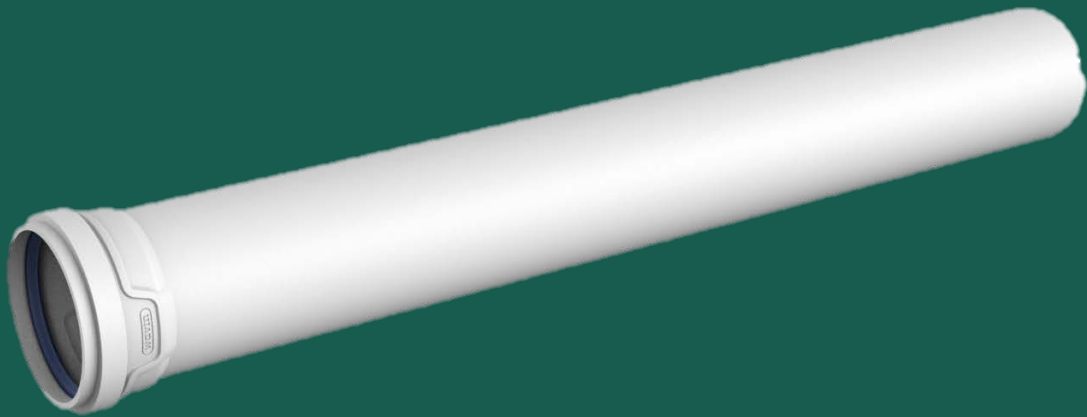


Environmental Product Declaration

In accordance with ISO 14025 and EN 15804 +A2



Owner of the declaration:
Norsk Wavin AS

Program holder and publisher:
The Norwegian EPD foundation

Declaration number:
NEPD-3474-2069-EN

Registration Number:
NEPD-3474-2069-EN

Issue date: 27.05.2022
Valid to: 27.05.2027

AS+ Pipe LGY

Wavin AS+ is a mineral-reinforced polypropylene (PP) low noise soil and waste solution. The AS+ has a unique material composition for optimal noise reduction.

Manufacturer
Wavin Germany Twist

General information

Product:

AS+ Pipe LGY with socket; DN50, 70, 90, 100, 125, 150, 200, and light grey colour (LGY).

Program Operator:

The Norwegian EPD Foundation
Post Box 5250 Majorstuen, 0303 Oslo, Norway
Tlf: +47 23 08 80 00
e-mail: post@epd-norge.no

Declaration Number:

NEPD-3474-2069-EN

This declaration is based on Product

Category Rules:

CEN standard EN 15804:2012+A2:2019 serves as core PCR, supplied with NPCR Part A, Version 2.0.

Statements:

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

Declared unit:

1 kg AS+ Pipe LGY

Declared unit with option:

A1,A2,A3,A4,A5,C1,C2,C3,C4,D

Functional unit:

Not applicable.

Verification:

Independent verification of the declaration and data, according to ISO14025:2010

internal

external



Harry van Ewijk, SGS Search

Independent verifier approved by EPD Norway

Owner of the declaration:

Norsk Wavin AS
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Manufacturer:

Wavin Germany Twist
Industriestraße 20, 49767, Twist, Germany
Phone: +49 5936 12 0
e-mail: info@wavin.de

Place of production:

Industriestraße 20, 49767, Twist, Germany

Management system:

EN ISO 9001:2015 and EN ISO 14001:2015

Organisation no:

DE811202622

Issue date:

27.05.2022

Valid to:

27.05.2027

Year of study:

2020

Comparability:

EPDs from other programmes than the Norwegian EPD foundation may not be comparable.

The EPD has been worked out by:

Lisa Overmars and Emma Thunnissen,
Ecochain Technologies



Approved (Manager of EPD Norway)

Product

Product description:

Wavin AS+ is a mineral-reinforced polypropylene (PP) low noise soil and waste solution. The AS+ has a unique material composition for improved noise performance. Optimal sound reduction is guaranteed due to high density of material. Optimized three layer pipe structure for low noise. The covered diameters are described in the Technical Data section.

