

## 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 aluminium 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 panels is also 100% recyclable at the end of its useful life.

This Environmental Product Declaration for roll formed aluminium and steel cladding is one of several different product EPDs offered by MCA. For more information visit [www.metalconstruction.org](http://www.metalconstruction.org)



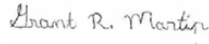
# ENVIRONMENTAL PRODUCT DECLARATION



**Roll Formed Aluminum and Steel Cladding**  
Industry-Wide EPD

According to ISO 14025,  
EN 15804, and ISO 21930:2017

|                                                                   |                                                                                                                                                                          |
|-------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| EPD PROGRAM AND PROGRAM OPERATOR NAME, ADDRESS, LOGO, AND WEBSITE | UL Environment 333 Pfingsten Road Northbrook, IL 60611<br><a href="https://www.ul.com/">https://www.ul.com/</a><br><a href="https://spot.ul.com">https://spot.ul.com</a> |
| GENERAL PROGRAM INSTRUCTIONS AND VERSION NUMBER                   | General Program Instructions v.2.4 July 2018                                                                                                                             |
| MANUFACTURER NAME AND ADDRESS                                     | Metal Construction Association<br>8735 W. Higgins Rd., Suite 300<br>Chicago IL 60631                                                                                     |
| DECLARATION NUMBER                                                | 4789289084.103.1                                                                                                                                                         |
| DECLARED PRODUCT & FUNCTIONAL UNIT OR DECLARED UNIT               | Roll Formed Aluminum and Steel Cladding; 100m <sup>2</sup>                                                                                                               |
| REFERENCE PCR AND VERSION NUMBER                                  | UL Part B: Insulated Metal Panels, Metal Composite Panels, and Metal Cladding: Roof and Wall Panels v.2.0 October 23, 2018                                               |
| DESCRIPTION OF PRODUCT APPLICATION/USE                            | Aluminum and steel sheet formed by rolling into a variety of profiles                                                                                                    |
| PRODUCT RSL DESCRIPTION (IF APPL.)                                | N/A                                                                                                                                                                      |
| MARKETS OF APPLICABILITY                                          | North America                                                                                                                                                            |
| DATE OF ISSUE                                                     | April 1, 2020                                                                                                                                                            |
| PERIOD OF VALIDITY                                                | 5 Years                                                                                                                                                                  |
| EPD TYPE                                                          | Industry-average                                                                                                                                                         |
| RANGE OF DATASET VARIABILITY                                      | Industry-average only                                                                                                                                                    |
| EPD SCOPE                                                         | Cradle to gate                                                                                                                                                           |
| YEAR(S) OF REPORTED PRIMARY DATA                                  | 2017                                                                                                                                                                     |
| LCA SOFTWARE & VERSION NUMBER                                     | GaBi ts, 9                                                                                                                                                               |
| LCI DATABASE(S) & VERSION NUMBER                                  | GaBi 2019 (service pack 37)                                                                                                                                              |
| LCIA METHODOLOGY & VERSION NUMBER                                 | TRACI 2.1                                                                                                                                                                |

|                                                                                                                                                                   |                                                                                       |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
| This PCR review was conducted by:                                                                                                                                 | UL Environment                                                                        |
|                                                                                                                                                                   | PCR Review Panel                                                                      |
|                                                                                                                                                                   | <a href="mailto:epd@ulenvironment.com">epd@ulenvironment.com</a>                      |
| This declaration was independently verified in accordance with ISO 14025: 2006.<br><input type="checkbox"/> INTERNAL <input checked="" type="checkbox"/> EXTERNAL |  |
|                                                                                                                                                                   | Grant R. Martin, UL Environment                                                       |
| This life cycle assessment was independently verified 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:** EPDs from different programs may not be comparable. Full conformance with a PCR allows EPD comparability only when all stages of a life cycle have been considered. However, variations and deviations are possible. Example of variations: Different LCA software and background LCI datasets may lead to differences results for upstream or downstream of the life cycle stages declared.



Roll Formed Aluminum and Steel Cladding  
Industry-Wide EPD



According to ISO 14025,  
EN 15804 and ISO 21930:2017

1. EPD Content

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 metal’s use. MCA is a volunteer-led organization that works to eliminate barriers to using metal in construction by supporting product performance testing, initiating research, and monitoring and responding to codes and regulations that affect metal. Visit [www.metalconstruction.org](http://www.metalconstruction.org) for more details.

