Architectural Louvers

Construction Specialties (CS) has a Louver for every demand. Whether you want your louver to be an architectural focal point or blend right in, Construction Specialties can help you achieve your goals without ever having to sacrifice function. And with a variety of performance types and finishes, the options are truly endless.

Louvers are essential to any successful building. They provide healthy air exchange, while ensuring unwanted elements, like rain, dirt, and animals remain outside. They also provide an extra architectural element to your building's exterior – giving you an opportunity to improve the look of any building while meeting mechanical requirements.

ENVIRONMENTAL PRODUCT DECLARATION

Program Operator	NSF Certification LLC 789 N. Dixboro, Ann Arbor, MI 48105 www.nsf.org
General Program instructions and Version Number	NSF Certifications Policies for Environmental Product Declarations (EPD) Version: November 1, 2022
Manufacturer Name and Address	Construction Specialties Inc. 3 Werner Way, Lebanon NJ 08833
Declaration Number	EPD10965
Declared Product and Functional Unit	Architectural Louvers Functional Unit: 100 m^2 of covering surface for 75 years
Reference PCR and Version Number	Part A: Life Cycle Assessment Calculation Rules and Report Requirements, Version 3.2 Part B: Insulated Metal Panels, Metal Composite Panels, and Metal Cladding: Roof and Wall Panels, Version 2
Product's intended Application and Use	Building barrier that regulates air flow while regulating water and wind mitigation from external environment
Product RSL	30 years
Markets of Applicability	North America
Date of Issue	06/21/2024
Period of Validity	5 years from date of issue
EPD Type	Product Specific
Range of Dataset Variability	N/A
EPD Scope	Cradle-to-Grave
Year of reported manufacturer primary data	2022
LCA Software and Version Number	SimaPro 9.5.9.2
LCI Database and Version Number	Ecoinvent 3.9.1
LCIA Methodology and Version Number	TRACI 2.1 IPCC 2021 GWP100 1.02 CML -baseline (version 4.7)
The sub-category PCR review was conducted by:	Thomas Gloria, PhD – Industrial Ecology Consultants Lindita Bushi, PhD – Athena Sustainable Materials Institute Bob Zabcik, P.E., LEED AP BD+C – NCI Building Systems
This declaration was independently verified in accordance with ISO 14025: 2006. The UL Environment "Part A: Life Cycle Assessment Calculation Rules and Report Requirements" v3.2 (December 2018), based on CEN Norm EN 15804 (2012) and ISO 21930:2017, serves as the core PCR, with additional considerations from the USGBC/UL Environment Part A Enhancement (2017) **☐ Internal ☒ External**	Jack Geibig - EcoForm jgeibig@ecoform.com
This life cycle assessment was conducted in accordance with ISO 14044 and the reference PCR by:	TrueNorth Collective
This life cycle assessment was independently verified in accordance with ISO 14044 and the reference PCR by:	Jack Geibig - EcoForm jgeibig@ecoform.com 

Limitations: Environmental declarations from different programs (ISO 14025) may not be comparable.
Comparison of the environmental performance of Products using EPD information shall be based on the product's use and impacts at the building level, and therefore EPDs may not be used for comparability purposes when not considering the building energy use phase as instructed under this PCR.
Full conformance with the 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.

Company

Founded in 1948, Construction Specialties (CS) is a family-owned building products manufacturer. CS provides solutions to complex challenges that architects, designers, building owners, facility managers and contractors face daily. Since inventing the first extruded louver, CS has become a global leader in all of our product categories: Acrovyn® interior wall protection, impact-resistant doors, entrance flooring, expansion joint solutions, architectural louvers and screens, facade solutions, safety venting and modular stairs, awnings & balconies. Drawing upon our decades of experience, CS provides extensive services resulting in high-quality products found in some of the world's most significant architecture. For more information about CS products and solutions, please visit c-sgroup.com.

Product Description

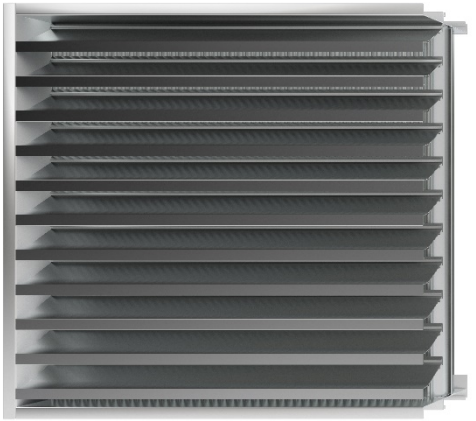

Figure 1: RS-9615 Storm resistant louver

Model RS-9615 is a 9" storm resistant, continuous line louver. This louver is tested and certified AMCA 500-L, AMCA 540 and AMCA 550 compliant.

Product Identification

This EPD represents Construction Specialties' architectural louvers, and a list of representative products and the product groups are listed below in Table 1. Product results are provided for the RS-9615 product, which utilizes the largest blades offered at 9" and represents the worst-case scenario for Construction Specialties' architectural louver portfolio since it has the largest mass over the 100 square meter functional unit and the results are driven by the extruded aluminum used in the product.