Product specification:

A typical composition of the pipes, including packaging, covered by this EPD is as follows:

Materials	%
PP	27%
Barium sulphate	51%
Filler	14%
Additives	8%
Rubber gasket & packaging	1%

The physical properties of the pipes covered in this EPD are:

- Density ~ 1,9 g/cm³
- E-Modul ~ 1800 N/mm²
- Linear coefficient of thermal expansion ~ 0,06 mm/mK
- Reaction to fire DIN 4102, B2 and EN13501 D-S3, d0
- Temperature Short-time load by 95°C and 90°C long-term stress

The colour of the pipe is light grey (LGY): RAL7035

Technical data:

The declared unit of this EPD is 1 kg AS+ Pipe LGY. The results per kg are based on the product 'AS+ Pipe LGY DN100 L=3 S/PL' ('base product'). The Table below provides the products covered with this EPD. The selected base product is representative for all products described in this Table; deviations of the LCA results of the other products compared to the base product are not more than 10%. The list below provides the mass per 1 meter pipe (including packaging). These masses should be used to calculate the LCA results per 1 meter pipe, by multiplying the results presented on page 7-10 with the weight specified below.

Product	Mass (kg/meter)	Product	Mass (kg/meter)
AS+ Pipe LGY DN50 L=0,15 S/PL	1.73	AS+ Pipe LGY DN100 L=0,5 S/PL	3.91
AS+ Pipe LGY DN50 L=0,25 S/PL	1.40	AS+ Pipe LGY DN100 L=1 S/PL	3.62
AS+ Pipe LGY DN50 L=0,5 S/PL	0.95	AS+ Pipe LGY DN100 L=2 S/PL	3.47
AS+ Pipe LGY DN50 L=1 S/PL	0.88	AS+ Pipe LGY DN100 L=2,7 S/PL	3.40
AS+ Pipe LGY DN50 L=2 S/PL	0.85	AS+ Pipe LGY DN100 L=3 S/PL	3.42
AS+ Pipe LGY DN50 L=2,7 S/PL	0.84	AS+ Pipe LGY DN125 L=0,25 S/PL	5.18
AS+ Pipe LGY DN50 L=3 S/PL	0.84	AS+ Pipe LGY DN125 L=0,5 S/PL	4.49

AS+ Pipe LGY DN70 L=0,15 S/PL	2.31	AS+ Pipe LGY DN125 L=1 S/PL	4.14
AS+ Pipe LGY DN70 L=0,25 S/PL	2.41	AS+ Pipe LGY DN125 L=2 S/PL	3.97
AS+ Pipe LGY DN70 L=0,5 S/PL	1.70	AS+ Pipe LGY DN125 L=2,7 S/PL	3.93
AS+ Pipe LGY DN70 L=1 S/PL	1.59	AS+ Pipe LGY DN125 L=3 S/PL	3.91
AS+ Pipe LGY DN70 L=2 S/PL	1.53	AS+ Pipe LGY DN150 L=0,5 S/PL	6.37
AS+ Pipe LGY DN70 L=2,7 S/PL	1.52	AS+ Pipe LGY DN150 L=1 S/PL	5.79
AS+ Pipe LGY DN70 L=3 S/PL	1.52	AS+ Pipe LGY DN150 L=2 S/PL	5.50
AS+ Pipe LGY DN90 L=0,15 S/PL	3.93	AS+ Pipe LGY DN150 L=2,7 S/PL	5.42
AS+ Pipe LGY DN90 L=0,25 S/PL	3.25	AS+ Pipe LGY DN150 L=3 S/PL	5.40
AS+ Pipe LGY DN90 L=0,5 S/PL	2.73	AS+ Pipe LGY DN200 L=0,25 S/PL	10.69
AS+ Pipe LGY DN90 L=1 S/PL	2.54	AS+ Pipe LGY DN200 L=0,5 S/PL	8.90
AS+ Pipe LGY DN90 L=2 S/PL	2.44	AS+ Pipe LGY DN200 L=1 S/PL	7.97
AS+ Pipe LGY DN90 L=2,7 S/PL	2.42	AS+ Pipe LGY DN200 L=2 S/PL	7.51
AS+ Pipe LGY DN90 L=3 S/PL	2.41	AS+ Pipe LGY DN200 L=2,7 S/PL	7.39
AS+ Pipe LGY DN100 L=0,25 S/PL	4.47	AS+ Pipe LGY DN200 L=3 S/PL	7.35

Market:

Europe, but the EPD is specific for Nordic countries.

