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# ENVIRONMENTAL PRODUCT DECLARATION

ISO 14025, ISO 21930 and EN 15804

| | |
|---|---|
| Owner of the declaration: | Paroc Group Oy |
| Program operator: | The Norwegian EPD Foundation |
| Publisher: | The Norwegian EPD Foundation |
| Declaration number: | NEPD-4101-3121-EN |
| Registration number: | NEPD-4101-3121-EN |
| ECO Platform reference number: | - |
| Issue date: | 29.12.2022 |
| Valid to: | 29.12.2027 |

ver-140225

## PAROC Stone Wool Thermal Insulation (Industry Slabs & Mats)

PAROC Technical Insulation

Paroc Group Oy
Owner of the declaration

## Product

**Product:**
PAROC Stone Wool Thermal Insulation (Pro Slab 350)

**Program operator:**
The Norwegian EPD Foundation
P.O. Box 5250 Majorstuen, N – 0303 Oslo, Norway
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**Declaration number:**
NEPD-4101-3121-EN

**ECO Platform reference number:**

**This declaration is based on Product Category Rules:**
CEN Standard EN 15804 / version A1 / serves as core PCR
NPCR 012:2018 version 2. Part B for Thermal insulation products

**Statement of liability:**
The owner of the declaration shall be liable for the underlying information and evidence.
EPD Norway shall not be liable with respect to manufacturer information, life cycle assessment data and evidences.

**Declared unit:**
1 m² of stone wool with a thermal resistance (R) of 1 Km²/W. 1 m² PAROC Pro Slab 350 at R=1 is at a weight of 1,44 kg with thickness of 36 mm.

**Declared unit with option:**
-

**Functional unit:**
1 m² of stone wool with thermal resistance (R) of 1 m²K/W with a reference service life of minimum 60 years. Impact excludes any lamination. See Annex, accompanying this EPD, for LCA results of facings.

**The EPD has been worked out by:**
Emelia Samuelsson, Paroc AB

**Verification:**

The CEN Norm EN 15804 serves as the core PCR. Independent verification of the declaration and data, according to ISO14025:2010

☐ internal ☒ external

Martin Erlandsson, IVL
(Independent verifier approved by EPD Norway)

**Owner of the declaration:**
Paroc Group Oy
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**Manufacturer:**
Paroc Group Oy
FI-00181, Helsinki
Finland

**Place of production:**
Trzemeszno, Poland
Hällekis, Sweden

**Management system:**
ISO 14001 and ISO 9001

**Organisation no:**
23025016

**Issue date:**
29.12.2022

**Valid to:**
29.12.2027

**Year of study:**
2018

**Comparability:**
EPD of construction products may not be comparable if they do not comply with EN 15804 and seen in a building context.

Approved

Håkon Hauan
(Managing Director EPD Norway)

## Product

**Product description:**
Stone wool is made from volcanic rock, typically basalt or dolomite, and an increasing proportion of recycled material.

PAROC stone wool insulation is naturally non-combustible and durable. It is made of natural stone (~2%) and air (~98%). As stone wools thermal performance is based on static air, insulation products keep their energy saving abilities and dimensions in different temperature and moisture conditions during the life cycle of a building.

**Market:**
Mainly Sweden, Finland, Norway, Denmark, Poland, Germany, Austria, Czech Republic, Slovakia, Belarus

**Reference service life:**
The reference service lifetime of PAROC products is equal to the reference service life of the building. For the purpose of this EPD the reference service life is considered to be minimum 60 years, which is usually the assumption about the lifetime of the building where this is installed.

**Product content:**

| Materials | % |
|---|---|
| Mineral Wool | 96-99% |
| Binder (phenol-formaldehyde-urea-copolymer) | 0-6% |
| Dustbinding (mineral oil) | 0,1-0,5% |

**Technical data:**

| Name | Value | Unit |
|---|---|---|
| Thermal conductivity EN 12939 and EN 12667 | 0,036 | W/(mK) |
| Thickness Class EN 823 EN 14303 | T3-T5 | |
| Fire Class EN 13501-1 | A1 | |
| Length and width EN 822 and EN 14303 | L ± 2 W ± 1,5 | % |
| Water vapour diffusion resistance factor /EN12086/ | 1 | |

## LCA: Calculation Rules

**Functional unit:**
1 m² stone wool with a thermal resistance (R) of 1 $Km^2W^{-1}$.

The calculation of the weight per square meter is done as follows:

*$m^2$-weight = density [$kg/m^3$] x insulation thickness [m] (in order to meet a specific thermal resistance) = $m^2$-weight insulation = density [$kg/m^3$[ x R [$m^2K/W$] x λ [W/m K] = [$kg/m^2$].*

The specific product, referred to in the declared unit, is 1 $m^2$ of PAROC Pro Slab 350 (40 kg/m3).