Table 1: Product names

Representative Product	Product Group	Products Included
Architectural Louvers	Non-drainable	GS-410, GS-610, A4080/A4085, A4100, A4105, 4180, A6080/A6085, A6100, A6105
	Drainable	A4097, A4177, A6097, A6177, A6155, A2097, B5157, GS-407, GS-607
	Storm-resistant	RS-3700, RS-5800, RS-9615, RS-2300, RS-4700, RS-5215, RS-5225, RSH-5700, RS-5900, RS-7315, RS-7305, RS-7705, RS-4605, RS-5605, RSV-5700
	Bold line	B-6485, B-7505
	Perform	PL-5800, PL-3600, PL-3705, PL-4080, PL-5700
	Extreme Weather	DC-9614, DC-4174, DC-6174, DCV-5704, DCH-5704, DC-5804, EW-5210
	Blast Resistant	BL-4179, BL-6179, BL-4089, BL-6089, BLH-5709, BLV-5709, BL-6809, BL-5609, BL-5809, BL-7709
	Thinline	2282, 2252, 1302

Product Specification

Non-drainable: Economical louvers for when high free area is desired and where water mitigation is not a concern.

Drainable: Louvers that provide drainage for rain coming in contact with the face/blade of the louver. They offer high free area and high air flow with a low pressure drop where minimal water migration is acceptable.

Storm-resistant: Louvers that are resistant to wind-driven rain and winds as high as 50mph that drive up to 8" of water per hour.

Bold line: Bold Line Louvers are comprised of varying blade depths in unlimited colors to provide creative design freedom while still meeting performance requirements.

Perform: Perform Louvers provide superior air and water performance while making the louver disappear under a modern perforated skin where the perforated sheet and louver are unified within a single framed system.

Extreme Weather: Louvers with the highest level of protection and certification to withstand large and small projectile impacts and high-velocity wind pressures. These are best used in coastal areas in hurricane-prone regions.

Blast Resistant: When an exterior façade calls from protection from external blasts, these louvers are designed to withstand blasts up to a 12 PSI load that can comply with General Services Administration Guidance.

Thinline: Where Louvers greater than 3" deep are not practical, these shallow blade louvers provide high free area, are ideal for thin wall and curtain wall applications where minimal depth is required and water mitigation is not a concern.

Flow Diagram

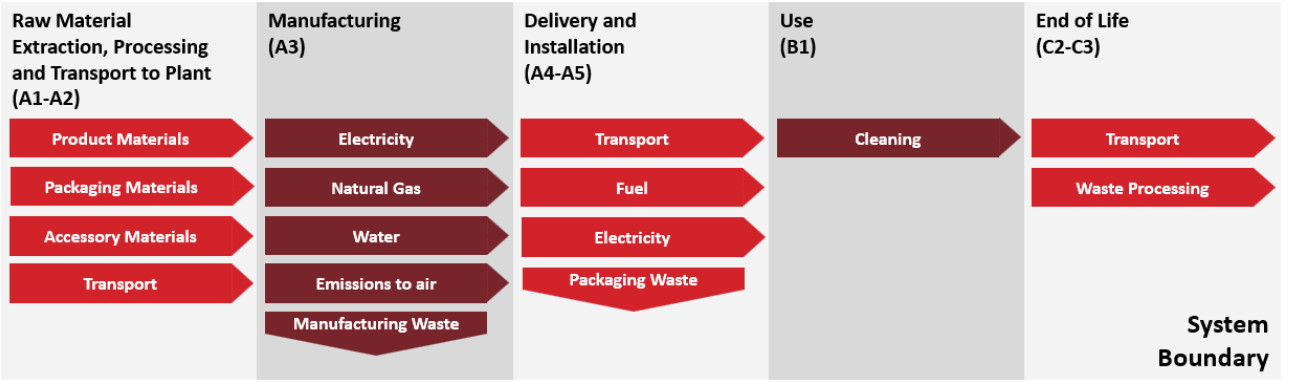

Figure 2: Process Flow Diagram

Declaration of Methodological Framework

This EPD is a cradle-to-grave study. A summary of the life cycle stages can be found in Table 6 and 7. The reference service life outlined in Reference Service Life & Estimated Building Service. The cut-off criteria are described in Cut-off Rules, and allocation procedures are described in Allocation. All known mass and energy flows are included in this EPD with no known flows being deliberately excluded.

Technical Requirements

The following technical data describe the RS-9615 product undergoing the life cycle assessment.

Table 2: Technical Details

Name	Value	Unit
Length	10	m
Width	10	m
Mass	5.69E+03	kg
Thickness	228.6	mm
Density	2.49E+02	kg/m^3
Free Area	59.1	m^2
Percent free area	59.1	%
To see additional performance data like pressure drop and water performance view the Performance Data Sheet.		

Properties of Declared Product as Delivered

Architectural louvers provide building ventilation by offering airflow and storm resistance like water mitigation and impact resistance. They are custom-made with the exact size, finish, and preassembled for each building they are being installed on. Each product can be outfitted with the optional bird screen and/or blank off accessories, and both of those accessories are captured within this EPD. Louvers can be coated in a wide range of colors using one of the four coating technologies available (anodized, kynar paint, powder coat, and metallic kynar). The finish selected for the aluminum Louver is anodized since it is the most impactful.

