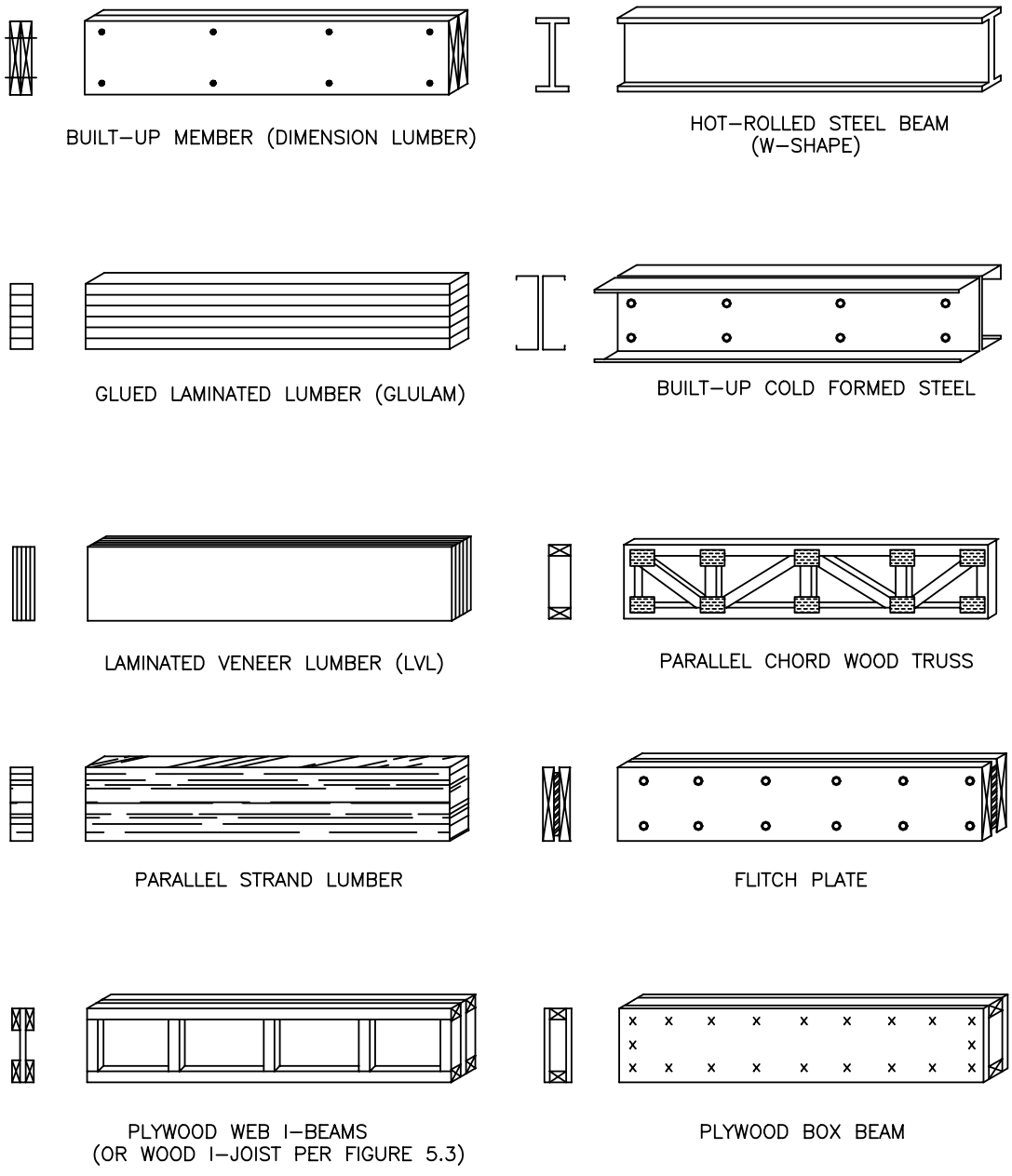
FIGURE 5.4 Examples of Beams and Girders



Steel I beams are often used in residential construction because of their greater spanning capability. Compared with wood members, they span longer distances with a shallower depth. A 2x4 or 2x6 is usually attached to the top surface with bolts to provide a fastening surface for floor joists and other structural members. Although steel beam shapes are commonly referred to as I-beams, a typical 8-inch-deep W-shaped beam is commonly considered a house beam. Alternatively, built-up cold-formed steel beams (i.e., back-to-back C-shapes) may be used to construct I-shaped girders. Refer to the *Steel Construction Manual* (AISC, 1989) and the American Iron and Steel Institute's publication RG-936 for the design of and span tables for residential applications of hot-rolled steel sections (AISI, 1993). Structural steel floor beam span tables are also found in the *Beam Series* (NAHBRC, 1981). The *Prescriptive Method for Cold-Formed Steel in Residential Construction* should be consulted for the design of built-up cold-formed steel sections as headers and girders (NAHBRC, 1998).

Engineered wood beams include I-joists, wood trusses (i.e., girder trusses) glue-laminated lumber, laminated veneer lumber, parallel strand lumber, etc. This guide does not address the design of engineered wood girders because product manufacturers typically provide span tables or engineered designs that are considered proprietary. Consult the manufacturer for design guidelines or completed span tables. The NDS does, however, provide a methodology for the design of glue-laminated beams (NDS•5).

Site-fabricated beams include plywood box beams, plywood I-beams, and flitch plate beams. *Plywood box beams* are fabricated from continuous dimension lumber flanges (typically 2x4s or 2x6s) sandwiched between two plywood webs; stiffeners are placed at concentrated loads, end bearing points, plywood joints, and maximum 24-inch intervals. *Plywood I-beams* are similar to box beams except that the plywood web is sandwiched between dimension lumber wood flanges (typically 2x4s or 2x6s), and stiffeners are placed at maximum 24-inch intervals. *Flitch plate beams* are fabricated from a steel plate sandwiched between two pieces of dimension lumber to form a composite section. Thus, a thinner member is possible in comparison to a built-up wood girder of similar strength. The steel plate is typically 1/4 to 1/2 inches thick and about 1/4-inch less in depth than the dimension lumber. The sandwich construction is usually assembled with through-bolts staggered at about 12 inches on center. Flitch plate beams derive their strength and stiffness from the composite section of steel plate and dimension lumber. The lumber also provides a medium for fastening other materials using nails or screws.

Span tables for plywood I-beams, plywood box beams, steel-wood I-beams, and flitch plate beams are provided in NAHB's *Beam Series* publications (NAHBRC, 1981). Refer to the APA's *Product Design Specification* (PDS) and *Supplement* for the design method used for plywood box beams (APA, 1998b). The *International One- and Two-Family Dwelling Code* (ICC, 1998), formerly the *CABO One- and Two-Family Dwelling Code*, provides a simple prescriptive table for plywood box beam headers.