Reference service life, product:

Lifetime on product calculated more than 100 year.

Reference service life, building:

LCA: Calculation rules

Declared unit:

1 kg AS+ Pipe LGY

Data quality:

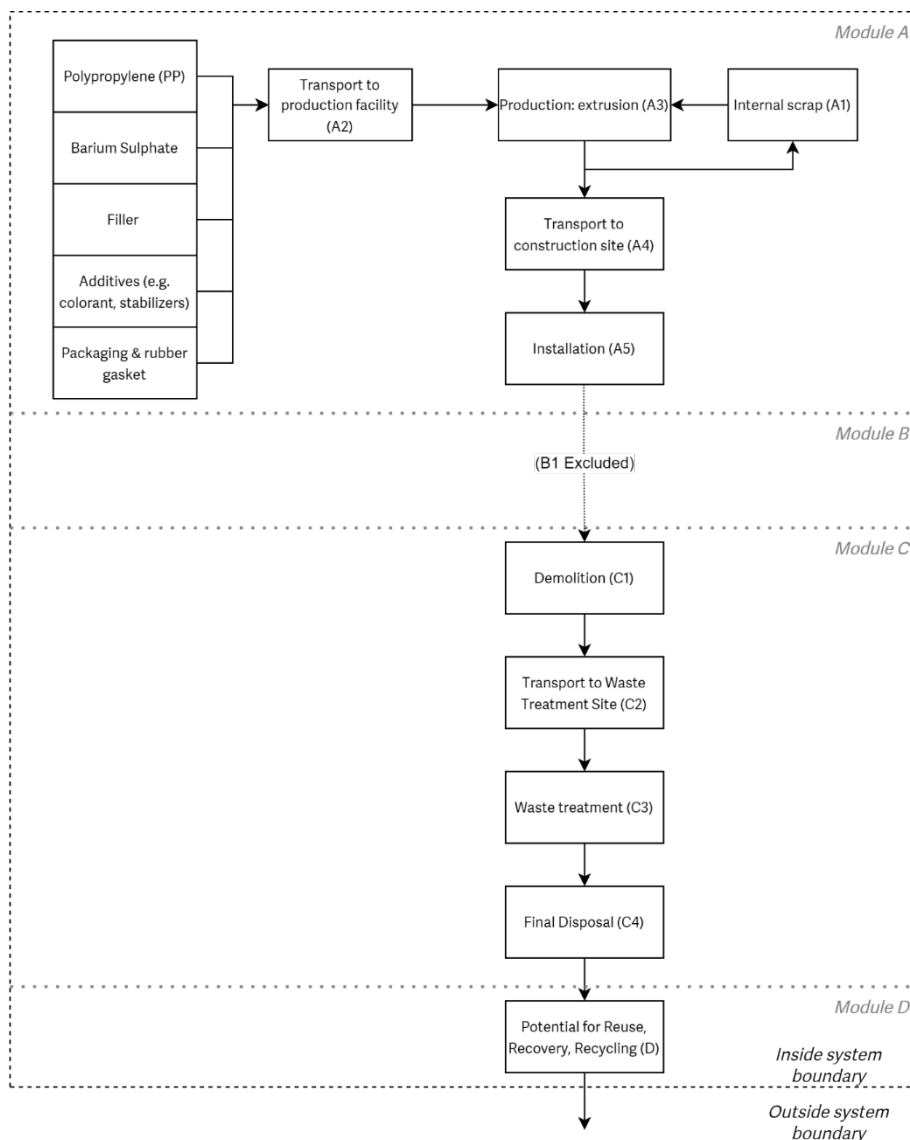
For module A1, specific data for product compositions as provided by the manufacturer are used. For module A2, transportation data of the raw materials used to the production site was collected. For module A3, energy consumption and waste production data was collected for production year 2020. The used background processes are derived from Ecoinvent 3.6.

Allocation:

Allocation was carried out in accordance with the provisions of the EN15804. All manufacturing inputs (energy and auxiliary materials) at production site level are allocated to different production processes, followed by allocation of the production processes to the products that are produced using these processes through mass allocation. No secondary materials have been used in the production process.

System boundary:

Modules A1-A5 and C1-D are included. The figure below shows a (simplified) process tree.



