Environmental Product Declaration

CedarBoards™ Siding

CERTAINTEED (CLAREMONT, NC; HAGERSTOWN, MD; JACKSON, MI)

CedarBoards D6" in Flagstone & CedarBoards B&B in Savannah Wicker

With innovative building solutions made possible through its comprehensive offering of interior and exterior products, CertainTeed is transforming how the industry builds. As leaders in building science and sustainable construction, CertainTeed makes it easier than ever to create high-performance, energy-efficient places to live, work and play, so that together we can make the world a better home.

A subsidiary of Saint-Gobain, one of the world's largest and oldest building products companies, CertainTeed has more than 6,900 employees and more than 60 manufacturing facilities throughout the United States and Canada. For more information visit: www.certainteed.com

UL CERTIFIED ENVIRONMENTAL PRODUCT DECLARATION UL.COM/EPD

ENVIRONMENTAL PRODUCT DECLARATION

certainteed
SAINT-GOBAIN

CedarBoards - Insulated Vinyl Siding

According to ISO 14025 and ISO 21930:2017

EPD PROGRAM AND PROGRAM OPERATOR NAME, ADDRESS, LOGO, AND WEBSITE	UL Solutions 333 Pfingsten Rd, Northbrook, IL 60062 www.ul.com www.spot.ul.com
GENERAL PROGRAM INSTRUCTIONS AND VERSION NUMBER	Program Operator Rules v 2.7 2022
MANUFACTURER NAME AND ADDRESS	CertainTeed 701 E Washington Ave, Jackson, MI 49203 2651 Penny Rd, Claremont, NC 28610 11676 Hopewell Rd, Hagerstown, MD 21740
DECLARATION NUMBER	4791015127.102.1
DECLARED PRODUCT & FUNCTIONAL UNIT OR DECLARED UNIT	1 square meter siding product with thickness 0.044 inch
REFERENCE PCR AND VERSION NUMBER	Product Category Rules for Building-Related Product and Services: Part A – Life Cycle Assessment Calculation Rules and Report Requirements, Version 3.2. December 2018. UL Environment. Product Category Rule Guidance for Building-Related Products and Services Part B: Cladding Product Systems EPD Requirements, Version 2.0 2021. UL Environment.
DESCRIPTION OF PRODUCT APPLICATION/USE	Manual installation of cladding product systems applied to a building exterior.
PRODUCT RSL DESCRIPTION (IF APPL.)	This study assumes a product service life of 50 years.
MARKETS OF APPLICABILITY	Global/North America
DATE OF ISSUE	August 26th, 2024
PERIOD OF VALIDITY	5 Years
EPD TYPE	Manufacturer-specific
RANGE OF DATASET VARIABILITY	N/A
EPD SCOPE	Cradle-to-grave
YEAR(S) OF REPORTED PRIMARY DATA	2019
LCA SOFTWARE & VERSION NUMBER	LCA FE software v10.7
LCI DATABASE(S) & VERSION NUMBER	The Sphera GaBi 2022.2, US LCI, and Ecoinvent v3.8 databases
LCIA METHODOLOGY & VERSION NUMBER	TRACI v2.1 and CML v4.2

The PCR review was conducted by:	UL Solutions PCR Review Panel epd@ul.com
This declaration was independently verified in accordance with ISO 14025: 2006 and ISO 21930:2017. ☐ INTERNAL ☒ EXTERNAL	Cooper McCollum Cooper McCollum, UL Solutions
This life cycle assessment was conducted in accordance with ISO 14044 and the reference PCR by:	Saint-Gobain
This life cycle assessment was independently verified in accordance with ISO 14044 and the reference PCR by:	Jim Mellentine, Thrive ESG

LIMITATIONS

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; the level of accuracy in estimation of effect differs for any particular product line and reported impact.

Comparability: EPDs from different programs may not be comparable. Full conformance with a 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.

1. Product Definition and Information

1.1. Description of Company/Organization

CertainTeed Corporation, a subsidiary of Saint-Gobain, is a leading North American manufacturer of interior building materials including gypsum, ceilings, and insulation as well as exterior building materials which include roofing, vinyl siding, trim and water protection.

1.2. Product Description

Product Identification

The CedarBoards™ siding product family includes multiple visuals that replicate the look of freshly cut cedar planks/boards. It is an insulated vinyl siding product.The panels are sold under the CertainTeed, Wolverine and Norandex brands. These products are manufactured in the Jackson, MI; Claremont, NC; and Hagerstown, MD CertainTeed facilities. CertainTeed Siding's quality assurance process is based on industry-accepted best practices that involve constant measurement and evaluation throughout the manufacturing process. This Environmental Product Declaration (EPD) is developed for these cladding system products.

Features

- PermaColor™ color protection backed by a limited lifetime fade resistant warranty
- TrueTexture™ rough cedar finish molded from real cedar board
- STUDfinder™: The patented STUDfinder installation system combines precisely engineered nail slot locations with graphics to ensure 16" on center fastening
- RigidForm™ technology tested to withstand wind load pressure up to 210 mph
- Class 1(A) fire rating
- R-value up to 2.7 (varies by profile)

