FEEL
GOOD
INSIDE

RECTICEL insulation

Environmental product declaration for a PU insulation board with aluminium facer 50µ

According to EN15804+A1 and ISO 14025

DECLARATION OF GENERAL INFORMATION

Introduction

This Environmental Product Declaration (EPD) is for 1 m^2 Polyurethane (PU) insulation board with an aluminium facer produced by Recticel at their site in Wevelgem. The applied declared unit is 1 m² thermal insulation board with an R_D value of 3,6 m^2K/W. The results presented in this EPD can be recalculated to other thicknesses and R_D values using an equation. The range of R_D values for which the EPD is valid is 0,8 -9,05 m^2K/W.
The considered insulation board is made of polyurethane and covered with an aluminium facer. The facer is on both sides a slightly honeycombed aluminium foil with thickness 0,05 mm. The insulation board is produced by Recticel insulation in Wevelgem and has as main raw materials Polyol and MDI.

Owner of the declaration

Recticel Insulation
Zuidstraat 15
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Explanatory material may be obtained by contacting Recticel NV: Frederick Gheysen
Email: gheysen.frederick@recticel.com

EPD programme and programme operator

Federal Public Service (FPS) of Health, Food Chain Safety and Environment
Product Policy Department
Victor Hortaplein 40, box 10
1060 Brussels, Belgium
Phone number: +32 (0)2 524.97.97
E-mail: epd@environment.belgium.be

Date of declaration and validity

October, 2018
The EPD has a 5 year validity period (Otober, 2023)

PCR, c-PCR and background LCA report

Belgian PCR for construction materials NBN/DTD B 08-001:2017
PCR for insulation materials EN 16783:2016
The EPD is in line with the background LCA report: Life cycle assessment of three types of PU insulation boards from Recticel (Peeters and Spirinckx, 2018)

Demonstration of verification

Demonstration of Verification	
CEN standard EN 15804 serves as the core PCR[a]	
Independent verification of the declaration and data according to EN ISO 14025:2010 ☐Internal ☑External	
Third party verifier[b]: Evert Vermaut	
a Product category rules b Optional for business-to-business communication; mandatory for business-to-consumer communication (see EN ISO 14025:2010, 9.4)	
LCA Consultant	**Verifier**
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Comparability

EPDs of construction products may not be comparable if they do not comply with the EN15804+A1.

Life cycle stages considered

This EPD is a cradle-to-gate with options EPD. The considered life cycle stages are indicated with 'x' in the table below.

Product			Construction		Use stage							End-of-life				Benefits and loads beyond the system boundary
					Related to the building fabric					Related to the building operation						
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Raw material supply	Transport	Manufacturing	Transport	Construction	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	Demolition	Transport	Waste processing	Disposal	Reuse / Recovery /Recycling potential
X	*X*	*X*	*X*	*MND*	*MND*	*MND*	*MND*	*MND*	*MND*	*MND*	*MND*	*MND*	*X*	*X*	*X*	*X*
X: Included in LCA; MND: Module Not Declared																

Type of EPD

This EPD is an average of multiple products, produced by a single manufacturer at a single production site. Results are provided for an 80 mm insulation board together with an equation (Equation 1) which allows the calculation of results for another thickness of insulation board.
The EPD is representative for the Belgian market.

DETAILED PRODUCT DESCRIPTION

Product description

The LCIA results presented in this EPD are results for an insulation board with a PU core of 80 mm thickness and an aluminium facer of 50 µm. Using Equation 1 (see section 'conversion factor to other thickness'), the results can be recalculated to another thickness of insulation board. The range of products for which the EPD is valid, is described in the next paragraph.

The PU insulation board chosen as a reference for this EPD has the following characteristics:

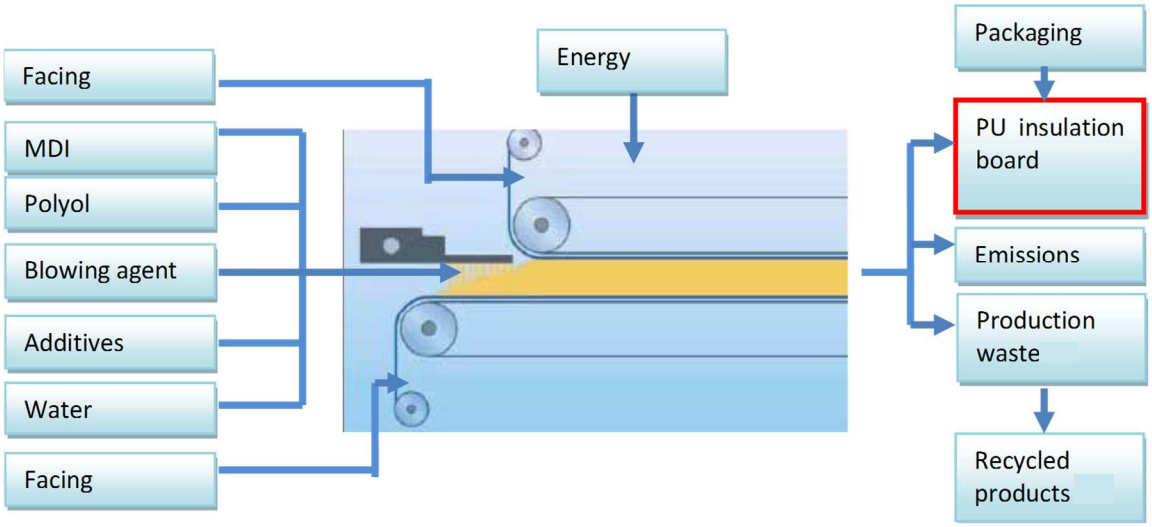
- Lambda = 0,022 W/mK
- Density = low density ±30kg/m³
- Facer = on both sides a slightly honeycombed aluminium foil – 0,05mm
- Produced in Wevelgem, with main raw materials Polyol and MDI
- ISO14001:2015
- ISO 9001:2015

Range of products for which the EPD is valid

The product for which the LCA results are declared in this EPD is representative for a product group containing different types of PU insulation boards with aluminium facers. The results presented in this EPD are valid for an 80 mm insulation board. However, using Equation 1, results can be recalculated to other thicknesses. When this equation is used, the EPD covers a product group with a thickness of PU core between 20 mm and 200 mm. The composition and weight of the aluminium facer also changes depending on the specific product. The variability within the product group has been investigated using the guidelines of the BE-PCR. The variability assessment revealed that the results present in this EPD are valid for insulation boards with commercial names: Powerdeck, Powerwall, Powerroof, Powerline and Powerline C.

Manufacturing process

PU is formed in a reaction between two components, polyol and isocyanate (MDI). Additives include water and catalysts. A blowing agent and flame retardant are added during the production process.



Technical properties

Property	Unit	Value
Thickness (total)	mm	80
Thickness facer	mm	0,05
Density of panel (PU core)	kg/m^3	30,1
Lambda value	W/m.K	0,022
R_D- value	K.m^2/W	3,6

More technical properties can be found in the Declaration of Performance (DoP) of the product. DoP's of the products of Recticel are available at: http://dop.recticelinsulation.com/.

Product contents

Material/chemical input	Mass (kg)	%
PU core	2,408	90%
Aluminium facer	0,28	10%

The product does not contain materials listed in the "Candidate list of Substances of Very High Concern for authorization" above a limit of 0.1% (W/W)

Reference service life

In general insulation materials are not replaced during the life span of a building. In the MMG project (Servaes et al., 2013) of the Flemish Waste Agency, a building life span of 60 years has been applied. The fact that insulation materials are in general not replaced during the life span of the building is considered as the most plausible scenario and thus a life span of 60 years is assumed as reference service life.

Additional information regarding the average EPD

The products within the product group are selected based on the type of facer used. All considered insulation boards have an aluminium facer. The composition and weight of the core can vary within the product group. Also the composition and weight of the aluminium facer can vary within the product group.

The declared unit used in this EPD is a 1 m² thermal insulation board with an R_D value of 3,6 m^{2}K/W. The results presented in this EPD can be recalculated to other thicknesses and R_D values using Equation 1. The range of R_D values for which this EPD is valid is 0,8 – 9,05 m²K/W.

The results presented in this EPD are the results for an insulation board of which the PU core has a thickness of 80 mm and with a lambda value of 0,022 W/m.K. This product has been composed based on a weighted average of all insulation boards produced at Recticel Wevelgem.

