Environmental Product Declaration

In accordance with ISO 14025 and EN 15804+A1 for:

EPS 80 insulation

From

EPS Sverige, a sector group within IKEM – Innovation and Chemical Industries in Sweden

Programme:	The International EPD® System, www.environdec.com
Programme operator:	EPD International AB
EPD owner:	IKEM -- Innovation and Chemical Industries in Sweden.
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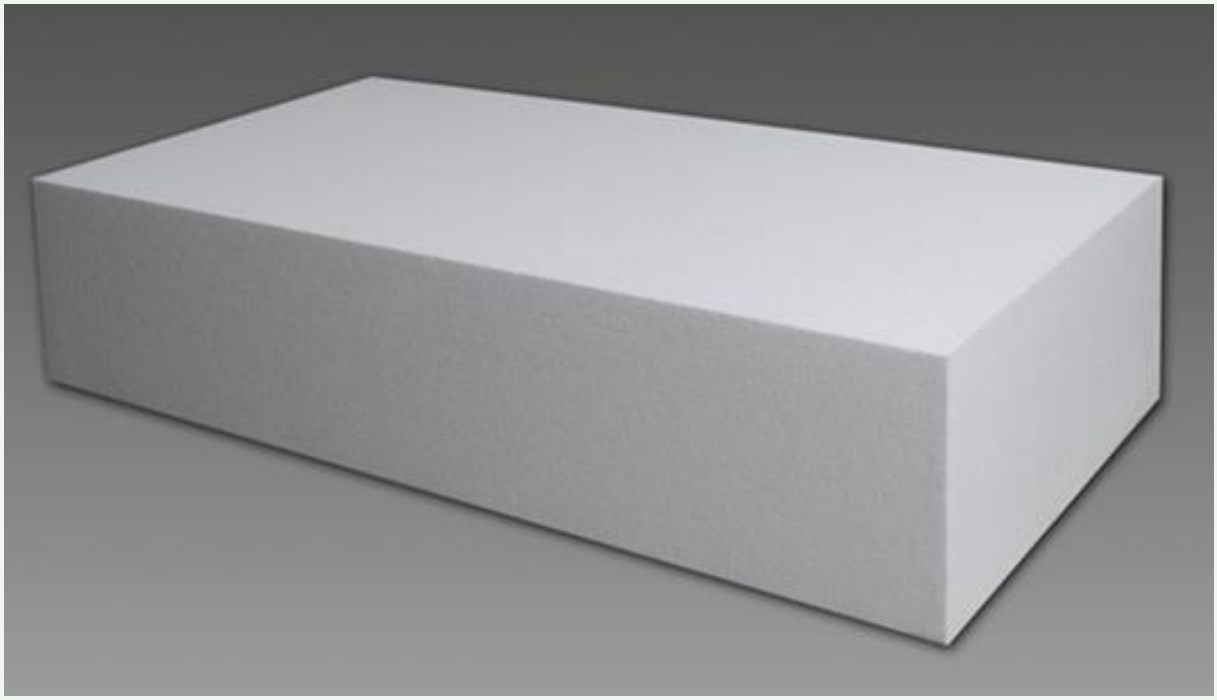
PCR used	PCR 2012:01. Construction products and construction services. Version 2.3. of 2018-11-15
Sub-PCR used	



General information

Owner of the EPD:

IKEM – Innovation and Chemical Industries in Sweden.
Adress: Box 55915, SE 102 16 Stockholm. Visiting address: Storgatan 19, Stockholm, Sweden.
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Name and location of production sites:

- BeWi Insulation AB:
  - Braxenvägen 8, 761 41, Norrtälje
  - Bruksgatan 2, 312 40, Genevad
- Jackon AB
  - Järnvägsgatan 39, 274 32, Skurup
  - Hamnviksvägen 9, 872 43, Kramfors
- Sundolitt AB
  - Nordgårdsvägen 2, 44782 Vårgårda

About the company

EPS-Sverige is a sector group within IKEM-Innovation and Chemical Industries in Sweden. EPS-Sverige promotes that EPS shall be used in a professional and building constructional right way using the technical, financial and environmental benefits in production, use, reuse, recycling or energy recovery.

