



Building with conscience.

EPD for StoTherm® ci Mineral

The **StoTherm® ci Mineral System** is a decorative and protective exterior wall system (EIFS) that combines superior air and weather tightness with excellent thermal performance and fire resistance. It incorporates noncombustible continuous exterior insulation and a continuous air and moisture barrier with Sto's high performance finishes to produce an advanced high performance wall cladding assembly.

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Stolit® Lotusan® Finishes	View The EPD



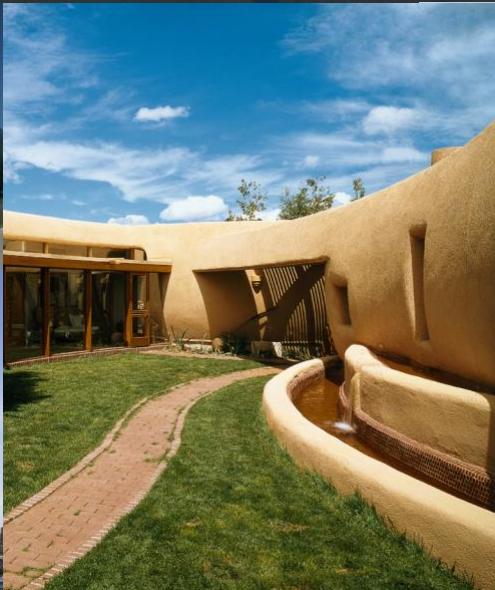


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EPD for Sto Gold Coat®

Sto Gold Coat® is a code recognized, vapor permeable fluid-applied membrane designed for application under ci wall systems. Sto Gold Coat® is a sheathing treatment which is part of the StoGuard® air barrier and moisture barrier family of products.



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PCR Identification	PCR for Architectural Coatings: NAICS 325510 on the basis of ISO 21930:2007, NSF International, 2017. Valid through June 23, 2022
Compliance to ISO 14040/44, ISO 14025 and ISO 21930	Yes
Product Category	Exterior Coating
Manufacturer's name	Sto Corp. 3800 Camp Creek Parkway SW, Building 1400, Suite 120 Atlanta, GA 30331 www.stocorp.com (800) 221-2397
EPD program operator	Epsten Group 101 Marietta St. Suite 2600, Atlanta, GA 30303 www.epstengroup.com
Declaration Number	01-003
Date of Certification	December 18 th , 2019
Period of Validity	5 years from date of certification
Functional Unit	One square meter of covered and protected substrate for 60 years
Market-base life used in assessment	10 Years
Design life used in assessment	N/A
Test method employed for determination of design life	N/A
Amount of colorant needed	See table 3
Overall Data Quality Assessment Score	Good
Site(s) in which the results of the LCA are representative	STO manufacturing sites in Atlanta, Georgia; Glendale, Arizona; and Rutland, Vermont
Information on where explanatory material can be obtained	See references at the end of this document.
LCA Software and Version Number	GaBi 9.2.0.58
LCI Database and Version Number	GaBi Database Version 8.7, Service Pack 39
This declaration was independently verified in accordance with ISO 14025: 2006 and the reference PCR: PCR for Architectural Coatings: NAICS 325510 <input type="checkbox"/> Internal <input checked="" type="checkbox"/> External	Kate McFeaters kmcfeaters@epstengroup.com 
This life cycle assessment was conducted in accordance with ISO 14044 and the reference PCR by:	WAP Sustainability Consulting, LLC
This life cycle assessment was independently verified in accordance with ISO 14040/44 and the reference PCR by:	Kate McFeaters kmcfeaters@epstengroup.com 

Comparability

In order to support comparative assertions, this EPD meets all comparability requirements stated in ISO 14025:2006. However, differences in certain assumptions, data quality, and variability between LCA data sets may still exist. As such, caution should be exercised when evaluating EPDs from different manufacturers, as the EPD results may not be entirely comparable. Any EPD comparison must be carried out at the building level per ISO 21930 guidelines. The results of this EPD reflect an average performance by the product and its actual impacts may vary on a case-to-case basis.

» Company

We believe in ‘**Building with conscience**’.

That means ensuring that all building products are not only safe, effective and easy to install, but also environmentally responsible and sustainable. We know you’re always looking for the smartest and newest technology to create energy efficient buildings with superior aesthetics.

That’s exactly what our products help you achieve. Products like our wall systems, coatings and finishes are consistent favorites among design professionals, contractors and property owners alike. Whatever your needs or vision may be, we offer products for every type of building project; whether it’s new construction, restoration or panelization, commercial or residential work.

An architect or specifier focuses on aesthetics and feasibility, a contractor needs products that are easy to work with, and a building owner requires high value and low costs on properties. Sto understands these unique needs, and delivers the smart, innovative materials and solutions that make this all possible. That’s why Sto remains the innovative leader in integrated exterior wall systems.

When you combine that commitment to product support and innovation with value-added offerings like consultative design and color services through [Sto Studio](#) or training in proper application techniques through the Sto Institute, you get an integrated exterior wall system solution unmatched in the industry.

» Manufacturing Sites Covered in this EPD

Atlanta Plant

Glendale Plant

Rutland Plant

» Performance Features

Waterproof Material	Structural and Durable	Low Temperature Application	Spray Applied with Airless Spray Equipment
Vapor Permeable	UV Durable	Build-in Freeze Protection	Water-base and Low VOC

» Product Identification

Sto Gold Coat® is a fluid-applied vapor permeable air barrier offered in 5-gallon pails. There are no finish or color base options provided.

Table 1: Sto Gold Coat® Identification

Product Name	Product Number	Base Type	Finish Type
Sto Gold Coat®	81636	n/a	n/a

» Product Description

Sto Gold Coat® is a fluid-applied vapor permeable air barrier and water-resistive barrier (WRB) with built-in anti-freeze properties. It is used over prepared vertical above grade concrete, concrete masonry, brick masonry, wood and glass mat gypsum sheathing behind StoTherm® ci and other wall claddings. Gold Coat® is treated in the study as a undercoater and it only utilizes the market-based lifetime (10 years for exterior undercoater).



» Material Composition

The material composition of Sto Gold Coat® is listed below:

Table 2: Material composition for Gold Coat®

Ingredient	Gold Coat®
Additives	1-2%
Colorant	3-4%
Polymer	25-26%
Silica	41-42%
Silicate	0%
Surfactant	0-1%
Water	25-26%

» Components related to Life Cycle Assessment

The functional unit for the LCA study was covering and protecting 1 square meter (m²) of substrate for a period of 60 years—the assumed lifetime of a building. The reference flow required for the functional unit is calculated based on the product lifespan scenarios prescribed in the PCR. The market-based lifetime is 10 years. By default, Gold Coat® has a 5-year warranty. In case it is applied on Sto’s wall systems, the warranty is extended to 10 years. The reference flow required for one functional unit is provided in Table 3.

Table 3: Market-based lifetime and reference flow

	Functional Unit [1 m ²]	Reference Flow [kg]	Tint needed [kg]
Lifespan		Market-based Lifetime [10 years]	
Gold Coat® over plywood)	1	3.08	N/A
Gold Coat® over CMU	1	8.87	N/A

» Scope and Boundaries of the Life Cycle Assessment

The LCA was performed in accordance with ISO 14040 standards. The study is a cradle-to-grave LCA and includes the following life stages as prescribed in the PCR.

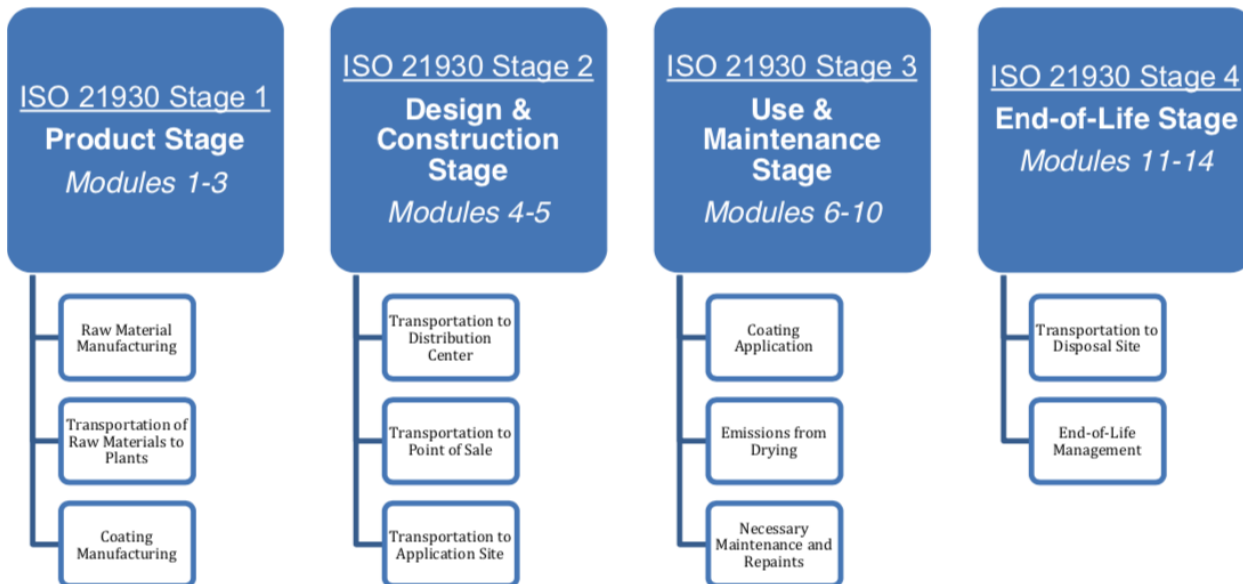


Figure 1: Life stages for the cradle-to-grave LCA

» Cut-off Criteria

Material inputs greater than 1% (based on total mass of the final product) were included within the scope of analysis. Material inputs less than 1% were included if sufficient data was available to warrant inclusion and/or the material input was thought to have significant environmental impact. Cumulative excluded material inputs and environmental impacts are less than 5% based on total weight of the functional unit.

» Data Quality

The overall data quality level was determined to be good. Primary data was collected from Sto's facilities in Atlanta, GA, Glendale, AZ and Rutland, VT for the 2018 reference year. When primary data did not exist, secondary data were obtained from the Gabi V8.7 Database Service Pack 39. Overall, both primary and secondary data are considered good quality in terms of geographic, temporal and technological coverage.

» Estimates and Assumption

Assumptions were made to represent the cradle-to-grave environmental performance of Sto's products. These assumptions were made in accordance with the PCR and include the transportation distances, the disposal of packaging material and the product at its end of life and use phase assumptions.

» Allocation

General principles of allocation were based on ISO 14040/44. Where possible, allocation was avoided. When allocation was necessary it was done on a physical mass basis.

» Product Stage

Sto Gold Coat is produced at Sto's Atlanta, GA, Glendale, AZ and Rutland, VT facilities. This stage includes an aggregation of raw material extraction, supplier processing, delivery, manufacturing and packaging by Sto. Sto Gold Coat is supplied in 5-gallon pails.

» Design and Construction Stage

The design and construction process stage starts with the packaged product leaving the production site and ends with being delivered to the application site.

During this stage, the finished product is moved from a shipping dock for distribution. The end gate is the application site after the purchaser acquires the finished product and transports it to the application site.

» Use and Maintenance Stage

The use stage begins when the user prepares the product before applying it to a substrate and ends with any leftover coating and discarded packaging entering the end-of-life stage. Detailed application instructions are provided online. The application procedure includes mixing and applying. As recommended, an electric drill/mixer and a spray pump are assumed to be used for mixing and application. The equipment is not included in the study as these are multi-use tools and the impacts per declared unit is considered negligible, but electricity to power application tools has been included.

As prescribed in the PCR, 10% of the wet mass of Sto Gold Coat is assumed to be unused and properly disposed of.

» End-of-Life Stage

Table 4: End-of-life Disposal Scenarios

Waste Flow	Recycling	Incineration	Landfilling
Paper Packaging	66.6%	6.01%	27.39%
Steel Packaging	33.3%	12.01%	54.69%
Plastic Packaging	9.1%	16.36%	74.54%
Unused Product	0%	0%	100%
Post-Consumer Product	0%	0%	100%

In this stage, the disposal of installation waste, packaging waste and product waste at its end of life is included. The disposal pathway of each waste stream is modeled based on the recommendation of PCR and US EPA's latest waste management fact sheet.

» Life Cycle Assessment Results

As prescribed by the PCR, TRACI 2.1 impact characterization methodology and IPCC 5th assessment report are adopted to calculate the environment impacts. Table 5 provides the acronym key of the impact indicators declared in this EPD.

Table 5: LCIA impact category and LCI Indicator keys

Abbreviation	Parameter	Unit
TRACI 2.1		
AP	Acidification potential of soil and water	kg SO ₂ eq
EP	Eutrophication potential	kg N eq
GWP	Global warming potential including biogenic carbon emission	kg CO ₂ eq
ODP	Depletion of stratospheric ozone layer	kg CFC 11 eq
POCP	Photochemical ozone creation potential	kg O ₃ eq
Resource Use Parameters		
RPR	Use of renewable primary energy	MJ, net calorific value (LHV)
RMR	Use of renewable Material Resources	kg
NRER	Depletion of Non-Renewable Energy Resources	MJ, net calorific value
NRMR	Depletion of Non-Renewable Material Resources	kg
FW	Consumption of Freshwater	m ³
Waste Parameters		
HWD	Disposed-of-hazardous waste	kg
NHWD	Disposed-of non-hazardous waste	kg
Biogenic Carbon Parameter		
BC	Biogenic Carbon	kg CO ₂ eq
Energy Differentiation Parameters		
HWP	Hydro/wind Power	MJ, net calorific value (LHV)
FE	Fossil Energy	MJ, net calorific value (LHV)
BE	Bio-energy	MJ, net calorific value (LHV)
NE	Nuclear Energy	MJ, net calorific value (LHV)
OE	Other Energy	MJ, net calorific value (LHV)

» Sto Gold Coat® over Plywood

	Indicator	1. Product Stage	2. Design & Construction Stage	3. Use & Maintenance Stage	4. End-of-Life Stage	
Market-based lifetime	AP [kg SO ₂ eq]	2.88E-02	1.24E-03	2.39E-05	8.39E-04	
	EP [kg N eq]	9.37E-04	1.01E-04	1.00E-06	1.48E-04	
	GWP [kg CO ₂ eq]	5.35E+00	2.42E-01	8.46E-03	1.79E-01	
	ODP [kg CFC 11 eq]	-1.42E-13	2.30E-17	2.81E-17	4.44E-16	
	POCP [kg O ₃ eq]	2.04E-01	2.84E-02	3.14E-01	1.36E-02	
	RPRE [MJ]	5.79E+00	1.06E-01	1.86E-02	1.29E-01	
	NRPRE [MJ]	1.22E+02	3.43E+00	1.36E-01	1.96E+00	
	FW [m ³]	3.11E-02	4.09E-04	4.76E-05	2.61E-04	
	RMR [kg]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	
	NRMR [kg]	3.23E+00	0.00E+00	0.00E+00	0.00E+00	
	HWD [kg]	1.12E-07	2.78E-08	5.98E-11	8.47E-09	
	NHWD [kg]	2.21E-01	1.29E-04	4.28E-05	3.16E+00	
	BC [kg CO ₂ eq]				3.81E-01	
	HWP [MJ]				1.98E-01	
	FE [MJ]				3.00E+00	
	BE [MJ]				9.76E-02	
	NE [MJ]				7.85E-01	
	OE [MJ]				7.88E-02	

» Sto Gold Coat® over CMU

	Indicator	1. Product Stage	2. Design & Construction Stage	3. Use & Maintenance Stage	4. End-of-Life Stage
Market-based lifetime	AP [kg SO ₂ eq]	8.29E-02	3.58E-03	6.86E-05	2.41E-03
	EP [kg N eq]	2.69E-03	2.92E-04	2.89E-06	4.26E-04
	GWP [kg CO ₂ eq]	1.54E+01	6.96E-01	2.43E-02	5.16E-01
	ODP [kg CFC 11 eq]	-4.07E-13	6.61E-17	8.07E-17	1.28E-15
	POCP [kg O ₃ eq]	5.87E-01	8.17E-02	9.04E-01	3.91E-02
	RPRE [MJ]	1.67E+01	3.05E-01	5.36E-02	3.70E-01
	NRPRE [MJ]	3.50E+02	9.87E+00	3.92E-01	5.63E+00
	FW [m3]	8.93E-02	1.18E-03	1.37E-04	7.52E-04
	RMR [kg]	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	NRMR [kg]	9.31E+00	0.00E+00	0.00E+00	0.00E+00
	HWD [kg]	3.22E-07	8.00E-08	1.72E-10	2.44E-08
	NHWD [kg]	6.36E-01	3.72E-04	1.23E-04	9.09E+00
	BC [kg CO ₂ eq]			1.10E+00	
	HWP [MJ]			5.70E-01	
	FE [MJ]			8.63E+00	
	BE [MJ]			2.81E-01	
	NE [MJ]			2.26E+00	
	OE [MJ]			2.27E-01	

» Interpretation

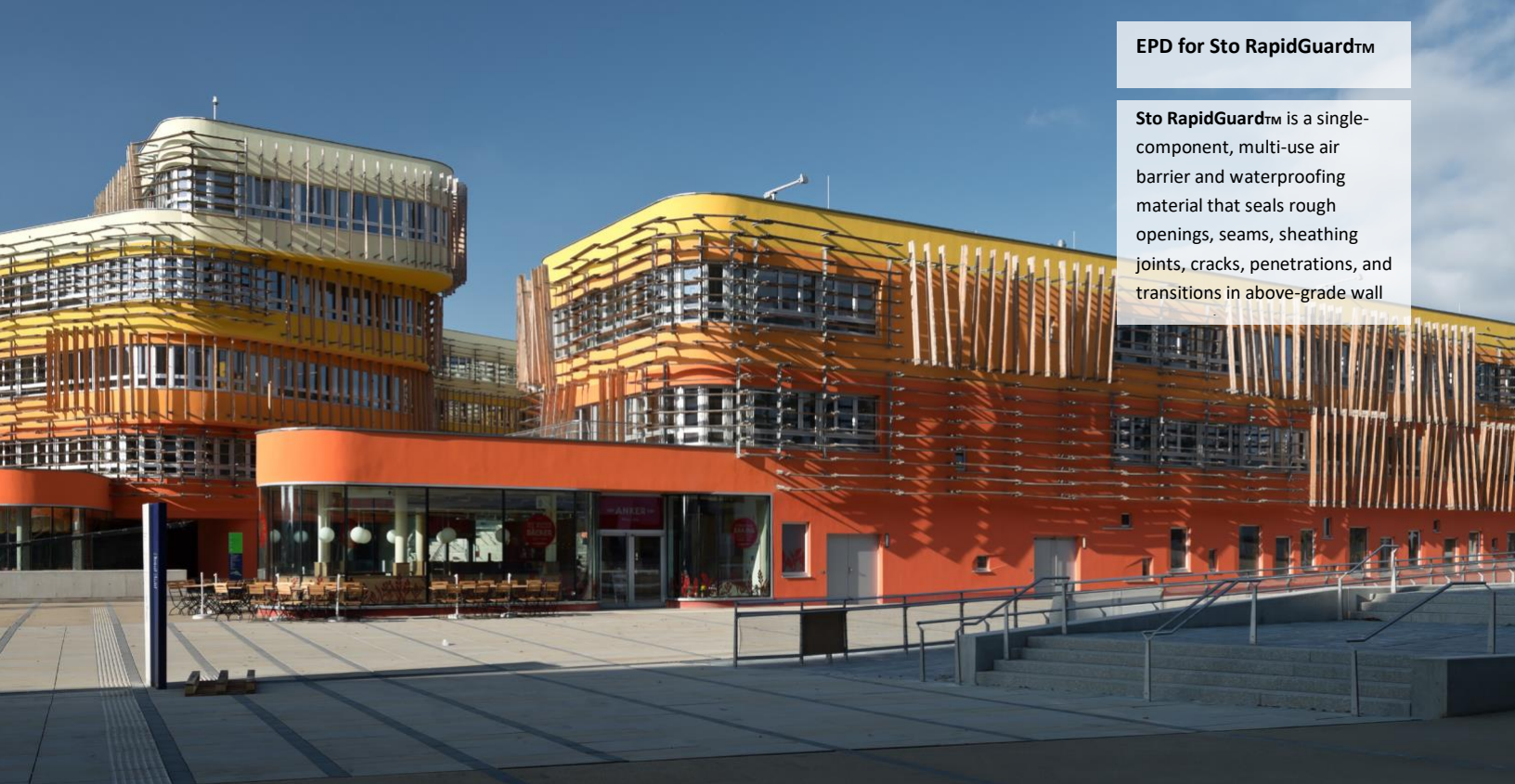
Overall, the Product Stage which includes raw material extraction delivery and product manufacturing are the highest contributors to all impact indicators except POCP where the contribution from application phase is more prominent because of VOC emission.

» Reference

- Life Cycle Assessment, LCA report for Sto Corp. WAP Sustainability, September 2019
- PCR for Architectural Coatings: NAICS 325510. NSF International, 2017
- ISO14044:2006 Environmental Management–Life cycle assessment–Requirements and Guidelines.
- ISO 14025:2006 Environmental labels and declarations – Type III environmental declarations – Principles and Procedures.
- ISO 21930:2007 Sustainability in buildings and civil engineering works – Core rules for environmental product declarations of construction products and services.
- Advancing Sustainable Materials Management: 2015 Fact Sheet. US EPA. Available at https://www.epa.gov/sites/production/files/2018-07/documents/2015_smm_msw_factsheet_07242018_fnl_508_002.pdf
- Product Bulletin – Sto Gold Coat. Sto Corp. Available at https://www.stocorp.com/wp-content/content/Products_TechService/Air%20Moisture%20Barriers/Product%20Bulletins/PB_81636_Sto_Gold%20Coat_EN.pdf

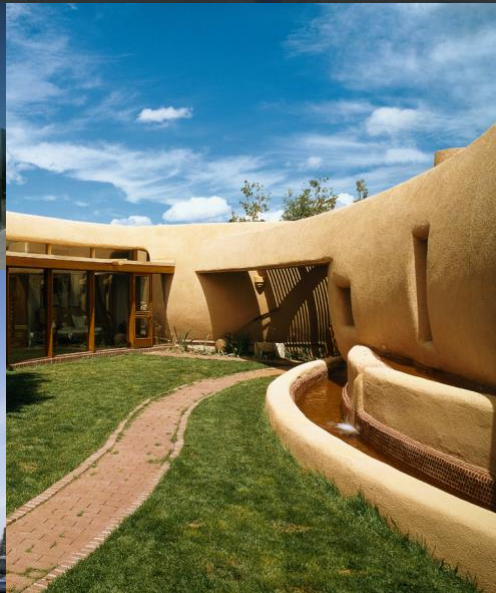


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EPD for Sto RapidGuard™

Sto RapidGuard™ is a single-component, multi-use air barrier and waterproofing material that seals rough openings, seams, sheathing joints, cracks, penetrations, and transitions in above-grade wall





Manufacturer Name	Sto Corp. 3800 Camp Creek Parkway SW, Building 1400, Suite 120, Atlanta, GA 30331 www.stocorp.com (800) 221-2397
EPD Program Operator	Epsten Group 101 Marietta St. Suite 2600, Atlanta, GA 30303 www.epstengroup.com
Compliance to ISO21930:2017	Yes
Product Name	Sto RapidGuard™
Product's Intended Application and Use	Air Barrier and Waterproofing Membrane
Declaration Number	01-006
Date of Certification	December 18 th , 2019
Period of Validity	5 years from date of certification
Functional Unit	One square meter of covered substrate for 60 years
Reference Service Life used in assessment	10 Years
Overall Data Quality Assessment Score	Good
Manufacturing Location	Facility in Guelph, ON, Canada
LCA Software and Version Number	GaBi 9.2.0.58
LCI Database and Version Number	GaBi Database, Service Pack 39
ISO 21930: 2017 serves as the core PCR Independent verification of the declaration and data, according to ISO 21930:2017 and ISO 14025:2006 <input type="checkbox"/> Internal <input checked="" type="checkbox"/> External	Kate McFeaters kmcfeaters@epstengroup.com <i>Katherine McFeaters</i>
This life cycle assessment was conducted in accordance with ISO 14044 and the reference PCR by:	WAP Sustainability Consulting, LLC
This life cycle assessment was independently verified in accordance with ISO 14044 and the reference PCR by:	Kate McFeaters kmcfeaters@epstengroup.com <i>Katherine McFeaters</i>

Comparability

In order to support comparative assertions, this EPD meets all comparability requirements stated in ISO 14025:2006. However, differences in certain assumptions, data quality, and variability between LCA data sets may still exist. As such, caution should be exercised when evaluating EPDs from different manufacturers, as the EPD results may not be entirely comparable. Any EPD comparison must be carried out at the building level per ISO 21930 guidelines. The results of this EPD reflect an average performance by the product and its actual impacts may vary on a case-to-case basis.

» Company

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» Manufacturing Sites Covered in this EPD

Manufacturing location is Guelph, ON, Canada

» Performance Features

Waterproof Material
Vapor Permeable

No mesh/fabric/tapes needed at rough openings and sheathing joints
Fast Cure

Cures in wet weather and on damp substrates
Gun Applied



» Product Identification

RapidGuard™ is offered in two packaging options. Table 1 lists the products declared in this EPD.

Table 1: List of RapidGuard™ Products

Product Name	Product Number
Sto RapidGuard™ Cartridge	81571-740
Sto RapidGuard™ Sausage	81571-741

» Product Description

Sto RapidGuard™ is a single-component, multi-use air barrier and waterproofing material that seals rough openings, seams, sheathing joints, cracks, penetrations, and transitions in above-grade wall construction.

» Technical Details

Table 2 : Technical Data

Performance*	Test Method	Test Criteria	Result
Water Penetration Resistance	AATCC-127 (waster column)	Resist 21.6" (55 cm) water for 5 hours	No water penetration
Tensile Strength	ASTM D412	n/a	250 psi (1724 kPa)
Elongation at Break	ASTM D412	n/a	400%
Durometer Hardness	ASTM D2240	Shore A	40-45 points
Adhesion (psi)	ASTM D4541	>50 psi (345 kPa) or substrate failure: OSB, Plywood, Concrete, CMU, Vinyl, Galvanized Steel, and Gypsum Sheathing	> 50 psi (345 kPa) > 20 psi (138 kPa) to gypsum sheathing (substrate failure)
Water Vapor Permeability (@DFT)	ASTM E96 (wet cup method)	n/a	6.18 perms @ 20 mils (353 ng/s•m ² •Pa) 5.37 perms @ 30 mils (307 ng/s•m ² •Pa)
Air Leakage Resistance	ASTM E2178	Less than 0.02 L/s/m ²	Pass
% Solids by Volume	n/a	n/a	98%
VOC Content	n/a	Compliant with EPA and South Coast AQMD requirements for Building Envelope Coatings	< 21 g/L
Building Code Compliance	Meets requirements of 2015 IBC, IRC, and IECC as an air barrier and joint treatment, ICC AC 212 and ASTM E 2570		

*Results are based on lab testing under controlled conditions. Results can vary between labs or from field tests.

» Material Composition

The material composition of RapidGuard™ is listed below:

Table 3: Material composition of RapidGuard™

Ingredient	Mass %
Calcium Carbonate	45-55%
Plasticizers	25-30%
Silane Polymer	17-24%
Colorant	2-3%
Wax	1-2%
Silica	1-2%
Other Additives	<1%

» Components related to Life Cycle Assessment

The functional unit for the LCA study was covering 1 square meter (m²) of substrate for a period of 60 years—the assumed lifetime of a building. The reference flow required for the functional unit is calculated based on the product lifespan scenarios prescribed in ISO 21930:2017. The reference service life of the product is 10 years which is the warranty of Sto's wall system. The reference flow required for one functional unit is provided in Table 4.

Table 4: Reference flow and Functional Unit

Product	Functional Unit [1 m ²]	Reference Flow [kg]
RapidGuard™	1	7.68

» Scope and Boundaries of the Life Cycle Assessment

The LCA was performed in accordance with ISO 14040 standards. The study is a cradle-to-grave LCA and includes the following life stages as prescribed in ISO 21930:2017.

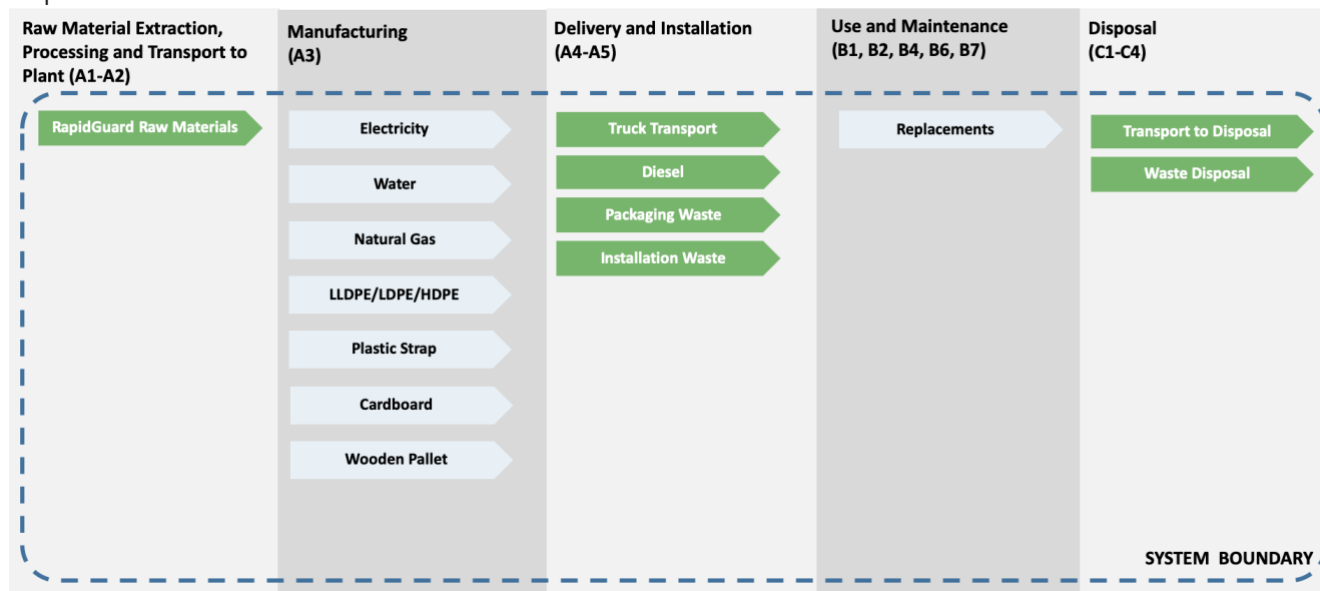


Figure 1: Life stages for the cradle-to-grave LCA

» Cut-off Criteria

Material inputs greater than 1% (based on total mass of the final product) were included within the scope of analysis. Material inputs less than 1% were included if sufficient data was available to warrant inclusion and/or the material input was thought to have significant environmental impact. Cumulative excluded material inputs and environmental impacts are less than 5% based on total weight of the functional unit.

» Data Quality

The overall data quality level was determined to be good. Primary data was collected from the manufacturing facility in Guelph, ON in Canada for the 2018 reference year. When primary data did not exist, secondary data were obtained from the Gabi V9.2.0.58 Database Service Pack 39. Overall, both primary and secondary data are considered good quality in terms of geographic, temporal and technological coverage.

» Estimates and Assumption

Assumptions were made to represent the cradle-to-grave environmental performance of Sto's products. These assumptions include the transportation distances, the disposal of packaging material and the product at its end of life and use phase assumptions.

» Allocation

General principles of allocation were based on ISO 14040/44. Where possible, allocation was avoided. When allocation was necessary it was done on a physical mass basis. To derive a per unit value for manufacturing inputs such as electricity, water, heating oil and natural gas, a series of allocation calculations were adopted. The facility level of utility data was allocated based on production values of different types of products in the same manufacturing facility. Then the data is further allocated among products of different packaging specifications based on the mass because it is believed the energy consumption and water consumption correlated better on a mass basis.

» Production Stage (A1-A3)

RapidGuard™ is manufactured in Guelph, ON in Canada. This stage includes an aggregation of raw material extraction, supplier processing, delivery, manufacturing and packaging by the manufacturer. The raw materials used in the production manufacturing are sourced from the USA, Europe and China. After proper homogenization, the product is filled in 29-oz. (0.86-L) cartridges and 20-oz. (0.6-L) sausages, and then further packaged in cartons and shipped on wooden pallets from Canada to facilities in the US for distribution.

» Transport to Construction Site (A4)

RapidGuard™ is assumed to be shipped from the manufacturing facility in Canada to distribution facilities in the US via truck. From the distribution facilities, the product is shipped to construction sites. Table 5 gives the transportation details including the distances and the truck dataset used in the model. Transport distances are calculated based on the locations of the manufacturing facility, the distribution facilities, and customers' zip codes retrieved from the sales records.

Table 5: Transport Details

Parameter	Details	Unit
Type of transport	Truck	-
Fuel type	Diesel	-
Liters of fuel	39.0625	l/100km
Vehicle type	Heavy duty diesel truck/ 45,000 lb payload	-
Transport distance from the manufacturing facility to distribution facilities	1724.17	km
Transport distance from the distribution facilities to construction sites	782.21	km

» Installation (A5)

RapidGuard™ is a one-component product without the need for mixing. The product can be applied with a caulking gun and spread with a dry joint knife, trowel or spatula while material is still wet. Detailed installation instructions can be found at Sto's website.

The installation process is manual. Thus, no energy or no material input other than the product is required. The LCA study considered a 10% of product loss in the installation process. Together with the product loss, the waste derived from the packaging material coming with the product are disposed of properly. In addition, the VOC emission from the curing of applied RapidGuard™ was also taken into account.

Table 6: Installation (A5)

Parameter	Value	Unit
Product loss per functional unit	7.68E-01	kg/ESL
Waste materials at the construction site before waste processing, generated by product installation	2.21E+00	kg/ESL
Plastic material recycled	1.77E-01	kg/ESL
Plastic material landfilled	1.47E+00	kg/ESL
Plastic material incinerated	3.02E-01	kg/ESL
Cardboard recycled	1.19E-01	kg/ESL
Cardboard landfilled	4.79E-02	kg/ESL
Cardboard incinerated	1.16E-02	kg/ESL
GWP based in biogenic carbon content of cardboard packaging	6.30E-01	kg CO ₂ e/ESL
Wood material recycled	1.40E-02	kg/ESL
Wood material landfilled	5.85E-02	kg/ESL
Wood material incinerated	1.36E-02	kg/ESL
GWP based in biogenic carbon content of wood packaging	1.55E-01	kg CO ₂ e/ESL
Direct emissions to ambient air	9.43E-02	kg/ESL

» Use Stage (B1-B5 & B6-B7)

Since the product is applied under a wall surface, there are no use phase inputs required to maintain the performance of the product other than the replacement needed through the estimated service life (ESL) of a whole building. The ESL in the study is assumed to be 60 years which is a standard established and used in many PCRs of similar product categories such as architectural coating. The RSL of the product is determined by the warranty of the product, which is ten years. Therefore, after initial installation on a building with a 60-year service life, there will be five replacements needed. Besides the emissions to the air disclosed in the above table, there are no other emissions to air, soil or water, including those of any regulated substances.

