

# ENVIRONMENTAL PRODUCT DECLARATION



ISO 14025 ISO 21930 EN 15804

Owner of the declaration	European Waterproofing Association AISBL
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Single layer mechanically fastened modified bitumen roof waterproofing system  
Product

European Waterproofing Association AISBL  
Owner of the declaration



## General information

### Product

Single layer mechanically fastened modified bitumen roof waterproofing system

### Program holder

The Norwegian EPD Foundation  
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### Declaration number:

NEPD00268E

### This declaration is based on Product Category Rules:

CEN Standard EN 15804 serve as core PCR  
EPD NORGE Roof Waterproofing NPCR 00022rev1  
december 2012

### Declared unit:

1 m<sup>2</sup> polyester-glass reinforced modified bitumen roof waterproofing membrane for single layer mechanically fastening

### Declared unit with option:

### Functional unit:

1 m<sup>2</sup> single layer mechanically fastened modified bitumen roof waterproofing system with a service life time of 60 years (including fasteners, installation and refurbishment after 30 years).

### The EPD has been worked out by:

Life Cycle Engineering  
Via Livorno, 60  
10144, Torino (Italy)



Together with BWA

### Verification:

Independent verification of data, other environmental information and EPD has been carried out in accordance with ISO14025, 8.1.3 and 8.1.4

externally  internally

*Helene Sedal*

Helene Sedal

(Independent verifier approved by EPD Norway)

### Declared unit:

1 m<sup>2</sup> polyester-glass reinforced modified bitumen roof waterproofing membrane for single layer mechanically fastening

### Owner of the declaration

European Waterproofing Association AISBL  
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### Manufacturer

The BWA members listed on page 6

### Place of production:

Production locations in Belgium, Denmark, Finland, Germany, Italy, Netherlands and Sweden (see participants on page 6)

### Management system:

Not applicable for association. Most production locations do have an ISO 14001 certificate

### VAT

BE 0597.802.387

### Issue date

22.09.2014

### Valid to

~~AGCEJEFJA~~

### Comparability:

EPD of construction products may not be comparable if they not comply with EN 15804 and seen in a building context.

### Year of study:

2010-2012

Approved

*Dagfinn Malnes*

Dagfinn Malnes  
Managing Director of EPD-Norway

Key environmental indicators	Unit	Cradle to gate A1 - A3
Global warming	kg CO <sub>2</sub> -eqv	3,55
Energy use	MJ	6,56E+01
Dangerous substances	*	-

Transport A4
4,58E-01
6,55E+00
-

\* The product contains no substances from the REACH Candidate list or the Norwegian priority list

\*\*\*\*\* Transport from production site to central warehouse in Norway

## Product

### Product description:

Modified bitumen sheet with polyester/glass reinforcement with an average thickness of 4.4 mm (5,5 kg/m<sup>2</sup>). Intended for mechanically fastened single layer application.

### Technical data:

Average of commonly in Europe used plastomeric/elastomeric bitumen sheets which complies with the local national requirements. Average taken of plastomeric/elastomeric bitumen sheets commonly used in Europe and complying with local national requirements. The participating production locations gave data for the most important product produced for this intended use. Following an mathematical average was made per group of countries (cluster) producing similar products. Based on an estimated production quantity per country a weighted average was calculated.

### Product specification

The main materials that are required for the production of an average membrane are listed in the table below.

Materials		%
Bitumen		49,9
Filler (e.g. limestone)		20
Polymers (SBS, PP, etc)		6,8
Reinforcement (PET + glass)		3,9
Mineral surfacing		6,9
Other		12,6

### Market:

Europe

### Reference service life:

60 years

## LCA: Calculation rules

### Functional unit:

1 m<sup>2</sup> single layer mechanically fastened modified bitumen roof waterproofing system with a service life time of 60 years (including fasteners, installation and refurbishment after 30 years).

### System boundary:

The processes belonging to the analyzed system were organized according to the following three phases:

### Upstream process

Include all impacts due to the production of raw materials, such as bitumen and polymers as well as recycled materials and transport to the production site.

