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The Norwegian EPD Foundation

ENVIRONMENTAL PRODUCT DECLARATION

ISO 14025, ISO 21930 and EN 15804

Owner of the declaration:	Paroc AB
Program operator:	The Norwegian EPD Foundation
Publisher:	The Norwegian EPD Foundation
Declaration number:	NEPD-1976-873-EN
Registration number:	NEPD-1976-873-EN
ECO Platform reference number:	-
Issue date:	20.12.2019
Valid to:	20.12.2024

PAROC Stone Wool Thermal Insulation (eXtra)

PAROC Building Insulation

Paroc AB
Owner of the declaration

Product

Product:
PAROC Stone Wool Thermal Insulation

Program operator:
The Norwegian EPD Foundation
P.O. Box 5250 Majorstuen, N – 0303 Oslo, Norway
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Declaration number:
NEPD-1976-873-EN

ECO Platform reference number:

This declaration is based on Product Category Rules:
CEN Standard EN 15804 serves as core PCR
NPCR 012:2018 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 eXtra at R=1 is at a weight of 1.062 kg.

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.

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

Verification:
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Manufacturer:
Paroc OY AB
21600 Pargas
Finland

Place of production:
Hällekis and Hässleholm, Sweden
Pargas, Finland

Management system:
ISO 14001 and ISO 9001

Organisation no:
887294852

Issue date:
20.12.2019

Valid to:
20.12.2024

Year of study:
2018

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

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)

Approved

Håkon Hauan
Managing Director of EPD-Norway

Product

Product description:
Stone wool is made from volcanic rock, typically basalt or dolomite, and an increasing proportion of recycled material. Stone wool is a wide spread building material which is mainly used for thermal insulation. Behind the product there is an 80-year history of stone wool production knowhow backed with technical insulation expertise and innovation.

Market:
Mainly Sweden, Finland, Norway and Denmark.

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%
Dust binding (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 12431	T2	
Fire Class EN 13501-1:2007+ A1:2009/	A1	
Length and width EN 822	L± 2,5 W ± 1,5	mm
Compressive Strength EN 827	NDP	
Dimension Stability at spec. temperature and humidity EN 1604	DS(70,-)	
Tensile strength perpendicular to faces /EN1607/	NDP	
Water vapour diffusion resistance factor /EN12086/	1	
Point Load /EN12430/	NDP	

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 m² of PAROC eXtra, 95 mm thickness from the product group of flexible slabs and mats.

Data quality:

The stone wool production data is site specific from PAROC plants in Hällekis and Hässleholm in Sweden together with Pargas in Finland. 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 Thinkstep AG, is used (/GaBi 9 2019/). 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 and auxiliary 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 2019/) with a country specific scope as far as available, e.g. for raw material extraction and production, transportation, fuels 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)
- Components 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 450 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 m² stone wool without any lamination.

LCA: System Boundaries

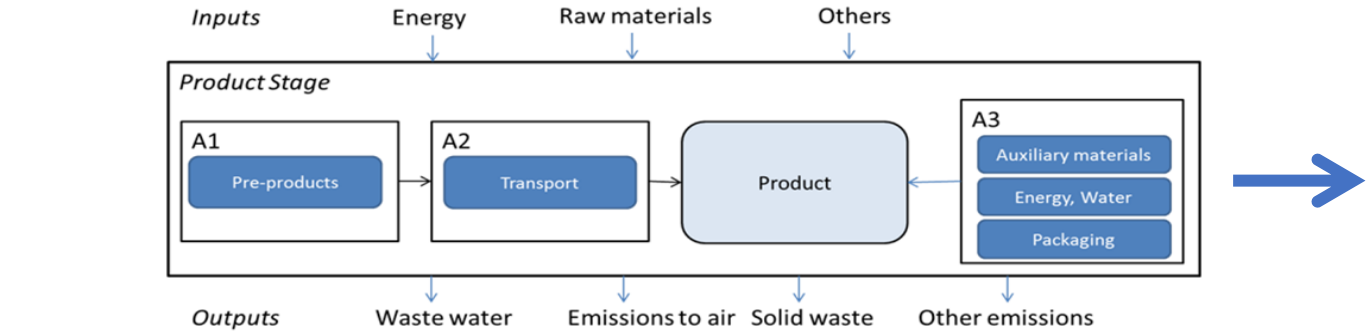

Figure 1. Schematic representation of the LCA system boundaries for the production module (A1-A3)

