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The Norwegian EPD Foundation

ENVIRONMENTAL PRODUCT DECLARATION

in accordance with ISO 14025, ISO 21930 and EN 15804

Owner of the declaration:	Fibo AS
Program operator:	The Norwegian EPD Foundation
Publisher:	The Norwegian EPD Foundation
Declaration number:	NEPD-2105-950-EN
Registration number:	NEPD-2105-950-EN
ECO Platform reference number:	-
Issue date:	17.03.2020
Valid to:	17.03.2025

Fibo wall panels

Fibo AS

www.epd-norge.no

General information

Product:
Fibo wall panels

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Declaration number:
NEPD-2105-950-EN

Place of production:
Lyngdal, Norway

ECO Platform reference number:

Management system:
NS-EN ISO 9001:2015, PEFC ST 2002:2013

This declaration is based on Product Category Rules:
CEN Standard EN 15804 serves as core PCR
NPCR 010:2019 Part B for Building boards version 3

Organisation no:
NO 964 193 991 MVA

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:
17.03.2020

Valid to:
17.03.2025

Declared unit:

Year of study:
2019

Declared unit with option:
1 m^2 covering surface of installed wall panel with an thickness of 10.2 mm and an expected lifetime of 20 years, including installation, maintenance and waste treatment at end-of-life.

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

Functional unit:

The EPD has been worked out by:
Vegard Ruttenborg
Norwegian Institute of Wood Technology

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:

Østfoldforskning

Fredrik Moltu Johnsen, PhD, Østfoldforskning AS
(Independent verifier approved by EPD Norway)

Approved

Håkon Hauan
Managing Director of EPD-Norway

Product

Product description:
Fibo wall panels are a waterproof panel system based on plywood covered with high-pressure laminate (HPL) on the front and a thinner balancing layer on the back.

Fibo wall panels can be used as water proof layer on walls in bathrooms. The panels are also suitable for wardrobes, washing rooms, cleaning rooms, laboratories, commercial kitchens, sport facilities, camping sites, hotels, schools, etc.

Technical data:
Plywood has 7 layers of veener in accordance to NS-EN 13986 with water resistant glue, a thickness of 9 mm and a density of 680 kg/m3. HPL in accordance to EN 438-3 with a thickness of 0.6-0.8 mm on the frontside and a balancing layer of 0.2-0.3 mm on the backside. The density of the HPL is 1350 kg/m3.

Market:
Norway, Northern Europe and North America. The scenarios are based on the Norwegian market.

Product specification:
Wall panels are made both as bathroom panels in a size of 60 cm x 240 cm and as kitchen board in a size of 60 cm x 58 cm.

Materials	kg	%
Birch plywood	6,12	80,74
High-pressure laminates	1,08	14,25
Glue and hardener	0,14	1,85
Balancing laminates	0,24	3,17
Total product	***7,58***	***100,00***
Wood packaging	0,20	
Plastic packaging	0,03	
Cardboard packaging	0,03	
Total with packaging	***7,83***	

Reference service life, product:
As a conservative scenario, the service life of the wall panel is set to 20 years. The estimated service lifetime is provided by the manufacturer. There is no available documentation for this estimation. With good maintenance of sealant in profiles, the service life of the panels can be extended, which means there will be no need for replacement of the panels after 20 years.

