MAC

METAL ARCHITECTURAL

Steel Roofing and Siding

MAC Metal Architectural Inc.

ENVIRONMENTAL PRODUCT DECLARATION

ISO 14025:2006 and ISO 21930:2017

ASTM INTERNATIONAL

MAC Metal Architectural Inc. is pleased to present this Environmental Product Declaration (EPD) for their steel roofing and siding products. This EPD was developed in compliance with ISO 14025 and ISO 21930 and has been verified by Lindita Bushi, Ph.D., Athena Sustainable Materials Institute.

The LCA and the EPD were prepared by Vertima Inc. The EPD includes cradle-to-gate life cycle assessment (LCA) results.

For more information about MAC Metal Architectural Inc., visit www.macmetalarchitectural.com.

For any explanatory material regarding this EPD, please contact the program operator.

1. GENERAL INFORMATION

PCR GENERAL INFORMATION			
Reference PCR	PCR Part B: Insulated Metal Panels, Metal Composite Panels, and Metal Cladding: Roof and Wall Panels. v.2.0 (UL-10010-5) UL Environment October 2018 to October 2023, extended to December 2024 (validity period)		
The PCR review was conducted by:	*Thomas Gloria, Ph.D. (chair)* *Industrial Ecology Consultants* *t.gloria@industrial-ecology.com*	*Lindita Bushi, PhD* *Athena Sustainable Materials Institute* *lindita.bushi@athenasmi.org*	*Bob Zabcik, P.E., LEED AP BD+C* *NCI Building Systems* *BobZ@ncigroup.com*

EPD GENERAL INFORMATION		
Program Operator	ASTM International 100 Barr Harbor Drive, West Conshohocken, PA 19428 www.astm.org	
Declared Product	**Steel roofing and siding products:** Board and Batten, Reverse Board and Batten, Harrywood, Harrywood Block, Harrywood Plus, Metal Block, MS Authentic, MS 1 & 2 (Wall), MS 1 Modular, MS 3 & 4, MS 380 Corrugated, MS 750 & 750 I, Norwood, Norwood Mini, Versa and Polymac **Insulated steel siding products:** Insulated Polymac	
EPD Registration Number EPD-711	**EPD Date of Issue** May 31, 2024	**EPD Period of Validity** May 31, 2024 to May 30, 2029
EPD Recipient Organization	MAC Metal Architectural Inc. 5975, chemin de la Savane Saint-Hubert (Quebec) J3Y 0X1 Canada www.macmetalarchitectural.com	MAC METAL ARCHITECTURAL

EPD Type/Scope and Declared Unit			**Year of Reported Manufacturer Primary Data**
Product-specific cradle-to-gate EPD with declared unit of coverage of 100 m^2 with metal product.			June 1, 2022 to May 31, 2023
Geographical Scope North America	**LCA Software** Open LCA v.2.0.3	**LCI Databases** Ecoinvent 3.9.1 and US LCI	**LCIA Methodology** TRACI 2.1 and CED LHV v1.0

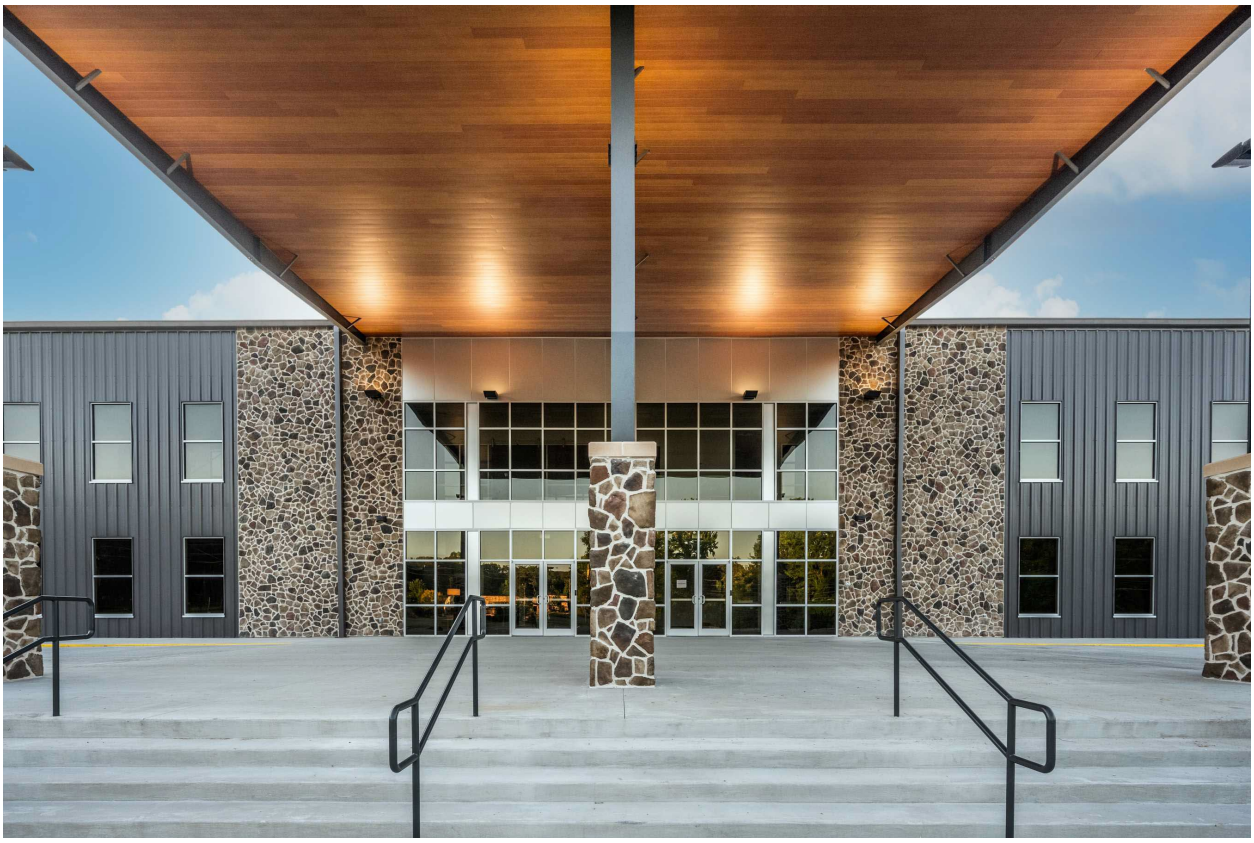
This LCA and EPD were prepared by:	Chantal Lavigne, M.A.Sc Vertima Inc. www.vertima.ca
This EPD and LCA were independently verified in accordance with ISO 14025:2006, ISO 14040:2006, ISO 14044:2006 and ISO 21930:2017, as well as UL Environment PCR Part B: Insulated Metal Panels, Metal Composite Panels, and Metal Cladding: Roof and Wall Panels. v.2.0 (UL-10010-5), and PCR Part A: Life Cycle Assessment Calculation Rules and Report Requirements. v.4.0 (UL-10010), which serves as the core PCR. ☐ Internal ☒ External	Lindita Bushi Lindita Bushi, Ph.D. Athena Sustainable Materials Institute

LIMITATIONS

Environmental declarations from different programs may not be comparable.[1]

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 the UL Environment Insulated Metal Panels, Metal Composite Panels, and Metal Cladding PCR, and ISO 21930:2017.[2][3]

EPD comparability is allowed only when all stages of a life cycle have been considered when they comply with all referenced standards, use the same sub-category PCR, and use equivalent scenarios with respect to construction works. However, variations and deviations are possible. Example of variations: Different LCA software and background LCI datasets may lead to differences in results upstream or downstream of the life cycle stages declared.[2]



[Photo courtesy of MAC Metal Architectural Inc.]

2. PRODUCT SYSTEM DESCRIPTION

2.1. DESCRIPTION OF COMPANY

MAC Metal Architectural Inc. (MAC), a Canadian manufacturer, was originally founded in 1996, initially specializing in steel roofing manufacturing before expanding its product offering to include steel siding. MAC Metal Architectural Inc. (MAC) has set itself apart through innovative processes, product designs and finishes which include printed colors that reproduce the look of noble materials such as wood, zinc, quartz and bronze.

2.2. PRODUCT DESCRIPTION

Board and Batten[1], Reverse Board and Batten[1], Harrywood[1], Harrywood Block[1], Harrywood Plus[1], Metal Block[1], MS Authentic[1,2], MS 1 & 2[1,2], MS 1 Modular[1, 2], MS 3&4[1,2], MS 380 Corrugated[1], MS750 &750I[1], Norwood[1], Norwood Mini[1], Polymac[1,3] and Versa[1] are steel roofing and cladding products.

All products are manufactured from pre-painted galvanized steel (22 ga., 24 ga. and/or 26 ga., grade 33 SS) in accordance with ASTM A 653/A 653 M. Polymac may be insulated with expanded polystyrene (EPS).

Figure 1 provides illustrations of Polymac steel sidings and Figure 2 provides illustrations of all steel products.

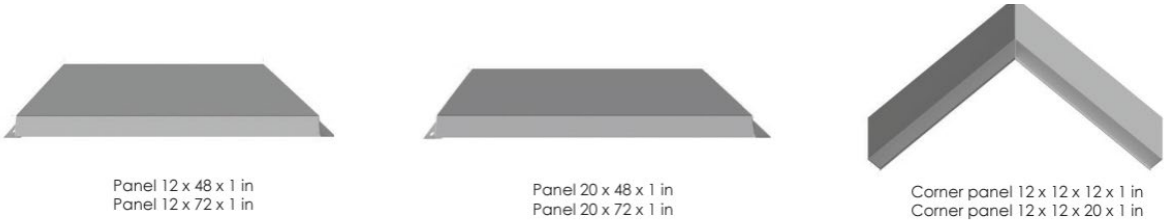


Figure 1: Polymac steel sidings [courtesy of MAC Metal Inc.].

