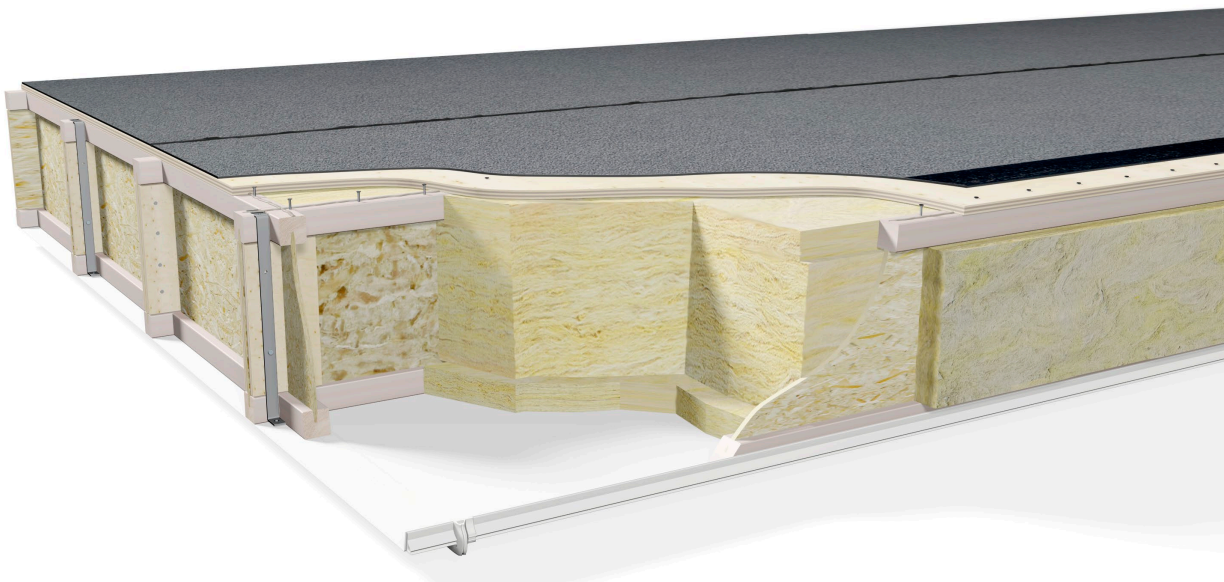


Environmental Product Declaration

In accordance with ISO 14025 and EN 15804 +A2



Owner of the declaration:
Lättelement AB

Program holder and publisher:
The Norwegian EPD foundation

Declaration number:
NEPD-3688-2633-EN

Registration number:
NEPD-3688-2633-EN

Issue date: 30.08.2022
Valid to: 30.08.2027

ver2-290922

Product

Roof panel A505

Manufacturer

Lättelement AB

General information

Product:

Roof panel A505

Program Operator:

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

Declaration Number:

NEPD-3688-2633-EN

This declaration is based on Product

Category Rules:

NPCR Part A: Construction products and services.
Ver. 2.0. March 2021. NPCR 010:2022 Part B:
Building boards. Ver.2.0. March 2022.

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 m² of roof panel. EPD based on specific product.

Declared unit with option:

Included modules: A1-A5, C1-C4, D

Functional unit:

-

Year of study:

2020

Verification of EPD-tool

Independent verification of the declaration, data and test-EPD is performed in accordance with EPD-Norway's procedures and guidelines for verification and approval of EPD tools.

Guangli Du, Aalborg University

(no signature required)

Owner of the declaration:

Lättelement AB
Contact person: Niklas Ahlqvist
Tel: +46 660 30 95 20
e-mail: niklas.ahlqvist@lattelement.se

Manufacturer:

Lättelement AB
adress: Högländsvägen 9,
891 50 Örnsköldsvik
Tel: 0660 30 95 00
e-mail: info@lattelement.se

Place of production:

Örnsköldsvik, Sweden

Management system:

According to ISO 9001:2015, ISO 14001:2015

Organisation no:

556199-8401

Issue date:

30.08.2022

Valid to:

30.08.2027

The EPD has been worked out by:

EPDs from other programmes than EPD Norge may not be comparable. EPDs of building materials are not necessarily comparable if they do not comply with EN 15804 and are seen in a construction context.

The EPD has been worked out by:

The EPD is based on IVL's EPD Generator v.1.0 for Lättelement, which is a reference flow tool.

