

# ENVIRONMENTAL PRODUCT DECLARATION



## **Polyurethane (PU) board:**

Foam without facing  
R=5



Product name:

**PU Board without facing (R5)**

Company name:

**PU Europe**

For the verification process, the following report is needed to complete the information about the LCA-model and is available at IBU (Institut für Bauen und Umwelt e.V.):

**“Background Report for Polyurethane Insulation Board EPD Generator”**

*Version: "Update March 2014"*

## **1 How to use this EPD- and LCA-tool for PU boards and sandwich elements**

This tool enables the user to generate Environmental Product Declarations (EPDs) and LCAs for Polyurethane boards and sandwich elements with different recipes and facings. The tool uses the input values to calculate the environmental impact figures that are required for EPDs and/or LCAs.

In order to get the EPDs verified, all the used data must be mentioned including their origin. The plausibility of the data must be demonstrated and the average breakdown must be explained. This is to be filled in into the part "Handbook" at the end of this report. There you can find more detailed instructions what to fill in. The input values themselves are filled in automatically in a table at the end of the handbook.

With this tool you can also calculate the environmental impacts of the use stage (which is not part of the EPD) including climate adaption, heating energy sources and prices, as well as the End of Life (EoL) including transport to EoL but this is not part of the EPD and does not lead to a verified EPD.

### **GaBi Envision and the EPD- and LCA-tool**

On left side of the tool-window in GaBi Envision, all values for the parameters have to be entered.

On the right side of this tool, you will then find:

- 1) EPD: automatically generated results for an IBU European Core EPD
- 2) Report: a customized report for detailed information for the members of PU Europe (not part of the verified EPD)
- 3) Handbook: the handbook explains in part A which limitations there are for the tool for generation of verified EPDs and in part B what to enter for the input parameters. Furthermore, there is a table in part C where the data sources have to be entered and the table in part D shows automatically all entered input values.

# ENVIRONMENTAL PRODUCT DECLARATION

as per ISO 14025

Owner of the Declaration **PU Europe – PU Board without facing (R5)**

## PU Board without facing (R5)

PU Europe

### Summary

#### PU Europe – PU Board without facing (R5)

Programme holder

Owner of Declaration

PU Europe  
Av. E. Van Nieuwenhuysse 6  
Brussels, Belgium

Declaration number

Declared Product / Declared Unit

1 m<sup>2</sup> PU thermal insulation board without facing and a thickness of 13 cm. The data presented here provide a complete picture of the performance during production, installation and end-of-life.

This Declaration is based on the PCR document:

Insulating materials made of foam plastics, 7-2013 (PCR tested and approved by the independent expert committee)

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.

Validity date

05/08/2019

Verification

CEN standard EN 15804 serves as core PCR

Date of issue

06/08/2014

Third party independent verification of the declaration according to ISO 14025:

Internal

External

Signature

Input field

Signature

Input field

Signature

Input field

### 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 without facing.

#### Application

The PU board covered by this EPD is used 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:

- thickness = 13 cm
- thermal conductivity = 0.026 W/m\*K
- foam density = 31 kg/m<sup>3</sup>
- total weight per m<sup>2</sup> = 4.03 kg/m<sup>2</sup>

This provides a thermal resistance R = 5 m<sup>2</sup> K/W.

#### Base materials / Ancillary materials

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

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

EPD – PU Europe – PU Board without facing (R5)

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 m<sup>2</sup> of PU thermal insulation board without facing and with the following specifications:

- A thickness of 13 cm,
- A declared thermal conductivity of 0.026 W/m\*K,
- A density of the foam of 31 kg/m<sup>3</sup>
- Weight of declared unit: 4.03 kg/m<sup>2</sup>
- Conversion factor to 1 kg: 0.248 m<sup>2</sup>/kg

This provides a thermal resistance  $R = 5 \text{ m}^2 \text{ K/W}$

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 boundaries

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 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 construction site (A4)

Litres of fuel l/100 km	[Diesel]: [Consumption]	0.00159
Transport distance km	[Distance]	500
Capacity utilisation (including empty runs) %		85

### Installation in the building (A5)

Material loss %	(cuttings): [per cent]	5
Packaging waste kg/m <sup>2</sup>		0.35

### Reference service life

Reuse	[waste type] [quantity]	0
kg		
Recycling	[waste type] [quantity]	0
kg		
Energy recovery	[waste type] [quantity]	4.23
kg		
Landfilling	[waste type] [quantity]	0
kg		
Waste processing (power from grid for shredding)		0.804

## 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 BOUNDARYS
Raw material supply	Transport	Manufacturing	Transport	Construction-in-stallation process	Use	Maintenance	Repair	Replacement <sup>1)</sup>	Refurbishment <sup>1)</sup>	Operational energy use	Operational water use	De-struction 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
<sup>1)</sup> The modules Replacement (B4) and Refurbishment (B5) are normally not relevant on the product. For clarity reasons, those two modules have been deleted in the following tables. If one or both modules are declared respective columns can be inserted.																

