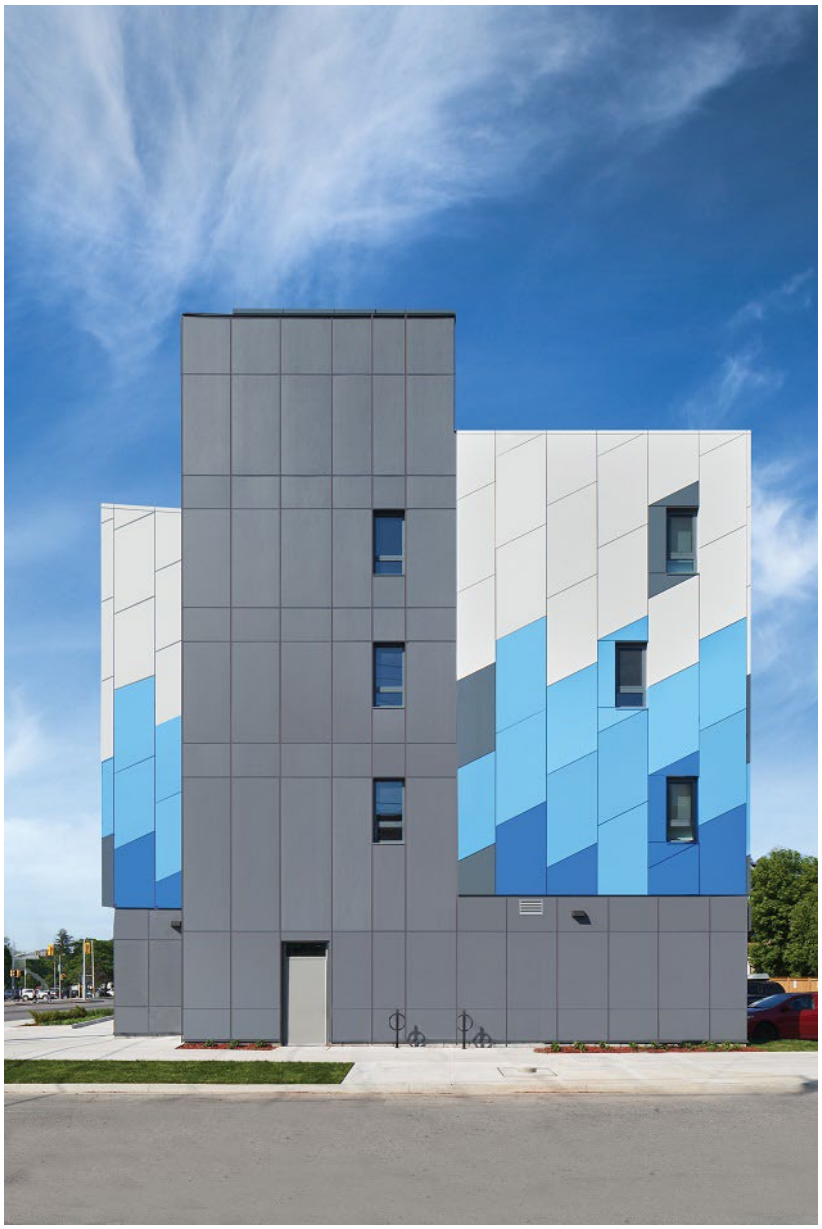
Environmental Product Declaration

ALPOLIC® Metal Composite Panels

FIRE-RESISTANT (FR) CORE AND ALUMINUM COMPOSITE PANELS



Photography by Michael Muraz

ALPOLIC

ALPOLIC, a division of Mitsubishi Chemical Group (MCG), has been changing the face of architecture for over 50 years. Since 1991, our materials have been designed, manufactured, and supplied with sustainability in mind from our headquarters in Chesapeake, Virginia. Lightweight and versatile, our premium metal composite materials (MCM) have inspired and enabled new iconic design possibilities worldwide.

Our commitment is to manufacturing efficiency, product sustainability, and material recovery for a better product and a healthier planet. We use the highest-quality recycled materials to maintain product integrity. Our precision die-coating process limits waste and controls VOCs. ALPOLIC materials are known for their shine and durability, guaranteed for up to 35 years. Select "cool" colors feature high solar reflectance and increase project energy efficiency.

With our EPD and other independent testing and reports, we're bringing transparency to the building products industry. For more information, visit www.alpolic-americas.com.

