

## ENVIRONMENTAL PRODUCT DECLARATION

# ROCKWOOL™ STONE WOOL Insulation

ROCKWOOL NORTH AMERICA



ROCKWOOL™ Stone Wool/Mineral Wool Insulation is optimized for performance, delivering on Thermal Comfort, Acoustics, Fire protection and more.



ROCKWOOL North America is Part of the ROCKWOOL Group, the world's leading stone wool/mineral wool manufacturer. Operating globally for over 80 years, over 30 years in North America the company manufactures stone wool insulation products that serve a wide range of applications in the Commercial, Residential, and Industrial/Technical segments.

Across the full range of our products and operations, ROCKWOOL is dedicated to enriching modern living. We strive to increase our positive impact on people and society by maximizing our positive product impact and minimizing our operational footprint. We recognize that operating with integrity and as a responsible business is equally important and underpins everything we do.

The United Nations Sustainable Development Goals (SDGs) steer our ambitions. We committed to 10 out of the 17 SDGs—pursuing the goals where we can have the greatest impact and that are the most aligned with our business competencies.

Our Environmental Product Declaration is another element of our commitment to serving our customers and the industry's requirements for sustainable solutions.



# ENVIRONMENTAL PRODUCT DECLARATION



Rockwool International A/S (Rockwool North America)  
Rockwool Stone wall thermal Insulation

According to EN 15804 and ISO 14025

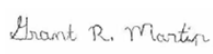
Dual Recognition by UL Environment and Institut Bauen und Umwelt e.V.

This declaration is an environmental product declaration (EPD) in accordance with ISO 14025. EPDs rely on Life Cycle Assessment (LCA) to provide information on a number of environmental impacts of products over their life cycle. **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, and the level of accuracy in estimation of effect differs for any particular product line and reported impact. **Comparability:** EPDs are not comparative assertions and are either not comparable or have limited comparability when they cover different life cycle stages, are based on different product category rules or are missing relevant environmental impacts. EPDs from different programs may not be comparable.



PROGRAM OPERATOR	UL Environment
DECLARATION HOLDER	ROCKWOOL International A/S (Rockwool North America)
ULE DECLARATION NUMBER	4789092768.101.1
IBU DECLARATION NUMBER	EPD-RWI-20190075-CCD1-EN
DECLARED PRODUCT	ROCKWOOL stone wool Thermal Insulation
REFERENCE PCR	Product Category Rules Part A: Calculation Rules for the Life Cycle Assessment and Requirements on the Background Report, 03.2018 Product Category Rules Part B: Mineral insulating materials, 12.2018

DATE OF ISSUE	17/07/2019
DATE OF EXPIRATION	17/06/2024

CONTENTS OF THE DECLARATION	General information Product / Product description LCA calculation rules LCA scenarios and further technical information LCA results References	
The PCR review was conducted by:	IBU – Institut Bauen und Umwelt e.V. PCR was approved by the Independent Expert Committee (IEC) of IBU	
The CEN Norm EN 15804 serves as the core PCR. This declaration was independently verified in accordance with ISO 14025 by Underwriters Laboratories <input type="checkbox"/> INTERNAL <input checked="" type="checkbox"/> EXTERNAL		
	Grant R. Martin, UL Environment	
This life cycle assessment was independently verified in accordance with EN 15804 and the reference PCR by:	IBU – Institut Bauen und Umwelt e.V.	



# ENVIRONMENTAL PRODUCT DECLARATION

as per /ISO 14025/ and /EN 15804/

Owner of the Declaration	ROCKWOOL International A/S (ROXUL Inc. - ROCKWOOL North America)
Programme holder	Institut Bauen und Umwelt e.V. (IBU)
Publisher	Institut Bauen und Umwelt e.V. (IBU)
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ROCKWOOL stone wool Thermal Insulation  
ROCKWOOL International A/S (ROXUL Inc. -  
ROCKWOOL North America)

[www.ibu-epd.com](http://www.ibu-epd.com) / <https://epd-online.com>



## General Information

ROCKWOOL International A/S  
(ROCKWOOL North America)

**Programme holder**

IBU - Institut Bauen und Umwelt e.V.  
Panoramastr. 1  
10178 Berlin  
Germany

**Declaration number**

EPD-RWI-20190075-CCD1-EN

**This declaration is based on the product category rules:**

Mineral insulating materials, 12.2018  
(PCR checked and approved by the SVR)

**Issue date**

18.06.2019

**Valid to**

17.06.2024



Prof. Dr.-Ing. Horst J. Bossenmayer  
(President of Institut Bauen und Umwelt e.V.)



Dr. Alexander Röder  
(Head of Board IBU)

ROCKWOOL stone wool Thermal  
Insulation

**Owner of the declaration**

ROXUL Inc.  
d/b/a ROCKWOOL North America  
8024 Esquesing Line  
Milton, Ontario  
Canada  
L9T 6W3

**Declared product / declared unit**

1 m<sup>2</sup> of stone wool thermal insulation product with an R<sub>D</sub>=1 m<sup>2</sup>K/W.

**Scope:**

The span of products, which are contained in this EPD refer to thermal insulation products for the North American market, for wall (interior and exterior) and roof applications with a range of densities from 36 to 200 kg/m<sup>3</sup> (2.2 to 12.5 lbs/ft<sup>3</sup>). The declared reference product in this EPD is 1m<sup>2</sup> Safe'n' Sound stone wool batt for interior partition of wood and steel frame constructions with a thermal resistance of R<sub>D</sub>=1 m<sup>2</sup> K/W (R<sub>US</sub>=5.68). The corresponding thermal conductivity has been measured at 24°C as per ASTM C518.

