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3rd PARTY VERIFIED

EPD

VERIFIED ENVIRONMENTAL PRODUCT DECLARATION | ISO 14025 & EN 15804



Owner of declaration

Company name: The EPS section under The Danish Plastics Federation
Jackon, Styrolit, Sundolitt
Vesterbrogade 1E, third floor,
1620 Copenhagen V
[CVR no. 11 48 82 77]



Issued:
04-07-2017

Valid to:
04-07-2022

Basis of calculation

This EPD is developed in accordance with the European standard EN 15804.

Comparability

EPDs of construction products may not be comparable if they do not comply with the requirements in EN 15804. EPD data may not be comparable if the datasets used are not developed in accordance with EN 15804 and if the background systems are not based on the same database.

Validity

This EPD has been verified in accordance with ISO 14025 and is valid for 5 years from the date of issue.

Use

The intended use of an EPD is to communicate scientifically based environmental information for construction products, for the purpose of assessing the environmental performance of buildings.

EPD type

- Cradle-to-gate
- Cradle-to-gate with options
- Cradle-to-grave

Programme operator

Danish Technological Institute
www.dti.dk



Programme

EPD Danmark
www.epddanmark.dk



Declared products

EPS insulation Graphite (compressive stress 80 kN/m²). In the following referred to as EPS insulation Graphite 80.

Production site

Production sites for Jackon, Styrolit and Sundolitt in Denmark.

Products use

The product is usually used in Denmark for heat insulation of buildings and comes in many dimensions with a range of thermal conductivity, lambda and compressive stress'. EPS insulation can be used almost anywhere in buildings: Slab floor, flooring, walls and roofs.

Declared unit

1 m² of EPS insulation Graphite 80 with a thickness of 31 mm.

CEN standard EN 15804 serves as the core PCR
Independent verification of the declaration and data, according to EN ISO 14025 <input type="checkbox"/> internal <input checked="" type="checkbox"/> external
Third party verifier: David Palm

[Name]
EPD Danmark

Life cycle stages and modules (X = included MNR = module not relevant)

Product		Construction process			Use								End of life			Beyond the system boundary
Raw material supply	Transport	Manufacturing	Transport	Installation process	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	De-construction demolition	Transport	Waste processing	Disposal	Re-use, recovery and recycling potential
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
X	X	X	X	X	MNR	MNR	MNR	MNR	MNR	MNR	MNR	MNR	X	X	MNR	X

Product information

Product description

The product components are shown in the table below, including variance from different producers.

Material	Weight-% of declared product
Polystyrene	Range: >90 - >95
Graphite	Range: <5 - <7
Pentane	<2

Representativity

This declaration, including data collection and the modeled foreground system including results, represents the average production of 1 m² of EPS insulation Graphite 80, with a thickness of 31 mm, for the three producers, Jackon, Styrolit and Sundolitt, located in Denmark. Product specific data are based on annual average values for year 2015. Resource use and environmental impacts have been calculated based on a weighted average of the production amount at each production plant. The product density is given as the approximate average value of the products from the three producers (no weighting applied). Background data is based on GaBi ts 7.3.3 incl. databases 2017 Edition and are less than 10 years old.

Dangerous substances

The declared products do not contain any substances listed in the "Candidate List of Substances of Very High Concern for Authorisation" (<http://echa.europa.eu/candidate-list-table>). Absence of these substances are declared by the producers.

Essential characteristics (CE)

The declared products are covered by harmonised technical specification DS/EN13163.

Further technical information can be obtained by contacting the manufacturer or on the manufacturers websites:

Jackon

Safety data sheet:

<https://www.jackon.dk/assets/FileUploads/JackonSuperEPS-sikkerhedsdatablade.pdf>

DoP: <https://www.jackon.dk/assets/FileUploads/Ydeevnedeklaration-DK-JS80.pdf>

Manufacturer's instructions: <https://www.jackon.dk/brochurer-2/>

Other information: <https://www.jackon.dk/brochurer-2/>

Styrolit

Safety data sheet:

<http://styrolit.dk/wp-content/uploads/2013/02/Datablad-Styrolit-P60-P80.pdf>

DoP: <http://styrolit.dk/wp-content/uploads/2013/12/Ydeevnedeklaration-P80.pdf>

Manufacturer's instructions: <http://styrolit.dk/downloads/>

Other information: <http://styrolit.dk/downloads/>

Sundolitt

Safety data sheet: <http://www.sundolitt.dk/sundolitt/miljo-og-kvalitet/miljo---sikkerhedsdata>

DoP: <http://www.sundolitt.dk/sundolitt/miljo-og-kvalitet/deklarationer>

Manufacturer's instructions:

<http://www.sundolitt.dk/sundolitt/produkter/sundolitt-climate---eps/c80>

Other information:

<http://www.sundolitt.dk/sundolitt/produkter/brochurer-og-nyhedsbreve>

Reference Service Life (RSL)

Properly built-in insulation is expected to have the same lifetime, applicable to declared properties, as the construction in which the insulation is built in. No experience indicates otherwise.