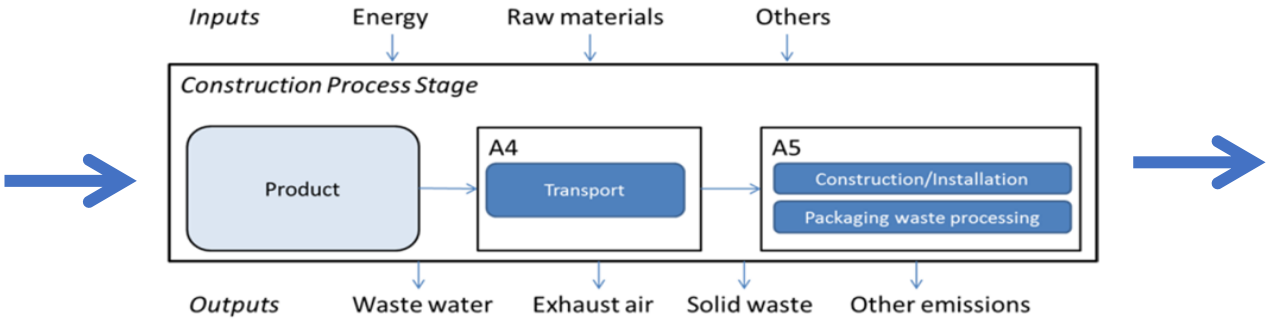

Figure 2. Schematic representation of the LCA system boundaries for the construction process stage (A4-A5)

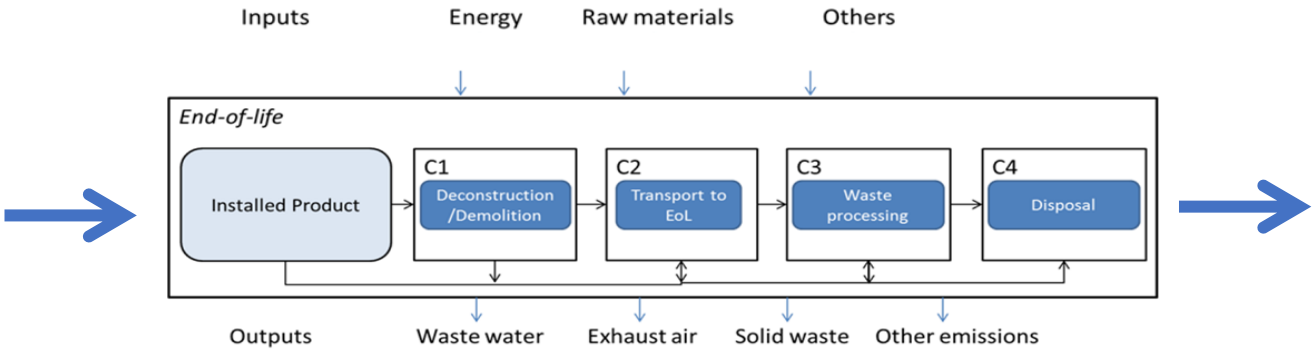

Figure 3. Schematic representation of the LCA system boundaries for the End-of-life stage (C1-C4)

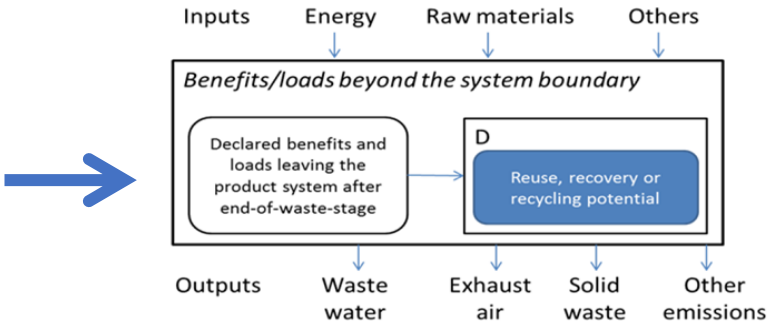

Figure 4. Schematic representation of the LCA system boundaries for the benefits and loads beyond the product system boundary in module D

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 % has been set. The average transport distance to the customer in Norway is assumed to be 450 km as a basis for this study. The assumption is based on a 300 km distance for the Swedish plants and a 700 km distance for the Finnish plant. Since the two Swedish plants contribute with a share of 63% and the Finnish plant with a share of 37% the weighted average distance is set to 450 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	30%	Truck fleet	450	0,9 liter	418,5 liter (0,46 liter/m^3 stone wool)

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	0%
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	Landfilling

Paroc maintains and offers its customers a used product take-back system called "Paroc Rewool" to enable the recycling of old stone wool slabs, boards and cutoffs.

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 Building 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.

