

ENVIRONMENTAL PRODUCT DECLARATION

VDS CURTAIN WALL

VETROTECH – VDS BY FORSTER FRAMING SYSTEM



VDS Curtain Wall by Forster is a comprehensive steel curtain wall system that offers monumental advantages while meeting the demand for fire resistance and barrier to heat.



PRESERVING THE FUTURE
FOR ALL

We take our environmental responsibilities very seriously. We offer our customers complete assurance that Vetrotech's glass solutions meet internationally recognized environmental standards at every stage of their life cycles. Our solutions contribute to building occupants' comfort and safety. We help your projects gain points for sustainable building labels such as LEED, BREAM, Green Globes and others.

Saint-Gobain is the worldwide leader in sustainable habitat. We continue our efforts to reduce the environmental impacts of production and use of our products through responsible development of sustainable building products and systems.

For more information visit:

<http://vetrotechusa.com>



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Fire Rated Steel Framing System

According to ISO 14025 and EN 15804

This declaration is an environmental product declaration (EPD) in accordance with ISO 14025 and EN 15804. EPDs rely on Life Cycle Assessment (LCA) to provide information on a number of environmental impacts of products over their life cycle. Exclusions: EPDs do not indicate that any environmental or social performance benchmarks are met, and there may be impacts that they do not encompass. LCAs do not typically address the site-specific environmental impacts of raw material extraction, nor are they meant to assess human health toxicity. EPDs can complement but cannot replace tools and certifications that are designed to address these impacts and/or set performance thresholds – e.g. Type 1 certifications, health assessments and declarations, environmental impact assessments, etc. Accuracy of Results: EPDs regularly rely on estimations of impacts, and the level of accuracy in estimation of effect differs for any particular product line and reported impact. Comparability: EPDs are not comparative assertions and are either not comparable or have limited comparability when they cover different life cycle stages, are based on different product category rules or are missing relevant environmental impacts. EPDs from different programs may not be comparable.



PROGRAM OPERATOR	UL Environment
DECLARATION HOLDER	Vetrotech Saint-Gobain
DECLARATION NUMBER	4788170061.101.1
DECLARED PRODUCT	VDS Curtainwall – VDS by Forster Framing System
REFERENCE PCR	Environdec PCR for Construction Products and Construction Services: V. 2.2 (2015)
DATE OF ISSUE	February 15, 2018
DATE OF EXPIRATION	August 15, 2023
CONTENTS OF THE DECLARATION	<ul style="list-style-type: none"> Product definition and information about building physics Information about basic material and the material's origin Description of the product's manufacture Indication of product processing Information about the in-use conditions Life cycle assessment results Testing results and verifications
The PCR review was conducted by:	The International EPD System
	Prepared by: Swedish Environmental Research Institute
	Martin Erlandsson, martin.erlandsson@ivl.se
This declaration was independently verified in accordance with ISO 14025 by Underwriters Laboratories <input type="checkbox"/> INTERNAL <input checked="" type="checkbox"/> EXTERNAL	
	Grant R. Martin, UL Environment
This life cycle assessment was independently verified in accordance with ISO 14044 and the reference PCR by:	
	Thomas P. Gloria, Industrial Ecology Consultants

This EPD conforms with EN 15804

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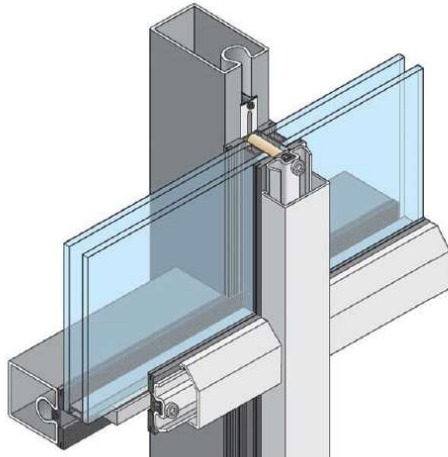
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Product Documentation

Product Description

Engineered steel curtain wall framing system to provide a fire-resistive or heat barrier framing solution with complete design flexibility. Frames are custom sized according to building specifications, including a steel profile, coating, and gasket for the glazing.

