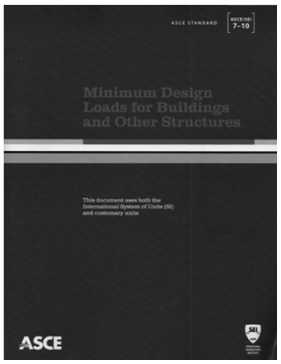
Advanced FBC: Changes to the Wind Load Provisions of the 2010 Florida Building Code and ASCE 7-10

presented by

T. Eric Stafford
T. Eric Stafford & Associates, LLC



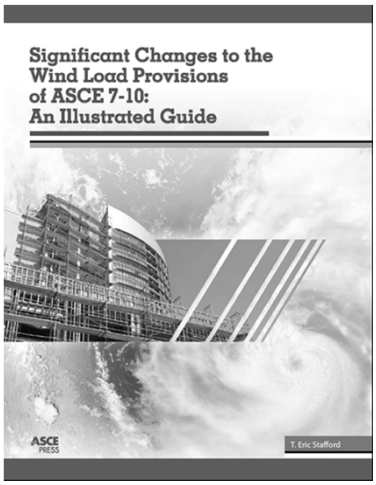
ASCE 7-10

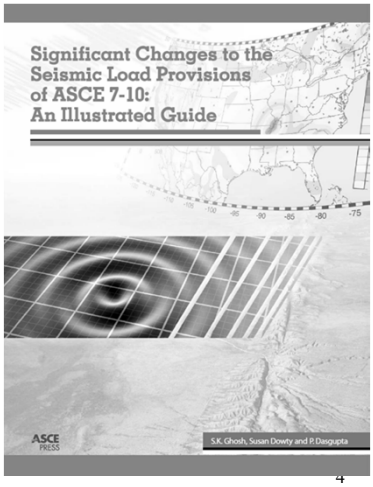
- **Available May 2010**
- **Most comprehensive update to wind load provisions since ASCE 7-98**
- **Referenced in the 2012 IBC and the 2012 IRC**
- **Referenced in the 2010 Florida Building Codes (Primary references in the Building and Residential Codes)**

2010 Florida Building Codes

- **Glitch Amendments to be incorporated in First Printing of Codes**
- **Codes available December 2011**
- **Effective Date – March 15, 2012**

ASCE 7-10





ASCE 7-10 Wind Provisions

- **Topics Discussed**
  - **Reorganization**
  - **New wind speed maps**
  - **Exposure Categories**
  - **Wind-borne Debris**
  - **Rooftop Structures**
  - **2010 Florida Building Code, Building**
  - **2010 Florida Building Code, Residential**

ASCE 7-10 Reorganization

- **ASCE 7-05: Chapter 6 contains all wind provisions**
- **ASCE 7-10:**
  - **6 new Chapters (Chapters 26-31)**
  - **Step by step design procedure provided at the beginning of each method**
  - **Intent is to clarify the applicability of the wind provisions**

ASCE 7-10 Reorganization

- **Chapter 26 – General Requirements**
  - **Scoping**
  - **Definitions**
  - **Wind speed map**
  - **Exposure**
  - **Gust factor**
  - **Topographic factor**

ASCE 7-10 Reorganization

- **Chapter 27 – MWFRS Directional Procedure**
  - **Buildings of all heights method**
  - **New simplified method for buildings with h ≤ 160 ft**

ASCE 7-10 Reorganization

- **Chapter 28 – MWFRS Envelope Procedure**
  - **Low-rise buildings method**
  - **Simplified method for simple diaphragm buildings**

ASCE 7-10 Reorganization

- **Chapter 29 – MWFRS Other Structures and Appurtenances**
  - **Signs**
  - **Rooftop structures**
  - **Other structures**

ASCE 7-10 Reorganization

- **Chapter 30 – Components and Cladding**
  - **Analytical method for h ≤ 60 ft**
  - **Simplified method for h ≤ 60 ft**
  - **Analytical method for h > 60 ft**
  - **Simplified method for h ≤ 160 ft**
  - **Analytical method for free roofs**
  - **Building appurtenances**

ASCE 7-10 Reorganization

- **Chapter 31 – Wind Tunnel Procedure**

ASCE 7-10 Reorganization

- **Each chapter further subdivided into Parts for example**
- **Chapter 27 Part 1**

PART 1: ENCLOSED, PARTIALLY ENCLOSED, AND OPEN BUILDINGS OF ALL HEIGHTS

- **Chapter 27 Part 2**

PART 2: ENCLOSED SIMPLE DIAPHRAGM BUILDINGS WITH $h \leq 160$ ft (48.8 m)

13

ASCE 7-10 Reorganization

- **How to find provisions in ASCE 7-10 using ASCE 7-05 as the basis.**
- **Significant Changes to Wind Load Provisions contains a crosswalk table.**

14

Excerpt

ASCE 7-05 Section	ASCE 7-10 Section
Text	
6.1 General	26.1 Procedures
6.1.1 Scope	26.1.1 Scope
6.1.2 Allowed Procedures	26.1.2 Procedures
6.1.3 Wind Pressures Acting on Opposite Faces of Each Building Surface	26.4.3 Wind Pressures Acting on Opposite Faces of Each Building Surface
-	26.1.2.1 Main Wind Force Resisting System (MWFRS)
-	26.1.2.2 Components and Cladding
6.1.4 Minimum Design Wind Loading	-
6.1.4.1 Main Wind-Force Resisting System	27.4.7 Minimum Design Wind Loads
	28.4.4 Minimum Design Wind Loading
	29.8 Minimum Design Wind Loading
6.1.4.2 Components and Cladding	30.2.2 Minimum Design Wind Pressures
6.2 Definitions	26.2 Definitions
6.3 Symbols and Notations	26.3 Symbols and Notations
6.4 Method 1-Simplified Procedure	Chapter 28 Part 2: Enclosed Simple Diaphragm Low-Rise Buildings
	28.6 Wind Loads-Main Wind-Force Resisting System
	Chapter 30 Part 2: Low-rise Buildings (Simplified)

ASCE 7-10 Reorganization

- **Each method/part also is provided with a tabular step-by-step design procedure**

Table 28.2-1 Steps to Determine Wind Loads on MWFRS Low-Rise Buildings

Step 1: Determine risk category of building or other structure, see Table 1.5-1

Step 2: Determine the basic wind speed, V, for applicable risk category, see Fig. 26.5-1A, B or C

Step 3: Determine wind load parameters:
- Wind directionality factor, K_d, see Section 26.6 and Table 26.6-1
- Exposure category B, C or D, see Section 26.7
- Topographic factor, K_{zt}, see Section 26.8 and Fig. 26.8-1
- Enclosure classification, see Section 26.10
- Internal pressure coefficient, (GC_{pi}), see Section 26.11 and Table 26.11-1

Step 4: Determine velocity pressure exposure coefficient, K_z or K_h, see Table 28.3-1

Step 5: Determine velocity pressure, q_z or q_h, Eq. 28.3-1

Step 6: Determine external pressure coefficient, (GC_p), using Fig. 28.4-1 for flat and gable roofs.

User Note: See Commentary Fig. C28.4-1 for guidance on hip roofs.

Step 7: Calculate wind pressure, p, from Eq. 28.4-1

Table 28.2-1 Steps to Determine Wind Loads on MWFRS Low-Rise Buildings

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Step 2: Determine the basic wind speed, V, for applicable risk category, see Fig. 26.5-1A, B or C

Step 3: Determine wind load parameters:
- Wind directionality factor, K_d, see Section 26.6 and Table 26.6-1
- Exposure category B, C or D, see Section 26.7
- Topographic factor, K_{zt}, see Section 26.8 and Fig. 26.8-1
- Enclosure classification, see Section 26.10
- Internal pressure coefficient, (GC_{pi}), see Section 26.11 and Table 26.11-1

ASCE 7-10 Reorganization

- **Procedures for determining wind loads have not changed**
- **Presentation of wind load design procedures have changed**

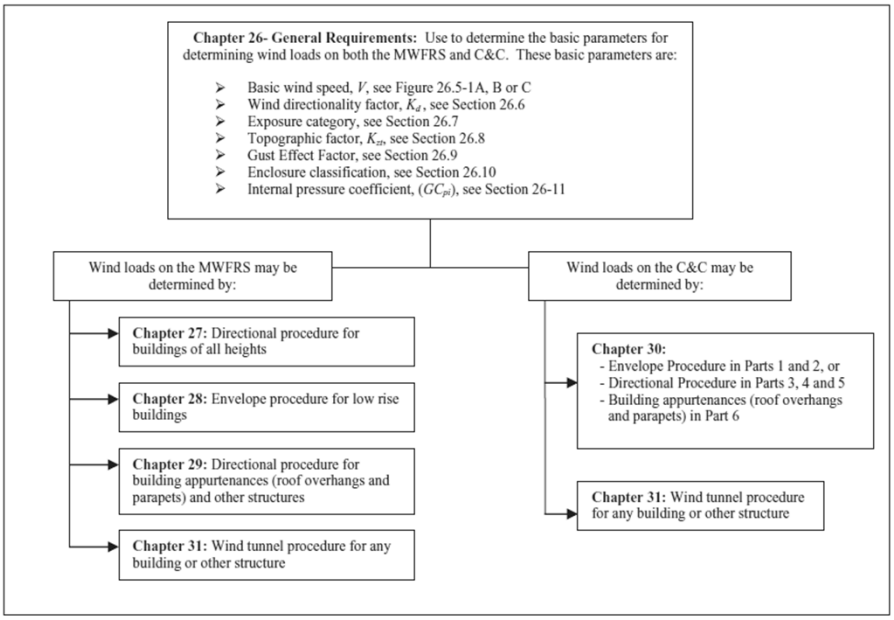


FIGURE 26.1-1 Outline of Process for Determining Wind Loads. Additional outlines and User Notes are provided at the beginning of each chapter for more detailed step-by-step procedures for determining the wind loads.

ASCE 7-10
Basic Wind Speeds

- **Basic wind speeds didn't changed at all from ASCE 7-98 through ASCE 7-05**
- **3-sec gust wind speeds introduced in ASCE 7-95 to replace fastest-mile wind speeds**
- **Minor adjustments between ASCE 7-95 and ASCE 7-98**

ASCE 7-10
Basic Wind Speeds

- **3 new maps**
  - **Risk Category II (700 year return period)**
  - **Risk category III and IV (1700 year return period)**
  - **Risk Category I (300 year return period)**
- **Strength design-based or "Ultimate" wind speeds**
- **Risk Category replaces the term Occupancy Category**

ASCE 7-10
Basic Wind Speeds

- **In most of the non-hurricane US mainland, the mapped values are exactly a 50 year mean recurrence interval**
- **In hurricane regions, the mapped values vary from 50 to 100 years along the hurricane coastline**
- **Wind speeds along the hurricane coastline have been adjusted upward so that when incorporated with the wind LF, produce a wind load having a consistent hazard level with the interior US (700 MRI)**

Risk Category II

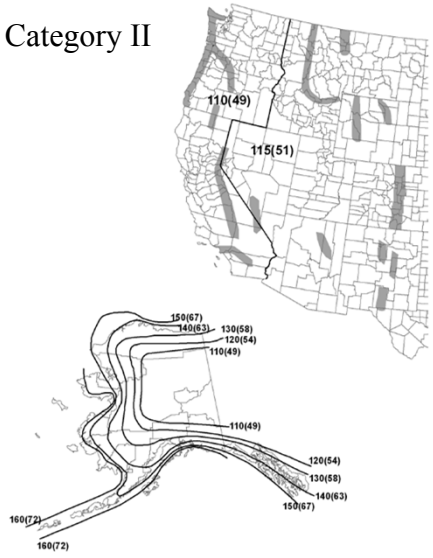
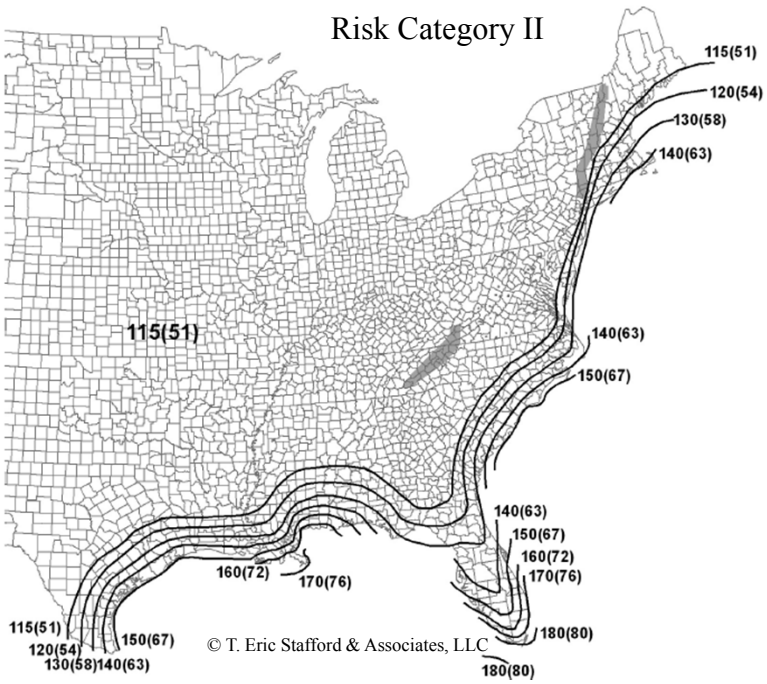


Figure 26.5-1A Basic Wind Speeds for Occupancy Category II Buildings and Other Structures.