Flow Diagram

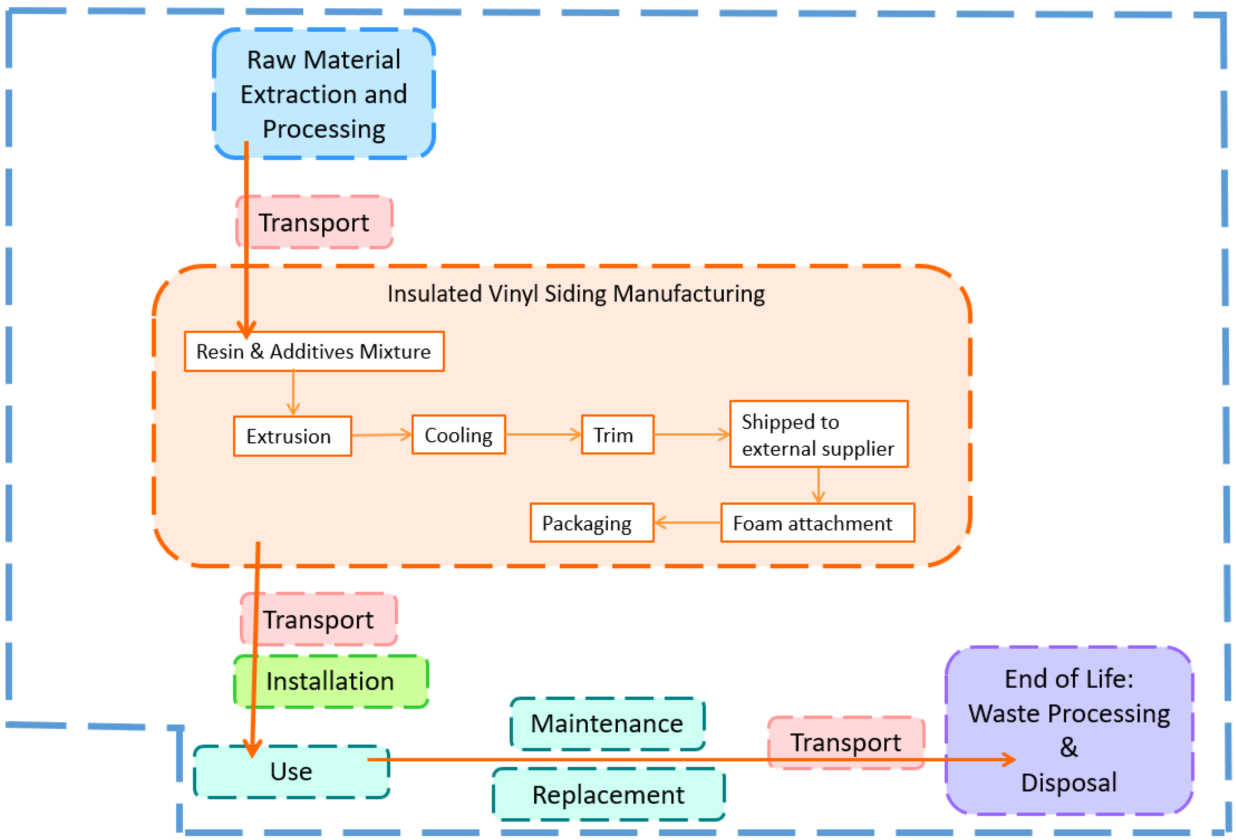


Figure 1. Flow Diagram

Product Average

This is a manufacturer specific EPD manufactured in three facilities. Three products within the product line were analyzed and a weighted average of three CertainTeed manufacturing plants was calculated to showcase each product's results.

1.3. Application

Manual installation of cladding product systems applied to a building exterior.

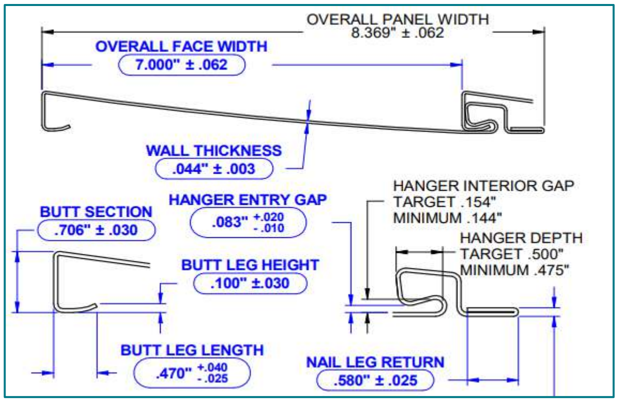
1.4. Declaration of Methodological Framework

The nature of life cycle assessment is to include a wide range of inputs and outputs associated with the product being analyzed. Constraining the LCA scope is an essential part of the study. The following section describes the various information included in the framework of this LCA study in order to appropriately define goal, scope, and boundaries of the study.

1.5. Technical Data

The performance of CertainTeed CedarBoards™ products are listed below:

Table 1. Technical Data

<table>
<tr><th>Items in this EPD</th><th></th><th>Performance Attributes</th></tr>
<tr><td>
</td><td>Foam-Backed/Insulated Horizontal Panels
(Example shown: CedarBoards S7)</td><td rowspan="2">

ASTM E 84

Fire Characteristics:
Vinyl Siding Facing Flame Spread Index <=25 EPS
Backing Flame Spread Index <=75 Smoke Development Index <=450

R-Value: up to 2.7 (see product specification for details)
ASTM C 272: water absorption < 2.75% by volume
ASTM 4226: Meets impact resistance that meets 60 lb/ft
ASTM 5206: tested for windload resistance to withstand negative wind load pressures (see specification document for details)
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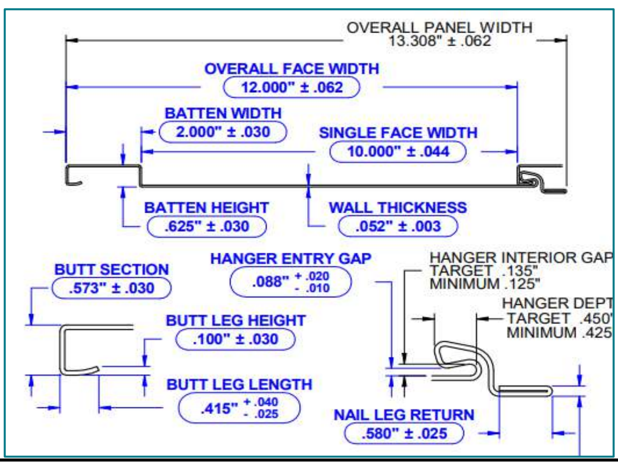
<tr><td>
</td><td>Foam-Backed/Insulated Vertical Panels
(Example shown: CedarBoards B&B)</td></tr>
</table>

1.6. Properties of Declared Product as Delivered

All flows to and from the environment within the system boundary are normalized to a unit summarizing the function of the system. The environmental impact potentials per functional unit are the basis for comparison in an LCA. It provides a unit of analysis and comparison for all environmental impacts.

