

ENVIRONMENTAL PRODUCT DECLARATION

ROLL FORMED CLADDING

WALL AND ROOF CLADDING SYSTEMS



The Metal Construction Association (MCA) is a non-profit organization formed in 1983 with the primary purpose of expanding the use of metal in construction. MCA unites diverse industry segments for the purpose of informing decision makers about the benefits of metal through awareness and education programs. MCA also supports third-party metal product research and testing. MCA and its members are committed to creating a cleaner, safer environment evidenced by the association's LCA program and support of similar initiatives.

Roll formed aluminum and steel cladding products are a major product category developed by MCA members. Metal cladding products are also an environmentally responsible and sustainable design choice that features high recycled content, low maintenance and long service life. The metal used in the claddings is also 100% recyclable at the end of its useful life.

This Environmental Product Declaration for roll formed aluminum and steel cladding is one of several different product EPDs offered by MCA.

For more information visit <https://metalconstruction.org>



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Industry-Wide EPD



According to ISO 14025,
ISO21930:2017

EPD PROGRAM AND PROGRAM OPERATOR NAME, ADDRESS, LOGO, AND WEBSITE	UL Solutions 333 Pfingsten Rd, Northbrook IL, 60062 www.ul.com www.spot.ul.com
GENERAL PROGRAM INSTRUCTIONS AND VERSION NUMBER	UL Solutions Program Operator Rules v.2.7 2022
MANUFACTURER NAME AND ADDRESS	Metal Construction Association 1061 American Lane, Suite 310 Schaumburg, IL 60173
DECLARATION NUMBER	4792126919.102.1
DECLARED PRODUCT & FUNCTIONAL UNIT OR DECLARED UNIT	Roll Formed Aluminum and Steel Cladding; 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 Oct 31, 2026)
DESCRIPTION OF PRODUCT APPLICATION/USE	Aluminum and steel sheet formed by rolling into a variety of profiles used as roof or wall panels.
MARKETS OF APPLICABILITY	North America
DATE OF ISSUE	August 11 th , 2026
PERIOD OF VALIDITY	5 Years
EPD TYPE	Industry-average
EPD SCOPE	Cradle-to-gate
YEAR(S) OF REPORTED PRIMARY DATA	2023
LCA SOFTWARE & VERSION NUMBER	LCA FE v10.9
LCI DATABASE(S) & VERSION NUMBER	Managed LCA Content 2025.2
LCIA METHODOLOGY & VERSION NUMBER	IPCC AR6 + CML 2001 Aug 2016 + TRACI 2.2

The PCR review was conducted by:	UL Solutions
	PCR Review Panel
	pcr@ul.com
This declaration was independently verified in accordance with ISO 14025: 2006. ☐ INTERNAL ☒ EXTERNAL	Cooper McCollum, UL Solutions
	Sphera Solutions, Inc.
This life cycle assessment was conducted in accordance with ISO 14044 and the reference PCR by:	Thomas P. Gloria, Industrial Ecology Consultants

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: Environmental declarations from different programs (ISO 14025) may not be comparable. 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. Full conformance with the PCR for metal panels and cladding allows EPD comparability 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 results for upstream or downstream of the life cycle stages declared.

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1. Product Definition and Information

1.1. Description of Company/Organization

The Metal Construction Association (MCA) is recognized as the leading advocate for the architectural metal products industry. Since it was formed in 1983, MCA has focused on promoting the use of metal in the building envelope through marketing, education, and action on public policies that affect the use of metal. MCA is a volunteer-led organization that works to eliminate barriers to using metal in construction by supporting product performance testing, initiating research, monitoring and responding to codes and regulations that impact the use of metal in the building envelope. Visit <https://metalconstruction.org> for more information.

Information in this document has been prepared by MCA technical staff with support and input from member companies through MCA's Council and Committee structure. The product configurations offered herein use ranges representative of all types of products described herein from the following MCA member companies:

	ATAS International, Inc. is a leading manufacturer of high-quality metal roofing, wall panels, and building envelope systems. The family-owned company specializes in providing diverse architectural cladding solutions for commercial and industrial construction projects. With a strong commitment to quality and innovation, ATAS offers extensive product lines to meet modern building requirements. www.atas.com
	Founded in 1988, Central States Manufacturing is a 100% employee-owned company producing high-quality metal building components, roofing, and siding for various sectors. Operating 13 facilities nationwide, the company delivers sustainable steel solutions with a commitment to reliability for contractors and distributors www.centralstatesco.com.
	Founded in 1988, Dimensional Metals, Inc. (DMI) is a premier U.S. manufacturer specializing in high-performance architectural metal roof and wall panel systems for the commercial construction industry. Headquartered in Reynoldsburg, Ohio, the company provides engineered solutions, including custom edge metals and water control systems, backed by comprehensive warranties. DMI differentiates itself through a full-service engineering department that delivers technical guidance, CAD shop drawings, and on-site field inspections. www.dmimetals.com
	Drexel Metals is a full-range solution provider for the construction industry, offering engineered metal roofing systems, architectural wall panels, equipment, and custom fabrication services. Through their regional manufacturing program, authorized fabricators, certified installers, and distributors extend the reach of Drexel Metals' proven products, all backed by the company's industry-leading warranty