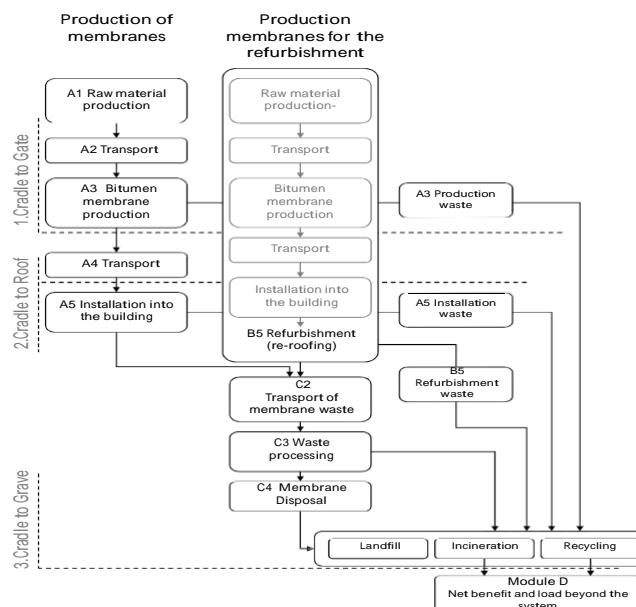
### Core process

Include all burden of the membrane production, such as energy, direct air and water emissions. Impacts of waste delivered to final disposal are considered as well.

### Downstream process

Include transportation to the roof location, the installation of the roofing membranes and the reroofing phase. The end of life treatment of the membranes and the ancillary installation products are also included.

In the figure below the modules according EN 15804 which are included in the analyzed system are visualized.



**Data quality:**

Production locations data year 2010 from 42 European production locations. For the main raw materials the most recent sector information was used. For bitumen, which is the main raw material, the Eurobitume Life Cycle Inventory (LCI) was used (see [www.eurobitume.eu](http://www.eurobitume.eu)). For plastics, Plastics Europe LCI studies were used as reference data. In some other cases already available EPDs were used (e.g. specific polyester fleece EPD 2011). Other data came from the Ecoinvent database (2011). The European electricity mix was used as reference data for all production plants. No primary data was directly collected from the raw material suppliers.

**Cut-off criteria:**

All major raw materials and all the essential energy is included. The production process for raw materials and energy flows that are included with very small amounts (<1%) are not included. This cut-off rule does not apply for hazardous materials and substances.

**Allocation:**

The allocation is made in accordance with the provisions of EN 15804. Incoming energy and water and waste production in-house production is allocated equally among all products through mass allocation. Effects of primary production of recycled materials allocated to the main product in which the material was used. The recycling process and transportation of the material is allocated to this analysis.

## LCA: Scenarios and additional technical information

The following information describe the scenarios in the different modules of the EPD.

**Transport from production place to user (A4)**

Type	Capacity utilisation (incl. return) %	Type of vehicle	Distance km	Fuel/Energy	Value
Truck	85 %	16-32 ton, Euro 3	500	l/tkm	

The average transport distance from the participating production locations to central warehouse in Norway is 800 km.

**Installation in the building (A5)**

	Unit	Value
Auxiliary	kg	
Water consumption	m <sup>3</sup>	
Electricity consumption	kWh	
Other energy carriers	kg/m <sup>2</sup>	0,05
Material loss	%	16
Output materials from waste treatment	kg	
Dust in the air	kg	

The membranes are fastened in the joint with 5 stainless steel mechanical fasteners per m<sup>2</sup>. To compensate installation losses and material needed for joints the membrane consumption is increased with 16 %.

**Replacement (B4)/Refurbishment (B5)**

	Unit	Value
Replacement cycle*	RSL	30
Electricity consumption	kWh	
Replacement of worn parts		
Other energy carriers	kg/m <sup>2</sup>	0,2
Material loss	%	12

\* The maintenance interval is 30 year. The refurbishment process consists the application of a new top layer which is fully bonded on the existing roofing system by torch.

**End of Life (C1, C3, C4)**

	Unit	Value
Hazardous waste disposed	kg	
Collected as mixed construction waste	kg	
Reuse	kg	
Recycling	%	8
Energy recovery	kg	
To landfill	%	68
To incineration without energy recovery	%	24

The environmental burden due to waste disposal of the membranes is calculated based on an average scenario which represents the current European situation. The average scenario is 68% to landfill, 24% to incineration (without energy recovery) and 8% to recycling. Compared to the Norwegian situation this can be regarded as a worst case scenario.

