epd-norge

Environmental Product Declaration

In accordance with ISO 14025 and EN 15804 +A2

Owner of the declaration:
Reforce Tech

Program holder and publisher:
The Norwegian EPD foundation

Declaration number:
NEPD-3317-1954-EN

Registration Number:
NEPD-3317-1954-EN

Issue date: 12.01.2022
Valid to: 12.01.2027

Product name

Basalt MiniBars™

Manufacturer
Reforce Tech

The Norwegian
EPD Foundation

General information

Product:
Basalt MiniBars™

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Declaration number:
NEPD-3317-1954-EN

Place of production:
Røyken, Norway

ECO Platform reference number:

Management system:
ISO 9001:2015 Quality Management System

This declaration is based on Product Category Rules:
CEN Standard EN 15804: A2:2019 serves as core PCR

Organisation no:
957577067

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.

Issue date:
12.01.2022

Valid to:
12.01.2027

Declared unit:
1 kg of Basalt MiniBars™

Year of study:
2021

Declared unit with option:
Modules A1, A2, A3, A4, A5, C1, C3, D

Comparability:
EPD of construction products may not be comparable if they not comply with EN 15804:A2:2019 and seen in a building context.

Functional unit:
1 kg of Basalt MiniBars™

The EPD has been worked out by:
Aniek Baltussen

Ecochain

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

☐ internal ☑ external

Third party verifier:

sign

Linda Høibye
(Independent verifier approved by EPD Norway)

Approved

Håkon Hauan
Managing Director of EPD-Norway

Product

Product description:
The Basalt MiniBars™ are used as reinforcement for concrete. They are a high-performance composite macrofiber, engineered to provide high post- cracking strength to concrete while at the same time increasing toughness, impact and fatigue resistance of concrete. In this way, Basalt MiniBars™ macrofiber can be used as secondary and/or primary reinforcement.

Life cycle description
The Lifecycle of the Basalt MiniBars™ the calculations are made for here is pictured in figure 1 and can be described in the following way. The materials that are used for the production are Basalt, Hydrogen peroxide hardener, Helix Thread 35 Tex, Vinyl Ester and packaging materials (A1). These materials are transported from Russia, Czech Republic, Germany and different places in Norway to Røyken, Norway (A2) were the Basalt MiniBars™ are produced using a wet-lay-up process (A3). Materials are transported to the site (A4) where they are used to be mixed with concrete with a conveyor and the packaging of the Basalt MiniBars™ is recycled (A5). After use, the Basalt MiniBars™ are treated the exact same way as the concrete. They are demolited, broken (C1) and the recycled material is used as gravel for roadfill (D).

Product specification:

Fibers are formed in a helical shaped MiniBar™ using a resin to lock in the helical geometry so the fibers work together bonded in concrete

Materials	kg	%
Basalt	0.76	74%
Vinyl Ester	0.2143	21%
Helix thread	0.04	4%
Hardener	0.006429	1%

Technical data:
Lengths tailored for concrete grade and application (Shrinkage, Flexural Tensile Strength or Average Residual Strength), 24, 33, 43 and 55mm lengths; Diameter 0.65mm; Helical and rough surface to bond with the concrete as demonstrated in concrete beam testing; Basalt MiniBars™ have a density close to the fresh concrete. As a result, the dispersion and the distribution in the concrete is homogeneous without floating or sinking, helping to optimize the thickness and the performances of the concrete structure. The Basalt MiniBars™ are inert and there is no additional technical information or specific technical conditions underlying scenarios and characterising the product's technical and functional performance during any of the life cycle stages to mention. Routine tests for airborne emissions are done in accordance with IBAC for ETA and CE markings which conclude in no mentionable airborne emissions. All technical details about the Basalt MiniBars™ follow the EN14889/2 standard.

Market:
ReforceTech sells their products on a global market. In this case, the LCA has been specified for use in Norway.

Reference service life, product:

The Basalt MiniBars™ have a service life corresponding to that of the life of the concrete structure where the Basalt MiniBars™ are embedded.

Reference service life, building:
The Basalt MiniBars™ have a service life corresponding to that of the life of the concrete structure where the Basalt MiniBars™ are embedded.

