ENVIRONMENTAL PRODUCT DECLARATION

ALUMINUM EXTRUSIONS

MILL-FINISHED, ANODIZED, AND PAINTED

Oldcastle BuildingEnvelope® aluminum extrusions are precision-engineered to meet the highest quality standards while ensuring industry-leading performance to contribute to resilient, healthy buildings.

Oldcastle BuildingEnvelope®

Oldcastle BuildingEnvelope® is the leading supplier of value-added, glazing-focused interior and exterior products and services in North America.

An Oldcastle BuildingEnvelope® team of experts engineer, test and manufacture solutions to bring buildings projects to life. This includes curtain walls, skylights, storefronts and entrances, architectural glass, glazing hardware, sun controls, interior partitions and more.

With the industry's largest national footprint, Oldcastle BuildingEnvelope® products have been used to achieve sustainability objectives for decades. From providing ample daylighting to improving the thermal performance of buildings, our integrated solutions artfully balance performance and aesthetics.

For more information, visit www.obe.com

UL CERTIFIED ENVIRONMENTAL PRODUCT DECLARATION UL.COM/EPD

ENVIRONMENTAL PRODUCT DECLARATION

Oldcastle BuildingEnvelope®

Mill-finished, Anodized and Painted Aluminum Extrusions
Products of Aluminum and Aluminum Alloys

According to ISO 14025, ISO21930:2017

EPD PROGRAM AND PROGRAM OPERATOR NAME, ADDRESS, LOGO, AND WEBSITE	UL Solutions www.spot.ul.com 333 Pfginsten Rd, Northbrook IL, 60062 www.ul.com
GENERAL PROGRAM INSTRUCTIONS AND VERSION NUMBER	UL Solutions Program Operator Rules v.2.7 2022
MANUFACTURER NAME AND ADDRESS	Oldcastle BuildingEnvelope®, 5430 LBJ Freeway, Suite 900, Dallas 75240
DECLARATION NUMBER	4791914422.101.1
DECLARED PRODUCT & FUNCTIONAL UNIT OR DECLARED UNIT	Mill-finished, Anodized and Painted Aluminum Extrusions, 1,000 kg (1 metric ton)
REFERENCE PCR AND VERSION NUMBER	Part A: Calculation Rules for the LCA and Requirements Project Report v4 Part B: Aluminum Construction Products v2
DESCRIPTION OF PRODUCT APPLICATION/USE	Architectural windows, curtain wall, window wall, storefronts, entrances, skylights, sun controls, interior partitions, hurricane-resistant, and delayed forced-entry systems.
PRODUCT RSL DESCRIPTION (IF APPL.)	N/A
MARKETS OF APPLICABILITY	North America
DATE OF ISSUE	October 31st, 2025
PERIOD OF VALIDITY	5 years
EPD TYPE	Product-specific
EPD SCOPE	Cradle to gate with options (A1-A3, C1-C4, and D)
YEAR(S) OF REPORTED PRIMARY DATA	2024
LCA SOFTWARE & VERSION NUMBER	Sphera LCA FE 10.9
LCI DATABASE(S) & VERSION NUMBER	Sphera MLC 2025.1
LCIA METHODOLOGY & VERSION NUMBER	IPCC AR6, TRACI 2.1, and CML-IA v.2016
The PCR review was conducted by:	UL Solutions PCR Review Panel Epd@ul.com
This declaration was independently verified in accordance with ISO 14025: 2006. ☐ INTERNAL ☐ EXTERNAL	Cooper McCollum, UL Solutions
This life cycle assessment was conducted in accordance with ISO 14044 and the reference PCR by:	WAP Sustainability
This life cycle assessment was independently verified in accordance with ISO 14044 and the reference PCR by:	Ik-Kim

LIMITATIONS

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

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

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

1. Product Definition and Information

1.1. Description of Company/Organization

Oldcastle BuildingEnvelope is the leading supplier of value-added, glazing-focused interior and exterior products and services in North America. Aluminum extrusion production facilities in North America, which are represented in this EPD, are located in Terrell, Texas and Midway, Tennessee.

Both Terrell and Midway facilities follow recognized industry standards:

- ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes. This specification includes guidelines regarding chemical compositions, manufacturing practices, mechanical properties and end product testing procedures.
- ASTM B807/B807M - Standard Practice for Extrusion Press Solution Heat Treatment for Aluminum Alloys.
- This specification establishes the controls required for extrusion press solution heat treatment of the 6xxx and 7xxx series aluminum alloys.
- AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum. This specification describes test procedures and requirements for architectural quality aluminum oxide coatings applied to aluminum extrusions and panels for architectural products.
- AAMA 2603 - Voluntary Specification, Performance Requirements and Test Procedures for Pigmented Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix).
- AAMA 2604 - Voluntary Specification, Performance Requirements and Test Procedures for High Performance Pigmented Organic Coatings on Aluminum Extrusions and Panels. This specification covers high performance organic coatings which are used on products produced by Oldcastle BuildingEnvelope.
- AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Pigmented Organic Coatings on Aluminum Extrusions and Panels. This specification covers superior organic coatings which are used on products produced by Oldcastle BuildingEnvelope.