Table 3: Functional Unit Details

Name	Value	Unit
Functional unit	100	m^2
Mass	5.69E+03	kg
Conversion factor to 1 kg	1.76E-02	m^2/kg

Material Composition

Table 4: Material Composition

Material	Mass %
Extruded Aluminum	93.2
Mineral Wool	5.7
Steel	1.1
Anodized coating	<0.01

No substances required to be reported as hazardous are associated with the production of this product.

Manufacturing

Architectural louvers are manufactured in a facility located in Acuna, Mexico. For each installation order, the necessary layout of extruded aluminum is cut, punched, drilled, and notched. Parts are then assembled, welded, coated, packed, and shipped. Depending on the desired coating, the welded assembly is subject to pretreatment prior to coating and curing prior to being packed for shipment.

Packaging

The type of packaging materials needed to safely deliver architectural louvers to the installation site is consistent, but the amount is dependent on the size of the louver. The louver size relates to the amount of extruded aluminum required, and Table 4 provides the amount of packaging needed for each kg of louver extruded aluminum needed for the functional unit of 100 m2.

Table 5: Packaging (per kg of louver extruded aluminum needed for the functional unit of 100 m2)

Material Type	Amount (kg)	Disposal Method
Soft wood	2.32E-01	75% Recycled, 20% Landfill, 5% Incineration
Strapping Steel	1.27E-01	57% Recycled, 34% Landfill, 9% Incineration
Staples	8.65E-03	57% Recycled, 34% Landfill, 9% Incineration
HDPE film	3.63E-03	15% Recycled, 68% Landfill, 17% Incineration
EPS	1.83E-03	15% Recycled, 68% Landfill, 17% Incineration
Corrugate	5.52E-04	75% Recycled, 20% Landfill, 5% Incineration
Tape	3.77E-04	75% Recycled, 20% Landfill, 5% Incineration
Nylon	2.42E-05	15% Recycled, 68% Landfill, 17% Incineration
HDPE foam	3.65E-06	15% Recycled, 68% Landfill, 17% Incineration

Transportation

It is assumed that all the raw materials sourced are distributed by truck. A weighted average distance of extruded aluminum suppliers to the manufacturing facility was calculated and used in the model.

The shipping distance and mode used in the model for transport from manufacturing to the installation site is defined by the PCR Part B, Section 3.5 as 554 km using diesel-powered truck/trailer.

The shipment of waste at the product's end of life is defined by the PCR Part B, Section 3.5 as 100 km using diesel-powered truck/trailer.

Product Installation

To ensure proper installation, the louver opening should be verified to be square and plumb, and a drill is needed to create the necessary mounting holes. Detailed instructions can be found at this link. The energy and fuel required during the installation of 100 m2 of louvers is defined by PCR Part B, Section 3.5 as 1 gallon of diesel and 2 kWh of electricity. Since each louver is custom built to the specifications of the installation site, it is assumed there is no product scrap generated during installation.

Use

The assumption for the maintenance is provided by PCR Part B, Section 3.3.1, including the cleaning frequency and the cleaning material.

Table 6: Production Cleaning Assumptions

Parameter	Input Per 100 Square Meter	Unit
Cleaning Per Year	2	#
Cleaning Per 75 Years	150	#
Soap & Water mixture per Cleaning	500	ml

Reference Service Life & Estimated Building Service

The reference service life of the products in typical outdoor conditions found in the US is 30 years as per PCR Part B, Section 2.13. For a building's estimated service life of 75 years as indicated in PCR Part A, Section 2.8.2, there will be 1.5 replacements needed after initial installation, meaning 250 m^2 of architectural louvers are needed over the full life of the building.

Disposal

Architectural louvers mainly consist of extruded aluminum, which is 100% recyclable, but in this EPD, the disposal assumptions are aligned to PCR Part A. Section 2.8.5.

Aluminum is assumed to be recycled at a rate of 85% and landfilled at a rate of 15% with no option for energy recovery.

LCA CALCULATION RULES

Functional Unit

The functional unit of the formed metal louver is 100 m^2 of coverage for 75 years, as indicated in Table 1.

System Boundary

The type of EPD is cradle-to-grave. All LCA modules are included and are summarized in Table 6 and 7.

Table 7: Description of the system boundary modules

	Product Stage			Construction Process Stage		Use Stage							End of Life Stage				Benefits and Loads Beyond the System Boundary
	A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
	Raw material supply	Transport	Manufacturing	Transport from gate to site	Assembly/Install	Use	Maintenance	Repair	Replacement	Refurbishment	Building Operational Energy Use During Product Use	Building Operational Water Use During Product Use	Deconstruction	Transport	Waste processing	Disposal	Reuse, Recovery, Recycling Potential
Cradle-to-Grave	**X**			**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**MND**