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	programs and site certification.
	Founded in 1967, Fabral is a leading manufacturer of high-quality metal roofing and wall systems designed for agricultural, commercial, and residential applications. The company utilizes advanced LEAN manufacturing processes to create durable products suitable for diverse, large-scale American building projects. Fabral focuses on providing engineering expertise and comprehensive warranties to address complex construction challenges. www.fabral.com/
	Founded in 1963, McElroy Metal is a Bossier City, Louisiana-based, third-generation, family-owned business that has transitioned into an employee-owned organization (ESOP). The company operates 14 manufacturing facilities and numerous service centers across the United States, specializing in over 30 panel profiles for residential, commercial, and industrial projects. They are a national leader in supplying durable, energy-efficient metal roofing and siding, including standing seam systems and insulated metal panels. https://www.mcelroymetal.com/
	Founded in 1963, Metal Sales Manufacturing Corporation is a prominent manufacturer of metal roof, wall, and building systems. The company operates 18 manufacturing facilities, serving the agricultural, commercial, architectural, industrial, and residential construction markets. With over 60 years of experience, Metal Sales focuses on providing high-performance, sustainable, and energy-efficient building solutions. www.metalsales.us.com/
	Petersen proudly manufactures PAC-CLAD architectural metal wall panels and metal roofing systems that inspire bold, creative building design. Made from high-quality steel and aluminum in many gauges, Petersen's products are engineered for long service life, durability, and superior performance. Most colors are Cool Roof-rated and meet LEED requirements, helping achieve energy efficiency and green building objectives. https://www.pac-clad.com

1.2. Product Description

Product Identification

Roll formed aluminum and steel panel products are manufactured using a straightforward process where pre-painted coiled material is unrolled, cut to length, and fed into a series of rollers which gradually form the desired profile. Additional finishing may occur such as application of seals and swedging, a special end treatment to facilitate field end



laps.

MCA products are used in a multitude of building coverage applications and offer a wide range of benefits, including aesthetics, durability, weather protection, wind resistance and enhanced fire resistance with each product type offering its own unique properties. This EPD focuses on cladding products that are considered representative of common products manufactured by member companies, as seen in Table 1.

A flow diagram depicting the manufacturing process can be found in Figure 1. The EPD is intended to represent an industry average for roll formed cladding. The industry average was calculated using horizontal averaging, with manufacturer datasets weighted by production output expressed in area (100 m² of roll-formed claddings) across participating facilities.

Product Specification

Table 1. Roll formed steel and aluminum cladding specification

PRODUCT	DESCRIPTION	PRIMARY PROCESSES
Roll formed steel cladding	Steel gauge: 18 – 30 gauge Example product: 0.023 inches (24 gauge) steel coil	Roll forming
Roll formed aluminum cladding	Aluminum gauge: 18 – 30 gauge Example product: 0.025 inches (22 gauge) aluminum coil	Roll forming

Flow Diagram

Figure 1 displays the cradle-to-gate manufacturing process of roll formed steel and aluminum cladding.

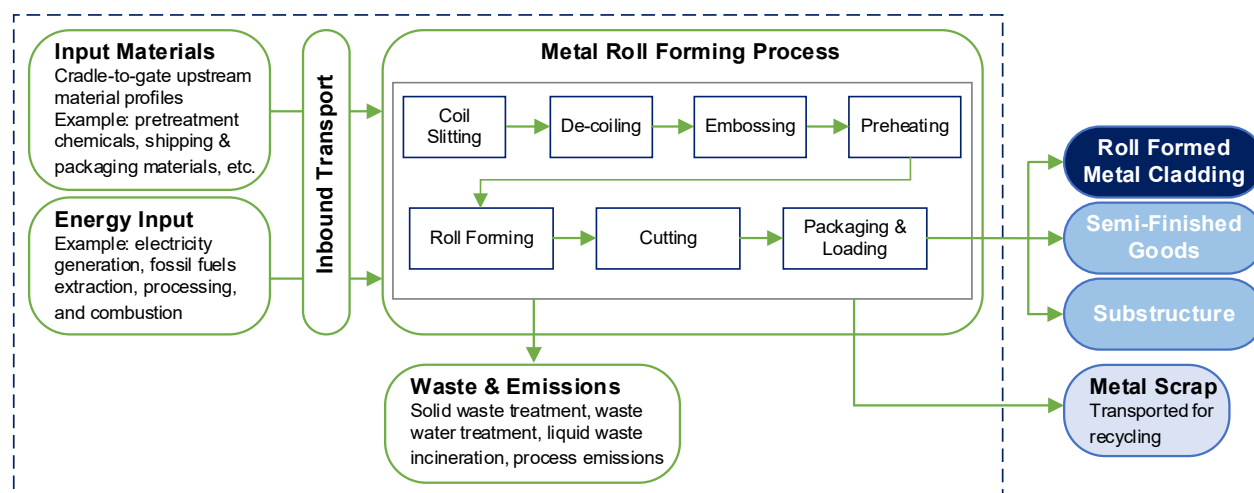


Figure 1. Cradle-to-Gate system boundary for roll formed steel and aluminum manufacturing



1.3. Application

Roll formed aluminum and steel cladding products are selected for use in a variety of roof and wall applications because of their long-term durability, low maintenance, wide variety of color and finish options, and their ability to improve building energy efficiency by integrating with renewable energy systems and passive air and water heating systems. They are also effective cladding for rainscreen wall systems when combined with cavities and perforated sub-framing.

Metal cladding products require less maintenance than many other exterior systems and meet the most demanding long-term performance requirements. Many designers and building owners also choose metal cladding for their environmental value of having recycled content and being recyclable or reusable at the end of a building’s useful life.

