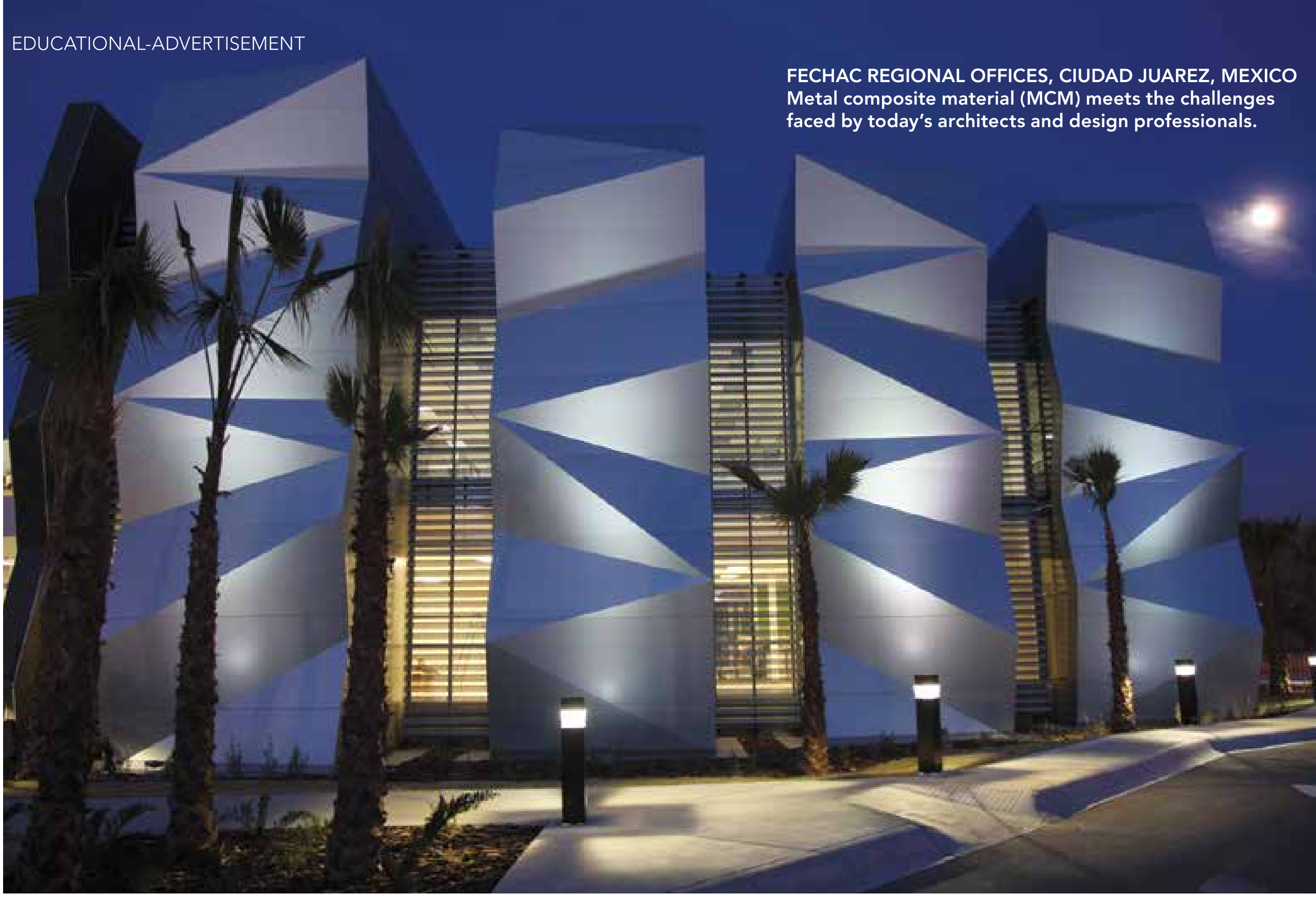

FECHAC REGIONAL OFFICES, CIUDAD JUAREZ, MEXICO
Metal composite material (MCM) meets the challenges faced by today's architects and design professionals.

Photo courtesy of Metal Construction Association

Individual Parts Bring a Greater Whole

A primer on MCMs

Sponsored by Metal Construction Association | *By Amanda Voss, MPP*

Clustered around a plan table, a group of architects in Vancouver, British Columbia, face a daunting task. The team needs a wall assembly that can actually realize the bends, rolls, and shapes they have created with their 3-D design software. This wall assembly must support the building's environment and primary use. It has to enable the design to exceed LEED New Construction Platinum standards. It must withstand the rain and humidity that are a reality in Vancouver. Finally, it will support and integrate with a living, fully vegetated rooftop.

Challenge accepted. In the end, one material is the team's natural choice for the wall assembly on this project: metal composite material.

METAL COMPOSITE MATERIAL

Metal composite material, or MCM, is formed by joining two metal skins to a solid plastic or fire-retardant core, which is then bonded under a precise temperature, pressure, and tension. This unique process makes MCM lighter, more versatile, and more flexible than a solid metal of similar thickness.