**Data quality:**

The stone wool production data is line specific from plants in Hällekis, Sweden and Trzemeszno, Poland. Foreground data refer to the year 2018 and is weighted according to produced volumes 2018.

For life cycle modeling the GaBi 9 Software System for Life Cycle Assessment, developed by Sphera Solutions, Inc. (formerly known as thinkstep AG), is used (/GaBi 9 2020/). All relevant background datasets are taken from the GaBi 9 software database. To ensure comparability of results in the LCA, the basic data of GaBi database were used for energy, transportation, auxiliary materials and facing materials.

The datasets are complete and conform to the system boundaries and the criteria for the exclusion of inputs and outputs.

Background data refer to the years 2018 until 2021 (/GaBi 9 2020/) with a country specific scope as far as available, e.g., for raw material extraction and production, transportation, and energy supply.

All relevant processes (foreground and background) have been considered when modelling stone wool production. The process data and the used background data are consistent. The data quality can be qualified as good.

**Allocation:**

The allocation is made in accordance with the provisions of EN 15804.

Incoming energy, water and waste production in-house is allocated equally among all products through mass allocation. Effects of primary production of recycled materials allocated to the main product in which the material was used. The recycling process and transportation of the material is allocated to this analysis.

**System boundary:**
Table below identifies the modules included in this study.

According to EN 15804 any declared benefits and loads from net flows leaching the product system not allocated as co-products and have passed the end-of-waste state shall be included in the module D. Module D includes reuse, recovery and/or recycling potentials.

The production stage (A1-A3) covers the following steps:

- Raw materials production (e.g., dolomite, diabase, pre-production of facing material e.g., glass fleece etc.)
- Production of the stone wool itself and the facings application
- Component's production (e.g., resin)
- Transports of raw materials and pre-products to manufacturing plants
- Production of packaging materials
- Waste management, water treatment, end-of-life of residues

With the exception of Modules A1 to A3 (describing the manufacturing of stone wool) all other modules are calculated on the basis of assumptions or scenarios.

The following scenarios were considered in this study:

- Modules A4: The average distance to building site is 273 km.
- Modules A5: Packaging waste processing, waste generated at the installation is assumed to be 0 %.
- Modules C2-C4: Similar to installation scenario with similar kind of waste. In C2 a transport to waste treatment distance 50 km is assumed.
- Module D: Credits from waste treatment (recycling and incineration with energy recovery) of product parts after use and from installation losses.

**Cut-off criteria:**

All major raw materials and all the essential energy is included. The production process for raw materials and energy flows that are included with very small amounts (<1%) are not included. This cut-off rule does not apply for hazardous materials and substances.

The declared unit is 1 $m^2$ stone wool without any lamination. The impact from the additional facings shall be added to the result, see the Annex accompanying this EPD for the LCA results.

## LCA: System Boundaries

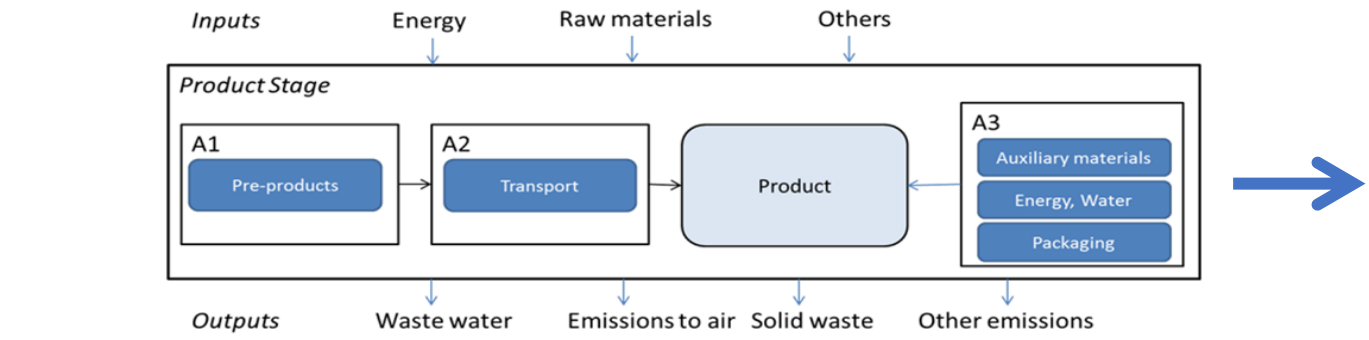


*Figure 1. Schematic representation of the LCA system boundaries for the production module (A1-A3)*

