

## 2015 IRC WIND SPEED CHANGES EXPLAINED

In the 2015 International Residential Code (IRC) there were several changes to the Wind Design Criteria sections (Section R301.2.1) and the associated wind speed maps (figures), and these changes have generated many questions. The IRC wind speed maps previously indicated “Basic Wind Speed” (also referred to as Nominal Wind Speed), but now indicate “Ultimate Design Wind Speed”. These are two different measurements of wind speed, so the numbers have increased, but that does not necessarily indicate that the actual wind speed has changed. As explained in the excerpt below from the 2015 IRC Code Commentary, the changes were made to better align with the IBC and the 2010 edition of ASCE 7 “Minimum Design Loads and Associated Criteria for Buildings and Other structures” (ASCE 7-10), to reduce confusion and provide a more comprehensive approach:

### Excerpt from 2015 IRC Code & Commentary

*“For the 2015 edition, the wind design provisions of the International Residential Code® (IRC®) have been brought in line with the 2012 IBC and ASCE 7-10. New maps based on the ASCE 7-10 ultimate wind speed data, but converted back down to nominal (ASD) basis, were provided in previous editions of the IRC, which led to some confusion among those stakeholders who work with both the IRC and the IBC.*

*A working group of stakeholders including the National Association of Home Builders (NAHB), the major material associations, the American Society of Civil Engineers (ASCE), and the Insurance Institute for Business and Home Safety developed a new ultimate wind speed basis for design. Thus the Chapter 3 wind design criteria and the corresponding definitions (see the definitions for “Hurricane-prone regions” and “Windborne debris region” in Section R202) have been updated. Further updates include\*:*

- *A new ultimate wind speed map [Figure R301.2(4)A].*
- *A new map of the regions where special high-wind design is required [Figure R301.2(4)B].*
- *A revised table (Table R301.2.1.3) for conversion of ultimate design wind speeds to nominal design (ASD) wind speeds, for use with those standards that have not updated their provisions.*
- *A revised table [Table R301.2(2)] for component and cladding pressures.*
- *The addition of Section R301.2.1.2.1 for substitutions and modifications to ASTM E1886.*
- *Revisions to Table R301.2.1.5.1 to reflect the change to the ultimate design basis, including the addition of a footnote indicating that buildings must be considered as “wind design required” where the ultimate design wind speed, as modified by the table, is 140 mph or more, as also required by Section R301.2.1.1.”*

*\*A copy of code change proposal RB39-13 (AMPC 1, 3, 4, 5) is attached.*

### Additional changes to the 2018 IBC

In the 2018 edition of the IBC, the Wind Loads section (Section 1609) was amended to align with changes in the 2016 edition of ASCE 7 (ASCE 7-16). The 2018 IBC changes were to “harmonize” terminology between the IBC and the latest edition of ASCE 7. Ironically, one of the many changes was to replace the term “Ultimate Design Wind Speed” with “Basic Wind Speed” which is the terminology that was used in the IRC prior to the 2015 changes. Also among the changes to the 2018 IBC, were changes to the maps decreasing wind speeds for the majority of the United States based on the latest available data. Along the hurricane coastline however, the wind speeds remain nearly unchanged.

## RB39-13

R202, R301.2.1, R301.2.1.1, R301.2.1.2, R301.2.1.2.1 (New), R301.2.1.3, R301.2.1.4, Table R301.2(2), Table R301.2(4)A, Table R301.2(4)B, Table R301.2(4)C, Table R301.2.1.2, Table R301.2.1.3, Table R301.2.1.5.1, Table R301.2(2), Table 301.7, Figure R301.2(4)A (New), Figure R301.2(4)B, Figure R301.2(4)C, Figure R301.2(7)

### **Proposed Change as Submitted**

**Proponent:** Gary J. Ehrlich, P.E., National Association of Home Builders (NAHB);

**Revise definitions as follows:**

#### **SECTION R202 DEFINITIONS**

**HURRICANE-PRONE REGIONS.** Areas vulnerable to hurricanes, defined as the U.S. Atlantic Ocean and Gulf of Mexico coasts where the ultimate design wind speed,  $V_{ult}$ , basic wind speed is greater than 115 ~~90~~ miles per hour (51.40 ~~51.40~~ m/s), and Hawaii, Puerto Rico, Guam, Virgin Islands, and America Samoa.

**WIND-BORNE DEBRIS REGION.** Areas within *hurricane-prone regions* located as designated in accordance with Figure R302.1(4)C. ~~;~~

1. Within 1 mile (1.61 km) of the coastal mean high water line where the ultimate design wind speed,  $V_{ult}$ , is 130 mph (58 m/s) or greater; or
2. In areas where the ultimate design wind speed,  $V_{ult}$ , is 140 mph (63.6 m/s) or greater; or Hawaii.

**Revise as follows:**

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

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

#### **Exceptions:**

1. For concrete construction, the wind provisions of this code shall apply in accordance with the limitations of Sections R404 and R611.
2. For structural insulated panels, the wind provisions of this code shall apply in accordance with the limitations of Section R613.

In regions where wind design is required in accordance with Figure R301.2(4)B ~~or where the basic wind speed shown on Figure R301.2(4)A equals or exceeds 110 miles per hour (49 m/s),~~ the design of buildings for wind loads shall be in accordance with one or more of the following methods:

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

The elements of design not addressed by the methods in Items 1 through 5 shall be in accordance with the provisions of this code. When ASCE 7 or the *International Building Code* is used for the design of the building, the wind speed map and exposure category requirements as specified in ASCE 7 and the *International Building Code* shall be used.

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

**FIGURE R301.2(4)A**  
**BASIC WIND SPEEDS**

**FIGURE R301.2(4)B**  
**REGIONS WHERE WIND DESIGN IS REQUIRED**

**FIGURE R301.2(4)C**  
**WIND-BORNE DEBRIS REGIONS**

**R301.2.1.2 Protection of openings.** Exterior glazing in buildings located in windborne debris regions shall be protected from windborne debris. Glazed opening protection for windborne debris shall meet the requirements of the Large Missile Test of ASTM E 1996 and ASTM E 1886 as modified in Section R301.2.1.2.1 referenced therein. ~~The applicable wind zones for establishing missile types in ASTM E 1996 are shown on Figure R301.2(4)C.~~ Garage door glazed opening protection for windborne debris shall meet the requirements of an *approved* impact-resisting standard or ANSI/DASMA 115.