MCM has transformed modern architecture. Building owners and architects wanting to make a design statement can look to the current generation of MCM for a wide range of interior and exterior options. The smooth, sleek material can be bent, curved, and joined in various shapes and configurations, and the panels keep their luster for years with minimal maintenance. MCM turns buildings into timeless works of art.

Where It Came From: Product History

The first aluminum composite material (ACM) was created as a result of a newly patented process of bonding aluminum to polyethylene for the communication industry. Alusuisse Aluminum then created the first ACM for use in the construction industry in 1969. It was not

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Learning Objectives
After reading this article, you should be able to:

1. Explain what a metal composite material (MCM) is and how it is produced.
2. Review the available options for MCM skins, including finishes, materials, and specifications, and how these aesthetic options can elevate occupant experience.
3. Discuss how MCM skins promote sustainability and practicability of the structure through its life cycle, shielding it from everyday wear and leading to enhanced building durability and health.
4. Describe the attributes of MCM core material and how these benefit occupants and create a safer structure during fires.
5. Debate the benefits MCM provides, including those related to environmental concerns, efficiency, and economy. Demonstrate how MCM, as a designed material bolsters structural lifespan, green goals, and the well-being of users.

To receive AIA credit, you are required to read the entire article and pass the test.

AIA COURSE #MCM20

Photo courtsey of Arconic Architectural Products

CHARLESTON COLISEUM AND CONVENTION CENTER, CHARLESTON, WEST VIRGINIA
The unique production process used to create MCM makes it lighter, versatile, and more flexible than a solid metal of similar thickness.

until 1979 that the first ACM was produced in North America. In the early 1980s, there were only a few companies worldwide producing ACM and shipping materials to North America for architectural projects.

During the 1990s, three companies were manufacturing ACM in North America, competing with foreign imports. 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 category was broadened to MCM.

Today, the number of manufacturers continues to grow worldwide, and the amount of variation in product offering and level of available product quality continues 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 products that identify as composite materials components is almost endless. The one constant that remains is that MCM cannot contain foam plastic material.

How It Is Made: Production of MCMs

One of the most significant variables seen within MCMs is the production process.

That said, the production process is fairly straightforward. Typically, an extruded core material is produced, followed by the application of a selected material that will bond the elements together. Finally, a metal skin material is added to provide both structural stability and a medium that can be finished in a number of colors and finish types. The individual elements are organized and passed through a bonding process. This process provides significant heat, pressure, and tension in order to bond the individual elements together, creating the MCM. It takes the combination of all three elements—heat, pressure, and tension—to create a complete composite panel. One of the most critical elements in the production of MCM is the bond strength between the core and the metal skin material. This bond is developed using a very precise chemistry, which bonds the metal and the traditionally bond-resistant core material, usually a polyethylene-based compound. To ensure the bond strength is within acceptable levels, manufacturers are required to test the bond strength, as manufactured, after 8 hours in boiling water, and after 21 days soaking in water at room temperature. These standard tests have worked well in the past and are required as part of the product-evaluation process to assure the panel will remain intact over time. Based on many thousands of square meters of experience, it was determined that a bond strength, both as manufactured and after controlled exposure, of 22.5 inch-pounds/inch (measuring bond peeling strength) was adequate to ensure that a panel remains a composite during normal exterior applications. 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.

After bonding, the panel must be cooled in a controlled process to maintain both the bond integrity and surface flatness. Because the metal skin is expanded at the higher bonding temperature, the skin contracts as it cools, making the entire assembly want to move, twist, and bow until the finished panel reaches ambient temperature. Without the controlled use of heat, pressure and tension, the panel will not achieve the signature uniformity of the MCM product. Overall flatness is also a major concern for an exterior cladding to maintain the desired absolutely flat appearance. Furthermore, the bond strength and panel flatness are the attributes that will make the panel perform against the elements and be visually acceptable, even after years of exposure.

Changes in the production process and material choices by newer companies joining the MCM manufacturer contingent are a significant consideration when defining the quality of the MCM in recent years. Various manufactures have created composite panels using a batch process; however, consistent visual appearance and bond strength between elements has not generally met the quality and consistency experienced in the continuous lamination process. Continuous panel production in a controlled factory environment has proven to be the most common best practice to ensure a high-quality, consistent panel product.

Codes

Chapter 2 of the International Building Code (IBC) defines an MCM as "a factory-manufactured panel consisting of metal skins bonded to both faces of a solid plastic core."

▶ Continues at ce.architecturalrecord.com

Amanda Voss, MPP, *is an author, editor, and policy analyst. Writing for multiple publications, she also serves as the current managing editor for* Energy Design Update.

The IBC contains a specific section dedicated to the use of MCM in construction: Section 1406. Section 1406 contains considerable detail about physical and fire performance, including the required testing to allow the use of MCM on practically all types of construction.

The building code has always looked at foam plastic and foam-plastic-containing materials as a different kind of product than MCM due to concerns of fire. These products and assemblies containing foam plastic are regulated in Chapter 26 of the code.