UL CERTIFIED ENVIRONMENTAL PRODUCT DECLARATION UL.COM/EPD

ENVIRONMENTAL PRODUCT DECLARATION

MITSUBISHI CHEMICAL GROUP | ALPOLIC

Mitsubishi ALPOLIC Metal Composite Material Panels
Fire Resistant (FR) Panels

According to ISO 14025, ISO21930:2017

EPD PROGRAM AND PROGRAM OPERATOR NAME, ADDRESS, LOGO, AND WEBSITE	UL Solutions www.ul.com 333 Pfingsten Rd, Northbrook IL, 60062 www.spot.ul.com
GENERAL PROGRAM INSTRUCTIONS AND VERSION NUMBER	UL Solutions General Program Instructions v.2.7 2022
MANUFACTURER NAME AND ADDRESS	Mitsubishi Chemical America - ALPOLIC® 401 Volvo Pkwy Chesapeake, VA 23320
DECLARATION NUMBER	4791529270.102.1
DECLARED PRODUCT & FUNCTIONAL UNIT OR DECLARED UNIT	Fire Resistant Metal Composite Panel; 100 m^2 coverage
REFERENCE PCR AND VERSION NUMBER	PCR Part A "Life Cycle Assessment Calculation Rules and Report Requirements" (UL Environment, 2022) and PCR Part B: "Insulated Metal Panels, Metal Composite Panels, and Metal Cladding: Roof and Wall Panels" (UL Environment, 2018) (extended to Dec 2024)
DESCRIPTION OF PRODUCT APPLICATION/USE	Metal composite material (MCM) panels consist of an inner and outer sheet of aluminum panels and a flame-resistant insulation core.
MARKETS OF APPLICABILITY	North America
DATE OF ISSUE	May 2nd 2025
PERIOD OF VALIDITY	5 Years
EPD TYPE	Product-average
EPD SCOPE	Cradle-to-gate
YEAR(S) OF REPORTED PRIMARY DATA	2023
LCA SOFTWARE & VERSION NUMBER	LCA FE v10.9 (formerly GaBi Software)
LCI DATABASE(S) & VERSION NUMBER	Managed LCA Content 2024.2 (formerly GaBi Database, CUP 2024.2)
LCIA METHODOLOGY & VERSION NUMBER	IPCC AR5 and AR6 + CML 2001 Aug 2016 + TRACI 2.1
The PCR review was conducted by:	UL Solutions PCR Review Panel epd@ul.com
This declaration was independently verified in accordance with ISO 14025: 2006. ☐ INTERNAL ☒ EXTERNAL	Cooper McCollum, UL Solutions
This life cycle assessment was conducted in accordance with ISO 14044 and the reference PCR by:	Sphera
This life cycle assessment was independently verified in accordance with ISO 14044 and the reference PCR by:	Maggie Wildnauer, WAP Sustainability

LIMITATIONS

Exclusions: EPDs do not indicate that any environmental or social performance benchmarks are met, and there may be impacts that they do not encompass. LCAs do not typically address the site-specific environmental impacts of raw material extraction, nor are they meant to assess human health toxicity. EPDs can complement but cannot replace tools and certifications that are designed to address these impacts and/or set performance thresholds – e.g. Type 1 certifications, health assessments and declarations, environmental impact assessments, etc.

Accuracy of Results: EPDs regularly rely on estimations of impacts; the level of accuracy in estimation of effect differs for any particular product line and reported impact.

Comparability: EPDs from different programs may not be comparable. Full conformance with a PCR allows EPD comparability only when all stages of a life cycle have been considered. However, variations and deviations are possible. Example of variations: Different LCA software and background LCI datasets may lead to differences results for upstream or downstream of the life cycle stages declared.

1. Product Definition and Information

1.1. Description of Company/Organization

A leader in metal composite material (MCM) manufacturing, Mitsubishi Chemical America's (MCA) ALPOLIC division is part of the global Mitsubishi Chemical Group (MCG). ALPOLIC Materials are ideal for architectural projects because they're lighter in weight, easier to fabricate into complex forms, and simpler to install than traditional materials. Yet they offer superior flatness, durability, and ease of maintenance. With the most extensive selection of stocked finishes and the broadest range of glosses – plus the ability to specify virtually any custom color – there's no limit to the architectural effects you can create.

With worldwide support capabilities, ALPOLIC Americas has been redefining skylines from its manufacturing headquarters in Chesapeake, VA. We stand behind our product like no other with our industry-leading Repair and Replace warranty, protecting your investment for up to 35 years. MCA uses the ISO 9001-2015 Quality Management System, and its materials are UL-certified.

Let us bring your vision to life with innovative ALPOLIC MCM.

1.2. Product Description

Product Identification

Mitsubishi's ALPOLIC fire-resistant (ALPOLIC®/fr) is a composite composed of two thin aluminum panels laminated to either side of a mineral-filled thermoplastic core. The aluminum surfaces have been coil-coated before bonding with an advanced Lumiflon® FEVE resin in a variety of finishes and colors. These architectural panels are installed on interiors and as cladding for the outer shell of buildings, offering protection from the elements while providing a lasting aesthetic appeal.