The VDS Curtain Wall by Forster Framing Systems weighs 7.10 kg/m. They are typically used with the Vetrotech Contraflam Fire Rated Safety Glass, which also has a separate EPD.



Features and Benefits

- Easy to assemble
- UL Certified in US and Canada
- Fabricated in the US

VDS Curtain Wall by Forster Framing Systems are certified to ASTM E119, Standard Test Methods for Fire Tests of Building Construction and Materials; UL 263, Standard for Fire Tests of Building Construction and Materials; NFPA 257, Standard on Fire Test for Window and Glass Block Assemblies; UBC 7, Fire Tests of Building Construction and Materials; and CAN/ULC S101, Standard Method of Fire Enfurance Tests of Bulding Construction and Materials.

Manufacturing Location

The manufacturing facilities involved in the production of the VDS Curtain Wall by Forster Framing System are:

<i>Manufacture of the steel profile:</i> Forster Profilsysteme AG Industriestrasse 24 Postfach Arbon, Switzerland	<i>Fabrication of the framing system:</i> Vetrotech Saint-Gobain 2108 B Street, NW Suite 110 Auburn, Washington
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Applications and Uses

VDS Curtain Wall by Forster Framing Systems are for commercial use. The products are used to hold or support glass panels as curtain walls.

Material Inputs

VDS Curtain Wall by Forster Framing System		
Component	Percent of Component	Percent of Final Product
Steel Profile (Forster <i>Thermfix Vario</i> profile)		62.0%
<i>Hot Rolled Steel</i>	98%	
<i>Stainless Steel</i>	2%	
Rubber Gasket		14.8%
Pressure Plate		13.3%
Paint		5.0%
Cover Cap		4.6%
Screws		0.2%
Putty		0.1%

Table 1: VDS Curtain Wall by Forster Framing System Product Components

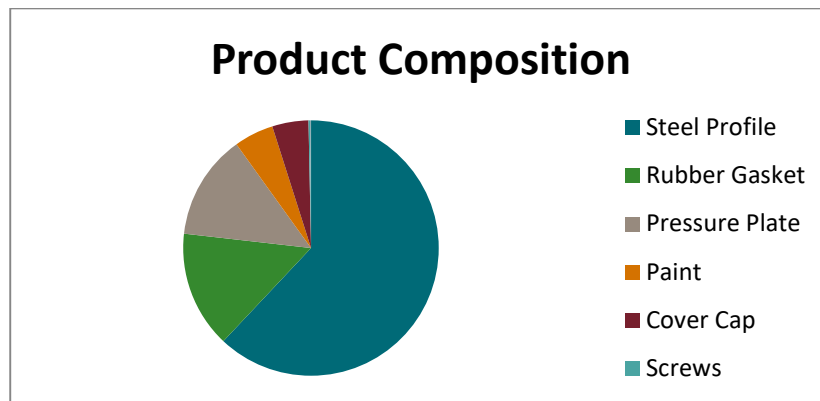


Figure 1: VDS Curtain Wall by Forster Framing System Product Components



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Manufacturing Process

VDS Curtain Wall by Forster Framing Systems are fabricated at the Auburn, WA facility and this is the only Saint-Gobain facility to produce the VDS Curtain Wall by Forster products. The steel profile portion of the product is manufactured by the Forster company in Arbon, Switzerland where large rolls of steel sheets are processed through various forming operations to create the steel profiles. The profiles are then cut into 6 meter lengths and shipped to the Vetrotech Saint-Gobain Auburn, WA facility for fabrication.

After the steel profiles from Forster arrive at the Vetrotech facility, they are cut and welded according to the order or builder specifications for the frame size. The welded frame is then prepped for paint and sanded with sandpaper to allow better adhering of the paint to the steel surface. Paint is then applied and dried in a natural gas heated oven. Gaskets necessary for the installation of the glass panels is applied before the product is packaged for shipping to the construction site.

