 times the reference bending design value shall be permitted for use in structural applications.

Exception: *Salvage lumber* identified by an existing *grade mark* in accordance with 2303.1.1 shall be permitted to use 90% of the design values assigned to that grade of sawn lumber in the AWC NDS provided the following conditions are met:

1. The *salvage lumber* is free of locations where net section has been reduced.
2. A visual inspection of the salvage lumber shows no sign of failure.
3. It is known that the *salvage lumber* has not been subjected to sustained exposure to elevated temperatures above 100°F (38°C).

Add new standard(s) as follows:

ASTM

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

ASTM D4761-19	Standard Test Methods for Mechanical Properties of Lumber and Wood-Based Structural Materials

Reason: Research, including studies by the Consortium for the Research on Renewable Industrial Materials (CORRIM 2010), highlights a key advantage of salvage lumber over materials reused like steel and concrete when it comes to energy use and carbon footprint (Lippke et al. 2004, Perez-Garcia et al. 2005). The timber framing industry understood this as early as the 1970s, using salvage lumber from industrial structures for new projects. Over the last 30 years, businesses selling salvage sawn lumber from deconstructed buildings have grown rapidly.

There's a significant opportunity here: since the early 1900s, more than 3 trillion board feet of lumber have been processed in the United States, much of which is still in use today (Steer 1948, Howard 2001). However, current building codes do not appear to specifically recognize the use of salvage sawn lumber, creating inconsistencies in how it's handled on job sites. Some building inspectors may allow salvage sawn lumber because it has a proven track record, while others may reject it outright due to a lack of official guidance administered by code. This uncertainty can be solved by updating codes to reflect the value of this material, permitting salvage sawn lumber to be reused safely.

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Steer, H. B. 1948. Lumber production in the US 1799–1946. Miscellaneous Publication 669. USDA Forest Service, Washington, D.C.

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Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

There is no cost impact because sawn lumber is currently allowed by code. This code proposal adds another lumber choice for builders and designers; it is not a requirement to use salvage lumber. Data showing salvage lumber is equal (or less) in cost to non-salvage lumber from Reuse Institute:

Reclaimed Lumber Prices						
From: The Reuse Center, Bellingham, WA	Prices good for week of: 11/18/2024					
From: 'Deconstruction Dave' Bennink, Owner	*antique wood based on rough-sawn finish, like 100 years old or older; Antique is likely Douglas Fir not Hem Fir					
Warehouse phone 360-733-1363		Reuse Center	Reuse Center	Comparison:	Comparison:	
MATERIAL TYPE	Unit Type	Standard utility grade	Antique/rustic*	Lowes Price	Lowes material	
		Price per unit	Price per unit	listed online	description	
2x4	lineal foot	$0.39	$1	$0.54	Hemfir kiln dried	Lowes
2x6	lineal foot	$0.49	$2	$0.83	Hemfir kiln dried	Lowes

2x8	lineal foot	$0.75	$2.50	$1.12	Hemfir kiln dried	Lowes
2x10	lineal foot	$1.00	$3.35	$1.49	Hemfir kiln dried	Lowes
2x12	lineal foot	$1.33	$4.00	$1.86	Premiun Grade Fir	Home Depot
4x4	lineal foot	$0.65	$2.10	1.36	Premium Grade Fir #2	Home Depot
4x6	lineal foot	$1.10	$2.50	$2.04	Premium Grade Fir #2	Home Depot
6x6 treated post	lineal foot	$2.75	$6.25 Untreated	$6.48	Pole barn treated post, rough	
6x8 treated post	lineal foot	$3.75	$9.25 Untreated	$9.18	Pole barn treated post, rough	

NOTE: Standard Utility/framing grade is lumber milled from the 1970s to present date. Antique/rustic lumber was milled 100 years ago or older. There are many boards that fall between those two date sets and their price will fall between the prices listed for reclaimed.

Staff Analysis: A review of the standard proposed for inclusion in the code, ASTM D4761-19 Standard Test Methods for Mechanical Properties of Lumber and Wood-Based Structural Materials, with regard to some of the key ICC criteria for referenced standards (Section 4.6 of CP#28) will be posted on the ICC website on or before April 1, 2025.

S153-25

S154-25 Part I

IBC: 2303.4.1.1

Proponents: Greg Greenlee, SBCA, representing SBCA, Technical Director (ggreenlee@sbcacomponents.com); Jay Jones, representing Truss Plate Institute, Executive Director (jpjones@tpinst.org)

THIS IS A 2 PART CODE CHANGE. PART I WILL BE HEARD BY THE IBC STRUCTURAL CODE COMMITTEE. PART II WILL BE HEARD BY THE IRC-B CODE COMMITTEE. SEE THE TENTATIVE HEARING ORDER FOR THESE COMMITTEES.

2024 International Building Code

Revise as follows:

2303.4.1.1 Truss design drawings. The written, graphic and pictorial depiction of each individual truss shall be provided to the *building official* for approval prior to installation. Truss design drawings shall be provided with the shipment of trusses delivered to the job site. Truss design drawings shall include, at a minimum, the following information~~:~~, and for metal plate connected wood trusses, any additional information required to be included on the *truss design drawings* per *ANSI/TPI 1.*

1. ~~Slope or depth, span and spacing.~~
2. ~~Location of all joints and support locations.~~
3. ~~Number of plies if greater than one.~~
4. ~~Required bearing widths.~~
5. ~~Design *loads* as applicable, including:~~
   - ~~5.1. Top chord *live load*.~~
   - ~~5.2. Top chord *dead load*.~~
   - ~~5.3. Bottom chord *live load*.~~
   - ~~5.4. Bottom chord *dead load*.~~
   - ~~5.5. Additional *loads* and locations.~~
   - ~~5.6. Environmental design criteria and *loads* (such as wind, rain, snow, seismic).~~
6. ~~Other lateral *loads*, including *drag strut loads*.~~
7. ~~Adjustments to wood member and metal connector plate design value for conditions of use.~~
8. ~~Maximum reaction force and direction, including maximum uplift reaction forces where applicable.~~
9. ~~Joint connection type and description, such as size and thickness or gage, and the dimensioned location of each joint connector except where symmetrically located relative to the joint interface.~~
10. ~~Size, species and grade for each wood member.~~
11. ~~Truss-to-truss connections and truss field assembly requirements.~~
12. ~~Calculated span-to-deflection ratio and maximum vertical and horizontal deflection for live and total *load* as applicable.~~
13. ~~Maximum axial tension and compression forces in the truss members.~~
14. ~~Required permanent *individual truss member* restraint location and the method and details of restraint and diagonal bracing to be used in accordance with Section 2303.4.1.2.~~

1. Building code used for design.
2. Slope or depth, span and spacing.

3. Location of all joints and support locations.
4. Number of plies if greater than one.
5. Required bearing widths and if wane is restricted in the bearing area.
6. Design loads as applicable, including:
    6.1. Top chord controlling case of *live load*, reduced *live load* if used, snow load, or rain load;
    6.2. Top chord *dead load*;
    6.3. Bottom chord *live load*;
    6.4. Bottom chord *dead load*;
    6.5. Additional loads and locations;
    6.6. Environmental load design criteria (wind speed, snow, rain, seismic, and all applicable factors as required to calculate the truss loads); and
    6.7. Other lateral loads, including *drag strut loads*.
7. Adjustments to wood member and connector design values for conditions of use.
8. Maximum reaction force and direction at each bearing location, including maximum uplift reaction forces where applicable.
9. Joint connector type, manufacturer, size, and thickness or gauge, and the dimensioned location of each connector except where symmetrically located relative to the joint interface.
10. Size, species, and grade for each wood member.
11. Truss-to-truss connection and truss field assembly requirements.
12. Calculated span-to-deflection ratio and/or maximum vertical and horizontal deflection for live load, and for live plus dead load and KCR as applicable.
13. Maximum axial tension and compression forces in the truss members.
14. Fabrication tolerances as applicable.
15. Required permanent individual truss member restraint locations.
16. Truss designer.
17. A note on each *truss design drawing* to install the permanent *truss member lateral restraint* and *truss diagonal braces* in accordance with Section 2303.4.1.2.

S154-25 Part I

S154-25 Part II

IRC: R502.12.4, R802.10.1

Proponents: Greg Greenlee, SBCA, representing SBCA, Technical Director (ggreenlee@sbcacomponents.com); Jay Jones, representing Truss Plate Institute, Executive Director (jpjones@tpinst.org)

2024 International Residential Code

Revise as follows:

R502.12.4 Truss design drawings. *Truss design drawings*, prepared in compliance with Section R502.12.1, shall be submitted to the *building official* and *approved* prior to installation. *Truss design drawings* shall be provided with the shipment of trusses delivered to the job site. *Truss design drawings* shall include, at a minimum, the following information ~~specified as follows:~~, and for metal plate connected wood trusses, any additional information required to be included on the *truss design drawings* per *ANSI/TPI 1*.

1. ~~Slope or depth, span and spacing.~~
2. ~~Location of all joints.~~
3. ~~Required bearing widths.~~
4. ~~Design loads as applicable:~~
    - 4.1. ~~Top chord *live load*.~~
    - 4.2. ~~Top chord *dead load*.~~
    - 4.3. ~~Bottom chord *live load*.~~
    - 4.4. ~~Bottom chord *dead load*.~~
    - 4.5. ~~Concentrated loads and their points of application.~~
    - 4.6. ~~Controlling wind and earthquake loads.~~
5. ~~Adjustments to lumber and joint connector design values for conditions of use.~~
6. ~~Each reaction force and direction.~~
7. ~~Joint connector type and description, such as size, thickness or gage, and the dimensioned location of each joint connector except where symmetrically located relative to the joint interface.~~
8. ~~Lumber size, species and grade for each member.~~
9. ~~Connection requirements for:~~
    - 9.1. ~~Truss-to-girder-truss.~~
    - 9.2. ~~Truss ply-to-ply.~~
    - 9.3. ~~Field splices.~~
10. ~~Calculated deflection ratio, maximum description for live and total load, or both.~~
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.~~
12. ~~Required permanent truss member bracing location.~~

1. Building code used for design.
2. Slope or depth, span and spacing.
3. Location of all joints and support locations.

4. Number of plies if greater than one.

5. Required bearing widths and if wane is restricted in the bearing area.

6. Design loads as applicable, including:

   6.1 Top chord controlling case of *live load*, reduced *live load* if used, snow load, or rain load;

   6.2 Top chord *dead load*;

   6.3 Bottom chord *live load*;

   6.4 Bottom chord *dead load*;

   6.5 Additional loads and locations;

   6.6 Environmental load design criteria (wind speed, snow, rain, seismic, and all applicable factors as required to calculate the truss loads); and

   6.7 Other lateral loads, including *drag strut loads*.

7. Adjustments to wood member and connector design values for conditions of use.

8. Maximum reaction force and direction at each bearing location, including maximum uplift reaction forces where applicable.

9. Joint connector type, manufacturer, size, and thickness or gauge, and the dimensioned location of each connector except where symmetrically located relative to the joint interface.

10. Size, species, and grade for each wood member.

11. Truss-to-truss connection and truss field assembly requirements.

12. Calculated span-to-deflection ratio and/or maximum vertical and horizontal deflection for live load, and for live plus dead load and KCR as applicable.

13. Maximum axial tension and compression forces in the truss members.

14. Fabrication tolerances as applicable.

15. Required permanent individual truss member restraint locations.

16. Truss designer.

17. A note on each *truss design drawing* to install the permanent lateral restraint and diagonal braces in accordance with the project-specific bracing requirements when they exist or with standard industry details such as BCSI B3 for metal plate connected wood trusses in the absence of specific information by any registered design professional.

R802.10.1 Truss design drawings. *Truss design drawings*, prepared in conformance to Section R802.10.1, shall be provided to the *building official* and *approved* prior to installation. *Truss design drawings* shall be provided with the shipment of trusses delivered to the job site. *Truss design drawings* shall include, at a minimum, the following information~~:~~, and for metal plate connected wood trusses, any additional information required to be included on the *truss design drawings* per *ANSI/TPI 1*.

~~1. Slope or depth, span and spacing.~~

~~2. Location of all joints.~~

~~3. Required bearing widths.~~

~~4. Design loads as applicable.~~

~~4.1. Top chord *live load* (as determined from Section R301.6).~~

~~4.2. Top chord *dead load*.~~

~~4.3. Bottom chord *live load*.~~

~~4.4. Bottom chord *dead load*.~~

~~4.5. Concentrated loads and their points of application.~~

~~4.6. Controlling wind and earthquake loads.~~

~~5. Adjustments to lumber and joint connector design values for conditions of use.~~

~~6. Each reaction force and direction.~~

~~7. Joint connector type and description such as size, thickness or gage and the dimensioned location of each joint connector except where symmetrically located relative to the joint interface.~~

~~8. Lumber size, species and *grade for each member*.~~

~~9. Connection requirements for:~~

~~9.1. Truss to girder-truss.~~

~~9.2. Truss ply to ply.~~

~~9.3. Field splices.~~

~~10. Calculated deflection ratio or maximum description for live and total load.~~

~~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.~~

~~12. Required permanent truss member bracing location.~~

1. Building code used for design.

2. Slope or depth, span and spacing.

3. Location of all joints and support locations.

4. Number of plies if greater than one.

5. Required bearing widths and if wane is restricted in the bearing area.

6. Design loads as applicable, including:

   6.1. Top chord controlling case of *live load*, reduced *live load* if used, snow load, or rain load;

   6.2. Top chord *dead load*;

   6.3. Bottom chord *live load*;

   6.4. Bottom chord *dead load*;

   6.5. Additional loads and locations;

   6.6. Environmental load design criteria (wind speed, snow, rain, seismic, and all applicable factors as required to calculate the truss loads); and

   6.7. Other lateral loads, including *drag strut loads*.

7. Adjustments to wood member and connector design values for conditions of use.

8. Maximum reaction force and direction at each bearing location, including maximum uplift reaction forces where applicable.

9. Joint connector type, manufacturer, size, and thickness or gauge, and the dimensioned location of each connector except where symmetrically located relative to the joint interface.
10. Size, species, and grade for each wood member.
11. Truss-to-truss connection and truss field assembly requirements.
12. Calculated span-to-deflection ratio and/or maximum vertical and horizontal deflection for live load, and for live plus dead load and KCR as applicable.
13. Maximum axial tension and compression forces in the truss members.
14. Fabrication tolerances as applicable.
15. Required permanent individual truss member restraint locations.
16. Truss designer.
17. A note on each *truss design drawing* to install the permanent lateral restraint and diagonal braces in accordance with the project-specific bracing requirements when they exist or with standard industry details such as BCSI B3 for metal plate connected wood trusses in the absence of specific information by any registered design professional.

Reason: ANSI/TPI 1 is the referenced standard for metal-plate-connected wood trusses. The requirements for information to be included on metal-plate-connected wood trusses are specified in ANSI/TPI 1. Previously this information had been copied from ANSI/TPI 1 and included in the IRC and IBC for wood trusses. ANSI/TPI 1 is on a development cycle that is different than the IBC and IRC causing the potential for conflicting information. Additionally, currently the language in the IRC and the IBC does not match and does not match what is in ANSI/TPI 1.

It should be noted that the language in these sections is not exclusive to metal-plate-connected wood trusses. While it isn't explicitly stated, presumably truss members are permitted to be joined by nails, glue, bolts, timber connectors, or other approved framing devises in addition to metal connector plates. Accordingly, a pointer to ANSI/TPI 1 has been added for metal-plate connected wood trusses to capture any component specific requirements that may be introduced in the referenced standard.

This change will ensure that the information provided in the truss design drawings is consistent between references in the IRC and IBC, and current with the most recent version of ANSI/TPI 1.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

The change proposal eliminates inconsistent information and reduces confusion. There is no impact on the cost of construction.

S154-25 Part II

S155-25

IBC: SECTION 202, 2303.4.1.2, FIGURE 2303.4.1.2 (1), FIGURE 2303.4.1.2(2), FIGURE 2303.4.1.2(3), FIGURE 2303.4.1.2(4), FIGURE 2303.4.1.2(5), 2303.4.1.2.1

Proponents: Greg Greenlee, SBCA, representing SBCA, Technical Director (ggreenlee@sbcacomponents.com); Jay Jones, representing Truss Plate Institute, Executive Director (jpjones@tpinst.org)

2024 International Building Code

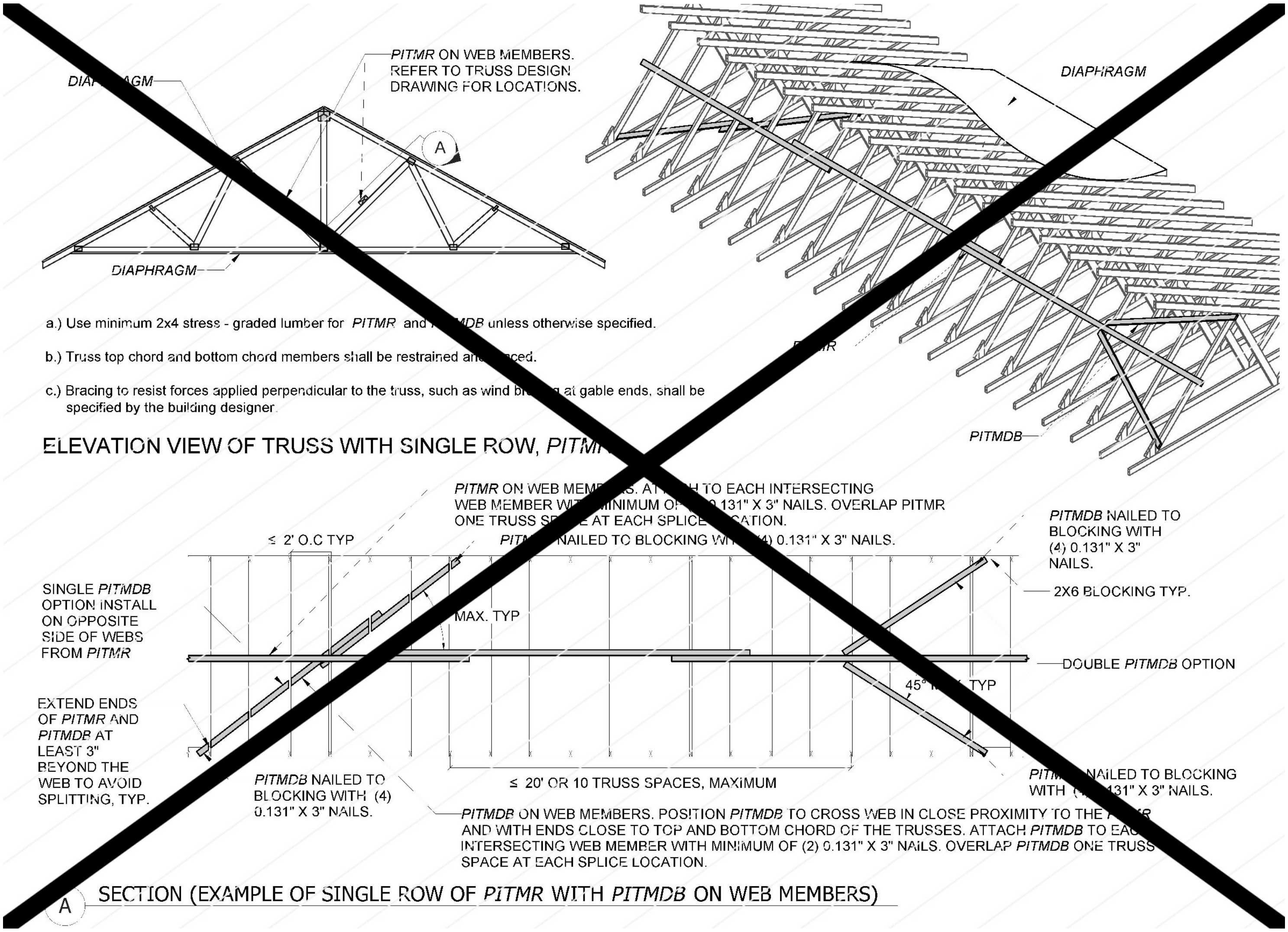
Revise as follows:

[BS] ~~PERMANENT INDIVIDUAL~~ TRUSS ~~MEMBER~~ DIAGONAL BRACING ~~(PITMDB)~~. Structural member or assembly intended to permanently stabilize the ~~*PITMRs*~~ *truss member lateral restraint*.
[BS] ~~PERMANENT INDIVIDUAL~~ TRUSS MEMBER LATERAL RESTRAINT ~~(PITMR)~~. Permanent restraint ~~Restraint~~ that is used to prevent local buckling of an individual truss chord or web member due to ~~because~~ of the axial forces in the *individual truss member.*

2303.4.1.2 Permanent ~~individual~~ truss member lateral restraint ~~(PITMR)~~ and ~~permanent individual~~ truss ~~member~~ diagonal bracing ~~(PITMDB)~~. Where the truss design drawings designate the need for permanent ~~*permanent individual*~~ *truss member lateral restraint*, it shall be accomplished by one of the following methods:

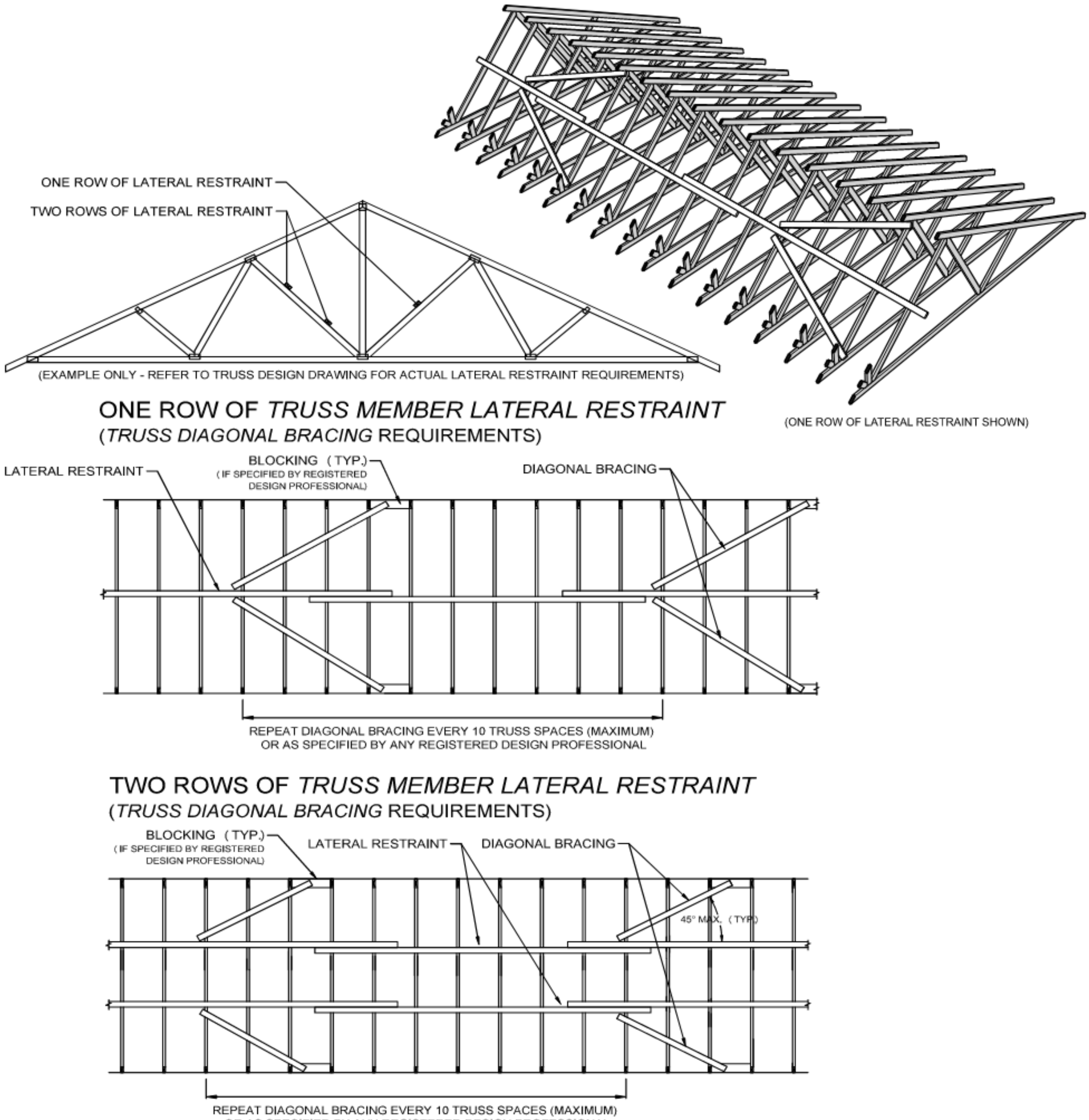
1. ~~*PITMR* and *PITMDB*~~ Permanent *truss member lateral restraint* and *truss diagonal bracing* installed using standard industry lateral restraint and diagonal bracing details in accordance with TPI 1, Section 2.3.3.1.1, accepted engineering practice, or Figures 2303.4.1.2(1) ~~,~~ and (3) ~~, and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

Delete and substitute as follows:



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

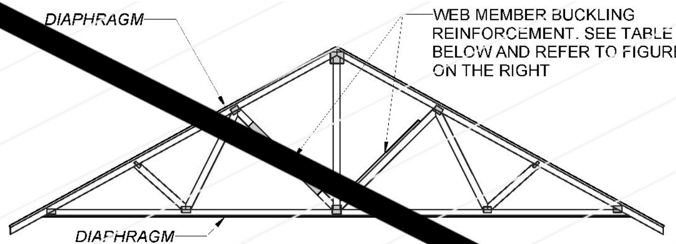
~~**FIGURE 2303.4.1.2 (1) PITMR AND PITMDB FOR TRUSS WEB MEMBERS REQUIRING ONE ROW OF PITMR**~~



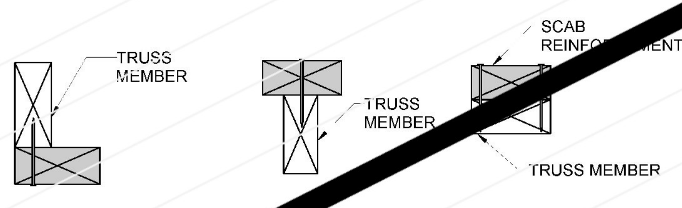
1. Use minimum 2x4 stress-graded lumber for Lateral Restraints and Diagonal Bracing.
2. Attach Lateral Restraints to each intersecting web member with a minimum of (2) 3" x 0.131" nails except use (3) nails where the Diagonal Braces terminate.
3. Attach Diagonal Brace to each intersecting web member with a minimum of (2) 3" x 0.131" nails. Nail to blocking at ends when specified by a registered design professional.
4. Extend ends of Lateral Restraints and Diagonal Braces 3" beyond the web to avoid splitting.
5. Install Diagonal Braces so they terminate in close proximity to the Lateral Restraint and the ends are close to the top and bottom chords.