EPDs are comparable only if they comply with ISO 21930: 2017, use the same sub-category PCR where applicable, include all relevant information modules and are based on equivalent scenarios with respect to the context of construction works.

The functional unit for the study is one square meter of siding product. The siding product has a mass of 2.41 kilograms (including overlap). The product thickness considered for the study is 0.044 inch. The product is available in multiple thicknesses. However, this EPD only covers the 0.044 inch insulated vinyl siding product. The reference service life is 50 years.

1.7. Material Composition

The system's core component consists of polyvinyl chloride (PVC), acrylonitrile styrene acrylate (ASA), calcium carbonate, expanded polystyrene (EPS) foam, and additives.

Table 2. Material Composition

Component	CedarBoards - Insulated Vinyl Average
PVC	72-73%
Calcium Carbonate	2.5-8%
ASA	0-8.5%
Foam	7%
Color Compound	5%
Additives	2.5-8%
Total:	100%

1.8. Manufacturing

A detailed analysis of the insulated vinyl product family's manufacturing process was completed by the Saint-Gobain North America ESG group. A process flow diagram is attached in Appendix A and illustrates all process steps, inputs, and outputs including material, energy, emissions, and wastes.

The manufacturing process begins as resin is unloaded from railroad cars through an air-conveying system into silos holding up to 250,000 pounds. From these main storage silos, resin is conveyed to the blender where titanium dioxide and other micro ingredients are added to create the processing compound. After blending, the compound is conveyed to the siding extrusion line where it is carefully metered so a consistent amount enters the extruder.

Extrusion is a process in which a thermoplastic resin (one that softens when heated and hardens when cooled) is pushed through a heated barrel and die by two large, precisely tooled screws. As they turn, the screws knead and thoroughly mix the PVC compound. Both the screws and the barrel of the extruder are heated, which melts the resin and makes it easier to mix and push. The heat (300° to 400° F) also accelerates the physical reaction (fusion) between PVC and the micro-ingredients in the compound. All vinyl siding is extruded, but CertainTeed was the first to extrude all its siding and accessories with twin-screw extruders. Twin-screw extrusion is preferable to single-screw extrusion because it heats and distributes material more evenly, resulting in a product with better physical properties. As the PVC compound is forced ahead of the rotating screws, the very tight tolerances in the double barrel promote complete fusion of the ingredients. Color concentrate is added at the extruder, a technique that produces rich, durable color in every siding panel.

The vinyl panels are then shipped to a third party to apply the EPS foam insulation to the backside of the panel and the panels are then returned to a CertainTeed plant for warehousing.

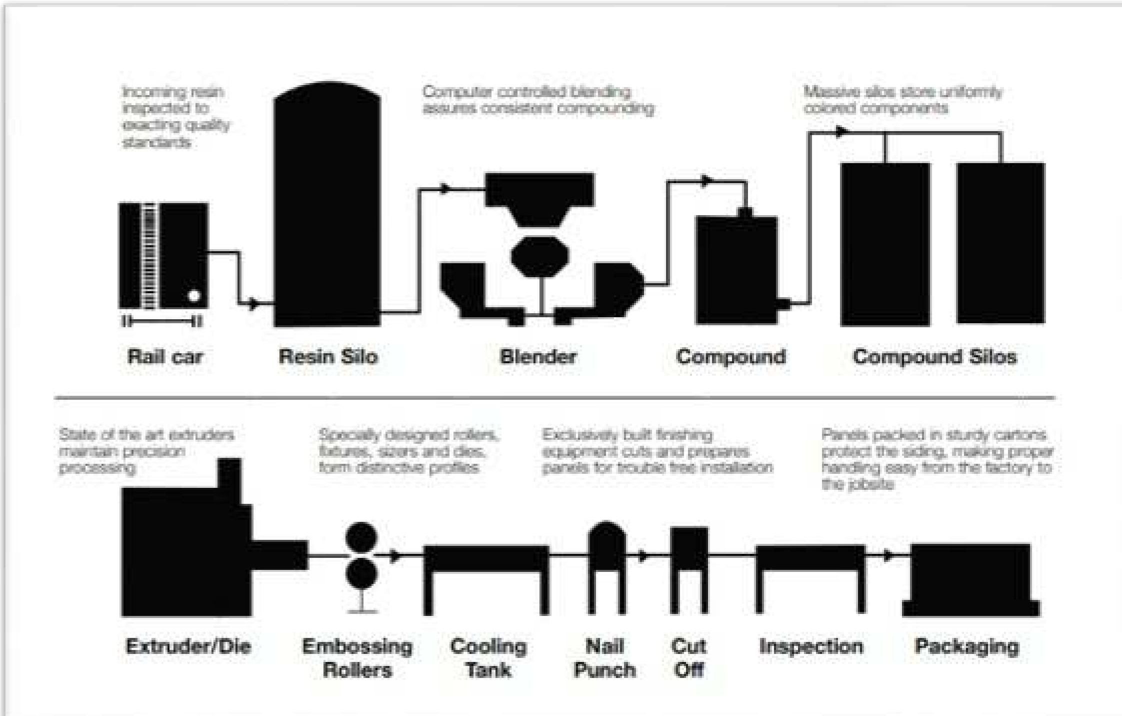


Figure 2. Manufacturing Overview

1.9. Packaging

Packaging of the final product after production is included in the life cycle assessment. The siding product is banded and placed in corrugated containers. The insulated vinyl products are then shipped on pallets. The purchased amount of packaging material was provided by the CertainTeed facilities personnel and the weight of each material per kilogram of finished product was calculated.

Table 3. Packaging Inputs

Packaging Inputs	CedarBoards - Insulated Vinyl Siding
Banding	2.20E-04
Banding Clips	1.24E-05
Corners	2.66E-04

Corrugated Container	8.94E-02
Pallets	3.95E-02
Total kg of packaging:	**1.29E-01 kg**

1.10. Transportation

Raw materials are transported to the manufacturing sites by standard freight truck, train, or ocean freighters. Unless otherwise noted, transport vehicles are fueled with diesel fuel.