Table 7: Replacement (B4)

Parameter	Value	Unit
Reference Service Life (RSL)	10	Years
Estimated Service Life (ESL)	60	Years
Replacement cycle	5	(ESL/RSL)-1
Declared product properties	As per Product Identification section	-
Design application parameters	As per technical details in Table 2	-
An assumed quality of work, when installed in accordance with the manufacturer's instructions	Industry Standard	-

>> End-of-Life Stage (C1-C4)

In this stage, the product at its end of life is transported to the waste disposal facility and processed. Included in this stage are the following:

- Deconstruction – There are no impacts during this stage as the product is manually removed.
- Transportation to disposal – Estimated fuel requirements made based on weight of product and average distance to landfill.
- Waste processing for landfilling – This process is included in the landfilling process.
- Waste disposal – Due to the fact that all the products in study are installed as part of a wall system including the external coating/finish, and are not able to be dismantled based on their material type, it is reasonable to assume that the products at their end-of-life stage are landfilled.

Table 8: End-of-Life Parameters

	RapidGuard™	Unit
Collected with mixed construction waste	6.82	kg/ESL
Landfilling	100	%
Product for final deposition	6.82	kg/ESL

» Life Cycle Assessment Results

As prescribed by ISO 21930:2017, TRACI 2.1 impact characterization methodology and IPCC 5th assessment report are adopted to calculate the environment impacts. Table 9 provides the acronym key of the impact indicators declared in this EPD.

Table 9: LCIA impact category and LCI Indicator keys

Abbreviation	Parameter	Unit
TRACI 2.1		
AP	Acidification potential of soil and water	kg SO ₂ eq
EP	Eutrophication potential	kg N eq
GWP	Global warming potential including biogenic carbon emission	kg CO ₂ eq
ODP	Depletion of stratospheric ozone layer	kg CFC 11 eq
POCP	Photochemical ozone creation potential	kg O ₃ eq
ADP-Fossil Fuel	Abiotic depletion potential for fossil resources (An indicator derived from CML 2001-Jan 2016)	MJ, net calorific value
Resource Use Parameters		
RPR _E	Renewable primary energy as energy carrier	MJ, net calorific value
RPR _M	Renewable primary energy resources as material utilization	MJ, net calorific value
NRPR _E	Non-renewable primary energy as energy carrier	MJ, net calorific value
NRPR _M	Non-renewable primary energy as material utilization	MJ, net calorific value
SM	Use of secondary material	kg
RSF	Use of renewable secondary fuels	MJ, net calorific value
NRSF	Use of non-renewable secondary fuels	MJ, net calorific value
RE	Recovered energy	MJ, net calorific value
FW	Use of fresh water	m ³
Waste Parameters		
HWD	Disposed-of-hazardous waste	kg
NHWD	Disposed-of non-hazardous waste	kg
HLRW	High-level radioactive waste disposed	kg
ILLRW	Intermediate and low-level radioactive waste disposed	kg
Carbon Removal and Emission Parameter		
BCRP	Biogenic Carbon Removal from Product	kg CO ₂ eq
BCEP	Biogenic Carbon Emission from Product	kg CO ₂ eq
BCRK	Biogenic Carbon Removal from Packaging	kg CO ₂ eq
BCEK	Biogenic Carbon Emission from Packaging	kg CO ₂ eq
BCEW	Biogenic Carbon Emission from Combustion of Waste from Renewable Sources Used in Production Processes	kg CO ₂ eq
CCE	Calcination Carbon Emissions	kg CO ₂ eq
CCR	Carbonation Carbon Removals	kg CO ₂ eq
CWNR	Carbon Emissions from Combustion of Waste from Non- Renewable Sources used in Production Processes	kg CO ₂ eq

» Sto RapidGuard™ – Results

TRACI Results and ADP-Fossil Fuel

Impact Category	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
AP [kg SO ₂ eq]	2.50E-02	1.45E-03	3.19E-04	0.00E+00	0.00E+00	0.00E+00	1.35E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.60E-06	0.00E+00	2.29E-04	MND
EP [kg N eq]	7.68E-04	1.20E-04	9.48E-05	0.00E+00	0.00E+00	0.00E+00	4.97E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.96E-07	0.00E+00	1.17E-05	MND
GWP [kg CO ₂ eq]	4.49E+00	3.02E-01	1.64E-01	0.00E+00	0.00E+00	0.00E+00	2.50E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.72E-03	0.00E+00	4.99E-02	MND
ODP [kg CFC 11 eq]	3.13E-13	-1.62E-15	-1.19E-15	0.00E+00	0.00E+00	0.00E+00	1.54E-12	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-1.47E-17	0.00E+00	-2.62E-15	MND
POCP [kg O ₃ eq]	1.94E-01	3.31E-02	2.61E-03	0.00E+00	0.00E+00	0.00E+00	1.17E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.93E-04	0.00E+00	4.59E-03	MND
ADP-fossil fuel [MJ]	8.28E+01	4.26E+00	3.13E-01	0.00E+00	0.00E+00	0.00E+00	4.41E+02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.85E-02	0.00E+00	7.77E-01	MND

Resource Use

Impact Category	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
RPR _E [MJ]	1.80E+01	1.33E-01	2.14E-02	0.00E+00	0.00E+00	0.00E+00	9.11E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.20E-03	0.00E+00	6.08E-02	MND
RPR _M [MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	MND
NRPR _E [MJ]	8.96E+01	4.29E+00	3.22E-01	0.00E+00	0.00E+00	0.00E+00	4.75E+02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.87E-02	0.00E+00	7.97E-01	MND
NRPR _M [MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	MND
SM [kg]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	MND
RSF [MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	MND
NRSF [MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	MND
RE [MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	MND
FW [m ³]	3.84E-02	5.14E-04	2.70E-04	0.00E+00	0.00E+00	0.00E+00	1.96E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.64E-06	0.00E+00	9.46E-05	MND

Waste

Impact Category	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
HWD [kg]	1.85E-07	3.47E-08	1.11E-09	0.00E+00	0.00E+00	0.00E+00	1.12E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.14E-10	0.00E+00	2.79E-09	MND
NHWD [kg]	4.63E-01	1.62E-04	3.48E-01	0.00E+00	0.00E+00	0.00E+00	9.75E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.46E-06	0.00E+00	1.14E+00	MND
HLRW [kg]	3.62E-06	1.15E-08	4.38E-09	0.00E+00	0.00E+00	0.00E+00	1.82E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.03E-10	0.00E+00	9.70E-09	MND
ILLRW [kg]	2.70E-03	9.49E-06	3.52E-06	0.00E+00	0.00E+00	0.00E+00	1.36E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.56E-08	0.00E+00	7.72E-06	MND

Carbon Removal and Emission

Indicator	RapidGuard™
BCRP [kg CO2 eq]	7.80E-01
BCEP [kg CO2 eq]	7.85E-01
BCRK [kg CO2 eq]	1.36E-01
BCEK [kg CO2 eq]	6.26E-02
BCEW [kg CO2 eq]	0.00E+00
CCE [kg CO2 eq]	0.00E+00
CCR [kg CO2 eq]	0.00E+00
CWNR [kg CO2 eq]	0.00E+00

>> Interpretation

In one reference service life of the product, the production stage, which includes raw material extraction, transportation from suppliers and manufacturing, is the highest contributor to all impact indicators. The impact from the remaining stages is negligible. From the perspective of a whole building lifespan, the vast majority of the impacts are derived from the number of replacements needed. This is directly related to the impacts associated with the manufacture of new products that are used to replace the original. Improving the relatively short lifespan of the product is essential to reducing the overall impact of the product.

>> Reference

- Life Cycle Assessment, LCA report for Sto Corp. WAP Sustainability, October 2019
- ISO14044:2006 Environmental Management–Life cycle assessment–Requirements and Guidelines.
- ISO 14025:2006 Environmental labels and declarations – Type III environmental declarations – Principles and Procedures.
- ISO 21930:2007 Sustainability in buildings and civil engineering works – Core rules for environmental product declarations of construction products and services.
- Sto Studio. Sto Corp, 2019. Available at <https://www.stocorp.com/sto-studio-us/>
- Installation Guide, Sto RapidGuard. Sto Corp. Available at [https://www.stocorp.com/wp-content/content/Systems_TechService/Air%20and%20Moisture%20Barriers/Installation%20and%20Repair/IG_Sto%20RapidGuard%20Installation%20Guide\(HiRes\).pdf](https://www.stocorp.com/wp-content/content/Systems_TechService/Air%20and%20Moisture%20Barriers/Installation%20and%20Repair/IG_Sto%20RapidGuard%20Installation%20Guide(HiRes).pdf)

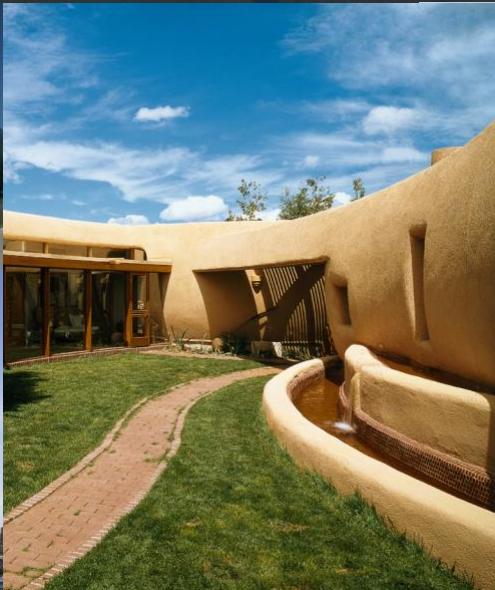


Building with conscience.





**EPD for StoGuard®
Transition Membrane**

StoGuard® Transition Membrane is a flexible air barrier membrane for use on vertical above grade wall construction over properly prepared concrete, concrete masonry (CMU), glass mat gypsum sheathing and Exterior or Exposure I wood-based sheathing.





Manufacturer Name	Sto Corp. 3800 Camp Creek Parkway SW, Building 1400, Suite 120, Atlanta, GA 30331 www.stocorp.com (800) 221-2397
EPD Program Operator	Epsten Group 101 Marietta St. Suite 2600, Atlanta, GA 30303 www.epstengroup.com
Compliance to ISO21930:2017	Yes
Product Name	StoGuard® Transition Membrane
Product's Intended Application and Use	Flexible air barrier membrane
Declaration Number	01-007
Date of Certification	December 18 th , 2019
Period of Validity	5 years from date of certification
Functional Unit	One square meter of covered substrate for 60 years
Reference Service Life used in assessment	10 Years
Overall Data Quality Assessment Score	Good
Manufacturing Location	Wörschach, Austria
LCA Software and Version Number	GaBi 9.2.0.58
LCI Database and Version Number	GaBi Database, Service Pack 39
ISO 21930: 2017 serves as the core PCR Independent verification of the declaration and data, according to ISO 21930:2017 and ISO 14025:2006 <input type="checkbox"/> Internal <input checked="" type="checkbox"/> External	Kate McFeaters kmcfeaters@epstengroup.com 
This life cycle assessment was conducted in accordance with ISO 14044 and the reference PCR by:	WAP Sustainability Consulting, LLC
This life cycle assessment was independently verified in accordance with ISO 14044 and the reference PCR by:	Kate McFeaters kmcfeaters@epstengroup.com 

Comparability

In order to support comparative assertions, this EPD meets all comparability requirements stated in ISO 14025:2006. However, differences in certain assumptions, data quality, and variability between LCA data sets may still exist. As such, caution should be exercised when evaluating EPDs from different manufacturers, as the EPD results may not be entirely comparable. Any EPD comparison must be carried out at the building level per ISO 21930 guidelines. The results of this EPD reflect an average performance by the product and its actual impacts may vary on a case-to-case basis.

» Company

We believe in 'Building with conscience'.

That means ensuring that all building products are not only safe, effective and easy to install, but also environmentally responsible and sustainable. We know you're always looking for the smartest and newest technology to create energy efficient buildings with superior aesthetics.

That's exactly what our products help you achieve. Products like our wall systems, coatings and finishes are consistent favorites among design professionals, contractors and property owners alike. Whatever your needs or vision may be, we offer products for every type of building project; whether it's new construction, restoration or panelization, commercial or residential work.

An architect or specifier focuses on aesthetics and feasibility, a contractor needs products that are easy to work with, and a building owner requires high value and low costs on properties. Sto understands these unique needs, and delivers the smart, innovative materials and solutions that make this all possible. That's why Sto remains the innovative leader in integrated exterior wall systems.

When you combine that commitment to product support and innovation with value-added offerings like consultative design and color services through Sto Studio or training in proper application techniques through the Sto Institute, you get an integrated exterior wall system solution unmatched in the industry.

» Manufacturing Sites Covered in this EPD

Manufacturing location is Wörschach, Austria.

» Product Description

StoGuard® Transition Membrane is applicator-friendly and cost-saving:

- StoGuard® Transition Membrane can be easily applied without the use of special tools or applicator training.
- Thanks to the durability of StoGuard® Transition Membrane, it will not tear or lose effectiveness while in service.
- Because StoGuard® Transition Membrane is a fully adhered product, it will not peel or suffer loss of adhesion along edges.
- StoGuard® Transition Membrane will not stain surfaces due to adhesive leaching or streaking.
- StoGuard® Transition Membrane does not require the use of primers or terminations mastics for proper installation.
- Because StoGuard® Transition Membrane is a flexible material, it can be used in a wide range of applications for both static and dynamic joint conditions. One product solves multiple job site conditions.
- StoGuard® Transition Membrane is compatible with all StoGuard® vapor permeable or vapor impermeable membranes.



» Product Identification

StoGuard® Transition Membrane is offered in five different width options. It is a flexible air barrier membrane for use on vertical above grade wall construction over properly prepared concrete, concrete masonry (CMU), glass mat gypsum sheathing and Exterior or Exposure I wood-based sheathing. Table 1 lists the products declared in this EPD.

Table 1: List of StoGuard® Transition Membrane Products

Product Name	Product #	Width
StoGuard® Transition Membrane	81272	120 mm (4.75")
	81342	152 mm (6")
	81343	228 mm (9")
	81344	304 mm (12")
	81349	457 mm (18")

» Performance Features

Waterproof	Flexible	Fully adhered membrane	No adhesive leaching	Compatible with other StoGuard® products
Fast and easy to install	Durable	UV-resistant	Versatile	Sustainability

» Technical Details

Table 2: Technical Data

Performance	Test Method	Test Criteria	Result
Elongation*	ASTM D412	Measure	260%
Tensile Strength*	ASTM D412	Measure	60 psi (.41 MPa)
Tear and Adhesion Properties at 25% Elongation	ASTM C1523	No tearing or loss of adhesion after conditioning	Pass after dry, wet, frozen, and heat aged conditioning
Water Vapor Permeance	ASTM E96		1.48 perms (85 ng/Pa•s•m2)
Air Leakage**	ASTM E2178	≤ 0.02 L/m2•s @ 75 Pa (≤ 0.004 cfm/ft2 @ 1.57 psf)	Passed
Water Column	AATCC 127 (modified)	No leakage for 5 hours minimum	Passed
Adhesion	ASTM D4541	≥ 60 psi (414 kPa)	Passed on plywood, OSB, concrete, and CMU substrates. Exceeded strength of glass mat facing attachment when adhered to glass mat gypsum sheathing
Cyclic Elongation	Lab Method	500 cycles at 0% to 50% elongation and return	No loss of continuity of membrane or loss of bond at joint

*Elongation and Tensile strength measured in transverse direction (perpendicular to length of roll).

** Based on extrapolation of similar E2178 test data.

» Material Composition

The material composition of StoGuard® Transition Membrane is listed below:

Table 3: Material composition of StoGuard® Transition Membrane

Ingredient	Mass %
Polyester	20-25%
Thermoplastic Elastomer	75-80%
Colorant	0.04%

» Components related to Life Cycle Assessment

The functional unit for the EPD was covering 1 square meter (m²) of substrate for a period of 60 years—the assumed lifetime of a building. The reference flow required for the functional unit is calculated based on the product lifespan scenarios prescribed in ISO 21930:2017. The reference service life of the product is 10 years which is the warranty of Sto’s wall system. Because the impacts of the product applied on different substrates differ by more than 10%. The results will be reported separately for application on plywood and CMU, which is respectively the lower and upper band of the amount of installation material. The reference flow required for one functional unit is provided in Table 4.

Table 4: Reference flow and Functional Unit

Substrate	Functional Unit [1 m ²]	Product	Reference Flow of product [kg]	Installation Material	Reference Flow of installation material [kg]
Plywood	1	StoGuard®	2.4	Sto Gold Coat	5.6
CMU		Transition Membrane			12.06

» Scope and Boundaries of the Life Cycle Assessment

The LCA was performed in accordance with ISO 14040 standards. The study is a cradle-to-grave LCA and includes the following life stages as prescribed in ISO 21930:2017.

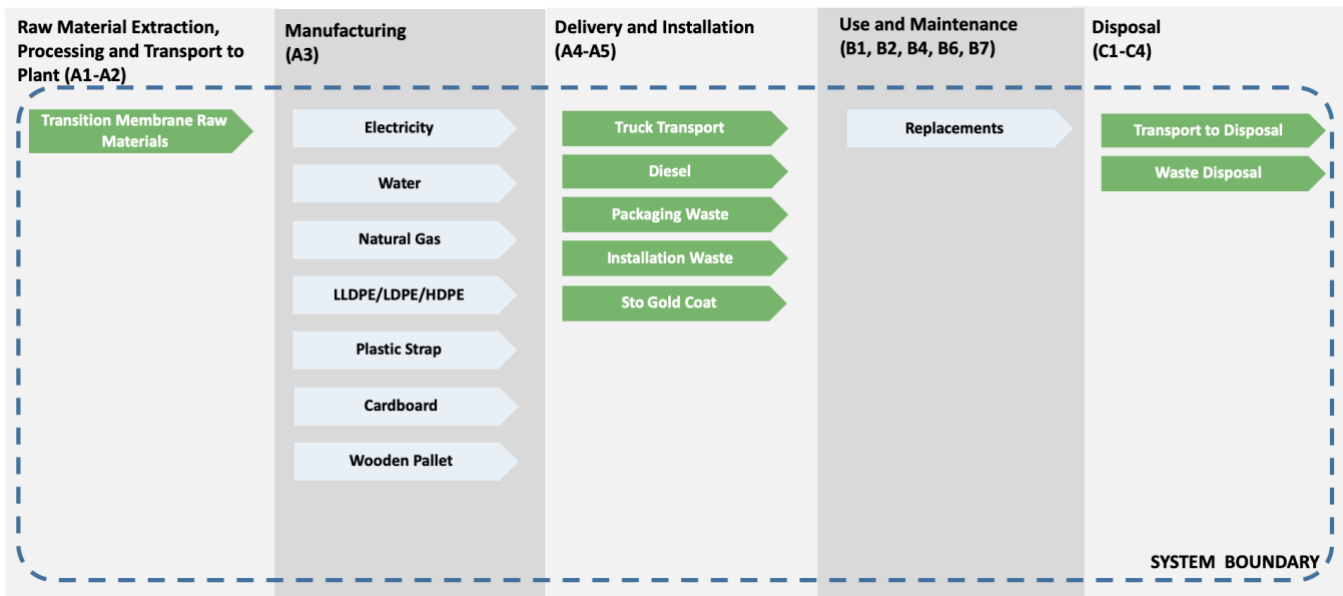


Figure 1: Life stages for the cradle-to-grave LCA

» Cut-off Criteria

Material inputs greater than 1% (based on total mass of the final product) were included within the scope of analysis. Material inputs less than 1% were included if sufficient data was available to warrant inclusion and/or the material input was thought to have significant environmental impact. Cumulative excluded material inputs and environmental impacts are less than 5% based on total weight of the functional unit.

» Data Quality

The overall data quality level was determined to be good. Primary data was collected from the manufacturing facility in Wörschach, Austria for the 2018 reference year. When primary data did not exist, secondary data were obtained from the Gabi V9.2.0.58 Database Service Pack 39. Overall, both primary and secondary data are considered acceptable quality in terms of geographic, temporal and technological coverage.

» Estimates and Assumption

Assumptions were made to represent the cradle-to-grave environmental performance of Sto's products. These assumptions include up stream and downstream transportation distances, the disposal of packaging material, the method in which the product is disposed of at its end of life and relevant use phase assumptions.

» Allocation

General principles of allocation were based on ISO 14040/44. Where possible, allocation was avoided. When allocation was necessary it was done on a physical mass basis. To derive a per unit value for manufacturing inputs such as electricity, water, and natural gas, a series of allocation calculations were adopted. The facility level of utility data was allocated based on production values of different types of products in the same manufacturing facility. Then the data is further allocated among products of different specifications based on the mass because it is believed the energy consumption and water consumption correlated better on a mass basis.

» Production Stage (A1-A3)

StoGuard® Transition Membrane is manufactured in Wörschach, Austria. This stage includes an aggregation of raw material extraction, supplier processing, delivery, manufacturing and packaging by the manufacturer.

» Transport to Construction Site (A4)

The product is assumed to be shipped from the manufacturing facility to distribution facilities in the US via truck and ocean freight transportation. From the distribution facilities, the product is shipped to construction sites by trucks. Table 5 gives the transportation details including the distances and the truck dataset used in the model. Transport distances are calculated based on the locations of the manufacturing facility, the distribution facilities, and customers' zip codes retrieved from the sales records.

Table 5: Transport Details

Parameter	Truck in US	Ocean Vessel	Truck in EU	Unit
Fuel type	Diesel	Heavy fuel oil	Diesel	-
Liters of fuel	39.0625	0.00023	33.1	l/100km
Vehicle type	Heavy duty diesel truck/ 50,000 lb payload	Container ship, 5,00 to 200,000 dwt payload capacity, ocean going	Truck-trailer, Euro 0-6 mix, 34 - 40t gross weight / 27t payload capacity	-
Transport distance from the manufacturing facility to the departure port	n/a	n/a	441	km
Transport from EU to the USA	n/a	14127.62	n/a	km
Transport from arrival port to distribution facilities	446.59	n/a	n/a	km
Transport distance from the distribution facilities to construction sites	636.45	n/a	n/a	km

» Installation (A5)

StoGuard® Transition Membrane is installed with any of the StoGuard® fluid-applied air barrier products: Sto Gold Coat, Sto Emerald Coat, Sto AirSeal or Sto VaporSeal. It also may be installed using Sto Extra Seal cementitious air barrier material. In this EPD, Sto Gold Coat is used as the complementary installation material due to the availability of its LCA data. Detailed application instructions are provided online.

The installation process is manual. Thus no energy or additional material other than the product and Sto Gold Coat is required. The use amount of Sto Gold Coat is calculated based on the coverages on two substrates: plywood and CMU, which give a lower and upper band of the coverage area. The LCA study considered a 10% of product loss as waste in the installation process. Together with the product loss, the waste was also generated from the packaging material. In addition, VOC emissions from the curing of applied Sto Gold Coat was also taken into account.

Table 6: Installation (A5)

Parameter	Transition Membrane on Plywood	Transition Membrane on CMU	Unit
Product loss per functional unit		0.24	kg/ESL
Waste materials at the construction site before waste processing, generated by product installation	1.10E+00	2.07E+00	kg/ESL
Plastic material recycled	9.65E-02	1.82E-01	kg/ESL
Plastic material landfilled	7.99E-01	1.51E+00	kg/ESL
Plastic material incinerated	1.64E-01	3.10E-01	kg/ESL
Cardboard recycled		2.38E-03	kg/ESL
Cardboard landfilled		9.60E-04	kg/ESL
Cardboard incinerated		2.32E-04	kg/ESL
GWP based in biogenic carbon content of cardboard packaging		2.10E-4	kg CO ₂ e/ESL
Wood material recycled		2.64E-03	kg/ESL
Wood material landfilled		1.10E-02	kg/ESL
Wood material incinerated		2.56E-03	kg/ESL
GWP based in biogenic carbon content of wood packaging		2.92E-02	kg CO ₂ e/ESL
Steel material recycled	7.13E-03	1.54E-02	kg/ESL
Steel material landfilled	1.17E-02	2.53E-02	kg/ESL
Steel material incinerated	2.53E-03	5.44E-03	kg/ESL
Direct emissions to ambient air	2.04E-01	3.95E-01	kg/ESL

» Use Stage (B1-B5 & B6-B7)

Since the product is applied under a wall surface, there are no use phase inputs required to maintain the performance of the product other than the replacement needed through the estimated service life (ESL) of a whole building. The ESL in the study is assumed to be 60 years which is a standard established and used in many PCRs of similar product categories such as architectural coating. The RSL of the product is determined by the warranty of the product, which is ten years. Therefore, after initial installation on a building with a 60-year service life, there will be five replacements needed. Besides the emissions to the air disclosed in the above table, there are no other emissions to air, soil or water, including those of any regulated substances.

Table 7: Replacement (B4)

Parameter	Value	Unit
Reference Service Life (RSL)	10	Years
Estimated Service Life (ESL)	60	Years
Replacement cycle	5	(ESL/RSL)-1
Declared product properties	As per Product Identification section	-
Design application parameters	As per technical details in Table 2	-
An assumed quality of work, when installed in accordance with the manufacturer's instructions	Industry Standard	-

» End-of-Life Stage (C1-C4)

In this stage, the product at its end of life is transported to the waste disposal facility and processed. Included in this stage are the following:

- Deconstruction – There are no impacts during this stage as the product is manually removed.
- Transportation to disposal – Estimated fuel requirements made based on weight of product and average distance to landfill.
- Waste processing for landfilling – This process is included in the landfilling process.
- Waste disposal – Due to the fact that all the products in study are installed as part of a wall system including the external coating/finish, and are not able to be dismantled based on their material type, it is reasonable to assume that the products at their end-of-life stage are landfilled.

Table 8: End-of-Life Parameters

Parameter	Transition Membrane on Plywood	Transition Membrane on CMU	Unit
Collected with mixed construction waste	6.98	12.6	kg/ESL
Landfilling	100	100	%
Product for final deposition	6.98	12.6	kg/ESL

» Life Cycle Assessment Results

As prescribed by ISO 21930:2017, TRACI 2.1 impact characterization methodology and IPCC 5th assessment report are adopted to calculate the environment impacts. Table 9 provides the acronym key of the impact indicators declared in this EPD.

Table 9: LCIA impact category and LCI Indicator keys

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EP	Eutrophication potential	kg N eq
GWP	Global warming potential including biogenic carbon emission	kg CO ₂ eq
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POCP	Photochemical ozone creation potential	kg O ₃ eq
ADP-Fossil Fuel	Abiotic depletion potential for fossil resources (An indicator derived from CML 2001-Jan 2016)	MJ, net calorific value
Resource Use Parameters		
RPR _E	Renewable primary energy as energy carrier	MJ, net calorific value
RPR _M	Renewable primary energy resources as material utilization	MJ, net calorific value
NRPR _E	Non-renewable primary energy as energy carrier	MJ, net calorific value
NRPR _M	Non-renewable primary energy as material utilization	MJ, net calorific value
SM	Use of secondary material	kg
RSF	Use of renewable secondary fuels	MJ, net calorific value
NRSF	Use of non-renewable secondary fuels	MJ, net calorific value
RE	Recovered energy	MJ, net calorific value
FW	Use of fresh water	m ³
Waste Parameters		
HWD	Disposed-of-hazardous waste	kg
NHWD	Disposed-of non-hazardous waste	kg
HLRW	High-level radioactive waste disposed	kg
ILLRW	Intermediate and low-level radioactive waste disposed	kg
Carbon Removal and Emission Parameter		
BCRP	Biogenic Carbon Removal from Product	kg CO ₂ eq
BCEP	Biogenic Carbon Emission from Product	kg CO ₂ eq
BCRK	Biogenic Carbon Removal from Packaging	kg CO ₂ eq
BCEK	Biogenic Carbon Emission from Packaging	kg CO ₂ eq
BCEW	Biogenic Carbon Emission from Combustion of Waste from Renewable Sources Used in Production Processes	kg CO ₂ eq
CCE	Calcination Carbon Emissions	kg CO ₂ eq
CCR	Carbonation Carbon Removals	kg CO ₂ eq
CWNR	Carbon Emissions from Combustion of Waste from Non- Renewable Sources used in Production Processes	kg CO ₂ eq

» StoGuard® Transition Membrane on Plywood -- Results

TRACI Results

Impact Category	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
AP [kg SO ₂ eq]	1.75E-03	1.69E-03	9.76E-03	0.00E+00	0.00E+00	0.00E+00	6.73E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.54E-06	0.00E+00	2.54E-04	MND
EP [kg N eq]	1.71E-04	6.90E-05	3.44E-04	0.00E+00	0.00E+00	0.00E+00	2.99E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.83E-07	0.00E+00	1.30E-05	MND
GWP [kg CO ₂ eq]	1.17E+00	9.20E-02	1.96E+00	0.00E+00	0.00E+00	0.00E+00	1.64E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.02E-03	0.00E+00	5.53E-02	MND
ODP [kg CFC 11 eq]	-1.52E-13	-3.88E-16	1.74E-11	0.00E+00	0.00E+00	0.00E+00	8.62E-11	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-1.63E-17	0.00E+00	-2.91E-15	MND
POCP [kg O ₃ eq]	3.17E-02	3.38E-02	7.11E-02	0.00E+00	0.00E+00	0.00E+00	7.09E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.14E-04	0.00E+00	5.09E-03	MND
ADP-fossil fuel [MJ]	3.18E+01	1.20E+00	3.81E+01	0.00E+00	0.00E+00	0.00E+00	3.60E+02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.27E-02	0.00E+00	8.62E-01	MND

Resource Use

Impact Category	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
RPR _E [MJ]	3.00E+00	2.55E-02	1.74E+00	0.00E+00	0.00E+00	0.00E+00	2.41E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.33E-03	0.00E+00	6.74E-02	MND
RPR _M [MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	MND
NRPR _E [MJ]	3.33E+01	1.21E+00	4.09E+01	0.00E+00	0.00E+00	0.00E+00	3.82E+02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.29E-02	0.00E+00	8.84E-01	MND
NRPR _M [MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	MND
SM [kg]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	MND
RSF [MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	MND
NRSF [MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	MND
RE [MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	MND
FW [m ³]	4.74E-03	7.57E-05	1.06E-02	0.00E+00	0.00E+00	0.00E+00	7.74E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.15E-06	0.00E+00	1.05E-04	MND

Waste

Impact Category	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
HWD [kg]	2.54E-08	1.22E-08	3.95E-08	0.00E+00	0.00E+00	0.00E+00	4.03E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.48E-10	0.00E+00	3.10E-09	MND
NHWD [kg]	1.18E-02	3.43E-05	2.61E-01	0.00E+00	0.00E+00	0.00E+00	7.68E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.62E-06	0.00E+00	1.26E+00	MND
HLRW [kg]	7.91E-07	2.76E-09	1.30E-06	0.00E+00	0.00E+00	0.00E+00	1.05E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.15E-10	0.00E+00	1.08E-08	MND
ILLRW [kg]	5.92E-04	2.06E-06	1.08E-03	0.00E+00	0.00E+00	0.00E+00	8.43E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.50E-08	0.00E+00	8.56E-06	MND

» StoGuard® Transition Membrane on CMU – Results

TRACI Results

Impact Category	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
AP [kg SO ₂ eq]	1.75E-03	1.69E-03	1.89E-02	0.00E+00	0.00E+00	0.00E+00	1.14E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.59E-05	0.00E+00	4.24E-04	MND
EP [kg N eq]	1.71E-04	6.90E-05	6.56E-04	0.00E+00	0.00E+00	0.00E+00	4.60E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.47E-06	0.00E+00	2.16E-05	MND
GWP [kg CO ₂ eq]	1.17E+00	9.20E-02	3.77E+00	0.00E+00	0.00E+00	0.00E+00	2.57E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.04E-03	0.00E+00	9.23E-02	MND
ODP [kg CFC 11 eq]	-1.52E-13	-3.88E-16	3.37E-11	0.00E+00	0.00E+00	0.00E+00	1.68E-10	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-2.72E-17	0.00E+00	-4.85E-15	MND
POCP [kg O ₃ eq]	3.17E-02	3.38E-02	1.37E-01	0.00E+00	0.00E+00	0.00E+00	1.06E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.57E-04	0.00E+00	8.49E-03	MND
ADP-fossil fuel [MJ]	3.18E+01	1.20E+00	7.38E+01	0.00E+00	0.00E+00	0.00E+00	5.42E+02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.12E-02	0.00E+00	1.44E+00	MND

Resource Use

Impact Category	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
RPR _E [MJ]	3.00E+00	2.55E-02	3.36E+00	0.00E+00	0.00E+00	0.00E+00	3.25E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.22E-03	0.00E+00	1.13E-01	MND
RPR _M [MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	MND
NRPR _E [MJ]	3.33E+01	1.21E+00	7.91E+01	0.00E+00	0.00E+00	0.00E+00	5.76E+02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.16E-02	0.00E+00	1.48E+00	MND
NRPR _M [MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	MND
SM [kg]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	MND
RSF [MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	MND
NRSF [MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	MND
RE [MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	MND
FW [m ³]	4.74E-03	7.57E-05	2.04E-02	0.00E+00	0.00E+00	0.00E+00	1.27E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.59E-06	0.00E+00	1.75E-04	MND

Waste

Impact Category	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
HWD [kg]	2.54E-08	1.22E-08	7.64E-08	0.00E+00	0.00E+00	0.00E+00	5.99E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.81E-10	0.00E+00	5.17E-09	MND
NHWD [kg]	1.18E-02	3.43E-05	4.65E-01	0.00E+00	0.00E+00	0.00E+00	1.29E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.70E-06	0.00E+00	2.11E+00	MND
HLRW [kg]	7.91E-07	2.76E-09	2.51E-06	0.00E+00	0.00E+00	0.00E+00	1.66E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.91E-10	0.00E+00	1.80E-08	MND
ILLRW [kg]	5.92E-04	2.06E-06	2.10E-03	0.00E+00	0.00E+00	0.00E+00	1.35E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.59E-07	0.00E+00	1.43E-05	MND

Carbon removal and Emission

Indicator	Transition Membrane on plywood	Transition Membrane on CMU
BCRP [kg CO2 eq]	5.86E-02	6.10E-02
BCEP [kg CO2 eq]	5.95E-02	6.13E-02
BCRK [kg CO2 eq]	5.51E-03	5.96E-03
BCEK [kg CO2 eq]	2.05E-03	2.37E-03
BCEW [kg CO2 eq]	0.00E+00	0.00E+00
CCE [kg CO2 eq]	0.00E+00	0.00E+00
CCR [kg CO2 eq]	0.00E+00	0.00E+00
CWNR [kg CO2 eq]	0.00E+00	0.00E+00

» Interpretation

In one reference service life of the product, the stage that contributes the most environmental impact is the installation stage. Unlike many products, the impact derived from the production of the declared product is exceeded by those from the installation of Sto Transition Membrane. This also explains the significant differences in impacts between substrate types. From the perspective of a whole building lifespan, the vast majority of the impacts are derived from the number of replacements needed. This is directly related to the impacts associated with the manufacture of new installation material and new products that are used to replace the original. Improving the relatively short lifespan of the products is essential to reducing the overall impact of the product.

» Reference

- Life Cycle Assessment, LCA report for Sto Corp. WAP Sustainability, October 2019
- ISO14044:2006 Environmental Management–Life cycle assessment–Requirements and Guidelines.
- ISO 14025:2006 Environmental labels and declarations – Type III environmental declarations – Principles and Procedures.
- ISO 21930:2007 Sustainability in buildings and civil engineering works – Core rules for environmental product declarations of construction products and services.
- Sto Studio. Sto Corp, 2019. Available at <https://www.stocorp.com/sto-studio-us/>
- Product Bulletin – StoGuard Transition Membrane. Sto Corp. Available at https://www.stocorp.com/wp-content/content/Products_TechService/Air%20Moisture%20Barriers/Product%20Bulletins/PB_81272_StoGuard_Transition_Membrane_EN.pdf

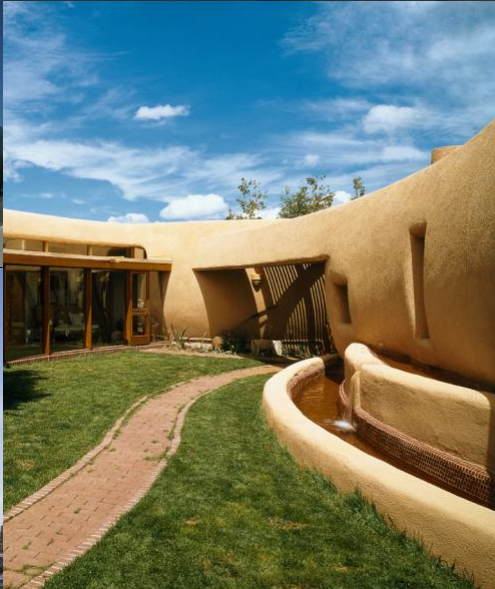


Building with conscience.