Easy to fabricate and install, ALPOLIC®/fr sets the industry standard for fire safety while offering nearly limitless design possibilities. The largest selection of stocked colors is ready to meet your tightest lead times. Stock ALPOLIC®/fr panels are 4 mm thick and available in widths of 50 inches and 62 inches and lengths of 146 inches and 196 inches. Custom lengths and thicknesses are also available. In addition to our expansive inventory, we offer precision custom color matching. Metallic, mica, prismatic, multi-color finishes; stone and timber effects; decorative metal finishes; natural metals; and anodized aluminum are also available.

These panels offer the rigidity of heavy-gauge sheet metal in a lightweight material. They accommodate virtually any architectural fastening system and are perfect for curtain wall façades, rainscreen systems, and other architectural cladding applications that require the use of a fire-resistant panel. Never compromise on your vision with beautiful, durable, and safe ALPOLIC MCM.

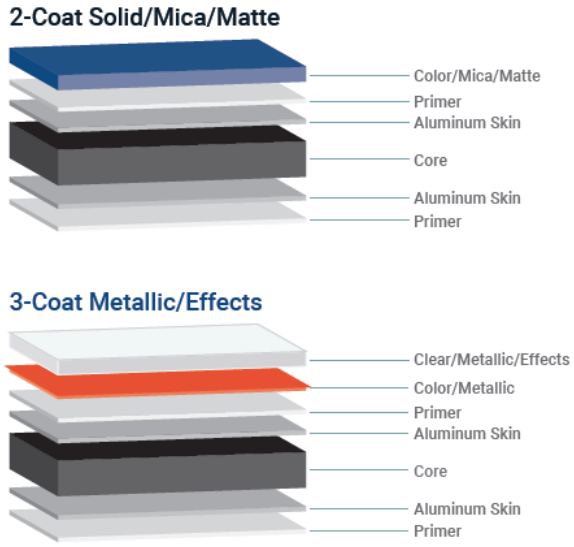


Figure 1. ALPOLIC Metal Composite Material

Product Specification

Table 1. FR core MCM panel specification

PRODUCT	DESCRIPTION	PRIMARY PROCESSES
FR Core MCM Panels	Metal Substrate thickness: 0.01 and 0.02 inches FR core thickness: 3, 4, and 6 mm Primary product: 0.02 inches aluminum cladding skins with 4 mm thick fire-resistant core	• Continuous coil coating • MCM sheet manufacturing • MCM panel fabrication

Flow Diagram

Figure 2 displays the flow diagram of the cradle-to-gate study on Mitsubishi's MCM panels.

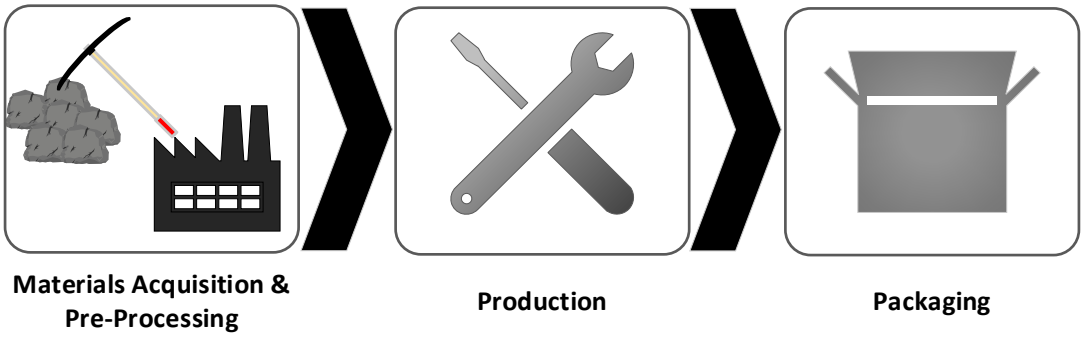


Figure 2. System boundary of Mitsubishi's ALPOLIC® fire resistant (FR) core and aluminum composite panel.

1.3. Application

ALPOLIC® metal composite materials (MCM) are some of the most versatile architectural materials available and can be used to create a practically unlimited world of complex forms and shapes. Offering the rigidity of heavy-gauge metals with the flexibility of a lightweight composite material, our MCM provides uncompromising performance to support fire safety and code compliance.

ALPOLIC®/fr panels are used in residential, commercial, and industrial applications. They are commonly installed on the exterior shell of the building, curtain wall facades, rainscreen systems, and other architectural cladding applications.

MCM is prized for both its versatility and its value. With faster installation than traditional building materials and reduced structure steel requirements of heavier alternatives, the cost savings during installation can quickly add up. With little maintenance and finishes warranted to last up to 35 years, you can depend on a look that lasts with durable ALPOLIC MCM.

Declared unit of this product system is coverage of 100 square meters (1076.4 square feet) of building area.

