MIAMI-DADE COUNTY, FLORIDA
METRO-DADE FLAGLER BUILDING

BUILDING CODE COMPLIANCE OFFICE
METRO-DADE FLAGLER BUILDING
140 WEST FLAGLER STREET, SUITE 1603
MIAMI, FLORIDA 33130-1563
(305) 375-2901 FAX (305)375-2908

CONTRACTOR LICENSING SECTION
(305) 375-2527 FAX (305) 375-2558

CONTRACTOR ENFORCEMENT SECTION
(305) 375-2966 FAX (305) 375-2908

PRODUCT CONTROL DIVISION
(305) 375-2902 FAX (305) 372-6339

MEMO

TO: **All Building Officials in Miami-Dade County**

FROM: **Herminio F. González, P.E., Director**
Building Code Compliance Office

DATE: **May 12, 2009**

SUBJECT: Wind Load Directionality Factor K_d

This memo is provided to clarify the use of Directionality Factor K_d given in American Society of Civil Engineers standard, ASCE 7 for calculating wind loads on buildings and structures in Miami-Dade County.

In the strength design load combinations provided in ASCE 7-88 and 7-93 the 1.3 factor for wind included a "wind directionality factor" of 0.85. In ASCE 7-98, 7-02 and 7-05, the loading combinations used 1.6 instead of 1.3 (Approximately equals 1.6 X 0.85); the directionality factor is included in the equation for velocity pressure. Therefore, the note shown below the directionality factor table in ASCE 7 indicates that "This factor shall only be applied when used in conjunction with load combinations specified in 2.3 and 2.4." The explanation given by Structural Engineering Institute of ASCE in its Frequently Asked **Question # 9** about the wind provisions of ASCE 7-02 is " Separating the directionality factor from load combinations allows the designer to use specific directionality factors for each structure and allows the factor to be revised more readily when new research becomes available".

See attachment *"Frequently Asked Questions by Structural Engineering Institute"* for your reference.

The 1/3rd allowable stress increase for wind load, which was deleted in 2004 Florida Building Code, has no relationship with the wind directionality factor.

If you have any questions contact Mr. Iqbal Shaikh, P.E. of my staff at (305) 375-4615.

HFG:is

ATTACHMENTS

Frequently Asked Questions about the Wind Provisions of ASCE 7-02

Reprinted From "Guide to the Use of the Wind Load Provisions of ASCE 7-02"
By Kishor C. Mehta and James M. Delahay

The questions and answers below came directly from Chapter 4 of "Guide to the Use of the Wind Load Provisions of ASCE 7-02" by Kishor C. Mehta and James M. Delahay. Additional FAQ's appear in the guide. It is available through the ASCE publications department for $49.00 nonmember / $36.75 member. The guide will not be released until December, but you can reserve your copy now by calling ASCE at 1-800-548-2723.

1. *Is it possible to obtain larger scale maps of basic wind speeds (see Figures 6-1, 6-1a, 6-1b, and 6-1c) so that the locations of the wind speed contours can be determined with greater accuracy?*

No. The wind speed contours in the hurricane-prone region of the United States are based on hurricane wind speeds from Monte Carlo simulations and on estimates of the rate at which hurricane wind speeds attenuate to 90 mph following landfall. Because the wind speed contours of these figures represent a consensus of the ASCE 7 Task Committee on Wind Loads, increasing the map scale would do nothing to improve their accuracy.

2. *IBC Figure 1609 gives the 3-s wind speed at the project location. However, according to the Notes, Figure 1609 is for Exposure C. If the project location is Exposure B, what is the proper wind speed to use?*

The basic wind speed in IBC Figure 1609 or ASCE 7-02 is defined as a 3-s gust wind speed at 33 ft above ground for Exposure Category C, which is the standard measurement. The velocity pressure exposure coefficient, K_z, adjusts the wind speed for exposure and height above ground. However, for simplicity the coefficient is applied in the pressure equation, thus adjusting pressure rather than wind speed. Use of K_z adjusts the pressures from Exposure C to Exposure B.

3. *If the design wind loads are to be determined for a building that is located in a special wind region (shaded areas) in Figures 6-1, 6-1a, 6-1b, and 6-1c, what basic wind speed should be used?*

The purpose of the special wind regions in these figures is to alert the designer to the fact that there are regions in which wind speed anomalies are known to exist. Wind speeds in these regions may be substantially higher than the speeds indicated on the map, and the use of regional climatic data and consultations with a wind engineer or meteorologist are advised.

