WHITE PAPER

Definitions for the Supply and Installation of MCM

OVERVIEW

Metal Composite Material (MCM) has been a key element in exterior wall cladding construction since the early 1980's, yet many of the common industry terms are not well known across the design and code enforcement community. Many of these "common" terms identify important responsibilities in the use of MCM systems. A proper understanding will provide the reader with important information that could save time and cost related to the purchase, fabrication, and installation of MCM cladding systems.

DISCUSSION

Even though used as a cladding material since the 1980's in North America, MCM panels and systems are often described by a unique set of terms that may not be known throughout the industry. Too often, MCM issues are not directed to the appropriate responsible party costing time and resources. Some of these issues include:

- Overall visual problems with the installation are referred to the MCM Manufacturer for resolution.
- Fabricators are contacted about overall panel color consistency.
- The design and code enforcement community are unsure how to verify that materials and installation systems are compliant with the local code requirements.

Clarification of these MCM industry specific common terms below should assist in both addressing these types of issues as well as the overall use of MCM panels and systems

Metal Composite Material (MCM):

The International Building Code definition for MCM is:

> **A factory-manufactured panel consisting of metal skins bonded to both faces of a solid plastic core.**

While technically correct, additional points, such as performance and visual appearance, should be considered when specifying MCM to ensure use of quality cladding material. MCA believes a more complete definition for MCM is:

> A factory-manufactured panel consisting of two metal skins bonded to each major face of an extruded thermoplastic based or injection molded thermoset core using a continuous process where heat and tension is applied to the skins to maintain flatness.

Looking now at each component:

- ***Extruded solid thermoplastic-based core***
    - ***Fire-Performance:*** *In order to meet building code requirements and related fire performance testing, MCM products are manufactured with extruded thermoplastic solid cores containing significant amounts of fire-retardant chemistry. Referred to as an "FR" panel, this designation refers to what are often thought of as interchangeable terms "fire-retardant" or "fire-resistant". While not really interchangeable, both terms are related to the movement of flames throughout a structure.*
    - ***Consistency:*** *One of the key elements required to manufacture architecturally flat MCM panels is a core material in a tightly controlled process that maintains consistent core thickness. Consistency is critical for the permanent bonding of an MCM's top and bottom metal skins through the controlled application of heat and pressure. If the thickness of the core varies, even minutely, the adhesion of metal skins to the core could be compromised over a lifetime of panel thermal movement. Short of a bond failure, panel visual appearance could be negatively impacted.*
- ***Continuous tension process*** *– Another key MCM production control is metal skin tension. Tension is not only critical for keeping panels flat during the manufacturing process, but also during thermal cycling of the cladding system once installed on the project.*

There are an ever-increasing number of "other" materials on the market that claim to be an "MCM" panel or "just like an MCM", however the following points should also be considered when making a material choice:

- ***Different Core Materials:*** *There are several wall panel products in the market with core materials including honeycomb/corrugated metal or plastic, wood component products, and other similar cores that do not provide 100% contact bond strength to the skin. While these products may meet the minimum bond strength per square inch, the actual bonding contact area is much smaller meaning that any local failure of the bond may have a significant impact on local bond strength. These core types also may allow moisture to come in contact and react with any adhesive or bonding agent process used across the sheet rather than just at the product edge. Generally, moisture and adhesives do not perform well together, but the real question is whether the bond strength will hold up after 20-30 years on a building maintaining a flat and visually acceptable wall panel.*
- ***Different Skin Materials: We've*** *already discussed the importance of metal skin tension for maintaining panel flatness during production and on the project. Just as important is the overall thermal expansion rate. If one side expands with the application of heat (solar energy) at "X%", then the other side must expand at the same rate, or the panels will visually bow and deflect. While this may go away when the panel cools again, the different thermal expansion rates also impact joints and connections. Besides, who wants to tell a building owner they should "Come back after the sun goes down and the panels will look flat as the day they were installed".*

Metal Composite Material (MCM) Panel System

Too often, designers do not consider that panel systems (as part of the wall assembly) include several components beyond the MCM sheet.

The IBC definition for MCM System is:

> **An exterior wall covering fabricated using MCM in a specific assembly including joints, seams, attachments, substrate, framing, and other details as appropriate to a particular design.**

In practice, MCM sheets are fabricated and fastened with panel connectors to an aluminum extrusion system which is, in turn, attached to structural framing via system anchors for the purpose of transferring primary wind loads to the building structure.

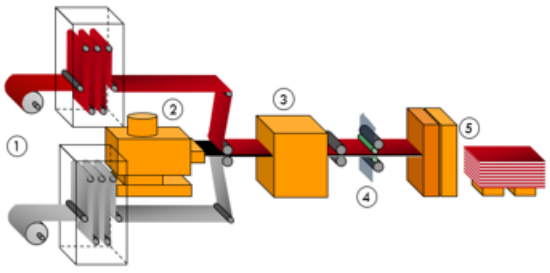
The components of an MCM panel system include:

- *Perimeter Attachment System: Aluminum framing extrusions, either continuous or in the form of clips, used to transfer wind loads from the panel to the support structure. This transfer is made through connectors, both mechanical and adhesive, from the MCM to the perimeter framing and from the perimeter framing through system anchors to the primary wall system.*
- *Panel Stiffeners: MCM can deflect a great amount without yielding, enabling it to return "back to flat" when the load is removed. Despite this great performance trait, the building code generally limits how far a panel can bow for visual appearance reasons. To comply with these deflection limits, MCM Fabricators may adhere stiffeners in the form of aluminum profiles to the backside of the MCM to limit deflection. In general terms, stiffeners are spaced 16-24" on center based on the wind load and the engineering design of the panel assembly. These stiffeners are adhered to the back side of the panel with some type of flexible adhesive. In some cases, stiffeners are mechanically fastened to the perimeter frame while in other cases, stiffeners stop short of the panel perimeter framing and rely on the adhesive attachment to the backside of the MCM. It is important to confirm the need for stiffeners and stiffener attachment design with a registered design professional and the MCM fabricator.*

MCM Manufacturer:

> The entity whose core competency is manufacturing MCM by bonding metal skins to an extruded or injection molded solid plastic core (contains no air voids) using heat, pressure and tension to form sheet goods for a panel system.

