J•JOSEPHSON

VERIFIED by SCS Global Services
ENVIRONMENTAL PRODUCT DECLARATION
BASED ON LCA

Declaration Owner
J. Josephson, Inc.
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South Hackensack, NJ 07606
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Products
P3Tec Advanced Wall Protection

Functional Unit
1 m² of installed product with a building Estimated Service Life (ESL) of 75-years

EPD Number and Period of Validity
SCS-EPD-09379
EPD Valid September 6, 2023 through September 5, 2028

Product Category Rule
PCR Guidance for Building-Related Products and Services Part A: Life Cycle Assessment Calculation Rules and Report Requirements. Version 3.2. Sept. 2018

PCR Guidance for Building-Related Products and Services Part B: Wall and Door Protection EPD Requirements. Version 1.0. May 2019.

Program Operator
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SCSglobal SERVICES

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Address:	35 Horizon Boulevard, South Hackensack, NJ 07606
Declaration Number:	SCS-EPD-09379
Declaration Validity Period:	EPD Valid September 6, 2023 through September 5, 2028
Product:	P3Tec Advanced Wall Protection
Program Operator:	SCS Global Services
Declaration URL Link:	https://www.scsglobalservices.com/certified-green-products-guide
LCA Practitioner:	Beth Cassese, LCACP, SCS Global Services
LCA Software:	OpenLCA 1.11, ecoinvent v3.9
Independent critical review of the LCA and data, according to ISO 14044 and ISO 14071	☒ internal ☐ external
LCA Reviewer:	Ilan MacAdam-Somer, SCS Global Services
Part A Product Category Rule:	PCR Guidance for Building-Related Products and Services Part A: Life Cycle Assessment Calculation Rules and Report Requirements. Version 3.2. UL Environment. Sept. 2018
PCR Review conducted by:	Lindita Bushi, PhD (Chair); Hugues Imbeault-Tétreault, ing., M.Sc.A.; Jack Geibig
Part B Product Category Rule:	PCR Guidance for Building-Related Products and Services Part B: Wall and Door Protection EPD Requirements. Version 1.0. May 2019
Part B PCR Review conducted by:	Lindita Bushi, Athena Sustainable Materials Institute; Lise Lauren, EarthShift Global; Jim Mellentine, Ramboll Environment
Independent verification of the declaration and data, according to ISO 14025 and the PCR	☐ internal ☒ external
EPD Verifier:	Thomas Gloria, Ph.D., Industrial Ecology Consultants
Declaration Contents:	

Disclaimers: *This EPD conforms to ISO 14025, 14040, 14044, and 21930. This EPD is not conformant to the latest version of EN 15804.*

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 J. Josephson

J. Josephson is the largest commercial wallcovering manufacturer in North America, selling to over 50 countries world-wide. J. Josephson's state-of-the-art manufacturing facility is located in South Hackensack, New Jersey, only about 10 miles west of New York City. Running twenty-four hours a day, with an emphasis on innovation and world-class design, J. Josephson stays focused on the customer and provides the highest quality product in the shortest lead times. With the largest portfolio of print and emboss rollers, there are no limits in terms of color and design that can be created. Constantly investing in the future, J. Josephson supports 5 distinct brands: Bolta, Genon, Symphony, Tower, and Vycon that are distributed to all market segments globally.

J. Josephson's environmental responsibility and compliance have earned the highest ratings in the industry for its sustainability practices and independent certification for reductions in water and energy use.

2. Product

2.1 Product Description

J. Josephson's P3TEC Advanced Wall Protection is manufactured at the South Hackensack, New Jersey facility. The primary materials include polyvinyl chloride, polyester/cotton blend woven backing, adhesives and pigments. P3TEC includes a rigid vinyl laminate and a polyvinyl fluoride cap film.

P3Tec Advance Wall Protection is a rigid vinyl wall covering with a polyester/cotton blend backing, adhesives, pigments, and a polyvinyl fluoride film. P3Tec is engineered to withstand an impact force much greater than other wallcovering and wall protection products while retaining advantages of physical flexibility. P3Tec also resists surface damage from harsh chemicals and staining agents and protects against surface abrasion damage.

J. Josephson P3Tec products belong to the Thermal Protection specification code, CSI code 09 72 16.16 (Rigid Sheet Vinyl Wall Covering) and the UNSPSC code 72151400 (Wall Covering).

2.2 Application

J. Josephson's P3TEC Advanced Wall Protection is designed for used in commercial interiors.

2.3 Methodological Framework

This EPD is a cradle-to-grave EPD, including the life cycle stages for raw material extraction and processing, raw material transport, manufacture including packaging, final product distribution, product installation, use, and end-of-life product disposal.

Resource use at the production facility is allocated to the product based on product area as a fraction of facility production. All processes contributing to greater than 1% of the total environmental impact indicator for each impact is included in the inventory. All known materials and processes were included in the life cycle inventory.

2.4 Technical Data

Technical specifications and product performance testing results for the products are summarized in Table 1. Detailed product characteristics can be found at the manufacturer's website (www.P3TEC.com).

Table 1. *Technical specification for P3TEC Advanced Wall Protection.*

Property	Test Method	Result
Standard Width		48 in
		122 cm
Standard Length		15 yd
		13.7 m
Fire Performance	ASTM E84	Flame Spread 10
		Smoke Developed Index 120
Chemical and Stain Resistance	ASTM D-543	Pass
Bacterial Resistance	ASTM G-21	Zero Growth
Fungal Resistance	ASTM G-21	Zero Growth
Taber Abrasion Resistance	ASTM D0460	0.0173%
Emission Standard	CARB Emission Standards Section 93120.2(a)	Compliant for Formaldehyde
Impact Strength	ASTM F476-84	24 to 100 inch-pounds
Taber Abrasion	ASTM D 4060-07	0.0173%
VOC Emissions	CDPH 01350	$\leq$ 0.5 mg/m^3
Specific Gravity	ASTM D792	1.4
Tensile Strength	ASTM D638	MD: 200 lbs. CD: 189 lbs.