1.4. Declaration of Methodological Framework

This EPD is "cradle-to-gate" covering the production stage (modules A1 to A3). This includes raw material extraction and upstream processing, secondary material processing, inbound transportation, and manufacturing. This study excludes installation, use, and end-of-life stages as they are not required as per PCR. Module D has also been excluded as it is optional as per PCR. Further details are described in MGC's background report (Sphera, 2025).

Capital goods and infrastructure flows are excluded from this analysis due to the minimal extent to which they affect the LCIA results. For the manufacturing of ALPOLIC/FR panels, capital goods and infrastructure last for decades with periodic replacement of key components as needed. All other impacts associated with the use stage of the building while the product is being produced and all human labor and commute have also been excluded.

No other known flows are deliberately excluded from this EPD.

The cut-off allocation approach is applied in the case of any post-consumer and post-industrial recycled content, which is assumed to enter the system burden-free. Only environmental impacts from the point of recovery and forward (e.g., inbound transports, grinding, processing, etc.) are considered.

1.5. Technical Requirements

ALPOLIC®/FR panels must meet the following technical requirements:

Performance Standards – Air Tightness

ASTM E 283	Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Skylights, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen

Performance Standards – Fire

ASTM D1929	Standard Test Method for Determining Ignition Temperature of Plastics
ASTM E 84	Standard Test Method for Surface Burning Characteristics of Building Materials
ASTM E119	Standard Test Methods for Fire Tests of Building Construction and Materials
CAN/ULC S101	Standard Methods of Fire Endurance Tests of Building Construction Materials
CAN/ULC S102	Surface Burning Characteristics of Building Materials and Assemblies
CAN/ULC S134	Standard Method of Fire Test of Exterior Wall Assemblies

Materials and Assemblies

NFPA 285	Standard Fire Test Method for Evaluation of Fire Propagation Characteristics of Exterior Wall Assemblies Containing Combustible Components
ASTM D 635	Standard Test Method for Rate of Burning and/or Extent and Time of Burning of Plastics in a Horizontal Position
ASTM E 162	Standard Test Method for Surface Flammability of Materials Using a Radiant Heat Energy Source
UL 1715	Fire Test of Interior Finish Material

Performance Standards – Structural

ASTM C 297	Standard Test Method for Flatwise Tensile Strength of Sandwich Constructions
ASTM C 393	Standard Test Method for Core Shear Properties of Sandwich Constructions by Beam Flexure
ASTM C 481	Standard Test Method for Laboratory Aging of Sandwich Constructions
ASTM D 1002	Standard Test Method for Apparent Shear Strength of Single-Lap-Joint Adhesively Bonded Metal Specimens by Tension Loading (Metal-to-Metal)
ASTM D 1781	Standard Test Method for Climbing Drum Peel for Adhesives
ASTM E 72	Standard Test Methods of Conducting Strength Tests of Panels for Building Construction
ASTM E 228	Standard Test Method for Linear Thermal Expansion of Solid Materials With a Push-Rod

	Dilatometer
ASTM E 330	Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference

Performance Standards – Water Resistance

ASTM E 331	Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference
AAMA 501.1	Water Penetration of Windows, Curtain Walls and Doors Using Dynamic Pressure
AAMA 501.2	Quality Assurance and Water Field Check of Installed Storefronts, Curtain Walls and Sloped Glazing Systems
AAMA 508	Voluntary Test Method and Specification for Pressure Equalized Rainscreen Wall Cladding Systems
AAMA 509	Voluntary Test and Classification Method for Drained and Back Ventilated Rain Screen Wall Cladding Systems

Performance Standards – Finishes

AAMA 611	Specification for Anodized Architectural Aluminum
AAMA 2604	Performance Requirements and Test Procedures for High Performance Organic Coatings on Aluminum Extrusions and Panels
AAMA 2605	Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels
ASTM D 822	Standard Practice for Filtered Open-Flame Carbon-Arc Exposures of Paint and Related Coatings
ASTM D 968	Standard Test Methods for Abrasion Resistance of Organic Coatings by Falling Abrasive
ASTM D 1308	Standard Test Method for Effect of Household Chemicals on Clear and Pigmented Coating Systems
ASTM D 1735	Standard Practice for Testing Water Resistance of Coatings Using Water Fog Apparatus
ASTM D 2244	Standard Practice for Calculation of Color Tolerances and Color Differences from Instrumentally Measured Color Coordinates
ASTM D 2794	Standard Test Method for Resistance of Organic Coatings to the Effects of Rapid Deformation (Impact)
ASTM D 3359	Standard Test Methods for Rating Adhesion by Tape Test
ASTM D 3363	Standard Test Method for Film Hardness by Pencil Test
ASTM D 4145	Standard Test Method for Coating Flexibility of Prepainted Sheet

ASTM D 4212	Standard Test Method for Viscosity by Dip-Type Viscosity Cups
ASTM D 4214	Standard Test Methods for Evaluating the Degree of Chalking of Exterior Paint Films

1.6. Properties of Declared Product as Delivered

ALPOLIC®/FR MCM panels are delivered and installed in a variety of sizes and configurations customized to the project's needs. This EPD is representative of all the ALPOLIC®/FR MCM panels produced by MCA.