Final products are transported on trucks throughout the United States and Canada. This study assumed 473 km for the final shipment of product based on primary data provided by plant personnel.

1.11. Installation

This study assumes a 5% scrap rate generated from the installation of the product. In addition, disposal of the packaging material is included in the installation phase. Following the Vinyl Siding Industry LCA, the product lines were modeled based on installation by manual labor. Installation is modeled for nails placed 41 cm (16 in) on center; nail use is 0.0024 kg (0.0053 lb) per 0.09 m2 (per ft2) of siding. The installation hardware assumptions were derived from the Vinyl Siding Institute (VSI) industry EPD.

Table 4. Installation packaging waste by material type

Packaging Installation Waste by Material Type			
	Recycled (kg/kg)	Landfilled (kg/kg)	Incinerated (kg/kg)
Plastics	7.29E-05	3.30E-04	0.00E+00
Metals	7.07E-06	4.22E-06	0.00E+00
Paper	9.67E-02	2.58E-02	3.58E-03

1.12. Use

The PCR does not provide any use phase modeling guidance or requirements. This study followed the same use phase assumptions as the Vinyl Siding Institute industry EPD. The maintenance phase (B2) would require water and household cleaners to keep up with the appearance of the siding material. The VSI estimate that 4.5 liters of water and 2.6 grams of soap would be consumed via cleaning was replicated within this study.

1.13. Reference Service Life and Estimated Building Service Life

This study assumes a product service life of 50 years. The selected service life used in this study reflects the expert opinion of the product manufacturer and the 75-year building service life indicated in the PCR.

1.14. Reuse, Recycling, and Energy Recovery

No reuse, recycling, and energy recovery will be reported for this study.

1.15. Disposal

There is no industry consensus for end of life scenarios, per the PCR Part B guidance. For this reason, the study will follow PCR Part A guidance of 100% landfill as the method of disposal at end of life.

Table 5. End Of Life Scenario

Name		Value	Unit
Assumptions for scenario development (description of deconstruction, collection, recovery, disposal method, and transportation)			
End of Life Transportation	Fuel type	Diesel	-
	Liters of fuel	6.53E-03	l/100km
	Vehicle type	Standard Freight Trailer	-
	Transport Distance	100	km
	Gross density of product transported	1.24E+03	kg/m3
Collection process (specified by type)	Collected separately	0	kg
	Collected with mixed construction waste	2.41	kg
Recovery (specified by type)	Reuse	0	kg
	Recycling	0	kg
	Landfill	2.41	kg
	Incineration	0	kg
	Incineration with energy recovery	0	kg
	Energy conversion (specify efficiency rate)	-	
Disposal (specified by type)	Product or material for final disposal	2.41	kg
Removals of biogenic carbon (excluding packaging)		0	kg CO2

2. Life Cycle Assessment Background Information

2.1. Functional or Declared Unit

The functional unit for the study is one square meter of installed insulated vinyl siding system. One square meter has a mass of 2.41 kilograms. The reference service life is 50 years.

Table 6. Functional Unit

Name	Value	Unit
Functional unit	1	square meter
Declared thickness	0.044	inches
Surface weight per declared unit	2.41	kg/m^2
Density per declared unit	1244.1	kg/m^3

2.2. System Boundary

The life cycle assessment conducted for this EPD is a “cradle-to-grave” study. The system boundary includes raw material supply and transport, manufacturing, distribution, installation, use, and end of life. The figure below outlines life cycle stages included in the study.

Table 7. System Boundary

Description of the System Boundary (X=included in LCA: 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	X	X	X	X	X	X	X	X	X	X	X	MND

2.3. Estimates and Assumptions

Estimates and assumptions are required when little or no data is available. The study's assumptions and estimates are recorded and documented in the background report. Any limitation in the use of primary data for unit processes contributing over 15% to any indicator result shall be provided in the EPD. The B4 results are primarily determined by the RSL assumption.

2.4. 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. For that a documented assumption is admissible.

For Hazardous Substances – as defined by the U.S. Occupational Health and Safety Act the following requirements apply:

- The Life Cycle Inventory (LCI) of hazardous substances will be included, if the inventory is available.
- If the LCI for a hazardous substance is not available, the substance will appear as an input in the LCI of the product, if its mass represents more than 0.1% of the product composition.
- If the LCI of a hazardous substance is approximated by modeling another substance, documentation will be provided.

This EPD is in compliance with the cut-off criteria. No known flows were deliberately excluded. Capital items for the production processes (machines, buildings, etc.) were not taken into consideration.

2.5. Data Sources

LCA FE software v10.7 system was used for modeling the life cycle of the CertainTeed Insulated Vinyl siding product line (CedarBoards). The Sphera LCA FE, US LCI, and Ecoinvent v3.8 databases were used for raw materials, transportation, and energy inputs.

2.6. Data Quality

Wherever secondary data is used, the study adopts critically reviewed data for consistency, precision, and reproducibility to limit uncertainty. Since the inventory flows for the utilized databases are very often accompanied by a series of data quality ratings, a general indication of precision can be inferred. Using these ratings, the data sets used generally have medium-to-high precision. The Saint-Gobain North American ESG Department collected specific data on energy and material inputs, wastes, water use, emissions, and transportation impacts for the Jackson, MI; Claremont, NC; and Hagerstown, MD manufacturing plants.

2.7. Period under Review

For this life cycle assessment, the Saint-Gobain North American ESG Department collected specific data on energy and material inputs, wastes, water use, emissions, and transportation impacts for the Jackson, MI; Claremont, NC; and Hagerstown, MD manufacturing plants. The data used spanned between January 1, 2019 and December 31, 2019.

2.8. Allocation

The foam-backed/insulated products are made in Jackson, MI; Claremont, NC; and Hagerstown, MD. However, there are additional products produced at this location that were excluded from the study. Allocation was conducted based on the production mass data provided by the facility as a percentage of the overall production mass at each facility.

