Environmental Product Declaration

Environmental Product Declaration for Roller Shade System Products produced by Rollease Acmeda

ADMINISTRATIVE INFORMATION

International Certified Environmental Product Declaration

Declared Product:	This Environmental Product Declaration (EPD) covers shade roller system products produced by Rollease Acmeda. Declared unit: 1 (one) meter of hardware system
Declaration Owner:	Rollease Acmeda 750 East Main Street Stamford, CT www.rolleaseacmeda.com
Program Operator:	Labeling Sustainability 575 SE Courances Dr Port St. Lucie, FL www.labelingsustainability.com
Product Category Rule:	ISO 21930:2017 Sustainability in buildings and civil engineering works – Core rules for environmental product declarations of construction product and services PCR Program Operator: International Organization for Standardization PCR review was conducted by: Mr. Jack Geibig, Mt. Thaddeus Owen, Sr. Michael Overcash
Independent LCA Reviewer and EPD Verifier:	This declaration was independently verified in accordance with ISO 14025:2006 Independent verification of the declaration, according to ISO 14025:2006 External: X Third Party Verifier Geoffrey Guest, Certified 3rd Party Verifier under Labeling Sustainability Program (www.labelingsustainability.com), CSA Group (www.csaregistries.ca)
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COMPANY DESCRIPTION

Rollease Acmeda innovates, designs and manufactures window covering hardware, automated shades and machinery for use in both commercial and residential applications.

Established in 1980, Rollease Acmeda has consistently been on the cutting edge of design, development and distribution within the industry. Due to their many years of experience and knowledge Rollease Acmeda is able to deliver a wider range of product options, modern technologies and a high-level of service to our customers. Rollease Acmeda serves all segments of the domestic and international window covering industry including OEMs, fabricators, workrooms, commercial contractors, interior designers, architects, retailers, internet and mail order catalogs.

STUDY GOAL

The intended application of this life cycle assessment (LCA) is to comply with the procedures for creating a Type III environmental product declaration (EPD) and publish the EPD for public review on the website, www.labelingsustainability.com. This level of study is in accordance with EPD Product Category Rule (PCR) for Fabric covering published by the International Standards Organization (ISO) 21930:2017 Sustainability in buildings and civil works - Core rules for EPDs of construction products and services; International Standards Organization (ISO) 14025:2006 Environmental labels and declarations, Type III environmental declarations-Principles and procedures; ISO 14044:2006 Environmental management, Life cycle assessment- Requirements and guidelines; and ISO 14040:2006 Environmental management, Life cycle assessment-Principles and framework. The performance of this study and its subsequent publishing is in alignment with the business-to-business (B2B) communication requirements for the environmental assessment of building products. The study does not intend to support comparative assertions and is intended to be disclosed to the public.

This project report was commissioned to differentiate Rollease Acmeda from their competition for the following reasons: generate an advantage for the organization; offer customers information to help them make informed product decisions; improve the environmental performance. Rollease Acmeda by continuously measuring, controlling and reducing the environmental impacts of their products; help project facilitators working on Leadership in Energy and Environmental Design (LEED) projects achieve their credit goal. Rollease Acmeda's license to operate in the community. The intended audience for this EPD report is Rollease Acmeda's employees, their suppliers, project specifiers of their products, architects, and engineers. The EPD report is also available for policy makers, government officials interested in sustainability, academic professors, and LCA professionals.

DESCRIPTION OF PRODUCT AND SCOPE

Rollease Acmeda Roller Shade Systems are highly versatile and engineered for smooth operation, offering single, dual and/or linked-shade configurations with open, fascia, and pocket options. The shades evaluated are all manually operated utilizing Rollease Acmeda chain operated clutches and hardware. These systems allow shades to seamlessly integrate into the ceiling or mounting structure when not in use. Designed for both residential and commercial installation needs.

This EPD assumes the impacts from products manufactured in accordance with the standards outlined in this report. This EPD is a cradle-to-gate study, and therefore, stages extending beyond the plant gate are not included in this EPD. Excluded stages include transportation of the manufactured material to the construction site; on-site construction processes and components; building (infrastructure) use and maintenance; and "end-of-life" effects.

SHADE ROLLER SYSTEM DESIGN SUMMARY

The following tables provide a list of the shade roller system products considered in this EPD along with key performance parameters.

Table 1: **Declared products with All declared products considered in this environmental product declaration**

Prod#	Short description	Product type	Unit	Density, kg/Unit	bio-carbon content, kg C/DU dry basis	Product Group
1	Contract series one open system, single roll – roller shade system	Shade Roller System	m	1.34	0	Hardware
2	Contract series one fascia system, single roll – roller shade system	Shade Roller System	m	2.24	0	Hardware
3	Contract series one pocket system, single roll – roller shade system	Shade Roller System	m	4.36	0	Hardware
4	Contract series one open system, double roll – roller shade system	Shade Roller System	m	1.73	0	Hardware
5	Contract series one fascia system, double roll – roller shade system	Shade Roller System	m	3.43	0	Hardware
6	Contract series one pocket system, double roll – roller shade system	Shade Roller System	m	5.44	0	Hardware
7	Contract series one open system, linked roll – roller shade system	Shade Roller System	m	1.61	0	Hardware
8	Contract series one fascia system, linked roll – roller shade system	Shade Roller System	m	2.38	0	Hardware

9	Contract series one pocket system, linked roll – roller shade system	Shade Roller System	m	4.64	0	Hardware
10	Contract series two open system, single roll – roller shade system	Shade Roller System	m	2.16	0	Hardware
11	Contract series two fascia system, single roll – roller shade system	Shade Roller System	m	3.68	0	Hardware
12	Contract series two pocket system, single roll – roller shade system	Shade Roller System	m	5.18	0	Hardware
13	Contract series two open system, double roll – roller shade system	Shade Roller System	m	2.49	0	Hardware
14	Contract series two fascia system, double roll – roller shade system	Shade Roller System	m	3.98	0	Hardware
15	Contract series two pocket system, double roll – roller shade system	Shade Roller System	m	6.38	0	Hardware
16	Contract series two open system, linked roll– roller shade system	Shade Roller System	m	2.4	0	Hardware
17	Contract series two fascia system, linked roll – roller shade system	Shade Roller System	m	4.06	0	Hardware
18	Contract series two pocket system, linked roll – roller shade system	Shade Roller System	m	5.43	0	Hardware

SHADE ROLLER SYSTEM DESIGN COMPOSITION

The following figures provide mass breakdown (kg per declared unit) of the material composition of each shade roller system design considered.

