Continuus Materials

VERIFIED by SCS GLOBAL SERVICES ENVIRONMENTAL PRODUCT DECLARATION BASED ON LCA

Declaration Owner

Continuus Materials
8000 Research Forest Drive, Suite 115
The Woodlands, TX 77382 United States
www.continuusmaterials.com | +1 (415) 385 3399

Products

EVERBOARD™ Roof Boards, produced at Des Moines, Iowa manufacturing facility:

- *EVERBOARD™ - ¼" paper faced*
- *EVERBOARD™ - ¼" fiberglass faced*
- *EVERBOARD™ - ½" paper faced*
- *EVERBOARD™ - ½" fiberglass faced*

Functional Unit

The functional unit is one square meter of roof cover board product maintained for 75 years.

EPD Number and Period of Validity

SCS-EPD-06489
EPD Valid October 26, 2020 through October 25, 2025
Version: August 23, 2022

Product Category Rule

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

Program Operator

SCS Global Services
2000 Powell Street, Ste. 600, Emeryville, CA 94608
+1.510.452.8000 | www.SCSglobalServices.com

SCSglobal SERVICES

Declaration Owner:	Continuus Materials
Address:	8000 Research Forest Drive, Suite 115 The Woodlands, TX 77382 United States
Declaration Number:	SCS-EPD-06489
Declaration Validity Period:	October 26, 2020 through October 25, 2025
Version Date:	August 23, 2022
Program Operator:	SCS Global Services
Declaration URL Link:	https://www.scsglobalservices.com/certified-green-products-guide
LCA Practitioner:	Gerard Mansell, PhD.
LCA Software:	OpenLCA 1.10
Independent critical review of the LCA and data, according to ISO 14044 and ISO 14071	☐ internal ☒ external
LCA Reviewer:	Tom Gloria, Ph.D., Industrial Ecology Consultants
Product Category Rule:	ISO 21930:2017. Sustainability in buildings and civil engineering works — Core rules for environmental product declarations of construction products and services.
PCR Review conducted by:	ISO Technical Committee
Independent verification of the declaration and data, according to ISO 14025 and the PCR	☐ internal ☒ external
EPD Verifier:	Tom Gloria, Ph.D., Industrial Ecology Consultants
Declaration Contents:	1. About Continuus Materials....2 2. Product....2 3. LCA: Calculation Rules....4 4. LCA: Scenarios and Additional Technical Information....10 5. LCA: Results....13 6. LCA: Interpretation....23 7. Additional Environmental Information....23 8. References....23

Disclaimers: *This EPD conforms to ISO 14025, 14040, 14044, and ISO 21930.*

Scope of Results Reported: *The PCR requirements limit the scope of the LCA metrics such that the results exclude environmental and social performance benchmarks and thresholds, and exclude impacts from the depletion of natural resources, land use ecological impacts, ocean impacts related to greenhouse gas emissions, risks from hazardous wastes and impacts linked to hazardous chemical emissions.*

Accuracy of Results: *Due to PCR constraints, this EPD provides estimations of potential impacts that are inherently limited in terms of accuracy.*

Comparability: *The PCR this EPD was based on was not written to support comparative assertions. EPDs based on different PCRs, or different calculation models, may not be comparable. When attempting to compare EPDs or life cycle impacts of products from different companies, the user should be aware of the uncertainty in the final results, due to and not limited to, the practitioner's assumptions, the source of the data used in the study, and the specifics of the product modeled.*

In accordance with ISO 21930:2017, EPDs are comparable only if they comply with the core PCR, 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.

1. About Continuus Materials

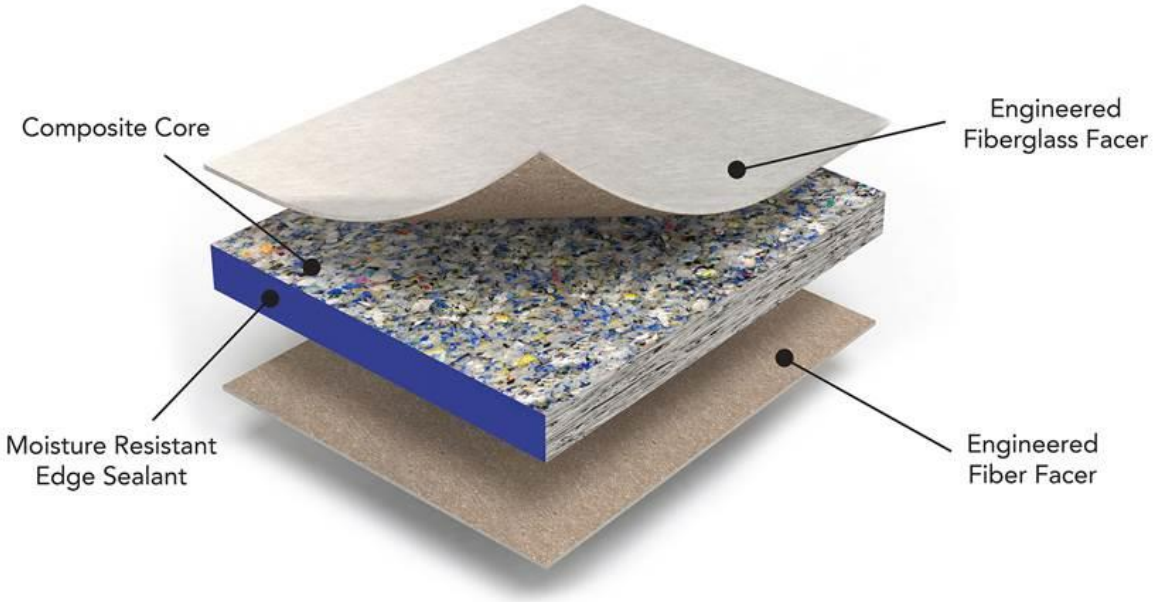
Continuus Materials manufacturers high-performance, cost- competitive panels for the building products industry. The cores of our panels are made from fiber and plastic mined from materials destined for landfill.

2. Product

The EVERBOARD™ roof cover board products are manufactured from a proprietary blend of post-industrial and post-consumer plastic and cellulose fiber, providing remarkable performance and installation benefits.

The EVERBOARD™ roof cover board products are manufactured at Continuus Materials' production facility in Des Moines, IA primarily from plastic and fiber diverted from municipal waste streams. The products are formed into boards under heat and pressure and include a polyethylene liner and either a paper, or fiberglass facer on each side. The products are packaged using corrugated board, steel banding and wooden pallets. This EPD includes four (4) products for use in commercial roofing applications:

- EVERBOARD™ - ¼" paper facing
- EVERBOARD™ - ¼" fiberglass facing
- EVERBOARD™ - ½" paper facing
- EVERBOARD™ - ½" fiberglass facing



2.2 Application

The EVERBOARD™ products provide the primary function of a roof cover board for commercial roofing applications.

2.3 Technical Data

Technical specifications of the products included in the LCA scope, as well as product performance testing results are available on the manufacturer's website (https://www.continuusmaterials.com/everboard/) and summarized in Table 1.

Table 1. *Technical performance specifications for the EVERBOARD™ products.*

Physical Properties	Standard	Value	
		1/4" Board	1/2" Board
Width		4' ± 1/8" (1.22 m ± 3.175 mm)	4' ± 1/8" (1.22 m ± 3.175 mm)
Length		4' to 8' ± 1/4" (1.22 m to 2.44 m ± 6.35 mm)	4' to 8' ± 1/4" (1.22 m to 2.44 m ± 6.35 mm)
Thickness		1/4" ± 1/16" (6.35 mm ± 1.59 mm)	1/2" ± 1/16" (12.7 mm ± 1.59 mm)
Weight		1.20 lbs./sf (5.86 kg/m^2)	1.80 lbs./sf (8.79 kg/m^2)
Flexural Strength	ASTM D3043 - Standard Test Methods for Structural Panels in Flexure	52 lbf (231 N) max load	78 lbf (347 N) max load
Compressive Strength	ASTM D3043 - Standard Test Methods for Structural Panels in Flexure	3,900 psi (267 bar)	3,900 psi (267 bar)
Permeability	ASTM E96 - Standard Test Methods for Water Vapor Transmission of Materials	<1.0 Perms	<1.0 Perms
Mold Resistance	ASTM D3273 - Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber	10 out of 10	10 out of 10
Flame Spread	ASTM E108 - Standard Test Methods for Fire Tests of Roof Coverings	Class A	Class A

2.4 Base Materials

The primary materials include plastic and fiber diverted from municipal solid waste streams, a polyethylene liner and facing materials of either recycled paper, or fiberglass sourced from various suppliers. Packaging materials consist of corrugated board, steel and wood pallets.