A total mass of 749 kg is delivered for 100 m^2 coverage. Technical properties of the MCM product under study is shown in Table 2.

Table 2. Product properties.

NAME	VALUE	UNIT
Length	**2.4-6**	**m**
Width	**1-1.5**	**m**
Thickness	**4**	**mm**
Weight	**7.62**	**kg/m²**
Tensile Strength	**49.13**	**MPa**
Modulus of Elasticity	**39,300.1**	**MPa**

1.7. Material Composition

ALPOLIC®/FR MCM panels comprise of two thin panels of aluminum laminated to either side of a mineral-filled thermoplastic core. Aluminum coil are rolled out into 24 or 30 gauge sheets. A fire resistant MCM core is laminated to the aluminum skin. Mass specifications of each ALPOLIC®/FR panels is listed in Table 3.

Table 3. Base material mass by percentage for ALPOLIC®/FR MCM panels.

MATERIAL	MASS COMPOSITION (%)
Aluminum	53
Thermoplastic	47

1.8. Manufacturing

MCM are manufactured and assembled by Mitsubishi in the US with parts brought in from the US, Canada, and overseas. These panels are formed by bonding two metal panels to a mineral-filled thermoplastic core placed between them. Using very precise conditions of temperature, pressure, and tension, the product is a strong metal composite panel.

Continuous Coil Coating

1. The aluminum coil is continuously unwound into the process from a pay-off reel. A coil stitcher mechanically notches two coils together, allowing for continuous production. The aluminum then travels through an accumulator tower and onto the finish coaters.
2. The finish coaters apply a coat of paint, which is then cured by the finish ovens and cooled. The process is repeated for each required paint layer.
3. The painted aluminum passes through an exit accumulator tower and then rewound on a re-coiler. The painted aluminum coil is now ready for the lamination process.

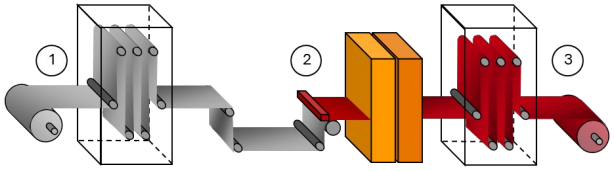


Figure 4. Continuous Coil Coating process

Continuous Lamination Process

1. The metal coils are introduced into the process from two pay-off reels.
2. The laminating rollers bond the metal to the continuously extruded thermoplastic core.
3. The laminated material then enters the cooling chamber and is constantly moved at a steady rate by the pulling rollers.
4. A protective masking film is applied to the MCM to protect the surface finish.
5. The MCM is trimmed to the required width, sheared to the required length, and stacked for inspection and final packaging.

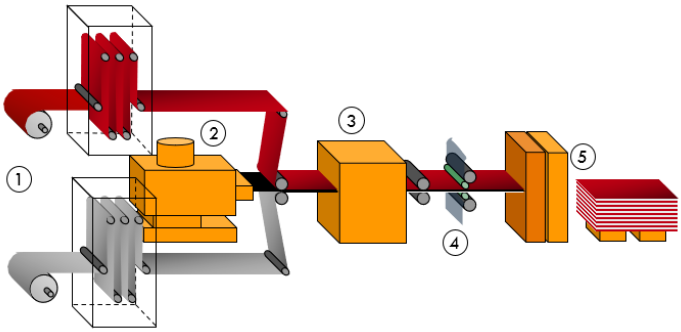


Figure 5. Continuous Lamination Process

MCM is finished with a primer system on both sides and a color coat on the outward-facing side to protect and beautify the aluminum skin. Some finishes also have an additional clear coat to enhance and preserve a special effect, such as a metallic or prismatic look. Another option is to brush, polish or anodize the aluminum surface itself to protect the resulting effect with a clear coat.

ALPOLIC MCM is coil-coated, using an advanced die-coat process. Most finishes incorporate the incredibly durable and shade-stable FEVE fluoropolymer resin. The range of possible finishes is spectacular: solids, micas, metallics,

prismatics, decorative metals, shimmer effects, stone, timber, and more. It's even possible to provide a multi-color finish on a single panel.

1.9. Packaging

ALPOLIC®/fr panels have a protective film applied to the finish after lamination and are packaged in crates with oriented strand board sides and tops and wrapped with plastic banding. There is about 6.89 kg of plastic film and 14 kg of pallet use per declared unit.

