expensive approach of requiring the new trusswork to bear only on the existing columns, bypassing the existing roof framing altogether. Alternatively, they might require that the new supports be spaced so closely as to approximate a uniform load—not the most cost-effective solution, either.

To make matters even more complicated, any significant change in the roof slope will increase the vertical projected area of the roof and result in a larger design wind loading on the building. Now, the whole building's lateral load-resisting system may have to be rechecked, involving the engineer even deeper into the project.

To be ready for such complications and be able to make educated design decisions while preparing the construction documents, specifying design professionals are wise to learn about the available types of support framing for metal reroofing.

14.2.5 Structural Framework for Slope Changes

The proposed reroofing framework has to provide the same level of strength and rigidity as any other metal roof structure. In practice it means that the spacing of the new ("retrofit") purlins is probably limited to 5 ft or so (Fig. 14.1). A closer, perhaps half as wide, spacing is needed at the "salient corner" areas near the eaves, rake, and ridge (for certain roof slopes), to resist the increased wind loading there. Similarly, purlin spacing is reduced in the areas of a potential snow drift accumulation.

Whenever the existing roof structure stays in place, the new framework resists not only the wind and snow loads on the new roof but also the wind loads on the new gabled endwalls. Thus two kinds of bracing are required for stability: vertical, between the framing uprights, and horizontal, in the plane of the new roof, to act as a diaphragm. The diaphragm action can be provided by rod or angle bracing, by steel deck, or by certain types of through-fastened roofing (but usually not standing-seam roofing, as discussed in Chap. 5).

Another important issue to consider is lateral bracing of the new purlins. When closely spaced and cross-braced, the framework verticals provide the necessary bracing, but this may not be the case when the supports are far apart. As pointed out in Chap. 5, the manufacturers' design practices for lateral support of purlins vary widely and range from conservative to ignorant. To ensure a uniformity of design assumptions among the bidders, the owner's requirements relating to the acceptable diaphragm construction and purlin bracing methods should be spelled out in the contract documents.

To avoid a blow-off of the new metal roofing which in a sense acts as a giant sail erected on top of the existing building, proper anchorage into the existing structure is critical. The anchorage details should be designed by the metal system manufacturer and carefully checked by the engineer of record. The details should be custom designed for the actual existing roof structure, instead of showing the new fasteners terminating in a mass of concrete, an easy but useless "solution" submitted all too often.

If the existing roof structural decking—not just the roofing—needs to be removed for an easier attachment to the existing framing, or because of excessive corrosion, one should remember to replace it with a new decking or horizontal bracing to provide lateral support for the existing roof beams and to restore the existing roof diaphragm.

The details of roofing for the new work, such as clip design, endlap fastening, placement of stepped expansion joints, and the like, remain the same as for new roofing (see Chap. 6). The new "attic space" needs to be carefully assessed in terms of code requirements for fire safety, ventilation, and egress.

14.2.6 Determination of New Support Locations

The locations of new roofing supports are determined by the type and spacing of the existing roof structural members. The new supports are best located directly above the existing roof purlins, whether the purlins are made of steel, concrete, or wood. This approach avoids bearing on the existing roof decking, which could be corroded or decayed by water leakage, even if theoretically adequate.

The desired roof slope is accomplished by varying the height of the new columns. All the variable-height columns must be precut to the exact size unless a license to use adjustable supports is first