Table 2. *Material content for the EVERBOARD™ products in kg per square meter and percent of total mass.*

Component	EVERBOARD™ - 1/4"; paper facing	EVERBOARD™ - 1/4"; fiberglass facing	EVERBOARD™ - 1/2 "; paper facing	EVERBOARD™ - 1/2"; fiberglass facing
	kg/m^2	kg/m^2	kg/m^2	kg/m^2
Waste fiber	3.34	3.16	5.62	5.45
	55%	52%	57%	55%
Waste plastic	2.22	2.11	3.75	3.63
	36%	35%	38%	37%
Recycled paper	0.403	0.201	0.403	0.201
	6.6%	3.3%	4.1%	2.0%
Fiberglass mat	0.00	0.497	0.00	0.497
	0%	8.2%	0%	5.0%
LDPE	0.140	0.140	0.140	0.140
	2.3%	2.3%	1.4%	1.4%
Total Product	6.10	6.10	9.92	9.92
	100%	100%	100%	100%

Table 3. *Material content for the EVERBOARD™ product packaging, per square meter.*

Component	EVERBOARD™ - 1/4"; paper facing	EVERBOARD™ - 1/4"; fiberglass facing	EVERBOARD™ - 1/2 "; paper facing	EVERBOARD™ - 1/2"; fiberglass facing
	kg/m^2	kg/m^2	kg/m^2	kg/m^2
Cardboard	$3.81x10^{-3}$	$3.81x10^{-3}$	$5.09x10^{-3}$	$5.09x10^{-3}$
	1.5%	1.5%	1.5%	1.5%
Wood	0.229	0.229	0.305	0.305
	91%	91%	91%	91%
Steel	$1.91x10^{-2}$	$1.91x10^{-2}$	$2.54x10^{-2}$	$2.54x10^{-2}$
	7.6%	7.6%	7.6%	7.6%
Total Packaging	0.252	0.252	0.336	0.336
	100%	100%	100%	100%

2.5 Manufacture

The EVERBOARD™ roof cover board products are manufactured at the company's production facility in Des Moines, Iowa. Resource use at the production facility is allocated to the products based on surface area.

2.6 Environment and Health during Manufacture

No environmental or health impacts are expected during the manufacture of the product.

2.7 Product Processing/Installation

Typical installation is accomplished using hand tools and light equipment.

2.8 Packaging

The EVERBOARD™ products are packaged for shipment using corrugated board, steel banding and wood pallets.

2.9 Condition of Use

No special conditions of use are noted.

2.10 Environment and Health during use

No environmental or health impacts are expected due to normal use of the roof boards.

2.11 Reference Service Life

The Reference Service Life (RSL) of the roof cover board product is based on the manufacturer's estimated lifetime of 20 years. The building Estimated Service Life (ESL) is 75 years, consistent with the PCR.

2.12 Extraordinary Effects

No environmental or health impacts are expected due to extraordinary effects including fire and/or water damage and unforeseeable mechanical destruction.

2.13 Further Information

Further information on the product can be found on the manufacturers' website at https://www.continuusmaterials.com.

3. LCA: Calculation Rules

3.1 Functional Unit

The functional unit used in the study is defined as 1 m^2 of roof cover board product maintained for 75 years. The reference flows for each product are summarized in Table 4.

Table 4. *Reference flows for the EVERBOARD™ products, per square meter.*

Product Name	Reference flow (kg/m^2)	Reference Service Life – RSL (years)	Replacement Cycle (ESL/RSL-1)
EVERBOARD™ - 1/4"; paper facing	6.10	20	2.75
EVERBOARD™ - 1/4"; fiberglass facing	6.10	20	2.75
EVERBOARD™ - 1/2 "; paper facing	9.92	20	2.75
EVERBOARD™ - 1/2"; fiberglass facing	9.92	20	2.75

3.2 System Boundary

The scope of the EPD is cradle-to-grave, including raw material extraction and processing, transportation, product manufacture, product delivery, installation and use, and product disposal. The life cycle phases included in the EPD scope are described in Table 5 and illustrated in Figure 1.

Table 5. *The modules and unit processes included in the scope for the EVERBOARD™ products.*

Module	Module description from the PCR	Unit Processes Included in Scope
A1	Extraction and processing of raw materials; any reuse of products or materials from previous product systems; processing of secondary materials; generation of electricity from primary energy resources; energy, or other, recovery processes from secondary fuels	Extraction and processing of raw materials for the roof cover board product system components.
A2	Transport (to the manufacturer)	Transport of component materials to the manufacturing facility
A3	Manufacturing, including ancillary material production	Manufacturing of products and packaging (incl. upstream unit processes)
A4	Transport (to the building site)	Transport of product (including packaging) to the building site
A5	Construction-installation process	Impacts from the installation of product are assumed negligible. Only impacts from packaging disposal are included in this phase
B1	Product use	Use of the products in a commercial building setting. Impacts associated with the use of the products are zero.
B2	Product maintenance	Maintenance of products over the 75-year ESL. No maintenance of the products is required over its lifetime.
B3	Product repair	The products are not expected to require repair over their lifetime
B4	Product replacement	The materials and energy required for replacement of the product over the 75-year ESL of the assessment are included in this phase
B5	Product refurbishment	The products are not expected to require refurbishment over their lifetime
B6	Operational energy use by technical building systems	There is no operational energy use associated with the use of the product
B7	Operational water use by technical building systems	There is no operational water use associated with the use of the product
C1	Deconstruction, demolition	Demolition of the product is accomplished using hand tools with no associated emissions and negligible impacts
C2	Transport (to waste processing)	Transport of the product to waste treatment at end-of-life
C3	Waste processing for reuse, recovery and/or recycling	The products are assumed disposed of by landfilling which require no waste processing
C4	Disposal	Disposal of the product in a municipal landfill
D	Reuse-recovery-recycling potential	Module Not Declared

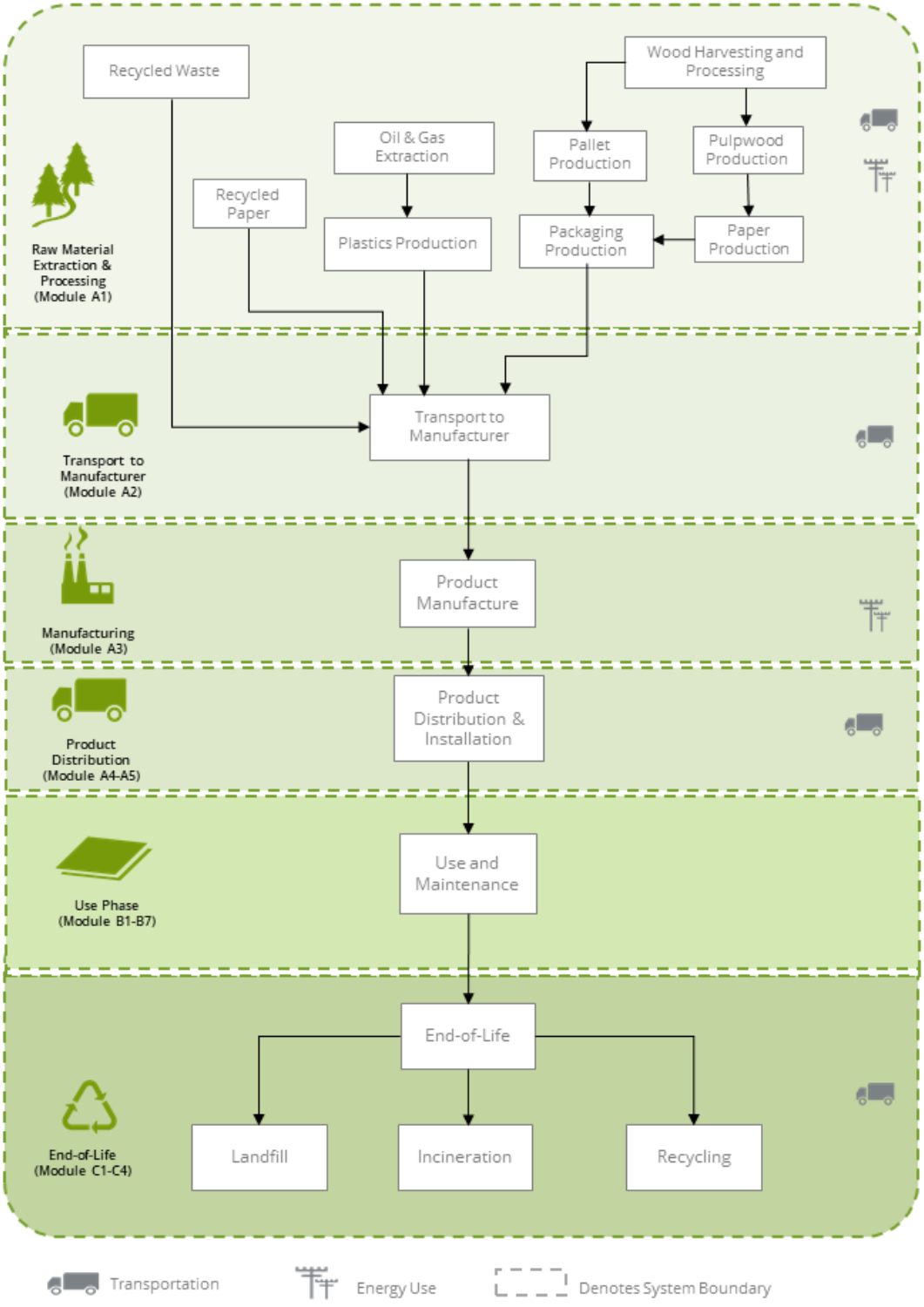


Figure 1. *Flow diagram representing the major unit operations in the life cycle of the EVERBOARD™ products.*