Information in this document has been prepared by MCA technical staff and members of MCA’s Roofing Council and its Wall Panel Council who are volunteers representing the leading manufacturers of metal products used in roof and wall applications. The product configurations offered herein use ranges representative of all types of roll formed metal panels based on specific products from the following MCA member manufacturers:

|                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  <b>ATAS International, Inc.</b><br>Sustainable Building Envelope Technology | Founded in 1963, ATAS International, Inc. is a leading manufacturer of metal roofing, wall cladding, ceilings, perimeter edge metal, and accessories. The ATAS portfolio features an expansive selection of products available in aluminum, steel, zinc, stainless steel, and copper. Standard profiles include narrow and wide ribbed wall panels, corrugated styles, standing seam and batten seam roof systems, metal shingles, shakes, tiles, and more. With sustainability at the forefront of modern building design, ATAS proudly supports green building objectives with high performance solutions, such as solar-ready roof panels, insulated metal panels, cool roofing products, and solar air heating wall panels. ATAS has ISO 9001:2015 certified manufacturing locations located in Allentown, PA and Mesa, AZ. For more information at ATAS International, please visit <a href="http://www.atas.com">www.atas.com</a> . |
|  <b>DMI</b><br>DIMENSIONAL METALS, INC.                                      | Since 1988 Dimensional Metals, Inc. (DMI) has specialized in the manufacturing of architectural metal roof and wall panel systems as well as fabricated architectural sheet metal for the construction industry. We are backed by decades of proven metal envelope design, dependable Technical Field Services, and an Engineering Department delivering sustainable solutions. You are sure to find the product that will best enhance your design. Visit <a href="http://www.dmimetals.com">www.dmimetals.com</a> for more information.                                                                                                                                                                                                                                                                                                                                                                                                 |



ENVIRONMENTAL PRODUCT DECLARATION



Roll Formed Aluminum and Steel Cladding  
Industry-Wide EPD



According to ISO 14025,  
EN 15804 and ISO 21930:2017

|                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|-------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|    | <p>For over 50 years Englert has offered an exceptionally broad range of standing seam metal roof and wall panel profiles, panel widths and finishes to meet any design objective. With one of the most technically advanced paint-lines in the world, all of our 26 ULTRA-Cool™ finishes are low-gloss, environmentally friendly, Energy Star® compliant and 20 of those finishes are LEED-compliant, and backed by widely recognized product testing, the best warranties in the industry, and engineering expertise.</p>                                                                                                                                                                                                                                     |
|    | <p>Founded in 1967, Fabral is a widely recognized producer of metal roofing and wall panels for architectural, commercial, post frame, industrial, residential, transportation and agricultural applications. Fabral offers a wide variety of quality product offerings, advanced LEAN manufacturing processes and dedicated customer service values. In 1997, Fabral joined Euramax International, Inc., a producer of aluminum, steel, vinyl, copper and fiberglass products for original equipment manufacturers, distributors, contractors and home centers in North America and Western Europe. Visit <a href="http://www.fabral.com">www.fabral.com</a> for more information.</p>                                                                         |
|  | <p>When McElroy Metal was founded in 1963, it was built on three key traits: quality, service and performance. While we've certainly grown over the last 55 years, those traits are still the cornerstone of our business philosophy today.</p> <p>As a best-in-class metal roofing manufacturer with a complementary selection of metal wall panels and substructural components, we're here to meet any commercial, industrial, or residential need. With locations across the United States, our goal is to make your dream metal roof or wall a reality—no matter your location, project, or style preferences.</p>                                                                                                                                         |
|  | <p>For over 40 years, Petersen Aluminum Elk Grove Village, IL has been a leading provider of architectural metal products. PAC-CLAD products provide unmatched aesthetics, performance and sustainability to any project. Where possible, Petersen products include a high percentage of recycled material. Additionally, these products offer a long life span, and at the end of their extended service life, are 100% recyclable. Most of the PAC-CLAD colors meet LEED®, ENERGY STAR® and cool roof certification requirements. For more information visit <a href="http://www.pac-clad.com">www.pac-clad.com</a> or <a href="http://www.pacgreeninfo.com">www.pacgreeninfo.com</a> for the most current information on sustainable cool metal roofing.</p> |

1.2. Product Description





Roll Formed Aluminum and Steel Cladding  
Industry-Wide EPD



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Roll formed aluminum and steel products undergo the simplest production process of the evaluated products as no core is used. Aluminum coated coils are formed into the desired profile using a factory roller.