[1] Steel cladding: Product Construction Specification Institute (CSI) MasterFormat code 07 42 13.13 Formed Metal Wall Panels

[2] Steel cladding: Product Construction Specification Institute (CSI) MasterFormat code 07 41 13.13 Formed Metal Roof Panels

[3] Steel cladding: Product Construction Specification Institute (CSI) MasterFormat code 07 42 13.19 Insulated Metal Wall

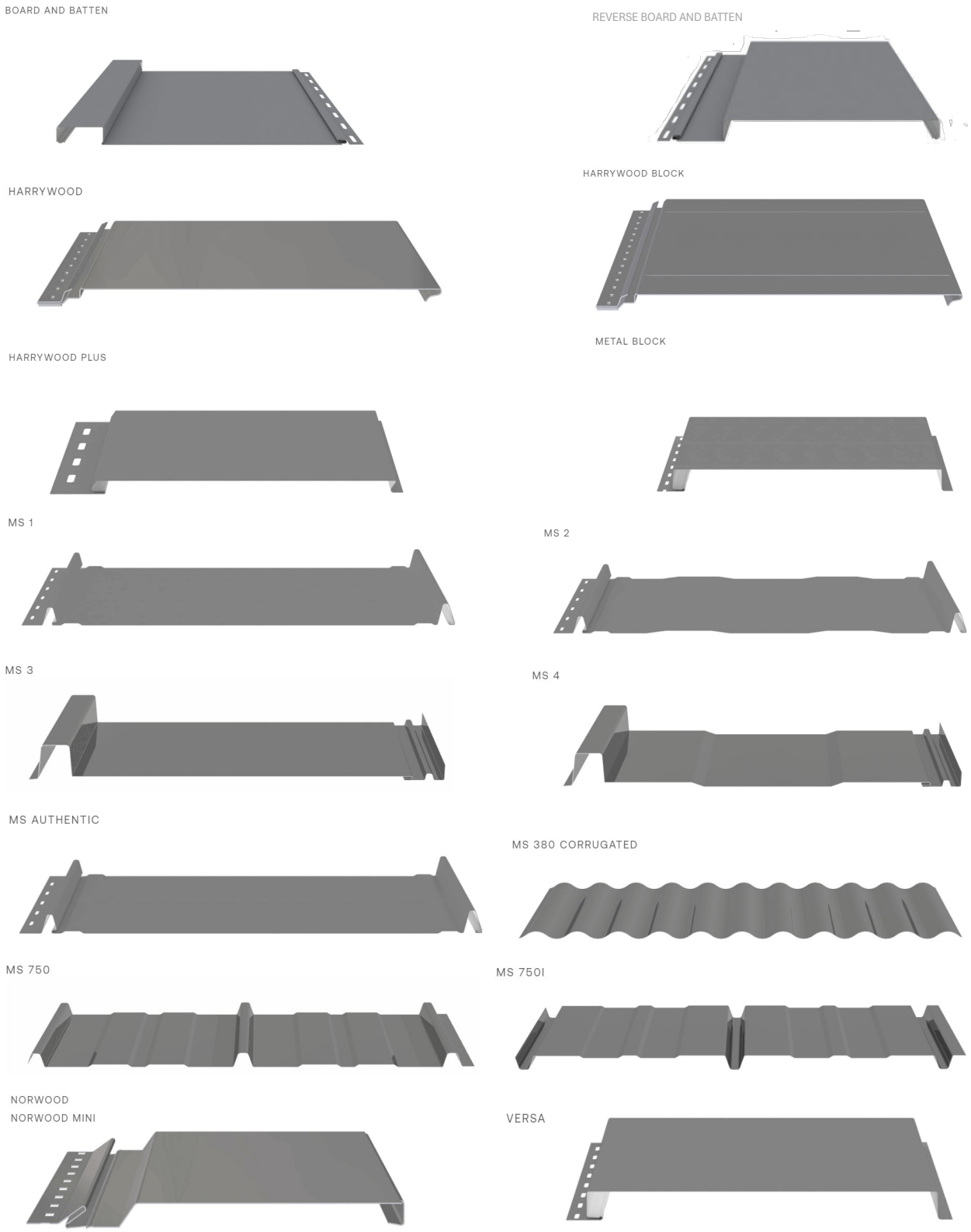


Figure 2: Steel siding and roofing panels [courtesy of MAC Metal Inc.].

2.3. PRODUCTION AVERAGE

Steel siding and roofing panels results are presented for the Harrywood Plus steel sidings. To obtain the product-specific environmental impacts of the other all steel siding and roofing products, the environmental impacts of the Harrywood Plus are multiplied by a scaling factor (listed in Table 8 in the results section).

For Insulated Polymac, the results for the 12 x 72 in. panels are representative of all Insulated Polymac panels as environmental impact results do not differ by more than ± 10%.

All products are produced at one facility based in Saint-Hubert, Quebec.

2.4. PRODUCT APPLICATION

MAC Metal Architectural Inc.'s steel roofing and cladding can be used in both residential and commercial applications.

To see projects where MAC Metal Architectural Inc.'s steel roofing and cladding are used, visit https://macmetalarchitectural.com/en/our-projects/.

2.5. TECHNICAL DATA

Siding profiles are extensively tested in accordance with Canadian and American standards, with the aim of providing an aesthetically and structurally high-performing product. All the products are manufactured from pre-painted galvanized steel (22 ga., 24 ga. and/or 26 ga. grade 33 SS) in accordance with ASTM A 653/A 653 M and are rolled to guarantee consistent dimensions and quality. Profiles are tested for fire resistance, deflection under wind load, and maximum sustained pressure, and have received various accreditations. Namely, MAC Metal Architectural Inc. products respect the following standards:

- ASTM E84 - Standard test method for surface burning characteristics of building materials;
- CAN/ULC-S135 - Standard method of test for determination of degrees of combustibility of building materials using an oxygen consumption calorimeter.

Table 1 and Table 2 present the dimensions and weights of the steel sidings & roofings and insulated Polymac steel sidings as delivered, respectively. Table 2 also indicates the RSI value of insulated Polymac steel sidings. All weight values include steel, galvanization coating and paint weight as well as EPS foam and glue weight when applicable.

Table 1: Steel sidings and roofings installed coverage dimensions and weights

Products	Standard length mm in.	Height (covered) mm in.	Thickness (depth) mm in.	Weight per panel 26 ga. kg lb.	24 ga. kg lb.	22 ga. kg lb.
Board and Batten	3048 120	304.8 12	19.05 0.75	4.8 10.7	-	-
Reverse Board and Batten	3962 156	304.8 12	19.05 0.75	6.3 13.8	-	-
Harrywood	3658 144	154.0 6.0625	8.636 0.34	2.9 6.4	3.7 8.2	-
Harrywood Block	3658 144	154.0 6.0625	8.636 0.34	2.9 6.4	3.7 8.2	-
Harrywood Plus	3658 144	154.0 6.0625	8.636 0.34	2.9 6.4	3.7 8.2	-
Metal Block*	305 12	304.8 12	25.40 1	-	0.62 1.4	0.75 1.7
MS Authentic, MS 1 & 2 (Wall)*	304.8 12	489.0 19.25	26.99 1.0625	0.73 1.6	0.93 2.0	1.1 2.5
MS 1 Modular 19.25 in.*	304.8 12	489.0 19.25	26.99 1.0625	0.73 1.6	0.93 2.0	1.1 2.5
MS 1 Modular 15.625 in.*	304.8 12	396.9 15.625	26.99 1.0625	0.62 1.4	0.79 1.7	1.0 2.1
MS 1 Modular 11.375 in.*	304.8 12	288.9 11.375	26.99 1.0625	0.48 1.1	0.62 1.4	0.75 1.7
MS 3 & 4 (Wall)*	304.8 12	444.5 17.5	38.10 1.5	0.73 1.6	0.93 2.0	-
MS 380 Corrugated*	304.8 12	533.4 21	9.53 0.375	0.73 1.6	0.93 2.0	-
MS 750 & 750 I*	304.8 12	520.7 20.5	25.40 1	0.73 1.6	0.93 2.0	-
Norwood	3657.6 144	136.5 5.375	11.18 0.44	2.9 6.4	3.7 8.2	-
Norwood Mini	3657.6 144	111.1 4.375	11.18 0.44	2.2 4.8	2.8 6.1	-
Versa	3657.6 144	111.1 4.375	25.40 1	-	0.6 1.4	0.8 1.7
Polymac (20x48 in. panel)	1219.2 48	508.0 20	25.40 1	-	3.9 8.6	4.7 10.4
	1219.2	304.8	25.40	-	2.6	3.1

Products	Standard length mm in.	Height (covered) mm in.	Thickness (depth) mm in.	Weight per panel 26 ga. kg lb.	24 ga. kg lb.	22 ga. kg lb.
Polymac (12x48 in. panel)	48	12	1		5.7	6.9
Polymac (20x72 in. panel)	1828.8 72	508.0 20	25.40 1	-	5.7 12.6	7.0 15.4
Polymac (12x72 in. panel)	1828.8 72	304.8 12	25.40 1	-	3.8 8.4	4.7 10.3
Polymac (12x12x12 in. corner panel)	609.6 24	304.8 12	50.80 2	-	1.4 3.0	1.6 3.6
Polymac (20x12x12 in. corner panel)	1016 40	304.8 12	50.80 2	-	2.0 4.5	2.5 5.4