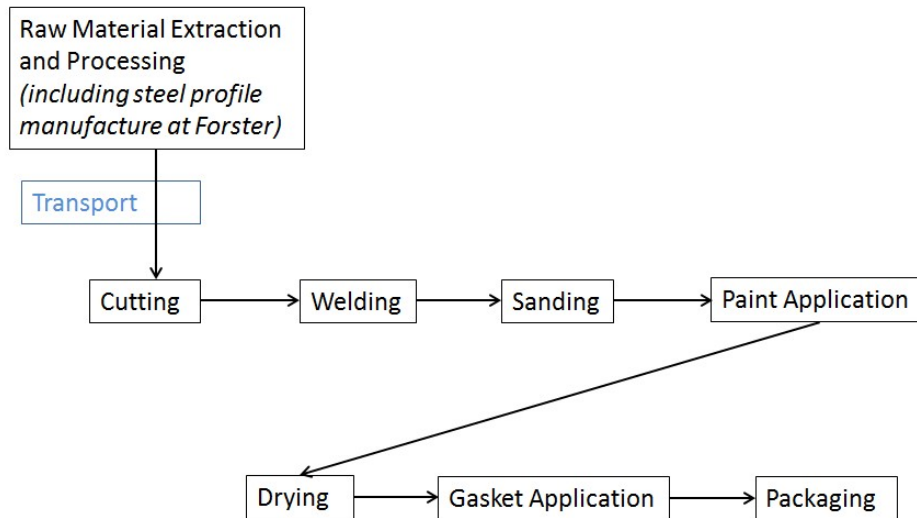


Figure 2: VDS Curtain Wall by Forster Framing System Process Flow



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LCA Calculation Rules

Declared Unit

The declared unit for this study is one meter (1 m) of framing.

System Boundary

The life cycle analysis performed for this EPD includes “cradle-to-gate with options” life cycle stages. The system boundary includes raw material supply, manufacture, and transport; the VDS Curtain Wall fabrication at the Auburn, WA facility; packaging; transport to the construction site; and installation.

Description of the System Boundary (x=included; MND=module not declared)																
Product Stage			Construction Process Stage		Use Stage							End of Life Stage				Benefits & Loads Beyond System Boundaries
Raw Material Supply	Transport	Manufacturing	Transport from the gate to the site	Assembly	Use	Maintenance	Repair	Replacement	Refurbishment	Operational Energy Use	Operational Water Use	De-construction/Demolition	Transport	Waste Processing	Disposal	Reuse-Recover-Recycling Potential
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
X	X	X	X	X	MND	MND	MND	MND	MND	MND	MND	MND	X	X	X	MND

Table 2: VDS Curtain Wall by Forster Framing System Description of the System Boundary

Estimates and Assumptions

Life cycle analysis requires that assumptions are made to constrain the project boundary or model processes when little to no data is available. Key assumptions made for this study of the VDS Curtain Wall by Forster Framing System include the paint mixture of primer, top coat, and catalyst; the disposition of the manufacture waste for recycle and landfill; the final product transportation; the amount and weight of additional installation materials; and the disposition of the end of life waste for recycle and landfill.



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Cut-off Criteria

Processes whose total contribution to the final result, with respect to their mass and in relation to all considered impact categories, is less than 1% can be neglected. The sum of the neglected processes may not exceed 5% by mass of the considered impact categories. The life cycle analysis performed for this EPD is in compliance with the cut-off criteria since no known processes were neglected or excluded from the analysis.

Background Data

SimaPro v8.1 software was used for modeling the life cycle of the VDS Curtain Wall by Forster Framing System product. Each background dataset used was taken from the SimaPro databases, Ecoinvent v3, US-Ecoinvent 2.2, and US LCI.