LCA: Calculation rules

Declared unit:
1 kg of Basalt MiniBars™

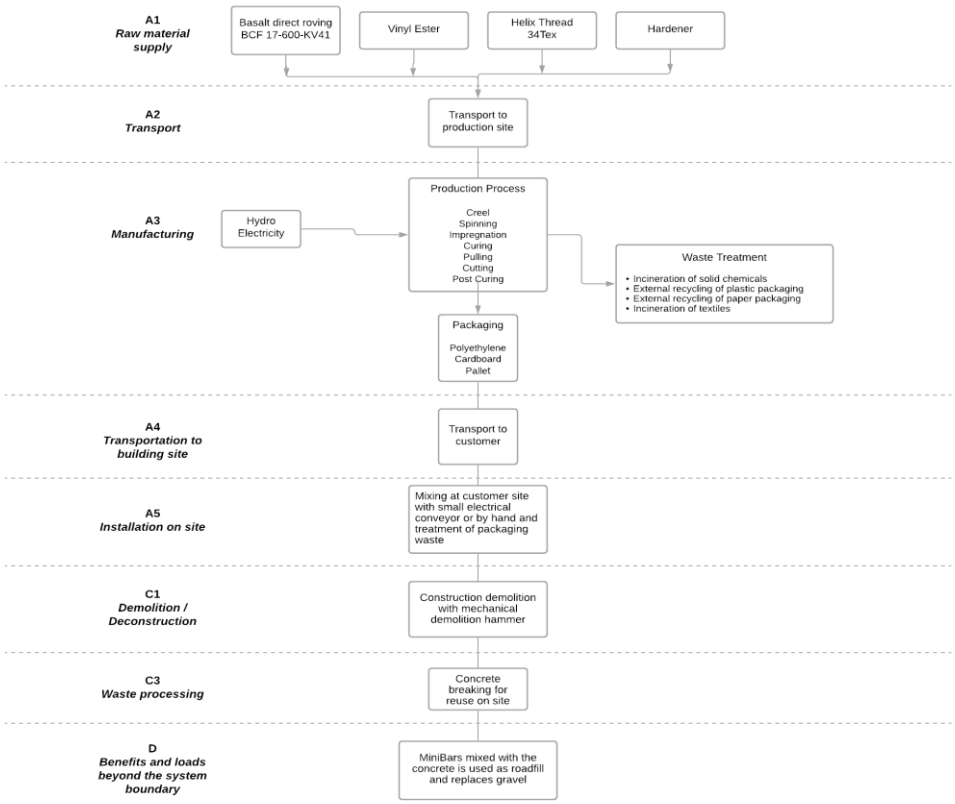

Figure 1: Process tree of 1 kg of Basalt MiniBars™

System boundary:
The production is considered from the resource extraction of the input materials and energy sources until the 'end-of-life' phase of the Basalt MiniBars™. Therefore, the production stage (A1-A3) within ReforceTech's production plant in Røyken, Norway is taken into account including the waste generated at the production site and caused by the production of the Basalt MiniBars™. Residues, waste streams and production loss are modelled up to the end-of-waste state. Furthermore, the transport to a client, the installation and disposal of the packaging of the product and the waste treatment of the product are also taken into account up until the recycling of the product and savings of gravel used for roadfill. In summary, a cradle-to-grave analysis of the Basalt MiniBars™ has been performed.

Data quality:
To simulate the product stage, data recorded by ReforceTech from the production year 2019.

The supplier of the basalt in the Basalt MiniBars™ has been involved. This supplier was asked to provide all production data so this could be used for the calculation of the impact of basalt. For other materials used, relevant information about the input materials were provided by ReforceTech through their suppliers. All background data records were retrieved from the Ecoinvent database (Version 3.5, 2018) and a data quality assessment was done. Most of the datasets from Ecoinvent 3.5 used are based on information about the last ten years (e.g. the dataset voor Vinyl Ester from 2013 and lorry transport from 2011) or updated within the last 10 years (e.g. natural gas in industrial furnace in 2013). There were some datasets that have been older (e.g. the dataset for hydrogen peroxide originated from 1995 or the EUR-pallet originated from 2000 - all datasets have been updated regularily and were approved for Ecoinvent 3.5 in 2018). If datasets have been any older they have been checked on technological and geographical comparability and whether the input and output flows in the datasets matched ReforceTechs provided data.

Allocation:
The allocation is made in accordance with the provisions of EN 15804+A2:2019. Incoming energy and waste production in-house is allocated equally among all products through mass allocation. No secondary materials have been used in the production process.