The expected service life of the building in which the EPS insulation Graphite 80 will be used is here set to be 60 years.¹

¹ In accordance with Norwegian specifications (see NPCR 12 rev1 (2012)).

LCA background

Declared unit

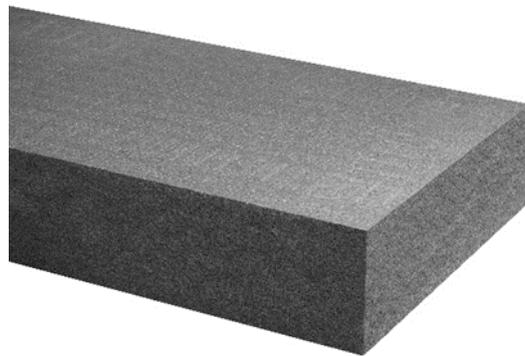
The LCI and LCIA results in this EPD relates to EPS insulation Graphite 80 with a thickness of 31 mm.

Name	Value	Unit
Declared unit	1	m ²
Density	16	kg/m ³
Conversion factor to 1 kg.	0.50	-

Functional unit

The functional unit is 1 m² of EPS insulation Graphite 80, with a thickness of 31 mm, having the same service life as the building in which the EPS insulation will be used, is set to be 60 years.

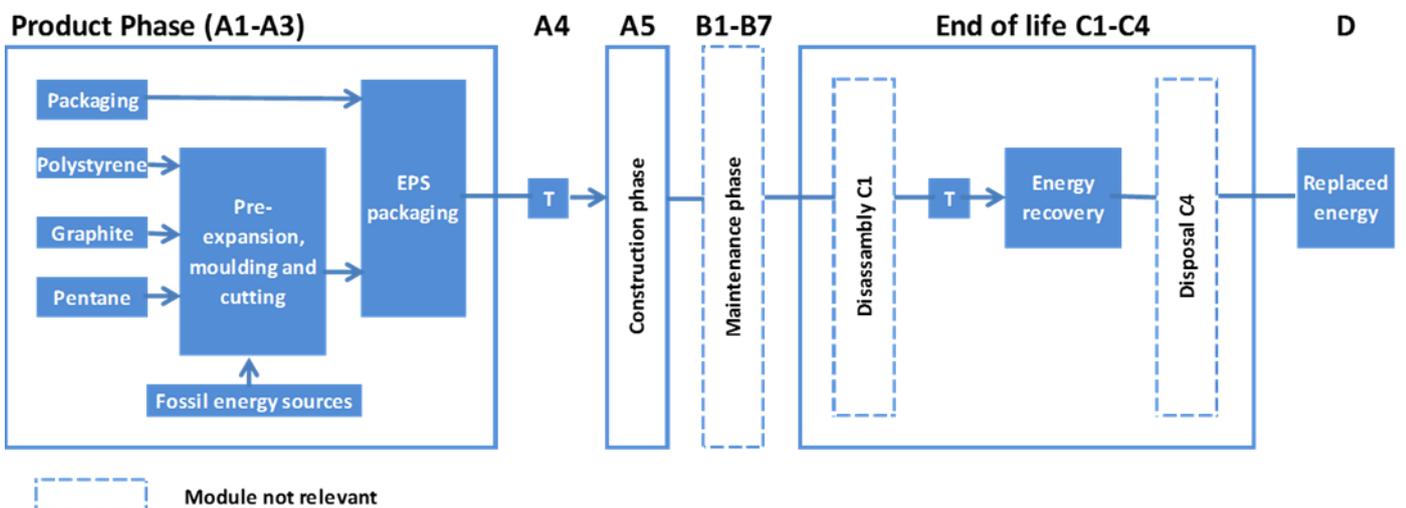
Product illustration



PCR

This EPD is developed according to the core rules for the product category of construction products in EN 15804. Besides EN 15804, which is the core Product Category Rule (PCR), *NPCR 12 rev1* is used as PCR for this EPD.

