

PRIMARY FRAMING

CHAPTER 5

SECONDARY FRAMING: GIRTS AND PURLINS

5.1 INTRODUCTION

Secondary structural members span the distance between the primary building frames of metal building systems. They play a complex role that extends beyond supporting roof and wall covering and carrying exterior loads to main frames. Secondary structurals, as these members are sometimes called, may serve as flange bracing for primary framing and may function as a part of the building's lateral load-resisting system. Roof secondary members, known as *purlins*, often form an essential part of horizontal roof diaphragms; wall secondary members, known as *girts*, are frequently found in wall bracing assemblies.

A third type of secondary framing, known by the names of *eave strut*, *eave purlin*, or *eave girt*, acts as part purlin and part girt—its top flange supports roof panels, its web, wall siding (Fig. 5.1).

Girts, purlins, and eave struts exhibit similar structural behavior. Since most secondary members normally encountered in metal building systems are made of cold-formed steel, our discussion starts with some relevant issues in design of cold-formed steel structures.

5.2 DESIGN OF COLD-FORMED FRAMING

As mentioned in Chap. 2, the main design standard for cold-formed framing is Specification for the Design of Cold-Formed Steel Structural Members by American Iron and Steel Institute (AISI).¹ The Specification, Commentary, Design Examples, and other information constitute the *AISI Manual*.² The first edition of the Specification appeared in 1946, with subsequent editions following in 1960, 1968, 1980, 1986, 1989 (by Addendum), 1996, 1999, and 2000 (the last two by Supplement). The LRFD-based Specification was first issued in 1991.³

In 2002, the title was changed to North American Specification for the Design of Cold-Formed Steel Structural Members,⁴ to reflect the fact that many of the Specification's provisions apply not only to the United States, but also to Canada and Mexico. The provisions common to all three countries are included in the main body of the document; the country-specific items are placed in the Appendix. The users of the 2002 Specification have a choice of ASD, LRFD, and LSD—Limit States Design—formats. (The LSD design approach is widely used outside the United States.) As can be imagined, the combined Specification does not look any simpler than its notoriously complex predecessors.

The changes between various editions are substantial, a fact that reflects on the continuing research in this area of steel design. Since the Specification provisions are so fluid, framing manufacturers are challenged to comply with the latest requirements. Unfortunately, some have fallen behind, still using the previous editions.

Anyone who has ever attempted to design a light-gage member following the Specification provisions probably realized how tedious and complex the process was. This fact helps explain why