TITLE: Recent Changes in the Determination of Wind Loads on Roofs as Outlined by ASCE-7

DESIGNATION: IIBEC-TA-002-2011 (updated 2013)

OBJECTIVE: To present a summary of the recent changes associated with the determination of wind loads for roofs in accordance with ASCE-7, *Minimum Design Loads for Buildings and Other Structures*. This Technical Advisory is considered to be informative in nature and intended to provide general information regarding the recent changes. The interpretation and full understanding of the referenced document shall be the responsibility of the designer.

A. SUMMARY OF CHANGES

ASCE-7 is revised on a five-year cycle with the previous version published in 2005 and the newest version published in late 2010. The 2010 version of ASCE-7 will be referenced in the 2012 version of the IBC. The following text presents a summary of the changes and a comparison of the 2005 criteria and the 2010 criteria, where applicable.

A.1 WIND SPEED MAPS

- ASCE-7 2005: Basic wind speeds that range from 85 mph to 150 mph are provided on a single map for the United States and are based on peak gusts measured 33 feet above grade for Exposure C.

- ASCE-7 2010: Three different maps are provided – Map 1 for buildings in Category I (low risk to life); Map 2 for buildings in Category II (most residential, commercial, and industrial buildings); and Map 3 for buildings in Categories III and IV (housing large number of people or critical commercial services). The wind speeds depicted on these maps are also based on peak gusts measured 33 feet above grade for Exposure C.

A.2 IMPORTANCE FACTOR

- ASCE-7 2005: The importance factor is used in the wind load calculation and reduces loads for Category I buildings, but increases loads for Category III and IV buildings.

- ASCE-7 2010: Since the load factor is applied to wind speeds, the importance factor is eliminated.

A.3 LOAD COMBINATIONS

- ASCE-7 2005: A load factor of 1.6 is used for the Load and Resistance Factor Design (LRFD) method; a load factor of 1.0 is used for the Allowable Stress Design (ASD) method.

- ASCE-7 2010: The load factor is changed to 1.0 for the LRFD method, except for buildings located in hurricane-prone regions; the load factor is changed to 0.6 for the ASD method, except for buildings located in hurricane-prone regions.

A.4 HURRICANE-PRONE REGIONS

- New computer model indicates that wind speeds decay faster once the storm moves inland, so that the wind speeds that are farther from the storm's core are actually lower. New maps will push the wind speed lines seaward and reduce the size of the hurricane-prone regions. Some areas that are currently located in hurricane-prone regions in ASCE-7 2005 will not be in ASCE-7 2010.

A.5 EXPOSURE D

- ASCE-7 2005: Exposure D was eliminated from this version along the hurricane coastline.

- ASCE-7 2010: Exposure D was reinstated for a narrow strip along the coast, based on research that indicates that either high waves do not dampen wind speeds or the surface roughness of the ocean is smoother than previously believed. Therefore, the exposure is more similar to Exposure D than Exposure C, and higher wind loads would be expected in these areas under the 2010 version, compared with the 2005 version.

A.6 WIND-BORNE DEBRIS

- ASCE-7 2005: The extent of the wind-borne debris region was the same for Categories II, III, and IV.

- ASCE-7 2010: The area of wind-borne debris has been defined more conservatively and extends further inland, resulting in a larger areas for some Category III buildings and for all Category IV buildings.

A.7 SIMPLIFIED PROCEDURE

- ASCE-7 2005: The simplified procedure is suitable for determining wind pressures for buildings up to 60 feet tall.

- ASCE-7 2010: The simplified procedure is suitable for determining wind pressures for buildings up to 160 feet tall.

A.8 BUILDING CATEGORIES

- ASCE-7 2005: The classification (Category I-IV) of buildings for determination of wind loads is defined based on the nature of occupancy, including number of people in one area, type of facility, and other criteria.

- ASCE-7 2010: The classification (Category I-IV) of buildings for determination of wind loads is based on the risk associated with unacceptable performance. These categories are defined more generally, and the risk category is determined by the specifier.

A.9 TEXT ORGANIZATION

- ASCE-7 2005: Information related to wind loads is contained within Chapter 6.

- ASCE-7 2010: Information related to wind loads is contained within Chapter 26 (Wind Loads: General Requirements); Chapters 27-29 (Wind Loads on Buildings - MWFRS); Chapter 30 (Wind Loads - Components and Cladding); and Chapter 31 (Wind Tunnel Procedure).

B. SUPPORTING DOCUMENTATION

- ASCE-7 2010

- Sample Building Classification: ASCE-7 2010

- Sample Wind Speed Map: ASCE-7 2010

C. REFERENCES

1. *Significant Changes to the Wind Load Provisions of ASCE 7-10: An Illustrated Guide*, published by ASCE.

   - This publication focuses on updates to the wind load requirements set forth in ASCE 7-2010. The wind load provisions have undergone the most extensive revision since the 1995 edition of the standard. Mirroring the organization of the wind chapters in ASCE-7 2010, this reference summarizes each change to the wind provisions that might affect practice or enforcement and immediately follows up with the precise wording of the change. The impact of each update is explained in clear, straightforward language accompanied by diagrams, examples, and color photographs and illustrations to enrich the reader's understanding.

2. Applied Technology Council (ATC) Web site (www.atcouncil.org)

   - This Web site offers a "Wind Speed by Location" site to provide users with a tool to find site-specific wind speed using the GPS coordinate system. The reason this utility is needed is that the spatial resolution of the wind speed maps that are displayed in ASCE-7 2010 are not sufficient to determine a site-specific wind speed. There are no reference city or town locations on the ASCE-7 2010 maps, and while county boundaries are shown, the resolution is affected when the maps are expanded large enough to distinguish the boundaries and approximate the city locations.

3. "Mapping the 2010 Wind Changes," by Thomas Smith, published in *Professional Roofing*, August 2010.

4. *ASCE 7-10 Wind Provisions and Effects on Wood Design and Construction*, by Philip Line and William L. Coulbourne, published by the American Wood Council, http://www.awc.org/pdf/ASCE7-10WindChanges.pdf.