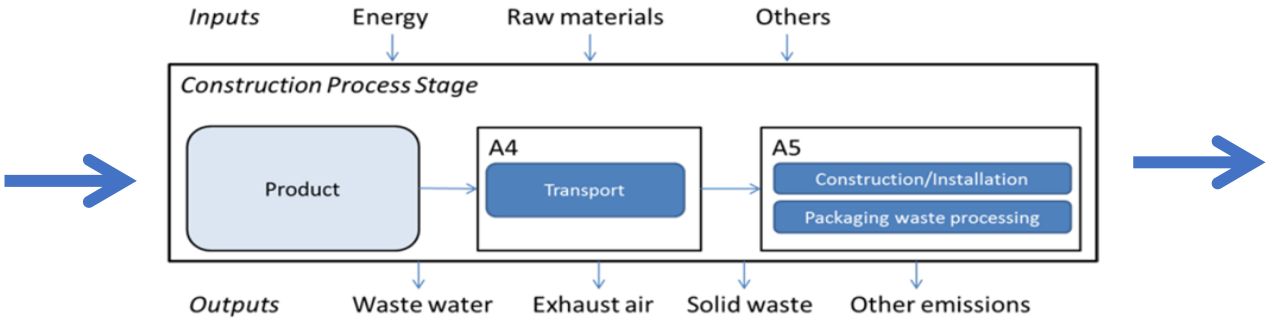


*Figure 2. Schematic representation of the LCA system boundaries for the construction process stage (A4-A5)*

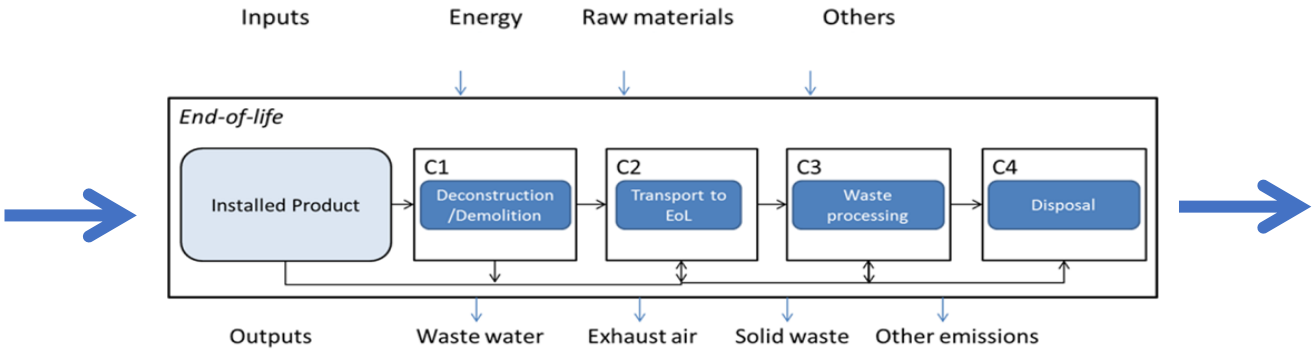


*Figure 3. Schematic representation of the LCA system boundaries for the End-of-life stage (C1-C4)*

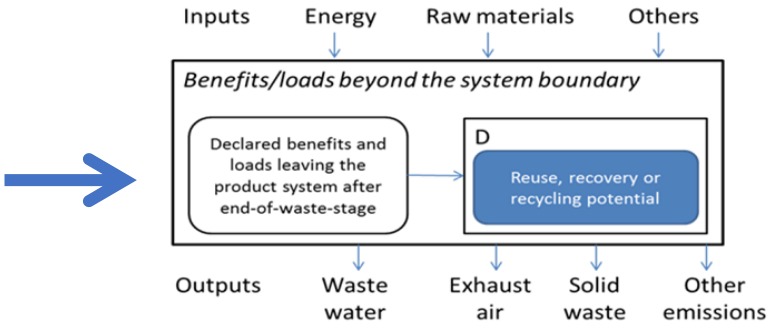


*Figure 4. Schematic representation of the LCA system boundaries for the benefits and loads beyond the product system boundary in module D*

## LCA: Scenarios and Additional Technical Information

The following information describe the scenarios in the different modules of the EPD.