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).



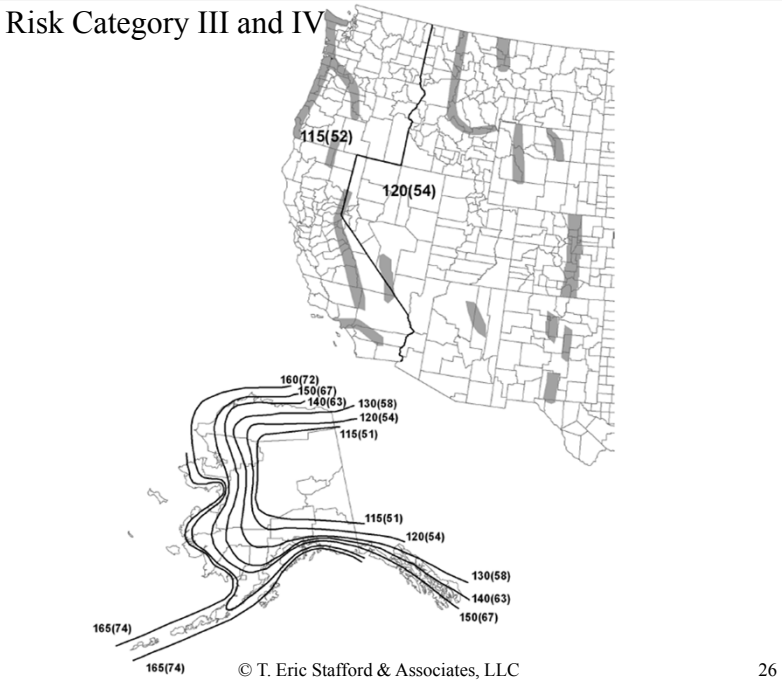
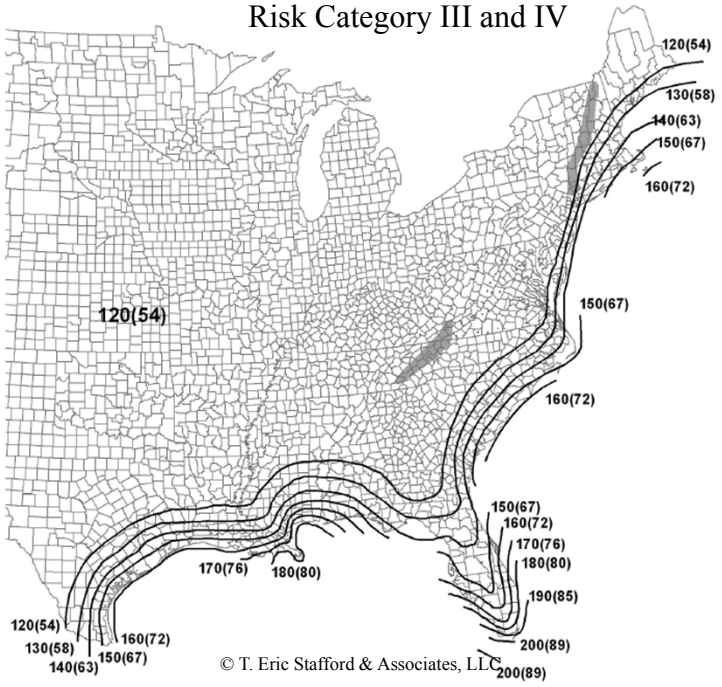


Figure 26.5-1B Basic Wind Speeds for Occupancy Category III and IV Buildings and Other Structures.

Risk Category III and IV



Risk Category I

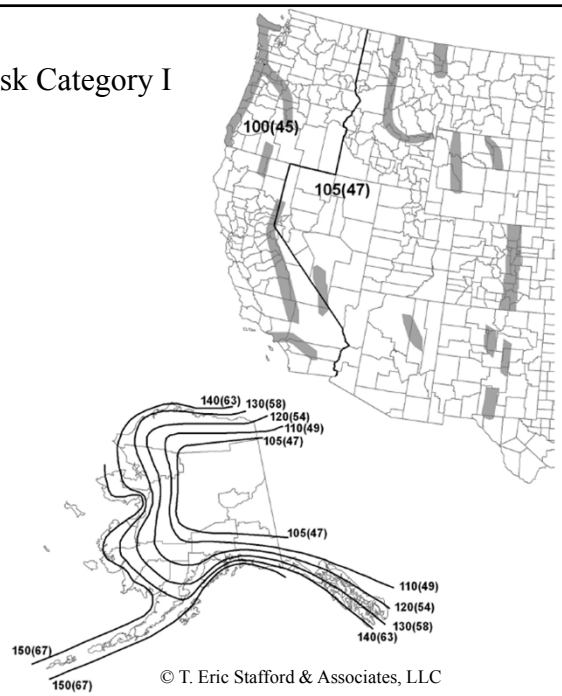
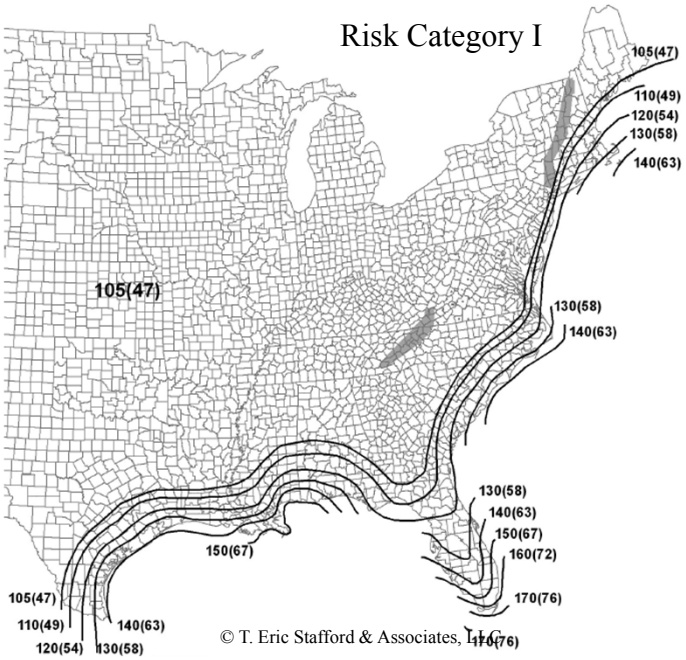


Figure 26.5-1C Basic Wind Speeds for Occupancy Category I Buildings and Other Structures.



ASCE 7-10
Basic Wind Speeds

- **Implications**
  - **Net wind loads are decreasing**
- **New data suggests ASCE 7-05 wind speeds are conservative**

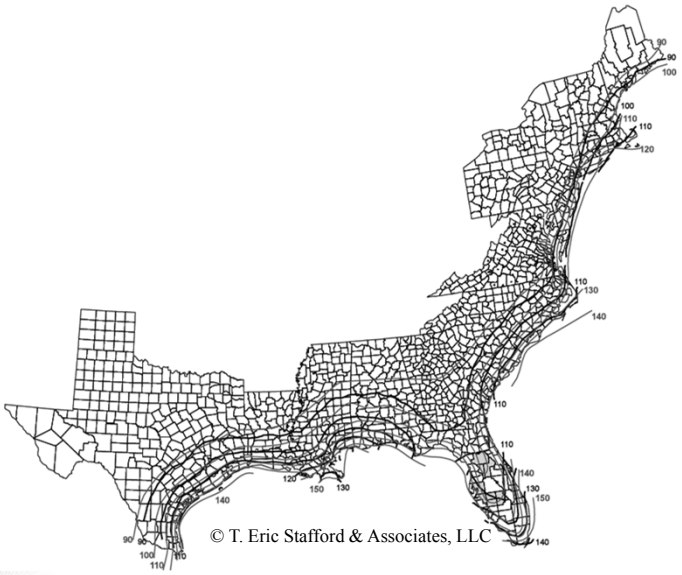
ASCE 7-10 Wind Speeds

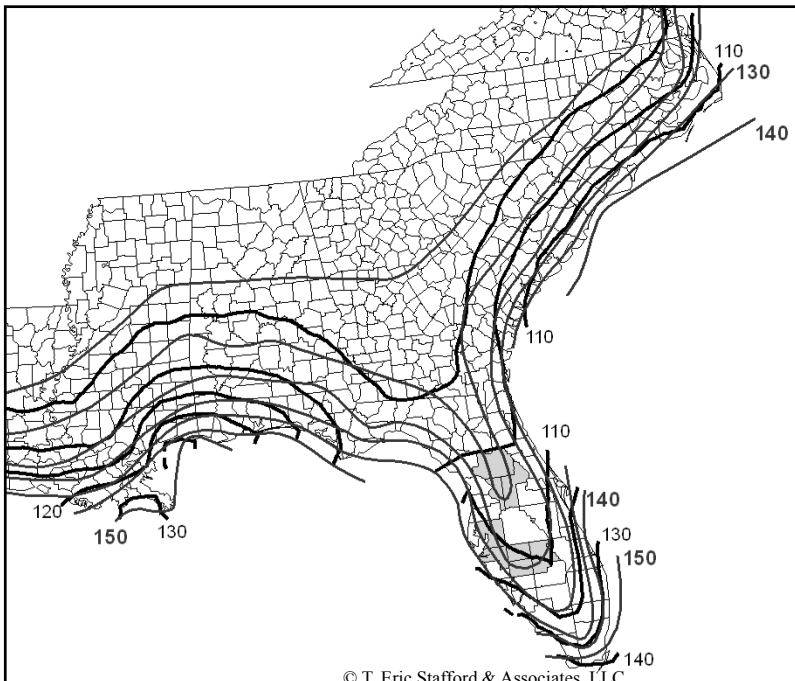
- **Why lower wind speeds?**
- **New model produces more intense hurricanes making landfall than the old model but results in lower wind speeds**
- **Lower winds associated with the new model for the Holland B parameter.**
- **Holland B controls the wind-pressure relationship**
- **Paper describing the statistical model for *B* published in the Journal of Applied Meteorology in 2008.**

