

ENVIRONMENTAL PRODUCT DECLARATION

IN ACCORDANCE WITH ISO 14025 AND ISO 21930:2017

SmartEPD-2024-034-0162-01

Cellular PVC- Restoration Millwork® Sheets



Date of Issue:
Sep 05, 2024

Expiration:
Sep 05, 2029

Last updated:
Sep 05, 2024



General Information

CertainTeed Saint-Gobain

20 Moores Rd, Malvern, PA 19355

888-233-8990

sustainability@saint-gobain.com certainteed.com



Product Name:	Cellular PVC- Restoration Millwork® Sheets
Functional Unit:	1 m2 of installed cladding product
Declaration Number:	SmartEPD-2024-034-0162-01
Date of Issue:	September 05, 2024
Expiration:	September 05, 2029
Last updated:	September 05, 2024
EPD Scope:	Cradle to grave A1 - A3, A4, A5, B1 - B7, C1 - C4
Market(s) of Applicability:	North America

Reference Standards

Standard(s):	ISO 14025 and ISO 21930:2017
Core PCR:	UL UL Part B: Cladding Product Systems EPD Requirements v.2 Date of issue: April 13, 2021 Valid until: April 13, 2026
Sub-category PCR review panel:	 Contact Smart EPD for more information.
General Program Instructions:	 Smart EPD General Program Instructions v.1.0, November 2022

Verification Information

LCA Author/Creator:  Saint-Gobain North American ESG Sustainability Group |  sustainability@saint-gobain.com

EPD Program Operator:  Smart EPD |  info@smartepd.com |  www.smartepd.com |
 585 Grove St., Ste. 145 PMB 966, Herndon, VA 20170, USA

Verification: Independent critical review of the LCA and data, according to ISO 14044 and ISO 14071 : External
 Amy E. Landis |  amylandis@mines.edu

Independent external verification of EPD, according to ISO 14025 and reference PCR(s) : External
 Amy E. Landis |  amylandis@mines.edu

Limitations, Liability, and Ownership

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 whole building life cycle. EPD comparability is only possible 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. The EPD owner has sole ownership, liability, and responsibility for the EPD.

Organization Information

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.

Further information can be found at: <https://www.saint-gobain-northamerica.com/>

Product Description

The Restoration Millwork sheets are made of expanded rigid polyvinyl chloride (PVC) with a small-cell micro-structure. These sheets come in woodgrain and smooth surface textures and are available in widths of 4' with lengths ranging from 8' to 20'. Actual thicknesses options include 3/8", 1/2", 3/4", and 1". While there are other products made at the respective facility, the 8-foot size sheet has been chosen as the representative product for this product line due to its consistent adherence to high selling standards. These products serve as an exemplar for the entire product line, showcasing the quality and performance that are expected. Furthermore, they reflect the popularity and demand in the market, making them critical items for analysis.

Feature and Benefits

- Low maintenance and long-lasting
- UV-resistant material
- Class A (Class 1) Flame Spread Classification
- Meets ICC and CCMC code requirements

Further information can be found at: <https://www.certainteed.com/products/trim-products/restoration-millwork-sheets>

Product Information

Functional Unit:	1 m2 of installed cladding product
Mass:	6.73 kg
Reference Service Life:	50 Years
Product Specificity:	✗ Product Average ✓ Product Specific

Averaging:

Averaging was not conducted for this EPD.

Plants



Social Circle
Ronthor Dr, Social Circle, GA, USA

Product Specifications

Product Classification Codes:	EC3 - Cladding UNSPSC - 30151800
Thickness to achieve Functional or Declared Unit:	0.0127 m
Density:	530 kg/m3
Length:	2.44 m
Width:	1.22 m
Tensile strength:	8.69 MPa
Modulus of Elasticity:	547.88 MPa
U-value of assembly including interruptions to insulation:	N/A W/m2-K
R-value of typical materials where continuous:	N/A m2-K/W
Water vapor permeance:	N/A metric perms
Liquid water absorption:	N/A % of dry weight
Airborne sound reduction:	N/A dB
Sound absorption coefficient:	N/A %