IKEM is an industry and employer organization representing 1,400 companies with 70,000 employees in the chemical, plastics and materials industries. The EPS-Sverige sector group consists of the leading manufacturers of EPS for construction purposes: Bewi, Jackon and Sundolitt. Through the manufacturing of EPS insulation boards with high insulation capacity, long life, low weight, attractive price and being recyclable, the construction industry is provided with insulation that promotes sustainable building.

Product information

Product name

EPS insulation with compressive stress 80 kN/m², referred to as EPS 80. The following commercial products are covered by this EPD:

- Products by BeWi Insulation AB:
  - EPS 80 and EPS Grey
- Products by Jackon AB:
  - Jackopor 80
- Products by Sundolitt AB:
  - C80 and S80

Product description

EPS insulation boards are made of white or gray polystyrene raw material, which also depends on the color of the finished EPS boards. The gray polystyrene raw material contains about 3% graphite, which gives the material a little better insulation capacity. Production of EPS insulation boards is done by heating polystyrene granules containing 4-6% pentane with water vapor in a closed block form.

After that, the block is cut with a heated wire to the desired size. A typical size is 600 mm wide, 1200 mm long and thickness between 10-200 mm. During manufacture and shortly thereafter, about half of the amount of pentane is released. Any leftovers from production is recycled in the same process.

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Technical information

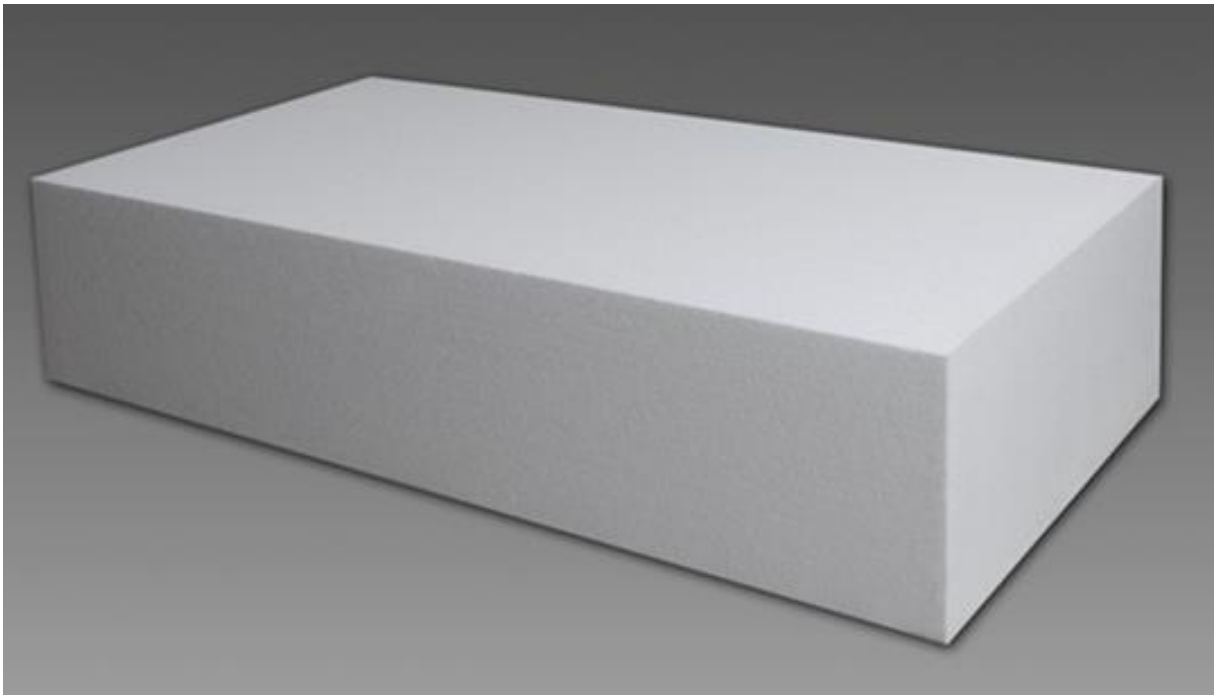
The estimated service life of the products is at least 60 years according to the manufacturer, as in principle the product is not affected at all by ageing. The product included in this EPD follows the technical standard SS-EN-13163, and has the following technical properties:

- R-value: 1 m2K/W
- Thickness: 38mm
- K-value: 0,038 W/mK

Product content

The approximate material content (in weight %) of the product is: expandable polystyrene (90-95%), pentane (4-6%) and graphite (0-3%). This composition can vary depending of the products and manufacturer and is just an estimation.

