will have a much stronger position if he or she has clearly shown the edge-distance requirements in the contract documents. Trying to change the manufacturer's standard details after the contract award may be more difficult.

In many cases, when significant anchor bolt capacity is needed, girts with flush inset cannot be used, because the columns would then be placed too close to the edge and the anchor bolts would lack the desired edge distance. A bypass girt inset might provide the answer. This illustrates once again how the structural engineer of record may have to influence the areas of metal building design that are supposedly within the purview of the manufacturer.

10.4 FRAMING AROUND OVERHEAD DOORS

10.4.1 Design Requirements

Many commercial and industrial buildings have large overhead doors and other wall openings (Fig. 10.4). The manufacturers of pre-engineered buildings share common methods of framing door and window openings in metal-clad exterior walls. Extending jambs made of cold-formed channels to the next horizontal girt or eave strut usually frames an opening, with a similar header on top (Fig. 10.5). This detail may work for doors and windows of small to moderate size, but not for large industrial overhead doors.

In wide overhead doors, slats subjected to heavy wind loading are typically too shallow and flexible to span the distance between the jambs as beams. Instead, doors resisting high winds behave as elastic membranes supported at the jambs, with some additional support provided at their top and bottom edges. These membranes undergo large deformations under load, which can lead to the doors being blown out of the guides.

Unfortunately, this is exactly what often happens. Heavy rains typically accompany hurricanes, and the entry of the wind-driven rain inside the building ruins its contents and leads to a major monetary loss, even if the rest of the exterior skin stays intact. For example, in surveying the damage from two 1970 hurricanes, Ref. 2 observes that the wind caused light framing around overhead doors to deflect excessively, which led to derailment of roller supports and subsequent door failure.

FIGURE 10.4 Large overhead doors are a staple of metal building systems. (*Photo: Maguire Group Inc.*)

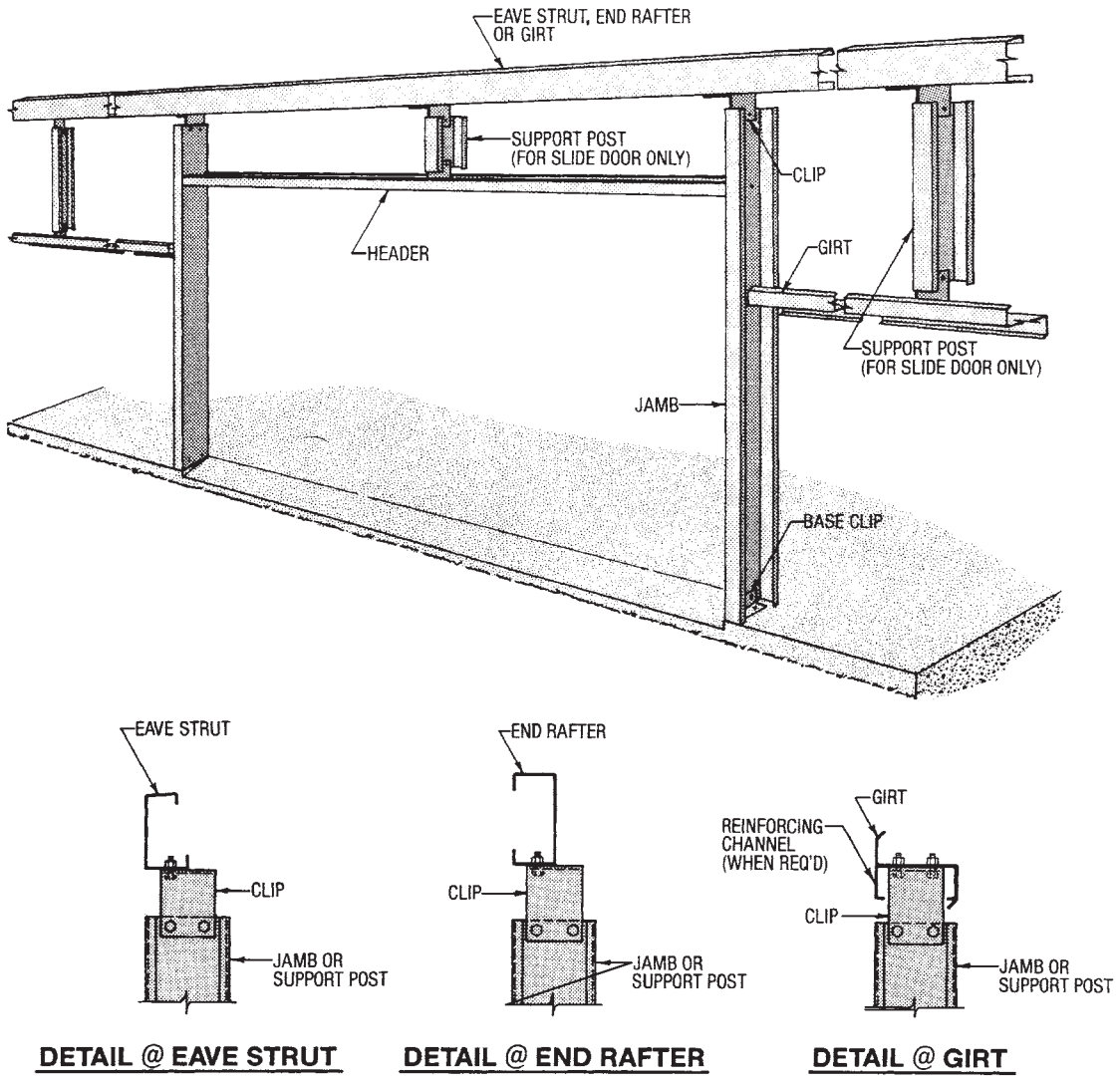

FIGURE 10.5 Typical framed opening for a sliding door. (*Star Building Systems.*)

To prevent this, large overhead doors are often supplied with wind locks—devices that positively attach the slats to the guides. Now the door cannot be easily blown in, because it is secured to the supports, but these supports must be essentially immovable under load. The horizontal reactions exerted by the membrane on the supports are quite substantial, and the jambs must be designed to resist them without overstress, excess deflection, or rotation. Otherwise, both the supports and the door will be blown in or allow wind to enter the building. The overhead door manufacturer determines the magnitude of the reactions as a function of door size, wind loading, and other parameters.

The Door and Access Systems Manufacturers Association explains the various reaction components from wind loading in its Technical Data Sheet #251, "Architects and Engineers Should Understand Loads Exerted by Overhead Coiling Doors."[3] Their Data Sheet #259 deals with some of