

Statement of Verification

BREG EN EPD No.: 000516

Issue 01

This is to verify that the
Environmental Product Declaration
provided by:
Polyroof Products Ltd



is in accordance with the requirements of:
EN 15804:2012+A2:2019
and
BRE Global Scheme Document SD207

This declaration is for:
1 m² of the Protec waterproofing system utilised in a typical waterproofing application

Company Address

Polyroof Products Ltd,
Furness House,
Castle Park Industrial Estate,
Flint
CH6 5XA
United Kingdom



POLYROOF
ADVANCED LIQUID ROOFING

Signed for BRE Global Ltd

Emma Baker
Operator

24 July 2023
Date of this Issue

24 July 2023
Date of First Issue

23 July 2028
Expiry Date



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Environmental Product Declaration

EPD Number: 000516

General Information

EPD Programme Operator	Applicable Product Category Rules
BRE Global Watford, Herts WD25 9XX United Kingdom	BRE 2021 Product Category Rules (PN 514 Rev 3.0) for Type III environmental product declaration of construction products to EN 15804:2012+A2:2019.
Commissioner of LCA study	LCA consultant/Tool
Polyroof Products Ltd, Furness House, Castle Park Industrial Estate, Flint CH6 5XA United Kingdom	LCA Tool: BRE LINA A2 LCA Consultant: Bala Subramanian
Declared/Functional Unit	Applicability/Coverage
1 m ² of the Protec waterproofing system utilised in a typical waterproofing application	Product Specific
EPD Type	Background database
Cradle to Gate with Modules C and D	Ecoinvent 3.8
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 <input type="checkbox"/> Internal <input checked="" type="checkbox"/> External	
(Where appropriate ^b)Third party verifier: Roger Connick	
a: Product category rules b: Optional for business-to-business communication; mandatory for business-to-consumer communication (see EN ISO 14025:2010, 9.4)	
Comparability	
Environmental product declarations from different programmes may not be comparable if not compliant with EN 15804:2012+A2:2019. Comparability is further dependent on the specific product category rules, system boundaries and allocations, and background data sources. See Clause 5.3 of EN 15804:2012+A2:2019 for further guidance	

Information modules covered

Product			Construction		Use stage							End-of-life				Benefits and loads beyond the system boundary
					Related to the building fabric					Related to the building						
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Raw materials supply	Transport	Manufacturing	Transport to site	Construction – Installation	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	Deconstruction demolition	Transport	Waste processing	Disposal	Reuse, Recovery and/or Recycling potential
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

Note: Ticks indicate the Information Modules declared.

Manufacturing site(s)

Polyroof Products Ltd,
Furness House,
Castle Park Industrial Estate,
Flint,
CH6 5XA,
United Kingdom

Construction Product

Product Description

Protec is a flexible hybrid polymer waterproofing system ideal for a wide range of roofing and waterproofing applications. Highly versatile, fast curing and tough, the system is a cold liquid applied membrane and is BBA approved with a certified lifespan of 25 years.

Technical Information

The results in this EPD refer to a Protec waterproofing membrane laid with typical coverage rates (1.5 L/m² first coat, 0.5 L/m² second coat), standard 450g glass fibre chopped strand matting, and typical catalyst levels.

Property	Value, Unit
Nominal Resin Coverage Rate	2 L/m ²
Nominal Wet Weight of Membrane	3.20 kg/m ²
Nominal Dry Weight of Membrane*	3.15 kg/m ²

*Due to its ultra-low VOC advanced technology, Protec resin typically loses only around 1.77% of its mass during curing.

The Protec system has BBA Certification (Certificate Number 09/4676) with a certified lifespan of at least 25 years. It can achieve a classification of BROOF(t4), the top rating achievable for a flat roofing system. The product also has a European Technical Assessment (ETA-20/0914) and United Kingdom Technical Assessment (UKTA-22/6389). The product is also available with FM certification. Detailed technical information is provided within these certificates.