* may be up to 18.29 m (60 ft)

Table 2: Insulated Polymac sidings installed coverage dimensions and weights

Products	Standard length mm in.	Height (covered) mm in.	Thickness (depth) mm in.	Weight per panel (24 ga.) kg lb.	R-value (RSI) $m^2 \cdot K/W$ $°F\ ft^2\ h/Btu$
Polymac with Insulation (20x48 in. panel)	1219.2 48	508.0 20	25.40 1	4.2 9.2	0.66 3.75
Polymac with Insulation (12x48 in. panel)	1219.2 48	304.8 12	25.40 1	2.8 6.1	0.66 3.75
Polymac with Insulation (20x72 in. panel)	1828.8 72	508.0 20	25.40 1	6.2 13.6	0.66 3.75
Polymac with Insulation (12x72 in. panel)	1828.8 72	304.8 12	25.40 1	4.1 9.0	0.66 3.75
Polymac with Insulation (12x12x12 in. corner panel)	609.6 24	304.8 12	25.40 1	1.4 3.2	0.66 3.75
Polymac with Insulation (20x12x12 in. corner panel)	1016 40	304.8 12	25.40 1	2.2 4.8	0.66 3.75

For specific properties and performance data, please consult the product data sheets available at: https://macmetalarchitectural.com/en/ressources/

2.6. PROPERTIES OF DECLARED PRODUCT AS DELIVERED

Products are available in various sizes and steel thickness (steel gauge).

Dimensions of products as received represent the projected flat area covered by the product as output by the final manufacturing process step and does not account for losses due to overlap and scrap during installation. The EPD results are presented according to the projected flat area covered by the product.

The coverage area refers to the area as covered by the installed product. These are the dimensions presented in Table 1 and Table 2. The following table presents the correspondence between the two, i.e., the multiplication factor to apply to the projected flat area to obtain the corresponding coverage area.

$$Coverage\ area\ (m^2) = projected\ flat\ area\ (m^2) * multiplication\ factor$$

For one Harrywood Plus panel, which has a projected flat area of 179 mm (7.0625 in.) x 3658 mm (144 in.), the coverage is:

$$Coverage\ area\ (m^2) = (0.179 *\ 3.658) * 0.859 = 0.563\ m^2$$ = 154 mm x 3658mm

Table 3: Projected flat area (m^2) to coverage area (m^2) multiplication factor

Products	Multiplication factor
Board and Batten	0.906
Reverse Board and Batten	0.906
Harrywood	0.898
Harrywood Block	0.899
Harrywood Plus	0.859
Metal Block	0.923
MS Authentic, MS 1 & 2 (Wall)	0.917
MS 1 Modular 19.25 in.	0.917
MS 1 Modular 15.625 in.	0.912
MS 1 Modular 11.375 in.	0.884
MS 3 & 4 (Wall)	0.889
MS 380 Corrugated	0.928
MS 750 & 750 I	0.933
Norwood	0.843
Norwood Mini	1.000
Versa	0.923

Products	Multiplication factor
Polymac (20x48 in. panel)	0.952
Polymac (12x48 in. panel)	0.923
Polymac (20x72 in. panel)	0.952
Polymac (12x72 in. panel)	0.923
Polymac (12x12x12 in. corner panel)	0.923
Polymac (20x12x12 in. corner panel)	0.952

2.7. MATERIAL COMPOSITION

All steel siding and roofing products are made of pre-painted galvanized steel.

Insulated Polymac sidings are made of pre-painted galvanized steel, EPS foam and glue as detailed in the table below.

Table 4: Insulated Polymac material composition.

Products	Pre-painted galvanized steel	EPS foam	Glue
Polymac (20x48 in. panel)	93.0%	4.3%	2.8%
Polymac (12x48 in. panel)	93.8%	3.7%	2.4%
Polymac (20x72 in. panel)	92.8%	4.3%	2.8%
Polymac (12x72 in. panel)	93.7%	3.8%	2.5%
Polymac (12x12x12 in. corner panel)	94.5%	3.3%	2.2%
Polymac (20x12x12 in. corner panel)	93.7%	3.8%	2.5%

For more details on material content, please refer to the health product declaration (HPD) available at http://www.hpd-collaborative.org/hpd-public-repository/.

2.8. MANUFACTURING

Pre-painted galvanized steel coils are laminated with a protective film before being formed into the product profile and cut to size.

2.9. TRANSPORTATION

Transportation to the installation site is not accounted for in this study as the system boundaries only include modules A1 to A3 and exclude module A4.

2.10. PRODUCT INSTALLATION

Products should be processed and installed according to industry standards and according to the applicable building codes.

MAC Metal Inc. installation guides are available at: https://macmetalarchitectural.com/en/ressources/.

2.11. PACKAGING

Board and Batten, Harrywood, Harrywood Block, Harrywood Plus, Metal Block, MS Authentic, MS1&2, MS1 Modular, MS 3&4, MS 380 Corrugated, MS7560 &750I, Norwood, Norwood Mini, Polymac and Versa are all packaged using the materials presented in the Table below.

Table 5: Quantity of packaging materials per 100 m² of MAC Metal Architectural Inc. products

Item	Harrywood Plus			Insulated Polymac 12x72 in. panel	Unit
	22 ga.	24 ga.	26 ga.	24 ga.	
Wooden pallets	4.51E+01	5.89E+01	7.27E+01	6.60E+01	kg
Plywood	2.17E+00	2.83E+00	3.50E+00	3.18E+00	kg
Glue	7.04E-03	9.19E-03	1.13E-02	1.03E-02	kg
Reinforced polyethylene wrap	9.50E-01	1.24E+00	1.53E+00	1.39E+00	kg
EPS foam - type 1	2.18E-01	2.85E-01	3.52E-01	3.19E-01	kg
EPS foam	2.22E-01	2.89E-01	3.57E-01	3.24E-01	kg
Fastener	1.48E-01	1.93E-01	2.38E-01	2.16E-01	kg
Polyester straps	7.01E-02	9.15E-02	1.13E-01	1.03E-01	kg
Tape	3.24E-02	4.23E-02	5.22E-02	4.74E-02	kg
Paper label	8.00E-03	1.04E-02	1.29E-02	1.17E-02	kg
Cardboard	5.72E+00	7.46E+00	9.21E+00	8.37E+00	kg
Protective film	3.61E+00	3.61E+00	3.61E+00	3.61E+00	kg

2.12. USE CONDITIONS

Since the roofs, the exterior sidings, and the accessories MAC Metal Architectural Inc. offer are made from superior-grade steel following an incomparable painting process that ensures longevity and sturdiness, MAC offers to all its customers its 40-year Quiet Guarantee. This guarantee ensures your peace of mind in the face of time and bad weather.

More details can be found at: https://macmetalarchitectural.com/en/categorie-ressource/warranties/.

2.13. RE-USE PHASE

Products can be re-used if still in good condition and taken apart with care.

2.14. DISPOSAL

The steel should be recycled, while the EPS foam may be recycled where services exist.

3. LCA CALCULATION RULES

3.1. DECLARED UNIT OR FUNCTIONAL UNIT

The declared unit (DU) for this study is coverage of **100 m² with metal products**. 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 losses due to overlap and scrap during installation.

Table 6 presents all products targeted by this report and their weight per DU, as well as the conversion factor to 1 kg.

Table 6: Mass per 100 m² of products and conversion factor to 1 kg.

Products	Mass per product				Conversion factor to 1 kg		
	26 ga.	24 ga.	22 ga.	Unit	26 ga.	24 ga.	22 ga.
Board and Batten	471.7	-	-	kg	0.212	-	-
Reverse Board and Batten	471.7	-	-	kg	0.212	-	-
Harrywood	462.8	590.9	-	kg	0.216	0.169	-
Harrywood Block	462.8	590.9	-	kg	0.216	0.169	-
Harrywood Plus	442.3	564.8	687.2	kg	0.226	0.177	0.146
Metal Block	-	613.8	746.9	kg	-	0.163	0.134
MS Authentic, MS 1 & 2 (Wall)	446.4	570.0	693.5	kg	0.224	0.175	0.144
MS 1 Modular 19.25 in.	446.4	570.0	693.5	kg	0.224	0.175	0.144
MS 1 Modular 15.625 in.	464.1	592.5	721.0	kg	0.215	0.169	0.139
MS 1 Modular 11.375 in.	485.4	619.8	754.1	kg	0.206	0.161	0.133
MS 3 & 4 (Wall)	476.2	608.0	-	kg	0.210	0.164	-
MS 380 Corrugated	414.4	529.0	-	kg	0.241	0.189	-
MS 750 & 750 I	426.7	544.8	-	kg	0.234	0.184	-
Norwood	490.0	625.7	-	kg	0.204	0.160	-
Norwood Mini	534.1	681.9	-	kg	0.187	0.147	-
Versa	-	613.8	746.9	kg	-	0.163	0.134
Polymac (20x48 in. panel)	-	596.7	726.0	kg	-	0.168	0.138
Polymac (12x48 in. panel)	-	642.6	781.9	kg	-	0.156	0.128
Polymac (20x72 in. panel)	-	587.8	715.2	kg	-	0.170	0.140
Polymac (12x72 in. panel)	-	633.0	770.2	kg	-	0.158	0.130
Polymac (12x12x12 in. corner panel)	-	671.4	816.9	kg	-	0.149	0.122
Polymac (20x12x12 in. corner panel)	-	623.4	758.5	kg	-	0.160	0.132

