广东高丽铝业有限公司
GLOBOND GUANGDONG GAOLI ALUMINIUM INDUSTRY CO.,LTD

Environmental Product Declaration

Guangdong Gaoli Aluminum Industry Co.,Ltd.

Solid Aluminum Panels

ASTM INTERNATIONAL

1. General Information

Name of the Manufacturer: Guangdong Gaoli Aluminium Industry Co., LTD

Program Operator: ASTM International

Declaration Number: EPD 118

Reference PCR: IBU PCR Part A: Part A: Calculation Rules for the Life Cycle Assessment and Requirements on the Project report – Version 1.3 (19.06.2014). & IBU PCR Part B: Requirements on the EPD for Products of aluminium and aluminium alloys – Version 1 (07.2014).

Date of Issuance: September 27, 2019

End of Validity: September 27, 2024

Product Name: Solid aluminum panels

Product Group: Products of aluminium and aluminium alloys

Declared Product/Declared Unit: 1 ton solid aluminum panels

EPD Scope: Cradle-to-gate A1, A2, and A3

Verification:

The CEN Norm EN 15804 serves as the core PCR. Independent verification of the declaration according to ISO 14025 and ISO 21930.

☐ internal ☒ external

LCA Reviewer and EPD Verifier:

Name: Timothy S. Brooke
Organization: ASTM International

Signature: 

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Product

2.1 Product Description

The declared unit is 1 metric ton solid aluminum panels – as Manufactured at Guangdong Gaoli Aluminum Industry Co. Ltd.'s Chinese facility. To convert from one metric tonne to one kilogram, a factor of 0.001 is applied. Product specifications for the solid aluminum panel product line is available at: https://globond.com/products

The product group is representative of the entire range of solid aluminum panels produced at the facility.

The products are manufactured in accordance with the following standards:

- ASTM B221-13/B221M-13 Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes
- ASTM B241/B241M-12e1 Standard Specification for Aluminum and Aluminum-Alloy Seamless Pipe and Seamless Extruded Tube
- ASTM B317/B317M-07 Standard Specification for Aluminum-Alloy Extruded Bar, Rod, Tube, Pipe, Structural Profiles, and Profiles for Electrical Purposes (Bus Conductor)
- ASTM B345/B345M-11 Standard Specification for Aluminum and Aluminum-Alloy Seamless Pipe and Seamless Extruded Tube for Gas and Oil Transmission and Distribution Piping Systems
- ASTM B429/B429M-10e1 Standard Specification for Aluminum-Alloy Extruded Structural Pipe and Tube
- ASTM B491/B491M-06 Standard Specification for Aluminum and Aluminum-Alloy Extruded Round Tubes for General-Purpose Applications

2.2 Application:

Solid aluminum panels are used in a variety of construction applications. Various grades, thicknesses, and dimensions are specified according to requirements specific to the application.

2.3 Technical Data:

Table 1: Technical Information

Name	Value	Unit
Density	2.66-2.84	(kg/m3) x 10^3
Melting point (typical)	475-655	°C
Electrical conductivity (Typical) at 20°C/at 68˚F	Equal Volume:16-36	MS/m (0.58*%IACS)
Thermal conductivity (Typical) at 25˚c/at 77˚F	113-234	W/(m.K)
Average Coefficient of thermal expansion (Typical) 20˚ to 100˚c /68° to 212°F	22.3-23.9	per ˚C
Modulus of elasticity (Typical)	69-73	MPa x 10^3
Hardness (Typical)	19-150	HB
Yield strength (min)	15-490	MPa
Ultimate tensile strength (min)	60-560	MPa
Breaking elongation (min) (50mm & 4D)	>4	%

Strength and other technical properties vary and are available from the manufacturer for specific orders

2.4 Delivery Status:

The declared unit is 1 ton solid aluminum panels. The product is available in different dimensions and thicknesses.