**Exception:** Wood structural panels with a minimum thickness of 7/16 inch (11 mm) and a maximum span of 8 feet (2438 mm) shall be permitted for opening protection in one- and two-story buildings. Panels shall be precut and 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 component and cladding loads determined in accordance with either Table R301.2(2) or ASCE 7, with the permanent corrosion-resistant attachment hardware provided and anchors permanently installed on the building. Attachment in accordance with Table R301.2.1.2 is permitted for buildings with a mean roof height of 45 33 feet (10 058 mm) or less where the ultimate design wind speed,  $V_{ult}$  is 180 mph or less. ~~located in Wind Zones 1 and 2 in accordance with Figure R301.2(4)C.~~

**TABLE R301.2.1.2**  
**WINDBORNE DEBRIS PROTECTION FASTENING**  
**SCHEDULE FOR WOOD STRUCTURAL PANELS<sup>a,b,c,d</sup>**

a. This table is based on 430 180 mph ultimate design wind speeds,  $V_{ult}$  and a 45 33-foot mean roof height.

(Table and footnotes not shown to remain unchanged.)

**R301.2.1.2.1. Application of ASTM E 1996.** The text of Section 2.2 of ASTM E 1996 shall be substituted as follows:

2.2 ASCE Standard:

ASCE 7-10 American Society of Civil Engineers Minimum Design Loads for Buildings and Other Structures

The text of Section 6.2.2 of ASTM E 1996 shall be substituted as follows:

6.2.2 Unless otherwise specified, select the wind zone based on the strength design wind speed,  $V_{ult}$ , as follows:

6.2.2.1 *Wind Zone 1*—130 mph  $\leq$  ultimate design wind speed,  $V_{ult} < 140$  mph.

6.2.2.2 *Wind Zone 2*—140 mph  $\leq$  ultimate design wind speed,  $V_{ult} < 150$  mph at greater than one mile (1.6 km) from the coastline. The coastline shall be measured from the mean high water mark.

6.2.2.3 *Wind Zone 3*—150 mph (58 m/s)  $\leq$  ultimate design wind speed,  $V_{ult} \leq 160$  mph (63 m/s), or 140 mph (54 m/s)  $\leq$  ultimate design wind speed,  $V_{ult} \leq 160$  mph (63 m/s) and within one mile (1.6 km) of the coastline. The coastline shall be measured from the mean high water mark.

6.2.2.4 *Wind Zone 4*—ultimate design wind speed,  $V_{ult} > 160$  mph (63 m/s).

**R301.2.1.3 Wind speed conversion.** When referenced documents are based on nominal design-fastest mile wind speeds, the ultimate design-three-second gust basic wind speeds,  $V_{ult}-V_{3s}$ , of Figure R301.2(4)A shall be converted to nominal design-fastest mile wind speeds,  $V_{asd}-V_{fm}$ , using Table R301.2.1.3.

**TABLE R301.2.1.3  
EQUIVALENT BASIC WIND SPEEDS**

**TABLE R301.2.1.3  
WIND SPEED CONVERSIONS<sup>a</sup>**

$V_{ult}$	110	115	120	130	140	150	160	170	180	190	200
$V_{asd}$	85	89	93	101	108	116	124	132	139	147	155

a. Linear interpolation is permitted

**R301.2.1.4 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. For a site located in the transition zone between categories, the category resulting in the largest wind forces shall apply. Account shall be taken of variations in ground surface roughness that arise from natural topography and vegetation as well as from constructed features. For a site where multiple detached one- and two-family dwellings, townhouses or other structures are to be constructed as part of a subdivision, master-planned community, or otherwise designated as a developed area by the authority having jurisdiction, the exposure category for an individual structure shall be based upon the site conditions that will exist at the time when all adjacent structures on the site have been constructed, provided their construction is expected to begin within one year of the start of construction for the structure for which the exposure category is determined. For any given wind direction, the exposure in which a specific building or other structure is sited shall be assessed as being one of the following categories:

1. ~~Exposure A. Large city centers with at least 50 percent of the buildings having a height in excess of 70 feet (21 336 mm). Use of this exposure category shall be limited to those areas for which terrain representative of Exposure A prevails in the upwind direction for a distance of at least 0.5 mile (0.8 km) or 10 times the height of the building or other structure, whichever is greater.~~

Possible channeling effects or increased velocity pressures due to the building or structure being located in the wake of adjacent buildings shall be taken into account.

12. Exposure B. Urban and suburban areas, wooded areas, or other terrain with numerous closely spaced obstructions having the size of single-family dwellings or larger. Exposure B shall be assumed unless the site meets the definition of another type exposure.
23. Exposure C. Open terrain with scattered obstructions, including surface undulations or other irregularities, having heights generally less than 30 feet (9144 mm) extending more than 1,500 feet (457 m) from the building site in any quadrant. This exposure shall also apply to any building located within Exposure B type terrain where the building is directly adjacent to open areas of Exposure C type terrain in any quadrant for a distance of more than 600 feet (183 m). This category includes flat, open country and grasslands.
34. Exposure D. Flat, unobstructed areas exposed to wind flowing over open water for a distance of at least 5000 feet (1,524 m) 1 mile (1.61 km). ~~Shorelines in Exposure D include inland waterways, the Great Lakes, and coastal areas of California, Oregon, Washington and Alaska.~~ This exposure shall apply only to those buildings and other structures exposed to the wind coming from over the water. Exposure D extends inland from the shoreline a distance of ~~600 feet (183 m) 4500 feet (457 m)~~ or 20-40 times the height of the building or structure, whichever is greater. This category includes smooth mud flats, salt flats and unbroken ice.

**TABLE R301.2.1.5.1**  
**BASIC WIND MODIFICATION FOR TOPOGRAPHIC WIND EFFECT**

**TABLE R301.2.1.5.1**  
**BASIC WIND MODIFICATION FOR TOPOGRAPHIC WIND EFFECT<sup>a</sup>**

BASIC WIND SPEED FROM FIGURE R301.2(4)	AVERAGE SLOPE OF THE TOP HALF OF HILL, RIDGE OR ESCARPMENT (percent)						
	0.10	0.125	0.15	0.175	0.20	0.23	0.25
	Required Basic Wind Speed, Modified for Topographic Wind Speed-Up (rounded)						
110	132	137	142	147	152	158	162
115	138	143	148	154	159	165	169
120	144	149	155	160	166	172	176
130	156	162	168	174	179	N/A	N/A
140	168	174	181	N/A	N/A	N/A	N/A
150	180	N/A	N/A	N/A	N/A	N/A	N/A

a. Table applies to a feature height of 500 feet or less and dwellings sited a distance equal or greater than half the feature height.