Transports to the customer are calculated on the basis of a scenario with an average truck trailer with a 27 t payload. For the final stone wool product, a loading ratio of 30 % of weight capacity has been set. The average transport distance to the customer is assumed to be 273 km as a basis for this study. The assumption is based on a 270 km distance for the Polish plant and a 277 km distance for the Swedish plant. Since the Polish plant contribute with a share of 53% and the Swedish plant with a share of 47% the weighted average distance is set to 273 km.

### Transport to the Building Site (A4)

| Type | Capacity utilisation (incl. return) % | Type of vehicle | Distance km | Energy use per km | Total energy use |
|---|---|---|---|---|---|
| Truck | 100% (30% weight capacity) | Truck fleet | 273 | 0,9 liter | 245,7 liters |

### Installation in the Building (A5)

| Parameter | Parameter expressed by functional unit |
|---|---|
| Auxiliary materials for the installation | Not applicable |
| Consumption of other resources | Not applicable |
| Quantitative description of the type of energy and consumption rate during the installation process | Not applicable |
| Wastes at the construction site generated from the installation of the product | Installation waste is assumed to be 0% since all material can be used within the building |
| Material outputs as a result from waste management processes at the installation site. For example, compilation for recycling, for energy recovery and final disposal | Waste management process for packaging materials |
| Emissions to air, soil and water | Not applicable |

### End of Life (C1, C2, C3, C4)

| Parameter | Parameter expressed by functional unit |
|---|---|
| Compilation processes district | Not applicable |
| Recycling systems | Not applicable |
| Final disposal | 1,44 kg Landfilling |

### Benefits/loads Beyond the System Boundary (D)

Materials that create a benefit in Module D are packaging materials. Benefits from the packaging waste treatment are considered in module D. Energy products of incineration (e.g., steam, electricity, metals) are credited using the European production averages (e.g., European grid mix for power). Credits are reported in module D.

## LCA: Results

Life Cycle Impact Assessment results represent the environmental impacts for the life cycle of stone wool from cradle to grave.

The goal is to address all necessary parameters according to EN 15804 for creating EPDs. In a first step the results are calculated based on 1 kg stone wool representing the PAROC average. After that the data is scaled according to the provided density and lambda and fixed to the mass required for one square meter product with the respective R value = 1.

The PAROC Technical Insulation products are clustered according to their application into different product groups. Scaling factors are included in the EPD indicating the factor which to multiply with the indicators in order to get the environmental burden on product level described. The scaling factors solely refer to the stone wool used in these products, and thus do not include the different facings. Due to this fact, the variation is less than 10% by reason of the density, lambda and binder. The additional impact from the facings shall be added to the final result, see the Annex accompanying this EPD for the LCA results. The scaling calculation shall be done as follows:

*Reference product environmental impact per m2 (1,93) x scaling factor of specific product + environmental impact of specific facing*

| **Product groups** |
|---|
| Process Industry Mats |
| Process Industry Wired Mats |
| Process Industry Lamella Mats |
| Process Industry Slabs |

| Product Group | Product | Thickness | Scaling Factor |
|---|---|---|---|
| Process Industry Mats | PAROC Pro Loose Wool | 80 | 1,25 |
| | PAROC Pro Loose Mat 70 | 30-120 | 1,70 |
| | PAROC Pro Loose Mat 600 | 30-120 | 1,70 |
| | PAROC Pro Loose Mat WR 600 | 30-120 | 1,70 |
| | PAROC Pro Loose Mat 100 | 30-120 | 2,43 |
| | PAROC Pro Loose Mat 660 | 30-120 | 2,43 |
| | PAROC Pro Loose Mat WR 660 | 30-120 | 2,43 |
| | PAROC Pro Mat 50 | 30-120 | 1,25 |
| | PAROC Pro Mat 350 | 30-120 | 1,25 |
| | PAROC Pro Mat WR 350 | 30-120 | 1,25 |
| | PAROC Pro Mat 80 | 30-120 | 1,94 |
| | PAROC Pro Mat 640 | 30-120 | 1,94 |
| | PAROC Pro Mat WR 640 | 30-120 | 1,94 |
| | PAROC Pro Mat 100 | 30-120 | 2,43 |
| | PAROC Pro Mat 660 | 30-120 | 2,43 |
| | PAROC Pro Mat WR 660 | 30-120 | 2,43 |