Main Product Contents

Material/Chemical Input	%
Polymer	30-35
Monomer	10-15
Additives	20-30
Glass Fibre	10-15
BPO	1-5
Others	0-5

Manufacturing Process

Raw materials are delivered to Polyroof's manufacturing site in Flint and stored on site until required.

Resin

The enterprise resource planning software manages the complete manufacturing process for the resin element of the membrane. It generates a batch manufacturing record that contains strict procedures to produce each product in accordance with ISO 9001. The process involves an automated loading of raw materials into a high-shear reactor with conditions including mixing time, vacuum pressure, temperature, and nitrogen blanketing strictly controlled. All batches are quality control tested in accordance with quality plans. The vessels are decanted using low-pressure air via a filtering system into product pails. The pails are stored on site until ready for delivery to the customer.

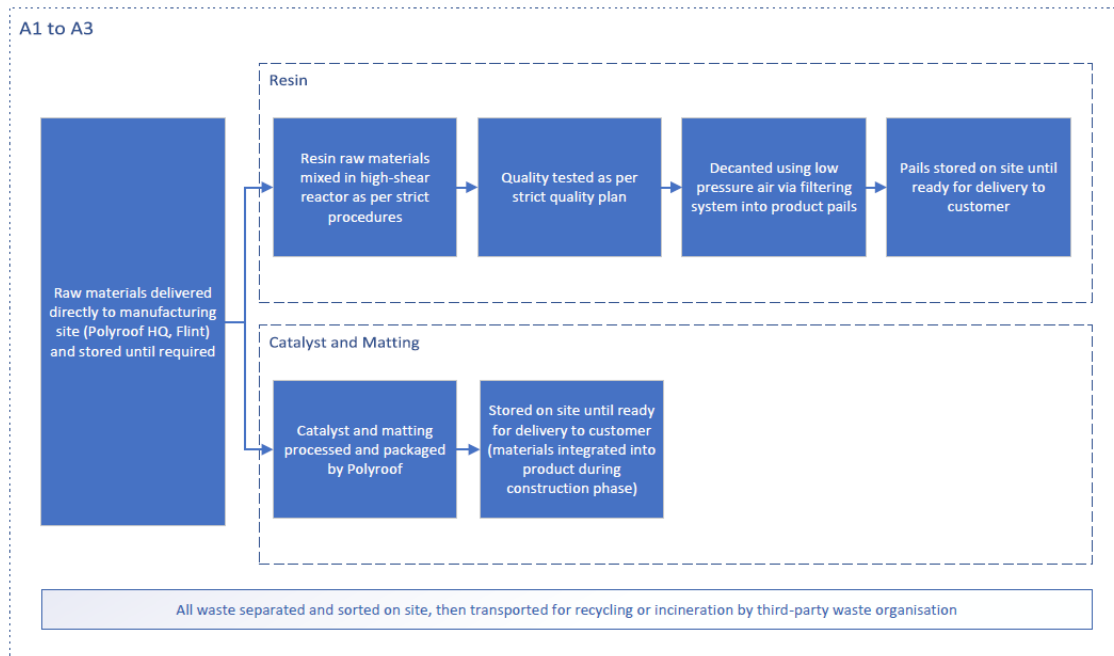
Catalyst and Matting

The catalyst and 450g glass fibre chopped strand matting are processed and packaged by Polyroof; they are then stored on site until ready for delivery to the customer. The catalyst is used to cure the resin and is introduced to the resin during the construction phase. The 450g glass fibre chopped strand matting is embedded into the base coat of the system during the construction phase.

Waste

All waste material generated at Polyroof's manufacturing site in Flint is separated and sorted on site, then transported for recycling or incineration by a third-party waste organisation.

Process flow diagram



Construction Installation

Protec is a highly versatile, fast curing, fully reinforced cold liquid applied membrane system ideal for a wide range of roofing and waterproofing applications. The Protec *RapidCure* technology utilises catalyst, accelerators and inhibitors allowing full control over cure times across a wide range of temperatures all year round. The membrane is reinforced with glass fibre mat, allowing the system to be easily detailed around penetrations and other details. The membrane can be finished in various colours and anti-slip options.