Table 8: System Boundary

Module Name	Description	Analysis Period	Summary of Included Elements
A1	Product Stage: Raw Material Supply	2022	Raw Material sourcing and processing as defined by secondary data. Packaging materials and materials for accessories are included as well.
A2	Product Stage: Transport	2022	Shipping from supplier to manufacturing site based on product weights and estimated distance.
A3	Product Stage: Manufacturing	2022	Energy, water, and material inputs required for manufacturing products from raw materials. Manufacturing emissions and waste are included as well.
A4	Construction Stage: Transport	2022	Shipping distance and mode from manufacturing site to project site is defined by PCR Part B, Section 3.5 – 554 km by diesel powered truck
A5	Construction Stage: Installation	2022	Energy and fuel used during installation is defined by PCR Part B, Section 3.5 – 1 gallon of diesel and 2 kWh of electricity.
B1	Use Stage: Use	2022	Cleaning materials and frequency are defined by PCR Part B, Section 3.3.1 – 500 ml of 1% sodium lauryl sulfate solution twice per year
B2	Use Stage: Maintenance	2022	The product does not require maintenance once installed.
B3	Use Stage: Repair	2022	The product does not require repair once installed.
B4	Use Stage: Replacement	2022	The product does not require replacement once installed.
B5	Use Stage: Refurbishment	2022	The product does not require refurbishment once installed.
B6	Operational Energy Use	2022	The product does not impact the operational energy use of the building.
B7	Operational Water Use	2022	The product does not impact the operational energy use of the building.
C1	Deconstruction	2022	Energy and fuel used during deconstruction is defined by PCR Part B, Section 3.5 – 1 gallon of diesel and 2 kWh of electricity.
C2	Transport	2022	Shipping from project site to waste processing is defined by PCR Part B, Section 3.5 – 100 km using diesel powered truck.
C3	Waste Processing	2022	Waste processing is not required. All waste can be processed as is.
C4	Disposal	2022	The disposal process of the product varies with the material type as per Part A Section 2.8.5. The impacts from landfilling are modeled based on secondary data.
D	Benefits beyond system	MND	Credits from energy or material capture. This module is not considered.

Estimates & Assumptions

All estimates and assumptions are within the requirements of ISO 14040/44, and PCR Part A & B. The majority of the estimations are within the primary data. The primary data was collected as annual totals including all utility usage, emissions, waste generated, and raw materials purchased. Mass of extruded aluminum delivered was calculated based on raw materials purchased and waste metal generated. For the LCA, the consumption and waste information were divided by the amount of extruded aluminum delivered to create factors based on a per kilogram basis.

Cut-off Rules

Input and output flows of mass and energy greater than 1% (based on total mass of final product and total energy usage of the product system) or greater than 1% of environmental impacts were included within the scope of the analysis. Flows less than 1% were included if sufficient data were available to warrant inclusion and/or the flow was thought to have significant environmental impact. Cumulative excluded flows and environmental impacts are less than 5% per module based on total mass, energy usage, and impacts of the product system. Where data gaps were identified, they are filled by conservative assumptions with average, generic, or proxy data and assumptions are documented. No known flows relevant to the product system are deliberately excluded from this EPD.

Data Sources

Primary data were collected by facility personnel, and whenever available, supplier transport data was used. When primary data did not exist, secondary data for raw material production was utilized from Ecoinvent 3.9.1 database.

Data Quality

The Data Quality of the life cycle inventory data used in this study are evaluated based on temporal, geographical, technological representativeness, and completeness. All data quality aspects have been evaluated and given a rating.
The overall data quality is considered to be: Very good.

Temporal: The primary data provided by the manufacturer represents all information for calendar year 2022, and is less than two years old. Time coverage of this data is considered very good.

Geographical: The geographical scope of the manufacturing portion of the life cycle is Acuna, Mexico, and all primary data were collected from the manufacturer. The geographic coverage of primary data is considered Excellent.

Technological: Primary data provided by the manufacturer is specific to the technology that Construction Specialties uses in manufacturing their products. It is site specific and considered to be of good quality.

Completeness: All upstream and downstream activities are included using a combination of primary and secondary data. For the processes within the system boundary, all energy and material flows have been included in the model. No known flows are excluded and is considered to be excellent quality.

It is worth noting that the energy and water used in manufacturing the products includes overhead energy such as lighting, heating, and sanitary use of water. Sub-metering would improve the technological coverage of data quality. Data necessary to model cradle-to-gate unit processes was sourced from ecoinvent LCI datasets. Improved life cycle data from suppliers would improve technological coverage.

Period Under Review

The period under review is calendar year 2022.

Allocation

General principles of allocation were based on ISO 14040/44, and where possible, allocation was avoided. No multi-output allocation was necessary in the foreground of the study, and manufacturing inventories were assigned using a mass allocation approach based on provided data of production volumes. Secondary data taken from ecoinvent v3.9.1 cut-off by classification has allocation applied to it.

