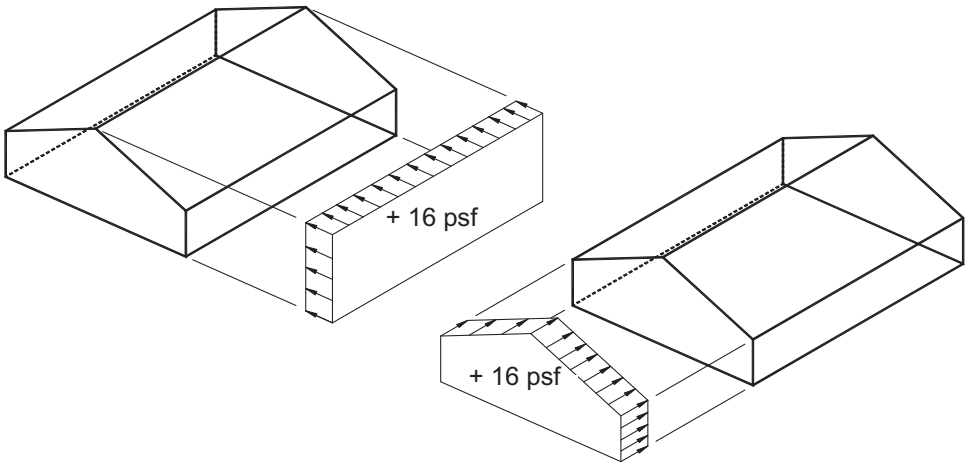

Figure C27.4-1 Application of Minimum Wind Load

the maximum wind shear for Load Case 2. Although this is more in line with wind tunnel experience on square and rectangular buildings with aspect ratios up to about 2.5, it may not cover all cases, even for symmetric and common building shapes where larger torsions have been observed. For example, wind tunnel studies often show an eccentricity of 5 percent or more under full (not reduced) base shear. The designer may wish to apply this level of eccentricity at full wind loading for certain more critical buildings even though it is not required by the standard. The present more moderate torsional load requirements can in part be justified by the fact that the design wind forces tend to be upper-bound for most common building shapes.

In buildings with some structural systems, more severe loading can occur when the resultant wind load acts diagonally to the building. To account for this effect and the fact that many buildings exhibit maximum response in the across-wind direction (the standard currently has no analytical procedure for this case), a structure should be capable of resisting 75 percent of the design wind load applied simultaneously along each principal axis as required by Case 3 in Fig. 27.4-8.

For flexible buildings, dynamic effects can increase torsional loading. Additional torsional loading can occur because of eccentricity between the elastic shear center and the center of mass at each level of the structure. Eq. 27.4-5 accounts for this effect.

It is important to note that significant torsion can occur on low-rise buildings also (Isyumov and Case 2000) and, therefore, the wind loading requirements of Section 27.4.6 are now applicable to buildings of all heights.

As discussed in Chapter 31, the wind tunnel procedure should always be considered for buildings with unusual shapes, rectangular buildings with larger aspect ratios, and dynamically sensitive buildings. The effects of torsion can more accurately be determined for these cases and for the more normal building shapes using the wind tunnel procedure.

C27.4.7 Minimum Design Wind Loads

This section specifies a minimum wind load to be applied horizontally on the entire vertical projection of the building as shown in Fig. C27.4-1. This load case is to be applied as a separate load case in addition to the normal load cases specified in other portions of this chapter.

PART 2: ENCLOSED SIMPLE DIAPHRAGM BUILDINGS WITH $h \leq 160$ ft

This section has been added to ASCE 7-10 to cover the common practical cases of enclosed simple diaphragm buildings up to height $h = 160$ ft. Two classes of buildings are covered by this method. Class 1 buildings have $h \leq 60$ ft with plan aspect ratios L/B between 0.2 and 5.0. Cases A through F are described in Appendix D to allow the designer to establish the lines of resistance of the MWFRS in each direction so that the torsional load cases of Fig. 27.4-8 need not be considered. Class 2 buildings have 60 ft $< h \leq 160$ ft with plan aspect ratios of L/B between 0.5 and 2.0.