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

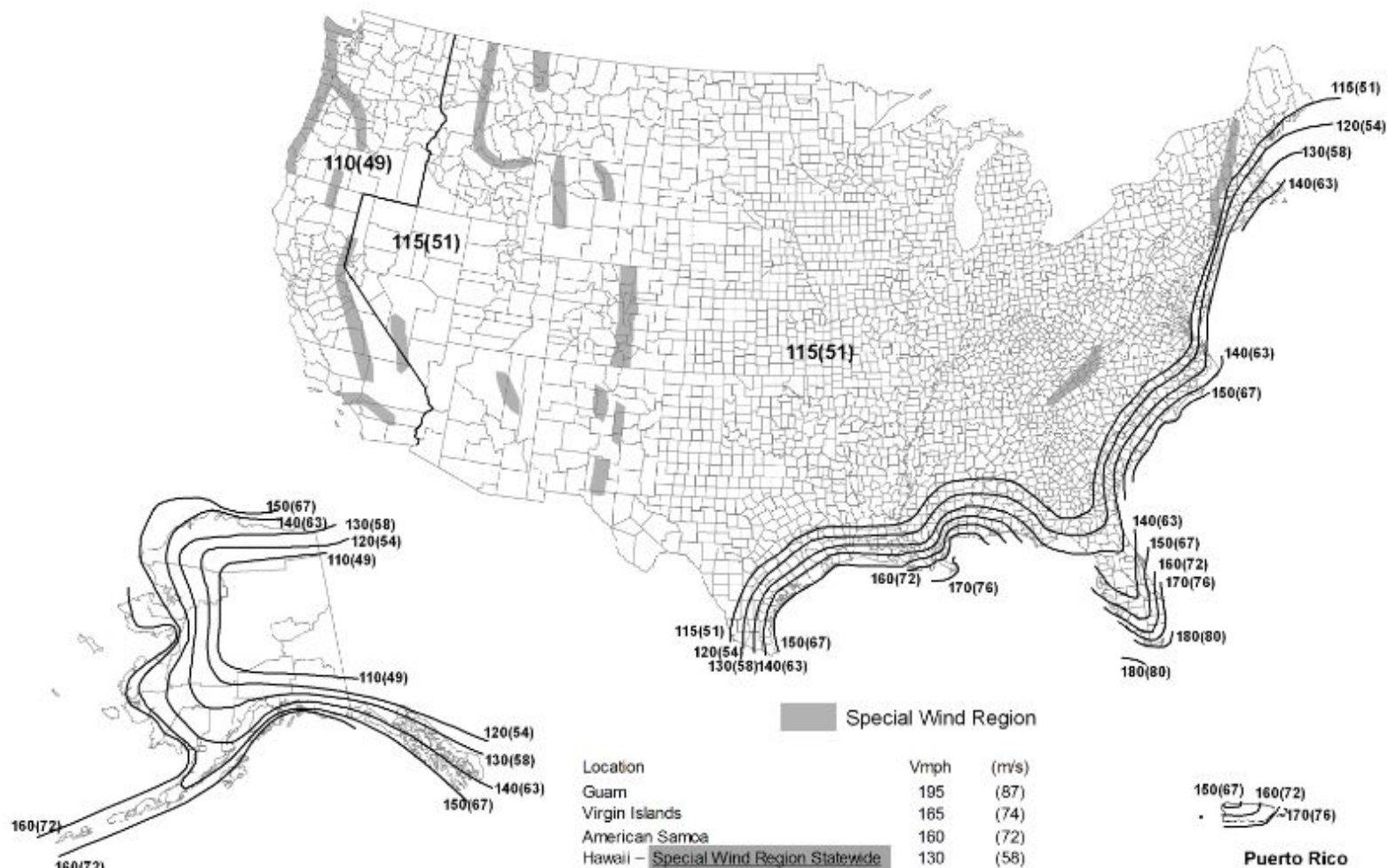
	ZONE	EFFECTIVE WIND AREA (feet2)	ULTIMATE DESIGN WIND SPEED, $V_{ULT}$ (mph)																	
			110		115		120		130		140		150		160		170		180	
Roof 0 to 7 degrees	1	10	10.0	-	10.0	-	10.0	-	10.0	-	10.0	-	9.9	-	11.2	-	12.6	-	14.2	-35.0
	1	20	10.0	-	10.0	-	10.0	-	10.0	-	10.0	-	9.2	-	10.6	-	11.9	-	13.3	34.1
	1	50	10.0	-	10.0	-	10.0	-	10.0	-	10.0	-	8.5	-	10.0	-	10.8	-	12.2	-32.9
	1	100	10.0	-	10.0	-	10.0	-	10.0	-	10.0	-	7.8	-	10.0	-	10.0	-	11.3	-32.0
	2	10	10.0	-	10.0	-	10.0	-	10.0	-	10.0	-	9.9	-	11.2	-	12.6	-	14.2	-58.7
	2	20	10.0	-	10.0	-	10.0	-	10.0	-	10.0	-	9.2	-	10.6	-	11.9	-	13.3	-52.4
	2	50	10.0	-	10.0	-	10.0	-	10.0	-	10.0	-	8.5	-	10.0	-	10.8	-	12.2	-44.1
	2	100	10.0	-	10.0	-	10.0	-	10.0	-	10.0	-	7.8	-	10.0	-	10.0	-	11.3	-37.9
	3	10	10.0	-	10.0	-	10.0	-	10.0	-	10.0	-	9.9	-	11.2	-	12.6	-	14.2	-88.3
	3	20	10.0	-	10.0	-	10.0	-	10.0	-	10.0	-	9.2	-	10.6	-	11.9	-	13.3	-73.1
	3	50	10.0	-	10.0	-	10.0	-	10.0	-	10.0	-	8.5	-	10.0	-	10.8	-	12.2	-53.1
	3	100	10.0	-	10.0	-	10.0	-	10.0	-	10.0	-	7.8	-	10.0	-	10.0	-	11.3	-37.9