1.10. Transportation

An average weighted distances and modes of transportation are included for the inbound transportation of raw materials, operating materials, and auxiliary materials to the Chesapeake, VA facility. Outbound transportation for external waste treatment has also been included.

2. Life Cycle Assessment Background Information

2.1. Functional or Declared Unit

The declared unit is coverage of 100 square meters (1076 square feet) with metal product. The coverage area refers to the projected flat area covered by the product as output by the final manufacturing process step, and does not account for the losses due to overlap and scrap during installation.

Table 4: Reference flow of FR Core MCM panels.

NAME	MCM FR CORE PANELS
Declared Unit [m^2]	100
Product mass [kg / 100 m^2]	749

2.2. System Boundary

This EPD is "cradle-to-gate" covering the production stage (modules A1 to A3). This includes raw material extraction and upstream processing, secondary material processing, inbound transportation, and manufacturing. The construction stage (modules A4 to A5), use stage (modules B1 to B7), and end-of-life stage (modules C1 to C4) are not included in this study.

Capital goods and infrastructure flows are excluded from this analysis due to the minimal extent to which they affect the LCIA results. The manufacturing of MCM FR core panels, capital goods, and infrastructure last for 20 to 30 years with periodic replacement of key components identified during routine maintenance and predictive failure modeling. An annual production of 2 million tons of MCM panels. All other impacts associated with the use stage of the building

while the product is being produced and all human labor and commute have also been excluded.

2.3. Estimates and Assumptions

This study is based on primary data collected from MCA's Chesapeake, VA facility. Background datasets that are based on regional averages are used to represent the production of raw and auxiliary materials by upstream suppliers. When multiple datasets were available, a conservative approach was adopted where a dataset with the higher environmental impact was used.

2.4. Cut-off Criteria

The cut-off criteria for including or excluding materials, energy, and emissions data of the study are as follows:

1. **Mass** – According to ISO guidelines, if a flow is less than 1% of the cumulative mass of the model it may be excluded, providing its environmental relevance is not a concern. For the purpose of this LCA, all known mass flows are reported, and no known flows were deliberately excluded.
2. **Energy** – According to ISO guidelines, if a flow is less than 1% of the cumulative energy of the model it may be excluded, providing its environmental relevance is not a concern. For the purpose of this LCA, all known energy flows are reported, and no known flows were deliberately excluded.
3. **Environmental relevance** – If a flow meets the above criteria for exclusion yet is thought to potentially have a significant environmental impact, it was included. Material flows which leave the system (emissions) and whose environmental impact is greater than 1% of the whole impact of an impact category that has been considered in the assessment must be covered. This judgment was made based on experience and documented as necessary.

Packaging of incoming raw materials (e.g. pallets, totes, super-sacks) is excluded as they represent less than 1% of the product mass and are not environmentally relevant.

Capital goods and infrastructure to produce MCM panels have also been excluded as they product millions of units over the course of their life, so the impact on a single functional unit is minimal.

2.5. Data Sources

The LCA model was created using the LCA for Experts (LCA FE) software v10.9 system for life cycle engineering, developed by Sphera (Sphera, 2024). Background life cycle inventory data for raw materials and processes were obtained from the Sphera MLC 2024.2 database (CUP 2024.2). Primary manufacturing data were provided by MCA.

2.6. Data Quality

A variety of tests and checks were performed by the LCA practitioner throughout the project to ensure high quality of the completed LCA. Checks included an extensive internal review of the project-specific LCA models developed as well as the background data used. A full data quality assessment is documented in the background report.

Temporal coverage

Primary data is taken from the 2023 calendar year of continuous operation. These data were then used to calculate average production values for each company. All secondary data were from Sphera's MLC 2024.2 data bases and are representative of the years 2016 – 2023.

Geographical coverage

This background LCA represents MCA's MCM panels produced in the Chesapeake, VA facility. Primary data are representative of this facility. Regionally specific datasets were used to represent the energy consumption. Proxy datasets were used as needed for raw material inputs to address the lack of data for a specific material or a specific geographical region. These proxy datasets were chosen for their technological representativeness of the actual materials.

Technological coverage

Manufacturing data were collected directly from MCA. This also includes waste, emissions, and energy use from the reported annual production during the reference year.

2.7. Period under Review

This EPD intends to represent production in 2023.

2.8. Allocation

Multi-output allocation follows the requirements of ISO 14044, section 4.3.4.2 (ISO, 2006a; ISO, 2006b). When allocation becomes necessary during the data collection phase, the allocation rule most suitable for the respective process step was applied. Energy outputs were allocated based on production mass. Material and waste were allocated based on engineering knowledge to assign appropriate input and outputs to differen types of MCM panels.