2.5 Base Materials:

The solid aluminum panel product is 100% aluminium. Aluminium is is an alloy that also contains small amounts of other base metals. For the purposes of toxicity screening, aluminium is considered a base ingredient with CAS # 7429-90-5.

2.6 Manufacturing:

The processes that occur at Guangdong Gaoli Aluminum Industry Co. Ltd.'s facility include: receipt of aluminum billet, extrusion, and the packaging of the finished aluminium product.

2.7 Environment and Health Considerations during Manufacturing:

Air: Hazardous air emission releases comply with regulatory thresholds.

Water/soil: Pollutants in wastewater discharge comply with regulatory thresholds.

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

2.8 Product Processing/Installation:

The product is installed in a manner and with equipment that is specific to the application for which it was purchased.

2.9 Packaging:
Solid aluminum panels are packaged in low density polyethylene plastic wrap. The product is secured to pallets using steel straps. Any other packaging that is required by a particular customer is negotiated separately from the materials contract and is thus outside the system boundary. No other packaging was included in the product system.

2.10 Conditions of Use:
No special features of contents are required for the period of use.

2.11 Environment and Health Considerations During Use:
Solid aluminum panels are comprised of inert materials and poses no signficant environmental or health considerations during the use phase.

2.12 Reference Service Life:
No reference service life is declared in this EPD as the scope is limited to A1-A3.

2.13 Extraordinary Effects:
Fire: Aluminum products 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 desctruction: Not relevant for aluminum extrusions.

2.14 Re-use Phase:
At the end of the product's service life, aluminium may be reused or recycled, however, neither of these are included in this EPD. No energy recovery possibilities exist.

2.15 Disposal:
The waste code in accordance with the European Waste Index is 17 04 02. At the end of service life the product may either be re-used, disposed in a landfill, or recycled.

2.16 Further Information:
No further information is reported in this EPD.

2.17 Content Declaration Regarding Potential Toxicity
This EPD makes no claim as to the potential toxicity of the product during use. As noted in Section 2.5, the product is 100% aluminium which is considered a base ingredient with CAS # 7429-90-5. No known health risks are associated the use of aluminum panels.

3: LCA Calculation Rules

3.1 Declared Unit:

The declared unit is 1 ton solid aluminum panels produced by Guangdong Gaoli Aluminium Industry Co. Ltd.

3.2 System Boundary:

The system boundary for this study is limited to a cradle-to-gate focus. The following three life cycle stages as per the governing PCR are included in the study scope:

- A1- Raw material supply (upstream processes): bauxite extraction, handling, and smelting to produce aluminium billets.
- A2- Transportation: transportation of all input materials and fuels from the suppliers to the gate of the manufacturing facility.
- A3- Manufacturing (core process): the processes that occur at Guangdong Gaoli Aluminum Industry Co. Ltd.'s facility: material handling, extrusion, and packaging. Also includes the operations of the manufacturing facility and all process emissions that occur at the production facility.

3.3 Estimates and Assumptions:

All significant foreground data was gathered from the manufacturer based on measured values (i.e. without estimation). The weighted average product profile is assumed to be representative of the various dimensions and options offered by Guangdong Gaoli Aluminum Industry Co. Ltd.

3.4 Cut-off Criteria:

The cut-off criteria for all activity stage flows considered within the system boundary conform with ISO14044:2006, section 6 of the IBU PCR Part A:

- All inputs and outputs to a (unit) process were included in the calculation for which data is available. Data gaps were filled by conservative assumptions with average or generic data. Any assumptions for such choices were documented;
- In case of insufficient input data or data gaps for a unit process, the cut-off criteria were 1% of renewable and non-renewable primary energy usage and 1% of the total mass of that unit process. The total neglected input flows, e.g. per module A1-A3 were a maximum of 5% of energy usage and mass. Conservative assumptions in combination with plausibility considerations and expert judgement were used to demonstrate compliance with these criteria;
- Particular care was taken to include material and energy flows known to have the potential to cause significant emissions into air and water or soil related to the environmental indicators of this standard. Conservative assumptions in combination with plausibility considerations and expert judgement were be used to demonstrate compliance with these criteria.

