

ENVIRONMENTAL PRODUCT DECLARATION

as per ISO 14025 and EN 15804

Owner of the Declaration	PU Europe
Programme holder	Institut Bauen und Umwelt e.V. (IBU)
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PU thermal insulation board with mineral fleece facing
PU Europe

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General Information

<p>PU Europe</p> <hr/> <p>Programme holder IBU - Institut Bauen und Umwelt e.V. Panoramastr. 1 10178 Berlin Germany</p> <hr/> <p>Declaration number EPD-PUE-20130286-CBE1-EN</p> <hr/> <p>This Declaration is based on the Product Category Rules: Insulating materials made of foam plastics, 07-2013 (PCR tested and approved by the independent expert committee)</p> <hr/> <p>Issue date 27.02.2014</p> <hr/> <p>Valid to 26.02.2019</p> <hr/> <p></p> <hr/> <p>Prof. Dr.-Ing. Horst J. Bossenmayer (President of Institut Bauen und Umwelt e.V.)</p> <hr/> <p></p> <hr/> <p>Dr. Burkhard Lehmann (Managing Director IBU)</p>	<p>PU board with mineral fleece facing</p> <hr/> <p>Owner of the Declaration PU Europe Av. E. Van Nieuwenhuysse 6 1160 Brussels (Belgium)</p> <hr/> <p>Declared product / Declared unit 1 m² PU thermal insulation board with mineral fleece facing and a thickness of 13.0 cm. The data presented here provide a complete picture of the performance during production, installation and end-of-life.</p> <hr/> <p>Scope: This EPD is a generic association EPD covering PU insulation boards produced by PU Europe members. These members represent 90 % of this market segment and use similar production techniques across Europe. The EPD therefore represents an average of these producers. 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.</p> <hr/> <p>Verification</p> <table border="1"> <tr> <td colspan="2">The CEN Norm EN 15804 serves as the core PCR</td> </tr> <tr> <td colspan="2">Independent verification of the declaration according to ISO 14025</td> </tr> <tr> <td><input type="checkbox"/> internally</td> <td><input checked="" type="checkbox"/> externally</td> </tr> </table> <hr/> <p></p> <hr/> <p>Prof. Dr. Birgit Grahl (Independent tester appointed by SVA)</p>	The CEN Norm EN 15804 serves as the core PCR		Independent verification of the declaration according to ISO 14025		<input type="checkbox"/> internally	<input checked="" type="checkbox"/> externally
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Product

Product description

Polyurethane (PU) is a high performance thermal insulation material offering the lowest thermal conductivity of all insulation products commonly available in the market. It offers excellent compressive strength at low densities. PU includes both PUR (polyurethane) and PIR (polyisocyanurate) products.

The product covered by this EPD is a factory-made, closed-cell PU foam board with a flexible mineral fleece facing.

Application

The PU board covered by this EPD is applied for the thermal insulation of residential and commercial buildings according to /EN 13165/ (e.g. interior and exterior insulation for roofs, floors, ceilings and walls).

Technical Data

In this Life Cycle Assessment, a PU insulation board with the following properties has been regarded:

Constructional data

Name	Value	Unit
Gross density	31	kg/m ³
Thermal conductivity	0.026	W/(mK)

Base materials / Ancillary materials

Core material (about 87 % of the weight of the declared unit):

Closed-cell polyurethane foam made from MDI (60.5 %), polyols (29 %), pentane (5 %) and additives (5.5 %).

Facing (about 13 % of the weight of the declared unit):

Mineral fleece mainly consisting of calcium carbonate (84 %), glass fibre (13 %) and urea formaldehyde (3 %).

The PU board for insulation does not contain substances which are included in the "Candidate List of Substances of Very High Concern for Authorisation".

Default values on packaging (use and waste), production waste, air emission and energy used are arithmetic averages of the inputs and outputs per ton produced over one reference year from different PU Europe manufacturers. Since the same machinery and

similar process conditions are applied across Europe, using same base chemicals, they can be considered valid.

Reference service life

The reference service life is 50 years.

LCA: Calculation rules

Declared Unit

The declared unit is 1 m² of PU thermal insulation board with a mineral fleece facing and with the following specifications:

Declared unit

Name	Value	Unit
Declared unit	1	m ²
Gross density of the foam	31	kg/m ³
Conversion factor to 1 kg	0.216	m ² /kg
Thickness	13	cm
Thermal conductivity	0.026	W/mK
Weight of declared unit	4.63	kg/m ²

This provides a thermal resistance R = 5 m² K/W.

The LCI (Life Cycle Inventory) data used in this report is the weighted average of the data supplied by individual members of PU Europe, who manufacture products meeting this specification. The product is manufactured in accordance with /EN 13165/ "Thermal insulation products for buildings – Factory made rigid polyurethane foam (PUR) products – Specification".