EPD for BTS® Plus

Sto BTS® Plus is a one-component, polymer-modified, cement based, dry powder material used as an adhesive and base coat in Sto Wall Claddings, including StoTherm ci Classic and StoTherm ci Lotusan Systems.



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Solutions for a Sustainable World



PCR Identification	PCR for Architectural Coatings: NAICS 325510 on the basis of ISO 21930:2007, NSF International, 2017. Valid through June 23, 2022
Compliance to ISO 14040/44, ISO 14025 and ISO 21930	Yes
Product Category	Exterior Coating
Manufacturer's name	Sto Corp. 3800 Camp Creek Parkway SW, Building 1400, Suite 120 Atlanta, GA 30331 www.stocorp.com (800) 221-2397
EPD program operator	Epsten Group 101 Marietta St. Suite 2600, Atlanta, GA 30303 www.epstengroup.com
Declaration Number	01-004
Date of Certification	December 18 th , 2019
Period of Validity	5 years from date of certification
Functional Unit	One square meter of covered and protected substrate for 60 years
Market-base life used in assessment	10 Years
Design life used in assessment	N/A
Test method employed for determination of design life	N/A
Amount of colorant needed	See table 3
Overall Data Quality Assessment Score	Good
Site(s) in which the results of the LCA are representative	STO manufacturing sites in Atlanta, Georgia; and Glendale, Arizona.
Information on where explanatory material can be obtained	See references at the end of this document.
LCA Software and Version Number	GaBi 9.2.0.58
LCI Database and Version Number	GaBi Database Version 8.7, Service Pack 39
This declaration was independently verified in accordance with ISO 14025: 2006 and the reference PCR: PCR for Architectural Coatings: NAICS 325510 <input type="checkbox"/> Internal <input checked="" type="checkbox"/> External	Kate McFeaters kmcfeaters@epstengroup.com 
This life cycle assessment was conducted in accordance with ISO 14044 and the reference PCR by:	WAP Sustainability Consulting, LLC
This life cycle assessment was independently verified in accordance with ISO 14040/44 and the reference PCR by:	Kate McFeaters kmcfeaters@epstengroup.com 

Comparability

In order to support comparative assertions, this EPD meets all comparability requirements stated in ISO 14025:2006. However, differences in certain assumptions, data quality, and variability between LCA data sets may still exist. As such, caution should be exercised when evaluating EPDs from different manufacturers, as the EPD results may not be entirely comparable. Any EPD comparison must be carried out at the building level per ISO 21930 guidelines. The results of this EPD reflect an average performance by the product and its actual impacts may vary on a case-to-case basis.

» Company

We believe in ‘**Building with conscience**’.

That means ensuring that all building products are not only safe, effective and easy to install, but also environmentally responsible and sustainable. We know you’re always looking for the smartest and newest technology to create energy efficient buildings with superior aesthetics.

That’s exactly what our products help you achieve. Products like our wall systems, coatings and finishes are consistent favorites among design professionals, contractors and property owners alike. Whatever your needs or vision may be, we offer products for every type of building project; whether it’s new construction, restoration or panelization, commercial or residential work.

An architect or specifier focuses on aesthetics and feasibility, a contractor needs products that are easy to work with, and a building owner requires high value and low costs on properties. Sto understands these unique needs, and delivers the smart, innovative materials and solutions that make this all possible. That’s why Sto remains the innovative leader in integrated exterior wall systems.

When you combine that commitment to product support and innovation with value-added offerings like consultative design and color services through [Sto Studio](#) or training in proper application techniques through the Sto Institute, you get an integrated exterior wall system solution unmatched in the industry.

» Manufacturing Sites Covered in this EPD

Atlanta Plant

Glendale Plant

» Performance Features

One-component Polymer Modified	High Polymer/ Cement Ratio Creamy Smooth Consistency	Vapor Permeable High Build	Pre-blended Low Cement Ratio
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» Product Identification

Sto BTS® Plus is offered in 47-lb bags and used as an undercoater. Thus, there are no finish or color base options provided.

Table 1: BTS® Plus Identification

Product Name	Product Number	Base Type	Finish Type
Sto BTS® Plus	80130	n/a	n/a



» Product Description

Sto BTS® Plus is a one-component, polymer-modified, cement based, dry powder material used as an adhesive, skim coat and base coat in Sto Wall Claddings, including StoTherm ci Classic and StoTherm ci Lotusan Systems. According to the classification scheme developed by American Coating Association (ACA), BTS® Plus is treated in the study as an undercoater and as per PCR, it should only utilize the market-based lifetime (10 years for exterior undercoater).

» Material Composition

The material compositions of BTS® Plus are listed below:

Table 2: Material composition for BTS® Plus

Ingredient	BTS® Plus
Additives	0-1%
Cement	40-45%
Colorant	0-1%
Polymer	2-3%
Silica	54-55%
Silicate	0-1%

» Components related to Life Cycle Assessment

The functional unit for the LCA study was covering and protecting 1 square meter (m²) of substrate for a period of 60 years—the assumed lifetime of a building. The reference flow required for the functional unit is calculated based on the product lifespan scenarios prescribed in the PCR. The market-based lifetime is 10 years. By default, BTS® Plus has a 5-year warranty. In case it is applied on Sto’s wall systems, the warranty is extended to 10 years. The reference flow required for one functional unit is provided in Table 3.

Table 3: Market-based lifetime and reference flow

	Functional Unit [1 m ²]	Reference Flow [kg]	Tint needed* [kg]
Lifespan			
Market-based Lifetime [10 years]			
BTS® Plus – Adhesive over Rough Masonry	1	40.39	N/A
BTS® Plus – Average		14.12	N/A

» Scope and Boundaries of the Life Cycle Assessment

The LCA was performed in accordance with ISO 14040 standards. The study is a cradle-to-grave LCA and includes the following life stages as prescribed in the PCR.

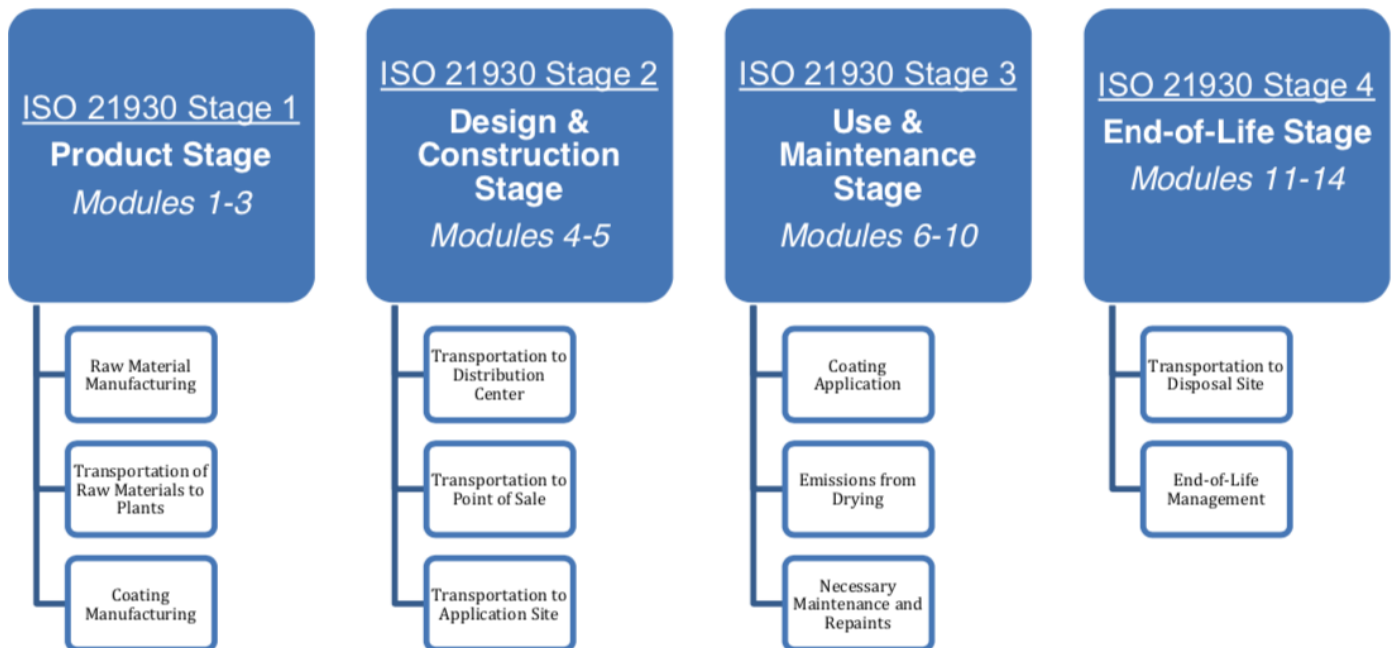


Figure 1: Life stages for the cradle-to-grave LCA

» Cut-off Criteria

Material inputs greater than 1% (based on total mass of the final product) were included within the scope of analysis. Material inputs less than 1% were included if sufficient data was available to warrant inclusion and/or the material input was thought to have significant environmental impact. Cumulative excluded material inputs and environmental impacts are less than 5% based on total weight of the functional unit.

» Data Quality

The overall data quality level was determined to be good. Primary data was collected from Sto's facilities in Atlanta, GA, and Glendale, AZ for the 2018 reference year. When primary data did not exist, secondary data were obtained from the Gabi V8.7 Database Service Pack 39. Overall, both primary and secondary data are considered good quality in terms of geographic, temporal and technological coverage.

» Estimates and Assumption

Assumptions were made to represent the cradle-to-grave environmental performance of Sto's products. These assumptions were made in accordance with the PCR and include the transportation distances, the disposal of packaging material and the product at its end of life and use phase assumptions.

» Allocation

General principles of allocation were based on ISO 14040/44. Where possible, allocation was avoided. When allocation was necessary it was done on a physical mass basis.

» Product Stage

BTS® Plus is a dry-powder product. It is manufactured in both the Atlanta, GA and Glendale, AZ facilities. The facility in Atlanta also supplies BTS® concentrate to Glendale facility, based on which BTS® Plus is produced. BTS® Plus is packaged in a paper bag at 47 pounds (21.3 kgs) per bag. This stage includes an aggregation of raw material extraction, supplier processing, delivery, manufacturing and packaging by Sto.

» Design and Construction Stage

The design and construction process stage starts with the packaged product leaving the production site and ends with being delivered to the application site.

During this stage, the finished product is moved from a shipping dock for distribution. The end gate is the application site after the purchaser acquires the finished product and transports it to the application site.

» Use and Maintenance Stage

The use stage begins when the user prepares the product before applying it to a substrate and ends with any leftover coating and discarded packaging entering the end-of-life stage. Detailed application instructions are provided online. The application procedure includes mixing and applying. In the mixing process, BTS® Plus requires the addition of water at an average rate of 5.45 kg of water per 21.3-kg bag. As recommended, an electric drill/mixer and a spray pump are assumed to be used for mixing and application. The equipment is not included in the study as these are multi-use tools and the impacts per declared unit is considered negligible, but electricity to power application tools has been included.

As prescribed in the PCR, 10% of the wet mass of BTS® Plus is assumed to be unused and properly disposed of.

» End-of-Life Stage

Table 4: End-of-life Disposal Scenarios

Waste Flow	Recycling	Incineration	Landfilling
Paper Packaging	66.6%	6.01%	27.39%
Unused Product	0%	0%	100%
Post-Consumer Product	0%	0%	100%

In this stage, the disposal of installation waste, packaging waste and product waste at its end of life is included. The disposal pathway of each waste stream is modeled based on the recommendation of PCR and US EPA's latest waste management fact sheet.

» Life Cycle Assessment Results

As prescribed by the PCR, TRACI 2.1 impact characterization methodology and IPCC 5th assessment report are adopted to calculate the environment impacts. Table 5 provides the acronym key of the impact indicators declared in this EPD.

Table 5: LCIA impact category and LCI Indicator keys

Abbreviation	Parameter	Unit
TRACI 2.1		
AP	Acidification potential of soil and water	kg SO ₂ eq
EP	Eutrophication potential	kg N eq
GWP	Global warming potential including biogenic carbon emission	kg CO ₂ eq
ODP	Depletion of stratospheric ozone layer	kg CFC 11 eq
POCP	Photochemical ozone creation potential	kg O ₃ eq
Resource Use Parameters		
RPR	Use of renewable primary energy	MJ, net calorific value (LHV)
RMR	Use of renewable Material Resources	kg
NRER	Depletion of Non-Renewable Energy Resources	MJ, net calorific value
NRMR	Depletion of Non-Renewable Material Resources	kg
FW	Consumption of Freshwater	m ³
Waste Parameters		
HWD	Disposed-of-hazardous waste	kg
NHWD	Disposed-of non-hazardous waste	kg
Biogenic Carbon Parameter		
BC	Biogenic Carbon	kg CO ₂ eq
Energy Differentiation Parameters		
HWP	Hydro/wind Power	MJ, net calorific value (LHV)
FE	Fossil Energy	MJ, net calorific value (LHV)
BE	Bio-energy	MJ, net calorific value (LHV)
NE	Nuclear Energy	MJ, net calorific value (LHV)
OE	Other Energy	MJ, net calorific value (LHV)

» BTS® Plus – Adhesive over Rough Masonry

	Indicator	1. Product Stage	2. Design & Construction Stage	3. Use & Maintenance Stage	4. End-of-Life Stage
Market-based lifetime	AP [kg SO ₂ eq]	8.90E-02	1.56E-02	6.73E-04	1.07E-02
	EP [kg N eq]	9.00E-03	1.27E-03	3.03E-05	1.52E-03
	GWP [kg CO ₂ eq]	3.86E+01	3.04E+00	2.42E-01	1.94E+00
	ODP [kg CFC 11 eq]	3.82E-12	2.89E-16	8.03E-16	6.57E-15
	POCP [kg O ₃ eq]	1.61E+00	3.57E-01	5.67E-03	1.79E-01
	RPRE [MJ]	4.35E+01	1.33E+00	5.23E-01	2.22E+00
	NRPRE [MJ]	4.64E+02	4.30E+01	3.85E+00	2.99E+01
	FW [m3]	1.09E-01	5.13E-03	1.18E-02	3.47E-03
	RMR [kg]	2.05E-01	0.00E+00	0.00E+00	0.00E+00
	NRMR [kg]	4.04E+01	0.00E+00	0.00E+00	0.00E+00
	HWD [kg]	7.01E-07	3.49E-07	1.73E-09	1.11E-07
	NHWD [kg]	4.33E+00	1.62E-03	3.30E-03	4.09E+01
	BC [kg CO ₂ eq]			4.21E+00	
	HWP [MJ]			2.67E+00	
	FE [MJ]			3.97E+01	
	BE [MJ]			1.29E+00	
	NE [MJ]			1.04E+01	
	OE [MJ]			1.04E+00	

» BTS® Plus – Average Substrate

	Indicator	1. Product Stage	2. Design & Construction Stage	3. Use & Maintenance Stage	4. End-of-Life Stage
Market-based lifetime	AP [kg SO ₂ eq]	3.11E-02	5.46E-03	2.35E-04	3.73E-03
	EP [kg N eq]	3.15E-03	4.45E-04	1.06E-05	5.30E-04
	GWP [kg CO ₂ eq]	1.35E+01	1.06E+00	8.44E-02	6.78E-01
	ODP [kg CFC 11 eq]	1.34E-12	1.01E-16	2.81E-16	2.30E-15
	POCP [kg O ₃ eq]	5.62E-01	1.25E-01	1.98E-03	6.26E-02
	RPRE [MJ]	1.52E+01	4.66E-01	1.83E-01	7.74E-01
	NRPRE [MJ]	1.62E+02	1.51E+01	1.35E+00	1.04E+01
	FW [m ³]	3.82E-02	1.79E-03	4.12E-03	1.21E-03
	RMR [kg]	7.16E-02	0.00E+00	0.00E+00	0.00E+00
	NRMR [kg]	1.41E+01	0.00E+00	0.00E+00	0.00E+00
	HWD [kg]	2.45E-07	1.22E-07	6.07E-10	3.88E-08
	NHWD [kg]	1.51E+00	5.68E-04	1.15E-03	1.43E+01
	BC [kg CO ₂ eq]			1.47E+00	
	HWP [MJ]			9.34E-01	
	FE [MJ]			1.39E+01	
	BE [MJ]			4.51E-01	
	NE [MJ]			3.64E+00	
	OE [MJ]			3.65E-01	

» Interpretation

Overall, the Product Stage is the major contributor to many impact categories including GWP. This is understandable as cement is a major ingredient of BTS® Plus and it is an energy-intensive material.

» Reference

- Life Cycle Assessment, LCA report for Sto Corp. WAP Sustainability, September 2019
- PCR for Architectural Coatings: NAICS 325510. NSF International, 2017
- ISO14044:2006 Environmental Management–Life cycle assessment–Requirements and Guidelines.
- ISO 14025:2006 Environmental labels and declarations – Type III environmental declarations – Principles and Procedures.
- ISO 21930:2007 Sustainability in buildings and civil engineering works – Core rules for environmental product declarations of construction products and services.
- Advancing Sustainable Materials Management: 2015 Fact Sheet. US EPA. Available at https://www.epa.gov/sites/production/files/2018-07/documents/2015_smm_msw_factsheet_07242018_fnl_508_002.pdf
- Product Bulletin – Sto BTS® Plus. Sto Corp. Available at https://www.stocorp.com/wp-content/content/Products_TechService/Base%20Coats%20and%20Adhesives/Product%20Bulletins/PB_80727_Sto_BTS_Plus_EN.pdf

EJOT Baubefestigungen GmbH

Product sustainability fact sheet

Product information for the building certification scheme LEED v4® (Leadership in Energy and Environmental Design)

The intention of this document is to support project teams pursuing LEED v4 certification by providing an overview of how your products contribute to LEED v4 credits. Basis of this information is Leed v4 credit library (2014 -07)¹

Fastening systems for ETICS

General Information

Company name:	EJOT Baubefestigungen GmbH
Address:	In der Stockwiese 35, 57334 Bad Laasphe, Germany
Contact person:	René Achenbach
Phone:	+49 2752 908 - 7985
Email:	rene.achenbach@ejot.de
Homepage:	www.ejot.de
Date:	31.10.2014

Product information

Product description

The declared products of the EJOT Building Fasteners, business area External Thermal Insulation Composite Systems (ETICS), are produced of various kinds of plastic and/ or steel. The products can be differentiated by their field of application and their effective length. Within the framework of this declaration average anchors and screws with an effective length of 175, 195 and 215 mm are considered. A linear extrapolation is permitted for the not shown lengths. The declaration includes all products included in the portfolio of the following product groups:

- Washer anchors (screw-in and hammer-in anchors)
- Additional washers for washer anchors
- Façade anchors (screw-in and hammer-in anchors)
- Screw- in anchors for securing of double-shell masonry
- Concrete screws for fastening of ceiling insulation
- Accessories

These are products with a European Technical Assessment (ETA) and/ or a national approval as well as constructive products.

Application

The products considered within this framework are mainly for the mechanical fastening of ETICS on different substrates. Part of the considered portfolio is used for the securing of double-shell masonry or for fastening of ceiling insulation.

Technical data

Name	Value	Unit
Diameter of dowel	8 - 10	mm
Plate diameter without additional plate	60	mm
Depth of drill hole	35 - 80	mm

¹ <http://www.usgbc.org/credits> (8/2014)

EJOT Baubefestigungen GmbH

Product sustainability fact sheet

Anchoring depth	25 - 70	mm
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Product declarations

Environmental product declaration

Number	EPD-EJO-20140128-IBD1-DE
Program operator	Institute Construction and Environment (IBU - Institut Bauen und Umwelt e.V.), Berlin, Germany
Author of the LCA	PE INTERNATIONAL AG, Leinfelden-Echterdingen, Germany

Materials and Resources (MR)

Summary

Materials and Resources credits encourage using sustainable building materials and reducing waste. Indoor environmental quality credits promote better indoor air quality and access to daylight and views.

Building product disclosure and optimization - environmental product declarations

Intent of this credit

To encourage the use of products and materials for which life-cycle information is available and that have environmentally, economically, and socially preferable life-cycle impacts. To reward project teams for selecting products from manufacturers who have verified improved environmental life-cycle impacts.

Product information for EJOT fastening systems for ETICS within this credit:

Item	Value
Critically reviewed LCA acc. to ISO 14044	yes
Reviewer	Institute Construction and Environment (IBU - Institut Bauen und Umwelt e.V.), Berlin, Germany
Download link of the document/study	http://bau-umwelt.de/download/CY49a0afbfX149653f0993XY36e0/EPD_EJO_20140128_IBD1_DE.pdf
Product specific EPD (Type III, including external verification)	yes
EPD program operator	Institute Construction and Environment (IBU - Institut Bauen und Umwelt e.V.), Berlin, Germany; www.construction-environment.com
EPD program operator country	Germany
EPD number	EPD-EJO-20140128-IBD1-DE

Results of the LCA – ENVIRONMENTAL IMPACTS:

Declared unit: 1 average EJOT fastening system for ETICS with a length of 195 mm		
Declared life cycle stages (standard DIN EN 15978)	PRODUCT STAGE	END OF LIFE STAGE
	A1-A3	C4
GWP [kg CO ₂ -eq.]	1.250E-1	4.530E-4
ODP [kg CFC11-eq.]	1.410E-11	6.200E-15
AP [kg SO ₂ -eq.]	4.700E-4	2.880E-6
EP [kg PO ₄ 3-- eq.]	4.580E-5	3.950E-7
POCP [kg Ethene-eq.]	5.540E-5	2.710E-7
ADPE [kg Sb eq.]	4.760E-6	1.700E-10

Product name: EJOT fastening systems for ETICS

EJOT Baubefestigungen GmbH

Product sustainability fact sheet

ADPF [MJ]	1.830E+0	5.960E-3
Caption	GWP = Global warming potential; ODP = Depletion potential of the stratospheric ozone layer; AP = Acidification potential of land and water; EP = Eutrophication potential; POCP = Formation potential of tropospheric ozone photochemical oxidants; ADPE = Abiotic depletion potential for non-fossil resources; ADPF = Abiotic depletion potential for fossil resources	

Results of the LCA – RESOURCE USE:

Declared life cycle stages (standard DIN EN 15978)	Declared unit: 1 average EJOT fastening system for ETICS with a length of 195 mm	
	PRODUCT STAGE	END OF LIFE STAGE
	A1-A3	C4
PE total [MJ]	2,16E+0	6,74E-3
PERE [MJ]	1,800E-1	-
PERM [MJ]	0	-
PERT [MJ]	1,800E-1	5,140E-4
PENRE [MJ]	1,590E+0	-
PENRM [MJ]	3,870E-1	-
PENRT [MJ]	1,980E+0	6,230E-3
SM [kg]	2,740E-3	0,000E+0
RSF [MJ]	0	0
NRSF [MJ]	0	0
FW [m³]	3,840E-4	-1,880E-5

Caption

PE total = Total use of primary energy resources (=PERT+PENRT); PERE = Use of renewable primary energy excluding renewable primary energy resources used as raw materials; PERM = Use of renewable primary energy resources used as raw materials; PERT = Total use of renewable primary energy resources; PENRE = Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials; PENRM = Use of non-renewable primary energy resources used as raw materials; PENRT = Total use of non-renewable primary energy resources; SM = Use of secondary material; RSF = Use of renewable secondary fuels; NRSF = Use of non-renewable secondary fuels; FW = Use of net fresh water

Results of the LCA – OUTPUT FLOWS AND WASTE CATEGORIES:

Declared life cycle stages (standard DIN EN 15978)	Declared unit: 1 average EJOT fastening system for ETICS with a length of 195 mm	
	PRODUCT STAGE	END OF LIFE STAGE
	A1-A3	C4
HWD [kg]	1,190E-4	2,800E-7
NHWD [kg]	2,230E-3	3,350E-2
RWD [kg]	5,910E-5	1,090E-7
CRU [kg]	0	0
MFR [kg]	0	0
MER [kg]	0	0
EEE [MJ]	0	0
EET [MJ]	0	0

Caption

HWD = Hazardous waste disposed; NHWD = Non-hazardous waste disposed; RWD = Radioactive waste disposed; CRU = Components for re-use; MFR = Materials for recycling; MER = Materials for energy recovery; EE = Exported energy per energy carrier; EEE = Exported energy, electric energy, EET = Exported energy, thermal energy

Since the raw materials for the production stage are the main contributors to the results of the LCA, there is a linear correlation between the weight of the raw materials (and thus the length of the fastening systems, since the density remains the same) and the impacts on the environment. To calculate the impacts of systems with other lengths, the following formula can be used:

$$P(x) = [P(x1) / x1] * x$$

P(x): indicator of the new system that shall be declared

P(x1): indicator of the declared system (e.g. global warming potential (GWP) of the ETICS fastening system with 195 mm)

Product name: EJOT fastening systems for ETICS

EJOT Baubefestigungen GmbH

Product sustainability fact sheet

x: length of the new system that shall be calculated [mm] (e.g. 175 mm)
x1: length of the declared system [mm] (here 195 mm)

Building product disclosure and optimization – sourcing of raw materials

Intent of this credit

To encourage the use of products and materials for which life cycle information is available and that have environmentally, economically, and socially preferable life cycle impacts. To reward project teams for selecting products verified to have been extracted or sourced in a responsible manner.

Product information for EJOT fastening systems for ETICS within this credit:

Option 1	Description
Third-party verified corporate sustainability report (CSR)	no
Downloadlink to the report	-
Option 2	Description
Participation in an extended producer responsibility program	no
Postconsumer recycled content	8 % steel scrap (referred to the whole fastening system)
Preconsumer recycled content	-

Building product disclosure and optimization – material ingredients

Intent of this credit

To encourage the use of products and materials for which life-cycle information is available and that have environmentally, economically, and socially preferable life-cycle impacts. To reward project teams for selecting products for which the chemical ingredients in the product are inventoried using an accepted methodology and for selecting products verified to minimize the use and generation of harmful substances. To reward raw material manufacturers who produce products verified to have improved life-cycle impacts.

Product information for EJOT fastening systems for ETICS within this credit:

Type of reporting/Item	Value/Comment
Health Product Declaration (HPD)	no
Material Safety Data Sheet (MSDS)	MSDS is available on request
GreenScreen v1.2 Benchmark	no
REACH compliancy	yes The formulation is checked according to the current REACH candidate list. The formulation does not contain any substances of very high concern. Certificates are available on request.

Disclaimer: The content of, and results shown in this report are based on data and information submitted by the client. Therefore, PE International AG makes no representation or warranty, express or implied, in regard of the correctness or completeness of the content of this document or the results shown.

Product name: EJOT fastening systems for ETICS

ENVIRONMENTAL PRODUCT DECLARATION

THERMAFIBER® MINERAL WOOL

OWENS CORNING



Owens Corning™ Thermafiber® Mineral Wool Insulation enhances comfort, energy savings and sustainability in new and existing structures.



Owens Corning, and its family of companies, is a leading global producer of residential and commercial building materials, glass fiber reinforcements, and engineered materials for composite systems. It uses a decision framework for managing the company as a sustainable enterprise. It is the foundation of the company's strategy of building market-leading businesses, global in scope – human in scale, and reflects the company's purpose: our people and products make the world a better place.

Owens Corning is committed to balancing economic growth with social progress and sustainable solutions to its building materials and composite customers around the world.

This Environmental Product Declaration is a component of our stated goal to provide life cycle information on all core products.

sustainability.owenscorning.com



ENVIRONMENTAL PRODUCT DECLARATION



Thermafiber® Mineral Wool
Light and Heavy Density Mineral Wool Insulation

According to ISO 14025,
EN 15804 and ISO 21930:2017

EPD PROGRAM AND PROGRAM OPERATOR NAME, ADDRESS, LOGO, AND WEBSITE	UL Environment 333 Pfingsten Road Northbrook, IL 60611 https://www.ul.com/ https://spot.ul.com
GENERAL PROGRAM INSTRUCTIONS AND VERSION NUMBER	General Program Instructions v.2.4 July 2018
MANUFACTURER NAME AND ADDRESS	Owens Corning, One Owens Corning Parkway, Toledo, OH, USA
DECLARATION NUMBER	4788956323.101.1
DECLARED PRODUCT & FUNCTIONAL UNIT OR DECLARED UNIT	1 m ² insulation at R _{SI} -1
REFERENCE PCR AND VERSION NUMBER	Part B: Building Envelope Thermal Insulation EPD Requirements, UL 10010-1
DESCRIPTION OF PRODUCT APPLICATION/USE	Thermafiber® Mineral Wool is a type of slag wool insulation product used in a variety of building applications, both residential and commercial, requiring the use of thermal insulation.
PRODUCT RSL DESCRIPTION (IF APPL.)	75 years
MARKETS OF APPLICABILITY	North America
DATE OF ISSUE	October 1, 2019
PERIOD OF VALIDITY	5 Years
EPD TYPE	Product-specific
RANGE OF DATASET VARIABILITY	N/A
EPD SCOPE	Cradle to gate with options (A4, A5, C1-C4)
YEAR(S) OF REPORTED PRIMARY DATA	2018
LCA SOFTWARE & VERSION NUMBER	SimaPro 9.0.0.35
LCI DATABASE(S) & VERSION NUMBER	ecoinvent 3.5
LCIA METHODOLOGY & VERSION NUMBER	TRACI 2.1 v1.05; Cumulative Energy Demand LHV (CED) V1.00

This PCR review was conducted by:	UL Environment
	PCR Review Panel
This declaration was independently verified in accordance with ISO 14025: 2006. <input type="checkbox"/> INTERNAL <input checked="" type="checkbox"/> EXTERNAL	epd@ulenvironment.com
	<i>Grant R. Martin</i> Grant R. Martin, UL Environment
This life cycle assessment was independently verified in accordance with ISO 14044 and the reference PCR by:	<i>Thomas P. Gloria</i> Thomas P. Gloria, Industrial Ecology Consultants

LIMITATIONS

Exclusions: EPDs do not indicate that any environmental or social performance benchmarks are met, and there may be impacts that they do not encompass. LCAs do not typically address the site-specific environmental impacts of raw material extraction, nor are they meant to assess human health toxicity. EPDs can complement but cannot replace tools and certifications that are designed to address these impacts and/or set performance thresholds – e.g. Type 1 certifications, health assessments and declarations, environmental impact assessments, etc.

Accuracy of Results: EPDs regularly rely on estimations of impacts; the level of accuracy in estimation of effect differs for any particular product line and reported impact.

Comparability: EPDs from different programs may not be comparable. Full conformance with a PCR allows EPD comparability only when all stages of a life cycle have been considered. However, variations and deviations are possible. Example of variations: Different LCA software and background LCI datasets may lead to differences results for upstream or downstream of the life cycle stages declared.

ENVIRONMENTAL PRODUCT DECLARATION



Thermafiber® Mineral Wool
Light and Heavy Density Mineral Wool Insulation

According to ISO 14025,
EN 15804 and ISO 21930:2017

1. Product Definition and Information

1.1. Description of Company/Organization

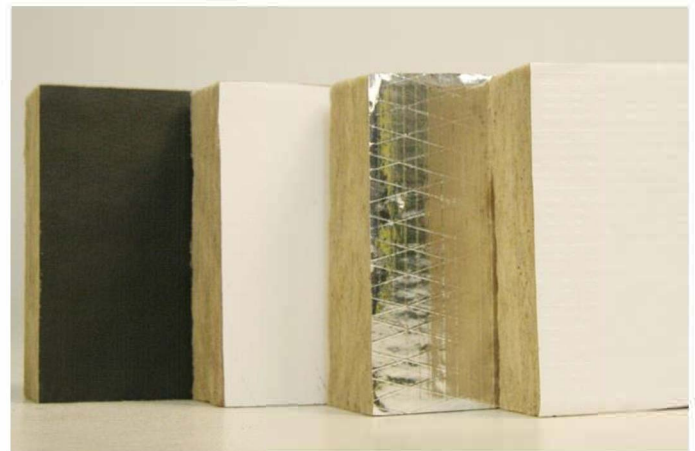
Founded in 1938, Owens Corning has been a leader in insulation, roofing and fiberglass composites. It has a global presence with 20,000 people in 33 countries. This Environmental Product Declaration is representative of product produced at the locations listed below.

Wabash Plant Wabash, IN 46992	Joplin Plant Joplin, MO 64804
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1.2. Product Description

Product Identification

Thermafiber® Mineral Wool Insulation products are comprised of semi-rigid and rigid boards and batts. Mineral wool resists mold, fungi, and is vermin proof due to its being an inorganic material. The R-value of Thermafiber® Mineral Wool Insulation ranges from 3.7 - 4.3 per inch of thickness. It is available in multiple thicknesses, densities, and various facings by product type. Reflected by its R-value, mineral wool's insulating performance is achieved by its densely packed fibers. Its high resistance to heat flow translates into year-round comfort and energy savings.



Product Availability†

Product	Density	R-value per inch***	Thickness*	Widths**	Lengths**
Fire & Sound Guard®a	2.5 pcf	---	3"	15", 23"	47"
Fire & Sound Guard®b	2.5 pcf	---	3"	16", 24"	48"
FireSpan® 40c	4.0 pcf	4.3	2" - 7"	24", 36", 72"	48", 60", 72"
FireSpan® 90c	8.0 pcf	4.3	1" - 7"	24", 36", 72"	48", 60", 72"
Safing	4.0 pcf, 6.0 pcf	4.3	1" - 7"	16", 24", 36"	48", 60"
SAFB™	2.5 pcf	3.8	1½" - 7"	15", 16", 17", 23", 24", 25"	48"
SAFB™	4.0 pcf	4.2	1"	15", 16", 17", 23", 24", 25"	48"
RainBarrier® 45	4.5 pcf	4.3	1" - 7"	16", 24", 36"	48", 60"
RainBarrier® HD	6.0 pcf	4.3	1" - 7"	16", 24", 36"	48", 60"
UltraBatt™a	2.5 pcf	4.2	3.5", 5.5", 7.1"	15", 23"	47"
UltraBatt™b	2.5 pcf	4.2	2.5", 3.5", 6"	16", 24"	48"
VersaBoard® 35	3.5 pcf	4.2	1½" - 7"	24", 36"	48", 60"
VersaBoard® 40 & 60	4.0 pcf, 6.0 pcf	4.3	1" - 7"	24", 36"	48", 60"
VersaBoard® 80	8.0 pcf	4.3	1" - 5"	24", 36"	48", 60"
Tolerance	--	--	+1/4", -1/8"	± 1/8"	± 1/2"

*Thicknesses are available in 1/2" increments.; ** Custom sizes are available upon request.; *** R-value [=] hr-ft²·°F/BTU

a. Availability indicated for wood stud application; b. Availability indicated for steel stud application; c. Tolerance of length indicated is +3/4", -1/4"

†. For additional information, visit www.thermafiber.com.