MCA products are used in a multitude of building coverage applications and offer a wide range of benefits, including aesthetics, durability, rain screening, fireproofing, and reduced energy costs, with each product type offering its own unique properties. This EPD focuses on panel 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 3. The EPD is intended to represent an industry average for roll formed cladding. The average is weighted based on on the area of product manufactured at each of the member’s facilities (i.e., vertical averaging).

| Table 1: Panel products under study |                                                                                             |                                                                                              |
|-------------------------------------|---------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------|
| PRODUCT                             | DESCRIPTION                                                                                 | PRIMARY PROCESSES                                                                            |
| Roll formed steel cladding          | Steel gauge: 18 – 29 Gauge<br><br>Primary product: 0.028 inches (24 Gauge) steel coil       | <ul style="list-style-type: none"><li>Continuous coil coating</li><li>Roll forming</li></ul> |
| Roll formed aluminum cladding       | Aluminum gauge: 16 – 29 Gauge<br><br>Primary product: 0.025 inches (22 Gauge) aluminum coil | <ul style="list-style-type: none"><li>Continuous coil coating</li><li>Roll forming</li></ul> |

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 help improve energy efficiency, such as solar roof and wall systems, and rainscreen applications. Metal cladding products require less maintenance than other exterior systems and meet the most demanding 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, sports complexes, and convention centers.

1.4. Declaration of Methodological Framework

The production stage (i.e., cradle-to-gate), including raw material extraction and processing, processing of secondary material, transport to the manufacturer, and manufacturing, is required by the PCR. The PCR considers installation, use, end-of-life, and recovery stages (modules A4 through D) as optional. As such, this study excludes the optional stages. Since this is a “cradle-to-gate” study, the products are not declared as fulfilling a building reference service life. This study also excludes construction of capital equipment, including tools used to produce, install and maintain the products; maintenance and operation of support equipment; human labor and commute; building energy consumption; and all other impacts associated with the use stage relative to energy use for the building in which the product is installed. The included and excluded life cycle stages are summarized in Table 2.





Table 2: Life cycle modules included in EPD

| Production                                                      |                           |               | Installation               |                            | Use stage         |             |        |             |               |                        |                       | End-of-Life                 |                  |                                                   |          | Next product system                    |
|-----------------------------------------------------------------|---------------------------|---------------|----------------------------|----------------------------|-------------------|-------------|--------|-------------|---------------|------------------------|-----------------------|-----------------------------|------------------|---------------------------------------------------|----------|----------------------------------------|
| Raw material supply (extraction, processing, recycled material) | Transport to manufacturer | Manufacturing | Transport to building site | Installation into building | Use / application | Maintenance | Repair | Replacement | Refurbishment | Operational energy use | Operational water use | Deconstruction / demolition | Transport to EoL | Waste processing for reuse, recovery or recycling | Disposal | Reuse, recovery or recycling potential |
| A1                                                              | A2                        | A3            | A4                         | A5                         | B1                | B2          | B3     | B4          | B5            | B6                     | B7                    | C1                          | C2               | C3                                                | C4       | D                                      |
| X                                                               | X                         | X             | MND                        | MND                        | MND               | MND         | MND    | MND         | MND           | MND                    | MND                   | MND                         | MND              | MND                                               | MND      | MND                                    |

X = declared module; MND = module not declared

## 1.5. Technical Data

### Substrate Performance

|            |                                                                                                                                                      |
|------------|------------------------------------------------------------------------------------------------------------------------------------------------------|
| AISI S100  | North American Specification for the Design of Cold-Formed Steel Structural Members Specifications for Aluminum Structures, the Aluminum Association |
| 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                                                       |
| ASTM A924  | Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process                                              |



# ENVIRONMENTAL PRODUCT DECLARATION



Roll Formed Aluminum and Steel Cladding  
Industry-Wide EPD



According to ISO 14025,  
EN 15804 and ISO 21930:2017

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

## Metal Roof Performance

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

ASTM C1363 Standard Test Method for Thermal Performance of Building Materials and Envelope Assemblies by Means of a Hot Box Apparatus

ASTM C423 Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method

ASTM C578 Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation

ASTM E90 Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements

ASTM E96 Standard Test Methods for Water Vapor Transmission of Materials Specimen

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

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

ASTM E413 Classification for Rating Sound Insulation

ASTM E795 Standard Practices for Mounting Test Specimens During Sound Absorption Tests

ASTM E1514 Specification for Structural Standing Seam Steel Roof Panel Systems

ASTM E1592 Standard Test Method for Structural Performance of Sheet Metal Roof and Siding Systems by Uniform Static Air Pressure Difference

ASTM E1637 Specification for Structural Standing Seam Aluminum 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