MCMs IN ACTION: CASE STUDY #1

Photo courtesy of 3A Composites USA

TOWER HOSPITAL AT RUSH UNIVERSITY MEDICAL CENTER, CHICAGO

Project: Tower Hospital at Rush University Medical Center
Location: Chicago
Architect: Perkins+Will
Contractor: Powers/Jacob Joint Venture
Metal Installer: ASI
MCA/MCM Alliance Member Manufacturer: 3A Composites USA
MCA/MCM Alliance Member Fabricator: Sobotec
Completion: January 2012

Chicago is renowned for its skyscraper skyline, and the city's new Tower Hospital at Rush University Medical Center stands among the best. More than just a pretty building, its design was driven by and for its occupants—the doctors, nurses, staff, and patients who use it.

The 840,000-square-foot, LEED Gold certified Tower Hospital is the main bed tower on the Rush University Medical Center campus. The unique butterfly-shaped design is awe-inspiring from the exterior, but the design serves an important purpose as well. The floor plan, essentially a triangle, brings the patient rooms closer together, a specific concern for the nurses seeking more efficient access to patients.

"We used an inside-out approach to design Tower Hospital," says John Moorhead, senior project designer at Perkins+Will, the Chicago-based architects who designed the building.

The architects collaborated with Rush staff to find out how they worked and designed the shape of the building to fit their operational model. "We let that impact what the design needed to be," Moorhead explains. "The nurses talked about the number of miles they walk per shift. They were particularly interested in creating a plan that pushed together the patient rooms."

Once the butterfly shape was conceptualized, the challenge became how to make it fly: functionally, aesthetically, and monetarily. An ACM provided the solution. About 250,000 square feet of MCM in a custom color was installed as exterior wall cladding on the Tower Hospital.

"Metal provided flexibility and affordability," Moorhead says. "It was the perfect choice to give the crisp white look that Rush was interested in, and it was easily adaptable to the curvilinear shape of the building."

At one point in the planning, the idea of the butterfly shape was nearly scrapped for a more standard rectangular shape to stay within budget, but the Rush team was determined to achieve its vision.

"The dramatic curvilinear shape was driven by the clinical team and our inside-out approach," Moorhead says. "The doctors and nurses really liked the operational flow of this plan. The question then became: How do we clad it within the budget allowance?"

The ACM used to clad the tower helped Rush realize both of those goals. "MCM is durable, does not warp, and can be bent into any shape," says Ben Branham, architectural marketing manager at 3A Composites USA. "The Rush Tower has a lot of bends and curves. MCM provided the vehicle for architects to do that."

Sobotec in Hamilton, Ontario, the metal fabricator on the project, designed a unitized curtain-wall system to enclose the tower as quickly as possible. Sobotec created AutoCAD computer-generated drawings to fabricate MCM panels. ASI, in charge of the installation, then fit the panels into the prefabricated curtain wall with a framed support system for the metal panels and glass.

The campus has a number of metal buildings, so an ACM-clad tower made sense in that respect as well. Choosing white as its color also was purposeful. "Whenever the color of a building is white, people assume they did not look at color, but we looked at color extensively," Moorhead says. "They [Rush] really wanted to project an image of fresh, clean, modern, and technically savvy. It is very crisp white, part of the image they wanted to project." Rush also wanted to avoid the recent trend in hospital design, which is to make hospitals look more like hotels.

Rush University and the City of Chicago praise the new Tower Hospital. The project has won numerous awards and accolades, including *Engineering News-Record Midwest*'s Project of the Year (2012) and the 2013 MCA Chairman's Award in the Institutional Project category. KPMG named the Rush Tower "one of the most innovative and inspiring urban architecture projects in the world." The *Chicago Tribune* architectural critic Blair Kamin called it a "towering achievement, the new Rush hospital could be Chicago's next great building."

Tower Hospital's architectural and operational goals were achieved largely because of metal. "While our foremost goal was for the new hospital's design to support its function and enhance patient care, we also knew it would be very important to establish a strong visual presence in Chicago's skyline and along the expressway leading to and from the city," says Mike Lamont, associate vice president, Capital Projects, Rush University Medical Center.

Photo courtesy of HMC Architects

CENTRAL LOS ANGELES AREA HIGH SCHOOL

The metal skins on today's MCM offer a variety of finishes and material, as well as provide vital performance for the building itself.

MCM SKINS

As the name implies, in an MCM, the skins are made of metal. While MCMs originally used only aluminum, today's product embraces a variety of metal surfaces—from stainless steel, to zinc, copper, and even titanium. Variations in metal, metal thickness, and finish are now common. MCMs can be finished in virtually any color a building owner or architect wishes.

The main purpose for the skin is threefold:

- To provide a substrate that can be painted or left in its natural state to create a visually appealing product with a long service life.
- To transfer the wind loading from the surface of the panel to the anchorage system.
- To protect the core material directly from fire.

To protect the core material from damage, fire, and provide a quality finish or appearance, metal skins must be used on both sides of the core material. Panels with metal on one side and some alternate material on the other are also prone to warping and buckling due to differing expansion rates and the ability to take load from either direction (positive or negative wind loading).

Skin Thickness

Since its introduction into the North American market, the typical aluminum thickness has been 0.019 inch (0.5 millimeter). This dimension provides a good protection layer for the entire composite and resists normal exposure without significant visual damage due to exposure during normal use.