3.5 Background Data and 3.6 Data Quality:

Data was gathered for the primary material inputs used in the production of the solid aluminium panels for calendar year 2018. Table 2 describe each LCI data source for raw materials (A1), transportation by mode (A2) and the core manufacture process (A3). Table 2 also includes a data quality assessment for all secondary data on the basis of the technological, temporal, and geographical representativeness as per the IBU PCR.

Table 2: Secondary Data Sources and Data Quality Assessment

A1: Raw Material Inputs				
Inputs	**LCI Data Source**	**Geography**	**Year**	**Data Quality Assessment**
Aluminium Billet	Ecoinvent 3.3: GM Aluminium, primary, ingot {IAI Area, EU27 & EFTA}| aluminium, ingot, primary, import from Middle East (Gulf cooperation Council) | Cut-off, U	Middle East	2018	**Technology:** very good Process models average global technology **Time:** very good Data is <5 years old **Geography:** very good Data is representative of global conditions.
A2: Transportation				
Inputs	**LCI Data Source**	**Geography**	**Year**	**Data Quality Assessment**
Trucking	ecoinvent 3.3: Transport, freight, lorry >32 metric ton, EURO3 {GLO}| market for | Cut-off, U	Global	2018	**Technology:** very good Process models average global technology **Time:** good Data is 6 years old **Geography:** very good Data is representative of global conditions.
A3: Manufacturing				
Energy	**LCI Data Source**	**Geography**	**Year**	**Data Quality Assessment**
Electricity	ecoinvent 3.3: Electricity, high voltage {OM}| market for electricity, high voltage | Cut-off, U	China	2018	**Technology**: very good Process models average China technology **Time**: very good Data is < 5 years old **Geography**: very good Data is representative of China electricity.
Natural Gas	ecoinvent 3.3: Heat, central or small-scale, natural gas {RoW}| heat production, natural gas, at boiler atmospheric low-NOx non-modulating <100kW | Alloc Rec, U GM	Global	2018	**Technology:** very good Process models average global technology **Time:** very good Data is <5 years old **Geography:** very good Data is representative of global conditions.

Diesel	ecoinvent 3.3: Heat, district or industrial, other than natural gas {RoW}| heat production, heavy fuel oil, at industrial furnace 1MW | Alloc Rec, U	Global	2018	**Technology:** very good Process models average global technology **Time:** very good Data is <5 years old **Geography:** very good Data is representative of global conditions.
Ancillary Materials and Packaging	**LCI Data Source**	**Geography**	**Year**	**Data Quality Assessment**
Pallets	ecoinvent 3.3: EUR-flat pallet {GLO}| market for | Alloc Rec, U UAE	Global	2018	**Technology:** very good Process models average global technology **Time:** very good Data is <5 years old **Geography:** very good Data is representative of global conditions.
Steel Straps	World Steel data for finished cold rolled coil	Global	2012	**Technology:** very good Process models average global technology **Time:** very good Data is 7 years old **Geography:** very good Data is representative of global conditions.
Plastic Wrap	ecoinvent 3.3: Packaging film, low density polyethylene {GLO}| market for | Alloc Def, U Packaging	Global	2018	**Technology:** very good Process models average global technology **Time:** very good Data is <5 years old **Geography:** very good Data is representative of global conditions.
Lubricants	ecoinvent 3.3: Lubricating oil {GLO}| market for | Alloc Rec	Global	2018	**Technology:** very good Process models average global technology **Time:** very good Data is <5 years old **Geography:** very good Data is representative of global conditions.
Water	**LCI Data Source**	**Geography**	**Year**	**Data Quality Assessment**
Municipal Water	Modeled as elementary flow	N/A	N/A	N/A
Waste	**LCI Data Source**	**Geography**	**Year**	**Data Quality Assessment**
Aluminium recycled	Internally recycled	N/A	N/A	N/A

3.7 Period under Review:

Data was gathered for the primary material inputs used in the production of the solid aluminum panels for calendar year 2018.