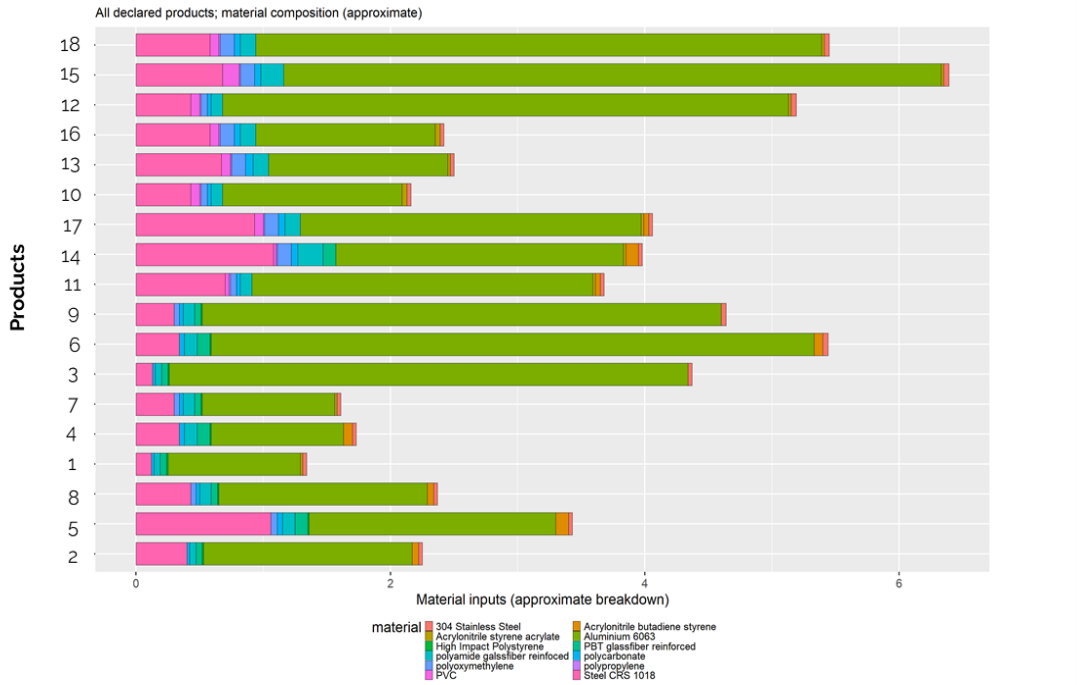

Figure 1: **Material composition - All declared products per 1 (one) meter of hardware system**

SYSTEM BOUNDARIES

The following figure depicts the cradle-to-gate system boundary considered in this study:

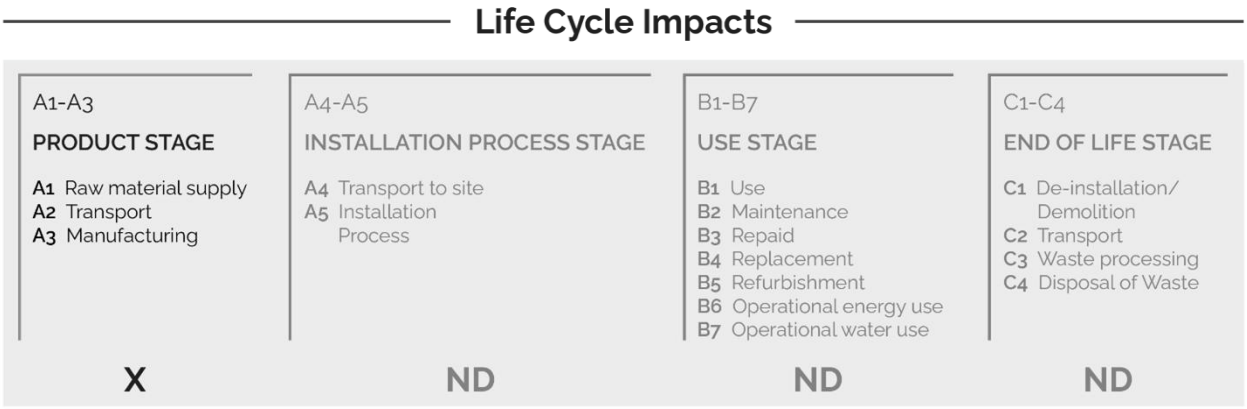

Figure 2: **General life cycle phases for consideration in a construction works system. (X=module declared, ND= module not declared)**

This is a Cradle-to-gate life cycle assessment, and the following life cycle stages are included in the study:

- A1: Raw material supply (upstream processes) - Extraction, handling, and processing of the materials used in manufacturing the declared products in this LCA.
- A2: Transportation - Transportation of A1 materials from the supplier to the "gate" of the manufacturing facility (i.e. A3).
- A3: Manufacturing (core processes)- The energy and other utility inputs used to store, move, and manufacture the declared products and to operate the facility.

The following figure illustrates the general activities and input requirements for producing shade roller system products and is not necessarily exhaustive.