### Transport to waste processing (C2)

Type	Capacity utilisation (incl. return) %	Type of vehicle	Distance km	Fuel/Energy	Value
Truck	50 %	16-32 ton	50	l/tkm	

Transport to waste treatment: For the transportation of roofing material waste to waste treatment with a truck (16-32 ton) for the standard transport distance of 50 km.

For waste processing for recycling: for collection of waste fractions the standard transport distance of 50 km is considered (distance between building site to waste sorting facility). For the waste processing only the electricity consumption of waste sorting facilities has been considered.

### Benefits and loads beyond the system boundaries (D)

	Unit	Value
Global warming potential	kg CO <sub>2</sub> -Eqv	-3,13
Energy use	MJ	-111

## LCA: Results

The environmental burden has been calculated by means of the 24 indicators according to EN 15804 requirements.

System boundaries (X=included, MND=module not declared, MNR=module not relevant)

Product stage			Construction installation stage		Use stage							End of life stage				Beyond the system boundaries
Raw materials	Transport	Manufacturing	Transport	Construction installation stage	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	MNR	x	MNR	MNR	MND	x	x	x	x

### Environmental impact

Parameter	Unit	A1-A3	A4	A5	B5	C2	C3	C4	D
GWP	kg CO <sub>2</sub> -eqv	3,55E+00	2,86E-01	1,69E+00	5,45E+00	7,54E-02	9,47E-02	7,36E+00	-3,13E+00
ODP	kg CFC11-eqv	1,69E-07	4,30E-08	8,13E-08	2,78E-07	9,95E-09	2,32E-09	2,94E-08	-4,10E-07
POCP	kg C <sub>2</sub> H <sub>4</sub> -eqv	3,14E-03	1,89E-04	9,09E-04	4,19E-03	4,32E-05	4,56E-05	4,38E-04	-1,22E-03
AP	kg SO <sub>2</sub> -eqv	1,44E-02	1,34E-03	4,56E-03	1,99E-02	1,86E-04	3,96E-04	2,13E-03	-7,66E-03
EP	kg PO <sub>4</sub> <sup>3-</sup> -eqv	2,00E-03	3,10E-04	6,03E-03	8,19E-03	4,06E-05	1,82E-04	5,94E-02	-4,18E-03
ADPM	kg Sb-eqv	6,32E-05	1,80E-10	1,93E-05	8,24E-05	1,46E-10	6,15E-09	2,68E-07	-2,54E-08
ADPE	MJ	1,98E+02	4,05E+00	4,19E+01	2,43E+02	1,07E+00	1,25E+00	3,26E+00	-9,77E+01

**GWP** Global warming potential; **ODP** Depletion potential of the stratospheric ozone layer; **POCP** Formation potential of tropospheric photochemical oxidants; **AP** Acidification potential of land and water; **EP** Eutrophication potential; **ADPM** Abiotic depletion potential for non fossil resources; **ADPE** Abiotic depletion potential for fossil resources



## Resource use

Parameter	Unit	A1-A3	A4	A5	B5	C2	C3	C4	D
RPEE	MJ	8,39E+00	5,78E-03	1,73E+00	1,01E+01	1,53E-03	8,26E-02	8,86E-02	-2,89E+00
RPEM	MJ	3,42E-01	0	5,48E-02	3,97E-01	0	0	0	0
TPE	MJ	8,73E+00	5,78E-03	1,78E+00	1,05E+01	1,53E-03	8,26E-02	8,86E-02	-2,89E+00
NRPE	MJ	5,72E+01	4,09E+00	2,03E+01	8,06E+01	1,08E+00	1,61E+00	3,73E+00	-1,09E+02
NRPM	MJ	1,54E+02	0	2,46E+01	1,78E+02	0	0	0	0
TRPE	MJ	2,11E+01	4,09E+00	4,49E+01	2,59E+02	1,08E+00	1,61E+00	3,73E+00	-1,09E+02
SM	kg	1,56E+02	0	2,49E+01	1,80E+02	0	0	0	0
RSF	MJ								
NRSF	MJ								
W	m <sup>3</sup>	1,29E+00	3,11E-05	2,06E-01	1,50E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00