Recycling Program:

Both primary production facilities, Terrell and Midway, have a robust recycling program including both pre-consumer and post-consumer recycled content. On an annual basis, Oldcastle Building Envelope utilizes recycled billet in a minimum of 21% of the aluminum produced. This recycled billet typically contains 50% pre-consumer recycled content and 25% post-consumer recycled content.

Pre-consumer recycled content results from Oldcastle BuildingEnvelope aluminum extrusion production which has built-in scrap that includes a percentage of the billet not extruded to concentrate impurites, end trimmings, start up parts, trimmed anodize rack mark, etc. This scrap is captured and sent to a local remelter where the scrap is processed and refined. This material is returned to Oldcastle Building Envelope for use in LEED specified projects along with regular products.

Reuse of Other Waste Streams:

Oldcastle BuildingEnvelope also captures other waste streams for reuse, including:

- Incoming paper products (cardboard, kraft paper, office paper) are gathered to be sent to recyclers
- Steel left over from project or maintenance activities is sent into the steel recycling supply chain

- Solvents from the painting process go into a fuels program for cement production
- Various oils from maintenance activities are sent to an oil recycler
- Water used in the anodizing and paint pretreatment processes is cleaned in in-house water treatment plants and returned to the environment for reuse. The water meets strict quality standards with monitoring being conducted both in-house and by local regulatory agencies. This water flows back into local reservoirs that support healthy sport fishing hatcheries and regional drinking water sources.

1.2. Product Description

Product Identification

This EPD covers the production of aluminum extrusions with the following finish options: mill-finished, anodized or painted. The results for each product type are calculated for the production-weighted average for Oldcastle BuildingEnvelope sites in North America.

The manufacturing process is detailed under the manufacturing section and is represented, at a high level, in the product flow diagram shown in Figure 1.

Flow Diagram

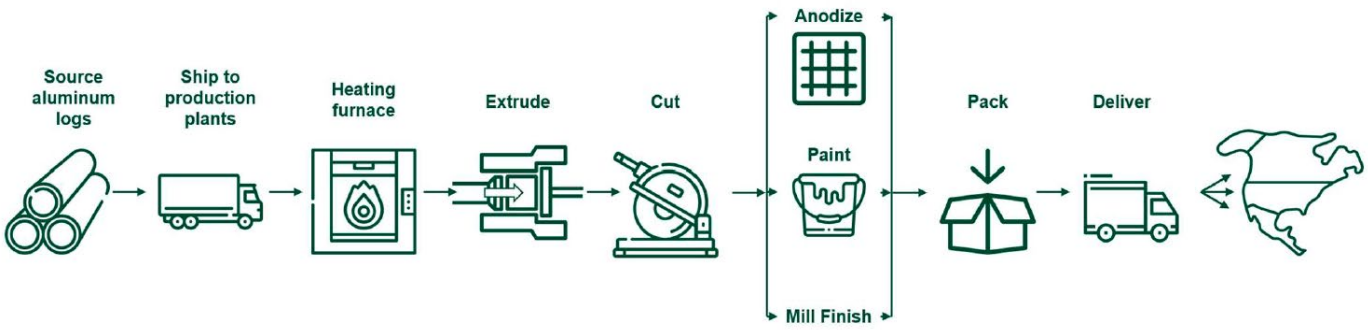

Figure 1. Product Flow Diagram

Product Average

The 2024 production data used in this EPD considers all extruded aluminum products produced by Oldcastle BuildingEnvelope during the year. The products are manufactured at two facilities in Texas and Tennessee. Results are weighted according to production totals at the two locations based on the 2024 data.

1.3. Application

Oldcastle Building Envelope aluminum extrusions are utilized in a wide variety of interior and exterior architectural glazing applications, including: curtain walls, window walls, commercial and architectural windows, storefront framing systems, sun controls and shading devices, entrances/doors, skylights, hurricane resistant systems, delayed-forced-entry systems and interior systems.

1.4. Technical Requirements

Technical data for the studied products can be found in the table below.

Table 1. Technical Data for 6063-T5 and 6063-T6 Aluminum Products

NAME	VALUE	UNIT
Density[1]	2.7 x 10^3	kg/m^3
Melting point[2]	616 – 654	˚C
Electrical conductivity at 20˚C[2,4,5]	53, 55	% of IAC[3]
Thermal conductivity[4,5]	208, 200	W/(m.K)
Coefficient of thermal expansion	23 x 10^{-6}	m/m.˚C
Modulus of elasticity[6]	69 x 10^3	N/mm^2
Shear modulus[7]	25.8 x 10^3	N/mm^2
Specific heat capacity[8]	960	J/kg.˚C
Hardness, Brinell number[6]	60, 73	HB
Yield strength[9,4,5]	103, 172[9]	N/mm^2
Ultimate tensile strength[9,4,5]	145, 206	N/mm^2
Breaking elongation[9]	8%	%
Chemical composition[10]	98.9%	% by mass

1.5. Properties of Declared Product as Delivered

The output of the extrusion process is a fabricated aluminum extrusion that can be mill-finish or surface finished, and is ready for additional fabrication or installation on an architectural project. Oldcastle BuildingEnvelope extrusions are either standardized or custom designs for specific end-use applications. Extrusions vary in shape, size and thickness depending on the product and application.