Products	Mass per product				Conversion factor to 1 kg		
	26 ga.	24 ga.	22 ga.	Unit	26 ga.	24 ga.	22 ga.
Polymac with Insulation (20x48 in. panel)	-	641.9	-	kg	-	0.156	-
Polymac with Insulation (12x48 in. panel)	-	684.9	-	kg	-	0.146	-
Polymac with Insulation (20x72 in. panel)	-	633.2	-	kg	-	0.158	-
Polymac with Insulation (12x72 in. panel)	-	675.5	-	kg	-	0.148	-
Polymac with Insulation (12x12x12 in. corner panel)	-	710.7	-	kg	-	0.141	-
Polymac with Insulation (20x12x12 in. corner panel)	-	665.4	-	kg	-	0.150	-

3.2. SYSTEM BOUNDARIES

The system boundaries are **cradle-to-gate**, i.e., only cover the production life cycle stage as illustrated in **Table 7**. Within this life cycle stage, three (3) modules are considered, namely A1) Extraction and Upstream Production, A2) Transport to Factory and A3) Manufacturing. Construction (A4; A5), Use (B1 to B7) and End-of-life (C1 to C4) stages are not included in the present study. Figure 3 presents the process flow diagram for MAC Metal Architectural Inc.'s products. Neither green power nor CO_2 credits are used in the framework of this project. An attributional LCA approach is used.

Table 7: Description of the system boundary life cycle stages and related information modules

PRODUCTION STAGE			CONSTRUC-TION STAGE		USE STAGE							END-OF-LIFE STAGE			
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4
Extraction and Upstream Production	Transport to Factory	Manufacturing	Transport to site	Installation	Use	Maintenance	Repair	Replacement	Refurbishment	Operational Energy Use	Operational Water Use	Deconstruction / Demolition	Transport to Waste Processing or Disposal	Waste Processing	Disposal of Waste
X	X	X	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND

Key: X = included; MND = module not declared (excluded)

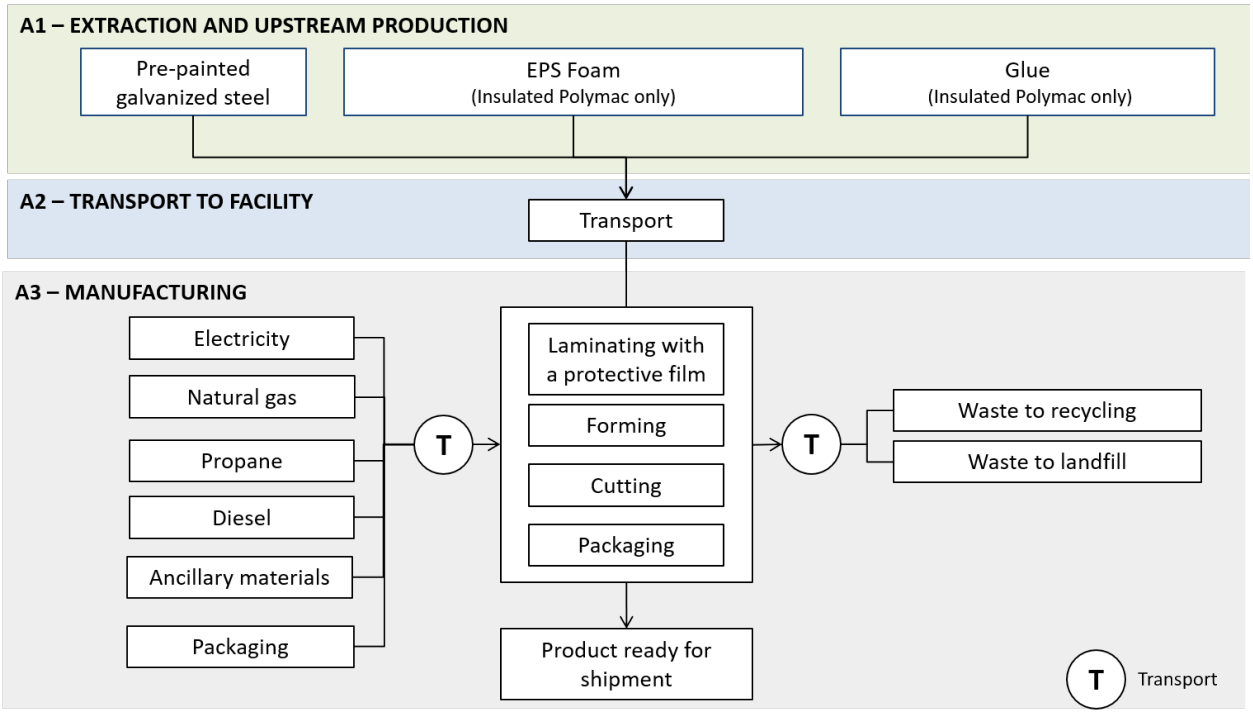


Figure 3: Cradle-to-gate system boundaries of MAC Metal Architectural Inc. steel roofing and siding products. "T" refers to transport.

Extraction and upstream production: This module includes the extraction and processing of the raw materials needed to manufacture the steel roofing and siding products.

Transport to facility: This module includes the transportation of raw materials from the suppliers to the MAC Metal Architectural facility located in Saint-Hubert (Quebec).

Manufacturing: This module includes energy consumption used in the manufacturing processes, heating of the building, as well as the use of fork-lifts on site. Ancillary materials were also considered, as was the transport of waste to the waste treatment and the waste treatment itself.

Finally, packaging materials to make products ready for shipment, as well as their transport to MAC Metal Architectural's facility, are covered by this stage.

3.3. CUT-OFF CRITERIA

According to the UL Environment PCR,[2] all known mass and energy flows shall be reported. No known flows should be deliberately excluded. These criteria are in accordance with ISO 21930:2017,[3] which states "*Cut-off rules shall not be applied in order to hide data. Any application of the criteria for the exclusion of inputs and outputs shall be documented.*"

In this study, no known mass nor energy flows were excluded from the system boundaries.

For this study, no data on the construction, maintenance or dismantling of the capital assets, daily transport of the employees, office work, business trips and other activities from MAC Metal Architectural Inc.'s employees were

included in the model. The model only takes into account the processes associated with infrastructure that are already included in the ecoinvent unit processes.

3.4. ALLOCATION

The ISO 14040 allocation procedure states that whenever possible, allocation should be avoided by collecting data related to the process under study or by expanding the product system.

According to ISO 14040, step 2 consists of partitioning the inputs and outputs between the different products in a way that reflects the physical relationship between them. The UL Environment PCR suggests using mass to allocate flows.[2]

Energy consumption, ancillary materials and packaging were allocated to the products on a mass basis. The protective film was allocated to the products on a surface basis.

No burdens are allocated across the system boundary with secondary materials, secondary fuel, or recovered energy flows arising from waste.

[Photo courtesy of MAC Metal Architectural Inc.]

3.5. DATA SOURCES AND QUALITY REQUIREMENTS

Data Quality Parameter	Data Quality Discussion
Source of manufacturing data	Manufacturing data was collected from the manufacturing plant located in Saint-Hubert for one production year starting June 1, 2022, and ending May 31, 2023. This data represents 100% of product production and includes the total annual mass of products produced at the manufacturing plant; specific product composition; raw materials and fuels entering the product production process; transport distance of materials and fuels, electricity consumption, water consumption, emissions to the environment at the manufacturing plant, and packaging.
Source of secondary data	Background data were taken from ecoinvent 3.9.1 "cut-off" datasets. Datasets were selected based on their representativeness of the products' composing materials. When appropriate, the dataset's grid mix was changed for the grid mix of the province or country where production takes places. Otherwise, ecoinvent data representative of the global market or "rest-of-the-world" were selected as proxies. Wood and transport data were taken from the US LCI Database, which is specific to a North American context. Finally, for pre-painted galvanized steel and EPS foam, data came from product-specific Type III EPDs.
Geographical representativeness	MAC Metal Architectural Inc.'s manufacturing facility is based in the province of Quebec; hence electricity consumption is based on the Quebec grid mix. Geographical correlation of the material supply and the selected datasets are largely representative of the same area. When this was not possible, datasets representing a larger geographical area were used.
Temporal representativeness	Primary data was collected so as to be representative of one full year of production starting June 1, 2022, and ending May 31, 2023. Datasets selected from ecoinvent and US LCI were not always published within the last ten years. Nevertheless, ecoinvent and US LCI remain reference LCI databases.
Technological representativeness	Primary data, obtained from the manufacturer, is representative of the current technologies and materials used by this company.
Completeness	All relevant process steps were considered and modelled to satisfy the goal and scope. No known flows were cut off.

4. LIFE CYCLE ASSESSMENT RESULTS

4.1. RESULTS TABLES

LCIA results are relative expressions and do not predict impacts on category endpoints, the exceeding of thresholds, safety margins or risks.

The six impact categories presented are globally deemed mature enough to be included in Type III environmental declarations. Other categories are being developed and defined and LCA should continue making advances in their development. However, the EPD users shall not use additional measures for comparative purposes.