Photo courtesy of 3A Composites USA

MASSACHUSETTS COLLEGE OF ART AND DESIGN STUDENT RESIDENCE HALL, BOSTON

New developments in technology have created an even broader range of finishes for MCM.

Skin Finishes

Skin-selection decisions, both in their metal material and finish, will impact the finished product and how well it performs for the building owner.

When ACM was introduced in the 1970s, 0.019-inch (0.5-millimeter) stretched and leveled aluminum coil was commonly available in both a 3000 series alloy for painted applications and a 5000 series alloy for anodized applications.

New developments in paint-application technology mean a broader range of options.

Aluminum skins are typically painted with any one of two fluoropolymer finishes (PVDF and FEVE) that meet the industry standard requirements of AAMA 2605. These finishes can range from earth tones with a low-gloss finish to rich, vibrant colors with a high-gloss finish and all the way to metallic finishes. Newer surface finishes can imitate other materials, like wood, marble, or granite.

The aluminum skins provide a surface the finishes will adhere to that will not excessively expand or contract due to temperature—something that would affect the finish. Excessive surface movement can even cause some exterior finishes to fail.

Non-aluminum metals, like copper or zinc, are also very popular. Generally left unfinished, these MCMs provide the appearance of a solid metal plate at a fraction of its weight and cost.

Alternate Skin Materials

Other metals beyond aluminum have been successfully used as skins for MCMs. In fact, the use of alternate metals as a skin material has been so prevalent that the overall product definition in the codes was changed from ACM to MCM more than 15 years ago. Stainless steel, carbon steel, zinc, titanium, copper, and other natural metals have been used in the manufacturing process with a great deal of success. These choices allow for a visual effect that is very similar but far less expensive than use of a solid metal sheet with the same appearance. MCMs also avoid the issue of excessive weight that a solid metal sheet presents.

There are certain areas of concern when dealing with MCMs using alternate metal types. First, the natural aging process of materials must be accounted for in the design. Most often, metals other than aluminum are used for visual impact and to obtain an "aged" look. Zinc and copper are examples of materials that change their appearance over time.

Another concern is the interaction of the metal skins with any other accessory metal materials, such as flashing and fasteners. Galvanic corrosion can be an issue in the presence of water and two or more dissimilar metals. Care should be taken throughout the design phase and during construction to avoid this type of corrosion, which will lead to premature failure of the metal skins and quite possibly the MCM panel itself.

One variation used by several manufacturers is to make an MCM with an alternate metal skin on the exterior side and an aluminum or non-metallic skin on the interior side. This is done solely for cost purposes, as the interior skin is generally many times less expensive than the metal skin used on the exterior side. The issue with this practice is in the difference in thermal expansion between the two skin materials and the potential galvanic reaction of fasteners that pass through both skins.

Structural Performance

Wind

One of the benefits of MCM panels is that they can be manufactured in panel sizes with very large spans, sometimes as large as 5 feet, which can lead to panel deflection during times of significant wind. The 0.019-inch aluminum skins have demonstrated, over many decades, their capability to accept high wind loads without creating excessive stress on the paint finish or yield of the metal. This performance is, in fact, one of the key advantages for MCMs. The material is very forgiving and will return to flat when the excessive wind loading is removed.

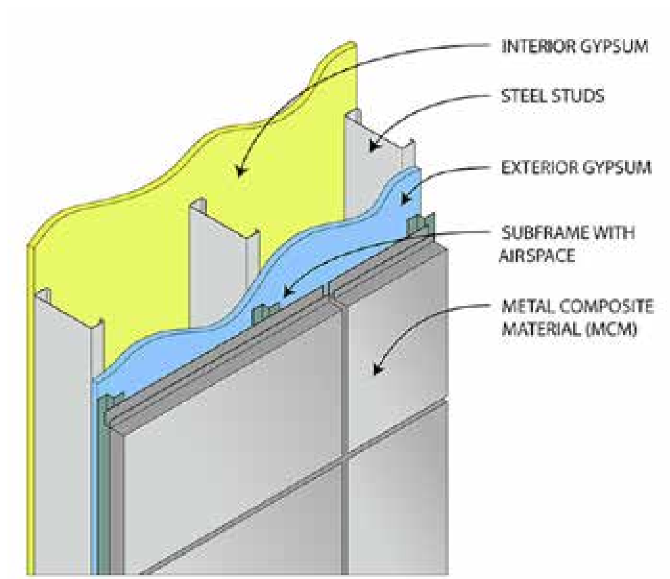
Under testing, 0.019-inch-thick aluminum skins validate their capability to be fabricated and folded so that the wind load can be transferred back to the structure.

Arguably the most important performance requirement for aluminum skin is the transfer of load from the panel face to the "return leg," commonly designed in today's installation systems. While loading is distributed along the entire perimeter of the panel, specific testing and actual field use have shown that the 0.019-inch skin does not yield due to the loading or due to repeated flexing of the panel under load.