1.6. Material Composition

The extrusions are composed of primarily 6063 series alloy with a small amount (<1%) of 6005 or 6061 series alloy.

- Anodizing contains <0.01% of Tin on color anodizing and <0.01% of Nickel Acetate on all finishes as part of the sealing process.
- Typical paint coatings are 1.2 mils in a typical 80 mils thick extrusion (0.080").

The surface treatment processes alter the material content of the finished extrusions, and the material breakdown is presented in Table 2 below.

Table 2. Material Composition of Aluminum Products

[1] The Aluminum Association, Aluminum Standards and Data 2017 Table 2.4
[2] The Aluminum Association, Aluminum Standards and Data 2017 Table 2.3
[3] Percent of International Annealed Copper by equal volume
[4] Values for 6063-T5 Aluminum. Yield and tensile strength are aluminum with diameter, thickness, or minimum distance across flats of 12.7 mm – 25.4mm (0.501 – 1.000 in)
[5] Values for 6063-T6 Aluminum. Yield and tensile strength are aluminum with diameter, thickness, or minimum distance across flats up through 25.4 mm (1.000 in)
[6] The Aluminum Association, Aluminum Standards and Data 2017 Table 2.1
[7] The Aluminum Design Manual 2010 Table A.3.4
[8] The Aluminum Design Manual 2010 4.2.3.3
[9] The Aluminum Association, Aluminum Standards and Data 2017 Table 11.1
[10] The Aluminum Association, Aluminum Standards and Data 2017 Table 1.1

MATERIAL	EXTRUSION, MILL-FINISHED	EXTRUSION, ANODIZED*	EXTRUSION, PAINTED
Aluminum (includes alloying agents)	100%	100%	93%
Paint (solvent-based)	-	-	6%
Primer (solvent-based)	-	-	1%

**Anodization chemicals do not adhere to the extrusion.*

1.7. Manufacturing

The manufacturing stage starts with extraction and processing of aluminum logs and ancillary materials, followed by the transportation of these materials to Oldcastle BuildingEnvelope plants.

Mill-finished Extrusion

The extrusion manufacturing process produces extruded profiles from cast billet. The process begins with a furnace that elevates the temperature of the billet to a predetermined level, depending on the alloy and the profile. Oldcastle BuildingEnvelope utilizes a combination of hot billet saws and shears to cut billets to size in-process, which minimizes in-process scrap. Next the billets are placed into the hydraulic powered extrusion press, which forces the heated billet through a heated steel die to form the desired shape. The extrusions are air cooled or water quenched, with specific quench parameters dependent on alloy and desired properties. The extrusion is then clamped and stretched to straighten the profile.

The straightened lengths are cut to length and then aged in an oven to achieve the desired temper. Subsequently, the profile lengths are packed for shipment, sent for surface finishing, and/or further fabricated (e.g. cut to smaller, precise lengths, thermally enhanced, machined, bent, punched, etc.). Any finishing or fabrication is dependent on customer specifications. Any further fabrication as noted above is outside the scope of this study, as is any finishing (painting or anodizing) performed by a third party.

Anodizing

Extrusions undergoing the anodizing process are cleaned and etched in a series of baths. Subsequently, they are immersed in an acid electrolyte bath and an electrical current is passed through the solution. A cathode is mounted to the inside of the anodizing tank, while the aluminum extrusions act as the anode. Oxygen ions are released from the electrolyte and combine with aluminum atoms at the surface of the extrusion being anodized. This creates a durable aluminum oxide layer fully integrated with the underlying aluminum. Colorants can subsequently be added. The final step is a sealing stage to enhance durability.

Painting

Extrusions to be painted are typically cleaned and then treated with a pre-treatment to enhance adhesion in a horizontal paint booth. After pre-treatment, the extrusions will be coated with a liquid paint and baked. Various primer and paint formulations may be used depending on the desired performance.

1.8. Packaging

Oldcastle BuildingEnvelope aluminum extrusions are custom bundled utilizing plastic bands or tape depending on the automation level applicable to the product. Each bundle is separated in the carton dependent on material finish, paper for anodized and foam for painted materials. The bundles are then packed in plain cardboard that are either fan-folded on manual tables or machine-cut-to-size. Cardboard cartons are secured with plastic strapping, tape or wood-blocks with plastic bands prior to shipping and dependent on product sizing and needs.

