ENVIRONMENTAL PRODUCT DECLARATION

as per ISO 14025 and EN 15804

Owner of the Declaration	EUMEPS European Manufacturers of Expanded Polystyrene
Programme holder	Institut Bauen und Umwelt e.V. (IBU)
Publisher	Institut Bauen und Umwelt e.V. (IBU)
Declaration number	EPD-EUM-20160272-IBG1-EN
ECO EPD Ref. No.	ECO-00000509
Issue date	20/04/2017
Valid to	19/04/2022

Expanded Polystyrene (EPS) Foam Insulation (density 30 kg/m³)

EUMEPS

www.ibu-epd.com / https://epd-online.com

1. General Information

EUMEPS – Expanded Polystyrene (EPS) Foam Insulation	**Expanded Polystyrene (EPS) Foam Insulation (density 30 kg/m³)**
Programme holder IBU - Institut Bauen und Umwelt e.V. Panoramastr. 1 10178 Berlin Germany	**Owner of the Declaration** EUMEPS – European Association of EPS Weertersteenweg 158 B-3680 Maaseik Belgium
Declaration number EPD-EUM-20160272-IBG1-EN	**Declared product / Declared unit** Expanded polystyrene foam (EPS) produced by EUMEPS members. The EPD applies to 1 m³ and 1 m² with R-value 1 (in EPD Annex) with average density of 30 kg/m³.
This Declaration is based on the Product Category Rules: Insulating materials made of foam plastics, 07.2014 (PCR tested and approved by the SVR) **Issue date** 20/04/2017 **Valid to** 19/04/2022	**Scope:** The companies contributing to the data collection produce one third of the expanded polystyrene foam boards sold by the members of the EUMEPS association in Europe. The data have been provided by 19 factories out of 18 companies for the year 2015. 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 owner of the declaration shall be liable for the underlying information and evidence; the IBU shall not be liable with respect to manufacturer information, life cycle assessment data and evidences.
Prof. Dr.-Ing. Horst J. Bossenmayer (President of Institut Bauen und Umwelt e.V.)	**Verification** The CEN Norm /EN 15804/ serves as the core PCR Independent verification of the declaration according to /ISO 14025/ ☐ internally ☒ externally
Dr. Burkhart Lehmann (Managing Director IBU)	Prof. Dr. Birgit Grahl (Independent verifier appointed by SVR)

2. Product

2.1 Product description / Product definition

This EPD describes Expanded Polystyrene foam (EPS). 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 28 to 32 kg/m3 corresponding to a compressive strength value of about 200 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 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 19 converters from amongst the EUMEPS membership from all parts of Europe, based upon production during 2015.

For the placing on the market of the product in the EU/EFTA (with the exception of Switzerland) Regulation (EU) No. 305/2011 (CPR) applies. The product needs a Declaration of Performance taking into consideration /EN 13163:2012+A1:2015 Thermal insulation products for buildings — Factory made expanded polystyrene (EPS) products — Specification/ and the CE-marking.
These products are additionally approved for use in specific applications under mandatory or voluntary agreement or certification schemes at the national

level. These products are controlled and certified by Notified Bodies.
A large number of the manufacturing plants are certified according to /ISO 9001/ and/or /ISO 14001/.

2.2 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.

2.3 Technical Data
Performance data of the product in accordance with the Declaration of Performance with respect to its Essential Characteristics according to EN 13163:2012+A1:2015.

Additional data:

Constructional data

Name	Value	Unit
Thermal conductivity acc. to /EN 12667/	0.033	W/(mK)
Density	28-32	kg/m³
Compressive stress or compressive strength acc. to /EN 826/	200	kPa
Bending strength acc. to /EN 12089/	250	kPa
Water vapour transmission μ acc. to /EN 12086/	40-100	

2.4 Delivery status
Polystyrene is normally transported by lorry.
The product dimensions can vary depending on, for example, the product, the manufacturer, the application and the applicable quality label.
Dimensional data: length: max. 8000 mm, width: max. 1300 mm, thickness: max.1000 mm.

