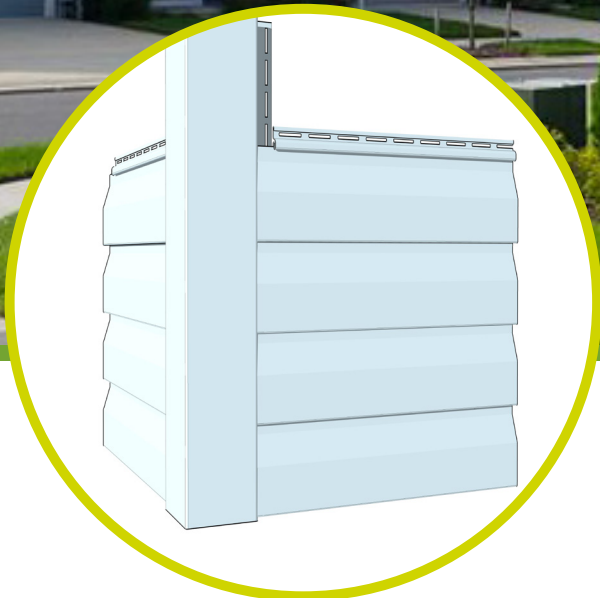


ENVIRONMENTAL PRODUCT DECLARATION

Vinyl Siding

Industry Averaged Vinyl Siding



What You Will Find in This EPD



ADVANTAGES TO VINYL SIDING

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CARBON FOOTPRINT

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Advantages of Vinyl Siding

- ✓ Is recyclable
- ✓ Has low impact on global warming
- ✓ Little water is used to manufacture
- ✓ Less than 1% waste in manufacturing
- ✓ Many design options
- ✓ Lightweight and resource efficient
- ✓ Retains colors
- ✓ Virtually no maintenance is required
- ✓ Long life span
- ✓ Resilient in all climates

Did you know, in addition to traditional vinyl siding, insulated vinyl siding is also available?





Carbon Footprint

To understand the measurement of the numbers below check out the [BEES \(Building for Environmental and Economic Sustainability software\)](#) tool online. A tool developed by the NIST (National Institute of Standards and Technology) that measures the life cycles of different types of cladding.



Vinyl siding manufacturing is an extremely efficient process that require few raw materials. There are relatively low inputs of energy during the extraction, transport and manufacturing process. **4.95** kg CO2 Eq.



The transport of vinyl siding from packaging to construction takes little energy because it weighs less than other typical construction building materials. **0.19** kg CO2 Eq.



The installation of siding is done primarily by manual labor. Nails or screws can be used to install the siding. The energy required to operate compressors to power air guns is quite small. **0.45** kg CO2 Eq.



No routine maintenance is required to prolong the lifetime of vinyl siding, although cleaning is recommended to maintain appearance. Cleaning would normally be done with water and household cleaners. **0.14** kg CO2 Eq.



Replacement is not common. As the lifetime of a building is assumed to be 75 years, a replacement factor of 0.5 is assumed. **3.2** kg CO2 Eq.



The transport of vinyl siding from demolition to waste processing takes little energy because vinyl siding weighs less than other typical construction building materials. **0.02** kg CO2 Eq.



Waste processing of vinyl is limited. Recycling opportunities for vinyl siding are available; there are pilot programs in operation to improve the recycling infrastructure. **0.00** kg CO2 Eq.



Vinyl siding is most commonly disposed of in municipal solid waste streams at the end of the product's service life. This study assumes that 20% of the products get incinerated in waste-to-heat energy recovery facilities and the remaining 80% are landfilled. **0.85** kg CO2 Eq.