3. Life Cycle Assessment Scenarios

Table 8. Transport to the building site (A4)

NAME	VALUE	UNIT
Fuel type	Diesel	
Liters of fuel	6.56E-03	l/100km
Vehicle type- Scenario A	Standard Freight Trailer	
Transport distance- Scenario A	868	km
Vehicle type- Scenario B	Rail	
Transport distance- Scenario B	809	km
Capacity utilization (including empty runs, mass based	85	%
Gross density of products transported	1244.1	kg/m^3
Weight of products transported (if gross density not reported)		kg
Volume of products transported (if gross density not reported)		m^3

Capacity utilization volume factor (factor: =1 or <1 or ≥ 1 for compressed or nested packaging products)	<1	-

Table 9. Installation into the building (A5)

NAME	VALUE	UNIT
Ancillary materials	Packaging: 1.29E-01 Nails: 1.10E-02	kg
Net freshwater consumption specified by water source and fate (amount evaporated, amount disposed to sewer)	0	m^3
Other resources	0	kg
Electricity consumption	0	kWh
Other energy carriers	0	MJ
Product loss per functional unit	1.21E-01	kg
Waste materials at the construction site before waste processing, generated by product installation	2.50E-01	kg
Product transport from building site to waste processing distance	100	km
Product transport from building site to waste processing mode	Diesel-powered truck/trailer	-
Output materials resulting from on-site waste processing (specified by route; e.g. for recycling, energy recovery and/or disposal)	3.71E-01- Landfill disposal	kg
Biogenic carbon contained in packaging	2.09E+00	kg CO_2 e
Direct emissions to ambient air, soil and water	0	kg
VOC content	Not Tested[1]	µg/m^3

[1] As this is an exterior product, the VOC content is not in our testing protocol.

Table 10. Reference Service Life

NAME	VALUE	UNIT
RSL	**50**	years
Declared product properties (at the gate) and finishes, etc.	**See Certified Vinyl Siding Installers program for more details.**	Units as appropriate
Design application parameters (if instructed by the manufacturer), including references to the appropriate practices and application codes)		Units as appropriate
An assumed quality of work, when installed in accordance with the manufacturer's instructions		Units as appropriate
Outdoor environment, (if relevant for outdoor applications), e.g. weathering, pollutants, UV and wind exposure, building orientation, shading, temperature		Units as appropriate
Indoor environment, (if relevant for indoor applications), e.g. temperature, moisture, chemical exposure)		Units as appropriate
Use conditions, e.g. frequency of use, mechanical exposure.		Units as appropriate
Maintenance, e.g. required frequency, type and quality of replacement components	**Clean with water and household cleaners**	Units as appropriate

Table 11. Maintenance (B2)

NAME	VALUE	UNIT

Maintenance process information (cite source in report)	Soap and water	-
Maintenance cycle	1	Number/ RSL
Maintenance cycle	1.5	Number/ ESL
Net freshwater consumption specified by water source and fate (amount evaporated, amount disposed to sewer)	4.50E-03	m^3
Ancillary materials specified by type (e.g. cleaning agent)	0	kg
Other resources	2.60E-03	kg
Energy input, specified by activity, type and amount	0	kWh
Other energy carriers specified by type	0	kWh
Power output of equipment	0	kW
Waste materials from maintenance (specify materials)	0	kg
Direct emissions to ambient air, soil and water	0	kg
Further assumptions for scenario development (e.g. frequency and time period of use, number of occupants);	0	-

Table 12. Repair (B3)

NAME	VALUE	UNIT
Repair process information (cite source in report)	-	None required
Inspection process information (cite source in report)	-	None required
Repair cycle	0	Number/ RSL
Repair cycle	0	Number/ ESL
Net freshwater consumption specified by water source and fate (amount evaporated, amount disposed to sewer)	0	m^3
Ancillary materials specified by type (e.g. cleaning agent)	0	kg
Energy input, specified by activity, type and amount	0	kWh
Waste materials from repair (specify materials)	0	kg
Direct emissions to ambient air, soil and water	0	kg
Further assumptions for scenario development (e.g. frequency and time period of use, number of occupants);	N/A	N/A

Table 13. Replacement (B4)

NAME	VALUE	UNIT
Replacement cycle	50 years	Number/ RSL
Replacement cycle	1.5	Number/ ESL
Energy input, specified by activity, type and amount	-	kWh
Net freshwater consumption specified by water source and fate (amount evaporated, amount disposed to sewer)	-	m^3
Ancillary materials specified by type (e.g. cleaning agent)	Packaging: 1.29E-01	kg
Replacement of worn parts, specify parts/materials	Siding: 2.41	kg
Direct emissions to ambient air, soil and water	0	kg

Further assumptions for scenario development, e.g. frequency and time period of use	-	As appropriate

Table 14. Refurbishment (B5)

NAME	VALUE	UNIT
Refurbishment process description (cite source in report)	-	-
Replacement cycle	-	Number/ RSL
Replacement cycle	-	Number/ ESL
Energy input, specified by activity, type and amount	-	kWh
Net freshwater consumption specified by water source and fate (amount evaporated, amount disposed to sewer)	-	m^3
Material input for refurbishment, including ancillary materials specified by type (e.g. cleaning agent)	-	kg
Waste material(s), specified by material	-	kg
Direct emissions to ambient air, soil and water	-	kg
Further assumptions for scenario development (e.g. frequency and time period of use, number of occupants);	-	-

Table 15. Operational energy use (B6) and Operational water use (B7)

NAME	VALUE	UNIT
Net freshwater consumption specified by water source and fate (amount evaporated, amount disposed to sewer)	-	m^3
Ancillary materials	-	kg
Energy input, specified by activity, type and amount	-	kWh
Equipment power output	-	kW
Characteristic performance (e.g. energy efficiency, variation of performance with capacity utilization)	-	Units as appropriate
Direct emissions to ambient air, soil and water	-	kg
Further assumptions for scenario development (e.g. frequency and time period of use, number of occupants);	-	As appropriate

Table 16. End of life (C1-C4)