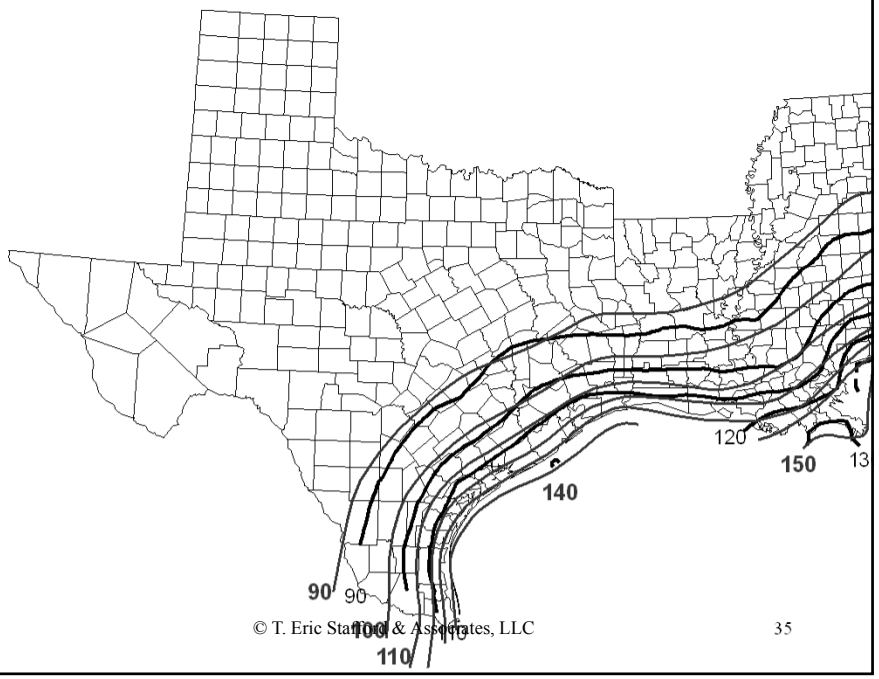
Additional Data in New Model

Parameter	2000 Model	Current Model	Increase
Number of full scale wind speed traces (with maximum wind recorded) used to validate windfield model	63	245	390%
Number of dropsonde profiles used to verify marine boundary layer model	0	650	
Number of hurricanes used to develop Holland *B* model	17	35	100%
Number of landfall hurricanes	167	189	13%
Number of landfall intense hurricanes (defined by pressure)	70	84	20%
Number of hurricanes used to develop filling model	38	57	68%
Number of years of landfall data used to develop model	96	107	11%

Comparison of ($V_{700}/\sqrt{1.6}$) to ASCE 7-05 Wind Speeds







Design Pressure Comparisons

City	V ASCE 7-05/2007 FBC	V ASCE 7-10 (est.)	Percent Difference in Comparable Design Pressures	
			Exp B Inland	Exp D[2,3] Coastal
Pensacola	140	155	-27%	-12%
Tampa	123	145	-17%	0%
Orlando	110	135	-10%	NA
Miami-Dade[1]	146	175	-14%[1]	+3%
Broward[1]	140	170	-12%[1]	+6%
Tallahassee	110	118	-31%	NA
Gainesville	100	125	-7%	NA
Jacksonville	120	125	-35%	-22%

ASCE 7-10
Basic Wind Speeds

- **Strength Design Load Factor = 1.0**
- **Allowable Stress Design – multiply W x 0.6**
- **Use of different maps for different Risk Categories negates the need for Importance Factors**
  - **"*I*" deleted from wind chapters**

ASCE 7-10
Basic Wind Speeds

TABLE C26.5-6
Design Wind Speeds: ASCE 7-93 to ASCE 7-10

ASCE 7-05 Design Wind Speed (3-sec gust in mph)	*ASCE 7-10 Design Wind Speed (3-sec gust in mph)*	*ASCE 7-93 Design Wind Speed (fastest mile in mph)*
85	110*	71
90	115*	76
100	126	85
105	133	90
110	139	95
120	152	104
130	164	114
140	177	123
145	183	128
150	190	133
170	215	152

* Wind speed values of 110 mph and 115 mph were rounded from the "exact" conversions of $85\sqrt{1.6}$ = 108 and $90\sqrt{1.6}$ = 114 mph, respectively.

ASCE 7-10
Exposure Categories

- **Determination of Exposure Categories is a two step process**
  - **Evaluate Surface Roughness Type**
  - **Determine Exposure Category based on type and amount of surface roughness**
- **Wind direction and sectors**
  - **Exposure of building to be determined for the two upwind sectors extending 45 degrees either side of selected wind direction.**

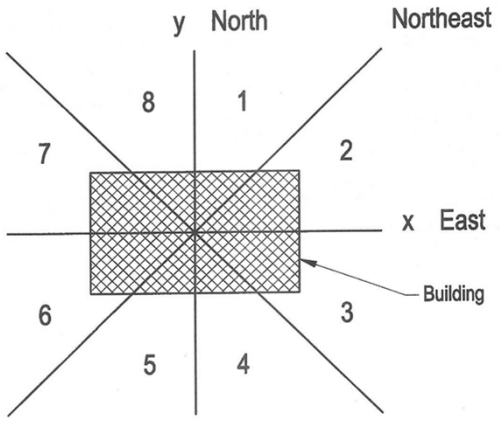
ASCE 7-10
Exposure Categories

26.7.1 Wind Directions and Sectors

For each selected wind direction at which the wind loads are to be determined, the exposure of the building or structure shall be determined for the two upwind sectors extending 45° either side of the selected wind direction. The exposure in these two sectors shall be determined in accordance with Sections 26.7.2 and 26.7.3, and the exposure whose use would result in the highest wind loads shall be used to represent the winds from that direction.

ASCE 7-10
Exposure Categories

Surface Roughness
Directions



ASCE 7-10
Surface Roughness B

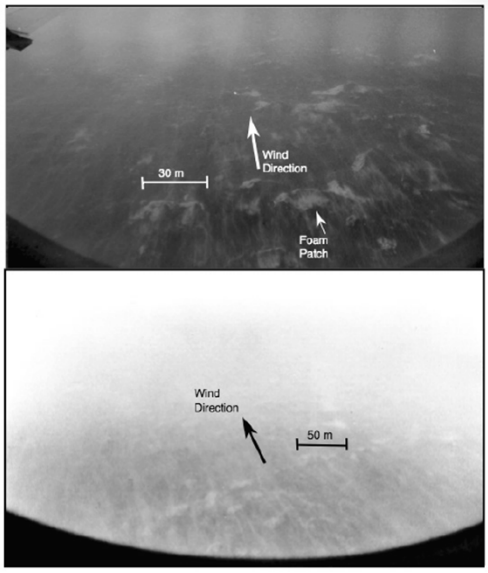
Surface Roughness B: Urban and suburban areas, wooded areas, or other terrain with numerous closely spaced obstructions having the size of single-family dwellings or larger.

ASCE 7-10
Surface Roughness C and D

- **Older research and modeling suggested roughness increased with increase in wind speed**
- **Hence ASCE 7-98, -02, and -05 classified water surfaces in hurricane-prone regions as Exposure C**

ASCE 7-10
Surface Roughness C and D

- **New research suggests otherwise**
- **Roughness of ocean does not continue to increase with increasing wind speed.**



Courtesy M. D. Powell, NOAA

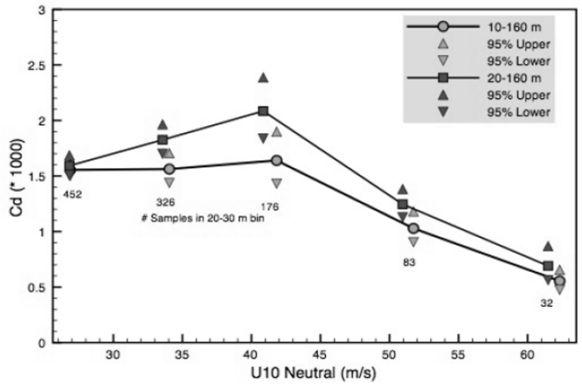
45

ASCE 7-10
Surface Roughness C and D

- **Sea surface drag coefficient reaches a maximum at wind speeds of 60 - 80 mph**
- **Some evidence that sea surface drag coefficient actually decreases at higher wind speeds reflecting a "frothing" or smoothing**
- **Use of Surface Roughness D now required for all water surfaces in Hurricane Prone Regions**

46

ASCE 7-10
Surface Roughness C and D



Courtesy M. D. Powell, NOAA

ASCE 7-10
Surface Roughness C and D

Surface Roughness C: Open terrain with scattered obstructions having heights generally less than 30 ft (9.1 m). This category includes flat open country~~,~~ and grasslands~~, and all water surfaces in hurricane prone regions~~.

Surface Roughness D: Flat, unobstructed areas and water surfaces ~~outside hurricane prone regions~~. This category includes smooth mud flats, salt flats, and unbroken ice.

ASCE 7-10
Exposure Categories

26.7.3 ~~6.5.6.3~~ Exposure Categories.

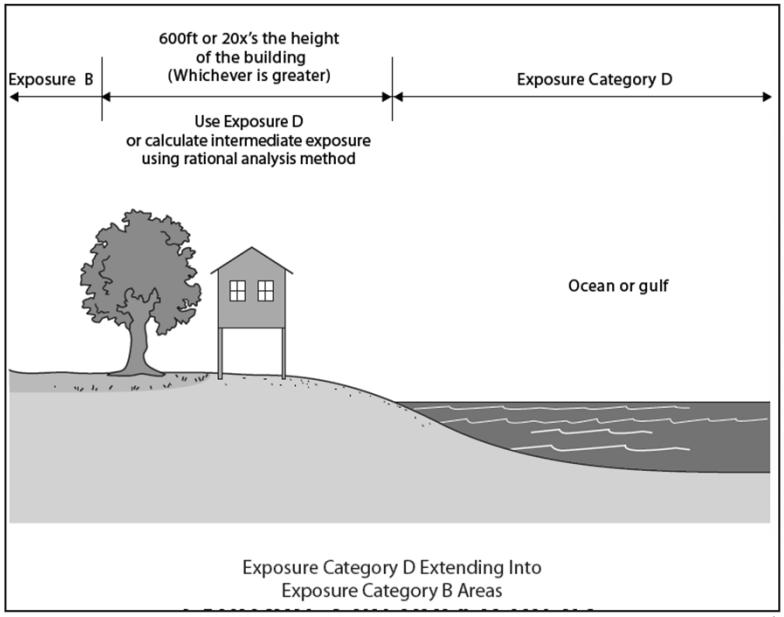
Exposure B: For buildings with a mean roof height of less than or equal to 30 ft (9.1 m), Exposure B shall apply where the ground surface roughness ~~condition~~, as defined by Surface Roughness B, prevails in the upwind direction for a distance ~~of at least~~ greater than 1,500 ft (457 m). For buildings with a mean roof height greater than 30 ft (9.1 m), Exposure B shall apply where Surface Roughness B prevails in the upwind direction for a distance C ~~of at least~~ greater than 2,600 ft (792 m) or 20 times the height of the building, whichever is greater.

> ~~**EXCEPTION:** For buildings whose mean roof height is less than or equal to 30 ft, the upwind distance may be reduced to 1,500 ft.~~

Exposure C: Exposure C shall apply for all cases where Exposures B or D do not apply.

ASCE 7-10
Exposure Categories

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 greater than 5,000 ft (1,524 m) or 20 times the building height, whichever is greater. ~~Exposure D shall extend into downwind areas of Surface Roughness B or C for a distance of 600 feet (200 m) or 20 times the height of the building, whichever is greater.~~ Exposure D shall also apply where the ground surface roughness immediately upwind of the site is B or C, and the site is within a distance of 600 ft (183 m) or 20 times the building height, whichever is greater, from an exposure D condition as defined in the previous sentence.



51

ASCE 7-10
Enclosure Classification

- **Protection of Glazed Openings**
  - **Wind-borne debris region triggered by wind speed**
  - **New wind speeds necessitate recalibration of the trigger.**

52

ASCE 7-10
Protection of Glazed Openings

- **Definitions revised for correlation with ASTM E 1996**

GLAZING, IMPACT RESISTANT: Glazing that has been shown by testing ~~in accordance with ASTM E1886 and ASTM E1996 or other approved test methods~~ to withstand the impact of ~~wind-borne~~ test missiles ~~likely to be generated in wind-borne debris regions during design winds~~. See Section 26.10.3.2.

