ENVIRONMENTAL PRODUCT DECLARATION

as per ISO 14025 and EN 15804

Owner of the Declaration	**EUMEPS – Expanded Polystyrene (EPS) Foam Insulation**
Programme holder	Institut Bauen und Umwelt e.V. (IBU)
Publisher	Institut Bauen und Umwelt e.V. (IBU)
Declaration number	EPD-EPS-20130077-CBG1-EN
Issue date	28.05.2013
Valid to	27.05.2018

Expanded Polystyrene (EPS) Foam Insulation (without flame retardant, density 20 kg/m³), EPS 100

EUMEPS (region Scandinavia)

Institut Bauen und Umwelt e.V.

www.bau-umwelt.com / https://epd-online.com

General Information

EUMEPS

Programme holder

IBU - Institut Bauen und Umwelt e.V.
Rheinufer 108
D-53639 Königswinter

Declaration number

EPD-EPS-20130077-CBG1-EN

This Declaration is based on the Product Category Rules:

Insulating materials made of foam plastics, 10-2012
(PCR tested and approved by the independent expert committee)

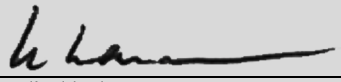
Issue date

28.05.2013

Valid to

27.05.2018

Prof. Dr.-Ing. Horst J. Bossenmayer
(President of Institut Bauen und Umwelt e.V.)



Prof. Dr.-Ing. Hans-Wolf Reinhardt
(Chairman of SVA)

EPS

Owner of the Declaration

EUMEPS – European Association of EPS
Weertersteenweg 158
B-3680 Maaseik (Belgium)

Declared product / Declared unit

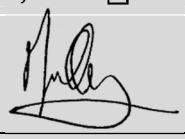
Expanded Polystyrene (EPS) without flame retardant, with average density of 20 kg/m³ / 1 m³ and 1 m² with R-value 1

Scope:

The applicability of the document is restricted to EPS boards produced by manufacturing plants of EPS converters who are members of their national EPS association, which themselves are members of EUMEPS. The data have been provided by a representative mix of 3 converters from amongst the EUMEPS membership from Scandinavia, based upon production during 2011.

Verification

The CEN Norm EN 15804 serves as the core PCR
Independent verification of the declaration and data according to ISO 14025
☐ internally ☒ externally



Olivier Muller
(Independent tester appointed by SVA)

Product

Product description

This EPD describes Expanded Polystyrene foam (EPS) in accordance with EN 13163. The closed cell structure is filled with air (98% air; only 2% polystyrene) and results in a light weight, tough, strong and rigid thermoplastic insulation foam. The products are mainly used for thermal and acoustical insulation of buildings. The foam is available in various dimensions and shapes. Boards can be supplied with different edge treatments such as butt edge, ship lap, tongue and groove. Density range is from about 18 to 22 kg/m³ corresponding to a compressive strength value of about 100 kPa.
This EPD is applicable to homogeneous EPS products without material combinations or facings. Most important properties are the thermal conductivity and compressive strength.
The declared products are manufactured without use of flame retardant.

Application

The performance properties of EPS thermal insulation foams make them suitable for use in many applications. The range of products described in this document is used in applications such as wall insulation, pitched roof insulation, ETICS, cavity wall insulation, ceiling insulation, insulation for building equipment and industrial installations.

Technical Data

Constructional data

Name	Value	Unit
Gross density	18-22	kg/m³
Thermal conductivity acc. to EN 12667	0.035	W/(mK)
Compressive strength acc. to EN 826	100	kPa
Bending strength acc. to EN 12089	150	kPa
Water vapour diffusion resistance factor acc. to EN 12086	30-70	-

Base materials / Ancillary materials

EPS foams are made of polystyrene (95 % by weight), blown with pentane up to 6 % by weight, which is released partly during or shortly after production.
This EPD refers to products, which are produced without the addition of a flame retardant.
Typically no other additives are used. Polystyrene and pentane are produced from oil and gas therefore linked to the availability of these raw materials.
The product dimensions can vary depending on, for example, the product, the manufacturer, the application and the applicable quality label.

