



FIGURE 4.15 Lean-to framing. (*Metallic Building Systems.*)

#### 4.8.1 Single-Slope Frames

Each of the five basic pre-engineered framing systems can be produced in a single-slope, rather than gable, configuration. The single-slope feature does not significantly affect structural behavior of the framing, its clear span capacity, or typical details. Confusing the terminology, some companies call their single-slope rigid-frame products (Fig. 4.1*h*) “lean-to rigid frames.” In such cases, a picture is truly worth a thousand words.

Single-slope framing is frequently used for office complexes and strip shopping malls, where rainwater needs to be drained away from the parking areas or from the adjacent buildings.

#### 4.8.2 Trussframes

Coronis Building Systems, Inc., started production of its proprietary framing line in 1956 and has since developed over 8000 variations of the framing. A typical trussframe\* resembles a tapered beam, except for its web, which is made of truss-type members rather than being solid (Fig. 4.16). Other trussframe varieties include multispan, cantilevered pole-type shelters, canopies, and lean-tos.

A major advantage of this system, as claimed by the manufacturer, is the absence of horizontal reactions at the columns under gravity loads, a natural property of tapered-beam framing (or any other simply supported straight beam, for that matter).

\*Trussframe is a trademark of Coronis Building Systems, Inc.



FIGURE 4.16 Trusses. (*Coronis Building Systems.*)

#### 4.8.3 Delta Joist System

Delta Joists\* are unlikely to be confused with any other structure. We would have placed this system in the next chapter, were these triangulated three-dimensional joists produced by Butler Manufacturing Co. not conceived and sold as a complete roof-support system rather than as mere roof purlins. The joists, which are available in 1-ft increments, have a constant depth of  $25\frac{1}{4}$  in, regardless of loading. Their top and bottom chords are made of hot-rolled steel angles; the diagonals consist of round bars. The joists possess a very desirable characteristic—lateral stability—which makes them truly different, since it obviates the need for purlin bracing and perhaps even for traditional horizontal roof diaphragms.

The Delta Joist system is best suited for buildings with load-bearing masonry or precast walls, where exterior columns and wall bracing are not needed; it can be adapted for non-load-bearing end-walls if optional steel frames are used. The system normally provides a roof slope of  $\frac{1}{4}$ :12 and requires the building width to be a multiple of 4 ft. The joists can span up to 60 ft, a distance normally unattainable with the secondary members traditionally used in metal building systems. The Delta Joist system is intended to support Butler's proprietary standing-seam roof panels; top flanges of the joists come prepunched for attachment of the roof clips.

#### 4.8.4 Flagpole-Type Systems and Systems with Fixed-Base Columns

Occasionally, a manufacturer proposes a system that does not look much different from the competing ones but costs less. The savings can sometimes be explained by the fact that all the building columns, or the exterior columns only, are designed with fixed bases. In this design,

\*Delta Joist is a trademark of Butler Manufacturing Co.