The variability within the product group has been investigated following the guidelines given in the BE-PCR. The variability within the product group is low and the EPD is valid for insulation boards with commercial names: Powerdeck, Powerwall, Powerroof, Powerline and Powerline C.

LCA CALCULATION RULES

Declared unit

The declared unit is 1 m^2 thermal insulation for a specific R_D- value of the product as placed on the market. The R_D value of the PU insulation board with aluminium facer with a thickness of 80 mm is 3,6 m^2K/W. The results presented in this EPD can be recalculated to other thicknesses and R_D values using Equation 1. The range of R_D values for which this EPD is valid is 0,8 -9,05 m^2K/W.

Conversion factor to other thickness

The LCA results are provided for an insulation panel with a thickness of 80 mm. The LCA results are declared separately for the PU core and aluminium facer. LCA results for the PU core can be recalculated for other thicknesses using Equation 1:

LCA results new thickness = (LCA result PU core 80 mm * new thickness (mm) / 80 mm) + LCA result facer

Equation 1: Equation to recalculate LCIA results for the 80 mm core to other thicknesses

The variability in LCIA results using other thicknesses and composition of the aluminium facer has been investigated during the LCA study. The variability within the product group is low and the EPD is valid for the insulation boards with commercial names: Powerdeck, Powerwall, Powerroof, Powerline and Powerline C.

Allocations

Allocation of the inputs and outputs (emissions and waste) to primary and secondary PU has been done based on physical properties, the m^2 of primary PU and secondary PU produced. Also the material inputs necessary to produce scrap and cutting losses are allocated to primary and secondary PU using physical properties (m^2 of primary and secondary PU produced).

Cut-off rules

The following processes are considered below cut-off:

- Possible additional energy required to apply glue during the production of the aluminium facer.
- End of life treatment of the cutting losses from facers at the production facility.
- Possible energy recovery from facers in module D.

The total of neglected input flows per module is less than 5% of energy usage and mass as prescribed by EN15804+A1.

LCA software data sources and data quality

For the calculation of the LCA results, the software program SimaPro 8.3.0.0 has been used. Data have been selected based on their data quality. The applied life cycle inventory database is ecoinvent 3.3, except for polyol, for which more recent data from PlasticsEurope have been used and for MDI for which the Industry 2.0 database has been used. This database contained the most recent PlasticsEurope data for MDI.
Manufacturer specific data have been collected for the year 2016.

LCA RESULTS

The LCA results are provided for an insulation panel with a thickness of 80 mm. The LCA results are declared separately for the PU core and aluminium facer. LCA results for the PU core can be recalculated for other thicknesses using the Equation 1.

The variability in LCIA results using other thicknesses and composition of the aluminium facer has been investigated during the LCA study. The variability within the product group is low and thus allows for the grouping of several products in this EPD. The products within the scope of this EPD are described in the section 'Range of products for which the EPD is valid'.