2.5 Properties of Declared Product as Delivered

Product dimensions are 48 inches (1.22 meters) wide in 15-yard (13.7 meter) rolls. The product has a nominal thickness of 0.038 inches (0.097 cm).

2.6 Material Composition

The primary materials include a polyvinyl chloride, polyester/cotton blend woven backing, adhesives and pigments. P3TEC also includes a rigid vinyl laminate and a polyvinyl fluoride cap film. Note that the assumed installation scrap rate is 4.1%, requiring 1.04 m2 of final product to meet the 1 m2 installed functional unit.

Table 2. *Material component summary for P3TEC Advanced Wall Protection per m^2 installed.*

Material	kg/m^2	Percent
Polyvinylchloride	0.382	43.9%
Rigid vinyl	0.379	43.6%
Polyester/Cotton backing	0.045	5.2%
Plastisol	0.029	3.4%
Polyvinyl fluoride film	0.018	2.0%
Ink	0.017	2.0%
Total:	**0.869**	**100%**

2.8 Manufacturing

P3TEC Advanced Wall Protection is manufactured in a multi-stage printing and laminating process. Inks are blended for each pattern and applied to the PVC substrate in a printing machine. The fabric backing is laminated to the PVC substrate, and cap film, and an embossing is applied for finish. The product is then cut to size, packaged and shipped.

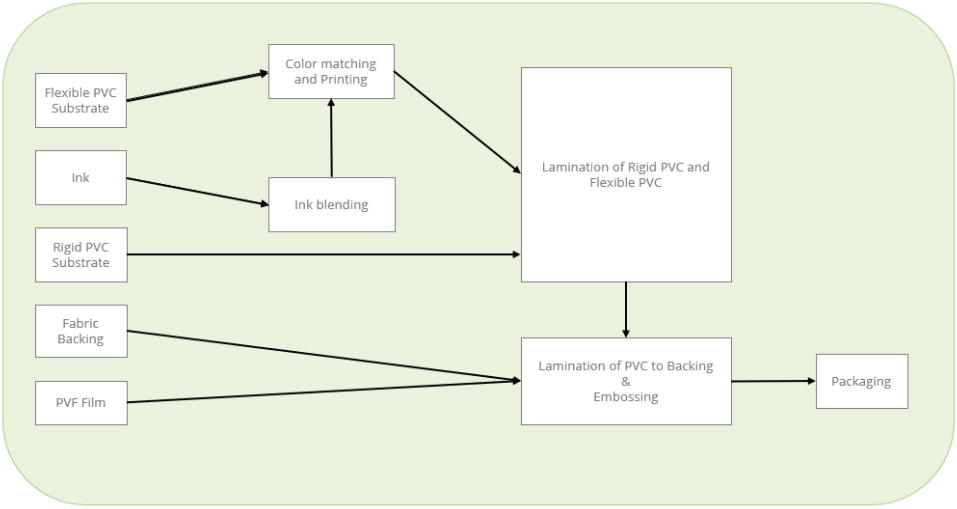

Figure 1. *Manufacturing diagram for P3TEC Advanced Wall Protection.*

2.9 Packaging

The P3TEC Advanced Wall Protection products are packaged for shipment using plastic endcaps on the rolls and cardboard boxes.

Table 3. *Material content of packaging for P3TEC Advanced Wall Protection per m^2 installed.*

Material	kg/m^2	Percent
Plastic	0.025	17%
Cardboard	0.126	83%
Total Packaging:	**0.151**	**100%**

2.10 Transportation

Transportation distance and mode from the manufacturing facility to distribution and installation was included in the study. According to the manufacturer, 85% of the product is distributed domestically and 15% is distributed internationally. For the domestic product distribution, the average transportation distance to point of sale is estimated to represent the worst-case scenario of transport across the contiguous US. International product distribution is estimated as the average shipping distance from the New York port to China, India, Belgium, and Italy.

2.10 Product Installation

Installation of the product involves preparation of the surface with a primer, followed by application of an adhesive. The product installation also includes the disposal of an estimated 4.1% of product scrap and disposal of the packaging waste. Waste treatment is modelled using the product and packaging waste disposal scenario for the U.S. as required by the Part A PCR. Transportation of the installation waste is assumed to be 50 km by truck.

2.11 Use

P3TEC Advanced Wall Protection requires regular maintenance in the form of cleaning and will require replacement during the building Estimated Service Life. Other use phase modules for repair, refurbishment, operational energy use, and operation water use are assumed to have zero impacts.

2.12 Reference Service Life and Estimated Building Service Life

The Reference Service Life (RSL) of the P3TEC Advanced Wall Protection is 5 years, based on the manufacturer's warranty. As required by the PCR, the building Estimated Service Life (ESL) is assumed to be 75 years.

2.13 Re-Use Phase

P3TEC Advanced Wall Protection is not typically reused or recycled at end-of-life.

2.14 Disposal

At end-of-life, P3TEC Advanced Wall Protection may be disposed of in accordance with local regulation. For purposes of this study, the end-of-life disposal for the U.S. was used as described in the Part A PCR.

3. LCA: Calculation Rules

3.1 Functional Unit

The P3TEC Advanced Wall Protection products provide the primary function of wallcovering and protection from stain, abrasion, and impact. According to ISO 14044, the functional unit is "the quantified performance of a product system, for use as a reference unit." According to the PCR, the functional unit applicable to the P3TEC products, is 1 m^2 of installed product maintained for an ESL of 75 years.