Successful applications include commercial facilities, healthcare facilities, industrial facilities, transportation, schools and universities, warehousing and distribution centers, data centers, sports complexes, and convention centers.

1.4. Declaration of Methodological Framework

This EPD is “cradle-to-gate” covering the modules A1 to A3. This includes raw material extraction and upstream processing, secondary material production, inbound transportation, cladding manufacturing, and subsequent fabrication into finished cladding products. 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 the PCR. Further details are described in MCA’s background report (Sphera, 2026).

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 roll formed aluminum and steel cladding, capital goods and infrastructure last for decades with only 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.

1.5. Technical Requirements

Substrate Material Standards

ANSI/SDI AISI S100	North American Specification for the Design of Cold-Formed Steel Structural Members Specifications for Aluminum Structures, the Aluminum Association
ADM - 2020	Aluminum Design Manual Part 1, Specification for Aluminum Structures
ASTM A463	Standard Specification for Steel Sheet, Aluminum-Coated, by the Hot-Dip Process
ASTM A653	Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
ASTM A1063	Standard Specification for Steel Sheet, Twin-Roll Cast, Zinc-Coated (Galvanized) by the Hot-Dip Process
ASTM A792	Standard Specification for Steel Sheet, 55 % Aluminum-Zinc Alloy-Coated by the Hot-Dip Process



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ASTM A924 Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process

ASTM B209 Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate

Metal Roof and Wall Performance (General)

AAMA 501.1 Water Penetration of Windows, Curtain Walls and Doors Using Dynamic Pressure

ANSI/CRRS S100 Standard Test Methods for Determining Radiative Properties of Materials

ASTM B117 Standard Practice for Operating Salt Spray (Fog) Apparatus

ASTM C1371 Standard Test Method for Determination of Emittance of Materials Near Room Temperature Using Portable Emissometers

ASTM C1549 Standard Test Method for Determination of Solar Reflectance Near Ambient Temperature Using a Portable Solar Reflectometer

ASTM E903 Standard Test Method for Solar Absorptance, Reflectance, and Transmittance of Materials Using Integrating Spheres

ASTM E1514 Standard Specification for Structural Standing Seam Steel Roof Panel Systems

ASTM E1637 Standard Specification for Structural Standing Seam Aluminium Roof Panel Systems

ASTM E1646 Standard Test Method for Water Penetration of Exterior Metal Roof Panel Systems by Uniform Static Air Pressure Difference

ASTM E1680 Standard Test Method for Rate of Air Leakage through Exterior Metal Roof Panel Systems

ASTM E1918 Standard Test Method for Measuring Solar Reflectance of Horizontal and Low-Sloped Surfaces in the Field

ASTM E2140 Standard Test Method for Water Penetration of Metal Roof Panel Systems by Static Water Pressure Head

ASTM E283 Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Skylights, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen

ASTM E331 Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference

FM 4471 Approval Standard for Class 1 Panel Roofs

FM 4481 Approval Standard for Class 1 Exterior Wall Systems

Metal Roof and Wall Performance (Structural)

ASTM E330 Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference



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ASTM E1592	Standard Test Method for Structural Performance of Sheet Metal Roof and Siding Systems by Uniform Static Air Pressure Difference
FM 4474	Standard for Evaluating the Simulated Wind Uplift Resistance of Roof Assemblies
UL 580	Tests for Uplift Resistance of Roof Assemblies
UL 1897	Uplift Tests for Roof Covering Systems

Paint Finish Performance

ASTM D523	Standard Test Method for Specular Gloss
ASTM D968	Standard Test Methods for Abrasion Resistance of Organic Coatings by Falling Abrasive
ASTM D1308	Standard Test Method for Effect of Household Chemicals on Clear and Pigmented Coating Systems
ASTM D2244	Standard Practice for Calculation of Color Tolerances and Color Differences from Instrumentally Measured Color Coordinates
ASTM D2247	Standard Practice for Testing Water Resistance of Coatings in 100 % Relative Humidity
ASTM D2794	Standard Test Method for Resistance of Organic Coatings to the Effects of Rapid Deformation (Impact)
ASTM D4214	Standard Test Methods for Evaluating the Degree of Chalking of Exterior Paint Films

Fire Performance

ASTM E84	Standard Test Method for Surface Burning Characteristics of Building Materials
ASTM E108	Standard Test Methods for Fire Tests of Roof Coverings
ASTM E119	Standard Test Methods for Fire Tests of Building Construction and Materials
ASTM E631	Standard Terminology of Building Constructions
UL 790	Standard Test Method for Fire Tests of Roof Coverings

Applicable Model Codes, Standards or Listings

International Building Code/Local building code

ICC-ES Approvals

ASCE/SEI 7 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures

UL – Building Materials Directory

FM Approvals – Approval Guide

FMRC FM Approvals – RoofNav.com



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1.6. Properties of Declared Product as Delivered

Roll-formed aluminum and steel claddings are delivered and installed in a variety of sizes and configurations customized to the project's needs. This EPD is representative of the claddings produced by MCA members. Technical properties of the claddings under study are shown in Table 2.