Use Information

Installation of Protec must be carried out by a network of independent, approved roofing contractors in accordance with the Polyroof approved contractor scheme. During the service life of the membrane, there is no specific maintenance requirements for the Protec system, other than standard inspection and maintenance for flat roofs as stated in BS 6229.

Reference Service Life

Protec is BBA approved (Cert No. 09/4676) with a certified lifespan of at least 25 years.

End of Life

In the majority of situations, the Protec membrane will be in place until the building is demolished as it can be easily overlaid at end of life (with either a new waterproofing system or as part of a thermal upgrade).

It is expected that the membrane will be sent to incineration with energy recovery plant alongside any attached substrate or roofing materials following demolition of the building.

Life Cycle Assessment Calculation Rules

Declared unit description.

1 m² of the Protec waterproofing system utilised in a typical waterproofing application.

System boundary

This is a cradle to gate with modules C and D LCA of Polyroof's Protec waterproofing system manufactured by Polyroof in the United Kingdom. It follows the modular design defined in EN15804:2012+A2:2019 and BRE 2021 Product Category Rules (PN 514 Rev 3.0).

Data sources, quality and allocation

The Protec system is made up of three main components: resin, catalyst, and glass fibre matt. The latter two components bypass the manufacturing process which is reserved for the resin production. The percentage of Protec Resin manufactured during the data collection period (1st April 2021 to 31st March 2021) compared to total site resin production was 12.9% by mass. Therefore, total site process data such as fuel consumption, water consumption and discharge and waste emissions attributable to the Protec Resin were calculated using this allocation factor. After reviewing the data collection form, it was determined that the mass balance was within tolerance and therefore no uplifting of input materials was necessary. Secondary data has been obtained for all other upstream and downstream processes that are beyond the control of the manufacturer (i.e., raw material production) from the ecoinvent 3.8 database. All ecoinvent datasets are complete within the context used and conform to the system boundary and the criteria for the exclusion of inputs and outputs, according to the requirements specified in EN15804.

ISO14044 guidance. Quality Level	Geographical representativeness	Technical representativeness	Time representativeness
Very Good	Data from area under study.	Data from processes and products under study. Same state of technology applied as defined in goal and scope (i.e., identical technology).	n/a
Very Good	n/a	n/a	There is approximately 1-2 years between the Ecoinvent LCI reference year, and the time period for which the LCA was undertaken.

Specific European datasets have been selected from the ecoinvent LCI for this LCA. Manufacturer uses the national grid electricity for production, so therefore the national grid electricity dataset has been used for the LCA modelling (Ecoinvent 3.8). The quality level of time representativeness is also Very Good as the background LCI datasets are based on ecoinvent v3.8 which was compiled in 2021. Therefore, there is less than 5 years between the ecoinvent LCI reference year and the time period for which the LCA was undertaken.

Cut-off criteria

All inputs or outputs have been included and all raw materials, packaging and transport, energy, water use and wastes, are included. Direct emissions to air of VOCs are effectively negligible. No direct emissions to water and soil. Upstream extraction and/or processing of inputs are included within the use of the background datasets within ecoinvent 3.8.

LCA Results

(MND = module not declared)