Material Composition

Material/Component Category	Origin	% Mass
Metal Release Lubricant	None	0.05-1.0
Polyvinyl Chloride (PVC)	None	74-77
Tin Stabilizer	None	1-3
Wax	None	0.1-0.5
Performance Additive	None	0.1-0.5
Blowing Agent	None	1-3
Calcium Stearate	None	0.5-1.5
Process Aid	None	2-4
Calcium Carbonate	None	12-14
Titanium Dioxide	None	1-3
Lubricant	None	0.1-0.5

Packaging Material	Origin	kg Mass
Woven Polyethylene (PE) Shroud	None	0.00045
Slip Sheet - Styrofoam	None	0.00031
Pallets - Wood	None	0.0039
Slip Sheet - Cardboard	None	0.006
Polyethylene Terephthalate (PET) Bands	None	0.00038
Low Density Polyethylene (LDPE) Film	None	0.00313

Biogenic Carbon Content	kg C per m2
Biogenic carbon content in product	None
Biogenic carbon content in accompanying packaging	0.0013

Hazardous Materials
No regulated hazardous or dangerous substances are included in this product.

EPD Data Specificity

Primary Data Year:	2022
Manufacturing Specificity:	✗ Industry Average ✗ Manufacturer Average ✓ Facility Specific

Software and LCI Data Sources

LCA Software:	Sphera LCA for Experts (formerly GaBi) v. 10.8
LCI Foreground Database(s):	GaBi Professional Database v.
LCI Background Database(s):	Ecoinvent v. 3.9.1 GaBi Extension database XVIII: NREL USLCI Integrated v. 2022

