

Seismology FAQ Submittals

Question: Design requirements for diaphragms of low-rise buildings having re-entrant corner irregularities (Type 2, Table 16-M) include the loss if the 1/3 increase as specified in Sect. 1633.2.9, item 6. Does it also include the requirements of item 7, and if so, how should this be done? It seems that the intent of this section is that it applies more to buildings without significant stiffness at the outstanding legs of the L, rather than to low-rise tilt-up structures.

Subject: Re-entrant Corners

Code Reference: 97UBC, 1633.2.9

Answer:

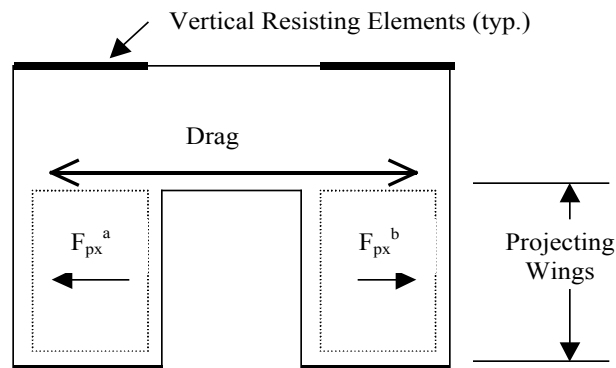
Table 16-M defines that a re-entrant plan irregularity conditions exists when both projections of the structure beyond the re-entrant corner are greater than 15 percent of the plan dimension of the structure in the given direction. In this instance, Table 16-M indicates that both items 6 and 7 must be satisfied. This means that if a re-entrant plan irregularity exists no 1/3 increase should be considered when designing drag members, splices and their connections to the vertical elements, when considering the requirements of item 7. However, either the 1/3 allowable stress or load duration increase is still permitted when designing diaphragm chords for the conditions of item 7, because chords are not included within the restrictions of item 6.

Independent motion of the projecting wings of diaphragms is a condition that is more severe in flexible diaphragms than it is in rigid diaphragms. In a perfectly rigid diaphragm, no independent motion could occur. However, because all diaphragms have some degree of flexibility, at least some degree of independent motion occurs in all diaphragms.

Where elaborate computer models are used to represent structure behavior, semi-rigid diaphragm properties can be used to determine the approximate degree of independent phasing of projecting wings that can occur, resulting in a more precise calculation of maximum chord and drag forces.

For flexible diaphragms, independent motion should be considered by applying the applicable portion of the diaphragm force, F_{px} , against each projecting wing of the diaphragm. An example of applying independent motions to determine chord and drag forces is shown below. Note that the forces in the drag element indicated would equal zero for at least a portion of the drag element when F_{px}^a and F_{px}^b are applied in the same direction. Only when the forces applied as independent motions can the maximum value of the drag force throughout the length of the drag element be determined.

Note that, except where excepted by Section 1633.2.6, collector elements, splices and their connections to resisting elements are required to resist the special seismic load combination of Section 1612.4.



Plan View of Diaphragm