Table 2. Product properties

NAME	STEEL	ALUMINUM	UNIT
Length	0 – 15	0-15	m
Width	0.3 – 0.91	0.3 – 0.91	m
Thickness	0.38 – 0.76	0.7 – 1.27	mm (nominal)
Density	7,850	2,700	kg/m ³
Tensile Yield	225 - 380	n/a	MPa
Tensile Strength	350 – 550	200 - 310	MPa
Modulus of Elasticity	200 - 210	69-70	GPa

1.7. Material Composition

Steel cladding products are made of 100% steel and are roll formed into the desired profile from 18 – 29 gauge steel sheet. Aluminum cladding products are made of 100% aluminum and are roll formed into the desired profile from 16 – 29 gauge aluminum sheet. Coatings applied to the coils (e.g., paint or protective layers) are supplied pre-applied by upstream coil providers.

1.8. Manufacturing

Roll forming is a continuous bending operation in which a strip of metal (typically coiled steel or aluminum) is passed through consecutive sets of rolls, or stands, each performing only an incremental part of the bend, until the desired cross-section profile is obtained. Roll forming is ideal for producing parts with long lengths or in large quantities with a minimum amount of handling as compared to other types of forming (e.g., press brake). A variety of cross-section profiles can be produced, but each profile requires a carefully crafted set of roll tools.

The claddings can be factory-formed, as seen in Figure 2, or formed on the jobsite using a mobile roll former, as seen in Figure 3, or a combination of both.



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Figure 2. In-line roll former
Image courtesy of McElroy Metals



Figure 3. Mobile roll former
Image courtesy of Drexel Metals

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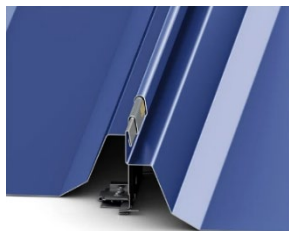
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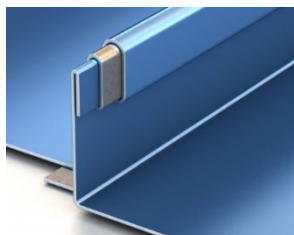
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Aluminum and steel coils can be formed into a variety of profiles and sizes depending on the need of the project, as seen in Figure 4.

Standing Seam (Roofs)



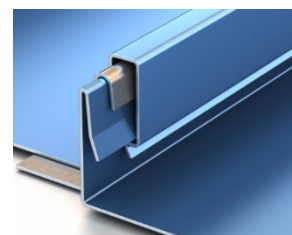
Trapezoidal Seam



Vertical Seam

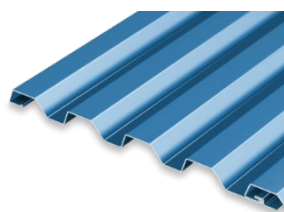


T-Seam

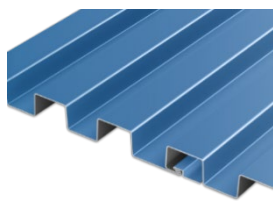


Snap Seam

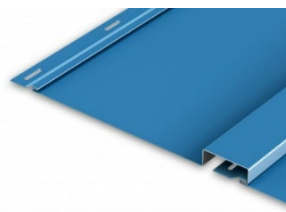
Concealed Fastener (Walls)



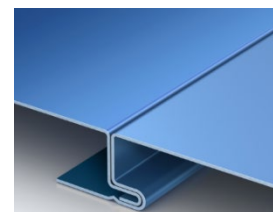
Trapezoidal Facade



Rectangular Facade

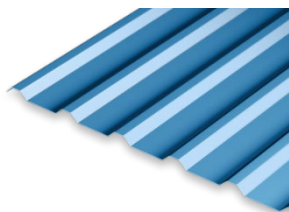


Board and Batten

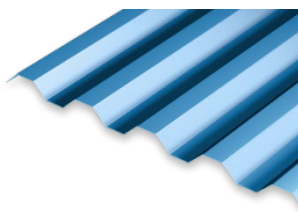


Flush

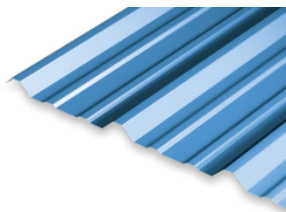
Exposed Fastener (Roofs and walls)



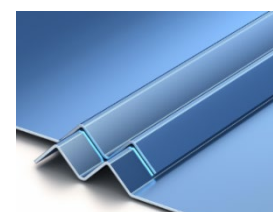
Utility Panel



7.2 Panel



R-Panel



5V Panel

Figure 4. Types of roll-formed profiles

Images courtesy of Drexel Metals and McElroy Metals

1.9. Packaging

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Foam sheets are layered between roll formed cladding before the products are stacked on wooden pallets and expanded polystyrene underlayment and wrapped in polyethylene film. Figure 5 shows an example of packaged roll formed product.



Figure 5. Packaging process of roll formed product

Photo courtesy of MBCI

1.10. Transportation

Average weighted distances and modes of transportation are included for the inbound transportation of raw materials, operating materials, and auxiliary materials to each manufacturing facility. Outbound transportation for external waste treatment has also been included.

1.11. Industry Average

This declaration represents a production-weighted industry average for roll formed aluminum and steel cladding products manufactured by eight (8) different participating MCA member organizations at eight manufacturing facilities in North America, as identified in Table 3. The declaration is intended to represent roll formed aluminum and steel cladding products within the scope defined in this EPD and should not be used to represent products with substantially different material compositions, manufacturing technologies, or geographic production locations. Product-specific shipment statistics for roll-formed steel and roll-formed aluminum cladding products were not available; therefore, industry shipment information for the U.S. and Canadian metal roof and wall market was used to assess representativeness. Based on this information, participating manufacturers represented at least 20% of the estimated annual North American shipment volume for roll formed cladding products. Additional information regarding industry representativeness is provided in the background report (Sphera, 2026). The median reference flow corresponds to 100 m² of roll-formed cladding. Variability between manufacturers is primarily driven by product thickness, material type (steel or aluminum), coating specifications, facility scale, and regional electricity grid mixes.