Reference service life
Properly installed EPS boards (see: Installation) are durable with respect to their insulation, structural and dimensional properties. They are water resistant, resistant against micro-organisms and against most chemical substances. EPS, however, should not be brought into contact with organic solvents.
If applied correctly the lifetime of EPS insulation is equal to the building life time, usually without requiring any maintenance. Durability studies on applied EPS show no loss of technical properties after 35 years. Additional tests with products under artificial aging show that "no deficiencies are to be expected from EPS fills placed in the ground over a normal life cycle of 100 years."/Langzeitverhalten 2004/, /Long-term performance 2001/.

The application of insulation material has a positive impact on energy efficiency of buildings. Quantification is only possible in context with the construction system of the building.

Dependent on the specific material and the frame conditions of installation, residual pentane may diffuse. Quantified measurements and release profiles cannot be declared.

LCA: Calculation rules

Declared Unit
Reference value is 1 m³ of expanded polystyrene rigid foam. In addition, the results for the functional unit of a volume per square metre that leads to an R-value of 1 are considered.

Declared unit

Name	Value	Unit
Declared unit	1	m^3
Gross density	20	kg/m^3
Conversion factor to 1 kg	1/20	-
Declared unit	1	m^2
R-value	1	-
Thickness	3.5	cm
Volume per m²	0.035	m³
Conversion factor to 1 kg	1/0.7	-

System boundary
The analysis of the product life cycle includes production of the basic materials, transport of the basic materials, manufacture of the product and the packaging materials and is declared in module A1-A3. Transport of the product is declared in module A4, and disposal of the packaging materials in module A5.

Gained energy from packaging incineration is declared in module D.
The use stage is not taken into account in the LCA calculations. The positive impact on environment due to energy saving depends on the application system in the building. This needs to be considered on next level by the evaluation of buildings.
The end-of-life scenarios include the transport to end-of-life stage (C2)

EoL-scenario "Incineration": 100% incineration: The effort and emissions of an incineration process is declared in module C3. Resulting energy is declared in module D.
EoL-scenario "Landfilling": 100% landfilling: The effort and emissions of the landfilling is declared in module C4.

Comparability
Basically, a comparison or an evaluation of EPD data is only possible if all the data sets to be compared were created according to EN 15804 and the building context, respectively the product-specific characteristics of performance, are taken into account.

LCA: Scenarios and additional technical information

Transport to the building site (A4)

Name	Value	Unit
Litres of fuel (truck, per 1m³)	0,141	l/100km
Transport distance	200	km
Capacity utilisation (including empty runs)	50	%
Gross density of products transported	20	kg/m^3

Installation into the building (A5)
Product specific handling recommendations can be found in product and application literature, brochures and data sheets provided by the suppliers.

End of life (C1-C4)
The considered amount of product for the End-of-Life scenario "Incineration" and "Landfilling" refers to the respective declared unit.

LCA: Results

All impact categories, with the exception of POCP, are dominated by the influence of the basic material (polystyrene granules mix) production. The polystyrene deployed in the production process already contains a large part of the environmental burdens. The foaming process for the declared product polystyrene rigid foam also contributes significantly to the environmental impacts. The emission of pentane during that process makes a contribution to the Photochemical Ozone Creation Potential (POCP).
Transportation has a low influence on all impact categories compared to the contributions from other areas.
The primary energy demand is basically determined by the requirements for the basic material production (polystyrene granules with pentane).
Due to the high calorific value of the product, incineration during the end-of-life stage in scenario “Incineration” results in an energy gain.

PRODUCT STAGE			CONSTRUCTION PROCESS STAGE		USE STAGE							END OF LIFE STAGE				BENEFITS AND LOADS BEYOND THE SYSTEM BOUNDARYS
Raw material supply	Transport	Manufacturing	Transport	Construction-installation process	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	MND	MND	MND	MND	MND	MND	MND	MND	X	X	X	X

RESULTS OF THE LCA - ENVIRONMENTAL IMPACT: density 20 kg/m³ (range: 18-22 kg/m³)