## Metal Wall Performance

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





Roll Formed Aluminum and Steel Cladding  
Industry-Wide EPD



According to ISO 14025,  
EN 15804 and ISO 21930:2017

|                                 |                                                                                                                                                             |
|---------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------|
| ASTM C1363                      | Standard Test Method for Thermal Performance of Building Materials and Envelope Assemblies by Means of a Hot Box Apparatus                                  |
| ASTM C423                       | Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method                                                |
| ASTM C578                       | Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation                                                                                   |
| ASTM D1494                      | Standard Test Method for Diffuse Light Transmission Factor of Reinforced Plastics Panels                                                                    |
| ASTM E90                        | Standard Test Method for Laboratory Measurement of Airborne Sound                                                                                           |
| ASTM E96                        | Standard Test Methods for Water Vapor Transmission of Materials                                                                                             |
| ASTM E119                       | Measurement Procedure for Noise Power Ratio                                                                                                                 |
| ASTM E283                       | Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the |
| ASTM E330                       | Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference           |
| ASTM E331                       | Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference               |
| ASTM E413                       | Classification for Rating Sound Insulation                                                                                                                  |
| ASTM E795                       | Standard Practices for Mounting Test Specimens During Sound Absorption Tests                                                                                |
| <b>Paint Finish Performance</b> |                                                                                                                                                             |
| ASTM D523                       | Standard Test Method for Specular Gloss                                                                                                                     |
| ASTM D968                       | Standard Test Methods for Abrasion Resistance of Organic Coatings by Falling Abrasive                                                                       |
| ASTM D2244                      | Standard Practice for Calculation of Color Tolerances and Color Differences from Instrumentally Measured Color Coordinates                                  |





Roll Formed Aluminum and Steel Cladding  
Industry-Wide EPD



According to ISO 14025,  
EN 15804 and ISO 21930:2017

|                         |                                                                                                      |
|-------------------------|------------------------------------------------------------------------------------------------------|
| 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                  |
| <b>Fire Performance</b> |                                                                                                      |
| ASTM E84                | Standard Test Method for Surface Burning Characteristics of Building Materials                       |
| ASTM E119               | Standard Test Methods for Fire Tests of Building Construction and Materials                          |
| ASTM E631               | Standard Terminology of Building Constructions                                                       |

**Model Codes or Standards**

- International Building Code
- Local Building Code
- ASCE/SEI 7 – Minimum Design Loads for Buildings and Other Structures
- UL-Building Materials Directory
- UL- Fire Resistance Directory
- ASHRAE, TIMA –[Handbook of Fundamentals & Insulation Requirements]
- SMACNA, [Architectural Sheet Metal Manual – Gutter design and flashing details]
- (FS HH-I-521)(FS HH-I-558b)-[Fiberglass Insulation]
- FS HH-I-1972)-([Insulation Board Thermal Faced, Polyurethane or Polyisocyanurate])
- FMRC-Approval Guide
- FMRC-Specification Tested Products Guide
- ANSI B18.6.4 –[Steel Self-Tapping Screw Standard]
- SAE J78 Self Drilling Tapping Screws
- MCA Technical Bulletin, Fastener Selection Guidelines, 2008
- AAMA 501-[Method of Test for Metal Curtain Walls]

1.6. Properties of Declared Product as Delivered

Manufacturers supply roll formed steel products in a variety of sizes and configurations customized to each project’s requirements. The data for this EPD is representative of panels offered by the participating manufacturers. Technical properties of panel products under study can be seen in Table 3.





Roll Formed Aluminum and Steel Cladding  
Industry-Wide EPD



According to ISO 14025,  
EN 15804 and ISO 21930:2017

**Table 3: Product properties**

| PARAMETER                   | VALUE       | UNIT                |
|-----------------------------|-------------|---------------------|
| Length                      | 1 – 15      | m                   |
| Width                       | 0.3 – 0.91  | m                   |
| Thickness                   | 0.38 – 0.76 | mm                  |
| Density                     | 7850        | kg / m <sup>3</sup> |
| Tensile strength            | 350 – 550   | MPa                 |
| Modulus of elasticity       | 200,000     | MPa                 |
| Airborne sound reduction    | 10 – 20     | dB                  |
| Noise reduction coefficient | 10 – 15     | %                   |

## 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.

## 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 panels can be factory-formed, as seen in Figure 1, or formed on the jobsite using a mobile roll former, as seen in Figure 2, or a combination of both.





Roll Formed Aluminum and Steel Cladding  
Industry-Wide EPD



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EN 15804 and ISO 21930:2017



Figure 1: Inline Roll Former



Figure 2: Mobile Roll Former

Figure 3 shows a detailed roll formed cladding manufacturing process.





