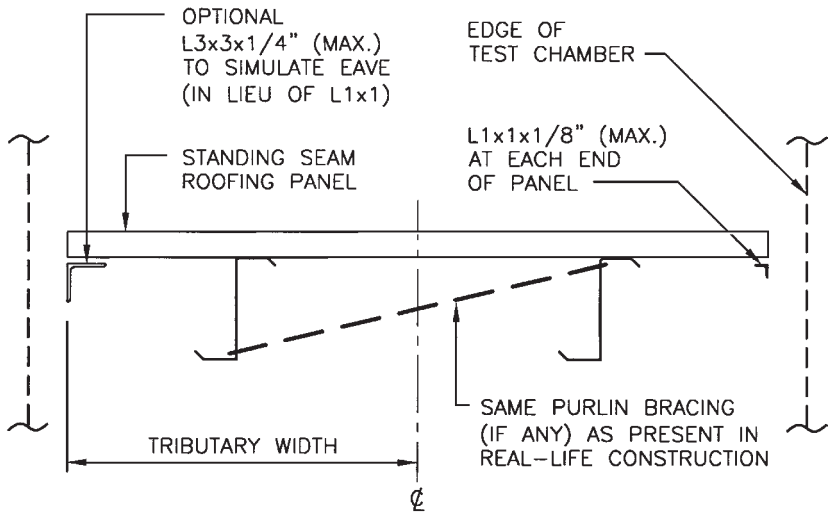

FIGURE 5.34 Schematic setup of base test.

factor established. For a given purlin, the reduction factor depends on several variables; chief among them are the type of roofing and the number and type of purlin braces.

The main advantage of the base test is its simplicity: It is much easier to test two single-span purlins than several bays of continuous purlins—or the whole building. Still, the very simplicity of the test raises some questions about its predictive ability for a complex behavior of continuous purlins carrying standing-seam roofing. Relatively minor changes in the setup can lead to significantly different results.

For example, should the $3 \times 3 \times 1/4$ in continuous angle of Fig. 5.34 be anchored at the ends to prevent its horizontal (but not vertical) displacement, as allowed by the base test? If the angle is so anchored, the strength of the system may be overestimated by the test and its results may be unconservative, especially for standing-seam roofs with little diaphragm strength and stiffness.[18] Conversely, if the angle is not anchored, the results may be overly conservative.[19] Another difficult situation arises when the purlins rotate under load and their flanges overcome the "adequate space" and jam against the test chamber walls. Thus prevented from further rotation, the purlins could probably carry some additional load, even though in real life the situation would be quite different.

These and other issues can certainly be addressed in the future, as the test procedure is refined. Additional information about the base test and the broader topic of purlin stability can be found in *A Guide for Designing with Standing Seam Roof Panels,* a publication of the American Iron and Steel Institute.[19]

5.5.5 Purlin Bracing at Supports

So far, we have mainly considered the issues of purlin bracing *between* the supports—the frame rafters and the endwall framing—although we have stated that purlin stability must be ensured at the supports as well. We mention at the beginning of this chapter that light-gage C and Z purlins are typically either bolted directly to the supports or are attached to them by means of purlin clips. The regular purlin bearing clips are designed for preventing web crippling failures and not necessarily for keeping the purlin rotationally stable. Indeed, the thin web of a typical purlin clip (such as that of Fig. 5.6) may not be able to stabilize the purlin laterally. Web stiffeners also do not prevent purlin rotation at supports. The special devices intended to do that are called *antiroll* clips.

Unlike regular bearing clips, antiroll devices are equipped with some sort of diagonal legs or stiffeners that can resist lateral reactions from the purlins. Some bearing and antiroll clips available from one manufacturer are shown in Fig. 5.35. Of these, clips (*b*) and (*d*) are antiroll, although the welded plate in (*a*) can also act in that capacity if thick enough and properly welded to the support. Another antiroll clip design is shown in Fig. 5.36.

