

ENVIRONMENTAL PRODUCT DECLARATION

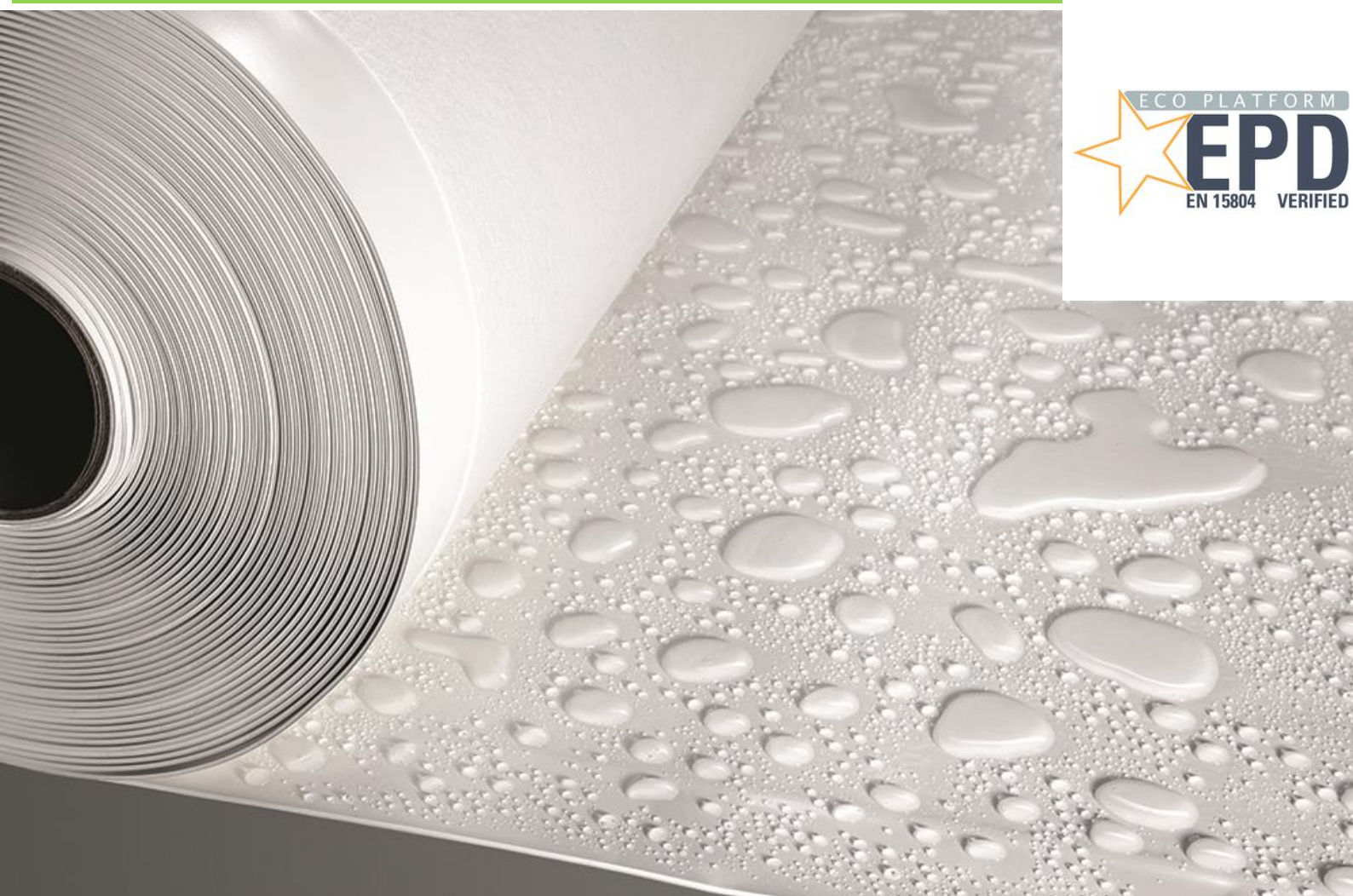
as per ISO 14025 and EN 15804+A1

Owner of the Declaration	alwitra GmbH
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EVA roofing and waterproofing membranes
EVALON® V, VG, VSK, VGSK, dual