The products included in this EPD are all manufactured in one or several of the ROCKWOOL North American facilities:

- Milton (Ontario, Canada)
- Grand Forks (British Columbia, Canada)
- Byhalia, (Mississippi, US).

The EPD is based on weighted LCA inventory data from the 3 plants. The environmental impacts and indicators are determined by applying the product specific scaling factor and R<sub>D</sub> value (please refer to section "Technical Data" for guidance). Speciality facings are not included in the scaling factors. The LCA results for these are listed in the Annex. The production data correspond to the year 2017.

The owner of the declaration shall be liable for the underlying information and evidence; the IBU shall not be liable with respect to manufacturer information, life cycle assessment data and evidences.

**Verification**

The standard /EN 15804/ serves as the core PCR  
Independent verification of the declaration and data  
according to /ISO 14025:2010/

internally  externally



Dr. Frank Werner  
(Independent verifier appointed by SVR)

## Product

### Product description / Product definition

ROCKWOOL stone wool thermal insulation is a fire safe material for insulation against heat, cold, fire, vibrations and noise.

It is traditionally made from volcanic rock (typically basalt or dolomite), an increasing proportion of recycled material, a low percentage of resin binder, which in ROCKWOOL thermal insulation products are usually up to 3%, syrups/ hydrolyzed starch in less than 1% and mineral oil in less than 0.2%.

The ROCKWOOL Products described in this declaration are produced for the North American market in the form of slabs or mats in the density range from 36 up to 200 kg/m<sup>3</sup>. The products are supplied in thicknesses of 25 to 203 mm.

Product-specific environmental impacts are compiled by applying the relevant scaling factor (listed in the Scaling Factor table) in the Product Specific Scaling formula.

Product Name	scaling compared to reference	Product Name	scaling compared to reference
SAFE'n'SOUND	1,0	CURTAINROCK 80	2,4
AFB	1,0	CURTAINROCK 80 RFF *	2,4
AFB evo	0,9	FABROCK 120	3,5
CAVITYROCK	1,6	FABROCK 30	1,1
COMFORTBATT R10	0,9	FABROCK 60	1,7
COMFORTBATT R14	0,9	FABROCK 85	2,4
COMFORTBATT R15	1,0	FABROCK BATT	1,1
COMFORTBATT R22	0,9	FABROCK HD	5,1
COMFORTBATT R22.5	0,9	FABROCK LT	1,3
COMFORTBATT R23	1,1	FABROCK WRAP	1,4
COMFORTBATT R24 WS	1,3	MONOBOARD	4,9
COMFORTBATT R24 SS	0,9	MONOBOARD PLUS	4,9
COMFORTBATT R28	0,9	ROCKBOARD 40	1,5
COMFORTBATT R30	0,9	ROCKBOARD 40 BM *	1,5
COMFORTBATT R32	0,9	ROCKBOARD 60	2,2
COMFORTBOARD 110	4,3	ROCKBOARD 80	3,1
COMFORTBOARD 80	3,1	ROCKWOOL PLUS MB	0,9
CONROCK	3,2	ROXUL SAFE	1,8
CONROCK 60	2,2	ROXUL SAFE 45	1,6
CURTAINROCK	1,3	ROXUL SAFE 55	2,0
CURTAINROCK 40	1,6	ROXUL SAFE 65	2,5
CURTAINROCK 40 RFF *	1,6	TOPROCK DD	4,3
		TOPROCK DD PLUS	4,3

\*) See annex for Environmental impact of specialty facing.

### Product Specific Scaling Formula:

Environmental Impact per m<sup>2</sup> = Environmental Impact reference product \* scaling factor + Environmental Impact facing material\*\*.

\*\* Only add facing material for products with specialty facings.

Please note that the R<sub>D</sub>-values used for scaling give a very good indication of the amount of material needed to achieve the desired insulation effect of other product types, but it is not an exact measure.

For the use and application of the product the respective Federal or local legal provisions at the place of use (outside European Union) apply.

### Application

The spectrum of products, included in the scope of this EPD refer to thermal insulation products, for interior and exterior wall and roof applications with a range of densities from 36 to 200 kg/m<sup>3</sup> (2 to 12 lb/sqf).

The products included in this EPD along with their intended use are presented in the table below:

#### Intended Use of Products

Product Family	Product Identification	Intended use
I.	AFB evo™	Interior Wall and Floor Applications
II.	COMFORTBOARD™, COMFORTBATT®, SAFE'n'SOUND®, AFB®, CAVITYROCK®, CURTAINROCK®, ROXUL SAFE™, ROCKBOARD®, PLUS™ MB	Interior and Exterior Applications
III.	MONOBOARD®, TOPROCK® DD, TOPROCK® DD MULTIFIX™	Roof Insulation or Insulating Cover Board over Other Insulation
IV.	MONOBOARD® PLUS, TOPROCK® DD Plus	Low-Slope Roof Applications
V	CONROCK®, FABROCK®	OEM

### Technical Data

The technical specifications for the products described in the EPD are stated below. Further documentation is available via [www.rockwool.com](http://www.rockwool.com).