3.3 Estimates and Assumptions

- The Continuus Materials manufacturing facility is located in Des Moines, IA. Ecoinvent inventory datasets for the grid electricity resource mix for the relevant EPA NERC eGRID subregion (MROW) were used to estimate resource use and emissions from electricity consumption at the facility.
- Energy resource use and emissions at the manufacturing facility were reported separately for electricity and fuel consumption. Resource use and emissions were allocated to the product based on the surface area of the product as a fraction of the total facility production (i.e., area-based allocation).
- For virgin materials, the upstream raw materials extraction and processing could not be modeled with actual process information. Representative data from the Ecoinvent LCI databases were utilized as appropriate.
- Disposal of product and packaging is modeled based on regional statistics regarding municipal solid waste generation and disposal in the United States. The data include end-of-life recycling rates of product and packaging materials.
- For final disposal of the product and packaging material at end-of-life, all materials are assumed to transported 20 miles by diesel truck to either a landfill, incineration facility, or material reclamation facility (for recycling). Datasets representing disposal in a landfill and waste incineration are from Ecoinvent.

It should also be noted that LCIA results are relative expressions and do not predict impacts on category endpoints, the exceeding of thresholds, safety margins or risks.

The PCR allows for the results for several inventory flows related to construction products to be reported as "other parameters". These are aggregated inventory flows, and do not characterize any potential impact; results should be interpreted considering this limitation.

3.4 Cut-off criteria

According to the PCR, processes contributing greater than 1% of the total environmental impact indicator for each impact are included in the inventory. No data gaps were allowed which were expected to significantly affect the outcome of the indicator results. No known flows are deliberately excluded from this EPD.

3.5 Background Data

Primary data were provided by Continuus Materials for their manufacturing facility. The sources of secondary LCI data are the Ecoinvent database.

Table 6. *Data sources for the EVERBOARD™ product system.*

Component	Dataset	Data Source	Publication data
PRODUCT			
Waste fiber	n/a	n/a	n/a
Waste plastic	n/a	n/a	n/a
Recycled paper	containerboard production, linerboard, testliner | containerboard, linerboard | Cutoff, S/RoW	EI v3.6	2019
Fiberglass mat	glass fibre production | glass fibre | Cutoff, S/RoW	EI v3.6	2019
	limestone production, crushed, washed | limestone, crushed, washed | Cutoff, S/RoW	EI v3.6	2019
	acrylonitrile-butadiene-styrene copolymer production | acrylonitrile-butadiene-styrene copolymer | Cutoff, S/RER	EI v3.6	2019
	market for acrylic dispersion, without water, in 65% solution state | acrylic dispersion, without water, in 65% solution state | Cutoff, S/RoW	EI v3.6	2019
	carbon black production | carbon black | Cutoff, S/GLO	EI v3.6	2019
	zinc oxide production | zinc oxide | Cutoff, S/RoW	EI v3.6	2019
LDPE	market for packaging film, low density polyethylene | packaging film, low density polyethylene | Cutoff, S/GLO	EI v3.6	2019
PACKAGING			
Cardboard	market for folding boxboard/chipboard | folding boxboard/chipboard | Cutoff, S/GLO	EI v3.6	2019
Wood pallet	market for EUR-flat pallet | EUR-flat pallet | Cutoff, S/GLO	EI v3.6	2019
Steel banding	market for steel, low-alloyed | steel, low-alloyed | Cutoff, S/GLO	EI v3.6	2019
TRANSPORT			
Road transport	market for transport, freight, lorry 16-32 metric ton, EURO4 | transport, freight, lorry 16-32 metric ton, EURO4 | Cutoff, S/RoW	EI v3.6	2019
RESOURCES			
Grid electricity	Electricity, low voltage, per kWh - RFCE/RFCE	eGRID; EI v3.6	2019; 2019
Heat - natural gas	market group for heat, district or industrial, natural gas | heat, district or industrial, natural gas | Cutoff, S/GLO	EI v3.6	2019

-

3.6 Data Quality

The data quality assessment addressed the following parameters: time-related coverage, geographical coverage, technological coverage, precision, completeness, representativeness, consistency, reproducibility, sources of data, and uncertainty.

Table 7. *Data quality assessment for the EVERBOARD™ product system.*

Data Quality Parameter	Data Quality Discussion
Time-Related Coverage: Age of data and the minimum length of time over which data is collected	The most recent available data are used, based on other considerations such as data quality and similarity to the actual operations. Typically, these data are representative of 2015 or more recent. All of the data used represented an average of at least one year's worth of data collection, and up to three years in some cases. Manufacturer-supplied data (primary data) are based on annual production for 2019.
Geographical Coverage: Geographical area from which data for unit processes is collected to satisfy the goal of the study	The data used in the analysis provide the best possible representation available with current data. Surrogate data used in the assessment are representative of North American or European operations. Data representative of European operations are considered sufficiently similar to actual processes. Data representing disposal processes are based on US statistics.
Technology Coverage: Specific technology or technology mix	For the most part, data are representative of the actual technologies used for processing, transportation, and manufacturing operations. Representative datasets, specific to the type of material, are used to represent the actual processes, as appropriate.
Precision: Measure of the variability of the data values for each data expressed	Precision of results are not quantified due to a lack of data. Data collected for operations were typically averaged for one or more years and over multiple operations, which is expected to reduce the variability of results.
Completeness: Percentage of flow that is measured or estimated	The LCA model included all known mass and energy flows for production of the products. In some instances, surrogate data used to represent upstream and downstream operations may be missing some data which is propagated in the model. No known processes or activities contributing to more than 1% of the total environmental impact for each indicator are excluded. In total, these missing data represent less than 5% of the mass or energy flows.
Representativeness: Qualitative assessment of the degree to which the data set reflects the true population of interest	Data used in the assessment represent typical or average processes as currently reported from multiple data sources and are therefore generally representative of the range of actual processes and technologies for production of these materials. Considerable deviation may exist among actual processes on a site-specific basis; however, such a determination would require detailed data collection throughout the supply chain back to resource extraction.
Consistency: Qualitative assessment of whether the study methodology is applied uniformly to the various components of the analysis	The consistency of the assessment is considered to be high. Data sources of similar quality and age are used with a bias towards Ecoinvent v3.6 data where available. Different portions of the product life cycle are equally considered.
Reproducibility: Qualitative assessment of the extent to which information about the methodology and data values would allow an independent practitioner to reproduce the results reported in the study	Based on the description of data and assumptions used, this assessment would be reproducible by other practitioners. All assumptions, models, and data sources are documented.
Sources of the Data: Description of all primary and secondary data sources	Data representing energy use at the manufacturing facility represent annualized average production and are considered of high quality due to the length of time over which these data are collected, as compared to a snapshot that may not accurately reflect fluctuations in production. The Ecoinvent v3.6 database is used for secondary LCI datasets.
Uncertainty of the Information: Uncertainty related to data, models, and assumptions	Uncertainty related to materials in the products and packaging is low. Actual supplier data for upstream operations was not available for suppliers and the study relied upon the use of existing representative datasets. These datasets contained relatively recent data (<10 years) but lacked geographical representativeness. Uncertainty related to the impact assessment methods used in the study are high. The impact assessment method required by the PCR includes impact potentials, which lack characterization of providing and receiving environments or tipping points.

3.7 Period under review

The period of review represents annual production for 2019.

3.8 Allocation

Manufacturing resource use was allocated to the products based on surface area. Impacts from transportation were allocated based on the mass of material and distance transported.

The product system includes recycled materials, which were allocated using the recycled content allocation method (also known as the 100-0 cut-off method). Using the recycled content allocation approach, system inputs with recycled content do not receive any burden from the previous life cycle other than reprocessing of the waste material. At end-of-life, materials which are recycled leave the system boundaries with no additional burden.

3.9 Comparability

The PCR this EPD was based on was not written to support comparative assertions. EPDs based on different PCRs, or different calculation models, may not be comparable. When attempting to compare EPDs or life cycle impacts of products from different companies, the user should be aware of the uncertainty in the final results, due to and not limited to, the practitioner's assumptions, the source of the data used in the study, and the specifics of the product modeled.

4. LCA: Scenarios and Additional Technical Information

Delivery and Installation stage (A4 - A5)

Distribution of the roof cover board products to the point of installation is included in the assessment. Transportation parameters for modeling product distribution are summarized in Table 8. Average distances by transport mode were used to represent distribution to the North American consumer market.