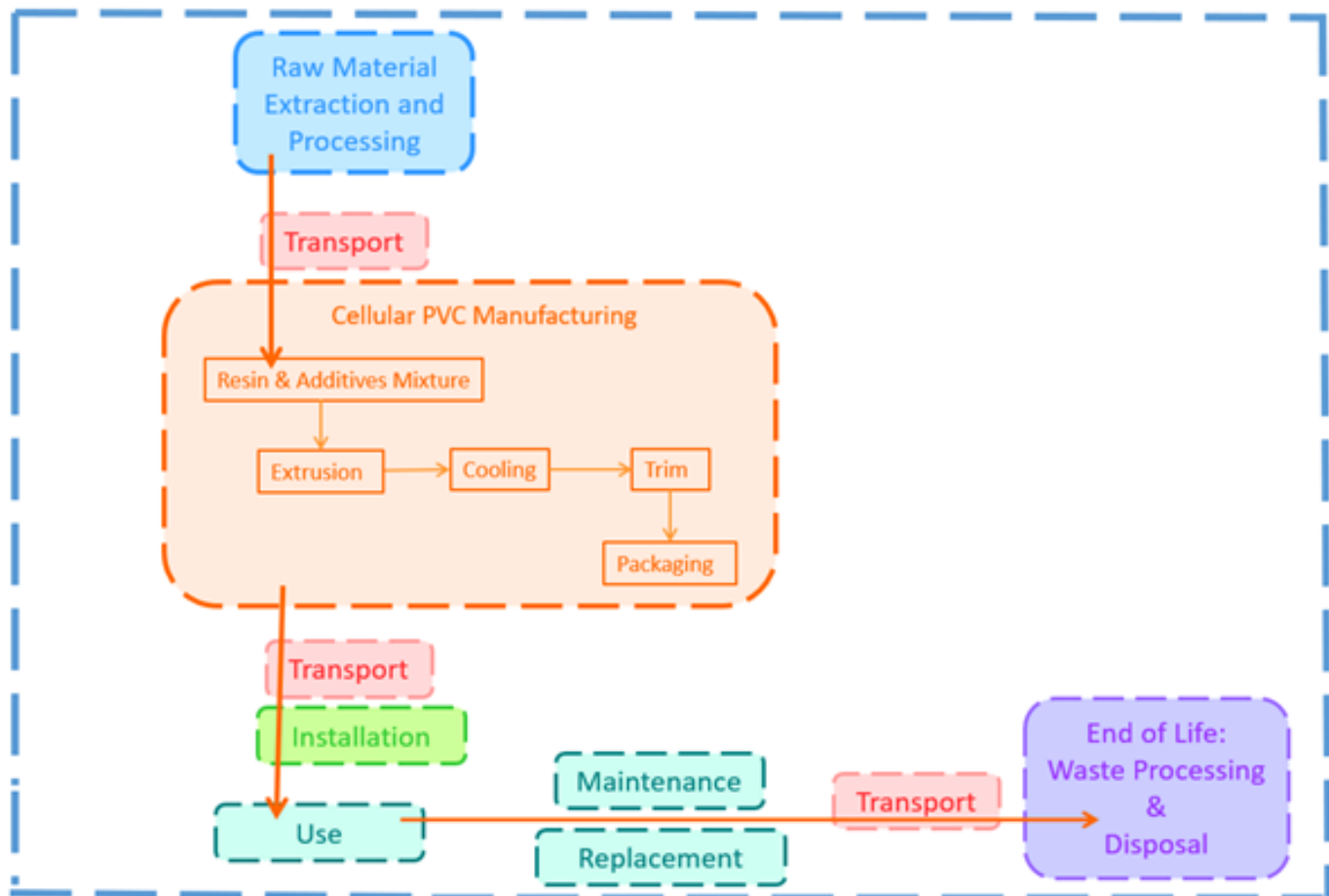
Renewable Electricity

Renewable electricity is used:	No
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System Boundary

Production	A1	Raw material supply	✓
	A2	Transport	✓
	A3	Manufacturing	✓
Construction	A4	Transport to site	✓
	A5	Assembly / Install	✓
Use	B1	Use	✓
	B2	Maintenance	✓
	B3	Repair	✓
	B4	Replacement	✓
	B5	Refurbishment	✓
	B6	Operational Energy Use	✓
	B7	Operational Water Use	✓
End of Life	C1	Deconstruction	✓
	C2	Transport	✓
	C3	Waste Processing	✓
	C4	Disposal	✓
Benefits & Loads Beyond System Boundary	D	Recycling, Reuse Recovery Potential	ND

Product Flow Diagram



Life Cycle Module Descriptions

This LCA study is characterized as a “cradle to grave” study, examining the Cellular PVC Sheets, product lines from raw material extraction through to final disposal. For this life cycle assessment, the Saint-Gobain North America (SGNA) ESG department, with assistance from personnel at the manufacturing locations, collected specific data on energy and material inputs, wastes, water usage, emissions, and transportation impacts for the CertainTeed Sheets in Social Circle, GA for the calendar year 2022. Each of these stages is closely monitored and optimized to ensure maximum efficiency and sustainability.

- Raw Materials (Module A1)

A thorough analysis of the material inputs was completed for the inventory of this study.

- Transportation of raw materials (Module A2)

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. The raw material transportation distance were modeled based on the actual data provided by experts from the plant.

- Manufacturing (Module A3)

The initial stage of the manufacturing process involves the unloading of resin from railroad cars via an air-conveying system into silos. The resin is then conveyed to the blender, where a blowing agent, regrind, and other micro-ingredients are added to create the processing compound. Following the blending process, the compound is conveyed to the cellular PVC extrusion line, where it is carefully metered to ensure a consistent amount enters the extruder. Extrusion is a thermoplastic resin processing

technique that involves pushing the resin through a heated barrel and die using two precisely tooled screws. As the screws turn, they thoroughly mix and knead the PVC compound. The barrel and screws of the extruder are heated, which melts the resin and eases mixing and pushing. The heat, which ranges from 300° to 400° F, also accelerates the physical reaction (fusion) between PVC and the micro-ingredients in the compound. All cellular PVC is extruded, but CertainTeed was the first to use twin-screw extruders to extrude all its cellular PVC and accessories. Twin-screw extrusion is preferred 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 double barrel's very tight tolerances promote complete fusion of the ingredients. When the cellular PVC sheet exits the extruder, it is still very hot, almost molten. Between the extruder die and cooling tank, the sheet passes through a textured roller and a rubber roller for embossing. Depending on the rollers, CertainTeed SPG and accessories are embossed in either rough cedar, woodgrain, smooth brushed, or smooth textures.

- Packaging (Module A3)

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 Cellular PVC sheet 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 linear meter of finished product was calculated.

- Transport from the gate to the site (Module A4)

Final products are transported on trucks throughout the United States and Canada. This study assumed an average of 500 km for the final shipment of product based on the estimates and assumptions within the Cladding Product Category Rule (PCR).