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

FIGURE 2303.4.1.2 (1) TRUSS MEMBER LATERAL RESTRAINT AND TRUSS DIAGONAL BRACING



ELEVATION VIEW OF L, T OR SCAB REINFORCEMENT



TYPES OF WEB MEMBER BUCKLING REINFORCEMENT

a.) Truss top chord and bottom chord members shall be restrained and br...

b.) Bracing to resist forces applied perpendicular to the truss, such as wind bracing ... ble ends, shall be specified by the building designer.

c.) Use the table below unless project specific web member reinforcement is provided on the truss design drawing or supplemental truss buckling reinforcement details are provided by the truss designer.

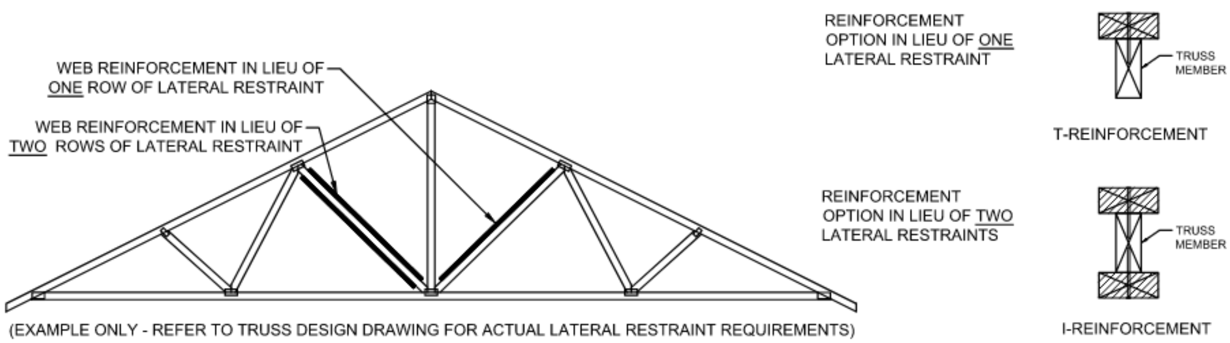
NUMBER OF ROWS OF PITMR SPECIFIED ON WEB MEMBER	SIZE OF TRUSS WEB	TYPE AND SIZE OF WEB REINFORCEMENT[1] FOR T, L OR SCAB	GRADE OF WEB REINFORCEMENT	MINIMUM LENGTH OF WEB REINFORCEMENT	MINIMUM CONNECTION OF WEB REINFORCEMENT TO WEB
ONE	2x4	2x4	Same species and grade or better than web member	90% of web or extend to within 6" of end of web member, whichever is greater	(0.131" x 3") nails at 6" on-center[2]
	2x6	2x6			
	2x8	2x8			

[1]Maximum allowable web length is 14'

[2]Attach Scab reinforcement to web with two rows of minimum 0.131" x 3" nails at 6" on-center

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

~~FIGURE 2303.4.1.2(2) ALTERNATIVE INSTALLATION USING BUCKLING REINFORCEMENT FOR TRUSS WEB MEMBERS IN LIEU OF ONE ROW OF PITMR~~

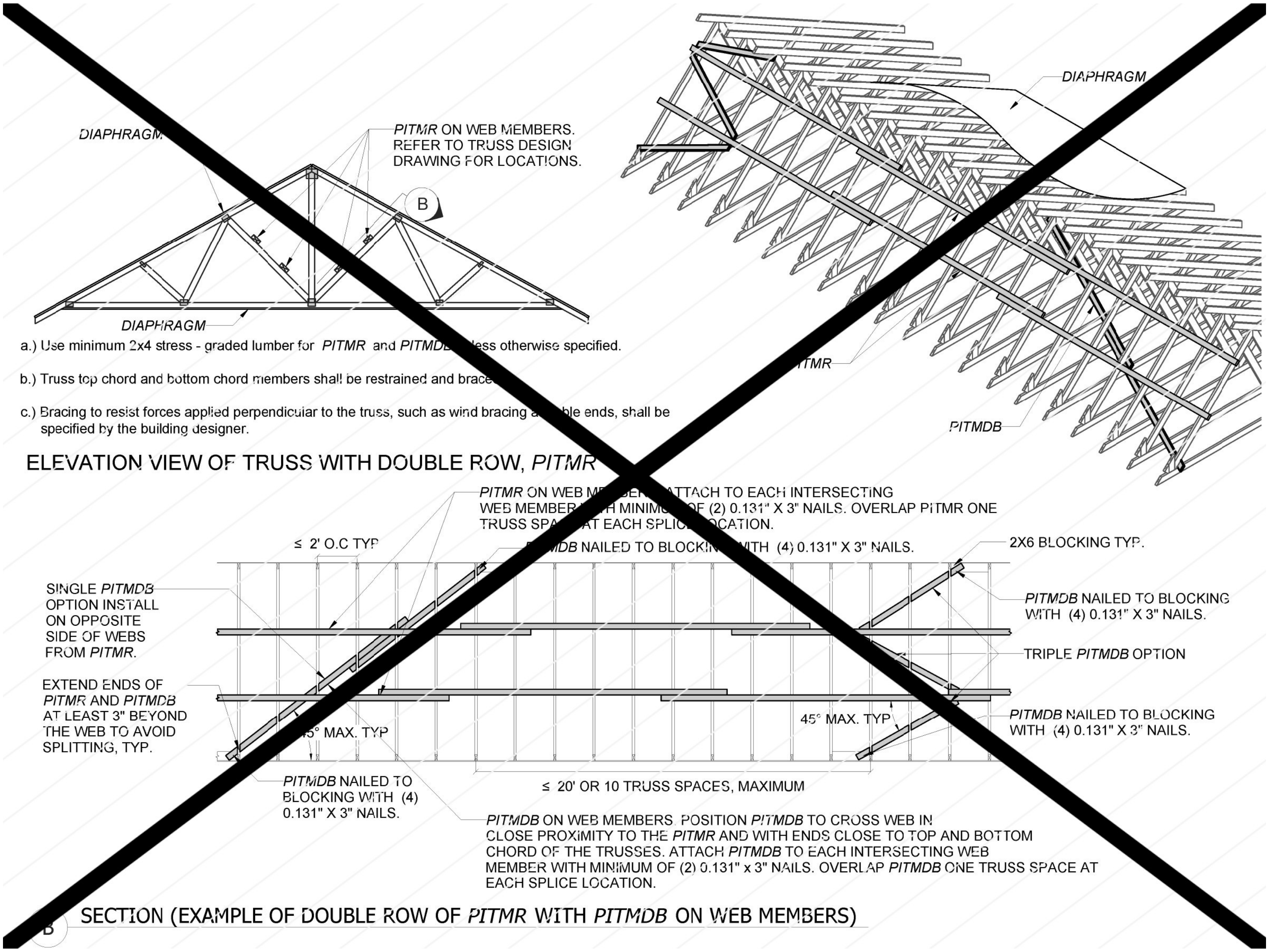


Specified Lateral Restarint	Size of Truss Web	Required Web Reinforcement		Required Grade of Reinforcement	Minimum Length of Reinforcement	Minimum Connection of Reinforcement
						
1 Row	2x4	2x4	---	Same species and grade or better than web member	90% of web or extend to within 6" of end of web member, whichever is greater	3" x 0.131" nails at 6" o.c.
	2x6	2x6	---			
	2x8	2x8	---			
2 Rows	2x4	---	2-2x4			
	2x6	---	2-2x6			
	2x8	---	2-2x8			

1. Table is applicable for webs up to a maximum length of 14 ft.
2. Use the reinforcements shown on this table unless otherwise specified on the truss design drawing or by any registered design professional.

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

FIGURE 2303.4.1.2(2) WEB REINFORCEMENT OPTION IN LIEU OF TRUSS MEMBER LATERAL RESTRAINTS

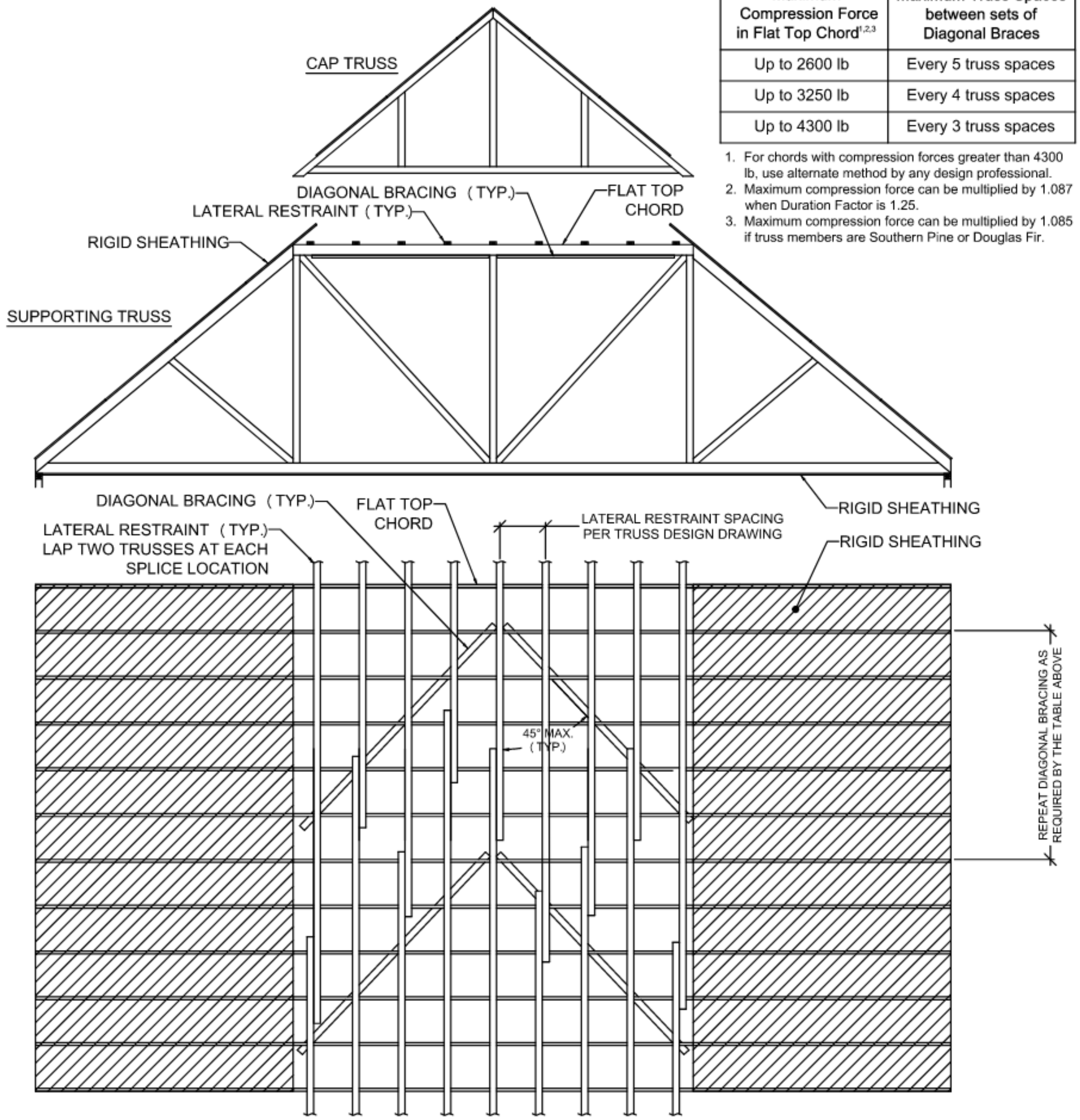


~~For SI:1 inch = 25.4 mm, 1 foot = 304.8 mm.~~

~~**FIGURE 2303.4.1.2(3) PITMR AND PITMDB FOR TRUSS WEB MEMBERS REQUIRING TWO ROWS OF PITMR**~~

Maximum Compression Force in Flat Top Chord[1,2,3]	Maximum Truss Spaces between sets of Diagonal Braces
Up to 2600 lb	Every 5 truss spaces
Up to 3250 lb	Every 4 truss spaces
Up to 4300 lb	Every 3 truss spaces

1. For chords with compression forces greater than 4300 lb, use alternate method by any design professional.
2. Maximum compression force can be multiplied by 1.087 when Duration Factor is 1.25.
3. Maximum compression force can be multiplied by 1.085 if truss members are Southern Pine or Douglas Fir.



1. Use minimum 2x4 stress-graded lumber for Lateral Restraints and Diagonal Bracing.
2. Attach Lateral Restraints to each intersecting chord member with a minimum of (2) 3" x 0.131" nails.
3. Attach Diagonal Braces to each intersecting chord member with a minimum of (3) 3" x 0.131" nails.
4. Extend ends of Lateral Restraints and Diagonal Braces 3" beyond chords to avoid splitting.

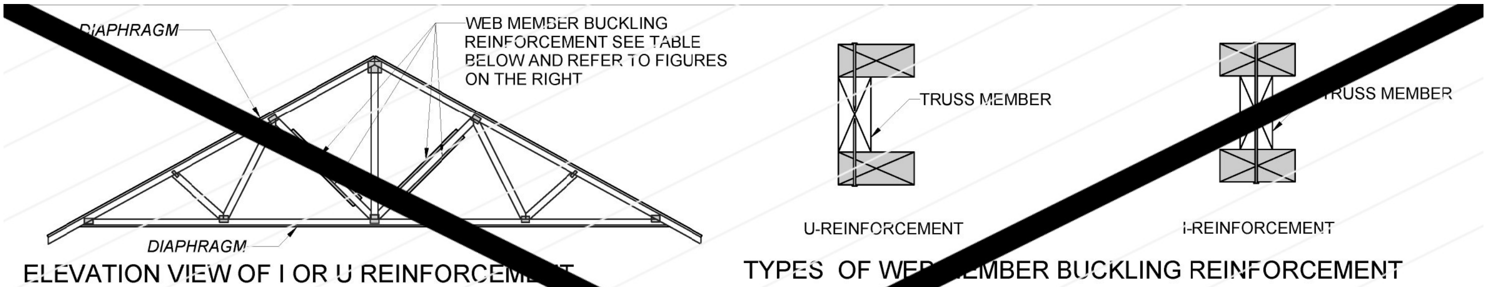
FIGURE 2303.4.1.2 (3)
TRUSS MEMBER LATERAL RESTRAINT AND TRUSS DIAGONAL BRACING FOR FLAT TOP CHORD PORTION OF PIGGYBACK TRUSS ASSEMBLY

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

FIGURE 2303.4.1.2(3) TRUSS MEMBER LATERAL RESTRAINT AND TRUSS DIAGONAL BRACING FOR FLAT TOP CHORD

PORTION OF PIGGYBACK TRUSS ASSEMBLY

Delete without substitution:



a.) Truss top chord and bottom chord members shall be restrained and brace[illegible]

b.) Bracing to resist forces applied perpendicular to the truss, such as wind bracing a[illegible] ends, shall be spe[illegible] by the building designer.

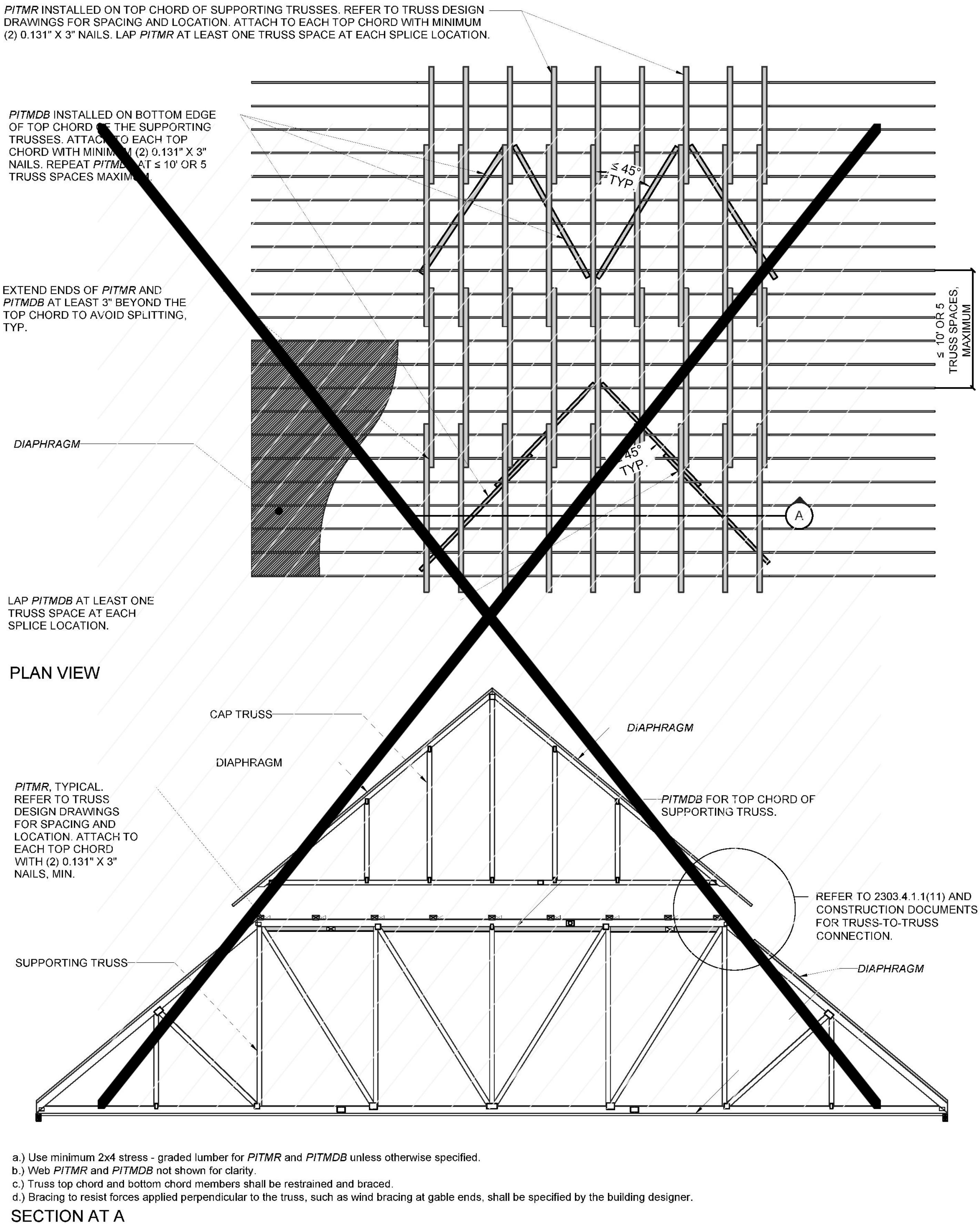
c.) Use the table below unless project specific web member reinforcement is provided on the t[illegible] desi[illegible]awing or supplemental truss buckling reinforcement details are provided by the truss designer.

NUMBER OF ROWS OF PITMR SPECIFIED ON WEB MEMBER	SIZE OF TRUSS WEB	TYPE AND SIZE OF WEB FOR I OR U REINFORC[illegible]ENT[1]	G[illegible]DE OF WEB REINFORCEMENT	MINIMUM LENGTH OF WEB [illegible]EINFORCEMENT	MINIMUM CONNECTION OF WEB REINFORCEMENT TO WEB
TWO	2x[illegible]	(2) -2x4	Same species and grade or better than web member	90% of web or extend to within 6" of end of web member, whichever is greater	(0.13[illegible]") nails at 6" on-[illegible]
	2x6	(2) -2x6			
	2x8	(2) -2x8			

[1]Maximum allowable web length is 14'

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

~~**FIGURE 2303.4.1.2(4) ALTERNATIVE INSTALLATION USING BUCKLING REINFORCEMENT FOR TRUSS WEB MEMBERS IN LIEU OF TWO ROWS OF PITMR**~~



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

~~FIGURE 2303.4.1.2(5) PITMR AND PITMDB FOR FLAT PORTION OF TOP CHORD IN A PIGGYBACK ASSEMBLY~~

Delete and substitute as follows:

~~**2303.4.1.2.1 Trusses installed without a diaphragm.** Trusses installed without a *diaphragm* on the top or bottom chord shall require a project specific *PITMR* and *PITMDB* design prepared by a *registered design professional.*~~

~~**Exception:** Group U occupancies.~~

2303.4.1.2.1 Trusses installed without continuous wood or gypsum panels bracing the truss chords. Truss top chords not braced with continuous wood structural panels fastened per Table 2304.10.2 and truss bottom chords not braced with gypsum panel product fastened per Table 2508.1 or continuous wood structural panels fastened per Table 2304.10.2 shall require a project specific permanent *truss member lateral restraint* and *truss diagonal bracing* design prepared by a *registered design professional.*

Exceptions:

1. Group U occupancies.
2. Floor trusses without compression forces in the bottom chord
3. Piggyback base truss top chords and other trusses with partially over-framed chords

Reason: This proposal is intended to address and clarify a few issues related to permanent restraint and bracing for wood trusses. Each item is described below.

Nomenclature Consistency

Between TPI 1, SBCA's BCSI and the IBC multiple terms and acronyms have been adopted to describe a member used to restrain a truss web and the members used to collect the restraining forces and resolve them. As an industry we are working to consolidate the terminology across all these documents.

This past year members of the Structural Building Components Association (SBCA), Truss Plate Institute (TPI) and National Framers Council (NFC) formed a task group to review and update the Building Component Safety Information (BCSI) document. During these meetings the task group discussed and determined that the terms 'lateral restraint' and 'diagonal bracing' are the most widely used and best understood within the industry. PITMR and PITMDB are not widely considered to be part of the truss industry's vernacular. When these terms were added to the IBC in 2018 it was an attempt to better describe the terminology. We have found that this has not happened as intended.

To maintain clarity in the code the terms 'truss member lateral restraint' and 'truss diagonal bracing' were added. These will replace PITMR and PITMD in the definitions, Section 2303.4.1.2 and 2303.4.1.2.1, and Figures 2303.4.1.2 (1) and (3).

The updated version of BCSI uses the terms 'lateral restraint' and 'diagonal bracing'. When ANSI/TPI 1 is up for its next review a similar terminology consolidation review will occur with the intention to match what has been used in ANSI/TPI 1 and proposed in this modification. Adding these defined terms and modifications to these sections and figures were made to use these terms consistently.

Consolidation and Correction in Figures

Figure 2303.4.1.2 (1) was combined with Figure 2303.4.1.2 (3), and Figure 2303.4.1.2 (2) was combined with Figure 2303.4.1.2 (4). These figures were also modified to replace the use of PITMR and PITMBD with the terms 'lateral restraint' and 'diagonal bracing'. The diagonal brace spacing is shown incorrectly in Figures 2303.4.1.2 (1) and (3) which has been corrected in the new Figure 2303.4.1.2 (1). Finally, nailing requirements for the lateral restraint and diagonal brace members were clarified.

Figures 2303.4.1.2 (1) and (3)

In both Figures 2303.4.1.2(1) and (3) the single brace option has been removed with a preference for the double brace option that provides more capacity with the prescriptive nailing requirements. The change coincides with recement modifications to the BCSI document.

The note in the current Figures 2303.4.1.2(1) and (3) requiring blocking at the ends of the diagonal braces has been revised to indicate that blocking is only required when specified by a registered design professional. This change was made because the prescriptive conditions addressed by this detail do not inherently require blocking at these locations. However, blocking may be required if the bracing is designed by a registered design professional and a different bracing solution is specified. The new Figure 2303.4.1.2(1) shows the blocking and includes a note regarding the registered design professional.

For the condition currently shown in Figure 2303.4.1.2 (1) and (3), and in the proposed version, the bracing force at the joint where the blocking is specified is limited by the prescriptive two-nail connection of the lateral restraint to the web (three-nail connection in the proposed version), where the diagonal braces terminate. This bracing force is distributed equally between the two diagonal braces and transferred to the joint where blocking is shown. Therefore, using this detail, the maximum force that can be transferred to that joint is low and field performance confirms that this low force can be effectively transferred without blocking.

Figures 2303.4.1.2 (2) and (4)

The web reinforcing tables in Figures 2303.4.1.2 (2) and (4) were combined and revised by removing the 'L', 'U', and scab reinforcement options, matching revisions made to the latest version of BCSI. Although, the 'L', 'U', and scab reinforcements are viable options, they are not always equivalent to the 1 or 2 rows of CLRs as indicated in the current table. The condensed table is shown in the new Figure 2303.4.1.2 (2).

Figure 2303.4.1.2 (5)

The permanent restraint and bracing requirements in Figure 2303.4.1.2 (5) were enhanced to limit diagonal brace spacing as a function of the compressive force in the flat portion of the base truss top chord. Field observations have shown that these are critical elements, and it is important that the connections in the bracing and restraint system are not over stressed. A table has been added providing maximum diagonal bracing spacing requirements for different levels of compression forces in the flat portion of the top chord member. Also, an upper applicability limit for the prescriptive detail has been added so that it is not used in conditions that may overstress the prescribed connections.

Use of the Term 'Diaphragm'

The defined term 'diaphragm' was replaced in Section 2303.4.1.2.1 with 'continuous wood panel' or 'gypsum panel' sheathing to underscore that a diaphragm is not necessarily needed to brace the chord of a truss. A building designer may opt to use a diaphragm, but it isn't a requirement to brace the truss. Continuous sheathing is the term used in ANSI/TPI 1, DSB and BCSI. With the addition of the terms 'wood structural panel' and gypsum panel product' references for required fastening for each of these added.

Added Exceptions

Two exceptions were added to clarify where the code provision does not apply and a project specific permanent restraint and bracing plan is not required. First, Exception 2 was added for when a floor truss is not subject to compression forces in the bottom chord, and buckling isn't a concern. Exception 3 clarifies that the provision does not apply to piggyback base truss top chords and other trusses with partially over-framed chords where there are other controlling requirements, such as the new Figure 2303.4.1.2 (3).

Bibliography: *National Design Standard for Bracing Metal Plate Connected Wood Trusses* (DSB-22), TPI
Building Component Safety Information Guide to Good Practice for Handling, Installing, Restraining and Bracing of Structural Building Components (BCSI-2025), SBCA

Cost Impact: Increase

Estimated Immediate Cost Impact:

Terminology Changes

The terminology changes in this proposal are editorial.

Cost Impact: **NONE**

Reference to a "Diaphragm"

The proposed change clarifies that "rigid sheathing" is required to brace the truss chords rather than referencing a "diaphragm." This is not a change in policy but rather a correction to align the code language with standard industry practices. Historically, diaphragms have not been explicitly designed to brace truss chords, and current construction methods already rely on rigid sheathing for this purpose. Therefore, this proposal does not introduce any changes to typical construction practices. Instead, it ensures the model code is technically accurate and eliminates potential confusion during code enforcement.