| Product Group | Product | Thickness | Scaling Factor |
|---|---|---|---|
| Process Industry Wired Mats | PAROC Pro Wired Mat 80 | 30-120 | 2,00 |
| | PAROC Pro Wired Mat LE 80 | 30-120 | 2,00 |
| | PAROC Pro Wired Mat 100 | 30-120 | 2,50 |
| | PAROC Pro Wired Mat LE 100 | 30-120 | 2,50 |
| | PAROC Pro Wired Mat 130 | 30-120 | 3,43 |
| | PAROC Pro Wired Mat 700 TH1 | 30-120 | 3,43 |
| | PAROC Pro Wired Mat WR 130 | 30-120 | 3,43 |
| | PAROC Pro Wired Mat WR 700 TH1 | 30-120 | 3,43 |
| | PAROC Pro Wired Mat 550 | 30-120 | 1,80 |
| | PAROC Pro Wired Mat WR 550 | 30-120 | 1,80 |
| | PAROC Pro Wired Mat 660 | 30-120 | 1,94 |
| | PAROC Pro Wired Mat WR 660 | 30-120 | 1,94 |
| | PAROC Pro Wired Mat 680 | 30-120 | 2,43 |
| | PAROC Pro Wired Mat WR 680 | 30-120 | 2,50 |

| Product Group | Product | Thickness | Scaling Factor |
|---|---|---|---|
| Process Industry Lamella Mats | PAROC Pro Lamella Mat | 20-120 | 1,35 |
| | PAROC Pro Lamella Mat 80 | 20-121 | 2,33 |
| | PAROC Pro Lamella Mat 100 | 20-122 | 2,92 |

| Product Group | Product | Thickness | Scaling Factor |
|---|---|---|---|
| Process Industry Slabs | PAROC Pro Roof Slab 20 kPa | 20-190 | 2,19 |
| | PAROC Pro Roof Slab WR 20 kPa | 20-190 | 2,19 |
| | PAROC Pro Roof Slab 30 kPa | 20-150 | 2,43 |
| | PAROC Pro Roof Slab 50 kPa | 20-140 | 3,85 |
| | PAROC Pro Roof Slab WR 50 kPa | 20-140 | 3,85 |
| | PAROC Pro Roof Slab 80 kPa | 20-130 | 5,28 |
| | PAROC Pro Roof Slab WR 80 kPa | 20-130 | 5,28 |
| | PAROC Pro Roof Wedge | 20-190 | 2,19 |
| | PAROC Pro Pipe Slab 100 | 20-150 | 2,57 |
| | PAROC Pro Pipe Slab 140 | 20-150 | 3,89 |
| | PAROC Pro Pipe Slab 640 | 20-150 | 1,94 |
| | PAROC Pro Pipe Slab 680 | 20-150 | 3,08 |
| | PAROC Pro Slab 35 | 20-20 | 1,02 |
| | PAROC Pro Slab 200 | 20-125 | 5,56 |
| | PAROC Pro Slab 350 | 20-200 | 1,00 |
| | PAROC Pro Slab WR 350 | 20-200 | 1,00 |
| | PAROC Pro Slab 450 | 20-250 | 1,46 |
| | PAROC Pro Slab WR 450 | 20-250 | 1,46 |
| | PAROC Pro Slab 640 | 20-250 | 1,94 |
| | PAROC Pro Slab WR 640 | 20-250 | 1,94 |
| | PAROC Pro Slab 660 | 20-210 | 2,43 |
| | PAROC Pro Slab WR 660 | 20-210 | 2,43 |
| | PAROC Pro Slab 680 | 20-175 | 3,08 |
| | PAROC Pro Slab WR 680 | 20-175 | 3,08 |
| | PAROC Pro Slab 700 | 20-140 | 3,85 |
| | PAROC Pro Slab WR 700 | 20-140 | 3,85 |