#### Technical data

Name	Value	Unit
Sound absorption coefficient /ASTM C423/	7 - 11	%
Compressive Strength /ASTM C165/	0 - 190	kPa at 25% compression
Reaction to Moisture (Water Vapor Transmission, Desiccant Method) /ASTM E96/	27 - 41	perm
Thermal Resistance /ASTM C518 (C177)/	3.9-4.3	Fhr.ft <sup>2</sup> /Btu
Flame Spread/Smoke Developed /ASTM E84 [UL 723] / CAN/ULC S102/	0/0	
Determination of Fungi Resistance /ASTM C1338/	Passed	

Performance data of the product with respect to its characteristics in accordance with the relevant technical provision.

### Base materials / Ancillary materials

The stone wool raw materials are non-scarce natural stone and secondary raw materials in a percentage up to 97%. The raw materials are used either in their natural form, crushed or in a cement-bound briquette. The product composition is presented below:

- virgin stone (71%)
- slags and other secondary materials (23%)
- binder (5.7%)
- mineral oil and bonding agent (0.3%)

Mineral wool fibers produced by ROCKWOOL are classified as non-hazardous under /REACH/ (Regulation (EC) No 1272/2008 of the European parliament and of the council of 16 December 2008 on classification, labelling and packaging of substances and mixtures). ROCKWOOL are registered with /REACH/ under the following definition: "Man-made vitreous (silicate) fibers with random orientation with alkaline oxide and alkali earth oxide (Na<sub>2</sub>O+K<sub>2</sub>O+CaO+MgO+BaO) content greater than 18% by weight and fulfilling one of the Note Q conditions".

Non added formaldehyde alternatives are available

and covered by this EPD. (Regulation (EC) No 1272/2008 - REACH)

The possible facing materials include Mineral fleeces. Aluminium foil, Aluminium foil reinforced mineral fiber grid, PE craft paper, Wired mesh, PP film, Plaster board, Mineral cloth, Bitumen and are presented in the Annex.

The product is typically packaged in PE shrink wrap bundles, that are shipped on single use wooden pallets. The packaging consists of 8% of the final product.

### Reference service life

When installed correctly, the service life of ROCKWOOL stone wool is only limited by the service life of the structure wherein the product is installed. For the purpose of this EPD the reference service life of the structure is considered to be 75 years, as also defined in the North American PCR /UL 10010-1:2018/. For more information, please refer to the scenario section in this EPD.

## LCA: Calculation rules

### Declared Unit

The specific product, referred to in the declared unit is 1m<sup>2</sup> of Safe 'n' Sound stone wool batt with a thermal resistance  $R_{SI}=1\text{m}^2\text{K/W}$ . The reference product has a thickness of 37mm (1.5 in) and a density of 40 kg/m<sup>3</sup> (2.5 lb/ft<sup>3</sup>).

Applied averages are based on the annual production volumes at the North American production facilities. The environmental impacts of applied facing are listed in Annex.

### Declared unit (reference product)

Name	Value	Unit
Declared Unit	1	m <sup>2</sup>
Gross density	40	kg/m <sup>3</sup>
Surface	1	m <sup>2</sup>
Weight	1.48	kg
Conversion factor to 1 kg	0.676	-
Thickness to achieve declared unit	0.037	m

### System boundary

EPD type: **Cradle to Grave.**

The modules considered in the life cycle assessment as per system boundaries, outlined in section 5.5. of the /PCR/ Part A: "Calculation Rules for the Life Cycle Assessment and Requirements on the Project Report" are described as follows:

### Production

The product stage **A1-A3** includes:

- Provision of preliminary products and energy and relevant upstream processes;
- Transporting the raw materials and preliminary materials to ROCKWOOL production facilities;
- Production process in the ROCKWOOL production facilities including energy inputs and emissions;
- Electricity consumption;
- Waste processing up to the end-of-waste state or disposal of waste residues, during the production stage;
- Production of packaging material;
- Manufacturing of products and co-product.

The environmental impact of co-products from the steel and coal fired electricity production (slags, alumina and ashes entering the system as inputs to the manufacturing) is accounted for and economic allocation is applied.

Recycled stone wool and fuels come free of environmental burden, as it enters the product system as waste. Their transport to the factory is accounted for.

During the melting of raw materials pig iron is created in the cupola furnace. Pig iron is a co-product, which is subsequently sold to the market and economic allocation is applied.

Modules A1, A2 and A3 are declared as an aggregated Module A1-A3.

State or Province electricity grid mixes have been applied.

### Construction/Installation

The Construction Stage **A4-A5** includes:

- A4 transport to the building site
- A5 installation to the building

The transport in A4 is modeled by volume with truck as a default vehicle, as the most conservative approach. The values are based on annual average delivery data. In A5 the default installation is assumed to be manual, therefore no energy consumption or ancillary equipment is needed. The product waste from installation is assumed to be 2% and according to the modularity principle of /EN15804/ its impacts are fully allocated to A5.

The A5 stage, according to /EN 15804/ includes also waste processing up to the end-of-waste state or disposal of final residues during the construction process stage and impacts and aspects related to product losses during installation.

Finally, the A5 module includes also the corresponding end-of-life considerations for packaging. The default assumption here for installation waste is 100% landfill.

### Building Use

The use-stage **B1-B7**, related to the building fabric includes:

- B1 use or application of the installed product;
- B2 maintenance;
- B3 repair;
- B4 replacement;
- B5 refurbishment;
- B6 – Operational energy use;
- B7 – Operational water use;

ROCKWOOL Stone wool insulation is installed permanently in the structure and does not require maintenance, repair, replacement or refurbishment under normal use conditions. Similarly,

ROCKWOOL stone wool insulation has no operational energy or water use.