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Table 3: Manufacturers, manufacturing location, and products included by company.

COMPANY	MANUFACTURING LOCATION	STEEL	ALUMINUM
ATAS International, Inc.	Allentown, PA	x	x
Fabral	Lancaster, PA	x	x
Central States	Lowell, AR	x	
DMI	Reynoldsburg, OH	x	x
Drexel	Louisville, KY	x	x
McElroy	Sunnyvale, TX	x	
Metal Sales	Sellersburg, IN	x	
Petersen	Elk Grove Village, IL	x	x

2. Life Cycle Assessment Background Information

2.1. Functional or Declared Unit

The declared unit is coverage of 100 square meters (1,076 square feet) with metal product. The coverage area refers to the flat, projected surface area of the product as measured after the final manufacturing step and does not include material losses from overlap and scrap during installation.

Table 4: Reference flow of roll formed aluminum and steel claddings, weighted average basis.

NAME	ROLL FORMED STEEL	ROLL FORMED ALUMINUM
Declared Unit [m ²]	100	100
Product mass [kg / 100 m ²]	420	120

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, manufacturing and fabrication. 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 roll formed cladding, capital goods, and infrastructure last for 20 to 35 years with periodic replacement of key components identified during routine maintenance and predictive failure modeling. All other impacts are associated with the use stage of the building while the product is being produced. All human labor and commute have also been excluded.



2.3. Estimates and Assumptions

This study is based on primary data collected from MCA member manufacturing facilities. 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 approach was adopted in the case of any post-consumer and post-industrial recycled content, which was assumed to enter the system burden-free. Only environmental impacts from the point of recovery and forward (e.g., inbound transport, remelting, subsequent processing, etc.) are considered. Additionally, the cut-off approach was applied to manufacturing (pre-consumer) scrap sent to external recycling. Transport of manufacturing scrap to the point of recovery is included, but no impacts are assigned to the recycling processes or future use of the material.

The specific 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 roll formed aluminum and steel claddings have also been excluded as they produce millions of units over the course of their life, so the impact on a single declared 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, 2025). Background life cycle inventory data for raw materials and processes were obtained from the Sphera MLC 2025.2 database (CUP 2025.2). Primary manufacturing data was provided by manufacturers who are MCA members.

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 the

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weighted average production of MCA members. All secondary data were from Sphera's MLC 2025.2 databases and are representative of the years 2011 – 2025. For MDF, OSB, and PU flexible foam, the most recent LCI datasets are CORRIM 2011 and Europur 2013, specific to packaging applications. Alternative non-industry datasets were not used as proxies, as the environmental profiles of these materials are not expected to differ significantly in ways that would materially affect the study results.

Geographical coverage

Primary data for this study is based on site-specific data collected from MCA members' manufacturing facilities. Regionally specific datasets were used to represent 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 members. To that end, data on material composition, manufacturing, and transport were provided as primary data by the MCA members. The raw material inputs were based on total production output, bill of materials, and recycled content composition. Waste, emissions, and energy use were based on measured and calculated data 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 processing step was applied. Energy output was allocated based on production mass.

For the metal cladding system, two co-products were identified: semi-finished goods and substructure. Semi-finished goods were not assigned electricity consumption, while substructure was not assigned packaging burdens, as it is a pass-through item and not packaged separately. Electricity used in processing the substructure was allocated to it.

Semi-finished goods were primarily steel or aluminum coils cut to smaller sizes at the factory and either shipped to another manufacturing facility or mobile roll former for final fabrication. Substructure materials were typically framing members or roof decks made of steel, fabricated at the same facility and shipped to the jobsite along with the roof and wall panels.

3. Life Cycle Assessment Results

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

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Table 5. Description of the system boundary modules

	PRODUCT STAGE			CONSTRUCTION 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 | x = Declared

3.1. Life Cycle Impact Assessment Results

Tables 6 and 7 present the cradle-to-gate LCIA results (modules A1-A3) for roll-formed steel and aluminum cladding, respectively, normalized to 100 m² of installed product. The reported GWP excludes contributions from land use change and biogenic CO₂. GWP values reported here exclude biogenic CO₂. Contributions from upstream processes, including land use and land use change embedded in the LCA datasets, are included in the reported total. Separate reporting of GWP-LULUC is not required by the governing PCR. Biogenic carbon flows, such as carbon stored in packaging materials, are reported separately under BCRK in module A3.

Abiotic depletion potential (fossil fuels) is calculated using the CML 2001 method. The impact categories included in this EPD are considered sufficiently mature for inclusion in Type III environmental product declarations, while additional indicators continue to be developed. LCIA results are relative expressions of potential environmental impacts and do not predict actual impacts on category endpoints, exceedance of thresholds, or safety margins. Results presented in this EPD shall not be used as the sole basis for comparative assertions.



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Table 6. North American Impact Assessment Results, Resource Use, Waste and Output Flows, and Carbon Emissions and Removals per 100 m² of roll formed steel cladding.