ENVIRONMENTAL PRODUCT DECLARATION



Thermafiber® Mineral Wool
Light and Heavy Density Mineral Wool Insulation

According to ISO 14025,
EN 15804 and ISO 21930:2017

Product Specification

	Fire & Sound Guard®	FireSpan® 90 & FireSpan® 40	Safing	SAFB™	RainBarrier® 45	RainBarrier® HD	UltraBatt™	VersaBoard® 35	VersaBoard® 40 & 60	VersaBoard® 80
Corrosion Resistance† ASTM C665 (Type)										
Unfaced	---	I ¹	I ²	I ³	I ²	I ²	I	I ²	I ²	I ²
Foil Faced		III ¹	III ²		III ²	III ²		III ²	III ²	III ²
Black & White Mat, ASJ								II	II	II
Classification ASTM C612 (Type)	---	IA, IB, II, III, IVA	IA, IB, II	I ⁴	IA, IB, IVA	IA, IB, II, III, IVA	---	IA	IA, II, III, IVA	IA, II, III, IVA
Combustibility ASTM E136 (Rated Non-combustible per NFPA Standard 220)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Water Vapor Permeance † ASTM E96 (Perms as tested)										
Unfaced	---	50	50	---	50	50	50	50	50	50
Foil Faced		0.02	0.02				0.02	0.02	0.02	0.02
ASJ							0.02	0.02	0.02	0.02
Surface Burning Characteristics† ASTM E84 (Flame Spread/Smoke Developed)										
Unfaced	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0	0/0
Foil Faced		25/0	25/0				25/0	25/0	25/0	25/0
Surface Burning Characteristics CAN/ULC S102 (Flame Spread/Smoke Developed)										
Unfaced	0/0	0/5	0/0	0/5	0/5	0/5	0/0	0/0	0/0	0/0
Water Vapor Sorption ASTM C1104 (Absorption by volume)	<1%	<1%	<1%	<1%	0.03%	0.03%	<1%	<1%	<1%	<1%
Stability ASTM C356 (Linear shrinkage@1200°F (650°C))	---	<2%	---	---	<2%	<2%	---	<2%	<2%	<2%

† Values for unfaced insulation are indicated; values for faced option are indicated if applicable.

--- indicates specification is not applicable to product.

1. Class A, Category 1
2. Non-corrosive, Type I, III
3. Type I, per Federal Specification HH-I-521F
4. Type I, per Federal Specification HH-I-558B



ENVIRONMENTAL PRODUCT DECLARATION



Thermafiber® Mineral Wool
Light and Heavy Density Mineral Wool Insulation

According to ISO 14025,
EN 15804 and ISO 21930:2017

Product Average

The results of this declaration represent an average performance for the listed products and manufacturing locations. Reported densities for included products and production locations are from manufacturing, facility-level data to create a production-weighted average, which was used to determine the mass of the functional unit for the LCA.

1.3. Application

Thermafiber® mineral wool insulation products are used in residential and multi-family construction as nonstructural thermal-insulating materials in floor-ceiling assemblies, attics, crawl spaces and walls. In exterior walls, it can be used as continuous insulation in the building envelope, and within interior walls, it can be used as acoustic insulation for partitions.

Mineral wool is commonly used in curtain wall perimeter fire containment applications because of its fire resistant properties. In commercial applications it can be used as continuous insulation in the building envelope. Additionally, the high density of mineral wool insulation offers excellent sound absorption properties, making these products an integral part of overall wall systems designed to reduce sound transmission.

1.4. Declaration of Methodological Framework

This declaration is a product-specific EPD and is cradle-to-installation with end-of-life. The underlying LCA upon which this EPD is based included the following life cycle modules: *Raw Material supply (A1); Inbound Transportation (A2); Manufacturing (A3); Distribution (A4); Installation (A5); End-of-life, Transport (C2) and End-of-life, Disposal (C4)*. No known flows have been deliberately excluded. The product is expected to perform as claimed for the 75-year reference service life if it remains clean and dry in its installed state.

1.5. Technical Requirements

At a minimum, Thermafiber® Mineral Wool Insulation products for commercial applications meet or exceed one of the following:

- ❖ **Corrosion Resistance**
 - Type I, II or III when tested in accordance with ASTM C665, *Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing*
- ❖ **Classification**
 - Type IA, IB, II, III or IVA when tested in accordance with ASTM C612, *Standard Specification for Mineral Fiber Block and Board Thermal Insulation*
- ❖ **Combustibility**
 - Rated Non-combustible per NFPA Standard 220 when tested in accordance with ASTM E136, *Standard Test Method for Assessing Combustibility of Materials Using a Vertical Tube Furnace at 750°C*
- ❖ **Water Vapor Permeance**
 - 50 perms when tested in accordance with ASTM E96, *Standard Test Methods for Water Vapor Transmission of Materials*
- ❖ **Surface Burning Characteristics**
 - Flame Spread 0, Smoke Developed 0 when tested in accordance with ASTM E84, *Standard Test Method for Surface Burning Characteristics of Building Materials*
- ❖ **Water Vapor Sorption**
 - Absorption of less than 1% by volume when tested in accordance with ASTM C1104, *Standard Test Method for Determining the Water Vapor Sorption of Unfaced Mineral Fiber Insulation*
- ❖ **Stability**
 - Linear Shrinkage <2% @1200°F (650°C) when tested in accordance with ASTM C356, *Standard Test Method for Linear Shrinkage of Preformed High-Temperature Thermal Insulation Subjected to Soaking Heat*



ENVIRONMENTAL PRODUCT DECLARATION



Thermafiber® Mineral Wool
Light and Heavy Density Mineral Wool Insulation

According to ISO 14025,
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1.6. Properties of Declared Product as Delivered

When installed in typical building and construction assemblies according to all applicable Owens Corning specifications, recommendations and guidelines, Thermafiber® Mineral Wool Insulation delivers its advertised R-value.

1.7. Material Composition

Thermafiber® Mineral Wool Insulation consists of two major components, charge and binder. The primary raw material used is blast furnace slag, a by-product of the steel industry. The reuse of slag into mineral wool prevents this material from being discarded into landfills and results in a minimum total recycled content of 70% in the final product. These materials are sourced locally and transported to manufacturing facilities.

Material Component	Material Component%	
	Heavy Density	Light Density
Charge		
Slag	67-70%	67-70%
Feldspar	6-9%	6-9%
Trap rock	20-23%	23-26%
Binder		
Resin	1-4%	1-4%
Urea	1-3%	1-3%
Other	< 1%	< 1%

1.8. Manufacturing

Manufacturing Locations

Owens Corning North American manufacturing locations can be found across the United States. Primary data from these two manufacturing facilities were used for the underlying life cycle assessment. Results provided in this declaration are based on a production-weighted average of these two manufacturing facilities.

Wabash Plant Wabash, IN 46992	Joplin Plant Joplin, MO 64804
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ENVIRONMENTAL PRODUCT DECLARATION



Thermafiber® Mineral Wool
Light and Heavy Density Mineral Wool Insulation

According to ISO 14025,
EN 15804 and ISO 21930:2017

Manufacturing Process

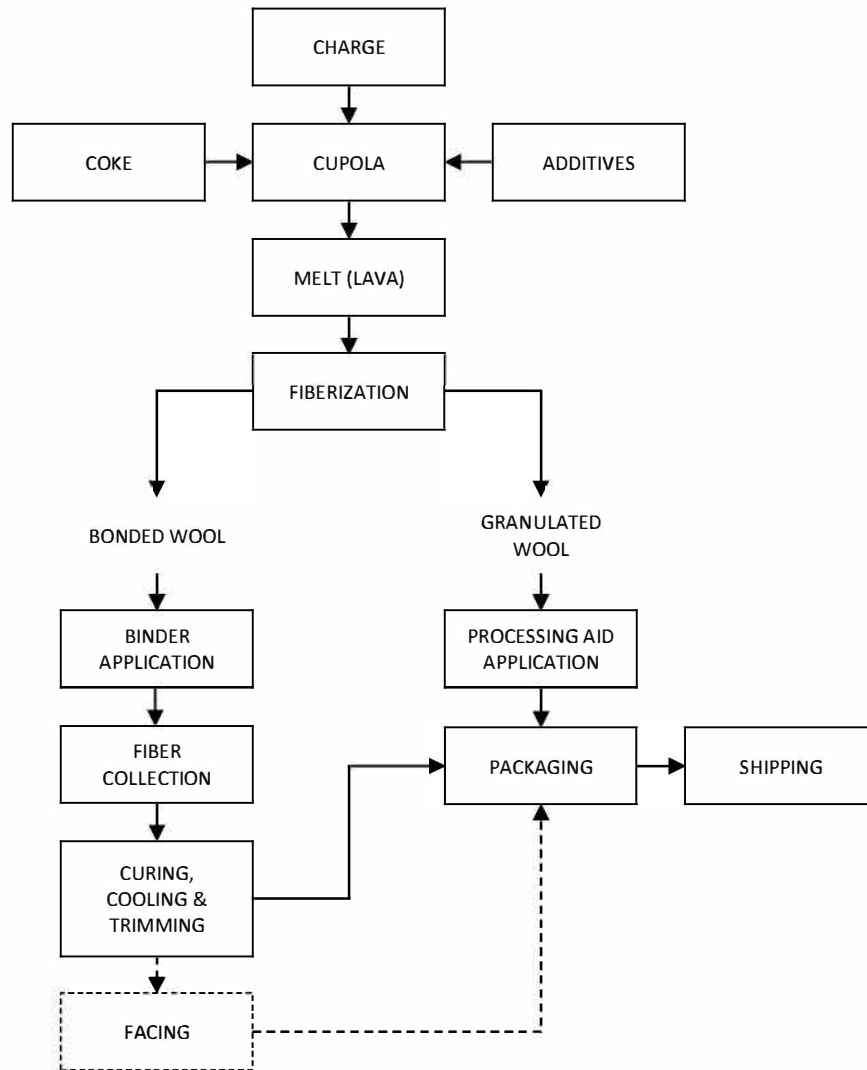


Figure 1. Process Flow Diagram for Manufacturing of Mineral Wool Insulation

The diagram above for Thermafiber® Mineral Wool Insulation is representative of the processes used by the manufacturing facilities. Although minor differences exist due to the availability of specific suppliers for materials, there are no significant process differences among manufacturing locations.



ENVIRONMENTAL PRODUCT DECLARATION



Thermafiber® Mineral Wool
Light and Heavy Density Mineral Wool Insulation

According to ISO 14025,
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1.9. Packaging

Thermafiber® Mineral Wool Insulation products are packaged using LDPE (low-density polyethylene) film in the form of bags or plastic film. Regional disposal scenarios for the U.S. were used as a default assumption for the packaging waste generated during installation. Disposal rates used by material type and waste treatment method are shown in the table below.

Country/Region	Material Type	Recycling Rate	Landfill Rate	Incineration Rate
United States	Plastics	15%	68%	17%
	Metals	57%	34%	9%
	Pulp (cardboard, paper)	75%	20%	5%

1.10. Transportation

The product outbound transportation from manufacturing facility is by diesel-truck. The average distance from manufacturing facility to construction site for Thermafiber® Heavy Density and Light Density Mineral Wool Insulation is 1,090 mi (1,750 km) and 1,100 mi (1,770 km), respectively.

1.11. Product Installation



Thermafiber® Mineral Wool Insulation products are made for easy handling and installation. As a semi-rigid product that is easy to cut and install, its flexibility allows it to conform to building shapes and construction irregularities. It comes in standard-sized sheets and is easily cut with a serrated knife.

The boards and batts can be friction fitted in between studs with the ends of each piece butted closely together to fill all voids. Mineral wool can also be mechanically attached depending on the application.

Rainscreen and cavity wall systems vary greatly from types of hangers and how they are installed. Generally, mineral wool insulation is installed with abutted joints and mechanically secured and attached to the building substrate without the need to tape joints.



ENVIRONMENTAL PRODUCT DECLARATION



Thermafiber® Mineral Wool
Light and Heavy Density Mineral Wool Insulation

According to ISO 14025,
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1.12. Use

Due to its nature, Thermafiber® Mineral Wool Insulation is a passive device requiring no utilities or maintenance over its useful life. Provided the mineral wool is used as intended, during the use phase, reductions in a building's energy consumption do occur; however, the energy savings from the use of thermal insulation have not been included within the system boundaries.

1.13. Reference Service Life and Estimated Building Service Life

The product is assumed to remain in service for the life of the building, 75 years.

1.14. Reuse, Recycling, and Energy Recovery

Thermafiber® Mineral Wool Insulation may be reused; however, no formal recycling programs currently exist for mineral wool insulation.

1.15. Disposal

The End of Life stage modeled for mineral wool insulation consisted of the transportation by tractor-trailer truck of the insulation for an assumed distance of 100 miles to a landfill and the subsequent disposal of the used insulation in the landfill.



ENVIRONMENTAL PRODUCT DECLARATION



Thermafiber® Mineral Wool
Light and Heavy Density Mineral Wool Insulation

According to ISO 14025,
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2. Life Cycle Assessment Background Information

2.1. Function and Functional Unit

The functional unit is 1 m² of insulation material with a thickness that gives an average thermal resistance $R_{SI} = 1 \text{ m}^2\text{K/W}$ and with a building service life of 75 years. Faced Thermafiber® Mineral Wool Insulation additionally has 1 m² of a facing add-on, which is applied to the top surface of the insulation material. For this study, the declared unit amount of the facing add-on is 1 m², and the amount of the declared unit required for the functional unit is 1 m².

Table 1. Functional Unit Properties of Thermafiber® Mineral Wool Insulation

Thermafiber® Heavy Density Mineral Wool Insulation	
Functional unit	1 m ² of insulation material with a thickness that gives an average thermal resistance $R_{SI} = 1 \text{ m}^2\text{K/W}$
Mass of Functional unit	3.49E+00 kg
Thickness to achieve Functional unit	3.38E-02 m
Thermafiber® Light Density Mineral Wool Insulation	
Functional unit	1 m ² of insulation material with a thickness that gives an average thermal resistance $R_{SI} = 1 \text{ m}^2\text{K/W}$
Mass of Functional unit	1.68E+00 kg
Thickness to achieve Functional unit	3.47E-02 m

Table 2. Declared Unit Properties of Facing Add-ons for Faced Thermafiber® Mineral Wool Insulation

Facing	Mass of Declared unit (1 m ²)	Description
F-140001, 5225T-White	5.81E-02 kg	Plain White Foil Scrim (2x2) Polyethylene
F-140011, 5225T Printed	5.37E-02 kg	Printed Foil Scrim (2x2) Polyethylene
F-140012, 5263 Printed 5x5	6.35E-02 kg	Printed Foil Scrim (5x5) Polyethylene
F-140021, 30J	1.42E-01 kg	White All Service Jacket (ASJ)
F-140024, WMP-VR	8.30E-02 kg	White Polypropylene Scrim Kraft
F-140031, 3114B	6.84E-02 kg	Black Nonwoven Glass Fiber Mat
F-140041, 7503	7.08E-02 kg	White Nonwoven Glass Fiber Nonwoven Mat
F-140042, G/47499	3.76E-02 kg	Black Nonwoven Polyester Fiber Mat
F-140071, 3035/PE 2.0	1.37E-01 kg	Perforated Foil Scrim (2x3) Kraft
F-140081, 5225T	5.37E-02 kg	Plain Foil Scrim (2x2) Polyethylene
F-140091, 5229	9.28E-02 kg	Plain Foil Scrim (1.8x1.8) Polyethylene
F-140095, 5229 Printed	9.28E-02 kg	Printed Foil Scrim (1.8x1.8) Polyethylene

ENVIRONMENTAL PRODUCT DECLARATION



Thermafiber® Mineral Wool
Light and Heavy Density Mineral Wool Insulation

According to ISO 14025,
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2.2. System Boundary

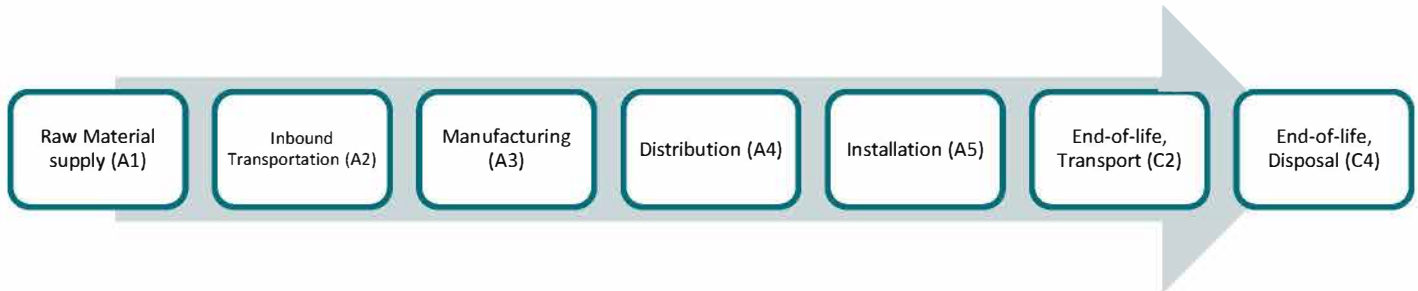


Figure 2. System Boundary of Thermafiber® Mineral Wool Insulation

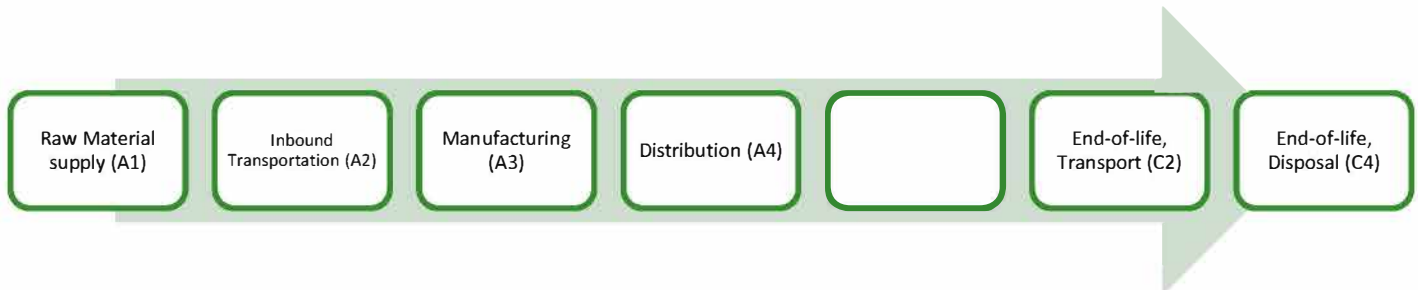


Figure 3. System Boundary of Facing Addons for Faced Thermafiber® Mineral Wool Insulation

The system boundaries for this study include inputs and outputs for the following life cycle stages for mineral wool insulation:

- ❖ Raw Material supply (A1) – applicable to Thermafiber® Mineral Wool Insulation and Facing Addons
 - extraction of resources and production of raw materials
 - collection and processing of recycled materials
 - extraction of resources and production of packaging materials for finished goods
- ❖ Inbound Transportation (A2) – applicable to Thermafiber® Mineral Wool Insulation and Facing Addons
 - transportation of all input materials to manufacturing facilities
- ❖ Manufacturing (A3) – applicable to Thermafiber® Mineral Wool Insulation and Facing Addons
 - electricity and water use and combustion of natural gas and coke (consumption and associated emissions)
 - transportation of fuels and consumable materials used in manufacturing
 - transportation of waste materials for recycling externally
 - transportation of waste-to-landfill waste to landfill as well as disposal in landfill
 - air emissions from fiber collection as well as from curing, cooling, cutting and trimming bonded mineral wool insulation including other releases to environmental media
- ❖ Distribution (A4) – applicable to Thermafiber® Mineral Wool Insulation and Facing Addons
 - transportation from manufacturing facilities to distribution centers
 - transportation from distribution centers to construction site
- ❖ Installation (A5)
 - transportation and disposal of packaging waste – applicable to Thermafiber® Mineral Wool Insulation
- ❖ End-of-life, Transport (C2) – applicable to Thermafiber® Mineral Wool Insulation and Facing Addons
 - transportation from building deconstruction site to landfill
- ❖ End-of-life, Disposal (C4) – applicable to Thermafiber® Mineral Wool Insulation and Facing Addons
 - disposal in landfill

ENVIRONMENTAL PRODUCT DECLARATION



Thermafiber® Mineral Wool
Light and Heavy Density Mineral Wool Insulation

According to ISO 14025,
EN 15804 and ISO 21930:2017

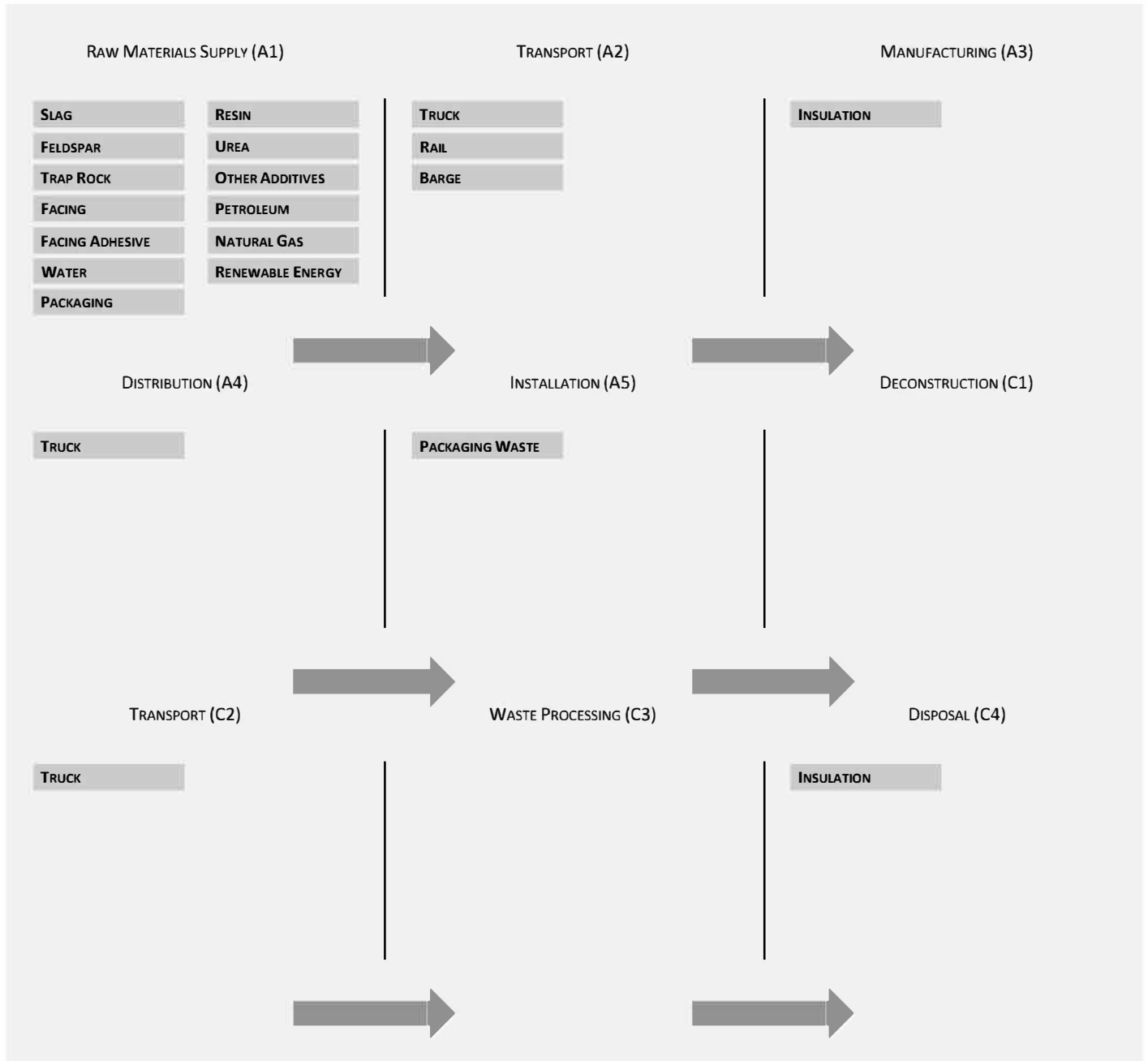


Figure 4. Flow Diagram of Thermafiber® Mineral Wool Insulation



ENVIRONMENTAL PRODUCT DECLARATION



Thermafiber® Mineral Wool
Light and Heavy Density Mineral Wool Insulation

According to ISO 14025,
EN 15804 and ISO 21930:2017

2.3. Estimates and Assumptions

Thermafiber® Mineral Wool Insulation is a passive device requiring no utilities or maintenance over its useful life; it is assumed that the product remains in service for the 75-year reference service.

2.4. Cut-off Criteria

Per section 2.9 of the governing PCR, the procedure detailed in ISO 21930, section 7.1.8 was followed regarding the exclusion of inputs and outputs. For energy, mass and environmental impacts, the cut-off criteria were 1% per the standard. Per the standard "the total of neglected input flows per module shall be a maximum of 5% of energy usage, mass and environmental impacts." Flows excluded for this study include infrastructure, capital goods and workforce burdens. Inputs and outputs associated with infrastructure (construction, maintenance and demolition of buildings/plants, road surfaces, transport equipment, etc.) are not included. This choice is based on experience from previous LCAs where the contribution from these items was negligible due to the long lifetime of the equipment compared to the high production volume of material during that lifetime. Although pallets are used in the transportation of packaged, finished mineral wool insulation boards, pallets have been excluded due to their high reuse rates since they would have a negligible impact if otherwise included.

2.5. Data Sources

Primary data was collected from the locations listed in the Manufacturing section. Life-cycle modeling and calculation of potential environmental impacts were conducted using the LCA software SimaPro 9, version 9.0.0.35, developed by PRé Consultants bv. The LCI database used for secondary data was the ecoinvent 3.5 database, provided with the Developer version of the software. In situations where LCI databases did not contain life-cycle inventory data for certain specific materials or processes used in either the manufacturing of precursor, input raw materials or the manufacturing of the mineral wool insulation itself, LCI data for a similar material or process was used as a substitute. In order to determine the most representative substitute, preliminary analyses were conducted.

2.6. Data Quality

To determine how representative the data used to model the life-cycle of Owens Corning® Thermafiber® Mineral Wool Insulation manufactured in 2018 is, the temporal, geographical and technological aspects of the data were assessed. For the Owens Corning facilities analyzed in the underlying LCA study, the data used adequately represents the technology used in 2018 in the United States.

2.7. Period under Review

For the manufacturing facilities considered in the LCA, Owens Corning primary data was collected for the 2018 calendar year.

2.8. Allocation

The products studied in this analysis are all members of the Thermafiber® Mineral Wool Insulation product family. Plants reported the total amount of Thermafiber® Mineral Wool Insulation produced as well as the amount produced of each individual product. In general, the characteristics that differentiate one product from another within the family are its density, form and the use and type of a binder. Particular product application can be considered another differentiating characteristic; however, these three attributes are the main physical properties that distinguish one product from another.

Exceptions to this are Faced Thermafiber® Mineral Wool Insulation. For these products, it was possible to avoid additional allocation by treating the facing materials as separate modular processes, the LCIs of which were analyzed separately. Aside from those mentioned, no other allocation modeling considerations were necessary.

ENVIRONMENTAL PRODUCT DECLARATION



Thermafiber® Mineral Wool
Light and Heavy Density Mineral Wool Insulation

According to ISO 14025,
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3. Life Cycle Assessment Scenarios

Table 3. Transport to the building site (A4)

	Thermafiber® Heavy Density Mineral Wool Insulation (1 m ² , R _{S1} -1)	Thermafiber® Light Density Mineral Wool Insulation (1 m ² , R _{S1} -1)	
Fuel type	diesel, low-sulfur	diesel, low-sulfur	
Liters of fuel	1.59E-02	7.65E-03	l/100km
Vehicle type	Transport, freight, lorry 16-32 metric ton, EURO3	Transport, freight, lorry 16-32 metric ton, EURO3	
Transport distance	1.75E+03	1.77E+03	km
Capacity utilization (including empty runs, mass based) [†]	63%	63%	%
Gross density of products transported	1.03E+02	4.86E+01	kg/m ³
Weight of products transported (if gross density not reported)	3.49E+00	1.68E+00	kg
Volume of products transported (if gross density not reported)	3.38E-02	3.47E-02	m ³
Capacity utilization volume factor (factor: =1 or <1 or ≥ 1 for compressed or nested packaging products)	1	1	-

[†] EcoTransIT. World. Ecological Transport Information Tool for Worldwide Transports Methodology and Data - Update 4th December 2014. (https://www.ecotransit.org/download/EcoTransIT_World_Methodology_Report_2014-12-04.pdf)



ENVIRONMENTAL PRODUCT DECLARATION



Thermafiber® Mineral Wool
Light and Heavy Density Mineral Wool Insulation

According to ISO 14025,
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Table 4. Transport to the building site (A4) for F-1400XX Facing Addon

	F-140001	F-140011	F-140012	F-140021	F-140024	F-140031	F-140041	F-140042	F-140071	F-140081	F-140091	F-140095
Fuel type	diesel, low-sulfur	diesel, low-sulfur	diesel, low-sulfur	diesel, low-sulfur	diesel, low-sulfur	diesel, low-sulfur	diesel, low-sulfur	diesel, low-sulfur	diesel, low-sulfur	diesel, low-sulfur	diesel, low-sulfur	diesel, low-sulfur
Liters of fuel (l/100km)	2.64E-04	2.44E-04	2.88E-04	6.43E-04	3.77E-04	3.10E-04	3.21E-04	1.71E-04	6.21E-04	2.44E-04	4.21E-04	4.21E-04
Vehicle type	Transport, freight, lorry 16-32 metric ton, EURO3	Transport, freight, lorry 16-32 metric ton, EURO3	Transport, freight, lorry 16-32 metric ton, EURO3	Transport, freight, lorry 16-32 metric ton, EURO3	Transport, freight, lorry 16-32 metric ton, EURO3	Transport, freight, lorry 16-32 metric ton, EURO3	Transport, freight, lorry 16-32 metric ton, EURO3	Transport, freight, lorry 16-32 metric ton, EURO3	Transport, freight, lorry 16-32 metric ton, EURO3	Transport, freight, lorry 16-32 metric ton, EURO3	Transport, freight, lorry 16-32 metric ton, EURO3	Transport, freight, lorry 16-32 metric ton, EURO3
Transport distance (km)	1.76E+03	1.76E+03	1.76E+03	1.76E+03	1.76E+03	1.76E+03	1.76E+03	1.76E+03	1.76E+03	1.76E+03	1.76E+03	1.76E+03
Capacity utilization (including empty runs, mass based)‡	63%	63%	63%	63%	63%	63%	63%	63%	63%	63%	63%	63%
Gross density of products transported (kg/m ³)	3.81E+02	3.58E+02	3.25E+02	6.19E+02	4.08E+02	1.42E+02	1.11E+02	1.64E+02	5.98E+02	3.58E+02	6.09E+02	6.09E+02
Weight of products transported (if gross density not reported) (kg)	5.81E-02	5.37E-02	6.35E-02	1.42E-01	8.30E-02	6.84E-02	7.08E-02	3.76E-02	1.37E-01	5.37E-02	9.28E-02	9.28E-02
Volume of products transported (if gross density not reported) (m ³)	1.52E-04	1.50E-04	1.96E-04	2.29E-04	2.03E-04	4.83E-04	6.35E-04	2.29E-04	2.29E-04	1.50E-04	1.52E-04	1.52E-04
Capacity utilization volume factor (factor: =1 or <1 or ≥ 1 for compressed or nested packaging products)	1	1	1	1	1	1	1	1	1	1	1	1

‡ EcoTransIT. World. Ecological Transport Information Tool for Worldwide Transports Methodology and Data - Update 4th December 2014. (https://www.ecotransit.org/download/EcoTransIT_World_Methodology_Report_2014-12-04.pdf)



ENVIRONMENTAL PRODUCT DECLARATION



Thermafiber® Mineral Wool
Light and Heavy Density Mineral Wool Insulation

According to ISO 14025,
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Table 5. Installation into the building (A5)

	Thermafiber® Heavy Density Mineral Wool Insulation (1 m ² , R _{SI} -1)	Thermafiber® Light Density Mineral Wool Insulation (1 m ² , R _{SI} -1)	
Ancillary materials	0.00E+00	0.00E+00	kg
Net freshwater consumption specified by water source and fate (amount evaporated, amount disposed to sewer)	0.00E+00	0.00E+00	m ³
Other resources	0.00E+00	0.00E+00	kg
Electricity consumption	0.00E+00	0.00E+00	kWh
Other energy carriers	0.00E+00	0.00E+00	MJ
Product loss per functional unit	0.00E+00	0.00E+00	kg
Waste materials at the construction site before waste processing, generated by product installation	1.60E-02	4.30E-02	kg
Output materials resulting from on-site waste processing (specified by route; e.g. for recycling, energy recovery and/or disposal)	0.00E+00	0.00E+00	kg
Biogenic carbon contained in packaging	0.00E+00	0.00E+00	kg CO ₂
Direct emissions to ambient air, soil and water	0.00E+00	0.00E+00	kg
VOC content [†]	0.00E+00	0.00E+00	µg/m ³

[†] VOC content determined in accordance to "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources using Environmental Chambers - version 1.2." CA Specification 01350.