Indicator	Unit	A1 - core	A2 - core	A3 - core	A1-3 - facer	A4 - core	A4 - facer	A5	B
		Raw material	Transport	Manufacturing	Product stage	Transport to site	Transport to site	Construction	Use
Environmental impacts per m^2 insulation material									
GWP	kg CO2 eq.	5,58E+00	1,00E-01	9,09E-01	1,84E+00	1,64E-01	1,91E-02	MND	MND
ODP	kg CFC 11 eq.	7,71E-08	1,98E-08	8,76E-08	8,75E-08	3,00E-08	3,49E-09	MND	MND
AP	kg SO2 eq.	1,21E-02	3,24E-04	2,81E-03	9,71E-03	4,50E-04	5,23E-05	MND	MND
EP	kg (PO4)3-eq.	1,78E-03	5,46E-05	5,48E-04	9,19E-04	7,61E-05	8,85E-06	MND	MND
POCP	kg C2H4 eq.	1,63E-03	3,11E-05	3,55E-03	7,44E-04	3,11E-05	3,61E-06	MND	MND
ADPE	kg Sb eq.	1,01E-06	1,96E-07	1,15E-05	8,42E-05	7,61E-08	8,84E-09	MND	MND
ADPF	MJ eq.	1,44E+02	1,58E+00	1,21E+01	2,43E+01	2,32E+00	2,70E-01	MND	MND
HTCE	CTUh	2,30E-08	6,86E-10	1,96E-08	9,15E-08	3,89E-10	4,52E-11	MND	MND
HTnCE	CTUh	3,35E-07	1,88E-08	1,23E-07	6,47E-07	7,65E-09	8,90E-10	MND	MND
ETF	CTUe	7,53E-01	3,50E-01	8,72E-01	1,90E+00	1,04E-01	1,20E-02	MND	MND
PM	kg PM 2.5 eq.	8,64E-04	5,46E-05	3,42E-04	2,33E-03	3,95E-05	4,59E-06	MND	MND
IRHH	kg U235 eq.	1,99E+00	7,51E-03	9,13E-02	5,56E-02	1,05E-02	1,23E-03	MND	MND
WRD	m^3 water eq.	4,42E-01	2,55E-05	4,15E-04	-6,66E-03	4,06E-05	4,73E-06	MND	MND
LUO – SOM	kg C deficit	7,12E-02	1,54E-01	2,88E-01	4,01E-01	4,19E-02	4,87E-03	MND	MND
LUO – B	PDF*m^2a	1,02E-02	8,91E-03	1,61E-02	2,74E-02	2,42E-03	2,81E-04	MND	MND
LUT – SOM	kg C deficit	1,02E-01	3,48E-01	6,26E-01	1,09E+00	4,23E-01	4,91E-02	MND	MND
LUT - B	PDF*m^2a	-9,70E-04	3,27E-04	-3,63E-05	4,09E-04	1,05E-03	1,22E-04	MND	MND

GWP = Global Warming Potential (Climate Change); ODP = Ozone Depletion Potential; AP = Acidification Potential for Soil and Water; EP = Eutrophication Potential; POCP = Photochemical Ozone Creation; ADPE = Abiotic Depletion Potential – Elements; ADPF = Abiotic Depletion Potential – Fossil Fuels; HTCE = Human Toxicity – cancer effects; HTnCE = Human Toxicity – non cancer effects; ETF = Ecotoxicity – freshwater; PM = Particulate Matter; IRHH = Ionizing Radiation – human health effects; WRD = Water Resource Depletion: LUO – SOM = Land Use Occupation – SOM; LUO – B: Land Use Occupation – biodiversity ALL; LUT – SOM = Land Use Transformation – SOM; LUT – B = Land Use Transformation – Biodiversity ALL

Indicator	Unit	C1	C2 - core	C2 - facer	C3- core	C3 - facer	C4 - core	C4 - facer	D - core	D - facer
		Demolition	Transport	Transport	Waste Processing	Waste Processing	Disposal	Disposal	Reuse /Recovery/Recycling	Reuse / Recovery/Recycling potential
Environmental impacts per m²insulation material										
GWP	kg CO2 eq.	MND	5,17E-02	6,01E-03	0,00E+00	0,00E+00	6,31E+00	9,53E-03	-1,41E+00	0,00E+00
ODP	kg CFC 11 eq.	MND	9,31E-09	1,08E-09	0,00E+00	0,00E+00	4,73E-08	1,74E-09	-2,33E-07	0,00E+00
AP	kg SO2 eq.	MND	1,70E-04	1,97E-05	0,00E+00	0,00E+00	4,06E-03	6,12E-05	-1,93E-03	0,00E+00
EP	kg (PO4)3- eq.	MND	2,73E-05	3,17E-06	0,00E+00	0,00E+00	1,79E-03	1,19E-05	-2,47E-04	0,00E+00
POCP	kg C2H4 eq.	MND	1,41E-05	1,64E-06	0,00E+00	0,00E+00	7,20E-05	5,10E-06	-1,89E-04	0,00E+00
ADPE	kg Sb eq.	MND	1,53E-07	1,78E-08	0,00E+00	0,00E+00	3,07E-07	1,09E-08	-2,64E-07	0,00E+00
ADPF	MJ eq.	MND	7,81E-01	9,08E-02	0,00E+00	0,00E+00	5,25E+00	1,58E-01	-2,39E+01	0,00E+00
HTCE	CTUh	MND	3,89E-10	4,53E-11	0,00E+00	0,00E+00	3,50E-08	1,73E-10	-4,15E-09	0,00E+00
HTnCE	CTUh	MND	7,58E-09	8,81E-10	0,00E+00	0,00E+00	1,78E-07	7,05E-10	-4,26E-08	0,00E+00
ETF	CTUe	MND	1,25E-01	1,46E-02	0,00E+00	0,00E+00	7,90E+00	6,91E-03	-3,65E-01	0,00E+00
PM	kg PM 2.5 eq.	MND	2,51E-05	2,91E-06	0,00E+00	0,00E+00	2,01E-04	1,56E-05	-1,50E-04	0,00E+00
IRHH	kg U235 eq.	MND	3,29E-03	3,82E-04	0,00E+00	0,00E+00	8,46E-03	6,75E-04	-2,21E-01	0,00E+00
WRD	m^3 water eq.	MND	4,89E-06	5,69E-07	0,00E+00	0,00E+00	1,81E-03	-9,79E-06	-7,56E-05	0,00E+00
LUO – SOM	kg C deficit	MND	4,11E-02	4,77E-03	0,00E+00	0,00E+00	4,05E-02	1,15E-02	-2,51E-01	0,00E+00
LUO – B	PDF*m^2a	MND	2,38E-03	2,76E-04	0,00E+00	0,00E+00	2,29E-03	6,50E-04	-1,39E-02	0,00E+00
LUT – SOM	kg C deficit	MND	1,48E-01	1,72E-02	0,00E+00	0,00E+00	3,46E-01	3,83E-02	-7,50E-01	0,00E+00
LUT - B	PDF*m^2a	MND	1,57E-04	1,83E-05	0,00E+00	0,00E+00	4,43E-04	-2,59E-04	-2,76E-03	0,00E+00

