GREENHECK
Codes & Standards
CS/103-12
PRODUCT APPLICATION GUIDE
A technical bulletin for engineers, contractors and students in the air movement and control industry.

New Test Standards for Louvers – International Building Code and Florida Building Code

The International Building Code (IBC) version 2012 along with the latest Florida Building Code (FBC) version 2010 have introduced new wind speed and load requirements along with new large missile impact requirements relative to wall louvers within the defined Hurricane Prone Region. This article will discuss the basis of these new standards.

Wind Speed (MPH) Versus Wind Load (PSF)

The most recent **previous** versions of both the IBC and the FBC adopted the methods prescribed within **American Society of Civil Engineers (ASCE) version 7-05** for determining both wind speeds (MPH) and wind loads (PSF) for both main reinforcing structures and components or cladding such as wall louvers. Wind speed (MPH) is simply one factor in the equation. Other items such as Importance Factor, Exposure and Height Above Grade play a major role in determining the actual pressure (PSF) requirements.

Importance Factor

The Importance Factor would depend upon the economic impact or civilian life impact in the event of a building or structure failure resulting from a catastrophic wind event such as a hurricane. If the building or structure were deemed to have minimal impact in the event of failure, the Importance Factor is 0.77 in the Hurricane Prone Region or 0.87 in the non-Hurricane Prone Region. If the building or structure would have mid-level impact in the event of failure, the Importance Factor is 1.0. Any high impact or critical buildings or structures would carry an Importance Factor of 1.15.

Exposure

Exposure considers the location of the building or structure. If the building or structure is located in a metropolitan environment surrounded by other buildings or structures, Exposure B is assumed. If the building or structure is located with direct exposure to coastal waters or completely flat terrain without rough disruption, Exposure D is assumed. Any other location would assume Exposure C. The worst case scenario Exposure is D.

Height Above Grade

Height above grade is simply how high up the components or cladding are located on the building or structure. The higher a louver is located on a given stucture, the greater impact on the wind loading.

Additionally, ASCE 7-05 defines the Hurricane Prone Region as any location along the United States Atlantic and Gulf of Mexico coast where the basic wind speed is greater than 90 MPH. Hawaii, Guam, US Virgin Islands, American Samoa and Puerto Rico are all considered within the Hurricane Prone Region as well. *Please reference the following examples as a sampling of corresponding wind speeds and pressures using several relevant criteria per ASCE 7-05.*

Ultimate Design Wind Speed: (MPH): 120

Importance Factor: 1.0

Exposure: C

Height Above Grade (Ft): 20, 40, 60

Calculated Wind Pressure (PSF): 53, 61, 66

GREENHECK
Building Value in Air.
P.O. Box 410 • Schofield, WI 54476 • 715.359.6171 • Fax 715.355.2399

Ultimate Design Wind Speed: (MPH): 120

Importance Factor: 1.15

Exposure: C

Height Above Grade (Ft): 20, 40, 60

Calculated Wind Pressure (PSF): 60, 70, 76

Basic Wind speed (MPH): 140

Importance Factor: .77

Exposure: D

Height Above Grade (Ft): 30, 50, 70

Calculated Wind Pressure (PSF): 71, 78, 103

Basic Wind speed (MPH): 140

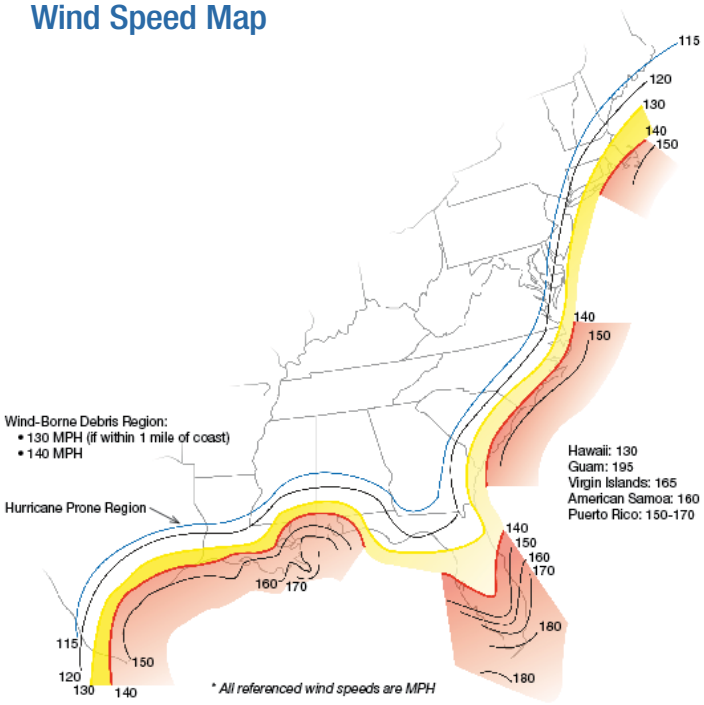
Importance Factor: 1.15

Exposure: D

Height Above Grade (Ft): 30, 50, 70

Calculated Wind Pressure (PSF): 106, 116, 154

ASCE 7-10 Building Risk Category II Wind Speed Map



IBC 2012 along with FBC 2010 both adopted the latest ASCE standard, version 7-10. ASCE 7-10 now considers three different wind speed maps rather than one map previously depicted by ASCE 7-05. Rather than considering the Importance Factor within the wind speed/wind pressure equation one must consider the Building Risk Category, whether it is a I, II, III or IV.