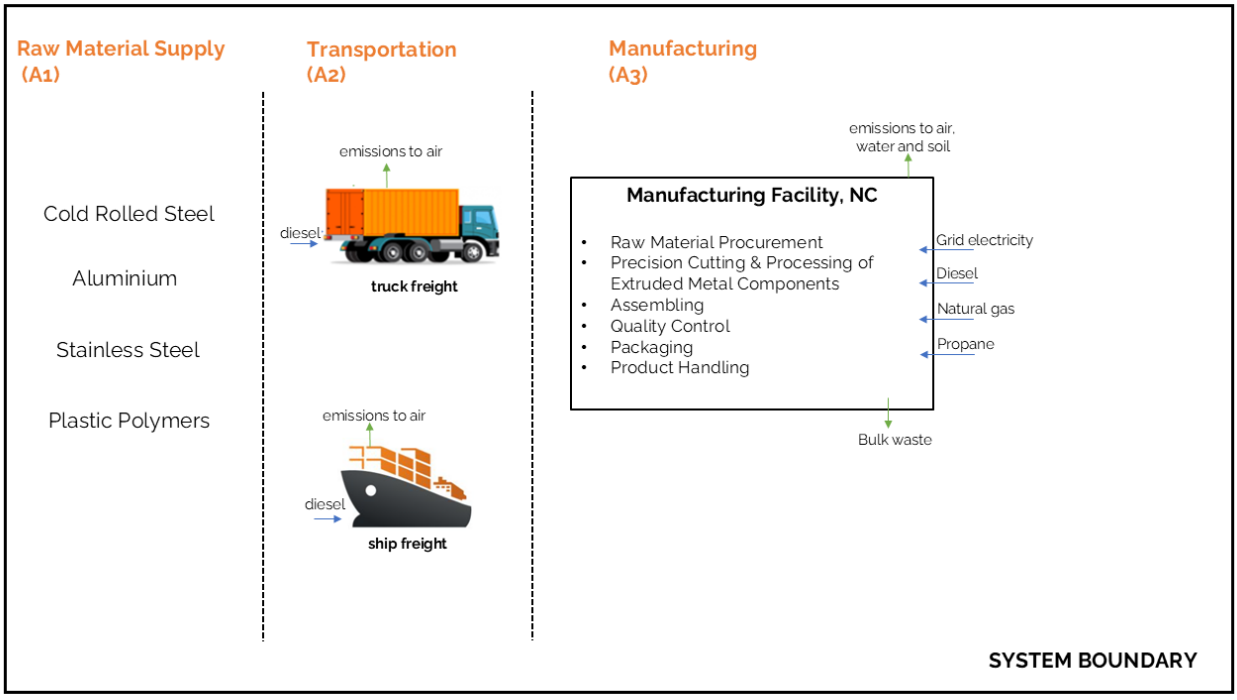

Figure 3: **General system inputs considered in the product system and categorized by modules in scope.**

In addition, according to the relevant PCR, the following requirements are excluded from this study:

- Production, manufacture and construction of A3 building/capital goods and infrastructure.
- Production and manufacture of steel production equipment, steel delivery vehicles, earth-moving equipment, and laboratory equipment.
- Personnel-related activities (travel, furniture, office supplies).
- Energy use related to company management and sales activities.

For this EPD the facility, owned and operated by Rollease Acmeda, is located at their facility in Connecticut, USA. All operating data is formulated using the actual data from Rollease Acmeda's facility at the above location, including water, energy consumption and waste generation. All inputs for this system boundary are calculated for the plant.

This life cycle inventory was organized in a spreadsheet and was then input into an RStudio environment where pre-calculated LCIA results for relevant products/activities stemming from the ecoinvent v3.10 database and a local EPD database in combination with primary data from Rollease Acmeda was utilized. Explanations of the contribution of each data source to this study are outlined in the section 'Data Sources and Quality. Further LCI details for each declared product are provided in the sections 'Detailed LCI tables' and 'Transport tables' of the detailed LCA report. A parameter uncertainty analysis was also performed where key statistical results (e.g. min/mean/max etc.) are provided in the detailed EPD report.

No known flows are deliberately excluded from this EPD.

CUT-OFF CRITERIA

ISO 14044:2006 and the focus PCR requires the LCA model to contain a minimum of 95% of the total inflows (mass and energy) to the upstream and core modules be included in this study. The cut-off criteria were applied to all other processes unless otherwise noted above as follows. A 1% cut-off is considered for all renewable and non-renewable primary energy consumption and the total mass of inputs within a unit process where the total of the neglected inputs does not exceed 5%.

DATA SOURCES AND DATA QUALITY ASSESSMENT

No recovered on-site energy occurs at this facility.

No re-used or recycled material for utilization on-site or off-site was reported at this facility.

The following statements explain how the above facility requirements/generation were derived:

Raw material transport: Rollease Acmeda provided all primary information for the reference year 2024, including comprehensive details on raw material consumption and logistics data. The transportation of these materials was determined based on the actual distance from the manufacturers or distributors. Logistics for A2 requirements relied on primary data to document transportation specifics, including the exact distance, mode of transport, and location details such as city, state, and country.

Electricity: The reported electricity consumption is based on primary data from Rollease Acmeda's utility bills for the reporting period. Electricity allocation was initially determined by calculating the average electricity consumption value in kWh per declared unit (i.e., kWh/m). Subsequently, this value was multiplied by the total meter (m) production for each product covered in this study.

Process/space heating: The facility incorporates natural gas within its production processes. The reported natural gas consumption is based on Rollease Acmeda's primary information derived from utility bills for the reporting period. The allocation methodology for natural gas consumption follows the same approach as that of electricity. The conversion factor used for Therm to MJ to represent the natural gas heating values in Mega joules (MJ) was 1 U.S therm equating to 105.50 MJ.

Fuel required for machinery: Diesel and propane consumption are accurately calculated based on direct purchase records for the reporting period 2024. The allocation methodology for propane and diesel consumption follows the same approach as that of electricity. For diesel, the conversion factor was determined as 1 U.S gallon of diesel ≈ 146 MJ of energy. The conversion factor for propane was determined as 1 U.S gallon of propane ≈ 101 MJ of energy.

Waste generation: Waste generation values were calculated using primary information from Rollease Acmeda's records or vendor bills, which include bulk waste only. No additional waste is attributed to the products, as all waste generated during the manufacturing process is fully recyclable and can be reintegrated into other products' system. Transportation defaults were used because the driver's route and ultimate destination are unknown. Therefore, the exact mileage could not be confirmed by the waste hauler.

Recovered energy: No recycling was considered in this cradle-to-gate study.

Recycled/reused material/components: Default material losses, 2%, were used.

Module A1 material losses: Direct emissions on-site were modeled with the best available ecoinvent processes (see LCI list).

Direct A3 emissions accounting: NA

The following tables depict a list of assumed life cycle inventory utilized in the LCA modeling to generate the impact results across the life cycle modules in scope. An assessment of the quality of each LCI activity utilized from various sources is also provided.