Table 4. *Functional unit and reference flows for P3TEC Advanced Wall Protection.*

Functional Unit	Thickness to Achieve Functional Unit (cm)	Mass (kg)	Conversion Factor
1 m² of installed product	0.97	0.869	1.15

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, use, and product disposal. The life cycle phases included in the EPD scope are described in Table 6 and illustrated in Figure 3.

Table 5. *System boundary for P3TEC Advanced Wall Protection.*

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

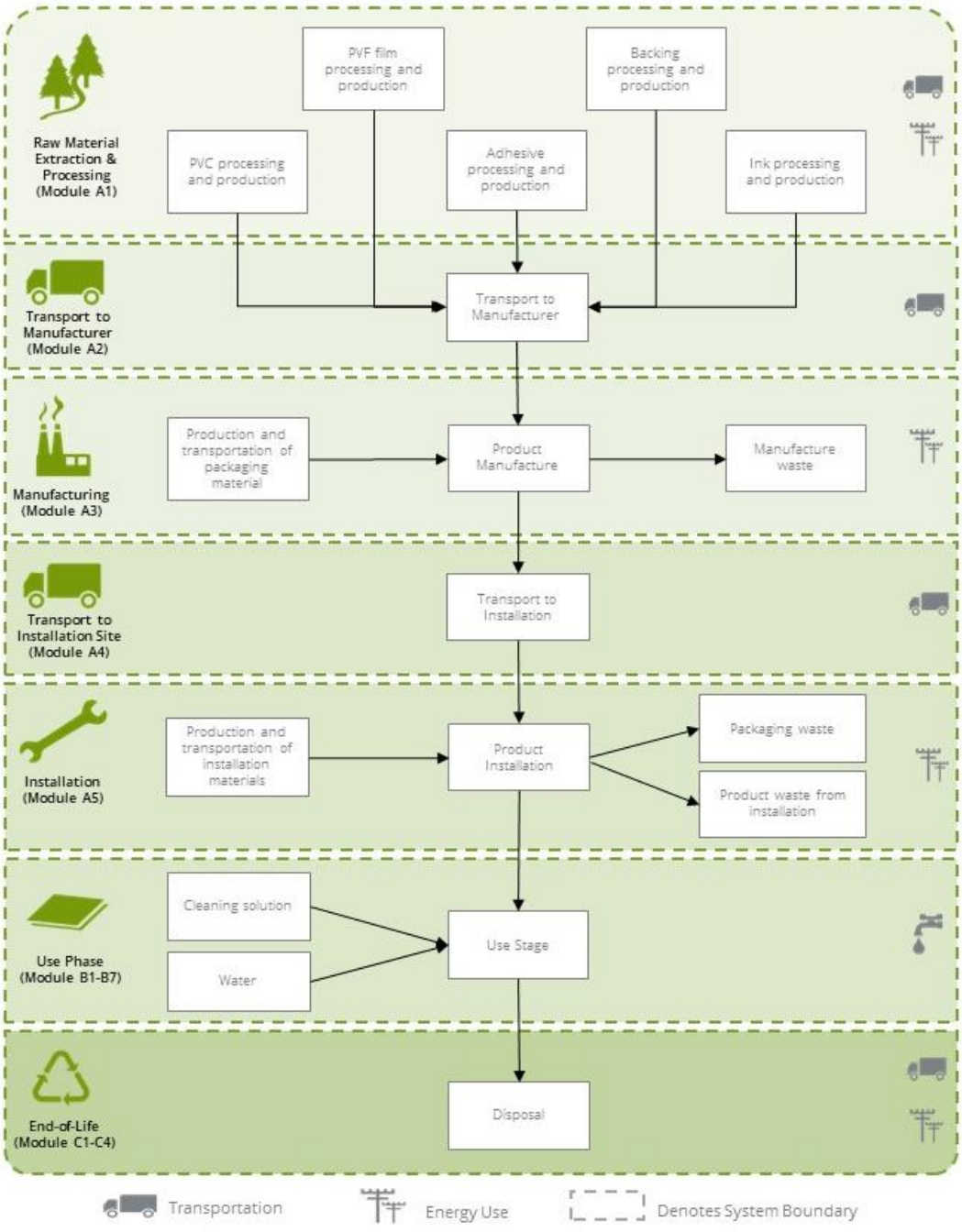

Figure 2. *P3TEC Advanced Wall Protection system boundary.*

3.3 Product Specific Calculations for Use and End-of-Life

According to the PCR, for cradle-to-grave EPDs, modules B1, B3, B5, B6 and B7 are reported as "0" impacts. Product maintenance (B2) is modelled as required in the PCR, using weekly cleaning of a 50 ml 10% hydrochloric acid solution with assumed evaporation as emissions to air. Module B4 (Replacement) is calculated using the 5-year RSL and the default 75-year ESL.

3.4 Estimates and Assumptions

- Specific data were not available the polyethylene glycol adhesive in the product recipe. A secondary dataset ethylene glycol was used from the Ecoinvent database.
- Specific data were not available on the various inks used in the product recipe. Datasets for ethyl acetate and isopropyl acetate from the Ecoinvent database were used based on the available SDS from the primary ink supplier.
- Specific data were not available on the polyester/cotton backing in the product recipe. Cotton fiber and polyethylene terephthalate secondary datasets from the Ecoinvent database were used in a 35%/65% mix respectively, based on the previous LCA study.
- Transportation distance for the ink raw materials was assumed to be 12 km by truck (Distance for primary supplier).
- Manufacturing waste is assumed to be landfilled with transport of 50 km by truck.
- Wastewater from manufacture is assumed to be discharged to the sewer.
- Installation of the P3Tec product is assumed to use 0.12 kg of primer and 0.18 kg of adhesive per square meter, based on the installation instructions provided on the J. Josephson P3Tec website.
- The installation primer and adhesive products are assumed to be the same materials indicated in the prior 2018 study: Roman Pro-935 primer and Roman Pro-555 Extreme tack wallcovering adhesive.
- Product waste from installation is assumed to be 4.1%, based on product experts at J. Josephson.
- Transport of the packaging waste and product waste from installation is assumed to be 50 km by truck.
- Product maintenance is assumed to be weekly cleaning using 50 ml of 10% hydrochloric acid solution, with assumed evaporation as emissions to air, per the Part B PCR.
- The Reference Service Life (RSL) of the product is assumed to be 5 years, as provided by product experts for consistency with the product warranty.
- The Estimated Service Life (ESL) of the building/construction works was assumed to be 75 years, as required by the Part A PCR.
- Transport of the product at end-of-life to waste processing and disposal is assumed to be 50 km by truck.
- For the product end-of-life, disposal of product is assumed per the Part A PCR product disposal assumptions by region.

