



Part I

What is a Metal Composite Material (MCM)?

Simple question, right? Well, maybe not so simple. According to Wikipedia, the definition of a composite material is a “material that is made from several different substances.”

No focus on the type of materials; the bond between materials; or the performance of the product. In fact, concrete and reinforced carbon graphic material can also be considered composite materials. Point taken, but in this instance to narrow the focus down to construction and even more so into the area of exterior cladding with a metal surface (face, skin, etc.), the International Building Code (IBC) defines a metal composite material (MCM) as:

Metal Composite Material (MCM). A factory-manufactured panel consisting of metal skins bonded to both faces of a solid plastic core.

Taking that a step further, the IBC has an entire section dedicated to the use of MCM in construction (1406). The section contains considerable detail about physical and fire performance and the required testing to allow the use of MCM on a variety of construction types. However, IBC Section 1406 has only have been around since 2000 and the use of MCM in North America dates back to the late 1970’s. Take a look at some history:

The first aluminum composite material (ACM) was created in Europe in 1969^(a). It wasn’t until 1979 that the first ACM was produced in North America. In the early 1980s, there were a number of companies worldwide producing ACM and shipping to North America for architectural projects. By the time the 1990s came around, there were several companies manufacturing ACM in North America. There was also a number of companies from around the world providing ACM for the construction industry in North America. To make things even more confusing, processes were developed to use alternate skin materials such as copper, zinc, steel, stainless steel, and even titanium. With this skin material change, the product name had to be broadened to Metal Composite Material (MCM). Today, the number of manufacturers continues to grow worldwide and the amount of variation in product offering and quality continue to expand along with it.

Aluminum skins, alternate metal skins, solid plastic core, metal honeycomb core, metal corrugated core, honeycomb plastic core—the list of components is almost endless for products that go by the name of “composite material.” The one constant that remains in place since the origin of ACM and MCM in North America is that the core material cannot contain foam plastic material. The building code has always looked at foam plastic and foam plastic containing materials as a different kind of product due to concerns of fire. These products and assemblies containing foam plastic are regulated in Chapter 26 of the code.



One of the other significant variables seen in the industry over the years is the production process used to make the MCM. The typical process is to extrude or place a core material between two continuous skins of metal with some type of bonding technology to keep the components together, run the assembly through a series of heated rolls under a considerable amount of pressure, ending with the panel being that is cut to length. Various manufactures have tried to create composite panels in a batch process, however consistent visual appearance and bond strength between the core and the skins has generally been a limiting factor in production. Continuous panel production in a controlled factory environment has proven to be the most common practice to ensure a high quality, consistent panel product.

As we continue through the different parts of this paper we will discuss some of the product variances available in the market and what impact choices of core material, skins, and finishes can have on the end product and the MCM performance over the life of the building.

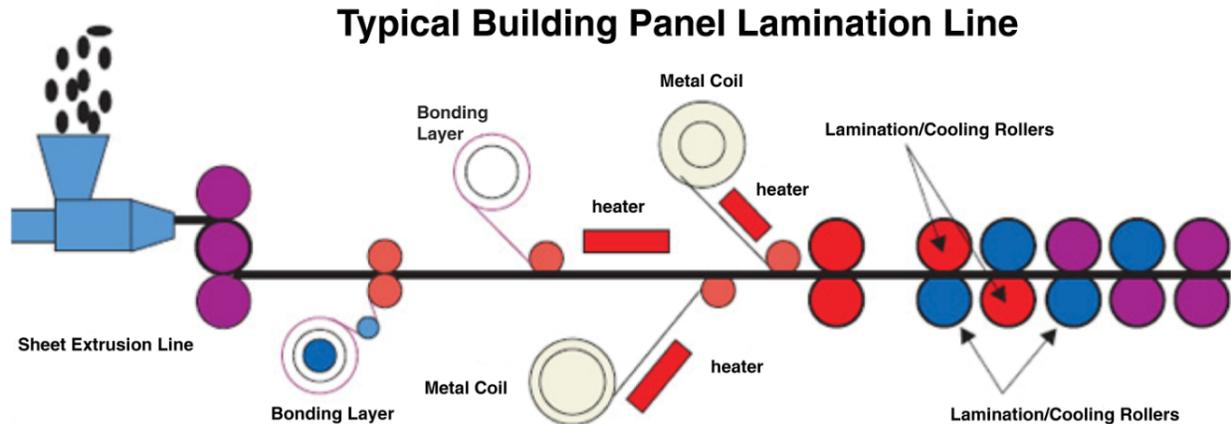
Disclaimer:

This document reflects the views of the MCA leadership and members and is for general information only. MCA reserves the right to change, revise, add to, or delete any data contained in the document without prior notice.

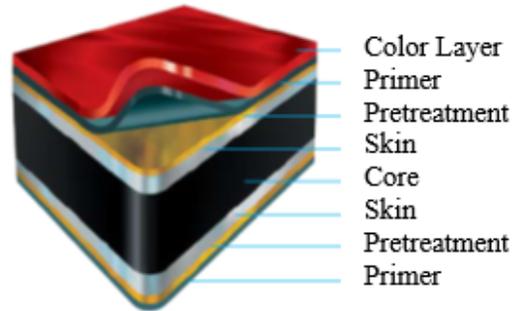
Part II

What is a Metal Composite Material (MCM)?—Production

Part I of this series discussed the history behind MCMs and a bit about the manufacturing process. Part II dives a little deeper into the production and quality control of the MCM panels.



The production process is fairly straightforward. Typically, an extruded core material is produced, followed by the application of some material that will bond the elements together. Finally an aluminum sheet material is added to provide structural stability and a medium that can be finished in a number of colors and finish types. This entire stack of material is heated and passed through a lamination roll that provides significant pressure to bond the individual elements. At this point, what you have is a bonded sheet at a high temperature that must be cooled in a controlled process to maintain the bond integrity and flatness as it cools. Sounds like a simple process, however, what really is happening is a semi-soft malleable core is becoming more rigid as it cools between two metal skins. The skins are generally aluminum and they are also at a high temperature and cooling as the process continues. Metal, having the expansion rate it does, contracts as it cools making the entire assembly want to move, twist, and bow until the finished panel reaches ambient temperature. Without the controlled addition of heat and pressure, the required bond strength is generally not attained to keep the panel together. It is this controlled cooling which maintains the panel flatness as the product cools.



Originally, the requirement for this “continuous process” was included in the code definition of an MCM. However, it should be, at least theoretically, possible to achieve an adequate bond and a panel that will remain flat when some type of batch process is used.

The key takeaways from the production of the MCM are the bond strength and panel flatness that will make the panel acceptable even after years of exposure. Based on many thousands of square meters of experience, it was determined that a bond strength, both as-manufactured and after controlled exposure, of 100N-mm/mm was adequate to ensure that a panel would remain bonded over time. This performance value has been built into the requirements used by all major manufacturers and certification agencies to evaluate the acceptability of the finished MCM. Overall flatness is also a major concern for an exterior cladding. This is defined in the MCA White Paper: [*Visual Acceptance Parameters for Metal Composite Material \(MCM\) Panels and Panel Systems.*](#)

Now that you know more about the history and production of MCM panels. The next part in this discussion will cover some of the differences between products. The core, skins, metals used, and finishes. It also will discuss some of the impacts these choices can make on the finished product and what it means to the end customer.

Disclaimer:

This document reflects the views of the MCA leadership and members and is for general information only. MCA reserves the right to change, revise, add to, or delete any data contained in the document without prior notice.