GWP = Global Warming Potential (Climate Change); ODP = Ozone Depletion Potential; AP = Acidification Potential for Soil and Water; EP = Eutrophication Potential; POCP = Photochemical Ozone Creation; ADPE = Abiotic Depletion Potential – Elements; ADPF = Abiotic Depletion Potential – Fossil Fuels; HTCE = Human Toxicity – cancer effects; HTnCE = Human Toxicity – non cancer effects; ETF = Ecotoxicity – freshwater; PM = Particulate Matter; IRHH = Ionizing Radiation – human health effects; WRD = Water Resource Depletion: LUO – SOM = Land Use Occupation – SOM; LUO – B: Land Use Occupation – biodiversity ALL; LUT – SOM = Land Use Transformation – SOM; LUT – B = Land Use Transformation – Biodiversity ALL

Indicator	Unit	A1 - core	A2 - core	A3 - core	A1-3 - facer	A4 - core	A4 - facer	A5	B
		Raw material	Transport	Manufacturing	Product stage	Transport to site	Transport to site	Construction	Use
Resource use									
PERE	MJ	4,46E+00	2,79E-02	1,33E+00	3,25E+00	1,56E-02	1,81E-03	MND	MND
PERM	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	MND	MND
PERT	MJ	4,46E+00	2,79E-02	1,33E+00	3,25E+00	1,56E-02	1,81E-03	MND	MND
PENRE	MJ	7,09E+01	1,63E+00	1,83E+01	2,68E+01	2,35E+00	2,73E-01	MND	MND
PENRM	MJ	7,39E+01	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	MND	MND
PENRT	MJ	1,45E+02	1,63E+00	1,83E+01	2,68E+01	2,35E+00	2,73E-01	MND	MND
SM	kg	0,00E+00	0,00E+00	0,00E+00	2,17E-01	0,00E+00	0,00E+00	MND	MND
RSF	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	MND	MND
NRSF	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	MND	MND
FW	m^3	2,72E+03	3,38E-04	6,73E-03	2,38E-02	3,03E-04	3,53E-05	MND	MND
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 = Net use of fresh water									
Waste to disposal									
HWD	kg	2,67E-06	8,25E-07	1,77E-05	2,11E-03	8,35E-07	9,71E-08	MND	MND
NHWD	kg	1,49E-02	1,41E-01	1,11E-01	3,39E-01	3,47E-02	4,03E-03	MND	MND
RWD	kg	6,04E-06	1,14E-05	8,40E-05	5,31E-05	1,70E-05	1,97E-06	MND	MND
HWD = Hazardous waste disposed; NHWD = Non-hazardous waste disposed; RWD = Radioactive waste disposed									
Other output flows									
CRU	kg	INA	INA	4,07E-02	0,00E+00	INA	INA	MND	MND
MFR	kg	INA	INA	0,00E+00	0,00E+00	INA	INA	MND	MND
MER	kg	INA	INA	0,00E+00	0,00E+00	INA	INA	MND	MND
EEh	MJ	INA	INA	6,02E-01	0,00E+00	INA	INA	MND	MND
EEe	MJ	INA	INA	3,01E-01	0,00E+00	INA	INA	MND	MND
CRU = Components for reuse; MFR = Materials for recycling; MER = Materials for energy recovery; EEh = Exported energy as heat; EEe = Exported energy as electricity									

