ENVIRONMENTAL PRODUCT DECLARATION

ISO 14025 ISO 21930 EN 15804

epd-norge.no
The Norwegian EPD Foundation

Owner of the declaration	Bitumen Waterproofing Association
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Declaration number	NEPD00268E
Issue date	22.09.2014
Valid to	22.09.2019

Single layer mechanically fastened modified bitumen roof waterproofing system

Product

Bitumen Waterproofing Association

Owner of the declaration

General information

Product

Single layer mechanically fastened modified bitumen roof waterproofing system

Owner of the declaration

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Program holder

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Manufacturer

The BWA members listed on page 6

Declaration number:

NEPD00268E

Place of production:

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

This declaration is based on Product Category Rules:

CEN Standard EN 15804 serve as core PCR

EPD NORGE Roof Waterproofing NPCR 00022rev1 december 2012

Management system:

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

Declared unit:

1 m^2 polyester-glass reinforced modified bitumen roof waterproofing membrane for single layer mechanically fastening

Org. No:

Declared unit with option:

Issue date

22.09.2014

Functional unit:

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

Valid to

22.09.2019

The EPD has been worked out by:

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

Together with BWA

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

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)

Approved

Dagfinn Malnes
Managing Director of EPD-Norway

Declared unit:

1 m2 polyester-glass reinforced modified bitumen roof waterproofing membrane for single layer mechanically fastening

Key environmental indicators	Unit	Cradle to gate A1 - A3	Transport A4
Global warming	kg CO_2 -eqv	3,55	4,58E-01
Energy use	MJ	6,56E+01	6,55E+00
Dangerous substances	*	-	-

* 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^2) . 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 partcipating 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 m2 single layer mechanically fastened modified bitumen roof waterproofing system with a service life time of 60 years (including fasteners, installation and refurbisment after 30 years).

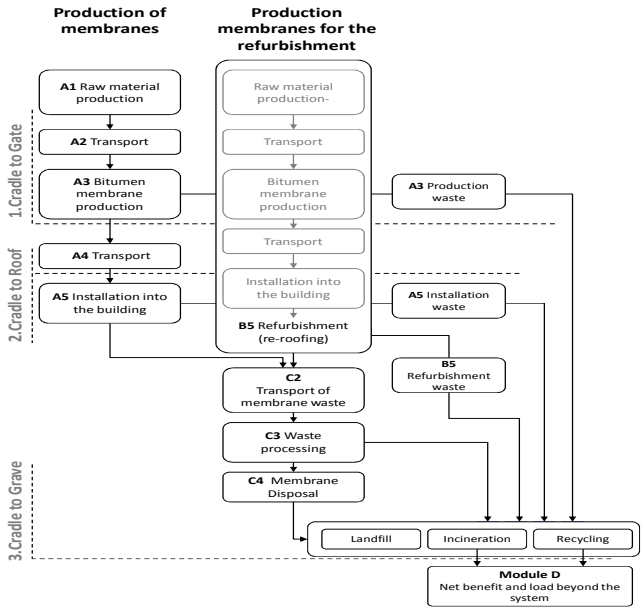
System boundary:
The processes belonging to the analyzed system were organized according to the following three phases:

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) . 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.

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.

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.

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^3	
Electricity consumption	kWh	
Other energy carriers	kg/m^2	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^2. 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^2	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 CO2-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_2-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_2H_4-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_2-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_4^{3-}-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^3	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 = $9{,}0*10^{-3}$ = 0,009

List of partcipants *)

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

Greenhouse gas emissions: 0,15 kg CO_2 - 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 Declarartion for Bitumen Roof Waterproofing Systems S-EP-00414 rev. 1.1

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