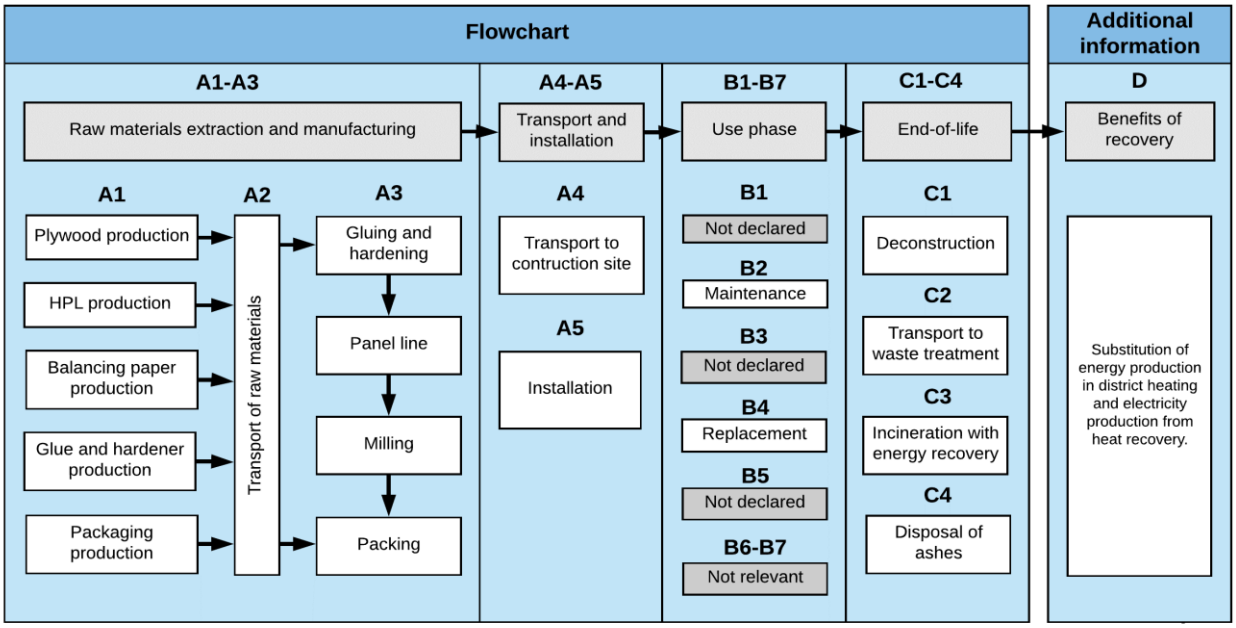
LCA: Calculation rules

Declared unit with options:
1 m2 covering surface of installed wall panel with an thickness of 10.2 mm and an expected lifetime of 20 years, including installation, maintenance and waste treatment at end-of-life.

System boundary:
A flow chart with the system bounadries are shown below in figure 1.

Module D i calculated based on exported energy from waste processing substituting average electricity and district heating production.

Figure 1: Flow diagram according to the modular approach.



Data quality:
Manufacturing data is collected in 2019 and is based on average data for 2018. Data for exported energy from waste processing are based on Statistics Norway and are representative for 2017 (2018a, b, c). Data for manufacturing of HPL is collected from an EPD (IBU, 2017). The remaining data are from Ecoinvent v3.5 "Allocation cut-off by classification" (2018), but adjusted to improve representativeness.
Modelling and LCA calculations is performed with SimaPro version 9.0.0.48.

Allocation:
The allocation is made in accordance with the provisions of EN 15804. No allocation has been utilized in the production at Fibo AS. All incoming and outgoing materials and energy are allocated to the main product. Allocation in upstream processes is used by default in Ecoinvent v3.5.

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.

Calculation of biogenic carbon content:
Sequestration and emissions of biogenic carbon is calculated according to EN16485:2014. This approach is based on the modularity principle in EN15804:2012 that states that all environmental aspects and impacts are declared in the life cycle where they appear. The calculation of biogenic carbon content and conversion to carbon dioxide is done according to NS-EN 16449:2014. Net contribution to GWP from biogenic carbon by each module is shown on page 8. Wood raw materials origins from sustainable forestry and is PEFC certified (DNV GL, 2019).

LCA: Scenarios and additional technical information

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

Transport to building site is based on a scenario with transport from the factory to a builders' merchant in Oslo and then an additional 30 km to a building site.