	ZONE	EFFECTIVE	ULTIMATE DESIGN WIND SPEED, $V_{ULT}$ (mph)																	
		WIND AREA (feet <sup>2</sup> )	110		115		120		130		140		150		160		170		180	
Roof > 7 to 27 degrees	1	10	10.0	-	10.0	-	10.0	-	10.5	-	12.2	-	14.0	-	15.9	-	17.9	-	20.2	-32.0
	1	20	10.0	-	10.0	-	10.0	-	10.0	-	11.1	-	12.8	-	14.5	-	16.4	-	18.4	-31.1
	1	50	10.0	-	10.0	-	10.0	-	10.0	-	10.0	-	11.1	-	12.7	-	14.3	-	16.0	-29.9
	1	100	10.0	-	10.0	-	10.0	-	10.0	-	10.0	-	9.9	-	11.2	-	12.6	-	14.2	-29.0
	2	10	10.0	-	10.0	-	10.0	-	10.5	-	12.2	-	14.0	-	15.9	-	17.9	-	20.2	-55.8
	2	20	10.0	-	10.0	-	10.0	-	10.0	-	11.1	-	12.8	-	14.5	-	16.4	-	18.4	-51.2
	2	50	10.0	-	10.0	-	10.0	-	10.0	-	10.0	-	11.1	-	12.7	-	14.3	-	16.0	-45.4
	2	100	10.0	-	10.0	-	10.0	-	10.0	-	10.0	-	9.9	-	11.2	-	12.6	-	14.2	-40.9
	3	10	10.0	-	10.0	-	10.0	-	10.5	-	12.2	-	14.0	-	15.9	-	17.9	-	20.2	-82.4
	3	20	10.0	-	10.0	-	10.0	-	10.0	-	11.1	-	12.8	-	14.5	-	16.4	-	18.4	-77.0
	3	50	10.0	-	10.0	-	10.0	-	10.0	-	10.0	-	11.1	-	12.7	-	14.3	-	16.0	-69.9
	3	100	10.0	-	10.0	-	10.0	-	10.0	-	10.0	-	9.9	-	11.2	-	12.6	-	14.2	-64.6
Roof > 27 to 45 degrees	1	10	11.9	-	13.1	-	14.2	-	16.7	-	19.4	-	22.2	-	25.3	-	28.5	-	32.0	-35.0
	1	20	11.6	-	12.7	-	13.8	-	16.2	-	18.8	-	21.6	-	24.6	-	27.7	-	31.1	-33.2
	1	50	11.2	-	12.2	-	13.3	-	15.6	-	18.1	-	20.8	-	23.6	-	26.7	-	29.9	-30.8
	1	100	10.9	-	11.9	-	12.9	-	15.1	-	17.6	-	20.2	-	22.9	-	25.9	-	29.0	-29.0
	2	10	11.9	-	13.1	-	14.2	-	16.7	-	19.4	-	22.2	-	25.3	-	28.5	-	32.0	-40.9
	2	20	11.6	-	12.7	-	13.8	-	16.2	-	18.8	-	21.6	-	24.6	-	27.7	-	31.1	-39.1
	2	50	11.2	-	12.2	-	13.3	-	15.6	-	18.1	-	20.8	-	23.6	-	26.7	-	29.9	-36.8
	2	100	10.9	-	11.9	-	12.9	-	15.1	-	17.6	-	20.2	-	22.9	-	25.9	-	29.0	-35.0
	3	10	11.9	-	13.1	-	14.2	-	16.7	-	19.4	-	22.2	-	25.3	-	28.5	-	32.0	-40.9
	3	20	11.6	-	12.7	-	13.8	-	16.2	-	18.8	-	21.6	-	24.6	-	27.7	-	31.1	-39.1
	3	50	11.2	-	12.2	-	13.3	-	15.6	-	18.1	-	20.8	-	23.6	-	26.7	-	29.9	-36.8
	3	100	10.9	-	11.9	-	12.9	-	15.1	-	17.6	-	20.2	-	22.9	-	25.9	-	29.0	-35.0
Wall	4	10	13.1	-	14.3	-	15.5	-	18.2	-	21.2	-	24.3	-	27.7	-	31.2	-	35.0	-37.9
	4	20	12.5	-	13.6	-	14.8	-	17.4	-	20.2	-	23.2	-	26.4	-	29.7	-	33.4	-36.4
	4	50	11.7	-	12.8	-	13.9	-	16.3	-	19.0	-	21.7	-	24.7	-	27.9	-	31.3	-34.3
	4	100	11.1	-	12.1	-	13.2	-	15.5	-	18.0	-	20.6	-	23.5	-	26.5	-	29.8	-32.7
	4	500	10.0	-	10.6	-	11.6	-	13.6	-	15.8	-	18.1	-	20.6	-	23.2	-	26.1	-29.0
	5	10	13.1	-	14.3	-	15.5	-	18.2	-	21.2	-	24.3	-	27.7	-	31.2	-	35.0	-46.8
	5	20	12.5	-	13.6	-	14.8	-	17.4	-	20.2	-	23.2	-	26.4	-	29.7	-	33.4	-43.7
	5	50	11.7	-	12.8	-	13.9	-	16.3	-	19.0	-	21.7	-	24.7	-	27.9	-	31.3	-39.5
	5	100	11.1	-	12.1	-	13.2	-	15.5	-	18.0	-	20.6	-	23.5	-	26.5	-	29.8	-36.4
	5	500	10.0	-	10.6	-	11.6	-	13.6	-	15.8	-	18.1	-	20.6	-	23.2	-	26.1	-29.0

For SI: 1 foot = 304.8 mm, 1 square foot = 0.0929 m<sup>2</sup>, 1 mile per hour = 0.447 m/s, 1 pound per square foot = 0.0479 kPa.

**Notes:**

- The effective wind area shall be equal to the span length multiplied by an effective width. This width shall be permitted to be not be less than one-third the span length. For cladding fasteners, the effective wind area shall not be greater than the area that is tributary to an individual fastener.
- For effective areas between those given above, the load may be interpolated; otherwise, use the load associated with the lower effective area.
- Table values shall be adjusted for height and exposure by multiplying by the adjustment coefficient in Table R301.2(3).
- See Figure R301.2(7) for location of zones.
- Plus and minus signs signify pressures acting toward and away from the building surfaces.