INDICATORS	UNITS	A1	A2	A3	TOTAL
Impact Categories					
Global Warming Potential (GWP 100), IPCC 2021, AR6	kg CO ₂ eq	8.28E+02	6.78E+01	5.12E+01	9.47E+02
Ozone Depletion Potential (ODP)	kg CFC 11 eq	4.30E-09	1.91E-11	2.12E-09	6.44E-09
Eutrophication Potential, Freshwater (EP _{freshwater})	kg P eq	2.76E-04	5.50E-05	2.66E-05	3.58E-04
Eutrophication Potential, Marine (EP _{marine})	kg N eq	8.78E-01	2.23E-01	3.74E-02	1.14E+00
Acidification Potential (AP)	kg SO ₂ eq	1.90E+00	2.43E-01	5.89E-02	2.20E+00
Smog Formation Potential (SFP)	kg O ₃ eq	3.20E+01	5.55E+00	1.39E+00	3.89E+01
Abiotic Resource Depletion Potential of Non-renewable (fossil) energy resources (ADP _{fossil})	MJ, LHV	8.17E+03	8.60E+02	8.29E+02	9.86E+03
Resource Use					
RPR _e : Renewable primary resources used as energy carrier	MJ	1.48E+03	3.61E+01	2.47E+02	1.76E+03
RPR _m : Renewable primary resources with energy content used as material	MJ	0.00E+00	0.00E+00	2.12E+02	2.12E+02
NRPR _e : Non-renewable primary resources used as energy carrier	MJ	8.67E+03	8.68E+02	7.43E+02	1.03E+04
NRPR _m : Non-renewable primary resources with energy content used as material	MJ	1.03E+02	0.00E+00	1.37E+02	2.40E+02
SM: Secondary materials	kg	2.00E+02	0.00E+00	2.41E-01	2.01E+02
RSF: Renewable secondary fuels	MJ	-	-	-	0.00E+00
NRSF: Non-renewable secondary fuels	MJ	-	-	-	0.00E+00
RE: Recovered energy	MJ	-	-	-	0.00E+00
FW: Use of net fresh water resources	m ³	2.16E+00	3.90E-02	1.06E-01	2.30E+00
Waste Categories and Output Flows					
HWD: Hazardous waste disposed (HWD)	kg	-	-	-	0.00E+00
NHWD: Non-hazardous waste disposed	kg	0.00E+00	0.00E+00	8.83E-01	8.83E-01
HLRW: High-level radioactive waste, conditioned, to final repository	kg	2.00E-04	3.54E-06	2.07E-05	2.25E-04
ILLRW: Intermediate- and low-level radioactive waste, conditioned, to final repository	kg	2.16E-01	2.98E-03	1.78E-02	2.36E-01
CRU: Components for re-use	kg	-	-	-	0.00E+00
MFR: Materials for recycling	kg	0.00E+00	0.00E+00	7.62E+00	7.62E+00
MER: Materials for energy recovery	kg	-	-	-	0.00E+00
EEE: Recovered electrical energy exported from the product system	MJ	-	-	-	0.00E+00
EET: Recovered thermal energy exported from the product system	MJ	-	-	-	0.00E+00



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Carbon Emissions and Removals					
BCRP: Biogenic carbon removal from product	kg	-	-	-	0.00E+00
BCEP: Biogenic carbon emission from product	kg	-	-	-	0.00E+00
BCRK: Biogenic carbon removal from packaging	kg	0.00E+00	0.00E+00	2.19E+01	2.19E+01
BCEK: Biogenic carbon emission from packaging	kg	-	-	-	0.00E+00
BCEW: Biogenic carbon emission from combustion of renewable waste used in production	kg	-	-	-	0.00E+00
CCE: Calcination carbon emissions	kg	-	-	-	0.00E+00
CCR: Carbonation carbon removal	kg	-	-	-	0.00E+00
CWNR: Carbon emission from combustion of non-renewable waste used in production	kg	-	-	-	0.00E+00

Table 7. North American Impact Assessment Results, Resource Use, Waste and Output Flows, and Carbon Emissions and Removals per 100 m² of roll formed aluminum cladding.

INDICATORS	UNITS	A1	A2	A3	TOTAL
Impact Categories					
Global Warming Potential (GWP 100), IPCC 2021	kg CO ₂ eq	6.08E+02	2.80E+01	1.20E+02	7.56E+02
Ozone Depletion Potential (ODP)	kg CFC 11 eq	8.72E-10	7.87E-12	6.15E-09	7.03E-09
Eutrophication Potential, Freshwater (EP _{freshwater})	kg P eq	1.33E-04	2.27E-05	7.01E-05	2.26E-04
Eutrophication Potential, Marine (EP _{marine})	kg N eq	6.23E-01	9.18E-02	1.05E-01	8.19E-01
Acidification Potential (AP)	kg SO ₂ eq	2.32E+00	1.00E-01	1.72E-01	2.59E+00
Smog Formation Potential (SFP)	kg O ₃ eq	2.25E+01	2.29E+00	3.76E+00	2.86E+01
Abiotic Resource Depletion Potential of Non-renewable (fossil) energy resources (ADP _{fossil})	MJ, LHV	6.66E+03	3.55E+02	1.91E+03	8.92E+03
Resource Use					
RPR _e : Renewable primary resources used as energy carrier	MJ	3.38E+03	1.49E+01	3.93E+02	3.79E+03
RPR _m : Renewable primary resources with energy content used as material	MJ	0.00E+00	0.00E+00	4.21E+02	4.21E+02
NRPR _e : Non-renewable primary resources used as energy carrier	MJ	6.95E+03	3.58E+02	1.76E+03	9.07E+03
NRPR _m : Non-renewable primary resources with energy content used as material	MJ	1.17E+02	0.00E+00	2.84E+02	4.02E+02
SM: Secondary materials	kg	1.23E+02	0.00E+00	6.83E-01	1.24E+02
RSF: Renewable secondary fuels	MJ	-	-	-	0.00E+00
NRSF: Non-renewable secondary fuels	MJ	-	-	-	0.00E+00