The cut-off allocation approach is adopted in the case of any post-consumer and post-industrial recycled content, which is assumed to enter the system burden-free. Only environmental impacts from the point of recovery and forward (e.g., inbound transports, grinding, processing, etc.) are considered.

3. Life Cycle Assessment Results

The included and excluded life cycle stages are summarized in Table 5.

Table 5. Description of the system boundary modules

	PRODUCT STAGE			CONSTRUCT-ION PROCESS STAGE		USE STAGE							END OF LIFE STAGE				BENEFITS AND LOADS BEYOND THE SYSTEM BOUNDARY
	A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
	Raw material supply	Transport	Manufacturing	Transport from gate to site	Assembly/Install	Use	Maintenance	Repair	Replacement	Refurbishment	Building Operational Energy Use During Product Use	Building Operational Water Use During Product Use	Deconstruction	Transport	Waste processing	Disposal	Reuse, Recovery, Recycling Potential
EPD Type	x	x	x	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND

MND = Module not declared.

3.1. Life Cycle Impact Assessment Results

Comparison of the environmental performance of metal panel and cladding products using EPD information shall be based on the product's use and impacts at the building level, and therefore EPDs may not be used for comparability purposes when not considering the building use phase as instructed under this PCR.

Table 6. North American Impact Assessment Results per Declared Unit

IMPACT CATEGORY	A1	A2	A3	TOTAL
GWP100, AR6 excl bio CO_2 [kg CO_2 eq]	2.41E+03	7.65E+01	2.48E+02	**2.73E+03**
GWP100, AR6 incl bio CO_2 [kg CO_2 eq]	2.40E+03	7.65E+01	2.26E+02	**2.70E+03**
GWP100, AR5 excl bio CO_2 [kg CO_2 eq]	2.46E+03	7.77E+01	2.55E+02	**2.79E+03**
GWP100, AR5 incl bio CO_2 [kg CO_2 eq]	2.45E+03	7.77E+01	2.34E+02	**2.76E+03**
ODP [kg CFC-11 eq]	9.25E-11	7.51E-13	2.85E-11	**1.22E-10**
AP [kg SO_2 eq]	3.83E-01	4.43E-02	2.32E-02	**4.51E-01**
EP [kg N eq]	1.13E+01	7.19E-01	2.27E-01	**1.22E+01**
SFP [kg O_3 eq]	1.57E+02	2.05E+01	5.11E+00	**1.83E+02**
ADP_{fossil} [MJ, LHV]	3.29E+04	9.51E+02	3.63E+03	**3.75E+04**

As per Section 4.7 of PCR Part A (UL Environment, 2022), GWP100 is calculated based on IPCC methodology, both AR5 and AR6 are reported. ADP_{fossil} is calculated based on CML 2001 methodolody.

The GWP indicators reported in this study exclude land use change impacts since manufacturing, use, and disposal of SPF products do not have a significant impact on land use, as it does not consume any agricultural products or chemicals that have a direct impact on land use.

3.2. Life Cycle Inventory Results

Table 7. Resource Use per Declared Unit

PARAMETER	A1	A2	A3	TOTAL
RPR_E [MJ, LHV]	1.15E+04	4.62E+01	5.29E+02	**1.21E+04**
RPR_M [MJ, LHV]	2.06E+02	0.00E+00	2.35E+02	**4.41E+02**
RPR_T [MJ, LHV]	1.17E+04	4.62E+01	7.64E+02	**1.25E+04**
$NRPR_E$ [MJ, LHV]	2.86E+04	9.81E+02	4.59E+03	**3.42E+04**
$NRPR_M$ [MJ, LHV]	7.23E+03	0.00E+00	3.72E+02	**7.60E+03**
$NRPR_T$ [MJ, LHV]	3.58E+04	9.81E+02	4.96E+03	**4.18E+04**
SM [kg]	1.36E+02	0.00E+00	0.00E+00	**1.36E+02**
RSF [MJ, LHV]	-	-	-	-
NRSF [MJ, LHV]	-	-	-	-
RE [MJ, LHV]	-	-	-	-
FW [m^3]	2.32E+01	1.05E-01	9.00E-01	**2.42E+01**

Table 8. Output Flows and Waste Categories per Declared Unit

PARAMETER	A1	A2	A3	TOTAL
HWD [kg]	0.00E+00	0.00E+00	2.47E+00	**2.47E+00**
NHWD [kg]	0.00E+00	0.00E+00	2.37E+00	**2.37E+00**
HLRW [kg] or [m^3]	1.05E-03	1.24E-05	5.62E-04	**1.62E-03**
ILLRW [kg] or [m^3]	1.02E+00	1.05E-02	4.74E-01	**1.50E+00**
CRU [kg]	-	-	-	-
MR [kg]	0.00E+00	0.00E+00	2.62E+01	**2.62E+01**
MER [kg]	-	-	-	-
EEE [MJ, LHV]	0.00E+00	0.00E+00	1.27E+01	**1.27E+01**
EET [MJ, LHV]	0.00E+00	0.00E+00	3.80E+00	**3.80E+00**