Impact

Impact resistance of the MCM is a more measurable trait. The most common indicator of this performance is the TAS 201 (ASTM E1996) impact testing, currently used for Miami-Dade Product Approval. While the large missiles used in testing typically penetrate the ACM panel, standard small missile impact testing is generally successful due to a combination of the performance of the metal skin and composite action of the product.

INSTALLED MCM CROSS-SECTION



Skin Specification Highlights: General Areas of Concern

Over the years, different manufacturers have introduced thinner aluminum skins used on either the exterior (exposed) side or the interior (nonexposed) side down to measurements of 0.01 inch. While this thickness of aluminum skin material was initially introduced for signage, companies employed it for architectural use to save costs. Questions raised by using this thinner aluminum skin material include: fire and structural concerns, particularly resistance to skin damage that would expose the core material; the ability of the thinner skin to transfer load without yielding; failure of anchor fastening due to fastener pull through the thinner skins; and visual flatness of the MCM with thinner aluminum skin.

Differential expansion must also be accounted for with MCMs. Aluminum typically expands at a rate of 1/8 inch for 8 feet of length over a 100 degrees Fahrenheit temperature change. Other materials, both metallic and non-metallic, can have quite different expansion rates, which could lead to an unbalanced panel. It only takes a slight amount of differential to create a visual bow in the panel either with or without stiffeners. This bow is very apparent with high-gloss finishes and is even more apparent with highly reflective natural metals.

MCM CORES

MCM core material has a significant impact on performance. While a number of different chemical compositions and formulas can be used, the core material generally falls into what is referenced in the industry as either "standard" or "fire-resistive" core.

MCM manufacturers typically provide two types of core products: standard and fire retardant. While these product lines typically differ from one another in core composition, both are regulated by the Metal Composite Material (MCM) Section 1406 of the IBC.

The most important point to note about the core material is that the core is generally where the largest amount of combustible material occurs within the panel, and the performance of the core generally dictates the fire performance for both the MCM and the MCM system.

In the IBC, the performance requirements for specifying one MCM product type over another primarily depend on panel height above grade or grade plane and separation distance to the property line or other structures within the property boundaries. Moreover, these provisions changed significantly in the 2012 version of the IBC, making the correct choice of core material a complex process.

Photo courtesy of HMC Architects
LOS ANGELES HIGH SCHOOL
While MCM offers exceptional design flexibility, selecting its core material dictates what the overall fire performance of the product will be.

Standard Core Material

When ACM was first introduced to North America, the common core material was an extruded polyethylene. Many of the standard products available today continue to use this type of core. The common practice is to extrude a flat layer of core material that was bonded to the metal skins in a single continuous process. This bonding method allows the use of the heat, pressure, and tension to aid in the creation of the composite panel.

The standard core material meets all of the code requirements for panel use up to 40 feet above grade. The primary criteria governing standard core material is ASTM E84, which measures the surface flame spread of a material. The code requires this value to be less than 25. As a point of reference, the flame spread of a red oak flooring panel is used as a baseline and equated to a value of 100. The performance of the panel is considered in whole, so the metal skin material protects the core material from contributing to the fire during initial exposure.

There are other plastic materials that have been used successfully in place of polyethylene; however, the industry definition of an MCM is a panel that contains a solid plastic core bonded in a continuous process. The batch process does not meet the intent of this MCM panel criteria.

Companies have promoted core color or core density as a performance attribute; however, the most important points regarding the core remain:

- **Solid core material:** The skins of ACM are relatively thin (0.019 inch) and can easily telegraph any surface imperfection, including a discontinuity in the core, such as a honeycomb or corrugated core would produce. Higher-gloss or highly reflective finishes exaggerate these discontinuities and lead to visual problems with the panel and finish.
- **Bond strength between the core and skins:** The standard is set at 22.5 inch-pounds/inch for the bond strength between the core and skin material. This strength was not a simple shear or tension test, but rather a peeling test that demonstrates that the material will not delaminate over time. This test, ASTM D1781, has been used by this industry since the 1980s and is included in the acceptance criteria (AC25) used to develop evaluation reports for MCM products and systems.

Fire-Resistive Core Material

As MCMs gained in popularity for their aesthetic opportunities and performance attributes, the application of MCM cladding expanded into high-rise construction.

Concern over fire performance is different once the cladding is used above 40 feet.

In the United States, NFPA 285 has been developed to exhibit relative real-world fire performance. A similar test has been developed for Canadian use, NRC/ULC S134. The Class A flame-spread certification remains an additional requirement for those MCMs to be used above 40 feet.

The 2012 IBC established criteria to determine when a standard or fire-retardant core must be used. The major elements that dictate the type of core material to use include: panel height above grade or grade plane; wall construction type (rated or non-rated fire assemblies); and proximity to the property line or other structures within the property boundaries. The alternative performance criteria to NFPA 285 for MCM is referenced in the 2018 IBC in Sections 1406.10 and 1406.11 and include testing requirements, including ASTM E84, ASTM D635, ASTM D1929, and NFPA 285. Use of these sections is complex and should be considered only after discussion with the MCM manufacturer.