Parameters describing environmental impacts			GWP-total	GWP-fossil	GWP-biogenic	GWP-luluc	ODP	AP	EP-freshwater
			kg CO ₂ eq	kg CO ₂ eq	kg CO ₂ eq	kg CO ₂ eq	kg CFC11 eq	mol H ⁺ eq	kg (PO ₄) ³⁻ eq
Product stage	Raw material supply	A1	1.02E+01	1.01E+01	8.89E-02	7.03E-03	2.13E-06	6.51E-02	2.74E-03
	Transport	A2	7.08E-01	7.07E-01	5.95E-04	2.81E-04	1.63E-07	3.11E-03	4.53E-05
	Manufacturing	A3	5.28E-01	6.39E-01	-1.12E-01	4.55E-04	3.95E-08	2.16E-03	2.30E-04
	Total	A1-3	1.14E+01	1.15E+01	-2.29E-02	7.77E-03	2.33E-06	7.04E-02	3.02E-03
Construction process stage	Transport	A4	MND	MND	MND	MND	MND	MND	MND
	Construction	A5	MND	MND	MND	MND	MND	MND	MND
Use stage	Use	B1	MND	MND	MND	MND	MND	MND	MND
	Maintenance	B2	MND	MND	MND	MND	MND	MND	MND
	Repair	B3	MND	MND	MND	MND	MND	MND	MND
	Replacement	B4	MND	MND	MND	MND	MND	MND	MND
	Refurbishment	B5	MND	MND	MND	MND	MND	MND	MND
	Operational energy use	B6	MND	MND	MND	MND	MND	MND	MND
	Operational water use	B7	MND	MND	MND	MND	MND	MND	MND
100% Incineration with energy recovery									
End of life	Deconstruction, demolition	C1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Transport	C2	2.66E-02	2.66E-02	2.27E-05	1.04E-05	6.15E-09	1.08E-04	1.71E-06
	Waste processing	C3	9.97E+00	9.97E+00	5.32E-04	1.89E-05	6.42E-09	1.11E-03	9.22E-06
	Disposal	C4	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Potential benefits and loads beyond the system boundaries	Reuse, recovery, recycling potential	D	-2.33E+00	-2.32E+00	-1.20E-02	-3.17E-03	-1.57E-07	-7.25E-03	-3.79E-04

GWP-total = Global warming potential, total;
 GWP-fossil = Global warming potential, fossil;
 GWP-biogenic = Global warming potential, biogenic;
 GWP-luluc = Global warming potential, land use and land use change;

ODP = Depletion potential of the stratospheric ozone layer;
 AP = Acidification potential, accumulated exceedance; and
 EP-freshwater = Eutrophication potential, fraction of nutrients reaching freshwater end compartment

LCA Results (continued)

(MND = module not declared)

Parameters describing environmental impacts			EP-marine	EP-terrestrial	POCP	ADP-mineral&metals	ADP-fossil	WDP	PM
			kg N eq	mol N eq	kg NMVOC eq	kg Sb eq	MJ, net calorific value	m ³ world eq deprived	disease incidence
Product stage	Raw material supply	A1	9.24E-03	9.19E-02	3.49E-02	1.68E-04	1.76E+02	8.27E+00	5.89E-07
	Transport	A2	9.21E-04	1.01E-02	3.05E-03	2.44E-06	1.07E+01	4.78E-02	6.06E-08
	Manufacturing	A3	5.62E-04	5.47E-03	2.53E-03	1.38E-06	9.70E+00	1.29E-01	3.26E-08
	Total	A1-3	1.07E-02	1.07E-01	4.05E-02	1.72E-04	1.97E+02	8.45E+00	6.82E-07
Construction process stage	Transport	A4	MND	MND	MND	MND	MND	MND	MND
	Construction	A5	MND	MND	MND	MND	MND	MND	MND
Use stage	Use	B1	MND	MND	MND	MND	MND	MND	MND
	Maintenance	B2	MND	MND	MND	MND	MND	MND	MND
	Repair	B3	MND	MND	MND	MND	MND	MND	MND
	Replacement	B4	MND	MND	MND	MND	MND	MND	MND
	Refurbishment	B5	MND	MND	MND	MND	MND	MND	MND
	Operational energy use	B6	MND	MND	MND	MND	MND	MND	MND
	Operational water use	B7	MND	MND	MND	MND	MND	MND	MND
100% Incineration with energy recovery									
End of life	Deconstruction, demolition	C1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Transport	C2	3.25E-05	3.55E-04	1.09E-04	9.25E-08	4.02E-01	1.81E-03	2.29E-09
	Waste processing	C3	5.66E-04	5.79E-03	1.53E-03	1.88E-07	4.12E-01	7.27E-02	8.48E-09
	Disposal	C4	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Potential benefits and loads beyond the system boundaries	Reuse, recovery, recycling potential	D	-1.71E-03	-1.90E-02	-4.64E-03	-6.53E-06	-6.17E+01	-4.41E-01	-3.54E-08