Flow diagram



System boundaries

This EPD is based on a cradle-to-grave LCA, in which 100 weight-% has been accounted for.

The general rules for the exclusion of inputs and outputs follows the requirements in EN 15804, 6.3.5, where the total of neglected input flows per module shall be a maximum of 5 % of energy usage and mass and 1 % of renewable and non-renewable primary energy usage and mass for unit processes.

Product stage (A1-A3) includes:

- A1 – Extraction and processing of raw materials
- A2 – Transport to the production site
- A3 – Manufacturing processes

The product stage comprises the acquisition of all raw materials, products and energy, transport to the production site, packaging and waste processing up to the "end-of-waste" state or final disposal. The LCA results are declared in aggregated form for the product stage, which means, that the sub-modules A1, A2 and A3 are declared as one module A1-A3.

The production process includes a combination of heat and pressure and utilize clean technologies that are minimally energy- and water intensive as the energy is recycled in a closed circuit. This makes EPS production highly effective. No solid waste results directly from the production of EPS products, as waste is immediately returned to production line. However, some solid waste is produced from the packaging, e.g. used for raw material transport and transport of packaging materials for the finished EPS products.

The pentane content in the EPS products is highest right after production, where after it continues to decrease. After approximately one month almost all the pentane has been emitted from the products.

While some of the pentane is released after the production process, it still relates to the production and is thus here treated as if all the pentane was released during the production, that is, all impacts from the pentane emission is reported in module A3.

The distance from the production site to waste handling site, for waste processing of waste from the production process, is assumed to be 10 km.

Construction process stage (A4-A5) includes:

- A4 - Transport to building site:

EPS insulation Graphite 80				
Type of transport	Capacity utilized incl. return (%)	Distance (km)	Fuel consumption (l/tkm)	Value (l/t)
Truck (34-40 t)	5	100	1.73E-01	17.3

A5 - Installation into building

This includes provision of all materials, products and energy, as well as waste processing up to the end-of waste state or disposal of final residues during the construction stage, as well as all impacts and aspects related to losses during the construction process.

Installation of EPS insulation requires almost no use of materials and energy. Therefore, the building stage (A5) only includes transport and end-of-life handling for used packaging material.

The distance from the building site to waste handling site is assumed to be 10 km.

Use stage (B1-B7) includes:

The use stage, related to the building fabric (B1-B5) includes, according to EN 15804:

- B1 - Use or application of the installed product
- B2 - Maintenance
- B3 - Repair
- B4 - Replacement
- B5 - Refurbishment

This stage includes provision and transport of all materials, products and related energy and water use, as well as waste processing up to the end-of-waste state or disposal of final residues during this part of the use stage. These information modules also include all impacts and aspects related to the losses during this part of the use stage (i.e. production, transport and waste processing and disposal of the lost products and materials).

The use stage related to the operation of the buildings (B6-B7), according to EN 15804:

- B6 - Operational energy use
- B7 - Operational water use

The use stage (B1-B7) is assumed not relevant in this LCA study, as declared above. This is due to the assumption that the insulation material requires no maintenance or replacement during the buildings technical lifetime. This means that no material or energy consumption, nor any emissions, have been included for this stage.

End of life stage (C1-C4) includes:

- C1 - Deconstruction, demolition
- C2 - Transport to waste processing
- C3 - Waste processing for reuse, recovery and/or recycling and energy recovery
- C4 - Disposal

Including provision and all transport, provision of all materials, products and related energy and water use.

C1 - Deconstruction, demolition

It is assumed, that the EPS insulation is collected separately and that no materials or energy is consumed for dismantling of the EPS products. Thus, the end of life stage includes only impacts from the stages C2-C4. End of life handling (C3) is assumed to be waste incineration, taking place at a waste handling site.

The distance from the building site to waste handling site is assumed to be 10 km.

EPS insulation Graphite 80				
Type of transport	Capacity utilized incl. return (%)	Distance (km)	Fuel consumption (l/tkm)	Value (l/t)
Truck (34-40 t)	5	10	1.73E-01	1.73

No disposal (C4) is included, as the end of life handling is assumed to be waste incineration.

Benefits and loads beyond the system boundary (D) includes:

D - Reuse, recovery and/or recycling potentials, expressed as net impacts and benefits

This module includes net impacts and benefits from reuse, recovery and/or recycling potentials beyond the system boundary for all modules beyond A1-A3. In this EPD, module D includes energy recovery from incineration of products and packaging, for which generic GaBi dataset values have been applied.