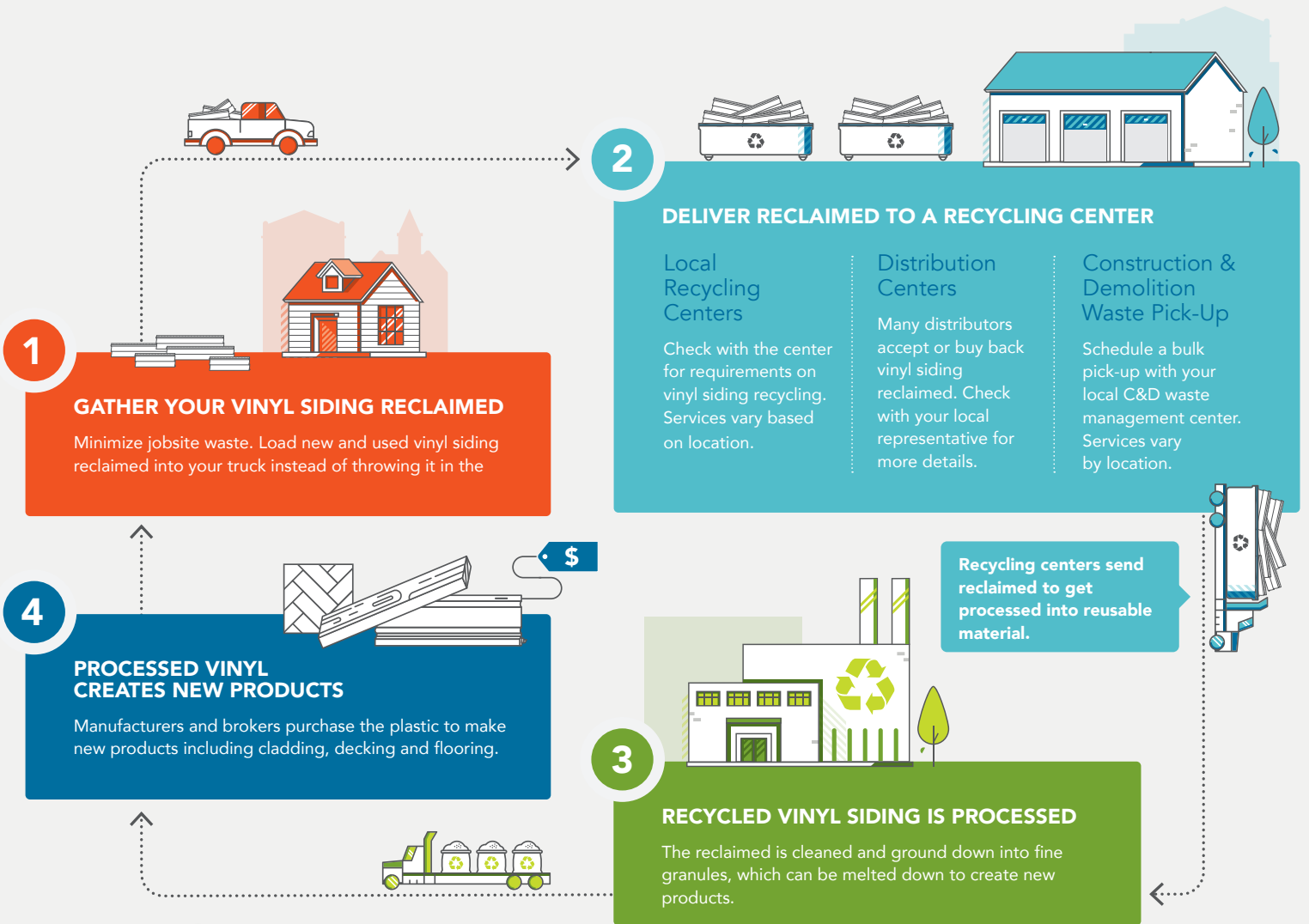
Vinyl siding is completely recyclable, as it is a thermoplastic. A number of VSI member companies offer take-back and extended producer responsibility programs to help minimize vinyl siding waste. **0.00** kg CO2 Eq.