EP-marine = Eutrophication potential, fraction of nutrients reaching marine end compartment;
 EP-terrestrial = Eutrophication potential, accumulated exceedance;
 POCP = Formation potential of tropospheric ozone;
 ADP-mineral&metals = Abiotic depletion potential for non-fossil resources;

ADP-fossil = Depletion potential of the stratospheric ozone layer;
 WDP = Water (user) deprivation potential, deprivation-weighted water consumption; and
 PM = Particulate matter.

LCA Results (continued)

(MND = module not declared)

			Parameters describing environmental impacts				
			IRP	ETP-fw	HTP-c	HTP-nc	SQP
			kBq U ²³⁵ eq	CTUe	CTUh	CTUh	dimensionless
Product stage	Raw material supply	A1	7.76E-01	1.77E+03	2.02E-08	3.96E-07	2.63E+01
	Transport	A2	5.48E-02	8.31E+00	2.72E-10	8.69E-09	7.27E+00
	Manufacturing	A3	1.14E-01	1.36E+01	2.55E-09	9.91E-09	1.29E+01
	Total	A1-3	9.45E-01	1.80E+03	2.30E-08	4.15E-07	4.65E+01
Construction process stage	Transport	A4	MND	MND	MND	MND	MND
	Construction	A5	MND	MND	MND	MND	MND
Use stage	Use	B1	MND	MND	MND	MND	MND
	Maintenance	B2	MND	MND	MND	MND	MND
	Repair	B3	MND	MND	MND	MND	MND
	Replacement	B4	MND	MND	MND	MND	MND
	Refurbishment	B5	MND	MND	MND	MND	MND
	Operational energy use	B6	MND	MND	MND	MND	MND
	Operational water use	B7	MND	MND	MND	MND	MND
100% Incineration with energy recovery							
End of life	Deconstruction, demolition	C1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Transport	C2	2.07E-03	3.14E-01	1.02E-11	3.29E-10	2.76E-01
	Waste processing	C3	2.03E-03	7.83E+00	1.45E-09	1.02E-08	1.58E-01
	Disposal	C4	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Potential benefits and loads beyond the system boundaries	Reuse, recovery, recycling potential	D	-2.17E+00	-2.88E+01	-5.85E-10	-1.67E-08	-2.30E+01

IRP = Potential human exposure efficiency relative to U235;
 ETP-fw = Potential comparative toxic unit for ecosystems;
 HTP-c = Potential comparative toxic unit for humans;

HTP-nc = Potential comparative toxic unit for humans; and
 SQP = Potential soil quality index.

LCA Results (continued)

(MND = module not declared)

			Parameters describing resource use, primary energy					
			PERE	PERM	PERT	PENRE	PENRM	PENRT
			MJ	MJ	MJ	MJ	MJ	MJ
Product stage	Raw material supply	A1	7.20E+00	0.00E+00	7.20E+00	1.36E+02	3.46E+01	1.70E+02
	Transport	A2	1.50E-01	0.00E+00	1.50E-01	1.05E+01	0.00E+00	1.05E+01
	Manufacturing	A3	1.15E+00	1.36E+00	2.51E+00	4.42E+00	5.72E-01	5.00E+00
	Total	A1-3	8.49E+00	1.36E+00	9.86E+00	1.51E+02	3.52E+01	1.86E+02
Construction process stage	Transport	A4	MND	MND	MND	MND	MND	MND
	Construction	A5	MND	MND	MND	MND	MND	MND
Use stage	Use	B1	MND	MND	MND	MND	MND	MND
	Maintenance	B2	MND	MND	MND	MND	MND	MND
	Repair	B3	MND	MND	MND	MND	MND	MND
	Replacement	B4	MND	MND	MND	MND	MND	MND
	Refurbishment	B5	MND	MND	MND	MND	MND	MND
	Operational energy use	B6	MND	MND	MND	MND	MND	MND
	Operational water use	B7	MND	MND	MND	MND	MND	MND
100% Incineration with energy recovery								
End of life	Deconstruction , demolition	C1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Transport	C2	5.66E-03	0.00E+00	5.66E-03	3.95E-01	0.00E+00	3.95E-01
	Waste processing	C3	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Disposal	C4	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Potential benefits and loads beyond the system boundaries	Reuse, recovery, recycling potential	D	-7.06E+01	0.00E+00	-7.06E+01	-3.88E+02	0.00E+00	-3.88E+02