**RPEE** Renewable primary energy resources used as energy carrier; **RPEM** Renewable primary energy resources used as raw materials; **TPE** Total use of renewable primary energy resources; **NRPE** Non renewable primary energy resources used as energy carrier; **NRPM** Non renewable primary energy resources used as materials; **TRPE** Total use of non renewable primary energy resources; **SM** Use of secondary materials; **RSF** Use of renewable secondary fuels; **NRSF** Use of non renewable secondary fuels; **W** Use of net fresh water

## End of life - Waste

Parameter	Unit	A1-A3	A4	A5	B5	C2	C3	C4	D
HW	kg	1,89E+01	3,11E-05	3,02E+00	2,19E+01	0	0	0	-7,96E-02
NHW	kg	2,49E+02	3,11E-05	6,53E+02	9,00E+02	0	1,76E+00	8,08E+03	-1,29E+00
RW	kg	3,84E-01	1,06E-06	6,16E-02	4,46E-01	0	1,36E-05	0	0

**HW** Hazardous waste disposed; **NHW** Non hazardous waste disposed; **RW** Radioactive waste disposed

## End of life - Output flow

Parameter	Unit	A1-A3	A4	A5	B5	C2	C3	C4	D
CR	kg	NA	NA	NA	NA	NA	NA	NA	NA
MR	kg	2,68E-02		6,64E-02	6,64E-02			8,38E-01	
MER	kg	2,75E-02		2,08E-01	2,08E-01			2,61E+00	
EEE	MJ	NR	NR	NR	NR	NR	NR	NR	NR
ETE	MJ	NR	NR	NR	NR	NR	NR	NR	NR

**CR** Components for reuse; **MR** Materials for recycling; **MER** Materials for energy recovery; **EEE** Exported electric energy; **ETE** Exported thermal energy

Reading example: 9,0 E-03 =  $9,0 \cdot 10^{-3} = 0,009$

### List of participants \*)

Country	Production location	Country	Production location
Belgium	ATAB - Antwerpen De Boer - Antwerpen	Italy	Copernit - pegognaga
	Derbigum/Imperbel - Perwez		Imper - Mappano
	Soprema - Grobbendonk		Index - Castel D'azzano
Denmark	Icopal Denmark - Ikast	Netherlands	Polyglass - Ponte Piave
Finland	Nordic Waterproofing - Vejen	Sweden	Pluvitec - Ronco all'Adige
	Katepal - Lempäälä		Icopal BV - Groningen
Germany	Nordic Waterproofing - Lohja	Sweden	Troelstra & de Vries - IJlst
	Paul Bauder - Achim		Icopal - Malmö
			Nordic Waterproofing - Höganäs

\*) Not all the 42 production locations participating in the BWA LCA-project are listed. Only the production locations which participated in the additional EPD Norge project are listed.

## Additional Norwegian requirements

### Electricity

The European electricity mix was used as reference data for each production plant.

Greenhouse gas emissions: 0,15 kg CO<sub>2</sub> - eqv/MJ

### Dangerous substances

None of the following substances have been added to the product: Substances on the REACH Candidate list of substances of very high concern (of 16.06.14) or substances on the Norwegian Priority list (of 12.09.13) or substances that lead to the product being classified as hazardous waste. The chemical content of the product complies with regulatory levels as given in the Norwegian Product Regulations.

### Transport

Transport from production site to central warehouse in Norway is: 800 km

### Carbon footprint

Carbon footprint has not been worked out for the product.

## Bibliography

ISO 14025:2006	Environmental labels and declarations - Type III environmental declarations - Principles and procedures
ISO 14044:2006	Environmental management - Life cycle assessment - Requirements and guidelines
EN 15804:2012	Sustainability of construction works - Environmental product declaration - Core rules for the product category of construction products
ISO 21930:2007	Sustainability in building construction - Environmental declaration of building products
LCE, Turin 17-09-2012	BWA: 2010-2012 LCA PROJECT for EPD purposes
PCR	NPCR 22 PCR for preparing an EPD for product group Roof waterproofing
Environdec	BWA Environmental product Declaration for Bitumen Roof Waterproofing Systems S-EP-00414 rev. 1.1

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