Indicator	Unit	C1	C2 - core	C2 - facer	C3- core	C3 - facer	C4 - core	C4 - facer	D - core	D - facer
		Demolition	Transport	Transport	Waste Processing	Waste Processing	Disposal	Disposal	Reuse /Recovery/Recycling	Reuse / Recovery/Recycling potential
Resource use										
PERE	MJ	MND	9,10E-03	1,06E-03	0,00E+00	0,00E+00	7,20E-02	3,32E-03	-1,59E+00	0,00E+00
PERM	MJ	MND	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
PERT	MJ	MND	9,10E-03	1,06E-03	0,00E+00	0,00E+00	7,20E-02	3,32E-03	-1,59E+00	0,00E+00
PENRE	MJ	MND	7,91E-01	9,20E-02	0,00E+00	0,00E+00	5,38E+00	1,65E-01	-3,88E+01	0,00E+00
PENRM	MJ	MND	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
PENRT	MJ	MND	7,91E-01	9,20E-02	0,00E+00	0,00E+00	5,38E+00	1,65E-01	-3,88E+01	0,00E+00
SM	kg	MND	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
RSF	MJ	MND	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
NRSF	MJ	MND	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
FW	m^3	MND	1,36E-04	1,58E-05	0,00E+00	0,00E+00	1,16E-02	-3,36E-05	-5,77E-03	0,00E+00
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 = Net use of fresh water										
Waste to disposal										
HWD	kg	MND	4,89E-07	5,69E-08	0,00E+00	0,00E+00	7,69E-06	1,32E-07	-2,77E-05	0,00E+00
NHWD	kg	MND	3,68E-02	4,28E-03	0,00E+00	0,00E+00	2,81E-01	2,40E-01	-3,36E-02	0,00E+00
RWD	kg	MND	5,23E-06	6,08E-07	0,00E+00	0,00E+00	1,22E-05	1,01E-06	-2,01E-04	0,00E+00
HWD = Hazardous waste disposed; NHWD = Non-hazardous waste disposed; RWD = Radioactive waste disposed										
Other output flows										
CRU	kg	MND	INA	INA	0,00E+00	0,00E+00	0,00E+00	0,00E+00	/	/
MFR	kg	MND	INA	INA	0,00E+00	0,00E+00	0,00E+00	0,00E+00	/	/
MER	kg	MND	INA	INA	0,00E+00	0,00E+00	0,00E+00	0,00E+00	/	/
EEh	MJ	MND	INA	INA	0,00E+00	0,00E+00	1,25E+01	0,00E+00	/	/
EEe	MJ	MND	INA	INA	0,00E+00	0,00E+00	6,26E+00	0,00E+00	/	/
CRU = Components for reuse; MFR = Materials for recycling; MER = Materials for energy recovery; EEh = Exported energy as heat; EEe = Exported energy as electricity										

SCENARIOS AND ADDITIONAL TECHNICAL INFORMATION

Construction process

Specific transport scenarios from Recticel have been used. Recticel delivers 60% directly to the construction site and 40% to a supplier. The average load of a truck is between 65 m³ and 70 m³. This means that one truck can deliver 2.1 ton of insulation materials. This effective load has been taken into account in the calculations. Trucks return empty to Recticel. For the transport from the supplier to the construction site, we refer to the scenarios defined in the BE-PCR. 85% is transported with a 16-32 ton EURO 5 truck from supplier to construction site and 15% is transported with a 7,5-16 ton EURO 5 lorry from supplier to construction site. The load factors from ecoinvent have been adapted in order to beter reflect the volume limited transport.