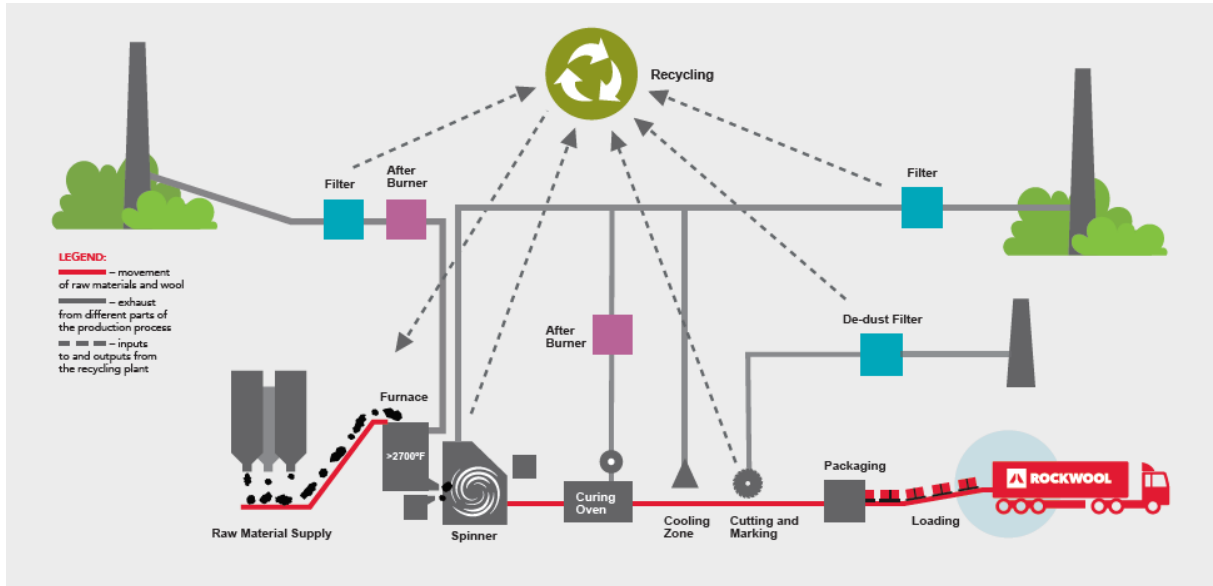
**End of Life**

The End-of-life stage **C1-C4** includes:

- C1 de-construction, demolition;
- C2 transport to waste processing;
- C3 waste processing for reuse, recovery and/or recycling;
- C4 disposal.

These stages also include provision and all transport, provision of all materials, products and related energy and water use. Manual deconstruction is assumed for C1 and no impacts are assigned. The credits from disposal (heat or electricity recovery) are assigned to module D.

**Module D** includes reuse, recovery and/or recycling potentials expressed as net impacts and benefits. Here the credits from electricity generation on landfill are considered.



**Comparability**

Basically, a comparison or an evaluation of EPD data is only possible if all the data sets to be compared were created according to /EN 15804/ and the building context, respectively the product-specific characteristics of performance, are taken into account.

LCA results across EPDs can be calculated with different background databases, modelling assumptions, geographic scope and time periods, all of which are valid and acceptable according to Product Category Rules (PCR) and ISO standards. Caution should be used when attempting to compare EPD results.

The used software for the development of the declaration was /GaBi/, version 8.0.1.257 by thinkstep.

**LCA: Scenarios and additional technical information**

The following technical information for the declared modules can be used for scenario development in a building context.

**Transport to the building site (A4)**

Name	Value	Unit
Litres of fuel /volumetric transport considered/	38	l/100km
Transport distance /weighted average from factory specific distances/	981	km
Capacity utilisation (including empty runs)	85	%
Gross density of products transported	40	kg/m <sup>3</sup>

The transport of the materials to the customer is modeled as a volumetric transport, meaning that the truck reaches its capacity with volume before it reaches it with mass. The same conservative approach is followed for all the products of this EPD, even for the ones with high density.

**Installation into the building (A5)**

Name	Value	Unit
Other resources	-	kg
Electricity consumption	0	kWh
Material loss	2	%

**Reference service life**

The declared reference service life only applies for the reference conditions which are stated below.

Name	Value	Unit
Life Span according to the manufacturer	75	a
Declared product properties	/ASTM C423/: "Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method" /ASTM C165/: "Standard Test Method for Measuring Compressive Properties of Thermal Insulations".	-

	<p>-/ASTM E96/: "Standard Test Methods for Water Vapor Transmission of Materials".</p> <p>-/ASTM C518 (C177)/: "Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus".</p> <p>-/ASTM E84 (UL 723)/: "Standard Test Method for Surface Burning Characteristics of Building Materials".</p> <p>-/ASTM C1338/: "Standard Test Method for determining Fungi Resistance of Insulation Materials and Facings".</p>	
Design Application parameters, including references to the appropriate practices	See installation guidelines. Installation to be conducted in accordance with manufacturer's guidelines	
Quality of work assumption when installed in accordance with the manufacturer's instructions	It is assumed that the manufacturer's instructions are clear and followed. In case of any uncertainty the manufacturer should be contacted for instructions	
Outdoor environment, e.g. weathering, pollutants, UV and wind	Not for outdoor application, except if specifically stated on the product	
Indoor Environment, e.g. temperature, moisture etc.	Not in direct contact with indoor environment, except if specifically stated on the product.	
Usage conditions, e.g. frequency of use, mechanical exposure etc.	No usage conditions, except if specifically stated on the product. Please follow manufacturer's guidelines	
Maintenance, e.g. required frequency, type and quality of replacement components	No maintenance is generally required, unless specifically stated on the product. Please refer to manufacturer guidelines	

**Reuse, recovery and/or recycling potentials (D), relevant scenario information**

Any declared benefits and loads from net flows leaving the product system that have not been allocated as co-products and that have passed the end-of-waste state are included in module D. Such declared benefits can for ROCKWOOL products occur in stages A5, C3 and C4. For the internal recycling of stone wool it is important that no double counting occurs. The outputs of waste stone wool from modules A5 and C1 are considered linked to the inputs of waste stone wool into A1. Therefore only the net output flow (output from A5 plus C1 minus input to A1) is considered as a net output flow from the system and considered in Module D.