Typically, a manufacturer's standard panel material meets the performance requirements for the first three tests only, while the fire-retardant core material meets the performance requirements of all four test standards. When the construction conditions are within the limitations outlined below, a combination of some or all of the first three fire tests are required in the IBC, and a standard core material can be used. When these installation conditions are not within the defined limitations, either the fire-retardant core material must be used, or the authority having jurisdiction (AHJ) must accept the material in accordance with Section 104.11. Should the building require fire-rated construction, another important consideration is whether the manufacturer of the MCM has performed third-party-verified testing to show compliance with the requirements of the applicable fire tests.

Generally, MCM is required to meet the performance criteria of NFPA 285 when installed higher than 40 feet above the grade plane. However, there are certain installation conditions that may allow use up to a height of 75 feet above the grade plane without this requirement. The applications are defined in Section 1406 and are based on the allowable use of other combustible materials throughout the code.

In the 2018 IBC, the use of combustible materials on all construction types to a height of 40 feet above grade plane is allowed. The only limitation is a fire-separation distance of less than 5 feet. If that limitation cannot be met, a fire-retardant material or AHJ acceptance must be obtained. Installations of standard core MCM up to 50 feet above grade plane are defined in Section 1406.11.2 and based on the allowable use of plastic veneer defined in Chapter 26. If the ASTM D1929 and section size and vertical separation of section limitations cannot be met, fire-retardant material must be used.

There is no single formulation of fire-retardant core material required to meet code criteria. Each MCM manufacturer develops its own formulation and production parameters. The most common solution is to replace a portion of the combustible material found within the core material with either fire-retardant chemistry or an inert filler that would not promote flame spread.

MCMs IN ACTION: CASE STUDY #2

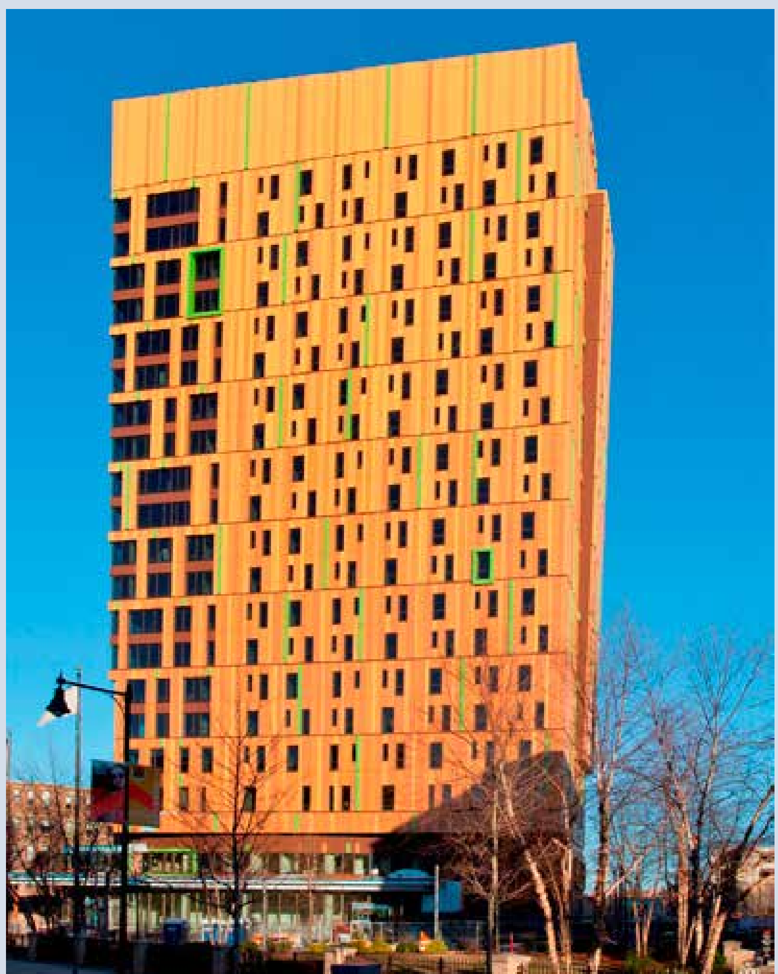


Photo courtesy of 3A Composites USA

MASSACHUSETTS COLLEGE OF ART AND DESIGN STUDENT RESIDENCE HALL, BOSTON

Project: Massachusetts College of Art and Design Student Residence Hall
Location: Boston
Architect: ADD
MCA/MCM Alliance Member Manufacturer: 3A Composites USA
Composite Fabricator/Installer: Lymo Construction
Contractor: Suffolk Construction
Completion: May 2012

Size: 150,000 square feet, 20 stories tall, 493 bed capacity

For the team at ADD that created the new residence hall at the Massachusetts College of Art and Design in Boston, the collaborative process gave birth to a piece of architectural artwork that garnered it the 2013 MCA Chairman's Award for Education – Colleges and Universities.

Using 5,900 MCM panels in seven different colors and five different widths, depths, and gloss levels, lead architect B.K. Boley and his team sought to infuse the building's exterior with the look and feel of the project's aesthetic inspiration, Gustav Klimt's 1909 painting "Tree of Life." Like the painting, the building uses an eclectic arrangement of colors to mimic an organic form—a concept that quickly gained approval from the group ADD invited into the charrette discussions used to plan and design the project.