3.8 Allocation:

Guangdong Gaoli Aluminum Industry Co. Ltd. produces valuable aluminium scrap and no other valuable coproducts from their extrusion operations. The IBU PCR requires economic allocation but, in this case, the overall value of the various coproducts was less than 5% of total revenue. Thus, in accordance with the PCR's principle of making conservative estimations, we did not allocate any of the environmental burden to the coproducts and instead allocated 100% to the primary product output.

Recycling processes were treated as closed loop recycling because the scrap is recycled in the same facility. No credits were given to the product system for the value of the recyclable materials and the burden to recycle the scrap was incorporated within the modeled unit processes.

3.9 Comparability:

This LCA was created using industry average data for upstream materials. Data variation can result from differences in supplier locations, manufacturing processes, manufacturing efficiency and fuel types used.

4: LCA: Scenarios and additional technical information

The scope of this EPD is limited to modules A1-A3 and thus no additional scenario or technical information is applicable.

5. LCA: Results

Life cycle impact assessment (LCIA) is the phase in which the set of results of the inventory analysis – the inventory flow table – is further processed and interpreted in terms of environmental impacts and resource use inventory metrics. As specified in the IBU PCR, Table 3 below summmarizes the LCA results for the cradle-to-gate (A1-A3) product system.

Table 3: LCA Results
Description of the System Boundary
(x : included in LCA; mnd: module not declared)

Product			Construction Installation		Use							End-of-life				Benefits of Loads Beyond the System Boundary		
Raw Material supply	Transport	Manufacturing	Transport	Construction/Installation	Use	Maintenance	Repair	Replacement	Refurbishment	Operational Energy Use	Operational Water Use	De-Construction/ Demolition	Transport	Waste processing	Disposal	Reuse	Recovery	Recycling
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D	D	D
x	x	x	mnd	mnd	mnd	mnd	mnd	mnd	mnd	mnd	mnd	mnd	mnd	mnd	mnd	mnd	mnd	mnd

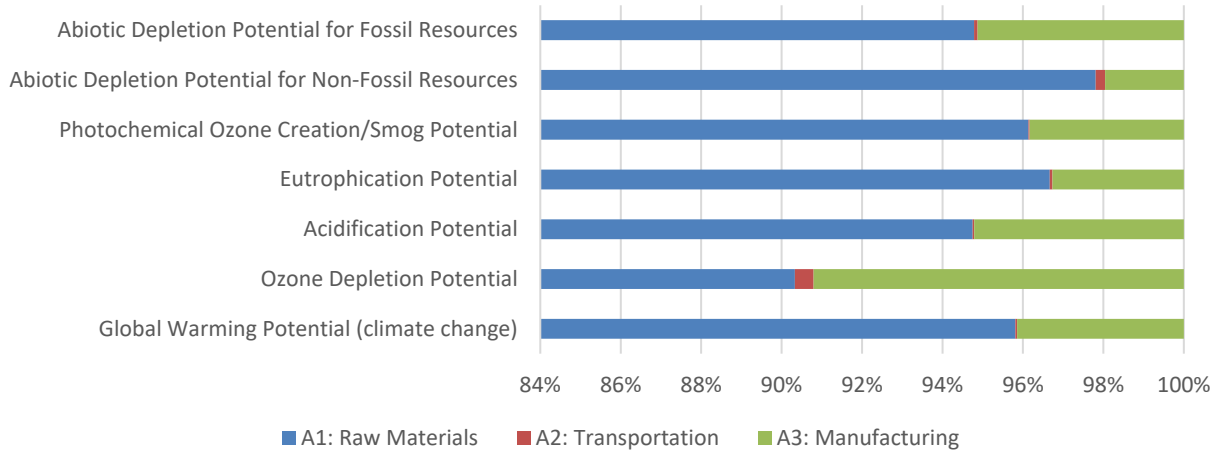
Table 3 Continued: Impact Assessment Results for 1 ton solid aluminum panels