Recyclability

Vinyl siding is completely recyclable as it is a thermoplastic; however, the infrastructure and logistics to recycle vinyl siding may be limited in certain regions of the U.S. and Canada. The products analyzed in this declaration did not contain recycled content; however, some VSI manufacturers do offer vinyl siding options that integrate pre- and post-consumer recycled content into their products to increase resource efficiency manufacturing practices up and down the life cycle of the product.

Here is how it works!



Did you know, vinyl siding can be recycled to create new products—including piping, decking, flooring and even more vinyl siding?



Longevity

Vinyl siding is engineered with purpose — to deliver maximum protection and beauty with minimum hassle and maintenance for years to come. Vinyl siding has a useful life of 50 years or more, as many manufacturers provide warranties of 50 years or longer. In this life span, vinyl siding is durable and prevails to the outside elements such as extreme weather, mold and unwanted pesky critters. Vinyl also requires very little upkeep throughout the 50 year life span.

For a more thorough analysis of the life span of vinyl siding, please see the life cycle assessment data on pages 10-11.





Materials Sustainability

Vinyl siding products require minimal raw material and produce virtually no waste. Vinyl siding requires less water and energy compared to other building materials, plus less fossil fuel for transportation.

Vinyl, also known as PVC or polyvinyl chloride, starts with two simple building blocks: chlorine (57%) from common salt, one of the Earth's most common compounds, and ethylene (43%), which is produced from natural gas. Chlorine is manufactured from salt predominately through diaphragm/membrane cell electrolysis. The use of this technology, compared to previous mercury cell process technology, significantly reduces energy consumption and emissions, and significantly reduces hazardous waste. In the U.S. and Canada, over 99% of PVC resin is produced from vinyl chloride monomer that is manufactured using diaphragm/membrane cell electrolysis.

*Did you know,
the main ingredient in
vinyl siding is salt?*





National Green Building Programs

Why get a National Green Building Certification? There are many reasons: increase in property value, qualify for tax credits, but most importantly, a building or community with a NGBS certification recognizes green construction and adds a cost saving benefit from the amount of energy that will be saved over the lifespan of the structure, which will promote better occupancy rates.

Vinyl Siding Green Credits through Nationally Recognized Programs

LEED (Leadership in Energy and Economic Design)

NGBS (National Green Building Standard)

CalGreen (California Green Building Code)

Did you know over 50% of buildings are certified green buildings?





Vinyl Siding Environmental Data

Product Description

In this declaration, an industry-wide average of horizontal vinyl siding with a 0.040" thickness with a 50/50 ratio with poly(vinyl) chloride (PVC) and acrylonitrile-styrene-acrylate (ASA) capstock is documented. The following manufacturers have participated in this study:

Associated Materials, Inc. – Burlington, Ontario, Canada • Ennis, Texas, USA

CertainTeed Corporation – Jackson, Michigan, USA • Hagerstown, Maryland, USA

Cornerstone Building Brands – Paris, Ontario, Canada

ProVia Products – Booneville, Mississippi, USA

Westlake Royal Building Products – Columbus, Ohio, USA

The results in this declaration are representative for the U.S. and Canada. The declared unit for this study is 1 meter squared of installed vinyl siding with a 50 year service life, with a weight of 4.78 pounds, or 2.17 kilograms. As the lifetime of a building is assumed to be 75 years, a replacement factor of 0.5 is assumed.

Vinyl siding is an exterior cladding product offered in a diverse selection of profiles, colors, textures, architectural trim and accessories to assist remodelers, builders, designers and architects in customizing their new construction and renovation designs.

Vinyl siding produced by VSI member companies are produced according to the standard ASTM D3679, Standard Specification for *Rigid Poly(Vinyl Chloride) (PVC) Siding*.