Cut-off criteria:
The data was provided by the production location for the production of the Basalt MiniBars™ specifically and accounted for the production of 1 kg of Basalt MiniBars™. Therefore all materials and processes used to create the Basalt MiniBars™ are taken into consideration. As the EN15804+A2 states, the total of neglected flows per module shall be a maximum of 5% of energy usage and mass. The neglected flows in this case is capital goods (during the production). These are expected to not exceed the 5% stated in the EN15804+A2 and thus of less significance for the product footprint. Another important cut-off criteria is that the waste streams and output flows from the supplied materials could not be determined and are therefore left out of scope. It is assumed that it would be a very low contribution to the environmental footprint of the Basalt MiniBars™ as the Basalt producer (the producer of the main contributing ingredient for the Basalt MiniBars™) mentions that the waste fibre is used in needle punched mats and wool production and if it for whatever reason cannot be used, it is remelted*. There is no information available about the other input materials. The exact output flow for the used materials to produce the Basalt MiniBars™ is therefore not known (INA), but the contribution to energy usage and mass is expected to be lower than 5%.

LCA: Scenarios and additional technical information

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

Transport to construction site (A4)

Type	Capacity utilisation (incl. return) %	Type of vehicle	Distance km	Fuel/Energy consumption	Value (l/t)
Truck		Standard truck	500	l/tkm	
Railway				kWh/tkm	
Boat				l/tkm	
<Other Transportation>				<xx>	

Assembly (A5)

	Unit	Value
Auxiliary	kg	
Water consumption	m^3	
Electricity consumption	kWh	
Other energy carriers	MJ	
Material loss	kg	
Output materials from waste treatment	kg	
Dust in the air	kg	
Transport by conveyor	tonkm	4E-06

Use (B1)

	Unit	Value

Maintenance (B2)/Repair (B3)

	Unit	Value
Maintenance cycle*		
Auxiliary	kg	
Other resources	kg	
Water consumption	m^3	
Electricity consumption	kWh	
Other energy carriers	MJ	
Material loss	kg	

Replacement (B4)/Refurbishment (B5)

	Unit	Value
Replacement cycle*		
Electricity consumption	kWh	
Replacement of worn parts	0	

* Number or RSL (Reference Service Life)

	Unit	Value
Water consumption	m^3	
Electricity consumption	kWh	
Other energy carriers	MJ	
Power output of equipment	kW	

End of Life (C1, C3, C4)

	Unit	Value
Hazardous waste disposed	kg	
Collected as mixed construction waste	kg	
Reuse	kg	
Recycling	kg	1
Energy recovery	kg	
To landfill	kg	

Transport to waste processing (C2)

Type	Capacity utilisation (incl. return) %	Type of vehicle	Distance km	Fuel/Energy consumption	Value (l/t)
Truck				l/tkm	
Railway				kWh/tkm	
Boat				l/tkm	
<Other Transportation>				<xx>	

Benefits and loads beyond the system boundaries (D)

	Unit	Value
Saving of gravel for roadfill	kg	1

Additional technical information

LCA: Results

This is a product specific EPD. The results displayed below apply to 1 kg of Basalt MiniBars™.

System boundaries (X=included, MND= module not declared, MNR=module not relevant)

Product stage			Assemby stage		Use stage							End of life stage				Beyond the system boundaries
Raw materials	Transport	Manufacturing	Transport	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	MND	MND	MND	MND	MND	MND	MND	X	MND	X	MND	X