~~**IMPACT RESISTANT COVERING:** A covering designed to protect glazing, which has been shown by testing withstood the impact of test missiles when tested in accordance with ASTM E1886 and ASTM E1996 or other approved test methods to withstand the impact of wind-borne missiles likely to be generated in wind-borne debris regions during design winds.~~

IMPACT PROTECTIVE SYSTEM: Construction that has been shown by testing to withstand the impact of test missiles and that is applied, attached, or locked over exterior glazing. See Section 26.10.3.2.

ASCE 7-10
Protection of Glazed Openings

- **Wind-borne Debris Regions**

WIND-BORNE DEBRIS REGIONS: Areas within hurricane prone regions ~~located:~~ where impact protection is required for glazed openings. See Section 26.10.3.

~~1. Within 1 mile of the coastal mean high water line where the basic wind speed is equal to or greater than 110 mi/h and in Hawaii, or~~
~~2. In areas where the basic wind speed is equal to or greater than 120 mi/h.~~

ASCE 7-10
Protection of Glazed Openings

26.10.3 ~~6.5.9.3 Wind-Borne Debris~~ Protection of Glazed Openings.

Glazed openings in Risk Category II, III, or IV buildings located in hurricane-prone regions shall be protected as specified in this Section ~~Glazing in buildings located in wind-borne debris regions shall be protected~~

26.10.3.1 Wind-borne Debris Regions.

Glazed openings shall be protected in accordance with Section 26.10.3.2 in the following locations:

1. Within 1 mile of the coastal mean high water line where the basic wind speed is equal to or greater than 130 mi/h (58 m/s), or
2. In areas where the basic wind speed is equal to or greater than 140 mi/h (63 m/s).

ASCE 7-10
Protection of Glazed Openings

- ***Cont.***

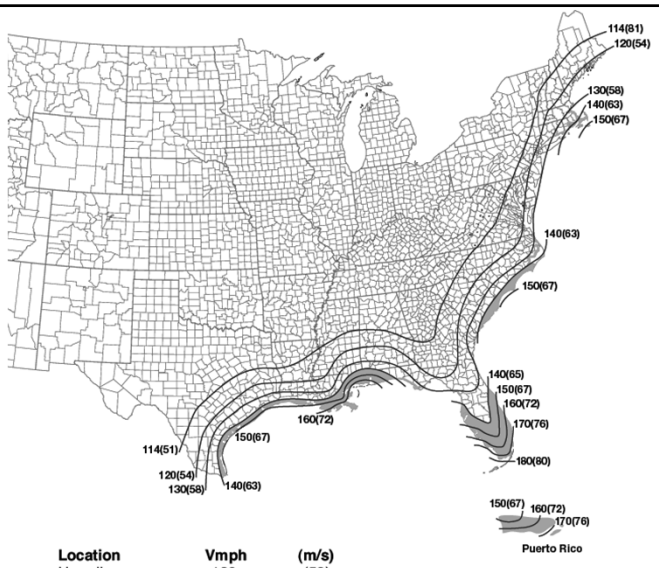
For Risk Category II buildings and structures and Risk Category III buildings and structures, except health care facilities, the windborne debris region shall be based on Figure 26.5-1A. For Risk Category III health care facilities and Risk Category IV buildings and structures the windborne debris region shall be based on Figure 26.5.1-B. Risk Categories shall be determined in accordance with Section 1.5.

Exceptions:

1. ~~1.~~ Glazing in ~~Category II, III, or IV buildings~~ located over 60 ft (18.3 m) above the ground and over 30 ft (9.2 m) above aggregate surface roofs located within 1,500 ft (458 m) of the building shall be permitted to be unprotected.
2. ~~2. Glazing in Category I buildings shall be permitted to be unprotected.~~

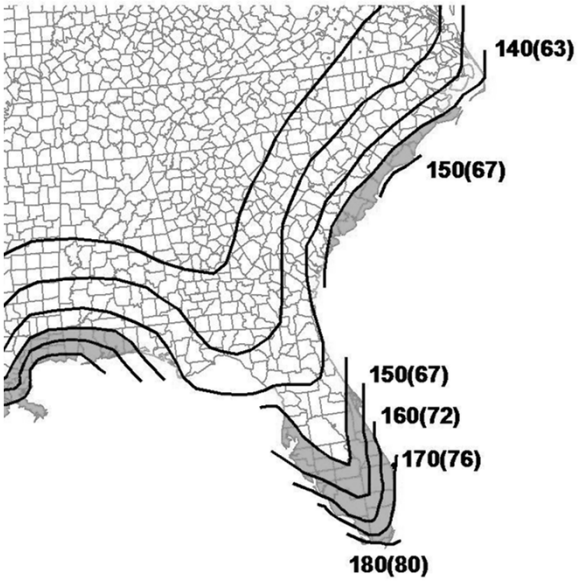
ASCE 7-10
Protection of Glazed Openings

- **Risk Category II and Risk Category III Buildings, excluding health care facilities use Risk Category II Map wind speeds**
- **Risk Category III health care facilities and Risk Category IV Buildings use Risk Category III and IV Map wind speeds**

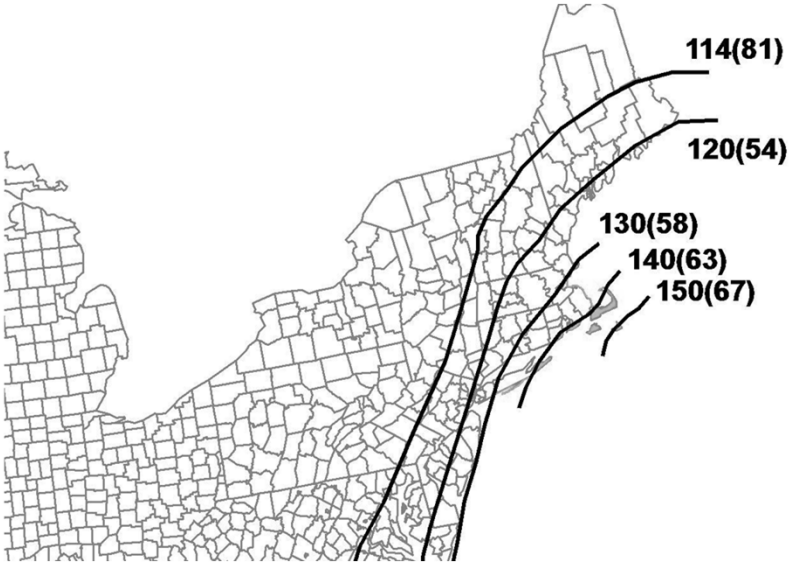


Location	Vmph	(m/s)
Hawaii	130	(58)
Guam	195	(87)
Virgin Islands	165	(72)
American Samoa	160	(72)

WBDR for Risk Category II and Risk Category III buildings excluding health care facilities V ≥ 140 mph; and Within 1 mile of the coastal mean high water line where V ≥ 130 mph



59



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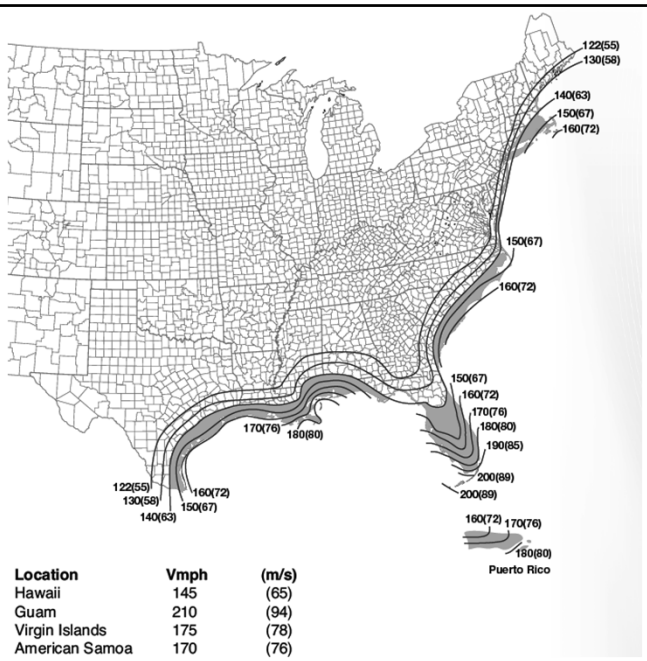


Location	Vmph	(m/s)
Hawaii	145	(65)
Guam	210	(94)
Virgin Islands	175	(78)
American Samoa	170	(76)

WBDR for Risk Category IV and Risk Category III buildings health care facilities V ≥ 140 mph; and Within 1 mile of the coastal mean high water line where V ≥ 130 mph

ASCE 7-10
Protection of Glazed Openings

26.10.3.2 Protection Requirements for Glazed Openings.

Glazing in buildings requiring protection shall be protected with an impact protective system ~~impact-resistant covering~~ or shall be impact-resistant glazing. ~~according to the requirements specified in ASTM E1886 and ASTM E1996 or other approved test methods and performance criteria. The levels of impact resistance shall be a function of Missile Levels and Wind Zones specified in ASTM E1886 and ASTM E1996.~~

Impact protective systems and impact resistant glazing shall be subjected to missile test and cyclic pressure differential tests in accordance with ASTM E1996 as applicable. Testing to demonstrate compliance with ASTM E1996 shall be in accordance with ASTM E1886. Impact resistant glazing and impact protective systems shall comply with the pass/fail criteria of Section 7 of ASTM E1996 based on the missile required by Table 3 or Table 4 of ASTM E1996.

EXCEPTION: Other testing methods and/or performance criteria are permitted to be used when approved.

 62

ASCE 7-10
Protection of Glazed Openings

Glazing and impact protective systems in buildings and structures, classified as Risk Category IV in accordance with Section 1.5, shall comply with the "enhanced protection" requirements of Table 3 of ASTM E1996. Glazing and impact protective systems in all other structures shall comply with the "basic protection" requirements of Table 3 of ASTM E1996.

User Note: The wind zones that are specified in ASTM E1996 for use in determining the applicable missile size for the impact test, have to be adjusted for use with the wind speed maps of ASCE 7-10 and the corresponding wind borne debris regions, see Section C26.10.3.2.

 63

ASCE 7-10
Protection of Glazed Openings

Modify Section 6.2.2 of ASTM E1996 as follows:

6.2.2 Unless otherwise specified, select the wind zone based on the basic wind speed as follows:
6.2.2.1 Wind Zone 1 - 130 mph ≤ basic wind speed < 140 mph, and Hawaii.
6.2.2.2 Wind Zone 2 - 140 mph ≤ basic wind speed < 150 mph at greater than 1.6 km (one mile 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) ≤ basic wind speed ≤ 160 mph (63 m/s), or 140 mph (54 m/s) ≤ basic wind speed ≤ 160 mph (63 m/2) and within 1.6 km (one mile) of the coastline. The coastline shall be measured from the mean high water mark.
6.2.2.4 Wind Zone 4 - basic wind speed > 160 mph (63 m/s).

 64

ASCE 7-10
Chapter 29 – Rooftop Equipment

29.5.1 ~~6.5.15.1~~ ROOFTOP STRUCTURES AND EQUIPMENT FOR BUILDINGS WITH $h \leq 60$ FT (18.3 m).