LCIA Indicators		Unit	A1-A3 Total
GWP	Global Warming Potential (climate change)	kg CO2-eq	3.20E+04
ODP	Ozone Depletion Potential	kg CFC-11-eq	5.84E-04
AP	Acidification Potential	kg SO2-eq	1.84E+02
EP	Eutrophication Potential	kg PO4-eq	2.65E+01
POCP	Photochemical Ozone Creation/Smog Potential	kg C2H4 eq	1.03E+01
ADPE	Abiotic Depletion Potential for Non-Fossil Resources	kg Sb eq	1.15E-02
ADPF	Abiotic Depletion Potential for Fossil Resources	MJ Surplus	2.52E+05
Inventory Metrics – Resources		**Unit**	**A1-A3 Total**
PERE	Use of renewable primary energy as energy	MJ	1.23E+04
PERM	Use of renewable primary energy as a material	MJ	0.00E+00
PERT	Total use of renewable primary energy	MJ	1.23E+04
PENRE	Use of non-renewable primary energy as energy	MJ	2.70E+05
PENRM	Use of non-renewable primary energy as a material	MJ	0.00E+00
PENRT	Total use of non-renewable primary energy	MJ	2.70E+05
SM	Use of secondary materials	kg	1.39E+04
RSF	Use of renewable secondary fuels	MJ	4.35E+02
NRSF	Use of non-renewable secondary fuels	MJ	6.32E-02
FW	Use of freshwater resources	m3	1.80E+02
Inventory Metrics – Waste and Outputs		**Unit**	**A1-A3 Total**
HWD	Disposed of Hazardous Waste	kg	0.00E+00
NHWD	Disposed of Non-Hazardous Waste	kg	0.00E+00
RWD	Disposed of Radioactive Waste	kg	0.00E+00
CRU	Components for Reuse	kg	0.00E+00
MFR	Materials for Recycling	kg	0.00E+00
MER	Materials for Energy Recovery	kg	0.00E+00
EEE	Exported Electrical Energy (Waste to Energy)	kg	0.00E+00
ETE	Exported Thermal Energy (Waste to Energy)	kg	0.00E+00

6. Interpretation

Figure 1 shows the relative contribution to the cumulative impacts of the A1 through A3 phases of the cradle-to-gate life cycle. All impact categories are dominated by Module A1. This is due to the fact this module incorporates all the upstream extraction and refining of primary aluminum which is known to be an energy-intensive process. Module A2 (transporting the aluminum to the production facility) and Module A3 (the extrusion of the aluminum) cause less than 10% of any potential impacts.

Figure 1: Contribution of Modules A1, A2, and A3 to Environmental Impact Indicators



7. Requisite Evidence

No environemental claims beyond the LCA results are made in this EPD and thus no additional evidence is required.

8. References

1. Athena Institute: 2019 - A Cradle-to-Gate Life Cycle Assessment of Solid Aluminum Panels Manufactured by Guangdong Gaoli Aluminum Industry Co. Ltd. Background LCA report to this EPD.
2. EN 15804:2012 Sustainability of construction works – Environmental product declarations – Core rules for the product category of construction products.
3. IBU PCR Part A: Part A: Calculation Rules for the Life Cycle Assessment and Requirements on the Project report – Version 1.3 (19.06.2014).
4. IBU PCR Part B: Requirements on the EPD for Products of aluminium and aluminium alloys – Version 1 (07.2014).
5. ISO 21930: 2017 Building construction – Sustainability in building construction – Environmental declaration of building products.
6. ISO 14025: 2006 Environmental labeling and declarations - Type III environmental declarations - Principles and procedures.
7. ISO 14044: 2006 Environmental management - Life cycle assessment - Requirements and guidelines.
8. ISO 14040: 2006 Environmental management - Life cycle assessment - Principles and framework.