LCA: Scenarios and Additional Technical Information

Table 9: Transport to the building site (A4)

Parameter	Value	Unit
Fuel Type	Diesel	-
Liters of fuel	17.4	l/100km
Vehicle Type	Diesel Truck of size >32 metric tons	-
Transport distance	100	km
Gross density of products transported	3.31E+02	kg/m^3
Weight of products transported	7.56E+03	kg
Volume of products transported	22.86	m^3
Capacity utilization volume factor	1	-

Table 10: Installation into the building (A5)

Parameter	Value	Unit
Ancillary materials	0	kg
Net freshwater consumption specified by water source and fate	0	m^3
Other resources	0	kg
Electricity consumption	2	kWh
Other energy carriers (diesel)	1.44E+02	MJ
Product wastage generated per 100 m^2	0	kg
Waste materials at the construction site before waste processing, generated by product installation	0	kg
Output materials resulting from on-site waste processing	0	kg
Mass of plastic packaging waste	2.74E+01	kg
Mass of cardboard packaging waste	4.64E+00	kg
Mass of wooden packaging waste	1.16E+03	kg
Mass of metal packaging waste	6.80E+02	kg
Direct emissions to ambient air, soil, and water	0	kg
VOC emissions	0	$\mu g/m^3$

Table 11: Reference Service Life

Parameter	Value	Unit
RSL	30	Years
Declared product properties and finishes, etc.	See Table 2	Units as appropriate
Use conditions	See Table 5	Units as appropriate

Table 12: End of life (C1-C4)

Parameter		Value	Unit
Assumptions for scenario development		PCR Part A Prescribed	
Collection process	Collected separately	0	kg
	Collected with mixed construction waste	5.69E+03	kg
Recovery	Reuse	0	kg
	Recycling	5.08E+03	kg
	Landfill	6.06E+02	kg
	Incineration	0	kg
	Incineration with energy recovery	0	kg
	Energy conversion	0	MJ
Disposal	Product or material for final deposition	5.69E+03	kg
Removals of biogenic carbon		0	kg CO_2

LCA Results

All results are given per functional unit, which is 100 m^2 of installed product over product life of 30 years, therefore, to reach an estimated building life of 75 years, the results should be multiplied by 2.5. Environmental Impacts were calculated using the SimaPro LCA software. Impact results have been calculated using both TRACI 2.1 and CML 2001-Jan 2016 characterization factors, and third party verified ISO 14040/44 secondary LCI data sets contribute more than 67% of total impacts. LCIA results are relative expressions and do not predict impacts on category endpoints, the exceeding of thresholds, safety margins or risks. These six impact categories are globally deemed mature enough to be included in Type III environmental declarations. Other categories are being developed and defined and LCA should continue making advances in their development, however the EPD users shall not use additional measures for comparative purposes.

The results below are provided for the worse-case product and configuration: the RS-9615 product, which utilizes the largest blades offered at 9" and has the largest mass over the 100 square meter functional unit, with anodized coating and both accessory options for bird screen and blank off. More granular results are provided in the LCA Interpretation section and the Additional Environmental Informational contains results for the best-case product, the RS-2300 product, which uses the smaller 2" blades (around 60% fewer impacts than the RS-9615), and the DC-5704, which represents louvers for extreme weather using 5" blades (around 35% fewer impacts than the RS-9615).

Table 13: Acronym Key

Acronym	Text	Acronym	Text
GWP	Global warming potential	OPD	Depletion of stratospheric ozone layer
AP	Acidification potential of soil and water	EP	Eutrophication potential
SFP	Smog formation potential	ADP-fossil	Abiotic depletion potential for fossil resources
LCI Indicators			
RPR_E	Use of renewable primary energy excluding renewable primary energy resources used as raw materials	SM	Use of secondary materials
RPR_M	Use of renewable primary energy resources used as raw materials	RSF	Use of renewable secondary fuels
$NRPR_E$	Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials	NRSF	Use of non-renewable secondary fuels
$NRPR_M$	Use of non-renewable primary energy resources used as raw materials	FW	Net use of fresh water
HWD	Disposed-of-hazardous waste	MR	Materials for recycling
NHWD	Disposed-of non-hazardous waste	MER	Materials for energy recovery
HLRW	High-level radioactive waste, conditioned, to final repository	EE	Exported energy
ILLRW	Intermediate- and low-level radioactive waste, conditioned, to final repository	CRU	Components for reuse
RE	Recovered energy		
Carbon Emissions and Removals			
BCRP	Biogenic Carbon Removal from Product	BCEP	Biogenic Carbon Emission from Product
BCRK	Biogenic Carbon Removal from Packaging	BCEK	Biogenic Carbon Emission from Packaging

RS-9615 ARCHITECTURAL LOUVER PRODUCT COVERING 100 M²

LCIA Results

Table 14: LCIA Results for RS-9615 (per 100 m2)

Impact Category	A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
CML Results																	
ADP-fossil fuel [MJ]	6.59E+05	6.33E+03	4.82E+04	6.33E+03	5.75E+02	3.05E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.87E+02	8.60E+02	0.00E+00	6.48E+01	MND
TRACI 2.1 Results																	
GWP [kg CO_2 eq]	7.06E+04	4.26E+02	3.97E+03	4.26E+02	3.85E+01	7.58E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.45E+01	5.78E+01	0.00E+00	2.93E+00	MND
ODP [kg CFC 11 eq]	9.13E-04	7.93E-06	1.15E-04	7.93E-06	7.26E-07	3.66E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.35E-07	1.08E-06	0.00E+00	8.33E-08	MND
AP [kg SO_2 eq]	5.30E+02	1.00E+00	1.35E+01	1.01E+00	2.37E-01	3.16E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.63E-01	1.37E-01	0.00E+00	1.80E-02	MND
EP [kg N eq]	2.91E+02	3.62E-01	8.23E+00	3.62E-01	4.00E-02	5.25E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.67E-02	4.92E-02	0.00E+00	4.08E-03	MND
SFP [kg O_3 eq]	5.01E+03	1.80E+01	1.60E+02	1.80E+01	6.67E+00	3.03E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.11E+00	2.45E+00	0.00E+00	4.67E-01	MND