Steel siding and roofing panels results are presented for the Harrywood Plus steel sidings. To obtain the product-specific environmental impacts of the other all-steel siding and roofing products, the environmental impacts of the Harrywood Plus (22 ga, 24 ga and 26 ga) are multiplied by a respective scaling factor (listed in the Scaling Factor table).

$$Impact\ result\ Product_x(y\ ga.) = Impact\ result\ Harrywood\ Plus\ (y\ ga.) * Scaling\ Factor$$

For example, the global warming potential (GWP_{100}-AR5) of Board and Batten (26 ga.) is equal to 1.58E3 kg CO_2 eq./100m^2.

$$GWP_{100} - AR5\ Board\ and\ Batten(26\ ga.) = GWP_{100} - AR5\ Harrywood\ Plus\ (26\ ga.) * 1.066$$

$$GWP_{100} - AR5\ Board\ and\ Batten(26\ ga.) = 1.48E3\ kg\ CO_2e\ q./100m^2 * 1.066$$
$$= 1.58E3\ kg\ CO_2e\ q./100m^2$$

Table 8: EPD results scaling factors for MAC Metal Architectural's steel roofing and siding products

Products	Scaling factor
Board and Batten	1.066
Reverse Board and Batten	1.066
Harrywood	1.046
Harrywood Block	1.046
Harrywood Plus	1.000
Metal Block	1.087
MS Authentic, MS 1 & 2 (Wall)	1.009
MS 1 Modular 19.25 in.	1.009
MS 1 Modular 15.625 in.	1.049
MS 1 Modular 11.375 in.	1.097
MS 3 & 4 (Wall)	1.077
MS 380 Corrugated	0.937
MS 750 & 750 I	0.965
Norwood	1.108
Norwood Mini	1.207
Versa	1.087

Harrywood Plus 22 ga.

Table 9: LCIA results for 100 m² of Harrywood Plus steel panel (22 ga.)

Environmental Indicator	Unit	Harrywood Plus (22 ga.)			
		A1	A2	A3	A1 - A3
		(per 100 m2)	(per 100 m2)	(per 100 m2)	(per 100 m2)
TRACI 2.1					
GWP_{100}-AR5[1]	kg CO_2 eq.	1.06E+03	5.41E+01	9.55E+01	1.21E+03
GWP_{100}-AR4[2]	kg CO_2 eq.	1.06E+03	5.38E+01	9.42E+01	1.21E+03
AP	kg SO2 eq.	2.33E+00	6.58E-01	5.12E-01	3.50E+00
EP	kg N eq.	1.11E-01	4.73E-02	1.58E-01	3.16E-01
ODP	kg CFC-11 eq.	4.50E-09	1.86E-07	1.51E-06	1.70E-06
SFP	kg O_3 eq.	4.23E+01	1.80E+01	1.28E+01	7.31E+01
FFD	MJ Surplus	1.39E+03	1.06E+02	2.30E+02	1.73E+03
GWP: Global Warming Potential; **AP**: Acidification Potential; **EP**: Eutrophication Potential; **ODP**: Ozone Layer Depletion Potential; **SFP**: Smog Formation Potential; **FFD**: Fossil Fuel Depletion Potential.					

(1) GWP 100, excludes biogenic CO2 removals and emissions associated with biobased products and packaging; 100-year time horizon GWP factors are provided by the IPCC 2013 Fifth Assessment Report (AR5).
(2): GWP 100, excludes biogenic CO2 removals and emissions associated with biobased products and packaging; 100-year time horizon GWP factors are provided by the IPCC 2007 Fourth Assessment Report (AR4).

Table 10: Resource use for 100 m² of Harrywood Plus steel panel (22 ga.)

Environmental Indicator	Unit	Harrywood Plus (22 ga.)			
		A1	A2	A3	A1 - A3
		(per 100 m2)	(per 100 m2)	(per 100 m2)	(per 100 m2)
Resource use					
RPR_E[(1)]	MJ, LHV	1.86E+03	1.41E+00	7.99E+02	2.66E+03
RPR_M[(2)]	MJ, LHV	0.00E+00	0.00E+00	0.00E+00	0.00E+00
RPR_T	MJ, LHV	1.86E+03	1.41E+00	7.99E+02	2.66E+03
$NRPR_E$[(3)]	MJ, LHV	1.70E+04	7.28E+02	8.41E+02	1.86E+04
$NRPR_M$[(4)]	MJ, LHV	5.61E-03	0.00E+00	1.38E+01	1.38E+01
$NRPR_T$	MJ, LHV	1.70E+04	7.28E+02	8.55E+02	1.86E+04
SM	MJ, LHV	6.42E+02	0.00E+00	1.56E-03	6.42E+02
RSF	MJ, LHV	1.17E-02	0.00E+00	0.00E+00	1.17E-02
NRSF	MJ, LHV	1.41E-01	0.00E+00	0.00E+00	1.41E-01
FW[(6)]	m^3	5.22E+00	9.00E-03	2.81E+00	8.04E+00

RPR_E: Renewable Primary Resources Used as Energy Carrier (Fuel); **RPR_M**: Renewable Primary Resources with Energy Content Used as Material; **RPR_T**: Renewable Primary Resources Total; **$NRPR_E$**: Non-Renewable Primary Resources Used as Energy Carrier (Fuel); **$NRPR_M$**: Non-Renewable Primary Resources with Energy Content Used as Material; **$NRPR_T$**: Non-Renewable Primary Resources Total; **SM**: Secondary Materials; **RSF**: Renewable Secondary Fuels; **NRSF**: Non-Renewable Secondary Fuels; **FW**: Use of Net Fresh Water Resources.

(1): $RPR_E = RPR_T - RPR_M$, where RPR_T is equal to the value for renewable energy obtained using the CED methodology (LHV).

(2) Calculated as per ACLCA ISO 21930 Guidance, 6.2 Renewable primary resources with energy content used as a material, RPR_M.

(3): $NRPR_E = NRPR_T - NRPR_M$, where $NRPR_T$ is equal to the value for non-renewable energy obtained using the CED methodology (LHV).

(4): Calculated as per ACLCA ISO 21930 Guidance, 6.4 Non-renewable primary resources with energy content used as a material, $NRPR_M$.

(5): Represents the use of net fresh water calculated from life cycle inventory results, i.e., water consumption.

Table 11: Output flows and waste for 100 m² of Harrywood Plus steel panel (22 ga.)

Environmental Indicator	Unit	Harrywood Plus (22 Ga)			
		A1	A2	A3	A1 - A3
		(per 100 m2)	(per 100 m2)	(per 100 m2)	(per 100 m2)
Output flows and waste categories					
HWD(1)	kg	7.05E-06	4.73E-01	4.13E+01	4.18E+01
NHWD(2)	kg	1.74E-05	7.06E-01	5.72E+00	6.42E+00
HLRW(3)	m^3	4.19E-07	5.45E-11	1.04E-07	5.23E-07
ILLRW(4)	m^3	1.28E-04	3.23E-10	1.80E-07	1.28E-04
CRU	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MFR	kg	0.00E+00	0.00E+00	1.03E+02	1.03E+02
MER	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00
EE	MJ, LHV	0.00E+00	0.00E+00	0.00E+00	0.00E+00

HWD: Hazardous Waste Disposed; **NHWD**: Non-Hazardous Waste Disposed; **RWD**: Radioactive Waste Disposed; **HLRW**: High-Level Radioactive Waste, Conditioned, to Final Repository; **ILLRW**: Intermediate and Low-Level Radioactive Waste, Conditioned, to Final Repository; **CRU**: Components for Re-Use; **MFR**: Materials for Recycling; **MER**: Materials for Energy Recovery; **EE**: Exported Energy.

(1): Calculated from life cycle inventory results, based on datasets classified under "treatment and disposal of hazardous waste" and EPD values. The manufacturer does not generate hazardous waste.

(2): Calculated from life cycle inventory results, based on waste that is neither "hazardous" nor "radioactive" and EPD values.

(3): Calculated from life cycle inventory results, based on ecoinvent waste flow "high-level radioactive waste for final repository." The manufacturer does not generate radioactive waste.

(4): Calculated from life cycle inventory results, based on ecoinvent waste flow "low-level radioactive waste for final repository." The manufacturer does not generate radioactive waste.

Harrywood Plus 24 ga.

Table 12: LCIA results for 100 m² of Harrywood Plus steel panel (24 ga.)

Environmental Indicator	Unit	Harrywood Plus (24 ga.)			
		A1	A2	A3	A1 - A3
		(per 100 m2)	(per 100 m2)	(per 100 m2)	(per 100 m2)
TRACI 2.1					
GWP_{100}-AR5(1)	kg CO_2 eq.	8.70E+02	4.44E+01	7.98E+01	9.94E+02
GWP_{100}-AR4(2)	kg CO_2 eq.	8.70E+02	4.42E+01	7.86E+01	9.93E+02
AP	kg SO2 eq.	1.91E+00	5.41E-01	4.27E-01	2.88E+00
EP	kg N eq.	9.09E-02	3.89E-02	1.33E-01	2.63E-01
ODP	kg CFC-11 eq.	3.70E-09	1.53E-07	1.24E-06	1.39E-06
SFP	kg O_3 eq.	3.48E+01	1.48E+01	1.05E+01	6.01E+01
FFD	MJ Surplus	1.14E+03	8.74E+01	1.94E+02	1.42E+03
GWP: Global Warming Potential; **AP**: Acidification Potential; **EP**: Eutrophication Potential; **ODP**: Ozone Layer Depletion Potential; **SFP**: Smog Formation Potential; **FFD**: Fossil Fuel Depletion Potential.					