The lateral force F_h, on rooftop structures and equipment ~~with A_f less than $(0.1Bh)$~~ located on buildings with a mean roof height, $h \leq 60$ ft (18.3 m) shall be determined from Eq. 29.5-2 ~~6-28. increased by a factor of 1.9. The factor shall be permitted to be reduced linearly from 1.9 to 1.0 as the value of Af is increased from $(0.1Bh)$ to (Bh).~~

$$F_h = q_h (GC_r) A_f (lb) (N) \qquad (29.5\text{-}2)$$

where:

GC_r = 1.9 for rooftop structures and equipment with A_f less than $(0.1Bh)$. GC_r shall be permitted to be reduced linearly from 1.9 to 1.0 as the value of A_f is increased from $(0.1Bh)$ to (Bh)

q_h = velocity pressure evaluated at mean roof height of the building

A_f = vertical projected area of the rooftop structure or equipment on a plane normal to the direction of wind, in ft^2 (m^2)

ASCE 7-10
Chapter 29 – Rooftop Equipment

The vertical uplift force, F_v, on rooftop structures and equipment shall be determined from Eq. 29.5-3:

$$F_v = q_h (GC_r) A_r \qquad (29.5\text{-}3)$$

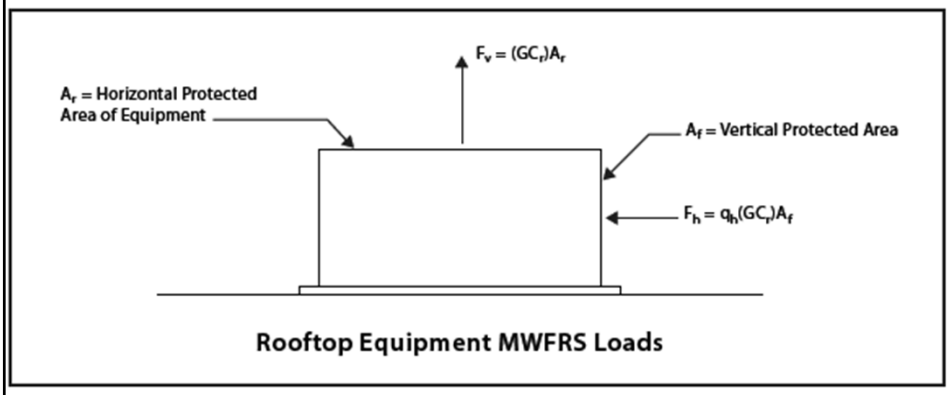
where:

GC_r = 1.5 for rooftop structures and equipment with A_r less than $(0.1BL)$. GC_r shall be permitted to be reduced linearly from 1.5 to 1.0 as the value of A_r is increased from $(0.1BL)$ to (BL).

q_h = velocity pressure evaluated at the mean roof height of the building

A_r = horizontal projected area of roof top structure or equipment, in ft^2 (m^2)

ASCE 7-10
Chapter 29 – Rooftop Equipment



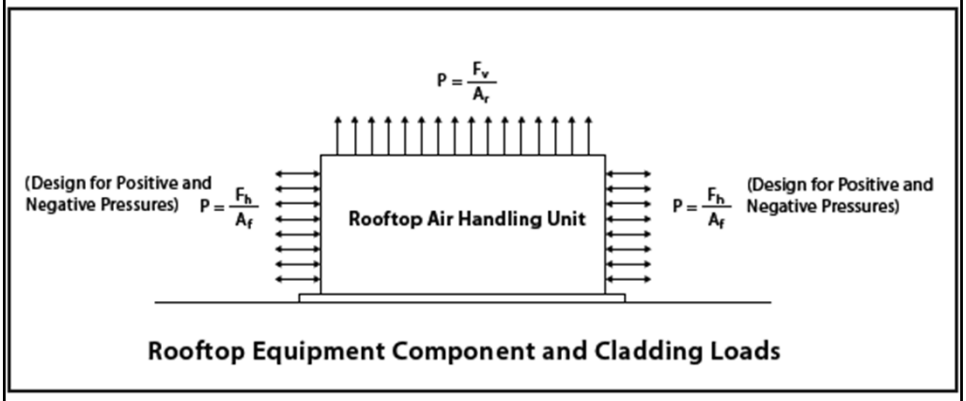
Rooftop Equipment MWFRS Loads

ASCE 7-10
Chapter 29 – Rooftop Equipment

30.11 ROOFTOP STRUCTURES AND EQUIPMENT FOR BUILDINGS WITH h ≤ 60 ft (18.3 m)

The components and cladding pressure on each wall of the rooftop structure shall be equal to the lateral force determined in accordance with Section 29.5.1 divided by the respective wall surface area of the rooftop structure and shall be considered to act inward and outward. The components and cladding pressure on the roof shall be equal to the vertical uplift force determined in accordance with Section 29.5.1 divided by the horizontal projected area of the roof of the rooftop structure and shall be considered to act in the upward direction.

ASCE 7-10
Chapter 29 – Rooftop Equipment



Rooftop Equipment Component and Cladding Loads

 69

ASCE 7-10
Chapter 30 – Components and Cladding

1) Part 1 is applicable to an enclosed or partially enclosed:
   - Low-rise building (see definition in Section 26.2)
   - Building with $h \leq 60$ ft (18.3 m)

Old analytical method for h ≤ 60 ft

2) Part 2 is a simplified approach and is applicable to an enclosed:
   - Low-rise building (see definition in Section 26.2)
   - Building with $h \leq 60$ ft (18.3 m)

Old simplified method (Method 1) for h ≤ 60 ft

 70

ASCE 7-10
Chapter 30 – Components and Cladding

3) Part 3 is applicable to an enclosed or partially enclosed:
   – Building with $h > 60$ ft (18.3 m)

Old analytical method for h > 60 ft

4) Part 4 is a simplified approach and is applicable to an enclosed
   – Building with $h \leq 160$ ft (48.8 m)

New simplified method for h ≤ 160 ft

ASCE 7-10
Chapter 30 – Components and Cladding

5) Part 5 is applicable to an open building of all heights having a pitched free roof, monoslope free roof, or trough free roof.
6) Part 6 is applicable to building appurtenances such as roof overhangs and parapets and rooftop equipment.

ASCE 7-10
Chapter 30 – Simplified h ≤ 160 ft

Table 30.7-1 Steps to Determine C&C Wind Loads Enclosed Building with h ≤ 160 ft

Step 1: Determine risk category of building, see Table 1.5-1

Step 2: Determine the basic wind speed, *V*, for applicable risk category, see Figure 26.5-1A, B or C

Step 3: Determine wind load parameters:
- Exposure category B, C or D, see Section 26.7

Step 4: Enter Table 30.7-2 to determine pressure on walls and roof, *p*, using Eq. 30.7-1. Roof types are:
- Flat roof ($\theta < 10$ deg)
- Gable roof
- Hip roof
- Monoslope roof
- Mansard roof

Step 5: Determine topographic factors, K_{zt}, and apply factor to pressures determined from tables (if applicable), see Section 26.8.

ASCE 7-10
Chapter 30 – Simplified h ≤ 160 ft

30.7.1 WIND LOADS—COMPONENTS AND CLADDING

30.7.1.1 Wall and Roof Surfaces.

$$p = p_{table}(EAF)(RF)K_{zt} \qquad (30.7\text{-}1)$$

where:

RF = effective area reduction factor from Table 30.7-2
EAF = Exposure adjustment factor from Table 30.7-2
K_{zt} = topographic factor as defined in Section 26.8

Components and Cladding – Part 4		h ≤ 160 ft.
Table 30.7-2	C & C Zones	C&C
Enclosed Buildings		Wall and Roof Pressures

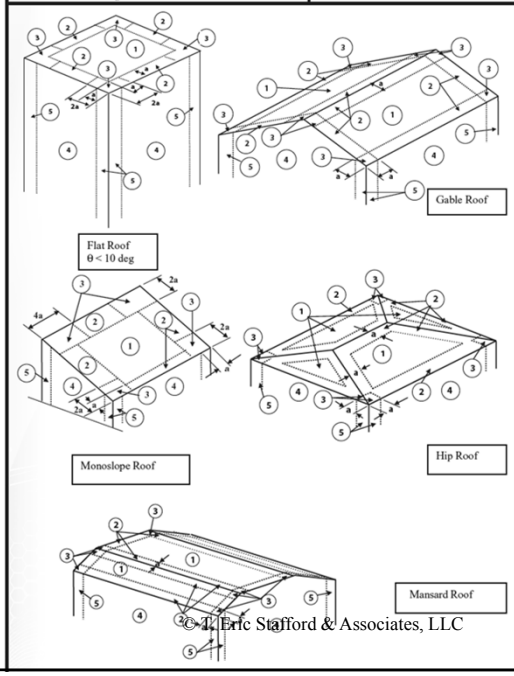
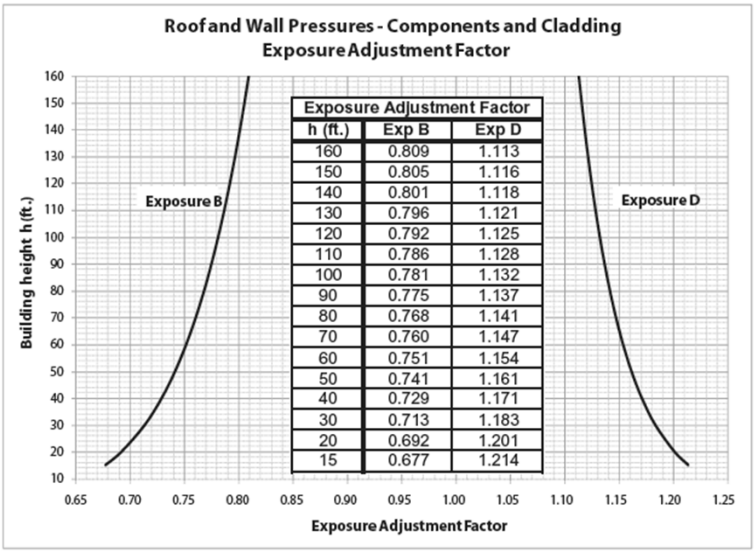


Table 30.7-2
Components and Cladding – Part 4
Exposure C

C & C
V = 110-120 mph
h = 15-80 ft.

V (MPH)			110					115					120				
		Load			Zone					Zone					Zone		
h (ft)	Roof Form	Case	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
80	Flat Roof	1	-50.2	-78.8	-107.5	-34.3	-63.0	-54.9	-86.2	-117.5	-37.5	-68.8	-59.8	-93.8	-127.9	-40.9	-74.9
		2	NA	NA	NA	34.3	34.3	NA	NA	NA	37.5	37.5	NA	NA	NA	40.9	40.9
	Gable Roof	1	-37.5	-63.0	-94.7	-40.7	-63.0	-41.0	-68.8	-103.6	-44.5	-68.8	-44.6	-74.9	-112.8	-48.4	-74.9
	Mansard Roof	2	21.6	21.6	21.6	37.5	34.3	23.6	23.6	23.6	41.0	37.5	25.7	25.7	25.7	44.6	40.9
	Hip Roof	1	-34.3	-59.8	-88.4	-40.7	-63.0	-37.5	-65.3	-96.6	-44.5	-68.8	-40.9	-71.1	-105.2	-48.4	-74.9
		2	21.6	21.6	21.6	37.5	34.3	23.6	23.6	23.6	41.0	37.5	25.7	25.7	25.7	44.6	40.9
	Monoslope Roof	1	-43.9	-56.6	-97.9	-40.7	-63.0	-48.0	-61.9	-107.0	-44.5	-68.8	-52.2	-67.4	-116.5	-48.4	-74.9
		2	18.4	18.4	18.4	37.5	37.5	20.2	20.2	20.2	41.0	41.0	21.9	21.9	21.9	44.6	44.6
70	Flat Roof	1	-48.8	-76.7	-104.5	-33.4	-61.2	-53.4	-83.8	-114.2	-36.5	-66.9	-58.1	-91.2	-124.3	-39.7	-72.8
		2	NA	NA	NA	33.4	33.4	NA	NA	NA	36.5	36.5	NA	NA	NA	39.7	39.7
	Gable Roof	1	-36.5	-61.2	-92.1	-39.6	-61.2	-39.9	-66.9	-100.7	-43.2	-66.9	-43.4	-72.8	-109.6	-47.1	-72.8
	Mansard Roof	2	21.0	21.0	21.0	36.5	33.4	23.0	23.0	23.0	39.9	36.5	25.0	25.0	25.0	43.4	39.7
	Hip Roof	1	-33.4	-58.1	-85.9	-39.6	-61.2	-36.5	-63.5	-93.9	-43.2	-66.9	-39.7	-69.2	-102.3	-47.1	-72.8
		2	21.0	21.0	21.0	36.5	33.4	23.0	23.0	23.0	39.9	36.5	25.0	25.0	25.0	43.4	39.7
	Monoslope Roof	1	-42.7	-55.0	-95.2	-39.6	-61.2	-46.6	-60.1	-104.1	-43.2	-66.9	-50.8	-65.5	-113.3	-47.1	-72.8
		2	17.9	17.9	17.9	36.5	36.5	19.6	19.6	19.6	39.9	39.9	21.3	21.3	21.3	43.4	43.4