Product groups
Blowing wool
Facade
Flexible slabs and mats
Metal panel core
Roofs
Special applications

Product Group	Product	Application	Scaling Factor
Blowing Wool	PAROC BLT 1 (BLT 6EX)	Loft	1,09
		Loft	1,14
		Frame, slope ≤ 25°	1,23
		Frame, slope ≤ 45°	1,50
		Frame, slope > 45°	1,57
		Frame, slope > 45°	2,05
	PAROC BLT 3	Loft	1,25
		Frame, slope ≤ 45°	1,83
		Frame, slope > 45°	2,33
	PAROC BLT 5	Loft	1,33
		Frame, slope ≤ 45°	2,40
		Frame, slope > 45°	2,40
		Frame, horizontal	2,23
	PAROC BLT 6	Loft	1,25
		Frame, slope ≤ 45°	2,11
		Frame, slope > 45°	2,46
		Frame, horizontal	2,11
	PAROC BLT 7	Masonry wall	2,06
	PAROC BLT 9	Loft	1,52
	(BLT6 RASKAS)	Frame, slope ≤ 45°	2,11
		Frame, slope > 45°	2,46
		Frame, horizontal	2,11
	PAROC BLT 9b	Loft	1,52
		Frame, slope ≤ 45°	2,11
		Frame, slope > 45°	2,46
		Frame, horizontal	2,11
	PAROC BLT 10	Masonry wall	1,78
	PAROC SHT 1 (IST8)	Loft	1,71
	PAROC SHT 2	Loft	1,25
	PAROC SHT 10	Loft	1,71

Product Group	Product	Thickness	Scaling Factor
Facade	Cortex	30	3,13
	Cortex	40-100	2,67
	Cortex one	80-230	1,60
	Cortex pro	40-70	2,52
	COS 10	20	3,44
	COS 10	30-75	2,62
	COS 10	80-240	2,16
	COS 15	20-80	3,62
	COS 15	95-200	2,95
	COS 5	25	3,40
	COS 5	30-40	2,63
	COS 5	50-255	1,98
	Fatio plus	30-240	2,52
	Linio 10	20-40	3,26
	Linio 10	50-200	2,87
	Linio 15	20-30	5,38
	Linio 15	40-50	4,20
	Linio 15	70-200	3,39
	Linio 15	205	3,61
	Linio 80	200-400	3,06
	WAB 10	13	6,00
	WAB 10	17-50	4,92
	WAS 25	20	4,58
	WAS 25	30-100	2,90
	WAS 25	110-130	2,44
	WAS 35	30-250	2,37
	WAS 45	30-220	1,89
	WAS 50	30-290	1,50

Product Group	Product	Thickness	Scaling Factor
Flexible Slabs & Mats	eXtra	30-45	1,11
	eXtra	50-290	1,00
	eXtra, xs	95-290	0,97
	eXtra plus	30-290	1,31
	eXtra pro	45-220	1,42
	Solid	45-290	1,03
	Sonus	45-50	1,10
	Sonus	66-145	0,94
	UNM 37	30-145	1,03
	UNS 34	30-290	1,34
	UNS 35	30	1,30
	UNS 35	35	1,62
	UNS 35	40-45	1,34
	UNS 35	50-175	1,22
	UNS 37	30-40	1,20
	UNS 37	45-290	1,04
	UNS 39	30-220	0,94

Product Group	Product	Thickness	Scaling Factor
Metal Panel Core	CES 40CS45	121-139	2,45
	CES/CEL 40CS50	100-152	2,64
	SES 8	98	3,04
	CES/CEL 50C41	120	3,23
	CES/CEL 50 C	100-152	3,26
	CES 40F	124-132	3,64
	CEL/CEL 50CS75	102-170	3,70
	CES/CEL 60CS100	100-122	3,99
	SES 11ld	151-152	4,15
	SES 11la	98-150	4,27
	CES/CEL 50CS100rl	126-129	4,48
	CES/CEL 50CS100	100-124	4,69
	CES 100CS115	102-107	4,69
	CES/CEL 50F	102-132	4,79
	CES/CEL 75F	98-126,5	5,23
	SES 15la	98-115	5,69
	CES/CEL 90CS150	102-131	5,83
	SES 18la, ld	25-98	7,75

Product Group	Product	Thickness	Scaling Factor
Roofs	ROX 1 (WAS 50)	30-290	1,63
	ROL 30	200-450	2,22
	ROS 20	50-170	2,67
	ROL 50	375	2,71
	ROX 2 (COS 15)	95	2,95
	ROL 60	124-380	2,98
	ROS 30	100-200	3,33
	ROS 30	40-100	3,52
	ROU 40, 1,2,3,4,5	20-76	3,79
	ROS 40	40-190	3,94
	TURF	50-190	4,03
	ROBSTER 40	20-50	4,25
	ROBSTER 50	30-50	4,33
	ROS 50	100-190	4,40
	ROS 50	35-100	4,64
	ROU 60, 1,2,3	10-70	4,89
	ROS 60	100-200	4,97
	ROS 70	60-140	5,24
	ROB 40	30	5,40
	ROS 60	35-100	5,42
	ROB 50	20-35	5,57
	ROB 60	17-30	5,88
	ROS 70	40	5,99
	ROS 80	40-120	6,18
	ROB 80	20-50	6,76
	ROB 100	30	7,22