4. *In the design of the main wind force-resisting systems (MWFRS), the provisions of Figure 6-6 apply to enclosed or partially enclosed buildings of all heights. The provisions of Figure 6-10 apply to enclosed or partially enclosed buildings with mean roof height less than or equal to 60 ft. Does this mean that either figure may be used for the design of a low-rise MWFRS?*

Figure 6-6 may be used for buildings of all heights, whereas Figure 6-10 applies only to low-rise buildings. Section 6.2 defines low-rise buildings to comply with mean roof height h £ 60 ft and h not to exceed least horizontal dimensions. Pressure coefficients for low-rise buildings given in Figure 6-10 represent "pseudo" loading conditions enveloping internal structural reactions of total uplift, total horizontal shear, bending moment, etc. (see Section C6.5.11). Thus, they are not real wind-induced loads. These loads work adequately for buildings of the shapes shown in Figure 6-10, but they become questionable when extrapolated to other shapes.

5. *Do I consider a tilt-up wall system to be components and cladding (C&C) or MWFRS or both?*

Both. Depending on the direction of the wind, a tilt-up wall system must resist either MWFRS forces or C&C forces. In the C&C scenario, the elements receive the wind pressure directly and transfer the forces to the MWFRS in the other direction. When a tilt-up wall acts as a shear wall, it is resisting forces of MWFRS. Because the wind is not expected to blow from both directions at the same time, the MWFRS forces and C&C forces are analyzed independently from each other in two different load cases. This is also true of masonry and reinforced-concrete walls.

6. *Section 6.1.4.1 provides for a minimum wind pressure of 10 lb/ft^2 multiplied by the area of the building or structure projected onto a vertical plane normal to the assumed wind direction of MWFRS. Does this provision apply to low-rise buildings?*

It should. There was some confusion in ASCE 7-98 provisions for low-rise buildings where it was difficult to interpret application of loads on building frames using the two cases of loads at each corner. Figure 6-10 in ASCE 7-02 clarifies with illustrative sketches the application of loads on low-rise buildings, and only one table of pressure coefficients is provided. In addition, Note 6 is added to account for minimum total horizontal shear, although this provision does not guarantee minimum 10 psf on the projected area of the building.

8. *When can I use the one-third stress increase specified in some material standards?*

When using the loads or load combinations specified in ASCE 7-02, no increase in allowable stress is permitted except when the increase is justified by the rate of duration of load (such as duration factors used in wood design). Instead, load combination #6 from Section 2.4.1 of ASCE 7-02 was added for the case when wind load and another transient load are combined. This load combination applies a 0.75 factor to the transient loads ONLY (not to the dead load). The 0.75 factor applied to the transient loads accounts for the fact that it is extremely unlikely that two maximum events will happen at the same time.

9. *Why can the wind directionality factor (K_d) only be used with the load combinations specified in Sections 2.3 and 2.4 of ASCE 7-02?*

In the strength design load combinations provided in previous editions of ASCE 7 (ASCE 7-95 and earlier), the 1.3 factor for wind included a "wind directionality factor" of 0.85. In ASCE 7-98, the loading combinations used 1.6 instead of 1.3 (approximately equals 1.6 x 0.85), and the directionality factor is included in the equation for velocity pressure. Separating the directionality factor from the load combinations allows the designer to use specific directionality factors for each structure and allows the factor to be revised more readily when new research becomes available.

10. *What exposure category should I use for the MWFRS if the terrain around my site is Exposure B, but there is a large parking lot directly next to one of the elevations?*

Section 6.5.6 of ASCE 7-02 provides general definitions of Exposures B, C, and D; however, the designer must refer to the Commentary for a detailed explanation for each exposure. The exposure depends on the size of the parking lot, its size relative to the building, and the number and type of obstructions in the area. Section C6.5.6 of the Commentary includes a formula (Eq. C6-2) that will help the designer determine if the terrain roughness is sufficient to be categorized as Exposure B. Note that, for Exposure B, the fetch distance is 2,630 ft or 10 times the structure's height, whichever is greater. Also note that the Commentary provides suggestions for determining the "upwind fetch surface area."

For clearings such as parking lots, wide roads, road intersections, underdeveloped lots, and tree clearings, the Commentary provides a rational procedure and an example to interpolate between Exposure B and C; the designer is encouraged to use this procedure.

11. *What pressure coefficients should be used to reflect contributions for the underside (bottom) of the roof overhangs and balconies?*

Sections 6.5.11.4.1 and 6.5.11.4.2 specify pressure coefficients to be used for roof overhangs to determine loads for MWFRS and C&C, respectively. No specific guidance is given for balconies, but use of the loading criteria for roof overhangs should be adequate.

12. *If the mean roof height, h, is greater than 60 ft with a roof geometry that is other than flat roof, what pressure coefficients are to be used for roof C&C design loads?*

Section 6.5.12.4.3 permits use of pressure coefficients of Figures 6-11 through 6-16 provided the mean roof height $h < 90$ ft, the height-to-width ratio is 1 or less, and Eq. 6-22 is used.

Note 6 of Figure 6-17 permits use of coefficients of Figure 6-11 when the roof angle $0 > 10°$.

14. *Under what conditions is it necessary to consider speed-up due to topographic effects when calculating wind loads?*