- Installation (Module A5)

Installation of CertainTeed products is accomplished by manual labor and typically does not require any additional materials. If necessary, cutting is done by hand using hand held cutting tools. Installation is modeled for two fasteners per every framing member for Cellular PVC applications ((0.0024 kg (0.0053 lb) per 0.09 m (per ft) of cladding). Using the CertainTeed Hidden Fastening System, choose the correctly sized fastener: 1-1/2 in., the fastener must penetrate a framing member and/or structural sheathing. If you use 1/2 in. OSB (a type of structural sheathing), the fastener needs to penetrate the framing member only 1 in. For sheets – vertical wall fastenings, perimeter fasteners spaced 4 in. apart can be secured into OSB. Fasteners on 16 in. centers must also be secured into framing members. There is no overlap of trim products during installation.

- Use (Modules B1-B7)

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.

- End of Life (Modules C1-C4)

Just as the installation of the Cellular PVC trim product is done by hand, the deconstruction (module C1) is also assumed to be by hand, so this study assumes the deconstruction module of the end-of-life stage to be burden free. The product's end-of-life is assumed to be 100% landfill disposal based on Part A (2018) assumptions for end-of-life which specify 100% landfill for all materials besides metals in the United States.

LCA Discussion

Allocation Procedure

The Social Circle facility is the only location that produce the Cellular PVC product line in North America for CertainTeed Corporation. 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 the facility

Cut-off Procedure

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.

Data Quality Discussion

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 Social Circle manufacturing plant.

Results

Environmental Impact Assessment Results

IPCC AR5 GWP 100, TRACI 2.1
per 1 m2.
LCIA results are relative expressions and do not predict impacts on category endpoints, the exceeding of thresholds, safety margins or risks.

Impact Category	Method	Unit	A1A2A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4
GWP-total	IPCC AR5 GWP 100	kg CO2 eq	14.3	0.0891	0.00168	ND	0.000202	ND	7.27	ND	ND	ND	ND	0.0624	ND	0.0994
ODP	TRACI 2.1	kg CFC 11 eq	4.36e-7	1.41e-11	6.95e-11	ND	2.34e-11	ND	2.18e-7	ND	ND	ND	ND	2.36e-12	ND	5.47e-15
AP	TRACI 2.1	kg SO2 eq	0.181	0.00315	0.0000639	ND	0.000014	ND	0.0928	ND	ND	ND	ND	0.000375	ND	0.000617
EP	TRACI 2.1	kg N eq	0.00762	0.000173	0.0000269	ND	0.0000201	ND	0.00393	ND	ND	ND	ND	0.0000208	ND	0.0000273
POCP	TRACI 2.1	kg O3 eq	0.00953	0.0000737	0.0000142	ND	0.00000385	ND	0.00484	ND	ND	ND	ND	0.00000953	ND	0.0000513
ADP-fossil	TRACI 2.1	MJ	44	0.66	0.0153	ND	0.00696	ND	22.5	ND	ND	ND	ND	0.11	ND	0.171
GWP-fossil	IPCC AR5 GWP 100	kg CO2 eq	15.3	0.374	0.0115	ND	0.00278	ND	7.94	ND	ND	ND	ND	0.0624	ND	0.0994

Abbreviations:
GWP = Global Warming Potential, 100 years (may also be denoted as GWP-total, GWP-fossil (fossil fuels), GWP-biogenic (biogenic sources), GWP-luluc (land use and land use change)), ODP = Ozone Depletion Potential, AP = Acidification Potential, EP = Eutrophication Potential, SFP = Smog Formation Potential, POCP = Photochemical oxidant creation potential, ADP-Fossil = Abiotic depletion potential for fossil resources, ADP-Minerals&Metals = Abiotic depletion potential for non-fossil resources, WDP = Water deprivation potential, PM = Particular Matter Emissions, IRP = Ionizing radiation, human health, ETP-fw = Eco-toxicity (freshwater), HTP-c = Human toxicity (cancer), HTP-nc = Human toxicity (non-cancer), SQP = Soil quality index.