(1) GWP 100, excludes biogenic CO2 removals and emissions associated with biobased products and packaging; 100-year time horizon GWP factors are provided by the IPCC 2013 Fifth Assessment Report (AR5).

(2): GWP 100, excludes biogenic CO2 removals and emissions associated with biobased products and packaging; 100-year time horizon GWP factors are provided by the IPCC 2007 Fourth Assessment Report (AR4).

Table 13: Resource use for 100 m² of Harrywood Plus steel panel (24 ga.)

Environmental Indicator	Unit	Harrywood Plus (24 Ga)			
		A1	A2	A3	A1 - A3
		(per 100 m2)	(per 100 m2)	(per 100 m2)	(per 100 m2)
Resource use					
RPR_E[1]	MJ, LHV	1.53E+03	1.16E+00	6.50E+02	2.18E+03
RPR_M[2]	MJ, LHV	0.00E+00	0.00E+00	0.00E+00	0.00E+00
RPR_T	MJ, LHV	1.53E+03	1.16E+00	6.50E+02	2.18E+03
$NRPR_E$[3]	MJ, LHV	1.40E+04	5.98E+02	7.25E+02	1.53E+04
$NRPR_M$[4]	MJ, LHV	4.61E-03	0.00E+00	1.11E+01	1.12E+01
$NRPR_T$	MJ, LHV	1.40E+04	5.98E+02	7.36E+02	1.53E+04
SM	MJ, LHV	5.28E+02	0.00E+00	1.27E-03	5.28E+02
RSF	MJ, LHV	9.61E-03	0.00E+00	0.00E+00	9.61E-03
NRSF	MJ, LHV	1.16E-01	0.00E+00	0.00E+00	1.16E-01
FW[6]	m³	4.29E+00	7.40E-03	2.29E+00	6.59E+00

RPR_E: Renewable Primary Resources Used as Energy Carrier (Fuel); **RPR_M**: Renewable Primary Resources with Energy Content Used as Material; **RPR_T**: Renewable Primary Resources Total; **$NRPR_E$**: Non-Renewable Primary Resources Used as Energy Carrier (Fuel); **$NRPR_M$**: Non-Renewable Primary Resources with Energy Content Used as Material; **$NRPR_T$**: Non-Renewable Primary Resources Total; **SM**: Secondary Materials; **RSF**: Renewable Secondary Fuels; **NRSF**: Non-Renewable Secondary Fuels; **FW**: Use of Net Fresh Water Resources.

(1): $RPR_E = RPR_T - RPR_M$, where RPR_T is equal to the value for renewable energy obtained using the CED methodology (LHV).

(2) Calculated as per ACLCA ISO 21930 Guidance, 6.2 Renewable primary resources with energy content used as a material, RPR_M.

(3): $NRPR_E = NRPR_T - NRPR_M$, where $NRPR_T$ is equal to the value for non-renewable energy obtained using the CED methodology (LHV).

(4): Calculated as per ACLCA ISO 21930 Guidance, 6.4 Non-renewable primary resources with energy content used as a material, $NRPR_M$.

(5): Represents the use of net fresh water calculated from life cycle inventory results, i.e., water consumption.

Table 14: Output flows and waste for 100 m² of Harrywood Plus steel panel (24 ga.)

Environmental Indicator	Unit	Harrywood Plus (24 Ga)			
		A1	A2	A3	A1 - A3
		(per 100 m2)	(per 100 m2)	(per 100 m2)	(per 100 m2)
Output flows and waste categories					
HWD(1)	kg	5.79E-06	3.89E-01	3.62E+01	3.66E+01
NHWD(2)	kg	1.43E-05	5.80E-01	4.75E+00	5.33E+00
HLRW(3)	m^3	2.56E-02	1.63E-08	3.11E-05	2.56E-02
ILLRW(4)	m^3	3.44E-07	4.48E-11	8.57E-08	4.30E-07
CRU	kg	1.05E-04	2.66E-10	1.56E-07	1.05E-04
MFR	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MER	kg	0.00E+00	0.00E+00	8.49E+01	8.49E+01
EE	MJ, LHV	0.00E+00	0.00E+00	0.00E+00	0.00E+00

HWD: Hazardous Waste Disposed; **NHWD**: Non-Hazardous Waste Disposed; **RWD**: Radioactive Waste Disposed; **HLRW**: High-Level Radioactive Waste, Conditioned, to Final Repository; **ILLRW**: Intermediate and Low-Level Radioactive Waste, Conditioned, to Final Repository; **CRU**: Components for Re-Use; **MFR**: Materials for Recycling; **MER**: Materials for Energy Recovery; **E**E: Exported Energy.

(1): Calculated from life cycle inventory results, based on datasets classified under "treatment and disposal of hazardous waste" and EPD values. The manufacturer does not generate hazardous waste.

(2): Calculated from life cycle inventory results, based on waste that is neither "hazardous" nor "radioactive" and EPD values.

(3): Calculated from life cycle inventory results, based on ecoinvent waste flow "high-level radioactive waste for final repository." The manufacturer does not generate radioactive waste.

(4): Calculated from life cycle inventory results, based on ecoinvent waste flow "low-level radioactive waste for final repository." The manufacturer does not generate radioactive waste.

Harrywood Plus 26 ga.

Table 15: LCIA results for 100 m² of Harrywood Plus steel panel (26 ga.)

Environmental Indicator	Unit	Harrywood Plus (26 ga.)			
		A1	A2	A3	A1 - A3
		(per 100 m2)	(per 100 m2)	(per 100 m2)	(per 100 m2)
TRACI 2.1					
GWP_{100}-AR5(1)	kg CO_2 eq.	6.81E+02	3.48E+01	6.40E+01	7.80E+02
GWP_{100}-AR4(2)	kg CO_2 eq.	6.81E+02	3.46E+01	6.31E+01	7.79E+02
AP	kg SO2 eq.	1.50E+00	4.24E-01	3.42E-01	2.27E+00
EP	kg N eq.	7.12E-02	3.04E-02	1.08E-01	2.10E-01
ODP	kg CFC-11 eq.	2.90E-09	1.19E-07	9.72E-07	1.09E-06
SFP	kg O_3 eq.	2.73E+01	1.16E+01	8.32E+00	4.72E+01
FFD	MJ Surplus	8.95E+02	6.85E+01	1.58E+02	1.12E+03
GWP: Global Warming Potential; **AP**: Acidification Potential; **EP**: Eutrophication Potential; **ODP**: Ozone Layer Depletion Potential; **SFP**: Smog Formation Potential; **FFD**: Fossil Fuel Depletion Potential.					

(1) GWP 100, excludes biogenic CO2 removals and emissions associated with biobased products and packaging; 100-year time horizon GWP factors are provided by the IPCC 2013 Fifth Assessment Report (AR5).

(2): GWP 100, excludes biogenic CO2 removals and emissions associated with biobased products and packaging; 100-year time horizon GWP factors are provided by the IPCC 2007 Fourth Assessment Report (AR4).

Table 16: Resource use for 100 m² of Harrywood Plus steel panel (26 ga.)

Environmental Indicator	Unit	Harrywood Plus (26 Ga)			
		A1	A2	A3	A1 - A3
		(per 100 m2)	(per 100 m2)	(per 100 m2)	(per 100 m2)
Resource use					
RPR_E[1]	MJ, LHV	1.19E+03	9.08E-01	5.01E+02	1.70E+03
RPR_M[2]	MJ, LHV	0.00E+00	0.00E+00	0.00E+00	0.00E+00
RPR_T	MJ, LHV	1.19E+03	9.08E-01	5.01E+02	1.70E+03
$NRPR_E$[3]	MJ, LHV	1.09E+04	4.68E+02	6.08E+02	1.20E+04
$NRPR_M$[4]	MJ, LHV	3.61E-03	0.00E+00	8.54E+00	8.54E+00
$NRPR_T$	MJ, LHV	1.09E+04	4.68E+02	6.17E+02	1.20E+04
SM	MJ, LHV	4.13E+02	0.00E+00	9.71E-04	4.13E+02
RSF	MJ, LHV	7.52E-03	0.00E+00	0.00E+00	7.52E-03
NRSF	MJ, LHV	9.10E-02	0.00E+00	0.00E+00	9.10E-02
FW[6]	m³	3.36E+00	5.79E-03	1.78E+00	5.14E+00

RPR_E: Renewable Primary Resources Used as Energy Carrier (Fuel); **RPR_M**: Renewable Primary Resources with Energy Content Used as Material; **RPR_T**: Renewable Primary Resources Total; **$NRPR_E$**: Non-Renewable Primary Resources Used as Energy Carrier (Fuel); **$NRPR_M$**: Non-Renewable Primary Resources with Energy Content Used as Material; **$NRPR_T$**: Non-Renewable Primary Resources Total; **SM**: Secondary Materials; **RSF**: Renewable Secondary Fuels; **NRSF**: Non-Renewable Secondary Fuels; **FW**: Use of Net Fresh Water Resources.

(1): $RPR_E = RPR_T - RPR_M$, where RPR_T is equal to the value for renewable energy obtained using the CED methodology (LHV).

(2) Calculated as per ACLCA ISO 21930 Guidance, 6.2 Renewable primary resources with energy content used as a material, RPR_M.

(3): $NRPR_E = NRPR_T - NRPR_M$, where $NRPR_T$ is equal to the value for non-renewable energy obtained using the CED methodology (LHV).