PERE = Use of renewable primary energy excluding renewable primary energy 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 resource

LCA Results (continued)

(MND = module not declared)

Parameters describing resource use, secondary materials and fuels, use of water						
			SM	RSF	NRSF	FW
			kg	MJ net calorific value	MJ net calorific value	m ³
Product stage	Raw material supply	A1	2.74E-02	0.00E+00	0.00E+00	1.95E-01
	Transport	A2	0.00E+00	0.00E+00	0.00E+00	1.18E-03
	Manufacturing	A3	2.07E-06	0.00E+00	0.00E+00	3.13E-03
	Total	A1-3	2.74E-02	0.00E+00	0.00E+00	2.00E-01
Construction process stage	Transport	A4	MND	MND	MND	MND
	Construction	A5	MND	MND	MND	MND
Use stage	Use	B1	MND	MND	MND	MND
	Maintenance	B2	MND	MND	MND	MND
	Repair	B3	MND	MND	MND	MND
	Replacement	B4	MND	MND	MND	MND
	Refurbishment	B5	MND	MND	MND	MND
	Operational energy use	B6	MND	MND	MND	MND
	Operational water use	B7	MND	MND	MND	MND
100% Incineration with energy recovery						
End of life	Deconstruction, demolition	C1	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Transport	C2	0.00E+00	0.00E+00	0.00E+00	4.48E-05
	Waste processing	C3	0.00E+00	0.00E+00	0.00E+00	1.71E-03
	Disposal	C4	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Potential benefits and loads beyond the system boundaries	Reuse, recovery, recycling potential	D	-4.19E-03	0.00E+00	0.00E+00	-1.12E-02

SM = Use of secondary material;
RSF = Use of renewable secondary fuels;

NRSF = Use of non-renewable secondary fuels;
FW = Net use of fresh water

LCA Results (continued)

(MND = module not declared)

			Other environmental information describing waste categories		
			HWD	NHWD	RWD
			kg	kg	kg
Product stage	Raw material supply	A1	1.71E+00	1.92E+01	4.07E-04
	Transport	A2	1.18E-02	2.08E-01	7.22E-05
	Manufacturing	A3	9.04E-03	1.59E-01	1.55E-02
	Total	A1-3	1.73E+00	1.96E+01	1.60E-02
Construction process stage	Transport	A4	MND	MND	MND
	Construction	A5	MND	MND	MND
Use stage	Use	B1	MND	MND	MND
	Maintenance	B2	MND	MND	MND
	Repair	B3	MND	MND	MND
	Replacement	B4	MND	MND	MND
	Refurbishment	B5	MND	MND	MND
	Operational energy use	B6	MND	MND	MND
	Operational water use	B7	MND	MND	MND
100% Incineration with energy recovery					
End of life	Deconstruction, demolition	C1	0.00E+00	0.00E+00	0.00E+00
	Transport	C2	4.43E-04	7.87E-03	2.72E-06
	Waste processing	C3	0.00E+00	0.00E+00	0.00E+00
	Disposal	C4	0.00E+00	0.00E+00	0.00E+00
Potential benefits and loads beyond the system boundaries	Reuse, recovery, recycling potential	D	-2.56E-01	-3.54E+00	-1.09E-03