Cost Impact: **NONE**

Change in Blocking Guidance for Diagonal Bracing for Truss Webs

The current Figures 2303.4.1.2 (1 and 3) include a note requiring blocking at the ends of all diagonal braces. The proposed change updates this requirement, specifying that blocking is only necessary when indicated by a Registered Design Professional. Truss designs utilizing the prescriptive methods outlined in these figures do not require blocking under this change. As a result, costs will decrease for conditions where this prescriptive method is used (see "*Blocking Cost Justification*" below for cost decrease calculations).

Cost Impact: **DECREASE $0.03/sq ft**

Change to Diagonal Brace Frequency for Truss Webs

In Figures 2303.4.1.2 (1 and 3) the proposed change adjusts the dimension used to specify the spacing between sets of diagonal bracing. The dimension will now reflect the distance between lateral restraint anchor points rather than to the end of the diagonal brace. This revision reduces the allowable spacing between sets of diagonal bracing from 26 feet on center (effectively) to 20 feet on center. As a result, this change will lead to a slight increase in construction costs (see "Web Diagonal Brace Cost Justification" below for cost increase calculations).

Cost Impact: **INCREASE $0.01/sq ft.**

-

Revisions to the Web Reinforcement Tables - Figures 2303.4.1.2(2 and 4)

The proposed changes to these tables involve removing two of the four options for web reinforcement. Since the remaining two alternatives are equivalent in terms of installation cost, these revisions will not impact overall construction costs.

Cost Impact: **NONE**

Change to Diagonal Brace Frequency for Piggyback Trusses

This proposal introduces guidance for the required spacing of diagonal brace sets in piggyback trusses. Currently, Figure 2304.1.2(5) prescriptively requires diagonal brace sets every 10 feet for all conditions and is dimensioned to the end of the Diagonal Brace set. The proposed change adjusts the brace set frequency based on the compression force in the flat top chord and is dimensioned between anchor points. As a result, closer spacing will be required in certain cases where the compression force is high in the flat top chord, leading to a slight increase in construction costs for these specific conditions (see "Piggyback Diagonal Brace Cost Justification" below for cost increase calculation).

Cost Impact: **INCREASE 0.04/sq ft.** (where piggyback trusses are used that have high compression forces)

Estimated Immediate Cost Impact Justification (methodology and variables):

Blocking Cost Justification

Assumptions

1. A typical 40 ft span truss requires, on average, 2 Lateral Restraints.
2. Diagonal Bracing is required every 20 ft along each line of Lateral Restraint. (This results in 4 Diagonal Braces every 20 ft.)
3. Each Diagonal Brace requires 1 Block.

Calculation of Blocks per Square Foot

For a 40 ft x 20 ft area (800 sq ft):
4 Blocks are needed per 800 sq ft. or 4/800 = **0.005 Blocks /sq ft.**

Material Cost

1. Size of one Block: 24 inches (2 ft) long.
2. Cost of Blocking Material: **$1.00 per 24-inch block** (2x6 SPF #1/#2) (*)

Labor Rate

1. Framer Rate: $50/hour (*)
2. Time to install one Block: 5 minutes (or 1/12 of an hour)

Labor Cost to install one block:

$50/hr. /12 = **$4.17 /Block**

Total Installed Cost per Block

Material Cost + Labor Cost = $1.00 + $4.17 = **$5.17/Block**

Total Installed Cost per Square Foot

Since 1 block covers 200 sq ft:

$5.17/200 sq ft = **$0.03/sq ft.**

Summary

- Material Cost per Block: **$1.00**
- Labor Cost per Block: **$4.17**
- Total Installed Cost per Block: **$5.17**
- Total Installed Cost per Square Foot: **$0.03/sq ft**

** The cost estimates for material and labor were confirmed as reasonable values by a large truss manufacturing company located in Illinois.*

Web Diagonal Brace Cost Justification

Assumptions

1. A typical 40 ft span truss requires, on average, 2 Lateral Restraints.
2. Currently in 2024 IBC, Diagonal Bracing is required every **26 ft** (effectively) along each line of Lateral Restraint
3. It is **proposed** to correct this figure to show Diagonal Bracing required every **20 ft** along each line of Lateral Restraint.

Calculation of Diagonal Brace Sets per Square Foot

Current:

For a 40 ft x 26 ft area (1040 sq ft):

Two Diagonal Brace Sets are needed per 1040 sq ft. or 2/1040 = **0.00192 Diagonal Brace Sets /sq ft.**

Proposed:

For a 40 ft x 20 ft area (800 sq ft):

Two Diagonal Brace Sets are needed per 800 sq ft. or 2/800 = **0.00250 Diagonal Brace Sets /sq ft.**

Material Cost

1. One Diagonal Brace assumed to be 10 ft long
2. Cost of Diagonal Brace material: **$4.00 per 10 ft** board (2x4 SPF #1/#2) (*)

2 Diagonals in each set = 2 x $4.00 = **$8.00** / **Diagonal Brace Set**

Labor Cost

1. Framer Rate: **$50/hour**(*)
2. Time to cut and install one Diagonal Brace Set: 10 minutes (or 1/6 of an hour)

$50/hr. /6 = **$8.33** / **Diagonal Brace Set**

Total Installed Cost per Diagonal Brace Set

Material Cost + Labor Cost = $8.00 + $8.33 = **$16.33**/ **Diagonal Brace Set**

Change in Cost per Square Foot

Current:

$16.33 x 0.00192 = $0.0314/ sq ft.

Proposed:

$16.33 x 0.00250 = $0.0408/ sq ft.

Difference:

$0.0408 – $0.0314 = $0.0094 (**About 1 cent /sq ft**. increase)

* *The cost estimates for material and labor were confirmed as reasonable values by a large truss manufacturing company located in Illinois.*

Piggyback Diagonal Brace Cost Justification

Assumptions

1. A typical 40 ft span piggyback truss requires 4 Diagonal Braces to form one Brace Set.
2. Currently in 2024 IBC, Diagonal Brace Sets are required every **10 ft** throughout the run or trusses.
3. It is **proposed** to decrease the spacing between Diagonal Bracing sets in certain cases (high force flat top chord members) to as little as every **6 ft**.

Calculation of Diagonal Brace Sets per Square Foot

Current:

For a 40 ft x 10 ft area (400 sq ft):

One Diagonal Brace Set per 400 sq ft. or 1/400 = **0.00250 Diagonal Brace Sets /sq ft.**

Proposed for certain conditions:

For a 40 ft x 6 ft area (240 sq ft):

One Diagonal Brace Set per 240 sq ft. or 1/240 = **0.0042 Diagonal Brace Sets /sq ft.**

Material Cost

1. One Diagonal Brace in the set assumed to be 6 ft long
2. Cost of Diagonal Brace material: **$3.00 per 6 ft** board (2x4 SPF #1/#2) (*)

4 Diagonals in each Set = 4 x $3.00 = **$12.00 / Diagonal Brace Set**

Labor Cost

1. Framer Rate: **$50/hour** (*)
2. Time to cut and install one Diagonal Brace Set: 12 minutes (or 1/5 of an hour)

$50/hr. /5 = **$10.00 / Diagonal Brace Set**

Total Installed Cost per Diagonal Brace Set

Material Cost + Labor Cost = $12.00 + $10.00 = **$22.00/ Diagonal Brace Set**

Change in Cost per Square Foot

Current:

$22.00 x 0.00250 = $0.055/ sq ft.

Proposed:

$22.00 x 0.00420 = $0.092/ sq ft.

Difference:

$0.092 – $0.055 = **$0.037** (**About 4 cents /sq ft**. increase in the worst conditions)

** The cost estimates for material and labor were confirmed as reasonable values by a large truss manufacturing company located in Illinois.*

S155-25

S156-25

IBC: 2303.4.1.2.2 (New)

Proponents: Greg Greenlee, SBCA, representing SBCA, Technical Director (ggreenlee@sbcacomponents.com); Jay Jones, Truss Plate Institute, representing Truss Plate Institute, Executive Director (jpjones@tpinst.org)

2024 International Building Code

Add new text as follows:

2303.4.1.2.2 Truss Bracing Inspections. Permanent *truss member lateral restraint* and *truss diagonal bracing* to be inspected during the framing inspection per section 110.3.4.

Reason: The proposal clarifies that permanent truss member lateral restraint and truss diagonal bracing inspections should be included as part of the framing inspection.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

Section 110.3.4 already provides for framing inspections.

S156-25

S157-25

IBC: 2303.4.1.4.1

Proponents: Jack Butler, Butler & Butler, LLC, representing American Institute of Building Design (abutler@mpzero.com); Steven Mickley, representing American Institute of Building Design (steve.mickley@aibd.org)

2024 International Building Code

Revise as follows:

2303.4.1.4.1 Truss design drawings. Where required by ~~the *registered design professional*, the *building official* or~~ the statutes of the *jurisdiction* in which the project is to be constructed, each individual truss design drawing shall bear the seal and signature of the registered design professional serving as the the truss designer.

Exceptions:

1. Where a cover sheet and truss index sheet are combined into a single sheet and attached to the set of truss design drawings, the single cover/truss index sheet is the only document required to be signed and sealed by the truss designer.
2. Where a cover sheet and a truss index sheet are separately provided and attached to the set of truss design drawings, the cover sheet and the truss index sheet are the only documents required to be signed and sealed by the truss designer.

Reason: The revised wording reflects the single legally controlling element regarding professional practice requirements: the laws applicable in the jurisdiction. When laws of the jurisdiction permit someone other than a registered design professional to prepare the truss design drawings, then a requirement for signed and sealed drawings is not only inappropriate but is contrary to state law. Registered design professionals and building officials are not authorized to modify the provisions of state law.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

The proposed modification expresses the controlling nature of state professional regulations and thereby serves to clarify the intent of the subsection.

S157-25

S158-25

IBC: 2303.4.6, 2303.4.7, 2308.11.12

Proponents: Greg Greenlee, SBCA, representing SBCA, Technical Director (ggreenlee@sbcacomponents.com); Jay Jones, representing Truss Plate Institute, Executive Director (jpjones@tpinst.org)

2024 International Building Code

Revise as follows:

2303.4.6 TPI 1 specifications. In addition to Sections 2303.4.1 through 2303.4.5, the design, manufacture and quality criteria ~~assurance~~ of metal-plate-connected wood trusses shall be in accordance with TPI 1 with quality assurance audits performed by an *approved* third-party agency. Job-site inspections shall be in compliance with Section 110.4, as applicable.

2303.4.7 Truss quality assurance. Trusses not part of a manufacturing process in accordance with either Section 2303.4.6 or a referenced standard, which provides requirements for quality control inspections and for quality assurance audits done under the supervision of ~~a~~ an approved third-party quality assurance ~~control~~ agency, shall be manufactured in compliance with Sections 1704.2.5 and 1705.5, as applicable.

2308.11.12 Wood trusses. The design, manufacturer and quality requirements of w~~W~~ood trusses shall be ~~designed~~ in accordance with Section 2303.4. Connection to *braced wall lines* shall be in accordance with Section 2308.10.7.2.

Reason: The modifications clarify the quality requirements for trusses manufactured that are not part of a process in accordance with TPI 1 or another referenced standard should include both quality control inspections and quality assurance audits not just quality control. The revised language also coordinates the quality requirements with the language in with TPI 1 and used in the industry.

There is confusion in the industry about the quality requirements, the difference between quality control and quality assurance, and if third-party quality assurance audits are required. This language will clarify these items and make consistent requirements.

Additionally, the modifications clarify that quality assurance audits performed must be done by an approved third-party agency.

As written the section 2308.11.12 only references the design requirements of Section 2303.4. The modification clarifies that it shall include the design, manufacturer and quality requirements. This revised language is consistent with the proposed modifications to Section 2303.4.6 and 2303.4.7, and is consistent with TPI 1.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

The modifications clarify the current code requirements. No new requirements are added.

S158-25

S159-25

IBC: 1402.11 (New), 2304.3.3, 2304.3.3.1 (New), 2510.8 (New)

Proponents: Mellisa Mooren, representing Self (mmooren@skyeenv.com); Emily Lorenz, representing International Institute of Building Enclosure Consultants (IIBEC) (emilyblorenz@gmail.com)

2024 International Building Code

Add new text as follows:

1402.11 Accommodation of Framing Shrinkage. Exterior cladding systems shall be designed and constructed to accommodate vertical movements associated with shrinkage and compression.

Revise as follows:

2304.3.3 Shrinkage. Wood walls and bearing partitions shall not support more than two floors and a roof unless an analysis satisfactory to the *building official* shows that shrinkage of the wood framing will not have adverse effects on the *structure* or any plumbing, electrical or mechanical systems, exterior cladding systems, or other equipment installed therein due to excessive shrinkage or differential movements caused by shrinkage. The analysis shall show that the roof drainage system and the foregoing systems or equipment will not be adversely affected or, as an alternate, such systems shall be designed to accommodate the differential shrinkage or movements.

Add new text as follows:

2304.3.3.1 Exterior cladding. The exterior cladding system shall be designed and installed to prevent adverse effects to cladding materials. Provisions shall be made to protect cladding systems from damage resulting from vertical movements associated with shrinkage and compression of the wood framing.

2510.8 Accommodation of Framing Shrinkage. Exterior cladding systems shall be designed and constructed to accommodate vertical movements associated with shrinkage and compression.

Attached Files

- **Case study_5.pdf**
  https://www.cdpaccess.com/proposal/11244/35109/files/download/8845/
- **Case study_4.pdf**
  https://www.cdpaccess.com/proposal/11244/35109/files/download/8844/
- **Case study_3.pdf**
  https://www.cdpaccess.com/proposal/11244/35109/files/download/8843/
- **Case study_2.pdf**
  https://www.cdpaccess.com/proposal/11244/35109/files/download/8842/
- **Case study_1.pdf**
  https://www.cdpaccess.com/proposal/11244/35109/files/download/8841/

Reason: The intention of this code change proposal is to ensure that the cladding and structure designs are coordinated. The building enclosure is an important part of ensuring design loads are resisted, occupants are comfortable, and energy performance is achieved. Building enclosure consultants have been involved in numerous cases where differential wood shrinkage is not adequately considered in the design of the building enclosure system, which has been documented to cause significant damages to building envelope components, resulting in premature failure of the building enclosure.

Wood shrinkage is the dimensional change in wood associated with a change in moisture content, and it can be well over 1 in. on buildings that are four to six stories tall. Wood changes dimension in three directions: longitudinal, radial, and tangential. The tangential direction is the most significant, and the framing at floor lines often includes wood bands that are oriented such that the tangential shrinkage is vertical.

The *International Building Code* requires a shrinkage analysis for wood buildings greater than two stories tall, but the relationship between this analysis and the effect on exterior cladding systems is often ignored or misunderstood by design professionals. This code change highlights that exterior cladding systems need to be evaluated for shrinkage-related damage, similar to existing code requirements for plumbing, electrical, or mechanical systems. It also adds a pointer in Chapter 14 to ensure that the connection between wood shrinkage and exterior cladding systems is made.

Bibliography: McClain, Richard, and Steimle, Doug. 2017. “Accommodating Shrinkage in Multi-Story Wood-Frame Structures,” WW-WSP-10, Washington, D.C: Woodworks. https://www.woodworks.org/wp-content/uploads/wood_solution_paper-Accomodating-Shrinkage.pdf

French, Warren R. 2020. “Detailing Specific Cladding Requirements for Mid-Rise Wood-Framed Buildings,” Proceedings of the IIBEC 2020 Virtual International Convention and Trade Show, June 12-14, 2020, pp. 110-119, Raleigh, N.C.: International Institute of Building Enclosure Consultants (IIBEC). Wetherholt, Ray, and Hodgin, Derek. 2021. “Got Shrinkage? Why Wood Shrinkage Analysis is Required by the Code.” IIBEC Interface, January. Raleigh, NC: IIBEC.

Martin, Zeno, and Anderson, Eric. 2012. “A Case Study: Multistory Wood Frame Shrinkage Effects on Exterior Deck Drainage.” Structure. Chicago, IL: National Council of Structural Engineer Associations (NCSEA).

Siliznoff, Tammy. 2023. “Building Enclosure Design to Accommodate Wood Shrinkage.” Structure. Chicago, IL: NCSEA.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

There is no cost implication associated with this proposed code revision. Specifically, the existing code already includes a requirement to consider the vertical movements associated with wood frame shrinkage. The proposed revision simply alerts the design professionals (structural engineer and architect) to include building envelope components when considering potential damages associated with vertical movements.

S159-25

S160-25

IBC: TABLE 1404.5.2.2, TABLE 1404.5.3.1, TABLE 1404.5.3.2, TABLE 2304.6.1, TABLE 2304.10.2

Proponents: David Tyree, representing American Wood Council (dtyree@awc.org); Shane Nilles, representing American Wood Council (snilles@awc.org); Jason Smart, representing American Wood Council (jsmart@awc.org)

2024 International Building Code

Revise as follows:

[BS] TABLE 1404.5.2.2 FURRING MINIMUM FASTENING REQUIREMENTS FOR APPLICATION OVER FOAM PLASTIC SHEATHING TO SUPPORT CLADDING WEIGHT[a]

Portions of table not shown remain unchanged.

For SI: 1 inch = 25.4 mm, 1 pound per square foot (psf) = 0.0479 kPa, 1 pound per square inch = 0.00689 MPa.

DR = Design Required, o.c. = on center.

a. Wood furring shall be Southern Pine, Douglas Fir-Larch, Hem-Fir, Spruce-Pine-Fir ~~spruce-pine-fir~~ or ~~any softwood~~ other species with a specific gravity of 0.42 or greater in accordance with AWC NDS. Steel furring shall be minimum 33 ksi steel. Cold-formed 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 AISI S240.

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 pounds per square inch 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.

[BS] TABLE 1404.5.3.1 CLADDING MINIMUM FASTENING REQUIREMENTS FOR DIRECT ATTACHMENT OVER FOAM PLASTIC SHEATHING TO SUPPORT CLADDING WEIGHT[a]

Portions of table not shown remain unchanged.

For SI: 1 inch = 25.4 mm, 1 pound per square foot (psf) = 0.0479 kPa.

DR = Design Required, o.c. = on center.

a. Wood framing shall be Southern Pine, Douglas Fir-Larch, Hem-Fir, Spruce-Pine-Fir, ~~spruce-pine-fir~~ or ~~any wood~~ other species with a specific gravity of 0.42 or greater in accordance with ANSI/AWC NDS.

b. The thickness of *wood structural panels* complying with the specific gravity requirement of Note a shall be permitted to be included in satisfying the minimum penetration into framing.

c. Nail fasteners shall comply with ASTM F1667, except nail length shall be permitted to exceed ASTM F1667 standard lengths.

d. Foam sheathing shall have a minimum compressive strength of 15 psi in accordance with ASTM C578 or ASTM C1289.

[BS] TABLE 1404.5.3.2 FURRING MINIMUM FASTENING REQUIREMENTS FOR APPLICATION OVER FOAM PLASTIC SHEATHING TO SUPPORT CLADDING WEIGHT[a, b]

Portions of table not shown remain unchanged.

For SI: 1 inch = 25.4 mm, 1 pound per square foot (psf) = 0.0479 kPa, 1 pound per square inch = 0.00689 MPa.

DR = Design Required, o.c. = on center.

a. Wood framing and furring shall be Southern Pine, Douglas Fir-Larch, Hem-Fir, Spruce-Pine-Fir, ~~spruce-pine-fir~~ or ~~any wood~~ other species with a specific gravity of 0.42 or greater in accordance with ANSI/AWC NDS.

b. Nail fasteners shall comply with ASTM F1667, except nail length shall be permitted to exceed ASTM F1667 standard lengths.

c. The thickness of *wood structural panels* complying with the specific gravity requirements of Note a shall be permitted to be included in satisfying the minimum required 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-inch nominal 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 greater 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.

TABLE 2304.6.1 MAXIMUM BASIC WIND SPEED, V , PERMITTED FOR WOOD STRUCTURAL PANEL WALL SHEATHING USED TO RESIST WIND PRESSURES[a, b, c]

Portions of table not shown remain unchanged.

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

a. Panel strength axis shall be parallel or perpendicular to supports. Three-ply plywood sheathing with studs spaced more than 16 inches on center shall be applied with panel strength axis perpendicular to supports.

b. The table is based on wind pressures acting toward and away from building surfaces in accordance with Section 30.4 of ASCE 7. Lateral requirements shall be in accordance with Section 2305 or 2308.

c. Wood structural panels with span ratings of wall-16 or wall-24 shall be permitted as an alternative to panels with a 24/0 span rating. Plywood siding rated 16 on center or 24 on center shall be permitted as an alternative to panels with a 24/16 span rating. Wall-16 and plywood siding 16 on center shall be used with studs spaced not more than 16 inches on center.

d. Fastener spacing applies where the framing is Southern Pine, Douglas Fir-Larch, Hem-Fir, Spruce-Pine-Fir or other species with a specific gravity greater than or equal to 0.42 in accordance with AWC NDS. Where the specific gravity of the wood species used for wall framing is greater than or equal to 0.35 but less than 0.42 ~~in accordance with AWC NDS~~, nail spacing in the field of the panel shall be multiplied by 0.67. Where the specific gravity of the wood species used for wall framing is less than 0.35, fastening of the wall sheathing shall be designed in accordance with AWC NDS.

TABLE 2304.10.2 FASTENING SCHEDULE

Portions of table not shown remain unchanged.

For SI: 1 inch = 25.4 mm.

a. Nails spaced at 6 inches at intermediate supports where spans are 48 inches or more. For nailing of wood structural panel and particleboard diaphragms and shear walls, refer to Section 2305. Nails for wall sheathing are permitted to be common, box or casing.

b. Spacing shall be 6 inches on center on the edges and 12 inches on center at intermediate supports for nonstructural applications. Panel supports at 16 inches (20 inches if strength axis in the long direction of the panel, unless otherwise marked).

c. Where a rafter is fastened to an adjacent parallel ceiling joist in accordance with this schedule and the ceiling joist is fastened to the top plate in accordance with this schedule, the number of toenails in the rafter shall be permitted to be reduced by one nail.

d. RSRS is a Roof Sheathing Ring Shank nail meeting the specifications in ASTM F1667.

e. Tabulated fastener requirements apply where the basic wind speed, *V*, is less than 140 mph and the wood species used for roof framing is Southern Pine, Douglas Fir-Larch, Hem-Fir, Spruce-Pine-Fir or other species with a specific gravity greater than or equal to 0.42 in accordance with AWC NDS. Where the specific gravity of the wood species used for roof framing is greater than or equal to 0.35 but less than 0.42, fastening of roof sheathing shall be with RSRS-03 ($2\frac{1}{2}$″ × 0.131″ × 0.281″ head) nails unless alternative fastening is designed in accordance with AWC NDS. Where the specific gravity of the wood species used for roof framing is less than 0.35, fastening of the roof sheathing shall be designed in accordance with AWC NDS. 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 4 inches on center where the basic wind speed, *V*, is greater than 130 mph in Exposure B or greater than 110 mph in Exposure C. Spacing exceeding 6 inches on center at intermediate supports shall be permitted where the fastening is designed per the AWC NDS. ~~Where the specific gravity of the wood species used for roof framing is greater than or equal to 0.35 but less than 0.42 in accordance with AWC NDS, fastening of roof sheathing shall be with RSRS-03 ($2\frac{1}{2}$″ × 0.131″ × 0.281″ head) nails unless alternative fastening is designed in accordance with AWC NDS. Where the specific gravity of the wood species used for roof framing is less than 0.35, fastening of the roof sheathing shall be designed in accordance with AWC NDS.~~

f. Fastening is only permitted where the basic wind speed, *V*, is less than or equal to 110 mph and where fastening is to wood framing of a species with specific gravity greater than or equal to 0.42 in accordance with AWC NDS.

g. Nails and staples are carbon steel meeting the specifications of ASTM F1667. Connections using nails and staples of other materials, such as stainless steel, shall be designed by acceptable engineering practice or approved under Section 104.2.3.

Reason: There are several sections of the IBC which direct the user to the ANSI/AWC *National Design Specification (NDS) for Wood Construction* to determine the specific gravity of the wood. This code change proposes to add names of common wood species that have a specific gravity of 0.42 or greater to reduce the need to lookup wood specific gravity in the NDS. The common wood species names listed (i.e., Southern Pine, Douglas Fir-Larch, Hem-Fir, Spruce-Pine-Fir) all have specific gravity of 0.42 or greater and are used elsewhere in the code such as in span tables for joist, rafters, and headers. This revision will make the code easier to use without changing the technical requirements.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

There is no technical change proposed in this code change. The footnote clarifications improve the ease-of-use of the code.

S160-25

S161-25

IBC: 2304.10.1

Proponents: David Tyree, representing American Wood Council (dtyree@awc.org); Shane Nilles, representing American Wood Council (snilles@awc.org)

2024 International Building Code

Revise as follows:

2304.10.1 Fire protection of connections. Connections used with *fire-resistance-rated* members and in *fire-resistance-rated* assemblies ~~of Type IV-A, IV-B, or IV-C construction~~ shall be in accordance with Section 704.5.2. ~~protected for the time associated with the fire-resistance rating. Protection time shall be determined by one of the following:~~

1. ~~Testing in accordance with Section 703.2 where the connection is part of the *fire resistance* test.~~
2. ~~Engineering analysis that demonstrates that the temperature rise at any portion of the connection is limited to an average temperature rise of 250°F (139°C), and a maximum temperature rise of 325°F (181°C), for a time corresponding to the required *fire-resistance* rating of the structural element being connected. For the purposes of this analysis, the connection includes connectors, fasteners, and portions of wood members included in the structural design of the connection.~~

Reason: This proposal coordinates Section 2304.10.1 with FS9-24 which was approved in Group A to move this language into Section 704.5.2. This was done to ensure that these requirements are applied to all connections of fire-resistance-rated wood members and assemblies regardless of construction type.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

This is a change to coordinate with action taken on FS9-24 in Group A.

Staff Analysis: FS9-24 was AMC2 (by Comment #1 at CAH #2) and is public comment (PC) eligible.

S161-25

S162-25

IBC: 2304.10.6.2

Proponents: David Tyree, representing American Wood Council (dtyree@awc.org); Shane Nilles, representing American Wood Council (snilles@awc.org)

2024 International Building Code

Revise as follows:

2304.10.6.2 ~~Fastenings~~ Fasteners and connectors for wood foundations. ~~Fastenings, including nuts and washers,~~ Fasteners and connectors for wood foundations shall be as required in AWC PWF.