3.5 Units

According to the PCR, processes SI units are used for all LCA results. All results are also reported using three significant figures.

3.6 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.

3.7 Data Sources

Primary data were provided by J. Josephson for the South Hackensack, NJ manufacturing facility. The sources of secondary LCI data are the Ecoinvent database.

Table 6. *Data sources for the P3TEC Advanced Wall Protection model.*

Component	Dataset	Geographic Coverage	Data Source	Publication Date
Product Materials				
Ink	market for ethyl acetate | ethyl acetate | Cutoff, U	Global	Ecoinvent 3.9	2022
	market for isopropyl acetate | isopropyl acetate | Cutoff, U	RoW	Ecoinvent 3.9	2022
Plastisol	market for ethylene glycol | ethylene glycol | Cutoff, U	Global	Ecoinvent 3.9	2022
PVF film	market for polyvinylfluoride, film | polyvinylfluoride, film | Cutoff, U	Global	Ecoinvent 3.9	2022
Scrim	market for fibre, cotton | fibre, cotton | Cutoff, U	Global	Ecoinvent 3.9	2022
	market for fibre, polyester | fibre, polyester | Cutoff, U			
	weaving of synthetic fibre, for industrial use | weaving, synthetic fibre | Cutoff, U	Global	Ecoinvent 3.9	2022
Vinyl	market for polyvinylchloride, bulk polymerised | polyvinylchloride, bulk polymerised | Cutoff, U	Global	Ecoinvent 3.9	2022
Package Materials				
Cardboard	market for corrugated board box | corrugated board box | Cutoff, U	United States	Ecoinvent 3.9	2022
End caps	market for polyethylene, high density, granulate | polyethylene, high density, granulate | Cutoff, U	Global	Ecoinvent 3.9	2022
Transport Inputs				
Ship	market for transport, freight, sea, container ship | transport, freight, sea, container ship | Cutoff, U	Global	Ecoinvent 3.9	2022
Truck	market for transport, freight, lorry 16-32 metric ton, EURO4 | transport, freight, lorry 16-32 metric ton, EURO4 | Cutoff, U	Europe	Ecoinvent 3.9	2022
Manufacture Inputs				
Electricity	market for electricity, medium voltage | electricity, medium voltage | Cutoff, U	US eGrid RFCE	EPA	2020
Natural gas	heat production, natural gas, at industrial furnace >100kW | heat, district or industrial, natural gas | Cutoff, U	RoW	Ecoinvent 3.9	2022
Water	market for tap water | tap water | Cutoff, U	RoW	Ecoinvent 3.9	2022
Install Materials				
Adhesive	market for clay plaster | clay plaster | Cutoff, U	Global	Ecoinvent 3.9	2022
Primer	market for acrylic binder, with water, in 54% solution state | acrylic binder, with water, in 54% solution state | Cutoff, U	RoW	Ecoinvent 3.9	2022
Maintenance Materials				
Hydrochloric acid	market for hydrochloric acid, without water, in 30% solution state | hydrochloric acid, without water, in 30% solution state | Cutoff, U	RoW	Ecoinvent 3.9	2022
Water	market for tap water | tap water | Cutoff, U	RoW	Ecoinvent 3.9	2022
Waste Outputs				
Waste to incineration	treatment of municipal solid waste, incineration | municipal solid waste | Cutoff, U	RoW	Ecoinvent 3.9	2022
Waste to landfill	market for inert waste, for final disposal | inert waste, for final disposal | Cutoff, U	RoW	Ecoinvent 3.9	2022
Wastewater to Sewer	market for wastewater, average | wastewater, average | Cutoff, U	RoW	Ecoinvent 3.9	2022

3.8 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 P3TEC Advanced Wall Protection 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 manufacturer provided primary data on product manufacturing for the manufacturing facility in South Hackensack, NJ on annual production for 2021. Representative datasets (secondary data) for upstream and background processes are generally less than 5 years old.
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. Electricity use for product manufacture is modeled using representative datasets for the RFCE eGRID region represented in this study. Surrogate data used in the assessment are representative of global or European operations and are considered sufficiently similar to actual processes.
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 component 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 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.
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 v3.9 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 the 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 represents a 12-month average and is 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. For secondary LCI data, Ecoinvent v3.9 data are used.
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 all 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 methodology includes impact potentials, which lack characterization of providing and receiving environments or tipping points.

3.9 Period under review

The period of review is calendar year 2021.

3.8 Allocation

Manufacturing resource use was allocated to the products based on product area as a fraction of annual facility production. Impacts from transportation were allocated based on the mass of material and distance transported.

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

4.1 Transport to the Building Site (A4)

Distribution of the product to point of sale is included in the model, based on primary data received from the manufacturer. The transportation of final products is done via diesel truck and ocean freight container ship. Transportation parameters for modeling product distribution are summarized in Table 9.

