Several factors made this period significant for the history of metal buildings. First, the improving technology was constantly expanding the maximum clear-span capabilities of metal buildings. The first rigid-frame buildings introduced in the late 1940s could span only 40 ft. In a few years, 50-, 60-, and 70-ft buildings became possible. By the late 1950s, rigid frames with 100-ft spans were made.[5] Second, in the late 1950s, ribbed metal panels became available, allowing the buildings to look different from the old tired corrugated appearance. Third, colored panels were introduced by Stran-Steel Corp. in the early 1960s, permitting some design individuality. At about the same time, continuous-span cold-formed Z purlins were invented (also by Stran-Steel), the first factory-insulated panels were developed by Butler, and the first UL-approved metal roof appeared on the market.[1]

And last, but not least, the first computer-designed metal buildings also made their debut in the early 1960s. With the advent of computerization, the design possibilities became almost limitless. All these factors combined to produce a new metal-building boom in the late 1950s and early 1960s.

As long as the purchaser could be restricted to standard designs, the buildings could be properly called *pre-engineered.* Once the industry started to offer custom-designed metal buildings to fill the particular needs of each client, the name *pre-engineered building* became somewhat of a misnomer. In addition, this term was uncomfortably close to, and easily confused with, the unsophisticated *prefabricated buildings,* with which the new industry did not want to be associated.

Despite the fact that the term *pre-engineered buildings* is still widely used, and will be often found even in this book, the industry now prefers to call its product *metal building systems.*

1.2 METAL BUILDING SYSTEMS

Why "systems"? Is this just one more application of the cyber-speak indiscriminately applied to describe everything made of more than one component? Nowadays, even the words *paint system* or *floor cleaning system* do not provoke a smile.

In all fairness, *metal building system* satisfies the classical definition of a system as an interdependent group of items forming a unified whole. In a modern metal building, the components such as walls, roof, main and secondary framing, and bracing are designed to work together. A typical assembly of a metal building is shown in Fig. 1.2. In addition to a brief discussion here, the roles played by various metal building components are examined in Chap. 3.

A building's first line of defense against the elements consists of the wall and roof materials. These elements also resist structural loads, such as wind and snow, and transfer the loads to the supporting secondary framing. The secondary framing—wall girts and roof purlins—collects the loads from the wall and roof covering and distributes them to the main building frames, providing them with valuable lateral restraint along the way. The main structural frames, which consist of columns and rafters, carry the snow, wind, and other loads to the building foundations. The wall and roof bracing provides stability for the whole building. Even the fasteners are chosen to be compatible with the materials being secured and are engineered by the manufacturers.

The systems approach, therefore, is clearly evident. The term *metal building system* is proper and well-deserved. Over time, it will undoubtedly displace the still-common name, *pre-engineered buildings.*

1.3 SOME STATISTICS

Today, metal building systems dominate the low-rise nonresidential market. According to the Metal Building Manufacturers Association (MBMA), pre-engineered structures comprised 65 percent of all new one- and two-story buildings with areas of up to 150,000 ft^2 in 1995. The 1995 metal building sales of MBMA members totaled $2.21 billion; 355 million ft^2 of space was put in place. Large industrial buildings with areas of over 150,000 ft^2 added another 34.3 million ft^2 of new space.[6] The 2000 sales were $2.5 billion.

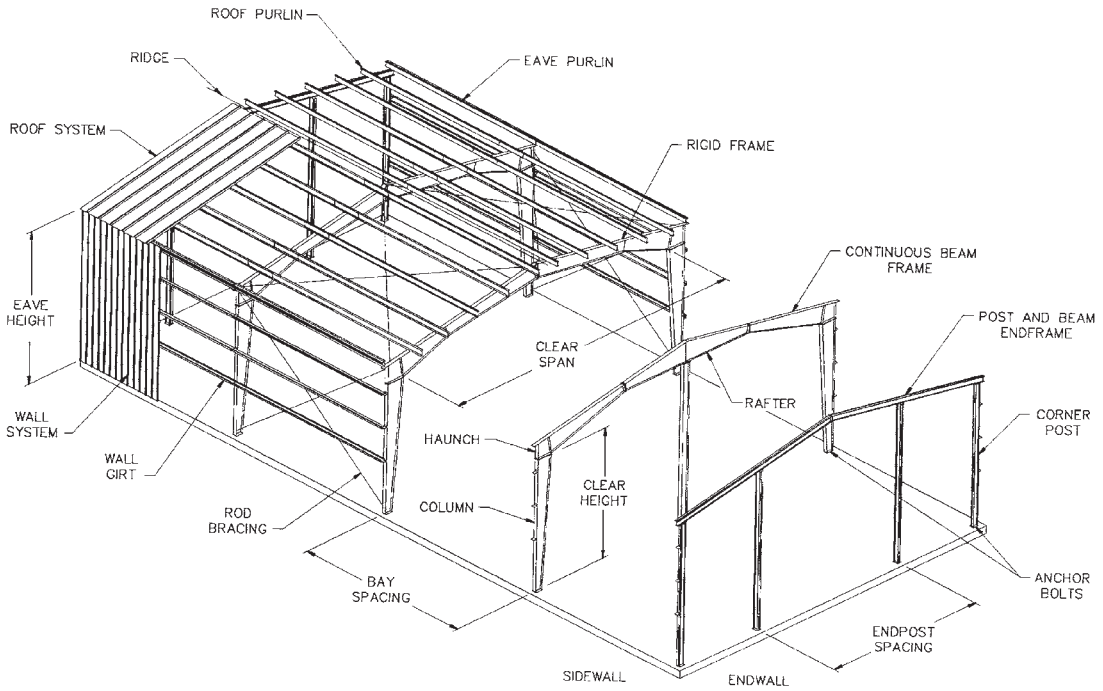

FIGURE 1.2 Typical components of a metal building system. (*VP Buildings.*)

Metal building systems serve many applications. Commercial uses have historically accounted for 30 to 40 percent of metal building sales. This category includes not only the familiar beige warehouses (Fig. 1.3), but also office buildings, garages, supermarkets, and retail stores (Figs. 1.4, 1.5, and 1.6). Another 30 to 40 percent of metal building systems are found in manufacturing uses—factories, material recycling facilities, automotive and chemical plants (Figs. 1.7, 1.8, and 1.9). Some 10 to 15 percent of pre-engineered buildings are used for community purposes: schools, town halls, and even churches (Figs. 1.10 and 1.11). The catch-all "miscellaneous" use includes everything else and, notably, agricultural buildings such as grain storage facilities, farm machinery, sheds, storage buildings, and livestock shelters.

1.4 THE ADVANTAGES OF METAL BUILDING SYSTEMS

Most metal buildings are purchased by the private sector, which seems to appreciate the advantages of proprietary pre-engineered buildings more readily than the public entities. What are these advantages?

- *Ability to span long distances.* There are not many other types of gabled structures than can span 100 ft or more in a cost-effective manner. The competition consists mainly of trusses, which require substantial design and fabricating time. (Special tensioned fabrics could also span the distance, but are in a class by themselves.)
- *Faster occupancy.* Anyone who has ever tried to assemble a piece of furniture can remember the frustration and the amount of time it took to comprehend the various components and the methodology of assembly. The second time around, the process goes much faster. A similar situation occurs at a construction site when a stick-built structure is being erected. The first time it takes a little longer…,