Picture of the product



UN CPC code

369 – other plastic products

Geographical scope

Nordic countries

Conversion factors to other classes

The results presented in this EPD can be converted to other nominal densities by using conversion factors. The following conversion factors have been calculated based on the difference with the EPS80, and can be applied to the results in this EPD:

Compressive strength class	Conversion factor
EPS 60	0.87
EPS 80	1
EPS 100	1.15
EPS 120	1.31
EPS 150	1.55
EPS 200	1.88
EPS 300	2.50

LCA information

PCR used

The PCR (Product category rules) that has been used in this EPD is PCR 2012:01. Construction products and construction services. Version 2.3. of 2018-11-15.

Declared unit

1 m^2 of EPS 80 insulation with 38mm thickness, an R-value of 1 K*m^2/W and class 80 kN/m^2

Service life

The estimated service life of the products is at least 60 years according to the manufacturer.

Time representativeness

The data used to model product manufacturing corresponds to 2018. The data from generic databases are from 2011 – 2018. No data used is older than 10 years.

Database(s) and LCA software used

Databases used are mainly from Thinkstep´s own database from 2019. The LCA software used is GaBi 8.

Data quality

The quality of the data is judged to be good. The data is recent and the data to model the core process was collected directly from the production sites.

System diagram

A basic flowchart of the system is presented in the figure below.

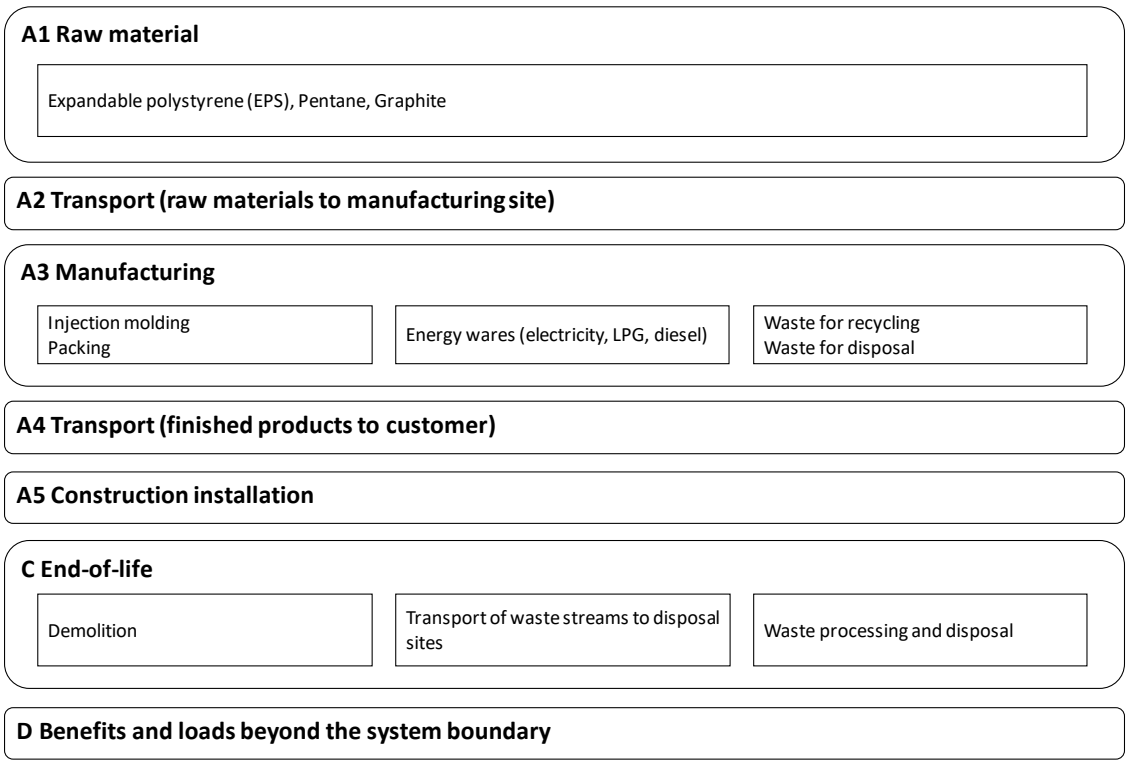


Figure 1 – Flow chart of the system

Description of system boundaries and delimitations

This study is a so-called *cradle-to-gate with options* according to the definition in the PCR followed. The life cycle impacts included are as the flowchart above shows. Also, in accordance to the PCR followed, the Polluter Pays Principle was applied. The life cycle starts by extracting raw materials used for the products, which is defining the boundary towards the nature. No infrastructure products are used for the manufacturing of the product.