Table 8. *Product distribution summary for P3TEC Advanced Wall Protection.*

Name	Unit	Value
Vehicle type	-	Truck
Fuel type	-	Diesel
Liters of fuel	l/100km	35
Transport distance	km	3400
Capacity utilization	%	37
Gross density of products transported	kg/m^3	0.080
Capacity utilization volume factor	-	1
Name	**Unit**	**Value**
Vehicle type	-	Ship
Fuel type	-	Heavy Fuel Oil
Liters of fuel	l/100km	0.41
Transport distance	km	1900
Capacity utilization	%	n/a
Gross density of products transported	kg/m^3	0.080
Capacity utilization volume factor	-	1

4.2 Installation into the Building (A5)

Table 9. *Installation summary for P3TEC Advanced Wall Protection per m^2.*

Name	Unit	Value
Ancillary materials	kg	0.300
Primer	kg	*0.120*
Adhesive	kg	*0.180*
Water consumption specified by water source and fate	m^3	0.00
Other resources	kg	0.00
Electricity consumption	kwh	0.00
Other energy carriers	MJ	0.00
Product loss per functional unit	kg	0.035
Overlap	cm	5.08
Output materials resulting from on-site waste processing	kg	0.186
Mass of packaging waste specified by type	kg	0.151
Cardboard	kg	*0.126*
Plastic	kg	*0.025*
Biogenic carbon contained in packaging	kg CO_2	0.230
Direct emissions to ambient air, soil, and water	kg	0.00
VOC content	µg/m^3	0.00

4.3 Use Phase (B1-B7)

As noted above, Modules B1, B3, B5, B6, and B7 are assumed to have 0 impacts.

Table 10. Maintenance (B2) summary for P3TEC Advanced Wall Protection per m^2.

Name	Unit	Value
Maintenance process information	Per PCR - weekly cleaning using 50 ml of 10% hydrochloric acid solution with assumed evaporation as emissions to air	
Maintenance cycle	Cycles/RSL	260
Maintenance cycle	Cycles/ESL	3,900
Net freshwater consumption specified by water source and fate	m3	0.176 (city water evaporated)
Ancillary materials specified by type	kg	0.03 (hydrochloric acid)
Other resources	kg	0.00
Energy input	kWh	0.00
Other energy carriers	kWh	0.00
Power output of equipment	kW	0.00
Waste materials from maintenance	kg	0.00
Direct emissions to ambient air, soil, and water	kg	175

Table 11. Replacement (B4) summary for P3TEC Advanced Wall Protection per m^2.

Name	Unit	Value
Reference Service Life	Years	5
Replacement cycle	(ESL/RSL)-1	14
Energy input	kWh	0.00
Net freshwater consumption specified by water source and fate	m3	0.00
Ancillary materials specified by type	kg	0.00
Replacement of worn parts	kg	0.00
Direct emissions to ambient air, soil, and water	kg	0.00

4.3 End-of-Life (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). It is assumed the P3TEC Advanced Wall Protection products are landfilled at end-of-life, as indicated in the PCR for product disposal in the United States. No emissions are generated during demolition (C1) while no waste processing (C3) is required for landfill disposal. Transportation of waste materials at end-of-life (C2) assumes a 50 km average distance to disposal by truck .

Table 12. *End-of-Life summary for P3TEC Advanced Wall Protection per m^2.*

End-of-life		Unit	KoolDuct® (per 1m^2)
Assumptions for scenario development		Manual deconstruction, followed by 50 km truck transport to final disposal in landfill	
Collection process	Collected separately	kg	0
	Collected with mixed construction waste	kg	0.834
Recovery	Reuse	kg	0
	Recycling	kg	0
	Landfill	kg	0.834
	Incineration	kg	0
	Incineration with energy recovery	kg	0
	Energy conversion (specify efficiency rate)	%	0
Disposal	Product or material for final disposition	kg	0.834
Removals of biogenic carbon (excluding packaging)		kg CO_2	0.031

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. All values in the tables below are rounded to three significant digits. The following impact indicators, specified by the PCR, are reported below:

Table 13. *Life Cycle Impact Assessment (LCIA) indicators and characterization methods used.*

Impact Category	Unit	Characterization Method
Global Warming Potential (GWP 100)	kg CO_2 eq	TRACI CML EN15804
Ozone Depletion Potential (ODP)	kg CFC 11 eq	TRACI CML EN 15804
Eutrophication Potential (EP)	kg N eq	TRACI EN 15804 (marine)
	kg $(PO_4)^{3-}$ eq	CML
	kg P eq	EN 15804 (freshwater)
Acidification Potential (AP)	kg SO_2 eq	TRACI CML
	mol H+ eq	EN 15804
Smog Formation Potential (SFP)	kg O_3 eq	TRACI
Photochemical Oxidant Creation Potential (POCP)	kg ethane eq	CML
	kg NMVOC eq	EN 15804
Fossil Fuel Depletion (FFD)	MJ eq	TRACI
Abiotic Depletion Potential – fossil fuels (ADPF)	MJ eq	CML

These 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 14. *Additional transparency indicators used.*

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	RWD: High-level, intermediate, and low-level radioactive waste, conditioned, to final repository	kg
$NRPR_M$: Non-renewable primary resources with energy content used as material	MJ, LHV	CRU: Components for re-use	kg
SM: Secondary materials	MJ, LHV	MR: Materials for recycling	kg
RSF: Renewable secondary fuels	MJ, LHV	MER: Materials for energy recovery	kg
NRSF: Non-renewable secondary fuels	MJ, LHV	EE: Recovered energy exported from the product system	MJ, LHV
RE: Recovered energy	MJ, LHV		
FW: Use of net freshwater resources	m^3	-	-

Table 15. *TRACI LCIA results for P3TEC Advanced Wall Protection per m^2 installed.*