## LCA: Results

| System Boundaries (X = declared module; MND = module not declared) | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Production | | | Installation | | Use Stage | | | | | | | End-of-Life | | | | Next Product System |
| Raw Material Supply (extraction, processing, recycled material) | Transport to Manufacturer | Manufacturing | Transport to Building Site | Installation into Building | Use / Application | Maintenance | Repair | Replacement | Refurbishment | Operational Energy Use | Operational Water Use | De-Construction / Demolition | Transport to EoL | Waste Processing for Reuse, Recovery or Recycling | 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 | MND | MND | MND | MND | MND | MND | MND | MND | X | MND | X | X |

**Environmental Impact:** 1m² PAROC Pro Slab 350 (per 1,44 kg)

| Parameter | Unit | A1-A3 | A4 | A5 | C2 | C4 | D |
|---|---|---|---|---|---|---|---|
| GWP-TOT* | [kg $CO_2$-eq.] | 1,93* | 0,0403 | 0,1243 | 0,00485 | 0,0196 | -0,0367 |
| ODP | [kg CFC11-eq.] | 8,41E-009 | 6,55E-018 | 1,58E-017 | 7,89E-019 | 1,08E-016 | -4,96E-016 |
| AP | [kg $SO_2$-eq.] | 0,00465 | 0,000108 | 9,06E-006 | 1,19E-005 | 0,000126 | -4,51E-005 |
| EP | [kg $PO_4^{3-}$eq.] | 0,000788 | 2,68E-005 | 1,97E-006 | 2,93E-006 | 1,42E-005 | -5,67E-006 |
| POCP | [kg ethene-eq.] | 0,000272 | -4E-005 | 7,14E-007 | -4,24E-006 | 9,46E-006 | -4,19E-006 |
| ADPM | [kg Sb-eq.] | 3,03E-007 | 3,31E-009 | 8,28E-010 | 3,99E-010 | 7,56E-009 | -6,64E-009 |
| ADPE | [MJ] | 15,8 | 0,543 | 0,0164 | 0,0655 | 0,278 | -0,523 |

GWP-TOT Global warming potential including emission and uptake of biogenic $CO_2$; ODP Depletion potential of the stratospheric ozone layer; POCP Formation potential of tropospheric photochemical oxidants; AP Acidification potential of land and water; EP Eutrophication potential; ADPM Abiotic depletion potential for non-fossil resources; ADPE Abiotic depletion potential for fossil resources.

*A1-3: including 0,0452 kg $CO_2$-eq. uptake of biogenic carbon dioxide included in product (0 kg $CO_2$-eq.) and packaging (0,0452 kg$CO_2$-eq.).

**Resource Use:** 1 m² PAROC Pro Slab 350 (per 1,44 kg)

| Parameter | Unit | A 1-3 | A4 | A5 | C2 | C4 | D |
|---|---|---|---|---|---|---|---|
| RPEE | [MJ] | 1,98 | - | 0,0035 | - | - | - |
| RPEM | [MJ] | 0,5 | - | -0,5 | - | - | - |
| TPE | [MJ] | 2,48 | 0,0306 | -0,4965 | 0,00369 | 0,0375 | -0,132 |
| NRPE | [MJ] | 13,9 | - | - | - | 2,777 | - |
| NRPM | [MJ] | 2,49 | - | - | - | -2,49 | - |
| TRPE | [MJ] | 16,4 | 0,545 | 0,0187 | 0,0657 | 0,287 | -0,637 |
| SM | [kg] | 0,0823 | 0 | 0 | 0 | 0 | 0 |
| RSF | [MJ] | 0 | 0 | 0 | 0 | 0 | 0 |
| NRSF | [MJ] | 0 | 0 | 0 | 0 | 0 | 0 |
| W | [m³] | 0,00552 | 3,54E-005 | 0,000224 | 4,27E-006 | 7,23E-005 | -0,000153 |

RPEE Renewable primary energy resources used as energy carrier; RPEM Renewable primary energy resources used as raw materials; TPE Total use of renewable primary energy resources; NRPE Non renewable primary energy resources used as energy carrier; NRPM Non renewable primary energy resources used as materials; TRPE Total use of non renewable primary energy resources; SM Use of secondary materials; RSF Use of renewable secondary fuels; NRSF Use of non renewable secondary fuels; W Use of net fresh water.