The fanfold and cardboard used in packaging contains 30% post-consumer recycled material, and the craft paper used to separate material in the boxes and bundles is 95% post-consumer recycled.
Once products are delivered, all packaging materials used, as described above, can be 100% recycled at an available recycling facility in the area. Approximately >95% of packaging, by weight, is cardboard, paper and wood which are more commonly accepted at recycling facilities. The remaining <5% consists of plastic banding, plastic strapping, foam sheeting and ancillary tape or glue which can be recycled at polymer recycling facilities. End-of-life for packaging is outside of the scope of this EPD.

1.9. Transportation

Transportation to the customer or construction site is outside of the scope of this EPD.

1.10. Product Installation

Installation is outside of the scope of this EPD.

1.11. Use

Product use is outside of the scope of this EPD.

1.12. Reuse, Recycling, and Energy Recovery

Aluminum is a highly recyclable material that can be recycled repeatedly. OBE's aluminum products are recycled at the industry average 95% rate, with the remaining (approximately 5%) of extruded aluminum products not recycled are landfilled, according to the Part B PCR.

While there is potential for reuse of the extrusions at end-of-life, there is no reuse or take-back program in place for the products at this time. There is no potential for energy recovery from incineration of aluminum extrusions.

1.13. Disposal

Using the above assumption at product end-of-life, approximately 5% of extruded aluminum products not recycled are landfilled.

2. Life Cycle Assessment Background Information

2.1. Declared Unit

The declared unit is 1 metric ton (1,000 kg) of aluminum extrusion.

Table 3. Declared Unit Information

NAME	VALUE	UNIT
Declared unit	1	metric ton
Conversion factor to 1 kg	0.001	-

2.2. System Boundary

Per the PCR, this cradle-to-gate analysis provides information on the product stage of the aluminum product life cycle, including modules A1-A3. End-of-life stages C1-C4 and benefits and loads beyond the system boundary (module D) are included:

- A1: Extraction and upstream production
- A2: Transport to the factory
- A3: Manufacturing
- C1: Deconstruction
- C2: Transport to end-of-life processing
- C3: Waste processing
- C4: Disposal of waste
- D: Benefits and loads beyond the system boundary

Table 4. Description of the system boundary modules

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

X: module declared, ND module not declared

2.3. Estimates and Assumptions

This EPD is based on primary data collected at Oldcastle Building Envelope's facilities. As such, the 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 from the supply chain. The results represent the production of an average Oldcastle BuildingEnvelope aluminum extrusion, but do not necessarily represent the results of any individual extrusion produced at Oldcastle BuildingEnvelope.

The underlying study was conducted in accordance with the PCR. While this EPD has been developed by industry experts to best represent the product system, real life environmental impacts of aluminum extrusions may extend beyond those defined in this document.

2.4. Cut-off Criteria

Cumulative excluded material inputs, energy inputs, and environmental impacts must not exceed 5% based on total weight, energy use, or environmental impact of the declared unit.

The list of excluded inputs include:

- Items like labels, inks, stickers, adhesives, etc. may have been excluded from the product and packaging BOMs due to their small mass compared to the total product and packaging.
- Some material and energy inputs may have been excluded within the MLC datasets used for this project. All MLC datasets have been critically reviewed and conform to the exclusion requirements of the PCR.

2.5. Data Sources

Primary data were collected by facility personnel and from utility bills and was used for all manufacturing processes. When primary data did not exist, secondary data was utilized from Sphera Managed LCA Content 2025.1.

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 review of project-specific LCA models and of the background data used.

Temporal coverage
The data are intended to represent extruded aluminum production during the 2024 calendar year. As such, Oldcastle BuildingEnvelope provided primary data for 12 consecutive months during the 2024 calendar year. These data were then used to calculate average production values for each company.

Geographical coverage
This background LCA represents Oldcastle BuildingEnvelope's product produced in the United States from global aluminum suppliers. Primary data are representative of these countries. Regionally specific datasets, where available, were used to represent each manufacturing location's energy consumption. Proxy datasets were used as needed for raw material inputs to address lack of data for a specific material or for a specific geographical region. These proxy datasets were chosen for their technological representativeness of the actual materials.

Technological coverage
Data on material composition were collected directly from Oldcastle BuildingEnvelope. Manufacturing data were provided by Oldcastle Building Envelope for the extruded aluminum products. Waste, emissions, and energy use are calculated from reported annual production during the reference year.

2.7. Period under Review

Primary data collected represent product during the 2024 calendar year. This analysis is intended to represent production in 2025.

2.8. Allocation

No multi-output allocation of foreground processes was necessary for this EPD. There were no co-products generated during the manufacturing processes that were relevant to outside product systems. End-of-life allocation generally follows the requirements of ISO 14044, section 4.3.4.3. This study uses the net scrap allocation approach and reports credits in module D.