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Industry-Wide EPD



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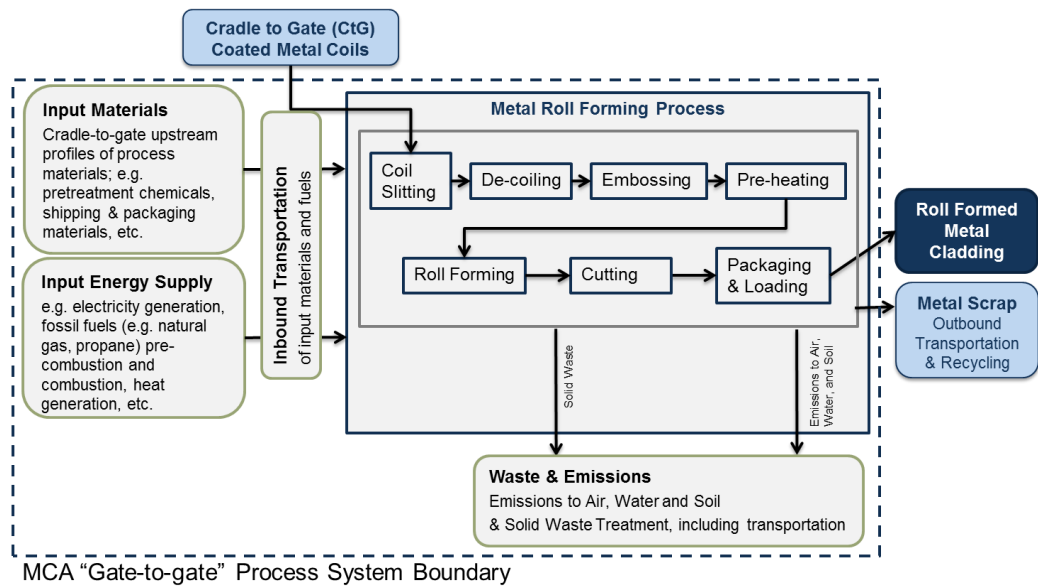


Figure 3: Roll formed cladding manufacturing process

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.



Figure 4: Types of roll forming profiles

1.9. Packaging

Foam sheets are layered between roll formed cladding before the products are stacked on wooden pallets and





Roll Formed Aluminum and Steel Cladding  
Industry-Wide EPD



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EN 15804 and ISO 21930:2017

expanded polystyrene underlayment and wrapped in polyethylene film. Figure 5 shows an example of packaged roll formed product.



Figure 5: Packaging process for roll formed product

1.10. Product Average

This declaration covers roll formed aluminum and steel cladding products manufactured by 6 different participating MCA member companies, representing a significant majority of annual production in the US and Canada, as seen in Table 4.

Table 4: Products by manufacturer

| COMPANY                       | MANUFACTURING LOCATION | STEEL | ALUMINUM |
|-------------------------------|------------------------|-------|----------|
| ATAS International, Inc.      | Morrisville, PA        | X     | X        |
| Dimensional Metals, Inc.      | Columbus, OH           | X     | X        |
| Englert                       | Perth Amboy, NJ        | X     | X        |
| Fabral                        | Jackson, GA            | X     | X        |
| McElroy                       | Peachtree City, GA     | X     |          |
| Petersen Aluminum Corporation | Elk Grove Village, IL  | X     | X        |

1.11. Transportation

Average transportation distances and modes of transport are included for the transport of the raw materials, operating materials, and auxiliary materials to production and assembly facilities.

2. Life Cycle Assessment Background Information

2.1. Declared Unit

The main purpose of metal cladding and panels is to provide weather protection for building walls and roofs. The





panels create barriers that control noise, water, and air transmission between an external environment and interior building space. Accordingly, the PCR’s functional unit for metal panels, metal composite panels, and metal cladding is the coverage of 100 square meters (1076.4 square feet) of building area. 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 5: Reference flows

| NAME                                    | ROLL FORM, STEEL | ROLL FORM, ALUMINUM |
|-----------------------------------------|------------------|---------------------|
| Declared unit [m <sup>2</sup> ]         | 100              | 100                 |
| Product mass [kg / 100 m <sup>2</sup> ] | 277              | 491                 |

2.2. System Boundary

A “cradle-to-gate” life cycle analysis was conducted. Within these boundaries, only the product stage (A1 – A3)—raw material supply, inbound transport of raw materials to manufacturing facility, manufacturing—is considered. The construction stage (A4 – A5), building use stage (B1 - B7), and end-of-life phase (C1 - C4) were not assessed, nor were the construction and maintenance of capital equipment (e.g., production equipment). Additionally, human labor and employee commute were not included in the analysis.