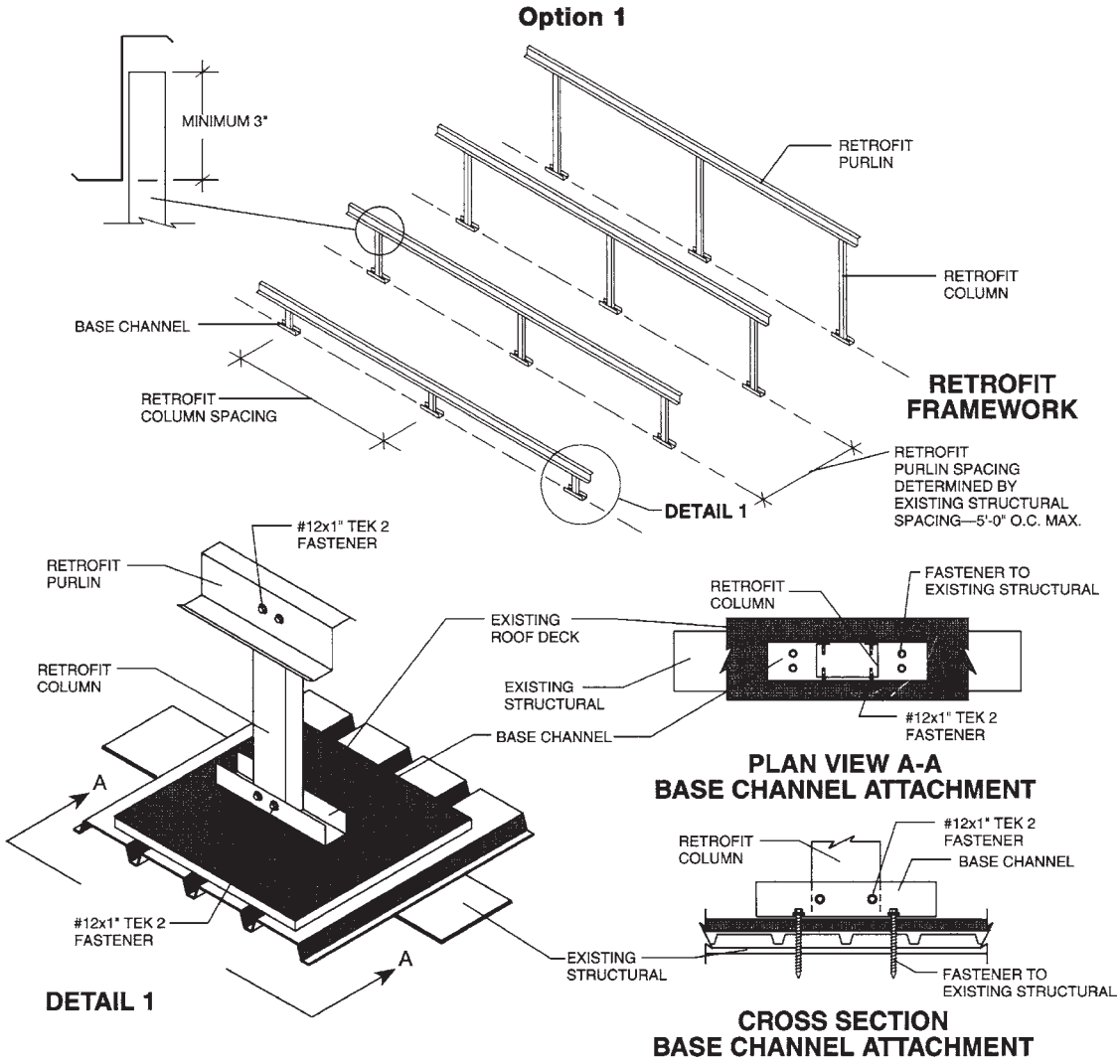

FIGURE 14.1 Option 1: Retrofit framing with columns located over existing roof purlins spaced not over 5 ft on centers. (*MBCI.*)

obtained from the patent holder. Columns of adjustable height—no matter how achieved—are covered by several patents held by Re-Roof America Company of Tulsa, Okla., which enforces its rights.

A grid of purlins and columns spaced not wider than 5 ft apart in both directions, and perhaps closer in some areas, is ideal. This is possible only when the existing roof purlins are also spaced 5 ft apart or less (Fig. 14.1).

The actual spacing of the new support columns along the purlin length may depend more on the type and span of the existing purlins than on the limitations imposed by the new framing. For example, if the existing roof is framed with bar joists and steel deck, the new posts should be located directly above the panel points of the joists and be spaced at one-quarter points of their span, or even closer, to approximate a uniform load. The reason: because of their proprietary design, the only structural information normally available about the joists is their uniform-load capacity; unlike