EPD developed by: Nadia Al-Ayish, IVL

EPD controlled by: Guangli Du, Aalborg University



Håkon Hauan, CEO EPD-Norge

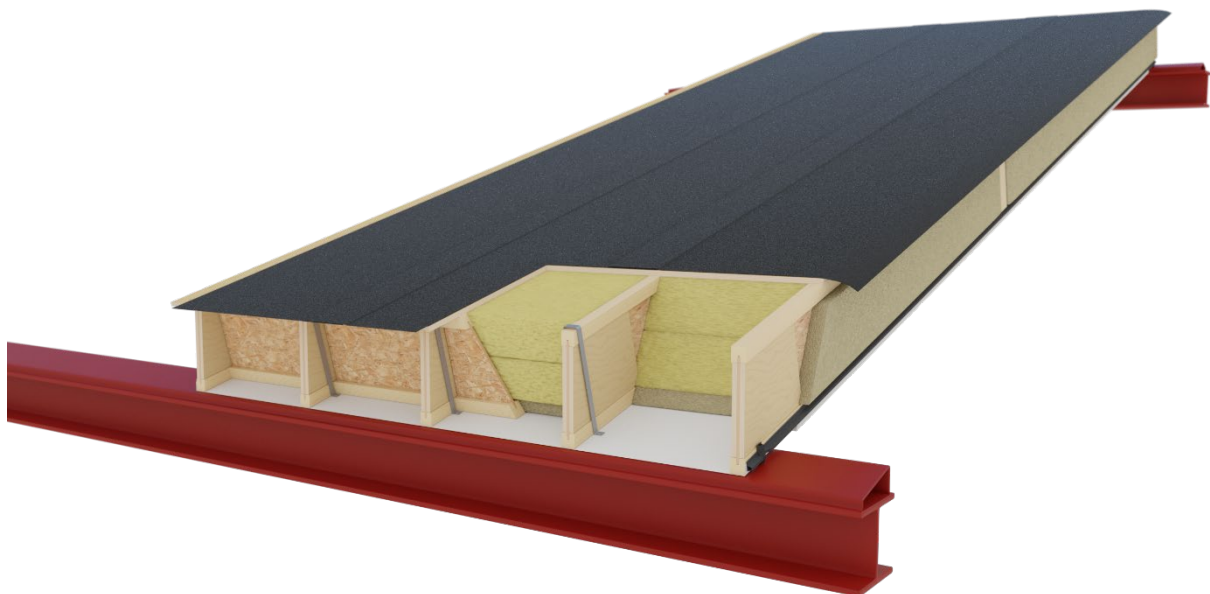
Product

Product description:

Roof panels from Lättelement is a load bearing, strong and lightweight construction product based on structural wooden I-joist, plywood, mineral wool insulation and steel sheet. The panels are intended to be used as load bearing panels in roofs in service class 1 and 2 according to EN 1995-1-1 and in internal humidity class 1-4 according to EN ISO 13788. The plywood and steel sheet are glued and mechanically fixed to the beams and therefore makes the panel function as a stressed skin panel.

The composition of this construction makes the panels very strong in relation to its low weight and thereby minimizing resource use. In addition, the steel sheets acts as a vapour barrier and meets the highest demands regarding airtightness.

The construction has a very low U-value, resulting in low energy consumption in the buildings where the product is installed.

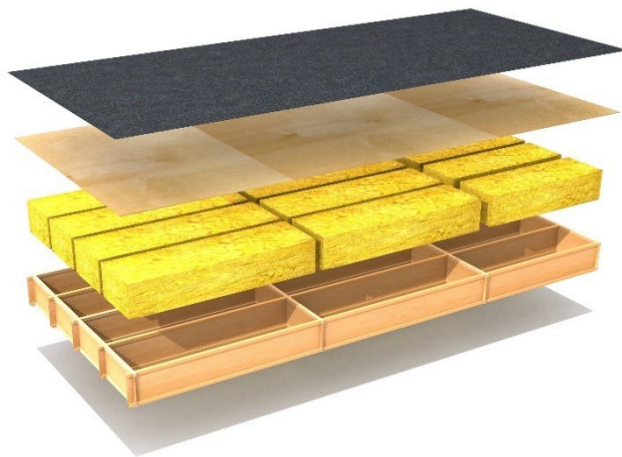


Manufacturing process:

The roof panels are produced in a geothermal heated factory in Örnsköldsvik. In four manual operated stages the raw material wooden I-joist, plywood, mineral wool insulation, bitumen felt and steel sheet are assembled into a complete roof panel. Gasol is used for thermal welding of the bitumen felt into a waterproof layer. Electric and air-powered machines are used for cutting the material into the right dimensions, with a low raw material scrap percentage of approximately 2%.