**End of life (C1 - C4)**

Name	Value	Unit
Landfilling	1.48	kg
Transport to landfill	50	km
Utilization rate	50	%



## LCA: Results

The table below shows the results of the LCA.

### DESCRIPTION OF THE SYSTEM BOUNDARY (X = INCLUDED IN LCA; MND = MODULE NOT DECLARED)

PRODUCT STAGE			CONSTRUCTION PROCESS STAGE		USE STAGE								END OF LIFE STAGE				BENEFITS AND LOADS BEYOND THE SYSTEM BOUNDARIES
Raw material supply	Transport	Manufacturing	Transport from the gate to the site	Assembly	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	De-construction demolition	Transport	Waste processing	Disposal	Reuse-Recovery-Recycling-potential	
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D	
X	X	X	X	X	X	X	MNR	MNR	MNR	MND	MND	X	X	X	X	X	

### RESULTS OF THE LCA - ENVIRONMENTAL IMPACT: 1 m<sup>2</sup> of thermal insulation product with an R=1m<sup>2</sup>K/W

CML 2001 – April 2013													
Parameter	Unit	A1-A3	A4	A5	B1	B2	C1	C2	C3	C4	D	D/1	D/2
GWP	[kg CO <sub>2</sub> -Eq.]	1,31E+00	4,25E-01	2,65E-01	0,00E+00	0,00E+00	0,00E+00	5,29E-03	0,00E+00	2,20E-02	-9,93E-02		
ODP	[kg R11-Eq.]	2,11E-09	7,06E-17	3,50E-10	0,00E+00	0,00E+00	0,00E+00	8,76E-19	0,00E+00	1,28E-16	2,27E-15		
AP	[kg SO <sub>2</sub> -Eq.]	1,03E-02	3,60E-04	2,62E-04	0,00E+00	0,00E+00	0,00E+00	4,84E-06	0,00E+00	1,32E-04	-2,44E-04		
EP	[kg (PO <sub>4</sub> ) <sup>3</sup> -Eq.]	1,14E-03	7,96E-05	4,96E-05	0,00E+00	0,00E+00	0,00E+00	1,09E-06	0,00E+00	1,50E-05	-1,99E-05		
POCP	[kg ethene-Eq.]	1,84E-03	1,38E-06	4,56E-05	1,54E-10	0,00E+00	0,00E+00	-1,40E-07	0,00E+00	1,01E-05	-3,35E-05		
ADPE	[kg Sb-Eq.]	4,63E-07	3,29E-08	7,19E-09	0,00E+00	0,00E+00	0,00E+00	4,09E-10	0,00E+00	8,10E-09	-1,61E-08		
ADPF	[MJ]	1,57E+01	5,79E+00	5,97E-01	0,00E+00	0,00E+00	0,00E+00	7,19E-02	0,00E+00	3,08E-01	-2,70E+00		

TRACI2.1													
Parameter	Unit	A1-A3	A4	A5	B1	B2	C1	C2	C3	C4	D	D/1	D/2
GWP	[kg CO <sub>2</sub> -Eq.]	1,31E+00	4,25E-01	3,00E-01	0,00E+00	0,00E+00	0,00E+00	5,29E-03	0,00E+00	2,20E-02	-9,94E-02		
ODP	[kg CFC11-Eq.]	2,38E-09	-1,32E-15	4,31E-10	0,00E+00	0,00E+00	0,00E+00	-1,65E-17	0,00E+00	-9,03E-16	1,50E-14		
AP	[kg SO <sub>2</sub> -Eq.]	1,01E-02	4,05E-04	4,94E-04	0,00E+00	0,00E+00	0,00E+00	5,55E-06	0,00E+00	1,41E-04	-2,46E-04		
EP	[kg N-Eq.]	6,20E-04	7,08E-05	3,89E-05	0,00E+00	0,00E+00	0,00E+00	9,13E-07	0,00E+00	6,48E-06	-7,92E-06		
SP	[kg O <sub>3</sub> -Eq.]	6,63E-02	6,63E-03	3,94E-03	2,80E-09	0,00E+00	0,00E+00	9,44E-05	0,00E+00	2,67E-03	-2,91E-03		

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; SP=Smog Creation Potential