Module	GWP 100	ODP	EP	AP	SFP	FFD
	kg CO_2 eq	kg CFC-11 eq	kg N eq	kg SO_2 eq	kg O_3 eq	MJ
A1	2.83	$1.33x10^{-6}$	0.010	0.012	0.158	3.51
A2	0.087	$1.54x10^{-9}$	$8.26x10^{-5}$	$3.40x10^{-4}$	0.009	0.159
A3	0.686	$2.01x10^{-8}$	0.001	0.002	0.025	0.273
A1-A3 Total:	**3.60**	**$1.35x10^{-6}$**	**0.011**	**0.014**	**0.192**	**3.94**
A4	0.674	$1.18x10^{-8}$	$6.40x10^{-4}$	0.003	0.075	1.22
A5	0.290	$4.40x10^{-9}$	$7.70x10^{-4}$	0.001	0.018	0.409
B1	0.00	0.00	0.00	0.00	0.00	0.00
B2	0.239	$6.06x10^{-8}$	$7.60x10^{-4}$	0.028	0.016	0.067
B3	0.00	0.00	0.00	0.00	0.00	0.00
B4	67.0	$1.92x10^{-5}$	0.182	0.267	4.38	85.0
B5	0.00	0.00	0.00	0.00	0.00	0.00
B6	0.00	0.00	0.00	0.00	0.00	0.00
B7	0.00	0.00	0.00	0.00	0.00	0.00
C1	0.00	0.00	0.00	0.00	0.00	0.00
C2	0.008	$1.44x10^{-10}$	$7.74x10^{-6}$	$3.21x10^{-5}$	$8.20x10^{-4}$	0.015
C3	0.00	0.00	0.00	0.00	0.00	0.00
C4	0.008	$2.11x10^{-10}$	$9.25x10^{-6}$	$4.79x10^{-5}$	0.001	0.022

Table 16. *CML LCIA results for P3TEC Advanced Wall Protection per m² installed.*

Module	GWP 100	ODP	EP	AP	POCP	ADPE
	kg CO_2 eq	kg CFC-11 eq	kg $(PO_4)^{3-}$ eq	kg SO_2 eq	kg ethane eq	MJ
A1	2.87	$1.21x10^{-6}$	0.005	0.011	0.001	32.7
A2	0.088	$1.17x10^{-9}$	$7.35x10^{-5}$	$2.90x10^{-4}$	$1.39x10^{-5}$	1.13
A3	0.695	$1.22x10^{-8}$	0.001	0.001	$1.10x10^{-4}$	2.94
A1-A3 Total:	**3.65**	**$1.22x10^{-6}$**	**0.006**	**0.013**	**0.001**	**36.8**
A4	0.679	$8.98x10^{-9}$	$6.00x10^{-4}$	0.003	$1.20x10^{-4}$	8.72
A5	0.294	$3.11x10^{-9}$	$3.90x10^{-4}$	0.001	$1.30x10^{-4}$	3.83
B1	0.00	0.00	0.00	0.00	0.00	0.00
B2	0.241	$5.94x10^{-8}$	$3.90x10^{-4}$	0.001	$5.71x10^{-5}$	1.82
B3	0.00	0.00	0.00	0.00	0.00	0.00
B4	67.8	$1.73x10^{-5}$	0.099	0.244	0.015	741
B5	0.00	0.00	0.00	0.00	0.00	0.00
B6	0.00	0.00	0.00	0.00	0.00	0.00
B7	0.00	0.00	0.00	0.00	0.00	0.00
C1	0.00	0.00	0.00	0.00	0.00	0.00
C2	0.008	$1.09x10^{-10}$	$6.88x10^{-6}$	$2.68x10^{-5}$	$1.30x10^{-6}$	0.106
C3	0.00	0.00	0.00	0.00	0.00	0.00
C4	0.008	$1.58x10^{-10}$	$9.55x10^{-6}$	$3.95x10^{-5}$	$2.07x10^{-6}$	0.151

Table 17. *EN 15804 LCIA results for P3TEC Advanced Wall Protection per m² installed.*

Module	GWP 100	ODP	EP (marine)	EP (fresh)	AP	POCP
	kg CO_2 eq	kg CFC-11 eq	kg N eq	kg P eq	mol H+ eq	kg NMVOC eq
A1	2.95	$1.36x10^{-6}$	0.005	0.001	0.031	0.011
A2	0.091	$1.40x10^{-9}$	$1.40x10^{-4}$	$7.19x10^{-6}$	$4.40x10^{-4}$	0.001
A3	0.581	$1.20x10^{-8}$	$5.30x10^{-4}$	$1.10x10^{-4}$	0.002	0.002
A1-A3 Total:	**3.62**	**$1.38x10^{-6}$**	**0.006**	**0.001**	**0.033**	**0.013**
A4	0.698	$1.08x10^{-8}$	0.001	$5.45x10^{-5}$	0.004	0.004
A5	0.316	$3.62x10^{-9}$	$3.00x10^{-4}$	$8.65x10^{-5}$	0.003	0.001
B1	0.00	0.00	0.00	0.00	0.00	0.00
B2	0.250	$4.99x10^{-8}$	$2.60x10^{-4}$	$8.98x10^{-5}$	0.002	0.001
B3	0.00	0.00	0.00	0.00	0.00	0.00
B4	68.1	$1.95x10^{-5}$	0.111	0.016	0.584	0.286
B5	0.00	0.00	0.00	0.00	0.00	0.00
B6	0.00	0.00	0.00	0.00	0.00	0.00
B7	0.00	0.00	0.00	0.00	0.00	0.00
C1	0.00	0.00	0.00	0.00	0.00	0.00
C2	0.008	$1.31x10^{-10}$	$1.34x10^{-5}$	$6.74x10^{-7}$	$4.14x10^{-5}$	$4.91x10^{-5}$
C3	0.00	0.00	0.00	0.00	0.00	0.00
C4	0.008	$1.94x10^{-10}$	$2.08x10^{-5}$	$7.22x10^{-7}$	$6.29x10^{-5}$	$7.58x10^{-5}$