Resource Use Results

Table 15: Resource Use Results for RS-9615 (per 100 m2)

Impact Category	A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
RPR_E [MJ]	6.73E+04	8.12E+01	3.54E+03	8.13E+01	7.46E+00	1.75E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.59E+00	1.10E+01	0.00E+00	7.15E-01	MND
RPR_M [MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	MND
$NRPR_E$ [MJ]	7.65E+05	6.83E+03	5.64E+04	6.83E+03	6.24E+02	4.16E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.05E+02	9.28E+02	0.00E+00	6.98E+01	MND
$NRPR_M$ [MJ]	9.81E+02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	MND
SM [kg]	2.59E+03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	MND
RSF [MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	MND
NRSF [MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	MND
RE [MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	MND
FW [m^3]	0.00E+00	0.00E+00	3.05E+01	0.00E+00	0.00E+00	2.97E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	MND

Output Flows and Waste Results

Table 16: Output Flows and Waste Results for RS-9615 (per 100 m2)

Impact Category	A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
HWD [kg]	0.00E+00	0.00E+00	1.94E+02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	MND
NHWD [kg]	0.00E+00	0.00E+00	1.88E+02	0.00E+00	6.07E+02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.85E+02	MND
HLRW [kg]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	MND
ILLRW [kg]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	MND
CRU [kg]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	MND
MR [kg]	0.00E+00	0.00E+00	1.69E+03	0.00E+00	1.26E+03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.30E+03	MND
MER [kg]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	MND
EE [MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	MND

Carbon Emissions and Removals

Table 17: Carbon Emissions and Removals Results for RS-9615 (per 100 m2)

Per m^2	Value
BCRP [$kgCO_2e$]	0.00E+00
BCEP [$kgCO_2e$]	0.00E+00
BCRK [$kgCO_2e$]	-6.83E+02
BCEK [$kgCO_2e$]	1.21E+02

LCA Interpretation

From the perspective of one cycle of the products, the two prominent stages with the most prominent impacts are raw material supply (A1) from extruded aluminum and manufacturing stage (A3). Currently a 30-year reference service life will lead to 1.5 replacements after initial installation of the products over the 75-year building life.

As seen in Figure 3 below, A1 raw materials stage contributes to over 90% of the RS-9615 product life cycle GWP impacts, following by A3 manufacturing which contributes around 5%. All other phases contribute less than 1% each. The impact categories for AP, EP, SFP, and ODP follow similar trend with A1 contributing over 85% to the product life cycle impacts.

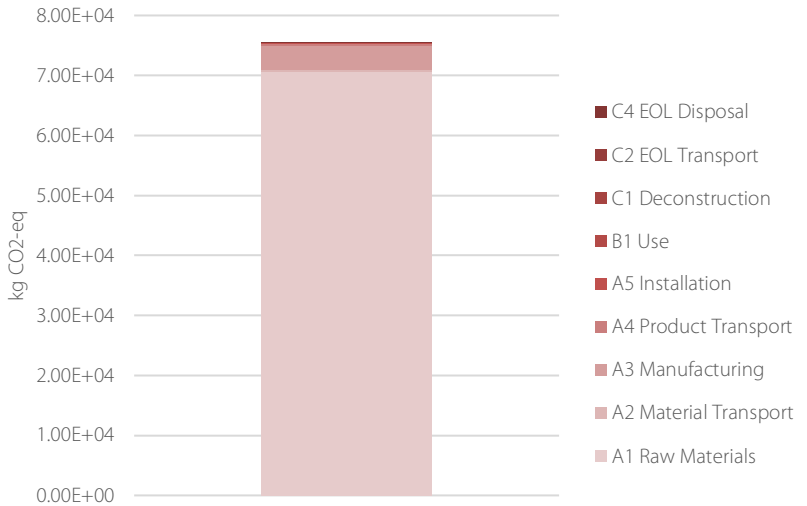

Figure 3: GWP Life Cycle Impacts for RS-9615 (per 100 m2)

Over 90% of the raw material GWP impacts are driven by the extruded aluminum, followed by the blank off, which contributes around 5%. All other materials contribute less than 2% each.