Life cycle stages, included and excluded

The life cycle stages included are A1-A5, C1-C4 and D.
The life cycle stages excluded are B1-B7.

Allocations made

Co-product allocation was not necessary in the studied system. A conservative assumption has been made that all the environmental impact is allocated to the product and not the co-product (i.e. the filling material).

Scenarios

The analysis is carried out using factory-specific data for use of energy and utilities and waste generation, as well as product-specific data for use of raw materials. Therefore, the results represent the product system and no other scenarios were applied.

Data used

Site-specific production data has been retrieved for 2018 from the production sites. The upstream and downstream processes have been modelled based on data from generic databases, mostly Thinkstep's database.

Cut-off

The study applies a cut-off criterion of 1%.

Main raw materials

The main raw materials used in the product can be seen in the flowchart in Figure 1.

Packaging

Most of the raw materials used for the production process are transported in plastic PE bags and cardboard boxes (Oktabin) depending of the specific product, and in some cases wooden palls are used. The products are transported to the customers in polyethylene plastic bags.

Transportation

Three types of transportation processes are included in this LCA study; the transport of raw materials and its packaging to the production sites, the transport of the final products to the customers and the transport of waste materials from the production sites to the disposal. The transport is mainly carried out by trucks and in some cases the raw materials are transported to the production site by boat.

Energy utilities

Both electricity and heat are used at the production sites. The electricity has been modelled using the Swedish residual electricity grid mix in the Thinkstep database. As for the heat, most of the sites use local LPG boilers and, in some cases, using biomass. Some of the sites also use diesel-powered internal transports.

Recycled materials

Some of the products use a small percentage of recycled post-consumer EPS waste as raw material. Following the polluter pays principle, only the transport of the recycled EPS to the production sites is accounted for in the calculations. The amount of recycled material used depends on the specific product and varies between 0-3% in weight of the total EPS input.

Secondary energy

No secondary energy is used for the manufacturing of the product.

Direct emissions from production site

The only emissions from the production sites besides the emissions from the local production of heat and the internal transports is pentane from the blow moulding process.

Waste

Wastes are generated during the manufacturing process in all production sites. These are transported to a sorting facility. The main waste streams from production are hazardous waste (sent to incineration), inert waste (to landfill), waste sent to recycling and industrial non-hazardous waste sent to incineration.

Scenario for module A4

The table below presents information concerning the scenario used to model the transport of the product to the customers:

Vehicle type used for transport	Vehicle load capacity	Fuel type and consumption	Capacity utilisation (%)	Average distance to customer (km)
EURO5 and EURO6	20 tonnes	Diesel, 3.7 l/10 km.	Between 30-95% depending on manufacturer	Weighted average, varies for each manufacturer

End-of-life

The environmental impacts of demolition correspond to the use of machinery, using a factor of 0,8 kWh per ton of material. For C2, the waste is assumed to be transported 20km to a disposal facility by 20-ton EURO5 trucks. An end-of-life scenario has been assumed for the product as the most likely to occur in Sweden, corresponding to 98,5% of the waste going to incineration with energy recovery and 1,5% of the waste to recycling. Both of these waste streams are accounted for in module D.

Benefits beyond the system boundaries (Module D)

The avoided emissions from incineration were modelled based on a scenario where 2,29MJ of electricity and 30,1MJ of steam are obtained per kilogram of EPS incinerated. It was assumed that the electricity output of this process substitutes electricity from the grid, and that the steam output substitutes steam from hard coal. A recovery efficiency of 40% was assumed for both processes, also to account for material losses.