2.5 Base materials / Ancillary materials
EPS foams are made of polystyrene (94% by weight), blown with pentane up to 6% by weight, which is released partly during or shortly after production. The consideration of pentane emissions is explained in chapter 3.
The polymeric flame retardant (Butadiene styrene brominated copolymer, CAS-nr. 1195978-93-8) is present at ca. 0.7% by weight to provide fire performance. In addition to the basic materials, the manufacturers use secondary (recycled) material. No other additives are used in relevant amounts.
Polystyrene and pentane are produced from oil and gas, therefore linked to the availability of these raw materials.

2.6 Manufacture
The conversion process of EPS beads to foamed insulation consists of the following manufacturing stages: pre-foaming, conditioning and finally block moulding. During the pre-foaming and moulding stages heating by steam causes the foaming of the beads due to the pentane blowing agent. The final shape is achieved by hot wire cutting of the block to give the desired board dimensions. Finally, the board edges are trimmed by cutting or grinding to obtain the desired edge detail. Typically cut offs are 100% recycled in line.

2.7 Environment and health during manufacturing
No further health protection measures, beyond the regulated measures for manufacturing companies, are necessary during any of the conversion steps for EPS.

EPS insulation is already in use for more than 50 years. No negative effects are known to people, animals or the environment.

No ozone depleting substances as regulated by the EU, such as CFC or HCFCs, are used as blowing agents for the production of EPS.

2.8 Product processing/Installation
There are no special instructions regarding personal precautions and environmental protection during product handling and installation.
Product specific handling recommendations can be found in product and application literature, brochures and data sheets provided by the suppliers.

2.9 Packaging
The products are packed loose, bundled by tape or packed on 4 or 6 sides with PE-film. The polyethylene based packaging film is recyclable and recycled in those countries having a suitable return system. A few manufacturers use cardboard in addition.

2.10 Condition of use
Water pick up by capillarity does not occur with well manufactured EPS foams, due to the closed cell structure. The thermal insulation performance of EPS is practically unaffected by exposure to water or water vapour.
Properly installed EPS boards (see: Installation) are durable with respect to their insulation, structural and dimensional properties. They are water resistant, resistant against microorganisms and against most chemical substances. EPS, however, should not be brought into contact with organic solvents.

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.

2.11 Environment and health during use
EPS insulation products in most applications are neither in direct contact with the environment nor with indoor air. When naked EPS products were tested for VOC emissions, the emissions proved to be below the most stringent regulatory limit values in countries with such regulation (see chapter 7.1).

2.12 Reference service life
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/.

2.13 Extraordinary effects

Fire
EPS products usually achieve the fire classification Euroclass E according to /EN 13501-1/. In their end use application, constructions with EPS can achieve a classification of B-s1,d0 according to /EN13501-1/. Ignition of the foam can only be observed after longer flame exposures. If the contact with the external heat source stops, the flame extinguishes and neither further burning nor smouldering can be observed. Tests according to /EN 45545-2/, the test to evaluate the toxicity of produced combustion gasses for railway components show for EPS insulation products CIT (Conventional Toxicity Index) values up to only 0.04. This means that EPS insulation products do not have a high contribution to the toxicity of smoke produced in case of fire /PlasticsEurope 2015/.

Water
EPS rigid foam is chemically neutral and not water soluble. No water soluble substances are released, which could lead to pollution of ground water, rivers or seas.
Because of the closed cell structure EPS insulation can be used even under moist conditions. In the case of unintended water ingress, e.g. through leakage, there is normally no need for replacement of EPS insulation. The insulation value of EPS remains almost unchanged in moist conditions.

Mechanical destruction
Not relevant for EPS products that have superior mechanical properties.

2.14 Re-use phase
Construction techniques should be employed to maximise the separation of EPS boards at the end of life of a building in order to maximise the potential for re-use. Another option for re-use is to leave the EPS boards in place when the existing construction is thermally upgraded.

