Environmental Product Declaration

according to ISO 14025 and EN 15804

This declaration is for:

Basalt Fibre Reinforced Polymer Rebar, 10mm

Provided by:

Galen LLC



program operator
Stichting MRPI®
publisher
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MRPI® REGISTRATION

1.1.00249.2021

DATE OF ISSUE

03-11-2021

EXPIRY DATE

03-11-2026

PRODUCT

Basalt Fibre Reinforced Polymer Rebar, 10mm

DECLARED UNIT/FUNCTIONAL UNIT

The production of 1 kilogram of product for use as BFRP mesh

DESCRIPTION OF PRODUCT

Basalt Fibre Reinforced Polymer (BFRP) mesh serves as an adequate replacement of reinforcement steel mesh used in concrete constructions.

VISUAL PRODUCT



MORE INFORMATION

www.galencomposite.ru

SCOPE OF DECLARATION

This MRPI®-EPD certificate is verified by **Anne Kees Jeeninga, Advieslab v.o.f..**
The LCA study has been done by **Ruben van Gaalen, EcoReview B.V. .**
The certificate is based on an LCA-dossier according to ISO14025 and EN15804+A2 (incl. A1). It is verified according to the 'MRPI®-EPD verification protocol November 2020.v4.0'. EPDs of construction products may not be comparable if they do not comply with EN15804+A2 (incl. A1). Declaration of SVHC that are listed on the 'Candidate List of Substances of Very High Concern for authorisation' when content exceeds the limits for registration with ECHA.

PROGRAM OPERATOR

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ir. J-P den Hollander, Managing director MRPI®

DEMONSTRATION OF VERIFICATION
CEN standard EN15804 serves as the core PCR[a]
Independent verification of the declaration and data, according to EN ISO 14025:2010: internal: external: X
Third party verifier:  Anne-Kees Jeeninga, Advieslab v.o.f.
[a] PCR = Product Category Rules

DETAILED PRODUCT DESCRIPTION

For the production of BFRP Basalt Roving is purchased, this is basalt rock which has been crushed and melted and then put on a bundle of continues unidirectional complex basalt fibres. These basalt roving are pulled through a bath of resin to impregnate them after which it's heated and dyed to finally undergo polymerization. This process is called pultrusion. After the pultrusion process the BFRP are being sand coated, netted and made with a diameter of 10mm. Then it's shipped to Orlimex in Czech Republic for distribution.

COMPONENT (> 1%)	[kg / %]
Basalt	81%
Resin	9%
Silica Sand	9%

(*) > 1% of total mass

SCOPE AND TYPE

The type of this EPD is Cradle-to-Gate (A1-A3). All major steps from the extraction of naturalresources to the factory gate are included in the environmental performance of the manufacturing phase, except those that are not relevant to the environmental performance of the product. It is not determined as to how the BFRP are to be processed at the end of life (after 50 years). Therefore, this module is not considered in this LCA study.

The software Simapro is used to perform the LCA. The background databases used are:
• Ecoinvent (v3.6)

PRODUCT STAGE			CONSTRUCTION PROCESS STAGE		USE STAGE							END OF LIFE STAGE				BENEFITS AND LOADS BEYOND THE SYSTEM BOUNDARIES
Raw material supply	Transport	Manufacturing	Transport gate to 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	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