Product specification:

Material	Weight [kg/m ²]	weight-%
Steel components	0,19	0,5
Glass wool	8,3	21,7
Stone wool	0,06	0,2
Bitumen felt	2,5	6,6
I-beam (wood)	11,54	30,3
Glue	0,34	0,8
EPDM	0,1	<0,5
Steel sheet	6,33	16,6
Plywood	8,6	22,5
Wooden components	0,14	0,4
Total	38,1	100



Technical data:

Specification	Roof panel A505
U-value	0,074 W/m ² K
Thickness	518 mm
Weight	38,1 kg/m ²

The panels is produced and approved in accordance with European Technical Approval (ETA 14/0257)



Market:

Nordic countries

Reference service life, product:

Reference service life is the same as the building, which is typically set to 50 or 60 years.

Reference service life, building:

-

LCA: Calculation rules

Declared unit:

1 m² of roof panel

Data quality:

Specific data for sawn timber is based on EPD from Svenskt Trä (S-P-02657). Specific data for steel sheet are based on EPD from SSAB (S-P-01922). Transports include empty return and are based on data from Sphera. Other material and data for different energy types are based on Sphera and modified data from ecoinvent 3.8. Energy data is calculated as an average value from actual consumption.

Material	Reference	Quality	Year
Steel components	Gabi/sphera database 2021.1.	Database	2019
Glass wool	Ecoinvent 3.8	Database	2021
Stone wool	Gabi/sphera database 2021.1.	Database	2020
Bitumen felt	Gabi/sphera database 2021.1.	Database	2021
I-beam (wood)	Ecoinvent 3.8, S-P-02657	Database	2020
Glue	Gabi/sphera database 2021.1.	Database	2021
EPDM	Gabi/sphera database 2021.1.	Database	2020
Steel sheet	S-P-01922	EPD	2020
Plywood	Gabi/sphera database 2021.1.	Database	2020
Wooden components	S-P-02657	EPD	2021

Allocation:

The allocation to the production facility is based on annual environmental loads divided by the total production regardless of product type. LCA data used is based on EPDs that comply with EN15804 or data from Sphera.

System boundary:

A1-A5, C1-C4, D.

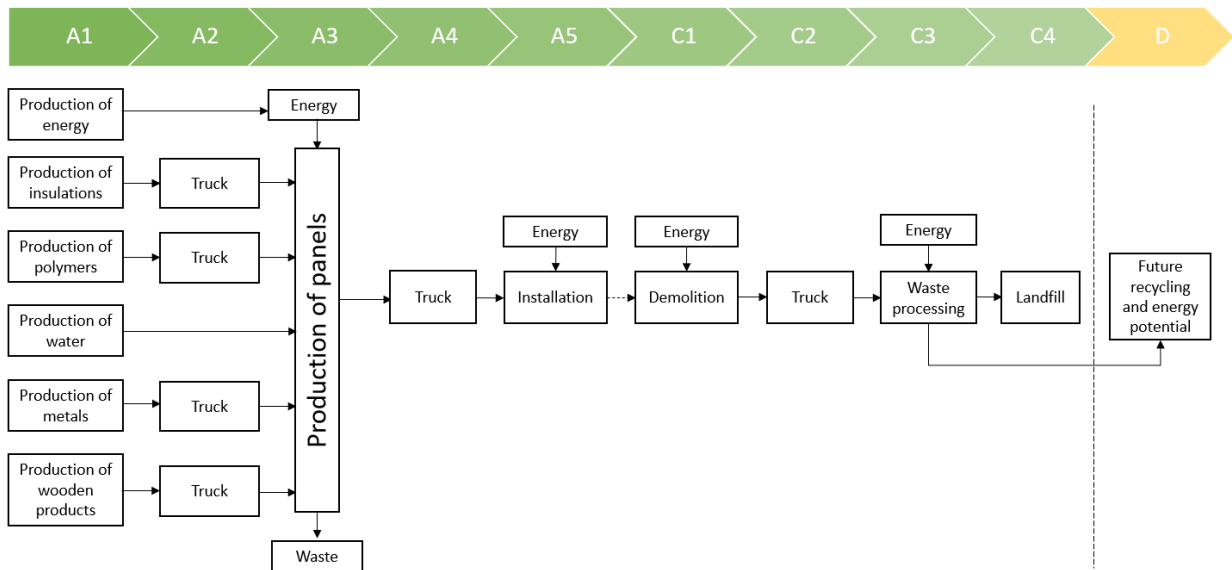


Figure 1. Flow chart of processes included in the life cycle.