### RESULTS OF THE LCA - RESOURCE USE: 1 m<sup>2</sup> of thermal insulation product with an R=1m<sup>2</sup>K/W

Parameter	Unit	A1-A3	A4	A5	B1	B2	C1	C2	C3	C4	D	D/1	D/2
PERE	[MJ]	3,88E+00	3,24E-01	1,91E+00	0,00E+00	0,00E+00	0,00E+00	4,06E-03	0,00E+00	3,97E-02	-3,27E-01		
PERM	[MJ]	2,29E+00	0,00E+00	-1,74E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00		
PERT	[MJ]	6,17E+00	3,24E-01	1,66E-01	0,00E+00	0,00E+00	0,00E+00	4,06E-03	0,00E+00	3,97E-02	-3,27E-01		
PENRE	[MJ]	1,50E+01	5,83E+00	7,56E-01	0,00E+00	0,00E+00	0,00E+00	7,23E-02	0,00E+00	3,19E-01	-3,08E+00		
PENRM	[MJ]	2,91E+00	0,00E+00	-6,76E-02	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00		
PENRT	[MJ]	1,79E+01	5,83E+00	6,89E-01	0,00E+00	0,00E+00	0,00E+00	7,23E-02	0,00E+00	3,19E-01	-3,08E+00		
SM	[kg]	6,41E-02	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	6,41E-02		
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		
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		
FW	[m <sup>3</sup> ]	1,44E-02	5,70E-04	8,21E-04	0,00E+00	0,00E+00	0,00E+00	7,07E-06	0,00E+00	8,04E-05	-1,37E-03		

Caption: 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: 1 m<sup>2</sup> of thermal insulation product with an R=1m<sup>2</sup>K/W

Parameter	Unit	A1-A3	A4	A5	B1	B2	C1	C2	C3	C4	D	D/1	D/2
HWD	[kg]	4,18E-07	3,24E-07	1,50E-08	0,00E+00	0,00E+00	0,00E+00	4,03E-09	0,00E+00	5,44E-09	-9,09E-10		
NHWD	[kg]	1,32E-01	4,72E-04	1,54E-02	0,00E+00	0,00E+00	0,00E+00	5,86E-06	0,00E+00	1,48E+00	6,42E-03		
RWD	[kg]	7,49E-04	7,88E-06	3,23E-05	0,00E+00	0,00E+00	0,00E+00	9,79E-08	0,00E+00	4,28E-06	-1,05E-04		
CRU	[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		
MFR	[kg]	0,00E+00	0,00E+00	3,71E-02	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00		
MER	[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		
EEE	[MJ]	0,00E+00	0,00E+00	2,28E-01	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00		
EET	[MJ]	0,00E+00	0,00E+00	6,84E-01	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00		

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; EEE = Exported electrical energy; EEE = Exported thermal energy

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# Annex

**For the following facing options, applicable to ROCKWOOL technical insulation products:**

**Black mat facer, reinforced foil facer, fiberglass facer  
to the**

## **ENVIRONMENTAL PRODUCT DECLARATION**

as per /ISO 14025/ and /EN 15804/

Owner of the Declaration	ROCKWOOL International A/S (ROCKWOOL Technical Insulation)
Programme holder	Institut Bauen und Umwelt e.V. (IBU)
Publisher	Institut Bauen und Umwelt e.V. (IBU)
Declaration number	EPD-RWI-20190075-CCD1-EN
Issue date	18.06.2019
Valid to	17.06.2019

ROCKWOOL stone wool technical insulation  
ROCKWOOL International A/S (ROCKWOOL  
Technical Insulation)



[www.ibu-epd.com](http://www.ibu-epd.com) / <https://epd-online.com>

## LCA: Results for the facing options

The LCA approach for the facings options follows the general methodology and assumptions from ROCKWOOL International, as these are explained in the background methodology report and have been verified and approved. This Annex is not a stand-alone document and it is used as a supplementary file to the verified EPD for technical Insulation.

Below the impact assessment results and life cycle indicators are presented, for all the possible facing options that can be available in a ROCKWOOL Technical Insulation product. If the provided product has the specific facing, its final impact result is given by adding the result of the product, as calculated above, and the result of the specific facing option. Both results are expressed per m<sup>2</sup> therefore no additional conversion is needed, The final result is given by the formula:

$$\text{Environmental Impact per m}^2_{\text{product X-with facing}} = \text{Environmental Impact}_{\text{product X without facing}} + \text{Environmental Impact}_{\text{facing material}}$$

The disposal scenario for the fibrous tissue is assumed to be landfill for all the facing options.

### DESCRIPTION OF THE SYSTEM BOUNDARY (X = INCLUDED IN LCA; MND = MODULE NOT DECLARED)

PRODUCT STAGE			CONSTRUCTION PROCESS STAGE		USE STAGE								END OF LIFE STAGE				BENEFITS AND LOADS BEYOND THE SYSTEM BOUNDARIES
Raw material supply	Transport	Manufacturing	Transport from the gate to the site	Assembly	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	De-construction demolition	Transport	Waste processing	Disposal	Reuse-Recovery-Recycling-potential	
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D	
X	X	X	X	X	X	MND	MNR	MNR	MNR	MND	MND	X	X	X	X	X	