MCM is a flat panel manufactured in a continuous process at a fixed width determined by the width of the metal coil used as the skin. The length of the panel is primarily limited by fabrication and transportation issues. This flat panel is truly a raw material that requires "fabrication" to be used as a cladding assembly. MCM manufacturers are often confused as providers of both MCM panels and panel systems whereas panel systems are generally developed and provided by MCM fabricators.



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MCM Distributor:

An intermediate entity that obtains and resells MCM sheet goods for use as exterior or interior cladding.

This is an interesting and potentially concerning entity that has become more popular in North America. The MCM Distributor purchases panels from several different sources which are made available to individuals in the construction industry. The concern over the distributor is twofold. First, a distributor interrupts the direct link between the MCM Manufacturer and the Fabricator. The MCM Manufacturers have been heavily involved in training Fabricators on the "dos and don'ts" associated to MCM work. There is a great amount of literature written, but there is also no replacement for experience and cooperation between these two partners in construction. Second, the MCM delivered to the project through a distributor may or may not be traceable in terms of code compliance, performance and quality. This may lead to some serious code enforcement problems that will be discussed in the section on Listing and Labeling.

MCM Fabricator:

The entity that cuts and routes the MCM sheet into a panel system to be used on the exterior or interior walls of a project. Panel fabrication includes the attachment of extrusions and other necessary components to the sheet which allows the system to be attached to the building in the field.

Fabricators are key to the success of the entire MCM industry. It is safe to say that the MCM panel is essentially useless until it is fabricated to resist deflection (stiffeners) and be attached to the structure using extrusions and connections/anchors. As previously stated, the Fabricators have a great deal of experience not only in the handling of MCM, but in the installation and performance of the MCM Systems that are most often designed by the Fabricators. Without using a truly experienced Fabricator, the building design and performance can easily fall short of performance and appearance expectations. MCM Fabricators are in most cases the direct customer of the MCM Manufacturer.

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MCM Installer:

> The entity responsible for the installation of the panel system on the structure. This may include elements such as insulation, weather barrier and additional support structure for the panel system. The Installer may have a direct relationship with the MCM Fabricator or may be an independent contractor specializing in the installation of MCM systems.

The MCM Installer takes the fabricated MCM System sent to the jobsite by the MCM Fabricator and is responsible for the necessary labor and expertise to install the cladding system on the structure. In many cases, there are field conditions which do not exactly match the drawings, and the Installer must become an "on site" fabricator. In these cases, the installer must adapt panels to the project situation while maintaining the performance and appearance of the MCM system. This ability is not something you read in a book. It is an acquired skill that can take many years to perfect.

The MCM installer is often associated with the MCM Fabricator, and these two experts may even be joined by contract language. What is most important is that the installer understands how the MCM system from the fabricator works and the critical elements/procedures that must be implemented to provide a high-quality installation.

Listing and Labeling:

IBC requires all MCM used as exterior cladding material to be labeled in accordance with IBC Section 1406.13. The label type and what information is required is defined in IBC Section 1703.5. (Listing and labeling requirements of the local code enforced shall be followed if not using the IBC.) Labeling shall include the following information:

- An *approved agency* shall perform all code required testing to show that a panel material or assembly has been tested in accordance with the building code.
- The code *approved agency* shall provide periodic inspection, in-plant, if necessary, to verify that the product or assembly being produced is representative of the material or assembly tested.
- The *label* shall contain the manufacturer's identification and definitive information describing the product or assembly and the *approved agency's* identification.
- The *label* shall be permanently affixed or printed on the material in a method that cannot be removed without being destroyed or as acceptable to the *approved agency* and code compliance officials in accordance with the code.

For buildings constructed in accordance with the code, use of a listed and labeled MCM is not optional. The requirements are specifically called out in the International Building Code (IBC) and the field inspector for the municipality can and will go as far as stopping construction if it is found that these labeling requirements are not met. MCM panels have received certain allowances in panel marking, so it is important to review the Evaluation Report for the material to be used. Not only is it important to ensure that the panel material meets the requirements of the code, but the attachment system, fabrication, and installation must also be recognized to be acceptable to what has been tested to show compliance with the code.

SUMMARY

While the MCM system is installed on the structure as a finished product, there is no single source responsible for all the work that goes into providing that system. The MCM manufacturer provides a single (very important) element of the system but does not fabricate or install the system. Similarly, the fabricator can only create a quality finished product if the base components are designed and fabricated to perform as a unit. Finally, the best materials, fabricated in the finest quality, cannot visually overcome a poor-quality installation. Furthermore, only a proper installation will meet the performance criteria specified for a project.

The saying goes, "It takes a village . . . . ." and in the case of a quality MCM system installation, this statement is very true. The designers must make sure that each element of the process (materials, fabrication, and installation) is acceptable and meets the project requirements for quality and performance.

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- Technical guidance
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- Educational and awareness programs
- Advocating for the interests of our industry
- Recognition of industry-achievement awards
- Monitoring of industry issues, such as codes and standards
- Research to develop improved metal construction products
- Promotional and marketing support for the metal construction industry
- Publications to promote use of metal wall and roof products in construction

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