Data Quality

Wherever secondary data is used, the study adopts critically reviewed data for consistency, precision, and reproducibility to limit uncertainty. The data sources used are complete and representative of Europe and North America (depending on the material source) in terms of the geographic and technological coverage and are less than ten years old. Any deviations from these initial data quality requirements for secondary data are documented in the report. Overall, the primary data from the manufacturing location is of good quality, being directly tracked and measured by facility personnel. Secondary data sets are of fair-to-good quality.

Period Under Review

Data for the LCA performed for this EPD was collected for the 2016 calendar year.

Allocation

The Auburn, WA facility is the only location in the United States that produces VDS Curtain Wall by Forster Framing Systems. However, the Auburn, WA facility also produces other products with differing impacts, so allocation was determined on the production mass data with input from process experts at the facility.

Comparability

Comparison of the environmental performance of construction products using EPD information is only possible if the EPDs were created in accordance with the EN 15804 standard and the building context and product specific characteristics are taken into account.

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Technical Information

Transport to the Construction Site

Transport to the Construction Site		
Parameter	Units	Value
Vehicle type used for transport	-	Long distance truck
Vehicle load capacity	kg per vehicle	20,412
Fuel type and consumption	Liter of fuel type per distance	39 liters of diesel per 100 km
Distance to construction site	km	3321
Capacity utilization (including empty runs)	%	100
Bulk density of transported products	kg/m ³	~8000

Table 3: VDS Curtain Wall by Forster Framing System Transport to the Construction Site

Installation of the Product

Installation of the Product		
Parameter	Units	Value
Ancillary materials for installation	kg	0.284
Water use	m ³	0
Other resource use	kg	0
Quantitative description of energy type and consumption during the preparation and installation process	kWh	190.496
Direct emissions to ambient air, soil, and water	kg	0
Waste materials on the building site, generated by the product's installation, specified by type	kg (packaging waste to landfill)	4.656
Output materials (specified by type) as result of waste processing at the construction site	kg	0
Vehicle type used for transport specified for all waste and output materials types	-	Refuse truck
Vehicle load capacity	kg	9000
Fuel type and consumption	Liter of fuel type per	1.8 liters of diesel per km
Distance to construction site	km	161
Capacity utilization (including empty runs)	%	-
Bulk density of transported products	kg/m ³	-

Table 4: VDS Curtain Wall by Forster Framing System Installation of the Product

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End of Life

End of Life		
Parameter	Units	Value
Reuse	kg	0
Recycling	kg	5.322
Energy recovery	kg	0
Landfill	kg	1.774

Table 5: VDS Curtain Wall by Forster Framing System End of Life

LCA Results and Interpretation

Environmental Impact Potentials

The environmental impact potentials listed below were assessed through the cradle-to-gate with options life cycle of the VDS Curtain Wall by Forster Framing System products, including raw materials, manufacture, packaging, final product shipping, installation, and end of life as defined above. The results are shown for both a North American context using the TRACI 2.1 Impact Assessment Method and a Rest of World context using the CML 4.1 Impact Assessment Method.

TRACI 2.1 Environmental Impact Potentials								
Impact Category	Unit	Raw Materials (including transportation)	Manufacture	Packaging	Final Product Shipping	Installation	End of Life	Total
Global Warming Potential (GWP-T)	kg CO2 eq.	2.44E+01	1.48E+01	2.65E+00	2.19E+00	1.51E+00	1.52E-01	4.57E+01
Ozone Depletion Potential (ODP-T)	kg CFC-11 eq.	3.42E-06	3.07E-07	6.58E-08	8.34E-11	2.80E-08	5.02E-09	3.83E-06
Acidification Potential (AP-T)	kg SO2 eq.	1.68E-01	1.24E-01	1.25E-02	1.31E-02	1.59E-02	1.09E-03	3.34E-01
Eutrophication Potential (EP-T)	kg N eq.	1.22E-01	1.96E-02	2.94E-03	7.28E-04	2.56E-03	7.24E-05	1.48E-01
Photochemical Ozone Creation Potential (POCP-T)	kg O3 eq.	2.06E+00	1.04E+00	2.36E-01	3.57E-01	4.70E-01	3.02E-02	4.20E+00
Abiotic Resource Depletion Potential (ADP-T)	MJ	3.46E+01	1.53E+01	5.37E+00	4.19E+00	2.54E+00	3.42E-01	6.23E+01