Table 2: **LCI inputs assumed for module A1 (i.e. raw material supply).** ***Data Quality Assessment Key Poor=0, Fair= 1, Good=2, Very Good=3***

Input	LCI Activity	Data Source	Geo	Year	Technology	Time	Geography	Reliability	Completeness
304 Stainless Steel	steel production, electric, chromium steel 18/8/steel, chromium steel 18/8/RoW/kg	ecoinvent v3.10 in 2024	New York	2024	2	3	2	3	3
Polypropylene	polypropylene production, granulate/polypropylene, granulate/RoW/kg	ecoinvent v3.10 in 2024	Melbourne	2024	2	3	2	3	3
Steel CRS 1018	steel production, converter, low-alloyed/steel, low-alloyed/RoW/kg	ecoinvent v3.10 in 2024	Multiple Regions	2024	2	3	2	3	3
Aluminium 6063	aluminium alloy production, AlMg3/aluminium alloy, AlMg3/RoW/kg	ecoinvent v3.10 in 2024	Jawa Timur	2024	2	3	2	3	3
Acrylonitrile butadiene styrene	acrylonitrile-butadiene-styrene copolymer production/acrylonitrile-butadiene-styrene copolymer/RoW/kg	ecoinvent v3.10 in 2024	Ohio	2024	2	3	2	3	3
Acrylonitrile styrene acrylate	styrene-acrylonitrile copolymer production/styrene-acrylonitrile copolymer/RoW/kg	ecoinvent v3.10 in 2024	Jiangsu	2024	2	3	2	3	3
PVC	polyvinylchloride production, bulk polymerisation/polyvinylchloride, bulk polymerised/RoW/kg	ecoinvent v3.10 in 2024	Jiangsu	2024	2	3	2	3	3
Polyamide glass fiber reinfoced	glass fibre reinforced plastic production, polyamide, injection moulded/glass fibre reinforced	ecoinvent v3.10 in 2024	Jiangsu	2024	2	3	2	3	3

	plastic, polyamide, injection moulded/RoW/kg								
Polyoxymethylene	polymethyl methacrylate production, beads/polymethyl methacrylate, beads/RoW/kg	ecoinvent v3.10 in 2024	CT	2024	2	3	2	3	3
Polycarbonate	polycarbonate production/polycarbonate/RoW/kg	ecoinvent v3.10 in 2024	Jiangsu	2024	2	3	2	3	3
High Impact Polystyrene	polystyrene production, high impact/polystyrene, high impact/RoW/kg	ecoinvent v3.10 in 2024	NC	2024	2	3	2	3	3

Table 3: **LCI inputs assumed for module A2 (i.e. transport of A1 inputs).** ***Data Quality Assessment Key Poor=0, Fair= 1, Good=2, Very Good=3***

Input	LCI Activity	Data Source	Geo	Year	Technology	Time	Geography	Reliability	Completeness
304 Stainless Steel- freight transport via Truck	market for transport, freight, lorry 7.5-16 metric ton, EURO4/transport, freight, lorry 7.5-16 metric ton, EURO4/RER/tkm	ecoinvent v3.10 in 2024	RER	2024	2	3	1	3	3
Acrylonitrile butadiene styrene-freight transport via Truck	market for transport, freight, lorry 7.5-16 metric ton, EURO4/transport, freight, lorry 7.5-16 metric ton, EURO4/RER/tkm	ecoinvent v3.10 in 2024	RER	2024	2	3	1	3	3
Acrylonitrile styrene acrylate-freight transport via Ship	transport, freight, lorry with refrigeration machine, 3.5-7.5 ton, EURO5, carbon dioxide, liquid refrigerant, cooling/transport, freight, lorry with refrigeration machine, 3.5-7.5 ton, EURO5, carbon dioxide, liquid refrigerant, cooling/GLO/tkm	ecoinvent v3.10 in 2024	GLO	2024	2	3	1	3	3
Acrylonitrile styrene acrylate-freight transport via Truck	market for transport, freight, lorry 7.5-16 metric ton, EURO4/transport,	ecoinvent v3.10 in 2024	RER	2024	2	3	1	3	3

	freight, lorry 7.5-16 metric ton, EURO4/RER/tkm								
Aluminium 6063- freight transport via Ship	transport, freight, lorry with refrigeration machine, 3.5-7.5 ton, EURO5, carbon dioxide, liquid refrigerant, cooling/transport, freight, lorry with refrigeration machine, 3.5-7.5 ton, EURO5, carbon dioxide, liquid refrigerant, cooling/GLO/tkm	ecoinvent v3.10 in 2024	GLO	2024	2	3	1	3	3
Aluminium 6063- freight transport via Truck	market for transport, freight, lorry 7.5-16 metric ton, EURO4/transport, freight, lorry 7.5-16 metric ton, EURO4/RER/tkm	ecoinvent v3.10 in 2024	RER	2024	2	3	1	3	3
Bulk waste- freight transport via Truck	market for transport, freight, lorry 7.5-16 metric ton, EURO4/transport, freight, lorry 7.5-16 metric ton, EURO4/RER/tkm	ecoinvent v3.10 in 2024	RER	2024	2	3	1	3	3
Cardboard- freight transport via Truck	market for transport, freight, lorry 7.5-16 metric ton, EURO4/transport, freight, lorry 7.5-16 metric ton, EURO4/RER/tkm	ecoinvent v3.10 in 2024	RER	2024	2	3	1	3	3
Expanded polystyrene- freight transport via Truck	market for transport, freight, lorry 7.5-16 metric ton, EURO4/transport, freight, lorry 7.5-16 metric ton, EURO4/RER/tkm	ecoinvent v3.10 in 2024	RER	2024	2	3	1	3	3
High Impact Polystyrene- freight transport via Truck	market for transport, freight, lorry 7.5-16 metric ton, EURO4/transport, freight, lorry 7.5-16 metric ton, EURO4/RER/tkm	ecoinvent v3.10 in 2024	RER	2024	2	3	1	3	3