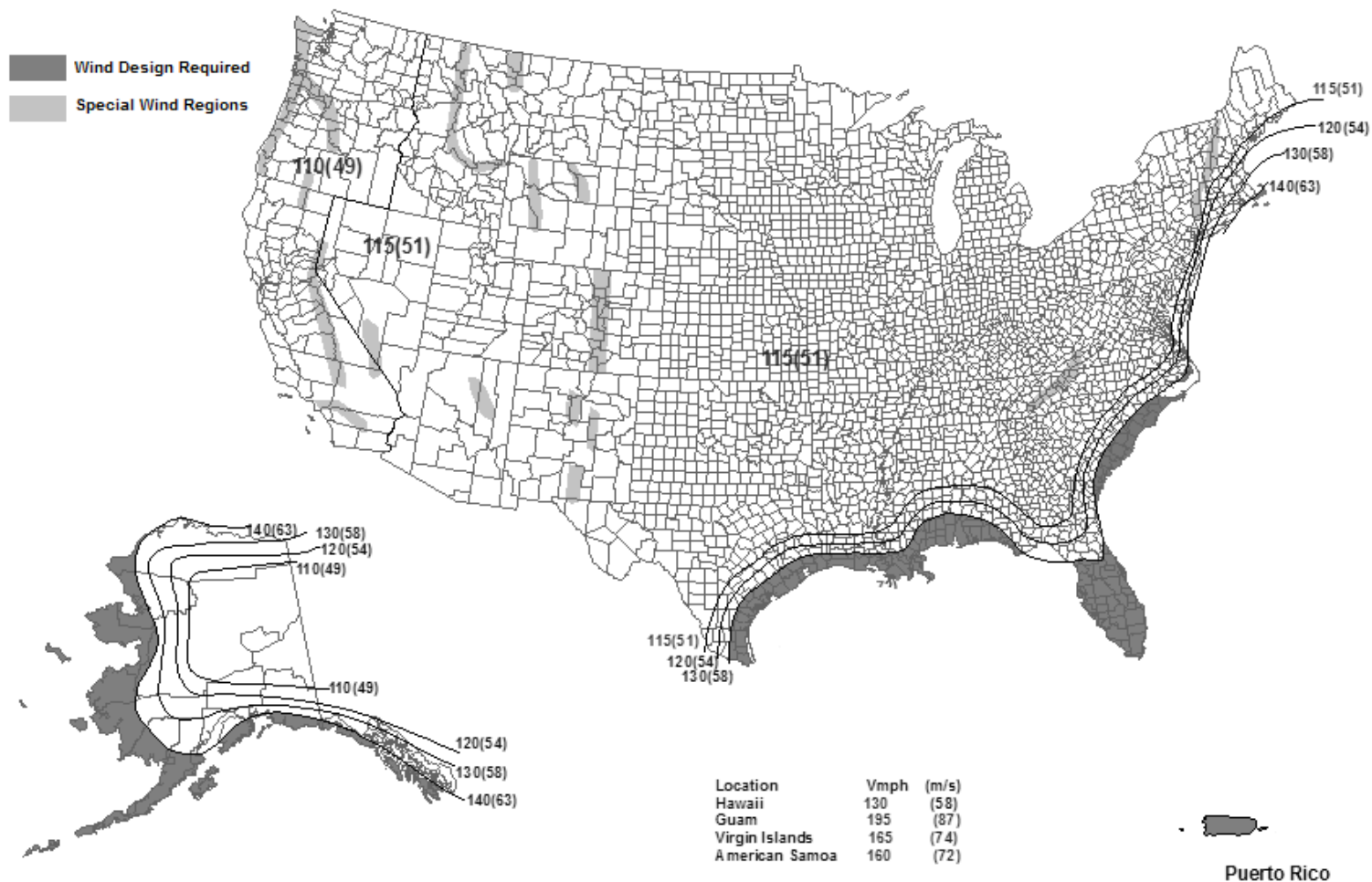


**Notes:**

1. Values are nominal design 3-second gust wind speeds in miles per hour (m/s) at 33 ft (10m) above ground for Exposure C category.
2. Linear interpolation between contours is permitted.
3. Islands and coastal areas outside the last contour shall use the last wind speed contour of the coastal area.
4. Mountainous terrain, gorges, ocean promontories, and special wind regions shall be examined for unusual wind conditions.
5. Wind speeds correspond to approximately a 7% probability of exceedance in 50 years (Annual Exceedance Probability = 0.00143, MRI = 700 Years).