System boundary

This life cycle assessment for the production of the polyurethane insulation board considers the life cycle from the supply of raw materials to the manufacturer's

gate (cradle-to-gate with options). It also includes the transport to the construction site, the installation and the end-of-life stage of the used PU thermal insulation board. The life cycle is split into the following individual phases:

- A1 - Raw material formulation (foam materials)
- A2 - Raw material transport
- A3 - Production of the polyurethane insulation board (energy demands, waste, auxiliaries etc.) and packaging material
- A4 - Transport system house to warehouse and from warehouse to the construction site
- A5 - Emissions and cutting losses during installation and packaging disposal
- C2 - Transport of the used product from the building site to the waste management site
- C3/C4 - End-of-Life: waste management (thermal recovery)
- D - Benefits and loads beyond system boundary

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	0.00159	l/100km
Transport distance	100	km
Gross density of products transported	31	kg/m ³
Capacity utilization (including empty runs)	85	%

Installation into the building (A5)

Name	Value	Unit
Material loss	5 %	kg
Packaging waste	0.35	kg/m ²

End of life (C1-C4)

Name	Value	Unit
Reuse	0	kg
Recycling	0	kg
Energy recovery	4.23	kg
Landfilling	0	kg
Waste processing (C3) Energy for shredding	0.924	MJ

LCA: Results

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 m² installed PU insulation board – thickness of 13.0 cm

Parameter	Unit	A1 - A3	A4	A5	C2	C3	C4	D
GWP	[kg CO ₂ -Eq.]	12.9	0.356	0.655	0.067	0.124	9.62	-4.9
ODP	[kg CFC11-Eq.]	2.09E-5	6.21E-12	1.18E-11	1.17E-12	1.11E-10	1.01E-10	-1.85E-9
AP	[kg SO ₂ -Eq.]	3.01E-2	2.08E-3	2.48E-4	3.92E-4	5.85E-4	3.96E-3	-1.18E-2
EP	[kg (PO ₄) ⁻³ -Eq.]	4.51E-3	4.96E-4	5.37E-5	9.33E-5	3.08E-5	9.58E-4	-8.04E-4
POCP	[kg Ethen Eq.]	1.42E-2	-8.28E-4	1.67E-5	-1.56E-4	3.45E-5	2.64E-4	-9.69E-4
ADPE	[kg Sb Eq.]	3.15E-5	1.33E-8	5.97E-9	2.49E-9	1.7E-8	8.4E-8	-3.88E-7
ADPF	[MJ]	278	4.91	0.222	0.924	1.4	2.52	-69.8

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 m² installed PU insulation board – thickness of 13.0 cm

Parameter	Unit	A1 - A3	A4	A5	C2	C3	C4	D
PERE	[MJ]	9.89	-	-	-	-	-	-
PERM	[MJ]	0	-	-	-	-	-	-
PERT	[MJ]	9.89	0.193	0.029	0.036	0.363	0.161	-6.04
PENRE	[MJ]	195	-	-	-	-	-	-
PENRM	[MJ]	101	-	-	-	-	-	-
PENRT	[MJ]	296	4.92	0.283	0.927	2.18	2.84	-82.7
SM	[kg]	-	-	-	-	-	-	-
RSF	[MJ]	0	0	0	0	0	0	0
NRSF	[MJ]	0	0	0	0	0	0	0
FW	[m ³]	-	-	-	-	-	-	-

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 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 m² installed PU insulation board – thickness of 13.0 cm

Parameter	Unit	A1 - A3	A4	A5	C2	C3	C4	D
HWD	[kg]	-	-	-	-	-	-	-
NHWD	[kg]	-	-	-	-	-	-	-
RWD	[kg]	-	-	-	-	-	-	-
CRU	[kg]	-	-	-	-	-	-	0
MFR	[kg]	-	-	-	-	-	-	0
MER	[kg]	-	-	-	-	-	-	4.23
EEE	[MJ]	0	0	0.995	0	0	13.8	-
EET	[MJ]	0	0	2.74	0	0	38.1	-

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

*FW, HWD, NHWD, RWD: Not all of the used inventories for the calculation of the LCA support the methodological approach for the declaration of water and waste indicators. The material amounts, displayed with these inventories contribute to 29 % to the production. This is significant, as > 3 % (referring to the mass of the declared unit). The indicators are not declared (decision of IBU advisory board 2013-01-07).

**SM: Only the foreground system is considered.

***MFR: No credit is given for the amount of recycled steel entering the system without loads.

References

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Generation of Environmental Product Declarations
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General principles

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PCR Part A

Institut Bauen und Umwelt e.V., Königswinter (pub.):
Product Category Rules for Construction Products
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of Institut Bauen und Umwelt (IBU), Part A: Calculation
Rules for the Life Cycle Assessment and
Requirements on the Background Report. April 2013
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PCR Part B

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Insulating materials made of foam plastics; Institute
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ISO 14025

DIN EN ISO 14025:2011-10: Environmental labels and
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Principles and procedures

EN 15804

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

EN 13165

EN 13165:2012: Thermal insulation products for
buildings – Factory made rigid polyurethane foam (PU)
products – Specification

GaBi 6 2013

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GaBi 6 2013B

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<http://documentation.gabi-software.com/>

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