Environmental impact

Parameter	Unit	A1	A2	A3	A1-A3	A4	A5	C1	C3	D	A-D
GWP-total	kg CO2-eq.	1.79E+00	2.01E-01	1.14E-01	2.11E+00	2.56E-01	4.30E-04	2.78E-02	8.42E-04	-4.31E-03	2.39E+00
GWP-fossil	kg CO2-eq.	1.94E+00	2.01E-01	1.10E-01	2.25E+00	2.56E-01	-8.63E-04	2.78E-02	8.40E-04	-4.30E-03	2.53E+00
GWP-biogenic	kg CO2-eq.	-1.48E-01	9.29E-05	3.79E-03	-1.44E-01	1.79E-05	1.30E-03	4.59E-06	1.30E-06	-1.25E-05	-1.43E-01
GWP-luluc	kg CO2-eq.	8.48E-04	7.15E-05	2.71E-04	1.19E-03	1.14E-04	-2.97E-06	2.36E-06	2.44E-07	-4.43E-06	1.30E-03
ODP	kg CFC11-eq.	1.73E-07	4.64E-08	8.46E-09	2.28E-07	5.49E-08	-7.30E-11	6.28E-09	1.84E-10	-4.42E-10	2.89E-07
AP	mol H+ eq.	7.27E-03	1.18E-03	3.22E-04	8.78E-03	1.01E-03	-7.11E-06	2.91E-04	8.60E-06	-3.14E-05	1.00E-02
EP-freshwater	kg PO4-eq.	8.00E-05	3.05E-06	4.12E-06	8.71E-05	5.73E-06	-7.31E-08	2.12E-07	1.61E-08	-2.62E-07	9.28E-05
EP-marine	kg N eq.	1.43E-03	4.21E-04	5.83E-05	1.91E-03	2.62E-04	-1.15E-06	1.26E-04	3.66E-06	-8.68E-06	2.29E-03
EP-terrestial	mol N eq.	1.58E-02	4.66E-03	8.27E-04	2.13E-02	2.95E-03	-1.53E-05	1.39E-03	4.03E-05	-1.03E-04	2.56E-02
POCP	kg NMVOC eq.	8.10E-03	1.31E-03	2.27E-04	9.64E-03	9.11E-04	-3.89E-06	3.81E-04	1.11E-05	-2.78E-05	1.09E-02
ADPm	kg Sb-eq.	5.44E-06	5.49E-07	1.42E-07	6.13E-06	1.39E-06	-5.48E-09	9.28E-09	9.05E-10	-2.33E-08	7.50E-06
ADPf	MJ	3.51E+01	3.10E+00	1.28E+00	3.95E+01	3.78E+00	-2.01E-02	4.02E-01	1.23E-02	-5.46E-02	4.36E+01
WDP	m^3	4.37E-01	2.48E-02	2.41E+00	2.88E+00	3.08E-02	-2.01E-03	2.31E-03	1.73E-03	-6.06E-02	2.85E+00
Caption	GWP-total = Globale Warming Potential - total; GWP-fossil = Global Warming Potential - fossil fuels; GWP-biogenic = Global Warming Potential - biogenic; GWP-luluc = Global Warming Potential - land use and land use change; ODP = Ozone Depletion; AP = Acidifcation; EP-freshwater = Eutrophication – aquatic freshwater; EP-marine = Eutrophication – aquatic marine; EP-terrestrial = Eutrophication – terrestrial; POCP = Photochemical zone formation; ADPm = Abiotic Depletion Potential – minerals and metals; ADPf = Abiotic Depletion Potential – fossil fuels; WDP = water use										
Disclaimer											

Additional environmental indicators

Parameter	Unit	A1	A2	A3	A1-A3	A4	A5	C1	C3	D	A-D
PM	Disease incidence	6.51E-08	1.76E-08	3.82E-09	8.66E-08	1.38E-08	-1.14E-10	7.63E-09	2.21E-10	-5.25E-10	1.08E-07
IRP	kBq U235 eq.	4.21E-02	1.32E-02	1.69E-02	7.22E-02	1.57E-02	-7.42E-05	1.73E-03	6.06E-05	-2.21E-04	8.94E-02
ETP-fw	CTUe	3.95E+01	2.22E+00	1.96E+00	4.37E+01	2.97E+00	-8.30E-02	2.27E-01	7.74E-03	-7.91E-02	4.68E+01
HTP-c	CTUh	2.82E-09	8.49E-11	8.71E-11	2.99E-09	1.14E-10	-5.33E-13	7.82E-12	3.05E-13	-3.03E-12	3.11E-09
HTP-nc	CTUh	1.90E-08	2.79E-09	2.00E-09	2.38E-08	3.24E-09	-2.19E-11	1.98E-10	7.07E-12	-8.49E-11	2.71E-08
SQP	Pt.	2.14E+01	2.57E+00	-5.88E-01	2.34E+01	1.82E+00	-1.97E-01	5.09E-02	1.68E-03	-6.68E-02	2.50E+01
Caption	PM = Particulate matter emissions, potential incidence of disease due to PM emissions; IRP = Ionising radiation, human health, potential human exposure efficiency relative to U235; ETP-fw = Ecotoxicity (frewhwater), potential Comparative Toxic Unit for ecosystems; HTP-c = Human toxicity, cancer effects, potential Comparative Toxic Unit for humans; HTP-nc = Human toxicity, non-cancer effects, Potential Comparative Toxic Unit for humans; SQP = Land use related impact / soil quality, Potential soil quality index.										