2.15 Disposal
EPS manufacturers advise that their products should be treated according to the EU waste strategy. The first option is recycling. Take back schemes are already in place in many countries. Recycling of EPS in many cases is technically and economically feasible, e.g. as aggregate in light weight concrete /Waste Study 2011/.
At the end of its life cycle as the second option an EPS product can be ultimately incinerated with energy recovery. Due to the high calorific value of polystyrene, energy embedded in EPS boards can be recovered in municipal waste incinerators equipped with energy recovery units for steam and electricity generation and for district heating.

In this EPD two EoL scenarios are considered: 100% thermal treatment (EoL1) and 100% material recycling (EoL2) are taken into consideration, also to allow easily the calculation of several mixed scenarios. For example to calculate the global warming potential (GWP) for a 70/30 scenario, following calculation rule for module 3 is applied:

$$\mathbf{GWP_{C3\ calc} = 70\% * GWP_{C3/1} * 30\%\ GWP_{C3/2}}$$

The same calculation rule is valid for modules C3, C4 and D.

The material is assigned to the waste category: 17 06 04 insulation materials other than those mentioned in 17 06 01 (insulation materials containing asbestos) and 17 06 03 (other insulation materials consisting of or containing dangerous substances) /AVV/.

2.16 Further information
Additional information can be found at www.eumeps.org or at the homepages of the respective manufacturer.

3. LCA: Calculation rules

3.1 Declared Unit
The declared unit is 1 m³ 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. The conversion factors are listed in the table below.

Declared unit

Name	Value	Unit
Gross density	30	kg/m³
Conversion factor to 1 kg	0.033	-
Declared unit	1	m³

The primary data is weighted over the annual amount of saleable EPS by mass per producer.
Declaration type according to PCR part A:
2b) Declaration of an average product as an average from several manufacturers’ plants.

3.2 System boundary
Type of the EPD: cradle to gate - with options.
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, beyond the system boundary.

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 1: 100% incineration: The effort and emissions of an incineration process is declared in module C4. Resulting energy is declared in module D

EoL-scenario 2: 100% Material recycling: The effort of material treatment is considered in C3. Resulting benefits on avoided primary material is declared in module D.

3.3 Estimates and assumptions

The applied European average polystyrene data set "Expandable Polystyrene (EPS)" - provided by /PlasticsEurope/ in 2015 - already include blowing agent and flame retardant as a defined recipe. Due to the limited variation of ingredients within the EPS production, this generic data set fulfills the requirement of an LCA in an adequate way.

3.4 Cut-off criteria

All data from the production data acquisition are considered, i.e. all raw materials and their transport, water, thermal and electrical energy, packaging materials and production waste.
Machines, facilities and infrastructure required during manufacture are not taken into account.

3.5 Background data

Background data is taken from the GaBi software /GaBi ts/, see www.gabi-software.com/databases.

3.6 Data quality

For life cycle modelling of the considered products, the GaBi ts Software System for Life Cycle Engineering and GaBi ts database is used.
The annual quantities for 2015 have been provided by the manufacturers and used as primary data.

3.7 Period under review

As a good basis EUMEPS foreground data already exists from the generation of environmental product declarations in 2011. For the current EPD update only former detected parameters with significant influence are collected this time. Important processes are basically the consumption of thermal energy and electricity. For the included ingredients only small variations are possible. Waste and water consumption is of marginal importance in regard to the considered environmental categories.
Moreover the collection of 2015 production volumes is essential to allow the calculation of a new weighted average.
The data collected by the manufacturers is based on yearly production amounts. The production data refers to the yearly consumption in 2015.

3.8 Allocation

The production process does not deliver any co-products. The applied software model does not contain any allocation.
Nevertheless the overall EPS production of all participating EUMEPS members comprises further products with differing densities beside the product considered in this study. Data for raw material input, thermal and electrical energy as well as auxiliary material are allocated by mass.

3.9 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.
The used background database has to be mentioned.

4. LCA: Scenarios and additional technical information

The following technical information is a basis for the declared modules or can be used for developing specific scenarios in the context of a building assessment if modules are not declared (MND).
The values refer to the declared unit of 1 m³.