X = Modules Assessed

ND = Not Declared

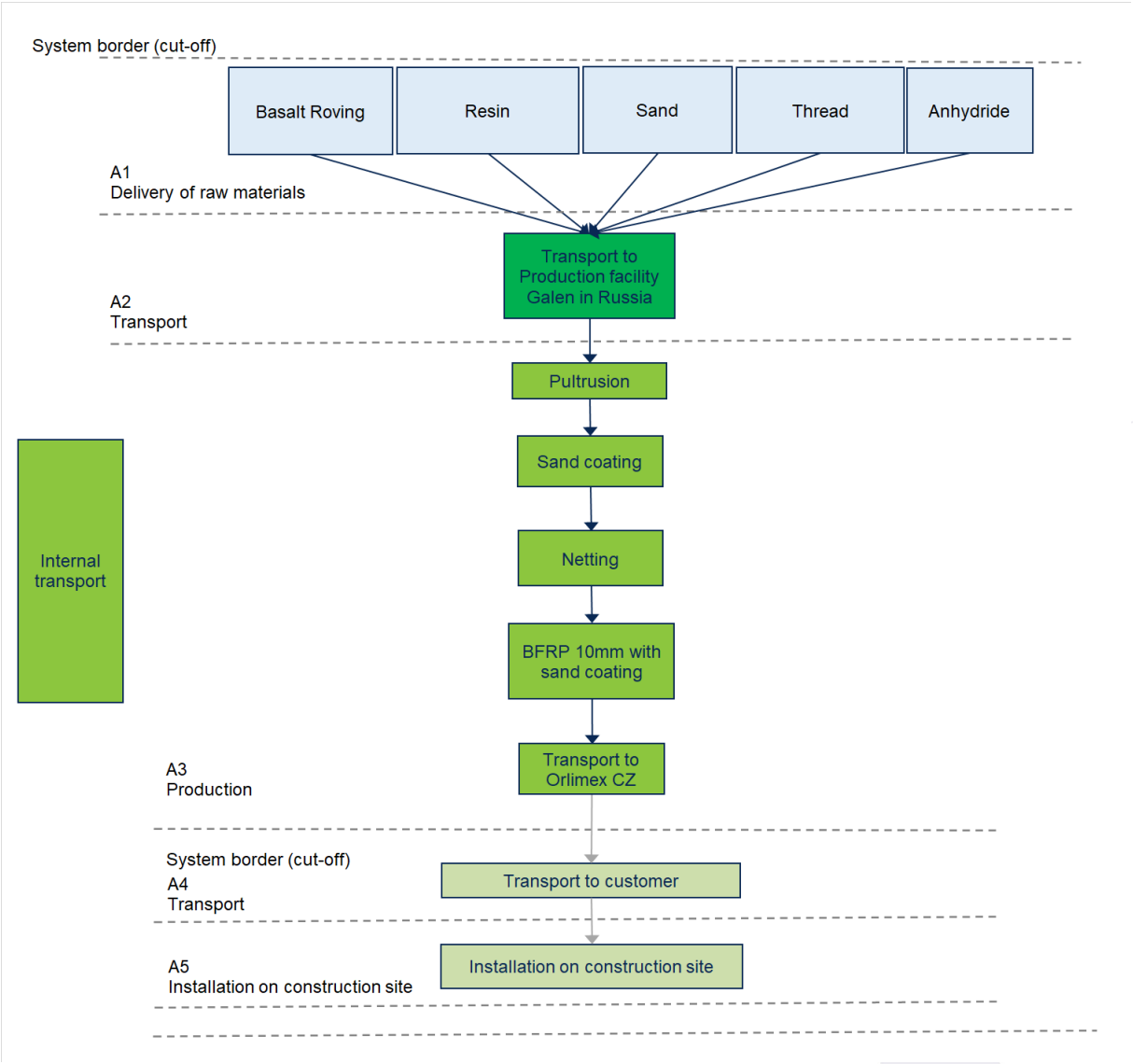

Figure: LCA process diagram according to EN 15804 (7.2.1)

REPRESENTATIVENESS

This EPD is representative for products produced and sold in the EU. The BFRP is produced in one production site of Galen in Cheboksary, Russia.

ENVIRONMENTAL IMPACT per functional unit or declared unit (indicators A1)

	UNIT	A1	A2	A3	A1-A3
ADPE	kg Sb. eq.	1.07E-5	1.21E-5	1.19E-6	2.40E-5
ADPF	MJ	3.91E+1	7.21E+0	7.51E+0	5.38E+1
GWP	kg CO2 eq.	2.17E+0	4.72E-1	4.61E-1	3.14E+0
ODP	kg CFC 11 eq.	2.69E-7	8.37E-8	4.75E-8	4.01E-7
POCP	kg ethene eq.	8.55E-4	2.85E-4	1.44E-4	1.45E-3
AP	kg SO2 eq.	5.92E-3	2.07E-3	1.86E-3	9.85E-3
EP	kg (PO4)3- eq.	7.94E-4	4.07E-4	1.90E-4	1.39E-3

Toxicity indicators and ECI (Dutch market)

HTP	kg DCB-eq.	7.84E-1	1.99E-1	5.46E-2	1.16E+0
FAETP	kg DCB-eq.	1.35E-1	5.80E-3	1.50E-3	1.42E-1
MAETP	kg DCB-eq.	2.79E+1	2.09E+1	7.14E+0	5.59E+1
TETP	kg DCB-eq.	4.48E-3	7.02E-4	2.01E-3	7.29E-3
ECI	Euro	2.20E-1	6.00E-2	5.00E-2	3.30E-1
ADPF	kg Sb. eq.	1.88E-2	3.47E-3	3.61E-3	2.59E-2

ADPE = Abiotic Depletion Potential for non-fossil resources
ADPF = Abiotic Depletion Potential for fossil resources
GWP = Global Warming Potential
ODP = Depletion potential of the stratospheric ozone layer
POCP = Formation potential of tropospheric ozone photochemical oxidants
AP = Acidification Potential of land and water
EP = Eutrophication Potential
HTP = Human Toxicity Potential
FAETP = Fresh water aquatic ecotoxicity potential
MAETP = Marine aquatic ecotoxicity potential
TETP = Terrestrial ecotoxicity potential
ECI = Environmental Cost Indicator
ADPF = Abiotic Depletion Potential for fossil resources expressed in [kg Sb-eq.]
ND = Not Declared