Reason: “Fastenings” is an outdated term and is proposed to be replaced by "fasteners and connectors" which is consistent with terminology used in ANSI/AWC Permanent Wood Foundation (PWF) Design Specification in Section 2.4.1.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

There are no technical changes proposed in this code change. This proposal editorially coordinates with terminology used in the PWF.

S162-25

S163-25

IBC: 2304.11, 2304.11.1, TABLE 2304.11, 2304.11.1.1, 2304.11.1.2, 2304.11.1.3, AWC Chapter 35 (New)

Proponents: David Tyree, representing American Wood Council (dtyree@awc.org); Shane Nilles, representing American Wood Council (snilles@awc.org)

2024 International Building Code

Revise as follows:

2304.11 Heavy timber construction. Where a *structure*, portion thereof or individual structural elements are required by provisions of this code to be of heavy timber, the *building elements* therein shall comply with the applicable provisions of either Sections 2304.11.1 through 2304.11.4 or ANSI/AWC FDS requirements for heavy timber. ~~Minimum dimensions of heavy timber shall comply with the applicable requirements in Table 2304.11 based on roofs or floors supported and the configuration of each structural element, or in Sections 2304.11.2 through 2304.11.4. Lumber decking shall be in accordance with Section 2304.9.~~

2304.11.1 Details of heavy timber structural members. Heavy timber structural members shall be detailed and constructed in accordance with Sections 2304.11.1 through 2304.11.1.3. Minimum dimensions of heavy timber shall comply with the applicable requirements in Table 2304.11.1 based on roofs or floors supported and the configuration of each structural element, or in Sections 2304.11.2 through 2304.11.4. Lumber decking shall be in accordance with Section 2304.9.

TABLE ~~2304.11~~ 2304.11.1 MINIMUM DIMENSIONS OF HEAVY TIMBER STRUCTURAL MEMBERS

SUPPORTING	HEAVY TIMBER STRUCTURAL ELEMENTS	MINIMUM NOMINAL SOLID SAWN SIZE		MINIMUM GLUED-LAMINATED NET SIZE		MINIMUM STRUCTURAL COMPOSITE LUMBER NET SIZE	
		Width, inch	Depth, inch	Width, inch	Depth, inch	Width, inch	Depth, inch
Floor loads only or combined floor and roof loads	Columns; Framed sawn or glued-laminated timber arches that spring from the floor line; Framed timber trusses	8	8	6 3/4	8 1/4	7	7 1/2
	Wood beams and girders	6	10	5	10 1/2	5 1/4	9 1/2
Roof loads only	Columns (roof and ceiling loads); Lower half of: wood-frame or glued-laminated arches that spring from the floor line or from grade	6	8	5	8 1/4	5 1/4	7 1/2
	Upper half of: wood-frame or glued-laminated arches that spring from the floor line or from grade	6	6	5	6	5 1/4	5 1/2
	Framed timber trusses and other roof framing;[a] Framed or glued-laminated arches that spring from the top of walls or wall abutments	4[b]	6	3[b]	6 7/8	3 1/2[b]	5 1/2

For SI: 1 inch = 25.4 mm.

a. Spaced members shall be permitted to be composed of two or more pieces not less than 3 inches nominal in thickness where blocked solidly throughout their intervening spaces or where spaces are tightly closed by a continuous wood cover plate of not less than 2 inches nominal in thickness secured to the underside of the members. Splice plates shall be not less than 3 inches nominal in thickness.

b. Where protected by approved automatic sprinklers under the roof deck, framing members shall be not less than 3 inches nominal in width.

2304.11.1.1 Columns. Minimum dimensions of columns shall be in accordance with Table 2304.11.1. Columns shall be connected in an *approved* manner. Columns shall be continuous or aligned vertically from floor to floor in all stories of Type IV-HT construction. Girders and beams at column connections shall be closely fitted around columns and adjoining ends shall be cross tied to each other, or intertied by caps or ties, to transfer horizontal *loads* across joints. Wood bolsters shall not be placed on tops of columns unless the columns support roof *loads* only. Where traditional heavy timber detailing is used, connections shall be by means of reinforced concrete or metal caps with brackets, by properly designed steel or iron caps, with pintles and base plates, by timber splice plates affixed to the columns by metal connectors housed within the contact faces, or by other *approved* methods.

2304.11.1.2 Floor framing. Minimum dimensions of floor framing shall be in accordance with Table 2304.11.1. *Approved* wall plate boxes or hangers shall be provided where wood beams, girders or trusses rest on *masonry* or concrete walls. Where intermediate beams are used to support a floor, they shall rest on top of girders, or shall be supported by an *approved* metal hanger into which the ends of the beams shall be closely fitted. Where traditional heavy timber detailing is used, these connections shall be permitted to be supported by ledgers or blocks securely fastened to the sides of the girders.

2304.11.1.3 Roof framing. Minimum dimensions of roof framing shall be in accordance with Table 2304.11.1. Every roof girder and not less than every alternate roof beam shall be anchored to its supporting member to resist forces as required in Chapter 16.

Add new standard(s) as follows:

AWC

American Wood Council
222 Catoctin Circle SE, Suite 201
Leesburg, VA 20175

ANSI/AWC FDS-2024 Fire Design Specification for Wood Construction

Reason:

This proposal adds a reference to the ANSI/AWC *Fire Design Specification for Wood Construction* (FDS) heavy timber provisions to allow for an additional compliance path independent from the existing IBC heavy timber provisions. Section 2304.11 has been restructured to be charging language only, with the technical provisions relocated to 2304.11.1 to avoid conflict with the FDS. The FDS brings forth requirements consistent with the IBC, but with consistent product terminology and revised organization for heavy timber used in construction.

Cost Impact: Decrease

Estimated Immediate Cost Impact:

$0

Estimated Immediate Cost Impact Justification (methodology and variables):

This proposal adds an additional option in the code for heavy timber requirements. Therefore, it does not result in an increase in the cost of construction, because the existing compliance option is still available. This proposal could potentially decrease construction costs if this option is used, but will have no effect on construction costs if it is not used. Therefore, the decrease in cost is conservatively estimated as $0.

Staff Analysis: A review of the standard proposed for inclusion in the code, ANSI/AWC FDS-2024 Fire Design Specification for Wood Construction, with regard to some of the key ICC criteria for referenced standards (Section 4.6 of CP#28) will be posted on the ICC website on or before April 1, 2025.

S163-25

S164-25

IBC: 2304.11.2.2

Proponents: David Tyree, representing American Wood Council (dtyree@awc.org); Shane Nilles, representing American Wood Council (snilles@awc.org); Jason Smart, representing American Wood Council (jsmart@awc.org)

2024 International Building Code

Revise as follows:

2304.11.2.2 Interior walls and partitions. Interior walls and partitions shall be of solid wood construction formed by not less than two layers of 1-inch (25 mm) matched boards or laminated construction 4 inches (102 mm) thick, *cross-laminated timber* not less than 3" in thickness, or of 1-hour fire-resistance-rated construction.

Reason: The ANSI/AWC *Fire Design Specification for Wood Construction* (FDS) provides the most up-to-date provisions for heavy timber members. This proposal aligns the provisions in the code for heavy timber interior walls and partitions with the FDS by adding the minimum thickness of cross-laminated timber (CLT) for that application. As stated in the FDS and IBC 2301.2, the minimum thicknesses specified for CLT are actual dimensions.

Cost Impact: Decrease

Estimated Immediate Cost Impact:

$0

Estimated Immediate Cost Impact Justification (methodology and variables):

This proposal only adds an equivalent option in the code for heavy timber walls and partitions. It does not increase the cost of construction, because the existing compliance option is still available. This proposal could potentially decrease construction costs if this option is used, but will have no effect on construction costs if it is not used. Therefore, the decrease in cost is conservatively estimated as $0.

S164-25

S165-25

IBC: 2304.11.3, 2304.11.3.1, 2304.11.3.2

Proponents: David Tyree, representing American Wood Council (dtyree@awc.org); Shane Nilles, representing American Wood Council (snilles@awc.org)

2024 International Building Code

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

Revise as follows:

2304.11.3.1 Cross-laminated timber floors. *Cross-laminated timber* shall be not less than 4 inches (102 mm) in thickness. *Cross-laminated timber* shall be continuous from support to support and mechanically fastened to one another. *Cross-laminated timber* shall be permitted to be connected to walls without a shrinkage gap ~~providing~~ provided swelling or shrinking is considered in the design. Corbelling of *masonry* walls under the floor shall be permitted to be used.

2304.11.3.2 Sawn or glued-laminated plank floors. Sawn or glued-laminated plank floors shall be one of the following:

1. Sawn or glued-laminated planks, splined or tongue-and-groove, of not less than 3 inches (76 mm) nominal in thickness covered with 1-inch (25 mm) nominal dimension tongue-and-groove flooring, laid crosswise or diagonally, $^{15}/_{32}$-inch (12 mm) *wood structural panel*, ~~or~~ $^{1}/_{2}$-inch (12.7 mm) *particleboard*, or ¾ - inch (19 mm) thickness concrete or gypsum concrete topping.
2. Planks not less than 4 inches (102 mm) nominal in width set on edge close together and well spiked and covered with 1-inch (25 mm) nominal dimension flooring or $^{15}/_{32}$-inch (12 mm) *wood structural panel*, ~~or~~ $^{1}/_{2}$-inch (12.7 mm) *particleboard*, or ¾ - inch (19 mm) thickness concrete or gypsum concrete topping.

The lumber shall be laid so that continuous lines of joints will occur only at points of support. Floors shall not extend closer than $^{1}/_{2}$ inch (12.7 mm) to walls. Such $^{1}/_{2}$-inch (12.7 mm) space shall be covered by a molding fastened to the wall and so arranged that it will not obstruct the swelling or shrinkage movements of the floor. Corbelling of masonry walls under the floor shall be permitted to be used in place of molding.

Reason: This proposal adds an option of ¾" concrete or gypsum concrete topping above sawn or glued-laminated plank floors to protect against passage of flames and gasses to match ANSI/AWC Fire Design Specification for Wood Construction (FDS). Concrete or gypsum concrete topping is not currently recognized under the heavy timber provisions of the IBC. Recognized materials for this purpose are currently limited to flooring or panels of prescribed thicknesses. This requirement does not replace the requirement for 1" noncombustible material used above mass timber flooring in Type IV-A and IV-B construction. There is also an editorial grammatical change in 2304.11.3.1.

Cost Impact: Decrease

Estimated Immediate Cost Impact:

$0

Estimated Immediate Cost Impact Justification (methodology and variables):

This proposal adds an additional option in the code for toppings on sawn or glued-laminated plank floors. Therefore, it does not result in an increase in the cost of construction, because the existing compliance options are still available. This proposal could potentially decrease construction costs if this option is used, but will have no effect on construction costs if it is not used. Therefore, the decrease in cost is conservatively estimated as $0.

S165-25

S166-25

IBC: 2308.8.1.1, TABLE 2308.8.1.1(1), TABLE 2308.8.1.1(2) (New), TABLE 2308.8.1.1(2), TABLE 2308.8.1.1(4) (New)

Proponents: David Tyree, representing American Wood Council (dtyree@awc.org); Shane Nilles, representing American Wood Council (snilles@awc.org)

2024 International Building Code

Revise as follows:

2308.8.1.1 Allowable girder spans. The allowable spans of girders that are fabricated of dimension lumber shall not exceed the values set forth in Table 2308.8.1.1(1), 2308.8.1.1(2), 2308.8.1.1(3) or 2308.8.1.1(~~2~~4).

TABLE 2308.8.1.1(1) LATERALLY SUPPORTED HEADER AND GIRDER SPANS[a, b] FOR EXTERIOR BEARING WALLS (Maximum spans for Douglas fir-larch, hem-fir, Southern pine and spruce-pine-fir and required number of jack studs)

Portions of table not shown remain unchanged.

For SI: 1 inch = 25.4 mm, 1 pound per square foot = 0.0479 kPa.

a. Spans are given in feet and inches.

b. Spans are based on minimum design properties for No. 2 grade lumber of Douglas fir-larch, hem-fir, Southern pine and spruce-pine fir.

c. Building width is measured perpendicular to the ridge. For widths between those shown, spans are permitted to be interpolated.

d. NJ = Number of jack studs required to support each end. Where the number of required jack studs equals one, the header is permitted to be supported by an approved framing anchor attached to the full-height wall stud and to the header.

e. Use 30 psf allowable stress design ground snow load for cases in which allowable stress design ground snow load is less than 30 psf and the roof live load is equal to or less than 20 psf.

f. Spans are calculated assuming a single span header or girder under uniform load where the top of the header or girder is laterally braced by perpendicular framing. Where the top of the header or girder is not laterally braced (for example, cripple studs bearing on the header), refer to Table 2308.8.1.1(2). ~~tabulated spans for headers consisting of 2 × 8, 2 × 10, or 2 × 12 sizes shall be multiplied by 0.70 or the header or girder shall be designed.~~

Add new text as follows:

TABLE 2308.8.1.1(2)
LATERALLY UNSUPPORTED (DROPPED) HEADER AND GIRDER SPANS[a,b] FOR EXTERIOR BEARING WALLS (Maximum spans for Douglas Fir-Larch, Hem-Fir, Southern Pine and Spruce-Pine-Fir and required number of jack studs)

HEADERS AND GIRDERS SUPPORTING	SIZE	ALLOWABLE STRESS DESIGN GROUND SNOW LOAD, $p_{g(asd)}$, (psf)[e]																	
		30						50						70					
		Building width[c] (feet)																	
		12		24		36		12		24		36		12		24		36	
		Span[f]	NJ[d]	Span[f]	NJ[d]	Span[f]	NJ[d]	Span[f]	NJ[d]	Span[f]	NJ[d]	Span[f]	NJ[d]	Span[f]	NJ[d]	Span[f]	NJ[d]	Span[f]	NJ[d]
	1-2 × 6	3-11	1	3-0	2	2-6	2	3-4	1	2-7	2	2-2	2	3-0	2	2-3	2	1-11	2
	1-2 × 8	4-10	2	3-9	2	3-2	2	4-2	2	3-3	2	2-8	2	3-9	2	2-10	2	2-5	3
	1-2 × 10	5-7	2	4-4	2	3-8	2	4-10	2	3-9	2	3-2	3	4-4	2	3-4	3	2-10	3
	1-2 × 12	6-2	2	4-11	2	4-3	3	5-5	2	4-4	3	3-8	3	4-11	2	3-10	3	3-3	3

	2-2 × 4	3-11	1	3-0	1	2-6	1	3-4	1	2-6	1	2-2	1	3-0	1	2-3	1	1-11	1
	2-2 × 6	5-8	1	4-4	1	3-8	1	4-11	1	3-9	1	3-2	2	4-5	1	3-4	2	2-10	2
	2-2 × 8	6-9	1	5-4	1	4-6	2	5-11	1	4-7	2	3-11	2	5-4	1	4-2	2	3-6	2
Roof and ceiling	2-2 × 10	7-6	1	6-0	2	5-2	2	6-7	2	5-3	2	4-6	2	6-0	2	4-9	2	4-1	2
	2-2 × 12	8-0	2	6-6	2	5-9	2	7-2	2	5-10	2	5-1	2	6-6	2	5-4	2	4-7	3
	3-2 × 8	8-0	1	6-5	1	5-6	1	7-1	1	5-7	1	4-10	2	6-5	1	5-1	2	4-4	2
	3-2 × 10	8-9	1	7-1	1	6-2	2	7-9	1	6-3	2	5-5	2	7-1	1	5-8	2	4-11	2
	3-2 × 12	9-4	1	7-7	2	6-8	2	8-4	2	6-9	2	5-11	2	7-7	2	6-2	2	5-5	2
	4-2 × 8	8-10	1	7-2	1	6-3	1	7-11	1	6-4	1	5-5	1	7-2	1	5-9	1	4-11	2
	4-2 × 10	9-8	1	7-11	1	6-11	1	8-8	1	7-0	1	6-1	2	7-11	1	6-5	2	5-6	2
	4-2 × 12	10-4	1	8-5	1	7-5	2	9-3	1	7-6	2	6-7	2	8-6	1	6-11	2	6-0	2
	1-2 × 6	3-2	1	2-6	2	2-2	2	2-11	2	2-4	2	1-11	2	2-8	2	2-2	2	1-10	2
	1-2 × 8	4-0	2	3-2	2	2-8	2	3-8	2	2-11	2	2-5	3	3-5	2	2-8	2	2-3	3
	1-2 × 10	4-7	2	3-8	2	3-2	3	4-3	2	3-5	3	2-11	3	3-11	2	3-2	3	2-8	3
	1-2 × 12	5-3	2	4-3	3	3-8	3	4-10	2	3-11	3	3-4	3	4-6	3	3-8	3	3-1	4
	2-2 × 4	3-2	1	2-6	1	2-1	1	2-11	1	2-3	1	1-11	1	2-8	1	2-1	1	1-9	1
	2-2 × 6	4-8	1	3-8	1	3-2	2	4-4	1	3-4	2	2-10	2	3-11	1	3-2	2	2-8	2
	2-2 × 8	5-8	1	4-6	2	3-11	2	5-3	2	4-2	2	3-7	2	4-10	2	3-11	2	3-4	2
Roof, ceiling and one center-bearing floor	2-2 × 10	6-4	2	5-2	2	4-6	2	5-11	2	4-10	2	4-2	2	5-6	2	4-6	2	3-10	2
	2-2 × 12	6-10	2	5-9	2	5-0	2	6-5	2	5-4	2	4-8	3	6-1	2	5-0	2	4-5	3
	3-2 × 8	6-9	1	5-6	1	4-9	2	6-4	1	5-1	2	4-5	2	5-11	1	4-9	2	4-1	2
	3-2 × 10	7-5	1	6-2	2	5-5	2	7-0	1	5-9	2	5-0	2	6-6	2	5-5	2	4-8	2
	3-2 × 12	8-0	2	6-8	2	5-11	2	7-6	2	6-3	2	5-6	2	7-0	2	5-11	2	5-2	2
	4-2 × 8	7-7	1	6-3	1	5-5	1	7-1	1	5-9	1	5-0	2	6-7	1	5-5	1	4-8	2
	4-2 × 10	8-4	1	6-11	2	6-1	2	7-9	1	6-5	2	5-7	2	7-4	1	6-1	2	5-3	2
	4-2 × 12	8-11	1	7-5	2	6-7	2	8-4	2	6-11	2	6-2	2	7-10	2	6-7	2	5-10	2
	1-2 × 6	2-11	2	2-3	2	1-10	2	2-8	2	2-1	2	1-9	2	2-7	2	1-11	2	1-8	2
	1-2 × 8	3-8	2	2-10	2	2-4	3	3-5	2	2-7	2	2-2	3	3-2	2	2-6	3	2-1	3
	1-2 × 10	4-3	2	3-4	3	2-9	3	4-0	2	3-1	3	2-7	3	3-9	2	2-11	3	2-5	3
	1-2 × 12	4-10	2	3-10	3	3-3	3	4-6	3	3-7	3	3-0	4	4-4	3	3-4	3	2-10	4
	2-2 × 4	2-11	1	2-3	1	1-10	1	2-8	1	2-1	1	1-9	1	2-6	1	1-11	1	1-7	1
	2-2 × 6	4-3	1	3-3	2	2-9	2	4-0	1	3-1	2	2-7	2	3-9	1	2-10	2	2-5	2
	2-2 × 8	5-2	2	4-1	2	3-6	2	4-10	2	3-10	2	3-3	2	4-7	2	3-7	2	3-0	2
Roof, ceiling and one clear-span floor	2-2 × 10	5-10	2	4-8	2	4-0	2	5-6	2	4-5	2	3-9	2	5-3	2	4-2	2	3-7	3
	2-2 × 12	6-4	2	5-3	2	4-7	3	6-1	2	4-11	2	4-3	3	5-9	2	4-8	3	4-1	3
	3-2 × 8	6-3	1	5-0	2	4-3	2	5-11	1	4-8	2	4-0	2	5-7	1	4-5	2	3-9	2
	3-2 × 10	6-11	2	5-7	2	4-10	2	6-7	2	5-3	2	4-7	2	6-3	2	5-0	2	4-4	2
	3-2 × 12	7-5	2	6-1	2	5-5	2	7-1	2	5-10	2	5-1	2	6-9	2	5-6	2	4-10	3
	4-2 × 8	7-0	1	5-8	1	4-10	2	6-8	1	5-4	2	4-6	2	6-4	1	5-0	2	4-3	2
	4-2 × 10	7-8	1	6-3	2	5-6	2	7-4	1	5-11	2	5-2	2	7-0	1	5-8	2	4-11	2
	4-2 × 12	8-3	2	6-9	2	6-0	2	7-10	2	6-5	2	5-8	2	7-6	2	6-2	2	5-5	2
	1-2 × 6	2-8	2	2-1	2	1-10	2	2-6	2	2-0	2	1-8	2	2-5	2	1-11	2	1-7	2
	1-2 × 8	3-4	2	2-8	2	2-3	3	3-2	2	2-6	2	2-2	3	3-0	2	2-4	3	2-0	3
	1-2 × 10	3-11	2	3-2	3	2-8	3	3-8	2	2-11	3	2-6	3	3-6	2	2-9	3	2-5	3
	1-2 × 12	4-6	3	3-8	3	3-2	4	4-3	3	3-5	3	2-11	4	4-1	3	3-3	3	2-9	4
	2-2 × 4	2-8	1	2-1	1	1-9	1	2-6	1	2-0	1	1-8	1	2-4	1	1-10	1	1-7	1
	2-2 × 6	3-11	1	3-1	2	2-8	2	3-8	1	2-11	2	2-6	2	3-6	1	2-9	2	2-4	2
	2-2 × 8	4-10	2	3-11	2	3-4	2	4-7	2	3-8	2	3-2	2	4-4	2	3-5	2	2-11	2
Roof, ceiling and two center-bearing floors	2-2 × 10	5-6	2	4-6	2	3-11	2	5-2	2	4-3	2	3-8	3	5-0	2	4-0	2	3-6	3

	2-2 × 12	6-0	2	5-0	2	4-5	3	5-9	2	4-9	3	4-2	3	5-6	2	4-7	3	4-0	3
	3-2 × 8	5-10	1	4-9	2	4-1	2	5-6	1	4-6	2	3-10	2	5-3	2	4-3	2	3-8	2
	3-2 × 10	6-6	2	5-4	2	4-9	2	6-2	2	5-1	2	4-5	2	5-11	2	4-10	2	4-3	2
	3-2 × 12	7-0	2	5-11	2	5-3	2	6-8	2	5-7	2	5-0	3	6-5	2	5-5	2	4-9	3
	4-2 × 8	6-7	1	5-5	1	4-8	2	6-3	1	5-1	2	4-5	2	6-0	1	4-10	2	4-2	2
	4-2 × 10	7-3	1	6-0	2	5-4	2	6-11	2	5-9	2	5-0	2	6-8	2	5-6	2	4-9	2
	4-2 × 12	7-9	2	6-6	2	5-10	2	7-5	2	6-3	2	5-6	2	7-2	2	6-0	2	5-4	2
	1-2 × 6	2-3	2	1-8	2	1-5	2	2-3	2	1-8	2	1-5	3	2-2	2	1-8	2	1-5	3
	1-2 × 8	2-10	2	2-2	3	1-10	3	2-10	2	2-2	3	1-10	3	2-8	2	2-1	3	1-9	3
	1-2 × 10	3-4	2	2-6	3	2-2	3	3-4	3	2-6	3	2-2	4	3-2	3	2-6	3	2-1	4
	1-2 × 12	3-10	3	3-0	3	2-6	4	3-10	3	3-0	4	2-6	4	3-8	3	2-10	4	2-5	4
	2-2 × 4	2-3	1	1-8	1	1-4	1	2-3	1	1-8	1	1-4	1	2-2	1	1-7	1	1-4	2
	2-2 × 6	3-3	1	2-6	2	2-1	2	3-3	2	2-6	2	2-1	2	3-2	2	2-5	2	2-1	2
	2-2 × 8	4-1	2	3-2	2	2-8	2	4-1	2	3-2	2	2-8	2	3-11	2	3-1	2	2-7	3
Roof, ceiling, and two clear-span floors	2-2 × 10	4-9	2	3-8	2	3-2	3	4-8	2	3-8	2	3-2	3	4-6	2	3-7	3	3-0	3
	2-2 × 12	5-4	2	4-3	3	3-8	3	5-3	2	4-3	3	3-8	3	5-1	2	4-1	3	3-6	3
	3-2 × 8	5-0	1	3-11	2	3-4	2	5-0	2	3-11	2	3-4	2	4-10	2	3-9	2	3-2	2
	3-2 × 10	5-9	2	4-7	2	3-10	2	5-7	2	4-6	2	3-10	2	5-5	2	4-4	2	3-9	3
	3-2 × 12	6-4	2	5-2	2	4-5	3	6-2	2	5-0	2	4-5	3	5-11	2	4-10	3	4-3	3
	4-2 × 8	5-9	1	4-6	2	3-10	2	5-8	1	4-6	2	3-10	2	5-5	1	4-4	2	3-8	2
	4-2 × 10	6-6	2	5-2	2	4-5	2	6-4	2	5-1	2	4-5	2	6-1	2	4-11	2	4-3	2
	4-2 × 12	7-1	2	5-9	2	5-0	2	6-10	2	5-7	2	4-11	2	6-7	2	5-5	2	4-9	3

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 pound per square foot = 0.0479 kPa.

a. Spans are given in feet and inches.

b. Spans are based on minimum design properties for No. 2 grade lumber of Douglas Fir-Larch, Hem-Fir, Southern Pine, and Spruce-Pine-Fir.

c. Building width is measured perpendicular to the ridge. For widths between those shown, spans are permitted to be interpolated.

d. NJ = Number of jack studs required to support each end. Where the number of required jack studs equals one, the header is permitted to be supported by an approved framing anchor attached to the full-height wall stud and to the header.

e. Use 30 psf allowable stress design ground snow load for cases in which allowable stress design ground snow load is less than 30 psf and the roof live load is equal to or less than 20 psf.

f. Spans are assuming a single span header or girder under uniform load where the top of the header or girder is not laterally braced by perpendicular framing.

Revise as follows:

TABLE 2308.8.1.1(~~2~~3) LATERALLY SUPPORTED HEADER AND GIRDER SPANS[a, b] FOR INTERIOR BEARING WALLS (Maximum spans for Douglas fir-larch, hem-fir, Southern pine and spruce-pine-fir and required number of jack studs)

Portions of table not shown remain unchanged.