3. Life Cycle Assessment Scenarios

Table 5. End of life (C1-C4)

NAME		MILL-FINISHED EXTRUSIONS	ANODIZED EXTRUSIONS	PAINTED EXTRUSIONS	UNIT
Assumptions for scenario development (description of deconstruction, collection, recovery, disposal method and transportation)					
Collection process (specified by type)	Collected separately	0.00	0.00	0.00	kg
	Collected with mixed construction waste	1,000	1,000	1,000	kg
Recovery (specified by type)	Reuse				kg
	Recycling	950	950	950	kg
	Landfill	50	50	50	kg
	Incineration	0.00	0.00	0.00	kg
	Incineration with energy recovery	-	-	-	kg
	Energy conversion efficiency rate	-	-	-	-
Disposal (specified by type)	Product or material for final deposition	50	50	50	kg
Removals of biogenic carbon (excluding packaging)		0.00	0.00	0.00	kg CO_2

Table 6. Reuse, recovery and/or recycling potentials (D), relevant scenario information

NAME	MILL-FINISHED EXTRUSIONS	ANODIZED EXTRUSIONS	PAINTED EXTRUSIONS	UNIT
Net energy benefit from energy recovery from waste treatment declared as exported energy in C3 (R>0.6)	0.00	0.00	0.00	MJ
Net energy benefit from thermal energy due to treatment of waste declared as exported energy in C4 (R<0.6)	0.00	0.00	0.00	MJ
Net energy benefit from material flow declared in C3 for energy recovery	0.00	0.00	0.00	MJ
Process and conversion efficiencies	100%	100%	100%	%
Further assumptions for scenario development (e.g. further processing technologies, assumptions on correction factors);				

4. Life Cycle Assessment Results

North American life cycle impact assessment (LCIA results are declared using TRACI 2.1, IPCC AR5 GWP and CML 2001 v.2016 methodologies. LCIA results are relative expressions and do not predict actual impacts, the exceeding of thresholds, safety margins or risks.

4.1. Mill-Finished Extrusions – Life Cycle Impact Assessment Results

Table 7. North American Impact Assessment Results

INDICATORS	A1-A3	C1	C2	C3	C4	D
IPCC AR5						
GWP incl. [kg CO_2 eq]	7.45E+03	0.00E+00	8.35E+00	0.00E+00	1.13E+00	-4.43E+03
GWP excl. [kg CO_2 eq]	7.54E+03	0.00E+00	8.30E+00	0.00E+00	1.14E+00	-4.43E+03
TRACI 2.1, CML						
AP [kg SO_2 eq]	2.62E+01	0.00E+00	2.33E-02	0.00E+00	7.07E-03	-2.07E+01
EP [kg N eq]	9.83E-01	0.00E+00	1.99E-03	0.00E+00	8.17E-04	-4.60E-01
ODP [kg CFC-11 eq]	1.52E-10	0.00E+00	3.69E-13	0.00E+00	2.34E-13	-1.32E-12
SFP [kg O_3 eq]	4.60E+02	0.00E+00	5.22E-01	0.00E+00	1.01E-01	-1.70E+02
ADP_{fossil} [MJ, LHV]	9.81E+04	0.00E+00	1.05E+02	0.00E+00	1.62E+01	-4.00E+04

Table 8. Resource Use, Waste and Output Flows

PARAMETER	A1-A3	C1	C2	C3	C4	D
Resource Use						
RPR_E [MJ, LHV]	1.53E+04	0.00E+00	4.39E+00	0.00E+00	2.38E+00	-2.87E+04
RPR_M [MJ, LHV]	8.51E+02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
$NRPR_E$ [MJ, LHV]	1.00E+05	0.00E+00	1.06E+02	0.00E+00	1.67E+01	-4.07E+04
$NRPR_M$ [MJ, LHV]	4.23E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
SM [kg]	7.37E+02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
RSF [MJ, LHV]	0.00E+00	0.00E+00	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	0.00E+00	0.00E+00
RE [MJ, LHV]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
FW [m^3]	4.15E+01	0.00E+00	4.74E-03	0.00E+00	1.82E-03	-9.58E+01
Output Flows & Waste						
HWD [kg]	3.87E-05	0.00E+00	1.75E-08	0.00E+00	4.00E-09	-2.51E-05
NHWD [kg]	2.02E+03	0.00E+00	1.08E-02	0.00E+00	1.00E+02	-1.73E+03
HLRW [kg]	9.84E-04	0.00E+00	4.31E-07	0.00E+00	2.09E-07	-3.50E-04
ILLRW [kg]	8.74E-01	0.00E+00	3.62E-04	0.00E+00	1.84E-04	-2.80E-01
CRU [kg]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MR [kg]	3.30E+02	0.00E+00	0.00E+00	9.50E+02	0.00E+00	0.00E+00
MER [kg]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
EE [MJ, LHV]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Table 9. Carbon Emissions and Removals

PARAMETER	A1-A3	C1	C2	C3	C4	D
BCRP [kg CO_2]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
BCEP [kg CO_2]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
BCRK [kg CO_2]	9.38E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
BCEK [kg CO_2]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
BCEW [kg CO_2]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CCE [kg CO_2]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CCR [kg CO_2]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CWNR [kg CO_2]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