Product Group	Product	Thickness	Scaling Factor
Special Applications	FPY 1	20-30	0,96
	NRS 1	70-120	1,37
	NRS 3	50-150	1,73
	NRS 1	50-70	1,83
	CGL 20, cc, cy,cyc, yc	120	2,06
	NRS 2	50-200	2,11
	CGS 1	40-200	2,43
	GRL 30	200-300	2,64
	FPL 80	200-200	2,96
	CGL 80, 80y	50-220	3,07
	NRS 2	30-45	3,08
	NRS 4	40	3,15
	FPB 10, FPS10	30-199	3,24
	GRS 20	40-100	3,24
	NRS 5	20-100	3,62
	SSB 1	20-100	3,97
	GRS 30	30-200	4,37
	FPS 14	20-150	4,73
	GRS 40	30-100	4,80
	FPS 16	40-90	5,63
	SSB 2	17-80	5,91
	FPS 17	20-100	5,98
	FPS 20	20-50	7,59

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 eXtra

Parameter	Unit	A1-A3	A4	A5	C2	C4	D
GWP	[kg CO_2-eq.]	1,46	0,0495	0,0976	0,00359	0,0158	-0,0465
ODP	[kg CFC11-eq.]	7,49E-009	8,13E-018	1,92E-017	5,9E-019	9,19E-017	-6E-016
AP	[kg SO_2-eq.]	0,00283	0,000135	1,12E-005	8,95E-006	9,47E-005	-7,53E-005
EP	[kg PO_4^{3-}-eq.]	0,00061	3,41E-005	2,39E-006	2,26E-006	1,07E-005	-8,26E-006
POCP	[kg ethene-eq.]	0,000172	-4,86E-005	8,7E-007	-3,11E-006	7,27E-006	-6,09E-006
ADPM	[kg Sb-eq.]	3,13E-007	3,79E-009	9,8E-010	2,75E-010	5,81E-009	-7,99E-009
ADPE	[MJ]	10,9	0,667	0,0195	0,0484	0,221	-0,666

GWP Global warming potential; 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.

Resource Use: 1 m² PAROC eXtra

Parameter	Unit	A 1-3	A4	A5	C2	C4	D
RPEE	[MJ]	2,72	-	-	-	-	-
RPEM	[MJ]	0,535	-	-	-	-	-
TPE	[MJ]	3,25	0,0388	0,004	0,00282	0,029	-0,156
NRPE	[MJ]	8,95	-	-	-	-	-
NRPM	[MJ]	2,49	-	-	-	-	-
TRPE	[MJ]	11,4	0,67	0,0225	0,0486	0,229	-0,823
SM	[kg]	0,0703	0	0	0	0	0
RSF	[MJ]	0	0	0	0	0	0
NRSF	[MJ]	0	0	0	0	0	0
W	[m³]	0,00756	6,57E-005	0,000268	4,76E-006	5,77E-005	-0,000184

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: 1m^2 PAROC eXtra

Parameter	Unit	A 1-3	A4	A5	C2	C4	D
HW	[kg]	2,23E-008	3,74E-008	1,91E-011	2,71E-009	3,9E-009	-3,35E-010
NHW	[kg]	0,207	5,44E-005	0,000682	3,95E-006	1,06	-0,00034
RW	[kg]	8,47E-005	9,09E-007	1,19E-006	0	0	0

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

End of Life – Output Flow: 1m^2 PAROC eXtra

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	0,0528	0	0	0
EEE	[MJ]	0	0	0,185	0	0	0
ETE	[MJ]	0	0	0,376	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 ****
Global Warming	Kg $C0_2$-eqv	1,46	0,05
Energy Use (=TPE+TRPE)	MJ	14,65	-
Dangerous substances	*	-	-

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

****Transport from production site to central warehouse in Norway.

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 is in line with EN 15804. Within the different plants the country specific Swedish or Finnish power grid mix (reference year 2016) is applied.

Greenhouse gas emissions		
Country	**Amount**	**Unit**
Sweden Finland	0,0143 0,0143	Kg CO_2-eqv/kWh 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 15.01.2019 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

Transport from production site to central warehouse in Norway is: 450 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.*
Dr. Iris Matzke, Yannick Bernard	*Background report for EPD of Paroc Stone Wool Insulation. November 2019.*
PCR	*NPCR 010 rev1, Building Boards, The Norwegian EPD Foundation, 12/2013.*

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