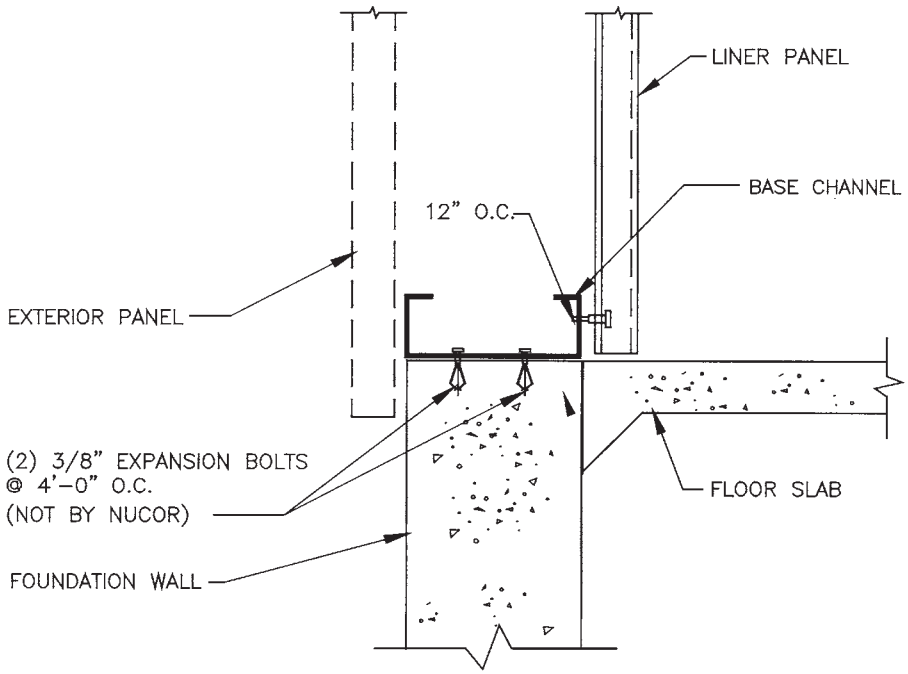

FIGURE 7.15 The base channel simplifies attachment of exterior and liner panels. (*Nucor Building Systems.*)

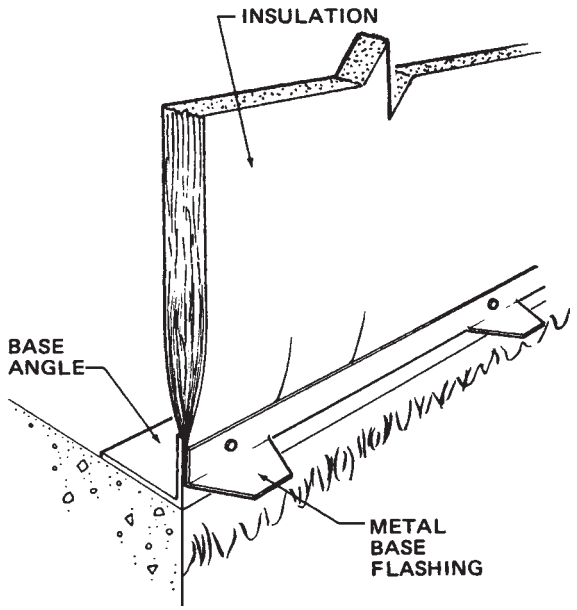

FIGURE 7.16 Metal base flashing fits the wall panel profile. (*Butler Manufacturing Co.*)

7.3 HARD WALLS: GENERAL ISSUES

7.3.1 Why Use Hard Walls?

As the name suggests, *hard walls* are those made of masonry or concrete, not metal panels. Hard walls offer beauty, stability, security, sound-, fire-, and lateral-load resistance, and a host of other benefits. Long a staple of conventional construction, exterior walls of masonry and concrete are increasingly found in pre-engineered buildings. Their growing use can be traced not only to the owners' realization of the benefits, but also to an increased involvement of architects in specifying metal building systems. Also, some cities and towns frown on issuing building permits for metal-clad pre-engineered buildings and insist on traditional masonry exteriors instead.

There are two main types of hard walls: single-wythe (single-leaf) and cavity. Weather resistance of single-wythe walls, also known as barrier walls, depends largely on the solidity and impermeability of one wall layer. These walls are typically made of *concrete masonry units* (CMU).

The idea behind cavity walls is that a single line of defense against moisture is unreliable almost by definition, and a second line is needed. Contemporary cavity walls typically consist of masonry veneer in combination with a structural backup wall, either of masonry or of steel studs. Masonry walls are examined in the following sections, and concrete walls are discussed separately in Sec. 7.7.

7.3.2 The Challenges of Using Hard Walls in Metal Building Systems

Some difficulties of incorporating walls of masonry and concrete into metal building systems are rather obvious; others require careful study. The obvious challenges concern the inherent incompatibility of heavy and brittle hard wall materials and light and flexible metal framing. Also, masonry and cast-in-place concrete are constructed in a relatively slow field process—the exact opposite of the concept behind metal building systems, which stresses fast construction. Prefabricated masonry panels are available but not yet widely used.

The less obvious difficulties lie in the structural interaction between the hard walls and the metal framing. Perhaps the most important is the structural duty the hard walls are assigned, e.g., loadbearing or enclosure walls. Among other issues, hard walls need lateral support at two or more of their edges, but the means of providing this support may not be present in standard metal building systems. Similarly, the standard details developed for all-metal buildings may not work with masonry or concrete exteriors. For example, the flange bracing of primary frame columns, provided by girts in all-metal systems, calls for custom details in buildings with hard walls. These and some other challenges are discussed in the sections that follow.

7.3.3 Using Hard Walls as Loadbearing Walls

Exterior concrete and masonry can be used as loadbearing or non-loadbearing walls, as shear walls, or as pure enclosure. The design details for the various wall types depend on the specific wall materials. In general, some building manufacturers seem to prefer using hard walls as enclosure (non-bearing) walls, perhaps to preserve the all-metal system design assumptions in their design software. Some even retain metal wall bracing in their hard-wall buildings. As discussed in Chap. 3, the lateral stiffness of hard walls greatly exceeds that of rod or cable bracing, rendering the bracing unnecessary beyond the building erection stage.

Hard-wall design is typically excluded from the metal building manufacturer's scope of work. Therefore, whenever hard walls have a structural role in the metal building system, their design must be closely coordinated with that of the metal framing. This may present some difficulty if the hard walls are designed before the building manufacturer is selected. (A similar problem faces those designing foundations for metal buildings, as discussed in Chap. 12.)