ENVIRONMENTAL PRODUCT DECLARATION



Thermafiber® Mineral Wool
Light and Heavy Density Mineral Wool Insulation

According to ISO 14025,
EN 15804 and ISO 21930:2017

Table 6. Reference Service Life

RSL	75 years
Declared product properties (at the gate) and finishes, etc.	Not applicable (Insulation properties require installation into a building.)
Design application parameters (if instructed by the manufacturer), including references to the appropriate practices and application codes)	Install per instructions
An assumed quality of work, when installed in accordance with the manufacturer's instructions	Will meet R-value (Installer should install per manufacturer instructions)
Outdoor environment, (if relevant for outdoor applications), e.g. weathering, pollutants, UV and wind exposure, building orientation, shading, temperature	Not applicable (Indoor or covered in outdoor applications)
Indoor environment, (if relevant for indoor applications), e.g. temperature, moisture, chemical exposure)	Product should be kept dry
Use conditions, e.g. frequency of use, mechanical exposure.	Not applicable (Insulation is a passive product which is not used directly during life)
Maintenance, e.g. required frequency, type and quality of replacement components	None needed (Insulation does not need maintenance during its use)

Table 7. End-of-life, Transport (C2)

		Thermafiber® Heavy Density Mineral Wool Insulation (1 m ² , R _{SI} -1)	Thermafiber® Light Density Mineral Wool Insulation (1 m ² , R _{SI} -1)	F-1400XX Facing Addon (1 m ²)	
Assumptions for scenario development (description of deconstruction, collection, recovery, disposal method and transportation)	Although reuse and recycling of mineral wool insulation at its end of life is possible, there are no formal programs for collection and transport. It is assumed that all product is sent to landfill at end of life.				
Collection process (specified by type)	Collected separately	0.00E+00	0.00E+00	[0.00E+00]	kg
	Collected with mixed construction waste	3.49E+00	1.68E+00	[‡]	kg
Recovery (specified by type)	Reuse	0.00E+00	0.00E+00	[0.00E+00]	kg
	Recycling	0.00E+00	0.00E+00	[0.00E+00]	kg
	Landfill	0.00E+00	0.00E+00	[0.00E+00]	kg
	Incineration	0.00E+00	0.00E+00	[0.00E+00]	kg
	Incineration with energy recovery	0.00E+00	0.00E+00	[0.00E+00]	kg
	Energy conversion efficiency rate	0.00E+00	0.00E+00	[0.00E+00]	
Disposal (specified by type)	Product or material for final deposition	0.00E+00	0.00E+00	[0.00E+00]	kg
Removals of biogenic carbon (excluding packaging)		0.00E+00	0.00E+00	[0.00E+00]	kg CO ₂

‡ Value [kg] for F-1400XX Facing Addon (1 m²) can be found in Table 4 in row values for "Weight of products transported"



ENVIRONMENTAL PRODUCT DECLARATION



Thermafiber® Mineral Wool
Light and Heavy Density Mineral Wool Insulation

According to ISO 14025,
EN 15804 and ISO 21930:2017

Table 8. End-of-life, Disposal (C4)

		Thermafiber® Heavy Density Mineral Wool Insulation (1 m ² , R _{SI} -1)	Thermafiber® Light Density Mineral Wool Insulation (1 m ² , R _{SI} -1)	F-1400XX Facing Addon (1 m ²)	
Assumptions for scenario development (description of deconstruction, collection, recovery, disposal method and transportation)	Although reuse and recycling of mineral wool insulation at its end of life is possible, there are no formal programs for collection and transport. It is assumed that all product is sent to landfill at end of life.				
Collection process (specified by type)	Collected separately	0.00E+00	0.00E+00	[0.00E+00]	kg
	Collected with mixed construction waste	0.00E+00	0.00E+00	[0.00E+00]	kg
Recovery (specified by type)	Reuse	0.00E+00	0.00E+00	[0.00E+00]	kg
	Recycling	0.00E+00	0.00E+00	[0.00E+00]	kg
	Landfill	0.00E+00	0.00E+00	[0.00E+00]	kg
	Incineration	0.00E+00	0.00E+00	[0.00E+00]	kg
	Incineration with energy recovery	0.00E+00	0.00E+00	[0.00E+00]	kg
	Energy conversion efficiency rate	0.00E+00	0.00E+00	[0.00E+00]	
Disposal (specified by type)	Product or material for final deposition	3.49E+00	1.68E+00	[‡]	kg
Removals of biogenic carbon (excluding packaging)		0.00E+00	0.00E+00	[0.00E+00]	kg CO ₂

‡ Value [kg] for F-1400XX Facing Addon (1 m²) can be found in **Table 4** in row values for "Weight of products transported"



ENVIRONMENTAL PRODUCT DECLARATION



Thermafiber® Mineral Wool
Light and Heavy Density Mineral Wool Insulation

According to ISO 14025,
EN 15804 and ISO 21930:2017

4. Life Cycle Assessment Results

Table 9. Description of the system boundary modules

	PRODUCT STAGE			CONSTRUCTION PROCESS STAGE		USE STAGE							END OF LIFE STAGE				BENEFITS AND LOADS BEYOND THE SYSTEM BOUNDARY	
	A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D	
	Raw material supply	Transport	Manufacturing	Transport from gate to site	Assembly/Install	Use	Maintenance	Repair	Replacement	Refurbishment	Building Operational Energy Use During Product Use	Building Operational Water Use During Product Use	Deconstruction	Transport	Waste processing	Disposal	Reuse, Recovery, Recycling Potential	Reference Service Life
Thermafiber® Mineral Wool Insulation (1 m ² , R _{SI} -1)	x	x	x	x	x	MND	MND	MND	MND	MND	MND	MND	MND	x	MND	x	MND	75 years
F-1400XX Facing Addon for Faced Thermafiber® Mineral Wool Insulation (1 m ²)	x	x	x	x	MND	MND	MND	MND	MND	MND	MND	MND	MND	x	MND	x	MND	75 years
EPD Type: Cradle to installation with end of life	Required					Optional (Based on scenarios)							Required				Required	



ENVIRONMENTAL PRODUCT DECLARATION



Thermafiber® Mineral Wool
Light and Heavy Density Mineral Wool Insulation

According to ISO 14025,
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4.1. Life Cycle Impact Assessment Results

Table 10 LCIA Results for North America (TRACI) for Thermafiber® Heavy Density Mineral Wool Insulation (1 m², R_{SI}-1)

Thermafiber® Heavy Density Mineral Wool Insulation (1 m ² , R _{SI} -1)								
TRACI v2.1	A1 - A3	A4	A5	B1 - B7	C1	C2	C3	C4
GWP 100 [kg CO2 eq]	9.71E+00	1.00E+00	1.15E-03	MND	MND	9.22E-02	MND	1.83E-02
ODP [kg CFC-11 eq]	1.14E-06	2.47E-07	6.19E-11	MND	MND	2.28E-08	MND	8.85E-09
AP [kg SO2 eq]	6.95E-02	6.23E-03	1.86E-06	MND	MND	5.74E-04	MND	1.60E-04
EP [kg N eq]	2.61E-02	1.24E-03	5.09E-05	MND	MND	1.15E-04	MND	3.42E-05
POCP [kg O3 eq]	7.65E-01	1.69E-01	4.92E-05	MND	MND	1.56E-02	MND	3.81E-03
ADP _{fossil} [MJ, LHV]	1.17E+01	2.22E+00	5.62E-04	MND	MND	2.05E-01	MND	8.22E-02

[GWP 100 - Global Warming Potential]; [ODP - Ozone Depletion Potential]; [AP - Acidification Potential]; [EP - Eutrophication Potential]; [POCP - Smog Formation Potential]; [ADP_{fossil} - Abiotic Resource Depletion Potential of Non-renewable (fossil) energy resources]

Table 11 LCIA Results for North America (TRACI) for Thermafiber® Light Density Mineral Wool Insulation (1 m², R_{SI}-1)

Thermafiber® Light Density Mineral Wool Insulation (1 m ² , R _{SI} -1)								
TRACI v2.1	A1 - A3	A4	A5	B1 - B7	C1	C2	C3	C4
GWP 100 [kg CO2 eq]	4.77E+00	4.88E-01	3.07E-03	MND	MND	4.45E-02	MND	8.84E-03
ODP [kg CFC-11 eq]	4.28E-07	1.20E-07	1.66E-10	MND	MND	1.10E-08	MND	4.27E-09
AP [kg SO2 eq]	2.99E-02	3.04E-03	4.99E-06	MND	MND	2.77E-04	MND	7.74E-05
EP [kg N eq]	1.29E-02	6.06E-04	1.36E-04	MND	MND	5.52E-05	MND	1.65E-05
POCP [kg O3 eq]	2.92E-01	8.23E-02	1.32E-04	MND	MND	7.51E-03	MND	1.84E-03
ADP _{fossil} [MJ, LHV]	4.67E+00	1.08E+00	1.51E-03	MND	MND	9.88E-02	MND	3.97E-02

[GWP 100 - Global Warming Potential]; [ODP - Ozone Depletion Potential]; [AP - Acidification Potential]; [EP - Eutrophication Potential]; [POCP - Smog Formation Potential]; [ADP_{fossil} - Abiotic Resource Depletion Potential of Non-renewable (fossil) energy resources]

Table 12 LCIA Results for North America (TRACI) for F-1400XX Facing Addon (1 m²), Cradle-to-Grave (A1-C4)

TRACI v2.1 Cradle-to-Grave (A1-C4)						
	GWP 100 [kg CO2 eq]	ODP [kg CFC-11 eq]	AP [kg SO2 eq]	EP [kg N eq]	POCP [kg O3 eq]	ADP _{fossil} [MJ, LHV]
F-1400XX Facing Addon (1 m ²)	A1-C4	A1-C4	A1-C4	A1-C4	A1-C4	A1-C4
F-140001, 5225T-White	4.65E-01	2.79E-08	2.61E-03	1.26E-03	3.43E-02	4.13E-01
F-140011, 5225T Printed	4.49E-01	2.67E-08	2.54E-03	1.22E-03	3.33E-02	3.80E-01
F-140012, 5263 Printed 5x5	4.81E-01	2.85E-08	2.68E-03	1.26E-03	3.55E-02	4.97E-01
F-140021, 30J	6.41E-01	4.89E-08	3.62E-03	2.20E-03	5.24E-02	7.04E-01
F-140024, WMP-VR	1.90E-01	2.16E-08	1.11E-03	9.43E-04	1.94E-02	3.56E-01
F-140031, 3114B	1.91E-01	2.07E-08	1.19E-03	4.86E-04	1.95E-02	3.22E-01
F-140041, 7503	2.01E-01	2.14E-08	1.27E-03	5.09E-04	2.07E-02	3.29E-01
F-140042, G/47499	1.25E-01	1.42E-08	5.37E-04	7.27E-04	8.46E-03	3.20E-01
F-140071, 3035/PE 2.0	6.48E-01	4.38E-08	3.48E-03	1.61E-03	4.95E-02	9.86E-01
F-140081, 5225T	4.49E-01	2.67E-08	2.54E-03	1.22E-03	3.33E-02	3.80E-01
F-140091, 5229	9.40E-01	4.82E-08	5.22E-03	2.51E-03	6.57E-02	7.97E-01
F-140095, 5229 Printed	9.40E-01	4.82E-08	5.22E-03	2.51E-03	6.57E-02	7.97E-01

[GWP 100 - Global Warming Potential]; [ODP - Ozone Depletion Potential]; [AP - Acidification Potential]; [EP - Eutrophication Potential]; [POCP - Smog Formation Potential]; [ADP_{fossil} - Abiotic Resource Depletion Potential of Non-renewable (fossil) energy resources]

Results by life cycle module, the aggregate of which are shown in [Table 12](#), can be found in [Appendix A](#).



ENVIRONMENTAL PRODUCT DECLARATION



Thermafiber® Mineral Wool
Light and Heavy Density Mineral Wool Insulation

According to ISO 14025,
EN 15804 and ISO 21930:2017

4.2. Life Cycle Inventory Results

Table 13 Resource Use for Thermafiber® Heavy Density Mineral Wool Insulation (1 m², R_{SI}-1)

Parameter	A1 - A3	A4	A5	B1 - B7	C1	C2	C3	C4
RPRE [MJ, LHV]	2.29E+00	1.52E-01	3.77E-05	MND	MND	1.40E-02	MND	4.64E-03
RPRM [MJ, LHV]	0.00E+00	0.00E+00	0.00E+00	MND	MND	0.00E+00	MND	0.00E+00
NRPRE [MJ, LHV]	1.14E+02	1.55E+01	3.92E-03	MND	MND	1.43E+00	MND	5.67E-01
NRPRM [MJ, LHV]	1.02E+01	0.00E+00	0.00E+00	MND	MND	0.00E+00	MND	0.00E+00
SM [kg]	4.23E+00	0.00E+00	0.00E+00	MND	MND	0.00E+00	MND	0.00E+00
RSF [MJ, LHV]	0.00E+00	0.00E+00	0.00E+00	MND	MND	0.00E+00	MND	0.00E+00
NRSF [MJ, LHV]	0.00E+00	0.00E+00	0.00E+00	MND	MND	0.00E+00	MND	0.00E+00
RE [MJ, LHV]	0.00E+00	0.00E+00	0.00E+00	MND	MND	0.00E+00	MND	0.00E+00
FW [m3]	3.59E-02	2.76E-03	1.42E-06	MND	MND	2.54E-04	MND	5.91E-04

[RPRE - Renewable primary energy used as energy carrier (fuel)]; [RPRM - Renewable primary resources with energy content used as material]; [NRPRE - Non-renewable primary resources used as an energy carrier (fuel)]; [NRPRM - Non-renewable primary resources with energy content used as material]; [SM - Secondary materials]; [RSF - Renewable secondary fuels]; [NRSF - Non-renewable secondary fuels]; [RE - Recovered energy]; [FW - Use of net fresh water resources]

Table 14 Resource Use for Thermafiber® Light Density Mineral Wool Insulation (1 m², R_{SI}-1)

Parameter	A1 - A3	A4	A5	B1 - B7	C1	C2	C3	C4
RPRE [MJ, LHV]	1.28E+00	7.42E-02	1.01E-04	MND	MND	6.76E-03	MND	2.24E-03
RPRM [MJ, LHV]	0.00E+00	0.00E+00	0.00E+00	MND	MND	0.00E+00	MND	0.00E+00
NRPRE [MJ, LHV]	4.91E+01	7.56E+00	1.05E-02	MND	MND	6.89E-01	MND	2.73E-01
NRPRM [MJ, LHV]	6.12E+00	0.00E+00	0.00E+00	MND	MND	0.00E+00	MND	0.00E+00
SM [kg]	2.19E+00	0.00E+00	0.00E+00	MND	MND	0.00E+00	MND	0.00E+00
RSF [MJ, LHV]	0.00E+00	0.00E+00	0.00E+00	MND	MND	0.00E+00	MND	0.00E+00
NRSF [MJ, LHV]	0.00E+00	0.00E+00	0.00E+00	MND	MND	0.00E+00	MND	0.00E+00
RE [MJ, LHV]	0.00E+00	0.00E+00	0.00E+00	MND	MND	0.00E+00	MND	0.00E+00
FW [m3]	1.44E-02	1.35E-03	3.81E-06	MND	MND	1.23E-04	MND	2.85E-04

[RPRE - Renewable primary energy used as energy carrier (fuel)]; [RPRM - Renewable primary resources with energy content used as material]; [NRPRE - Non-renewable primary resources used as an energy carrier (fuel)]; [NRPRM - Non-renewable primary resources with energy content used as material]; [SM - Secondary materials]; [RSF - Renewable secondary fuels]; [NRSF - Non-renewable secondary fuels]; [RE - Recovered energy]; [FW - Use of net fresh water resources]

Table 15 Resource Use for F-1400XX Facing Addon (1 m², Cradle-to-Grave (A1-C4))

	RPRE [MJ, LHV]	RPRM [MJ, LHV]	NRPRE [MJ, LHV]	NRPRM [MJ, LHV]	SM [kg]	RSF [MJ, LHV]	NRSF [MJ, LHV]	RE [MJ, LHV]	FW [m3]
Facing Addon	A1-C4	A1-C4	A1-C4	A1-C4	A1-C4	A1-C4	A1-C4	A1-C4	A1-C4
F-140001, 5225T-White	4.71E-01	0.00E+00	5.26E+00	6.56E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.23E-03
F-140011, 5225T Printed	4.64E-01	0.00E+00	5.00E+00	5.18E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.08E-03
F-140012, 5263 Printed 5x5	4.97E-01	0.00E+00	5.89E+00	1.48E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.49E-03
F-140021, 30J	5.63E+00	2.59E+00	7.75E+00	7.40E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.05E-03
F-140024, WMP-VR	2.07E+00	1.73E+00	3.05E+00	1.07E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.56E-03
F-140031, 3114B	1.21E-01	0.00E+00	2.82E+00	9.44E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.62E-03
F-140041, 7503	1.27E-01	0.00E+00	2.90E+00	7.82E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.63E-03
F-140042, G/47499	8.49E-02	3.75E-01	2.44E+00	1.81E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.82E-03
F-140071, 3035/PE 2.0	2.59E+00	1.73E+00	9.76E+00	4.82E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.21E-03
F-140081, 5225T	4.64E-01	0.00E+00	5.00E+00	5.18E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.08E-03
F-140091, 5229	9.85E-01	0.00E+00	1.07E+01	2.10E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.39E-03
F-140095, 5229 Printed	9.85E-01	0.00E+00	1.07E+01	2.10E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.39E-03

[RPRE - Renewable primary energy used as energy carrier (fuel)]; [RPRM - Renewable primary resources with energy content used as material]; [NRPRE - Non-renewable primary resources used as an energy carrier (fuel)]; [NRPRM - Non-renewable primary resources with energy content used as material]; [SM - Secondary materials]; [RSF - Renewable secondary fuels]; [NRSF - Non-renewable secondary fuels]; [RE - Recovered energy]; [FW - Use of net fresh water resources]

Results by life cycle module, the aggregate of which are shown in **Table 15**, can be found in **Appendix B**.



ENVIRONMENTAL PRODUCT DECLARATION



Thermafiber® Mineral Wool
Light and Heavy Density Mineral Wool Insulation

According to ISO 14025,
EN 15804 and ISO 21930:2017

Table 16 Output Flows and Waste Categories for Thermafiber® Heavy Density Mineral Wool Insulation (1 m², R_{SI}-1)

Parameter	A1 - A3	A4	A5	B1 - B7	C1	C2	C3	C4
HWD [kg]	0.00E+00	0.00E+00	0.00E+00	MND	MND	0.00E+00	MND	0.00E+00
NHWD [kg]	2.73E+00	0.00E+00	4.95E-03	MND	MND	0.00E+00	MND	3.49E+00
HLRW [kg] or [m ³]	0.00E+00	0.00E+00	0.00E+00	MND	MND	0.00E+00	MND	0.00E+00
ILLRW [kg] or [m ³]	0.00E+00	0.00E+00	0.00E+00	MND	MND	0.00E+00	MND	0.00E+00
CRU [kg]	0.00E+00	0.00E+00	0.00E+00	MND	MND	0.00E+00	MND	0.00E+00
MR [kg]	5.06E-01	0.00E+00	1.24E-03	MND	MND	0.00E+00	MND	0.00E+00
MER [kg]	0.00E+00	0.00E+00	1.09E-03	MND	MND	0.00E+00	MND	0.00E+00
EE [MJ, LHV]	0.00E+00	0.00E+00	0.00E+00	MND	MND	0.00E+00	MND	0.00E+00

[HWD - Hazardous waste disposed]; [NHWD - Non-hazardous waste disposed]; [HLRW - High-level radioactive waste, conditioned, to final repository]; [ILLRW - Intermediate- and low-level radioactive waste, conditioned, to final repository]; [CRU - Components for re-use]; [MR - Materials for recycling]; [MER - Materials for energy recovery]; [EE - Exported energy];

Table 17 Output Flows and Waste Categories for Thermafiber® Light Density Mineral Wool Insulation (1 m², R_{SI}-1)

Parameter	A1 - A3	A4	A5	B1 - B7	C1	C2	C3	C4
HWD [kg]	0.00E+00	0.00E+00	0.00E+00	MND	MND	0.00E+00	MND	0.00E+00
NHWD [kg]	1.22E+00	0.00E+00	1.33E-02	MND	MND	0.00E+00	MND	1.68E+00
HLRW [kg] or [m ³]	0.00E+00	0.00E+00	0.00E+00	MND	MND	0.00E+00	MND	0.00E+00
ILLRW [kg] or [m ³]	0.00E+00	0.00E+00	0.00E+00	MND	MND	0.00E+00	MND	0.00E+00
CRU [kg]	0.00E+00	0.00E+00	0.00E+00	MND	MND	0.00E+00	MND	0.00E+00
MR [kg]	3.98E-01	0.00E+00	3.32E-03	MND	MND	0.00E+00	MND	0.00E+00
MER [kg]	0.00E+00	0.00E+00	2.93E-03	MND	MND	0.00E+00	MND	0.00E+00
EE [MJ, LHV]	0.00E+00	0.00E+00	0.00E+00	MND	MND	0.00E+00	MND	0.00E+00

[HWD - Hazardous waste disposed]; [NHWD - Non-hazardous waste disposed]; [HLRW - High-level radioactive waste, conditioned, to final repository]; [ILLRW - Intermediate- and low-level radioactive waste, conditioned, to final repository]; [CRU - Components for re-use]; [MR - Materials for recycling]; [MER - Materials for energy recovery]; [EE - Exported energy];

Table 18 Output Flows and Waste Categories for F-1400XX Facing Addon (1 m²), Cradle-to-Grave (A1-C4)

	HWD [kg]	NHWD [kg]	HLRW [kg] or [m ³]	ILLRW [kg] or [m ³]	CRU [kg]	MR [kg]	MER [kg]	EE [MJ, LHV]
Facing Addon	A1-C4	A1-C4	A1-C4	A1-C4	A1-C4	A1-C4	A1-C4	A1-C4
F-140001, 5225T-White	0.00E+00	5.81E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
F-140011, 5225T Printed	0.00E+00	5.37E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
F-140012, 5263 Printed 5x5	0.00E+00	6.35E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
F-140021, 30J	0.00E+00	1.42E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
F-140024, WMP-VR	0.00E+00	8.30E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
F-140031, 3114B	0.00E+00	6.84E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
F-140041, 7503	0.00E+00	7.08E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
F-140042, G/47499	0.00E+00	3.76E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
F-140071, 3035/PE 2.0	0.00E+00	1.37E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
F-140081, 5225T	0.00E+00	5.37E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
F-140091, 5229	0.00E+00	9.28E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
F-140095, 5229 Printed	0.00E+00	9.28E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

[HWD - Hazardous waste disposed]; [NHWD - Non-hazardous waste disposed]; [HLRW - High-level radioactive waste, conditioned, to final repository]; [ILLRW - Intermediate- and low-level radioactive waste, conditioned, to final repository]; [CRU - Components for re-use]; [MR - Materials for recycling]; [MER - Materials for energy recovery]; [EE - Exported energy];

Results by life cycle module, the aggregate of which are shown in **Table 18**, can be found in **Appendix C**.



ENVIRONMENTAL PRODUCT DECLARATION



Thermafiber® Mineral Wool
Light and Heavy Density Mineral Wool Insulation

According to ISO 14025,
EN 15804 and ISO 21930:2017

Table 19 Carbon Emissions and Removals for Thermafiber® Heavy Density Mineral Wool Insulation (1 m², R_S-1)

Parameter	A1 - A3	A4	A5	B1 - B7	C1	C2	C3	C4
BCRP [kg CO ₂]	0.00E+00	0.00E+00	0.00E+00	MND	MND	0.00E+00	MND	0.00E+00
BCEP [kg CO ₂]	0.00E+00	0.00E+00	0.00E+00	MND	MND	0.00E+00	MND	0.00E+00
BCRK [kg CO ₂]	0.00E+00	0.00E+00	0.00E+00	MND	MND	0.00E+00	MND	0.00E+00
BCEK [kg CO ₂]	0.00E+00	0.00E+00	0.00E+00	MND	MND	0.00E+00	MND	0.00E+00
BCEW [kg CO ₂]	0.00E+00	0.00E+00	0.00E+00	MND	MND	0.00E+00	MND	0.00E+00
CCE [kg CO ₂]	0.00E+00	0.00E+00	0.00E+00	MND	MND	0.00E+00	MND	0.00E+00
CCR [kg CO ₂]	0.00E+00	0.00E+00	0.00E+00	MND	MND	0.00E+00	MND	0.00E+00
CWNR [kg CO ₂]	0.00E+00	0.00E+00	0.00E+00	MND	MND	0.00E+00	MND	0.00E+00

[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]

Table 20 Carbon Emissions and Removals for Thermafiber® Light Density Mineral Wool Insulation (1 m², R_S-1)

Parameter	A1 - A3	A4	A5	B1 - B7	C1	C2	C3	C4
BCRP [kg CO ₂]	0.00E+00	0.00E+00	0.00E+00	MND	MND	0.00E+00	MND	0.00E+00
BCEP [kg CO ₂]	0.00E+00	0.00E+00	0.00E+00	MND	MND	0.00E+00	MND	0.00E+00
BCRK [kg CO ₂]	0.00E+00	0.00E+00	0.00E+00	MND	MND	0.00E+00	MND	0.00E+00
BCEK [kg CO ₂]	0.00E+00	0.00E+00	0.00E+00	MND	MND	0.00E+00	MND	0.00E+00
BCEW [kg CO ₂]	0.00E+00	0.00E+00	0.00E+00	MND	MND	0.00E+00	MND	0.00E+00
CCE [kg CO ₂]	0.00E+00	0.00E+00	0.00E+00	MND	MND	0.00E+00	MND	0.00E+00
CCR [kg CO ₂]	0.00E+00	0.00E+00	0.00E+00	MND	MND	0.00E+00	MND	0.00E+00
CWNR [kg CO ₂]	0.00E+00	0.00E+00	0.00E+00	MND	MND	0.00E+00	MND	0.00E+00

[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]

Table 21 Carbon Emissions and Removals for F-1400XX Facing Addon (1 m²), Cradle-to-Grave (A1-C4)

	BCRP [kg CO ₂]	BCEP [kg CO ₂]	BCRK [kg CO ₂]	BCEK [kg CO ₂]	BCEW [kg CO ₂]	CCE [kg CO ₂]	CCR [kg CO ₂]	CWNR [kg CO ₂]
Facing Addon	A1-C4	A1-C4	A1-C4	A1-C4	A1-C4	A1-C4	A1-C4	A1-C4
F-140001, 5225T-White	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
F-140011, 5225T Printed	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
F-140012, 5263 Printed 5x5	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
F-140021, 30J	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
F-140024, WMP-VR	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
F-140031, 3114B	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
F-140041, 7503	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
F-140042, G/47499	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
F-140071, 3035/PE 2.0	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
F-140081, 5225T	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
F-140091, 5229	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
F-140095, 5229 Printed	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

[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]

Results by life cycle module, the aggregate of which are shown in [Table 21](#), can be found in [Appendix D](#).



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4.3. Calculating Impact Category Results for Products with Specific Performance Properties

The environmental impact assessment results have been calculated for both light and heavy density mineral wool insulation. These results, found in [Table 11](#) and [Table 10](#), respectively, are for the functional unit, which has a surface area of 1 m² and a thermal resistance of R_{SI} = 1. In Imperial units, this thermal resistance, or R-value, is equivalent to 5.68 hr·ft²·°F/BTU (i.e., R_{IP} = 5.68 or R - 5.68). However, Thermafiber® Mineral Insulation, however, is manufactured in a variety of thicknesses and has a wide array of facing material options. In order to calculate impact values for Thermafiber® Mineral Wool Insulation having a specific thickness (in) with or without a specific facing material, the following equation can be used:

$$\text{Impact} = \left[\text{Impact of Functional unit}^a \right] \times \left[\text{Density Scaling Factor (in}^{-1}\text{)}^b \right] \times \left[\text{Thickness (in)} \right] + \left[\text{Impact of Facing material}^c \right]$$

Notes:

- For light density products (≤ 4 PCF), impact values can be found in [Table 11](#).
For heavy density products (> 4 PCF), impact values can be found in [Table 10](#).
- Density Scaling Factor = 0.732 in⁻¹ for light density products (≤ 4 PCF) and = 0.750 in⁻¹ for heavy density products (> 4 PCF).
- Impact values for 1 m² of various facing materials can be found in [Table 23](#) through [Table 34](#). If product is unfaced, impact value is 0.

5. LCA Interpretation

The underlying LCA upon which this EPD is based considered the following six environmental impact categories: Global Warming Potential (GWP 100); Ozone Depletion Potential (ODP); Acidification Potential (AP); Eutrophication Potential (EP); Smog Formation Potential (POCP); and Abiotic Resource Depletion Potential of Non-renewable (fossil) energy resources (ADP_{fossil}). The impact assessment results indicate that among the life cycle modules declared for Thermafiber® Mineral Wool Insulation, the *Manufacturing (A3)* life cycle module accounted for the majority of the potential environmental impact of each of these six impact categories.

Although the intended application of mineral wool is for building envelope thermal insulation, the affected reductions in a building's energy consumption when the mineral wool is used for this purpose were not included in the *Use* life cycle stage.



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6. Additional Environmental Information

6.1. Environment and Health During Manufacturing

Owens Corning manufacturing facilities of Thermafiber® Mineral Wool Insulation maintain quality management systems.

6.2. Environment and Health During Installation

This product is considered an article. 29 CFR 1910.1200(c) definition of an article is as follows: "Article" means a manufactured item other than a fluid or particle: (i) which is formed to a specific shape or design during manufacture; (ii) which has end use function(s) dependent in whole or in part upon its shape or design during end use; and (iii) which under normal conditions of use does not release more than very small quantities, e.g., minute or trace amounts of a hazardous chemical (as determined under paragraph (d) of this section), and does not pose a physical hazard or health risk to employees WHMIS Regulatory Status This product is considered an article per the Canadian Hazardous Products Regulation SOR/2015-17.

Manufactured articles which meet the definition of the Canadian Hazardous Products Act (any article that is formed to a specific shape or design during manufacture, the intended use of which when in that form is dependent in whole or in part on its shape or design, and that, when being installed, if the intended use of the article requires it to be installed, and under normal conditions of use, will not release or otherwise cause an individual to be exposed to a hazardous product) are not regulated by the Canadian Hazardous Products Regulation SOR/2015-17. The product's Safe Use Instruction Sheet includes exposure guidelines, engineering controls and individual protection measures.

6.3. Extraordinary Effects

No extraordinary effects or environmental impacts are expected due to destruction of the product by fire, water or mechanical means.

6.4. Delayed Emissions

No delayed emissions are expected from this product.



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6.5. Environmental Activities and Certifications

The material recycled content of Thermafiber® Mineral Wool Insulation has been verified by ICC-ES. The amounts and type of recycled content for Thermafiber® Mineral Wool Insulation products can be found in **Table 22** below.

Table 22 Thermafiber® Mineral Wool Insulation Material Recycled Content by Weight

Product Name	% Pre-Consumer Recycled Content		% Post-Consumer Recycled Content	% Total Recycled Content
	Standard Fiber	EPA Choice Fiber		
Thermafiber® SAFB™ Sound Control Insulation	70	75	0	70 – 75 ¹
Thermafiber® Safing™ Insulation	75		0	75
Thermafiber® FireSpan® 40 and 90 Curtain Wall Insulation	75		0	75
Thermafiber® UltraBatt™ Exterior Wall Insulation	70	N/A	0	70
Thermafiber® RainBarrier® 45 and HD Continuous Insulation	70	75	0	70 – 75 ¹
Thermafiber® TopStop® Head-of-Wall Insulation	75		0	75
Thermafiber® VersaBoard® Commercial Insulation	70	75	0	70 – 75 ¹

1. The values represent the minimum and maximum range of available recycled content for the product. The actual recycled content amount for the product provided to the end user depends on the product formulation requested by the customer.



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According to ISO 14025,
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Made with Wind Energy and Reduced Carbon Footprint

Thermafiber® Mineral Wool Insulation products are available upon request carrying SCS Global Services certification for "Made with Wind Energy" and "Reduced Carbon Footprint". Impact category results when electricity used during manufacturing is matched with wind energy produced as part of Owens Corning's Power Purchase Agreement can be found in the tables below. Cradle-to-gate (A1 - A3) values shown are based on the results from this EPD, which reflect the 2018 production year and are based on NERC regional grid values from the ecoinvent 3.5 LCI database implemented in SimaPro. Dataset and other methodological differences introduce a degree of variability leading to the reduction values shown below to differ from those that appear on certificates.

Thermafiber® Heavy Density Mineral Wool Insulation (1 m ² , R _{SI} -1)			
TRACI v2.1	A1 - A3 STANDARD PRODUCT	A1 - A3 CERTIFIED PRODUCT	% CHANGE
GWP 100 [kg CO ₂ eq]	9.71E+00	8.35E+00	-14%
ODP [kg CFC-11 eq]	1.14E-06	1.06E-06	-7%
AP [kg SO ₂ eq]	6.95E-02	6.51E-02	-6%
EP [kg N eq]	2.61E-02	1.40E-02	-47%
POCP [kg O ₃ eq]	7.65E-01	7.29E-01	-5%
ADP _{fossil} [MJ, LHV]	1.17E+01	1.10E+01	-6%

Thermafiber® Light Density Mineral Wool Insulation (1 m ² , R _{SI} -1)			
TRACI v2.1	A1 - A3 STANDARD PRODUCT	A1 - A3 CERTIFIED PRODUCT	% CHANGE
GWP 100 [kg CO ₂ eq]	4.77E+00	4.04E+00	-15%
ODP [kg CFC-11 eq]	4.28E-07	3.87E-07	-10%
AP [kg SO ₂ eq]	2.99E-02	2.78E-02	-7%
EP [kg N eq]	1.29E-02	6.51E-03	-50%
POCP [kg O ₃ eq]	2.92E-01	2.72E-01	-7%
ADP _{fossil} [MJ, LHV]	4.67E+00	4.27E+00	-9%

6.6. Further Information

Additional information may be found at www.owenscorning.com



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Thermafiber® Mineral Wool
Light and Heavy Density Mineral Wool Insulation



According to ISO 14025,
EN 15804 and ISO 21930:2017

7. References

Product Category Rules (PCR) Guidance for Building-Related Products and Services - Part B: Building Envelope Thermal Insulation EPD Requirements, UL 10010-1 Version 2.0, Second Edition, UL Environment, April 10, 2018.

Product Category Rules for Building Related Products and Services - Part A: Life Cycle Assessment Calculation Rules and Report Requirements, UL 10010 Version 3.2, Fifth Edition, UL Environment, December 12, 2018.

ISO 14025:2006(E), Environmental labels and declarations -Type III environmental declarations -Principles and procedures

ISO 14040:2006(E), Environmental management - Life cycle assessment - Principles and framework

ISO 14044:2006(E), Environmental management - Life cycle assessment - Requirements and guidelines

BS EN 15804:2012, Sustainability of construction works - Environmental product declarations - Core rules for the product category of construction products

ISO 21930:2017(E), Sustainability in buildings and civil engineering works - Core rules for environmental product declarations of construction products and services

PRé Consultants: SimaPro 9.0.0.35 LCA Software. 2019. The Netherlands.

ASTM C518-18: Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus

ASTM C665-18: Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing

Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources using Environmental Chambers - version 1.2, CA Specification 01350, January 2017.



