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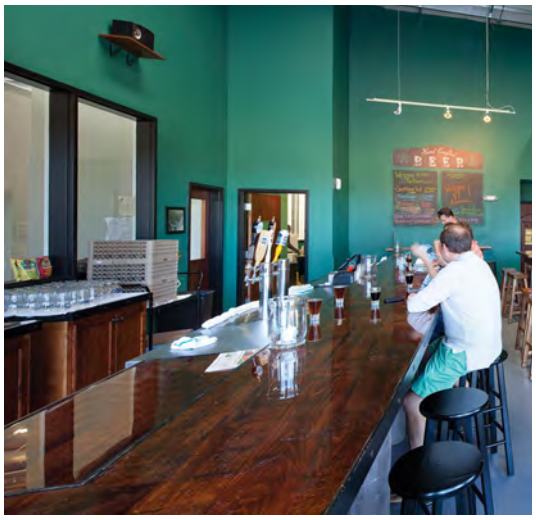

MBMA has Resources to Quantify **Sustainability of Metal Building Systems**

by Jay D. Johnson, LEED AP

Metal building systems have long been a popular choice for new low-rise, nonresidential buildings in the U.S., and they represent a significant portion of the overall construction market. They are very flexible and can be constructed for a wide range of end uses including school and athletic buildings, automobile dealerships, retail stores and centers, manufacturing facilities, agriculture buildings, warehouses and more. While their versatility has long been clear to potential owners and builders, one aspect of metal buildings that makes them even more appealing is their sustainability attributes. Many of the features that make these buildings so popular, including the use of recycled steel, efficient use of materials, low-to-no waste, ability to insulate to high levels, fast construction and more, also make them a desirable green choice. And now, the Metal Building Manufacturers Association (MBMA) has added several pieces of information for potential owners and builders to help them in their decision-making process. Three new Environmental Product Declarations, or EPDs, a complete whole-building life cycle analysis, and case studies comparing the environmental impacts of metal building systems to the impacts of other building types, are some of the resources that MBMA has made available.

With their wide range of applications and cost-effective construction, metal building systems are a popular choice for many new buildings. In addition to the variety of building applications, another benefit of metal buildings is the ease with which the building envelope can be constructed with different building materials to achieve various design requirements. Metal buildings commonly include metal wall panels which come in a variety of profiles and colors. However, if zoning requirements or a client needs to deviate from traditional metal building façades, other options can include concrete tilt-up, masonry block or brick. Metal building walls accommodate a variety of window types and sizes that meet daylighting needs.

A metal building roof is also well-suited to various design features. Some of these features include long spans with minimal-to-no interior support columns, low-slope or steep-slope, skylights, standing-seam or through-fastened metal panels, and a variety of colors. Furthermore, metal building roofs and walls can accommodate a variety of insulation levels and types to meet energy codes.

In addition to the structure's use and overall design, sustainable building has become an important factor in construction today. Metal buildings are proving to be a good choice in this important aspect of building and have long incorporated a number of sustainable building practices. Steel is the primary building material, and it is the most recycled and recyclable building material available. Metal buildings often use recycled steel in all parts of their primary and secondary framing, metal roofing and wall panels. At the end of its current use, this steel is 100 percent recyclable. According to the Steel Recycling Institute (SRI), structural steel has a recycling rate of 98 percent. The steel that is used today will, whenever it has completed its job, be used again, lessening the environmental impact in the future. More information is available at the SRI website, www.recycle-steel.org. The MBMA Life Cycle Analysis quantifies the importance of recycling, as it indicates that the upstream production of steel—extraction of raw materials and delivering the materials to the production facility—has the single most significant input driving the environmental impacts of steel used in metal buildings.

Waste – or the lack of it – is another attractive aspect of metal buildings. The building materials used for the primary framing, secondary framing, and metal roof or wall cladding are custom-engineered and produced for each building project to exacting specifications. During the fabrication phase, the amount of steel and other materials used in a metal building is optimized. Any excess materials used in the fabrication plant is reused or recycled. On the job site there is minimal waste to recycle, which may just include the shipping dunnage.