4.2. Anodized Extrusions – Life Cycle Impact Assessment Results

Table 10. North American Impact Assessment Results

INDICATORS	A1-A3	C1	C2	C3	C4	D
IPCC AR5						
GWP incl. [kg CO_2 eq]	8.77E+03	0.00E+00	8.35E+00	0.00E+00	1.13E+00	-4.63E+03
GWP excl. [kg CO_2 eq]	8.86E+03	0.00E+00	8.30E+00	0.00E+00	1.14E+00	-4.63E+03
TRACI 2.1, CML						
AP [kg SO_2 eq]	2.87E+01	0.00E+00	2.33E-02	0.00E+00	7.07E-03	-2.16E+01
EP [kg N eq]	1.25E+00	0.00E+00	1.99E-03	0.00E+00	8.17E-04	-4.80E-01
ODP [kg CFC-11 eq]	2.66E-10	0.00E+00	3.69E-13	0.00E+00	2.34E-13	-1.38E-12
SFP [kg O_3 eq]	4.92E+02	0.00E+00	5.22E-01	0.00E+00	1.01E-01	-1.78E+02
ADP_{fossil} [MJ, LHV]	1.16E+05	0.00E+00	1.05E+02	0.00E+00	1.62E+01	-4.18E+04

Table 11. Resource Use, Waste and Output Flows

PARAMETER	A1-A3	C1	C2	C3	C4	D
Resource Use						
RPR_E [MJ, LHV]	2.02E+04	0.00E+00	4.39E+00	0.00E+00	2.38E+00	-2.99E+04
RPR_M [MJ, LHV]	8.51E+02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
$NRPR_E$ [MJ, LHV]	1.22E+05	0.00E+00	1.06E+02	0.00E+00	1.67E+01	-4.25E+04
$NRPR_M$ [MJ, LHV]	4.23E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
SM [kg]	7.38E+02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
RSF [MJ, LHV]	0.00E+00	0.00E+00	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	0.00E+00	0.00E+00
RE [MJ, LHV]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
FW [m^3]	5.20E+01	0.00E+00	4.74E-03	0.00E+00	1.82E-03	-1.00E+02
Output Flows & Waste						
HWD [kg]	1.49E-02	0.00E+00	1.75E-08	0.00E+00	4.00E-09	-2.62E-05

NHWD [kg]	2.55E+03	0.00E+00	1.08E-02	0.00E+00	1.00E+02	-1.81E+03
HLRW [kg]	2.55E-03	0.00E+00	4.31E-07	0.00E+00	2.09E-07	-3.65E-04
ILLRW [kg]	2.19E+00	0.00E+00	3.62E-04	0.00E+00	1.84E-04	-2.92E-01
CRU [kg]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MR [kg]	3.57E+03	0.00E+00	0.00E+00	9.50E+02	0.00E+00	0.00E+00
MER [kg]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
EE [MJ, LHV]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Table 12. Carbon Emissions and Removals

PARAMETER	A1-A3	C1	C2	C3	C4	D
BCRP [kg CO_2]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
BCEP [kg CO_2]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
BCRK [kg CO_2]	9.38E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
BCEK [kg CO_2]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
BCEW [kg CO_2]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CCE [kg CO_2]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CCR [kg CO_2]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CWNR [kg CO_2]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

4.3. Painted Extrusions – Life Cycle Impact Assessment Results

Table 13. North American Impact Assessment Results

INDICATORS	A1-A3	C1	C2	C3	C4	D
IPCC AR5						
GWP incl. [kg CO_2 eq]	7.99E+03	0.00E+00	8.35E+00	0.00E+00	1.13E+00	-4.70E+03
GWP excl. [kg CO_2 eq]	8.09E+03	0.00E+00	8.30E+00	0.00E+00	1.14E+00	-4.70E+03
TRACI 2.1, CML						
AP [kg SO_2 eq]	2.88E+01	0.00E+00	2.33E-02	0.00E+00	7.07E-03	-2.19E+01
EP [kg N eq]	1.07E+00	0.00E+00	1.99E-03	0.00E+00	8.17E-04	-4.88E-01
ODP [kg CFC-11 eq]	1.99E-10	0.00E+00	3.69E-13	0.00E+00	2.34E-13	-1.42E-12
SFP [kg O_3 eq]	4.60E+02	0.00E+00	5.22E-01	0.00E+00	1.01E-01	-1.81E+02
ADP_{fossil} [MJ, LHV]	1.06E+05	0.00E+00	1.05E+02	0.00E+00	1.62E+01	-4.24E+04

Table 14. Resource Use, Waste and Output Flows

PARAMETER	A1-A3	C1	C2	C3	C4	D
Resource Use						
RPR_E [MJ, LHV]	1.83E+04	0.00E+00	4.39E+00	0.00E+00	2.38E+00	-3.04E+04
RPR_M [MJ, LHV]	8.51E+02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
$NRPR_E$ [MJ, LHV]	1.10E+05	0.00E+00	1.06E+02	0.00E+00	1.67E+01	-4.32E+04