Vinyl siding is produced according to the following standards:

- ASTM D3679 Standard Specification for Rigid Poly (Vinyl Chloride) (PVC) Siding
- ASTM D7856 Standard Specification for Color and Appearance Retention of Solid and Variegated Color Plastic Siding Products using CIELab Color Space

Table 1 - Vinyl Siding Technical Information

Name	Value	Unit
Length	3.66	m
Width	0.229	m
Thickness	1.016	mm
Density	1,430	kg/m ³

Table 2 - Vinyl Siding Formulation

Constituent	% in Siding with PVC Capstock	% in Siding with ASA Capstock
PVC	78%	73%
ASA	—	7.6%
Calcium Carbonate	11%	12%
Impact Modifier	2%	3%
Titanium Dioxide	4%	0.3%
Tin Stabilizer	0.6%	0.6%
Process Aid	0%	0.1%
Calcium Stearate	1.2%	0.5%
Pigments	1%	0.4%
Wax	1.5%	1.6%

Manufacturing

Vinyl siding manufacturing is an extremely efficient extrusion process requiring relatively low inputs of energy and water and, the ability to immediately return scrap and off-specification materials (regrind) directly into the manufacturing process results in virtually no manufacturing waste.

Environmental and Health Considerations during Manufacturing

In recent years, many vinyl siding manufacturers have integrated closed loop water systems which save millions of gallons of water each year per facility. Additionally, emissions controls have been in place to reduce emissions during manufacturing of PVC resin at supplier facilities.

Packaging

Vinyl siding is commonly packaged using wood pallets to protect the siding in transport. Some industry-members use cardboard cartons to protect the siding until installation. Cardboard is recyclable in most infrastructure recycling networks throughout North America.

Distribution

Based on the functional unit of 1 m², the following data describes the distribution of the product:

Table 3 - Distribution Formulation

Name	Value	Unit
Fuel type	Diesel	
Liters of fuel	36.2	l/100km
Vehicle type	Truck	
Transport distance	804	km
Capacity utilization (including empty runs, mass based)	90	%
Gross density of products transported	1,355	kg/m ³
Capacity utilization volume factor (factor: =1 or <1 or ≥ 1 for compressed or nested packaging products)	1	-

Product Installation

The energy required to operate compressors to power air guns is assumed to be small and is not included in the analysis. Installation is modeled for nails placed 41 cm (16 in) on center; nail use is 0.026 kg (0.057 lb) per 1 m² (per 10.76 ft²) of siding, approximately five to seven nails per 3.66 meter panel. Installation waste with a mass fraction of 5% is assumed, and this waste is assumed to go to a landfill, although vinyl siding can be recycled through many vinyl siding manufacturers' recycling programs. It is assumed that no electricity is used for the installation of the product.

VSI has developed a certification program for vinyl siding installers. Certified Vinyl Siding Installers have at least two years of installation experience and have demonstrated knowledge of proper installation techniques. This program follows the ASTM D4756 standard for the Standard Practice for Installation of Rigid Poly (Vinyl Chloride) (PVC) Siding and Soffit.

Table 4 - Installation Formulation

Name	Value	Unit
Ancillary materials	0.026	kg
Net freshwater consumption specified by water source and fate (amount evaporated, amount disposed to sewer)	-	m ³
Other resources	-	kg
Electricity consumption	-	kWg
Other energy carriers	-	MJ
Product loss per functional unit	0.10	kg
Waste materials at the construction site before waste processing, generated by product installation	0.29	kg
Output materials resulting from on-site waste processing	Construction & Demolition Waste: 0.10 Packaging: 0.19	kg
Biogenic carbon contained in packaging	4.05E-02	kg CO ₂
Direct emissions to ambient air, soil and water	-	kg
VOC content	n/a	ug/m ³

Use Considerations

No routine repair or maintenance is required to prolong the lifetime of the product, although cleaning is recommended to maintain appearance. Cleaning would normally be done with water and household cleaners. As the lifetime of a building is assumed to be 75 years, a replacement factor of 0.5 is assumed. Resource use due to replacement can be found in the LCA results section below.