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RE: Recovered energy	MJ	-	-	-	0.00E+00
FW: Use of net fresh water resources	m ³	1.00E+01	1.61E-02	2.52E-01	1.03E+01
Waste Categories and Output Flows					
HWD: Hazardous waste disposed (HWD)	kg	-	-	-	0.00E+00
NHWD: Non-hazardous waste disposed	kg	0.00E+00	0.00E+00	4.75E-01	4.75E-01
HLRW: High-level radioactive waste, conditioned, to final repository	kg	1.39E-04	1.46E-06	5.47E-05	1.95E-04
ILLRW: Intermediate- and low-level radioactive waste, conditioned, to final repository	kg	1.49E-01	1.23E-03	4.74E-02	1.97E-01
CRU: Components for re-use	kg	-	-	-	0.00E+00
MFR: Materials for recycling	kg	0.00E+00	0.00E+00	9.78E+00	9.78E+00
MER: Materials for energy recovery	kg	-	-	-	0.00E+00
EEE: Recovered electrical energy exported from the product system	MJ	-	-	-	0.00E+00
EET: Recovered thermal energy exported from the product system	MJ	-	-	-	0.00E+00
Carbon Emissions and Removals					
BCRP: Biogenic carbon removal from product	kg	-	-	-	0.00E+00
BCEP: Biogenic carbon emission from product	kg	-	-	-	0.00E+00
BCRK: Biogenic carbon removal from packaging	kg	0.00E+00	0.00E+00	4.40E+01	4.40E+01
BCEK: Biogenic carbon emission from packaging	kg	-	-	-	0.00E+00
BCEW: Biogenic carbon emission from combustion of renewable waste used in production	kg	-	-	-	0.00E+00
CCE: Calcination carbon emissions	kg	-	-	-	0.00E+00
CCR: Carbonation carbon removal	kg	-	-	-	0.00E+00
CWNR: Carbon emission from combustion of non-renewable waste used in production	kg	-	-	-	0.00E+00

4. LCA Interpretation

Contribution of each life cycle module (A1-A3) to the LCIA indicators is presented in Figure 6 and Figure 7 for roll formed steel and aluminum claddings, respectively. For steel claddings, 87% of GWP is associated with module A1, with 81% of the total GWP linked to prepainted galvalume and galvanized steel of various gauges. For aluminum cladding, 80% of GWP is associated with A1, 4% with A2, and 16% with A3, with approximately 80% of total GWP attributed to painted and unpainted aluminum. Module A1 dominates most impact categories for both steel and aluminum claddings, with the exception of ODP for aluminum, where contributions from later modules are more significant.

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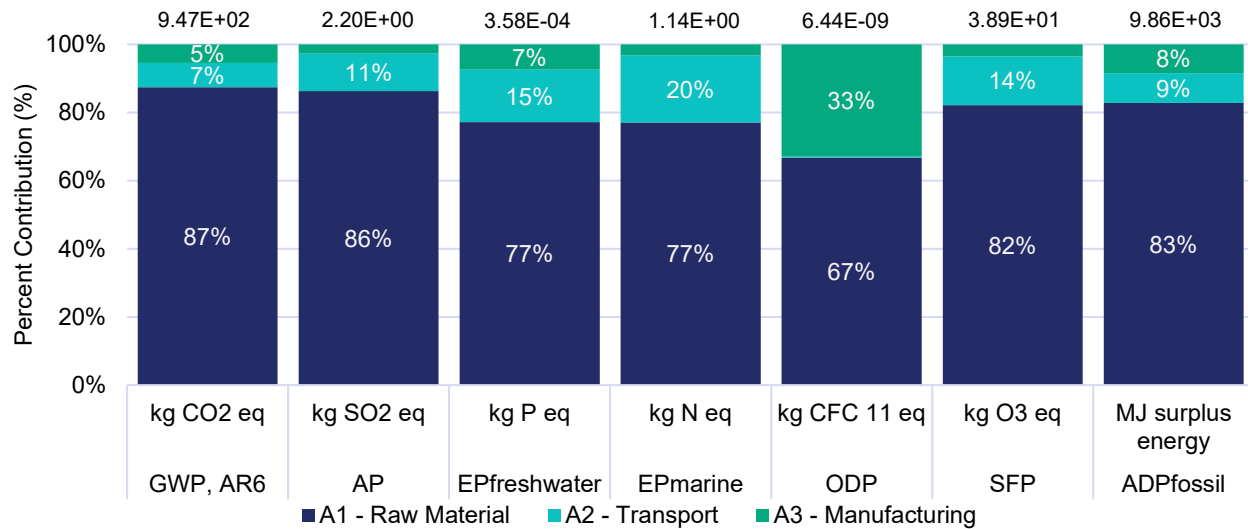


Figure 6. Contribution Analysis by Module of roll formed steel claddings per 100 m² coverage (GWP100 results exclude biogenic CO₂).