Cut-off criteria:

The study applies a cut-off of 1% according to EN 15804. This means that the amount of material excluded does not exceed that limit.

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)

Type	Capacity utilisation (incl. return) %	Type of vehicle	Distance KM	Fuel/Energy consumption	value (l/t)
Truck	35	Truck, 33t	513	0,031 litre/tons, km	15,7

Based on an average transport.

Assembly (A5)

	Unit	Value
Electricity consumption	kWh	0,61

Based on a specific information from Lättelement.

End-of-life (C1, C3, C4)

	Unit	Value
C1. Diesel demolition*	MJ	0,15
C3. Diesel steel processing*	MJ	17,4
C3. Diesel wood processing*	MJ	0,44

C3. Material for recycling (95% of the steel)	kg	6,2
C3. Material for energy recovery (100% of the wood)	kg	20,3
C4. To landfill (other and 5% of the steel)	kg	11,6

*Erlandsson & Pettersson (2015)

Transport to waste processing (C2)

Type	Capacity utilisation (incl. return) %	Type of vehicle	Distance KM	Fuel/Energy consumption	value (l/t)
Truck	45	Truck, 40t	35	0,03 litre/tons, km	0,9

Based on model according to industry agreement.

Benefits and loads beyond the system boundaries (D)

	Unit	Value
Substitution of Swedish District Heating Mix (combustion of wood)	MJ	389
Avoided materials (Recycling of primary steel)	kg	6,5

The scenario is based on a recycling rate according to module C.

Additional technical information

No additional information.

LCA: Results

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	MND	MND	MND	MND	MND	MND	MND	X	X	X	X	X

Core environmental impact indicators

Parameter	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
GWP-total	kg CO ₂ eq.	1.75E+00	1.44E+00	2.62E-02	1.27E-02	8.59E-02	3.61E+01	1.66E-01	- 2.86E+01
GWP-fossil	kg CO ₂ eq.	3.79E+01	1.43E+00	2.60E-02	1.26E-02	8.51E-02	3.91E-02	1.70E-01	- 4.89E+00
GWP-biogenic	kg CO ₂ eq.	- 3.62E+01	4.45E-03	1.32E-04	-1.63E-05	2.65E-04	3.60E+01	-4.95E-03	- 2.37E+01
GWP-LULUC	kg CO ₂ eq.	7.36E-02	7.98E-03	6.49E-05	1.04E-04	4.76E-04	2.19E-04	5.00E-04	1.15E-02
ODP	kg CFC11 eq.	1.80E-06	3.22E-08	6.20E-16	1.63E-18	1.92E-09	8.82E-10	6.63E-16	-5.00E-08
AP	mol H ⁺ eq.	2.23E-01	1.61E-02	8.07E-05	7.33E-05	9.58E-04	4.40E-04	1.22E-03	-3.86E-02
EP-freshwater	kg P eq.	4.13E-03	7.39E-05	5.59E-07	3.78E-08	4.40E-06	2.02E-06	2.86E-07	7.26E-05
EP-marine	kg N eq.	6.52E-02	8.66E-03	3.01E-05	3.59E-05	5.16E-04	2.37E-04	3.16E-04	-4.30E-03
EP-terrestrial	mol N eq.	8.23E-01	8.23E-02	2.51E-04	3.97E-04	4.90E-03	2.25E-03	3.46E-03	-7.24E-02
POCP	kg NMVOC eq.	1.70E-01	1.12E-02	6.62E-05	6.91E-05	6.70E-04	3.08E-04	9.55E-04	1.17E-02
ADP-M&M	kg Sb eq.	1.33E-03	7.70E-07	2.16E-08	9.69E-10	4.59E-08	2.11E-08	1.61E-08	- 6.10E+01
ADP-fossil	MJ	7.56E+02	2.18E+01	2.55E+00	1.69E-01	1.30E+00	5.95E-01	2.27E+00	4.51E+02
WDP	m ³	6.43E+01	2.56E+01	2.01E-02	1.11E-04	1.53E+00	7.01E-01	1.83E-02	3.27E+00