Paper- freight transport via Truck	market for transport, freight, lorry 7.5-16 metric ton, EURO4/transport, freight, lorry 7.5-16 metric ton, EURO4/RER/tkm	ecoinvent v3.10 in 2024	RER	2024	2	3	1	3	3
PBT glassfiber reinforced- freight transport via Truck	market for transport, freight, lorry 7.5-16 metric ton, EURO4/transport, freight, lorry 7.5-16 metric ton, EURO4/RER/tkm	ecoinvent v3.10 in 2024	RER	2024	2	3	1	3	3
polyamide glass fiber reinforced- freight transport via Ship	transport, freight, lorry with refrigeration machine, 3.5-7.5 ton, EURO5, carbon dioxide, liquid refrigerant, cooling/transport, freight, lorry with refrigeration machine, 3.5-7.5 ton, EURO5, carbon dioxide, liquid refrigerant, cooling/GLO/tkm	ecoinvent v3.10 in 2024	GLO	2024	2	3	1	3	3
polyamide glass fiber reinforced- freight transport via Truck	market for transport, freight, lorry 7.5-16 metric ton, EURO4/transport, freight, lorry 7.5-16 metric ton, EURO4/RER/tkm	ecoinvent v3.10 in 2024	RER	2024	2	3	1	3	3
polycarbonate- freight transport via Ship	transport, freight, lorry with refrigeration machine, 3.5-7.5 ton, EURO5, carbon dioxide, liquid refrigerant, cooling/transport, freight, lorry with refrigeration machine, 3.5-7.5 ton, EURO5, carbon dioxide, liquid refrigerant, cooling/GLO/tkm	ecoinvent v3.10 in 2024	GLO	2024	2	3	1	3	3
polycarbonate- freight transport via Truck	market for transport, freight, lorry 7.5-16 metric ton, EURO4/transport, freight, lorry 7.5-16	ecoinvent v3.10 in 2024	RER	2024	2	3	1	3	3

	metric ton, EURO4/RER/tkm								
Polyethylene film- freight transport via Truck	market for transport, freight, lorry 7.5-16 metric ton, EURO4/transport, freight, lorry 7.5-16 metric ton, EURO4/RER/tkm	ecoinvent v3.10 in 2024	RER	2024	2	3	1	3	3
polyoxymethylene- freight transport via Truck	market for transport, freight, lorry 7.5-16 metric ton, EURO4/transport, freight, lorry 7.5-16 metric ton, EURO4/RER/tkm	ecoinvent v3.10 in 2024	RER	2024	2	3	1	3	3
Polypropylene- freight transport via Ship	transport, freight, lorry with refrigeration machine, 3.5-7.5 ton, EURO5, carbon dioxide, liquid refrigerant, cooling/transport, freight, lorry with refrigeration machine, 3.5-7.5 ton, EURO5, carbon dioxide, liquid refrigerant, cooling/GLO/tkm	ecoinvent v3.10 in 2024	GLO	2024	2	3	1	3	3
Polypropylene- freight transport via Truck	market for transport, freight, lorry 7.5-16 metric ton, EURO4/transport, freight, lorry 7.5-16 metric ton, EURO4/RER/tkm	ecoinvent v3.10 in 2024	RER	2024	2	3	1	3	3
PVC- freight transport via Ship	transport, freight, lorry with refrigeration machine, 3.5-7.5 ton, EURO5, carbon dioxide, liquid refrigerant, cooling/transport, freight, lorry with refrigeration machine, 3.5-7.5 ton, EURO5, carbon dioxide, liquid refrigerant, cooling/GLO/tkm	ecoinvent v3.10 in 2024	GLO	2024	2	3	1	3	3
PVC- freight transport via Truck	market for transport, freight, lorry 7.5-16 metric ton,	ecoinvent v3.10 in 2024	RER	2024	2	3	1	3	3

	EURO4/transport, freight, lorry 7.5-16 metric ton, EURO4/RER/tkm								
Steel CRS 1018-freight transport via Ship	transport, freight, lorry with refrigeration machine, 3.5-7.5 ton, EURO5, carbon dioxide, liquid refrigerant, cooling/transport, freight, lorry with refrigeration machine, 3.5-7.5 ton, EURO5, carbon dioxide, liquid refrigerant, cooling/GLO/tkm	ecoinvent v3.10 in 2024	GLO	2024	2	3	1	3	3
Steel CRS 1018-freight transport via Truck	market for transport, freight, lorry 7.5-16 metric ton, EURO4/transport, freight, lorry 7.5-16 metric ton, EURO4/RER/tkm	ecoinvent v3.10 in 2024	RER	2024	2	3	1	3	3

Table 4: **LCI inputs assumed for module A3.** ***Data Quality Assessment Key Poor=0, Fair= 1, Good=2, Very Good=3***

Input	LCI Activity	Data Source	Geo	Year	Technology	Time	Geography	Reliability	Completeness
Bulk waste	process-specific burdens, residual material landfill/process-specific burdens, residual material landfill/RoW/kg	ecoinvent v3.10 in 2024	NC	2024	2	3	2	3	3
Cardboard	market for corrugated board box/corrugated board box/RoW/kg	ecoinvent v3.10 in 2024	NC	2024	2	3	2	3	3
Diesel	diesel, burned in building machine/diesel, burned in building machine/GLO/MJ	ecoinvent v3.10 in 2024	NC	2024	2	3	2	3	3
Electricity (NC warehouse)	market for electricity, medium voltage/electricity, medium voltage/US-SERC/kWh	ecoinvent v3.10 in 2024	NC	2024	2	3	2	3	3

Expanded polystyrene	market for polystyrene, expandable/polystyrene, expandable/GLO/kg	ecoinvent v3.10 in 2024	NC	2024	2	3	2	3	3
Natural gas	market for heat, district or industrial, natural gas/heat, district or industrial, natural gas/RoW/MJ	ecoinvent v3.10 in 2024	NC	2024	2	3	2	3	3
Paper	market for kraft paper/kraft paper/RoW/kg	ecoinvent v3.10 in 2024	NC	2024	2	3	2	3	3
Polyethylene film	market for packaging film, low density polyethylene/packaging film, low density polyethylene/GLO/kg	ecoinvent v3.10 in 2024	NC	2024	2	3	2	3	3
Propane	propane, burned in building machine/propane, burned in building machine/GLO/MJ	ecoinvent v3.10 in 2024	NC	2024	2	3	2	3	3
Tape	market for sealing tape, aluminium/PE, 50 mm wide/sealing tape, aluminium/PE, 50 mm wide/GLO/m	ecoinvent v3.10 in 2024	NC	2024	2	3	2	3	3

DATA QUALITY ASSESSMENT

Data quality/variability requirements, as specified in the PCR, are applied. This section describes the data quality achieved relative to the ISO 14044:2006 requirements. Data quality is judged based on its precision (measured, calculated or estimated), completeness (e.g., unreported emissions), consistency (degree of uniformity of the methodology applied within a study serving as a data source) and representativeness (geographical, temporal, and technological).