Table 8. *Product distribution parameters, per 1 m^2.*

Transport Parameter	Unit	EVERBOARD™ 1/4" – Paper-faced	EVERBOARD™ 1/2" – Paper-faced	EVERBOARD™ 1/4" – Fiberglass-faced	EVERBOARD™ 1/2" – Fiberglass-faced
Diesel truck – Fuel utilization	L/100 km	18.7	18.7	18.7	18.7
Diesel truck – Capacity utilization	%	76%	76%	76%	76%
Diesel truck – Distance (km)	km	805	805	805	805
Gross mass of products transported (including packaging)	kg	6.35	10.3	6.35	10.3

The impacts associated with the product installation are assumed negligible. The impacts associated with packaging disposal are included with the installation phase as per PCR requirements.

Table 9. *Installation parameters for the EVERBOARD™ roof cover board products, per 1 m^2.*

Parameter		EVERBOARD™ 1/4" – Paper-faced	EVERBOARD™ 1/2" – Paper-faced	EVERBOARD™ 1/4" – Fiberglass-faced	EVERBOARD™ 1/2" – Fiberglass-faced
Ancillary materials (kg)		-	-	-	-
Net freshwater consumption (m^3)		-	-	-	-
Electricity consumption (kWh)		-	-	-	-
Product loss per functional unit (kg)		negligible	negligible	negligible	negligible
Waste materials generated by product installation (kg)		negligible	negligible	negligible	negligible
Output materials resulting from on-site waste processing (kg)		na	na	na	na
Mass of packaging waste (kg)	Corrugated	$3.81x10^{-3}$	$5.09x10^{-3}$	$3.81x10^{-3}$	$5.09x10^{-3}$
	Wood	0.229	0.305	0.229	0.305
	Steel	$1.91x10^{-2}$	$2.54x10^{-2}$	$1.91x10^{-2}$	$2.54x10^{-2}$
Biogenic carbon contained in packaging (kg CO_2)		0.410	0.546	0.410	0.546
Direct emissions to ambient air, soil and water (kg)		-		-	-

Use stage (B1)

There are no direct impacts from the use of the products.

Maintenance stage (B2)

The products require no maintenance once installed and impacts for this life cycle stage are reported as zero.

Repair/Refurbishment stage (B3; B5)

Product repair and refurbishment are not relevant during the lifetime of the product.

Replacement stage (B4)

The materials and energy required for replacement of the product over the 75-year RSL of the assessment are included in this stage.

Building operation stage (B6 – B7)

There is no operational energy or water use associated with the use of the product.

Disposal stage (C1 - C4)

The disposal stage includes removal of the products (C1); transport of the products to waste treatment facilities (C2); waste processing (C3); and associated emissions as the product degrades in a landfill or is burned in an incinerator (C4). For the movable wall system products, no emissions are generated during demolition (C1) while no waste processing (C3) is required for incineration or landfill disposal.

Transportation of waste materials at end-of-life (C2) assumes a 20 mile (~32 km) average distance to disposal, consistent with assumptions used in the US EPA WARM model. The recycling rates used for the product packaging are based on regional statistics regarding municipal solid waste generation and disposal in the United States for 2015, from the US Environmental Protection Agency. The relevant disposal statistics used for the product and packaging are summarized in Table 10 and Table 11. For material not recycled, 80% are assumed landfilled and 20% incinerated.

Table 10. *Recycling rates for packaging materials at end-of-life.*

Material	Product	Packaging
Recycling Rates		
Pulp & Paper	79.0%	78.2%
Plastic	6.6%	n/a
Steel	n/a	5.4%
Wood	n/a	26.1%
Disposal of Non-recyclables		
Incineration	20%	20%
Landfill	80%	80%

Table 11. *End-of-life disposal scenario parameters for the roof cover board products.*

Parameter		EVERBOARD™ - 1/4"; paper facing	EVERBOARD™ - 1/4"; fiberglass facing	EVERBOARD™ - 1/2 "; paper facing	EVERBOARD™ - 1/2"; fiberglass facing
Assumptions for scenario development		EPA 2015 MSW	EPA 2015 MSW	EPA 2015 MSW	EPA 2015 MSW
Collection process					
	Collected with mixed construction waste (kg)	23.8	23.8	38.4	38.4
Recovery		n/a	n/a	n/a	n/a
Disposal	Recycling (kg)	11.7	10.6	18.9	17.7
	Landfill (kg)	9.70	10.6	15.7	16.6
	Incineration (kg)	2.42	2.65	3.91	4.14
Removals of biogenic carbon (kg CO_2 eq)		n/a	n/a	n/a	n/a

5. LCA: Results

Results of the Life Cycle Assessment are presented below. It is noted that LCA results are relative expressions and do not predict impacts on category endpoints, the exceeding of thresholds, safety margins or risks.

Table 12. *Life cycle phases included in the product system boundary.*

Product			Construction Process		Use							End-of-life				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 extraction and processing	Transport to manufacturer	Manufacturing	Transport	Construction - installation	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	Deconstruction demolition	Transport	Waste processing	Disposal	Reuse, recovery and/or recycling potential
X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	MND

X = Included in system boundary | MND = Module not declared

The following impact indicators, specified by the PCR, are reported below:

CML-IA Impact Category	Unit	TRACI 2.1 Impact Category	Unit
Global Warming Potential (GWP)	kg CO_2 eq	Global Warming Potential (GWP)	kg CO_2 eq
Depletion potential of the stratospheric ozone layer (ODP)	kg CFC 11 eq	Ozone Depletion Potential (ODP)	kg CFC 11 eq
Acidification Potential of soil and water (AP)	kg SO_2 eq	Acidification Potential (AP)	kg SO_2 eq
Eutrophication Potential (EP)	kg PO_4^{3-} eq	Eutrophication Potential (EP)	kg N eq
Photochemical Oxidant Creation Potential (POCP)	kg C_2H_4 eq	Smog Formation Potential (SFP)	kg O_3 eq
Abiotic depletion potential (ADP-elements) for non-fossil resources	kg Sb eq	Fossil Fuel Depletion Potential (ADP_{fossil})	MJ Surplus, LHV
Abiotic depletion potential (ADP-fossil fuels) for fossil resources	MJ, LHV	-	-

The following inventory parameters, specified by the PCR, are also reported.

Resources	Unit	Waste and Outflows	Unit
RPR_E: Renewable primary resources used as energy carrier (fuel)	MJ, LHV	HWD: Hazardous waste disposed	kg
RPR_M: Renewable primary resources with energy content used as material	MJ, LHV	NHWD: Non-hazardous waste disposed	kg
$NRPR_E$: Non-renewable primary resources used as an energy carrier (fuel)	MJ, LHV	HLRW: High-level radioactive waste, conditioned, to final repository	kg
$NRPR_M$: Non-renewable primary resources with energy content used as material	MJ, LHV	ILLRW: Intermediate- and low-level radioactive waste, conditioned, to final repository	kg
SM: Secondary materials	MJ, LHV	CRU: Components for re-use	kg
RSF: Renewable secondary fuels	MJ, LHV	MR: Materials for recycling	kg
NRSF: Non-renewable secondary fuels	MJ, LHV	MER: Materials for energy recovery	kg
RE: Recovered energy	MJ, LHV	EE: Recovered energy exported from the product system	MJ, LHV
FW: Use of net freshwater resources	m^3	-	-

Modules B1, B2, B3, B5, B6, and B7 are not associated with any impact and are therefore declared as zero. In addition, module C1 and C3 are likewise not associated with any impact as the products are expected to be manually deconstructed. Additionally, as the products do not contain bio-based materials, biogenic carbon emissions and removals are not declared. Module D is not declared. In the interest of space and table readability, these modules are not included in the results presented below.

Table 13. Life Cycle Impact Assessment (LCIA) results for the ***EVERBOARD™ - 1/4"; paper facing*** products over a 75-yr time horizon. Results reported in MJ are calculated using lower heating values. All values are rounded to three significant digits.