NAME		VALUE	UNIT
Assumptions for scenario development (description of deconstruction, collection, recovery, disposal method and transportation)		-	-
End of Life Transportation	Fuel type	Diesel	-
	Liters of fuel	6.53E-03	l/100km

	Vehicle type	Standard Freight Trailer	-
	Transport Distance	100	km
	Gross density of product transported	1.24E+03	kg/m3
Collection process (specified by type)	Collected separately	0	kg
	Collected with mixed construction waste	2.41	kg
Recovery (specified by type)	Reuse	0	kg
	Recycling	0	kg
	Landfill	2.41	kg
	Incineration	0	kg
	Incineration with energy recovery	0	kg
	Energy conversion efficiency rate	0	
Disposal (specified by type)	Product or material for final deposition	0	kg
Removals of biogenic carbon (excluding packaging)		0	kg CO_2

Table 17. Reuse, recovery and/or recycling potentials (D), relevant scenario information

NAME	VALUE	UNIT
Net energy benefit from energy recovery from waste treatment declared as exported energy in C3 (R>0.6)	-	MJ
Net energy benefit from thermal energy due to treatment of waste declared as exported energy in C4 (R<0.6)	-	MJ
Net energy benefit from material flow declared in C3 for energy recovery	-	MJ
Process and conversion efficiencies	-	
Further assumptions for scenario development (e.g. further processing technologies, assumptions on correction factors);	-	

4. Life Cycle Assessment Results

Table 18. Description of the system boundary modules

PRODUCT STAGE			CONSTRUCT-ION 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
EPD Type	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	MND

4.1. Life Cycle Impact Assessment Results

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.

Table 19. North American Impact Assessment Results- CedarBoards -Insulated Vinyl ASA T05

TRACI v2.1	A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4
GWP Fossil [kg CO_2 eq]	5.03E+00	6.43E-02	1.56E+00	1.06E-01	4.86E-01	0	9.10E-04	0	3.79E+00	0	0	0	0	2.12E-02	0	3.17E-01
GWP Incl. Biogenic [kg CO2 eq]	5.08E+00	6.41E-02	1.37E+00	1.06E-01	4.73E-01	0	5.73E-04	0	3.57E+00	0	0	0	0	2.12E-02	0	2.01E-02
ODP [kg CFC-11 eq]	5.25E-08	2.44E-12	4.56E-08	4.02E-12	1.27E-08	0	3.17E-11	0	5.54E-08	0	0	0	0	8.06E-13	0	2.81E-15
AP [kg SO_2 eq]	2.04E-02	6.53E-04	4.11E-03	6.38E-04	1.97E-03	0	4.68E-06	0	1.41E-02	0	0	0	0	1.28E-04	0	3.94E-04
EP [kg N eq]	1.20E-02	3.72E-05	3.03E-03	3.53E-05	1.55E-03	0	6.60E-06	0	8.33E-03	0	0	0	0	7.09E-06	0	8.43E-06
POCP [kg O_3 eq]	2.37E-01	1.95E-02	5.37E-02	1.76E-02	2.49E-02	0	6.57E-05	0	1.80E-01	0	0	0	0	3.52E-03	0	2.83E-03
ADP_{fossil} [MJ, LHV]	1.68E+01	1.14E-01	1.88E+00	1.88E-01	1.05E+00	0	2.31E-03	0	1.01E+01	0	0	0	0	3.77E-02	0	5.23E-02

Table 20. North American Impact Assessment Results- CedarBoards - Insulated Vinyl ASA T31

TRACI v2.1	A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4
GWP Fossil [kg CO_2 eq]	5.23E+00	6.49E-02	1.57E+00	1.07E-01	4.97E-01	0	9.10E-04	0	3.90E+00	0	0	0	0	2.14E-02	0	3.20E-01
GWP Incl. Biogenic [kg CO2 eq]	5.28E+00	6.41E-02	1.37E+00	1.06E-01	4.82E-01	0	5.67E-04	0	3.67E+00	0	0	0	0	2.12E-02	0	2.01E-02
ODP [kg CFC-11 eq]	5.29E-08	2.46E-12	4.60E-08	4.06E-12	1.28E-08	0	3.17E-11	0	5.59E-08	0	0	0	0	8.13E-13	0	2.84E-15
AP [kg SO_2 eq]	1.79E-02	6.59E-04	4.14E-03	6.44E-04	1.85E-03	0	4.68E-06	0	1.29E-02	0	0	0	0	1.29E-04	0	3.98E-04
EP [kg N eq]	1.21E-02	3.75E-05	3.06E-03	3.56E-05	1.57E-03	0	6.60E-06	0	8.41E-03	0	0	0	0	7.16E-06	0	8.51E-06
POCP [kg O_3 eq]	2.37E-01	1.97E-02	5.40E-02	1.78E-02	2.50E-02	0	6.57E-05	0	1.80E-01	0	0	0	0	3.55E-03	0	2.85E-03
ADP_{fossil} [MJ, LHV]	1.72E+01	1.15E-01	1.89E+00	1.90E-01	1.07E+00	0	2.31E-03	0	1.03E+01	0	0	0	0	3.80E-02	0	5.28E-02

Table 21. North American Impact Assessment Results -CedarBoards- Insulated PVC

TRACI v2.1	A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4
GWP FOSSIL [KG CO2 EQ]	5.16E+00	6.54E-02	1.57E+00	1.08E-01	8.45E-01	0	9.10E-04	0	4.04E+00	0	0	0	0	2.15E-02	0	3.22E-01
GWP Incl. Biogenic [kg CO2 eq]	5.18E+00	6.41E-02	1.37E+00	1.06E-01	4.75E-01	0	5.67E-04	0	3.62E+00	0	0	0	0	2.12E-02	0	2.01E-02
ODP [kg CFC-11 eq]	5.39E-08	2.48E-12	4.63E-08	4.09E-12	1.79E-08	0	3.17E-11	0	5.90E-08	0	0	0	0	8.19E-13	0	2.86E-15
AP [kg SO_2 eq]	1.58E-02	6.64E-04	4.16E-03	6.48E-04	2.93E-03	0	4.68E-06	0	1.24E-02	0	0	0	0	1.30E-04	0	4.01E-04
EP [kg N eq]	1.22E-02	3.78E-05	3.08E-03	3.58E-05	2.35E-03	0	6.60E-06	0	8.85E-03	0	0	0	0	7.21E-06	0	8.57E-06