$NRPR_M$ [MJ, LHV]	4.23E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
SM [kg]	6.71E+02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
RSF [MJ, LHV]	0.00E+00	0.00E+00	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	0.00E+00	0.00E+00
RE [MJ, LHV]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
FW [m^3]	4.92E+01	0.00E+00	4.74E-03	0.00E+00	1.82E-03	-1.01E+02
Output Flows & Waste						
HWD [kg]	4.69E+01	0.00E+00	1.75E-08	0.00E+00	4.00E-09	-2.66E-05
NHWD [kg]	2.13E+03	0.00E+00	1.08E-02	0.00E+00	1.00E+02	-1.84E+03
HLRW [kg]	1.82E-03	0.00E+00	4.31E-07	0.00E+00	2.09E-07	-3.71E-04
ILLRW [kg]	1.59E+00	0.00E+00	3.62E-04	0.00E+00	1.84E-04	-2.97E-01
CRU [kg]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MR [kg]	3.36E+02	0.00E+00	0.00E+00	9.50E+02	0.00E+00	0.00E+00
MER [kg]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
EE [MJ, LHV]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Table 15. Carbon Emissions and Removals

PARAMETER	A1-A3	C1	C2	C3	C4	D
BCRP [kg CO_2]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
BCEP [kg CO_2]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
BCRK [kg CO_2]	9.38E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
BCEK [kg CO_2]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
BCEW [kg CO_2]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CCE [kg CO_2]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CCR [kg CO_2]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CWNR [kg CO_2]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

5. LCA Interpretation

Mill-Finished Extrusions

Over the product life cycle, the greatest contributors to GWP for mill-finished aluminum extrusions are the raw materials (A1), driven by the aluminum input necessary to produce the extrusions. Raw materials represent between 86% and 93% of impacts across impact categories while manufacturing (A3) accounts for 3% to 8% of impacts across all categories. This is illustrated in Figure 2.

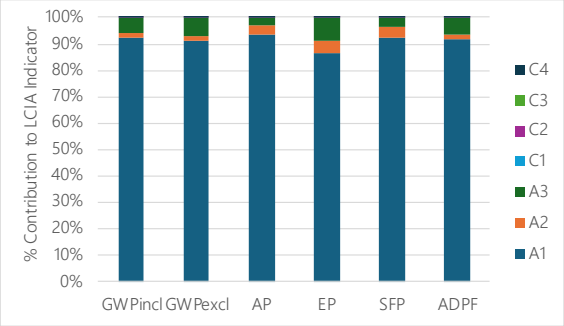

Figure 2. Contributions to Mill-Finished Extrusions LCIA Results

Anodized Extrusions

Over the product life cycle the greatest contributors to GWP for Anodized Aluminum Extrusions is raw materials (A1) and manufacturing (A3). Raw materials account for 70%-89% of impacts across impact categories, while manufacturing accounts for 7%-26% of impacts across impact categories. Manufacturing impacts across impact categories are mostly from electricity usage in the anodizing process.

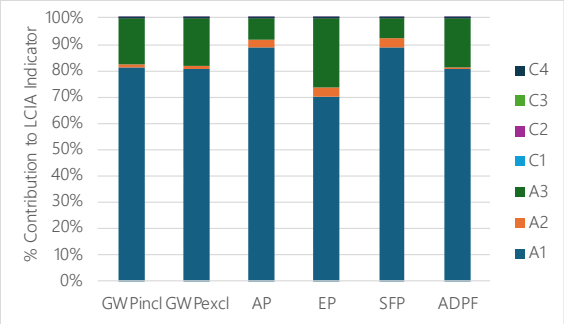

Figure 3. Contributions to Anodized Extrusions LCIA Results

Painted Extrusions

Over the product life cycle the greatest contributors to GWP for Painted Aluminum Extrusions is raw materials (A1) and manufacturing (A3). Raw materials account for 80% to 92% of impacts across impact categories, while manufacturing accounts between 5% and 15% of impacts across impact categories. Manufacturing impacts across impact categories are mostly from electricity usage in the painting process.

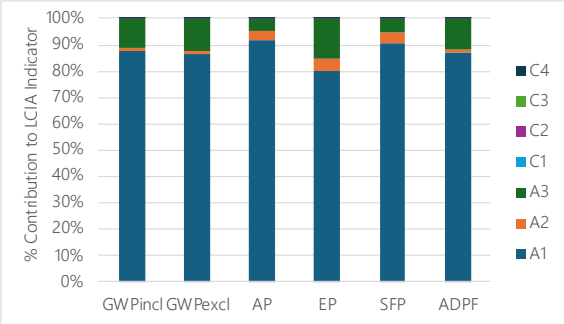

Figure 4. Contributions to Painted Extrusions LCIA Results

6. Additional Environmental Information

6.1. Environment and Health During Manufacturing and Installation

Air: Hazardous air emission releases from the extrusion and finishing processes comply with regulatory thresholds. Additionally, both paint lines utilize technology that destroys over 98% of the volitile organic compounds (VOC) created during the process. No gamma or ionizing radiation emissions are emitted during production or use of the product.