LCA results

ENVIRONMENTAL IMPACTS PER M ² EPS INSULATION GRAPHITE 80, WITH A THICKNESS OF 31 MM ²										
Parameter	Unit	A1-A3	A4	A5	B1-B7	C1	C2	C3	C4	D
GWP	[kg CO ₂ -eq.]	1.35E+00	2.58E-02	2.07E-02	-	-	2.57E-03	1.69E+00	-	-7.02E-01
ODP	[kg CFC11-eq.]	8.72E-11	2.09E-14	2.66E-15	-	-	2.09E-15	1.97E-13	-	-4.51E-13
AP	[kg SO ₂ -eq.]	3.41E-03	8.63E-05	1.38E-06	-	-	8.62E-06	9.60E-05	-	-7.03E-04
EP	[kg PO ₄ ³⁻ -eq.]	3.14E-04	2.12E-05	2.89E-07	-	-	2.12E-06	2.02E-05	-	-1.03E-04
POCP	[kg ethene-eq.]	1,03E-02	-3.23E-05	1.38E-07	-	-	-3.23E-06	9.70E-06	-	-6.07E-05
ADPE	[kg Sb-eq.]	6.83E-07	2.34E-09	1.14E-10	-	-	2.34E-10	8.26E-09	-	-1.58E-07
ADPF	[MJ]	4.05E+01	3.54E-01	2.14E-03	-	-	3.54E-02	1.58E-01	-	-9.52E+00
Caption	GWP = Global warming potential; ODP = Ozone depletion potential; AP = Acidification potential of soil and water; EP = Eutrophication potential; POCP = Photochemical ozone creation potential; ADPE = Abiotic depletion potential for non fossil resources; ADPF = Abiotic depletion potential for fossil resources									

RESOURCE USE PER M ² EPS INSULATION GRAPHITE 80, WITH A THICKNESS OF 31 MM										
Parameter	Unit	A1-A3	A4	A5	B1-B7	C1	C2	C3	C4	D
PERE	[MJ]	1.38E+00	1.83E-02	3.88E-04	-	-	1.83E-03	2.86E-02	-	-3.18E+00
PERM	[MJ]	8.54E-02	-	-	-	-	-	-	-	-
PERT	[MJ]	1.46E+00	1.83E-02	3.88E-04	-	-	1.83E-03	2.86E-02	-	-3.18E+00
PENRE	[MJ]	3.30E+01	3.56E-01	2.56E-03	-	-	3.56E-02	1.89E-01	-	-9.95E+00
PENRM	[MJ]	8.30E+00	-	-	-	-	-	-	-	-
PENRT	[MJ]	4.13E+01	3.56E-01	2.56E-03	-	-	3.56E-02	1.89E-01	-	-9.95E+00
SM	[kg]	-	-	-	-	-	-	-	-	-
RSF	[MJ]	-	-	-	-	-	-	-	-	-
NRSF	[MJ]	-	-	-	-	-	-	-	-	-
FW	[m ³]	8.01E-01	1.88E-03	3.29E-04	-	-	1.88E-04	2.42E-02	-	-7.71E-01
Caption	PERE = Use of renewable primary energy excluding renewable primary energy resources used as raw materials; PERM = Use of renewable primary energy resources used as raw materials; PERT = Total use of renewable primary energy resources; PENRE = Use of non renewable primary energy excluding non renewable primary 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 material; RSF = Use of renewable secondary fuels; NRSF = Use of non renewable secondary fuels; FW = Use of net fresh water									

WASTE CATEGORIES AND OUTPUT FLOWS PER M ² EPS INSULATION 80, WITH A THICKNESS OF 31 MM										
Parameter	Unit	A1-A3	A4	A5	B1-B7	C1	C2	C3	C4	D
HWD	[kg]	4.39E-04	1.86E-08	1.56E-12	-	-	1.86E-09	1.04E-10	-	-4.64E-09
NHWD	[kg]	2.02E-02	2.82E-05	3.23E-05	-	-	2.82E-06	1.68E-03	-	-9.58E-03
RWD	[kg]	3.36E-04	7.36E-07	1.67E-07	-	-	7.35E-08	1.24E-05	-	-1.74E-04

CRU	[kg]	-	-	-	-	-	-	-	-	-
MFR	[kg]	-	-	-	-	-	-	-	-	-
MER	[kg]	-	-	6.74E-03	-	-	-	5.00E-01	-	-5.07E-01
EEE	[MJ]	-	-	-	-	-	-	-	-	-2.69E+00
EET	[MJ]	-	-	-	-	-	-	-	-	-6.12E+00
Caption	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; EET = Exported thermal energy									

² There is some variability between producers, but for confidentiality reasons this is not included.