POCP [kg O_3 eq]	2.27E-01	1.98E-02	5.42E-02	1.79E-02	4.11E-02	0	6.57E-05	0	1.83E-01	0	0	0	0	3.57E-03	0	2.87E-03
ADP_{fossil} [MJ, LHV]	1.66E+01	1.16E-01	1.89E+00	1.91E-01	2.02E+00	0	2.31E-03	0	1.05E+01	0	0	0	0	3.83E-02	0	5.32E-02

4.2. Life Cycle Inventory Results

Table 22. Resource Use- CedarBoards -Insulated Vinyl ASA T05

PARAMETER	A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4
RPR_E [MJ, LHV]	1.80E+00	0	7.87E+00	0	6.48E-01	0	9.59E-03	0	4.96E+00	0	0	0	0	0	0	8.38E-02
RPR_M [MJ, LHV]	4.10E-02	0	2.00E+00	0	1.02E-01	0	0	0	0	0	0	0	0	0	0	0
$NRPR_E$ [MJ, LHV]	1.38E+02	8.28E-01	5.99E+01	1.37E+00	2.12E+00	0	2.12E-02	0	1.02E+02	0	0	0	0	2.74E-01	0.00E+00	6.27E-01
$NRPR_M$ [MJ, LHV]	1.08E+02	0	2.26E-02	0	5.40E+00	0	0	0	0	0	0	0	0	0	0	0
SM [kg]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
RSF [MJ, LHV]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NRSF [MJ, LHV]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
RE [MJ, LHV]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
FW [m^3]	1.10E-02	0	1.45E-02	0	2.74E-03	0	5.56E-04	0	1.39E-02	0	0	0	0	0	0	8.07E-04

Table 23. Resource Use- CedarBoards - Insulated Vinyl ASA T31

PARAMETER	A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4
RPR_E [MJ, LHV]	1.83E+00	0	7.95E+00	0	6.53E-01	0	9.59E-03	0	0	0	0	0	0	0	0	8.46E-02
RPR_M [MJ, LHV]	4.10E-02	0	2.00E+00	0	1.02E-01	0	0	0	0	0	0	0	0	0	0	0
$NRPR_E$ [MJ, LHV]	1.42E+02	8.36E-01	6.04E+01	1.38E+00	2.12E+00	0	2.12E-02	0	2.07E+02	0	0	0	0	2.77E-01	0	6.33E-01

$NRPR_M$ [MJ, LHV]	1.09E+02	0	2.26E-02	0	5.45E+00	0	0	0	0	0	0	0	0	0	0	0
SM [kg]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
RSF [MJ, LHV]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NRSF [MJ, LHV]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
RE [MJ, LHV]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
FW [m^3]	1.12E-02	0	1.47E-02	0	2.76E-03	0	5.56E-04	0	1.41E-02	0	0	0	0	0	0	8.15E-04

Table 24. Resource Use- CedarBoards- Insulated PVC

Parameter	A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4
RPR_E [MJ, LHV]	1.91E+00	0	7.99E+00	0	6.58E-01	0	9.59E-03	0	5.08E+00	0	0	0	0	0	0	8.50E-02
RPR_M [MJ, LHV]	4.34E-02	0	2.00E+00	0	1.02E-01	0	0	0	0	0	0	0	0	0	0	0
$NRPR_E$ [MJ, LHV]	1.37E+02	8.40E-01	6.07E+01	1.39E+00	2.02E+00	0	2.12E-02	0	1.02E+02	0	0	0	0	2.78E-01	0	6.37E-01
$NRPR_M$ [MJ, LHV]	9.93E+01	0	2.26E-02	0	4.97E+00	0	0	0	0	0	0	0	0	0	0	0
SM [kg]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
RSF [MJ, LHV]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NRSF [MJ, LHV]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
RE [MJ, LHV]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
FW [m^3]	1.16E-02	0	1.47E-02	0	2.78E-03	0	5.56E-04	0	1.43E-02	0	0	0	0	0	0	8.19E-04

Table 25. Output Flows and Waste Categories- CedarBoards- Insulated Vinyl ASA T05

Parameter	A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4
HWD [kg]	6.36E-07	0	6.81E-06	0	3.73E-07	0	4.44E-14	0	3.18E-07	0	0	0	0	0	0	1.81E-11
NHWD [kg]	3.72E-02	0	4.52E-02	0	1.13E-01	0	1.48E-04	0	5.63E-01	0	0	0	0	0	0	9.30E-01

HLRW [kg] or [m³]	1.89E-07	0	1.76E-06	0	4.13E-03	0	4.12E-11	0	9.80E-07	0	0	0	0	0	0	1.04E-08
ILLRW [kg] or [m³]	1.85E-04	0	1.47E-03	0	3.52E-07	0	3.65E-08	0	8.34E-04	0	0	0	0	0	0	9.59E-06
CRU [kg]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MFR [kg]	0	0	6.48E+01	0	0	0	0	0	0	0	0	0	0	0	0	0
MER [kg]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
EE [MJ, LHV]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table 26. Output Flows and Waste Categories- CedarBoards -Insulated Vinyl ASA T31

PARAMETER	A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4
HWD [kg]	6.72E-07	0	5.11E-06	0	2.89E-07	0	4.44E-14	0	3.35E-07	0	0	0	0	0	0	1.82E-11
NHWD [kg]	3.90E-02	0	4.52E-02	0	1.14E-01	0	1.48E-04	0	5.69E-01	0	0	0	0	0	0	9.39E-01
HLRW [kg] or [m³]	1.94E-07	0	1.76E-06	0	4.22E-03	0	4.12E-11	0	9.83E-07	0	0	0	0	0	0	1.05E-08
ILLRW [kg] or [m³]	1.90E-04	0	1.47E-03	0	3.54E-07	0	3.65E-08	0	8.36E-04	0	0	0	0	0	0	9.68E-06
CRU [kg]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MFR [kg]	0	0	6.48E+01	0	0	0	0	0	0	0	0	0	0	0	0	0
MER [kg]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
EE [MJ, LHV]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table 27. Output Flows and Waste Categories- CedarBoards- Insulated PVC