Table 9. Carbon Emissions and Removals per Declared Unit

PARAMETER	A1	A2	A3	TOTAL
BCRK [kg]	0.00E+00	0.00E+00	2.14E+01	**2.14E+01**
CCE [kg]	2.89E+01	0.00E+00	0.00E+00	**2.89E+01**

Output flows and waste categories represent the output and waste from upstream production of raw materials (A1), inbound transportation waste (A2), and waste treatment of manufacturing scrap (A3).

4. LCA Interpretation

Figure 4 presents the results for the environmental performance of 100 m^2 coverage of FR-core MCM panels. Extraction, processing, and premanufacturing of the raw materials (A1) have the largest contribution on the environmental footprint of the MCM panels, followed by manufacturing (A3), and transportation (A2). Within the raw materials, aluminum production represented the bulk of the impacts across the impact categories.

Although some of the raw materials are transported across large distances, the inbound transportation module (A2) has a very small contribution to the overall impact (1% – 11%).

Manufacturing (A3) has a modest impact and contributes between 2% – 23% across the impact categories considered in this study.

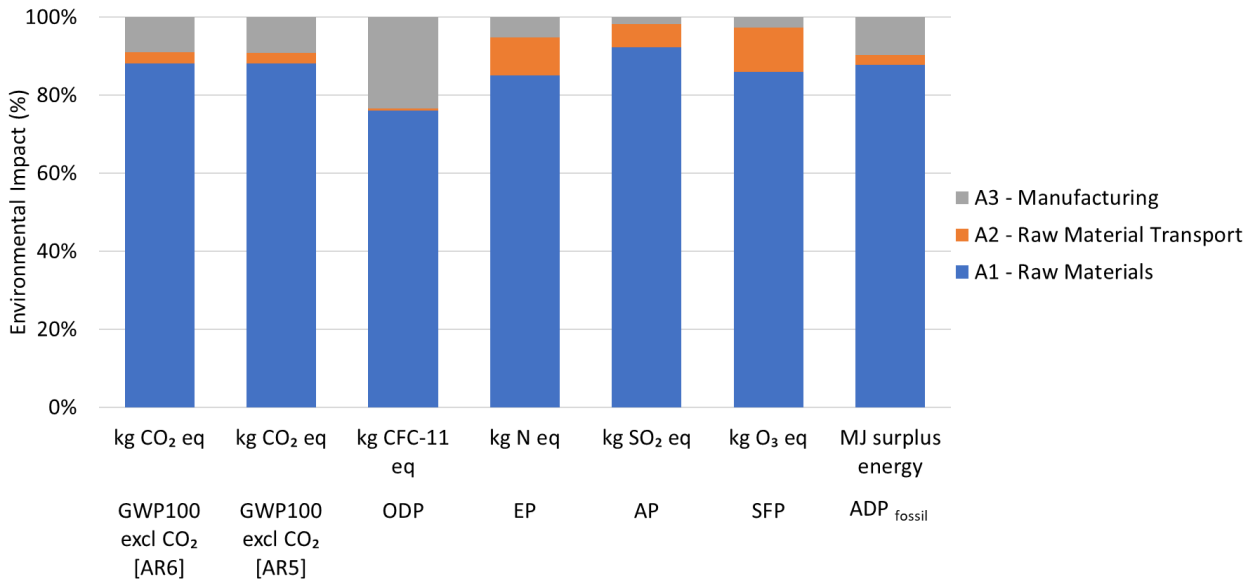


Figure 3. Contribution Analysis by Module of FR-Core MCM Panels per 100 m^2 coverage (GWP100 results exclude biogenic CO_2).

5. Additional Environmental Information

5.1. Environment and Health During Manufacturing

N/A

5.2. Extraordinary Effects

Fire

N/A

Water

N/A

Mechanical Destruction

N/A

5.3. Delayed Emissions

N/A

5.4. Environmental Activities and Certifications

ALPOLIC Materials is committed to the recovery of materials to create quality panels for fabrication. In addition, our in-house program Operation Encore encourages new and innovative uses for expired MCM. Components accepted through this recycling program are distributed to their appropriate industry recycling streams and featured in a variety of community and nonprofit projects.

With our Pallet Return Program, our customers can earn material credit for approved ALPOLIC pallets. Clearing out their yards, helping their bottom line, and keeping our pallets from landfills.

5.5. Further Information

More information can be found at https://alpolic-americas.com/sustainability/

6. References

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7. Contact Information

5.6. Study Commissioner

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