### RESULTS OF THE LCA - ENVIRONMENTAL IMPACT: 1 m<sup>2</sup> Black Mat Facer (black tissue)

Parameter	Unit	A1-A3	A4	A5	B1	C1	C2	C3	C4	D
GWP	[kg CO <sub>2</sub> -Eq.]	2,04E-01	5,45E-03	0,00E+00	0,00E+00	0,00E+00	8,57E-04	0,00E+00	1,46E-03	0,00E+00
ODP	[kg CFC11-Eq.]	3,72E-19	7,88E-19	0,00E+00	0,00E+00	0,00E+00	1,42E-19	0,00E+00	8,39E-18	0,00E+00
AP	[kg SO <sub>2</sub> -Eq.]	1,16E-03	4,24E-06	0,00E+00	0,00E+00	0,00E+00	7,28E-07	0,00E+00	8,72E-06	0,00E+00
EP	[kg (PO <sub>4</sub> ) <sup>3</sup> -Eq.]	7,94E-05	9,09E-07	0,00E+00	0,00E+00	0,00E+00	1,62E-07	0,00E+00	9,61E-07	0,00E+00
POCP	[kg ethene-Eq.]	7,55E-05	1,82E-08	0,00E+00	0,00E+00	0,00E+00	2,95E-09	0,00E+00	6,89E-07	0,00E+00
ADPE	[kg Sb-Eq.]	7,97E-06	3,64E-10	0,00E+00	0,00E+00	0,00E+00	6,62E-11	0,00E+00	5,34E-10	0,00E+00
ADPF	[MJ]	3,03E+00	6,67E-02	0,00E+00	0,00E+00	0,00E+00	1,17E-02	0,00E+00	2,05E-02	0,00E+00

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: Black Mat Facer (black tissue)

Parameter	Unit	A1-A3	A4	A5	B1	C1	C2	C3	C4	D
PERE	[MJ]	6,09E-01	3,64E-03	0,00E+00	0,00E+00	0,00E+00	6,82E-04	0,00E+00	2,70E-03	0,00E+00
PERM	[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
PERT	[MJ]	6,09E-01	3,64E-03	0,00E+00	0,00E+00	0,00E+00	6,82E-04	0,00E+00	2,70E-03	0,00E+00
PENRE	[MJ]	3,30E+00	6,67E-02	0,00E+00	0,00E+00	0,00E+00	1,18E-02	0,00E+00	2,09E-02	0,00E+00
PENRM	[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
PENRT	[MJ]	3,30E+00	6,67E-02	0,00E+00	0,00E+00	0,00E+00	1,18E-02	0,00E+00	2,09E-02	0,00E+00
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
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
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
FW	[m <sup>3</sup> ]	7,45E-04	6,67E-06	0,00E+00	0,00E+00	0,00E+00	1,15E-06	0,00E+00	5,27E-06	0,00E+00

Caption: 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: Black Mat Facer (black tissue)

Parameter	Unit	A1-A3	A4	A5	B1	C1	C2	C3	C4	D
HWD	[kg]	3,75E-09	3,81E-09	0,00E+00	0,00E+00	0,00E+00	6,55E-10	0,00E+00	3,59E-10	0,00E+00
NHWD	[kg]	1,88E-02	5,54E-06	0,00E+00	0,00E+00	0,00E+00	9,53E-07	0,00E+00	9,77E-02	0,00E+00
RWD	[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
CRU	[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
MFR	[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
MER	[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
EEE	[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
EET	[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

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; EEE = Exported electrical energy; EEE = Exported thermal energy

**DESCRIPTION OF THE SYSTEM BOUNDARY (X = INCLUDED IN LCA; MND = MODULE NOT DECLARED)**

PRODUCT STAGE			CONSTRUCTION PROCESS STAGE		USE STAGE							END OF LIFE STAGE				BENEFITS AND LOADS BEYOND THE SYSTEM BOUNDARIES
Raw material supply	Transport	Manufacturing	Transport from the gate to the site	Assembly	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	De-construction demolition	Transport	Waste processing	Disposal	Reuse-Recovery-Recycling-potential
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
X	X	X	X	X	X	MND	MNR	MNR	MNR	MND	MND	X	X	X	X	X

**RESULTS OF THE LCA - ENVIRONMENTAL IMPACT: 1 m<sup>2</sup> Reinforced foil facer**

Parameter	Unit	A1-A3	A4	A5	B1	C1	C2	C3	C4	D
GWP	[kg CO <sub>2</sub> -Eq.]	4,58E-01	3,03E-03	0,00E+00	0,00E+00	0,00E+00	4,26E-04	0,00E+00	7,43E-04	0,00E+00
ODP	[kg CFC11-Eq.]	1,89E-19	4,24E-19	0,00E+00	0,00E+00	0,00E+00	7,09E-20	0,00E+00	4,05E-18	0,00E+00
AP	[kg SO <sub>2</sub> -Eq.]	2,14E-03	2,42E-06	0,00E+00	0,00E+00	0,00E+00	3,65E-07	0,00E+00	4,05E-06	0,00E+00
EP	[kg (PO <sub>4</sub> ) <sup>3</sup> -Eq.]	1,33E-04	4,85E-07	0,00E+00	0,00E+00	0,00E+00	8,11E-08	0,00E+00	4,73E-07	0,00E+00
POCP	[kg ethene-Eq.]	1,34E-04	1,21E-08	0,00E+00	0,00E+00	0,00E+00	1,35E-09	0,00E+00	3,38E-07	0,00E+00
ADPE	[kg Sb-Eq.]	1,60E-07	1,82E-10	0,00E+00	0,00E+00	0,00E+00	3,31E-11	0,00E+00	2,70E-10	0,00E+00
ADPF	[MJ]	5,18E+00	3,64E-02	0,00E+00	0,00E+00	0,00E+00	5,81E-03	0,00E+00	1,01E-02	0,00E+00