Precision: Through measurement and calculation, the manufacturers collected and provided primary data on their annual production. For accuracy, the LCA practitioner and 3rd Party Verifier validated the plant gate-to-gate data.

Completeness: All relevant specific processes, including inputs (raw materials, energy and ancillary materials) and outputs (emissions and production volume) were considered and modeled to represent the specified and declared products. The majority of relevant background materials and processes were taken from ecoinvent v3.10 LCI datasets where relatively recent region-specific electricity inputs were utilized. The most relevant EPDs requiring key A1 input were also utilized where readily available

Consistency: To ensure consistency, the same modeling structure across the respective product systems was utilized for all inputs, which consisted of raw material inputs and ancillary material, energy flows, water resource inputs, product and co-products outputs, returned and recovered Shade Roller

System materials, emissions to air, water and soil, and waste recycling and treatment. The same background LCI datasets from the ecoinvent v3.10 database were used across all product systems. Crosschecks concerning the plausibility of mass and energy flows were continuously conducted. The LCA team conducted mass and energy balances at the plant and selected process level to maintain a high level of consistency.

Reproducibility: Internal reproducibility is possible since the data and the models are stored and available in a machine-readable project file for all foreground and background processes, and in Labeling Sustainability's proprietary Shade Roller System LCA calculator* for all production facility and product-specific calculations. A considerable level of transparency is provided throughout the detailed LCA report as the specifications and material quantity make-up for the declared products are presented and key primary and secondary LCI data sources are summarized. The provision of more detailed publicly accessible data to allow full external reproducibility was not possible due to reasons of confidentiality.

Labeling Sustainability has developed a proprietary tool that allows the calculation of PCR-compliant LCA results for Roller Shade System product designs. The tool auto-calculates results by scaling base-unit technosphere inputs (i.e. 1 kg sand, 1 kWh electricity, etc.) to replicate the reference flow conversions that take place in any typical LCA software like openLCA or SimaPro. The tool was tested against several LCAs performed in openLCA and the tool generated identical results to those realized in openLCA across every impact category and inventory metric (where comparisons could be readily made).

Representativeness: The representativeness of the data is summarized as follows.

- Time related coverage of the manufacturing processes' primary collected data from 2023-01-01 to 2024-12-31.
- Upstream (background) LCI data was either the PCR specified default (if applicable) or more appropriate LCI datasets as found in the country-adjusted ecoinvent v3.10 database.
- Geographical coverage for inputs required by the A3 facility(ies) is representative of its region of focus; other upstream and background processes are based on US, North American, or global average data and adjusted to regional electricity mixes when relevant.
- Technological coverage is typical or average and specific to the participating facilities for all primary data.

ENVIRONMENTAL INDICATORS AND INVENTORY METRICS

Per the PCR, this EPD supports the life cycle impact assessment indicators and inventory metrics as listed in the tables below. As specified in the PCR, the most recent US EPA Tool for the Reduction and Assessment of Chemical and Other Environmental Impacts (TRACI), impact categories were utilized as they provide a North American context for the mandatory category indicators to be included in the EPD. Additionally, the PCR requires a set of inventory metrics to be reported with the LCIA indicators (see tables below).

Table 5: **Life cycle impact categories and life cycle inventory metrics**

ID	LCIA indicators	Abbreviations	Units
1	Climate change: global warming potential (GWP100)	GWP	kg CO2-eq
2	Ozone depletion: ozone depletion potential (ODP)	ODP	kg CFC-11-eq
3	Acidification: acidification potential (AP)	AP	kg SO2-eq
4	Eutrophication: eutrophication potential	EP	kg N-eq
5	Smog formation potential	SFP	kg O3-eq
6	Energy resources: non-renewable: abiotic depletion potential (ADP): fossil fuels	ADPfossil	MJ
Inventory metrics			
7	Inventory indicators ISO21930: Cumulative Energy Demand - renewable energy resources	RPRE	MJ
8	Inventory indicators ISO21930: Renewable primary resources with energy content used as material (i.e., PERM)	PRM	MJ
9	Inventory indicators ISO21930: Cumulative Energy Demand - non-renewable energy resources	NRPRE	MJ
10	Inventory indicators ISO21930: Non-renewable primary resources with energy content used as material (i.e., PENRM)	NRPRM	MJ
11	Inventory indicators ISO21930: use of secondary material	SM	kg
12	Inventory indicators ISO21930: use of renewable secondary fuels	RSF	MJ
13	Inventory indicators ISO21930: recovered energy	RE	MJ
14	Inventory indicators ISO21930: use of net fresh water	FW	m3
15	Inventory indicators ISO21930: hazardous waste disposed	HWD	kg
16	Inventory indicators ISO21930: non-hazardous waste disposed	NHWD	kg
17	Inventory indicators ISO21930: high-level radioactive waste disposed	HLRW	kg
18	Inventory indicators ISO21930: intermediate and low-level radioactive waste disposed	ILLRW	kg
19	Inventory indicators ISO21930: materials for recycling	MR	kg
20	Inventory indicators ISO21930: materials for energy recovery	MER	kg
21	Inventory indicators ISO21930: exported energy - electricity	EEel	MJ
22	Inventory indicators ISO21930: exported energy - heat	EEheat	MJ

It should be noted that emerging LCA impact categories and inventory items are still under development and can have high levels of uncertainty that preclude international acceptance pending further development. Use caution when interpreting data in any of the following categories.

- Renewable primary energy resources as energy (fuel);
- Renewable primary resources as material;
- Non-renewable primary resources as energy (fuel);
- Non-renewable primary resources as material;
- Secondary Materials;
- Renewable secondary fuels;
- Non-renewable secondary fuels;
- Recovered energy;
- Abiotic depletion potential for non-fossil mineral resources.
- Land use related impacts, for example on biodiversity and/or soil fertility;
- Toxicological aspects;
- Emissions from land use change [GWP 100 (land-use change)];
- Hazardous waste disposed;
- Non-hazardous waste disposed;
- High-level radioactive waste;
- Intermediate and low-level radioactive waste;
- Components for reuse;
- Materials for recycling;
- Materials for energy recovery;
- Recovered energy exported from the product system.

TOTAL IMPACT SUMMARY

Interpretation

This life cycle study and subsequent EPD report represents the environmental impacts of 1 m of the hardware system, available in Contract Series One and Two with open, fascia, and pocket styles. The study revealed specific key contributors or environmental hotspots that significantly contribute to the products' carbon footprint.

