WIND LOADS

The wind load is the pressure applied against the structure from winds. Wind loads do not act the same as the gravity loads already discussed. They generally act laterally against the building. However, they can create both positive and negative pressures on a building. When the wind blows directly against an exterior wall, it acts positively against the wall trying to push against it. This is called a positive pressure on the building. However, when the wind hits the corner of a building or the top of a roof, it creates suction on the opposite side that is called a negative force on the building (see Figure 15-5).

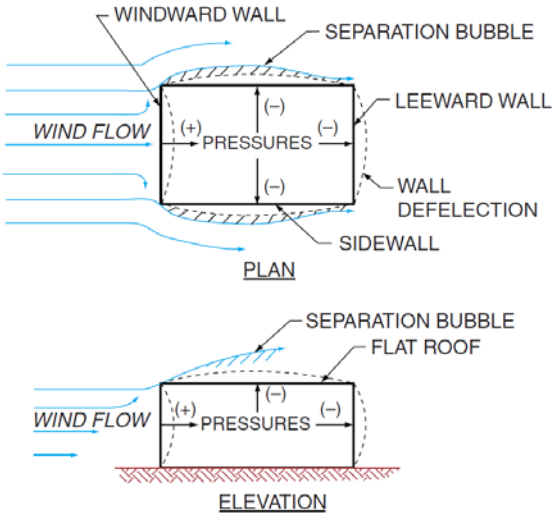

FIGURE 15-5 Wind pressures caused by external wind flow

Wind loads are determined based on the speed of the wind. Figure 15-6 shows the various wind speeds for the western portion of the continental United States. Figure 15-7 shows the wind speeds for the Florida coast. The wind speeds are equivalent to a three-second gust measured at thirty-three feet above the ground. The shaded areas on the maps are special wind regions. The local jurisdiction is responsible for determining the wind speed in these areas based on the fifty-year mean recurrence interval. [Ref. 1609.1]

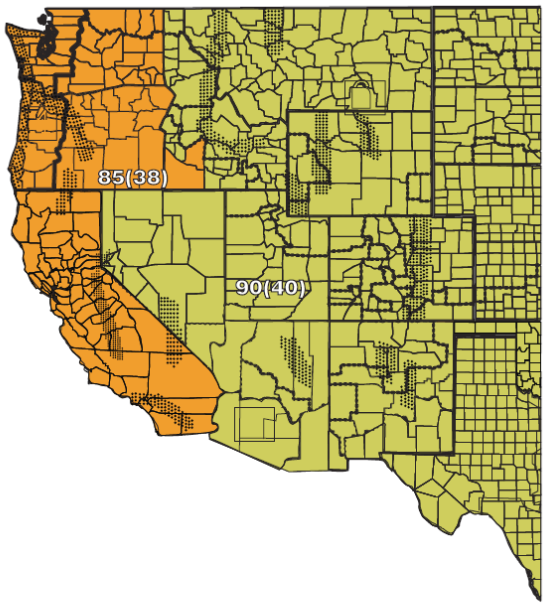

FIGURE 15-6 Basic wind speed (three-second gust) (based on IBC Figure 1609)

The wind speeds are used to calculate the load on the exterior walls and the roof and the overall stability of the building. As a building gets taller, the speed of the wind on the upper stories increases. The effect of the wind is also dependent on the topography, vegetation, and constructed features surrounding the area around the building. The code expresses these factors in categories called “surface roughness” and “exposure.”

For example, at areas along a coastline, the open water allows the wind to move much quicker. However, in a wooded area or urban area, the buildings and landscaping can slow the wind down. Therefore, the code requires that the design wind speed be increased in areas based on three exposure categories, B, C, and D. [Ref. 1609.4]

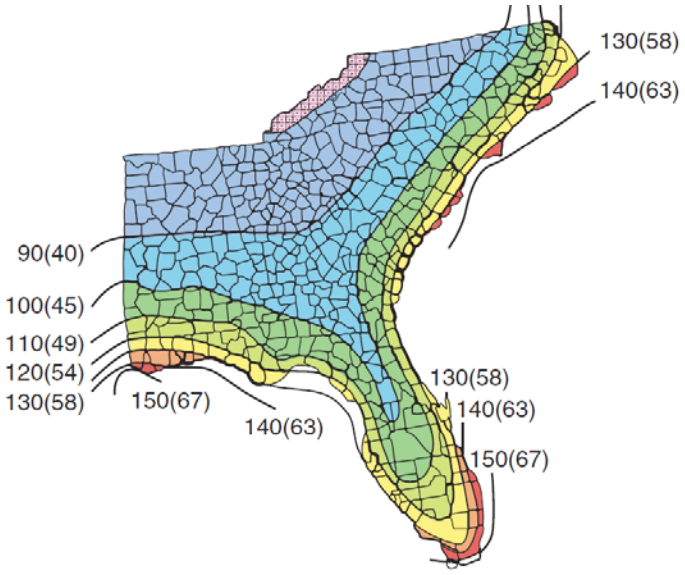

FIGURE 15-7 Basic wind speed (three-second gust) (based on IBC Figure 1609).

Code Basics

Surface Roughness Categories

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.

Surface Roughness C: Open terrain with scattered obstructions having heights generally less than thirty feet. This category includes flat open country, 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.