Comparisons cannot be made between product-specific or industry average EPDs at the design stage of a project, before a building has been specified. Comparisons may be made between product-specific or industry average EPDs at the time of product purchase when product performance and specifications have been established and serve as a functional unit for comparison. Environmental impact results shall be converted to a functional unit basis before any comparison is attempted. Any comparison of EPDs shall be subject to the requirements of ISO 21930 or EN 15804. EPDs are not comparative assertions and are either not comparable or have limited comparability when they have different system boundaries. EPDs are not comparative assertions and are either not comparable or have limited comparability when they have different system boundaries, are based on different product category rules or are missing relevant environmental impacts. Such comparison can be inaccurate, and could lead to erroneous selection of materials or products which are higher-impact, at least in some impact categories.

Resource Use Indicators per 1 m2.

Indicator	Unit	A1A2A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4
RPRE	MJ, net calorific value	8.69	ND	0.0193	ND	0.0292	ND	ND	ND	ND	ND	ND	ND	ND	0.22
RPRM	MJ, net calorific value	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
RPRT	MJ, net calorific value	8.69	ND	0.0193	ND	0.0292	ND	ND	ND	ND	ND	ND	ND	ND	0.22
NRPRE	MJ, net calorific value	413	4.8	0.153	ND	0.0641	ND	ND	ND	ND	ND	ND	0.803	ND	1.35
NRPRM	MJ, net calorific value	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
NRPRT	MJ, net calorific value	413	4.8	0.153	ND	0.0641	ND	ND	ND	ND	ND	ND	0.803	ND	1.35
SM	kg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
RSF	MJ, net calorific value	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
NRSF	MJ, net calorific value	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
RE	MJ	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
FW	m3	0.0522	ND	0.0000306	ND	0.00151	ND	ND	ND	ND	ND	ND	ND	ND	0.00034

Abbreviations:

RPRE or PERE = Renewable primary resources used as energy carrier (fuel), RPRM or PERM = Renewable primary resources with energy content used as material, RPRT or PERT = Total use of renewable primary resources with energy content, NRPRE or PENRE = Non-renewable primary resources used as an energy carrier (fuel), NRPRM or PENRM = Non-renewable primary resources with energy content used as material, NRPRRT or PENRT = Total non-renewable primary resources with energy content, SM: Secondary materials, RSF = Renewable secondary fuels, NRSF = Non-renewable secondary fuels, RE = Recovered energy, ADPF = Abiotic depletion potential, FW = Use of net freshwater resources, VOCs = Volatile Organic Compounds.

Waste and Output Flow Indicators per 1 m2.

Indicator	Unit	A1A2A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4
HWD	kg	0.0000207	ND	1.98e-12	ND	1.19e-13	ND	ND	ND	ND	ND	ND	ND	ND	2.9e-11
NHWD	kg	1.2	ND	0.433	ND	0.000396	ND	ND	ND	ND	ND	ND	ND	ND	6.74
RWD	kg	0.00394	ND	0.00000109	ND	9.76e-8	ND	ND	ND	ND	ND	ND	ND	ND	0.0000151
HLRW	kg	0.00000472	ND	1.14e-9	ND	1.1e-10	ND	ND	ND	ND	ND	ND	ND	ND	1.56e-8
ILLRW	kg	0.00393	ND	0.00000109	ND	9.75e-8	ND	ND	ND	ND	ND	ND	ND	ND	0.0000151

Abbreviations:

HWD = Hazardous waste disposed, NHWD = Non-hazardous waste disposed, RWD = Radioactive waste disposed, HLRW = High-level radioactive waste, ILLRW = Intermediate- and low-level radioactive waste, CRU = Components for re-use, MFR or MR = Materials for recycling, MER = Materials for energy recovery, MNER = Materials for incineration, no energy recovery, EE or EEE = Recovered energy exported from the product system, EET = Exported thermal energy.

Carbon Emissions and Removals per 1 m2.