Cut-off criteria:

All relevant inputs and outputs - like emissions, energy and materials - have been taken into account in this LCA. In accordance with EN15804, the total neglected input flows per module does not exceed 5% of energy usage and mass.

LCA: Scenarios and additional technical information

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

Transport from production place to assembly/user (A4)

The transportation distance from Twist to Oslo was considered.

Type	Capacity utilisation (incl. return) %	Type of vehicle	Distance KM	Fuel/Energy consumption
Truck	50%	Unspecified	945	0,027 l diesel/tkm

Boat	50%	Ferry	163	0,0295 kg heavy fuel oil/tkm
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Assembly (A5)

Product losses of 10% are considered. The installation is done manually, and therefore no energy is needed.

	Unit	Value
Material loss	kg	0,1
Packaging waste	kg	0,003

End of Life (C1, C3, C4)

Demolition is done manually, and therefore no energy is needed. The considered waste treatment for the pipe is 70% recycling, 20% incineration and 10% landfill.

	Unit	Value
Collected as mixed construction waste	kg	1
Reuse	kg	0
Recycling	kg	0,70
Energy recovery	kg	0,20
To landfill	kg	0,10

Transport to waste processing (C2)

The considered distances are 50 km to landfill, 100 km for energy recovery, and 250 km for recycling.

Type	Capacity utilisation (incl. return) %	Type of vehicle	Distance KM	Fuel/Energy consumption
Truck	50%	Unspecified	199,8	0,027 l diesel/tkm

Benefits and loads beyond the system boundaries (D)

For the PP, barium sulphate and additives, 0,67 kg of saved virgin PP was considered per kg material recycled (total of A5 en C3). For the filler, 0,67 kg of saved virgin filler was considered per kg filler recycled. The benefits from exported energy were calculation from the energy efficiencies for Northern countries reported by CEWEP, which is equal to an electrical efficiency of 11,0%, and a thermal efficiency of 72,6%. Energy recovery from all materials (including rubber gasket and packaging) was considered. Substitution of Norwegian electricity mix and district heating mix was assumed.

	Unit	Value
Saving of virgin PP	kg	0,44
Saving of virgin filler	kg	0,07
Substitution of electric energy	MJ	0,28
Substitution of thermal energy	MJ	1,87

Additional technical information

Not applicable.

LCA: Results

The LCA results are presented below for the declared unit defined on page 2 of the EPD document. Recalculation to results for pipes per meter can be done based on the technical data specified on page 3 and 4.

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

Product stage			Assembly stage		Use stage								End of life stage				Benefits & loads beyond system boundary
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								X	X	X	X	X	

Core environmental impact indicators

Indicator	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
GWP-total	kg CO2 eq.	1,47E+00	1,41E-01	2,41E-01	0,00E+00	2,62E-02	6,85E-01	4,80E-03	-1,04E+00
GWP-fossil	kg CO2 eq.	1,46E+00	1,41E-01	2,39E-01	0,00E+00	2,62E-02	6,82E-01	4,80E-03	-1,04E+00
GWP-biogenic	kg CO2 eq.	6,49E-03	7,07E-05	1,06E-03	0,00E+00	1,59E-05	2,29E-03	9,19E-06	-4,04E-03
GWP-LULUC	kg CO2 eq.	4,36E-03	5,45E-05	4,63E-04	0,00E+00	9,28E-06	2,04E-04	1,91E-07	-2,22E-04
ODP	kg CFC11 eq.	1,08E-07	3,19E-08	1,91E-08	0,00E+00	6,04E-09	4,51E-08	2,96E-10	-3,46E-08
AP	mol H ⁺ eq.	6,21E-03	1,28E-03	8,77E-04	0,00E+00	1,49E-04	1,11E-03	6,92E-06	-3,18E-03
EP-freshwater	kg P eq.	3,43E-05	1,08E-06	4,53E-06	0,00E+00	2,16E-07	9,68E-06	8,67E-09	-1,27E-05
EP-marine	kg N eq.	1,21E-03	3,95E-04	1,96E-04	0,00E+00	5,34E-05	2,88E-04	3,98E-06	-5,47E-04
EP-terrestrial	mol N eq.	1,37E-02	4,37E-03	2,19E-03	0,00E+00	5,89E-04	3,18E-03	2,82E-05	-6,06E-03
POCP	kg NMVOC eq.	4,81E-03	1,20E-03	7,19E-04	0,00E+00	1,68E-04	9,87E-04	9,01E-06	-2,83E-03
ADP-M&M	kg Sb eq.	1,02E-04	3,30E-06	1,10E-05	0,00E+00	6,78E-07	3,98E-06	6,94E-09	-7,69E-06
ADP-fossil	MJ	3,21E+01	2,11E+00	3,82E+00	0,00E+00	4,02E-01	3,53E+00	2,14E-02	-3,44E+01
WDP	m ³	1,79E+00	6,09E-03	1,88E-01	0,00E+00	1,24E-03	7,89E-02	1,05E-04	-6,28E-01