The findings are as follows:

The most significant contributor to the Rollease Acmeda hardware products' carbon footprint, measured in kg CO_2 eq, is (A2) transportation of aluminum 6063 via ship freight, contributing between 42%-56% of the total GWP impact. Following this, raw material aluminum 6063 accounts for 23%-42% of the total impact, depending on the quantity used per declared unit. While other components like steel and polyamide glass fiber-reinforced contribute to the overall global warming potential (GWP), their impact is comparatively smaller, less than 5%.

In conclusion, the findings highlight the need to adopt sustainable practices to mitigate the overall carbon footprint of the products. The mitigation strategies are as follows:

- Optimizing material usage to reduce quantity without compromising product quality.
- Optimizing and streamlining logistics to reduce transportation impacts attributed to the raw material transportation phase.

The following table reports the total LCA results for each product produced at the given shade roller system facility on a per 1 (one) meter of hardware system basis.

Table 6: **Total life cycle (across modules in scope) impact results for All declared products, assuming the geometric mean point values on a per 1 (one) meter of hardware system basis**

a) Midpoint Impact Categories:

Indicator/LCI Metric	GWP	ODP	AP	EP	SFP	ADPfossil
Unit	kg CO2-eq	kg CFC-11-eq	kg SO2-eq	kg N-eq	kg O3-eq	MJ
Minimum	2.94E+01	3.93E-07	1.05E-01	6.78E-02	1.87E+00	3.54E+02
Maximum	1.12E+02	1.47E-06	4.15E-01	2.51E-01	7.11E+00	1.31E+03
Mean	6.34E+01	8.24E-07	2.31E-01	1.42E-01	4.02E+00	7.53E+02
Median	6.44E+01	8.22E-07	2.26E-01	1.37E-01	4.04E+00	7.80E+02
1	2.94E+01	3.93E-07	1.05E-01	6.78E-02	1.87E+00	3.54E+02
2	4.58E+01	5.99E-07	1.62E-01	1.00E-01	2.91E+00	5.51E+02
3	7.82E+01	9.55E-07	2.98E-01	1.84E-01	5.02E+00	9.07E+02
4	3.31E+01	4.32E-07	1.16E-01	7.43E-02	2.07E+00	4.03E+02
5	5.99E+01	7.62E-07	2.10E-01	1.28E-01	3.76E+00	7.24E+02
6	9.73E+01	1.19E-06	3.65E-01	2.21E-01	6.21E+00	1.14E+03
7	3.18E+01	4.18E-07	1.13E-01	7.21E-02	2.00E+00	3.85E+02
8	4.61E+01	5.95E-07	1.64E-01	1.01E-01	2.91E+00	5.56E+02
9	7.76E+01	9.33E-07	2.98E-01	1.85E-01	4.97E+00	8.98E+02
10	4.33E+01	6.33E-07	1.52E-01	9.44E-02	2.74E+00	5.26E+02
11	7.23E+01	9.53E-07	2.57E-01	1.54E-01	4.59E+00	8.68E+02
12	7.91E+01	9.94E-07	3.10E-01	1.95E-01	5.07E+00	9.08E+02
13	4.52E+01	6.50E-07	1.59E-01	9.88E-02	2.84E+00	5.50E+02
14	6.90E+01	8.83E-07	2.43E-01	1.46E-01	4.31E+00	8.37E+02
15	1.12E+02	1.47E-06	4.15E-01	2.51E-01	7.11E+00	1.31E+03
16	4.66E+01	6.72E-07	1.62E-01	9.94E-02	2.93E+00	5.69E+02
17	8.04E+01	1.10E-06	2.81E-01	1.66E-01	5.09E+00	9.74E+02
18	9.33E+01	1.20E-06	3.50E-01	2.13E-01	5.95E+00	1.09E+03

b) Resource Inventory Metrics:

Indicator /LCI Metric	RPRE	PRM	NRPRE	NRPRM	SM	RSF	RE	FW
Unit	MJ	MJ	MJ	MJ	kg	MJ	MJ	m3
Minimum	3.24E+01	1.59E+01	3.19E+01	2.42E+00	1.40E+00	1.38E-01	2.17E-01	1.32E-01
Maximum	8.14E+01	1.59E+01	8.10E+01	1.11E+01	2.98E+00	1.45E-01	7.79E-01	4.80E-01
Mean	5.21E+01	1.59E+01	5.16E+01	6.78E+00	2.06E+00	1.41E-01	4.51E-01	2.75E-01
Median	4.99E+01	1.59E+01	4.94E+01	6.67E+00	2.04E+00	1.41E-01	4.72E-01	2.72E-01
1	3.24E+01	1.59E+01	3.19E+01	3.09E+00	1.40E+00	1.38E-01	2.17E-01	1.32E-01
2	4.09E+01	1.59E+01	4.04E+01	4.27E+00	1.70E+00	1.39E-01	3.38E-01	1.91E-01
3	6.48E+01	1.59E+01	6.43E+01	2.42E+00	2.42E+00	1.41E-01	5.33E-01	3.46E-01
4	3.39E+01	1.59E+01	3.34E+01	5.79E+00	1.46E+00	1.40E-01	2.43E-01	1.63E-01
5	4.76E+01	1.59E+01	4.71E+01	8.18E+00	1.98E+00	1.42E-01	4.41E-01	2.59E-01