Transport from production place to user (A4)

Type	Capacity utilisation (incl. return) %	Type of vehicle	Distance km	Fuel/Energy consumption	Fuel/Energy consumption
Lorry	53	EURO 5, >32 tonnes	400	0.023 l/tkm	0.31 l/km
Lorry	37	EURO 5, 16-32 tonnes	30	0.045 l/tkm	0.25 l/km

Assembly (A5)

	Unit	Value
Sealant	kg	0.027
Aluminium profile	kg	0.018
Water consumption	m^3	
Electricity consumption	MJ	0.0102
Other energy carriers	MJ	
Material loss	kg	0.758
Output materials from waste treatment	kg	0.25
Dust in the air	kg	

The assembly at building site includes 10 % product wastage and 1 MJ energy per kubic meter for lifting. Waste management of packaging and product wastage is included. In addition, the installation requires sealant and an aluminium profile.

Maintenance (B2)

	Unit	Value
Maintenance cycle, sealant*	yr	3
Sealant, total for 3 years	mL	50
Detergent, per year	mL	5
Water consumption, per year	liter	0.245
Electricity consumption	kWh	
Other energy carriers	MJ	
Material loss	kg	

Visible sealant is expected to be checked for damage annually. These areas is assumed to require repair during the service life. Examples of such areas are shower wardrobes in indoor swimming pools, hotels etc. If the sealant is required to be removed and replaced by new sealant it is assumed a consumption of 50 mL per square meter of wall panel. In the EPD calculations it is assumed a scenario where the sealant is replaced every 3rd year (extreme use). In addition, it is assumed that visible sealant in wet areas is cleaned with chlorine water every other month to remove skin and soap residue and to prevent fungal growth on the sealant. These requirments applies to both private and public buildings.

Replacement (B4)

	Unit	Verdi
Replacement cycle*	År	20
Electricity consumption	kWh	
Replacement of worn parts	0	

It is used a conservative scenario where the service life of the wall panels is set to 20 years. During the service life of the building it is required to replace the wall panels twice. With good maintenance of sealant in profiles, the service life of the panels can be longer, which means there will be no need for replacement of the panels after 20 years.

*Number or RSL (Reference Service Life)

End of Life (C1, C3, C4)

	Unit	Value
Hazardous waste disposed	kg	
Collected as mixed construction waste	kg	7.58
Reuse	kg	
Recycling	kg	
Energy recovery	kg	7.58
To landfill	kg	

Wall panels are collected as mixed construction waste at building site and treated with incineration with energy recovery. Ash from incineraiton is disposed in landfill.

The transport of wood waste is based on average distance for Norway in 2007 and was 85 km (Raadal et al., 2009).

Transport to waste processing (C2)

Type	Capacity utilisation (incl. return) %	Type of vehicle	Distance km	Fuel/Energy consumption	Fuel/Energy consumption
Lorry	43	Unspecified	85	0.03 l/tkm	0.28 l/km

Benefits and loads beyond the system boundaries (D)

	Unit	Value
Substitution of electricity	MJ	39,7
Substitution of district heating	MJ	272,9
Substitution of raw materials	kg	0,00

The benefits of exported energy from energy recovery is calculated with substiution of Norwegian electricity market mix on medium voltage and Norwegian district heating mix. The energy exported and the district heating mix is representative for the year 2017.

LCA: Results

The results for Global Warming Potential has a large contribution from sequestration of carbon dioxide during wood growth in the various modules. The uptake of biogenic carbon dioxide in the product in module A1-A3 is 9.8 kg CO_2 per declared unit. The same amount is released back to air in module C3 during incineration. Biogenic carbon stored in packaging is released to air when the waste packaging is incinerated in A5. The amount of net contribution of biogenic carbon to each module is shown on page 8.

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	X	MND	X	MND	MNR	MNR	X	X	X	X	X

Environmental impact

Parameter	Unit	A1-A3	A4	A5	B1	B2	B3	B4	B5
GWP	kg CO_2 -ekv	3,98E-01	3,09E-01	2,08E+00		1,10E+01		3,24E+01	
ODP	kg CFC11-ekv	6,96E-07	6,05E-08	9,17E-08		4,59E-08		1,75E-06	
POCP	kg C_2H_4 -ekv	6,06E-03	4,95E-05	7,56E-04		2,43E-03		1,39E-02	
AP	kg SO_2 -ekv	4,20E-02	9,99E-04	6,25E-03		1,95E-02		1,05E-01	
EP	kg PO_4^{3-}-ekv	9,10E-03	1,68E-04	1,18E-03		1,88E-03		2,30E-02	
ADPM	kg Sb-ekv	2,06E-05	6,45E-07	4,00E-06		2,59E-05		5,14E-05	
ADPE	MJ	1,51E+02	5,14E+00	2,30E+01		1,49E+02		4,17E+02	

