

FIGURE 3.23 Rod brace detail with welded plates and turnbuckles. (*Nucor Building Systems.*)

The second solution is to design each column as a cantilever fixed into the ground, like a flagpole. The foundations and columns designed this way tend to become rather expensive. However, one particular version of the fixed-base column design called *wind post*—an exterior column with fixed base—is relatively common. Wind posts can be used where wall bracing cannot be. Sometimes it is possible to place wind posts only in the end walls. As with all fixed-base columns, wind posts generate bending moments in the foundations; they should be used with caution and only when the foundations for them can be designed in advance. Some other limitations of the scheme relying on wind posts placed only in the end walls are listed in Fig. 3.26.

The third solution is to use *portal frames*, small rectangular rigid frames that fit between, and are attached to, the main building columns (Fig. 3.27). Portal frames are discussed further in the next section.

Alternatively, concrete or masonry *shear walls* that possess higher rigidity than the bracing may be used to provide lateral stability (Fig. 3.28). While expensive to construct specifically for the bracing purpose, shear walls cost very little in buildings with masonry or precast exteriors.

Various types of wall bracing should not be combined in the same wall, unless a detailed relative-rigidity analysis is first made.

3.3.9 Portal Frames

As just mentioned, the portal frame is a rigid frame that fits between the main building columns. Portal frames are typically placed in the side walls—in the direction perpendicular to the span of the main frames. A portal frame can be integrated into the metal building in one of two ways. The frame

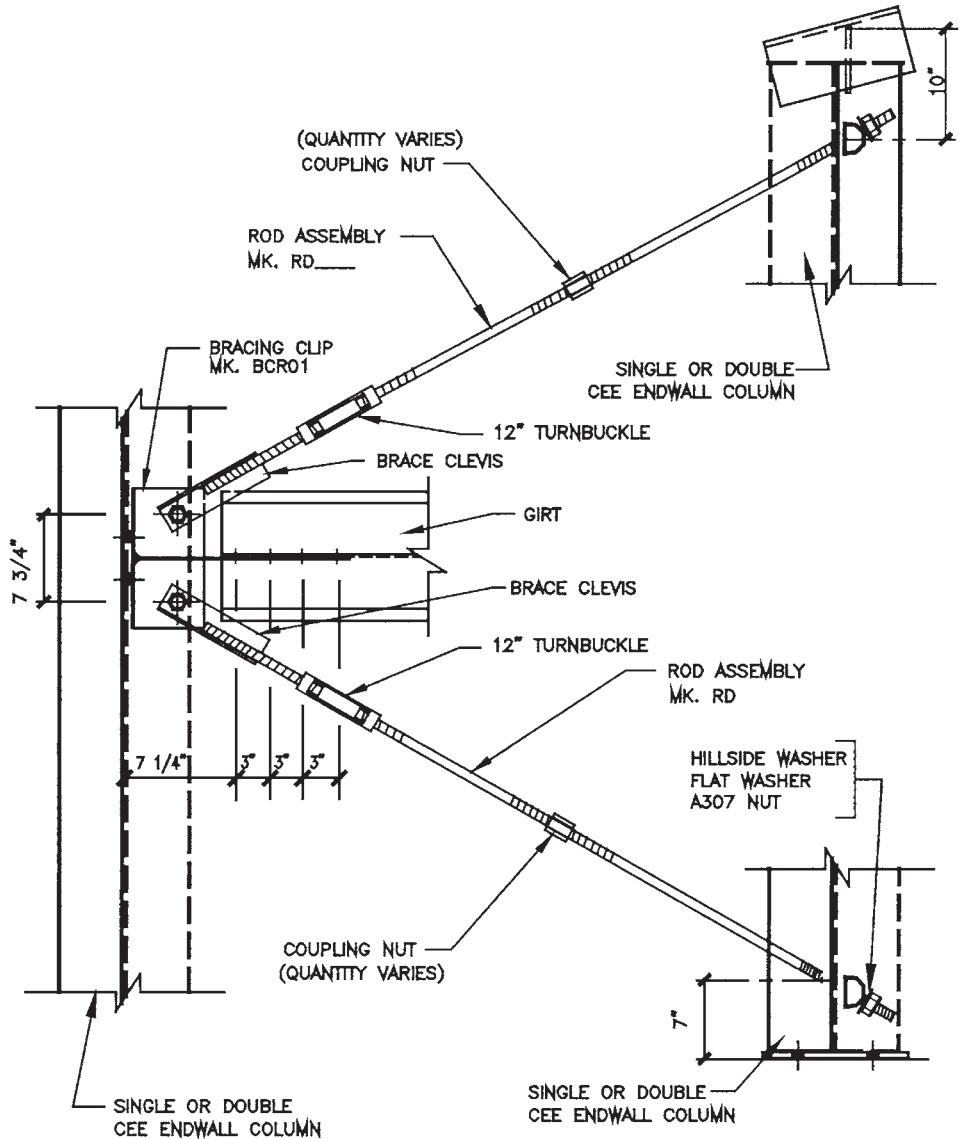


FIGURE 3.24 Detail of tiered rod brace. (Nucor Building Systems.)

can be placed as shown in Fig. 3.29, with its columns extending to the foundation and being secured to it with anchor rods. At the top, the portal frame is bolted to the primary frame columns by small brackets (Fig. 3.30).

Alternatively, the portal frame columns could stop short of the foundation. This requires attachment to the primary frame columns at both top and bottom. A major advantage of not extending the portal frame columns to the floor is that it avoids enlarging the foundation piers, something that could be appreciated by the foundation designer who may not know the exact locations of the portal frames