6	7.44E+01	1.59E+01	7.40E+01	5.79E+00	2.73E+00	1.44E-01	6.70E-01	4.35E-01
7	3.34E+01	1.59E+01	3.29E+01	4.67E+00	1.44E+00	1.39E-01	2.33E-01	1.47E-01
8	4.11E+01	1.59E+01	4.06E+01	5.87E+00	1.70E+00	1.40E-01	3.36E-01	2.02E-01
9	6.51E+01	1.59E+01	6.46E+01	4.00E+00	2.44E+00	1.42E-01	5.22E-01	3.56E-01
10	3.88E+01	1.59E+01	3.83E+01	7.18E+00	1.63E+00	1.39E-01	3.23E-01	1.77E-01
11	5.48E+01	1.59E+01	5.43E+01	6.83E+00	2.17E+00	1.41E-01	5.30E-01	2.86E-01
12	6.82E+01	1.59E+01	6.77E+01	6.51E+00	2.56E+00	1.41E-01	5.22E-01	3.67E-01
13	3.99E+01	1.59E+01	3.93E+01	8.91E+00	1.69E+00	1.40E-01	3.35E-01	1.90E-01
14	5.22E+01	1.59E+01	5.17E+01	1.11E+01	2.11E+00	1.44E-01	5.02E-01	3.11E-01
15	8.14E+01	1.59E+01	8.10E+01	9.80E+00	2.98E+00	1.45E-01	7.79E-01	4.80E-01
16	3.99E+01	1.59E+01	3.94E+01	9.16E+00	1.68E+00	1.40E-01	3.48E-01	1.90E-01
17	5.72E+01	1.59E+01	5.67E+01	9.95E+00	2.27E+00	1.42E-01	5.99E-01	3.11E-01
18	7.18E+01	1.59E+01	7.13E+01	8.49E+00	2.68E+00	1.42E-01	6.45E-01	4.01E-01

c) Waste/output Inventory Metrics:

Indicator /LCI Metric	**HWD**	**NHWD**	**HLRW**	**ILLRW**	**MR**	**MER**	**EEel**	**EEheat**
Unit	**kg**	**kg**	**kg**	**kg**	**kg**	**kg**	**MJ**	**MJ**
Minimum	2.36E+00	2.66E+01	5.02E-05	1.22E-04	3.51E-01	9.35E-05	6.51E-02	1.50E-01
Maximum	1.00E+01	1.10E+02	1.95E-04	4.67E-04	8.93E-01	1.79E-04	2.41E-01	5.30E-01
Mean	5.53E+00	5.99E+01	1.08E-04	2.60E-04	5.74E-01	1.31E-04	1.36E-01	3.11E-01
Median	5.42E+00	5.72E+01	1.03E-04	2.48E-04	5.77E-01	1.36E-04	1.34E-01	3.26E-01
1	2.36E+00	2.66E+01	5.02E-05	1.22E-04	3.51E-01	9.35E-05	6.51E-02	1.50E-01
2	3.77E+00	4.11E+01	7.58E-05	1.83E-04	4.67E-01	1.13E-04	9.78E-02	2.37E-01
3	7.29E+00	7.66E+01	1.43E-04	3.44E-04	6.72E-01	1.40E-04	1.73E-01	3.54E-01
4	2.65E+00	2.92E+01	5.48E-05	1.34E-04	3.67E-01	9.88E-05	7.21E-02	1.69E-01
5	5.10E+00	5.31E+01	9.54E-05	2.30E-04	5.50E-01	1.33E-04	1.24E-01	3.13E-01
6	8.81E+00	9.27E+01	1.73E-04	4.15E-04	7.98E-01	1.61E-04	2.11E-01	4.51E-01
7	2.58E+00	2.84E+01	5.31E-05	1.29E-04	3.61E-01	9.72E-05	6.92E-02	1.62E-01
8	3.80E+00	4.12E+01	7.62E-05	1.84E-04	4.62E-01	1.13E-04	9.83E-02	2.35E-01
9	7.45E+00	7.68E+01	1.43E-04	3.43E-04	6.55E-01	1.40E-04	1.71E-01	3.45E-01
10	3.45E+00	4.08E+01	7.05E-05	1.71E-04	4.48E-01	1.11E-04	9.26E-02	2.28E-01
11	6.00E+00	6.56E+01	1.18E-04	2.84E-04	6.52E-01	1.44E-04	1.52E-01	3.74E-01
12	8.05E+00	8.39E+01	1.50E-04	3.60E-04	6.53E-01	1.41E-04	1.77E-01	3.39E-01
13	3.73E+00	4.28E+01	7.31E-05	1.77E-04	4.51E-01	1.15E-04	9.60E-02	2.37E-01
14	5.74E+00	6.12E+01	1.10E-04	2.65E-04	6.04E-01	1.42E-04	1.43E-01	3.55E-01
15	1.00E+01	1.10E+02	1.95E-04	4.67E-04	8.93E-01	1.79E-04	2.41E-01	5.30E-01
16	3.67E+00	4.30E+01	7.40E-05	1.79E-04	4.66E-01	1.16E-04	9.80E-02	2.47E-01
17	6.44E+00	7.25E+01	1.27E-04	3.05E-04	7.09E-01	1.55E-04	1.66E-01	4.27E-01
18	8.58E+00	9.20E+01	1.65E-04	3.96E-04	7.68E-01	1.60E-04	2.02E-01	4.37E-01

ADDITIONAL ENVIRONMENTAL INFO

No regulated substances of very high concern are utilized on site.

REFERENCES

ISO Standards:

- ISO 6707-1: 2014 Buildings and Civil Engineering Works - Vocabulary - Part 1: General Terms
- ISO 14021:1999 Environmental Labels and Declarations - Self-declared Environmental Claims (Type II Environmental Labeling)
- ISO 14025:2006 Environmental Labels and Declarations - Type III Environmental Declarations - Principles and Procedures
- ISO 14040:2006 Environmental Management - Life Cycle Assessment - Principles and Framework
- ISO 14044:2006 Environmental Management - Life Cycle Assessment - Requirements and Guidelines
- ISO 14067:2018 Greenhouse Gases – Carbon Footprint of Products – Requirements and Guidelines for Quantification
- ISO 14050:2009 Environmental Management - Vocabulary
- ISO 21930:2017 Sustainability in Building Construction - Environmental Declaration of Building Products

EN Standards:

- EN 16757 Sustainability of construction works - Environmental product declarations – Product Category Rules for concrete and concrete elements
- EN 15804 Sustainability of construction works - Environmental product declarations -Core rules for the product category of construction products

Other References:

- ISO 21930:2017 Sustainability in Building Construction - Environmental Declaration of Building Products
- USGBC LEED v4 for Building Design and Construction, 11 Jan 2019 available at https://www.usgbc.org/resources/pcr-committee-process-resources-part-b
- USGBC PCR Committee Process & Resources: Part B, USGBC, 7 July 2017 available at https://www.usgbc.org/resources/pcr-committee-process-resources-part-b.
- US EPA (2020) Advancing Sustainable Materials Management: 2018 Fact Sheet, https://www.epa.gov/sites/production/files/2021-01/documents/2018_ff_fact_sheet_dec_2020_fnl_508.pdf