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According to ISO 14025,
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8. Appendices

8.1. Appendix A

Table 23 LCIA Results for North America (TRACI) for F-140001, 5225T-White (1 m²)

F-140001, 5225T-White (1 m ²)								
TRACI v2.1	A1 - A3	A4	A5	B1 - B7	C1	C2	C3	C4
GWP 100 [kg CO2 eq]	4.46E-01	1.69E-02	MND	MND	MND	1.54E-03	MND	3.05E-04
ODP [kg CFC-11 eq]	2.32E-08	4.16E-09	MND	MND	MND	3.81E-10	MND	1.47E-10
AP [kg SO2 eq]	2.49E-03	1.05E-04	MND	MND	MND	9.61E-06	MND	2.67E-06
EP [kg N eq]	1.24E-03	2.10E-05	MND	MND	MND	1.92E-06	MND	5.69E-07
POCP [kg O3 eq]	3.11E-02	2.85E-03	MND	MND	MND	2.61E-04	MND	6.34E-05
ADP _{fossil} [MJ, LHV]	3.71E-01	3.75E-02	MND	MND	MND	3.43E-03	MND	1.37E-03

[GWP 100 - Global Warming Potential]; [ODP - Ozone Depletion Potential]; [AP - Acidification Potential]; [EP - Eutrophication Potential]; [POCP - Smog Formation Potential]; [ADP_{fossil} - Abiotic Resource Depletion Potential of Non-renewable (fossil) energy resources]

Table 24 LCIA Results for North America (TRACI) for F-140011, 5225T Printed (1 m²)

F-140011, 5225T Printed (1 m ²)								
TRACI v2.1	A1 - A3	A4	A5	B1 - B7	C1	C2	C3	C4
GWP 100 [kg CO2 eq]	4.32E-01	1.56E-02	MND	MND	MND	1.43E-03	MND	2.82E-04
ODP [kg CFC-11 eq]	2.23E-08	3.85E-09	MND	MND	MND	3.52E-10	MND	1.36E-10
AP [kg SO2 eq]	2.43E-03	9.71E-05	MND	MND	MND	8.88E-06	MND	2.47E-06
EP [kg N eq]	1.20E-03	1.94E-05	MND	MND	MND	1.77E-06	MND	5.26E-07
POCP [kg O3 eq]	3.04E-02	2.63E-03	MND	MND	MND	2.41E-04	MND	5.86E-05
ADP _{fossil} [MJ, LHV]	3.41E-01	3.46E-02	MND	MND	MND	3.17E-03	MND	1.26E-03

Table 25 LCIA Results for North America (TRACI) for F-140012, 5263 Printed 5x5 (1 m²)

F-140012, 5263 Printed 5x5 (1 m ²)								
TRACI v2.1	A1 - A3	A4	A5	B1 - B7	C1	C2	C3	C4
GWP 100 [kg CO2 eq]	4.61E-01	1.84E-02	MND	MND	MND	1.69E-03	MND	3.33E-04
ODP [kg CFC-11 eq]	2.33E-08	4.55E-09	MND	MND	MND	4.16E-10	MND	1.61E-10
AP [kg SO2 eq]	2.55E-03	1.15E-04	MND	MND	MND	1.05E-05	MND	2.92E-06
EP [kg N eq]	1.24E-03	2.29E-05	MND	MND	MND	2.09E-06	MND	6.22E-07
POCP [kg O3 eq]	3.20E-02	3.11E-03	MND	MND	MND	2.85E-04	MND	6.93E-05
ADP _{fossil} [MJ, LHV]	4.51E-01	4.10E-02	MND	MND	MND	3.75E-03	MND	1.50E-03

Table 26 LCIA Results for North America (TRACI) for F-140021, 30J (1 m²)

F-140021, 30J (1 m ²)								
TRACI v2.1	A1 - A3	A4	A5	B1 - B7	C1	C2	C3	C4
GWP 100 [kg CO2 eq]	5.95E-01	4.11E-02	MND	MND	MND	3.76E-03	MND	7.43E-04
ODP [kg CFC-11 eq]	3.75E-08	1.02E-08	MND	MND	MND	9.28E-10	MND	3.59E-10
AP [kg SO2 eq]	3.34E-03	2.56E-04	MND	MND	MND	2.34E-05	MND	6.51E-06
EP [kg N eq]	2.14E-03	5.11E-05	MND	MND	MND	4.67E-06	MND	1.39E-06
POCP [kg O3 eq]	4.47E-02	6.94E-03	MND	MND	MND	6.35E-04	MND	1.55E-04
ADP _{fossil} [MJ, LHV]	6.01E-01	9.13E-02	MND	MND	MND	8.35E-03	MND	3.33E-03



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Table 27 LCIA Results for North America (TRACI) for F-140024, WMP-VR (1 m²)

F-140024, WMP-VR (1 m ²)								
TRACI v2.1	A1 - A3	A4	A5	B1 - B7	C1	C2	C3	C4
GWP 100 [kg CO2 eq]	1.63E-01	2.41E-02	MND	MND	MND	2.20E-03	MND	4.35E-04
ODP [kg CFC-11 eq]	1.49E-08	5.95E-09	MND	MND	MND	5.44E-10	MND	2.10E-10
AP [kg SO2 eq]	9.38E-04	1.50E-04	MND	MND	MND	1.37E-05	MND	3.81E-06
EP [kg N eq]	9.09E-04	2.99E-05	MND	MND	MND	2.74E-06	MND	8.13E-07
POCP [kg O3 eq]	1.48E-02	4.07E-03	MND	MND	MND	3.72E-04	MND	9.06E-05
ADP _{fossil} [MJ, LHV]	2.95E-01	5.35E-02	MND	MND	MND	4.90E-03	MND	1.95E-03

Table 28 LCIA Results for North America (TRACI) for F-140031, 3114B (1 m²)

F-140031, 3114B (1 m ²)								
TRACI v2.1	A1 - A3	A4	A5	B1 - B7	C1	C2	C3	C4
GWP 100 [kg CO2 eq]	1.69E-01	1.99E-02	MND	MND	MND	1.82E-03	MND	3.59E-04
ODP [kg CFC-11 eq]	1.52E-08	4.90E-09	MND	MND	MND	4.48E-10	MND	1.73E-10
AP [kg SO2 eq]	1.05E-03	1.24E-04	MND	MND	MND	1.13E-05	MND	3.14E-06
EP [kg N eq]	4.59E-04	2.47E-05	MND	MND	MND	2.26E-06	MND	6.70E-07
POCP [kg O3 eq]	1.58E-02	3.35E-03	MND	MND	MND	3.07E-04	MND	7.47E-05
ADP _{fossil} [MJ, LHV]	2.72E-01	4.41E-02	MND	MND	MND	4.03E-03	MND	1.61E-03

Table 29 LCIA Results for North America (TRACI) for F-140041, 7503 (1 m²)

F-140041, 7503 (1 m ²)								
TRACI v2.1	A1 - A3	A4	A5	B1 - B7	C1	C2	C3	C4
GWP 100 [kg CO2 eq]	1.78E-01	2.06E-02	MND	MND	MND	1.88E-03	MND	3.71E-04
ODP [kg CFC-11 eq]	1.57E-08	5.08E-09	MND	MND	MND	4.64E-10	MND	1.80E-10
AP [kg SO2 eq]	1.12E-03	1.28E-04	MND	MND	MND	1.17E-05	MND	3.25E-06
EP [kg N eq]	4.80E-04	2.55E-05	MND	MND	MND	2.34E-06	MND	6.94E-07
POCP [kg O3 eq]	1.68E-02	3.47E-03	MND	MND	MND	3.17E-04	MND	7.73E-05
ADP _{fossil} [MJ, LHV]	2.77E-01	4.57E-02	MND	MND	MND	4.18E-03	MND	1.67E-03

Table 30 LCIA Results for North America (TRACI) for F-140042, G/47499 (1 m²)

F-140042, G/47499 (1 m ²)								
TRACI v2.1	A1 - A3	A4	A5	B1 - B7	C1	C2	C3	C4
GWP 100 [kg CO2 eq]	1.13E-01	1.09E-02	MND	MND	MND	9.98E-04	MND	1.97E-04
ODP [kg CFC-11 eq]	1.11E-08	2.70E-09	MND	MND	MND	2.46E-10	MND	9.53E-11
AP [kg SO2 eq]	4.61E-04	6.80E-05	MND	MND	MND	6.22E-06	MND	1.73E-06
EP [kg N eq]	7.12E-04	1.36E-05	MND	MND	MND	1.24E-06	MND	3.68E-07
POCP [kg O3 eq]	6.40E-03	1.84E-03	MND	MND	MND	1.69E-04	MND	4.10E-05
ADP _{fossil} [MJ, LHV]	2.93E-01	2.43E-02	MND	MND	MND	2.22E-03	MND	8.85E-04



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Table 31 LCIA Results for North America (TRACI) for F-140071, 3035/PE 2.0 (1 m²)

F-140071, 3035/PE 2.0 (1 m ²)								
TRACI v2.1	A1 - A3	A4	A5	B1 - B7	C1	C2	C3	C4
GWP 100 [kg CO2 eq]	6.04E-01	3.97E-02	MND	MND	MND	3.63E-03	MND	7.17E-04
ODP [kg CFC-11 eq]	3.27E-08	9.80E-09	MND	MND	MND	8.96E-10	MND	3.47E-10
AP [kg SO2 eq]	3.20E-03	2.47E-04	MND	MND	MND	2.26E-05	MND	6.28E-06
EP [kg N eq]	1.56E-03	4.93E-05	MND	MND	MND	4.51E-06	MND	1.34E-06
POCP [kg O3 eq]	4.20E-02	6.70E-03	MND	MND	MND	6.13E-04	MND	1.49E-04
ADP _{fossil} [MJ, LHV]	8.87E-01	8.82E-02	MND	MND	MND	8.06E-03	MND	3.22E-03

Table 32 LCIA Results for North America (TRACI) for F-140081, 5225T (1 m²)

F-140081, 5225T (1 m ²)								
TRACI v2.1	A1 - A3	A4	A5	B1 - B7	C1	C2	C3	C4
GWP 100 [kg CO2 eq]	4.32E-01	1.56E-02	MND	MND	MND	1.43E-03	MND	2.82E-04
ODP [kg CFC-11 eq]	2.23E-08	3.85E-09	MND	MND	MND	3.52E-10	MND	1.36E-10
AP [kg SO2 eq]	2.43E-03	9.71E-05	MND	MND	MND	8.88E-06	MND	2.47E-06
EP [kg N eq]	1.20E-03	1.94E-05	MND	MND	MND	1.77E-06	MND	5.26E-07
POCP [kg O3 eq]	3.04E-02	2.63E-03	MND	MND	MND	2.41E-04	MND	5.86E-05
ADP _{fossil} [MJ, LHV]	3.41E-01	3.46E-02	MND	MND	MND	3.17E-03	MND	1.26E-03

Table 33 LCIA Results for North America (TRACI) for F-140091, 5229 (1 m²)

F-140091, 5229 (1 m ²)								
TRACI v2.1	A1 - A3	A4	A5	B1 - B7	C1	C2	C3	C4
GWP 100 [kg CO2 eq]	9.10E-01	2.70E-02	MND	MND	MND	2.46E-03	MND	4.87E-04
ODP [kg CFC-11 eq]	4.07E-08	6.65E-09	MND	MND	MND	6.08E-10	MND	2.35E-10
AP [kg SO2 eq]	5.03E-03	1.68E-04	MND	MND	MND	1.53E-05	MND	4.26E-06
EP [kg N eq]	2.47E-03	3.35E-05	MND	MND	MND	3.06E-06	MND	9.09E-07
POCP [kg O3 eq]	6.06E-02	4.55E-03	MND	MND	MND	4.16E-04	MND	1.01E-04
ADP _{fossil} [MJ, LHV]	7.29E-01	5.99E-02	MND	MND	MND	5.47E-03	MND	2.19E-03

Table 34 LCIA Results for North America (TRACI) for F-140095, 5229 Printed (1 m²)

F-140095, 5229 Printed (1 m ²)								
TRACI v2.1	A1 - A3	A4	A5	B1 - B7	C1	C2	C3	C4
GWP 100 [kg CO2 eq]	9.10E-01	2.70E-02	MND	MND	MND	2.46E-03	MND	4.87E-04
ODP [kg CFC-11 eq]	4.07E-08	6.65E-09	MND	MND	MND	6.08E-10	MND	2.35E-10
AP [kg SO2 eq]	5.03E-03	1.68E-04	MND	MND	MND	1.53E-05	MND	4.26E-06
EP [kg N eq]	2.47E-03	3.35E-05	MND	MND	MND	3.06E-06	MND	9.09E-07
POCP [kg O3 eq]	6.06E-02	4.55E-03	MND	MND	MND	4.16E-04	MND	1.01E-04
ADP _{fossil} [MJ, LHV]	7.29E-01	5.99E-02	MND	MND	MND	5.47E-03	MND	2.19E-03



ENVIRONMENTAL PRODUCT DECLARATION



Thermafiber® Mineral Wool
Light and Heavy Density Mineral Wool Insulation

According to ISO 14025,
EN 15804 and ISO 21930:2017

8.2. Appendix B

Table 35 Resource Use for F-140001, 5225T-White (1 m²)

Parameter	A1 - A3	A4	A5	B1 - B7	C1	C2	C3	C4
RPRE [MJ, LHV]	4.68E-01	2.57E-03	MND	MND	MND	2.35E-04	MND	7.71E-05
RPRM [MJ, LHV]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00
NRPRE [MJ, LHV]	4.96E+00	2.62E-01	MND	MND	MND	2.39E-02	MND	9.43E-03
NRPRM [MJ, LHV]	6.56E-01	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00
SM [kg]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00
RSF [MJ, LHV]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00
NRSF [MJ, LHV]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00
RE [MJ, LHV]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00
FW [m3]	3.17E-03	4.66E-05	MND	MND	MND	4.26E-06	MND	9.84E-06

[RPRE - Renewable primary energy used as energy carrier (fuel)]; [RPRM - Renewable primary resources with energy content used as material]; [NRPRE - Non-renewable primary resources used as an energy carrier (fuel)]; [NRPRM - Non-renewable primary resources with energy content used as material]; [SM - Secondary materials]; [RSF - Renewable secondary fuels]; [NRSF - Non-renewable secondary fuels]; [RE - Recovered energy]; [FW - Use of net fresh water resources]

Table 36 Resource Use for F-140011, 5225T Printed (1 m²)

Parameter	A1 - A3	A4	A5	B1 - B7	C1	C2	C3	C4
RPRE [MJ, LHV]	4.61E-01	2.37E-03	MND	MND	MND	2.17E-04	MND	7.13E-05
RPRM [MJ, LHV]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00
NRPRE [MJ, LHV]	4.73E+00	2.42E-01	MND	MND	MND	2.21E-02	MND	8.72E-03
NRPRM [MJ, LHV]	5.18E-01	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00
SM [kg]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00
RSF [MJ, LHV]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00
NRSF [MJ, LHV]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00
RE [MJ, LHV]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00
FW [m3]	3.03E-03	4.31E-05	MND	MND	MND	3.94E-06	MND	9.09E-06

Table 37 Resource Use for F-140012, 5263 Printed 5x5 (1 m²)

Parameter	A1 - A3	A4	A5	B1 - B7	C1	C2	C3	C4
RPRE [MJ, LHV]	4.94E-01	2.80E-03	MND	MND	MND	2.56E-04	MND	8.43E-05
RPRM [MJ, LHV]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00
NRPRE [MJ, LHV]	5.57E+00	2.86E-01	MND	MND	MND	2.61E-02	MND	1.03E-02
NRPRM [MJ, LHV]	1.48E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00
SM [kg]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00
RSF [MJ, LHV]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00
NRSF [MJ, LHV]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00
RE [MJ, LHV]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00
FW [m3]	3.42E-03	5.09E-05	MND	MND	MND	4.66E-06	MND	1.08E-05

Table 38 Resource Use for F-140021, 30J (1 m²)

Parameter	A1 - A3	A4	A5	B1 - B7	C1	C2	C3	C4
RPRE [MJ, LHV]	5.63E+00	6.25E-03	MND	MND	MND	5.72E-04	MND	1.88E-04
RPRM [MJ, LHV]	2.59E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00
NRPRE [MJ, LHV]	7.03E+00	6.37E-01	MND	MND	MND	5.83E-02	MND	2.30E-02
NRPRM [MJ, LHV]	7.40E-01	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00
SM [kg]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00
RSF [MJ, LHV]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00
NRSF [MJ, LHV]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00
RE [MJ, LHV]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00
FW [m3]	5.91E-03	1.14E-04	MND	MND	MND	1.04E-05	MND	2.40E-05



ENVIRONMENTAL PRODUCT DECLARATION



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According to ISO 14025,
EN 15804 and ISO 21930:2017

Table 39 Resource Use for F-140024, WMP-VR (1 m²)

Parameter	A1 - A3	A4	A5	B1 - B7	C1	C2	C3	C4
RPRE [MJ, LHV]	2.06E+00	3.67E-03	MND	MND	MND	3.35E-04	MND	1.10E-04
RPRM [MJ, LHV]	1.73E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00
NRPRE [MJ, LHV]	2.62E+00	3.74E-01	MND	MND	MND	3.42E-02	MND	1.35E-02
NRPRM [MJ, LHV]	1.07E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00
SM [kg]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00
RSF [MJ, LHV]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00
NRSF [MJ, LHV]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00
RE [MJ, LHV]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00
FW [m3]	3.47E-03	6.65E-05	MND	MND	MND	6.09E-06	MND	1.41E-05

Table 40 Resource Use for F-140031, 3114B (1 m²)

Parameter	A1 - A3	A4	A5	B1 - B7	C1	C2	C3	C4
RPRE [MJ, LHV]	1.17E-01	3.02E-03	MND	MND	MND	2.76E-04	MND	9.08E-05
RPRM [MJ, LHV]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00
NRPRE [MJ, LHV]	2.47E+00	3.08E-01	MND	MND	MND	2.82E-02	MND	1.11E-02
NRPRM [MJ, LHV]	9.44E-01	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00
SM [kg]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00
RSF [MJ, LHV]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00
NRSF [MJ, LHV]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00
RE [MJ, LHV]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00
FW [m3]	1.55E-03	5.48E-05	MND	MND	MND	5.01E-06	MND	1.16E-05

Table 41 Resource Use for F-140041, 7503 (1 m²)

Parameter	A1 - A3	A4	A5	B1 - B7	C1	C2	C3	C4
RPRE [MJ, LHV]	1.23E-01	3.13E-03	MND	MND	MND	2.86E-04	MND	9.40E-05
RPRM [MJ, LHV]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00
NRPRE [MJ, LHV]	2.55E+00	3.19E-01	MND	MND	MND	2.91E-02	MND	1.15E-02
NRPRM [MJ, LHV]	7.82E-01	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00
SM [kg]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00
RSF [MJ, LHV]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00
NRSF [MJ, LHV]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00
RE [MJ, LHV]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00
FW [m3]	1.56E-03	5.68E-05	MND	MND	MND	5.19E-06	MND	1.20E-05

Table 42 Resource Use for F-140042, G/47499 (1 m²)

Parameter	A1 - A3	A4	A5	B1 - B7	C1	C2	C3	C4
RPRE [MJ, LHV]	8.30E-02	1.66E-03	MND	MND	MND	1.52E-04	MND	4.99E-05
RPRM [MJ, LHV]	3.75E-01	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00
NRPRE [MJ, LHV]	2.25E+00	1.69E-01	MND	MND	MND	1.55E-02	MND	6.10E-03
NRPRM [MJ, LHV]	1.81E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00
SM [kg]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00
RSF [MJ, LHV]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00
NRSF [MJ, LHV]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00
RE [MJ, LHV]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00
FW [m3]	1.78E-03	3.01E-05	MND	MND	MND	2.76E-06	MND	6.37E-06



ENVIRONMENTAL PRODUCT DECLARATION



Thermafiber® Mineral Wool
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According to ISO 14025,
EN 15804 and ISO 21930:2017

Table 43 Resource Use for F-140071, 3035/PE 2.0 (1 m²)

Parameter	A1 - A3	A4	A5	B1 - B7	C1	C2	C3	C4
RPRE [MJ, LHV]	2.58E+00	6.04E-03	MND	MND	MND	5.52E-04	MND	1.82E-04
RPRM [MJ, LHV]	1.73E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00
NRPRE [MJ, LHV]	9.06E+00	6.15E-01	MND	MND	MND	5.63E-02	MND	2.22E-02
NRPRM [MJ, LHV]	4.82E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00
SM [kg]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00
RSF [MJ, LHV]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00
NRSF [MJ, LHV]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00
RE [MJ, LHV]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00
FW [m3]	7.07E-03	1.10E-04	MND	MND	MND	1.00E-05	MND	2.32E-05

Table 44 Resource Use for F-140081, 5225T (1 m²)

Parameter	A1 - A3	A4	A5	B1 - B7	C1	C2	C3	C4
RPRE [MJ, LHV]	4.61E-01	2.37E-03	MND	MND	MND	2.17E-04	MND	7.13E-05
RPRM [MJ, LHV]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00
NRPRE [MJ, LHV]	4.73E+00	2.42E-01	MND	MND	MND	2.21E-02	MND	8.72E-03
NRPRM [MJ, LHV]	5.18E-01	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00
SM [kg]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00
RSF [MJ, LHV]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00
NRSF [MJ, LHV]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00
RE [MJ, LHV]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00
FW [m3]	3.03E-03	4.31E-05	MND	MND	MND	3.94E-06	MND	9.09E-06

Table 45 Resource Use for F-140091, 5229 (1 m²)

Parameter	A1 - A3	A4	A5	B1 - B7	C1	C2	C3	C4
RPRE [MJ, LHV]	9.80E-01	4.10E-03	MND	MND	MND	3.75E-04	MND	1.23E-04
RPRM [MJ, LHV]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00
NRPRE [MJ, LHV]	1.02E+01	4.18E-01	MND	MND	MND	3.82E-02	MND	1.51E-02
NRPRM [MJ, LHV]	2.10E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00
SM [kg]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00
RSF [MJ, LHV]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00
NRSF [MJ, LHV]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00
RE [MJ, LHV]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00
FW [m3]	6.30E-03	7.44E-05	MND	MND	MND	6.80E-06	MND	1.57E-05

Table 46 Resource Use for F-140095, 5229 Printed (1 m²)

Parameter	A1 - A3	A4	A5	B1 - B7	C1	C2	C3	C4
RPRE [MJ, LHV]	9.80E-01	4.10E-03	MND	MND	MND	3.75E-04	MND	1.23E-04
RPRM [MJ, LHV]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00
NRPRE [MJ, LHV]	1.02E+01	4.18E-01	MND	MND	MND	3.82E-02	MND	1.51E-02
NRPRM [MJ, LHV]	2.10E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00
SM [kg]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00
RSF [MJ, LHV]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00
NRSF [MJ, LHV]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00
RE [MJ, LHV]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00
FW [m3]	6.30E-03	7.44E-05	MND	MND	MND	6.80E-06	MND	1.57E-05



ENVIRONMENTAL PRODUCT DECLARATION



Thermafiber® Mineral Wool
Light and Heavy Density Mineral Wool Insulation

According to ISO 14025,
EN 15804 and ISO 21930:2017

8.3. Appendix C

Table 47 Output Flows and Waste Categories for F-140001, 5225T-White (1 m²)

Parameter	A1 - A3	A4	A5	B1 - B7	C1	C2	C3	C4
HWD [kg]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00
NHWD [kg]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	5.81E-02
HLRW [kg] or [m ³]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00
ILLRW [kg] or [m ³]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00
CRU [kg]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00
MR [kg]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00
MER [kg]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00
EE [MJ, LHV]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00

[HWD - Hazardous waste disposed]; [NHWD - Non-hazardous waste disposed]; [HLRW - High-level radioactive waste, conditioned, to final repository]; [ILLRW - Intermediate- and low-level radioactive waste, conditioned, to final repository]; [CRU - Components for re-use]; [MR - Materials for recycling]; [MER - Materials for energy recovery]; [EE - Exported energy];

Table 48 Output Flows and Waste Categories for F-140011, 5225T Printed (1 m²)

Parameter	A1 - A3	A4	A5	B1 - B7	C1	C2	C3	C4
HWD [kg]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00
NHWD [kg]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	5.37E-02
HLRW [kg] or [m ³]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00
ILLRW [kg] or [m ³]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00
CRU [kg]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00
MR [kg]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00
MER [kg]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00
EE [MJ, LHV]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00

Table 49 Output Flows and Waste Categories for F-140012, 5263 Printed 5x5 (1 m²)

Parameter	A1 - A3	A4	A5	B1 - B7	C1	C2	C3	C4
HWD [kg]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00
NHWD [kg]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	6.35E-02
HLRW [kg] or [m ³]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00
ILLRW [kg] or [m ³]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00
CRU [kg]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00
MR [kg]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00
MER [kg]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00
EE [MJ, LHV]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00

Table 50 Output Flows and Waste Categories for F-140021, 30J (1 m²)

Parameter	A1 - A3	A4	A5	B1 - B7	C1	C2	C3	C4
HWD [kg]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00
NHWD [kg]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	1.42E-01
HLRW [kg] or [m ³]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00
ILLRW [kg] or [m ³]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00
CRU [kg]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00
MR [kg]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00
MER [kg]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00
EE [MJ, LHV]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00



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Table 51 Output Flows and Waste Categories for F-140024, WMP-VR (1 m²)

Parameter	A1 - A3	A4	A5	B1 - B7	C1	C2	C3	C4
HWD [kg]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00
NHWD [kg]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	8.30E-02
HLRW [kg] or [m ³]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00
ILLRW [kg] or [m ³]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00
CRU [kg]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00
MR [kg]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00
MER [kg]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00
EE [MJ, LHV]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00

Table 52 Output Flows and Waste Categories for F-140031, 3114B (1 m²)

Parameter	A1 - A3	A4	A5	B1 - B7	C1	C2	C3	C4
HWD [kg]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00
NHWD [kg]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	6.84E-02
HLRW [kg] or [m ³]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00
ILLRW [kg] or [m ³]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00
CRU [kg]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00
MR [kg]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00
MER [kg]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00
EE [MJ, LHV]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00

Table 53 Output Flows and Waste Categories for F-140041, 7503 (1 m²)

Parameter	A1 - A3	A4	A5	B1 - B7	C1	C2	C3	C4
HWD [kg]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00
NHWD [kg]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	7.08E-02
HLRW [kg] or [m ³]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00
ILLRW [kg] or [m ³]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00
CRU [kg]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00
MR [kg]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00
MER [kg]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00
EE [MJ, LHV]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00

Table 54 Output Flows and Waste Categories for F-140042, G/47499 (1 m²)

Parameter	A1 - A3	A4	A5	B1 - B7	C1	C2	C3	C4
HWD [kg]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00
NHWD [kg]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	3.76E-02
HLRW [kg] or [m ³]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00
ILLRW [kg] or [m ³]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00
CRU [kg]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00
MR [kg]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00
MER [kg]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00
EE [MJ, LHV]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00



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Table 55 Output Flows and Waste Categories for F-140071, 3035/PE 2.0 (1 m²)

Parameter	A1 - A3	A4	A5	B1 - B7	C1	C2	C3	C4
HWD [kg]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00
NHWD [kg]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	1.37E-01
HLRW [kg] or [m ³]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00
ILLRW [kg] or [m ³]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00
CRU [kg]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00
MR [kg]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00
MER [kg]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00
EE [MJ, LHV]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00

Table 56 Output Flows and Waste Categories for F-140081, 5225T (1 m²)

Parameter	A1 - A3	A4	A5	B1 - B7	C1	C2	C3	C4
HWD [kg]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00
NHWD [kg]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	5.37E-02
HLRW [kg] or [m ³]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00
ILLRW [kg] or [m ³]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00
CRU [kg]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00
MR [kg]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00
MER [kg]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00
EE [MJ, LHV]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00

Table 57 Output Flows and Waste Categories for F-140091, 5229 (1 m²)

Parameter	A1 - A3	A4	A5	B1 - B7	C1	C2	C3	C4
HWD [kg]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00
NHWD [kg]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	9.28E-02
HLRW [kg] or [m ³]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00
ILLRW [kg] or [m ³]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00
CRU [kg]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00
MR [kg]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00
MER [kg]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00
EE [MJ, LHV]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00

Table 58 Output Flows and Waste Categories for F-140095, 5229 Printed (1 m²)

Parameter	A1 - A3	A4	A5	B1 - B7	C1	C2	C3	C4
HWD [kg]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00
NHWD [kg]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	9.28E-02
HLRW [kg] or [m ³]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00
ILLRW [kg] or [m ³]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00
CRU [kg]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00
MR [kg]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00
MER [kg]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00
EE [MJ, LHV]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00



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8.4. Appendix D

Table 59 Carbon Emissions and Removals for F-140001, 5225T-White (1 m²)

Parameter	A1 - A3	A4	A5	B1 - B7	C1	C2	C3	C4
BCRP [kg CO ₂]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00
BCEP [kg CO ₂]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00
BCRK [kg CO ₂]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00
BCEK [kg CO ₂]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00
BCEW [kg CO ₂]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00
CCE [kg CO ₂]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00
CCR [kg CO ₂]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00
CWNR [kg CO ₂]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00

[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]

Table 60 Carbon Emissions and Removals for F-140011, 5225T Printed (1 m²)

Parameter	A1 - A3	A4	A5	B1 - B7	C1	C2	C3	C4
BCRP [kg CO ₂]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00
BCEP [kg CO ₂]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00
BCRK [kg CO ₂]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00
BCEK [kg CO ₂]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00
BCEW [kg CO ₂]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00
CCE [kg CO ₂]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00
CCR [kg CO ₂]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00
CWNR [kg CO ₂]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00

Table 61 Carbon Emissions and Removals for F-140012, 5263 Printed 5x5 (1 m²)

Parameter	A1 - A3	A4	A5	B1 - B7	C1	C2	C3	C4
BCRP [kg CO ₂]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00
BCEP [kg CO ₂]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00
BCRK [kg CO ₂]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00
BCEK [kg CO ₂]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00
BCEW [kg CO ₂]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00
CCE [kg CO ₂]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00
CCR [kg CO ₂]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00
CWNR [kg CO ₂]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00

Table 62 Carbon Emissions and Removals for F-140021, 30J (1 m²)

Parameter	A1 - A3	A4	A5	B1 - B7	C1	C2	C3	C4
BCRP [kg CO ₂]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00
BCEP [kg CO ₂]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00
BCRK [kg CO ₂]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00
BCEK [kg CO ₂]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00
BCEW [kg CO ₂]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00
CCE [kg CO ₂]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00
CCR [kg CO ₂]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00
CWNR [kg CO ₂]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00



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Table 63 Carbon Emissions and Removals for F-140024, WMP-VR (1 m²)

Parameter	A1 - A3	A4	A5	B1 - B7	C1	C2	C3	C4
BCRP [kg CO ₂]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00
BCEP [kg CO ₂]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00
BCRK [kg CO ₂]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00
BCEK [kg CO ₂]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00
BCEW [kg CO ₂]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00
CCE [kg CO ₂]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00
CCR [kg CO ₂]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00
CWNR [kg CO ₂]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00

Table 64 Carbon Emissions and Removals for F-140031, 3114B (1 m²)

Parameter	A1 - A3	A4	A5	B1 - B7	C1	C2	C3	C4
BCRP [kg CO ₂]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00
BCEP [kg CO ₂]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00
BCRK [kg CO ₂]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00
BCEK [kg CO ₂]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00
BCEW [kg CO ₂]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00
CCE [kg CO ₂]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00
CCR [kg CO ₂]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00
CWNR [kg CO ₂]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00

Table 65 Carbon Emissions and Removals for F-140041, 7503 (1 m²)

Parameter	A1 - A3	A4	A5	B1 - B7	C1	C2	C3	C4
BCRP [kg CO ₂]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00
BCEP [kg CO ₂]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00
BCRK [kg CO ₂]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00
BCEK [kg CO ₂]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00
BCEW [kg CO ₂]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00
CCE [kg CO ₂]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00
CCR [kg CO ₂]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00
CWNR [kg CO ₂]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00

Table 66 Carbon Emissions and Removals for F-140042, G/47499 (1 m²)

Parameter	A1 - A3	A4	A5	B1 - B7	C1	C2	C3	C4
BCRP [kg CO ₂]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00
BCEP [kg CO ₂]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00
BCRK [kg CO ₂]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00
BCEK [kg CO ₂]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00
BCEW [kg CO ₂]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00
CCE [kg CO ₂]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00
CCR [kg CO ₂]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00
CWNR [kg CO ₂]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00



ENVIRONMENTAL PRODUCT DECLARATION



Thermafiber® Mineral Wool
Light and Heavy Density Mineral Wool Insulation

According to ISO 14025,
EN 15804 and ISO 21930:2017

Table 67 Carbon Emissions and Removals for F-140071, 3035/PE 2.0 (1 m²)

Parameter	A1 - A3	A4	A5	B1 - B7	C1	C2	C3	C4
BCRP [kg CO ₂]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00
BCEP [kg CO ₂]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00
BCRK [kg CO ₂]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00
BCEK [kg CO ₂]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00
BCEW [kg CO ₂]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00
CCE [kg CO ₂]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00
CCR [kg CO ₂]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00
CWNR [kg CO ₂]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00

Table 68 Carbon Emissions and Removals for F-140081, 5225T (1 m²)

Parameter	A1 - A3	A4	A5	B1 - B7	C1	C2	C3	C4
BCRP [kg CO ₂]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00
BCEP [kg CO ₂]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00
BCRK [kg CO ₂]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00
BCEK [kg CO ₂]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00
BCEW [kg CO ₂]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00
CCE [kg CO ₂]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00
CCR [kg CO ₂]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00
CWNR [kg CO ₂]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00

Table 69 Carbon Emissions and Removals for F-140091, 5229 (1 m²)

Parameter	A1 - A3	A4	A5	B1 - B7	C1	C2	C3	C4
BCRP [kg CO ₂]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00
BCEP [kg CO ₂]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00
BCRK [kg CO ₂]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00
BCEK [kg CO ₂]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00
BCEW [kg CO ₂]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00
CCE [kg CO ₂]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00
CCR [kg CO ₂]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00
CWNR [kg CO ₂]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00

Table 70 Carbon Emissions and Removals for F-140095, 5229 Printed (1 m²)

Parameter	A1 - A3	A4	A5	B1 - B7	C1	C2	C3	C4
BCRP [kg CO ₂]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00
BCEP [kg CO ₂]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00
BCRK [kg CO ₂]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00
BCEK [kg CO ₂]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00
BCEW [kg CO ₂]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00
CCE [kg CO ₂]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00
CCR [kg CO ₂]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00
CWNR [kg CO ₂]	0.00E+00	0.00E+00	MND	MND	MND	0.00E+00	MND	0.00E+00





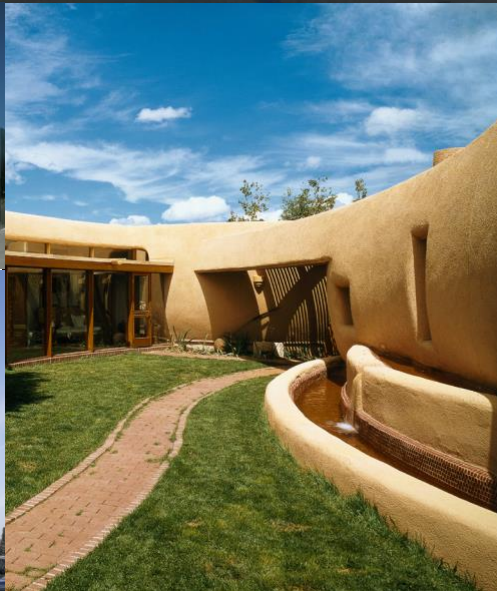
Building with conscience.



EPD for Stolit®
in varied textures

Product Textures: 1.0, 1.0 Dark, 1.5, 1.5 Dark, Freeform, Freeform Dark, R1.5, R1.5 Dark

Stolit® is a ready-mixed premium acrylic based exterior or interior textured wall finish enhanced with advanced polymer technology, designed for use as a finish coat over prepared vertical concrete, masonry or plaster substrates and in StoTherm® ci wall





PCR Identification	PCR for Architectural Coatings: NAICS 325510 on the basis of ISO 21930:2007, NSF International, 2017. Valid through June 23, 2022
Compliance to ISO1 4040/44, ISO 14025 and ISO 21930	Yes
Product Category	Exterior Coating
Manufacturer's name	Sto Corp. 3800 Camp Creek Parkway SW, Building 1400, Suite 120 Atlanta, GA 30331 www.stocorp.com (800) 221-2397
EPD program operator	Epsten Group 101 Marietta St. Suite 2600, Atlanta, GA 30303 www.epstengroup.com
Declaration Number	01-001
Date of Certification	December 18 th , 2019
Period of Validity	5 years from date of certification
Functional Unit	One square meter of covered and protected substrate for 60 years
Market-base life used in assessment	10 Years
Design life used in assessment	5 Years
Test method employed for determination of design life	Product default warranty
Amount of colorant needed	See Table 3
Overall Data Quality Assessment Score	Good
Site(s) in which the results of the LCA are representative	STO manufacturing sites in Atlanta, Georgia; Glendale, Arizona; and Rutland, Vermont
Information on where explanatory material can be obtained	See references at the end of this document.
LCA Software and Version Number	GaBi 9.2.0.58
LCI Database and Version Number	GaBi Database Version 8.7, Service Pack 39
This declaration was independently verified in accordance with ISO 14025: 2006 and the reference PCR: PCR for Architectural Coatings: NAICS 325510 <input type="checkbox"/> Internal <input checked="" type="checkbox"/> External	Kate McFeaters kmcfeaters@epstengroup.com 
This life cycle assessment was conducted in accordance with ISO 14044 and the reference PCR by:	WAP Sustainability Consulting, LLC
This life cycle assessment was independently verified in accordance with ISO 14040/44 and the reference PCR by:	Kate McFeaters kmcfeaters@epstengroup.com 

Comparability

In order to support comparative assertions, this EPD meets all comparability requirements stated in ISO 14025:2006. However, differences in certain assumptions, data quality, and variability between LCA data sets may still exist. As such, caution should be exercised when evaluating EPDs from different manufacturers, as the EPD results may not be entirely comparable. Any EPD comparison must be carried out at the building level per ISO 21930 guidelines. The results of this EPD reflect an average performance by the product and its actual impacts may vary on a case-to-case basis.

» Company

We believe in ‘**Building with conscience**’.

That means ensuring that all building products are not only safe, effective and easy to install, but also environmentally responsible and sustainable. We know you’re always looking for the smartest and newest technology to create energy efficient buildings with superior aesthetics.

That’s exactly what our products help you achieve. Products like our wall systems, coatings and finishes are consistent favorites among design professionals, contractors and property owners alike. Whatever your needs or vision may be, we offer products for every type of building project; whether it’s new construction, restoration or panelization, commercial or residential work.