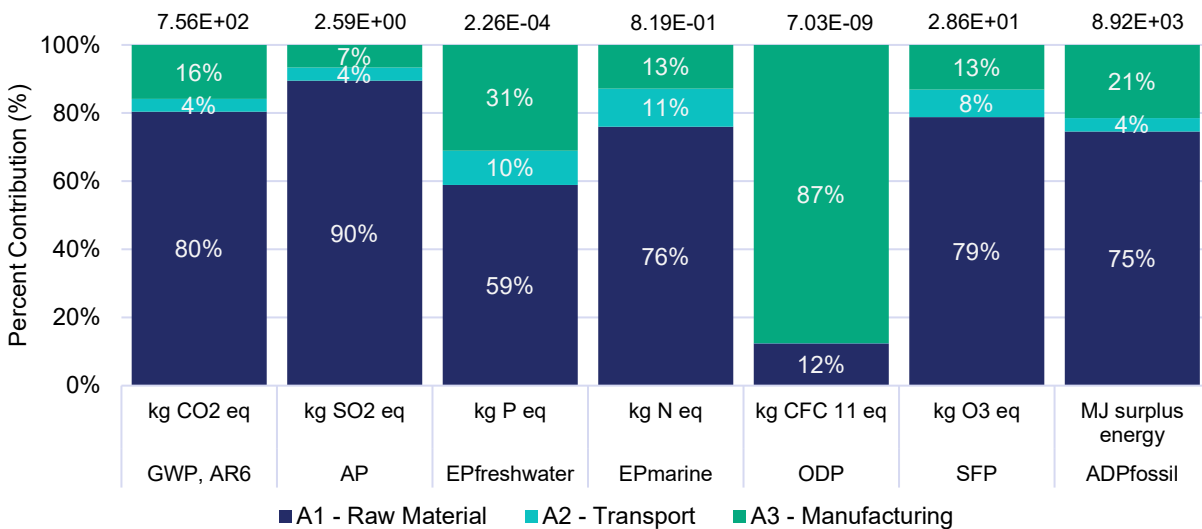


Figure 7. Contribution Analysis by Module of roll formed aluminum claddings per 100 m² coverage (GWP100 results exclude biogenic CO₂).



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5. Additional Environmental Information

5.1. Environment and Health During Manufacturing

The manufacturing process follows standard industry practices for worker health and environmental protection. Emissions and occupational exposures are managed in compliance with applicable health, safety, and environmental regulations. No substances required to be reported as hazardous are associated with the production of this product.

5.2. Extraordinary Effects

Fire

Steel and aluminum claddings are non-combustible, and while extreme heat may damage coatings or finishes, the base materials remain largely intact and recyclable. Environmental impacts from fire are not included in the LCA.

Water

Claddings are corrosion-resistant and designed for exposure to weather. Extraordinary flooding or prolonged submersion is not included in the study, though temporary wetting during normal service life is assumed.

Mechanical Destruction

Claddings may be dented or deformed by accidental impacts or extreme loads. Such events are considered extraordinary and are excluded from the LCA, as the materials remain recoverable and recyclable.

5.3. Delayed Emissions

No delayed emissions are expected during the use phase of the product. The materials used are stable under normal service conditions and do not release VOCs or other substances over time.

5.4. Environmental Activities and Certifications

This EPD represents an industry average product manufactured by multiple companies. Environmental and health-related certifications may vary by manufacturer and fabricator.

The following certifications may apply to some of the roll formed aluminum and steel products covered by this EPD:

- ISO 14001 – Environmental Management Systems
- UL GREENGUARD / GREENGUARD Gold – Low-emitting materials for indoor use
- LEED v4.1 Material Ingredient or EPD Credits
- LEED v5 MRp2 (Quantify and Assess Embodied Carbon), MRc2 (Reduce Embodied Carbon), and MRc4 (Building Product Selection and Procurement)

Details about these certification programs are available on the certifying bodies' websites. To verify which certifications apply to a specific product or supplier, please contact the manufacturer or visit their website.

5.5. Further Information

More information can be found at www.metalconstruction.org

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6. References

- ISO. (2006a). *ISO 14040: Environmental management – Life cycle assessment – Principles and framework*. Geneva: International Organization for Standardization.
- ISO. (2006b). *ISO 14044: Environmental management – Life cycle assessment – Requirements and guidelines*. Geneva: International Organization for Standardization.
- ISO. (2017). *ISO 21930: Sustainability in buildings and civil engineering works -- Core rules for environmental product declarations of construction products and services*. Geneva: International Organization for Standardization.
- Sphera. (2025). *Sphera LCA Database Documentation*. Retrieved from Sphera Solutions, Inc.: <https://lcadatabase.sphera.com/>
- Sphera. (2026). *Life Cycle Assessment of Metal Cladding and Panel Products, EPD Background Report*. Sphera.
- UL Environment. (2018). *Product Category Rule Guidance for Building-Related Products and Services - Part B "Insulated Metal Panels, Metal Composite Panels, and Metal Cladding: Roof and Wall Panels"*.
- UL Environment. (2022). *Product Category Rules for Building-Related Products and Services - Part A: Life Cycle Assessment Calculation Rules and Report Requirements, UL 10010 (v4.0)*.



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7. Contact Information

7.1 Study Commissioner



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7.2 LCA Practitioner



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