Water/Soil: Pollutants in wastewater discharge comply with regulatory thresholds. See Section 1, Description of organization, for details on the added water processing Oldcastle BuildingEnvelope conducts prior to discharging back to the environment. Oldcastle BuildingEnvelope products do not leach any chemicals to water or soil during use.

Noise: Due to adequate acoustical absorption and mitigation devices, measurements of sound levels have shown all values inside and outside the production plant comply with regulatory thresholds.

Product installation/use: Oldcastle BuildingEnvelope products are considered an "article" by safety data sheet (SDS) rules. The SDS states: Aluminum extrusions are classified by Oldcastle BuildingEnvelope as an article. An article means a manufactured item: (1) which is formed to a specific shape or design during manufacture (2) which has end use function(s) dependent in whole or in part upon its shape or design during end use; and (3) which does not release, or otherwise result in exposure to, a hazardous chemical under normal conditions of use. Any product that meets the definition of an article would be exempt from the requirements of the Occupational Safety and Health Administration Hazard Communication Standard and are outside the scope of the Globally Harmonized System. The product does not contain any hazardous materials, as classified by the Resource Conservation and Recovery Act.

Oldcastle BuildingEnvelope provides the following information as a service to its customers. Although reasonable care has been taken in the preparation of this document, Oldcastle BuildingEnvelope extends no warranties and make no representations as to the accuracy or completeness of the information contained herein, and assume no responsibility regarding the suitability of this information for the user's intended purposes or for the consequences of its use. Each individual should make a determination as to the suitability of the information for his or her particular purpose(s).

6.2. Extraordinary Effects

Fire: Aluminum extrusion comply with all local and federal laws with respect to fire hazards and control.

Water: There is no evidence to suggest water runoff or exposure under normal and intended operation will violate general water quality standards.

Mechanical Destruction: Not relevant for aluminum extrusions.

6.3. Environmental Activities and Certifications

Oldcastle BuildingEnvelope's facilties have proactive recycling programs. Aluminum conservation and recycling has the largest impact and accounts for the majority of the activity. Of no less importance are the systems in place to capture other waste streams for recycling. These include paper products (cardboard, kraft paper, office paper), steel left over from project or maintenance activites, solvents from the painting process that go into a fuels program for cement production and oils sold to an oil recycler.

Water used in the Anodizing process and Paint Pretreatment process is cleaned in in-house water treatment plants and returned to the environment for reuse. The water meets strict quality standards with monitoring being conducted both in-

house and by local regulatory agencies. This water flows back into local reservoirs that support healthy sport fishing hatcheries and regional drinking water sources.

7. References

CEN. (2019). *EN 15804+A2: Sustainability of construction works – Environmental product declarations – Core rules for the product category of construction products.* European Committee for Standardization.

CML - Department of Industrial Ecology. (2016, September 05). *CML-IA Characterisation Factors*. Retrieved from https://www.universiteitleiden.nl/en/research/research-output/science/cml-ia-characterisation-factors

IPCC. (2013). *Climate Change 2013: The Physical Science Basis. Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change.* [Stocker, T.F., D. Qin, G.-K. Plattner, M. Tignor, S.K. Allen, J. Boschung, A. Nauels, Y. Xia, V. Bex and P.M. Midgley (eds.)]. Cambridge, United Kingdom and New York, NY, USA: Cambridge University Press.

ISO. (2006). *ISO 14025: Environmental labels and declarations - Type III environmental declarations - Principles and procedures*. Geneva: International Organization for Standardization.

ISO. (2006). *ISO 14040/Amd 1:2020: Environmental management - Life cycle assessment - Principles and framework.* Geneva: International Organization for Standardization.

ISO. (2006). *ISO 14044/Amd 1:2017/Amd 2:2020: 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.

UL Environment. (2022). *Part A: Life Cycle Assessment Calculation Rules and Report Requirements*, UL 10010, V4.0.

UL Environment. (2022). *Product Category Rules (PCR) Guidance for Building Related Products and Services Part B: Aluminum Construction Product EPD Requirements*, UL 10010-38, v1.0. UL.

US EPA. (2012). *TRACI: The Tool for the Reduction and Assessment of Chemical and Other Environmental Impacts. Version 2.1 - User Guide*. Retrieved from https://nepis.epa.gov/Adobe/PDF/P100HN53.pdf

Oldcastle Building Envelope. (2025). *Background LCA Report for Aluminum Extrusion Products EPDs*

8. Contact Information

Study Commissioner

Oldcastle BuildingEnvelope®
5005 LBJ Freeway, Suite 1050
Dallas, TX 75244
866-653-2278
info@obe.com
www.obe.com

LCA Practitioner

WAP Sustainability, LLC
103 Powell Court, Suite 200
Brentwood, TN 37027-5079
855-452-2522
info@wapsustainability.com
www.wapsustainability.com