16.7.2 Problems with Metal Superstructure

Gaps under Column Base Plates. In conventional construction, column base plates normally bear on grouted leveling plates or are positioned on special leveling nuts. Very large base plates may be installed on a bed of grout separately from the column and welded to it later. In each case, the objective is to ensure a complete bearing under the bearing plates as well as column plumbness.

In pre-engineered construction, both the leveling plates and the grout are often dispensed with. The MBMA *Common Industry Practices* specifically excludes "grouting or filling of any kind under columns" from the metal building erector's work. The concrete subcontractor is probably long gone when the grouting is needed. Who's to do it?

Not surprisingly, most of the time the pre-engineered columns, which must be plumb within MBMA tolerances, are placed directly on top of concrete piers or foundation walls that are not perfectly level. As a result, the column base plates might bear on concrete only at one edge, with a small gap under the rest of the plate (Fig. 16.10). If this gap is not filled with grout or shims, the concrete may crack or the column base may slightly deform and settle under load, causing a rattle-producing "play" between the base plate and the anchor-bolt nut above it. Base plates of building columns that support cranes, and therefore require stability and precision of installation, should always be grouted, even by the owner's personnel if necessary.

Loose Roof or Wall Cross Bracing. Rod or cable bracing installed in roofs and walls of metal buildings is frequently observed to be loose, bent, or even missing. Such bracing does not fulfill its objective of stabilizing the building and ensuring that it can resist external loads without excessive deformations.

A cumulative movement of the structure, which can occur before loose bracing is stretched enough to be effective, can crack skylights and windows, jam doors, and disrupt operations of the structure-supported equipment—much as an excessive story drift would. The excessive "play" can also damage brittle wall finishes and lead to perceptible rattles and vibrations. Fortunately, this common erection deficiency is easy to spot and to correct.

Lateral Bracing for Primary and Secondary Members Missing or Not Properly Secured. The importance of properly installed purlin and girt bracing is emphasized in Chap. 5. Flange bracing for column and rafter interior flanges, where required by design, is equally important. Still, both these kinds of member bracing are regularly found to be missing, not properly connected, or installed the wrong way (e.g., a parallel purlin bracing is installed where a cross bracing was specified). Again, this deficiency is usually easy to correct if noticed in time, prior to an application of the interior finishes and insulation.

16.7.3 Roof Leaks

One of the most frequent complaints about metal building systems involves leaky metal roofs. At the design stage, chances of leaks can be greatly reduced if the roofing type and details are properly selected as described in Chaps. 6 and 14. Still, the most common reason for leaks is improper construction. A case in point: Watertightness of standing-seam roofing with trapezoidal seams depends greatly on a proper installation of corrugation closure strips at the eaves. This detail is not perfect even under the best of circumstances. If, however, the end closures are simply omitted, or poorly sealed, leakage is virtually guaranteed, because there is nothing to stop water coming from an overflowing gutter or from an ice dam. Two other examples are unprotected roof penetrations—a notoriously fertile ground for leaks—and an omission of the required sealants. Indeed, as Star Manufacturing Company's *Erection Guide*[5] points out, 99 percent of the leaks can be traced to the following:

FIGURE 16.10 A gap under the column base plate.

- Omission or mislocation of the required bar- and caulk-type sealants in the longitudinal roofing seam cavities
- Failure to install the extra strip of sealant known as pigtail at the four-way panel laps and at the eave connections
- Failure to install tape sealant under the screw heads
- Not caulking between the eave trim and the underside of the roof panels

A presence of the required sealants at these critical locations can be verified by a special "feeler" tool made of thin enough (0.005 in) material to fit inside the roofing seams. Wherever the sealant is determined to be missing, the only certain method of repair is to remove the panel in question and to reapply the sealant.

Such testing is time-consuming and well beyond the expertise of most owners and design professionals to whom few other safeguards of installation quality are available. The most basic and simple precaution—checking the erector's success rate in producing leak-free roofs—should of course be taken prior to signing the contract.