Partial table

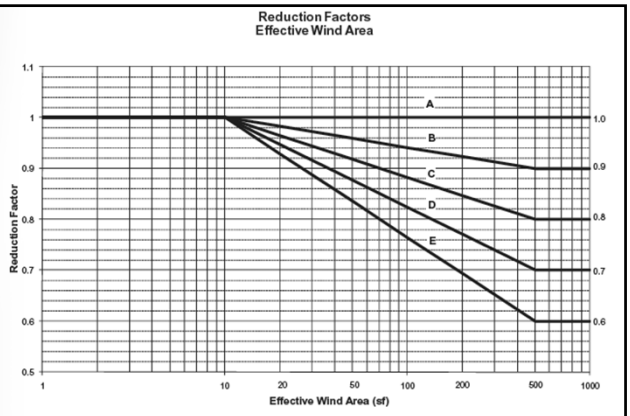


Exposure Adjustment Factor		
h (ft.)	Exp B	Exp D
160	0.809	1.113
150	0.805	1.116
140	0.801	1.118
130	0.796	1.121
120	0.792	1.125
110	0.786	1.128
100	0.781	1.132
90	0.775	1.137
80	0.768	1.141
70	0.760	1.147
60	0.751	1.154
50	0.741	1.161
40	0.729	1.171
30	0.713	1.183
20	0.692	1.201
15	0.677	1.214

EAF

77

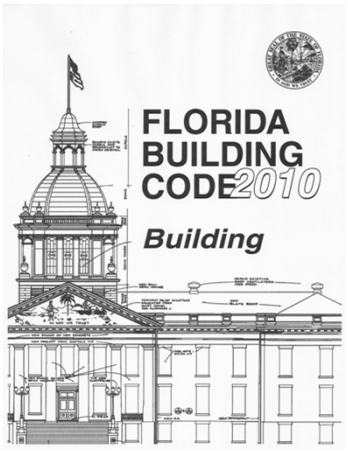
Reduction Factors

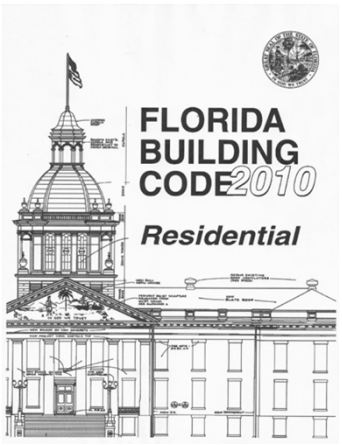


Reduction Factors
Effective Wind Area

Roof Form	Sign Pressure	Zone 1	Zone 2	Zone 3	Zone 4	Zone 5
Flat	Minus	D	D	D	C	E
Flat	Plus	NA	NA	NA	D	D
Gable, Mansard	Minus	B	C	C	C	E
Gable, Mansard	Plus	B	B	B	D	D
Hip	Minus	B	C	C	C	E
Hip	Plus	B	B	B	D	D
Monoslope	Plus	A	B	D	C	E
Monoslope	Minus	C	C	C	D	D
Overhangs	All	A	A	B	NA	NA

2010 Florida Building Codes





2010 Florida Building Codes

- **Available December 2011**
- **Effective Date: March 15, 2012**
- **Glitch Amendments included in first printing**
  - **No yellow or blue replacement pages**

2010 Florida Building Codes

- **Scope.** The provisions of this chapter shall govern the structural design of buildings, structures and portions thereof regulated by this code.

  Exception: Buildings and structures located within the high-velocity hurricane zone shall comply with the provisions of Section 1615 through 1626, and, as applicable in flood hazard areas, Section 1612.

2010 Florida Building Code, Building

- **1609.1.1 Determination of wind loads. Wind loads on every building or structure shall be determined in accordance with Chapters 26 through 30 of ASCE 7 or the provisions of the alternate all heights method in Section 1609.6. Wind shall be assumed to come from any horizontal direction and wind pressures shall be assumed to act normal to the surface considered.**

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- **Exceptions:**
  - **ICC 600**
  - **AF&PA WFCM**
  - **AISI 230**
  - **TIA 222**
  - **Screen enclosures comply with Section 2002.4**

2010 Florida Building Code, Building

- **~~Note: Clarification to ASCE 7. Arrows shown on Figure 6-10 of ASCE 7 indicate that the pressure coefficients apply specifically to "Direction of MWFRS being designed". This means that the longitudinal pressure coefficients are not applicable to trusses that span in the transverse direction and therefore uplift reactions for trusses that span in the transverse direction would be determined by the pressure coefficients associated with those shown for the transverse direction.~~**

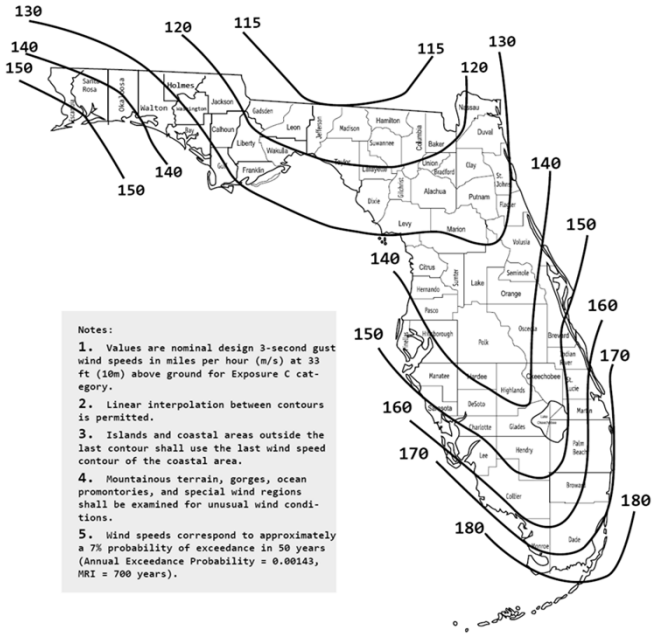

Figure 1609A Ultimate Design Wind Speeds, V_{ult}, for Risk Category II Buildings and Other Structures

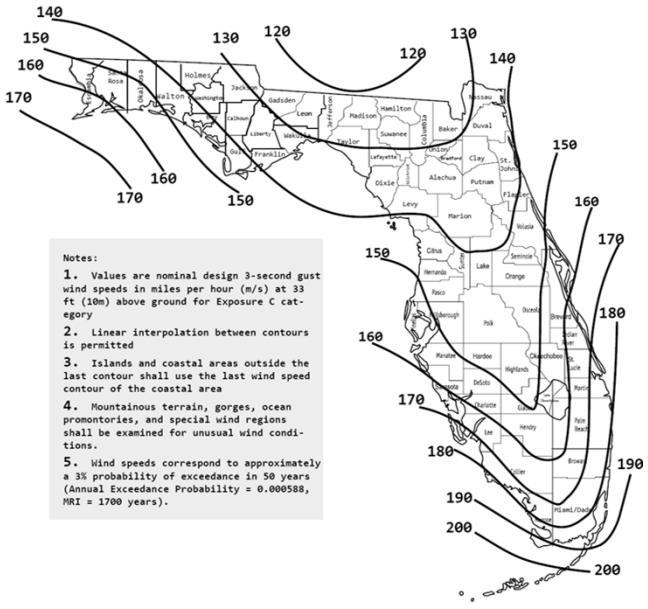

Figure 1609B Ultimate Design Wind Speeds, V_{ult}, for Risk Category III and IV Buildings and other Structures

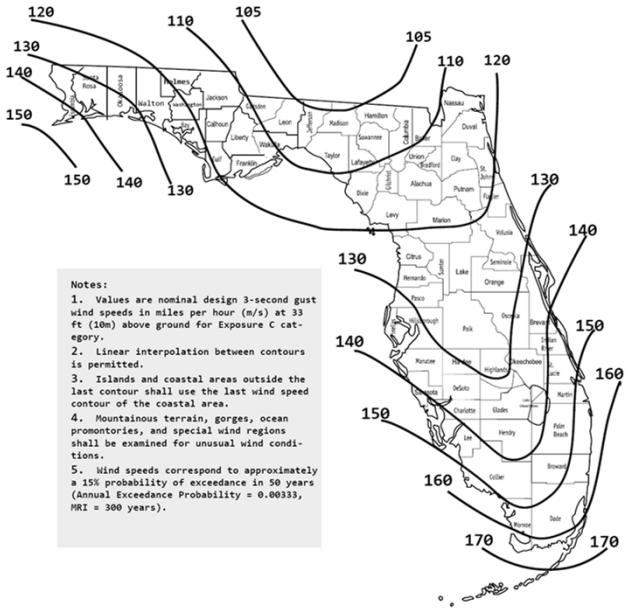

Figure 1609C Ultimate Design Wind Speeds, V_{ult} for Risk Category I Buildings and other Structures

2010 Florida Building Code, Building

- **High Velocity Hurricane Zones**
- **Section 1620.2**
  - **Miami-Dade County**
    - **Risk Category I: 165 mph**
    - **Risk Category II: 175 mph**
    - **Risk Category III and IV: 186 mph**
  - **Broward County**
    - **Risk Category I: 156 mph**
    - **Risk Category II: 170 mph**
    - **Risk Category III and IV: 180 mph**

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- ***Risk* Categories replace *Occupancy* Categories**
  - **Risk Category I ⟹ Occupancy Category I**
  - **Risk Category II ⟹ Occupancy Category II**
  - **Risk Category III ⟹ Occupancy Category III**
  - **Risk Category IV ⟹ Occupancy Category IV**
- **Table 1604.5**

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- **Risk Category I**
  - **Low hazard to human life in the event of failure**
    - **Ag facilities**
    - **Temporary facilities**
    - **Minor storage facilities**
    - **Screen enclosures**

2010 Florida Building Code, Building

- **Risk Category II**
  - **All buildings and structures except those listed in Risk Categories I, III and IV**
    - **One- and two-family dwellings**
    - **Retail**
    - **Office**

2010 Florida Building Code, Building

- **Risk Category III**
  - **Substantial hazard to human life in the event of failure**
    - **Public assembly with occupant load greater than 300**
    - **I-3**
    - **Certain educational facilities**
    - **Occupant load greater than 5000**

2010 Florida Building Code, Building

- **Risk Category IV**
  - **Essential facilities**
    - **I-2 with surgery or emergency treatment**
    - **Fire, rescue, ambulance, police stations**
    - **Shelters**
    - **Toxic materials**
    - **Aviation control towers**
    - **Critical national defense functions**

2010 Florida Building Code, Building

- **Key issues with new wind speed maps:**
  - **Strength Design Load Factor = 1.0**
  - **Allowable Stress Design – multiply W x 0.6**
  - **Use of different maps for different Risk Categories negates the need for Importance Factors**
  - **"*I*" deleted from wind chapters**

2010 Florida Building Code, Building

- **Strength Design Load Combinations**
  - **1.4(*D*+*F*)**
  - **1.2(*D* + *F* + *T*) + 1.6(*L* + *H*) + 0.5(L_r or *R*)**
  - **1.2*D*+ 1.6(L_r or *R*) + (f_1*L* or *.5W*)**
  - **1.2*D* + 1.0*W*+ *f*1*L* + 0.5(L_r or *R*)**
  - **1.2*D*+ f_1*L***
  - **0.9*D* + 1.0*W* + 1.6*H***
  - **0.9*D* + 1.6*H***

2010 Florida Building Code, Building

- **Allowable Stress Design Load Combinations**
  - ***D* + *F***
  - ***D* + *H* + *F* + *L* + *T***
  - ***D* + *H* + *F* + (L_r or *R*)**
  - ***D* + *H* + *F* + 0.75(*L* + *T*) + 0.75(L_r or *R*)**
  - ***D* + *H* + *F* + 0.6*W***
  - ***D* + *H* + *F* + .45*W* + 0.75*L* + 0.75(L_r or *R*)**
  - **0.6*D* + 0.6*W* + *H***
  - **0.6*D* + *H***

2010 Florida Building Code, Building

- **Section 1609.1.1 *(cont.)*.**
- **The wind speeds in Figure 1609A, 1609B and 1609C shall be converted to nominal wind speeds, V_{asd}, in accordance with Section 1609.3.1 when the provisions of the standards referenced in Exceptions 1 through 5 and 7 are used unless the wind provisions in the standards are based on Ultimate Wind Speeds as specified in Figures 1609A, 1609B, or 1609C or Chapter 26 of ASCE 7.**

2010 Florida Building Code, Building

- **Wind Speed, V_{ult}.** Ultimate design wind speeds.
- **Wind Speed, V_{asd}.** Nominal design wind speeds.