GWP-total: Global Warming Potential; **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 Exceedance; **EP-freshwater:** Eutrophication potential, fraction of nutrients reaching freshwater end compartment; See “additional Norwegian requirements” for indicator given as PO4 eq. **EP-marine:** Eutrophication potential, fraction of nutrients reaching freshwater end compartment; **EP-terrestrial:** Eutrophication potential, Accumulated Exceedance; **POCP:** Formation potential of tropospheric ozone; **ADP-M&M:** Abiotic depletion potential for non-fossil resources (minerals and metals); **ADP-fossil:** Abiotic depletion potential for fossil resources; **WDP:** Water deprivation potential, deprivation weighted water consumption

Additional environmental impact indicators

Indicator	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
PM	Disease incidence	5,65E-08	1,16E-08	8,90E-09	0,00E+00	2,37E-09	1,82E-08	1,46E-10	-2,70E-08
IRP	kBq U235 eq.	5,24E-02	9,22E-03	7,57E-03	0,00E+00	1,76E-03	1,22E-02	9,80E-05	-1,68E-02
ETP-fw	CTUe	3,28E+02	1,68E+00	3,37E+01	0,00E+00	3,27E-01	7,76E+00	1,67E-02	-4,46E+00
HTP-c	CTUh	5,56E-10	6,39E-11	1,09E-10	0,00E+00	1,16E-11	4,49E-10	4,91E-13	-1,86E-10
HTP-nc	CTUh	1,59E-07	1,94E-09	1,68E-08	0,00E+00	3,90E-10	5,95E-09	1,01E-11	-5,35E-09
SQP	Dimensionless	4,40E+00	1,65E+00	8,97E-01	0,00E+00	3,44E-01	2,51E+00	5,43E-02	-9,03E-01

PM: Particulate matter emissions; **IRP:** Ionising radiation, human health; **ETP-fw:** Ecotoxicity (freshwater); **ETP-c:** Human toxicity, cancer effects; **HTP-nc:** Human toxicity, non-cancer effects; **SQP:** Land use related impacts / soil quality

Classification of disclaimers to the declaration of core and additional environmental impact indicators

ILCD classification	Indicator	Disclaimer
ILCD type / level 1	Global warming potential (GWP)	None
	Depletion potential of the stratospheric ozone layer (ODP)	None
	Potential incidence of disease due to PM emissions (PM)	None
	Acidification potential, Accumulated Exceedance (AP)	None
	Eutrophication potential, Fraction of nutrients reaching freshwater end compartment (EP-freshwater)	None
ILCD type / level 2	Eutrophication potential, Fraction of nutrients reaching marine end compartment (EP-marine)	None
	Eutrophication potential, Accumulated Exceedance (EP-terrestrial)	None
	Formation potential of tropospheric ozone (POCP)	None
ILCD type / level 3	Potential Human exposure efficiency relative to U235 (IRP)	1
	Abiotic depletion potential for non-fossil resources (ADP-minerals&metals)	2
	Abiotic depletion potential for fossil resources (ADP-fossil)	2
	Water (user) deprivation potential, deprivation-weighted water consumption (WDP)	2
	Potential Comparative Toxic Unit for ecosystems (ETP-fw)	2
Potential Comparative Toxic Unit for humans (HTP-c)	2	

	Potential Comparative Toxic Unit for humans (HTP-nc)	2
	Potential Soil quality index (SQP)	2
<p>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.</p> <p>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</p>		