ENVIRONMENTAL IMPACT per functional unit or declared unit (core indicators A2)

	UNIT	A1	A2	A3	A1-A3
GWP-total	kg CO2 eq.	2.22E+0	4.76E-1	5.09E-1	3.20E+0
GWP-fossil	kg CO2 eq.	2.22E+0	4.76E-1	5.08E-1	3.20E+0
GWP-biogenic	kg CO2 eq.	-3.06E-5	2.20E-4	-1.35E-4	5.41E-5
GWP-luluc	kg CO2 eq.	2.76E-3	1.74E-4	1.32E-3	4.25E-3
ODP	kg CFC11 eq.	2.82E-7	1.05E-7	4.56E-8	4.32E-7
AP	mol H+ eq.	7.08E-3	2.76E-3	2.18E-3	1.20E-2
EP-freshwater	kg P eq.	6.88E-5	4.80E-6	2.73E-5	1.01E-4
EP-marine	kg N eq.	1.17E-3	9.72E-4	4.11E-4	2.55E-3
EP-terrestrial	mol N eq.	1.30E-2	1.07E-2	3.31E-3	2.71E-2
POCP	kg NMVOC eq.	4.58E-3	3.06E-3	1.60E-3	9.24E-3
ADP-minerals& metals	kg Sb eq.	1.07E-5	1.21E-5	1.19E-6	2.40E-5
ADP-fossil	MJ, net calorific value	3.73E+1	7.17E+0	7.94E+0	5.24E+1
WDP	m3 world eq. deprived	4.26E-1	2.57E-2	9.87E-2	5.51E-1

GWP-total = Global 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 = Depletion potential of the stratospheric ozone layer
AP = Acidification Potential, Accumulated Exceedence
EP-freshwater = Eutrophication Potential, fraction of nutrients reaching freshwater end compartment
EP-marine = Eutrophication Potential, fraction of nutrients reaching marine end compartment
EP-terrestrial = Eutrophication Potential, Accumulated Exceedence
POCP = Formation potential of tropospheric ozone photochemical oxidants
ADP-minerals&metals = Abiotic Depletion Potential for non fossil resources [2]
ADP-fossil = Abiotic Depletion for fossil resources potential [2]
WDP = Water (user) deprivation potential, deprivation-weighted water consumption [2]
ND = Not Declared

Disclaimer [2]

The results of this environmental impact indicator shall be used with care as the uncertainties on these results are high or as there is limited experienced with the indicator.

ENVIRONMENTAL IMPACT per functional unit or declared unit (additional indicators A2)

	UNIT	A1	A2	A3	A1-A3
PM	Disease incidence	3.31E-8	4.27E-8	2.65E-8	1.02E-7
IRP	kBq U235 eq.	1.17E-1	3.01E-2	5.43E-2	2.02E-1
ETP-fw	CTUe	3.04E+1	6.40E+0	3.29E+0	4.01E+1
HTP-c	CTUh	1.02E-9	2.08E-10	3.21E-10	1.55E-9
HTP-nc	CTUh	1.31E-8	7.00E-9	3.06E-9	2.32E-8
SQP	---	4.81E+0	6.22E+0	2.87E-1	1.13E+1

PM = Potential incidence of disease due to PM emissions
IRP = Potential Human exposure efficiency relative to U235 [1]
ETP-fw = Potential Comparative Toxic Unit for ecosystems [2]
HTP-c = Potential Comparative Toxic Unit for humans [2]
HTP-nc = Potential Comparative Toxic Unit for humans, non-cancer [2]
SQP = Potential soil quality index [2]
ND = Not Declared

Disclaimer [1]

This impact category deals mainly with the eventual impact of low dose ionizing radiation on human health of the nuclear fuel cycle. It does not consider effects due to possible nuclear accidents, occupational exposure nor due to radioactive waste disposal in underground facilities. Potential ionizing radiation from the soil, from radon and from some construction materials is also not measured by this indicator.

Disclaimer [2]

The results of this environmental impact indicator shall be used with care as the uncertainties on these results are high or as there is limited experienced with the indicator.