An architect or specifier focuses on aesthetics and feasibility, a contractor needs products that are easy to work with, and a building owner requires high value and low costs on properties. Sto understands these unique needs, and delivers the smart, innovative materials and solutions that make this all possible. That’s why Sto remains the innovative leader in integrated exterior wall systems.

When you combine that commitment to product support and innovation with value-added offerings like consultative design and color services through [Sto Studio](#) or training in proper application techniques through the Sto Institute, you get an integrated exterior wall system solution unmatched in the industry.

» Manufacturing Sites Covered in this EPD

Atlanta Plant

Glendale Plant

Rutland Plant

» Product Identification

Stolit® finishes are offered in various coarseness and color bases that allow more freedom in building exterior designing and finishing. Table 1 lists the products declared in this EPD.

Table 1: List of Stolit® Products

Product Name	Product Number	Base Type	Finish Type
Stolit® 1.0	80130	Tintable White	Fine
Stolit® 1.0 Dark Colors	82130	Deep	Fine
Stolit® 1.5	80131	Tintable White	Medium
Stolit® 1.5 Dark Colors	82131	Deep	Medium
Stolit® Freeform	80156	Tintable White	Freeform
Stolit® Freeform Dark Colors	82156	Deep	Freeform
Stolit® R1.5	80141	Tintable White	Swirl
Stolit® R1.5 Dark Colors	82141	Deep	Swirl

» Product Description

Stolit® is a series of ready-mixed, acrylic-based exterior or interior textured wall finishes. Stolit® is used as a decorative and protective wall coating over prepared vertical above grade concrete, masonry and plaster substrates, and in StoTherm® ci Systems. In this study, Stolit® 1.0, 1.5, R1.5 and Freeform are included. Two tint bases are offered: standard and dark colors which respectively can be transcribed to tintable white base and deep base in the PCR.



» Performance Features

Mildew Resistance	Ready Mixed	Moisture Resistance	Low VOC & Odor
Vapor Permeable	Integral Color	Water-based	

» Material Composition

The material compositions of Stolit® are listed below:

Table 2: Material composition for Stolit®

Product	Additives	Colorant	Limestone	Acrylic resin	Silica	Silicate	Surfactant	Water
Stolit® R1.5 Dark Colors	0.77%	0.60%	47.76%	5.03%	26.66%	2.69%	0.08%	15.75%
Stolit® R1.5	0.77%	0.60%	47.69%	5.03%	26.60%	2.69%	0.08%	15.88%
Stolit® 1.0 Dark Colors	0.77%	0.60%	49.20%	5.04%	25.26%	2.69%	0.07%	15.71%
Stolit® 1.0	0.77%	0.60%	49.16%	5.03%	25.20%	2.69%	0.07%	15.80%
Stolit® 1.5 Dark Colors	0.59%	0.61%	64.85%	6.95%	7.91%	2.46%	0.18%	15.65%
Stolit® 1.5	0.59%	0.80%	64.55%	6.95%	8.01%	2.46%	0.18%	15.66%
Stolit® Freeform Dark Colors	0.77%	0.58%	67.26%	4.84%	8.18%	2.59%	0.07%	15.08%
Stolit® Freeform	0.74%	0.58%	67.23%	4.84%	8.18%	2.58%	0.07%	15.13%

» Components related to Life Cycle Assessment

The functional unit for the LCA study was covering and protecting 1 square meter (m²) of substrate for a period of 60 years—the assumed lifetime of a building. The reference flow required for the functional unit is calculated based on the product lifespan scenarios prescribed in the PCR. The market-based lifetime is 10 years, and the design lifetime is determined either based on quality determined by ASTM tests or on the product warrant. By default, Stolit® finishes have a 5-year warranty. In case a finish is applied on Sto’s wall systems, the warranty is extended to 10 years. In this EPD, default warranty is adopted as the design lifetime. The reference flow required for one functional unit is provided in Table 3.

Table 3: Market-based lifetime and reference flow

	Functional Unit	Reference Flow [kg]	Tint needed* [kg]	Reference Flow [kg]	Tint needed* [kg]
Lifespan		Design Lifetime [5 years]		Market-based Lifetime [10 years]	
Stolit® R1.5 Dark Colors	1	30.59	2.69	15.29	1.35
Stolit® R1.5	1	30.59	0.79	15.29	0.40
Stolit® 1.0 Dark Colors	1	29.58	2.60	14.80	1.30
Stolit® 1.0	1	29.58	0.77	14.80	0.38
Stolit® 1.5 Dark Colors	1	34.05	3.00	17.03	1.50
Stolit® 1.5	1	34.05	0.88	17.03	0.44
Stolit® Freeform Dark Colors	1	53.08	4.66	26.53	2.33
Stolit® Freeform	1	53.08	1.37	26.53	0.69

» Scope and Boundaries of the Life Cycle Assessment

The LCA was performed in accordance with ISO 14040 standards. The study is a cradle-to-grave LCA and includes the following life stages as prescribed in the PCR.

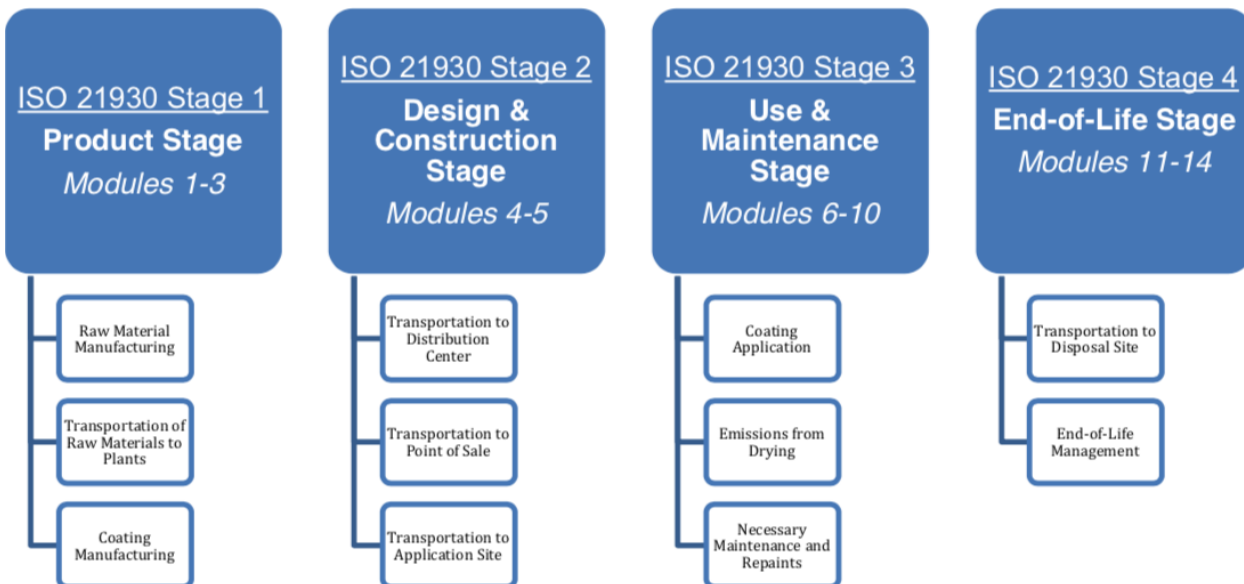


Figure 1: Life stages for the cradle-to-grave LCA

» Cut-off Criteria

Material inputs greater than 1% (based on total mass of the final product) were included within the scope of analysis. Material inputs less than 1% were included if sufficient data was available to warrant inclusion and/or the material input was thought to have significant environmental impact. Cumulative excluded material inputs and environmental impacts are less than 5% based on total weight of the functional unit.

» Data Quality

The overall data quality level was determined to be good. Primary data was collected from Sto's facilities in Atlanta, GA, Glendale, AZ and Rutland, VT for the 2018 reference year. When primary data did not exist, secondary data were obtained from the Gabi V8.7 Database Service Pack 39. Overall, both primary and secondary data are considered good quality in terms of geographic, temporal and technological coverage.

» Estimates and Assumption

Assumptions were made to represent the cradle-to-grave environmental performance of Sto's products. These assumptions were made in accordance with the PCR and include the transportation distances, the disposal of packaging material and the product at its end of life and use phase assumptions.

» Allocation

General principles of allocation were based on ISO 14040/44. Where possible, allocation was avoided. When allocation was necessary it was done on a physical mass basis.

» Product Stage

Stolit® is produced at Sto's Atlanta, GA, Glendale, AZ and Rutland, VT facilities. This stage includes an aggregation of raw material extraction, supplier processing, delivery, manufacturing and packaging by Sto. Stolit® is supplied in 5-gallon pails.

» Design and Construction Stage

The design and construction process stage starts with the packaged product leaving the production site and ends with being delivered to the application site.

During this stage, the finished product is moved from a shipping dock for distribution. The end gate is the application site after the purchaser acquires the finished product and transports it to the application site.

» Use and Maintenance Stage

The use stage begins when the user prepares the product before applying it to a substrate and ends with any leftover coating and discarded packaging entering the end-of-life stage. Detailed application instructions are provided [online](#). The application procedure includes mixing and applying. As recommended, an electric drill/mixer and a spray pump are assumed to be used for mixing and application. The equipment is not included in the study as these are multi-use tools and the impacts per declared unit is considered negligible, but electricity to power application tools has been included.

As prescribed in the PCR, 10% of the wet mass of Stolit® is assumed to be unused and properly disposed of.

» End-of-Life Stage

Table 4: End-of-life Disposal Scenarios

Waste Flow	Recycling	Incineration	Landfilling
Paper Packaging	66.6%	6.01%	27.39%
Steel Packaging	33.3%	12.01%	54.69%
Plastic Packaging	9.1%	16.36%	74.54%
Unused Product	0%	0%	100%
Post-Consumer Product	0%	0%	100%

In this stage, the disposal of installation waste, packaging waste and product waste at its end of life is included. The disposal pathway of each waste stream is modeled based on the recommendation of PCR and US EPA's latest waste management fact sheet.

» Life Cycle Assessment Results

As prescribed by the PCR, TRACI 2.1 impact characterization methodology and IPCC 5th assessment report are adopted to calculate the environment impacts. Table 5 provides the acronym key of the impact indicators declared in this EPD.

Table 5: LCIA impact category and LCI Indicator keys

Abbreviation	Parameter	Unit
TRACI 2.1		
AP	Acidification potential of soil and water	kg SO ₂ eq
EP	Eutrophication potential	kg N eq
GWP	Global warming potential including biogenic carbon emission	kg CO ₂ eq
ODP	Depletion of stratospheric ozone layer	kg CFC 11 eq
POCP	Photochemical ozone creation potential	kg O ₃ eq
Resource Use Parameters		
RPR	Use of renewable primary energy	MJ, net calorific value (LHV)
RMR	Use of renewable Material Resources	kg
NRER	Depletion of Non-Renewable Energy Resources	MJ, net calorific value
NRMR	Depletion of Non-Renewable Material Resources	kg
FW	Consumption of Freshwater	m ³
Waste Parameters		
HWD	Disposed-of-hazardous waste	kg
NHWD	Disposed-of non-hazardous waste	kg
Biogenic Carbon Parameter		
BC	Biogenic Carbon	kg CO ₂ eq
Energy Differentiation Parameters		
HWP	Hydro/wind Power	MJ, net calorific value (LHV)
FE	Fossil Energy	MJ, net calorific value (LHV)
BE	Bio-energy	MJ, net calorific value (LHV)
NE	Nuclear Energy	MJ, net calorific value (LHV)
OE	Other Energy	MJ, net calorific value (LHV)

	Indicator	1. Product Stage	2. Design & Construction Stage	3. Use & Maintenance Stage	4. End-of-Life Stage	
Market-based lifetime	AP [kg SO ₂ eq]	4.73E-02	6.12E-03	6.31E-03	4.41E-03	
	EP [kg N eq]	2.75E-03	4.98E-04	2.30E-04	7.14E-04	
	GWP [kg CO ₂ eq]	1.36E+01	1.19E+00	2.99E+00	9.16E-01	
	ODP [kg CFC 11 eq]	1.71E-09	1.13E-16	1.89E-14	2.49E-15	
	POCP [kg O ₃ eq]	5.46E-01	1.40E-01	8.05E-01	7.33E-02	
	RPRE [MJ]	1.64E+01	5.22E-01	3.20E+00	7.57E-01	
	NRPRE [MJ]	2.99E+02	1.69E+01	7.97E+01	1.11E+01	
	FW [m3]	7.08E-02	2.01E-03	1.79E-02	1.42E-03	
	RMR [kg]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	
	NRMR [kg]	1.59E+01	0.00E+00	1.35E+00	0.00E+00	
	HWD [kg]	4.77E-06	1.37E-07	1.13E-08	4.58E-08	
	NHWD [kg]	8.46E-01	6.36E-04	9.48E-03	1.70E+01	
	BC [kg CO ₂ eq]			1.53E+00		
	HWP [MJ]			9.79E-01		
	FE [MJ]			1.48E+01		
	BE [MJ]			4.84E-01		
	NE [MJ]			3.89E+00		
	OE [MJ]			3.90E-01		
	Design lifetime	Indicator	1. Product Stage	2. Design & Construction Stage	3. Use & Maintenance Stage	4. End-of-Life Stage
		AP [kg SO ₂ eq]	9.46E-02	1.22E-02	1.26E-02	8.82E-03
EP [kg N eq]		5.50E-03	9.96E-04	4.60E-04	1.43E-03	
GWP [kg CO ₂ eq]		2.72E+01	2.38E+00	5.98E+00	1.83E+00	
ODP [kg CFC 11 eq]		3.42E-09	2.26E-16	3.78E-14	4.98E-15	
POCP [kg O ₃ eq]		1.09E+00	2.80E-01	1.61E+00	1.47E-01	
RPRE [MJ]		3.28E+01	1.04E+00	6.40E+00	1.51E+00	
NRPRE [MJ]		5.98E+02	3.38E+01	1.59E+02	2.22E+01	
FW [m3]		1.42E-01	4.02E-03	3.58E-02	2.84E-03	
RMR [kg]		0.00E+00	0.00E+00	0.00E+00	0.00E+00	
NRMR [kg]		3.18E+01	0.00E+00	2.70E+00	0.00E+00	
HWD [kg]		9.54E-06	2.74E-07	2.26E-08	9.16E-08	
NHWD [kg]		1.69E+00	1.27E-03	1.90E-02	3.40E+01	
BC [kg CO ₂ eq]				3.07E+00		
HWP [MJ]				1.96E+00		
FE [MJ]				2.97E+01		
BE [MJ]			9.68E-01			
NE [MJ]			7.78E+00			
OE [MJ]			7.81E-01			

	Indicator	1. Product Stage	2. Design & Construction Stage	3. Use & Maintenance Stage	4. End-of-Life Stage	
Market-based lifetime	AP [kg SO ₂ eq]	6.36E-02	6.11E-03	1.93E-03	4.23E-03	
	EP [kg N eq]	2.83E-03	4.98E-04	7.06E-05	7.05E-04	
	GWP [kg CO ₂ eq]	1.39E+01	1.19E+00	9.06E-01	8.76E-01	
	ODP [kg CFC 11 eq]	1.71E-09	1.13E-16	5.66E-15	2.35E-15	
	POCP [kg O ₃ eq]	5.62E-01	1.40E-01	7.78E-01	6.97E-02	
	RPRE [MJ]	1.67E+01	5.22E-01	9.95E-01	7.11E-01	
	NRPRE [MJ]	3.03E+02	1.69E+01	2.38E+01	1.04E+01	
	FW [m3]	7.24E-02	2.01E-03	5.40E-03	1.34E-03	
	RMR [kg]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	
	NRMR [kg]	1.59E+01	0.00E+00	4.00E-01	0.00E+00	
	HWD [kg]	4.77E-06	1.37E-07	3.48E-09	4.35E-08	
	NHWD [kg]	8.54E-01	6.36E-04	2.91E-03	1.62E+01	
	BC [kg CO ₂ eq]			1.40E+00		
	HWP [MJ]			9.78E-01		
	FE [MJ]			1.48E+01		
	BE [MJ]			4.84E-01		
	NE [MJ]			3.89E+00		
	OE [MJ]			3.90E-01		
	Design lifetime	Indicator	1. Product Stage	2. Design & Construction Stage	3. Use & Maintenance Stage	4. End-of-Life Stage
		AP [kg SO ₂ eq]	1.27E-01	1.22E-02	3.86E-03	8.46E-03
EP [kg N eq]		5.66E-03	9.96E-04	1.41E-04	1.41E-03	
GWP [kg CO ₂ eq]		2.78E+01	2.38E+00	1.81E+00	1.75E+00	
ODP [kg CFC 11 eq]		3.42E-09	2.26E-16	1.13E-14	4.70E-15	
POCP [kg O ₃ eq]		1.12E+00	2.80E-01	1.56E+00	1.39E-01	
RPRE [MJ]		3.34E+01	1.04E+00	1.99E+00	1.42E+00	
NRPRE [MJ]		6.06E+02	3.38E+01	4.76E+01	2.08E+01	
FW [m3]		1.45E-01	4.02E-03	1.08E-02	2.68E-03	
RMR [kg]		0.00E+00	0.00E+00	0.00E+00	0.00E+00	
NRMR [kg]		3.18E+01	0.00E+00	8.00E-01	0.00E+00	
HWD [kg]		9.54E-06	2.74E-07	6.96E-09	8.70E-08	
NHWD [kg]		1.71E+00	1.27E-03	5.82E-03	3.24E+01	
BC [kg CO ₂ eq]				2.80E+00		
HWP [MJ]				1.96E+00		
FE [MJ]				2.97E+01		
BE [MJ]				9.68E-01		
NE [MJ]				7.77E+00		
OE [MJ]				7.80E-01		

	Indicator	1. Product Stage	2. Design & Construction Stage	3. Use & Maintenance Stage	4. End-of-Life Stage
Market-based lifetime	AP [kg SO ₂ eq]	4.91E-02	5.91E-03	6.11E-03	4.27E-03
	EP [kg N eq]	2.80E-03	4.82E-04	2.23E-04	6.91E-04
	GWP [kg CO ₂ eq]	1.42E+01	1.15E+00	2.90E+00	8.86E-01
	ODP [kg CFC 11 eq]	2.06E-09	1.09E-16	1.83E-14	2.41E-15
	POCP [kg O ₃ eq]	5.64E-01	1.35E-01	7.79E-01	7.09E-02
	RPRE [MJ]	1.77E+01	5.05E-01	3.10E+00	7.33E-01
	NRPRE [MJ]	3.09E+02	1.63E+01	7.69E+01	1.07E+01
	FW [m3]	7.34E-02	1.94E-03	1.73E-02	1.37E-03
	RMR [kg]	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	NRMR [kg]	1.54E+01	0.00E+00	1.30E+00	0.00E+00
	HWD [kg]	5.67E-06	1.32E-07	1.09E-08	4.43E-08
	NHWD [kg]	9.34E-01	6.12E-04	9.13E-03	1.65E+01
	BC [kg CO ₂ eq]			1.57E+00	
	HWP [MJ]			9.48E-01	
	FE [MJ]			1.44E+01	
	BE [MJ]			4.69E-01	
	NE [MJ]			3.76E+00	
	OE [MJ]			3.78E-01	
	Design lifetime	Indicator	1. Product Stage	2. Design & Construction Stage	3. Use & Maintenance Stage
AP [kg SO ₂ eq]		9.82E-02	1.18E-02	1.22E-02	8.54E-03
EP [kg N eq]		5.60E-03	9.64E-04	4.46E-04	1.38E-03
GWP [kg CO ₂ eq]		2.84E+01	2.30E+00	5.80E+00	1.77E+00
ODP [kg CFC 11 eq]		4.12E-09	2.18E-16	3.66E-14	4.82E-15
POCP [kg O ₃ eq]		1.13E+00	2.70E-01	1.56E+00	1.42E-01
RPRE [MJ]		3.54E+01	1.01E+00	6.20E+00	1.47E+00
NRPRE [MJ]		6.18E+02	3.26E+01	1.54E+02	2.14E+01
FW [m3]		1.47E-01	3.88E-03	3.46E-02	2.74E-03
RMR [kg]		0.00E+00	0.00E+00	0.00E+00	0.00E+00
NRMR [kg]		3.08E+01	0.00E+00	2.60E+00	0.00E+00
HWD [kg]		1.13E-05	2.64E-07	2.18E-08	8.86E-08
NHWD [kg]		1.87E+00	1.22E-03	1.83E-02	3.30E+01
BC [kg CO ₂ eq]				3.13E+00	
HWP [MJ]				1.90E+00	
FE [MJ]				2.87E+01	
BE [MJ]				9.37E-01	
NE [MJ]				7.53E+00	
OE [MJ]				7.56E-01	

	Indicator	1. Product Stage	2. Design & Construction Stage	3. Use & Maintenance Stage	4. End-of-Life Stage	
Market-based lifetime	AP [kg SO ₂ eq]	6.54E-02	5.91E-03	1.86E-03	4.09E-03	
	EP [kg N eq]	2.89E-03	4.82E-04	6.83E-05	6.82E-04	
	GWP [kg CO ₂ eq]	1.46E+01	1.15E+00	8.76E-01	8.48E-01	
	ODP [kg CFC 11 eq]	2.06E-09	1.09E-16	5.47E-15	2.27E-15	
	POCP [kg O ₃ eq]	5.81E-01	1.35E-01	7.52E-01	6.74E-02	
	RPRE [MJ]	1.81E+01	5.05E-01	9.63E-01	6.88E-01	
	NRPRE [MJ]	3.13E+02	1.63E+01	2.31E+01	1.01E+01	
	FW [m3]	7.53E-02	1.94E-03	5.22E-03	1.30E-03	
	RMR [kg]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	
	NRMR [kg]	1.54E+01	0.00E+00	3.80E-01	0.00E+00	
	HWD [kg]	5.65E-06	1.32E-07	3.37E-09	4.20E-08	
	NHWD [kg]	9.41E-01	6.15E-04	2.81E-03	1.56E+01	
	BC [kg CO ₂ eq]			1.44E+00		
	HWP [MJ]			9.47E-01		
	FE [MJ]			1.44E+01		
	BE [MJ]			4.68E-01		
	NE [MJ]			3.76E+00		
	OE [MJ]			3.78E-01		
	Design lifetime	Indicator	1. Product Stage	2. Design & Construction Stage	3. Use & Maintenance Stage	4. End-of-Life Stage
		AP [kg SO ₂ eq]	1.31E-01	1.18E-02	3.72E-03	8.18E-03
EP [kg N eq]		5.78E-03	9.64E-04	1.37E-04	1.36E-03	
GWP [kg CO ₂ eq]		2.92E+01	2.30E+00	1.75E+00	1.70E+00	
ODP [kg CFC 11 eq]		4.12E-09	2.18E-16	1.09E-14	4.54E-15	
POCP [kg O ₃ eq]		1.16E+00	2.70E-01	1.50E+00	1.35E-01	
RPRE [MJ]		3.62E+01	1.01E+00	1.93E+00	1.38E+00	
NRPRE [MJ]		6.26E+02	3.26E+01	4.62E+01	2.02E+01	
FW [m3]		1.51E-01	3.88E-03	1.04E-02	2.60E-03	
RMR [kg]		0.00E+00	0.00E+00	0.00E+00	0.00E+00	
NRMR [kg]		3.08E+01	0.00E+00	7.60E-01	0.00E+00	
HWD [kg]		1.13E-05	2.64E-07	6.74E-09	8.40E-08	
NHWD [kg]		1.88E+00	1.23E-03	5.62E-03	3.12E+01	
BC [kg CO ₂ eq]				2.88E+00		
HWP [MJ]				1.89E+00		
FE [MJ]				2.87E+01		
BE [MJ]				9.37E-01		
NE [MJ]				7.52E+00		
OE [MJ]				7.55E-01		

	Indicator	1. Product Stage	2. Design & Construction Stage	3. Use & Maintenance Stage	4. End-of-Life Stage
Market-based lifetime	AP [kg SO ₂ eq]	5.54E-02	6.81E-03	7.02E-03	4.91E-03
	EP [kg N eq]	3.14E-03	5.55E-04	2.56E-04	7.95E-04
	GWP [kg CO ₂ eq]	1.61E+01	1.32E+00	3.33E+00	1.02E+00
	ODP [kg CFC 11 eq]	1.90E-09	1.26E-16	2.11E-14	2.77E-15
	POCP [kg O ₃ eq]	6.28E-01	1.55E-01	8.97E-01	8.16E-02
	RPRE [MJ]	2.01E+01	5.81E-01	3.56E+00	8.44E-01
	NRPRE [MJ]	3.51E+02	1.88E+01	8.86E+01	1.23E+01
	FW [m3]	8.38E-02	2.24E-03	1.99E-02	1.58E-03
	RMR [kg]	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	NRMR [kg]	1.77E+01	0.00E+00	1.50E+00	0.00E+00
	HWD [kg]	5.30E-06	1.52E-07	1.25E-08	5.10E-08
	NHWD [kg]	1.06E+00	7.07E-04	1.05E-02	1.90E+01
	BC [kg CO ₂ eq]			1.78E+00	
	HWP [MJ]			1.09E+00	
	FE [MJ]			1.65E+01	
	BE [MJ]			5.39E-01	
NE [MJ]			4.33E+00		
OE [MJ]			4.35E-01		
Design lifetime	Indicator	1. Product Stage	2. Design & Construction Stage	3. Use & Maintenance Stage	4. End-of-Life Stage
	AP [kg SO ₂ eq]	1.11E-01	1.36E-02	1.40E-02	9.82E-03
	EP [kg N eq]	6.28E-03	1.11E-03	5.12E-04	1.59E-03
	GWP [kg CO ₂ eq]	3.22E+01	2.64E+00	6.66E+00	2.04E+00
	ODP [kg CFC 11 eq]	3.80E-09	2.52E-16	4.22E-14	5.54E-15
	POCP [kg O ₃ eq]	1.26E+00	3.10E-01	1.79E+00	1.63E-01
	RPRE [MJ]	4.02E+01	1.16E+00	7.12E+00	1.69E+00
	NRPRE [MJ]	7.02E+02	3.76E+01	1.77E+02	2.46E+01
	FW [m3]	1.68E-01	4.48E-03	3.98E-02	3.16E-03
	RMR [kg]	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	NRMR [kg]	3.54E+01	0.00E+00	3.00E+00	0.00E+00
	HWD [kg]	1.06E-05	3.04E-07	2.50E-08	1.02E-07
	NHWD [kg]	2.12E+00	1.41E-03	2.10E-02	3.80E+01
	BC [kg CO ₂ eq]			3.56E+00	
	HWP [MJ]			2.18E+00	
	FE [MJ]			3.31E+01	
BE [MJ]			1.08E+00		
NE [MJ]			8.66E+00		
OE [MJ]			8.70E-01		

	Indicator	1. Product Stage	2. Design & Construction Stage	3. Use & Maintenance Stage	4. End-of-Life Stage
Market-based lifetime	AP [kg SO ₂ eq]	7.53E-02	6.81E-03	2.14E-03	4.71E-03
	EP [kg N eq]	3.32E-03	5.55E-04	7.86E-05	7.84E-04
	GWP [kg CO ₂ eq]	1.67E+01	1.32E+00	1.01E+00	9.75E-01
	ODP [kg CFC 11 eq]	1.90E-09	1.26E-16	6.30E-15	2.61E-15
	POCP [kg O ₃ eq]	6.69E-01	1.55E-01	8.66E-01	7.76E-02
	RPRE [MJ]	2.05E+01	5.81E-01	1.11E+00	7.92E-01
	NRPRE [MJ]	3.59E+02	1.88E+01	2.65E+01	1.16E+01
	FW [m3]	8.63E-02	2.24E-03	6.01E-03	1.50E-03
	RMR [kg]	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	NRMR [kg]	1.77E+01	0.00E+00	4.40E-01	0.00E+00
	HWD [kg]	5.33E-06	1.52E-07	3.88E-09	4.84E-08
	NHWD [kg]	1.07E+00	7.07E-04	3.23E-03	1.80E+01
	BC [kg CO ₂ eq]			1.64E+00	
	HWP [MJ]			1.09E+00	
	FE [MJ]			1.65E+01	
	BE [MJ]			5.39E-01	
NE [MJ]			4.33E+00		
OE [MJ]			4.35E-01		
Design lifetime	Indicator	1. Product Stage	2. Design & Construction Stage	3. Use & Maintenance Stage	4. End-of-Life Stage
	AP [kg SO ₂ eq]	1.51E-01	1.36E-02	4.28E-03	9.42E-03
	EP [kg N eq]	6.64E-03	1.11E-03	1.57E-04	1.57E-03
	GWP [kg CO ₂ eq]	3.34E+01	2.64E+00	2.02E+00	1.95E+00
	ODP [kg CFC 11 eq]	3.80E-09	2.52E-16	1.26E-14	5.22E-15
	POCP [kg O ₃ eq]	1.34E+00	3.10E-01	1.73E+00	1.55E-01
	RPRE [MJ]	4.10E+01	1.16E+00	2.22E+00	1.58E+00
	NRPRE [MJ]	7.18E+02	3.76E+01	5.30E+01	2.32E+01
	FW [m3]	1.73E-01	4.48E-03	1.20E-02	3.00E-03
	RMR [kg]	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	NRMR [kg]	3.54E+01	0.00E+00	8.80E-01	0.00E+00
	HWD [kg]	1.07E-05	3.04E-07	7.76E-09	9.68E-08
	NHWD [kg]	2.14E+00	1.41E-03	6.46E-03	3.60E+01
	BC [kg CO ₂ eq]			3.29E+00	
	HWP [MJ]			2.18E+00	
	FE [MJ]			3.31E+01	
BE [MJ]			1.08E+00		
NE [MJ]			8.66E+00		
OE [MJ]			8.69E-01		

	Indicator	1. Product Stage	2. Design & Construction Stage	3. Use & Maintenance Stage	4. End-of-Life Stage	
Market-based lifetime	AP [kg SO ₂ eq]	8.88E-02	1.06E-02	1.10E-02	7.66E-03	
	EP [kg N eq]	4.96E-03	8.64E-04	3.99E-04	1.24E-03	
	GWP [kg CO ₂ eq]	2.51E+01	2.06E+00	5.20E+00	1.59E+00	
	ODP [kg CFC 11 eq]	-8.37E-13	1.96E-16	3.28E-14	4.32E-15	
	POCP [kg O ₃ eq]	1.01E+00	2.42E-01	1.40E+00	1.27E-01	
	RPRE [MJ]	2.98E+01	9.05E-01	5.56E+00	1.32E+00	
	NRPRE [MJ]	5.54E+02	2.93E+01	1.38E+02	1.92E+01	
	FW [m3]	1.29E-01	3.49E-03	3.10E-02	2.46E-03	
	RMR [kg]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	
	NRMR [kg]	2.76E+01	0.00E+00	2.33E+00	0.00E+00	
	HWD [kg]	7.85E-07	2.37E-07	1.95E-08	7.95E-08	
	NHWD [kg]	1.47E+00	1.10E-03	1.64E-02	2.96E+01	
	BC [kg CO ₂ eq]	2.71E+00				
	HWP [MJ]	1.70E+00				
	FE [MJ]	2.58E+01				
	BE [MJ]	8.40E-01				
	NE [MJ]	6.75E+00				
	OE [MJ]	6.77E-01				
	Design lifetime	Indicator	1. Product Stage	2. Design & Construction Stage	3. Use & Maintenance Stage	4. End-of-Life Stage
		AP [kg SO ₂ eq]	1.78E-01	2.12E-02	2.20E-02	1.53E-02
EP [kg N eq]		9.92E-03	1.73E-03	7.98E-04	2.48E-03	
GWP [kg CO ₂ eq]		5.02E+01	4.12E+00	1.04E+01	3.18E+00	
ODP [kg CFC 11 eq]		-1.67E-12	3.92E-16	6.56E-14	8.64E-15	
POCP [kg O ₃ eq]		2.02E+00	4.84E-01	2.80E+00	2.54E-01	
RPRE [MJ]		5.96E+01	1.81E+00	1.11E+01	2.64E+00	
NRPRE [MJ]		1.11E+03	5.86E+01	2.76E+02	3.84E+01	
FW [m3]		2.58E-01	6.98E-03	6.20E-02	4.92E-03	
RMR [kg]		0.00E+00	0.00E+00	0.00E+00	0.00E+00	
NRMR [kg]		5.51E+01	0.00E+00	4.66E+00	0.00E+00	
HWD [kg]		1.57E-06	4.74E-07	3.90E-08	1.59E-07	
NHWD [kg]		2.94E+00	2.20E-03	3.28E-02	5.92E+01	
BC [kg CO ₂ eq]		5.42E+00				
HWP [MJ]		3.40E+00				
FE [MJ]		5.15E+01				
BE [MJ]		1.68E+00				
NE [MJ]		1.35E+01				
OE [MJ]		1.35E+00				

	Indicator	1. Product Stage	2. Design & Construction Stage	3. Use & Maintenance Stage	4. End-of-Life Stage
Market-based lifetime	AP [kg SO ₂ eq]	1.20E-01	1.06E-02	3.34E-03	7.35E-03
	EP [kg N eq]	5.13E-03	8.64E-04	1.23E-04	1.22E-03
	GWP [kg CO ₂ eq]	2.58E+01	2.06E+00	1.57E+00	1.52E+00
	ODP [kg CFC 11 eq]	-8.35E-13	1.96E-16	9.82E-15	4.08E-15
	POCP [kg O ₃ eq]	1.05E+00	2.42E-01	1.35E+00	1.21E-01
	RPRE [MJ]	3.05E+01	9.05E-01	1.73E+00	1.23E+00
	NRPRE [MJ]	5.63E+02	2.93E+01	4.14E+01	1.81E+01
	FW [m3]	1.33E-01	3.49E-03	9.37E-03	2.33E-03
	RMR [kg]	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	NRMR [kg]	2.76E+01	0.00E+00	6.90E-01	0.00E+00
	HWD [kg]	7.89E-07	2.37E-07	6.04E-09	7.54E-08
	NHWD [kg]	1.49E+00	1.10E-03	5.04E-03	2.81E+01
	BC [kg CO ₂ eq]			2.49E+00	
	HWP [MJ]			1.70E+00	
	FE [MJ]			2.58E+01	
	BE [MJ]			8.40E-01	
NE [MJ]			6.74E+00		
OE [MJ]			6.77E-01		
Design lifetime	Indicator	1. Product Stage	2. Design & Construction Stage	3. Use & Maintenance Stage	4. End-of-Life Stage
	AP [kg SO ₂ eq]	2.40E-01	2.12E-02	6.68E-03	1.47E-02
	EP [kg N eq]	1.03E-02	1.73E-03	2.46E-04	2.44E-03
	GWP [kg CO ₂ eq]	5.16E+01	4.12E+00	3.14E+00	3.04E+00
	ODP [kg CFC 11 eq]	-1.67E-12	3.92E-16	1.96E-14	8.16E-15
	POCP [kg O ₃ eq]	2.10E+00	4.84E-01	2.70E+00	2.42E-01
	RPRE [MJ]	6.10E+01	1.81E+00	3.46E+00	2.46E+00
	NRPRE [MJ]	1.13E+03	5.86E+01	8.28E+01	3.62E+01
	FW [m3]	2.66E-01	6.98E-03	1.87E-02	4.66E-03
	RMR [kg]	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	NRMR [kg]	5.51E+01	0.00E+00	1.38E+00	0.00E+00
	HWD [kg]	1.58E-06	4.74E-07	1.21E-08	1.51E-07
	NHWD [kg]	2.98E+00	2.20E-03	1.01E-02	5.62E+01
	BC [kg CO ₂ eq]			4.98E+00	
	HWP [MJ]			3.39E+00	
	FE [MJ]			5.15E+01	
BE [MJ]			1.68E+00		
NE [MJ]			1.35E+01		
OE [MJ]			1.35E+00		

» Interpretation

For all the products in study, the majority of the environmental impacts come from the Product Stage, which includes raw material sourcing, transportation and manufacturing. The only exception is POCP whose dominant source is Use & Maintenance Stage because of VOC emission in the curing process. From a functional unit perspective, the lifetime of the product and the coverage rate play a major role in scaling the impacts. This explains why products of coarse finishes have a higher impact than those of fine finishes.