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

a. Spans are given in feet and inches.

b. Spans are based on minimum design properties for No. 2 grade lumber of Douglas fir-larch, hem-fir, Southern pine and spruce-pine fir.

c. *Building* width is measured perpendicular to the ridge. For widths between those shown, spans are permitted to be interpolated.

d. NJ = Number of jack studs required to support each end. Where the number of required jack studs equals one, the header is permitted to be supported by an *approved* framing anchor attached to the full-height wall stud and to the header.

e. Spans are calculated assuming a single span header or girder under uniform load where the top of the header or girder is laterally braced by perpendicular framing. Where the top of the header or girder is not laterally braced (for example, cripple studs bearing on the header), refer to Table 2308.8.1.1(4). ~~tabulated spans for headers consisting of 2 × 8, 2 × 10, or 2 × 12 sizes shall be multiplied by 0.70 or the header or girder shall be designed.~~

Add new text as follows:

TABLE 2308.8.1.1(4) LATERALLY UNSUPPORTED (DROPPED) HEADER AND GIRDER SPANS[a, b] FOR INTERIOR BEARING WALLS (Maximum spans for Douglas Fir-Larch, Hem-Fir, Southern Pine and Spruce-Pine-Fir and required number of jack studs)

HEADERS AND GIRDERS SUPPORTING	SIZE	BUILDING Width[c] (feet) 12		24		36	
		Span[e]	NJ[d]	Span[e]	NJ[d]	Span[e]	NJ[d]
	2-2 × 4	4-0	1	2-10	1	2-4	1
	2-2 × 6	5-11	1	4-3	1	3-5	1
	2-2 × 8	7-1	1	5-2	1	4-4	2
	2-2 × 10	7-11	1	5-11	2	5-0	2
	2-2 × 12	8-6	1	6-7	2	5-7	2
One floor only	3-2 × 8	8-5	1	6-4	1	5-3	1
	3-2 × 10	9-3	1	7-1	1	6-0	2
	3-2 × 12	9-11	1	7-8	2	6-7	2
	4-2 × 8	9-5	1	7-2	1	6-0	1
	4-2 × 10	10-3	1	7-11	1	6-9	1
	4-2 × 12	11-0	1	8-7	1	7-4	2
	2-2 × 4	2-7	1	1-11	1	1-7	1
	2-2 × 6	3-10	1	2-10	2	2-5	2
	2-2 × 8	4-9	1	3-7	2	3-0	2
	2-2 × 10	5-6	2	4-2	2	3-6	2
	2-2 × 12	6-1	2	4-9	2	4-1	3
Two floors	3-2 × 8	5-10	1	4-5	2	3-9	2
	3-2 × 10	6-7	1	5-1	2	4-4	2
	3-2 × 12	7-2	2	5-8	2	4-11	2
	4-2 × 8	6-7	1	5-1	1	4-3	2
	4-2 × 10	7-5	1	5-9	2	4-11	2
	4-2 × 12	8-0	1	6-4	2	5-6	2

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

a. Spans are given in feet and inches.

b. Spans are based on minimum design properties for No. 2 grade lumber of Douglas Fir-Larch, Hem-Fir, Southern Pine, and Spruce-Pine-Fir.

c. Building width is measured perpendicular to the ridge. For widths between those shown, spans are permitted to be interpolated.

d. NJ = Number of jack studs required to support each end. Where the number of required jack studs equals one, the header is permitted to be supported by an *approved* framing anchor attached to the full-height wall stud and to the header.

e. Spans are assuming a single span header or girder under uniform load where the top of the header or girder is not laterally braced by perpendicular framing.

Reason: Laterally unsupported header and girder spans are currently addressed by a conservative adjustment in footnote f of the existing header/girder span tables. Spans for laterally unsupported headers and girders are added consistent with ANSI/AWC 2024 Wood Frame Construction Manual to show appropriate spans, avoiding the unnecessary conservatism. With this proposal, the laterally unsupported header and girder condition is now addressed by stand-alone tables and no longer needs to be addressed through an adjustment factor footnote. Existing tables have been renumbered and titles have been revised to reflect that they are applicable to laterally supported headers and girders.

Additionally, language has been added to the footnotes to clarify that all header and girder calculations are based on the assumption that they are single-span headers or girders. This clarification is necessary as multi-span headers are not addressed by the tables.

Cost Impact: Decrease

Estimated Immediate Cost Impact:

$0

Estimated Immediate Cost Impact Justification (methodology and variables):

This proposal revises the code for laterally unsupported (dropped) header and girder spans. The new tables remove unnecessary conservatism, therefore this proposal could potentially decrease construction costs where the tables are used. The decrease in cost is conservatively estimated as $0.

S166-25

S167-25

IBC: 2308.6.1, FIGURE 2308.6.1 (New), 2308.6.2, FIGURE 2308.6.2 (New), 2308.6.3, 2308.6.4

Proponents: John Grenier, representing National Council of Structural Engineers Associations (NCSEA) (jgrenier@greniereng.com); Emily Guglielmo, representing NCSEA (eguglielmo@martinmartin.com)

2024 International Building Code

Revise as follows:

2308.6.1 Floor joists, roof rafters and ceiling joists. Notches on framing ends shall not exceed one-fourth the member depth. Notches in the top or bottom of the member shall not exceed one-sixth the depth and shall not be located in the middle third of the span. A notch not more than one-third of the depth is permitted in the top of a rafter or ceiling joist not further from the face of the support than the depth of the member. Holes bored in members shall not be within 2 inches (51 mm) of the top or bottom of the member and the diameter of any such hole shall not exceed one-third the depth of the member. *Holes bored in the middle third of the span shall be located in the center third of the joist depth and shall not exceed one third of the joist depth.* Where the member is notched, the hole shall not be closer than 2 inches (51 mm) to the notch. (*See Figure 2308.6.1)*

Add new text as follows:

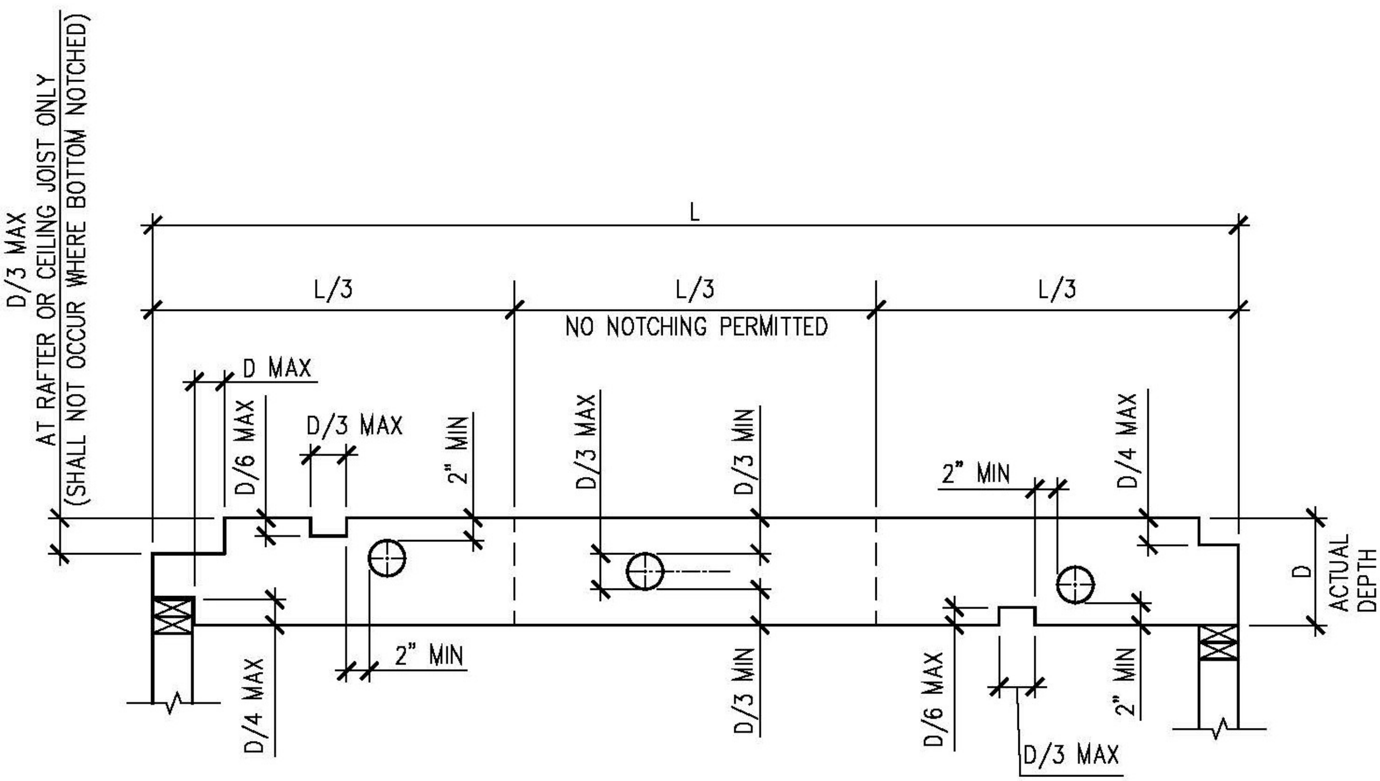
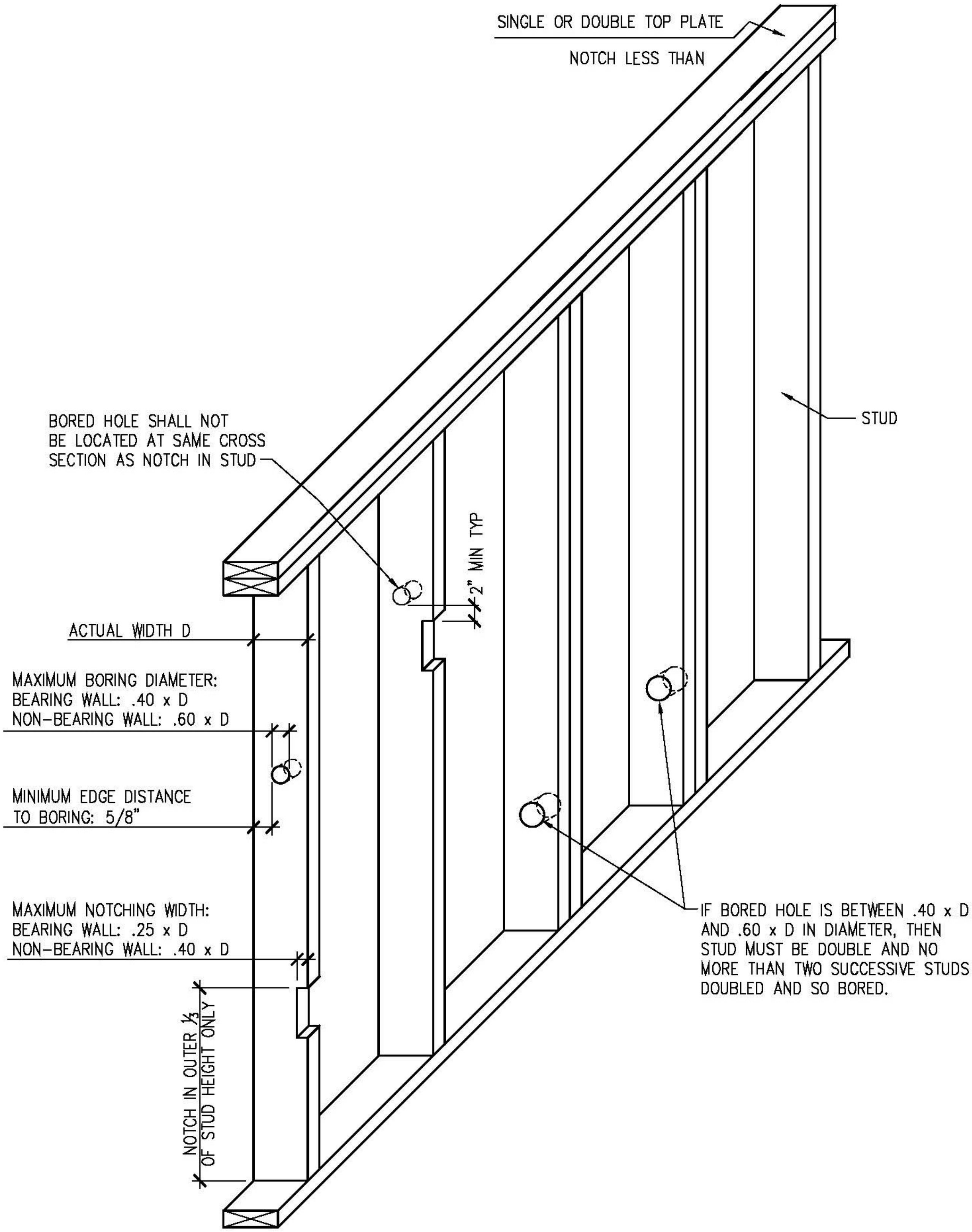


FIGURE 2308.6.1 JOIST BORING AND NOTCHING LIMITS

Revise as follows:

2308.6.2 Wall studs. In exterior walls and bearing partitions, a wood stud shall not be cut or notched in the middle one-third of the stud length and the cut or notch shall not exceed ~~in excess of~~ 25 percent of its depth. In nonbearing partitions that do not support loads other than the weight of the partition, a stud shall not be cut or notched in excess of 40 percent of its depth. *(See Figure 2308.6.2)*

Add new text as follows:



<u>FIGURE 2308.6.2</u> <u>WALL BORING AND NOTCHING LIMITS</u>

Revise as follows:

2308.6.3 Bored holes. The diameter of bored holes in exterior walls and bearing partitions, wood studs shall not exceed 40 percent of the stud depth. The diameter of bored holes in in interior nonbearing partitions , wood studs shall not exceed 60 percent of the stud depth ~~in nonbearing partitions~~. ~~The diameter of bored holes in wood studs shall not exceed 60 percent of the stud depth in any wall where each stud is doubled, provided that not more than two such successive doubled studs are so bored.~~ The edge of the bored hole shall not be closer than $^{5}/_{8}$ inch (15.9 mm) to the edge of the stud. Bored holes shall not be located within 2 inches of ~~at~~ the same section of stud as a cut or notch.

Exception: The diameter of bored holes in exterior walls and bearing partitions wood studs shall not exceed 60 percent of the stud depth when studs are doubled, provided that not more than two such successive doubled studs are so bored.

2308.6.4 Limitations. In designated lateral force-resisting system assemblies designed in accordance with this code ~~and greater than three *stories* in height or~~ in *Seismic Design Categories* C, D, E and F, the cutting, notching and boring of wall studs shall be as prescribed by the *registered design professional*.

~~In *structures* designed in accordance with the International Residential Code, modification of wall studs shall comply with the *International Residential Code*.~~

Reason: This proposal seeks to remove redundant language contained within the code section.

Section 2308 is limited to conventional light-frame construction. Section 2308.2.1 and Table 2308.2.1 limits the height of buildings, with a maximum of 3 stories in Seismic Design Category A and B, and fewer stories in higher SDC C, D and E. So the requirement for omitting the prescriptive limits to buildings of greater height is redundant.

Reference to IRC is not needed.

Proposal seeks to clarify language for notching and boring.

Wall stud notching is limited to the outer 1/3rd of studs this is consistent with limitations on joists and the location limits contained in the NDS WFCM.

Bored hole language was restructured to provide more clarity on which studs have 40% or 60% limits.

Bored hole language was clarified so that bore holes will not occur within the influence of a notch portion of a stud.

Cost Impact: Increase

Estimated Immediate Cost Impact:

This proposal may slightly increase the cost of construction, however the cost is increase is estimated to be close to negligible - estimated cost increase $0. Notching limitations on stud walls will limit where notches can occur thus potentially increasing the cost of construction

Estimated Immediate Cost Impact Justification (methodology and variables):

By clarifying the limitations on cutting, notching or boring of wood studs, the contractor will need to more carefully plan for the installation of electrical wiring and the in wall plumbing for a project, resulting in potentially more time needed during the construction process.

Estimated Life Cycle Cost Impact:

Decrease

Estimated Life Cycle Cost Impact Justification (methodology and variables):

This proposal has the potential of reducing life cycle costs by eliminating distressed or damaged wall framing that would require replacement or strengthening.

S167-25

S168-25

IBC: 2308.6, 2308.6.1 (New), 2308.6.2 (New), 2308.6.1, 2308.6.1.1, 2308.6.2, 2308.6.3, 2308.6.4, 2308.8.3, 2308.11.8

Proponents: David Tyree, representing American Wood Council (dtyree@awc.org); Shane Nilles, representing American Wood Council (snilles@awc.org); Jason Smart, representing American Wood Council (jsmart@awc.org)

2024 International Building Code

Revise as follows:

2308.6 Cutting, notching and boring of ~~dimensional~~ structural wood framing. Structural wood framing members shall not be cut, bored or notched in excess of the limitations specified in this section. ~~The provisions of this section shall only apply to dimensional wood framing and shall not include engineered wood products, heavy timber or prefabricated/manufactured wood assemblies.~~

Add new text as follows:

2308.6.1 Engineered wood products. Cuts, notches and holes bored in trusses, *structural composite lumber*, structural glued-laminated timber, cross-laminated timber or prefabricated wood I-joists are prohibited except where permitted by the manufacturer's recommendations or where the effects of such *alterations* are specifically considered in the design of the member by a *registered design professional*.

2308.6.2 Sawn lumber. This section shall apply to sawn lumber with nominal thickness of 2 inches to 4 inches.

Revise as follows:

~~2308.6.1~~ **2308.6.2.1 Floor joists, roof rafters and ceiling joists.** Notches on framing ends shall not exceed one-fourth the member depth. Notches in the top or bottom of the member shall not exceed one-sixth the depth and shall not be located in the middle third of the span. A notch not more than one-third of the depth is permitted in the top of a rafter or ceiling joist not further from the face of the support than the depth of the member. Holes bored in members shall not be within 2 inches (51 mm) of the top or bottom of the member and the diameter of any such hole shall not exceed one-third the depth of the member. Where the member is notched, the hole shall not be closer than 2 inches (51 mm) to the notch.

~~2308.6.1.1~~ **2308.6.2.1.1 Ceiling joists.** Where ceiling joists also serve as floor joists, they shall be considered floor joists within this section.

~~2308.6.2~~ **2308.6.2.2 Wall studs.** In exterior walls and bearing partitions, a wood stud shall not be cut or notched in excess of 25 percent of its depth. In nonbearing partitions that do not support loads other than the weight of the partition, a stud shall not be cut or notched in excess of 40 percent of its depth.

~~2308.6.3~~ **2308.6.2.3 Bored holes.** The diameter of bored holes in wood studs shall not exceed 40 percent of the stud depth. The diameter of bored holes in wood studs shall not exceed 60 percent of the stud depth in nonbearing partitions. The diameter of bored holes in wood studs shall not exceed 60 percent of the stud depth in any wall where each stud is doubled, provided that not more than two such successive doubled studs are so bored. The edge of the bored hole shall not be closer than $^5/_8$ inch (15.9 mm) to the edge of the stud. Bored holes shall not be located at the same section of stud as a cut or notch.

~~2308.6.4~~ **2308.6.2.4 Limitations.** In designated lateral force-resisting system assemblies designed in accordance with this code and greater than three *stories* in height or in *Seismic Design Categories* C, D, E and F, the cutting, notching and boring of wall studs shall be as prescribed by the *registered design professional*.

In *structures* designed in accordance with the International Residential Code, modification of wall studs shall comply with the *International Residential Code*.

2308.8.3 Engineered wood products. Engineered wood products shall be installed in accordance with manufacturer's recommendations. ~~Cuts, notches and holes bored in trusses, *structural composite lumber*, structural glued-laminated members or I-joists are not permitted except where permitted by the manufacturer's recommendations or where the effects of such alterations are specifically considered in the design of the member by a *registered design professional*.~~

2308.11.8 Engineered wood products. <u>Engineered wood products shall be installed in accordance with manufacturer's recommendations.</u> ~~*Prefabricated wood I-joists*, *structural glued-laminated timber* and *structural composite lumber* shall not be notched or drilled except where permitted by the manufacturer's recommendations or where the effects of such alterations are specifically considered in the design of the member by a *registered design professional*.~~

Reason: Changes adopted in 2024 IBC Section 2308.6 can be misinterpreted to prohibit the use of the provisions for cuts, notches, and bored holes in engineered wood products used in light-frame conventional construction, even when the engineered wood products have been evaluated for the effects of such cuts, notches, and bored holes with guidance provided by manufacturer's recommendations. This proposal adds language to make it clear that notching and boring of engineered wood products must be in accordance with manufacturer's recommendations or as specifically accounted for by the design.

The title of the section is revised to replace the term "dimensional" with "structural" to clarify its application to structural wood framing. A new section has been added which becomes Section 2308.6.1 and addresses limitations for engineered wood products, and Section 2308.6.2, and the subsections therein, addresses limitations for sawn lumber.

Additionally, Sections 2308.8.3 for floor framing and 2308.11.8 for roof framing have been revised to limit their provisions to specify that engineered wood products must be installed in accordance with the manufacturer's instructions and to remove any duplicated notching and boring provisions in Section 2308.6.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

There are no technical changes proposed in this code change. The proposal reorganizes existing provisions and clarifies their intent.

S168-25

S169-25

IBC: 2308.6, 2308.6.1, 2308.6.1.1, 2308.6.2, 2308.6.3, 2308.6.4

Proponents: Julius Carreon, City of Bellevue, representing Washington Association of Building Officials Technical Code Development Committee (jcarreon@bellevuewa.gov); Micah Chappell, Seattle Dept. of Construction and Inspections (SDCI), representing Washington Association of Building Officials Technical Code Development Committee (WABO TCD) (micah.chappell@seattle.gov)

2024 International Building Code

2308.6 Cutting, notching and boring of dimensional wood framing. The provisions of this section shall only apply to dimensional wood framing and shall not include engineered wood products, heavy timber or prefabricated/manufactured wood assemblies.

Revise as follows:

2308.6.1 Floor joists, roof rafters and ceiling joists. Notches on framing ends shall not exceed one-fourth the member depth. Notches in the top or bottom of the member shall not exceed one-sixth the depth and shall not be located in the middle third of the span. A notch not more than one-third of the depth is permitted in the top of a rafter or ceiling joist not further from the face of the support than the depth of the member. Holes bored in members shall not be within 2 inches (51 mm) of the top or bottom of the member and the diameter of any such hole shall not exceed one-third the depth of the member. Where the member is notched or bored, the notch or hole shall not be closer than 2 inches (51 mm) to ~~the~~ another notch or bore.

2308.6.1.1 Ceiling joists. Where ceiling joists also serve as floor joists, they shall be considered floor joists within this section.

2308.6.2 Wall studs. In exterior walls and bearing partitions, a wood stud shall not be cut or notched in excess of 25 percent of its depth. In nonbearing partitions that do not support loads other than the weight of the partition, a stud shall not be cut or notched in excess of 40 percent of its depth.

2308.6.3 Bored holes. The diameter of bored holes in wood studs shall not exceed 40 percent of the stud depth. The diameter of bored holes in wood studs shall not exceed 60 percent of the stud depth in nonbearing partitions. The diameter of bored holes in wood studs shall not exceed 60 percent of the stud depth in any wall where each stud is doubled, provided that not more than two such successive doubled studs are so bored. The edge of the bored hole shall not be closer than $^{5}/_{8}$ inch (15.9 mm) to the edge of the stud. Bored holes shall not be located ~~at~~ within two inches (51mm) of the same section of stud as a cut or notch.

2308.6.4 Limitations. In designated lateral force-resisting system assemblies designed in accordance with this code and greater than three *stories* in height or in *Seismic Design Categories* C, D, E and F, the cutting, notching and boring of wall studs shall be as prescribed by the *registered design professional*.

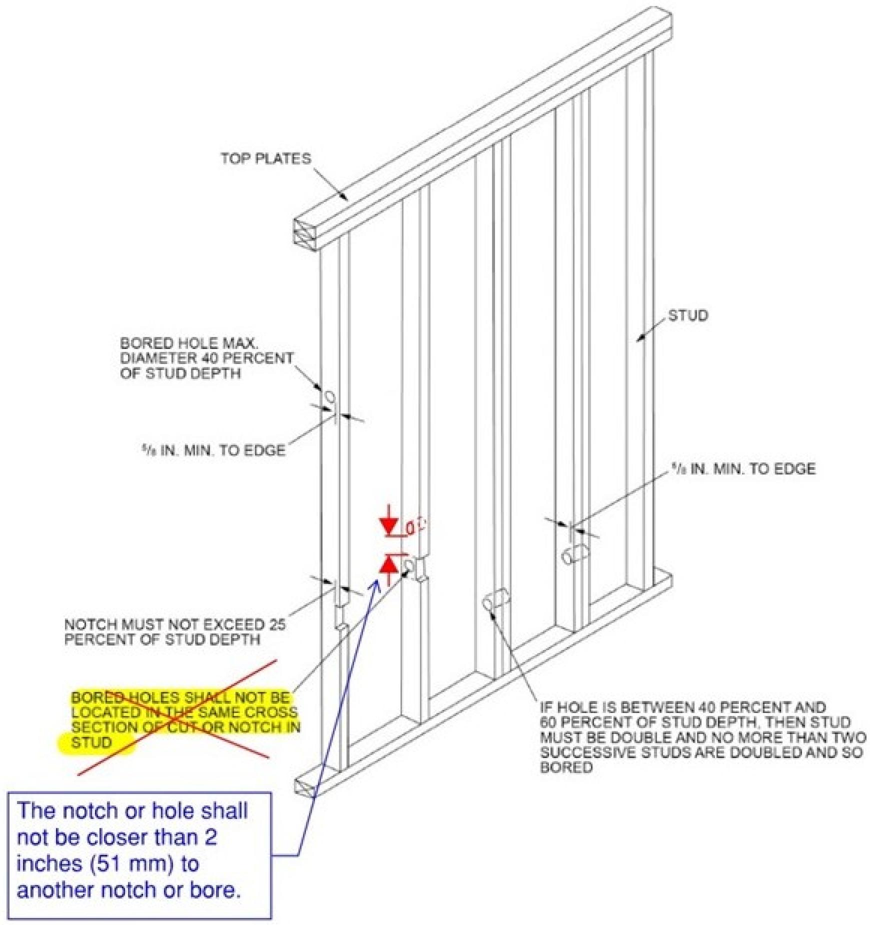
In *structures* designed in accordance with the International Residential Code, modification of wall studs shall comply with the *International Residential Code*.

Reason: This code change proposal is intended to correct the editorial inconsistencies in the reorganized code provisions for cutting, notching and boring of dimensional wood framing in the 2024 edition of the International Building Code.