Table 5 - Use Considerations

Name	Value	Unit
RSL	50	years
Declared product properties and finishes, etc.	See Certified Vinyl Siding Installers program for more details	
Design application		
An assumed quality of work, when installed in accordance with the manufacturer's instructions		
Use Conditions		
Outdoor environment		
Indoor environment	n/a	
Maintenance	Clean with water and household cleaners	

Environmental and Health Considerations During Use

Vinyl siding does not require painting, staining nor caulking during installation or during the use of the product. Consumption of materials and energy for the use phase can be found in the LCA results section below.

Service Life

The product is assumed to have a useful life of 50 years as many manufacturers provide warranties of 50 years or longer. As the lifetime of a building is assumed to be 75 years, a replacement factor of 0.5 is assumed, resulting in the combined impacts being multiplied by a factor of 1.5 (the estimated service life of the building divided by the reference service life of the product).

Table 6 - Service Life Formulation

Name	Value	Unit
Reference service life	50	years
Replacement cycle	0.5	ESL/ RSL - 1
Energy input, specified by activity	-	kWh
Net freshwater consumption	-	m ³
Ancillary materials	Packaging: 0.19	kg
Replacement of worn parts	Siding: 2.17	kg
Direct emissions	n/a	kg

Disposal

Table 7 - Disposal Formulation

Name		Value	Unit
Assumptions for scenario development		Products are manually removed and combined with construction and demolition waste.	
Collection process	Collected separately	-	kg
	Collected with mixed construction waste	2.17	kg
Recovery (specified by type)	Reuse	-	kg
	Recycling	-	kg
	Landfill	1.66	kg
	Incineration	0.41	kg
	Incineration with energy recovery	-	kg
	Energy conversion efficiency rate	-	
Disposal (specified by type)	Product or material for final deposition	Vinyl Siding: 2.17	kg
Removals of biogenic carbon (excluding packaging)			kg CO ₂

Life Cycle Assessment Study

The declared unit of this product is 1 square meter of a 0.040 inch (1.016 mm) thick vinyl external cladding with a double 4.5 inch (114.3 mm) profile. The reference service life is 50 years.

The system boundary is cradle-to-grave with all life cycle stages through Modules A to C have been considered.

Table 8 - Life Cycle Assessment Study

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

Allocation: Per production mass at each facility; a weighted average based on production totals between manufacturers was conducted.

Cut-Off Rules: No components and materials were knowingly omitted from the LCA. Data Sources: ecoinvent v3.7 and US LCI

Data Quality:

- Primary Data: 2020 calendar year
- Secondary Data: Representative of North America, based on ecoinvent and US LCI datasets developed or updated within 10 years.
 - Vinyl resin data was leveraged from the 2021 published LCA study by Franklin Associates (a division of ERM).

Software: SimaPro v9.2

Period Under Review: Data from 2020 was collected and average based on production from each participating facility

Life Cycle Assessment Study (continued)

Estimates and Assumptions:

- Products are assumed to travel 500 miles in a diesel-powered truck to the buliding site
- Manual installation occurs with a 5% scrap rate
- Products are assumed to travel 100km in a diesel-powered truck from the buliding site to the waste processor
- 20% of products are incinerated at the end of life; the remainder are landfilled.

