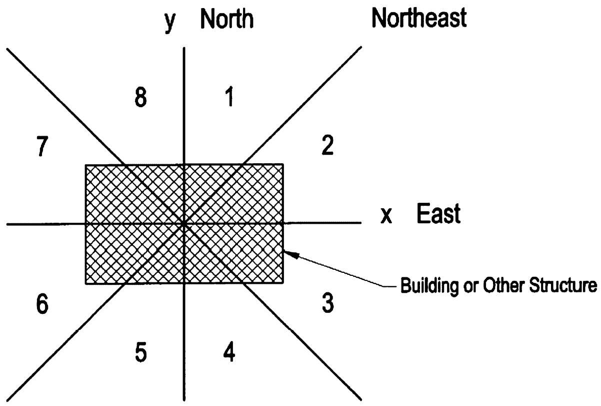

FIGURE C26.7-5 Determination of Wind Loads from Different Directions.

determined for eight wind directions at 45° intervals, with four falling along primary building axes as shown in Fig. C26.7-5. For each of the eight directions, upwind exposure is determined for each of two 45° sectors, one on each side of the wind direction axis. The sector with the exposure giving highest loads will be used to define wind loads for that direction. For example, for winds from the north, the exposure from sector one or eight, whichever gives the higher load, is used. For wind from the east, the exposure from sector two or three, whichever gives the highest load, is used. For wind coming from the northeast, the most exposed of sectors one or two is used to determine full x and y loading individually, and then 75 percent of these loads are to be applied in each direction at the same time according to the requirements of Section 27.4.6 and Fig. 27.4-8. The procedure defined in this section for determining wind loads in each design direction is not to be confused with the determination of the wind directionality factor K_d. The K_d factor determined from Section 26.6 and Table 26.6-1 applies for all design wind directions. See Section C26.6.

Wind loads for cladding and low-rise buildings elements are determined using the upwind exposure for the single surface roughness in one of the eight sectors of Fig. C26.7-5 that gives the highest cladding pressures.

C26.8 TOPOGRAPHIC EFFECTS

As an aid to the designer, this section was rewritten in ASCE 7-98 to specify when topographic effects need to be applied to a particular structure rather than when they do not as in the previous version. In an effort to exclude situations where little or no topographic effect exists, Condition (2) was added to include the fact that the topographic feature should protrude significantly above (by a factor of two or more) upwind terrain features before it becomes a factor. For example, if a significant upwind terrain feature has a height of 35 ft above its base elevation and has a top elevation of 100 ft above mean sea level then the topographic feature (hill, ridge, or escarpment) must have at least the H specified and extend to elevation 170 ft mean sea level (100 ft + [2 × 35 ft]) within the 2-mi radius specified.

A wind tunnel study by Means et al. (1996) and observation of actual wind damage has shown that the affected height H is less than previously specified. Accordingly, Condition (5) was changed to 15 ft in Exposure C.

Buildings sited on the upper half of an isolated hill or escarpment may experience significantly higher wind speeds than buildings situated on level ground. To account for these higher wind speeds, the velocity pressure exposure coefficients in Tables 27.3-1, 28.3-1, 29.3-1, and 30.3-1 are multiplied by a topographic factor, K_{zt}, determined by Eq. 26.8-1. The topographic feature (2-D ridge or escarpment, or 3-D axisymmetrical hill) is described by two parameters, H and L_h. H is the height of the hill or difference in elevation between the crest and that of the upwind terrain. L_h is the distance upwind of the crest to where the ground elevation is equal to half the height of the hill. K_{zt} is determined from three multipliers, K_1, K_2, and K_3, which are obtained from Fig. 26.8-1, respectively. K_1 is related to the shape of the topographic feature and the maximum speed-up near the crest, K_2 accounts for the reduction in speed-up with distance upwind or downwind of the crest, and K_3 accounts for the reduction in speed-up with height above the local ground surface.

The multipliers listed in Fig. 26.8-1 are based on the assumption that the wind approaches the hill along the direction of maximum slope, causing the greatest speed-up near the crest. The average maximum upwind slope of the hill is approximately $H/2L_h$, and measurements have shown that hills with slopes of less than about 0.10 ($H/L_h < 0.20$) are unlikely to produce significant speed-up of the wind. For values of $H/L_h > 0.5$ the speed-up effect is assumed to be independent of slope. The speed-up principally affects the mean wind speed rather than the amplitude of the turbulent fluctuations, and this fact has been accounted for in the values of K_1, K_2, and K_3 given in Fig. 26.8-1. Therefore, values of K_{zt} obtained from