Environmental impact

Parameter	Unit	B6	B7	C1	C2	C3	C4		D
GWP	kg CO_2 -ekv			8,99E-05	8,24E-02	1,33E+01	1,12E-03		-3,78E+00
ODP	kg CFC11-ekv			8,41E-12	1,53E-08	1,29E-08	3,87E-10		-2,30E-07
POCP	kg C_2H_4 -ekv			1,86E-08	1,38E-05	8,11E-05	3,03E-07		-1,31E-03
AP	kg SO_2 -ekv			4,05E-07	3,23E-04	2,69E-03	7,06E-06		-1,36E-02
EP	kg PO_4^{3-}-ekv			1,01E-07	5,67E-05	9,98E-04	1,29E-06		-3,11E-03
ADPM	kg Sb-ekv			1,41E-09	2,32E-07	2,25E-07	1,88E-09		-7,10E-06
ADPE	MJ			9,52E-04	1,34E+00	2,83E+01	3,67E-02		-5,16E+01

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

Parameter	Unit	A1-A3	A4	A5	B1	B2	B3	B4	B5
RPEE	MJ	1,30E+02	8,17E-02	2,53E+01		6,40E+00		5,40E+02	
RPEM	MJ	1,18E+02	0,00E+00	4,28E-01		0,00E+00		9,42E+00	
TPE	MJ	2,48E+02	8,17E-02	2,57E+01		6,40E+00		5,50E+02	
NRPE	MJ	1,65E+02	5,29E+00	2,53E+01		1,27E+02		4,69E+02	
NRPM	MJ	3,77E+01	0,00E+00	7,47E-01		1,78E-15		5,74E+00	
TRPE	MJ	2,03E+02	5,29E+00	2,61E+01		1,27E+02		4,75E+02	
SM	kg	4,41E-03	0,00E+00	4,94E-03		0,00E+00		1,87E-02	
RSF	MJ	2,38E-01	0,00E+00	8,97E-02		1,26E-01		1,97E+00	
NRSF	MJ	3,20E-02	0,00E+00	3,60E-02		8,39E-02		7,92E-01	
W	m^3	2,23E-01	1,03E-03	2,97E-02		6,51E-02		5,29E-01	

Resource use

Parameter	Unit	B6	B7	C1	C2	C3	C4		D
RPEE	MJ			1,15E-02	1,72E-02	1,14E+02	5,69E-04		-1,71E+02
RPEM	MJ			0,00E+00	0,00E+00	-1,14E+02	0,00E+00		0,00E+00
TPE	MJ			1,15E-02	1,72E-02	6,10E-01	5,69E-04		-1,71E+02
NRPE	MJ			1,62E-03	1,36E+00	3,75E+01	3,78E-02		-6,30E+01
NRPM	MJ			0,00E+00	0,00E+00	-3,56E+01	0,00E+00		0,00E+00
TRPE	MJ			1,62E-03	1,36E+00	1,86E+00	3,78E-02		-6,30E+01
SM	kg			0,00E+00	0,00E+00	0,00E+00	0,00E+00		0,00E+00
RSF	MJ			0,00E+00	0,00E+00	6,59E-01	0,00E+00		-1,06E+02
NRSF	MJ			0,00E+00	0,00E+00	3,28E-01	0,00E+00		-7,10E+01
W	m^3			8,58E-05	2,44E-04	1,04E-02	4,02E-05		-6,83E-01

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	B1	B2	B3	B4	B5
HW	kg	4,89E-02	3,17E-04	1,80E-02		5,40E-02		3,55E-01	
NHW	kg	1,28E+00	4,09E-01	2,26E-01		8,81E-02		4,10E+00	
RW	kg	4,77E-04	3,49E-05	6,11E-05		5,16E-06		1,17E-03	