How often should the antiroll devices be spaced? Some manufacturers do not use them at all and presumably hope for the best; some use them only for shallow slopes. Many manufacturers provide them at every five purlin lines or so, a practice that relies on the roofing to stabilize the purlins in between. Many types of through-fastened roofing may indeed be considered adequate bracing capable of transferring lateral forces from the purlins stabilized by antiroll clips to their neighbors. When this roofing is used, the actual spacing of antiroll clips is best determined by analysis involving a comparison of the total force acting on the clip with its lateral capacity. The force on the clip equals the bracing force in a single purlin multiplied by the number of purlin bays between the clips.

The situation is different for purlins supporting standing-seam roofing. As already discussed, this kind of roofing can slide relative to the purlins and provides questionable bracing for them. Here, it would seem that antiroll clips should be provided at each purlin line and at each support.

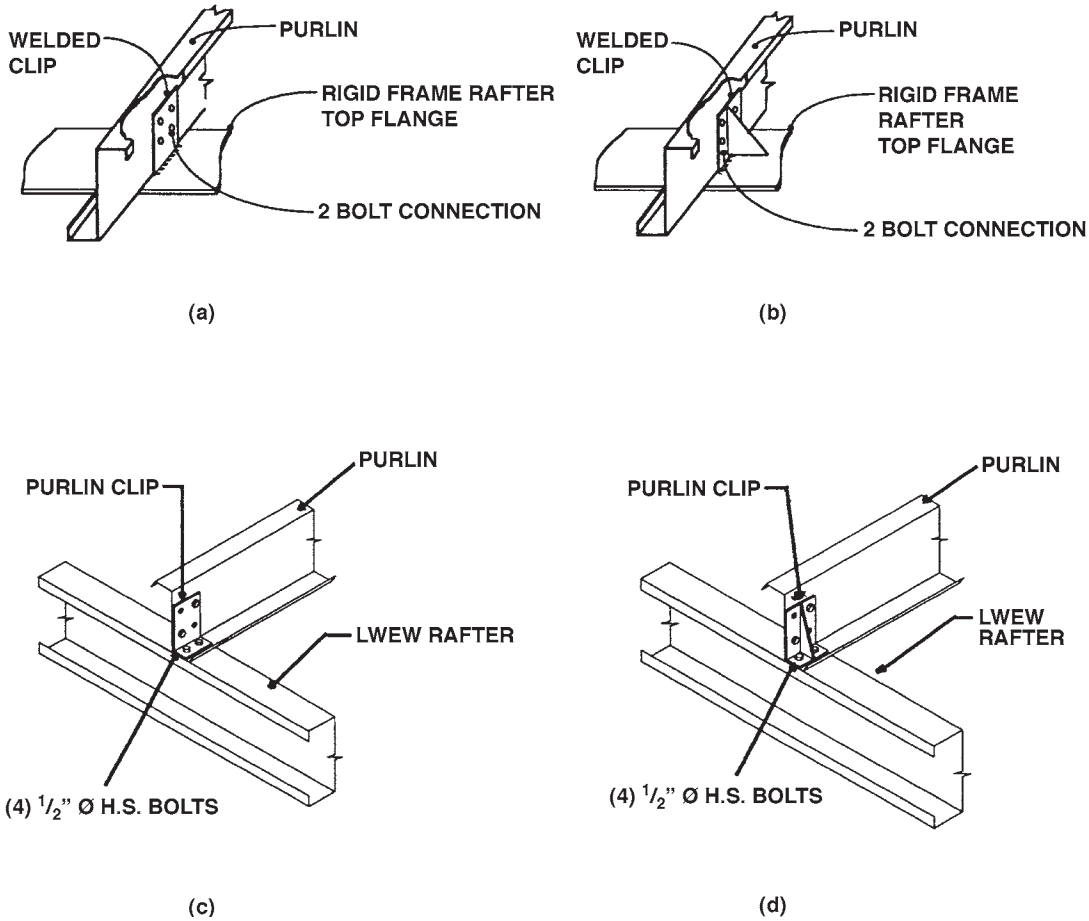

FIGURE 5.35 Various methods of purlin-to-rafter connection: (*a*) welded purlin clip; (*b*) welded clip with gusset; (*c*) angle clip; (*d*) angle clip with gusset. (*Steelox Systems, Inc.*)