"They were looking for a new building that was expressive of their mission, which is to train artists to engage with the public and to work in industry as fine artists," Boley says. "We came up with the idea of a tree of life as a symbol for the project because it represents rebirth, change, and optimism."

The building—which the students, in particular, wanted to be identifiable as "a painting in the sky," Boley recalls—houses 493 students in a 20-story structure that creates the image of organic order from chaos. There is a progression of darker and more muted browns at the bottom to lighter and glossier tones at the top, mimicking the way light plays off of a real tree. The mottled look of the exterior's profile is actually designed around a rational pattern in the panel width and depth and window arrangements: every two stories, the pattern repeats until it reaches the top of the building.

"We knew we wanted it to be organic, but we also knew it would have to be buildable," Boley says. "And composite metal panel ended up to be the best material to work with because we could pick our own colors—they are all custom colors—[and] we could have depth in the facade as opposed to a flat facade."

Boley's team also came up with panel designations and drawings that essentially acted as a map for the contractors to follow during installation.

Using the composite aluminum panels allowed the project to achieve its artistic goals and stay within its $48-million budget. Boley's team also chose a pressurized rainscreen system that has insulation behind it and spray foam insulation in the cavities, delivering a high R-value and overall energy efficiency, pointing the building toward LEED Gold status.

The team was able to use a rout-and-return method to rout and fold the panels so the contractor did not need to weld them together. That tight arrangement turned out to be emblematic of a project that almost everyone involved could appreciate.

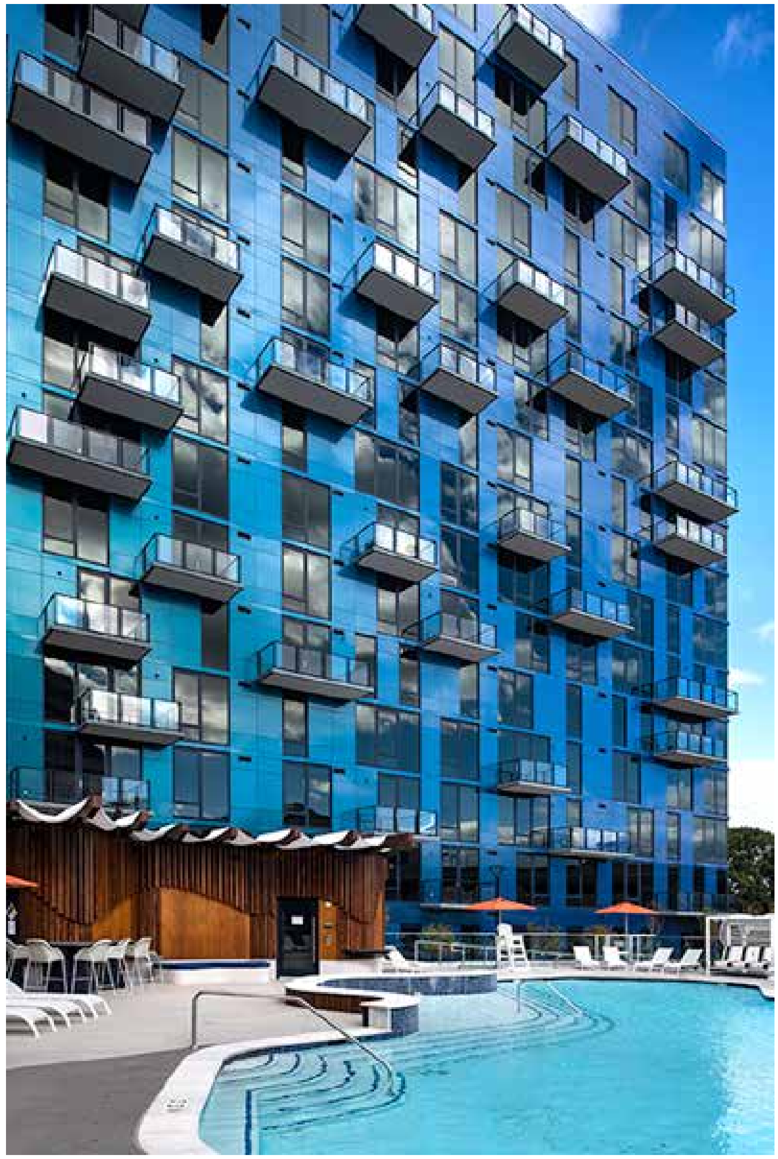


Photo courtesy of 3A Composites USA
EXO APARTMENTS, RESTON, VIRGINIA
MCMs offer exceptional design opportunities while providing reliability, economy, and environmental benefits.

PUTTING IT ALL TOGETHER: THE COMBINED BENEFITS OF MCM

The union of metal skin and core material in MCM yields multiple benefits to architect, building owner, and occupants. Not only do MCMs offer exceptional design and aesthetic flexibility, but they also create a reliable building envelope, are environmentally friendly, and keep installation and maintenance costs low.