The code provisions for cutting, notching and boring of dimensional wood framing have been re-organized and consolidated into a single location, Section 2308.6 (Conventional Construction), through code change proposal S224-22. The original proponent, Building Code Action Committee (BCAC) (bcac@iccsafe.org) submitted a Public Comment that included the above editorial changes and proposed relocating the provisions to Section 2304 (General Construction Requirements) during the Public Comment Hearing (PCH) process. However, this was disapproved primarily because the voters preferred to retain these provisions within the conventional construction section (Section 2308). We believe the following proposed revisions will clarify the intent of the code requirements:

- **2308.6.1 Floor joists, roof rafters, and ceiling joists:** The proposed amendment to the last sentence clarifies that the 2-inch minimum spacing allowance applies to wood members that are either notched or bored.
- **2308.6.3 Bored holes**: The proposed amendment to the last sentence makes the boring and notching requirements for wall studs consistent with the permitted 2-inch spacing requirements for joists, rafters, and beams (IBC 2308.6.1).

WABO TCD has also submitted a separate and almost identical code change proposal to the IRC Section R502.8 and Section R602.6, that address the same items above. Please see the attached mark-up IRC Figure R602-6 illustrating the proposed change in the spacing and boring requirements for wall studs.



Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

This proposal clarifies the intent of the code and does not result in any economic impact.

S169-25

S170-25

IBC: 2308.6.2, 2308.6.2.1 (New), 2308.9.8

Proponents: Stephen Kerr, representing NCSEA (skerr@jwa-se.com)

2024 International Building Code

2308.6.2 Wall studs. In exterior walls and bearing partitions, a wood stud shall not be cut or notched in excess of 25 percent of its depth. In nonbearing partitions that do not support loads other than the weight of the partition, a stud shall not be cut or notched in excess of 40 percent of its depth.

Add new text as follows:

2308.6.2.1 Drilling and notching of wall plates. In stud partitions where the cutting, drilling or notching of the sole plates or top plates exceeds 50 percent of its width, a galvanized metal tie not less than 0.054 inch thick (1.37 mm) (16 gage) and 1 1/2 inches (38 mm) in width shall be fastened to each plate across and to each side of the opening with not less than eight 10d (0.148 inch diameter) nails having a minimum length of 1 1/2 inches (38 mm) at each side or equivalent. The metal tie must extend not less than 6 inches past the opening.

Revise as follows:

2308.9.8 Pipes in walls. Stud partitions containing plumbing, heating or other pipes shall be framed and the joists underneath spaced to provide proper clearance for the piping. Where a partition containing piping runs parallel to the floor joists, the joists underneath such partitions shall be doubled and spaced to permit the passage of pipes and shall be bridged. Where plumbing, heating or other pipes are placed in, or partly in, a partition, necessitating the cutting of the soles or plates see section 2308.6.2.1.~~, a metal tie not less than 0.058 inch (1.47 mm) (16 galvanized gage) and 1 1/2 inches (38 mm) in width shall be fastened to each plate across and to each side of the opening with not less than six 16d nails.~~

Reason: Currently the conventional construction provisions of the IBC 2308.9.8 require metal tie straps for any size pipe within a wall that require cutting of the plate, no matter how minor the notching or cutting may be. The notching requirement modifications proposed are to make the IBC conventional construction more consistent with the current provisions within the IRC for top plates. Currently the IBC requires the plate straps to be installed at sole plates and all stud partitions (not just top plates within exterior walls and loadbearing partitions as is the case with IRC). No changes are proposed to where the straps are to be installed. The proposed notching requirements are located in section 2308.6.2.1 and not within 2308.9.8 because the International Mechanical Code (IMC Section 302.3) and International Fuel Gas Code (IFGC Section 302.3) currently refer to section 2308.6 for cutting, notching and boring in wood framing. The International Plumbing Code (IPC Section 307.2) currently references section 2308.10 of the IBC; however, there is a separate proposal to correct the pointer to the correct section. Placing all notching requirements within one section within the IBC makes logical sense and will hopefully simplify the code and reduce confusion by not having repeating provisions in multiple code sections.

The nailing requirements are also updated to be consistent with the IRC nailing requirements as well as standard practice. Updates reflect the nail specification to include the nail diameter and nail length. Note that currently in section 2308.9.8 species a 16d nail but does not specify a nail diameter or length, indicating that this provision is has not been maintained. Taken from Table 2304.10.2 typical 16d nails are 16d common that are 3 ½” long x 0.168” diameter. This provision reduces the required nail from a 16d nail to a 10d (0.148 inch diameter) nail and the nail length limited to only 1 ½” long versus a 3 ½” 16d nail, while increasing the total number of nails. This is consistent with the action taken in RB172-06/07 where the nail size, length and quantity were changed within the IRC. Because the straps will be the same as those within the IRC no new strap configurations will be required by hardware manufacturers, so existing straps will be readily available for construction.

Note that the straps contained in this proposal are separate from the “shield plates” that are required to protect pipes close to the edge of the framing members. IMC section 305.5, IPC section 305.6 and IFGC section 404.7 all contain requirements for protection against physical damage where piping is installed within concealed locations. This proposal does not impact those requirements.

Cost Impact: Increase

Estimated Immediate Cost Impact:

The cost of construction may slightly increase, with a net additional cost of less than $1 per strap.

Estimated Immediate Cost Impact Justification (methodology and variables):

While the number of nails increases the size of the nails is decreasing and more importantly reducing the likelihood of splitting the top plate. Adding four nails per strap should take less than one additional minute per strap. Based on a union carpenter rate of $61/hr (https://unionpayscales.com/trades/ubc-carpenters/) the additional time to install the extra nails is less than $1 per strap. Straps are already available to achieve the nailing because the nail requirements are already contained within the IRC, so no new strap design needs to be produced.

Estimated Life Cycle Cost Impact:

There should be no life cycle cost change.

Estimated Life Cycle Cost Impact Justification (methodology and variables):

The change in strap nailing will not change the life span of the structure, and the amount of materials within the connection is about the same. Strap length is equivalent to current requirements, and while the number of nails increases the length of the nails decreases, so there should be a near net amount of steel within each connection.

S170-25

S171-25

IBC: TABLE 2308.8.1.1(1)

Proponents: David Tyree, representing American Wood Council (dtyree@awc.org)

2024 International Building Code

Revise as follows:

TABLE 2308.8.1.1(1) HEADER AND GIRDER SPANS[a, b] FOR EXTERIOR BEARING WALLS (Maximum spans for Douglas fir-larch, hem-fir, Southern pine and spruce-pine-fir and required number of jack studs)

Portions of table not shown remain unchanged.

GIRDERS AND HEADERS SUPPORTING	SIZE	ALLOWABLE STRESS DESIGN GROUND SNOW LOAD, $p_{g(asd)}$, (psf)[e]																	
		30						50						70					
		Building width[c] (feet)																	
		12		24		36		12		24		36		12		24		36	
		Span[f]	NJ[d]	Span[f]	NJ[d]	Span[f]	NJ[d]	Span[f]	NJ[d]	Span[f]	NJ[d]	Span[f]	NJ[d]	Span[f]	NJ[d]	Span[f]	NJ[d]	Span[f]	NJ[d]
	1-2 × 6	4-0	1	~~3-1~~ 3-0	2	~~2-7~~ 2-6	2	3-5	1	~~2-8~~ 2-7	2	~~2-3~~ 2-2	2	3-0	2	2-4	2	~~2-0~~ 1-11	2
	1-2 × 8	5-1	2	~~3-11~~ 3-10	2	3-3	2	4-4	2	~~3-4~~ 3-3	2	~~2-10~~ 2-9	2	3-10	2	~~3-0~~ 2-11	2	~~2-6~~ 2-5	3
	1-2 × 10	6-0	2	~~4-8~~ 4-7	2	~~3-11~~ 3-10	2	5-2	2	~~4-0~~ 3-11	2	~~3-4~~ 3-3	3	4-7	2	~~3-6~~ 3-5	3	~~3-0~~ 2-11	3
	1-2 × 12	7-1	2	~~5-5~~ 5-4	2	~~4-7~~ 4-6	3	6-1	2	~~4-8~~ 4-7	3	~~3-11~~ 3-10	3	~~5-5~~ 5-4	2	~~4-2~~ 4-1	3	~~3-6~~ 3-5	3
	2-2 × 4	4-0	1	~~3-1~~ 3-0	1	~~2-7~~ 2-6	1	3-5	1	2-7	1	2-2	1	3-0	1	~~2-4~~ 2-3	1	~~2-0~~ 1-11	1
	2-2 × 6	~~6-0~~ 5-11	1	~~4-7~~ 4-6	1	~~3-10~~ 3-9	1	5-1	1	~~3-11~~ 3-10	1	~~3-3~~ 3-2	2	4-6	1	~~3-6~~ 3-5	2	~~2-11~~ 2-10	2
	2-2 × 8	~~7-7~~ 7-6	1	~~5-9~~ 5-8	1	~~4-10~~ 4-9	2	6-5	1	~~5-0~~ 4-10	2	~~4-2~~ 4-1	2	~~5-9~~ 5-8	1	~~4-5~~ 4-4	2	~~3-9~~ 3-7	2
Roof and ceiling	2-2 × 10	~~9-0~~ 8-11	1	~~6-10~~ 6-9	2	~~5-9~~ 5-8	2	7-8	2	~~5-11~~ 5-9	2	~~4-11~~ 4-10	2	6-9	2	~~5-3~~ 5-1	2	~~4-5~~ 4-3	2
	2-2 × 12	~~10-7~~ 10-6	2	~~8-1~~ 7-11	2	~~6-10~~ 6-8	2	9-0	2	~~6-11~~ 6-9	2	~~5-10~~ 5-8	2	8-0	2	~~6-2~~ 6-0	2	~~5-2~~ 5-0	3
	3-2 × 8	9-5	1	~~7-3~~ 7-2	1	~~6-1~~ 6-0	1	8-1	1	~~6-3~~ 6-1	1	~~5-3~~ 5-1	2	7-2	1	~~5-6~~ 5-5	2	~~4-8~~ 4-6	2
	3-2 × 10	~~11-3~~ 11-2	1	~~8-7~~ 8-5	1	~~7-3~~ 7-1	2	9-7	1	~~7-4~~ 7-3	2	~~6-2~~ 6-1	2	8-6	1	~~6-7~~ 6-5	2	~~5-6~~ 5-4	2
	3-2 × 12	13-2	1	~~10-1~~ 10-0	2	~~8-6~~ 8-4	2	11-3	2	~~8-8~~ 8-6	2	~~7-4~~ 7-1	2	10-0	2	~~7-9~~ 7-7	2	~~6-6~~ 6-4	2
	4-2 × 8	10-11	1	~~8-4~~ 8-3	1	~~7-0~~ 6-11	1	9-4	1	~~7-2~~ 7-0	1	~~6-0~~ 5-11	1	8-3	1	~~6-4~~ 6-3	1	~~5-4~~ 5-3	2
	4-2 × 10	12-11	1	~~9-11~~ 9-9	1	~~8-4~~ 8-2	1	~~11-1~~ 11-0	1	~~8-6~~ 8-4	1	~~7-2~~ 7-0	2	~~9-10~~ 9-9	1	~~7-7~~ 7-5	2	~~6-4~~ 6-2	2
	4-2 × 12	15-3	1	~~11-8~~ 11-6	1	~~9-10~~ 9-7	2	13-0	1	~~10-0~~ 9-10	2	~~8-5~~ 8-3	2	~~11-7~~ 11-6	1	~~8-11~~ 8-9	2	~~7-6~~ 7-3	2
	1-2 × 6	3-3	1	~~2-7~~ 2-6	2	2-2	2	3-0	2	2-4	2	2-0	2	2-9	2	2-2	2	1-10	2
	1-2 × 8	4-1	2	~~3-3~~ 3-2	2	2-9	2	3-9	2	~~3-0~~ 2-11	2	2-6	3	3-6	2	2-9	2	2-4	3
	1-2 × 10	~~4-11~~ 4-10	2	3-10	2	3-3	3	4-6	2	3-6	3	~~3-0~~ 2-11	3	4-1	2	3-3	3	2-9	3
	1-2 × 12	5-9	2	4-6	3	3-10	3	5-3	2	~~4-2~~ 4-1	3	3-6	3	4-10	3	3-10	3	3-3	4
	2-2 × 4	~~3-3~~ 3-2	1	2-6	1	~~2-2~~ 2-1	1	~~3-0~~ 2-11	1	~~2-4~~ 2-3	1	~~2-0~~ 1-11	1	2-8	1	~~2-2~~ 2-1	1	1-10	1
	2-2 × 6	4-10	1	3-9	1	~~3-3~~ 3-2	2	4-5	1	~~3-6~~ 3-5	2	~~3-0~~ 2-11	2	4-1	1	~~3-3~~ 3-2	2	~~2-9~~ 2-8	2
	2-2 × 8	6-1	1	~~4-10~~ 4-9	2	~~4-1~~ 4-0	2	5-7	2	~~4-5~~ 4-4	2	~~3-9~~ 3-8	2	5-2	2	~~4-1~~ 4-0	2	~~3-6~~ 3-5	2
Roof, ceiling and one center-bearing floor	2-2 × 10	7-3	2	5-8	2	~~4-10~~ 4-9	2	6-8	2	~~5-3~~ 5-2	2	~~4-5~~ 4-4	2	6-1	2	~~4-10~~ 4-9	2	4-1	2
	2-2 × 12	8-6	2	6-8	2	5-8	2	7-10	2	~~6-2~~ 6-1	2	~~5-3~~ 5-2	3	7-2	2	5-8	2	~~4-10~~ 4-9	3
	3-2 × 8	7-8	1	~~6-0~~ 5-11	1	5-1	2	7-0	1	~~5-6~~ 5-5	2	~~4-8~~ 4-7	2	6-5	1	5-1	2	~~4-4~~ 4-3	2
	3-2 × 10	9-1	1	~~7-2~~ 7-1	2	~~6-1~~ 6-0	2	8-4	1	~~6-7~~ 6-6	2	~~5-7~~ 5-6	2	7-8	2	~~6-1~~ 6-0	2	~~5-2~~ 5-1	2
	3-2 × 12	10-8	2	~~8-5~~ 8-4	2	~~7-2~~ 7-1	2	9-10	2	~~7-8~~ 7-7	2	~~6-7~~ 6-5	2	9-0	2	7-1	2	~~6-1~~ 6-0	2
	4-2 × 8	8-10	1	6-11	1	~~5-11~~ 5-10	1	8-1	1	6-4	1	~~5-5~~ 5-4	2	7-5	1	~~5-11~~ 5-10	1	~~5-0~~ 4-11	2
	4-2 × 10	~~10-6~~ 10-5	1	~~8-3~~ 8-2	2	~~7-0~~ 6-11	2	~~9-8~~ 9-7	1	~~7-7~~ 7-6	2	~~6-5~~ 6-4	2	8-10	1	~~7-0~~ 6-11	2	~~6-0~~ 5-10	2
	4-2 × 12	12-4	1	~~9-8~~ 9-7	2	~~8-3~~ 8-2	2	11-4	2	~~8-11~~ 8-10	2	~~7-7~~ 7-5	2	10-4	2	~~8-3~~ 8-2	2	~~7-0~~ 6-11	2
	1-2 × 6	2-11	2	2-3	2	1-11	2	2-9	2	2-1	2	1-9	2	2-7	2	2-0	2	1-8	2
	1-2 × 8	3-9	2	2-10	2	2-5	3	3-6	2	2-8	2	2-3	3	3-3	2	2-6	3	~~2-2~~ 2-1	3
	1-2 × 10	4-5	2	3-5	3	2-10	3	~~4-2~~ 4-1	2	3-2	3	2-8	3	~~3-11~~ 3-10	2	3-0	3	2-6	3
	1-2 × 12	5-2	2	4-0	3	3-4	3	4-10	3	3-9	3	~~3-2~~ 3-1	4	4-7	3	3-6	3	~~3-0~~ 2-11	4
	2-2 × 4	2-11	1	2-3	1	1-10	1	2-9	1	2-1	1	1-9	1	2-7	1	~~2-0~~ 1-11	1	~~1-8~~ 1-7	1
	2-2 × 6	4-4	1	3-4	2	2-10	2	4-1	1	~~3-2~~ 3-1	2	~~2-8~~ 2-7	2	3-10	1	~~3-0~~ 2-11	2	~~2-6~~ 2-5	2
	2-2 × 8	5-6	2	4-3	2	3-7	2	5-2	2	~~4-0~~ 3-11	2	3-4	2	4-10	2	~~3-9~~ 3-8	2	~~3-2~~ 3-1	2
Roof, ceiling and one clear span floor	2-2 × 10	6-7	2	5-0	2	4-2	2	6-1	2	~~4-9~~ 4-8	2	~~4-0~~ 3-11	2	5-9	2	4-5	2	~~3-9~~ 3-8	3
	2-2 × 12	7-9	2	5-11	2	4-11	3	7-2	2	~~5-7~~ 5-6	2	4-8	3	6-9	2	~~5-3~~ 5-2	3	~~4-5~~ 4-4	3
	3-2 × 8	6-11	1	5-3	2	4-5	2	6-5	1	~~5-0~~ 4-11	2	4-2	2	6-1	1	4-8	2	~~4-0~~ 3-11	2
	3-2 × 10	~~8-3~~ 8-2	2	6-3	2	5-3	2	7-8	2	~~5-11~~ 5-10	2	~~5-0~~ 4-11	2	~~7-3~~ 7-2	2	~~5-7~~ 5-6	2	~~4-8~~ 4-7	2
	3-2 × 12	9-8	2	7-5	2	6-2	2	9-0	2	~~7-0~~ 6-11	2	5-10	2	8-6	2	~~6-7~~ 6-6	2	~~5-6~~ 5-5	3
	4-2 × 8	8-0	1	6-1	1	5-1	2	7-5	1	~~5-9~~ 5-8	2	~~4-10~~ 4-9	2	7-0	1	~~5-5~~ 5-4	2	~~4-7~~ 4-6	2
	4-2 × 10	9-6	1	7-3	2	6-1	2	8-10	1	~~6-10~~ 6-9	2	~~5-9~~ 5-8	2	8-4	1	~~6-5~~ 6-4	2	~~5-5~~ 5-4	2
	4-2 × 12	11-2	2	8-6	2	7-2	2	10-5	2	~~8-0~~ 7-11	2	~~6-9~~ 6-8	2	~~9-10~~ 9-9	2	~~7-7~~ 7-6	2	~~6-5~~ 6-3	2
	1-2 × 6	2-8	2	2-1	2	1-10	2	2-7	2	2-0	2	~~1-9~~ 1-8	2	2-5	2	1-11	2	~~1-8~~ 1-7	2
	1-2 × 8	3-5	2	2-8	2	2-4	3	3-3	2	~~2-7~~ 2-6	2	2-2	3	3-1	2	2-5	3	~~2-1~~ 2-0	3
	1-2 × 10	4-0	2	3-2	3	2-9	3	3-10	2	~~3-1~~ 3-0	3	2-7	3	3-8	2	~~2-11~~ 2-10	3	2-5	3
	1-2 × 12	4-9	3	3-9	3	3-2	4	4-6	3	3-7	3	~~3-1~~ 3-0	4	4-3	3	~~3-5~~ 3-4	3	~~2-11~~ 2-10	4
	2-2 × 4	2-8	1	2-1	1	1-9	1	2-6	1	2-0	1	1-8	1	2-5	1	~~1-11~~ 1-10	1	1-7	1

GIRDERS AND HEADERS SUPPORTING	SIZE	ALLOWABLE STRESS DESIGN GROUND SNOW LOAD, *p* (psf)																	
		30						50						70					
		Building width (feet)																	
		12		24		36		12		24		36		12		24		36	
		Span	NJ	Span	NJ	Span	NJ	Span	NJ	Span	NJ	Span	NJ	Span	NJ	Span	NJ	Span	NJ
Roof, ceiling and two center-bearing floors																			
	2-2 × 6	4-0	1	3-2	2	2-8	2	3-9	1	3-0	2	~~2-7~~ 2-6	2	3-7	1	2-10	2	2-5	2
	2-2 × 8	5-0	2	4-0	2	3-5	2	~~4-10~~ 4-9	2	~~3-10~~ 3-9	2	~~3-3~~ 3-2	2	~~4-7~~ 4-6	2	3-7	2	~~3-1~~ 3-0	2
	2-2 × 10	6-0	2	4-9	2	4-0	2	5-8	2	4-6	2	3-10	3	5-5	2	4-3	2	~~3-8~~ 3-7	3
	2-2 × 12	7-0	2	5-7	2	4-9	3	6-8	2	~~5-4~~ 5-3	3	4-6	3	6-4	2	5-0	3	4-3	3
	3-2 × 8	6-4	1	5-0	2	4-3	2	6-0	1	4-9	2	~~4-1~~ 4-0	2	5-8	2	~~4-6~~ 4-5	2	~~3-10~~ 3-9	2
	3-2 × 10	7-6	2	5-11	2	5-1	2	7-1	2	~~5-8~~ 5-7	2	~~4-10~~ 4-9	2	6-9	2	~~5-4~~ 5-3	2	~~4-7~~ 4-6	2
	3-2 × 12	8-10	2	7-0	2	5-11	2	8-5	2	~~6-8~~ 6-7	2	~~5-8~~ 5-7	3	~~8-0~~ 7-11	2	~~6-4~~ 6-3	2	~~5-4~~ 5-3	3
	4-2 × 8	7-3	1	5-9	1	4-11	2	6-11	1	~~5-6~~ 5-5	2	4-8	2	6-7	1	5-2	2	~~4-5~~ 4-4	2
	4-2 × 10	8-8	1	6-10	2	5-10	2	8-3	2	6-6	2	~~5-7~~ 5-6	2	~~7-10~~ 7-9	2	~~6-2~~ 6-1	2	~~5-3~~ 5-2	2
	4-2 × 12	10-2	2	8-1	2	6-10	2	9-8	2	~~7-8~~ 7-7	2	~~6-7~~ 6-6	2	9-2	2	~~7-3~~ 7-2	2	~~6-2~~ 6-1	2
	1-2 × 6	2-3	2	1-9	2	1-5	2	2-3	2	1-9	2	1-5	3	2-2	2	1-8	2	1-5	3
	1-2 × 8	2-10	2	2-2	3	1-10	3	2-10	2	2-2	3	1-10	3	2-9	2	2-1	3	~~1-10~~ 1-9	3
	1-2 × 10	3-4	2	2-7	3	2-2	3	3-4	3	2-7	3	2-2	4	3-3	3	2-6	3	~~2-2~~ 2-1	4
	1-2 × 12	4-0	3	3-0	3	2-7	4	4-0	3	3-0	4	2-7	4	3-10	3	~~3-0~~ 2-11	4	2-6	4
	2-2 × 4	2-3	1	1-8	1	1-4	1	2-3	1	1-8	1	1-4	1	2-2	1	~~1-8~~ 1-7	1	1-4	2
	2-2 × 6	3-4	1	2-6	2	2-2	2	3-4	2	2-6	2	2-2	2	3-3	2	2-6	2	2-1	2
	2-2 × 8	4-3	2	3-3	2	2-8	2	4-3	2	3-3	2	2-8	2	4-1	2	~~3-2~~ 3-1	2	2-8	3
Roof, ceiling and two clear span floors	2-2 × 10	5-0	2	3-10	2	3-2	3	5-0	2	3-10	2	3-2	3	4-10	2	~~3-9~~ 3-8	3	~~3-2~~ 3-1	3
	2-2 × 12	5-11	2	4-6	3	3-9	3	5-11	2	4-6	3	3-9	3	5-8	2	~~4-5~~ 4-4	3	~~3-9~~ 3-8	3
	3-2 × 8	5-3	1	4-0	2	3-5	2	5-3	2	4-0	2	3-5	2	5-1	2	3-11	2	3-4	2
	3-2 × 10	6-3	2	4-9	2	4-0	2	6-3	2	4-9	2	4-0	2	6-1	2	4-8	2	~~4-0~~ 3-11	3
	3-2 × 12	7-5	2	5-8	2	4-9	3	7-5	2	5-8	2	4-9	3	7-2	2	5-6	3	~~4-8~~ 4-7	3
	4-2 × 8	6-1	1	4-8	2	3-11	2	6-1	1	4-8	2	3-11	2	5-11	1	~~4-7~~ 4-6	2	3-10	2
	4-2 × 10	7-3	2	5-6	2	4-8	2	7-3	2	5-6	2	4-8	2	7-0	2	~~5-5~~ 5-4	2	~~4-7~~ 4-6	2
	4-2 × 12	8-6	2	6-6	2	5-6	2	8-6	2	6-6	2	5-6	2	8-3	2	6-4	2	5-4	3

For SI: 1 inch = 25.4 mm, 1 pound per square foot = 0.0479 kPa.

a. Spans are given in feet and inches.

b. Spans are based on minimum design properties for No. 2 grade lumber of Douglas fir-larch, hem-fir, Southern pine and spruce-pine fir.

c. Building width is measured perpendicular to the ridge. For widths between those shown, spans are permitted to be interpolated.

d. NJ = Number of jack studs required to support each end. Where the number of required jack studs equals one, the header is permitted to be supported by an approved framing anchor attached to the full-height wall stud and to the header.

e. Use 30 psf allowable stress design ground snow load for cases in which allowable stress designground snow load is less than 30 psf and the roof liveload is equal to or less than 20 psf.

f. Spans are calculated assuming a single span header or girder under uniform load where the top of the header or girder is laterally braced by perpendicular framing. Where the top of the header or girder is not laterally braced (for example, cripple studs bearing on the header), tabulated spans for headers consisting of 2 × 8, 2 × 10, or 2 × 12 sizes shall be multiplied by 0.70 or the header or girder shall be designed.

Reason: This proposal updates the header tables in multiple locations to be aligned with ASCE 7-22. The proposed spans align with those found in the ANSI/AWC *2024 Wood Frame Construction Manual (WFCM)*. Additionally, language has been added to footnote f to clarify that all header and girder calculations are based on the assumption that they are single-span headers or girders. This clarification is necessary as multi-span headers are not addressed by the tables.

Cost Impact: Increase

Estimated Immediate Cost Impact:

$0

Estimated Immediate Cost Impact Justification (methodology and variables):

This proposal updates the header tables in multiple locations to be aligned with ASCE 7-22. Updated spans are typically shorter by either 1 or 2 inches. This minor adjustment in span will likely not impact the lumber lengths needed for construction, as some trimming will still be necessary to accommodate the actual header span end use. As the cost impact cannot be a decrease, and any increase is minimal that may not be realized due to typical waste, the cost impact is estimated at an increase of $0.