Impact Category	A1	A2	A3	A4	A5	B4	C2	C4
CML-IA								
GWP (kg CO_2 eq)	0.678	2.26	2.92	0.873	$2.59x10^{-2}$	25.4	0.249	2.21
	2.0%	6.5%	8.4%	2.5%	0.08%	73%	0.72%	6.4%
ODP (kg CFC-11 eq)	$3.33x10^{-8}$	$3.97x10^{-7}$	$1.16x10^{-7}$	$1.53x10^{-7}$	$2.33x10^{-9}$	$2.07x10^{-6}$	$4.34x10^{-8}$	$9.17x10^{-9}$
	1.2%	14%	4.1%	5.4%	0.08%	73%	1.5%	0.32%
AP (kg SO_2 eq)	$2.35x10^{-3}$	$8.87x10^{-3}$	$2.08x10^{-2}$	$3.43x10^{-3}$	$6.66x10^{-5}$	0.102	$1.16x10^{-3}$	$4.67x10^{-4}$
	1.7%	6.4%	15%	2.5%	0.05%	73%	0.84%	0.33%
EP (kg $(PO_4)^{3-}$ eq)	$1.19x10^{-3}$	$2.11x10^{-3}$	$6.94x10^{-3}$	$8.14x10^{-4}$	$4.97x10^{-4}$	$6.09x10^{-2}$	$2.51x10^{-4}$	$1.03x10^{-2}$
	1.4%	2.5%	8.4%	0.98%	0.60%	73%	0.30%	12%
POCP (kg C_2H_4 eq)	$2.65x10^{-4}$	$3.08x10^{-4}$	$8.37x10^{-4}$	$1.19x10^{-4}$	$5.11x10^{-6}$	$5.00x10^{-3}$	$3.85x10^{-5}$	$2.45x10^{-4}$
	3.9%	4.5%	12%	1.7%	0.07%	73%	0.56%	3.6%
ADPE (kg Sb eq)	$4.31x10^{-9}$	$2.32x10^{-9}$	$1.69x10^{-8}$	$8.97x10^{-10}$	$7.81x10^{-12}$	$6.77x10^{-8}$	$6.81x10^{-11}$	$1.21x10^{-10}$
	4.7%	2.5%	18%	0.97%	0.01%	73%	0.07%	0.13%
ADPF (MJ eq)	14.2	33.4	29.9	12.9	0.192	261	3.41	0.870
	4.0%	9.4%	8.4%	3.6%	0.05%	73%	0.96%	0.24%
TRACI 2.1								
GWP (kg CO_2 eq)	0.663	2.25	2.89	0.870	$2.45x10^{-2}$	24.9	0.249	2.09
	2.0%	6.6%	8.5%	2.6%	0.07%	73%	0.73%	6.2%
ODP (kg CFC-11 eq)	$4.22x10^{-8}$	$5.27x10^{-7}$	$1.52x10^{-7}$	$2.04x10^{-7}$	$3.10x10^{-9}$	$2.74x10^{-6}$	$5.78x10^{-8}$	$1.18x10^{-8}$
	1.1%	14%	4.1%	5.4%	0.08%	73%	1.5%	0.31%
AP (kg SO_2 eq)	$2.54x10^{-3}$	$1.04x10^{-2}$	$2.04x10^{-2}$	$4.02x10^{-3}$	$8.53x10^{-5}$	0.110	$1.44x10^{-3}$	$1.06x10^{-3}$
	1.7%	6.9%	14%	2.7%	0.06%	73%	0.96%	0.71%
EP (kg N eq)	$2.41x10^{-3}$	$2.64x10^{-3}$	$1.48x10^{-2}$	$1.02x10^{-3}$	$1.35x10^{-3}$	0.138	$1.89x10^{-4}$	$2.79x10^{-2}$
	1.3%	1.4%	7.9%	0.54%	0.72%	73%	0.10%	15%
SFP (kg O_3 eq)	$3.64x10^{-2}$	0.247	0.194	$9.56x10^{-2}$	$2.27x10^{-3}$	1.73	$4.07x10^{-2}$	$1.37x10^{-2}$
	1.5%	10%	8.2%	4.0%	0.10%	73%	1.7%	0.58%
FFD (MJ eq)	1.82	4.48	1.79	1.73	$2.67x10^{-2}$	28.7	0.483	0.109
	4.6%	11%	4.6%	4.4%	0.07%	73%	1.2%	0.28%

Table 14. Resource use and waste flows for the ***EVERBOARD™ - 1/4"; paper facing*** products over a 75-yr time horizon. Results reported in MJ are calculated using lower heating values. All values are rounded to three significant digits.

Parameter	A1	A2	A3	A4	A5	B4	C2	C4
Resources								
RPR_E (MJ)	0.904	0.370	6.53	0.143	$1.47x10^{-3}$	22.0	$1.26x10^{-2}$	$2.88x10^{-2}$
	3.0%	1.2%	22%	0.48%	0.00%	73%	0.04%	0.10%
RPR_M (MJ)	0.00	0.00	4.32	0.00	0.00	11.9	0.00	0.00
	0.00%	0.00%	27%	0.00%	0.00%	73%	0.00%	0.00%
$NRPR_E$ (MJ)	INA	INA	INA	INA	INA	INA	INA	INA
$NRPR_M$ (MJ)	INA	INA	INA	INA	INA	INA	INA	INA
SM (kg)	5.88	0.00	0.00	0.00	0.00	16.2	0.00	0.00
	27%	0.00%	0.00%	0.00%	0.00%	73%	0.00%	0.00%
RSF/NRSF (MJ)	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.
RE (MJ)	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.
FW (m^3)	$4.00x10^{-2}$	$2.42x10^{-2}$	0.158	$9.36x10^{-3}$	$1.28x10^{-4}$	0.650	$1.12x10^{-3}$	$3.87x10^{-3}$
	4.5%	2.7%	18%	1.1%	0.01%	73%	0.13%	0.44%
Wastes								
HWD (kg)	$7.15x10^{-6}$	$8.92x10^{-5}$	$2.22x10^{-5}$	$3.45x10^{-5}$	$4.69x10^{-7}$	$4.52x10^{-4}$	$9.26x10^{-6}$	$1.69x10^{-6}$
	1.2%	14%	3.6%	5.6%	0.08%	73%	1.5%	0.27%
NHWD (kg)	$6.98x10^{-2}$	1.60	0.446	0.617	0.192	14.7	$1.61x10^{-2}$	2.42
	0.35%	7.9%	2.2%	3.1%	0.96%	73%	0.08%	12%
HLRW (kg)	$2.25x10^{-6}$	$1.82x10^{-6}$	$1.74x10^{-5}$	$7.03x10^{-7}$	$7.26x10^{-9}$	$6.14x10^{-5}$	$5.75x10^{-8}$	$1.48x10^{-7}$
	2.7%	2.2%	21%	0.84%	0.01%	73%	0.07%	0.18%
ILLRW (kg)	$1.32x10^{-5}$	$2.20x10^{-4}$	$9.70x10^{-5}$	$8.52x10^{-5}$	$1.29x10^{-6}$	$1.23x10^{-3}$	$2.42x10^{-5}$	$4.26x10^{-6}$
	0.79%	13%	5.8%	5.1%	0.08%	73%	1.4%	0.26%
CRU (kg)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MR (kg)	0.00	0.00	0.00	0.00	$1.37x10^{-2}$	8.59	0.00	3.11
	0.00%	0.00%	0.00%	0.00%	0.12%	73%	0.00%	27%
MER (kg)	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.
EE (MJ)	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.

INA = Indicator not assessed | Neg. = Negligible

Table 15. Life Cycle Impact Assessment (LCIA) results for the ***EVERBOARD™ - 1/4"; fiberglass facing*** products over a 75-yr time horizon. Results reported in MJ are calculated using lower heating values. All values are rounded to three significant digits.