Risk Category I

A Risk Category I building or structure would have minimal economic or civilian life impact in the event of failure.

Risk Category II

A Risk Category II building or structure would have mid-level impact in the event of failure.

Risk Category III/IV

A Risk Category III/IV building or structure would have a high impact as a result of failure. The actual basic wind speeds increase with an increase in the Building Risk Category.

ASCE 7-10 now considers the factored load design rather than an allowable stress design. The end result — even though all relative wind speeds have increased, the actual calculated design pressure as it relates to wall louver products is very similar to or less than (in most cases) it would be considering ASCE 7-05.

Additionally ASCE 7-10 defines the Hurricane Prone Region as any location along the United States Atlantic or Gulf of Mexico coast where the basic wind speed is greater than 115 MPH as shown in the Building Risk Category II map (105 MPH on Building Risk Category I map and 120 MPH on Building Risk Category III/IV map). Hawaii, Guam, US Virgin Islands, American Samoa and Puerto Rico are all considered within the hurricane prone region. *Please reference the following examples as a sampling of corresponding wind speeds and pressures using several relevant criteria per ASCE 7-10.*

Ultimate Design Wind Speed (MPH): 140

Building Risk Category: II

Exposure: C

Height Above Grade (Ft): 20, 40, 60

Calculated Wind Pressure (PSF): 43, 50, 54

Ultimate Design Wind Speed (MPH): 150

Building Risk Category: III/IV
Exposure: C
Height Above Grade (Ft): 20, 40, 60
Calculated Wind Pressure (PSF): 49, 57, 62

Ultimate Design Wind Speed (MPH): 160
Building Risk Category: I
Exposure: D
Height Above Grade (Ft): 30, 50, 70
Calculated Wind Pressure (PSF): 72, 79, 105

Ultimate Design Wind Speed (MPH): 180
Building Risk Category: III/IV
Exposure: D
Height Above Grade (Ft): 30, 50, 70
Calculated Wind Pressure (PSF): 91, 100, 133

Large Missile Impact Standard(s) For Louvers

The most recent **previous** versions of the IBC define the Wind Borne Debris Region within the Hurricane Prone Region as any location where the basic wind speed is 120 MPH or greater (and Hawaii) or where the basic wind speed is 110 MPH or greater and located within one mile of the coastal mean high water line.

Louvers protecting air intake and exhaust ventilation ducts not assumed to be open that are located within 30 feet of grade shall meet the requirements of an approved impact-resisting standard or the Large Missile Impact Test of ASTM E1996.

Many considered Florida Large Missile Impact test protocol TAS 201 to be the approved impact-resisting standard. Florida test protocol TAS-201 boasts the same missile criteria as defined within ASTM E 1996 missile level D. Florida TAS 201 and ASTM E 1996 require a 9 pound 2 x 4 traveling at a rate of 50 FPS (34 MPH).

Both IBC 2012 and FBC 2010 have re-defined the Wind-Borne Debris region within the Hurricane Prone Region and have adopted the AMCA 540 test method for louvers impacted by wind borne debris.

The Wind-Borne Debris region is now defined as any location within the Hurricane Prone Region where the ultimate design wind speed is 140 MPH or greater (and Hawaii) or where the ultimate design wind speed is 130 MPH or greater and located within one mile of the coastal mean high water line.

AMCA 540 is very similar in spirit to ASTM E-1996 or Florida TAS 201. However, AMCA 540 requires the manufacturer test their smallest louver specimen rather than their largest. It is more difficult to pass a missile impact standard with a smaller louver specimen.

Additionally, AMCA 540 has two different missile speeds to consider. For Basic Protection Missile Level D is required. AMCA 540 Missile Level D simulates the impact of a 9 pound 2 x 4 traveling at a rate of 50 FPS (34 MPH). For further definition of Basic Protection please reference AMCA 540 section 3.2. Per AMCA 540, Enhanced Protection is required for all Essential Facilities. For Essential Facilities, the missile shall have an impact speed of Missile Level E.

Greenheck's onsite missile impact test

Missile Level E simulates the impact of a 9 pound 2 x 4 traveling at a rate of 80 FPS (55 MPH). For further definition of Essential Facilities please reference AMCA 540 section 3.1.

IBC 2012 references in section 1609.1.2.1, *"Louvers protecting intake and exhaust ventilation ducts not assumed to be open that are located within 30 feet (9144 mm) of grade shall meet the requirements of AMCA 540."* FBC 2010 indicates in section 1609.1.2.1, *"Louvers protecting intake and exhaust ventilation ducts not assumed to be open that are located within 30 feet (9144 mm) of grade shall meet requirements of 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."*

IBC 2012 will be considered by states during 2012 for adoption and use in 2013 and 2014. FBC 2010 formally went into effect March 15, 2012.

Check with your local code officials to determine the most up-to-date code requirements in your area.

GREENHECK®

P.O. Box 410 • Schofield, WI 54476-0410 • 715.359.6171 • greenheck.com