Table 9 - Life Cycle Impact Assessment Results

Part B.1 TRACI 2.1		Unit	A1-A3	A4	A5	B2	B4	C2	C3	C4
GWP	Global Warming Potential	kg CO2 eq	4.95E+00	1.90E-01	4.55E-01	1.42E-01	3.23E+00	1.54E-02	0.00E+00	8.50E-01
ODP	Depletion potential of the stratospheric ozone layer	kg CFC-11 eq	6.86E-07	7.23E-12	4.60E-08	9.00E-09	3.82E-07	5.86E-13	0.00E+00	3.24E-08
AP	Acidification potential	kg SO2 eq	3.54E-02	1.13E-03	2.64E-03	4.91E-04	1.99E-02	9.17E-05	0.00E+00	5.97E-04
EP	Eutrophication potential	kg N eq	6.45E-03	6.31E-05	9.08E-04	5.00E-03	3.93E-03	5.11E-06	0.00E+00	4.24E-04
POCP	Photochemical ozone creation potential	kg O3 eq	2.17E-01	3.10E-02	2.33E-02	5.94E-03	1.42E-01	2.51E-03	0.00E+00	9.42E-03
ADPF	Abiotic depletion potential for fossil resources	MJ	1.82E+01	3.63E-01	1.08E+00	5.11E-02	9.89E+00	2.94E-02	0.00E+00	1.60E-01
Part B.2 CML		Unit	A1-A3	A4	A5	B2	B4	C2	C3	C4
GWP	Global Warming Potential	kg CO2 eq	5.02E+00	1.90E-01	4.60E-01	1.43E-01	3.27E+00	1.54E-02	0.00E+00	8.51E-01
ODP	Depletion potential of the stratospheric ozone layer	kg CFC-11 eq	2.70E-07	7.16E-12	2.26E-08	8.03E-09	1.61E-07	5.80E-13	0.00E+00	2.85E-08
AP	Acidification potential	kg SO2 eq	3.85E-02	9.34E-04	2.76E-03	4.36E-04	2.14E-02	7.57E-05	0.00E+00	4.57E-04
EP	Eutrophication potential	kg PO4--- eq	3.62E-03	1.66E-04	4.78E-04	2.17E-03	2.24E-03	1.34E-05	0.00E+00	2.10E-04
POCP	Photochemical ozone creation potential	kg C2H4 eq	2.07E-03	4.31E-05	1.44E-04	7.43E-05	1.15E-03	3.49E-06	0.00E+00	3.14E-05
ADPE	Abiotic depletion (non-fossil)	kg Sb eq	4.36E-05	0.00E+00	6.49E-06	1.12E-06	2.54E-05	0.00E+00	0.00E+00	7.11E-07
ADPF	Abiotic depletion (fossil)	MJ	1.30E+02	2.44E+00	8.35E+00	5.09E-01	7.11E+01	1.97E-01	0.00E+00	1.29E+00

Table 10 - Use of Resources

Resource Use		Unit	A1-A3	A4	A5	B2	B4	C2	C3	C4
NR-PRE	Non-renewable primary resources used as an energy carrier	MJ	7.66E+01	2.44E+00	1.84E+00	6.73E-01	4.13E+01	1.97E-01	0.00E+00	1.42E+00
RPRE	Renewable primary resources used as an energy carrier	MJ	3.09E+00	0.00E+00	4.25E-01	8.02E-01	1.83E+00	0.00E+00	0.00E+00	1.47E-01
NR-PRM	Non-renewable primary resources with energy content used as a material	MJ	5.88E+01	0.00E+00	0.00E+00	0.00E+00	2.94E+01	0.00E+00	0.00E+00	0.00E+00
RPRM	Renewable primary resources with energy content used as a material	MJ	6.40E-01	0.00E+00	0.00E+00	0.00E+00	6.40E-01	0.00E+00	0.00E+00	0.00E+00
SM	Use of Secondary Materials	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
RSF	Renewable secondary Fuels	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
NRSF	Use of Non-Renewable secondary fuels	m3	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
FW	Fresh Water consumption	m3	2.42E-02	0.00E+00	1.20E-03	1.07E-02	2.59E-02	0.00E+00	0.00E+00	2.64E-02