2.3. Estimates and Assumptions

This study was based on primary data collected at MCA member company facilities. Datasets selected to represent the production of raw materials by upstream suppliers are based on regional or global averages rather than on primary data collected directly from member company supply chains. When selecting these datasets, a conservative approach was applied in that datasets associated with higher impacts are used when there are multiple possible options.

Secondly, this study was conducted in accordance with a PCR. While this guidance document has been developed by industry experts to best represent this product system, real life environmental impacts of metal panel and cladding products may extend beyond those defined in this document.

2.4. Cut-off Criteria

Data were included whenever possible. If it was necessary to exclude materials in order to facilitate the analysis, only flows representing less than 1% of the cumulative mass of the product system were excluded, providing their environmental relevance was judged not to be a concern.

Packaging of incoming raw materials (e.g. pallets, totes, super-sacks) are excluded as they represent less than 1% of the product mass and are not environmentally relevant. Capital goods and infrastructure required to produce metal panel and cladding products are presumed to produce millions of units to over the course of their life, so impact of a single functional unit attributed to this equipment is negligible; therefore, capital goods and infrastructure were excluded from this study.

2.5. Data Sources

As a general rule, specific data derived from specific production processes or average data derived from specific



Roll Formed Aluminum and Steel Cladding  
Industry-Wide EPD



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production processes shall be the first choice as a basis for calculating LCA results.

For life cycle modeling of the considered products, the GaBi Software System for Life Cycle Engineering, developed by thinkstep AG, was used to model the product systems considered in this assessment. All relevant background datasets were taken from the GaBi 2019 software database (service pack 37). The datasets from the GaBi database are documented in the online documentation (thinkstep, 2018). To ensure comparability of results in the LCA, the basic data of GaBi database were used for energy, transportation and auxiliary materials.

The worldsteel global average data were used for galvanized steel coil background data, with coil coating data obtained from MCA.

## 2.6. Data Quality

A variety of tests and checks were performed throughout the project to ensure high quality of the completed LCA. Checks included an extensive review of project-specific LCA models as well as the background data used.

### Temporal Coverage

All of the primary data is taken from 12 months of continuous operation in the 2017 fiscal year. All secondary data were obtained from the GaBi 2019 databases and published EPDs. Data are representative of the years 2010 to 2018

### Geographical Coverage

All primary and secondary data were collected specific to the countries or regions under study. Where country-specific or region-specific data were unavailable, proxy data were used.

### Technological Coverage

All primary and secondary data were modeled to be specific to the technologies or technology mixes under study. Where technology-specific data were unavailable, proxy data were used.

## 2.7. Reference Period

Data providers were asked to provide annual data for 2017.

## 2.8. Allocation

Since only facility level data were available, input and output flows were allocated among each facility's co-products to determine the flows associated with the products analyzed. Allocation of materials was done on an area-basis as appropriate.

End-of-life allocation generally follows the requirements of ISO 14044, section 4.3.4.3 and the product category rule. (UL Environment, 2018) Under the PCR, the product life cycle is modeled using the cut-off approach. Scrap inputs to manufacturing are reported under the secondary materials metric. The system boundary at end-of-life is drawn after scrap collection to account for the collection rate. This generates a scrap output flow that is reported under the materials for recycling metric.

Processing and recycling of the net amount of scrap leaving the system (i.e., scrap outputs minus secondary material inputs) is not included in this study.





Roll Formed Aluminum and Steel Cladding  
Industry-Wide EPD



According to ISO 14025,  
EN 15804 and ISO 21930:2017

## 2.9. Comparability

No comparisons or benchmarking is included in this EPD. LCA results across EPDs can be calculated with different background databases, modeling assumptions, geographic scope and time periods, all of which are valid and acceptable according to the Product Category Rules (PCR) and ISO standards. Caution should be used when attempting to compare EPD results.

## 3. Scenarios and Additional Technical Information

This EPD represents a cradle-to-gate analysis; as such, no additional information is provided as the downstream modules are not declared.

## 4. Life Cycle Assessment Results

Cradle-to-gate life cycle impact assessment results are shown for TRACI 2.1 characterization factors. These results are relative expressions and do not predict impacts on category endpoints such as human health or ecosystem quality, the exceeding of thresholds, safety margins, or risks.