Results per declared unit of 1 m³

Para-meter	Unit	A1-A3	A4	A5	C2	C3/I[1]	C3/L[2]	C4/I	C4/L	D/I	D/L
GWP	[kg CO_2-Eq.]	5,0E+01	5,9E-01	1,2E+00	9,8E-02	6,9E+01	0	0	1,4E+00	-3,8E+01	-6,2E-01
ODP	[kg CFC11-Eq.]	1,3E-06	1,0E-09	1,7E-10	1,7E-10	7,2E-09	0	0	5,9E-08	-2,2E-06	-3,4E-08
AP	[kg SO_2-Eq.]	1,4E-01	2,6E-03	1,1E-04	4,3E-04	4,3E-03	0	0	4,7E-03	-8,6E-02	-1,4E-03
EP	[kg $(PO_4)^{3-}$- Eq.]	1,2E-02	6,0E-04	3,5E-05	9,9E-05	1,6E-03	0	0	5,2E-03	-6,8E-03	-1,1E-04
POCP	[kg Ethen Eq.]	3,4E-01	2,8E-04	1,9E-05	4,3E-05	6,5E-04	0	0	5,9E-04	-6,3E-03	-1,0E-04
ADPE	[kg Sb Eq.]	7,5E-06	2,0E-08	6,7E-09	3,3E-09	3,2E-07	0	0	2,1E-07	-2,3E-06	-3,8E-08
ADPF	[MJ]	1,6E+03	8,1E+00	4,0E-01	1,4E+00	2,0E+01	0	0	2,0E+01	-5,8E+02	-9,5E+00

Results per declared unit of 1 m² with R-value 1 (λ = 0.035 W/mK, thickness 3.5 cm)

Para-meter	Unit	A1-A3	A4	A5	C2	C3/I	C3/L	C4/I	C4/L	D/I	D/L
GWP	[kg CO_2-Eq.]	1,8E+00	2,0E-02	4,1E-02	3,4E-03	2,4E+00	0	0	4,8E-02	-1,3E+00	-2,2E-02
ODP	[kg CFC11-Eq.]	4,5E-08	3,6E-11	6,0E-12	6,1E-12	2,5E-10	0	0	2,1E-09	-7,5E-08	-1,2E-09
AP	[kg SO_2-Eq.]	5,0E-03	9,1E-05	3,7E-06	1,5E-05	1,5E-04	0	0	1,7E-04	-3,0E-03	-4,9E-05
EP	[kg $(PO_4)^{3-}$- Eq.]	4,3E-04	2,1E-05	1,2E-06	3,5E-06	5,6E-05	0	0	1,8E-04	-2,4E-04	-3,9E-06
POCP	[kg Ethen Eq.]	1,2E-02	9,7E-06	6,6E-07	1,5E-06	2,3E-05	0	0	2,1E-05	-2,2E-04	-3,6E-06
ADPE	[kg Sb Eq.]	2,6E-07	6,9E-10	2,4E-10	1,2E-10	1,1E-08	0	0	7,3E-09	-8,2E-08	-1,3E-09
ADPF	[MJ]	5,5E+01	2,8E-01	1,4E-02	4,8E-02	7,1E-01	0	0	7,0E-01	-2,0E+01	-3,3E-01

Caption	GWP = Global warming potential; ODP = Depletion potential of the stratospheric ozone layer; AP = Acidification potential of land and water; EP = Eutrophication potential; POCP = Formation potential of tropospheric ozone photochemical oxidants; ADPE = Abiotic depletion potential for non fossil resources; ADPF = Abiotic depletion potential for fossil resources

RESULTS OF THE LCA - RESOURCE USE: density 20 kg/m³ (range: 18-22 kg/m³)

Results per declared unit of 1 m³

Para-meter	Unit	A1-A3	A4	A5	C2	C3/I	C3/L	C4/I	C4/L	D/I	D/L
PERE	[MJ]	1,4E+01	8,9E-03	1,1E-03	1,5E-03	4,3E-02	0	0	6,3E-01	-1,3E+01	-2,0E-01
PERM	[MJ]	0	0	0	0	0	0	0	0	0	0
PERT	[MJ]	1,4E+01	8,9E-03	1,1E-03	1,5E-03	4,3E-02	0	0	6,3E-01	-1,3E+01	-2,0E-01
PENRE	[MJ]	8,2E+02	8,2E+00	4,0E-01	1,4E+00	2,0E+01	0	0	2,2E+01	-6,6E+02	-1,1E+01
PENRM	[MJ]	7,9E+02	0	0	0	0	0	0	0	0	0
PENRT	[MJ]	1,6E+03	8,2E+00	4,0E-01	1,4E+00	2,0E+01	0	0	2,2E+01	-6,6E+02	-1,1E+01
SM	[kg]	5,6E-02	0	0	0	0	0	0	0	0	0
RSF	[MJ]	0	0	0	0	0	0	0	0	0	0
NRSF	[MJ]	0	0	0	0	0	0	0	0	0	0
FW	[kg]	1,7E+02	1,5E-01	1,4E+00	2,5E-02	7,3E+01	0	0	2,0E+00	-7,9E+01	-1,3E+00