Table 11 - Output Flows and Wastes

Output Flows		Unit	A1-A3	A4	A5	B2	B4	C2	C3	C4
HWD	Disposed-of-hazardous WASTE	kg	4.13E-05	0.00E+00	0.00E+00	0.00E+00	2.07E-05	0.00E+00	0.00E+00	0.00E+00
NHWD	Disposed-of non-hazardous WASTE	kg	3.70E-03	0.00E+00	2.92E-01	0.00E+00	1.23E+00	0.00E+00	0.00E+00	2.17E+00
RWD	Disposed-of Radioactive WASTE	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
CRU	Components for reuse	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
MFR	Materials for recycling	kg	2.43E-03	0.00E+00	0.00E+00	0.00E+00	1.22E-03	0.00E+00	0.00E+00	0.00E+00
MET	Materials for energy recovery	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
EEE	Exported electrical energy (waste to energy)	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
EET	Exported thermal energy (waste to energy)	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
BBPr	Bio-Based Products	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
BBPk	Bio-Based Packaging	kg	4.05E-02	0.00E+00	-4.05E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

The product module (raw materials through manufacturing) is the largest driver of the life cycle of vinyl siding. The raw materials stage is the primary driver of the production stage. Maintenance and end-of-life stages of vinyl siding have very minimal influences on the overall life cycle.

The testing for products containing no lead stabilizers is conducted to the standard ASTM E1753, *Standard Practice for Use of Qualitative Chemical Spot Test Kits for Detection of Lead in Dry Paint Films* and detects substances down to the 5,000 ppm limit.

References

- ISO 21930:2017: Sustainability in building construction – Environmental declaration of building products
- EPA, Tool for the Reduction and Assessment of Chemical and Other Environmental Impacts (TRACI)
- FTC Part 260, Green guides
- (ILCD, 2010) Joint Research Commission, 2010, ILCD Handbook: General Guide for Life Cycle Assessment
- Intergovernmental Panel on Climate Change (IPCC)
- ISO 14025:2006 *Environmental labels and declarations – Type III environmental declarations – Principles and Procedures*
- ISO 14040 *Environmental management - Life cycle assessment – Principles and framework*
- ISO 14044 *Environmental management - Life cycle assessment – Requirements and guidelines*
- ASTM D3679 *Standard Specification for Rigid Poly (Vinyl Chloride) (PVC) Siding*
- ASTM D7856 *Standard Specification for Color and Appearance Retention of Solid and Variegated Color Plastic Siding Products using CIE Lab Color Space*
- ASTM D4756 *Standard Practice for Installation of Rigid Poly(Vinyl Chloride) (PVC) Siding and Soffit*

LCA Development

This EPD and corresponding LCA were prepared by Sustainable Solutions Corporation of Royersford, Pennsylvania.



Verification and Authorization of the Declaration

This declaration is an environmental product declaration (EPD) in accordance with ISO 14025 and ISO 21930.

Program Operator	ASTM
Declaration Holder	Vinyl Siding Institute
Declaration Number	#
Declared Product	Industry Averaged Vinyl Siding (0.040" Double 4.5")
Reference PCR	PCR for EPDs: Cladding Products System Second Edition, 2021
Date of Issue	?
Period of Validity	5 years

The PCR review was conducted by:	
Environment and Development Foundation	
Signature	Reviewer Name
PCR: UL Environment	
Signature	Reviewer Name
This declaration was independently verified in accordance with ISO 14025 by ASTM <input type="checkbox"/> Internal <input checked="" type="checkbox"/> External	
This life cycle assessment was independently verified in accordance with ISO 14044 and the reference PCR by:	
Signature	Reviewer Name

About VSI and this EPD

The Vinyl Siding Institute

The Vinyl Siding Institute, Inc. (VSI) is the trade association for manufacturers of vinyl, other polymeric siding and suppliers to the industry.

VSI focuses on science-driven data that clarifies the Life Cycle of vinyl and polymeric siding.

VSI is 100% committed to educating building professionals about how vinyl and polymeric sidings are high performing sustainable building material.

For more information, please visit www.vinylsiding.org or contact the Vinyl Siding Institute at hello@vinylsiding.org.

Participating Members