To calculate the avoided emissions from recycling, it was assumed that the EPS recycled substitutes the production of EPS granulate. Here, a factor of 0,5 was applied in order to account for quality loss after each life cycle of the material. This substitution was applied to the net flow of primary material in the product, meaning that whenever the product contained recycled raw materials, these were not included in the calculation of module D.

Product system

The life cycle stages included in the analysis is illustrated in the table below, according to EN15804. If a module is included, it is indicated with “X” and if it is excluded with a “ND” (Not Declared).

Product stage			Construction process stage		Use stage							End of life stage				Resource recovery stage
Raw material	Transport	Manufacturing	Transport	Construction installation	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	Deconstruction, demolition	Transport	Waste processing	Disposal	Reuse, recycling or energy recovery potentials
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
X	X	X	X	X	ND	ND	ND	ND	ND	ND	ND	X	X	X	X	X

Inventory and Impact categories

In accordance with the International EPD system programme instructions and the specific PCR used, the following characterization factors are used:

PARAMETER	UNIT	Characterization factors
Global warming potential (GWP)	kg CO_2 eq.	CML2001 – Jan. 2016, baseline method.
Acidification potential (AP)	kg SO_2 eq.	
Eutrophication potential (EP)	kg PO_4^{3-} eq.	
Formation potential of tropospheric ozone (POCP)	kg C_2H_4 eq.	
Ozone layer depletion potential (ODP)	kg R11-e	
Abiotic depletion potential – Elements	kg Sb eq.	
Abiotic depletion potential – Fossil resources	MJ, net calorific value	

PARAMETER		UNIT
Primary energy resources – Renewable	Use as energy carrier	MJ, net calorific value
	Used as raw materials	MJ, net calorific value
	TOTAL	MJ, net calorific value
Primary energy resources – Non-renewable	Use as energy carrier	MJ, net calorific value
	Used as raw materials	MJ, net calorific value
	TOTAL	MJ, net calorific value
Secondary material		kg
Renewable secondary fuels		MJ, net calorific value
Non-renewable secondary fuels		MJ, net calorific value
Net use of fresh water		m^3

PARAMETER	UNIT
Hazardous waste disposed	kg
Non-hazardous waste disposed	kg
Radioactive waste disposed	kg

PARAMETER	UNIT
Components for reuse	kg

Content declaration

No substances that appear in the REACH candidate list of SVHC (Candidate List of Substances of Very High Concern) are present or used in the product concerning this EPD.

Environmental performance of the EPS80

Although there is a variation larger than 10% for some indicators modules, it would not be meaningful to report these at site level. Moreover, these variations are to a great extent caused by variation in the transport to site module (A2), which can naturally differ among sites.

Potential environmental impact per m^2 of EPS insulation

PARAMETER	UNIT	A1-A3	A4	A5	A1-A5	C1	C2	C3	C4	C1-C4	D
Global warming potential (GWP)	kg CO_2 eq.	1.63E+00	8.46E-03	1.86E-02	1.66E+00	4.35E-02	9.13E-04	5.45E-03	1.94E+00	1.99E+00	-9.81E-01
Acidification potential (AP)	kg SO_2 eq.	1.25E-10	1.37E-18	1.24E-18	1.25E-10	6.13E-18	1.47E-19	4.02E-17	1.16E-16	1.62E-16	-1.17E-12
Eutrophication potential (EP)	kg PO_4^{3-} eq.	4.30E-03	1.55E-05	2.25E-06	4.32E-03	6.28E-05	2.16E-06	4.65E-06	2.69E-04	3.39E-04	-1.20E-03
Formation potential of tropospheric ozone (POCP)	kg C_2H_4 eq.	4.14E-04	3.67E-06	4.80E-07	4.18E-04	8.67E-06	5.23E-07	6.73E-07	6.08E-05	7.07E-05	-1.51E-04
Ozone layer depletion potential (ODP)	kg R11-e	1.06E-02	-4.40E-06	1.45E-07	1.06E-02	6.93E-06	-7.37E-07	3.72E-07	1.82E-05	2.47E-05	-1.24E-04
Abiotic depletion potential – Elements	kg Sb eq.	1.50E-07	5.89E-10	2.31E-11	1.50E-07	1.18E-09	6.32E-11	4.64E-10	2.01E-09	3.72E-09	-1.63E-08
Abiotic depletion potential – Fossil resources	MJ, net calorific value	5.01E+01	1.12E-01	2.86E-03	5.02E+01	6.00E-01	1.21E-02	3.12E-02	2.45E-01	8.88E-01	-1.00E+01