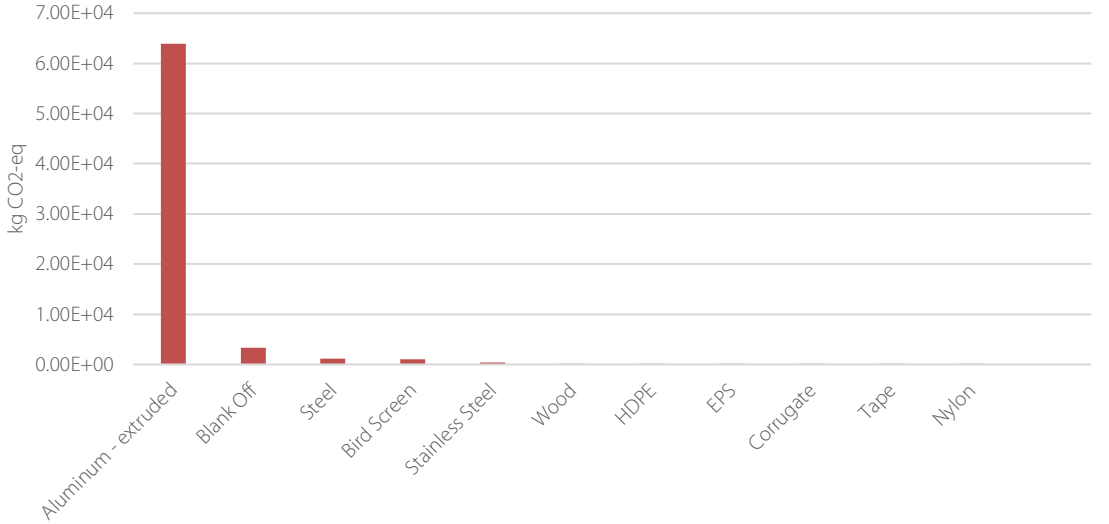

Figure 4: GWP by Raw Material for RS-9615 (per 100 m2)

Each product can be outfitted with the optional bird screen and/or blank off accessories, and both of those accessories and can be coated in a wide range of colors using one of the four coating technologies available (anodized, kynar paint, powder coat, and metallic kynar). The baseline results represent the most impactful scenario of the anodized coating and including both the bird screen and blank off accessories. Figure 5 below compares the coating and accessory combinations for the RS-9615 product. The least impactful scenario is the powder coat with no accessories (7% fewer GWP impacts than the baseline results).

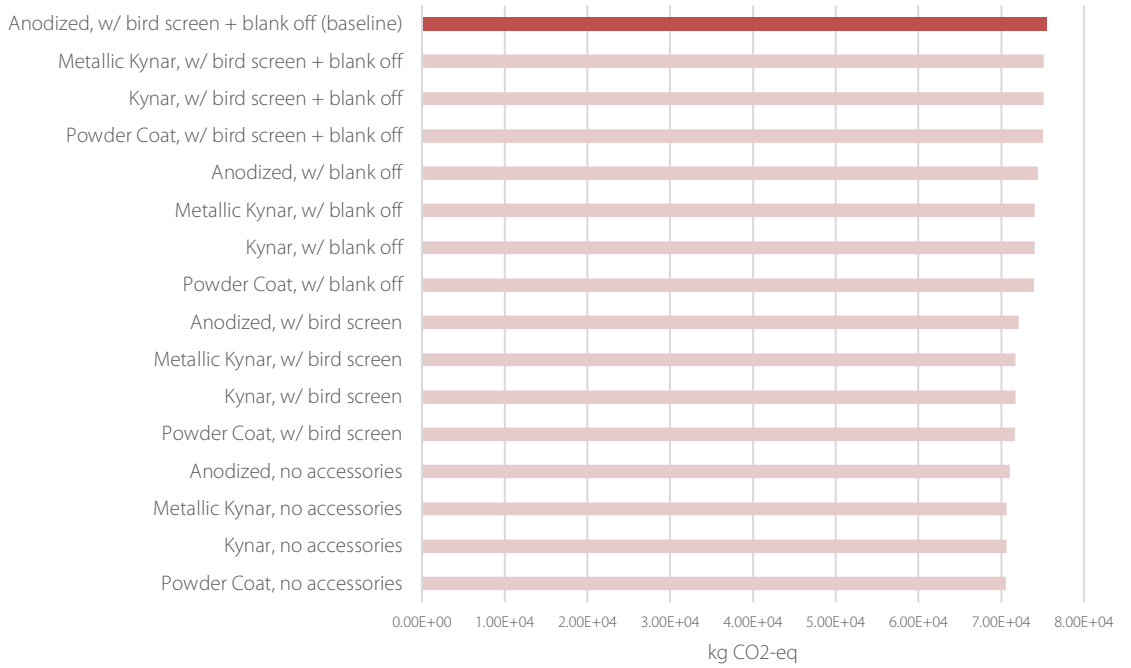

Figure 5: GWP Coating and Accessory Comparison for RS-9615 (per 100 m2)

The RS-9615 product utilizes the largest blades offered at 9" and represents the most conservative scenario for Construction Specialties' architectural louver portfolio since it has the largest mass over the 100 square meter functional unit and the results are driven by the extruded aluminum used in the product. Results are also provided for RS-2300, which uses the smaller 2" blades and DC-5704, which represents louvers for extreme weather using 5" blades, and figure 6 below shows the comparison of the three products.

Figure 6: GWP Product Comparison (with Anodized Coating with Bird Screen and Blank Off accessories (per 100 m2)

Additional Environmental Information

Results for the RS-2300, which uses the smaller 2" blades (around 60% fewer impacts than the RS-9615), and the DC-5704, which represents louvers for extreme weather using 5" blades (around 35% fewer impacts than the RS-9615) are provided below.