Table 18. *Resource Use indicator results for P3TEC Advanced Wall Protection per m^2 installed.*

Module	RPR_E	RPR_M	$NRPR_E$	$NRPR_M$	SM	RSF	NRSF	RE	FW
	MJ, LHV	MJ, LHV	MJ, LHV	MJ, LHV	kg	MJ, LHV	MJ, LHV	MJ, LHV	m^3
A1	3.02	0.278	36.4	0.00	0.372	0.00	0.00	0.00	0.064
A2	0.016	0.000	1.15	0.00	0.00	0.00	0.00	0.00	$1.60x10^{-4}$
A3	2.59	0.044	6.05	0.00	0.038	0.00	0.00	0.00	0.002
A1-A3 Total:	**5.62**	**0.322**	**43.6**	**0.00**	**0.410**	**0.00**	**0.00**	**0.00**	**0.067**
A4	0.121	0.000	8.84	0.00	0.00	0.00	0.00	0.00	0.001
A5	0.250	0.000	4.17	0.00	0.00	0.00	0.00	0.00	0.005
B1	0.00	0.000	0.00	0.00	0.00	0.00	0.00	0.00	0.00
B2	0.282	0.000	2.17	0.00	0.00	0.00	0.00	0.00	0.168
B3	0.00	0.000	0.00	0.00	0.00	0.00	0.00	0.00	0.00
B4	84.5	4.50	843	0.00	5.74	0.00	0.00	0.00	1.05
B5	0.00	0.000	0.00	0.00	0.00	0.00	0.00	0.00	0.00
B6	0.00	0.000	0.00	0.00	0.00	0.00	0.00	0.00	0.00
B7	0.00	0.000	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C1	0.00	0.000	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C2	0.001	0.000	0.108	0.00	0.00	0.00	0.00	0.00	$1.48x10^{-5}$
C3	0.00	0.000	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C4	0.002	0.000	0.153	0.00	0.00	0.00	0.00	0.00	$1.40x10^{-4}$

Table 19. *Waste and Output indicator results for P3TEC Advanced Wall Protection per m^2 installed.*

Module	HWD	NHWD	HLRW/ILLRW	CRU	MR	MER	EE
	kg	kg	kg	kg	kg	kg	MJ, LHV
A1	0.00	0.00	0.00	0.00	0.00	0.00	0.00
A2	0.00	0.00	0.00	0.00	0.00	0.00	0.00
A3	0.00	0.054	0.00	0.00	0.014	0.00	0.00
A1-A3 Total:	**0.00**	**0.054**	**0.00**	**0.00**	**0.014**	**0.00**	**0.00**
A4	0.00	0.00	0.00	0.00	0.00	0.00	0.00
A5	0.00	0.088	0.00	0.00	0.098	0.00	0.00
B1	0.00	0.00	0.00	0.00	0.00	0.00	0.00
B2	0.00	0.00	0.00	0.00	0.00	0.00	0.00
B3	0.00	0.00	0.00	0.00	0.00	0.00	0.00
B4	0.00	12.9	0.00	0.00	1.37	0.00	0.00
B5	0.00	0.00	0.00	0.00	0.00	0.00	0.00
B6	0.00	0.00	0.00	0.00	0.00	0.00	0.00
B7	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C1	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C2	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C3	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C4	0.00	0.834	0.00	0.00	0.00	0.00	0.00

Neg. = Negligible

6. LCA: Interpretation

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 contributions to total indicator impacts for the P3TEC Advanced Wall Protection products are dominated by the replacement module (B4). When examining the results without the use phase modules, the raw material module (A1) and the final product transportation module (A4) account for the majority of the impacts. Product manufacture and installation are generally the next highest contributor while contributions from the remaining life cycle stages are minimal.