Resource use

Parameter	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
RPEE	MJ	2,91E+00	2,85E-02	3,24E-01	0,00E+00	5,77E-03	3,00E-01	7,58E-04	-4,54E-01
RPEM	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
TPE	MJ	2,91E+00	2,85E-02	3,24E-01	0,00E+00	5,77E-03	3,00E-01	7,58E-04	-4,54E-01
NRPE	MJ	3,44E+01	2,24E+00	4,08E+00	0,00E+00	4,27E-01	3,76E+00	2,27E-02	-3,70E+01
NRPM	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
TRPE	MJ	3,44E+01	2,24E+00	4,08E+00	0,00E+00	4,27E-01	3,76E+00	2,27E-02	-3,70E+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
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
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
W	m ³	4,02E-02	2,24E-04	4,29E-03	0,00E+00	4,55E-05	2,36E-03	2,62E-05	-9,34E-03

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

End of life - Waste

Parameter	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
HW	KG	1,51E-05	5,03E-06	2,87E-06	0,00E+00	1,03E-06	7,44E-06	2,56E-08	-6,10E-06
NHW	KG	1,48E-01	1,17E-01	5,64E-02	0,00E+00	2,49E-02	1,69E-01	9,98E-02	-2,73E-02
RW	KG	5,70E-05	1,44E-05	8,98E-06	0,00E+00	2,74E-06	1,53E-05	1,40E-07	-1,50E-05

HW Hazardous waste disposed; NHW Non hazardous waste disposed; RW Radioactive waste disposed

End of life – output flow

Parameter	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
CR	kg	0,00E+00	0,00E+00	2,41E-06	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
MR	kg	0,00E+00	0,00E+00	6,99E-02	0,00E+00	0,00E+00	6,96E-01	0,00E+00	0,00E+00
MER	kg	0,00E+00	0,00E+00	2,28E-02	0,00E+00	0,00E+00	2,01E-01	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	2,83E-01

ETE	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	1,87E+00
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CR Components for reuse; MR Materials for recycling; MER Materials for energy recovery; EEE Exported electric energy; ETE Exported thermal energy

Information describing the biogenic carbon content at the factory gate

Biogenic carbon content	Unit	Value
Biogenic carbon content in product	kg C	0
Biogenic carbon content in the accompanying packaging	kg C	0,0004

Additional Norwegian requirements

Greenhouse 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 process(A3).

National electricity grid	Unit	Value
Hydroelectricity, average (Ecoinvent 3.6)	kg CO2 -eq/kWh	0,0496

Additional environmental impact indicators required in NPCR Part A for construction products

In order to increase the transparency of biogenic carbon contribution to climate impact, the indicator for GWP has been sub-divided into the following:

GWP-IOBC Climate impacts calculated according to the principle of instantaneous oxidation
 GWP-BC Climate impacts from the net uptake and emission of biogenic carbon from each module.

Indicator	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
GWP-IOBC	kg CO2 eq.	1,46E+00	1,41E-01	2,40E-01	0,00E+00	2,62E-02	6,82E-01	4,79E-03	-1,04E+00
GWP-BC	kg CO2 eq.	6,49E-03	7,07E-05	1,06E-03	0,00E+00	1,59E-05	2,29E-03	9,19E-06	-4,04E-03
GWP	kg CO2 eq.	1,47E+00	1,41E-01	2,41E-01	0,00E+00	2,62E-02	6,85E-01	4,80E-03	-1,04E+00

GWP-IOBC Global warming potential calculated according to the principle of instantaneous oxidation. **GWP-BC** Global warming potential from net uptake and emissions of biogenic carbon from the materials in each module. **GWP** Global warming potential

Hazardous substances

The declaration is based upon reference to threshold values and/or test results and/or material safety data sheets provided to EPD verifiers. Documentation available upon request to EPD owner.

- 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.

Indoor environment



The product meets the requirements for low emissions.

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 14044:2006	Environmental management - Life cycle assessment - Requirements and guidelines
EN 15804:2012+A2:2019	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
NPCR Part A	Construction products and services. Ver. 2.0. March 2021, EPD-Norge
CEWEP	Results of Specific Data for Energy, R1 Plant Efficiency Factor and NCV of 314 European Waste-to-Energy (WtE) Plants, CEWEP Energy Report III (status 2007-2010), 2012, Reiman, D.O.

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