assumes the purlin section to be constant throughout and is known as prismatic or reduced-stiffness analysis model.

The AISI Specification does not dictate which analysis model to use, leaving it up to the designer's discretion. The prevalent nonprismatic method better represents the actual conditions, while prismatic analysis is simpler. Most of today's design software follows the nonprismatic analysis model, as does the AISI Manual's design example.

The two analysis models yield similar but not identical results. For the same structure, the maximum negative bending moments produced by nonprismatic analysis exceed those produced by prismatic analysis, and the opposite is true for the maximum positive moments (Fig. 5.11).

Note that any decrease in the maximum negative bending moment under a prismatic analysis model also decreases the design moment at the splice location. The moment at the end of the lap computed by the prismatic analysis procedure will be less than that computed by the nonprismatic procedure. Accordingly, the purlin designed as a "prismatic" member could in some cases become overstressed under a combination of moment and shear loading at the end of the lap. Indeed, the end of the lap is a common critical location for purlin design (the others include the supports and the point of maximum positive moment). Epstein et al.[11] recommend that prismatic analysis be used only when the design is also found to be safe under the nonprismatic analysis model.

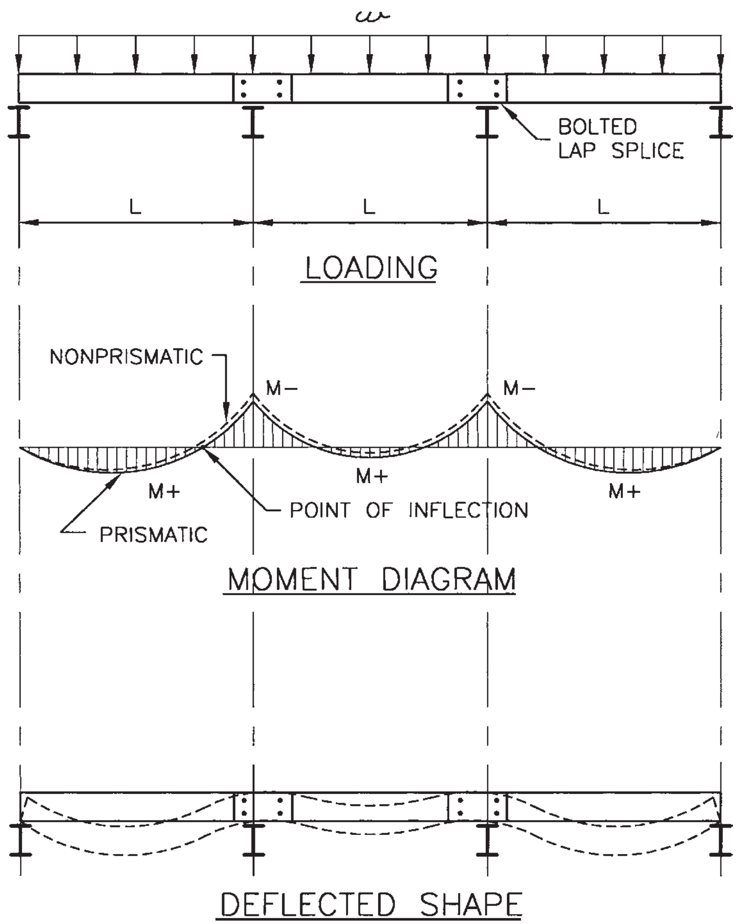

FIGURE 5.11 Continuous cold-formed purlins under uniform gravity loading. Note the difference in the moment diagrams for prismatic and nonprismatic analysis methods.

5.3.5 Can the Point of Inflection Be Considered a Braced Point?

The point of inflection is where the moment diagram changes its sign, i.e., the moment is zero. This is where the compression flange, which requires lateral bracing as discussed in Sec. 5.4, ceases to be in compression. The adjoining part of the flange is loaded in tension and does not require lateral bracing. An argument has been made that the point of inflection functions as a virtual purlin brace, so that the laterally unbraced purlin length could be measured from this point, rather than from the end of the splice. Measuring from the end of the splice is a more conservative approach shown in Fig. 5.11.

Measuring the unbraced length from the point of inflection often reduces the laterally unsupported purlin length and potentially yields a more economical design. However, the point of inflection is imaginary, and it may shift with the change in loading. For example, under partial loading (Fig. 5.12), the point of inflection is much closer to the support than under full uniform loading (Fig. 5.11). (Furthermore, the design positive bending moment is larger under partial loading.)

Another argument against using the point of inflection as a bracing point is illustrated in Fig. 5.13. As can be seen here, the point of inflection does not prevent the bottom flange of a purlin with

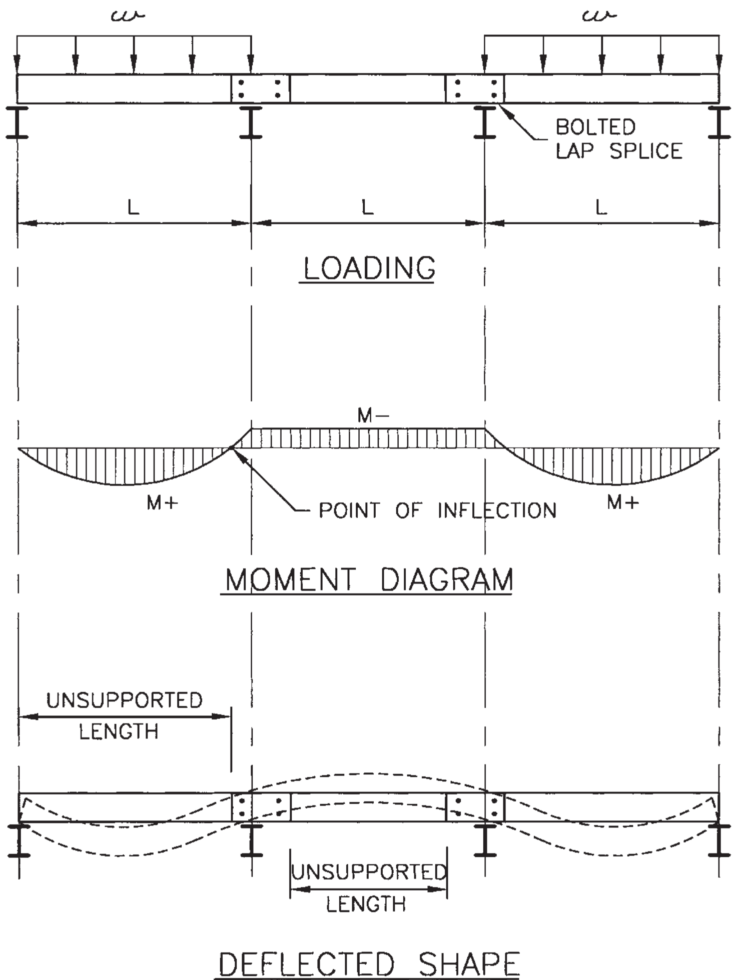

FIGURE 5.12 Continuous cold-formed purlins under partial gravity loading.