2010 Florida Building Code, Building

- **Section 1609.3.1 Converting from V_{ult} to V_{asd}**

$$V_{asd} = V_{ult}\sqrt{0.6}$$

Where:

V_{asd} = allowable stress design wind speed applicable to methods specified in Exceptions 1 through 5 of Section 1609.1.1

V_{ult} = strength design wind speeds determined from Figures 1609A, 1609B, or 1609C.

2010 Florida Building Code, Building Wind Speeds

- **Testing to allowable or nominal loads**
  - **Where testing for wind load resistance is based on allowable or nominal wind loads, the design wind loads determined in accordance with ASCE 7 or Section 1609 of the *Florida Building Code, Building* are permitted to be multiplied by 0.6 for the purposes of the wind load resistance testing.**
  - **Applicable to ASTM E 330 for doors**
  - **AAMA/WDMA 101 standards for glass windows and doors**

2010 Florida Building Code, Building Wind Speeds

- **AAMA/WDMA 101 NAFS assign Performance Grades based on allowable stress design**

AAMA Prime & Replacement Label

2010 Florida Building Code, Building Wind Speeds

- **1715.5.1. Exterior windows and doors.** The design pressures for window and door assemblies shall be calculated in accordance with component and cladding wind loads in Section 1609. The design pressures, as determined from ASCE 7, are permitted to be multiplied by 0.6.

2010 Florida Building Code, Building Wind Speeds

- **1609.3 Basic wind speed. The ultimate design wind speed V_{ult}, in miles per hour, for the development of the wind loads shall be determined by Figures 1609A, 1609B and 1609C. The ultimate design wind speed V_{ult} for use in the design of Risk Category II buildings and structures shall be obtained from Figure 1609A. The ultimate design wind speed V_{ult} for use in the design of Risk Category III and IV buildings and structures shall be obtained from Figure 1609B. The ultimate design wind speed V_{ult} for use in the design of Risk Category I buildings and structures shall be obtained from Figure 1609C. The exact location of wind speed lines shall be established by local ordinance using recognized physical landmarks such as major roads, canals, rivers and lake shores wherever possible.**

2010 Florida Building Code, Building Wind Speeds

- **Wind speed maps for each county developed by University of Florida for local jurisdictions to use as a guide for determining exact location of wind speed lines**
- **Also see ATC Windspeed By Location www.atcouncil.org/windspeed/**

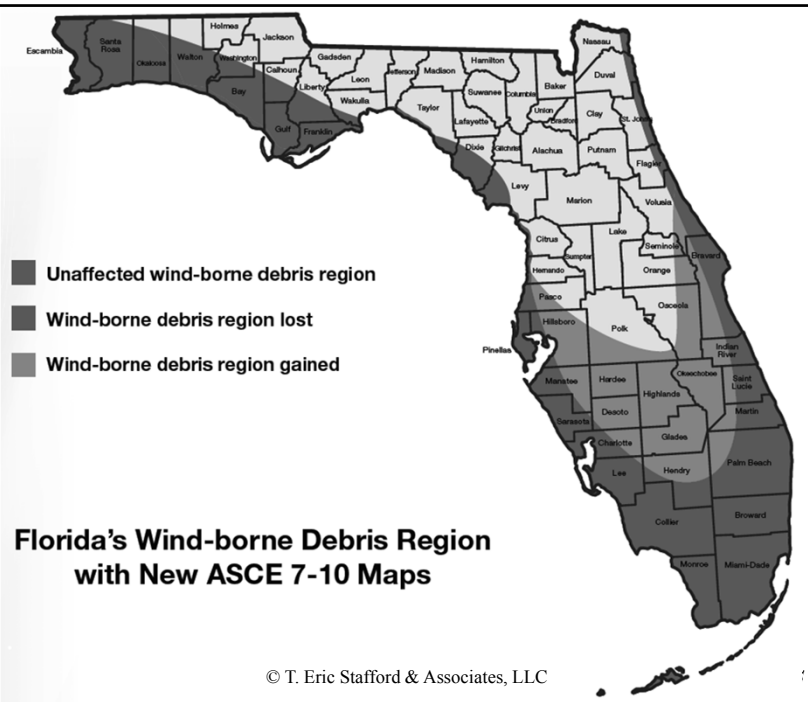
2010 Florida Building Code, Building

- **Section 1609.2**
- **Wind-borne Debris Regions**

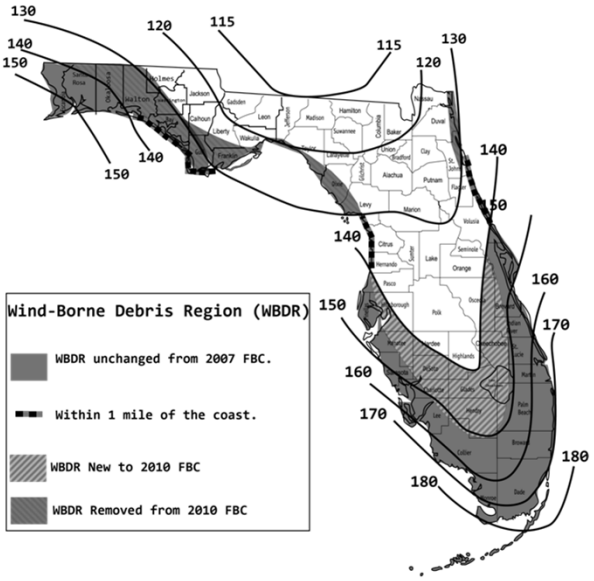
1. **1 mile of coastal mean high water line where V_{ult} is 130 mph or greater**
2. **Areas where V_{ult} is 140 mph or greater**

2010 Florida Building Code, Building

- **Wind-borne Debris Regions**
  - **Risk Category II and Risk Category III Buildings, excluding health care facilities based on Figure 1609A (Risk Category II map)**
  - **Risk Category III health care facilities and Risk Category IV Buildings based on Figure 1609B (Risk Category III and IV map)**

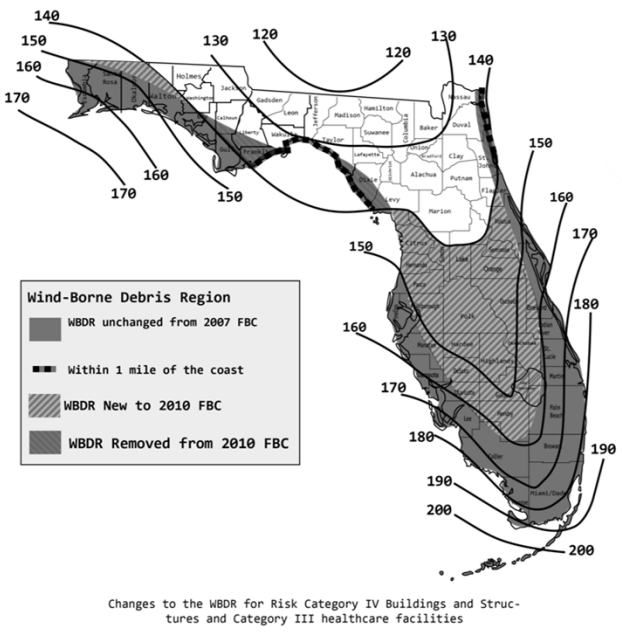


Impacts on WBDR for the State of Florida



Changes to the WBDR for Risk Category II and III
Buildings and Structures except health care facilities.
Includes Buildings scoped by the FBC

WBDR
Risk Category II
Buildings and
Risk Category III
excluding
healthcare
facilities



Changes to the WBDR for Risk Category IV Buildings and Structures and Category III healthcare facilities

WBDR
Risk Category IV
Buildings and
Risk Category III
healthcare
facilities

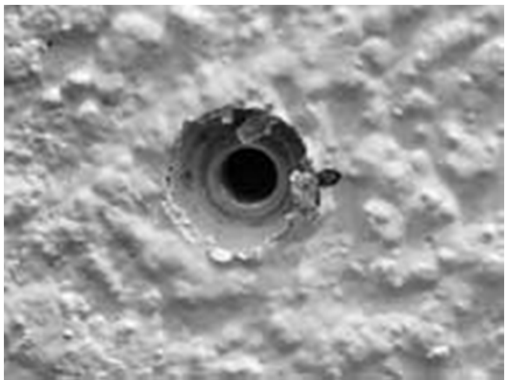
2010 Florida Building Code, Building Protection of Openings

- **Section 1609.1.2**
  - **Glazed openings required to be protected from wind-borne debris through impact resistance or protection with impact-resistant covering meeting**
    - **ASTM E 1886 and ASTM E 1996**
    - **SSTD 12**
    - **ANSI/DASMA 115**
    - **TAS 201, 202, and 203**

2010 Florida Building Code, Building Protection of Openings

- **Exceptions to Opening Protections**
  - **Wood Structural Panels still permitted for 1 and 2 story buildings**
  - **Limited to Groups R-3 and R-4**
  - **Anchorage required to be permanently installed on the building**
  - **Attachments designed per ASCE 7 or in accordance with Table 1609.1.2 for h ≤ 45 ft and V_{asd} ≤ 140 mph**

Protection of Openings - WBDR



2010 Florida Building Code, Building Protection of Openings

TABLE 1609.1.2
WIND-BORNE DEBRIS PROTECTION FASTENING SCHEDULE FOR WOOD STRUCTURAL PANELS

FASTENER TYPE	FASTENER SPACING (inches)[1,2]			
	Panel Span ≤ 2 ft	2 foot < panel Span ≤ 4 feet	4 feet < Panel Span ≤ 6 feet	6 feet < Panel Span ≤ 8 feet
#8 Wood screw-based anchor with 2-inch embedment length[3]	16	16	10	8
#10 Wood screw-based anchor with 2-inch embedment length[3]	16	16	12	9
¼ Lag screw-based anchor with 2-inch embedment length[3]	16	16	16	16

2010 Florida Building Code, Building Protection of Openings

- **ASTM E 1996**
  - **Wind Zones modified for correlation with ASCE 7-10 wind speeds**
  - **Cyclic Pressure Loading table modified for correlation with ASCE 7-10 wind speeds**

2010 Florida Building Code, Building Protection of Openings

- **ASTM E 1996 Wind Zones**
- **Section 6.2.2 of ASTM E 1996 shall be modified as follows:**
- **6.2.2.1 *Wind Zone 1* - 130 mph ≤ basic wind speed < 140 mph, and Hawaii.**
- **6.2.2.2 *Wind Zone 2* - 140 mph ≤ basic wind speed < 150 mph at greater than 1.6 km (one mile) 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) ≤ basic wind speed ≤160 mph (63 m/s), or 140 mph (54 m/s) ≤ basic wind speed ≤160 mph (63 m/s) and within 1.6 km (one mile) of the coastline. The coastline shall be measured from the mean high water mark.**
- **6.2.2.4 *Wind Zone 4* - basic wind speed >160 mph (63 m/s).**

2010 Florida Building Code, Building Protection of Openings

- **ASTM E 1996 Cyclic Loading (Table 1626 HVHZ)**

Air Pressure Cycles

0.2 to 0.5 P_{pos}[1]
0.0 to 0.6 P_{pos}
0.5 to 0.8 P_{pos}
0.3 to 1.0 P_{pos}
0.3 to 1.0 P_{neg}[2]
0.5 to 0.8 P_{neg}
0.0 to 0.6 P_{neg}
0.2 to 0.5 P_{neg}

- **Notes:**

  P_{pos} = 0.6 x positive ultimate design load in accordance with ASCE 7.