[1] Scenario ”I“ = 100% Incineration
[2] Scenario “L“ = 100% Landfilling

Results per declared unit of 1 m² with R-value 1 (λ = 0.035 W/mK, thickness 3.5 cm)

Para-meter	Unit	A1-A3	A4	A5	C2	C3/I	C3/L	C4/I	C4/L	D/I	D/L
PERE	[MJ]	4,9E-01	3,1E-04	3,9E-05	5,2E-05	1,5E-03	0	0	2,2E-02	-4,5E-01	-7,1E-03
PERM	[MJ]	0	0	0	0	0	0	0	0	0	0
PERT	[MJ]	4,9E-01	3,1E-04	3,9E-05	5,2E-05	1,5E-03	0	0	2,2E-02	-4,5E-01	-7,1E-03
PENRE	[MJ]	2,9E+01	2,9E-01	1,4E-02	4,8E-02	7,2E-01	0	0	7,7E-01	-2,3E+01	-3,8E-01
PENRM	[MJ]	2,8E+01	0	0	0	0	0	0	0	0	0
PENRT	[MJ]	5,6E+01	2,9E-01	1,4E-02	4,8E-02	7,2E-01	0	0	7,7E-01	-2,3E+01	-3,8E-01
SM	[kg]	2,0E-03	0	0	0	0	0	0	0	0	0
RSF	[MJ]	0	0	0	0	0	0	0	0	0	0
NRSF	[MJ]	0	0	0	0	0	0	0	0	0	0
FW	[kg]	6,1E+00	5,2E-03	4,9E-02	8,8E-04	2,6E+00	0	0	7,0E-02	-2,8E+00	-4,4E-02

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

RESULTS OF THE LCA – OUTPUT FLOWS AND WASTE CATEGORIES: density 20 kg/m³ (range: 18-22 kg/m³)

Results per declared unit of 1 m³

Para-meter	Unit	A1-A3	A4	A5	C2	C3/I	C3/L	C4/I	C4/L	D/I	D/L
HWD	[kg]	1,1E-01	0	1,6E-03	0	0	0	0	0	0	0
NHWD	[kg]	3,0E+01	4,0E-02	6,6E-03	6,7E-03	2,5E-01	0	0	2,2E+01	-3,2E+01	-5,1E-01
RWD	[kg]	1,6E-02	1,3E-05	2,1E-06	2,2E-06	8,8E-05	0	0	7,3E-04	-2,7E-02	-4,3E-04
CRU	[kg]	-	-	-	-	-	-	-	-	0	0
MFR	[kg]	-	-	-	-	-	-	-	-	0	0
MER	[kg]	-	-	-	-	-	-	-	-	0	0
EEE	[MJ]	-	-	-	-	-	-	-	-	-5,3E+01	-8,5E-01
EET	[MJ]	-	-	-	-	-	-	-	-	-4,7E+02	-7,7E+00

Results per declared unit of 1 m² with R-value 1 (λ = 0.035 W/mK, thickness 3.5 cm)

Para-meter	Unit	A1-A3	A4	A5	C2	C3/I	C3/L	C4/I	C4/L	D/I	D/L
HWD	[kg]	3,9E-03	0	5,4E-05	0	0	0	0	0	0	0
NHWD	[kg]	1,1E+00	1,4E-03	2,3E-04	2,4E-04	8,9E-03	0	0	7,7E-01	-1,1E+00	-1,8E-02
RWD	[kg]	5,6E-04	4,5E-07	7,4E-08	7,5E-08	3,1E-06	0	0	2,6E-05	-9,5E-04	-1,5E-05
CRU	[kg]	-	-	-	-	-	-	-	-	0	0
MFR	[kg]	-	-	-	-	-	-	-	-	0	0
MER	[kg]	-	-	-	-	-	-	-	-	0	0
EEE	[MJ]	-	-	-	-	-	-	-	-	-1,9E+00	-3,0E-02
EET	[MJ]	-	-	-	-	-	-	-	-	-1,6E+01	-2,7E-01

Caption	HWD = Hazardous waste disposed; NHWD = Non hazardous waste disposed; RWD = Radioactive waste disposed; CRU = Components for re-use; MFR = Materials for recycling; MER = Materials for energy recovery; EEE = Exported electrical energy; EEE = Exported thermal energy

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