PARAMETER	A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4
HWD [kg]	6.53E-07	0	5.49E-06	0	3.07E-07	0	4.44E-14	0	3.26E-07	0	0	0	0	0	0	1.83E-11
NHWD [kg]	9.40E-02	0	4.52E-02	0	1.15E-01	0	1.48E-04	0	5.99E-01	0	0	0	0	0	0	9.44E-01
HLRW [kg] or [m³]	2.24E-07	0	1.76E-06	0	6.95E-03	0	4.12E-11	0	9.97E-07	0	0	0	0	0	0	1.06E-08
ILLRW [kg] or [m³]	2.14E-04	0	1.47E-03	0	3.57E-07	0	3.65E-08	0	8.48E-04	0	0	0	0	0	0	9.73E-06
CRU [kg]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MFR [kg]	0	0	6.48E+01	0	0	0	0	0	0	0	0	0	0	0	0	0
MER [kg]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
EE [MJ, LHV]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table 28. Carbon Emissions and Removals

PARAMETER	A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4
BCRP [kg CO2]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
BCEP [kg CO2]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
BCRK [kg CO2]	0	0	-2.09E+00	0	0	0	0	0	0	0	0	0	0	0	0	0
BCEK [kg CO2]	0	0	0	0	2.09E+00	0	0	0	0	0	0	0	0	0	0	0
BCEW [kg CO2]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CCE [kg CO2]	2.18E-02	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CCR [kg CO2]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CWNR [kg CO2]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

5. LCA Interpretation

Based on the results from the life cycle assessment, the life cycle impacts are strongly driven by the raw materials and manufacturing processes. In addition, when considering the impacts of the insulated vinyl product, the impacts of the foam material and manufacturing are significant.

Increasing energy efficiency would help to reduce the overall environmental impacts for all three sites. Identifying alternate uses or recycling options for polyvinyl chloride and polypropylene at the end of its useful life will reduce the end-of-life and potential raw materials burdens of recycled product.

If possible, incorporating more recycled content (post-consumer polyvinyl chloride) into the product will help reduce the environmental impacts of the raw materials stage in the life cycle of insulated vinyl siding products. As recycled content increases, the raw materials driving impacts will decrease, thus improving the overall environmental impacts. Polyvinyl chloride and acrylonitrile-butadiene-styrene copolymer resins are the largest contributors to the raw material impacts for insulated vinyl siding products, responsible for up to 50% of the environmental impact potentials in several categories.

6. Additional Environmental Information

6.1. Environment and Health During Manufacturing

CertainTeed has well-established Environmental, Health, and Safety (EHS) and product stewardship programs which help to enforce proper evaluation and monitoring of chemicals that are chosen to manufacture products. These programs ensure that all environmental and OSHA requirements are met or exceeded to ensure the health and safety of all employees and contractors.

6.2. Environment and Health During Installation

Installation has minimal impacts due to the modular nature of siding panels and minimal energy required for installation. Siding panels require minimal cleaning with soap and water and the product will be replaced after 50 years.

6.3. Extraordinary Effects

Fire

ASTM E 84 - Fire Characteristics:

- Vinyl Siding Facing Flame Spread Index <=25
- EPS Backing Flame Spread Index <=75 Smoke Development Index <=450

When rigid vinyl siding is exposed to significant heat or flame, the vinyl will soften, sag, melt or burn, and may thereby expose material underneath. Although the expanded polystyrene backing is treated with a fire retardant chemical and will not support combustion, it is an organic material and should therefore be considered flammable if exposed to an open flame or ignition source. Also, care must be exercised when selecting underlayment materials because many underlayment materials are made from organic materials that are combustible. You should ascertain the fire properties of underlayment materials prior to installation. All materials should be installed in accordance with local, state and federal Building Code and fire regulations.

Water

This product is not subject to water damage.
ASTM C 272 - Water Absorption is <2.75% by volume

Mechanical Destruction

This product is intended for residental & commercials applications. Handling and installation information can be found in the CertainTeed Siding Installation Guide (CTS205). The product should be installed according to CertainTeed Siding installation instructions and in adherence with applicable building codes.

7. Supporting Documentation

The LCA reports the life cycle inventory and environmental impacts relevant to CertainTeed insulated vinyl siding product lines. The life cycle methods used for this study were consistent with ISO 14040 and 14044. This project is fulfilling the reporting requirements in Section 5 of ISO 14044 and Product Category Rules Guidance for Building-Related Products and Services UL® Environments (2021) Part B: Cladding Product Systems EPD Requirements, Version 2.0.

8. References

Product Category Rules for Building-Related Product and Services: Part A – Life Cycle Assessment Calculation Rules and Report Requirements, Version 3.2. December 2018. UL Environment.

Product Category Rule Guidance for Building-Related Products and Services Part B: Cladding Product Systems EPD Requirements, Version 2.0 2021. UL Environment.

Vinyl Siding Institute -- Vinyl, Insulated Vinyl, and Polypropylene Siding Life Cycle Assessment, May 2022. Sustainable Solutions Corporation

ISO 14025: 2006 Series – Environmental Management-Life Cycle Assessment

ISO 14040: 2006 Series – Environmental Management-Life Cycle Assessment

ISO 14044: 2006 Series – Environmental Management-Life Cycle Assessment

ISO 21930 – Sustainability in building construction – Environmental declaration of building products

Certified Vinyl Siding Installers program. https://polymericexteriors.org/

GaBi Databases. https://gabi.sphera.com/america/

US LCI Database. https://www.nrel.gov/lci/

Ecoinvent v3.8 Database. http://ecoinvent.org/

CertainTeed Siding Website. https://www.certainteed.com/siding/