## LCA: Results

**End of Life – Waste:** 1m² PAROC Pro Slab 350 (per 1,44 kg)

| Parameter | Unit | A 1-3 | A4 | A5 | C2 | C4 | D |
|---|---|---|---|---|---|---|---|
| HW | [kg] | 2,72E-008 | 2,53E-008 | 1,34E-011 | 3,06E-009 | 4,37E-009 | -2,53E-010 |
| NHW | [kg] | 0,261 | 8,34E-005 | 0,000584 | 1E-005 | 1,44 | -0,000286 |
| RW | [kg] | 0,00014 | 6,74E-007 | 9,18E-007 | 8,13E-008 | 3,26E-006 | -4,51E-005 |

HW Hazardous waste disposed; NHW Nonhazardous waste disposed; RW Radioactive waste disposed.

**End of Life – Output Flow:** 1m² PAROC Pro Slab 350 (per 1,44 kg)

| Parameter | Unit | A 1-3 | A4 | A5 | C2 | C4 | D |
|---|---|---|---|---|---|---|---|
| CR | [kg] | 0 | 0 | 0 | 0 | 0 | 0 |
| MR | [kg] | 0 | 0 | 0 | 0 | 0 | 0 |
| MER | [kg] | 0 | 0 | 0,0452 | 0 | 0 | 0 |
| EEE | [MJ] | 0 | 0 | 0 | 0 | 0 | 0 |
| ETE | [MJ] | 0 | 0 | 0 | 0 | 0 | 0 |

CR Components for reuse; MR Materials for recycling; MER Materials for energy recovery; EEE Exported electric energy; ETE Exported thermal energy.

| Key environmental indicators | Unit | Cradle to gate A1-A3 | Transport **** |
|---|---|---|---|
| GWP-TOT | kg $C0_2$-eqv | 1,93 | 0,0403 |
| Energy Use (=TPE+TRPE) | MJ | 18,88 | 0,5756 |
| Dangerous substances | * | - | - |

*The product contains no substances from the REACH Candidate list of the Norwegian priority list.

****Average transport from production site to customer.

## Additional Norwegian Requirements

**Greenhouse gas emissions from the use of hydroelectricity in the manufacturing phase**

The selection of the background data for the hydroelectricity generation in Sweden and power grid mix in Poland is in line with EN 15804 and contribute to GWP as given below.

| Greenhouse gas emissions | | |
|---|---|---|
| **Country** | **Amount** | **Unit** |
| Poland<br>Sweden | 0,931<br>0,0143 | kg $CO_2$-eqv/kWh<br>kg $CO_2$-eqv/kWh |

**Dangerous substances**

☒ The product contains no substances given by the REACH Candidate list or the Norwegian priority list. The product is classified as hazardous waste (Avfallsforskiften, Annex III), see table.

☐ The product contains substances given by the REACH Candidate list or the Norwegian priority list that are less than 0,1 % by weight.

☐ The product contains dangerous substances, more then 0,1% by weight, given by the REACH Candidate List or the Norwegian Priority list, see table.

☐ The product contains no substances given by the REACH Candidate list or the Norwegian priority list. The product is classified as hazardous waste (Avfallsforskiften, Annex III), see table.

**Dangerous substances**

None of the following substances have been added to the product: Substances on the REACH Candidate list of substances of very high concern or substances on the Norwegian Priority list as of 2022-06-10 or substances that lead to the product being classified as hazardous waste. The chemical content of the product complies with regulatory levels as given in the Norwegian Product Regulations.

**Transport**

Average transport distance from production site to customer is: 273 km

**Carbon footprint**

Carbon footprint has not been worked out for the product.

## Bibliography


| | |
|---|---|
| ISO 14025:2010 | *Environmental labels and declarations – Type III environmental declarations – Principles and procedures.* |
| ISO 14040:2006 | *Environmental management – Life cycle assessment – Principles and framework.* |
| ISO 14044:2006 | *Environmental management – Life cycle assessment – Requirements and guidelines.* |
| EN 15804:2012+A1:2013 | *Sustainability of construction works – Environmental product declaration – Core rules for the product category of construction products.* |
| ISO 21930:2007 | *Sustainability in building construction – Environmental declaration of building products.* |
| Goymann M, Kanekar H, Bernard Y | *Background report for EPD of Paroc Stone Wool Insulation. September 2020, revised October 2022.* |
| PCR | *NPCR 012:2018 version 2. Part B for Thermal insulation products* |



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