Additional information

Technical information on scenarios

Transport to the building site (A4)

Parameter	Value	Unit
Fuel type and consumption	EURO 5 (diesel, 1.73E-01 L/tkm)	
Transport distance	100	Km
Capacity utilisation (including empty runs) (mass based)	5	%
Bulk density of products transported	16	kg/m ³
Capacity utilisation volume factor	The volume has already been factored in: The capacity utilization given above is calculated based on volume, and converted to utilization based on mass, as EPS products are specifically lightweight goods.	

Installation of the product in the building (A5)

Parameter	Value	Unit
Ancillary materials	-	kg
Water use	-	m ³
Other resource use	-	kg
Energy type and consumption	-	kWh
Waste materials	3.2E-05	kg
Output materials	6.7E-03	kg
Direct emissions to air, soil or water	-	kg

Use (B1-B7)

Parameter	Value	Unit
Module not relevant		

Reference service life

Navn	
Reference service Life	Properly built-in insulation is expected to have the same lifetime, applicable to declared properties, as the construction in which the insulation is built in. The expected service life of the building the EPS insulation graphite 80 will be used in is here set to be 60 years.
Declared product properties	Reference is made to DoP's and manufacturer's instructions, where relevant.
Design application parameters	
Assumed quality of work	
Outdoor environment	
Indoor environment	
Usage conditions	
Maintenance	Maintenance and replacements of the insulation products is not considered relevant in order to obtain the expected reference service life.

End of life (C1-C4)

Parameter	Value	Unit
Collected separately	5.00E-01	kg
Collected with mixed waste	0	kg
For reuse	0	kg
For recycling	0	kg
For energy recovery	5.00E-01	kg
For final disposal	0	kg
Assumptions for scenario development	See information under 'System boundaries' above	-

Indoor air

The EPD does not give information on release of dangerous substances to indoor air because the horizontal standards on measurement of release of regulated dangerous substances from construction products using harmonised test methods according to the provisions of the respective technical committees for European product standards are not available.

Soil and water

The EPD does not give information on release of dangerous substances to soil and water because the horizontal standards on measurement of release of regulated dangerous substances from construction products using harmonised test methods according to the provisions of the respective technical committees for European product standards are not available.

Conversion table

Conversion table to other EPS Insulation types, based on approximate average densities from the producers, is given here. It is important to notice, that the functional unit changes when these product properties changes. EPS with higher compressive stress will have a higher thermal resistance and increased thickness also increases the thermal resistance. The EPS can also have other properties which alters the application areas.

Conversion values to other compressive stresses and thicknesses		
Compressive stress [kN/m ²]	Thickness [mm]	
	38	100
60	0.8	2.1
80	1.0	2.6

References

Publisher	 http://www.epddanmark.dk
Programme operator	Danish Technological Institute Sustainable Construction Kongsvang Allé 29 DK-8000 Aarhus C http://www.teknologisk.dk
LCA-practitioner	Susanne Vedel Hjuler COWI A/S Parallevej 2, 2800 Kongens Lyngby E-mail: suvj@cowi.com
LCA software / background data	GaBi ts 7.3.3 incl. databases 2017 Edition
3rd party verifier	David Palm, Ramböll Sverige AB

General programme instructions

Version 1.7

www.epddanmark.dk

EN 15804

DS/EN 15804 + A1:2013 - "Sustainability of construction works – Environmental product declarations – Core rules for the product category of construction products"

EN 15942

DS/EN 15942:2011 – " Sustainability of construction works – Environmental product declarations – Communication format business-to-business"

ISO 14025

DS/EN ISO 14025:2010 – " Environmental labels and declarations – Type III environmental declarations – Principles and procedures"

ISO 14040

DS/EN ISO 14040:2008 – " Environmental management – Life cycle assessment – Principles and framework"

ISO 14044

DS/EN ISO 14044:2008 – " Environmental management – Life cycle assessment – Requirements and guidelines"

NPCR 12 rev1

NPCR 12 rev1, Insulation materials, Issue date: 10.12.2012, valid to: 10.12.2017. The Norwegian EPD Foundation