Resource use

Parameter	Unit	A1	A2	A3	A1-A3	A4	A5	C1	C3	D	A-D
PERE	MJ	5.87E+00	3.40E-02	7.82E+00	1.37E+01	5.17E-02	-3.54E-02	2.33E-03	5.31E-03	-3.54E-03	1.37E+01
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	0.00E+00
PERT	MJ	5.87E+00	3.40E-02	7.82E+00	1.37E+01	5.17E-02	-3.54E-02	2.33E-03	5.31E-03	-3.54E-03	1.37E+01
PENRE	MJ	3.80E+01	3.29E+00	1.34E+00	4.27E+01	4.01E+00	-2.14E-02	4.27E-01	1.30E-02	-5.80E-02	4.71E+01
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	0.00E+00
PENRT	MJ	3.80E+01	3.29E+00	1.34E+00	4.27E+01	4.01E+00	-2.14E-02	4.27E-01	1.30E-02	-5.80E-02	4.71E+01
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
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^3	1.27E-02	5.37E-04	5.84E-02	7.16E-02	6.23E-04	-4.66E-05	5.26E-05	4.05E-05	-1.41E-03	7.09E-02
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 = Net use of fresh water										

End of life - Waste

Parameter	Unit	A1	A2	A3	A1-A3	A4	A5	C1	C3	D	A-D
HWD	kg	2.64E-05	1.98E-06	1.79E-06	3.01E-05	3.21E-06	-2.39E-08	1.79E-07	6.06E-09	-7.73E-08	3.34E-05
NHWF	kg	1.42E-01	1.82E-01	7.42E-02	3.99E-01	1.14E-01	-9.18E-06	4.29E-04	4.35E-05	-5.48E-04	5.12E-01
RWD	kg	4.08E-05	2.09E-05	8.47E-06	7.01E-05	2.47E-05	-6.80E-08	2.79E-06	8.54E-08	-2.44E-07	9.73E-05
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										

End of life - Output flow

Parameter	Unit	A1	A2	A3	A1-A3	A4	A5	C1	C3	D	A-D
CRU	kg	INA	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.72E-02	0.00E+00	0.00E+00	0.00E+00	2.72E-02
MFR	kg	INA	0.00E+00	8.00E-03	8.00E-03	0.00E+00	9.75E-04	0.00E+00	1.00E+00	0.00E+00	1.01E+00
MER	kg	INA	0.00E+00	5.70E-04	5.70E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.70E-04
EEE	MJ	INA	0.00E+00	1.48E-03	1.48E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.48E-03
ETE	MJ	INA	0.00E+00	2.55E-03	2.55E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.55E-03
Caption	CRU = Components for reuse; MFR = Materials for recycling; MER = Materials for energy recovery; EEE = Exported electric energy; ETE = Exported thermal energy										

Additional Norwegian requirements

Greenhous gas emission from the use of electricity in the manufacturing phase
National production mix from import, low voltage (production of transmission lines, in addition to direct emissions and losses in grid) of applied electricity for the manufacturing prosess(A3).
☐

Data source	Amount	Unit
Econinvent v3.5 (2018)	0.04	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 contains substances given by the REACH Candidate list or the Norwegian priority list that are less than 0,1 % by weight.

The product contain 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.

Name	CAS no.	Amount

Indoor environment
The product meets the requirements for low emissions (M1) according to EN15251: 2007 Appendix E.
No tests have been carried out on the product concerning indoor climate, because this is not relevant to the use of the item

Carbon footprint
Carbon footprint of the 1 kg of Basalt MiniBars™ is 2,39 kg CO2 eq (including Module A-D).
This is further elaborabed in the results section.

Bibliography

ISO 14025:2010 *Environmental labels and declarations - Type III environmental declarations - Principles and procedures*

ISO 14044:2006 *Environmental management - Life cycle assessment - Requirements and guidelines*

ISO 21930:2007 Sustainability in building construction - Environmental declaration of building products

*E-mail conversation with Oleg Kuzyakin, commercial director of Kamenny Vek - Advanced Basalt Fiber & Products on 17-12-2021

Background report: 20211221_Final_Basalt-MiniBar_LCA-LCI Report_EPD Norge

EN 15804: A2:2019 (Sustainability of construction works - Environmental product declarations - Core rules for the product category of construction products).

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