Today, MBMA consists of about 30 members, representing the best-known metal building manufacturers and over 9000 builders. Together, the group members account for about 9 out of 10 metal building systems built in this country. Recently, MBMA has opened its membership to industry suppliers, who may join as associate members to have greater access to MBMA programs and information.[2]

One of the most important roles played by the Association is providing engineering leadership to the manufacturers. Before MBMA was formed, each building supplier was using its own engineering assumptions and methods of analysis, a situation that resulted in a variable dependability of metal buildings. Development of the engineering standards was among the first steps taken by the new organization. Indeed, the MBMA Technical Committee was formed at the Association's first annual meeting on Dec. 4, 1956. Throughout the years, the MBMA's director of research and engineering served as the main technical representative of the industry. The Association's technical efforts, which have become especially intensive since the 1970s, were directly responsible for the increased sophistication of the manufacturers' engineering departments.

During its adolescence, the industry had to contend with a lack of building-code information about the behavior of one- and two-story buildings under wind loading. Since low-rise buildings were the main staple of metal building manufacturers, new research was desperately needed. MBMA has risen to the occasion and, by teaming up with the American Iron and Steel Institute (AISI) and the Canadian Steel Industries Construction Council, sponsored in 1976 a wind-tunnel research program at the University of Western Ontario (UWO), Canada.[3] Wind-tunnel testing had been in existence for decades, but this program under the leadership of Dr. Alan G. Davenport was its first extensive application to low-rise buildings. The results of this testing have been incorporated into the 1986 edition of the *MBMA Manual*[5] and have contributed to the development of the wind-load provisions in ANSI 58 (now ASCE 7), Standard Building Code, and other codes around the world.

Most of the research work at the UWO was conducted between 1976 and 1985. More recently, a program called Random City was conducted at the UWO Boundary Layer Wind Tunnel Laboratory. The Random City is a miniature model of a typical industrial town being subjected to a hurricane; the objective is to measure the wind forces acting on a typical low-rise building.[4] Similar studies are conducted at Clemson University, where standing-seam roof panels are being tested for dynamic wind forces, and at Mississippi State University, the site of experimental load simulation by electromagnets.

Research on snow loading also gets a share of MBMA's attention. For example, the effects of unbalanced snow loading on gable buildings are being studied at Rensselaer Polytechnic Institute with MBMA's sponsorship. Another area of the MBMA-sponsored research concerns the thermal effects that solar radiation produces in metal roof and wall assemblies.

Since metal building systems are not inherently fireproof, the establishment of UL-listed assemblies involving the system components is critical to acceptance of the industry by building officials. MBMA has facilitated the progress on this front by sponsoring the fire-rating tests of the tapered steel columns and of metal-roof assemblies.

Another important publication from MBMA followed in 2000. The *Metal Roofing System Design Manual* marked the culmination of a successful program intended to provide the specifiers with the best design details for various types of metal roofing.

In addition to its role in the development of engineering standards for low-rise buildings, MBMA serves as a promotional arm of the metal building industry. The group publishes the *MBMA Fact Book* and the *Annual Market Review* and offers videos, slide presentation shows, and other promotional materials explaining the benefits of metal building systems.

The Association has been instrumental in expanding the scope of the Quality Certification Program, administered by the American Institute of Steel Construction (AISC), to include metal building manufacturers. Originally, the program was intended to certify structural steel fabricators by ensuring consistently high quality throughout the entire production process. The new certification category MB (Metal Building Systems) is applicable to manufacturers of pre-engineered buildings "that incorporate engineering services as an integral part of the fabricated end product." The program objectives include evaluation of the manufacturer's design and quality assurance procedures and practices, certification of those manufacturers who qualify, periodic audits of the certified companies, and

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encouragement of others to adopt it. A certification by the well-known agency obviously enhances the manufacturer's image and facilitates acceptance of its system by local building officials. MBMA has made AISC certification a condition of membership. Building on the success of its AISC certification program, MBMA has developed and is actively promoting its Roofing Certification program. This new program is intended to further improve the standards of the metal roofing industry.

The Metal Building Manufacturers Association is located at 1300 Sumner Avenue, Cleveland, OH 44115-2851; its telephone number is (216) 241-7333; its website is www.mbma.com.

2.2.2 MBMA's Metal Building Systems Manual

Since its first edition in 1959, the *Manual*[5] has been a desktop reference source for metal building manufacturers and their engineers and builders. The amount of useful material included in this book—and its sheer volume—has been steadily increasing. The 1986 edition of the *Manual* (it was then called *Low Rise Building Systems Manual*) had only about 300 pages. The following 1996 edition changed its appearance from a slim, easy-to-carry gray volume to a thick, three-ring binder.

The 2002 edition was issued in the same easy-to-update three-ring binder format but otherwise signaled a change in direction. The name of the publication is now *Metal Building Systems Manual,* to sharpen its focus and improve its recognition by the specifiers. The first section of the *Manual,* which used to be called "Design Practices," is now split into three sections: "Load Application," "Crane Loads," and "Serviceability." Here, instead of presenting its own unique design methods as was done previously, the 2002 edition provides a commentary on the relevant structural provisions of the 2000 International Building Code (IBC). The "Load Application" section now contains extensive design examples that illustrate the design process. Instead of providing its own load combinations, the *Manual* now refers the reader to those of IBC.

Another major part of the MBMA *Low Rise Building Systems Manual,* "Common Industry Practices," includes a diverse range of topics dealing with sale, design, fabrication, delivery, and erection of metal building systems, and with some insurance and legal matters. The specifiers of metal buildings should pay particularly close attention to Section 2, "Sale of a Metal Building System," that spells out in detail which parts and accessories are included in a standard metal building system package, and which are normally excluded.

The next section of the *Manual,* "Guide Specifications," is intended to be used as a guide in preparing contract specifications. The *Manual* also includes an overview of AISC-MB certification provisions, a commentary on wind loads, representative fire protection ratings, load data by U.S. county, a glossary, an appendix, and the bibliography.

It is important to keep in mind that, while the *Manual* is widely used and respected, the information in it is presented from the standpoint of the manufacturers and is primarily intended to guide *them.* The *Manual* is not a building code with legally binding provisions; it is a trade document, and its use is voluntary. As with other similar trade documents, "Common Industry Practices" can be modified by project-specific contract language when justified.

2.3 AMERICAN IRON AND STEEL INSTITUTE (AISI)

The American Iron and Steel Institute has evolved from the American Iron Association, which was founded in 1855. Throughout the years, the Institute was instrumental in development of design codes and standards for a variety of steel structural members, occasionally crossing its ways with American Institute of Steel Construction (AISC). To avoid duplication, the two institutes have agreed to divide the applicability of their standards. Presently, the *AISC Manual* covers the design of hot-rolled structural steel members, which include the familiar wide-flange beams, angles, and channels. These members are cast and roll-formed to their final cross-sectional dimensions at steel mills at elevated temperatures. The *AISC Manual* also covers plate girders fabricated from plates with thicknesses generally greater than $^3/_{16}$ in.