(4): Calculated as per ACLCA ISO 21930 Guidance, 6.4 Non-renewable primary resources with energy content used as a material, $NRPR_M$.

(5): Represents the use of net fresh water calculated from life cycle inventory results, i.e., water consumption.

Table 17: Output flows and waste for 100 m² of Harrywood Plus steel panel (26 ga.)

Environmental Indicator	Unit	Harrywood Plus (26 Ga)			
		A1	A2	A3	A1 - A3
		(per 100 m2)	(per 100 m2)	(per 100 m2)	(per 100 m2)
Output flows and waste categories					
HWD(1)	kg	4.54E-06	3.05E-01	3.10E+01	3.13E+01
NHWD(2)	kg	1.12E-05	4.54E-01	3.79E+00	4.25E+00
HLRW(3)	m^3	2.00E-02	1.27E-08	2.46E-05	2.01E-02
ILLRW(4)	m^3	2.70E-07	3.51E-11	6.78E-08	3.37E-07
CRU	kg	8.23E-05	2.08E-10	1.32E-07	8.24E-05
MFR	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MER	kg	0.00E+00	0.00E+00	6.66E+01	6.66E+01
EE	MJ, LHV	0.00E+00	0.00E+00	0.00E+00	0.00E+00

HWD: Hazardous Waste Disposed; **NHWD**: Non-Hazardous Waste Disposed; **RWD**: Radioactive Waste Disposed; **HLRW**: High-Level Radioactive Waste, Conditioned, to Final Repository; **ILLRW**: Intermediate and Low-Level Radioactive Waste, Conditioned, to Final Repository; **CRU**: Components for Re-Use; **MFR**: Materials for Recycling; **MER**: Materials for Energy Recovery; **E**E: Exported Energy.

(1): Calculated from life cycle inventory results, based on datasets classified under "treatment and disposal of hazardous waste" and EPD values. The manufacturer does not generate hazardous waste.

(2): Calculated from life cycle inventory results, based on waste that is neither "hazardous" nor "radioactive" and EPD values.

(3): Calculated from life cycle inventory results, based on ecoinvent waste flow "high-level radioactive waste for final repository." The manufacturer does not generate radioactive waste.

(4): Calculated from life cycle inventory results, based on ecoinvent waste flow "low-level radioactive waste for final repository." The manufacturer does not generate radioactive waste.

Insulated Polymac 12x72 in. (24 ga.)

Table 18: LCIA results for 100 m² of Insulated Polymac steel panel (24 ga.)

Environmental Indicator	Unit	Insulated Polymac 12x72 in. (24 ga.)			
		A1	A2	A3	A1 - A3
		(per 100 m2)	(per 100 m2)	(per 100 m2)	(per 100 m2)
TRACI 2.1					
GWP_{100}-AR5[1]	kg CO_2 eq.	1.34E+03	5.23E+01	8.94E+01	1.48E+03
GWP_{100}-AR4[2]	kg CO_2 eq.	1.33E+03	5.20E+01	8.81E+01	1.47E+03
AP	kg SO2 eq.	4.12E+00	6.27E-01	4.78E-01	5.22E+00
EP	kg N eq.	4.41E-01	4.51E-02	1.49E-01	6.35E-01
ODP	kg CFC-11 eq.	1.16E-05	1.80E-07	1.39E-06	1.32E-05
SFP	kg O_3 eq.	6.06E+01	1.72E+01	1.18E+01	8.95E+01
FFD	MJ Surplus	4.78E+03	1.03E+02	2.17E+02	5.10E+03
GWP: Global Warming Potential; **AP**: Acidification Potential; **EP**: Eutrophication Potential; **ODP**: Ozone Layer Depletion Potential; **SFP**: Smog Formation Potential; **FFD**: Fossil Fuel Depletion Potential.					

(1) GWP 100, excludes biogenic CO2 removals and emissions associated with biobased products and packaging; 100-year time horizon GWP factors are provided by the IPCC 2013 Fifth Assessment Report (AR5).

(2): GWP 100, excludes biogenic CO2 removals and emissions associated with biobased products and packaging; 100-year time horizon GWP factors are provided by the IPCC 2007 Fourth Assessment Report (AR4).

Table 19: Resource use for 100 m² of Insulated Polymac 12x72 in. steel panel (24 ga.)

Environmental Indicator	Unit	Insulated Polymac 12x72 in. (24 ga.)			
		A1	A2	A3	A1 - A3
		(per 100 m2)	(per 100 m2)	(per 100 m2)	(per 100 m2)
Resource use					
RPR_E[(1)]	MJ, LHV	1.82E+03	1.37E+00	7.28E+02	2.55E+03
RPR_M[(2)]	MJ, LHV	0.00E+00	0.00E+00	0.00E+00	0.00E+00
RPR_T	MJ, LHV	1.82E+03	1.37E+00	7.28E+02	2.55E+03
$NRPR_E$[(3)]	MJ, LHV	2.28E+04	7.05E+02	8.25E+02	2.44E+04
$NRPR_M$[(4)]	MJ, LHV	1.56E+01	0.00E+00	9.98E-02	1.57E+01
$NRPR_T$	MJ, LHV	2.28E+04	7.05E+02	8.25E+02	2.44E+04
SM	MJ, LHV	5.92E+02	0.00E+00	1.42E-03	5.92E+02
RSF	MJ, LHV	1.08E-02	0.00E+00	0.00E+00	1.08E-02
NRSF	MJ, LHV	1.30E-01	0.00E+00	0.00E+00	1.30E-01
FW[(6)]	m³	6.88E+00	8.72E-03	2.57E+00	9.46E+00

RPR_E: Renewable Primary Resources Used as Energy Carrier (Fuel); **RPR_M**: Renewable Primary Resources with Energy Content Used as Material; **RPR_T**: Renewable Primary Resources Total; **$NRPR_E$**: Non-Renewable Primary Resources Used as Energy Carrier (Fuel); **$NRPR_M$**: Non-Renewable Primary Resources with Energy Content Used as Material; **$NRPR_T$**: Non-Renewable Primary Resources Total; **SM**: Secondary Materials; **RSF**: Renewable Secondary Fuels; **NRSF**: Non-Renewable Secondary Fuels; **FW**: Use of Net Fresh Water Resources.

(1): $RPR_E = RPR_T - RPR_M$, where RPR_T is equal to the value for renewable energy obtained using the CED methodology (LHV).

(2) Calculated as per ACLCA ISO 21930 Guidance, 6.2 Renewable primary resources with energy content used as a material, RPR_M.

(3): $NRPR_E = NRPR_T - NRPR_M$, where $NRPR_T$ is equal to the value for non-renewable energy obtained using the CED methodology (LHV).

(4): Calculated as per ACLCA ISO 21930 Guidance, 6.4 Non-renewable primary resources with energy content used as a material, $NRPR_M$.

(5): Represents the use of net fresh water calculated from life cycle inventory results, i.e., water consumption.

Table 20: Output flows and waste for 100 m² of Insulated Polymac 12x72 in. steel panel (24 ga.)

Environmental Indicator	Unit	Insulated Polymac 12x72 in. (24 ga.)			
		A1	A2	A3	A1 - A3
		(per 100 m2)	(per 100 m2)	(per 100 m2)	(per 100 m2)
Output flows and waste categories					
HWD(1)	kg	4.28E+01	4.58E-01	4.05E+01	8.38E+01
NHWD(2)	kg	8.34E+00	6.84E-01	6.79E+00	1.58E+01
HLRW(3)	m^3	2.87E-02	1.92E-08	3.49E-05	2.87E-02
ILLRW(4)	m^3	4.04E-07	5.28E-11	9.60E-08	5.00E-07
CRU	kg	1.18E-04	3.13E-10	1.75E-07	1.18E-04
MFR	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MER	kg	5.31E-01	0.00E+00	9.51E+01	9.57E+01
EE	MJ, LHV	0.00E+00	0.00E+00	0.00E+00	0.00E+00

HWD: Hazardous Waste Disposed; **NHWD**: Non-Hazardous Waste Disposed; **RWD**: Radioactive Waste Disposed; **HLRW**: High-Level Radioactive Waste, Conditioned, to Final Repository; **ILLRW**: Intermediate and Low-Level Radioactive Waste, Conditioned, to Final Repository; **CRU**: Components for Re-Use; **MFR**: Materials for Recycling; **MER**: Materials for Energy Recovery; **EE**: Exported Energy.

(1): Calculated from life cycle inventory results, based on datasets classified under "treatment and disposal of hazardous waste" and EPD values. The manufacturer does not generate hazardous waste.