MCM Systems Protect the Building Envelope

Properly designed and installed, MCM systems provide a very reliable building envelope that resists the elements and protect against air and water infiltration. Installation systems are available that virtually eliminate concerns over mold and mildew.

MCM is also an environmentally responsible and sustainable choice for buildings. Approximately 70 percent of an MCM aluminum by weight is recycled content.

MCM Systems Create Lower First Costs

Aesthetics is one reason MCM systems are increasing in popularity. Affordability is another. Early in their history, the use of MCM systems was limited to high-end projects. However, as a result of improvements in product technology and manufacturing efficiencies, as well as fabrication and installation techniques, MCM systems are more cost-competitive today than ever before.

Initial construction costs are often lower with MCM systems because the panels can typically be installed faster than alternative exteriors, such as precast, granite, or brick. Because of their light weight, MCM systems can also save money by reducing structural steel requirements since less support structure is needed.

As a result, MCM systems are now installed on a wide variety of building types and applications, ranging from major project wall panel systems to cornices and canopies, and frequently used to join areas between other major building materials, such as glass and precast panels.

MCM Systems Lower Building Life-Cycle Costs

Today's MCMs retain their color and finish for decades, ensuring that the building maintains its aesthetic appeal and property value for the long term. This longevity makes a difference when it comes time to sell the building. Facilities clad with MCM systems retain their curb appeal and never look dated, thereby reducing the need for pre-sale refurbishing costs.

Fire Protection

One of the phrases often heard in the field is "engineered to perform." Performance encompasses the ability of a product to endure, withstand daily wear and tear, and provide protection during hazardous events like fires and floods.

The only element generally considered combustible in an MCM is the core itself. While many of the fire-resistant cores have been tested and meet the requirements of a Class A material, the metal skins add an additional protection for that core material. Fire will typically reflect off the metal skin for quite some time before the metal becomes compromised and the core is directly exposed.

Photo courtesy of 3A Composites USA

VANDUSEN BOTANICAL GARDENS VISITOR CENTRE, VANCOUVER, BRITISH COLUMBIA

Aluminum composite panels were blended with traditional wood supports to both evoke and promote sustainability and beauty.

VISION ACHIEVED, CODES MET

What was once a small, focused industry that offered a lightweight alternative to solid plate installations has expanded into an industry today offering varied materials and manufacture meeting key performance requirements. With MCM systems, the choice of material is in the hands of the designer, and the choices of the owner and end users determines the type of performance required for a building to be considered safe and acceptable.

Step back to that plan table at Perkins+Will Canada. Now, travel to the job site and see the plans realized. Of all the qualities that garnered the VanDusen Botanical Gardens Visitor Centre in Vancouver, British Columbia, a 2013 Chairman's Award from the Metal Construction Association for metal roofing, perhaps foremost was how it blends striking aluminum composite panels with traditional wood supports to both evoke and promote sustainability and beauty. What sets the VanDusen building apart visually is its bold use of approximately 12,000 square feet of MCM panels on an undulating roof designed to look like five orchid leaves. The panels used in the building feature two coils of 0.020-inch aluminum thermobonded to a polyethylene core, all of which can be recycled. The panels cover a living, vegetation-filled roof constructed mainly of Douglas fir beams and plywood.

"The roof is really exuberant," says Jim Huffman, design principle for project architects Perkins+Will Canada, Vancouver. "And they wanted a building that really drew people in. One of the first meetings we had with the client—and I have never had a client say this before—they wanted the building to be outrageous."

The panels proved easy and quick to install, a plus in Vancouver's rainy climate. Because the 19,000-square-foot building has an organic design, the roof elements include a flowing stream of positive and negative curves, all achieved with an interlocking system of prefabricated panels. The installation firm designed a joint system that incorporated a two-piece nose cone that allowed them to extend one piece into the next panel, creating a seamless series of panels throughout each of the roof's elements.

Containing the heavy load of the roof's soil and plant life was one thing, but the panels also carried stress in a way that gave Perkins+Will and KPS a material that could bend and roll reliably and consistently into the organic shapes they created in their 3-D design software.

"This is art; this is expression," Dalzell says. "This is not a solid product; it is a shape and form. And what you do is, you let the shape and form take over a little bit. If you try to do what we pulled off here on a flat sheet of metal, be it aluminum or stainless or whatever, it would probably kink on you. You would be pushing it too hard, and it would let go."

The building was designed to exceed LEED New Construction Platinum standards. Even more ambitiously, it has been submitted for the International Future Living Institute's Living Building Challenge, a stringent standard that Huffman is confident the building will meet.

In addition to demonstrating sustainability with the living roof, the Visitor Centre practices it every day in ways that make the building a net-zero consumer of energy and water. It achieves that status, in part, by using solar hot water tubes on the roof to transfer heat to underground tanks for later use and an innovative, on-site bioreactor to clean wastewater and return it to a leaching field nearby.

"Our firm is a strong believer in sustainability, and that was one of the things that we thought a botanical garden should show to the public," Huffman says of the building, which cost almost $22 million (Canadian) to build. "That whole project is about sustainability, about showing people how they can live in the future. I think it is one of the greenest buildings in North America, if not in the world, right now."