End of life - Waste

Parameter	Unit	B6	B7	C1	C2	C3	C4		D
HW	kg			5,73E-07	3,97E-05	7,55E-04	1,09E-01		-1,54E-02
NHW	kg			6,87E-05	8,00E-02	2,19E-02	3,49E-02		-6,50E-01
RW	kg			1,13E-08	8,63E-06	3,99E-06	2,23E-07		-1,46E-04

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

End of life - Output flow

Parameter	Unit	A1-A3	A4	A5	B1	B2	B3	B4	B5
CR	kg	0,00E+00	0,00E+00	0,00E+00		0,00E+00		0,00E+00	
MR	kg	2,32E-02	0,00E+00	5,69E-02		0,00E+00		1,71E-01	
MER	kg	8,00E-03	0,00E+00	2,01E-01		0,00E+00		4,18E-01	
EEE	MJ	7,11E-01	0,00E+00	1,33E+00		2,80E+00		2,92E+01	
ETE	MJ	6,64E+00	0,00E+00	8,47E+00		3,15E+01		1,86E+02	

End of life - Output flow

Parameter	Unit	B6	B7	C1	C2	C3	C4		D
CR	kg			0,00E+00	0,00E+00	0,00E+00	0,00E+00		0,00E+00
MR	kg			0,00E+00	0,00E+00	5,55E-03	0,00E+00		0,00E+00
MER	kg			0,00E+00	0,00E+00	0,00E+00	0,00E+00		0,00E+00
EEE	MJ			0,00E+00	0,00E+00	1,26E+01	0,00E+00		-3,97E+01
ETE	MJ			0,00E+00	0,00E+00	7,80E+01	0,00E+00		-2,73E+02

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

Reading example: 9,0 E-03 = 9,0*10-3 = 0,009

Additional Norwegian requirements

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

Data source	Amount	Unit
Ecoinvent v3.5 (August 2018)	31.7	gram CO_2-eq/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.

Transport
Transport from production site to construction site in Norway according to scenario in module A4: 430 km

Indoor environment
The product meets the requirements for low emissions, M1 (Rise, 2019). See table below for test results.
Sealant FIBOSEAL meets the requirements according to EC 1 Plus (GEV, 2017).

Compounds	Requirement M1 (mg/m^2h)	Test results	Pass / Fail
TVOC	< 0,2	0,013	PASS
Formaldehyde	< 0,05	0,028	PASS
CMR 1A+1B	< 0,005	< 0,001	PASS
Ammonia	< 0,03	not measured	--
Odour	≥ 0,0	not measured	--

Carbon footprint
To increase the transparency of the climate impacts, the GWP indicator has been divided into sub-indicators:
GWP-IOBC Climate impacts calculated according to instant oxidation principle
GWP-BCIP Climate impacts calculated from the net impacts of sequestration and emission of biogenic carbon

Climate impact

Parameter	Unit	A1-A3	A4	A5	B1	B2	B3	B4	B5
GWP-IOBC	kg CO_2-ekv	1,05E+01	3,09E-01	1,77E+00		1,10E+01		3,25E+01	
GWP-BCIP	kg CO_2-ekv	-1,01E+01	0,00E+00	3,01E-01		0,00E+00		0,00E+00	
GWP	kg CO_2-ekv	3,98E-01	3,09E-01	2,08E+00		1,10E+01		3,24E+01	

Climate impact

Parameter	Unit	B6	B7	C1	C2	C3	C4		D
GWP-IOBC	kg CO_2-ekv			8,99E-05	8,24E-02	3,54E+00	1,12E-03		-3,78E+00
GWP-BCIP	kg CO_2-ekv			0,00E+00	0,00E+00	9,78E+00	0,00E+00		0,00E+00
GWP	kg CO_2-ekv			8,99E-05	8,24E-02	1,33E+01	1,12E-03		-3,78E+00

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Statistics Norway (2018c) *Table 04730: Consumption of fuel used for gross production of district heating, by type of energy (GWh), 2017.*

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