Transport to the building site (A4)

Name	Value	Unit
Transport distance	200	km
Capacity utilisation (including empty runs)	70	%
Gross density of products transported	30	kg/m³
Capacity utilisation volume factor	25	-

Installation in the building (A5)

The amount of installation waste varies and is not declared in this EPD. For the calculation of the environmental impact of EPS including a certain amount of installation waste the values for the production stage (A1-A3) and end of life (C3, C4 and D) have to be multiplied with the amount of waste (e.g. 2% installation waste, factor 1.02).

End of life (C1-C4)

The transport distance to disposal respective recycling is 50 km.
For the End of Life stage two different scenarios are considered. One scenario with 100% incineration (sc. 1; module C4 and D, R1<0.6)) and one scenario with 100% material recycling (sc. 2; module C3 and D) are calculated.

The incineration of EPS results in benefits, beyond the system boundary, for thermal energy and electricity under European conditions. The material recycling scenario generates benefits due to avoiding of primary EPS production.

Name	Value	Unit
Collected separately Scenario 2	30	kg
Collected as mixed construction waste Scenario 1	30	kg
Recycling Scenario 2	30	kg
Energy recovery Scenario 1	30	kg

Reuse, recovery and/or recycling potentials (D), relevant scenario information

Scenario 1: Module D includes the benefits of the incineration process C4 (incineration of EPS). A waste incineration plant with R1-value < 0.6 is assumed.
Scenario 2: For the calculation of benefit by recycling the data set "Expandable polystyrene" /PlasticsEurope/ is used, same as on input side.

5. LCA: Results

The following tables display the environmental relevant results according to /EN 15804/ for 1 m³ EPS board. The two EoL Scenarios are represented in modules C3, C4 and D. Scenario 1 reflects the thermal treatment of EPS with energy recovery. Scenario 2 shows the environmental results in case of material recycling considering avoided primary EPS material.

DESCRIPTION OF THE SYSTEM BOUNDARY (X = INCLUDED IN LCA; MND = MODULE NOT DECLARED)

PRODUCT STAGE			CONSTRUCTION PROCESS STAGE		USE STAGE							END OF LIFE STAGE				BENEFITS AND LOADS BEYOND THE SYSTEM BOUNDARIES
Raw material supply	Transport	Manufacturing	Transport from the gate to the site	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	MND	X	X	X	X

RESULTS OF THE LCA - ENVIRONMENTAL IMPACT: 1 m³ EPS foam (30 kg/m³)

Parameter	Unit	A1-A3	A4	A5	C2	C3/1	C3/2	C4/1	C4/2	D/1	D/2
GWP	[kg CO_2-Eq.]	94.11	1.76	0.85	0.31	0.00	21.76	101.15	0.00	-51.06	-71.46
ODP	[kg CFC11-Eq.]	5.93E-9	8.06E-12	1.91E-12	1.17E-12	0.00E+0	3.36E-9	1.94E-10	0.00E+0	-1.32E-9	-5.66E-9
AP	[kg SO_2-Eq.]	2.23E-1	4.61E-3	6.15E-5	8.87E-4	0.00E+0	2.25E-2	5.78E-3	0.00E+0	-2.23E-1	-1.95E-1
EP	[kg $(PO_4)^{3-}$-Eq.]	2.12E-2	1.08E-3	1.30E-5	1.90E-4	0.00E+0	2.61E-3	1.21E-3	0.00E+0	-1.07E-2	-1.73E-2
POCP	[kg ethene-Eq.]	3.90E-1	-1.36E-3	6.01E-6	-2.96E-4	0.00E+0	3.43E-3	7.24E-4	0.00E+0	-1.44E-2	-3.64E-2
ADPE	[kg Sb-Eq.]	4.48E-5	1.17E-7	4.91E-9	9.25E-9	0.00E+0	2.31E-6	4.89E-7	0.00E+0	-7.23E-6	-3.89E-5
ADPF	[MJ]	2638.90	24.17	0.11	4.32	0.00	327.76	9.60	0.00	-699.09	-2303.60