RESOURCE USE per functional unit or declared unit (A1 / A2)

	UNIT	A1	A2	A3	A1-A3
PERE	MJ	1.33E+0	8.98E-2	5.13E-1	1.94E+0
PERM	MJ	0.00	0.00	0.00	0.00
PERT	MJ	1.33E+0	8.98E-2	5.13E-1	1.94E+0
PENRE	MJ	4.06E+1	7.62E+0	8.56E+0	5.67E+1
PENRM	MJ	0.00	0.00	0.00	0.00
PENRT	MJ	4.06E+1	7.62E+0	8.56E+0	5.67E+1
SM	kg	0.00	0.00	0.00	0.00
RSF	MJ	0.00	0.00	0.00	0.00
NRSF	MJ	0.00	0.00	0.00	0.00
FW	m3	2.02E-2	8.74E-4	7.56E-3	2.86E-2

PERE = Use of renewable energy excluding renewable primary energy resources
PERM = Use of renewable energy resources used as raw materials
PERT = Total use of renewable primary energy resources
PENRE = Use of non-renewable primary energy resources excluding non-renewable 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 materials
RSF = Use of renewable secondary fuels
NRSF = Use of non renewable secondary fuels
FW = Use of net fresh water
ND = Not Declared

OUTPUT FLOWS AND WASTE CATEGORIES per functional unit or declared unit (A1 / A2)

	UNIT	A1	A2	A3	A1-A3
HWD	kg	3.95E-5	1.82E-5	8.67E-6	6.63E-5
NHWD	kg	8.66E-2	4.55E-1	1.59E-2	5.58E-1
RWD	kg	7.22E-5	4.71E-5	2.85E-5	1.48E-4
CRU	kg	0.00	0.00	0.00	0.00
MFR	kg	0.00	0.00	0.00	0.00
MER	kg	0.00	0.00	0.00	0.00
EEE	MJ	0.00	0.00	0.00	0.00
ETE	MJ	0.00	0.00	0.00	0.00

HWD = Hazardous Waste Disposed
NHWD = Non Hazardous Waste Disposed
RWD = Radioactive Waste Disposed
CRU = Components for reuse
MFR = Materials for recycling
MER = Materials for energy recovery
EEE = Exported Electrical Energy
ETE = Exported Thermal Energy
ND = Not Declared

BIOGENIC CARBON CONTENT per functional unit or declared unit (A2)

	UNIT	A1	A2	A3	A1-A3
BCCpr	kg C	0.00	0.00	0.00	0.00
BCCpa	kg C	0.00	0.00	0.00	0.00

BCCpr = Biogenic carbon content in product
BCCpa = Biogenic carbon content in packaging
ND = Not Declared

CALCULATION RULES

Data quality

Data flows have been modeled as realistically as possible. Data quality assessment is based on the principle that the primary data used for processes occurring at the production site is selected in the first instance. Where this is not available, other reference data is selected from appropriate sources.

Data collection period

The dataset is representative for the production processes used in 2020

Methodology and reproducibility

The process descriptions and quantities in this study are reproducible in accordance to the reference standards that have been used. The references of all sources, both primary and public sources and literature, have been documented. In addition, to facilitate the reproducibility of this LCA, a full set of data records has been generated. This data portfolio contains a summary of all the data used in this LCA.

SCENARIOS AND ADDITIONAL TECHNICAL INFORMATION

A1. Raw materials supply

This module considers all suppliers including the melting, crushing and processing of basalt roving by supplier to Galen.

A2. Transport of raw materials to manufacturer

This includes the transport distance of the raw material to the manufacturing facility via road, boat and/or train.

A3. Manufacturing

This module covers the manufacturing of the BFRP and includes all processes linked to production such as pultrusion, this is the process where basalt roving are pulled through a bath of resin to impregnate them after which it's heated and dyed to finally undergo polymerization.
Use of electricity and natural gas have been taken into account. The transport from Galen production facility to Orlimex in Czech Republic is included in A3. Is produced and certified in accordance with EN ISO/IEC 17067 standard.

Is produced and certified in accordance with EN ISO/IEC 17067 standard

DECLARATION OF SVHC

None of the substances contained in the product are listed in the “Candidate List of Substances of Very High Concern for authorisation”, or they do not exceed the threshold with the European Chemicals Agency.

REFERENCES

• CML - Department of Industrial Ecology, CML-IA Characterisation Factors, Dated August 2016, Leiden University, Leiden, Netherlands Available at: https://www.universiteitleiden.nl/en/research/research-output/science/cml-ia-characterisation-factors
• Simapro 9.1.1.1
• EN 15804: Sustainability of construction works - Environmental product declarations - Core rules for the product category of construction products', I.S. EN 15804:2012+A1:2013 and EN 15804+A2:2019.
• ISO 14040: Environmental management - Life cycle assessment – Principles and Framework', International Organization for Standardization, ISO14040:2006.
• ISO 14044: Environmental management - Life cycle assessment - Requirements and guidelines', International Organization for Standardization, ISO14044:2006.
• ISO 14025: Environmental labels and declarations -- Type III environmental declarations -- Principles and procedures', International Organization for Standardization, ISO14025:2006.
• NEN-EN 15804+A2 and NMD Bepalingsmethode Milieuprestatie en bouwwerken 1.0

REMARKS

None