Impact Category	A1	A2	A3	A4	A5	B4	C2	C4
CML-IA								
GWP (kg CO_2 eq)	0.913	2.21	2.92	0.873	$2.59x10^{-2}$	26.3	0.249	2.36
	2.5%	6.2%	8.2%	2.4%	0.07%	73%	0.70%	6.6%
ODP (kg CFC-11 eq)	$4.28x10^{-8}$	$3.88x10^{-7}$	$1.16x10^{-7}$	$1.53x10^{-7}$	$2.33x10^{-9}$	$2.08x10^{-6}$	$4.34x10^{-8}$	$1.01x10^{-8}$
	1.5%	14%	4.1%	5.4%	0.08%	73%	1.5%	0.36%
AP (kg SO_2 eq)	$3.89x10^{-3}$	$8.69x10^{-3}$	$2.08x10^{-2}$	$3.43x10^{-3}$	$6.66x10^{-5}$	0.106	$1.16x10^{-3}$	$5.14x10^{-4}$
	2.7%	6.0%	14%	2.4%	0.05%	73%	0.81%	0.36%
EP (kg $(PO_4)^{3-}$ eq)	$1.38x10^{-3}$	$2.06x10^{-3}$	$6.94x10^{-3}$	$8.14x10^{-4}$	$4.97x10^{-4}$	$6.25x10^{-2}$	$2.51x10^{-4}$	$1.08x10^{-2}$
	1.6%	2.4%	8.1%	0.96%	0.58%	73%	0.29%	13%
POCP (kg C_2H_4 eq)	$3.77x10^{-4}$	$3.02x10^{-4}$	$8.37x10^{-4}$	$1.19x10^{-4}$	$5.11x10^{-6}$	$5.38x10^{-3}$	$3.85x10^{-5}$	$2.76x10^{-4}$
	5.1%	4.1%	11%	1.6%	0.07%	73%	0.53%	3.8%
ADPE (kg Sb eq)	$9.63x10^{-8}$	$2.27x10^{-9}$	$1.69x10^{-8}$	$8.97x10^{-10}$	$7.81x10^{-12}$	$3.20x10^{-7}$	$6.81x10^{-11}$	$1.40x10^{-10}$
	22%	0.52%	3.9%	0.21%	0.00%	73%	0.02%	0.03%
ADPF (MJ eq)	18.0	32.7	29.9	12.9	0.192	270	3.41	0.969
	4.9%	8.9%	8.1%	3.5%	0.05%	73%	0.93%	0.26%
TRACI 2.1								
GWP (kg CO_2 eq)	0.894	2.21	2.89	0.870	$2.45x10^{-2}$	25.7	0.249	2.22
	2.5%	6.3%	8.2%	2.5%	0.07%	73%	0.71%	6.3%
ODP (kg CFC-11 eq)	$5.39x10^{-8}$	$5.16x10^{-7}$	$1.52x10^{-7}$	$2.04x10^{-7}$	$3.10x10^{-9}$	$2.75x10^{-6}$	$5.78x10^{-8}$	$1.29x10^{-8}$
	1.4%	14%	4.1%	5.4%	0.08%	73%	1.5%	0.35%
AP (kg SO_2 eq)	$4.09x10^{-3}$	$1.02x10^{-2}$	$2.04x10^{-2}$	$4.02x10^{-3}$	$8.53x10^{-5}$	0.114	$1.44x10^{-3}$	$1.15x10^{-3}$
	2.6%	6.6%	13%	2.6%	0.05%	73%	0.93%	0.74%
EP (kg N eq)	$2.74x10^{-3}$	$2.58x10^{-3}$	$1.48x10^{-2}$	$1.02x10^{-3}$	$1.35x10^{-3}$	0.142	$1.89x10^{-4}$	$2.91x10^{-2}$
	1.4%	1.3%	7.6%	0.53%	0.70%	73%	0.10%	15%
SFP (kg O_3 eq)	$5.38x10^{-2}$	0.242	0.194	$9.56x10^{-2}$	$2.27x10^{-3}$	1.77	$4.07x10^{-2}$	$1.48x10^{-2}$
	2.2%	10%	8.1%	4.0%	0.09%	73%	1.7%	0.61%
FFD (MJ eq)	2.22	4.39	1.79	1.73	$2.67x10^{-2}$	29.6	0.483	0.120
	5.5%	11%	4.4%	4.3%	0.07%	73%	1.2%	0.30%

Table 16. Resource use and waste flows for the ***EVERBOARD™ - 1/4"; fiberglass facing*** products over a 75-yr time horizon. Results reported in MJ are calculated using lower heating values. All values are rounded to three significant digits.

Parameter	A1	A2	A3	A4	A5	B4	C2	C4
Resources								
RPR_E (MJ)	0.908	0.362	6.53	0.143	$1.47x10^{-3}$	22.0	$1.26x10^{-2}$	$3.34x10^{-2}$
	3.0%	1.2%	22%	0.48%	0.00%	73%	0.04%	0.11%
RPR_M (MJ)	0.00	0.00	4.32	0.00	0.00	11.9	0.00	0.00
	0.00%	0.00%	27%	0.00%	0.00%	73%	0.00%	0.00%
$NRPR_E$ (MJ)	INA	INA	INA	INA	INA	INA	INA	INA
$NRPR_M$ (MJ)	INA	INA	INA	INA	INA	INA	INA	INA
SM (kg)	5.42	0.00	0.00	0.00	0.00	14.9	0.00	0.00
	27%	0.00%	0.00%	0.00%	0.00%	73%	0.00%	0.00%
RSF/NRSF (MJ)	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.
RE (MJ)	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.
FW (m^3)	$5.65x10^{-2}$	$2.37x10^{-2}$	0.158	$9.36x10^{-3}$	$1.28x10^{-4}$	0.695	$1.12x10^{-3}$	$4.17x10^{-3}$
	6.0%	2.5%	17%	0.99%	0.01%	73%	0.12%	0.44%
Wastes								
HWD (kg)	$9.43x10^{-6}$	$8.73x10^{-5}$	$2.22x10^{-5}$	$3.45x10^{-5}$	$4.69x10^{-7}$	$4.55x10^{-4}$	$9.26x10^{-6}$	$2.14x10^{-6}$
	1.5%	14%	3.6%	5.6%	0.08%	73%	1.5%	0.34%
NHWD (kg)	0.123	1.56	0.446	0.617	0.192	15.5	$1.61x10^{-2}$	2.67
	0.58%	7.4%	2.1%	2.9%	0.91%	73%	0.08%	13%
HLRW (kg)	$3.09x10^{-6}$	$1.78x10^{-6}$	$1.74x10^{-5}$	$7.03x10^{-7}$	$7.26x10^{-9}$	$6.37x10^{-5}$	$5.75x10^{-8}$	$1.73x10^{-7}$
	3.6%	2.1%	20%	0.81%	0.01%	73%	0.07%	0.20%
ILLRW (kg)	$1.85x10^{-5}$	$2.16x10^{-4}$	$9.70x10^{-5}$	$8.52x10^{-5}$	$1.29x10^{-6}$	$1.23x10^{-3}$	$2.42x10^{-5}$	$4.75x10^{-6}$
	1.1%	13%	5.8%	5.1%	0.08%	73%	1.4%	0.28%
CRU (kg)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MR (kg)	0.00	0.00	0.00	0.00	$1.37x10^{-2}$	7.74	0.00	2.80
	0.00%	0.00%	0.00%	0.00%	0.13%	73%	0.00%	27%
MER (kg)	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.
EE (MJ)	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.

INA = Indicator not assessed | Neg. = Negligible

Table 17. Life Cycle Impact Assessment (LCIA) results for the ***EVERBOARD™ - 1/2"; paper facing*** products over a 75-yr time horizon. Results reported in MJ are calculated using lower heating values. All values are rounded to three significant digits.

Impact Category	A1	A2	A3	A4	A5	B4	C2	C4
CML-IA								
GWP (kg CO_2 eq)	0.678	3.71	2.96	1.41	$3.46x10^{-2}$	35.2	0.405	3.60
	1.4%	7.7%	6.2%	2.9%	0.07%	73%	0.84%	7.5%
ODP (kg CFC-11 eq)	$3.33x10^{-8}$	$6.51x10^{-7}$	$1.20x10^{-7}$	$2.47x10^{-7}$	$3.11x10^{-9}$	$3.14x10^{-6}$	$7.05x10^{-8}$	$1.51x10^{-8}$
	0.78%	15%	2.8%	5.8%	0.07%	73%	1.6%	0.35%
AP (kg SO_2 eq)	$2.35x10^{-3}$	$1.46x10^{-2}$	$2.10x10^{-2}$	$5.53x10^{-3}$	$8.88x10^{-5}$	0.127	$1.89x10^{-3}$	$7.64x10^{-4}$
	1.4%	8.4%	12%	3.2%	0.05%	73%	1.1%	0.44%
EP (kg $(PO_4)^{3-}$ eq)	$1.19x10^{-3}$	$3.46x10^{-3}$	$7.02x10^{-3}$	$1.31x10^{-3}$	$6.62x10^{-4}$	$8.52x10^{-2}$	$4.08x10^{-4}$	$1.69x10^{-2}$
	1.0%	3.0%	6.0%	1.1%	0.57%	73%	0.35%	15%
POCP (kg C_2H_4 eq)	$2.65x10^{-4}$	$5.06x10^{-4}$	$8.57x10^{-4}$	$1.92x10^{-4}$	$6.81x10^{-6}$	$6.29x10^{-3}$	$6.26x10^{-5}$	$3.96x10^{-4}$
	3.1%	5.9%	10.0%	2.2%	0.08%	73%	0.73%	4.6%
ADPE (kg Sb eq)	$4.31x10^{-9}$	$3.81x10^{-9}$	$1.70x10^{-8}$	$1.45x10^{-9}$	$1.04x10^{-11}$	$7.40x10^{-8}$	$1.11x10^{-10}$	$1.98x10^{-10}$
	4.3%	3.8%	17%	1.4%	0.01%	73%	0.11%	0.20%
ADPF (MJ eq)	14.2	54.8	30.5	20.8	0.257	351	5.53	1.43
	3.0%	11%	6.4%	4.4%	0.05%	73%	1.2%	0.30%
TRACI 2.1								
GWP (kg CO_2 eq)	0.663	3.70	2.93	1.40	$3.27x10^{-2}$	34.5	0.404	3.40
	1.4%	7.9%	6.2%	3.0%	0.07%	73%	0.86%	7.2%
ODP (kg CFC-11 eq)	$4.22x10^{-8}$	$8.66x10^{-7}$	$1.57x10^{-7}$	$3.29x10^{-7}$	$4.14x10^{-9}$	$4.16x10^{-6}$	$9.39x10^{-8}$	$1.93x10^{-8}$
	0.74%	15%	2.8%	5.8%	0.07%	73%	1.7%	0.34%
AP (kg SO_2 eq)	$2.54x10^{-3}$	$1.71x10^{-2}$	$2.06x10^{-2}$	$6.48x10^{-3}$	$1.14x10^{-4}$	0.140	$2.34x10^{-3}$	$1.75x10^{-3}$
	1.3%	8.9%	11%	3.4%	0.06%	73%	1.2%	0.92%
EP (kg N eq)	$2.41x10^{-3}$	$4.33x10^{-3}$	$1.50x10^{-2}$	$1.64x10^{-3}$	$1.80x10^{-3}$	0.196	$3.07x10^{-4}$	$4.57x10^{-2}$
	0.90%	1.6%	5.6%	0.62%	0.68%	73%	0.12%	17%
SFP (kg O_3 eq)	$3.64x10^{-2}$	0.406	0.198	0.154	$3.03x10^{-3}$	2.44	$6.61x10^{-2}$	$2.24x10^{-2}$
	1.1%	12%	6.0%	4.6%	0.09%	73%	2.0%	0.67%
FFD (MJ eq)	1.82	7.36	1.85	2.80	$3.57x10^{-2}$	40.8	0.784	0.178
	3.3%	13%	3.3%	5.0%	0.06%	73%	1.4%	0.32%

