significantly more hurricane data have become available to improve the modeling process. These new data have resulted in an improved representation of the hurricane wind field, including the modeling of the sea–land transition and the hurricane boundary layer height; new models for hurricane weakening after landfall; and an improved statistical model for the Holland *B* parameter, which controls the wind pressure relationship. The new hurricane hazard model yields hurricane wind speeds that are lower than those given in ASCE 7-05, even though the overall rate of intense storms (as defined by central pressure) produced by the new model is increased compared to those produced by the hurricane simulation model used to develop the ASCE 7-98 through ASCE 7-05 wind speeds.

Correlation of Basic Wind Speed Map with the Saffir–Simpson Scale. Hurricane intensities are reported by the National Hurricane Center according to the Saffir–Simpson Hurricane Scale (Simpson 2003 and Liu 1999), shown in Table C26.5-1. This scale has found broad usage by hurricane forecasters and local and federal agencies responsible for short-range evacuation of residents during hurricane alerts, as well as long-range disaster planning and the news media. The scale contains five categories of hurricanes and distinguishes them based on wind speed intensity, barometric pressure at the center of the storm, and estimated storm surge and damage potential. Wind speed is the determining factor used in categorizing the hurricane.

The wind speeds used in the Saffir–Simpson Hurricane Scale are defined in terms of a sustained wind speed with a 1-min averaging time at 33 ft (10 m) over open water. The ASCE 7 standard by comparison uses a 3-s gust speed at 33 ft (10 m) above ground in Exposure C (defined as the Basic Wind Speed, and shown in the wind speed map, Fig. 26.5-1). An approximate relationship between the wind speeds in ASCE 7 and the Saffir–Simpson scale, based on recent data on the roughness of the water surface, is shown in Table C26.5-2. The table provides the sustained wind speeds of the Saffir–Simpson scale over water, equivalent intensity gust wind speeds over water, and equivalent intensity gust wind speeds over land. Table C26.5-3 takes into account research by Powell, et al. 2003 and Donelan, et al. 2004, which has determined that the sea surface roughness remains approximately constant for mean hourly speeds in excess of 30 m/s. For a storm of a given intensity, Table C26.5-3 takes into consideration both the reduction in wind speed as the storm moves from over water to over land due to changes in surface roughness and also the change in the gust factor as the storm moves from over water to over land (Vickery and Skerlj 2000 and Simiu et al. 2007). The sustained wind speed over water in Table C26.5-3 cannot be converted to a peak gust wind speed using the Durst curve of Fig. C26.5-1, which is only valid for wind blowing over open terrain (Exposure C).

The gust wind speed values given in Table C26.5-3 differ significantly from those given in ASCE 7-05 because the results of the research indicate that the aerodynamic roughness of the ocean does not continue to increase with increasing wind speed. The impact of this change in our understanding of the behavior of the ocean roughness as a function of wind speed is most apparent at high wind speeds. For example, in the case of a 155-mph sustained wind speed (over water) the roughness length, z_0, of the water computed using an ocean drag coefficient model that continues to increase with increasing wind speed is ~0.020 m. Using the gust factor models described in Vickery and Skerlj (2005), the 3-s gust wind speed associated with a 1-min average wind speed of 155 mph and a surface roughness of 0.020 m is 195 mph. The corresponding 3-s gust speed in Exposure C conditions ($z_0 = 0.03$ m) is 191 mph. These gust wind speed values match those given in Table C6-2 in ASCE 7-05.

The research (Vickery et al. 2008b and Powell et al. 2003) indicates that the ocean roughness does not exhibit a monotonic increase in roughness with increasing wind speed, as was previously assumed, and suggests that the sea surface drag coefficient increases with wind speed up to a maximum of only ~0.0025 or less. A drag coefficient of 0.0025 is associated with a surface roughness of 0.0033 m. Using the gust factor models described in Vickery and Skerlj (2005), the 3-s gust wind speed associated with a 1-min average wind speed of 155 mph and a surface roughness of 0.0033 m is about 190 mph. The corresponding 3-s gust speed in Exposure C conditions ($z_0 = 0.03$ m) is only 171 mph.

Table C26.5-4 shows the design wind speed from the ASCE 7 basic wind speed map (Fig. 26.5-1) for various locations along the hurricane coastline from Maine to Texas. This wind speed represents an approximate limit state. Tables C26.5-4 and C26.5-5 show the basic wind speeds for Risk Category II buildings and Risk Category III and IV buildings in terms of the Saffir–Simpson Hurricane Scale. These tables indicate the hurricane category equivalents. Structures designed to withstand the wind loads