With respect to global warming potential, biogenic carbon is not considered as the declared products only use biogenic materials for packaging. For packaging, no credit was given for the sequestration of biogenic carbon during the growth of plants used in plant-derived packaging materials. Any carbon temporarily sequestered during the use of bio-based materials is assumed to be re-released to the atmosphere upon their decomposition. Since the lifetime of plant-derived packaging materials is shorter than the 100 year time horizon of this impact category (GWP 100), GWP including biogenic carbon is not reported.



# ENVIRONMENTAL PRODUCT DECLARATION



Roll Formed Aluminum and Steel Cladding  
Industry-Wide EPD



According to ISO 14025,  
EN 15804 and ISO 21930:2017

## 4.1. Life Cycle Impact Assessment Results

**Table 6: North American Impact Assessment Results – Aluminum roll formed cladding**

| PARAMETER | UNIT                     | TOTAL           | A1       | A2       | A3       |
|-----------|--------------------------|-----------------|----------|----------|----------|
| GWP       | [kg CO <sub>2</sub> eq.] | <b>1.86E+03</b> | 1.83E+03 | 3.91E+00 | 2.35E+01 |
| ODP       | [kg CFC-11 eq.]          | <b>1.86E-05</b> | 1.86E-05 | 0.00E+00 | 0.00E+00 |
| AP        | [kg SO <sub>2</sub> eq.] | <b>9.12E+00</b> | 9.07E+00 | 1.44E-02 | 3.57E-02 |
| EP        | [kg N eq.]               | <b>2.27E-01</b> | 2.23E-01 | 1.29E-03 | 3.60E-03 |
| SFP       | [kg O <sub>3</sub> eq.]  | <b>9.17E+01</b> | 9.08E+01 | 3.24E-01 | 5.62E-01 |
| ADPF      | Surplus MJ               | <b>2.10E+03</b> | 2.06E+03 | 7.69E+00 | 2.82E+01 |

**Table 7: North American Impact Assessment Results – Steel roll formed cladding**

| PARAMETER | UNIT                     | TOTAL           | A1       | A2       | A3       |
|-----------|--------------------------|-----------------|----------|----------|----------|
| GWP       | [kg CO <sub>2</sub> eq.] | <b>1.53E+03</b> | 1.51E+03 | 7.07E+00 | 1.93E+01 |
| ODP       | [kg CFC-11 eq.]          | <b>1.88E-05</b> | 1.88E-05 | 0.00E+00 | 0.00E+00 |
| AP        | [kg SO <sub>2</sub> eq.] | <b>4.00E+00</b> | 3.95E+00 | 3.36E-02 | 2.60E-02 |
| EP        | [kg N eq.]               | <b>1.80E-01</b> | 1.75E-01 | 2.81E-03 | 2.43E-03 |
| SFP       | [kg O <sub>3</sub> eq.]  | <b>6.49E+01</b> | 6.37E+01 | 7.65E-01 | 4.27E-01 |
| ADPF      | Surplus MJ               | <b>7.20E+02</b> | 6.85E+02 | 1.39E+01 | 2.12E+01 |

## 4.2. Life Cycle Inventory Results – Steel roll formed cladding

**Table 8: Resource Use – Aluminum roll formed cladding**

| PARAMETER | UNIT      | TOTAL           | A1       | A2       | A3       |
|-----------|-----------|-----------------|----------|----------|----------|
| RPRE      | [MJ, LHV] | <b>9.29E+03</b> | 9.26E+03 | 1.79E+00 | 2.39E+01 |
| RPRM      | [MJ, LHV] | <b>9.09E+02</b> | 9.09E+02 | 0.00E+00 | 0.00E+00 |
| RPRT      | [MJ, LHV] | <b>1.02E+04</b> | 1.02E+04 | 1.79E+00 | 2.39E+01 |
| NRPRE     | [MJ, LHV] | <b>2.36E+04</b> | 2.31E+04 | 5.78E+01 | 4.95E+02 |
| NRPRM     | [MJ, LHV] | <b>1.49E+02</b> | 1.49E+02 | 0.00E+00 | 0.00E+00 |
| NRPRT     | [MJ, LHV] | <b>2.38E+04</b> | 2.32E+04 | 5.78E+01 | 4.95E+02 |
| SM        | [kg]      | <b>2.06E+02</b> | 2.06E+02 | 0.00E+00 | 0.00E+00 |
| RSF       | [MJ, LHV] | <b>0.00E+00</b> | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| NRSF      | [MJ, LHV] | <b>0.00E+00</b> | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| RE        | [MJ, LHV] | <b>0.00E+00</b> | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| FW        | [m3]      | <b>3.57E+01</b> | 3.56E+01 | 6.93E-03 | 1.07E-01 |