HWD = Hazardous waste disposed;
 NHWD = Non-hazardous waste disposed;
 RWD = Radioactive waste disposed

LCA Results (continued)

(MND = module not declared)

Other environmental information describing output flows – at end of life								
			CRU	MFR	MER	EE	Biogenic carbon (product)	Biogenic carbon (packaging)
			kg	kg	kg	MJ per energy carrier	kg C	kg C
Product stage	Raw material supply	A1	0.00E+00	3.78E-04	2.41E-05	1.56E-01	0.00E+00	0.00E+00
	Transport	A2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Manufacturing	A3	0.00E+00	1.07E-05	9.99E-11	8.12E-06	3.63E-02	2.29E-03
	Total	A1-3	0.00E+00	3.88E-04	2.41E-05	1.56E-01	3.63E-02	2.29E-03
Construction process stage	Transport	A4	MND	MND	MND	MND	MND	MND
	Construction	A5	MND	MND	MND	MND	MND	MND
Use stage	Use	B1	MND	MND	MND	MND	MND	MND
	Maintenance	B2	MND	MND	MND	MND	MND	MND
	Repair	B3	MND	MND	MND	MND	MND	MND
	Replacement	B4	MND	MND	MND	MND	MND	MND
	Refurbishment	B5	MND	MND	MND	MND	MND	MND
	Operational energy use	B6	MND	MND	MND	MND	MND	MND
	Operational water use	B7	MND	MND	MND	MND	MND	MND
100% Incineration with energy recovery								
End of life	Deconstruction , demolition	C1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Transport	C2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Waste processing	C3	0.00E+00	0.00E+00	3.15E+00	0.00E+00	0.00E+00	0.00E+00
	Disposal	C4	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Potential benefits and loads beyond the system	Reuse, recovery, recycling potential	D	0.00E+00	-3.59E-04	-2.96E-07	-2.52E-02	0.00E+00	0.00E+00

CRU = Components for reuse;
MFR = Materials for recycling

MER = Materials for energy recovery;
EE = Exported Energy

Scenarios and additional technical information

Scenarios and additional technical information			
Scenario	Parameter	Units	Results
C1 – Deconstruction	In the majority of situations, the Protec membrane will be in place until the building is demolished as it can be easily overlaid at end of life (with either a new waterproofing system or as part of a thermal upgrade). The demolition approach employed for the building and roof will differ considerably on a site-by-site basis due to its dependency on numerous factors, such as construction methodology, local geography and roofing substrate. However, it can be safely assumed that the energy attributed to deconstructing the membrane compared to the overall demolition will be effectively negligible. As a result, no impacts are attributed to module C1. Removed membranes will be sent to the pre-processing unit for incineration with energy recovery, along with any attached substrate or roofing materials.		
C2- Transportation	50km by road has been modelled for module C2 as a typical distance from the demolition site to the incineration with energy recovery plant. However, end-users of the EPD can use this information to calculate the impacts of a bespoke transport distance for module C2 if required.	Litres per km	0.227
	Distance: Deconstruction unit to pre-processing unit	km	50
C3 – Pre-processing	The recovered membranes will be sent to an incineration with energy recovery plant without the need for any pre-processing. There are no landfill waste emissions from the C1 or C3 stages, therefore no impacts are attributable to module C4.	kg/m ²	3.15
Module D	<p>The membrane, alongside whatever it is adhered to, will be incinerated for energy at end of life. This process is energy efficient, with 37.4% of the combustion heat recovered after incineration (Environmental agency, 2013) (DEFRA, 2013). The dataset used to calculate the avoided impacts of electricity consumption in a future system was "Electricity, medium voltage {GB} market for electricity, medium voltage EN15804, S".</p> <p>Calorific value of Protec membrane - 19.9 kW/m² @ 2.0 L/m² 100% Incineration with energy recovery - 3.15 kg/m²</p>		

Summary

Interpretation of results

The bulk of the environmental impacts and primary energy demand are attributed to the upstream manufacturing process, covered by information modules A1-A3 of EN15804:2012+A2:2019.

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