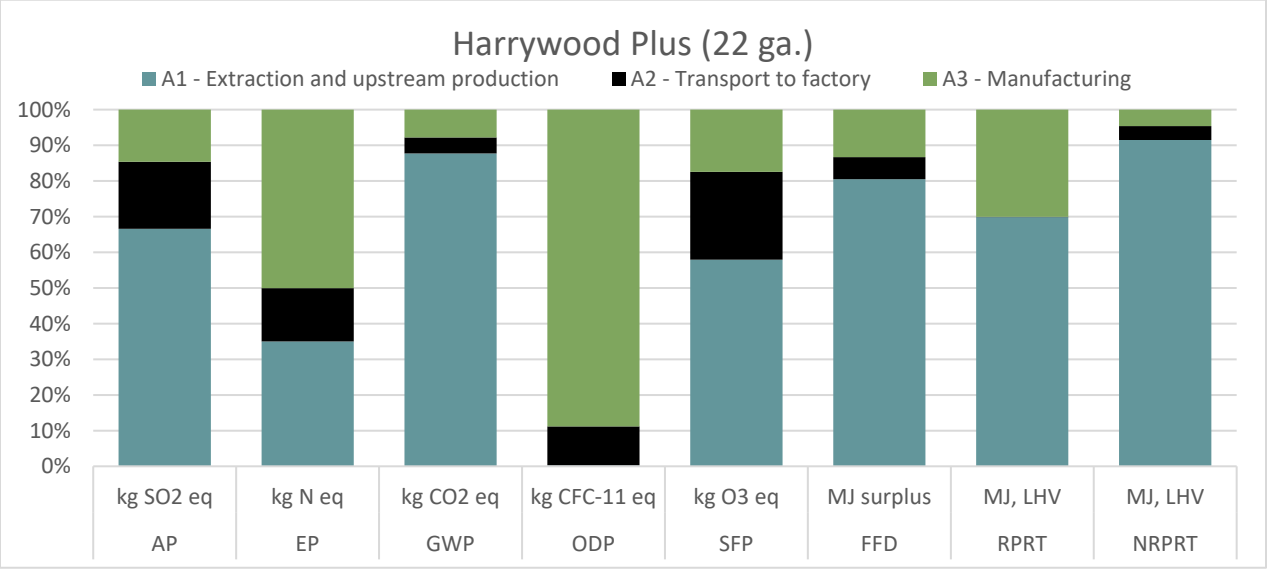
(2): Calculated from life cycle inventory results, based on waste that is neither "hazardous" nor "radioactive" and EPD values.

(3): Calculated from life cycle inventory results, based on ecoinvent waste flow "high-level radioactive waste for final repository." The manufacturer does not generate radioactive waste.

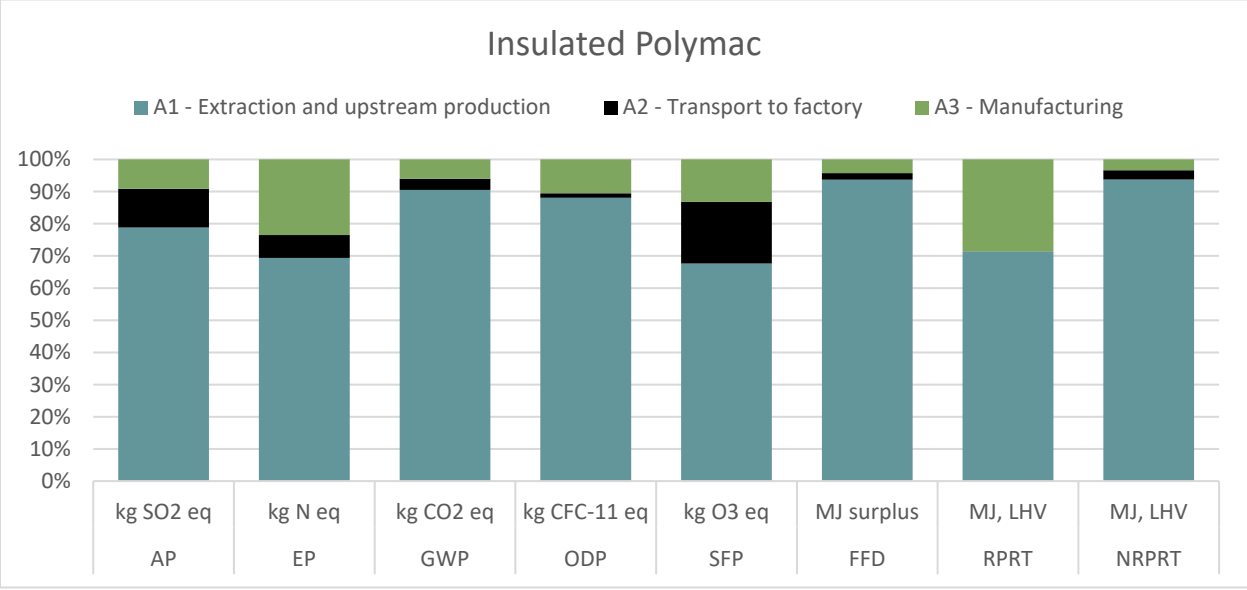
(4): Calculated from life cycle inventory results, based on ecoinvent waste flow "low-level radioactive waste for final repository." The manufacturer does not generate radioactive waste.

4.2. CONTRIBUTION ANALYSIS

For Harrywood Plus, as shown in the figure below, extraction and upstream production (A1) is the main contributor to acidification potential (AP), global warming potential (GWP), smog formation potential (SFP), fossil fuel depletion potential (FFD), as well as renewable and non-renewable resource consumption. As for eutrophication potential (EP), ozone layer depletion potential (ODP), the main contributor is manufacturing (A3).



As for Insulated Polymac, shown in the figure below, extraction and upstream production (A1) is the main contributor to all impact categories as well as renewable and non-renewable resource consumption.



GWP: Global Warming Potential; **AP**: Acidification Potential; **EP**: Eutrophication Potential; **ODP**: Ozone Layer Depletion Potential; **SFP**: Smog Formation Potential; **FFD**: Fossil Fuel Depletion Potential.

5. ADDITIONAL ENVIRONMENTAL INFORMATION

5.1. ENVIRONMENT AND HEALTH DURING MANUFACTURING AND INSTALLATION

MAC Metal Architectural Inc. is fully committed to the diligent protection of both the environment and the health and safety of its workers and its customers' workers. Its manufacturing process includes state-of-the-art environmental control equipment and workers are equipped with the highest quality personal protection gear. MAC Metal Architectural Inc.'s research and development process strives to create architectural products that have a sustainable impact on buildings and their occupants. No harmful substances or emissions are known to be emitted during installation as the products are painted, galvanized steel siding and roofing.

5.2. EXTRAORDINARY EFFECTS

MAC Metal Architectural Inc. is committed to offering quality products adapted to the various industry standards of the North American market. Their technical team works continuously with different accredited laboratories to ensure that their products meet the latest requirements in building construction as well as the realities of each of the regions they operate in. As the list is continuously evolving, please refer to MAC Metal Architectural's tests report online (https://macmetalarchitectural.com/en/categorie-ressource/technical-documents/).

Profiles are tested for fire resistance, deflection under wind loads, and maximum sustained pressure, and have received various accreditations. Namely, MAC Metal Architectural Inc.'s products respect the following standards:

- ASTM E84 - Standard test method for surface burning characteristics of building materials;
- CAN/ULC-S135 - Standard test method for determination of degrees of combustibility of building materials using an oxygen consumption calorimeter.

5.3. DELAYED EMISSIONS

No delayed emissions are considered.

5.4. ENVIRONMENTAL ACTIVITIES AND CERTIFICATIONS

MAC Metal Architectural Inc. is part of a third-party verification process with Vertima Inc. where MAC Metal Architectural Inc.'s products and its entire supply chain are assessed. At the end of the process, they will be receiving a Validated Eco-Declaration® summarizing verified environmental claims.

MAC Metal Architectural Inc. has also published two Health Product Declaration® covering the following products: Board and Batten, Harrywood, Harrywood Block, Harrywood Plus, Metal Block, MS Authentic, MS1&2, MS1 Modular, MS 3&4, MS 380 Corrugated, MS7560 &750I, Norwood, Norwood Mini, Polymac and Versa. More details are available on the HPDC public repository: https://www.hpd-collaborative.org/hpd-public-repository/.

5.5. FURTHER INFORMATION

Further information about MAC Metal Architectural Inc.'s products is available at https://macmetalarchitectural.com/.

6. REFERENCES

[1] International Organization for Standardization (ISO), "ISO 14025 Environmental labels and declarations - Type III environmental declarations - Principles and procedures," 2006.

[2] UL Environment, "Part B: Insulated Metal Panels, Metal Composite Panels, and Metal Cladding: Roof and Wall Panels (UL 10010-5)," 2018[Online]. Available: https://www.ul.com/offerings/product-category-rules-pcrs#uledev.

[3] International Organization for Standardization (ISO), "ISO 21930:2017(E) Sustainability in buildings and civil engineering works — Core rules for environmental product declarations of construction products and services," 2017.

[4] International Organization for Standardization (ISO), "ISO 14044:2006/AMD1:2017/AMD 2:2020 Environmental management - Life cycle assessment - Requirements and guidelines," 2006.

[5] UL Environment, "Product Category Rule (PCR) Guidance for Building-Related Products and Services Part A: Life Cycle Assessment Calculation Rules and Report Requirements, UL 10010 (v.4.0)," 2022[Online]. Available: https://www.ul.com/services/product-category-rules-pcrs#uledev.

[6] International Organization for Standardization (ISO), "ISO 14040:2006/AMD 1:2020 Environmental management - Life cycle assessment - Principles and framework," 2020.

[7] Vertima, "Life Cycle Assessment of MAC Metal Architectural Inc.'s steel roofing and cladding," 2024.

[8] ASTM International, "ASTM Program Operator Rules. Version: 8.0, Revised 04/29/20," 2020[Online]. Available: www.astm.org.

MAC

METAL ARCHITECTURAL

MAC Metal Architectural Inc.

5975, chemin de la Savane

Saint-Hubert (Quebec)

J3Y 0X1 CANADA

www.macmetalarchitectural.com

EPD

This LCA and EPD were prepared by Vertima Inc.

604 Saint Viateur Street
Quebec, QC
(418) 990-2800
G2L 2K8 CANADA

vertima

Environmental certification experts

vertima.ca