RS-2300 ARCHITECTURAL LOUVER PRODUCT COVERING 100 M²

Table 18: LCIA Results for RS-2300 (per 100 m2)

Impact Category	A1	A2	A3	A4	A5	B1	C1	C2	C4
CML Results									
ADP-fossil fuel [MJ]	2.63E+05	2.58E+03	1.69E+04	2.58E+03	3.23E+02	3.05E+00	1.87E+02	3.67E+02	9.59E+01
TRACI 2.1 Results									
GWP [kg CO_2 eq]	2.81E+04	1.74E+02	1.39E+03	1.74E+02	2.29E+01	7.58E-01	1.45E+01	2.47E+01	3.90E+00
ODP [kg CFC 11 eq]	3.72E-04	3.24E-06	4.03E-05	3.24E-06	4.07E-07	3.66E-08	2.35E-07	4.60E-07	1.21E-07
AP [kg SO_2 eq]	2.10E+02	4.10E-01	4.74E+00	4.10E-01	1.89E-01	3.16E-03	1.63E-01	5.82E-02	2.63E-02
EP [kg N eq]	1.15E+02	1.48E-01	2.89E+00	1.48E-01	2.49E-02	5.25E-03	1.67E-02	2.10E-02	4.48E-03
SFP [kg O_3 eq]	1.98E+03	7.35E+00	5.63E+01	7.36E+00	5.66E+00	3.03E-02	5.11E+00	1.04E+00	6.97E-01

DC-5794 ARCHITECTURAL LOUVER PRODUCT COVERING 100 M²

Table 19: LCIA Results for DC-5794 (per 100 m2)

Impact Category	A1	A2	A3	A4	A5	B1	C1	C2	C4
CML Results									
ADP-fossil fuel [MJ]	4.11E+05	3.97E+03	2.89E+04	3.97E+03	4.19E+02	3.05E+00	1.87E+02	5.47E+02	1.23E+01
TRACI 2.1 Results									
GWP [kg CO_2 eq]	4.39E+04	2.67E+02	2.37E+03	2.67E+02	2.88E+01	7.58E-01	1.45E+01	3.68E+01	2.98E+00
ODP [kg CFC 11 eq]	5.74E-04	4.97E-06	6.87E-05	4.97E-06	5.28E-07	3.66E-08	2.35E-07	6.86E-07	9.27E-08
AP [kg SO_2 eq]	3.30+02	6.30E-01	8.07E+00	6.30E-01	2.07E-01	3.16E-03	1.63E-01	8.69E-02	2.01E-02
EP [kg N eq]	1.81E+02	2.27E-01	4.93E+00	2.27E-01	3.07E-02	5.25E-03	1.67E-02	3.13E-02	3.43E-03
SFP [kg O_3 eq]	3.12E+03	1.13E+01	9.60E+01	1.13E+01	6.04E+00	3.03E-02	5.11E+00	1.56E+00	5.33E-01

Environment & Health During Manufacturing

During the manufacturing of the products covered in the EPD, all legal regulations regarding emissions to air, wastewater discharge, solid waste disposal and noise emissions are followed.

EXTRAORDINARY EFFECTS

Water

Should the product become flooded, the water should be removed by means of extraction and drying and the product should behave as originally intended. There are no environmental impacts associated with the product being flooded.

Mechanical Destruction

If the product is mechanically destroyed, it should be disposed of using standard procedures and replaced in a timely manner.

Environmental Activities & Certifications

General information about the certifications for Construction Specialties' louvers can be found in Construction Specialties' Louvers Product Guide. Product-specific environment certification information can be located at each product detail webpage under the tab "Data Sheets & Sustainability".

References

Bare, J., Norris, G., Pennington, D., & McKone, T. (2003). TRACI: The Tool for the Reduction and Assessment of Chemical and Other Environmental Impacts. Journal of Industrial Ecology.

ecoinvent Centre. (2023). ecoinvent Version 3.9.1.

Ecology, Department of Industrial. (2016). CML-IA database.

IPCC. (2021). Sixth Assessment report. The Physical Science Basis. Retrieved from https://www.ipcc.ch/assessment-report/ar6/

ISO 14025. (2006). Environmental labels and declarations — Type III environmental declarations — Principles and procedures. International Organization for Standardization.

ISO 14040. (2006). Environmental management -- Life cycle assessment -- Principles and framework. International Organization for Standardization.

ISO 14044. (2006). Environmental management - Life cycle assessment - Requirements and guidelines. International organization for Standardization (ISO).

ISO 21930. (2017). Sustainability in buildings and civil engineering works — Core rules for environmental product declarations of construction products and services.

UL. (2022). Product Category Rules for Building Related Products and Services, Part A: Life Cycle Assessment Calculation Rules and Report Requirements UL 10010, v4.0. UL.

UL Environment. (2018). Product Category Rules (PCR) Guidance for Building-Related Products and Services – Part B: Insulated Metal Panels, Metal Composite Panels, and Metal Cladding: Roof and Wall Panels (Vols. UL 10010-5, Edition 2).