Module A4 – Transport to the building site						
Type of vehicle (truck/boat/etc.)	Fuel consumption per distance	Distance (km)	Capacity utilisation (%)	Volume of transported goods (m^3)	Weight of transported goods (ton)	Assumptions
Truck 28-34 ton	0,207 l diesel/km	100	6% on weight basis	70 m^3	2,1	Recticel own data
Truck 16-32 ton	0,256 l diesel/km	35	25%	Adapted ecoinvent scenario	Adapted ecoinvent scenario	Worst case due to volume limited transport
Truck 7,5-16 ton	0,185 l diesel/km	35	25%	Adapted ecoinvent scenario	Adapted ecoinvent scenario	Worst case due to volume limited transport

End of life

The default scenario provided by the BE-PCR, being 95% to incineration and 5% to landfill has been used as end-of-life scenario. The BE-PCR also provides default scenarios for transport of waste which are:

- 30 km with a 16-32 ton EURO 5 lorry from demolition site to sorting plant/crusher/collection point;
- 50 km with a 16-32 ton EURO 5 lorry from sorting plant/crusher/collection point to landfill;
- 100 km with a 16-32 ton EURO 5 lorry from sorting plant/crusher/collection point to incineration.

Module C2 – Transport to waste processing					
Type of vehicle (truck/boat/etc.)	Fuel consumption (litres/km)	Distance (km)	Capacity utilisation (%)	Density of products (kg/m^3)	Assumptions
Truck 16-32 ton	0,256 l diesel/km	30	50%	ecoinvent scenario	ecoinvent scenario
Truck 16-32 ton	0,256 l diesel/km	50	50%	ecoinvent scenario	ecoinvent scenario
Truck 16-32 ton	0,256 l diesel/km	100	50%	ecoinvent scenario	ecoinvent scenario

End-of-life modules – C3 and C4		
Parameter	Unit	Value
Wastes collected separately	kg	0
Wastes collected as mixed construction waste	kg	2,69E+00
Waste for re-use	kg	0
Waste for recycling	kg	0
Waste for energy recovery	kg	2,55E+00
Waste for final disposal	kg	1,34E-01

Benefits and loads beyond the system boundary

In module D, the benefits and loads beyond the system boundaries are quantified. For this product, Module D contains the benefits from exported energy from waste disposal processes declared in module C4.

The BE-PCR describes how benefits from exported energy should be quantified in module D for incineration processes which take place in Belgium. The default scenarios are as follows:

- Net energy efficiency of 20% for thermal energy and 10% for electric energy (using the Lower Heating Value of waste (LHV)
- Substituting process for heat production: "Thermal energy from natural gas" (e.g. Heat, natural gas, at industrial furnace > 100 kW)
- Substituting process for electricity production: Belgian electricity mix (including imports but excluding losses from transformation and distribution)

The lower heating value of PU is 30,67 MJ/kg (documentation ecoinvent dataset: Waste polyurethane {RoW}| treatment of, municipal incineration | Alloc Rec, U). This means that for 1 kg of PU waste incinerated, 6,134 MJ heat and 3,067 MJ electricity is avoided.

ADDITIONAL INFORMATION ON EMISSIONS TO INDOOR AIR, SOIL AND WATER DURING USE STAGE

The horizontal standards on measurement of release of regulated dangerous substances from construction products using harmonised test methods are not yet available, therefore the EPD can lack this information (CEN TC 351).

However, no emissions to indoor air are expected.

REFERENCES

- EN 16783:2017. Thermal insulation products - Product category rules (PCR) for factory made and in-situ formed products for preparing environmental product declarations.
- EN15804:2012+A1:2013. CEN TC 350. Sustainability of construction works – Environmental product declarations – Core rules for the product category of construction products. European standard.
- NBN/DTD B 08-001:2017. Delem L., Wastiels L. 2016. BE-PCR. Sustainability of construction works – Environmental product declarations – Core rules for the product category of construction products – National annex to NBN EN 15804+A1.
- Peeters K., Spirinckx C. 2018. Life cycle assessment of three types of PU insulation boards from Recticel. LCA background report.
- Servaes, R., Allacker, K., Debacker, W., Delem L., De Nocker, L., De Troyer, F. Janssen, A., Peeters, K., Spirinckx, C., Van Dessel, J. (2013). Milieuprofiel van gebouwelementen. Te raadplegen via: www.ovam.be/materiaalprestatie-gebouwen.