**FIGURE R301.2(4)A**  
**ULTIMATE DESIGN WIND SPEEDS**



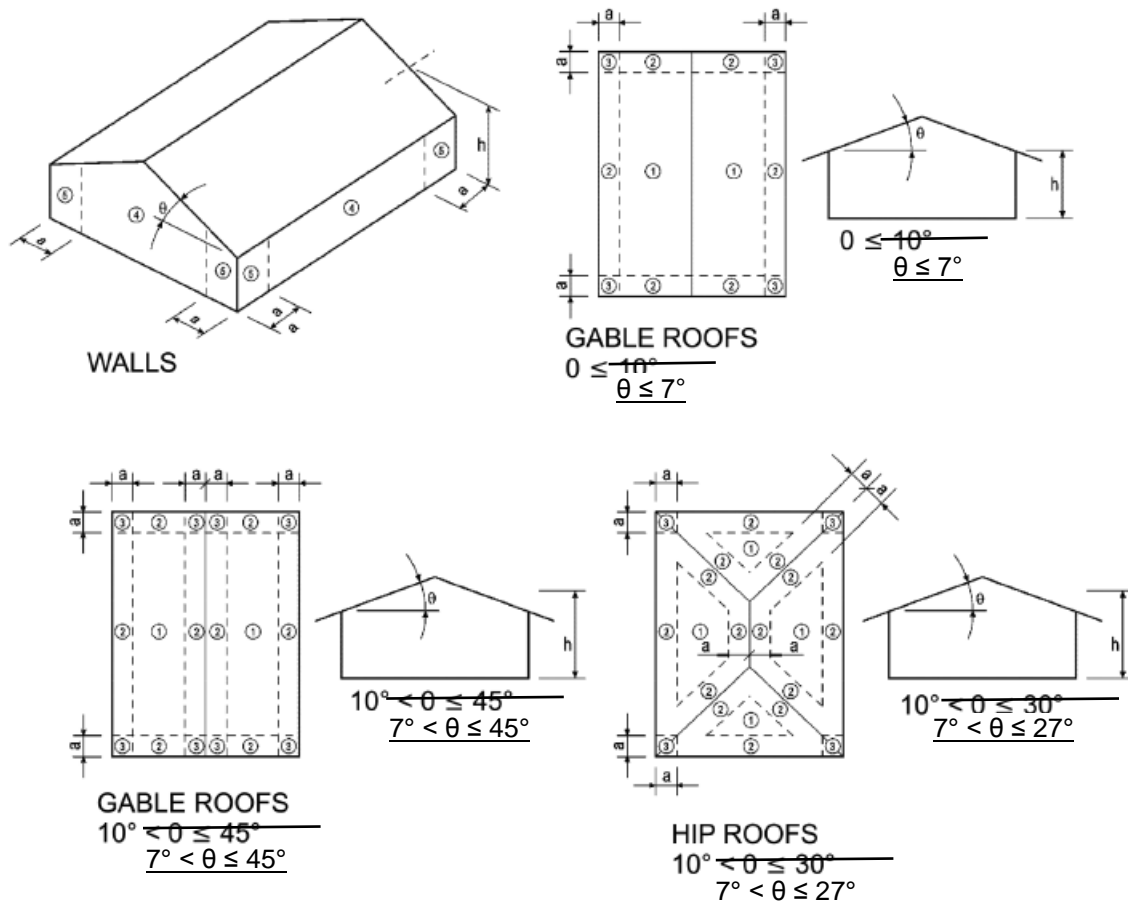


**Notes:**

1. Values are nominal design 3-second gust wind speeds in miles per hour (m/s) at 33 ft (10m) above ground for Exposure C category.
2. Linear interpolation between contours is permitted.
3. Islands and coastal areas outside the last contour shall use the last wind speed contour of the coastal area.
4. Mountainous terrain, gorges, ocean promontories, and special wind regions shall be examined for unusual wind conditions.
5. Wind speeds correspond to approximately a 7% probability of exceedance in 50 years.

**FIGURE R301.2(4)B**  
**REGIONS WHERE WIND DESIGN IS REQUIRED**





**FIGURE R301.2(7)**  
**COMPONENT AND CLADDING PRESSURE ZONES**

**TABLE R301.7**  
**ALLOWABLE DEFLECTION OF STRUCTURAL MEMBERS<sup>a, b, c, d, e</sup>**

STRUCTURAL MEMBER	ALLOWABLE DEFLECTION
Exterior walls <sup>a</sup> — wind loads <sup>a</sup> with plaster or stucco finish	H/360
Exterior walls <sup>a</sup> with other brittle finishes	H/240
Exterior walls <sup>a</sup> with flexible finishes	H/120 <sup>d</sup>
Lintels supporting masonry veneer walls <sup>e</sup>	L/600

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

a. The wind load shall be permitted to be taken as 0.7 times the Component and Cladding (ASD) loads obtained from Table R301.2(2) for the purpose of determining deflection limits herein.

(Footnotes not shown to remain unchanged.)

**Reason:** The purpose of this code change is to bring the wind provisions of the IRC in line with the 2012 IBC and ASCE 7-10. As a result of the schedule changes implemented during the 2009-2010 ICC code development cycle changes, there was not sufficient time to revise the IRC to fully implement the new ultimate wind speed basis of ASCE 7-10 and the 2012 IBC, due to the extent of prescriptive IRC provisions and tables which are directly related to basic wind speed.. New maps based on the ASCE 7-10 ultimate wind speed data but converted back down to nominal (ASD) basis were provided in the IRC. This has led to a fair amount of confusion among those stakeholders who work with both codes.

A working group of stakeholders including NAHB, the major material associations, ASCE, and the Insurance Institute for Business and Home Safety developed a series of IRC proposals to implement the new ultimate wind speed basis. This proposal updates the Chapter 3 design criteria, including definitions, a new ultimate wind speed map, a new map of the regions where special high-wind design is required, a conversion table to the nominal (ASD) wind speed basis for use with those standards which have not updated their provisions, and a revised table of component and cladding pressures.

It is noted the component and cladding pressure table is set up using the ultimate design wind speed, but reports pressures at an ASD level. That is, the listed pressures incorporate the 0.6 multiplier on wind loads per the allowable stress design load combinations shown in Section 1605.3 of the *International Building Code* and Section 2.3.2 of ASCE 7-10. This is done here and throughout this series of proposals to allow for easy adaptation of existing stock designs, construction documents and guidelines to the 2015 IRC, as the loads and pressures will be comparable to previous editions of the IRC for most sites.

The region in revised Figure R301.2(4)B where the use of alternate prescriptive high-wind standards or engineered design is required is defined using the 130mph contour along the Gulf Coast and along the southern portions of the Atlantic coast from Florida up to North Carolina. The 140mph contour is used for the northern portions of the Atlantic coast from Virginia up to Maine, and for Alaska. A 130mph trigger is also used for the assorted Caribbean and Pacific islands that are also considered part of the "hurricane-prone" region. This creates a region that approximately equals the region defined by the 110mph contour under the wind map used in the 2000 through 2009 IRC, maintains areas of Florida and the Gulf Coast traditionally outside of the prescriptive limits of the IRC, and maintains areas of New England traditionally included within the prescriptive limits of the IRC.

Code users desiring a more accurate determination in areas near or along a particular contour (or in general) can make use of the Applied Technology Council's Windspeed by Location web site (<http://www.atcouncil.org/windspeed/>) to obtain site-specific wind speeds using latitude/longitude or site address. This site was developed by ATC using the same data used to develop the wind maps for ASCE 7, the IBC and the IRC. As the site is not a reference standard or maintained by a government agency, we could not make a direct reference in the code figures. However, we include mention of the Windspeed by Location web site here to draw code users' attention to its existence and in hopes that mention of the web site could become part of the IRC Commentary.

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

**R301.2.1-RB-EHRLICH**

### **Committee Action Hearing Results**

The code change is contained in the [Updates to the 2013 Proposed Changes](http://www.iccsafe.org/cs/codes/Documents/2012-2014Cycle/Proposed-B/00-CompleteGroupB-MonographUpdates.pdf) posted on the ICC website. Please go to <http://www.iccsafe.org/cs/codes/Documents/2012-2014Cycle/Proposed-B/00-CompleteGroupB-MonographUpdates.pdf> for more information.

**Committee Action:**

**Approved as Submitted**

**Committee Reason:** The committee approved this proposed code change because they felt that it creates consistency between the International Codes and ASCE 7.