S171-25

S172-25

IBC: 2308.8.2.2, TABLE 2304.10.2

Proponents: David Tyree, representing American Wood Council (dtyree@awc.org); Shane Nilles, representing American Wood Council (snilles@awc.org); Jason Smart, representing American Wood Council (jsmart@awc.org)

2024 International Building Code

Revise as follows:

2308.8.2.2 Bearing. The ends of each joist shall have not less than 1$^1/_2$ inches (38 mm) of bearing on wood or metal, or not less than 3 inches (76 mm) on *masonry*, except where supported on a 1-inch by 4-inch (25 mm by 102 mm) let-in ribbon strip, and the joist and ribbon strip shall be nailed to the adjoining stud in accordance with Table 2304.10.2.

TABLE 2304.10.2 FASTENING SCHEDULE

Portions of table not shown remain unchanged.

DESCRIPTION OF BUILDING ELEMENTS	NUMBER AND TYPE OF FASTENER[g]	SPACING AND LOCATION
	Wall	
28. Ribbon strip supporting joists	3-8d box (2$^1/_2$″ x 0.113″); or 2-8d common (2$^1/_2$″ × 0.131″); or 2-10d box (3″ × 0.128″); or 2-1$^3/_4$″ 16 gage staples, 1″ crown	Face nail at each stud
29. Joist to stud where supported by ribbon strip	4-8d box (2$^1/_2$″ × 0.113″); or 3-8d common (2$^1/_2$″ × 0.131″); or floor 3-10d box (3″ × 0.128″); or 3-3″ × 0.131″ nails; or 3-3″ 14 gage staples, $^7/_{16}$″ crown	Face nail

Reason: Section 2308.8.2.2 permits a ribbon strip to provide bearing for joists but does not specify how the ribbon strip is required to be let-in to the stud and fastened. Additionally, the joists are required to be nailed to the adjacent stud, but no fasteners are specified. This code change provides provisions for proper installation of the ribbon strip and associated fastening with two new rows being added to Table 2304.10.2. The nailing for "Ribbon strip to supporting joists" is based on current item #19 and the nailing for "Joist to stud where supported by ribbon strip" is based on current item #21.

NOTE: The existing items in Table 2304.10.2 will be renumbered accordingly but are not shown for brevity.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

This code change proposal provides clarification for installation of ribbon strips which is already a framing option in the code.

S172-25

S173-25

IBC: 2308.9.3.2, 2308.9.3.2.1 (New)

Proponents: John Grenier, representing National Council of Structural Engineers Associations (NCSEA) (jgrenier@greniereng.com); Emily Guglielmo, representing NCSEA (eguglielmo@martinmartin.com)

2024 International Building Code

2308.9.3.2 Top plates. Bearing and exterior wall studs shall be capped with double top plates installed to provide overlapping at corners and at intersections with other partitions. End joints in double top plates shall be offset not less than 48 inches (1219 mm), and shall be nailed in accordance with Table 2304.10.2. Plates shall be a nominal 2 inches (51 mm) in depth and have a width not less than the width of the studs.

Exception: A single top plate is permitted, provided that the plate is adequately tied at corners and intersecting walls by not less than the equivalent of 3-inch by 6-inch (76 mm by 152 mm) by 0.036-inch-thick (0.914 mm) galvanized steel plate that is nailed to each wall or segment of wall by six 8d [$2^1/_2$-inch by 0.113-inch (64-mm by 2.87 mm)] box nails or equivalent on each side of the joint. For the butt-joint splice between adjacent single top plates, not less than the equivalent of a 3-inch by 12-inch (76 mm by 304 mm) by 0.036-inch-thick (0.914 mm) galvanized steel plate that is nailed to each wall or segment of wall by 12 8d [$2^1/_2$-inch by 0.113-inch (64 mm by 2.87 mm)] box nails on each side of the joint shall be required, provided that the rafters, joists or trusses are centered over the studs with a tolerance of not more than 1 inch (25 mm). The top plate shall not be required over headers that are in the same plane and in line with the upper surface of the adjacent top plates and are tied to adjacent wall sections as required for the butt joint splice between adjacent single top plates.

Where bearing studs are spaced at 24-inch (610 mm) intervals, top plates are less than two 2-inch by 6-inch (51 mm by 152 mm) or two 3-inch by 4-inch (76 mm by 102 mm) members and the floor joists, floor trusses or roof trusses that they support are spaced at more than 16-inch (406 mm) intervals, such joists or trusses shall bear within 5 inches (127 mm) of the studs beneath or a third plate shall be installed.

Add new text as follows:

<u>**2308.9.3.2.1 Wall top plate support..** Wall top plates shall be supported out of plane by diaphragms, perpendicular framing or blocking spaced no more than 32 inches on center and connected per table 2304.10.2, or by diagonal bracing specified by a registered design professional.</u>

Reason: Bracing of the wall top plate at walls parallel to metal plate connected wood trusses is addressed in BCSI B-3 which is not part of this code. Also, wall bracing at the top plate at the gable end of wood walls is referenced in FEMA FAI 22 Building Performance: Hurricane Andrew In Florida – Observations and FEMA P-55 Recommendations, and Technical Guidance and Coastal Construction Manual - Principles and Practices of Planning, Siting, Designing, Constructing, and Maintaining Residential Buildings in Coastal Areas, Fourth Edition, Volume II. Both of these documents note the failure of walls due to unbraced walls at the base of a the gable end wall/top plate of wall. Although these documents reference residential structures, the same principles apply to light framed wood constructed buildings for commercial and other uses. Additionally, see photo examples of construction deficiencies discovered in new construction by the author.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

There is no cost increase for this code change proposal. This is a clarification of current requirements to brace the wall top plates.

S173-25

S174-25

IBC: 2404.1

Proponents: Gwenyth Searer, Wiss, Janney, Elstner Associates, Inc., representing myself (gsearer@wje.com)

2024 International Building Code

Revise as follows:

2404.1 Vertical glass. Glass sloped 15 degrees (0.26 rad) or less from vertical in windows, curtain and window walls, doors and other exterior applications shall be designed to resist the wind *loads* due to *basic wind speed* , *V*, in Section 1609 for components and cladding. Glass in glazed curtain walls, glazed storefronts and glazed partitions shall meet the seismic requirements of ASCE 7, Section 13.5.9. The load resistance of glass under uniform *load* shall be determined in accordance with ASTM E1300.

The design of vertical glazing shall be based on Equation 24-1.

$$0.6F_{gw} \leq F_{ga}$$ **(Equation 24-1)**

where:

F_{gw} = Wind *load* on the glass due to *basic wind speed* , *V*, computed in accordance with Section 1609. F_{ga} = Short duration *load* on the glass as determined in accordance with ASTM E1300.

Exception: For buildings and structures assigned to Seismic Design Category B where the component Importance Factor, I_p, is equal to 1.0, and for all buildings and structures assigned to Seismic Design Category A, glass in glazed curtain walls, glazed storefronts, and glazed partitions need not meet the seismic requirements of ASCE 7, Section 13.5.9.

Reason: The portion of IBC Section 2404.1 that points to Section 13.5.9 of ASCE 7-22 creates a significant conflict with that standard. The way IBC Section 2404.1 is worded, the sentence "*Glass in glazed curtain walls, glazed storefronts and glazed partitions shall meet the seismic requirements of ASCE 7, Section 13.5.9*" requires compliance with Section 13.5.9 for all buildings and structures regardless of their Seismic Design Category.

However, buildings and structures in Seismic Design Category A are not designed for seismic loads, so seismic drifts are not calculated and it would consequently be difficult to determine whether or not glass met the fall-out seismic drift requirement of Section 13.5.9.1. Further, Section 11.7 of ASCE 7-22 provides a blanket statement that nonstructural components on buildings and structures assigned to Seismic Design Category A are exempt from seismic design requirements. Finally, Section 13.1.4 of ASCE 7-22 points the user to Table 13-1, which lists nonstructural components that are exempt from the requirements of Chapter 13 of ASCE 7-22; in this table, all nonstructural components are exempted from compliance with the entirety of Chapter 13 for all buildings and structures assigned to Seismic Design Category A.

Similarly for buildings and structures assigned to Seismic Design Category B, Table 13.1-1 of ASCE 7-22 exempts all architectural components except parapets from compliance with the entirety of Chapter 13 provided that the component Importance Factor, I_p, is equal to 1.0. So again, IBC Section 2404.1 points the user to Section 13.5.9 of ASCE 7-22, but that section does not apply, along with the whole chapter, if the component Importance Factor is equal to 1.To address this conflict, an exception is proposed to Section 2404.1 to provide an "out" for glass in all buildings and structures assigned to Seismic Design Category A, and for glass in buildings and structures assigned to Seismic Design Category B as long as the component Importance Factor is equal to 1.

Bibliography: https://unitedfacade.com/curtain-wall-system-cost-and-comparison-with-other-wall-systems

Cost Impact: Decrease

Estimated Immediate Cost Impact:

The removal of this conflict likely reduces head-scratching by engineers, architects, and building officials because they no longer have to figure out whether Section 13.5.9 must be followed, which could easily save several thousand dollars per building, perhaps more. In cases where the provisions of Section 13.5.9 would have mistakenly applied to the design of the glass, there might be significant cost savings if the building is large. Based on my thirty years of experience in the field of structural engineering, I estimate that this could easily save between ten thousand and several tens of thousands of dollars or more per building compared to a design where Section 13.5.9 was mistakenly applied. This cost would depend on the cladding construction, the size of the building, and how much drift could be accommodated by the cladding selected for the building.

Estimated Immediate Cost Impact Justification (methodology and variables):

It makes logical sense that removing a conflict from the code will reduce design time and construction costs. Given that structural and facade consultants charge out at several hundred dollars per hour, it wouldn't take many hours to save several thousand dollars by not having them re-engineer a cladding design to meet requirements that make little to no sense. Similarly, for the cladding itself, avoiding having a cladding to allow greater drifts than normal would preclude the need for larger joints, more sealant, and more attention to detail during construction. Given that claddings can easily cost $100 per square foot (https://unitedfacade.com/curtain-wall-system-cost-and-comparison-with-other-wall-systems/), saving even a small percentage of this cost can quickly add up to tens of thousands of dollars for a large building.

S174-25

S175-25

IBC: 2407.1

Proponents: Kevin Brinkman, NEI, representing NEII (klbrinkman@neii.org)

2024 International Building Code

Revise as follows:

2407.1 Materials. Glass used in a *handrail* or a *guard* shall be laminated glass constructed of fully tempered or heat-strengthened glass and shall comply with Category II of CPSC 16 CFR Part 1201 or Class A of ANSI Z97.1. Glazing in a *handrail* or a *guard* shall be of an *approved* safety glazing material that conforms to the provisions of Section 2406.1.1. For all glazing types, the minimum nominal thickness shall be $^{1}/_{4}$ inch (6.4 mm).

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

1. Single fully tempered glass complying with Category II of CPSC 16 CFR Part 1201 or Class A of ANSI Z97.1 shall be permitted to be used in *handrails* and *guards* where there is no walking surface beneath them or the walking surface is permanently protected from the risk of falling glass.
2. Glazing used in escalators and moving walks shall comply with the requirements for glazing in ASME A17.1/CSA B44.

Reason: Specific glazing requirements for escalators and moving walks are already addressed in ASME A17.1/CSA B44 Safety Code for Elevators and Escalators, requirements 6.1.3.3.3 and 6.2.3.3.3. These requirements are more appropriately defined in the elevator/escalator code. The proposed exception removes potential conflict between codes.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

There is no cost impact because this proposal is a clarification of where to find the existing requirements for glazing used on escalators and moving walks.

S175-25

S176-25

IBC: TABLE 2506.2, TABLE 2507.2, ASTM Chapter 35 (New)

Proponents: Tim Earl, GBH International, representing the Gypsum Association (tearl@gbhint.com)

2024 International Building Code

Revise as follows:

TABLE 2506.2 GYPSUM PANEL PRODUCTS MATERIALS AND ACCESSORIES

MATERIAL	STANDARD
Accessories for gypsum board	ASTM C1047
Adhesives for fastening gypsum board to wood framing	ASTM C557
Cold-formed steel studs and track, structural	AISI S240 or ASTM C955
Cold-formed steel studs and track, nonstructural	AISI S220 or ASTM C645
Elastomeric joint sealants	ASTM C920
Expandable foam adhesives for fastening gypsum wallboard to wood framing	ASTM D6464
Factory-laminated gypsum panel product	ASTM C1766
Fiber-reinforced gypsum panels	ASTM C1278
Glass mat gypsum backing panel	ASTM C1178
Glass mat gypsum panels	ASTM C1658
Glass mat gypsum substrate used as sheathing	ASTM C1177
Joint reinforcing tape and compound	ASTM C474; C475
Nails for gypsum boards	ASTM C514, F547, F1667
Steel screws	ASTM C954; C1002
Standard specification for gypsum board	ASTM C1396
Testing gypsum and gypsum products	ASTM C22; C472; C473

TABLE 2507.2 LATH, PLASTERING MATERIALS AND ACCESSORIES

MATERIAL	STANDARD
Accessories for gypsum veneer base	ASTM C1047
Blended cement	ASTM C595
Cold-formed steel studs and track, structural	AISI S240 or ASTM C955
Cold-formed steel studs and track, nonstructural	AISI S220 or ASTM C645
Exterior plaster bonding compounds	ASTM C932
Hydraulic cement	ASTM C1157; C1600
Gypsum casting and molding plaster	ASTM C59
Gypsum Keene's cement	ASTM C61
Gypsum plaster	ASTM C28
Gypsum veneer plaster	ASTM C587
Interior bonding compounds, gypsum	ASTM C631
Lime plasters	ASTM C5; C206
Masonry cement	ASTM C91
Metal lath	ASTM C847
Plaster aggregatesSand Perlite Vermiculite	ASTM C35; C897 ASTM C35 ASTM C35
Plastic cement	ASTM C1328
Portland cement	ASTM C150
Steel screws	ASTM C1002; C954
Welded wire lath	ASTM C933
Woven wire plaster base	ASTM C1032

Add new standard(s) as follows:

ASTM

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

ASTM C645-24: Standard Specification for Nonstructural Steel Framing Members
ASTM C955-24: Standard Specification for Cold-Formed Steel Structural Framing Members

Reason: This change adds the equivalent ASTM standards, which were removed from this section in the 2018 codes. Some users prefer to use ASTM standards.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

This simply adds ASTM standards as alternatives to the AISI standards.

Staff Analysis: A review of the following standards proposed for inclusion in the code regarding some of the key ICC criteria for referenced standards (Section 4.6 of CP#28) will be posted on the ICC website on or before April 1, 2025:

ASTM C645-24 Standard Specification for Nonstructural Steel Framing Members

ASTM C955-24 Standard Specification for Cold-Formed Steel Structural Framing Members

S176-25

S177-25

IBC: 2512.1.2, 2507.2, TABLE 2507.2, ASTM Chapter 35 (New)

Proponents: Jeff Bowlsby, representing Self

2024 International Building Code

Revise as follows:

2512.1.2 Weep screeds. A minimum 0.019-inch (0.48 mm) (No. 26 galvanized sheet gage), corrosion-resistant weep screed with a minimum vertical attachment flange of 3$^{1}/_{2}$ inches (89 mm) shall be provided at or below the foundation plate line on exterior stud walls in accordance with ASTM C926 and ASTM C1861. The weep screed shall be placed not less than 4 inches (102 mm) above the earth or 2 inches (51 mm) above paved areas and be of a type that will allow trapped water to drain to the exterior of the *building*. The *water-resistive barrier* shall lap the attachment flange. The exterior lath shall cover and terminate on the attachment flange of the weep screed.

2507.2 Standards. Lathing and plastering materials shall conform to the standards listed in Table 2507.2 and Chapter 35 and, where required for fire protection, shall conform to the provisions of Chapter 7.

TABLE 2507.2 LATH, PLASTERING MATERIALS AND ACCESSORIES

MATERIAL	STANDARD
Accessories for gypsum veneer base	ASTM C1047
Blended cement	ASTM C595
Cold-formed steel studs and track, structural	AISI S240
Cold-formed steel studs and track, nonstructural	AISI S220
Exterior plaster bonding compounds	ASTM C932
Hydraulic cement	ASTM C1157; C1600
Gypsum casting and molding plaster	ASTM C59
Gypsum Keene's cement	ASTM C61
Gypsum plaster	ASTM C28
Gypsum veneer plaster	ASTM C587
Interior bonding compounds, gypsum	ASTM C631
Lathing Accessories, Furring Accessories and Fasteners	ASTM C1861
Lime plasters	ASTM C5; C206
Masonry cement	ASTM C91
Metal lath	ASTM C847
Plaster aggregatesSand Perlite Vermiculite	ASTM C35; C897 ASTM C35 ASTM C35
Plastic cement	ASTM C1328
Portland cement	ASTM C150
Steel screws	ASTM C1002; C954
Welded wire lath	ASTM C933
Woven wire plaster base	ASTM C1032

Add new standard(s) as follows:

ASTM

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

ASTM C1861-23a — Standard Specification for Lathing and Furring Accessories, and Fasteners, for Interior and Exterior Portland Cement-Based Plaster

Reason: ASTM C1861 has been a reference standard in ASTM C1063, the metal lathing installation standard, since 2017.

ASTM C1861 is a product standard for lathing accessories, furring accessories and fasteners where their installation is specified in ASTM C1063.

Lathing accessory product manufacturers and project architectural specifications have been referencing ASTM C1861 for several years.

ASTM C1861 meets CP-28-05, Sections 4.4 and 4.6 requirements.

ASTM C1861 meets the requirements in the ICC References Standards Guide as a second tier reference standard and as such is currently enforceable by building code officials.

The ASTM C1861 task group members have expressed full support of an application to ICC for IBC for considering ASTM C1861 as a reference standard.

ASTM C1861 has been balloted for inclusion as a reference standard into ASTM E2128 Standard Guide for Evaluating Water Leakage of Buildings

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

The proposed referenced standard is already being used in industry for many years.

Staff Analysis: A review of the standard proposed for inclusion in the code, ASTM C1861-23a Standard Specification for Lathing and Furring Accessories, and Fasteners, for Interior and Exterior Portland Cement-Based Plaster, with regard to some of the key ICC criteria for referenced standards (Section 4.6 of CP#28) will be posted on the ICC website on or before April 1, 2025.

S177-25

S178-25

IBC: TABLE 2507.2

Proponents: Shamim Rashid-Sumar, representing National Ready Mixed Concrete Association (ssumar@nrmca.org); James Farny, Portland Cement Association, representing US cement manufacturers (jfarny@cement.org); Dr. Julian Mills-Beale, representing National Ready Mixed Concrete Association (jmills-beale@nrmca.org)

2024 International Building Code

Revise as follows:

TABLE 2507.2 LATH, PLASTERING MATERIALS AND ACCESSORIES

MATERIAL	STANDARD
Accessories for gypsum veneer base	ASTM C1047
Blended cement	ASTM C595
Cold-formed steel studs and track, structural	AISI S240
Cold-formed steel studs and track, nonstructural	AISI S220
Exterior plaster bonding compounds	ASTM C932
Performance ~~Hydraulic~~ hydraulic cement	ASTM C1157~~; C1600~~
Rapid-hardening hydraulic cement	ASTM C1600
Gypsum casting and molding plaster	ASTM C59
Gypsum Keene's cement	ASTM C61
Gypsum plaster	ASTM C28
Gypsum veneer plaster	ASTM C587
Interior bonding compounds, gypsum	ASTM C631
Lime plasters	ASTM C5; C206
Masonry cement	ASTM C91
Metal lath	ASTM C847
Plaster aggregatesSand Perlite Vermiculite	ASTM C35; C897 ASTM C35 ASTM C35
Plastic cement	ASTM C1328
Portland cement	ASTM C150
Steel screws	ASTM C1002; C954
Welded wire lath	ASTM C933
Woven wire plaster base	ASTM C1032

Reason: This proposal is part of a series of proposals to the IBC and IRC to update cement terminology in the building codes.

The proposed revisions reflect current cement technology and market conditions, which can vary across regions. Nationally, the market is no longer dominated by portland cement. More than sixty percent of the current cement market consists of blended cements, including portland-limestone cement (PLC) and other blended cements that meet the requirements of ASTM C595/C595M, Specification for Blended Hydraulic Cements (Portland Cement Association, 2025). ASTM C595/C595M is referenced in the International Building Code/ International Residential Code.

This specific proposal provides clarification and differentiation between ASTM C1157 for performance hydraulic cement and ASTM C1600 for rapid-hardening hydraulic cement.

Bibliography: Portland Cement Association, 2025. Reducing Carbon at the Cement Plant. https://cementprogress.com/reducing-carbon-at-the-cement-plant/

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

This editorial code change will not impact the cost of construction. See reason statement.

S178-25

S179-25

IBC: 1612.2, 3103.6.1.3, G113.1, G113.3

Proponents: Rebecca Quinn, RCQuinn Consulting, representing Association of State Floodplain Managers (rebecca@rcquinnconsulting.com); Chad Berginnis, representing Association of State Floodplain Managers (cberginnis@floods.org)

2024 International Building Code

Revise as follows:

1612.2 Design and construction. The design and construction of *buildings* and *structures* located in *flood hazard areas*, including *coastal high hazard areas* and *coastal A zones*, shall be in accordance with Chapter 5 of ASCE 7 and ASCE 24. Elevators, escalators, conveying systems and their components shall conform to ASCE 24 and ASME A17.1/CSA B44 as applicable.

~~**Exception:** *Temporary structures* complying with Section 3103.6.1.3.~~

Delete and substitute as follows:

~~**3103.6.1.3 Flood loads.** *Public-occupancy temporary structures* need not be designed for flood loads specified in Section 1612. Controlled occupancy procedures in accordance with Section 3103.8 shall be implemented.~~

3103.6.1.3 Flood loads. Temporary structures shall not be located in floodways and coastal high hazard areas. Temporary structures located in flood hazard areas other than floodways and coastal high hazard areas shall comply with Section 1612.

SECTION G113 TEMPORARY STRUCTURES AND TEMPORARY STORAGE

Revise as follows:

G113.1 Temporary structures. Temporary structures shall not be located in floodways and coastal high hazard areas. *Temporary structures* shall be erected for a period of less than 180 days. *Temporary structures* shall be anchored to prevent flotation, collapse or lateral movement resulting from hydrostatic *loads*, including the effects of buoyancy, during conditions of the *design flood*. Fully enclosed *temporary structures* shall have flood openings that are in accordance with ASCE 24 to allow for the automatic entry and exit of floodwaters.

G113.2 Temporary storage. Temporary storage includes storage of goods and materials for a period of less than 180 days. Stored materials shall not include *hazardous materials*.

G113.3 Floodway encroachment. *Temporary* ~~*structures* and temporary~~ storage in *floodways* shall meet the requirements of G104.5.

Reason: The proposal rectifies a disconnect that was created in the 2024 code cycle. The disconnect is between the IBC provisions for temporary structures in flood hazard areas and the minimum requirements of the National Flood Insurance Program. IBC Sec. 102.2 states that “the provisions of this code shall not be deemed to nullify any provisions of local, state or federal law. FEMA states that the most recent editions of the I-Codes meet or exceed the minimum requirements of the NFIP for buildings and structures. That is no longer the case, given the exemption of “public occupancy temporary structures” from the requirements of Section 1612 Flood Loads.

The exception to Sec. 1612.3 and Sec. 3103.6.1.3 completely circumvents all flood requirements for “public occupancy temporary structures.” We understand that those structures must have “controlled occupancy procedures” in place, but those procedures are about public safety, not about reducing flood damage. One of the objectives of the NFIP is to minimize flood damage to structures and collateral damage caused by structures that are not designed and constructed to resist damage.

Anyone watching reports of flooding will see dislodged structures. Not only do they contribute to debris, but they can also batter other buildings and can block bridge and culvert openings. Many communities attempt to impose requirements on owners/operators to have temporary structures removed from flood hazard areas before the onset of flooding, but often that just doesn't happen.

The proposal does not require temporary structures to fully comply with the elevation or dry floodproofing requirements of ASCE 24. ASCE 24 categorizes temporary structures in place for fewer than 180 days as Flood Design Class 1. It allows them below the flood elevation, with specific "wet floodproofing" measures to reduce damage.

The proposal limits placement of temporary structures in two parts of flood hazard areas:

1. Floodways, which are typically relatively narrow areas along riverine waterways where floodwater is deeper and flows faster. Floodways are delineated by FEMA to preclude encroachments that restrict flows – unless engineering analyses are performed. The NFIP requirements related to encroachments do not distinguish between whether the encroaching activities are permanent or temporary.
2. Coastal high hazard areas (flood Zone V), delineated along coastal shorelines and some very large lakes, are where waves during base flood conditions are expected to be 3 feet or higher. Those waves impose significant impact loads. This is why foundations for buildings in these areas must be columns or piles. We have observed for decades that non-elevated buildings in these areas sustain significant damage or are destroyed. Satisfying the ASCE 24 requirements for temporary structures, including anchoring to resist flood loads, would be impractical.

The proposed change to Sec. 3103.6.1.3 points to Sec. 1612, which relies on the referenced standard, ASCE 24. ASCE 24 has provisions for temporary structures that are in place for fewer than 180 days, which are Flood Design Class 1. Those temporary structures are specifically identified for be wet floodproofed. What that means is those structures must:

1. Be anchored to resist flotation and movement during conditions of the base flood.
2. Have flood damage-resistant materials below the base flood elevation.
3. Have flood openings in accordance with ASCE 24, when the structures are enclosed by walls.
4. Have mechanical systems, plumbing fixtures and electrical systems located at or above the base flood elevation, except that electrical wiring systems are permitted to be located below the base flood elevation provided they conform to the provisions of NFPA 70.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

The proposal requires all temporary structures to meet flood-resistant provisions, eliminating the exception for public occupancy temporary structures. However, there is no impact on the cost of construction of those structures because communities must still comply with NFIP regulations, which have similar requirements as IBC 1612/ASCE 24 described in the reason statement.

We acknowledge that there may be some cost associated with prohibiting temporary structures in floodways and coastal high hazard areas (e.g., finding alternate locations, lost opportunity cost, etc.). However, those costs may be offset by avoiding the cost of anchoring temporary structures in those high-risk flood hazard areas which typically have higher velocity flows or breaking waves. Anchoring to resist those loads could be costly and impractical for temporary structures. In addition, locating temporary structures outside of floodways eliminates the need and cost of preparing the engineering analyses required by Sec. 1612.3.2 to evaluate the impact of such structures on the floodway.

S179-25

S180-25 Part I

IBC: G109.4, G114.6; IEBC: [BS] 401.3; IFGC: [BS] 301.11; IMC®: [BS] 301.16

Proponents: Rebecca Quinn, RCQuinn Consulting, representing Association of State Floodplain Managers (rebecca@rcquinnconsulting.com); Chad Berginnis, representing Association of State Floodplain Managers (cberginnis@floods.org)

THIS IS A 2 PART CODE CHANGE. PART I WILL BE HEARD BY THE IBC STRUCTURAL CODE COMMITTEE. PART II WILL BE HEARD BY THE IRC-B CODE COMMITTEE. SEE THE TENTATIVE HEARING ORDER FOR THESE COMMITTEES.