Table 18. Resource use and waste flows for the ***EVERBOARD™ - 1/2"; paper facing*** products over a 75-yr time horizon. Results reported in MJ are calculated using lower heating values. All values are rounded to three significant digits.

Parameter	A1	A2	A3	A4	A5	B4	C2	C4
Resources								
RPR_E (MJ)	0.904	0.608	7.02	0.231	$1.96x10^{-3}$	24.3	$2.04x10^{-2}$	$4.72x10^{-2}$
	2.7%	1.8%	21%	0.70%	0.01%	73%	0.06%	0.14%
RPR_M (MJ)	0.00	0.00	5.76	0.00	0.00	15.8	0.00	0.00
	0.00%	0.00%	27%	0.00%	0.00%	73%	0.00%	0.00%
$NRPR_E$ (MJ)	INA	INA	INA	INA	INA	INA	INA	INA
$NRPR_M$ (MJ)	INA	INA	INA	INA	INA	INA	INA	INA
SM (kg)	9.70	0.00	0.00	0.00	0.00	26.7	0.00	0.00
	27%	0.00%	0.00%	0.00%	0.00%	73%	0.00%	0.00%
RSF/NRSF (MJ)	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.
RE (MJ)	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.
FW (m^3)	$4.00x10^{-2}$	$3.98x10^{-2}$	0.160	$1.51x10^{-2}$	$1.70x10^{-4}$	0.723	$1.82x10^{-3}$	$6.40x10^{-3}$
	4.1%	4.0%	16%	1.5%	0.02%	73%	0.18%	0.65%
Wastes								
HWD (kg)	$7.15x10^{-6}$	$1.46x10^{-4}$	$2.43x10^{-5}$	$5.56x10^{-5}$	$6.25x10^{-7}$	$6.93x10^{-4}$	$1.51x10^{-5}$	$2.74x10^{-6}$
	0.76%	16%	2.6%	5.9%	0.07%	73%	1.6%	0.29%
NHWD (kg)	$6.98x10^{-2}$	2.62	0.460	0.996	0.256	23.1	$2.62x10^{-2}$	3.97
	0.22%	8.3%	1.5%	3.2%	0.81%	73%	0.08%	13%
HLRW (kg)	$2.25x10^{-6}$	$2.99x10^{-6}$	$1.75x10^{-5}$	$1.13x10^{-6}$	$9.69x10^{-9}$	$6.66x10^{-5}$	$9.34x10^{-8}$	$2.41x10^{-7}$
	2.5%	3.3%	19%	1.2%	0.01%	73%	0.10%	0.27%
ILLRW (kg)	$1.32x10^{-5}$	$3.62x10^{-4}$	$9.89x10^{-5}$	$1.37x10^{-4}$	$1.72x10^{-6}$	$1.81x10^{-3}$	$3.94x10^{-5}$	$6.99x10^{-6}$
	0.53%	15%	4.0%	5.6%	0.07%	73%	1.6%	0.28%
CRU (kg)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MR (kg)	0.00	0.00	0.00	0.00	$1.83x10^{-2}$	13.8	0.00	5.02
	0.00%	0.00%	0.00%	0.00%	0.10%	73%	0.00%	27%
MER (kg)	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.
EE (MJ)	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.

INA = Indicator not assessed | Neg. = Negligible

Table 19. Life Cycle Impact Assessment (LCIA) results for the ***EVERBOARD™ - 1/2"; fiberglass facing*** products over a 75-yr time horizon. Results reported in MJ are calculated using lower heating values. All values are rounded to three significant digits.

Impact Category	A1	A2	A3	A4	A5	B4	C2	C4
CML-IA								
GWP (kg CO_2 eq)	0.913	3.66	2.96	1.41	$3.46x10^{-2}$	36.1	0.405	3.74
	1.9%	7.4%	6.0%	2.9%	0.07%	73%	0.82%	7.6%
ODP (kg CFC-11 eq)	$4.28x10^{-8}$	$6.43x10^{-7}$	$1.20x10^{-7}$	$2.47x10^{-7}$	$3.11x10^{-9}$	$3.14x10^{-6}$	$7.05x10^{-8}$	$1.60x10^{-8}$
	1.00%	15%	2.8%	5.8%	0.07%	73%	1.6%	0.37%
AP (kg SO_2 eq)	$3.89x10^{-3}$	$1.44x10^{-2}$	$2.10x10^{-2}$	$5.53x10^{-3}$	$8.88x10^{-5}$	0.131	$1.89x10^{-3}$	$8.12x10^{-4}$
	2.2%	8.1%	12%	3.1%	0.05%	73%	1.1%	0.45%
EP (kg $(PO_4)^{3-}$ eq)	$1.38x10^{-3}$	$3.42x10^{-3}$	$7.02x10^{-3}$	$1.31x10^{-3}$	$6.62x10^{-4}$	$8.68x10^{-2}$	$4.08x10^{-4}$	$1.74x10^{-2}$
	1.2%	2.9%	5.9%	1.1%	0.56%	73%	0.34%	15%
POCP (kg C_2H_4 eq)	$3.77x10^{-4}$	$5.00x10^{-4}$	$8.57x10^{-4}$	$1.92x10^{-4}$	$6.81x10^{-6}$	$6.66x10^{-3}$	$6.26x10^{-5}$	$4.27x10^{-4}$
	4.2%	5.5%	9.4%	2.1%	0.08%	73%	0.69%	4.7%
ADPE (kg Sb eq)	$9.63x10^{-8}$	$3.76x10^{-9}$	$1.70x10^{-8}$	$1.45x10^{-9}$	$1.04x10^{-11}$	$3.27x10^{-7}$	$1.11x10^{-10}$	$2.18x10^{-10}$
	22%	0.84%	3.8%	0.32%	0.00%	73%	0.02%	0.05%
ADPF (MJ eq)	18.0	54.1	30.5	20.8	0.257	359	5.53	1.53
	3.7%	11%	6.2%	4.2%	0.05%	73%	1.1%	0.31%
TRACI 2.1								
GWP (kg CO_2 eq)	0.894	3.65	2.93	1.40	$3.27x10^{-2}$	35.3	0.404	3.53
	1.9%	7.6%	6.1%	2.9%	0.07%	73%	0.84%	7.3%
ODP (kg CFC-11 eq)	$5.39x10^{-8}$	$8.55x10^{-7}$	$1.57x10^{-7}$	$3.29x10^{-7}$	$4.14x10^{-9}$	$4.16x10^{-6}$	$9.39x10^{-8}$	$2.05x10^{-8}$
	0.95%	15%	2.8%	5.8%	0.07%	73%	1.7%	0.36%
AP (kg SO_2 eq)	$4.09x10^{-3}$	$1.69x10^{-2}$	$2.06x10^{-2}$	$6.48x10^{-3}$	$1.14x10^{-4}$	0.144	$2.34x10^{-3}$	$1.83x10^{-3}$
	2.1%	8.6%	11%	3.3%	0.06%	73%	1.2%	0.93%
EP (kg N eq)	$2.74x10^{-3}$	$4.28x10^{-3}$	$1.50x10^{-2}$	$1.64x10^{-3}$	$1.80x10^{-3}$	0.200	$3.07x10^{-4}$	$4.68x10^{-2}$
	1.0%	1.6%	5.5%	0.60%	0.66%	73%	0.11%	17%
SFP (kg O_3 eq)	$5.38x10^{-2}$	0.401	0.198	0.154	$3.03x10^{-3}$	2.48	$6.61x10^{-2}$	$2.35x10^{-2}$
	1.6%	12%	5.9%	4.6%	0.09%	73%	2.0%	0.70%
FFD (MJ eq)	2.22	7.27	1.85	2.80	$3.57x10^{-2}$	41.7	0.784	0.190
	3.9%	13%	3.3%	4.9%	0.06%	73%	1.4%	0.33%

Table 20. Resource use and waste flows for the ***EVERBOARD™ - 1/2"; fiberglass facing*** products over a 75-yr time horizon. Results reported in MJ are calculated using lower heating values. All values are rounded to three significant digits.