Table 6: VDS Curtain Wall by Forster Framing System Environmental Impact Potentials (TRACI 2.1)



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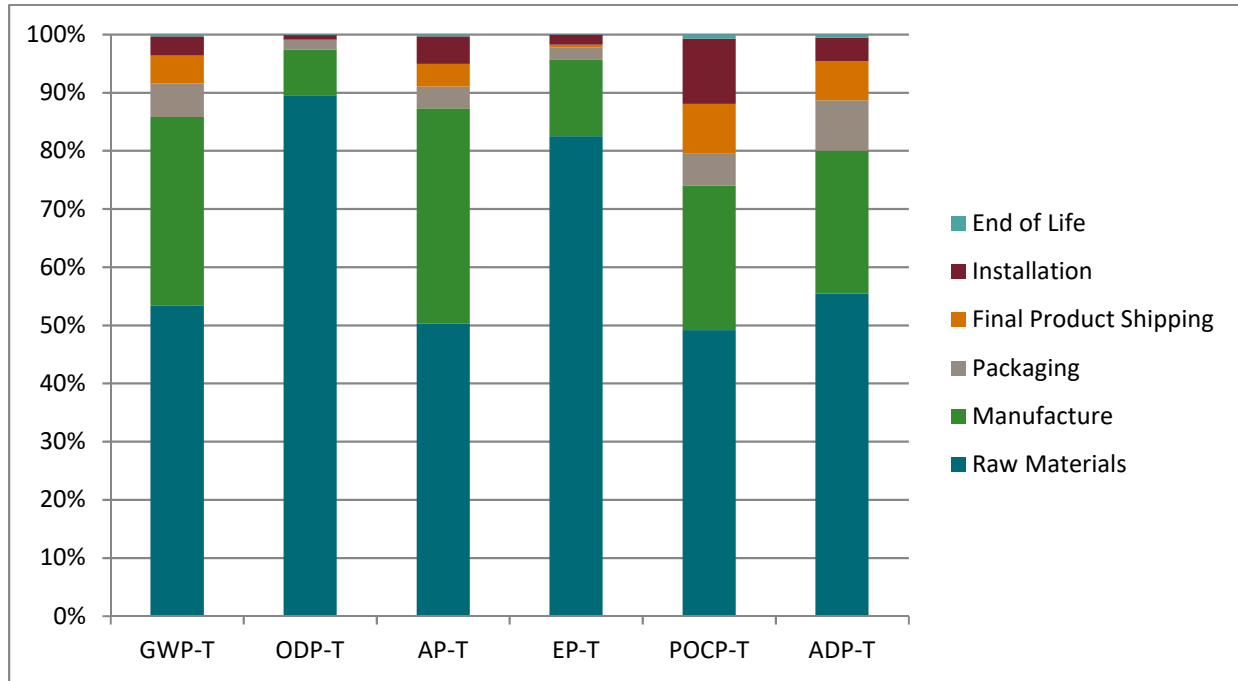


Figure 3: VDS Curtain Wall by Forster Framing System Environmental Impact Potentials (TRACI 2.1)