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: 1 m³ EPS foam (30 kg/m³)

Parameter	Unit	A1-A3	A4	A5	C2	C3/1	C3/2	C4/1	C4/2	D/1	D/2
PERE	[MJ]	59.06	1.37	0.98	0.01	0.00	23.21	1.48	0.00	-105.32	-30.85
PERM	[MJ]	0.96	0.00	-0.96	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PERT	[MJ]	60.02	1.37	0.02	0.01	0.00	23.21	1.48	0.00	-105.32	-30.85
PENRE	[MJ]	1488.70	24.26	10.22	4.33	0.00	359.03	1211.48	0.00	-738.36	-2350.80
PENRM	[MJ]	1210.10	0.00	-10.10	0.00	0.00	-1200.00	-1200.00	0.00	0.00	0.00
PENRT	[MJ]	2698.80	24.26	0.12	4.33	0.00	-840.97	11.48	0.00	-738.36	-2350.80
SM	[kg]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	30.00
RSF	[MJ]	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
NRSF	[MJ]	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
FW	[m³]	4.71E-1	3.44E-3	1.86E-3	2.19E-5	0.00E+0	4.06E-2	1.92E-1	0.00E+0	-2.49E-1	-3.59E-1

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: 1 m³ EPS foam (30 kg/m³)

Parameter	Unit	A1-A3	A4	A5	C2	C3/1	C3/2	C4/1	C4/2	D/1	D/2
HWD	[kg]	2.80E-2	1.83E-6	8.66E-10	1.61E-9	0.00E+0	9.59E-8	9.18E-9	0.00E+0	-3.38E-7	-2.80E-2
NHWD	[kg]	1.27E+0	2.04E-3	1.09E-3	2.17E-5	0.00E+0	8.49E-2	1.00E-1	0.00E+0	-2.49E-1	-1.14E+0
RWD	[kg]	2.37E-2	3.47E-5	7.38E-6	5.03E-6	0.00E+0	1.25E-2	7.48E-4	0.00E+0	-1.56E-2	-1.87E-2
CRU	[kg]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MFR	[kg]	0.00	0.00	0.00	0.00	0.00	30.00	0.00	0.00	0.00	0.00
MER	[kg]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
EEE	[MJ]	0.00	0.00	1.52	0.00	0.00	0.00	158.80	0.00	0.00	0.00
EET	[MJ]	0.00	0.00	3.47	0.00	0.00	0.00	362.04	0.00	0.00	0.00

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

In addition an EPD annex contains the LCA results for 1 m² with a specific R-value 1, because the provided function by an insulation material is the thermal resistance provided.

6. LCA: Interpretation

All impact categories, with the exception of POCP, are dominated by the influence of the basic material polystyrene and its production. The polystyrene employed in the production process already contains a large part of the environmental burdens.
The foaming process for the declared product also contributes significantly to the environmental impacts. The emission of pentane during that process contributes to the Photochemical Ozone Creation Potential (POCP).

The effort (input of additional energy and material) for the end-of-life scenarios (C3 and C4) and the resulting potential benefits of electricity and steam in scenario 1 (module D/1), due to the combustion, is separated. This results in negative values in module D/1. The recycling effort in scenario 2 causes benefits as well in module D/2 by avoiding production of primary EPS material.
Transports have a low influence on all impact categories compared to the contributions from the other areas.

7. Requisite evidence

7.1. VOC emission to indoor air

EPS products can be used for indoor applications, however they typically are not directly exposed to the indoor air, but covered by some kind of covering layer such as gypsum board.
The emissions of EPS have been measured for samples based upon 12 different kinds of EPS raw material. The measurements according to /CEN TS 16516/ and /ISO 16000 3-6-9-11/ were performed by Eurofins Product Testing A/S, Denmark in April 2016. The tested products all comply with the requirements of DIBt (October 2008) and /AgBB/ (May 2010) for use in applications directly exposed to indoor air.