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: Reinforced foil facer**

Parameter	Unit	A1-A3	A4	A5	B1	C1	C2	C3	C4	D
PERE	[MJ]	2,50E+00	1,82E-03	0,00E+00	0,00E+00	0,00E+00	3,45E-04	0,00E+00	1,35E-03	0,00E+00
PERM	[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
PERT	[MJ]	2,50E+00	1,82E-03	0,00E+00	0,00E+00	0,00E+00	3,45E-04	0,00E+00	1,35E-03	0,00E+00
PENRE	[MJ]	6,20E+00	3,03E-02	0,00E+00	0,00E+00	0,00E+00	5,88E-03	0,00E+00	1,08E-02	0,00E+00
PENRM	[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
PENRT	[MJ]	6,20E+00	3,03E-02	0,00E+00	0,00E+00	0,00E+00	5,88E-03	0,00E+00	1,08E-02	0,00E+00
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
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
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
FW	[m <sup>3</sup> ]	6,22E-03	3,03E-06	0,00E+00	0,00E+00	0,00E+00	5,74E-07	0,00E+00	2,64E-06	0,00E+00

Caption: 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: Reinforced foil facer**

Parameter	Unit	A1-A3	A4	A5	B1	C1	C2	C3	C4	D
HWD	[kg]	4,98E-09	1,90E-09	0,00E+00	0,00E+00	0,00E+00	3,27E-10	0,00E+00	1,79E-10	0,00E+00
NHWD	[kg]	1,22E-01	2,77E-06	0,00E+00	0,00E+00	0,00E+00	4,76E-07	0,00E+00	4,89E-02	0,00E+00
RWD	[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
CRU	[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
MFR	[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
MER	[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
EEE	[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
EET	[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

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; EEE = Exported electrical energy; EEE = Exported thermal energy

**DESCRIPTION OF THE SYSTEM BOUNDARY (X = INCLUDED IN LCA; MND = MODULE NOT DECLARED)**

PRODUCT STAGE			CONSTRUCTION PROCESS STAGE		USE STAGE							END OF LIFE STAGE				BENEFITS AND LOADS BEYOND THE SYSTEM BOUNDARIES
Raw material supply	Transport	Manufacturing	Transport from the gate to the site	Assembly	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	De-construction demolition	Transport	Waste processing	Disposal	Reuse-Recovery-Recycling-potential
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
X	X	X	X	X	X	MND	MNR	MNR	MNR	MND	MND	X	X	X	X	X

**RESULTS OF THE LCA - ENVIRONMENTAL IMPACT: 1 m<sup>2</sup> Fiberglass facer**

Parameter	Unit	A1-A3	A4	A5	B1	C1	C2	C3	C4	D
GWP	[kg CO <sub>2</sub> -Eq.]	6,26E-02	1,68E-03	0,00E+00	0,00E+00	0,00E+00	2,63E-04	0,00E+00	4,49E-04	0,00E+00
ODP	[kg CFC11-Eq.]	1,14E-19	2,42E-19	0,00E+00	0,00E+00	0,00E+00	4,37E-20	0,00E+00	2,58E-18	0,00E+00
AP	[kg SO <sub>2</sub> -Eq.]	3,56E-04	1,30E-06	0,00E+00	0,00E+00	0,00E+00	2,24E-07	0,00E+00	2,68E-06	0,00E+00
EP	[kg (PO <sub>4</sub> ) <sup>3-</sup> -Eq.]	2,44E-05	2,79E-07	0,00E+00	0,00E+00	0,00E+00	4,98E-08	0,00E+00	2,95E-07	0,00E+00
POCP	[kg ethene-Eq.]	2,32E-05	5,59E-09	0,00E+00	0,00E+00	0,00E+00	9,06E-10	0,00E+00	2,12E-07	0,00E+00
ADPE	[kg Sb-Eq.]	2,45E-06	1,12E-10	0,00E+00	0,00E+00	0,00E+00	2,03E-11	0,00E+00	1,64E-10	0,00E+00
ADPF	[MJ]	9,30E-01	2,05E-02	0,00E+00	0,00E+00	0,00E+00	3,58E-03	0,00E+00	6,29E-03	0,00E+00

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: Fiberglass facer**

Parameter	Unit	A1-A3	A4	A5	B1	C1	C2	C3	C4	D
PERE	[MJ]	1,87E-01	1,12E-03	0,00E+00	0,00E+00	0,00E+00	2,10E-04	0,00E+00	8,31E-04	0,00E+00
PERM	[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
PERT	[MJ]	1,87E-01	1,12E-03	0,00E+00	0,00E+00	0,00E+00	2,10E-04	0,00E+00	8,31E-04	0,00E+00
PENRE	[MJ]	1,02E+00	2,05E-02	0,00E+00	0,00E+00	0,00E+00	3,61E-03	0,00E+00	6,44E-03	0,00E+00
PENRM	[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
PENRT	[MJ]	1,02E+00	2,05E-02	0,00E+00	0,00E+00	0,00E+00	3,61E-03	0,00E+00	6,44E-03	0,00E+00
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
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
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
FW	[m <sup>3</sup> ]	2,29E-04	2,05E-06	0,00E+00	0,00E+00	0,00E+00	3,53E-07	0,00E+00	1,62E-06	0,00E+00

Caption: 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: Fiberglass facer**

Parameter	Unit	A1-A3	A4	A5	B1	C1	C2	C3	C4	D
HWD	[kg]	1,15E-09	1,17E-09	0,00E+00	0,00E+00	0,00E+00	2,01E-10	0,00E+00	1,10E-10	0,00E+00
NHWD	[kg]	5,78E-03	1,70E-06	0,00E+00	0,00E+00	0,00E+00	2,93E-07	0,00E+00	3,00E-02	0,00E+00
RWD	[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
CRU	[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
MFR	[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
MER	[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
EEE	[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
EET	[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

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; EEE = Exported electrical energy; EEE = Exported thermal energy