CML 4.1 Environmental Impact Potentials								
Impact Category	Unit	Raw Materials (including transportation)	Manufacture	Packaging	Final Product Shipping	Installation	End of Life	Total
Global Warming Potential	kg CO2 eq.	2.44E+01	1.48E+01	2.65E+00	2.19E+00	1.51E+00	1.52E-01	4.57E+01
Depletion Potential of Stratospheric Ozone	kg CFC-11 eq.	2.77E-06	2.17E-07	4.89E-08	8.26E-11	2.05E-08	3.76E-09	3.06E-06
Acidification Potential	kg SO2 eq.	1.69E-01	1.22E-01	1.22E-02	1.10E-02	1.49E-02	9.70E-04	3.30E-01
Eutrophication Potential	kg (PO4)3 eq.	5.99E-02	1.29E-02	2.40E-03	1.91E-03	3.18E-03	1.67E-04	8.05E-02
Formation Potential of Tropospheric Ozone	kg C2H4 eq.	1.06E-02	5.58E-03	1.71E-03	4.97E-04	5.96E-04	4.07E-05	1.90E-02
Abiotic Depletion Potential for Non-Fossil Resources	kg Sb eq.	4.06E-04	3.93E-05	9.36E-07	0.00E+00	3.39E-07	1.36E-08	4.47E-04
Abiotic Depletion Potential for Fossil Resources	MJ	3.36E+02	2.07E+02	4.36E+01	2.98E+01	2.19E+01	2.45E+00	6.41E+02

Table 6: VDS Curtain Wall by Forster Framing System Environmental Impact Potentials (CML 4.1)



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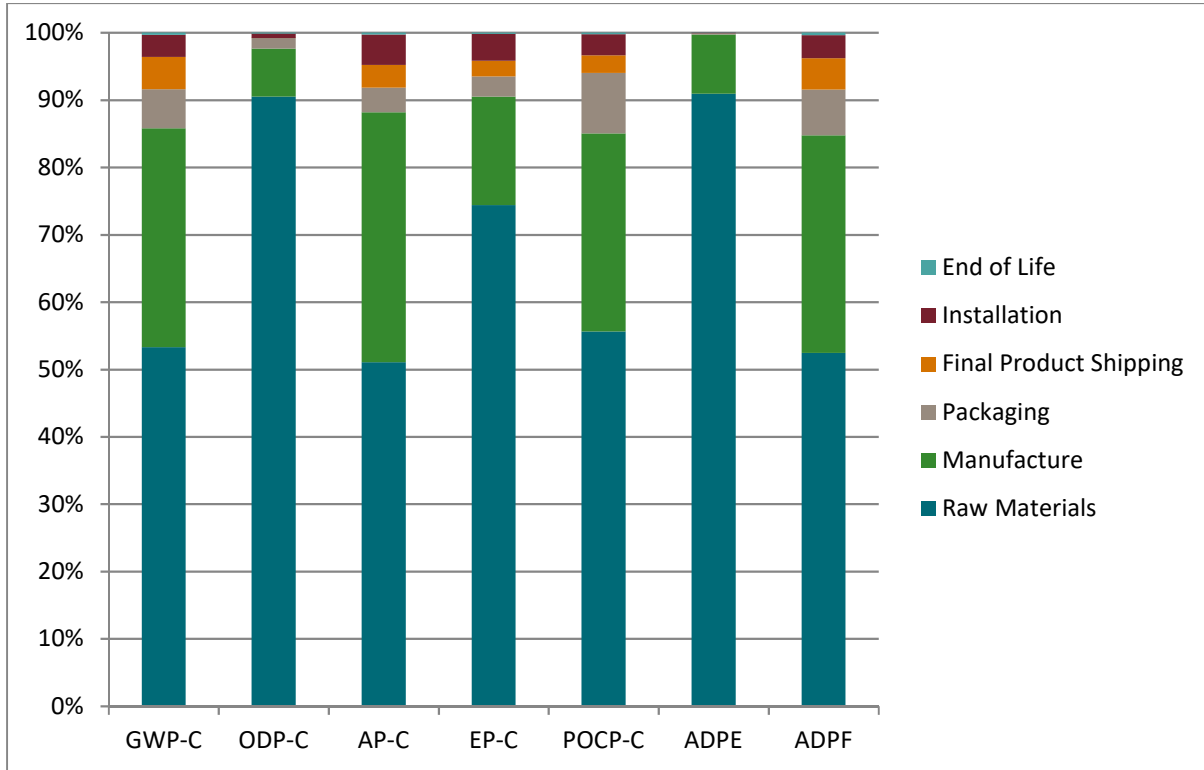