» Reference

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- PCR for Architectural Coatings: NAICS 325510. NSF International, 2017
- ISO14044:2006 Environmental Management–Life cycle assessment–Requirements and Guidelines.
- ISO 14025:2006 Environmental labels and declarations – Type III environmental declarations – Principles and Procedures.
- ISO 21930:2007 Sustainability in buildings and civil engineering works – Core rules for environmental product declarations of construction products and services.
- Advancing Sustainable Materials Management: 2015 Fact Sheet. US EPA. Available at https://www.epa.gov/sites/production/files/2018-07/documents/2015_smm_msw_factsheet_07242018_fnl_508_002.pdf
- Product Bulletin – Stolit® Acrylic Textured Finish. Sto Corp. Available at http://www.stocorp.com/wp-content/content/Products_TechService/Finishes/Product%20Bulletins/PB_80130-82156_Stolit_Finishes_EN.pdf



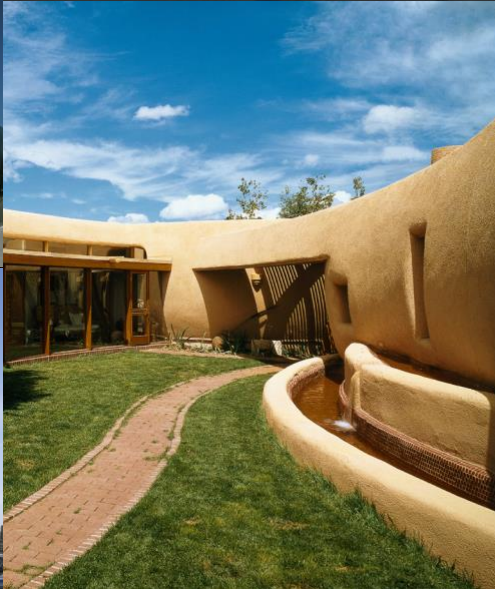
Building with conscience.



**EPD for Stolit® Lotusan®
in varied textures**

Product Textures: 1.0, 1.0 Dark,
1.5, 1.5 Dark, Freeform, Freeform
Dark.

Stolit® Lotusan® is a ready-mixed exterior textured finish that mimics the self-cleaning capabilities of the lotus leaf. Replicating the lotus plant's ability to send raindrops rolling gently off its leaves, Stolit® Lotusan® resists dirt pick-up while keeping walls clean and attractive. Stolit® Lotusan® with Lotus-Effect® technology is designed for use as a finish coat over prepared vertical concrete, masonry or plaster substrates and in StoTherm® ci Lotusan® wall claddings.





PCR Identification	PCR for Architectural Coatings: NAICS 325510 on the basis of ISO 21930: 2007, NSF International, 2017. Valid through June 23, 2022
Compliance to to ISO 14040/44, ISO 14025 and ISO 21930	Yes
Product Category	Exterior Coating
Manufacturer's name	Sto Corp. 3800 Camp Creek Parkway SW, Building 1400, Suite 120 Atlanta, GA 30331 www.stocorp.com (800) 221-2397
EPD program operator	Epsten Group 101 Marietta St. Suite 2600, Atlanta, GA 30303 www.epstengroup.com
Declaration Number	01-002
Date of Certification	December 18 th , 2019
Period of Validity	5 years from date of certification
Functional Unit	One square meter of covered and protected substrate for 60 years
Market-base life used in assessment	10 Years
Design life used in assessment	5 Years
Test method employed for determination of design life	Product default warranty
Amount of colorant needed	See Table 3
Overall Data Quality Assessment Score	Good
Site(s) in which the results of the LCA are representative	STO manufacturing sites in Atlanta, Georgia; Glendale, Arizona; and Rutland, Vermont
Information on where explanatory material can be obtained	See references at the end of this document.
LCA Software and Version Number	GaBi 9.2.0.58
LCI Database and Version Number	GaBi Database Version 8.7, Service Pack 39
This declaration was independently verified in accordance with ISO 14025: 2006 and the reference PCR: PCR for Architectural Coatings: NAICS 325510 <input type="checkbox"/> Internal <input checked="" type="checkbox"/> External	Kate McFeaters kmcfeaters@epstengroup.com 
This life cycle assessment was conducted in accordance with ISO 14044 and the reference PCR by:	WAP Sustainability Consulting, LLC
This life cycle assessment was independently verified in accordance with ISO 14044 and the reference PCR by:	Kate McFeaters kmcfeaters@epstengroup.com 

Comparability

In order to support comparative assertions, this EPD meets all comparability requirements stated in ISO 14025:2006. However, differences in certain assumptions, data quality, and variability between LCA data sets may still exist. As such, caution should be exercised when evaluating EPDs from different manufacturers, as the EPD results may not be entirely comparable. Any EPD comparison must be carried out at the building level per ISO 21930 guidelines. The results of this EPD reflect an average performance by the product and its actual impacts may vary on a case-to-case basis.

» Company

We believe in ‘**Building with conscience**’.

That means ensuring that all building products are not only safe, effective and easy to install, but also environmentally responsible and sustainable. We know you’re always looking for the smartest and newest technology to create energy efficient buildings with superior aesthetics.

That’s exactly what our products help you achieve. Products like our wall systems, coatings and finishes are consistent favorites among design professionals, contractors and property owners alike. Whatever your needs or vision may be, we offer products for every type of building project; whether it’s new construction, restoration or panelization, commercial or residential work.

An architect or specifier focuses on aesthetics and feasibility, a contractor needs products that are easy to work with, and a building owner requires high value and low costs on properties. Sto understands these unique needs, and delivers the smart, innovative materials and solutions that make this all possible. That’s why Sto remains the innovative leader in integrated exterior wall systems.

When you combine that commitment to product support and innovation with value-added offerings like consultative design and color services through [Sto Studio](#) or training in proper application techniques through the Sto Institute, you get an integrated exterior wall system solution unmatched in the industry.

» Manufacturing Sites Covered in this EPD

Atlanta Plant

Glendale Plant

Rutland Plant

» Product Identification

Stolit® Lotusan® finishes are offered in various coarseness and color bases that allow more freedom in building exterior designing and finishing. Table 1 lists the products declared in this EPD.

Table 1: List of Stolit® Lotusan® Products

Product Name	Product Number	Base Type	Finish Type
Stolit® Lotusan® 1.0	80190	Tintable White	Fine
Stolit® Lotusan® 1.0 Dark Colors	82190	Deep	Fine
Stolit® Lotusan® 1.5	80191	Tintable White	Medium
Stolit® Lotusan® 1.5 Dark Colors	82191	Deep	Medium
Stolit® Lotusan® Freeform	80193	Tintable White	Freeform
Stolit® Lotusan® Freeform Dark Colors	82193	Deep	Freeform

» Product Description

Stolit® Lotusan® is a series of ready mixed, textured wall coating with Lotus-Effect® technology that mimics the self-cleaning capabilities of the lotus leaf. Stolit® Lotusan® with Lotus-Effect® technology is designed for use as a finish coating over prepared vertical above-grade concrete, masonry or plaster substrates and in StoTherm® Lotusan® Wall Claddings including StoTherm® ci Lotusan®. In this study, Lotusan® 1.0, 1.5 and Freeform are included. Same as Stolit®, two tint bases are offered.



» Performance Features

Mildew Resistance	Ready Mixed	Moisture Resistance	Low VOC & Odor
Vapor Permeable	Integral Color	Water-based	Super Hydrophobic

» Material Composition

The material compositions of Stolit® Lotusan® are listed below:

Table 2: Material composition for Stolit® Lotusan®

	Additives	Colorant	Limestone	Acrylic resin	Silica	Silicate	Surfactant	Water
Stolit® Lotusan® 1.0 Dark Colors	4.68%	0.60%	49.26%	5.01%	21.66%	2.68%	0.05%	15.45%
Stolit® Lotusan® 1.0	4.69%	0.60%	49.24%	5.04%	21.45%	2.70%	0.05%	15.62%
Stolit® Lotusan® 1.5 Dark Colors	4.68%	0.60%	49.98%	4.99%	20.88%	2.85%	0.05%	15.37%
Stolit® Lotusan® 1.5	4.68%	0.60%	49.72%	4.98%	21.37%	2.66%	0.05%	15.35%
Stolit® Lotusan® Freeform Dark Colors	4.73%	0.64%	60.60%	5.37%	8.37%	2.87%	0.11%	16.56%
Stolit® Lotusan® Freeform	4.73%	0.64%	60.06%	5.36%	8.36%	2.87%	0.13%	17.10%

» Components related to Life Cycle Assessment

The functional unit for the LCA study was covering and protecting 1 square meter (m²) of substrate for a period of 60 years—the assumed lifetime of a building. The reference flow required for the functional unit is calculated based on the product lifespan scenarios prescribed in the PCR. The market-based lifetime is 10 years, and the design lifetime is determined either based on quality determined by ASTM tests or on the product warrant. By default, Stolit® Lotusan® finishes have a 5-year warranty. In case a finish is applied on Sto’s wall systems, the warranty is extended to 10 years. In this EPD, default warranty is adopted as the design lifetime. The reference flow required for one functional unit is provided in Table 3.

Table 3: Market-based lifetime and reference flow

	Functional Unit	Reference Flow [kg]	Tint needed* [kg]	Reference Flow [kg]	Tint needed* [kg]
	Lifespan		Design Lifetime [5 years]		Market-based Lifetime [10 years]
Stolit® Lotusan® 1.0 Dark Colors	1	29.16	2.60	14.58	1.30
Stolit® Lotusan® 1.0	1	29.16	0.77	14.58	0.38
Stolit® Lotusan® 1.5 Dark Colors	1	33.56	3.00	16.79	1.50
Stolit® Lotusan® 1.5	1	33.56	0.88	16.79	0.44
Stolit® Lotusan® Freeform Dark Colors	1	52.32	4.66	26.16	2.33
Stolit® Lotusan® Freeform	1	52.32	1.37	26.16	0.69

» Scope and Boundaries of the Life Cycle Assessment

The LCA was performed in accordance with ISO 14040 standards. The study is a cradle-to-grave LCA and includes the following life stages as prescribed in the PCR.

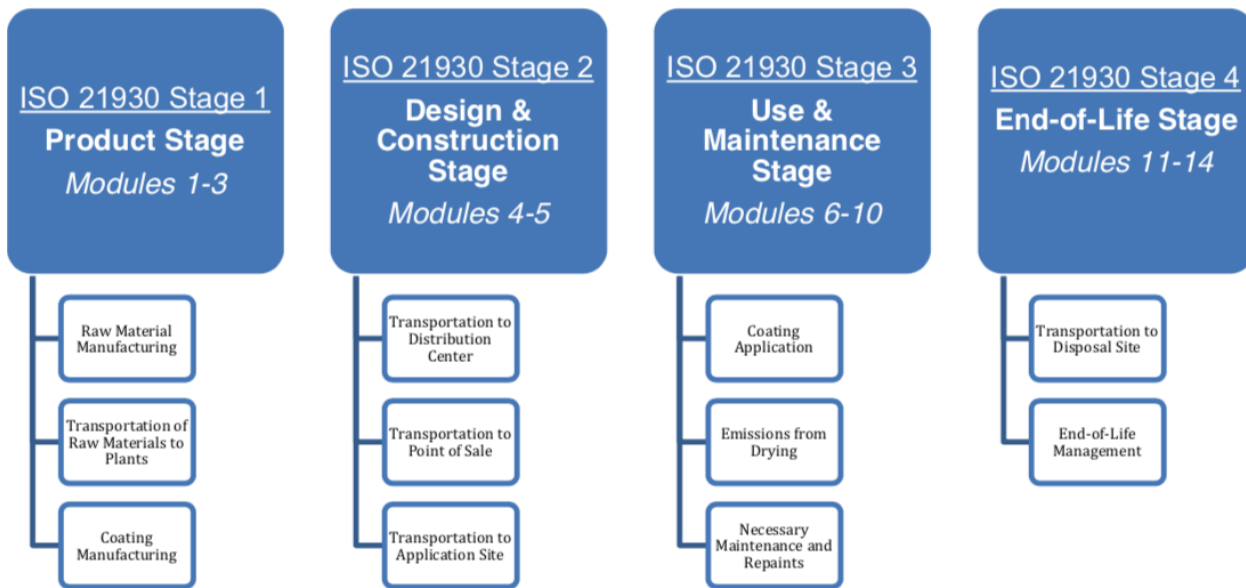


Figure 1: Life stages for the cradle-to-grave LCA

»» Cut-off Criteria

Material inputs greater than 1% (based on total mass of the final product) were included within the scope of analysis. Material inputs less than 1% were included if sufficient data was available to warrant inclusion and/or the material input was thought to have significant environmental impact. Cumulative excluded material inputs and environmental impacts are less than 5% based on total weight of the functional unit.

»» Data Quality

The overall data quality level was determined to be good. Primary data was collected from Sto's facilities in Atlanta, GA, Glendale, AZ and Rutland, VT for the 2018 reference year. When primary data did not exist, secondary data were obtained from the Gabi V8.7 Database Service Pack 39. Overall, both primary and secondary data are considered good quality in terms of geographic, temporal and technological coverage.

»» Estimates and Assumption

Assumptions were made to represent the cradle-to-grave environmental performance of Sto's products. These assumptions were made in accordance with the PCR and include the transportation distances, the disposal of packaging material and the product at its end of life and use phase assumptions.

»» Allocation

General principles of allocation were based on ISO 14040/44. Where possible, allocation was avoided. When allocation was necessary it was done on a physical mass basis.

»» Product Stage

Stolit® Lotusan® is produced at Sto's Atlanta, GA, Glendale, AZ and Rutland, VT facilities. This stage includes an aggregation of raw material extraction, supplier processing, delivery, manufacturing and packaging by Sto. Stolit® Lotusan® is supplied in 5-gallon pails.

»» Design and Construction Stage

The design and construction process stage starts with the packaged product leaving the production site and ends with being delivered to the application site.

During this stage, the finished product is moved from a shipping dock for distribution. The end gate is the application site after the purchaser acquires the finished product and transports it to the application site.

»» Use and Maintenance Stage

The use stage begins when the user prepares the product before applying it to a substrate and ends with any leftover coating and discarded packaging entering the end-of-life stage. Detailed application instructions are provided online. The application procedure includes mixing and applying. As recommended, an electric drill/mixer and a spray pump are assumed to be used for mixing and application. The equipment is not included in the study as these are multi-use tools and the impacts per declared unit is considered negligible, but electricity to power application tools has been included.

As prescribed in the PCR, 10% of the wet mass of Stolit® is assumed to be unused and properly disposed of.

»» End-of-Life Stage

Waste Flow	Recycling	Incineration	Landfilling
Paper Packaging	66.6%	6.01%	27.39%
Steel Packaging	33.3%	12.01%	54.69%
Plastic Packaging	9.1%	16.36%	74.54%
Unused Product	0%	0%	100%
Post-Consumer Product	0%	0%	100%

In this stage, the disposal of installation waste, packaging waste and product waste at its end of life is included. The disposal pathway of each waste stream is modeled based on the recommendation of PCR and US EPA's latest waste management fact sheet.

» Life Cycle Assessment Results

As prescribed by the PCR, TRACI 2.1 impact characterization methodology and IPCC 5th assessment report are adopted to calculate the environment impacts. Table 4 provides the acronym key of the impact indicators declared in this EPD.

Table 4: LCIA impact category and LCI Indicator keys

Abbreviation	Parameter	Unit
TRACI 2.1		
AP	Acidification potential of soil and water	kg SO ₂ eq
EP	Eutrophication potential	kg N eq
GWP	Global warming potential including biogenic carbon emission	kg CO ₂ eq
ODP	Depletion of stratospheric ozone layer	kg CFC 11 eq
POCP	Photochemical ozone creation potential	kg O ₃ eq
Resource Use Parameters		
RPR	Use of renewable primary energy	MJ, net calorific value (LHV)
RMR	Use of renewable Material Resources	kg
NRER	Depletion of Non-Renewable Energy Resources	MJ, net calorific value
NRMR	Depletion of Non-Renewable Material Resources	kg
FW	Consumption of Freshwater	m ³
Waste Parameters		
HWD	Disposed-of-hazardous waste	kg
NHWD	Disposed-of non-hazardous waste	kg
Biogenic Carbon Parameter		
BC	Biogenic Carbon	kg CO ₂ eq
Energy Differentiation Parameters		
HWP	Hydro/wind Power	MJ, net calorific value (LHV)
FE	Fossil Energy	MJ, net calorific value (LHV)
BE	Bio-energy	MJ, net calorific value (LHV)
NE	Nuclear Energy	MJ, net calorific value (LHV)
OE	Other Energy	MJ, net calorific value (LHV)

» Stolit® Lotusan® 1.0 Dark Colors

	Indicator	1. Product Stage	2. Design & Construction Stage	3. Use & Maintenance Stage	4. End-of-Life Stage	
Market-based lifetime	AP [kg SO ₂ eq]	6.23E-02	5.83E-03	6.11E-03	4.19E-03	
	EP [kg N eq]	3.64E-03	4.75E-04	2.23E-04	6.81E-04	
	GWP [kg CO ₂ eq]	1.45E+01	1.13E+00	2.90E+00	8.70E-01	
	ODP [kg CFC 11 eq]	-5.00E-13	1.08E-16	1.83E-14	2.35E-15	
	POCP [kg O ₃ eq]	8.08E-01	1.33E-01	1.15E+00	6.94E-02	
	RPRE [MJ]	4.25E+01	4.97E-01	3.10E+00	7.14E-01	
	NRPRE [MJ]	2.95E+02	1.61E+01	7.69E+01	1.04E+01	
	FW [m3]	7.57E-02	1.91E-03	1.73E-02	1.34E-03	
	RMR [kg]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	
	NRMR [kg]	1.52E+01	0.00E+00	1.30E+00	0.00E+00	
	HWD [kg]	8.52E-07	1.30E-07	1.09E-08	4.34E-08	
	NHWD [kg]	1.83E+00	6.06E-04	9.13E-03	1.61E+01	
	BC [kg CO ₂ eq]			5.29E+00		
	HWP [MJ]			9.34E-01		
	FE [MJ]			1.42E+01		
	BE [MJ]			4.62E-01		
	NE [MJ]			3.71E+00		
	OE [MJ]			3.72E-01		
	Design lifetime	Indicator	1. Product Stage	2. Design & Construction Stage	3. Use & Maintenance Stage	4. End-of-Life Stage
		AP [kg SO ₂ eq]	1.25E-01	1.17E-02	1.22E-02	8.38E-03
EP [kg N eq]		7.28E-03	9.50E-04	4.46E-04	1.36E-03	
GWP [kg CO ₂ eq]		2.90E+01	2.26E+00	5.80E+00	1.74E+00	
ODP [kg CFC 11 eq]		-1.00E-12	2.16E-16	3.66E-14	4.70E-15	
POCP [kg O ₃ eq]		1.62E+00	2.66E-01	2.30E+00	1.39E-01	
RPRE [MJ]		8.50E+01	9.94E-01	6.20E+00	1.43E+00	
NRPRE [MJ]		5.90E+02	3.22E+01	1.54E+02	2.08E+01	
FW [m3]		1.51E-01	3.82E-03	3.46E-02	2.68E-03	
RMR [kg]		0.00E+00	0.00E+00	0.00E+00	0.00E+00	
NRMR [kg]		3.03E+01	0.00E+00	2.60E+00	0.00E+00	
HWD [kg]		1.70E-06	2.60E-07	2.18E-08	8.68E-08	
NHWD [kg]		3.66E+00	1.21E-03	1.83E-02	3.22E+01	
BC [kg CO ₂ eq]				1.06E+01		
HWP [MJ]				1.87E+00		
FE [MJ]				2.83E+01		
BE [MJ]				9.23E-01		
NE [MJ]				7.42E+00		
OE [MJ]				7.45E-01		

	Indicator	1. Product Stage	2. Design & Construction Stage	3. Use & Maintenance Stage	4. End-of-Life Stage	
Market-based lifetime	AP [kg SO ₂ eq]	8.00E-02	5.83E-03	1.86E-03	4.01E-03	
	EP [kg N eq]	3.36E-03	4.75E-04	6.83E-05	6.72E-04	
	GWP [kg CO ₂ eq]	1.50E+01	1.13E+00	8.76E-01	8.31E-01	
	ODP [kg CFC 11 eq]	-4.92E-13	1.08E-16	5.47E-15	2.22E-15	
	POCP [kg O ₃ eq]	7.67E-01	1.33E-01	1.12E+00	6.59E-02	
	RPRE [MJ]	4.13E+01	4.98E-01	9.63E-01	6.69E-01	
	NRPRE [MJ]	2.93E+02	1.61E+01	2.31E+01	9.85E+00	
	FW [m3]	7.61E-02	1.92E-03	5.22E-03	1.27E-03	
	RMR [kg]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	
	NRMR [kg]	1.52E+01	0.00E+00	3.80E-01	0.00E+00	
	HWD [kg]	8.49E-07	1.30E-07	3.37E-09	4.11E-08	
	NHWD [kg]	1.84E+00	6.06E-04	2.81E-03	1.53E+01	
	BC [kg CO ₂ eq]			5.20E+00		
	HWP [MJ]			9.33E-01		
	FE [MJ]			1.42E+01		
	BE [MJ]			4.61E-01		
	NE [MJ]			3.71E+00		
	OE [MJ]			3.72E-01		
	Design lifetime	Indicator	1. Product Stage	2. Design & Construction Stage	3. Use & Maintenance Stage	4. End-of-Life Stage
		AP [kg SO ₂ eq]	1.60E-01	1.17E-02	3.72E-03	8.02E-03
EP [kg N eq]		6.72E-03	9.50E-04	1.37E-04	1.34E-03	
GWP [kg CO ₂ eq]		3.00E+01	2.26E+00	1.75E+00	1.66E+00	
ODP [kg CFC 11 eq]		-9.84E-13	2.16E-16	1.09E-14	4.44E-15	
POCP [kg O ₃ eq]		1.53E+00	2.66E-01	2.24E+00	1.32E-01	
RPRE [MJ]		8.26E+01	9.96E-01	1.93E+00	1.34E+00	
NRPRE [MJ]		5.86E+02	3.22E+01	4.62E+01	1.97E+01	
FW [m3]		1.52E-01	3.84E-03	1.04E-02	2.54E-03	
RMR [kg]		0.00E+00	0.00E+00	0.00E+00	0.00E+00	
NRMR [kg]		3.03E+01	0.00E+00	7.60E-01	0.00E+00	
HWD [kg]		1.70E-06	2.60E-07	6.74E-09	8.22E-08	
NHWD [kg]		3.68E+00	1.21E-03	5.62E-03	3.06E+01	
BC [kg CO ₂ eq]				1.04E+01		
HWP [MJ]				1.87E+00		
FE [MJ]				2.83E+01		
BE [MJ]				9.23E-01		
NE [MJ]				7.41E+00		
OE [MJ]				7.44E-01		

» Stolit® Lotusan® 1.5 Dark Colors

	Indicator	1. Product Stage	2. Design & Construction Stage	3. Use & Maintenance Stage	4. End-of-Life Stage	
Market-based lifetime	AP [kg SO ₂ eq]	6.98E-02	6.71E-03	7.02E-03	4.82E-03	
	EP [kg N eq]	3.76E-03	5.47E-04	2.56E-04	7.84E-04	
	GWP [kg CO ₂ eq]	1.68E+01	1.31E+00	3.33E+00	1.00E+00	
	ODP [kg CFC 11 eq]	-5.83E-13	1.24E-16	2.11E-14	2.70E-15	
	POCP [kg O ₃ eq]	8.62E-01	1.53E-01	1.32E+00	7.99E-02	
	RPRE [MJ]	4.70E+01	5.73E-01	3.56E+00	8.22E-01	
	NRPRE [MJ]	3.32E+02	1.85E+01	8.86E+01	1.20E+01	
	FW [m ³]	8.52E-02	2.21E-03	1.99E-02	1.54E-03	
	RMR [kg]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	
	NRMR [kg]	1.75E+01	0.00E+00	1.50E+00	0.00E+00	
	HWD [kg]	9.85E-07	1.50E-07	1.25E-08	4.99E-08	
	NHWD [kg]	2.10E+00	6.98E-04	1.05E-02	1.86E+01	
	BC [kg CO ₂ eq]			6.13E+00		
	HWP [MJ]			1.08E+00		
	FE [MJ]			1.63E+01		
	BE [MJ]			5.32E-01		
	NE [MJ]			4.27E+00		
	OE [MJ]			4.29E-01		
	Design lifetime	Indicator	1. Product Stage	2. Design & Construction Stage	3. Use & Maintenance Stage	4. End-of-Life Stage
		AP [kg SO ₂ eq]	1.40E-01	1.34E-02	1.40E-02	9.64E-03
EP [kg N eq]		7.52E-03	1.09E-03	5.12E-04	1.57E-03	
GWP [kg CO ₂ eq]		3.36E+01	2.62E+00	6.66E+00	2.00E+00	
ODP [kg CFC 11 eq]		-1.17E-12	2.48E-16	4.22E-14	5.40E-15	
POCP [kg O ₃ eq]		1.72E+00	3.06E-01	2.64E+00	1.60E-01	
RPRE [MJ]		9.40E+01	1.15E+00	7.12E+00	1.64E+00	
NRPRE [MJ]		6.64E+02	3.70E+01	1.77E+02	2.40E+01	
FW [m ³]		1.70E-01	4.42E-03	3.98E-02	3.08E-03	
RMR [kg]		0.00E+00	0.00E+00	0.00E+00	0.00E+00	
NRMR [kg]		3.49E+01	0.00E+00	3.00E+00	0.00E+00	
HWD [kg]		1.97E-06	3.00E-07	2.50E-08	9.98E-08	
NHWD [kg]		4.20E+00	1.40E-03	2.10E-02	3.72E+01	
BC [kg CO ₂ eq]				1.23E+01		
HWP [MJ]				2.15E+00		
FE [MJ]				3.26E+01		
BE [MJ]				1.06E+00		
NE [MJ]				8.54E+00		
OE [MJ]				8.58E-01		

	Indicator	1. Product Stage	2. Design & Construction Stage	3. Use & Maintenance Stage	4. End-of-Life Stage
Market-based lifetime	AP [kg SO ₂ eq]	9.14E-02	6.71E-03	2.14E-03	4.62E-03
	EP [kg N eq]	3.86E-03	5.47E-04	7.86E-05	7.74E-04
	GWP [kg CO ₂ eq]	1.72E+01	1.31E+00	1.01E+00	9.57E-01
	ODP [kg CFC 11 eq]	-5.68E-13	1.24E-16	6.30E-15	2.55E-15
	POCP [kg O ₃ eq]	8.80E-01	1.53E-01	1.29E+00	7.58E-02
	RPRE [MJ]	4.74E+01	5.73E-01	1.11E+00	7.70E-01
	NRPRE [MJ]	3.35E+02	1.85E+01	2.65E+01	1.13E+01
	FW [m3]	8.69E-02	2.21E-03	6.01E-03	1.46E-03
	RMR [kg]	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	NRMR [kg]	1.75E+01	0.00E+00	4.40E-01	0.00E+00
	HWD [kg]	9.78E-07	1.50E-07	3.88E-09	4.73E-08
	NHWD [kg]	2.12E+00	6.98E-04	3.23E-03	1.76E+01
	BC [kg CO ₂ eq]			5.98E+00	
	HWP [MJ]			1.07E+00	
	FE [MJ]			1.63E+01	
	BE [MJ]			5.31E-01	
NE [MJ]			4.27E+00		
OE [MJ]			4.29E-01		
Design lifetime	Indicator	1. Product Stage	2. Design & Construction Stage	3. Use & Maintenance Stage	4. End-of-Life Stage
	AP [kg SO ₂ eq]	1.83E-01	1.34E-02	4.28E-03	9.24E-03
	EP [kg N eq]	7.72E-03	1.09E-03	1.57E-04	1.55E-03
	GWP [kg CO ₂ eq]	3.44E+01	2.62E+00	2.02E+00	1.91E+00
	ODP [kg CFC 11 eq]	-1.14E-12	2.48E-16	1.26E-14	5.10E-15
	POCP [kg O ₃ eq]	1.76E+00	3.06E-01	2.58E+00	1.52E-01
	RPRE [MJ]	9.48E+01	1.15E+00	2.22E+00	1.54E+00
	NRPRE [MJ]	6.70E+02	3.70E+01	5.30E+01	2.26E+01
	FW [m3]	1.74E-01	4.42E-03	1.20E-02	2.92E-03
	RMR [kg]	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	NRMR [kg]	3.49E+01	0.00E+00	8.80E-01	0.00E+00
	HWD [kg]	1.96E-06	3.00E-07	7.76E-09	9.46E-08
	NHWD [kg]	4.24E+00	1.40E-03	6.46E-03	3.52E+01
	BC [kg CO ₂ eq]			1.20E+01	
	HWP [MJ]			2.15E+00	
	FE [MJ]			3.26E+01	
BE [MJ]			1.06E+00		
NE [MJ]			8.54E+00		
OE [MJ]			8.57E-01		

	Indicator	1. Product Stage	2. Design & Construction Stage	3. Use & Maintenance Stage	4. End-of-Life Stage
Market-based lifetime	AP [kg SO ₂ eq]	1.13E-01	1.05E-02	1.10E-02	7.51E-03
	EP [kg N eq]	6.53E-03	8.52E-04	3.99E-04	1.22E-03
	GWP [kg CO ₂ eq]	2.57E+01	2.04E+00	5.20E+00	1.56E+00
	ODP [kg CFC 11 eq]	-7.86E-13	1.93E-16	3.28E-14	4.22E-15
	POCP [kg O ₃ eq]	1.46E+00	2.39E-01	2.06E+00	1.25E-01
	RPRE [MJ]	7.50E+01	8.93E-01	5.56E+00	1.28E+00
	NRPRE [MJ]	5.27E+02	2.89E+01	1.38E+02	1.88E+01
	FW [m3]	1.35E-01	3.44E-03	3.10E-02	2.41E-03
	RMR [kg]	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	NRMR [kg]	2.72E+01	0.00E+00	2.33E+00	0.00E+00
	HWD [kg]	1.54E-06	2.34E-07	1.95E-08	7.78E-08
	NHWD [kg]	3.15E+00	1.09E-03	1.64E-02	2.89E+01
	BC [kg CO ₂ eq]			9.44E+00	
	HWP [MJ]			1.68E+00	
FE [MJ]			2.54E+01		
BE [MJ]			8.28E-01		
NE [MJ]			6.65E+00		
OE [MJ]			6.68E-01		
Design lifetime	Indicator	1. Product Stage	2. Design & Construction Stage	3. Use & Maintenance Stage	4. End-of-Life Stage
	AP [kg SO ₂ eq]	2.26E-01	2.10E-02	2.20E-02	1.50E-02
	EP [kg N eq]	1.31E-02	1.70E-03	7.98E-04	2.44E-03
	GWP [kg CO ₂ eq]	5.14E+01	4.08E+00	1.04E+01	3.12E+00
	ODP [kg CFC 11 eq]	-1.57E-12	3.86E-16	6.56E-14	8.44E-15
	POCP [kg O ₃ eq]	2.92E+00	4.78E-01	4.12E+00	2.50E-01
	RPRE [MJ]	1.50E+02	1.79E+00	1.11E+01	2.56E+00
	NRPRE [MJ]	1.05E+03	5.78E+01	2.76E+02	3.76E+01
	FW [m3]	2.70E-01	6.88E-03	6.20E-02	4.82E-03
	RMR [kg]	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	NRMR [kg]	5.44E+01	0.00E+00	4.66E+00	0.00E+00
	HWD [kg]	3.08E-06	4.68E-07	3.90E-08	1.56E-07
	NHWD [kg]	6.30E+00	2.18E-03	3.28E-02	5.78E+01
	BC [kg CO ₂ eq]			1.89E+01	
HWP [MJ]			3.35E+00		
FE [MJ]			5.08E+01		
BE [MJ]			1.66E+00		
NE [MJ]			1.33E+01		
OE [MJ]			1.34E+00		

	Indicator	1. Product Stage	2. Design & Construction Stage	3. Use & Maintenance Stage	4. End-of-Life Stage	
Market-based lifetime	AP [kg SO ₂ eq]	1.42E-01	1.05E-02	3.34E-03	7.20E-03	
	EP [kg N eq]	5.78E-03	8.52E-04	1.23E-04	1.21E-03	
	GWP [kg CO ₂ eq]	2.60E+01	2.04E+00	1.57E+00	1.49E+00	
	ODP [kg CFC 11 eq]	-6.63E-13	1.93E-16	9.82E-15	3.98E-15	
	POCP [kg O ₃ eq]	1.27E+00	2.39E-01	2.01E+00	1.18E-01	
	RPRE [MJ]	7.24E+01	8.93E-01	1.73E+00	1.20E+00	
	NRPRE [MJ]	5.15E+02	2.89E+01	4.14E+01	1.77E+01	
	FW [m ³]	1.35E-01	3.44E-03	9.37E-03	2.28E-03	
	RMR [kg]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	
	NRMR [kg]	2.72E+01	0.00E+00	6.90E-01	0.00E+00	
	HWD [kg]	1.46E-06	2.34E-07	6.04E-09	7.37E-08	
	NHWD [kg]	3.17E+00	1.09E-03	5.04E-03	2.74E+01	
	BC [kg CO ₂ eq]			9.24E+00		
	HWP [MJ]			1.67E+00		
	FE [MJ]			2.54E+01		
	BE [MJ]			8.28E-01		
	NE [MJ]			6.65E+00		
	OE [MJ]			6.68E-01		
	Design lifetime	Indicator	1. Product Stage	2. Design & Construction Stage	3. Use & Maintenance Stage	4. End-of-Life Stage
		AP [kg SO ₂ eq]	2.84E-01	2.10E-02	6.68E-03	1.44E-02
EP [kg N eq]		1.16E-02	1.70E-03	2.46E-04	2.42E-03	
GWP [kg CO ₂ eq]		5.20E+01	4.08E+00	3.14E+00	2.98E+00	
ODP [kg CFC 11 eq]		-1.33E-12	3.86E-16	1.96E-14	7.96E-15	
POCP [kg O ₃ eq]		2.54E+00	4.78E-01	4.02E+00	2.36E-01	
RPRE [MJ]		1.45E+02	1.79E+00	3.46E+00	2.40E+00	
NRPRE [MJ]		1.03E+03	5.78E+01	8.28E+01	3.54E+01	
FW [m ³]		2.70E-01	6.88E-03	1.87E-02	4.56E-03	
RMR [kg]		0.00E+00	0.00E+00	0.00E+00	0.00E+00	
NRMR [kg]		5.44E+01	0.00E+00	1.38E+00	0.00E+00	
HWD [kg]		2.92E-06	4.68E-07	1.21E-08	1.47E-07	
NHWD [kg]		6.34E+00	2.18E-03	1.01E-02	5.48E+01	
BC [kg CO ₂ eq]				1.85E+01		
HWP [MJ]				3.35E+00		
FE [MJ]				5.08E+01		
BE [MJ]				1.66E+00		
NE [MJ]				1.33E+01		
OE [MJ]				1.34E+00		

» Interpretation

For all the products in study, the majority of the environmental impacts come from the Product Stage, which includes raw material sourcing, transportation and manufacturing. The only exception is POCP whose dominant source is Use & Maintenance Stage because of VOC emission in the curing process. From a functional unit perspective, the lifetime of the product and the coverage rate play a major role in scaling the impacts. This explains why products of coarse finishes have a higher impact than those of fine finishes.

» Reference

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