Indicator	Unit	A1A2A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4
BCRP	kg CO2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
BCEP	kg CO2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
BCRK	kg CO2	0.00462	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
BCEK	kg CO2	ND	ND	-0.00462	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
BCEW	kg CO2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
CCE	kg CO2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
CCR	kg CO2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
CWNR	kg CO2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

Abbreviations:

BCRP = Biogenic Carbon Removal from Product, BCEP = Biogenic Carbon Emission from Product, BCRK = Biogenic Carbon Removal from Packaging, BCEK = Biogenic Carbon Emission from Packaging, BCEW = Biogenic Carbon Emission from Combustion of Waste from Renewable Sources Used in Production Processes, CCE = Calcination Carbon Emissions, CCR = Carbonation Carbon Removals, CWNR = Carbon Emissions from Combustion of Waste from Non-Renewable Sources used in Production Processes, GWP-luc = Carbon Emissions from Land-use Change.

Scenarios

Transport to the building/construction site (A4)

A4 Module

Fuel Type:	Diesel
Liters of Fuel:	30 l/100km
Vehicle Type:	Standard Freight Trailer
Transport Distance:	500 km
Capacity Utilization:	85 %
Packaging Mass:	0.0142 kg
Gross density of products transported:	530 kg/m3
Weight of products transported:	6.73 kg
Capacity utilization volume factor:	<1
Assumptions for scenario development:	Final products are transported on trucks and/or rail throughout the United States. This study assumed an average of 500 km for the final shipment of Trimboard, Sheet and Brickmould product lines based on the assumptions from the PCR.

Installation in to the building/construction site (A5)

A5 Module

Installation Scrap Rate Assumed:	5 %
Product Lost per Functional Unit:	0.381 kg
Waste Materials at the Construction Site Before Waste Processing:	0.488 kg
Mass of Packaging Waste Specified by Type:	0.0142 kg
Biogenic Carbon Contained in Packaging:	0.00126 kg
Assumptions for scenario development:	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 Cellular PVC Trim Industry LCA, the product lines were modeled based on installation by manual labor. Installation is modeled for two fasteners per every framing member for Cellular PVC applications ((0.0024 kg (0.0053 lb) per 0.09 m2 (per ft2) of cladding). Using the CertainTeed Hidden Fastening System, choose the correctly sized fastener: 1-1/2 in., the fastener must penetrate a framing member and/or structural sheathing. If you use 1/2 in. OSB (a type of structural sheathing), the fastener needs to penetrate the framing member only 1 in. For sheets – vertical wall fastenings, perimeter fasteners spaced 4in. apart can be secured into OSB. Fasteners on 16 in. centers must also be secured into framing members.

Reference Service Life

B1 Module

RSL:	50 Years
Declared Product Properties:	
N/A	
Design Application Parameters:	
N/A	

An Assumed Quality of Work, When Installed in Accordance with The Manufacturer’s Instructions:

- N/A
- Outdoor Environment:
 - N/A
- Indoor Environment:
 - N/A
- Use Conditions:
 - N/A
- Maintenance:
 - N/A

Maintenance (B2)
B2 Module

Maintenance Cycle:	1 Cycles/RSL
Net Fresh Water Consumption Specified by Water Source and Fate:	0.0045 m3
Other Resources:	0.0026 kg
Maintenance Process Information:	Use a soft bristle brush and a bucket of soapy water to remove normal dirt and grime. For especially stubborn stains or for mold or mildew, use a cleaner suitable for PVC products. For additional information visit: https://certainteed.widen.net/content/o1whofsa0o/pdf/restorationmillwork-installation-guide-04-03-1600-US-EN-2305.pdf?u=nwk4fd
Further assumptions for scenario development:	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 (VSI) industry EPD. The maintenance phase (B2) would require water and household cleaners to keep up with the appearance of the Cellular PVC 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.

Repair (B3)
B3 Module

Repair Process Information:	N/A
Inspection Process Information:	N/A
Further assumptions for scenario development:	N/A

Replacement (B4)

B4 Module

Reference Service Life:	50 Years
Replacement Cycle:	1.5 (ESL/RSL)-1
Ancillary Materials Specified by Type:	0.0142 kg
Replacement of Worn Parts:	6.73 kg

Refurbishment (B5)

B5 Module

Refurbishment Process Description:	N/A
Further assumptions for scenario development:	N/A

End of Life

C1 - C4 Modules

Collection Process

Collected with Mixed Construction Waste:	6.73 kg
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Disposal

Product or Material for Final Disposal:	6.73 kg
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Assumptions for scenario development:

Deconstruction by hand, disposal inert in landfill transported by truck.