Parameter	A1	A2	A3	A4	A5	B4	C2	C4
Resources								
RPR_E (MJ)	0.908	0.600	7.02	0.231	$1.96x10^{-3}$	24.3	$2.04x10^{-2}$	$5.18x10^{-2}$
	2.7%	1.8%	21%	0.70%	0.01%	73%	0.06%	0.16%
RPR_M (MJ)	0.00	0.00	5.76	0.00	0.00	15.8	0.00	0.00
	0.00%	0.00%	27%	0.00%	0.00%	73%	0.00%	0.00%
$NRPR_E$ (MJ)	INA	INA	INA	INA	INA	INA	INA	INA
$NRPR_M$ (MJ)	INA	INA	INA	INA	INA	INA	INA	INA
SM (kg)	9.24	0.00	0.00	0.00	0.00	25.4	0.00	0.00
	27%	0.00%	0.00%	0.00%	0.00%	73%	0.00%	0.00%
RSF/NRSF (MJ)	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.
RE (MJ)	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.
FW (m^3)	$5.65x10^{-2}$	$3.93x10^{-2}$	0.160	$1.51x10^{-2}$	$1.70x10^{-4}$	0.768	$1.82x10^{-3}$	$6.70x10^{-3}$
	5.4%	3.8%	15%	1.4%	0.02%	73%	0.17%	0.64%
Wastes								
HWD (kg)	$9.43x10^{-6}$	$1.45x10^{-4}$	$2.43x10^{-5}$	$5.56x10^{-5}$	$6.25x10^{-7}$	$6.95x10^{-4}$	$1.51x10^{-5}$	$3.19x10^{-6}$
	0.99%	15%	2.6%	5.9%	0.07%	73%	1.6%	0.34%
NHWD (kg)	0.123	2.59	0.460	0.996	0.256	23.8	$2.62x10^{-2}$	4.22
	0.38%	8.0%	1.4%	3.1%	0.79%	73%	0.08%	13%
HLRW (kg)	$3.09x10^{-6}$	$2.95x10^{-6}$	$1.75x10^{-5}$	$1.13x10^{-6}$	$9.69x10^{-9}$	$6.89x10^{-5}$	$9.34x10^{-8}$	$2.67x10^{-7}$
	3.3%	3.1%	19%	1.2%	0.01%	73%	0.10%	0.28%
ILLRW (kg)	$1.85x10^{-5}$	$3.58x10^{-4}$	$9.89x10^{-5}$	$1.37x10^{-4}$	$1.72x10^{-6}$	$1.82x10^{-3}$	$3.94x10^{-5}$	$7.47x10^{-6}$
	0.75%	14%	4.0%	5.5%	0.07%	73%	1.6%	0.30%
CRU (kg)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MR (kg)	0.00	0.00	0.00	0.00	$1.83x10^{-2}$	13.0	0.00	4.71
	0.00%	0.00%	0.00%	0.00%	0.10%	73%	0.00%	27%
MER (kg)	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.
EE (MJ)	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.

INA = Indicator not assessed | Neg. = Negligible

6. LCA: Interpretation

The interpretation phase conforms to ISO 14044 with further guidance from the ILCD General Guide for Life Cycle Assessment. The interpretation included the use of evaluation and sensitivity checks to steer the iterative process during the assessment, and a final evaluation including completeness, sensitivity, and consistency checks, at the end of the study.

The product replacement phase (*B4*) accounts for approximately 73% of the total impacts over the 75-yr ESL of the assessment, for all impact indicators. Excluding the product replacements, the contributions to the indicator results are primarily from the upstream transport (*A2*) followed by the product manufacturing phase (*A3*). In general, product distribution (*A4*) and product disposal (*C4*) are the next highest contributors to overall impacts for the product systems. A notable exception are the results for the Eutrophication Potential which is dominated by the product disposal phase for all cases.

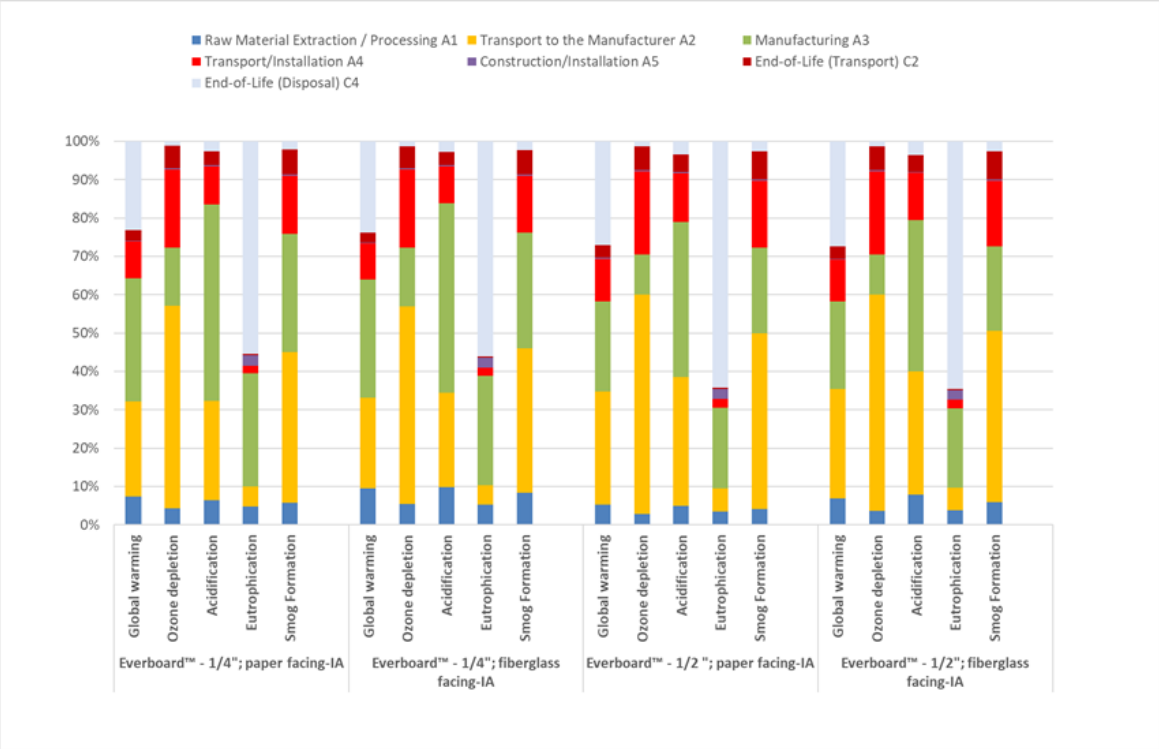


Figure 2. *Contribution analysis for the EVERBOARD™ roof cover board products. – TRACI v2.1 (excluding product replacements).*

7. Additional Environmental Information

Continuus Materials' manufacturing facilities comply with all local, state and national environmental protection requirements.

8. References

1. Life Cycle Assessment of EVERBOARD™ Roof Cover Boards. SCS Global Services Report. Prepared for Continuus Materials. October 2020.
2. ISO 14025:2006 Environmental labels and declarations – Type III environmental declarations – Principles and Procedures.
3. ISO 14040: 2006 Environmental Management – Life cycle assessment – Principles and Framework
4. ISO 14044: 2006 Environmental Management – Life cycle assessment – Requirements and Guidelines.
5. ISO 21930: 2017 Sustainability in buildings and civil engineering works — Core rules for environmental product declarations of construction products and services.
6. SCS Type III Environmental Declaration Program: Program Operator Manual. V10.0 April 2019. SCS Global Services.
7. Tool for the Reduction and Assessment of Chemical and Other Environmental Impacts (TRACI). Dr. Bare, J., http://www.epa.gov/nrmrl/std/traci/traci.html
8. CML-IA Characterization Factors. Leiden University, Institute of Environmental Sciences. April 2013. http://cml.leiden.edu/software/data-cmlia.html
9. Ecoinvent Centre (2019) ecoinvent data from v3.6. Swiss Center for Life Cycle Inventories, Dübendorf, 2019, http://www.ecoinvent.org
10. European Joint Research Commission. International Reference Life Cycle Data System handbook. *General guide for Life Cycle Assessment – Detailed Guidance.* © European Union, 2010.

For more information, contact:

Continuus Materials
8000 Research Forest Drive, Suite 115
The Woodlands, TX 77382 United States
+1 (415) 385 3399 | www.continuusmaterials.com

SCS Global Services
2000 Powell Street, Ste. 600, Emeryville, CA 94608 USA
Main +1.510.452.8000 | fax +1.510.452.8001