**Assembly Action:**

**None**

### **Individual Consideration Agenda**

**This item is on the agenda for individual consideration because public comments were submitted.**

*Public Comment 1:*

**Gary J Ehrlich, P.E., representing National Association of Home Builders (NAHB); Joseph D. Belcher, JDB Code Services Inc., representing the International Hurricane Protection Association, requests Approval as Modified by this Public Comment.**

**Modify the proposal as follows:**

**R301.2.1.2.1 Application of ASTM E 1996.** The text of Section 2.2 of ASTM E 1996 shall be substituted as follows:

*2.2 ASCE Standard:*

ASCE 7-10 American Society of Civil Engineers Minimum Design Loads for Buildings and Other Structures

The text of Section 6.2.2 of ASTM E 1996 shall be substituted as follows:

6.2.2 Unless otherwise specified, select the wind zone based on the ~~ultimate strength~~ design wind speed,  $V_{ult}$ , as follows:

6.2.2.1 *Wind Zone 1*—130 mph  $\leq$  ultimate design wind speed,  $V < 140$  mph.

6.2.2.2 *Wind Zone 2*—140 mph  $\leq$  ultimate design wind speed,  $V^{ult} < 150$  mph at greater than one mile (1.6 km) from the coastline. The coastline shall be measured from the mean high water mark.

6.2.2.3 *Wind Zone 3*—150 mph (58 m/s)  $\leq$  ultimate design wind speed,  $V \leq 170$ –160 mph (76.63 m/s), or 140 mph (54 m/s)  $\leq$  ultimate design wind speed,  $V \leq 170$ –160 mph (76.63 m/s) and within one mile (1.6 km) of the coastline. The coastline shall be measured from the mean high water mark.

6.2.2.4 *Wind Zone 4*—ultimate design wind speed,  $V > 170$ –160 mph (63 m/s).

*(Portions of proposal not shown to remain unchanged)*

**Commenter's Reason:** The purpose of this public comment is to amend the definition for Wind Zone 4 in ASTM E1996. The original intent of Wind Zone 4 was to address higher requirements for impact-resistant glazing and impact-resistive systems in Miami-Dade County only. When similar language was added to the IBC last cycle to amend ASTM E1996 to work with ultimate design wind speeds, a direct conversion of the previous trigger was made. It was not realized until Florida was in the process of adopting the 2012 IBC that this had the effect of extending Wind Zone 4 north into Broward, Palm Beach, Martin and St. Lucie counties where it had not previously applied and was not intended to apply. The result is a potential increase of \$2424 to \$4248 for wind-borne debris protection of residential buildings in those counties.

The Florida Building Code was amended to correct the inadvertent extension of Wind Zone 4. The IHPA attempted a floor modification at the Committee Action Hearing which NAHB was prepared to support, but was ruled out of order by the moderator. This public comment advances the proposed modification and fixes the unintended consequences of the original ASTM E1996 amendment.

One editorial change is also made to correct "strength design wind speed" to "ultimate design wind speed" to correlate with the remainder of the IRC wind update proposals.

## *Public Comment 2:*

**Gary J Ehrlich, P.E., representing National Association of Home Builders (NAHB), requests Approval as Modified by this Public Comment.**

**Modify the proposal as follows:**

**R301.2.1.4 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. For a site located in the transition zone between categories, the category resulting in the largest wind forces shall apply. Account shall be taken of variations in ground surface roughness that arise from natural topography and vegetation as well as from constructed features. For a site where multiple detached one- and two-family dwellings, townhouses or other structures are to be constructed as part of a subdivision, master-planned community, or otherwise designated as a developed area by the authority having jurisdiction, the exposure category for an individual structure shall be based upon the site conditions that will exist at the time when all adjacent structures on the site have been constructed, provided their construction is expected to begin within one year of the start of construction for the structure for which the exposure category is determined. For any given wind direction, the exposure in which a specific building or other structure is sited shall be assessed as being one of the following categories:

1. Exposure B. Urban and suburban areas, wooded areas, or other terrain with numerous closely spaced obstructions having the size of single-family dwellings or larger. Exposure B shall be assumed unless the site meets the definition of another type exposure.
2. Exposure C. Open terrain with scattered obstructions, including surface undulations or other irregularities, having heights generally less than 30 feet (9144 mm) extending more than 1,500 feet (457 m) from the building site in any quadrant. This exposure shall also apply to any building located within Exposure B type terrain where the building is directly adjacent to open areas of Exposure C type terrain in any quadrant for a distance of more than 600 feet (183 m). This category includes flat, open country and grasslands.
3. Exposure D. Flat, unobstructed areas exposed to wind flowing over open water, smooth mud flats, salt flats or unbroken ice for a distance of at least 5000 feet (1,524 m). This exposure shall also apply only to any these buildings located within Exposure B or C type terrain where the site is within and other structures exposed to the wind coming from over the water. Exposure D extends inland from the shoreline a distance of 600 feet (183 m) or 20 times the height of the building or structure, whichever is greater from an Exposure D condition. ~~This category includes smooth mud flats, salt flats and unbroken ice.~~

*(Portions of proposal not shown to remain unchanged)*

**Commenter's Reason:** The purpose of this public comment is to better correlate the definition of Exposure D with ASCE 7-10. The language proposed here is similar in concept to language proposed by SEAOC in RB45, but with better clarity. NAHB had worked with SEAOC to develop this language as a floor modification to RB39, but the modification was ruled out of order. A correlating public comment has been submitted for disapproval of RB45 if this public comment is approved.

*Public Comment 3:*

**Gary J Ehrlich, P.E., representing National Association of Home Builders (NAHB), requests Approval as Modified by this Public Comment.**

Modify the proposal as follows:

**TABLE R301.2.1.5.1  
BASIC ULTIMATE DESIGN WIND SPEED MODIFICATION FOR TOPOGRAPHIC WIND EFFECT<sup>a</sup>**

BASIC ULTIMATE DESIGN WIND SPEED FROM FIGURE R301.2(4)	AVERAGE SLOPE OF THE TOP HALF OF HILL, RIDGE OR ESCARPMENT (percent)						
	0.10	0.125	0.15	0.175	0.20	0.23	0.25
	Required <u>Ultimate Design</u> Basic Wind Speed, Modified for Topographic Wind Speed-Up (rounded)						
110	132	137	142	147	152	158	162
115	138	143	148	154	159	165	169
120	144	149	155	160	166	172	176
130	156	162	168	174	179	N/A	N/A
140	168	174	181	N/A	N/A	N/A	N/A
150	180	N/A	N/A	N/A	N/A	N/A	N/A

