Now is the time to hire a reputable local engineer and a soil boring contractor to perform a soils investigation. Is the soil good enough to allow for economical shallow foundations? The question is not idle, because in many industrial areas the best land has long been developed, and only the less desirable parcels are left—often those deemed uneconomical to build upon by others. Poor soils may require expensive deep foundations such as piles and caissons; the added cost could push the budget beyond the acceptable limits. Some other site preparation costs include demolition of any present structures, lot clearing, excavation, fill, and paving.

9.2 THE ROLE OF THE DESIGN PROFESSIONAL

9.2.1 The Basic Responsibilities

After schematic design is completed, either by the owner's in-house personnel or by an outside architect, and the site is selected, the owner can start thinking about methods of construction delivery. With a set of schematic plans and specifications in hand, an owner can pursue any one of the three basic construction methods: conventional (design and bid or negotiate), design-build, or contracting directly with a preselected manufacturer of metal building systems.

In both conventional and pre-engineered construction, the owner can be represented by an independent architect; in a design-build mode, the architect is a part of the builder's team. Since we are specifically interested in metal building systems, and since the manufacturer's staff rarely includes architects, the best course for the owner to follow is to hire an independent design team.

One of the first priorities of the design team is to develop a site-plan package for review and approval by a local planning and zoning board. The package will demonstrate how the owner intends to comply with federal, state, and local regulations. It may address such issues as wetland protection, increased traffic, pollution, sewage flow, parking, and appearance. While some localities are development-friendly, others might not be; occasionally, obtaining all the permits may take longer than the design and construction time combined.

In order to prepare the site package, the design team undertakes a comprehensive code review. (It goes without saying that the intimate knowledge of complex code provisions is a good enough reason to retain an architect in the first place!) By submitting a set of documents in compliance with the local code and all the local regulations, the owner can save a lot of valuable time and lower construction loan interest charges.

Design development and final design can proceed while the site package is being reviewed. The goal is to produce a set of contract documents that adequately communicate design intent without being overly specific and prescriptive.

In broad terms, the design professional is responsible for selecting the design criteria, for any items not normally carried by the metal building manufacturer, and for overall coordination. The items not commonly available from the manufacturers are listed in the MBMA's *Common Industry Practices,* and include foundations, insulation, fireproofing, finishes, cranes, electrical and mechanical equipment, overhead doors, and miscellaneous iron.

The *Practices* specifically state that ventilation, condensation, and energy conservation issues are beyond the manufacturer's responsibility and therefore are to be included in the design professional's scope of services.

The design team should examine the effects of the proposed building on adjacent structures, such as a possibility of snow drifting onto a lower existing roof. The manufacturer should not be expected to perform this purely engineering task, because some smaller manufacturers might not even have a full-time engineer on staff—only a technician who punches the numbers into a computer program. (Most owners are not aware of this fact, because the term *pre-engineered building* implies the presence of an engineer.)

The owners, on their part, should help the design professionals establish the appropriate project design criteria by supplying them with adequate data describing the details of the current and prob-

able future operations. These data might include, for example, the dimensions and weight of the equipment that will be housed in a metal building system and any crane requirements. Major industrial and government clients should also make available copies of their in-house design and construction standards and any other pertinent design material.

9.2.2 What to Specify

Some people still think that the architect's role in specifying metal building systems is selecting siding colors. It isn't quite so. While construction documents prepared for a pre-engineered building might not be as extensive or detailed as for conventional construction, they still need to communicate a great deal of information. Some of the items sought by manufacturers for proposal preparation are:[1]

- Information on the governing building code including, significantly, the edition. Avoid listing too many codes that may contain conflicting design criteria. While reputable manufacturers will use the most conservative criteria in cases of such conflict, some hungry upstarts might choose to do otherwise.
- Design loads to be used, such as collateral, snow, live, wind, and seismic. Some recurring problems with specifying snow vs. roof live loads are addressed in Chap. 10. Collateral (superimposed) dead load allowance should be carefully considered and its nature preferably identified. Rooftop HVAC equipment needs to be located on the roof plan, its weight and required roof openings specified. Any other concentrated loads, such as from a suspended walkway, warrant a separate mention. It is important to research the *local* code, which might contain higher design load requirements than model codes. For example, the design wind speed might be specified by a local code as 110 mi/h, while a national code calls for only 70 mi/h. (Of course, the opposite could be true, too: The local code could be based on an obsolete edition of a model code.)
- Load combinations. In addition to the combinations listed in the governing code, the designers may wish to include some others, as discussed in Chap. 3.
- The structural scheme assumed in the design (e.g., multispan rigid frame with pinned supports).
- Building dimensions, including length, width (do not forget that, to a manufacturer, building width is the distance between outside flanges of wall girts, not between column centerlines), eave height, and clear height.
- Exterior wall materials, finishes, and insulation. Some specifiers choose to leave doors and windows out of a metal building package: By purchasing these items locally, it is often possible to buy sturdier products with better hardware, and to avoid transit damage. However, in this case the design wind pressures to be used for these important components of the building envelope must be conveyed to their suppliers.
- Locations where wall bracing is to be avoided, for aesthetic or functional reasons and, perhaps, where bracing is desired. Also, any open-wall locations.
- Corrosion protection requirements. The specifiers are well advised to mention a presence of any existing facilities within $^1/_2$-mile radius which emit corrosive chemicals, a proximity to saltwater areas, and any other possible sources of corrosion. They should also evaluate a corrosive or moisture-producing potential of the operations within the building itself. In metal buildings, corrosion from the inside is difficult to protect against. While the exterior panel finishes might be quite good in fighting corrosion, interior steel framing is often protected only by a primer coat (Fig. 9.1). Many manufacturers lack the facilities for high-quality surface preparation and for application of premium coatings; they send the steel to specialty shops if those coatings are specified, driving up the cost. For main framing, it is preferable to use a high-quality field-applied paint than to specify a galvanized finish: Hot-dip galvanizing tends to promote warpage and distortion of framing members made of thin built-up plates. A few manufacturers offer mill-galvanized C or Z girts and purlins.