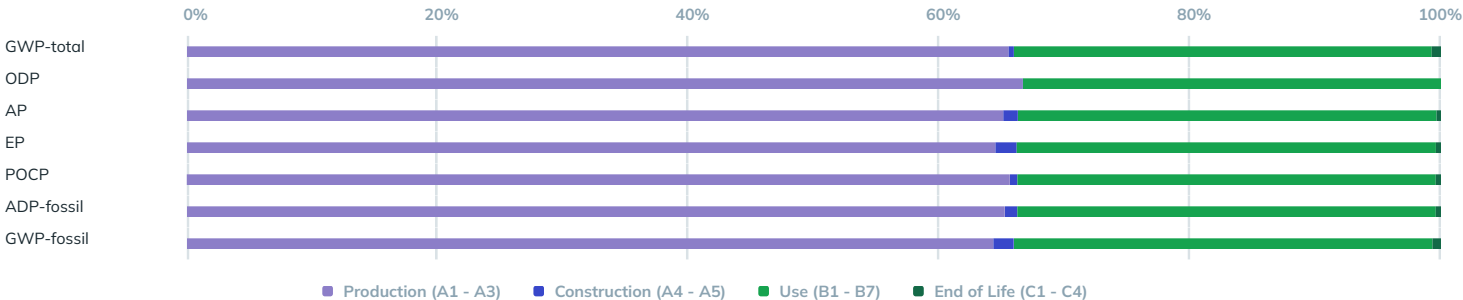
Interpretation

This study was conducted following appropriate ISO standards and best practices and intended to understand the life cycle impacts of Cellular PVC sheets. All data for the operation of the Social Circle, GA facility, as well as raw material transportation distances and modes, was collected directly from CertainTeed Siding. Efforts were made to check the data for internal consistency and to verify data with plant personnel. Sub-metering energy use for each critical stage in the manufacturing process would allow for more detailed analysis and is recommended. The findings in this research are limited by the inherent uncertainty of creating a representative model through LCA.

Many assumptions were made in the modeling of the product system with representative processes and datasets. While quality control was undertaken at each step in building the LCI and conducting the LCIA, uncertainty is present in the results since the data represents only one year of manufacturing information from Social Circle, GA. Detailed evaluation of more manufacturing plants and time periods would reduce the uncertainty. Some level of uncertainty is inherent in conducting LCA and decision making must reflect this fact.

Based on the results from the life cycle assessment, the life cycle impacts are strongly driven by the raw materials (A1), manufacturing processes (A3), and replacement (B4), each contributing 55%, 8% and 33%, respectively to the total global warming potential. The impacts of the PVC resin are significant when considering the impacts of the Restoration Millwork® sheets product. Identifying alternate uses or recycling options for polyvinyl chloride at the end of its useful life may reduce the end-of-life and potential raw materials burdens of recycled products. If possible, incorporating more recycled content (post-consumer polyvinyl chloride) into the product could help reduce the environmental impacts of the raw materials stage in the life cycle of Restoration Millwork® sheet products. As recycled content increases, the raw materials driving impacts could decrease, thus improving the overall environmental impacts. Polyvinyl chloride resins and process aids are the largest contributors to the raw

material impacts of the product line, responsible for up to 50% of the environmental impact potentials in several categories. Moreover, increasing energy efficiency would help reduce the overall manufacturing environmental impacts from the plant.



Additional Environmental Information

- 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.
- NGBS Green Certified (certificate #000052)
The product(s) shown on this report have been independently verified as eligible products for use in achieving points toward project certification under ICC-700 National Green Building Standard
- Environment and Health During Installation
Installation has minimal impacts due to the modular nature of siding panels and minimal energy required for installation. Cellular PVC sheets require minimal cleaning with soap and water and there are no maintenance requirements so use phase impacts are zero.
- Fire: ASTM E84 – Flame spread of 25 or less, smoke developed of 50 or less
- Water: This product is not subject to water damage and is naturally drainable due to the hollow back and engineered weep holes. Any water that gets behind the siding panels can drain out.
- Mechanical Destruction: This product is intended for residential & commercials applications. Handling and installation information can be found in the CertainTeed Restoration Millwork Guide. The product should be installed according to CertainTeed Restoration Millwork Installation instructions and in adherence with applicable building codes.

