## 14.3 EXTERIOR WALL REPLACEMENT AND REPAIR

Metal-clad walls age much in the same way as metal roofs do: the finishes deteriorate, seams open up, fasteners loosen and corrode. Sooner or later, the siding cries for attention. Fortunately, the walls are normally easier to upgrade than the roofs.

The simplest kind of wall rehabilitation is, of course, repainting, a relatively straightforward and familiar process. A more complicated situation arises when the walls are deteriorated beyond repair and need to be replaced with a product that works with the existing girt system.

Structural evaluation of the existing girts should be the first order of business. Are the girts properly sized? Is there excessive corrosion? What about lateral bracing? Connections? These questions must be satisfactorily answered before any siding replacement takes place. If the girts are spaced too widely or are deficient in some respect, it might be more economical to add the ones and use standard siding than to specify extra-strong replacement panels able to span long distances.

Most metal wall replacement projects include new windows, doors, flashing, and perhaps even framing around the openings to provide a coordinated exterior wall system. In fact, corrosion of door and window framing, coupled with rusting siding fasteners, is often among the first signs of metal building aging. Simply repainting the wall rarely solves the problem, because the rust will tend to bleed through the new paint (Fig. 14.10). In this situation it is best to replace the wall.

A special, if uncommon, situation arises when the existing metal panel walls need to be changed to "hard" walls. In this case the existing building is probably not rigid enough to laterally support such walls and possibly has to be replaced. To keep the operations uninterrupted in a facility of moderate size, it might be possible to build the new exterior "hard" walls and the new roof structure outside of the existing building envelope and later remove the old building piece by piece.

## 14.4 STRENGTHENING FRAMING FOR CHANGES IN LOADING CONDITIONS

Quite often, changes in ownership, occupancy, manufacturing process, or mechanical systems entail some changes in structural loading as well. Evaluation of such changes in conventionally designed buildings is a relatively straightforward task for structural engineers. Pre-engineered buildings, however, need to be "re-engineered," or at least evaluated for the new conditions, which is not straightforward at all given the proprietary nature of the framing. A few common examples:

- Change in overhead crane loading or layout. As the next chapter explains, the cranes exert concentrated loads on the metal building framing. Top-running overhead cranes are usually supported by the building columns, but monorails are commonly suspended from the frame rafters. Any increase in the monorail capacity, or relocation of the crane runway, will impose new loading on the pre-engineered frames for which the frames were not designed.
- A new overhead door is needed at the bay containing an existing cross bracing. Can the bracing be moved to another bay?
- A new, higher, building or an addition is going to be erected next to "our" structure. As a result, drifted snow will likely accumulate on the existing roof and perhaps overstress it. Can the building roof be strengthened?
- As a result of the mechanical system upgrade, new heavy rooftop-mounted HVAC equipment is proposed. Is the pre-engineered roof framing strong enough to support it?
- A new state-of-the-art process equipment can fit within the existing building only if one of the main-frame rafters "loses" a few inches in depth. Is this possible?

In all of those cases, an intelligent answer can only be given if the metal framing sizes are known and the building can be readily analyzed. Step one in this endeavor is a search for the original building structural drawings and calculations prepared by the metal building manufacturer. These could

**FIGURE 14.10** Rusting wall fasteners and window framing bleed through the paint.

be in the owner's file or at the city's building department or, if an architect was involved, in the architect's files. Alas, if anything is found at all, it is likely to consist only of the erection plans without any information on the member sizes. Recall that neither the fabrication drawings nor the calculations are normally provided by the manufacturer unless required by contract. Still, the plans can yield at least the building manufacturer's name and job number. Armed with this information, the owner's engineers can move to step two—contacting the original building manufacturer.

If still in business, manufacturers may have the coveted design files which contain the member sizes. In any case, they can help identify the design assumptions, grade of steel, and similar information needed for the analysis.

If the document search proves fruitless, it is usually possible to field measure the framing sizes for a new analysis. Such analysis may seem daunting to some structural engineers unfamiliar with the pre-engineered building design. In this case, step three is to seek assistance from a friendly metal-building manufacturer who could be in a better position to reanalyze the building for the new loading conditions. However rare, the need for such assistance is a good enough reason to keep working