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

Parameter	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
PM	Disease incidence	1.92E-06	8.63E-08	7.88E-10	2.56E-10	5.14E-09	2.36E-09	1.51E-08	- 2.57E+00
IRP	kBq U235 eq.	7.19E+00	4.90E-02	1.10E-01	2.94E-05	2.92E-03	1.34E-03	2.50E-03	1.94E+01
ETP-fw	CTUe	6.45E+02	3.80E+01	1.35E+00	1.22E-01	2.27E+00	1.04E+00	1.28E+00	2.29E+02
HTP-c	CTUh	1.04E-07	7.61E-10	5.17E-11	2.47E-12	4.53E-11	2.08E-11	1.90E-10	-9.63E-03
HTP-nc	CTUh	9.17E-07	4.64E-08	1.05E-09	1.37E-10	2.77E-09	1.27E-09	2.10E-08	-1.17E-01
SQP	Dimensionless	5.92E+03	2.78E+01	1.69E+00	5.82E-02	1.66E+00	7.62E-01	4.56E-01	1.49E+02

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 typ / 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
ILCD typ / level 2	Acidification potential, Accumulated Exceedance (AP)	None
	Eutrophication potential, Fraction of nutrients reaching freshwater end compartment (EP-freshwater)	None
	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
	Potential Human exposure efficiency relative to U235 (IRP)	1
ILCD typ / level 3	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	5.96E+02	7.47E+00	2.25E+00	9.46E-03	4.45E-01	2.05E-01	3.04E-01	1.94E+02
RPEM	MJ	1.11E+02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
TPE	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
NRPE	MJ	7.56E+02	2.18E+01	2.55E+00	1.70E-01	1.30E+00	5.97E-01	2.27E+00	3.61E+02
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	7.56E+02	2.18E+01	2.55E+00	1.70E-01	1.30E+00	5.97E-01	2.27E+00	3.61E+02
SM	kg	2.13E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
RSF	MJ	1.66E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NRSF	MJ	2.10E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	- 9.37E+01
W	m ³	1.62E+00	5.97E-01	3.86E-03	1.08E-05	3.56E-02	1.64E-02	5.58E-04	- 3.48E+00

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	4.17E-01	9.18E-11	6.74E-10	8.55E-12	5.47E-12	2.51E-12	2.40E-10	1.06E-07
NHW	KG	1.26E+00	2.75E-03	7.65E-04	2.52E-05	1.64E-04	7.52E-05	1.13E+01	-4.09E-02
RW	KG	2.05E-02	2.36E-05	9.46E-04	2.05E-07	1.41E-06	6.46E-07	2.38E-05	1.55E-01

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	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MR	kg	1.78E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.19E+00	0.00E+00	0.00E+00
MER	kg	2.19E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.03E+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	0.00E+00
ETE	MJ	3.49E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

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

Reading example: $9,0 \text{ E-03} = 9,0 \cdot 10^{-3} = 0,009$

Information describing the biogenic carbon content at the factory gate

Biogenic carbon content	Unit	Value
Biogenic carbon content in product	kg C	9,85
Biogenic carbon content in the accompanying packaging*	kg C	0

* Has been directly balanced out as combustion takes place shortly after in module A5.

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
Swedish electricity mix	kg CO ₂ -eq/kWh	0.042

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 GWP-IOBC is presented. This indicator excludes biogenic carbon dioxide and may also be referred to as GWP-GHG.

Indicator	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
GWP-IOBC	kg CO ₂ eq.	37.46	1.44	2.64E-02	1.25E-02	8.59E-02	3.94E-02	1.68E-01	- 4.45E+00

GWP-IOBC Global warming potential calculated according to the principle of instantaneous oxidation. In this indicator is uptake and emission of biogenic carbon dioxide set to zero, i.e. directly balanced out in the module where it appears. Alternative name of this indicator is GWP-GHG.

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 (Avfallsforskriften, Annex III), see table.

Name	CAS no.	Amount

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. Oslo: EPD-Norge
NPCR 010:2022	Part B: Building boards (references to EN 15804 +A2). ver 2.0, 2022 Oslo: EPD-Norge
Erlandsson & Pettersson (2015)	Klimatpåverkan för byggnader med olika energiprestanda Underlagsrapport till kontrollstation 2015. Report number U 5176.
EPD Norge (2019)	The Norwegian EPD Foundation/EPD-Norge, General Programme Instructions 2019. Version 3.0 dated 2019.04.24
Al-Ayish et al. (2022).	LCA methodology report for roof panels by Lättelement AB. IVL.

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		web	www.epd-norge.no
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EPD for the best environmental decision



Global
Program
Operator