

# 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

As construction materials go, even though used as a cladding material since the 1980's MCM is relatively new when compared to products like tilt-up concrete, brick, and steel siding that are commonly used in commercial construction. With over 40 years construction experience 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 the materials and installation system are compliant with the local code requirements.

Here are some common terms for the MCM industry and where clarification of these terms would help in 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, there are a few additional points that should be brought up when specifying MCM in order to ensure a quality cladding material.*

- ***Extruded solid plastic core*** – *One of the key elements required to make sure the panels are flat and even is to have the core material extruded where the thickness is very tightly controlled by the gap in the extrusion dies. Precise control of this gap in turn controls the core thickness which is adhered to the metal skins by a controlled application of heat and pressure. If the thickness of the core varies, even minutely, the adhesion of the skins to the core could be compromised leading to adhesion failure and delamination.*

- **Continuous tension process** – To keep panels flat during the manufacturing cooling process and during the thermal cycling on the side of a building, another key production control is tension in the metal skins. This tension is what makes the two panel skins expand and contract equally and maintain the balance and flatness of the panel.

MCA believes a more complete definition for MCM is:

A factory-manufactured panel consisting of two metal skins bonded to both faces of an extruded plastic core using a continuous process where tension is applied to the skins to maintain flatness.

There are several “other” materials on the market that claim to be an MCM panel, however these points should also be considered.

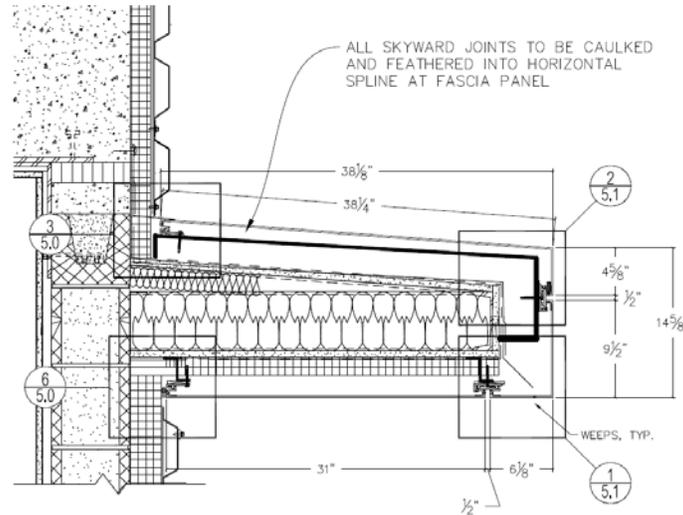
- **Solid Plastic Core:** There are several honeycomb or corrugated core products on the market that do not provide 100% contact bond strength to the skins. While these products may meet the minimum bond strength per square inch, the contact area is smaller meaning that any local failure of that bond has a significant impact on local bond strength. These core types also allow for moisture to come in contact and react with the adhesive across the sheet rather than just at the edge as in a traditional MCM. Generally, moisture and adhesives do not perform well together, but who can say how bond strength will hold up after 20-30 years on a building.
- **Different Skin Materials:** We’ve already discussed the importance of tension on the skin to maintain a flat panel over time. Just as important is the thermal expansion rate. If one side expands with the application of heat (solar energy) “X%”, the other side had better expand at that same rate or the panels are going to bow. While this would most likely go away when the panel cools again, the different thermal expansion rates will also impact joints and connections. Besides, who wants to tell a building owner: “Come back after the sun goes down and the panels will look flat as the day they went in”.

### Panel System:

Combination of MCM sheet goods fabricated to utilize an aluminum extrusion system attached with panel connectors and system anchors to transfer primarily wind load to the building structure.

Too often the designer does not consider that the panel system includes a number of components that go beyond just the MCM sheet. These include:

- **Perimeter Attachment System:** Typically, aluminum framing extrusions, continuous or clips, that are 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 panel support system.
- **Panel Stiffeners:** MCM can deflect a great amount without yielding so it can go back to flat when the load is removed. This is a great trait for MCM, but the code generally limits how far a panel can bow for visual appearance reasons. MCM Fabricators adhere stiffeners in the form of aluminum profiles to the backside of the MCM to limit this deflection. Generally, the stiffeners, if required, are spaced 16-24” on center. Also, for some systems the stiffeners are mechanically fastened to the perimeter frame where in other cases the stiffener is stopped short of that framing. Check with the fabricator to determine the need for stiffeners and how they integrate into the framing system.



**MCM Manufacturer:**

Entity that bonds the metal skins to an extruded solid plastic core 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 Distributor:**

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 “do’s 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 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:**

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 Installer:**

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 to the MCM Fabricator or may be an independent contractor specializing in the installation of MCM systems.

*The MCM Installer takes the fabricated MCM System from the shipping containers and are responsible for the necessary labor and expertise to hang the cladding system on the structure being clad. 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 to 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 1406.14. 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.*

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METAL CONSTRUCTION ASSOCIATION

8735 W. Higgins Road, Suite 300, Chicago, IL 60631

847.375.4718 | [mca@metalconstruction.org](mailto:mca@metalconstruction.org) | [www.metalconstruction.org](http://www.metalconstruction.org)

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## SUMMARY

While the MCM system goes on the structure as a finished product, there is no single source responsible for all of the work that goes into providing that system. The MCM manufacturer provides a single (very important) element of the system, however they do 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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