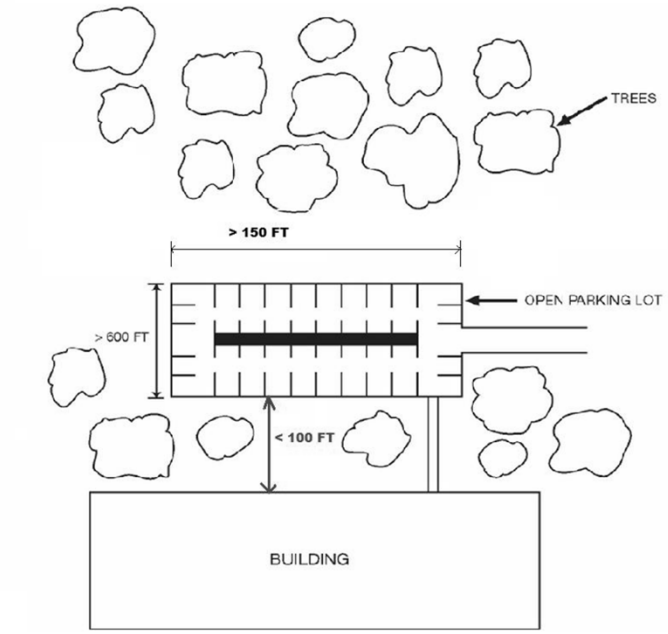
  P_{neg} = 0.6 x negative ultimate design load in accordance with ASCE 7.

2010 Florida Building Code, Building Exposure Categories

- **Surface Roughness and Exposure Categories mostly consistent with ASCE 7**
- **FBC Surface Roughness also considers:**
  - **Open patches in Surface Roughness B**
  - **Short term Surface Roughness Changes**

2010 Florida Building Code, Building Exposure Categories

- **Surface Roughness C excerpt (Section 1609.4.2) – Open Patches:**
  - **This surface roughness shall also apply to any building located within surface roughness B-type terrain where the building is within 100 feet horizontally in any direction of open areas of surface roughness C or D-type terrain that extends more than 600 feet (182.9 m) and width greater than 150 ft. in the upwind direction.**



2010 Florida Building Code, Building Exposure Categories

- **Surface Roughness C excerpt (Section 1609.4.2) – Short term changes:**
  - **Short-term (less than two year) changes in the pre-existing terrain exposure, for the purposes of development, shall not be considered surface roughness C. Where development buildout will occur within three years and the resultant condition will meet the definition of surface roughness B, surface roughness B shall be regulating for the purpose of permitting.**

2010 Florida Building Code, Building Exposure Categories

- **High Velocity Hurricane Zones**
  - **Miami-Dade and Broward Counties**
  - **All buildings considered to be Exposure C unless Exposure D applies**

2010 Florida Building Code, Building Wind Speed Conversions, V_{asd}

Table 1507.2.7.1
Classification of Asphalt Shingles

Classification of Asphalt Shingles			
Maximum Basic Wind Speed From Figures 1609A, B or C	**V_{asd}**	**ASTM D 7158**	**ASTM D 3161**
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

2010 Florida Building Code, Building Rooftop Equipment

- **1609.8 (1620.6 HVHZ) The lateral force on rooftop structures and equipment with A_f less than(0.1Bh) located on buildings of all heights shall be determined from Equation 29.5-1 in which the value of GC_f is 3.1. GC_f shall be permitted to be reduced linearly from 3.1 to 1.1 as the value of A_f is increased from (0.1Bh) to (Bh). The value of G from Section 26.9 shall not be used. Additionally, a simultaneous uplift force shall be applied, given by Equation 29.5-1 in which GC_f = 1.5 and A_f is replaced by the horizontal projected area, A_r, of the rooftop structure or equipment. For the uplift force GC_f shall be permitted to be reduced linearly from 1.5 to 1.0 as the value of A_r is increased from (0.1BL) to (BL).**

2010 Florida Building Code, Building Alternate All-heights Procedure

- **Section 1609.6**
  - **Not really a simplification**
  - **Based on ASCE 7-05 All-heights method**
  - **Mostly reorganization of the controlling variables for simple diaphragm building**
  - **Modified in the 2010 FBCB to work with ASCE 7-10**
  - **Still have to use ASCE 7**
  - **More complicated than ASCE 7**

125

2010 Florida Building Code, Building Alternate All-heights Procedure

- **Limitations**
  - **H ≤ 75 ft, with height to least width ratio of 4 or less, or frequency greater than or equal to 1 hz**
  - **Not sensitive to dynamic effects**
  - **Not subject to channeling or buffeting in wake of upwind obstructions**
  - **Simple diaphragm building**
  - **Open buildings, certain roof types, signs, and rooftop equipment have to comply with ASCE 7**

126

2010 Florida Building Code, Building Alternate All-heights Procedure

- **Basic Equation**

$$P_{net} = q_s K_z C_{net} K_{zt}$$

$$q_s = 0.00256V^2$$

$$C_{net} = K_d[(G)(C_p)-(GC_{pi})]$$

q_s given in Table 1609.6.2(1)

C_{net} given in Table 1609.6.2(2)

K_z and K_{zt} given in ASCE 7

Have to consider torsional load case from ASCE 7

TABLE 1609.6.2(1)
WIND STAGNATION PRESSURE (q_s) AT STANDARD HEIGHT OF 33 FEET[a]

BASIC WIND SPEED (mph)	105	110	120	125	130	140	150	160	170	180	190	200
PRESSURE, q_s (psf)	28.2	31.0	36.9	40.0	43.3	50.2	57.6	65.5	74.0	83.0	92.4	102.4

For SI: 1 foot = 304.8 mm, 1 mile per hour = 0.447 m/s, 1 pound per square foot = 47.88 Pa.
a. For basic wind speeds not shown, use $q_s = 0.00256\ V^2$.

TABLE 1609.6.2(2)
NET PRESSURE COEFFICIENTS, C_{net} [a, b]

STRUCTURE OR PART THEREOF	DESCRIPTION		C_{net} FACTOR			
			Enclosed		Partially enclosed	
	Walls:		+ Internal pressure	- Internal pressure	+ Internal pressure	- Internal pressure
	Windward wall		0.43	0.73	0.11	1.05
	Leeward wall		-0.51	-0.21	-0.83	0.11
	Sidewall		-0.66	-0.35	-0.97	-0.04
	Parapet wall	Windward	1.28		1.28	
		Leeward	-0.85		-0.85	
	Roofs:		Enclosed		Partially enclosed	
	Wind perpendicular to ridge		+ Internal pressure	- Internal pressure	+ Internal pressure	- Internal pressure
	Leeward roof or flat roof		-0.66	-0.35	-0.97	-0.04
	Windward roof slopes					
	Slope = 2:12 (10°)	Condition 1	-1.09	-0.79	-1.41	-0.47
		Condition 2	-0.28	0.02	-0.60	0.34
	Slope = 4:12 (18°)	Condition 1	-0.73	-0.42	-1.04	-0.11
		Condition 2	-0.05	0.25	-0.37	0.57
	Slope = 5:12 (23°)	Condition 1	-0.58	-0.28	-0.90	0.04
		Condition 2	0.03	0.34	-0.29	0.65
1. Main wind-force-resisting frames and systems	Slope = 6:12 (27°)	Condition 1	-0.47	-0.16	-0.78	0.15
		Condition 2	0.06	0.37	-0.25	0.68
	Slope = 7:12 (30°)	Condition 1	-0.37	-0.06	-0.68	0.25
		Condition 2	0.07	0.37	-0.25	0.69
	Slope = 9:12 (37°)	Condition 1	-0.27	0.04	-0.58	0.35
		Condition 2	0.14	0.44	-0.18	0.76
	Slope = 12:12 (45°)		0.14	0.44	-0.18	0.76
	Wind parallel to ridge and flat roofs		-1.09	-0.79	-1.41	-0.47
	Nonbuilding Structures: Chimneys, Tanks and Similar Structures:					
				h/D		
				1	7	25
	Square (Wind normal to face)			0.99	1.07	1.53
	Square (Wind on diagonal)			0.77	0.84	1.15
	Hexagonal or Octagonal			0.81	0.97	1.13
	Round			0.65	0.81	0.97
	Open signs and lattice frameworks			Ratio of solid to gross area		
				< 0.1	0.1 to 0.29	0.3 to 0.7
	Flat			1.30		1.16
	Round			0.87	0.94	1.08

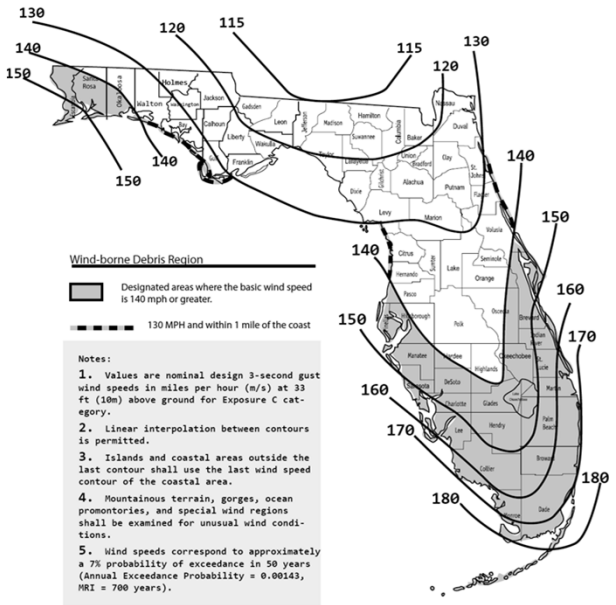
(continued)

129

2010 Florida Building Code, Residential Wind Provisions

- **Wind speed maps and designations same as FBCB**
- **Protection of Openings and Wind-borne Debris Regions similar to FBCB**
- **Exposure Categories same as FBCB**

130



131

Figure R301.2(4) Ultimate Design Wind Speeds, V_{ult}

2010 Florida Building Code, Residential Wind Provisions

- **Section R301.2.1.2 Protection of openings**
  - **(3) Ventilation openings in an exterior wall into an attic space in buildings located in windborne debris regions shall have opening protection from windborne debris. Such opening protection into an attic space shall meet the requirements AMCA 540 or shall be protected by an impact resistant cover complying with an approved impact-resistance standard or the large missile test of ASTM E 1996.**

132

2010 Florida Building Code, Residential Wind Speeds

- **Testing to allowable or nominal loads**
  - **Where testing for wind load resistance is based on allowable or nominal wind loads, the design wind loads determined in accordance with ASCE 7 or Section 1609 of the *Florida Building Code, Building* are permitted to be multiplied by 0.6 for the purposes of the wind load resistance testing.**
  - **Applicable to ASTM E 330 for doors**
  - **AAMA/WDMA 101 standards for glass windows and doors**

The End

T. Eric Stafford, P.E.
testafford@charter.net
205/987-9034