Figure 4: VDS Curtain Wall by Forster Framing System Environmental Impact Potentials (CML 4.1)

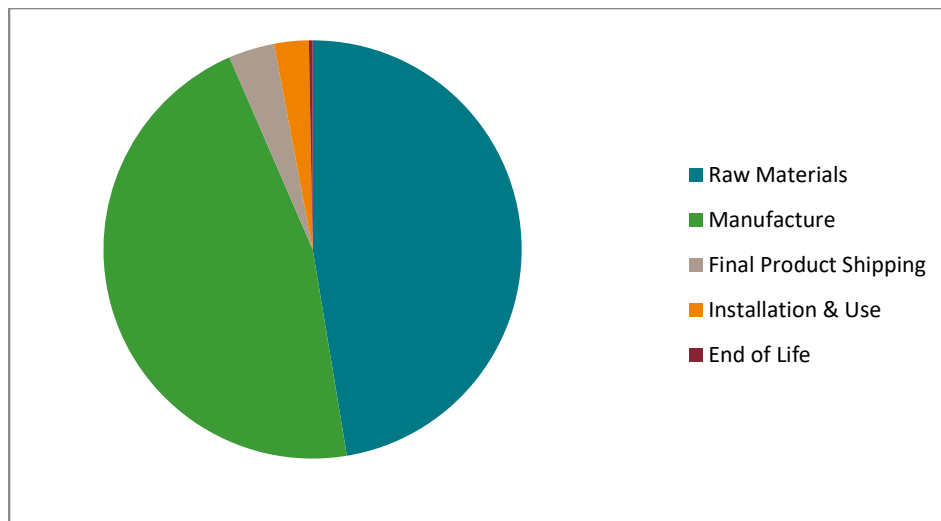


Figure 5: VDS Curtain Wall by Forster Framing System Energy Use by Life Cycle Stage



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Resource Use

Use of Resources		
Parameter	Unit	Value
Use of renewable primary energy excluding renewable primary energy resources used as raw materials	MJ	1.59E+02
Use of renewable primary energy resources used as raw materials	MJ	0.00E+00
Total use of renewable primary energy resources (primary energy and primary energy resources used as raw materials)	MJ	1.59E+02
Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials	MJ	6.87E+02
Use of non-renewable primary energy resources used as raw materials	MJ	0.00E+00
Total use of non-renewable primary energy resources (primary energy and primary energy resources used as raw materials)	MJ	6.87E+02
Use of secondary materials	MJ	9.37E+00
Use of renewable secondary fuels	MJ	0.00E+00
Use on non-renewable secondary fuels	MJ	0.00E+00
Use of net fresh water	m3	7.95E-03

Table 7: VDS Curtain Wall by Forster Framing System Use of Resources

Output Flows and Waste Categories

Output Flows and Waste Categories		
Parameter	Unit	Value
Hazardous waste disposed	kg	2.07E-02
Non-hazardous waste disposed	kg	1.85E+01
Radioactive waste disposed	kg	1.46E-03

Table 8: VDS Curtain Wall by Forster Framing System Output Flows and Waste



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References

- Environdec
 - Product Category Rule (PCR) for Construction Products and Construction Services: Version 2.2
- ISO 14025:2011-10: Environmental labels and declarations – Type III environmental declarations – Principles and procedures
- EN 15804: 2012: Sustainability of construction works – Environmental Product Declarations – Core rules for the product category of construction products
- Life Cycle Assessment: Vetrotech – VDS by Forster Framing System: VDS Lite, VDS Framing, VDS Curtainwall. December 2017. Saint-Gobain North America.
- Forster: www.forster-profile.ch/
- Vetrotech: <http://vetrotechUSA.com>

Life Cycle Development

This EPD and the corresponding LCA were prepared by Saint-Gobain Corporation North America in Malvern, Pennsylvania.