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

**TABLE R301.7  
ALLOWABLE DEFLECTION OF STRUCTURAL MEMBERS<sup>a, b, c, d, e</sup>**

STRUCTURAL MEMBER	ALLOWABLE DEFLECTION
Exterior walls - <u>wind loads</u> <sup>a</sup> with plaster or stucco finish	H/360
Exterior walls - <u>wind loads</u> <sup>a</sup> with other brittle finishes	H/240
Exterior walls - <u>wind loads</u> <sup>a</sup> with flexible finishes	H/120 <sup>d</sup>
Lintels supporting masonry veneer walls <sup>e</sup>	L/600

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

- a. The wind load shall be permitted to be taken as 0.7 times the Component and Cladding (ASD) loads obtained from Table R301.2(2) for the purpose of determining deflection limits herein.  
b. (No changes)  
c. (No changes)  
d. (No changes)  
e. (No changes)

*(Portions of proposal not shown to remain unchanged)*

**Commenter's Reason:** The purpose of this public comment is to insure the comprehensive Chapter 3 wind update is internally consistent with terminology and to correlate RB39 with other proposals.

In developing RB39, the wind speeds in Table R301.2.1.5.1, which provides simplified adjustments to wind speed for topographic effects, were updated to the new ultimate design wind speed basis. However, the term "basic wind speed" in the table was not changed to "ultimate design wind speed" as is done throughout the rest of the wind update (and in the 2012 IBC). This public comment picks up the change in terminology. A new footnote is also provided to clarify when the topographic wind effects make the site a "wind design required" region where use of the alternate standards (ICC-600, WFCM, AISI 230, etc.) are required.

The change to table R301.7 correlates RB39 with RB62, both of which were approved by the IRC Building Committee. As it stands, the committee actions would result in "wind loads" being deleted from the first exterior wall condition (plaster or stucco finish) but added to the other two conditions (brittle finishes and flexible finishes). This change will correlate the two proposals by insuring the "wind loads" language appears for all three conditions

*Public Comment 4:*

**Bonnie Manley, American Iron and Steel Institute, requests Approval as Modified by this Public Comment.**

Modify the proposal as follows:

**R301.2.1.3 Wind speed conversion.** When referenced documents are based on nominal design wind speeds and do not provide the means for conversion between the ultimate design wind speeds and the nominal design wind speeds, the ultimate design wind speeds,  $V_{ult}$ , of Figure R301.2(4)A shall be converted to nominal design wind speeds,  $V_{asd}$  using Table R301.2.1.3.

(Portions of proposal not shown to remain unchanged)

**Commenter's Reason:** The purpose of this comment is to ensure that the conversion table, Table R301.2.1.3, does not override Table A1-3 of AISI S230-07 w/S3-12, as follows:

**Table A1-3**  
**Conversion of ASCE 7 Basic Wind Speeds to AISI S230 Basic Wind Speeds (mph)<sup>1</sup>**

ASCE 7 Basic Wind Speed	110	115	126	139	152	164	177	190
AISI S230 Basic Wind Speed	85	90	100	110	120	130	140	150

<sup>1</sup> ASCE 7 permits linear interpolation between the contours of the basic wind speed maps.

This table is based upon ASCE 7-10 Table C26.5-6 and provides a direct conversion between the wind speeds, where  $V_{ult}$  is effectively listed as the row titled "ASCE 7 Basic Wind Speed" and  $V_{asd}$  is effectively listed as the row titled "AISI S230 Basic Wind Speed." This differs slightly from the conversion incorporated into Proposal RB39. However, for the purposes of cold-formed steel framing, it is important that the conversion process remains consistent between the IRC and AISI S230. Therefore, it is necessary to introduce a qualifier to the charging language in section R301.2.1.3 that recognizes that reference documents may include conversion tables of their own.

### Public Comment 5:

**Bonnie Manley, American Iron and Steel Institute, requests Approval as Modified by this Public Comment.**

Modify the proposal as follows:

**R301.2.1.1 Wind limitations and wind design required.** The wind provisions of this code shall not apply to the design of buildings where wind design is required in accordance with Figure R301.2(4)B.

#### Exceptions:

1. For concrete construction, the wind provisions of this code shall apply in accordance with the limitations of Sections R404 and R611.
2. For structural insulated panels, the wind provisions of this code shall apply in accordance with the limitations of Section R613.
3. For cold-formed steel light frame construction, the wind provisions of this code shall apply in accordance with the limitations of Sections R505, R603 and R804.

In regions where wind design is required in accordance with Figure R301.2(4)B, the design of buildings for wind loads shall be in accordance with one or more of the following methods:

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

The elements of design not addressed by the methods in Items 1 through 5 shall be in accordance with the provisions of this code. When ASCE 7 or the International Building Code is used for the design of the building, the wind speed map and exposure category requirements as specified in ASCE 7 and the International Building Code shall be used.

(Portions of proposal not shown to remain unchanged)

**Commenter's Reason:** The purpose of this comment is to ensure that the IRC wind design applicability limits for cold-formed steel light frame construction remain consistent with AISI S230-07 w/S3-12. AISI developed AISI S230-07 w/S3-12 to allow the 2007 edition of AISI S230 to be used in conjunction with the 2010 edition of ASCE 7. AISI S230-07 w/S3-13 incorporates the following conversion table:

**Table A1-3**  
**Conversion of ASCE 7 Basic Wind Speeds to AISI S230 Basic Wind Speeds (mph)<sup>1</sup>**

ASCE 7 Basic Wind Speed	110	115	126	139	152	164	177	190
AISI S230 Basic Wind Speed	85	90	100	110	120	130	140	150

<sup>1</sup> ASCE 7 permits linear interpolation between the contours of the basic wind speed maps.

This table is based upon ASCE 7-10 Table C26.5-6 and provides a direct conversion between the wind speeds, which differs slightly from the conversion incorporated into Proposal RB39. Specifically, AISI has chosen to convert the ASCE 7-05 design wind speed ("AISI S230 Basic Wind Speed" in Table A1-3) of 110 mph to 139 mph instead of 140 mph. Since this particular wind speed is often a trigger for additional requirements, it is important that it remains consistent throughout the IRC – in Sections R301, R505, R603 and R804 – and AISI S230. Therefore, it is necessary to introduce an exception to Section R301.2.1.1 for cold-formed steel light frame construction similar to the ones in place for concrete and structural insulated panels.

**RB39-13**

Final Action:	AS	AM	AMPC_____	D
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