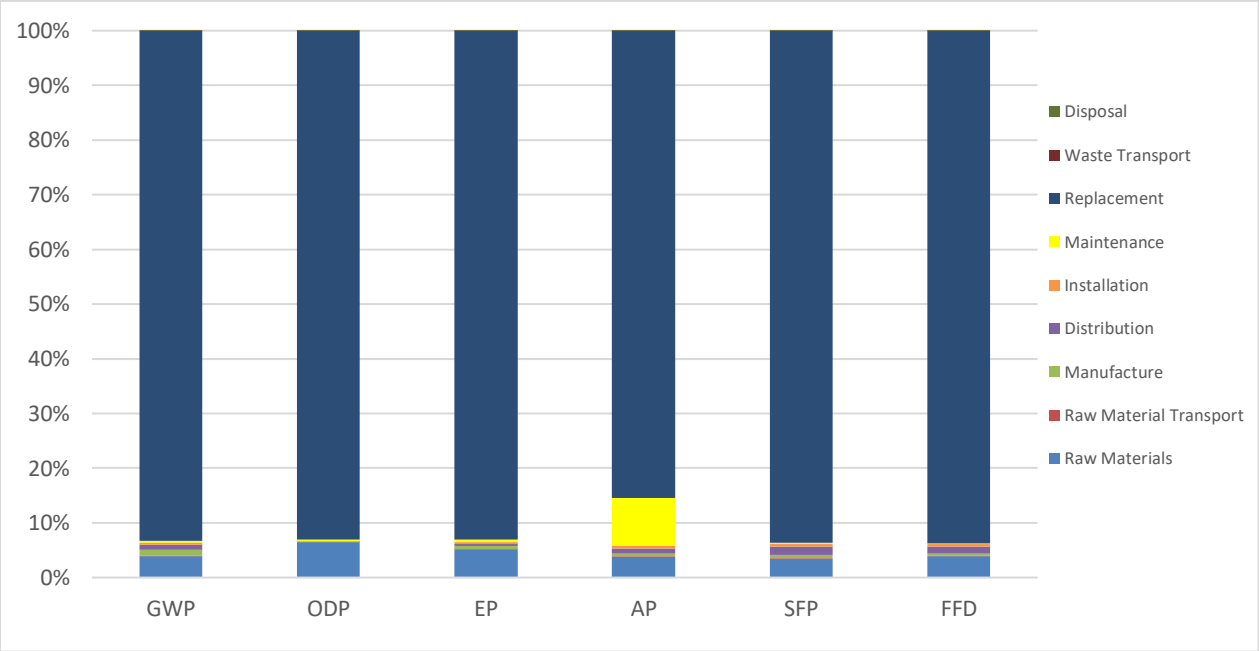

Figure 3. *Cradle-to-Grave contribution analysis for P3TEC Advanced Wall Protection (TRACI).*

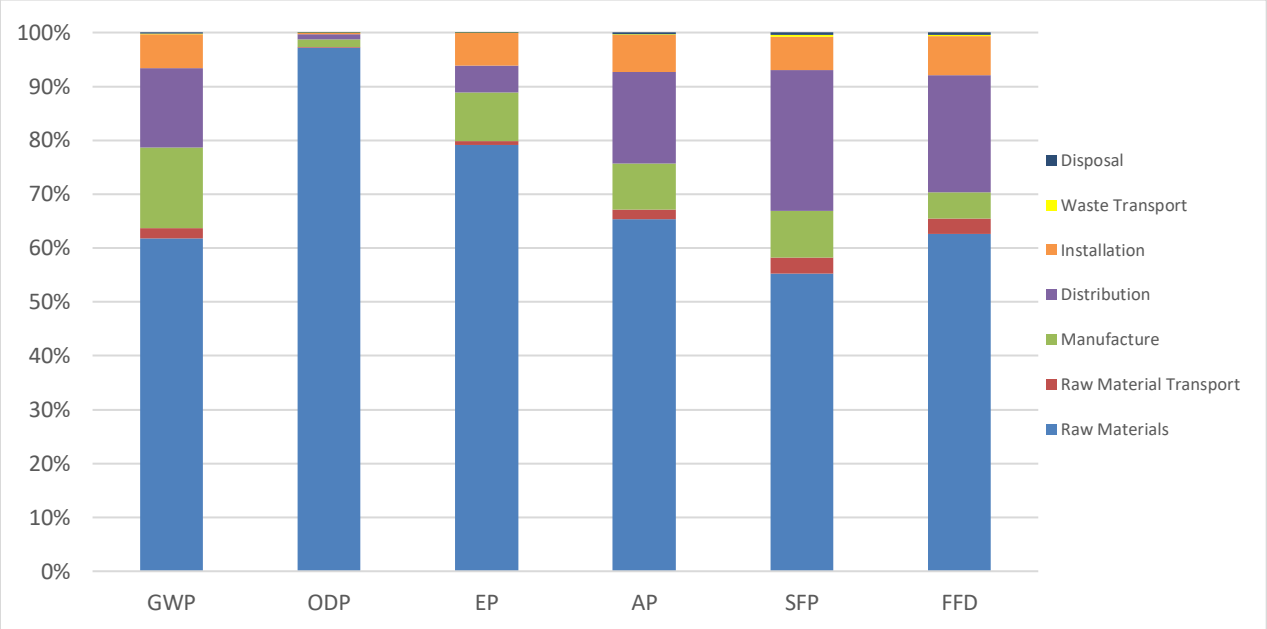

Figure 4. *Contribution analysis without Use phase for P3TEC Advanced Wall Protection (TRACI).*

7. Additional Environmental Information

7.1 Environment and Health during Manufacture

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

7.2 Environment and Health during Installation

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

7.3 Extraordinary Effects

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

7.4 Environmental Activities and Certifications

J. Josephson has an Environmental Management System.

7.5 Further Information

Further information on the product can be found on the manufacturers' website at http://www.P3TEC.com/

8. References

- Life Cycle Assessment of P3TEC Advanced Wall Protection. SCS Global Services Report. Prepared for J. Josephson. March 2023.
- ISO 14025:2006 Environmental labels and declarations – Type III environmental declarations – Principles and Procedures.
- ISO 14040: 2006 Environmental Management – Life cycle assessment – Principles and Framework
- ISO 14044: 2006/AMD 1:2017/ AMD 2:2020 Environmental Management – Life cycle assessment – Requirements and Guidelines.
- PCR Guidance for Building-Related Products and Services Part A: Life Cycle Assessment Calculation Rules and Report Requirements. Version 3.2. UL Environment. Sept. 2018
- PCR Guidance for Building-Related Products and Services Part B: Wall and Door Protection EPD Requirements. Version 1.0. May 2019.
- ISO 21930: 2017 Sustainability in buildings and civil engineering works — Core rules for environmental product declarations of construction products and services.
- SCS Type III Environmental Declaration Program: Program Operator Manual. V11.0 November 2021. SCS Global Services.
- CML 4.1 baseline, from Institute of Environmental Sciences Faculty of Science University of Leiden, Netherlands.
- Tool for the Reduction and Assessment of Chemical and Other Environmental Impacts (TRACI). U.S. EPA. https://www.epa.gov/chemical-research/tool-reduction-and-assessment-chemicals-and-other-environmental-impacts-traci
- EN 15804 +A2:2019 + AC:2021 Sustainability of construction works – Environmental Product Declarations – Core rules for the product category of construction products.
- Ecoinvent Centre (2020) ecoinvent data from v3.9. Swiss Center for Life Cycle Inventories, Dübendorf, 2022, http://www.ecoinvent.org

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