RESULTS OF THE LCA - ENVIRONMENTAL IMPACT: 1 m <sup>2</sup> installed PU insulation board									
		Manufacturing	Transport	Installation	Use stage	EoL - Transport	EoL - Waste processing	EoL - Disposal	BENEFITS AND LOADS BEYOND THE SYSTEM BOUNDARYS
Parameter	Unit	A1-A3	A4	A5	B	C2	C3	C4	D
GWP	[kg CO <sub>2</sub> -Äq.]	12.4	0.31	0.615	0	0.0584	0.108	8.87	-4.64
ODP	[kg CFC11-Äq.]	2.09E-005	5.41E-012	1.04E-011	0	1.02E-012	9.65E-011	8.88E-011	-1.76E-009
AP	[kg SO <sub>2</sub> -Äq.]	0.0282	0.00181	0.000229	0	0.000341	0.000509	0.00367	-0.0112
EP	[kg PO <sub>4</sub> <sup>3-</sup> -Äq.]	0.00424	0.000432	5.08E-005	0	8.12E-005	2.68E-005	0.000906	-0.000761
POCP	[kg Ethen Äq.]	0.00844	-0.000721	1.54E-005	0	-0.000136	3E-005	0.000245	-0.000921
ADPE	[kg Sb Äq.]	2.02E-005	1.15E-008	4.69E-009	0	2.17E-009	1.48E-008	6.19E-008	-3.67E-007
ADPF	[MJ]	272	4.28	0.195	0	0.804	1.22	2.19	-66.2
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 m <sup>2</sup> installed PU insulation board									
		Manufacturing	Transport	Installation	Use stage	EoL - Transport	EoL - Waste processing	EoL - Disposal	BENEFITS AND LOADS BEYOND THE SYSTEM BOUNDARYS
Parameter	Unit	A1-A3	A4	A5	B	C2	C3	C4	D
PERE	[MJ]	9.56	-	-	-	-	-	-	-
PERM	[MJ]	0	-	-	-	-	-	-	-
PERT	[MJ]	9.56	0.168	0.0253	0	0.0316	0.316	0.138	-5.73
PENRE	[MJ]	188	-	-	-	-	-	-	-
PENRM	[MJ]	101	-	-	-	-	-	-	-
PENRT	[MJ]	289	4.29	0.248	0	0.807	1.9	2.47	-78.4
SM**	[kg]	-	-	-	-	-	-	-	-
RSF	[MJ]	0	0	0	0	0	0	0	0
NRSF	[MJ]	0	0	0	0	0	0	0	0
FW*	[m <sup>3</sup> ]	not declared	not declared	not declared	not declared	not declared	not declared	not declared	not declared
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, not declared (decision of IBU advisory board 2013-01-07)								



RESULTS OF THE LCA- OUTPUT FLOWS AND WASTE CATEGORIES: 1 m <sup>2</sup> installed PU insulation board									
		Manufacturing	Transport	Installation	Use stage	EoL - Transport	EoL - Waste processing	EoL - Disposal	BENEFITS AND LOADS BEYOND THE SYSTEM BOUNDARYS
Parameter	Unit	A1-A3	A4	A5	B	C2	C3	C4	D
HWD*	[kg]	not declared	not declared	not declared	not declared	not declared	not declared	not declared	not declared
NHWD*	[kg]	not declared	not declared	not declared	not declared	not declared	not declared	not declared	not declared
RWD*	[kg]	not declared	not declared	not declared	not declared	not declared	not declared	not declared	not declared
CRU	[kg]	-	-	-	-	-	-	-	0
MFR***	[kg]	-	-	-	-	-	-	-	0
MER	[kg]	-	-	-	-	-	-	-	4.23
EE [power]	[MJ]	0	0	0.957	0	0	0	13.1	-
EE [thermal energy]	[MJ]	0	0	2.63	0	0	0	36	-
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; EE = Exported energy per energy carrier *Waste cannot be declared (decision of IBU advisory board 2013-01-07)								

*\*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

### **Institut Bauen und Umwelt 2011**

Institut Bauen und Umwelt e.V., Königswinter (pub.): Generation of Environmental Product Declarations (EPDs); General principles for the EPD range of Institut Bauen und Umwelt e.V. (IBU), 2011-06  
[www.bau-umwelt.de](http://www.bau-umwelt.de)

### **General principles**

for the EPD range of Institut Bauen und Umwelt e.V. (IBU), 2013-04  
[www.bau-umwelt.de](http://www.bau-umwelt.de)

### **PCR Part A**

Institut Bauen und Umwelt e.V., Königswinter (pub.): Product Category Rules for Construction Products from the range of Environmental Product Declarations of Institut Bauen und Umwelt (IBU), Part A: Calculation Rules for the Life Cycle Assessment and Requirements on the Background Report. April 2013  
[www.bau-umwelt.de](http://www.bau-umwelt.de)

### **PCR Part B**

PCR Guidance-Texts for Building-Related Products and Services; Part B: Requirements on the EPD for insulating materials made of foam plastics; Institute Construction and Environment e.V. (IBU). Version 1.4, 7<sup>th</sup> July 2013  
<https://epd-online.com>

### **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: 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**

GaBi 6: Documentation of GaBi 6: Software-System and Database for Life Cycle Engineering. Copyright, TM. Stuttgart, Echterdingen, 1992-2013  
<http://documentation.gabi-software.com/>



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