Many metal building providers have multiple production facilities around the country, so regionally-sourced materials are often available. And because the building materials are produced specifically for each job, job site preparation can be focused and disruption minimized. Once the materials are at the site, construction times are often faster than with traditional techniques and materials, keeping costs and environmental exposure to a minimum. Compared to other roofing materials, metal roofs have extended life spans, typically 40 years or more, and are completely recyclable when they do need to be replaced. These are a few, but certainly not all, of the benefits of metal building systems that also help to make them sustainable.

As the importance of sustainable building has grown in recent years, so has the need to document specific attributes and codify standards. There are now a range of green building codes, standards and rating systems in use. Some of the more well-known include:

- U.S. Green Building Council's (USGBC's) Leadership in Energy and Environmental Design (LEED) project rating systems. www.usgbc.org
- Green Building Initiative's (GBI's) Green Globes rating system. www.thegbi.org
- ANSI/ASHRAE/USGBC/IES Standard 189.1, Standard for the Design of High-Performance Green Buildings Except for Low-Rise Residential Construction. www.ashrae.org
- International Code Council's (ICC's) International Green Construction Code (IgCC). www.iccsafe.org

The drive toward sustainability and the importance of improved environmental decision-making has increased the focus on sustainable building information. Rating systems and codes rely in part on environmental claims by having this information verified by third parties. Examples of this include industry-wide EPDs derived from Life Cycle Assessment, or LCA, reports. The data used within the EPDs and LCA reports are also included within whole-building LCA software design tools, such as the Athena Institute Impact Estimator software available at www.athenasmi.org.

MBMA and its members have been at the forefront of this effort, working with various third-party entities to document the benefits of metal building systems. In recent years MBMA partnered with the Athena Institute to create an LCA for metal building systems and UL Environment (ULE) to verify industry-wide EPDs that comply with ISO 14025 and ISO 21930 standards. Using life cycle inventory (LCI) data incorporated into the Athena databases and Athena Impact Estimator, the LCA study benchmarked the environmental impacts of three specific parts of a metal building. These parts are the primary framing, the secondary framing and the metal cladding. ULE generated the three industry-wide EPDs, one for each of these metal building elements, from the LCA study results. Designers can now use the information to gain credits, meet codes and better understand the sustainable attributes of metal building systems.

The three complete EPDs can be found in the Energy and Sustainability section of MBMA.com. The MBMA LCA report is also available at MBMA.com. In addition to the Athena databases and information, MBMA and its members have contributed to the industry-wide data used in the National Renewable Energy Laboratory (NREL) U.S. LCI Database. This information can be incorporated into other whole-building LCA software to evaluate specific buildings and is available at www.nrel.gov/lci.

For those interested in a sustainability comparison of building types to get an idea of where metal buildings stand, there is a report available with that information as well. MBMA commissioned a third party, Walter P. Moore & Associates Inc., to conduct a series of independent, whole-building life cycle assessments using the Athena Impact Estimator. A total of 30 buildings were analyzed in the case study, which also used three different areas of the country for each building as part of the analysis.

The scope of the study included primary and secondary structural framing, wall and roof materials, including insulation, and foundations. It did not include items common to all buildings that would be repeatable for all cases and would not affect the outcomes. The study focused on the six major environmental metrics that the Athena Impact Estimator uses:

- Global warming potential
- Ozone depletion potential
- Acidification potential
- Smog potential
- Non-renewable energy
- Eutrophication potential

The conclusions for the two larger building types are clear: "Metal buildings showed lower environmental impacts in all six metrics when comparing structural and envelope materials to load-bearing masonry walls, concrete tilt-up and steel framed construction of the same building footprint and functional equivalence."

"In conclusion," the analysis sums up, "the study results show that for the types of construction where metal buildings are typically most economical, they usually also perform better in LCA analyses and have the least embodied building material impact." The case study report provides this easy-to-access analysis for those who don't have the time or ability to easily generate their own LCA comparisons and is available at MBMA.com.

The versatility and cost-effectiveness of metal building systems make them an ideal choice for a number of different end uses. The environmentally-friendly aspects of these buildings have been evident, but now MBMA provides the data and resources that quantifies their sustainability. With so many resources available, MBMA makes it easy to understand and maximize the sustainable aspects of metal building systems for anyone interested.

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