**Table 9: Resource Use – Steel roll formed cladding**

| PARAMETER | UNIT      | TOTAL           | A1       | A2       | A3       |
|-----------|-----------|-----------------|----------|----------|----------|
| RPRE      | [MJ, LHV] | <b>7.26E+02</b> | 7.05E+02 | 3.23E+00 | 1.82E+01 |
| RPRM      | [MJ, LHV] | <b>7.92E+02</b> | 7.92E+02 | 0.00E+00 | 0.00E+00 |
| RPRT      | [MJ, LHV] | <b>1.52E+03</b> | 1.50E+03 | 3.23E+00 | 1.82E+01 |



# ENVIRONMENTAL PRODUCT DECLARATION



Roll Formed Aluminum and Steel Cladding  
Industry-Wide EPD



According to ISO 14025,  
EN 15804 and ISO 21930:2017

|       |           |          |          |          |          |
|-------|-----------|----------|----------|----------|----------|
| NRPRE | [MJ, LHV] | 1.73E+04 | 1.69E+04 | 1.04E+02 | 3.29E+02 |
| NRPRM | [MJ, LHV] | 5.53E+01 | 5.53E+01 | 0.00E+00 | 0.00E+00 |
| NRPRT | [MJ, LHV] | 1.74E+04 | 1.69E+04 | 1.04E+02 | 3.29E+02 |
| SM    | [kg]      | 3.57E+01 | 3.57E+01 | 0.00E+00 | 0.00E+00 |
| RSF   | [MJ, LHV] | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| NRSF  | [MJ, LHV] | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| RE    | [MJ, LHV] | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| FW    | [m3]      | 3.17E+00 | 3.09E+00 | 1.25E-02 | 6.48E-02 |

Table 10: Output Flows and Waste Categories – Aluminum roll formed cladding

| PARAMETER | UNIT | TOTAL    | A1       | A2       | A3       |
|-----------|------|----------|----------|----------|----------|
| HWD       | [kg] | 7.52E-02 | 7.52E-02 | 4.68E-07 | 1.65E-07 |
| NHWD      | [kg] | 4.89E+02 | 4.88E+02 | 2.18E-03 | 2.20E-01 |
| HLRW      | [kg] | 1.76E-03 | 1.67E-03 | 1.54E-07 | 8.80E-05 |
| ILLRW     | [kg] | 2.97E-02 | 2.72E-02 | 4.16E-06 | 2.43E-03 |
| CRU       | [kg] | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| MFR       | [kg] | 1.01E+01 | 0.00E+00 | 0.00E+00 | 1.01E+01 |
| MER       | [kg] | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| EE        | [MJ] | 1.58E-03 | 1.58E-03 | 0.00E+00 | 0.00E+00 |

Table 11: Output Flows and Waste Categories – Steel roll formed cladding

| PARAMETER | UNIT | TOTAL    | A1       | A2       | A3       |
|-----------|------|----------|----------|----------|----------|
| HWD       | [kg] | 1.62E-03 | 1.61E-03 | 8.45E-07 | 1.40E-07 |
| NHWD      | [kg] | 6.68E+01 | 6.67E+01 | 3.93E-03 | 1.01E-01 |
| HLRW      | [kg] | 1.20E-04 | 8.25E-05 | 2.79E-07 | 3.73E-05 |
| ILLRW     | [kg] | 1.70E-03 | 6.64E-04 | 7.52E-06 | 1.03E-03 |
| CRU       | [kg] | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| MFR       | [kg] | 1.96E+01 | 0.00E+00 | 0.00E+00 | 1.96E+01 |
| MER       | [kg] | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| EE        | [MJ] | 2.17E-03 | 2.17E-03 | 0.00E+00 | 0.00E+00 |





Roll Formed Aluminum and Steel Cladding  
Industry-Wide EPD



According to ISO 14025,  
EN 15804 and ISO 21930:2017

## 5. LCA Interpretation

Nearly the entirety of burdens for all categories fall within module A1 (production of raw materials). Within raw materials production, the majority of impact categories are driven by the production of aluminum and steel.

Though some raw materials are transported vast distances, the inbound transportation module (A2) has a modest contribution to overall impact.

## 6. References

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## ENVIRONMENTAL PRODUCT DECLARATION



Roll Formed Aluminum and Steel Cladding  
Industry-Wide EPD



According to ISO 14025,  
EN 15804 and ISO 21930:2017

### 7. Contact Information

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#### 8.1. Study Commissioner

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#### 8.2. LCA Practitioner

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