Modified Impact Results: Renewable Electricity per 1 m2.

Impact Category	Indicator	Unit	A1A2A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4
GWP-total	ND	kg CO2 eq	12.6	0.0891	0.00168	ND	0.000202	ND	7.27	ND	ND	ND	ND	0.0624	ND	0.0994
ODP	ND	kg CFC 11 eq	4.36e-7	1.41e-11	6.95e-11	ND	2.34e-11	ND	2.18e-7	ND	ND	ND	ND	2.36e-12	ND	5.47e-15
AP	ND	kg SO2 eq	0.181	0.00315	0.0000639	ND	0.000014	ND	0.0928	ND	ND	ND	ND	0.000375	ND	0.000617
EP	ND	kg N eq	0.00759	0.000173	0.0000269	ND	0.0000201	ND	0.00393	ND	ND	ND	ND	0.0000208	ND	0.0000273
POCP	ND	kg O3 eq	0.00953	0.0000737	0.0000142	ND	0.00000385	ND	0.00484	ND	ND	ND	ND	0.00000953	ND	0.0000513
ADP-fossil	ND	MJ	43.2	0.66	0.0153	ND	0.00696	ND	22.5	ND	ND	ND	ND	0.11	ND	0.171
GWP-fossil	ND	kg CO2 eq	14.7	0.374	0.0115	ND	0.00278	ND	7.94	ND	ND	ND	ND	0.0624	ND	0.0994

Abbreviations:

GWP = Global Warming Potential, 100 years (may also be denoted as GWP-total, GWP-fossil (fossil fuels), GWP-biogenic (biogenic sources), GWP-luluc (land use and land use change)), ODP = Ozone Depletion Potential, AP = Acidification Potential, EP = Eutrophication Potential, SFP = Smog Formation Potential, POCP = Photochemical oxidant creation potential, ADP-Fossil = Abiotic depletion potential for fossil resources, ADP-Minerals&Metals = Abiotic depletion potential for non-fossil resources, WDP = Water deprivation potential, PM = Particulate Matter Emissions, IRP = Ionizing radiation, human health, ETP-fw = Eco-toxicity (freshwater), HTP-c = Human toxicity (cancer), HTP-nc = Human toxicity (non-cancer), SQP = Soil quality index.

Saint-Gobain is committed to achieving Carbon Neutrality by 2050. In January 2021, Saint-Gobain North America started receiving Renewable Energy Certificates (RECs) from a 12-year virtual power purchase agreement (vPPA) with the Blooming Grove Wind Farm in McLean County, Illinois. Each year within the agreement, the company receives and retires these RECs, effectively reducing CO2 equivalent emissions from electricity usage in the United States and Canada.

The updated results incorporate the impact of RECs on the electricity used in the manufacturing process (A3), as shown in the aggregated A1, A2, and A3 data in the 'Modified Impact Results: Renewable Electricity' table. The reduced impacts resulting from allocated RECs at Social Circle, GA were calculated using 32% wind-generated electricity, and 68% Solar generated electricity, covering 100% of the plant's electricity consumption in 2023. The REC data was modeled using the 'US-SERC Electricity production, wind, 1-3MW turbine, onshore' dataset, with a carbon intensity of 13.2 kg CO2e/MWh*. In addition to VPPA, Social Circle purchased additional Solar RECs, this was modeled using the 'US: Electricity from solar thermal Sphera' dataset with a carbon intensity of 10.6 kg CO2e/MWh*. Any remaining energy not covered by RECs was modeled based on local energy grid information for the manufacturing site(s).

References

- Product Category Rules for Building-Related Product and Services: Part A – Life Cycle Assessment Calculation Rules and Report Requirements, Version 3.1 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
- ISO 14040: 2006 Series – Environmental Management-Life Cycle Assessment
- ISO 21930 – Sustainability in building construction – Environmental declaration of building products
- LCA FE. <https://sphera.com/life-cycle-assessment-lca-software/>
- US LCI Database. www.nrel.gov/lci
- Ecoinvent v3.9.1 Database. <http://ecoinvent.org/>
- CertainTeed SPG Website. <https://www.certainteed.com/products/trim-products/restoration-millwork-sheets>