VOC Emissions

Name	Value	Unit
Overview of Results TVOC (28 d)	25	µg/m³
TVOC (C6 - C16) TVOC (3 d)	72	µg/m³
R (dimensionless) average	0.084	-
Carcinogenic Substances (28 d)	<1	µg/m³

All tested products live up to the current regulations in place around Europe and has emissions
which are below AgBB limit values and would be rated A+ in the French VOC regulation.

7.2 Leaching performance

Leaching behaviour is not relevant for EPS products

8. References

PCR Part A
PCR - Part A: Calculation rules for the Life Cycle Assessment and Requirements on the Background Report, version 1.4, Institut Bauen und Umwelt e.V., www.bau-umwelt.com, March 2016

PCR Part B
PCR - Part B: Requirements on the EPD for Insulating materials made of foam plastics, version 1.3, Institut Bauen und Umwelt e. V., www.bau-umwelt.com, July 2014

AgBB
Evaluation scheme Health-related Evaluation Procedure for Volatile Organic Compounds Emissions (VOC and SVOC) from Building Products, Committee for Health-related Evaluation of Building Products, Status May 2010

AVV
Ordinance concerning the European Waste Directory (Waste Directory Ordinance - AVV): Waste Directory Ordinance dated 10th December 2011 (Federal Legal Gazette I p. 3379), which has been modified by Article 5 Paragraph 22 of the law dated 24th February 2012 (Federal Legal Gazette. I p. 212).

CEN TS 16516
CEN TS 16516:2013-12: Construction products - Assessment of release of dangerous substances - Determination of emissions into indoor air

EN 826
EN 826:1996-05: Thermal insulating products for building applications – Determination of compression behaviour

EN 12086
EN 12086:1997-08: Thermal insulating products for building applications – Determination of water vapour transmission properties

EN 12089
EN 12089:1997-08: Thermal insulating products for building applications – Determination of bending behaviour

EN 12667
EN 12667:2001-05: Thermal performance of building materials and products – Determination of thermal resistance by means of guarded hot plate and heat flow meter method

EN 13501-1
EN 13501-1:2010-01: Fire classification of construction products and building elements – Part 1: Classification using data from reaction to fire tests

EN 13163
EN 13163:2009-02: Thermal insulation products for buildings – Factory made products of expanded polystyrene (EPS) - Specification

EN 45545-2
Railway applications - Fire protection on railway vehicles

GaBi ts
GaBi ts 7 dataset documentation for the software system and databases, LBP, University of Stuttgart and thinkstep, Leinfelden-Echterdingen, 2016 (http://documentation.gabi-software.com/)

ISO 9001

DIN EN ISO 9001:2008-12: Quality management systems – Requirements

ISO 14001
ISO 14001:2009-11: Environmental management systems – Requirements with guidance for use

ISO 16000 parts 3-6-9-11
Indoor air - Part 3:2011, Part 6:2011, Part 9:2006 and Part 11:2006

Langzeitverhalten 2004
Alterungsbeständigkeit von EPS mit Langzeitnachweis, Carbotech AG, Basel, S-E-E.ch, St. Gallen, 2004

Long-term performance 2001
Long term performance and durability of EPS as a lightweight filling material, Tor Erik Frydenlund, Roald Aaboe, EPS geofoam conference abstract, 2001

PlasticsEurope
European Association of polymer producers, PlasticsEurope AISBL, Brussels, www.plasticseurope.org, 2016

PlasticsEurope 2015
Factsheet "Toxicity of Combustion Gases from PS foams"; published by PlasticsEurope AISBL; Brussels/Belgium; January 2015

Waste Study 2011
Post-Consumer EPS Waste Generation and Management in European Countries 2009; Consultic, 2011

Institut Bauen und Umwelt
Institut Bauen und Umwelt e.V., Berlin(pub.): Generation of Environmental Product Declarations (EPDs);
www.ibu-epd.de

ISO 14025
DIN EN ISO 14025:2011-10: Environmental labels and declarations — Type III environmental declarations — Principles and procedures

EN 15804
EN 15804:2012-04+A1 2013: Sustainability of construction works — Environmental Product Declarations — Core rules for the product category of construction products

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