Use of resources per m^2 of EPS insulation

PARAMETER	UNIT	A1-A3	A4	A5	A1-A5	C1	C2	C3	C4	C1-C4	D
Renewable primary energy used as energy carrier	MJ, net calorific value	2.36E+00	6.54E-03	7.32E-04	2.37E+00	1.85E-03	7.01E-04	1.03E-02	6.17E-02	7.46E-02	-8.81E-01
Renewable primary energy used as raw materials	MJ, net calorific value	1.35E-02	0.00E+00	0.00E+00	1.35E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.16E-10
Total renewable primary energy	MJ, net calorific value	2.37E+00	6.54E-03	7.32E-04	2.38E+00	1.85E-03	7.01E-04	1.03E-02	6.17E-02	7.46E-02	-8.81E-01
Non-renewable primary energy used as energy carrier	MJ, net calorific value	5.25E+01	1.13E-01	3.42E-03	5.26E+01	6.02E-01	1.21E-02	4.14E-02	2.93E-01	9.48E-01	-1.08E+01
Non-renewable primary energy used as raw materials	MJ, net calorific value	1.56E-04	5.92E-06	9.43E-08	1.62E-04	3.30E-07	6.35E-07	1.79E-06	7.60E-06	1.04E-05	-4.35E-05
Total non-renewable primary energy	MJ, net calorific value	5.25E+01	1.13E-01	3.42E-03	5.26E+01	6.02E-01	1.21E-02	4.14E-02	2.93E-01	9.48E-01	-1.08E+01
Secondary material	MJ, net calorific value	5.64E-03	0.00E+00	0.00E+00	5.64E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Renewable secondary fuels	MJ, net calorific value	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
Non-renewable secondary fuels	MJ, net calorific value	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
Net use of fresh water	m^3	1.18E-02	1.11E-05	4.63E-05	1.19E-02	4.29E-06	1.19E-06	2.08E-05	3.93E-03	3.96E-03	-1.83E-03

Waste production per m^2 of EPS insulation

PARAMETER	UNIT	A1-A3	A4	A5	A1-A5	C1	C2	C3	C4	C1-C4	D
Hazardous waste disposed	kg	5.47E-04	6.30E-09	1.82E-11	5.47E-04	7.22E-11	6.76E-10	2.53E-11	5.23E-10	1.30E-09	-5.94E-06
Non-hazardous waste disposed	kg	2.94E-02	9.17E-06	1.96E-04	2.96E-02	7.31E-05	9.83E-07	3.89E-04	1.73E-02	1.78E-02	-7.82E-03
Radioactive waste disposed	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

Output flows per m^2 of EPS insulation

PARAMETER	UNIT	A1-A3	A4	A5	A1-A5	C1	C2	C3	C4	C1-C4	D
Components for re-use	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
Materials for recycling	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.54E-03	0.00E+00	0.00E+00	0.00E+00	9.54E-03	0.00E+00
Materials for energy recovery	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.27E-01	0.00E+00	0.00E+00	0.00E+00	6.27E-01	0.00E+00
Exported electrical energy	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

Programme-related information and verification

The EPD owner has the sole ownership, liability, and responsibility for the EPD. Environmental product declarations within the same product category from different programs may not be comparable. Environmental product declarations of construction products may not be comparable if they do not comply with EN 15804.

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CEN standard EN 15804 serves as the Core Product Category Rules (PCR)
Product category rules (PCR): PCR 2012:01. Construction products and construction services. Version 2.3 of 2018-11-15.
PCR review was conducted by: The Technical Committee of the International EPD® System. Chair: Massimo Marino. Contact via info@environdec.com
Independent third-party verification of the declaration and data, according to ISO 14025:2006: ☐ EPD process certification ☒ EPD verification
Third party verifier: Carl-Otto Nevén Approved by: The International EPD® System
Procedure for follow-up of data during EPD validity involves third party verifier: ☒ Yes ☐ No

References

- EN 15804:2012+A1:2013, Sustainability of construction works – Environmental product declarations – Core rules for the product category of construction products.
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