2024 International Building Code

SECTION G109
MANUFACTURED HOMES

Revise as follows:

G109.4 Protection of mechanical equipment and outside appliances.
<u>The following shall be elevated to or above the *design flood elevation:*</u>

<u>1.</u> Mechanical equipment and ~~outside~~ <u>exterior</u> appliances ~~shall be elevated to or above the *design flood elevation*~~.

<u>2.</u> <u>Replacement of exterior equipment and exterior appliances damaged by *flood*</u>

Exception: Where such equipment and appliances are designed and installed to prevent water from entering or accumulating within their components and the systems are constructed to resist hydrostatic and hydrodynamic *loads* and stresses, including the effects of buoyancy, during the occurrence of *flooding* up to the elevation required by Section R306 of the *International Residential Code*, the systems and equipment shall be permitted to be located below the elevation required by Section R306 of the *International Residential Code.* Electrical wiring systems shall be permitted below the design *flood* elevation provided that they conform to the provisions of NFPA 70.

SECTION G114
UTILITY AND MISCELLANEOUS GROUP U

G114.6 Protection of mechanical, plumbing and electrical systems. <u>The following shall be elevated to or above the *design flood elevation:*</u>

<u>1.</u> Mechanical, plumbing and electrical systems, including plumbing fixtures~~, shall be elevated to or above the *design flood elevation*~~.

<u>2.</u> <u>Replacement of exterior equipment and exterior appliances damaged by *flood.*</u>

Exception: Electrical systems, equipment and components; heating, ventilating, air conditioning and plumbing appliances; plumbing fixtures, duct systems and other service equipment shall be permitted to be located below the *design flood elevation* 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 elevation* in compliance with the flood-resistant construction requirements of this code. Electrical wiring systems shall be permitted to be located below the *design flood elevation* provided that they conform to the provisions of NFPA 70.

2024 International Existing Building Code

Revise as follows:

[BS] 401.3 Flood hazard areas. In *flood hazard areas,* <u>the following</u> ~~*repairs* that constitute *substantial improvement*~~ shall require that the building comply with Section 1612 of the *International Building Code*, or Section R306 of the *International Residential Code*, as applicable~~.~~:

1. Repairs that constitute *substantial improvement.*
2. Replacement of exterior equipment and exterior appliances damaged by *flood* .

2024 International Fuel Gas Code

Revise as follows:

[BS] 301.11 Flood hazard. For structures located in *flood hazard areas*, the following ~~the *appliance*, *equipment* and system installations regulated by this code~~ shall be located at or above the elevation required by Section 1612 of the *International Building Code* for utilities and attendant equipment~~.~~:

1. *Appliance*, *equipment* and system installations regulated by this code.
2. Replacement of exterior equipment and exterior appliances damaged by *flood.*

Exception: The *appliance*, *equipment* and system installations regulated by this code are permitted to be located below the elevation required by Section 1612 of the *International Building Code* for utilities and attendant equipment 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 such elevation.

2024 International Mechanical Code

Revise as follows:

[BS] 301.16 Flood hazard. For structures located in flood hazard areas, the following ~~mechanical systems, *equipment* and *appliances*~~ shall be located at or above the elevation required by Section 1612 of the *International Building Code* for utilities and attendant *equipment*~~.~~ :

1. Mechanical systems, *equipment* and *appliances*
2. Replacement of exterior equipment and exterior appliances damaged by *flood*

Exception: Mechanical systems, *equipment* and *appliances* are permitted to be located below the elevation required by Section 1612 of the *International Building Code* for utilities and attendant equipment 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 up to such elevation.

S180-25 Part I

S180-25 Part II

IRC: R306.1.6

Proponents: Rebecca Quinn, RCQuinn Consulting, representing Association of State Floodplain Managers (rebecca@rcquinnconsulting.com); Chad Berginnis, representing Association of State Floodplain Managers (cberginnis@floods.org)

2024 International Residential Code

SECTION R306
FLOOD-RESISTANT CONSTRUCTION

Revise as follows:

R306.1.6 Protection of mechanical, plumbing and electrical systems. The following ~~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 R306.2 or R306.3~~.~~:

1. Electrical systems, *equipment* and components; heating, ventilating, air-conditioning; plumbing *appliances* and plumbing fixtures; *duct systems*; and other service *equipment.*
2. Replacement of exterior equipment and exterior appliances damaged by *flood*
3. If replaced as part of a *substantial improvement*, electrical systems, *equipment* and components; heating, ventilating, air-conditioning 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 R306.2 or R306.3 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 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.

Reason:

Many buildings in floodplains were built before communities started regulating and requiring buildings to be elevated and constructed to minimize exposure to flooding. During a flood, exterior equipment that serves those non-elevated buildings gets damaged, even when the building itself is not substantially damaged. Having replacement equipment installed fully elevated minimizes future damage, saving owners time and money. In addition, when homes are flooded and elevated exterior equipment remains functional, clean-up and drying out are easier and faster. This means better management of mold conditions and businesses and families can more quickly move back into safer buildings.The State of Florida adopted similar provisions for the 8th Edition of the Florida Building Code.

The code change for Sec. 401.3, for repairs, requires replacement exterior equipment damaged by flood to be raised to or above the elevation required by the IRC, based on flood zone, unless the replacement equipment meets the limitations of the exception to be located below those elevations. The definition of “repair” includes “reconstruction, replacement or renewal of any part of an existing building for the purpose of its maintenance or to correct damage.”

Methods used to raise replacement exterior equipment are the same as the methods used when equipment is installed to serve new construction (wall-mounted, pedestal, platforms, or platforms that are cantilevered from or knee braced to the structure). Photographs below show typical methods of elevating equipment that serves dwellings.In some areas where the base flood elevation is very high, equipment can be installed on roofs rather than very tall platforms.

FEMA’s Mitigation Assessment Team reports prepared after some significant flood events document widespread damage to non-elevated exterior equipment. Elevating equipment at the time of replacement also saves homeowners from having to pay for replacement equipment after any subsequent flood event.

Equipment on wall-mounted bracket (https://www.energy.gov/energysaver/heat-pump-systems)

Equipment on wall mounted platform

Equipment on concrete platform

Equipment on platform


Photographs are provided courtesy of FEMA P-348 and Rebecca Quinn

Cost Impact: Increase

Estimated Immediate Cost Impact:

When nonconforming dwellings in flood hazard areas have non-elevated exterior equipment, this code change proposal requires compliance when the exterior equipment is replaced after being damaged by flooding. For new construction, exterior equipment is elevated as high as the dwelling because typical exterior equipment used for dwellings is not designed to satisfy the requirements and limitations of the exception that allows for inherently watertight equipment below the design flood elevation. Increased costs incurred would depend on the type of equipment. The cost to raise a compressor on a pedestal or platform includes the cost of the pedestal/platform and minor costs to extend wiring and piping, if necessary. Unlike elevating on a platform, the cost to wall-mount a mini-split heat pump does not vary based on height above grade, other than the additional length of wiring and refrigerant line. The actual cost increase of this proposal depends on the method of elevation (pedestal, platform, cantilevered/knee braced platform, wall-mounted), how high above grade is necessary to meet the elevation requirements of R306.2 or R306.3, as applicable, and other factors such as soil type. The cost of a professionally-built 6 foot tall wooden platform is approximately $500. For areas of shallower flooding, prefabricated metal stands are available for under $200. Wall mount brackets are in the range of $50 and that cost does not vary based on height above grade. The cost of additional refrigerant line to account for additional height will vary based on height above grade, but costs approximately $100 for 10 feet of copper refrigerant line. In areas where a very tall platform would be required, roof-mounting may be more cost-effective.

At least two long-term benefits off-set the upfront additional installation costs: damage avoided and cost of complete replacement if flooded, and faster drying, clean-up, and re-occupancy after subsequent flood events.

Estimated Immediate Cost Impact Justification (methodology and variables):

The dollar values included in the cost impact statement were obtained using publicly available data on home advisor websites and supplier websites

Staff Analysis: CC # S97-25 Part III and CC # S180-25 Part I addresses requirements in a different or contradicting manner. The committee is urged to make their intensions clear with their actions on these proposals..

S180-25 Part II

S181-25

IBC: G109.1, G109.4

Proponents: Rebecca Quinn, RCQuinn Consulting, representing Association of State Floodplain Managers (rebecca@rcquinnconsulting.com); Chad Berginnis, representing Association of State Floodplain Managers (cberginnis@floods.org)

2024 International Building Code

APPENDIX G
FLOOD-RESISTANT CONSTRUCTION

SECTION G109
MANUFACTURED HOMES

Revise as follows:

G109.1 Required elevation~~Elevation.~~ All new and replacement *manufactured homes* to be placed or substantially improved in a *flood hazard area* shall be elevated such that the top of the foundation for the *manufactured home* is at or above the ~~*design flood elevation*~~ elevations specified in Section R306.2 or R306.3 of the *International Residential Code*, as applicable to the flood hazard area.

G109.4 Protection of mechanical equipment and outside appliances. Mechanical equipment and outside appliances shall be elevated to or above the ~~*design flood elevation*~~ required elevations.

> **Exception:** Where such equipment and appliances are designed and installed to prevent water from entering or accumulating within their components and the systems are constructed to resist hydrostatic and hydrodynamic *loads* and stresses, including the effects of buoyancy, during the occurrence of *flooding* up to the required elevation ~~required by Section R306 of the *International Residential Code*~~, the systems and equipment shall be permitted to be located below the required elevation ~~required by Section R306 of the *International Residential Code*~~. Electrical wiring systems shall be permitted below the required elevations ~~design *flood* elevation~~ provided that they conform to the provisions of NFPA 70.

Reason:

Many states do not apply building codes to installation of manufactured homes. Those that do have requirements in IRC Sec. R306.1.9, which requires the homes to be elevated the same as site-built homes. Some communities elect to adopt IBC Appendix G, which includes requirements for manufactured homes.

This proposal modifies the IBC Appendix G provisions for elevation of manufactured homes to achieve the same elevation as the IRC for dwellings and manufactured homes by referring to elevation requirements in R306. IRC R306.1.9 requires the bottom of the frame of manufactured homes (equivalent to the top of the foundation) to be at or above the same elevations specified for dwellings in R306.2 or R306.3, as applicable to the flood hazard areas. There is no reasonable justification to have manufactured homes used as dwellings less protected than site-built dwellings, which is the current situation when IBC Appendix G109 is used to regulate installation of manufactured homes.

Bibliography: Kodavatiganti Y, Rahim MA, Friedland CJ, Mostafiz RB, Taghinezhad A and Heil S (2023), Material quantities and estimated construction costs for new elevated IRC 2015-compliant single-family home foundations. Front. Built Environ. 9:1111563. doi: 10.3389/fbuil.2023.1111563

Cost Impact: Increase

Estimated Immediate Cost Impact:

Most communities use FEMA Flood Insurance Studies and Flood Insurance Rate Maps for regulatory purposes. Those products delineate Special Flood Hazard Areas and, where detailed studies have been performed, they establish the base flood elevation (BFE). Unless communities adopt different maps, the design flood elevation equals the BFE for the purposes of enforcing the code. The current text requires the top of foundations for manufactured homes to be elevated to the BFE. Pointing to Sec. R306 will require one additional foot of elevation. Most manufactured homes in flood Zone A/AE are installed on piers or perimeter walls. In Coastal A Zones and coastal high hazard areas, (Zone V), foundations must be piles or columns.

The cost impact for this proposal is for an additional foot of foundation. Table 5 of the paper “Material quantities and estimated construction costs for new elevated IRC 2015-compliant single-family home foundations” (Kodavatiganti et al, 2023) estimates costs of foundations for site-built foundations at height increments of 0.3 m (approximately 1 ft) above grade. Using data from this table, the cost of an additional 1 foot of elevation for a 139 square meter (1496 square feet) home with a linear 1:5 aspect ratio (similar to a manufactured home) on a foundation of regularly spaced CMU piers on isolated concrete pads (CS-4 in the table) is $1,493 which translates to $1 per square foot. For a stem wall foundation on internal CMU piers (CS-3 in the table), with the same building footprint and aspect ratio, the cost of freeboard ranges from $2,223 for 0.2 m CMU to $3,379 for 0.3 m CMU. which translates to $1.49 to $2.26 per square foot.

This incremental per-foot cost is in-line with estimates for foundation and installation of double-wide manufactured homes (28’ x 70’) reported in 2018 to Pinellas County, Florida, by a licensed installer who indicated the cost difference between 3’ and 4’ tall foundations was $2,500 and the cost difference between 4’ and 5’ tall foundations was $5,000, with most of the additional cost associated with installation of the unit on the site-built foundation. Installation on foundations that are taller than about 6 to 7 ft above grade typically requires different equipment, which is more costly.

Estimated Immediate Cost Impact Justification (methodology and variables):

The paper by Kodavatiganti et al. determined costs of new construction of slab-on-fill and a variety of crawlspace foundations for varying building size, footprint aspect ratio, and elevation above grade. The cost difference between elevations was based on additional material costs using RSMeans. The methodology is more fully described in the paper.

Staff Analysis: CC # S97-25 Part III and CC #S181-25 addresses requirements in a different or contradicting manner. The committee is urged to make their intensions clear with their actions on these proposals.

S181-25

S182-25

IBC: G114.3, G114.4, G114.5, G114.6

Proponents: Rebecca Quinn, RCQuinn Consulting, representing Association of State Floodplain Managers (rebecca@rcquinnconsulting.com); Chad Berginnis, representing Association of State Floodplain Managers (cberginnis@floods.org)

2024 International Building Code

APPENDIX G
FLOOD-RESISTANT CONSTRUCTION

SECTION G114
UTILITY AND MISCELLANEOUS GROUP U

G114.1 Utility and miscellaneous Group U. Utility and miscellaneous Group U includes *buildings* that are accessory in character and miscellaneous *structures* not classified in any specific occupancy in this code, including, but not limited to, *agricultural buildings*, aircraft hangars (accessory to a one- or two-family residence), barns, carports, fences more than 6 feet (1829 mm) high, grain silos (accessory to a residential occupancy), *greenhouses*, livestock shelters, *private garages*, retaining walls, sheds, stables and towers.

G114.2 Flood loads. Utility and miscellaneous Group U *buildings* and *structures*, including *substantial improvement* of such *buildings* and *structures*, shall be anchored to prevent flotation, collapse or lateral movement resulting from *flood loads*, including the effects of buoyancy, during conditions of the *design flood*.

Revise as follows:

G114.3 Required elevation ~~Elevation~~. Unless dry floodproofed in accordance with ASCE 24, utility ~~Utility~~ and miscellaneous Group U *buildings* and *structures* that have floors, including *substantial improvement* of such *buildings* and *structures*, shall be elevated such that the *lowest floor*, including *basement*, is elevated to or above the elevation specified in ASCE 24. ~~*design flood elevation* in accordance with Section 1612 of this code.~~

G114.4 Enclosures ~~below design flood elevation~~. Fully enclosed areas below the required elevation ~~*design flood elevation*~~ shall be constructed in accordance with ASCE 24.

G114.5 Flood-damage-resistant materials. *Flood~~-~~damage-resistant materials* shall be used below the required elevation ~~*design flood elevation*~~.

G114.6 Protection of mechanical, plumbing and electrical systems. Mechanical, plumbing and electrical systems, including plumbing fixtures, shall be elevated to or above the required elevation ~~*design flood elevation*~~.

> **Exception:** Electrical systems, equipment and components; heating, ventilating, air conditioning and plumbing appliances; plumbing fixtures, duct systems and other service equipment shall be permitted to be located below the required elevation ~~*design flood elevation*~~ 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 required elevation ~~*design flood elevation*~~ in compliance with the flood-resistant construction requirements of this code. Electrical wiring systems shall be permitted to be located below the required elevation ~~*design flood elevation*~~ provided that they conform to the provisions of NFPA 70.

Reason:
Group U includes buildings and structures of an accessory character and miscellaneous structures not classified in any specific occupancy. When proposed in flood hazard areas, IBC Sec. 1612 requires design in accordance with ASCE 24 Flood Resistant Design and Construction. Group U buildings are nonresidential in nature, which means in floodplains they can be elevated or dry floodproofed, and some can be wet floodproofed. Wet floodproofing refers to a range of measures that allow areas to flood, while minimizing damage.

The proposed phrase “unless otherwise provided in ASCE 24” is added for clarity so that users know that Group U buildings that have floors and that qualify for dry floodproofing or wet floodproofing can be constructed with those measures. And then for Group U buildings with floors that are elevated, rather than send users to IBC Sec 1612 which refers users to ASCE 24 to determine the appropriate height of lowest floors, the change directs users to ASCE 24. The proposal puts the elevation requirement in G114.3, and changes other references to point to that section, thus ensuring consistency. The requirements for enclosures, materials, and mechanical, plumbing, and electrical systems are unchanged.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

This proposal adds more direct pointers to existing requirements in the code. There is no change to the technical content of the provisions. By reminding users of existing applicable requirements there will be no cost impact when approving this proposal.

S182-25

S183-25

IBC: N104.1.2, N106.2.1

Proponents: Rebecca Quinn, RCQuinn Consulting, representing Association of State Floodplain Managers (rebecca@rcquinnconsulting.com); Chad Berginnis, representing Association of State Floodplain Managers (cberginnis@floods.org)

2024 International Building Code

APPENDIX N
REPLICABLE BUILDINGS

Revise as follows:

N104.1.2 Structural plans, specifications and engineering details. Where approval of the structural requirements of the *replicable design* is sought, the submittal documents shall include details for each wind region, *seismic design category*, *flood hazard area* and *climate zone* for which approval is sought; and shall include the following:

1. Signed and sealed structural design calculations that support the member sizes on the drawings.
2. Design *load* criteria, including: frost depth, *live loads*, snow *loads*, wind *loads*, earthquake design date, flood loads, and other special *loads*
3. Details of foundations and superstructure.
4. Details of compliance with Section 1612 for replicable buildings proposed to be located in *flood hazard areas*.
5. ~~4.~~ Provisions for *special inspections*.

N106.2.1 Architectural plans and specifications. Architectural plans and specifications shall include the following:

1. *Construction documents* for variations from the *replicable design*.
2. Construction for portions that are not part of the *replicable design*.
3. Documents for local requirements as identified by the *building official*.
4. *Construction documents* detailing the foundation system.
5. *Construction documents* detailing compliance with Section 1612 for replicable buildings proposed to be located in *flood hazard areas*.

Reason: The objectives of Appendix N Replicable Buildings stated in Section N101.2 are to "allow a jurisdiction to recover from a natural disaster faster and allow for consistent application of codes for replicable building projects." However, the most common natural disaster is missing from the list in N103.1 which specifies construction document requirements. This proposal rectifies that omission. In addition, compliance with flood requirements is site-specific and should be included in structural plans and documents specific to locations.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

This proposal explicitly specifies documentation of compliance with existing requirements in the code. Buildings in flood hazard areas must already comply with the cited code requirements. There is no change to the technical content of the provisions. By being more explicit about existing documentation requirements there will be no cost impact when approving this proposal.

S183-25

S184-25

IBC: APPENDIX H, SECTION H101, H101.2

Proponents: Kota Wharton, representing City of Grove City (kwharton@grovecityohio.gov)

2024 International Building Code

APPENDIX H
SIGNS

SECTION H101
GENERAL

H101.1 General. A *sign* shall not be erected in a manner that would confuse or obstruct the view of or interfere with exit signs required by Chapter 10 or with official traffic signs, signals or devices. *Signs* and *sign* support *structures*, together with their supports, braces, guys and anchors, shall be kept in repair and in proper state of preservation. The display surfaces of *signs* shall be kept neatly painted or posted at all times.

Revise as follows:

H101.2 Signs exempt from permits. Exemptions 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 *signs*: ~~The following *signs* are exempt from the requirements to obtain a *permit* before erection~~:

1. Painted nonilluminated *signs*.
2. Temporary *signs* announcing the sale or rent of property.
3. *Signs* erected by transportation authorities.
4. *Projecting signs* not exceeding 2.5 square feet (0.23 m^2).
5. The changing of moveable parts of an *approved sign* that is designed for such changes, or the repainting or repositioning of display matter shall not be deemed an alteration.

Reason: This code change clarifies the extent of exemptions from compliance with other provisions of code and the other laws and ordinances of the jurisdiction. The langage mirrors language found in 105.2.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

This code change reaffirms the codes intent to provide exemptions from permitting requirements only within this body of code.

S184-25

S185-25

IBC: APPENDIX N, SECTION N101, N101.1, N101.2, SECTION N104, N104.1, SECTION N105, N105.1, N105.3, N105.4, SECTION N106, N106.1, N106.2, SECTION N107, N107.1, N107.2

Proponents: Kota Wharton, representing City of Grove City (kwharton@grovecityohio.gov)

2024 International Building Code

APPENDIX N
REPLICABLE BUILDINGS

SECTION N101
ADMINISTRATION

N101.1 Purpose. The purpose of this appendix is to provide a format and direction regarding the implementation of a *replicable building* program.

Revise as follows:

N101.2 Objectives. Such programs allow a *jurisdiction* to ~~recover from a natural disaster faster and~~ allow for consistent application of the codes for *replicable building* projects. It will result in faster turnaround for the end user, and a quicker turnaround through the plan review process.

SECTION N104
REPLICABLE DESIGN SUBMITTAL REQUIREMENTS

N104.1 General. A summary description of the *replicable design* and related *construction documents* shall be submitted to an *approved agency* <u>or the *building official*</u>. Where approval is requested for elements of the *replicable design* that is not within the scope of the *International Building Code*, the *construction documents* shall specifically designate the codes for which review is sought. *Construction documents* shall <u>be prepared by a *registered design professional* where required by the statutes of the *jurisdiction* in which the project is to be constructed</u> ~~be signed, sealed and dated by a *registered design professional*~~.

SECTION N105
REVIEW AND APPROVAL OF REPLICABLE DESIGN

N105.1 General. Proposed *replicable designs* shall be reviewed by an *approved agency* <u>or the *building official*</u>. The review shall be applicable only to the *replicable design* features submitted in accordance with Section N104. The review shall determine compliance with this code and additional codes specified in Section N104.1.

N105.3 Deficiencies. Where the review of the submitted *construction documents* identifies elements where the design is deficient and will not comply with the applicable code requirements, the *approved agency* <u>or *building official*</u> shall notify the proponent of the *replicable design*, in writing, of the specific areas of noncompliance and request correction.

N105.4 Approval. Where the review of the submitted *construction documents* determines that the design is in compliance with the codes designated in Section N104.1, and where deficiencies identified in Section N105.3 have been corrected, the *approved agency* <u>or *building official*</u> shall issue a summary report of *Approved* Replicable Design. The summary report shall include any limitations on the *approved replicable design* including, but not limited to, climate zones, wind regions and *seismic design categories*.

SECTION N106
SITE-SPECIFIC APPLICATION OF APPROVED REPLICABLE DESIGN

N106.1 General. Where site-specific application of a *replicable design* that has been *approved* under the provisions of Section N105 is sought, the *construction documents* submitted to the *building official* shall comply with this section.

N106.2 Submittal documents. A summary description of the *replicable design* and related construction document shall be submitted to the *building official*. *Construction documents* shall be signed, sealed and dated by the *registered design professional*. A statement~~, signed, sealed and dated by the *registered design professional*,~~ that the *replicable design* submitted for local review is the same as the *replicable design* reviewed by the *approved* agency or *building official* shall be submitted. The statement shall be prepared by a registered design professional where required by the statutes of the jurisdiction in which the project is to be constructed.

SECTION N107
SITE-SPECIFIC REVIEW AND APPROVAL OF REPLICABLE DESIGN

N107.1 General. Proposed site-specific application of *replicable design* shall be submitted to the *building official* in accordance with the provisions of Chapter 1 and Appendix N.

N107.2 Site-specific review and approval of replicable design. The *building official* shall verify that the *replicable design* submitted for site-specific application is the same as the *approved replicable design* reviewed by the *approved agency* or the *building official*. In addition, the *building official* shall review the following for code compliance.

1. *Construction documents* for variations from the *replicable design*.
2. Construction for portions of the building that are not part of the *replicable design*.
3. Documents for local requirements as identified by the *building official*.

Reason: This code change does the following:

- Revises the intent of the replicable building projects program to allow for non-disaster related projects.
- Clarifies that the building official is able to review prototypical construction drawings.
- Clarifies that a registered design professional's seal is only required where required by the jurisdictions existing laws.

First, the intent of the replicable building program is artificially limited to disaster recovery. While the use may be most beneficial there, the program could be effective for rapid development and address building and housing shortages. The proposed language expands the program.

Second, the proposed language clarifies that the building official is able to review these plans. While inherent, because the building official could approve their agency as the approved agency, the proposed language makes it clear that the building official can receive the plans.

Third, as in other provisions of the code, the I-Codes historically stay out of asserting sealing requirements. The proposed language reaffirms the deference to jurisdictions to set their own rules about seal requirements.

Cost Impact: Decrease

Estimated Immediate Cost Impact:

Where adopted, the expansion of the program to non-recovery objectives and removal of seal requirements (where not required by other laws). Minimum $0 decrease

Estimated Immediate Cost Impact Justification (methodology and variables):

The assertion of first statements is founded in the initial assertions for the program; faster turnaround for the end user and a quicker turnaround through the plan review process.

Removal of seal requirements, where not required by other laws, the proposed language would have an appreciable decrease in cost.

S185-25

S186-25

IBC: 1705.5.2

Proponents: Emily Dunham, representing NCSEA Code Advisory Committee Special Inspections/Quality Assurance Subcommittee (emily.dunham@greshamsmith.com); Emily Guglielmo, representing NCSEA (eguglielmo@martinmartin.com)

2024 International Building Code

Revise as follows:

1705.5.2 ~~Metal-plate-connected~~ Wood trusses spanning 60 feet or greater. Where a truss clear span is 60 feet (18 288 mm) or greater, the *special inspector* shall verify that the temporary installation restraint/bracing and the permanent individual truss member restraint/bracing are installed in accordance with the *approved* truss submittal package.

Reason: Removal of "Metal plate connected" from the title correlates the title of the section with the enforceable language that only applies to trusses with a clear span of 60' or greater. All wood trusses with spans 60 feet or greater are required to have a special plan developed per section 2303.4.1.3. Consequently, special inspections should be performed for these same trusses and not limited to metal-plate-connected wood trusses.

Cost Impact: The change proposal is editorial in nature or a clarification and has no cost impact on the cost of construction

Justification for no cost impact:

Title changes are editorial and will have no cost impact, refer to reason statement.

S186-25