alwitra GmbH

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1. General information

<p>alwitra GmbH</p> <hr/> <p>Programme holder IBU - Institut Bauen und Umwelt e.V. Panoramastr. 1 10178 Berlin Germany</p> <hr/> <p>Declaration number EPD-ALW-201900185-IBC1-EN</p> <hr/> <p>This Declaration is based on the Product Category Rules: Plastic and elastomer roofing and sealing sheet systems, 07.2014 (PCR tested and approved by the independent expert council (SVR))</p> <hr/> <p>Issue date 17.01.2020</p> <hr/> <p>Valid to 16.01.2025</p> <hr/> <p></p> <hr/> <p>Dipl. Ing. Hans Peters (Chairman of the Board of Institut Bauen und Umwelt e.V.)</p> <hr/> <p></p> <hr/> <p>Dr. Alexander Röder (Managing Director of the Institut Bauen und Umwelt e.V.)</p>	<p>EVA roofing and waterproofing membranes EVALON® V, VG, VSK, VGSK, dual</p> <hr/> <p>Owner of the declaration alwitra GmbH Am Forst 1 54296 Trier Germany</p> <hr/> <p>Declared product / Declared unit 1 m² of average produced roofing and waterproofing membrane EVALON® V, VG, VSK, VGSK, dual</p> <hr/> <p>Scope: This EPD is an average EPD for roofing and waterproofing membranes EVALON® V, VG, VSK, VGSK, dual made by alwitra GmbH. The products are manufactured in 54411 Hermeskeil, Germany.</p> <p>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. This EPD has been drawn up according to the requirements stipulated in <i>EN 15804+A1</i>. Following, the standard is simply referred to as <i>EN 15804</i>.</p> <hr/> <p>Verification The European standard <i>EN 15804</i> serves as the core PCR</p> <p>Independent verification of the declaration and Information according to <i>ISO 14025:2010</i></p> <p><input type="checkbox"/> internally <input checked="" type="checkbox"/> externally</p> <hr/> <p></p> <hr/> <p>Matthias Schulz Independent verifier appointed by the SVR</p>
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2. Product

2.1 Product description / Product definition

This EPD contains a description of bitumen compatible EVAC - ethylene vinyl acetate terpolymer/copolymer - (EVA in Germany) roofing and waterproofing membrane systems. The declared products consist of a high polymer alloy of EVA terpolymer and PVC (polyvinyl chloride) including additives. EVALON® membranes are equipped with a polyester fleece backing (additionally with glass fleece, where applicable). Self-adhesive membranes are additionally equipped with a self-adhesive coating including release film. EVALON® membranes can also be manufactured with a central polyester scrim. The declared products are manufactured in a calendering process. Seam welding is carried out with hot air or tetrahydrofuran (THF).

The EVALON® product line includes the following varieties:

- EVALON® V** with polyester fleece backing (effective thickness 1.2/1.5 mm; total thickness 2.1/2.4 mm)
- EVALON® VG** with polyester/glass fleece backing (effective thickness 1.2/1.5 mm; total thickness 2.1/2.4 mm)
- EVALON® VSK** with polyester fleece backing and self-adhesive coating (effective thickness 1.2/1.5 mm; total thickness 2.2/2.5 mm)
- EVALON® VGSK** with polyester/glass fleece backing and self-adhesive coating (effective thickness 1.2/1.5 mm; total thickness 2.2/2.5 mm)
- EVALON® dual** with middle reinforcement, effective thickness/total thickness 1.5 mm

For placing the product on the market in the EU/EFTA (except Switzerland), Regulation (EU) No 305/2011 (CPR) shall apply. The product requires a Declaration of Performance in accordance with *DIN EN*

13956:2013-03, Flexible sheets for waterproofing - Plastic and rubber sheets for roof waterproofing - Definitions and characteristics and
 DIN EN 13967: 2017-08, Flexible sheets for waterproofing - Plastic and rubber damp proof sheets including plastic and rubber basement tanking sheet - Definitions and characteristics, as well as CE marking. For application, the corresponding national regulations shall apply.

2.2 Application

The intended use of the declared product is as follows:

Roof waterproofing

Single-ply waterproofing of non-used and used flat and low slope roofs. Depending on specification, the membranes are applied as follows:

EVALON® V and EVALON® VG

- loose laid under ballast
- mechanically fastened
- adhesive bonding with system adhesive

EVALON® VSK

- adhesive bonding (self-adhesive coating) to various standard substrates with alwitra wash primer SK or SK-L.

EVALON® VGSK

- with its integrated fire retarding layer bonded directly to unbacked EPS insulation boards without any wash primer. Like EVALON® VSK, they can also be bonded with alwitra wash primer

EVALON® dual

- loose laid under ballast
- mechanically fastened

Waterproofing of foundations

Single-ply waterproofing of non-waterproof foundations or constructional parts against ground moisture and non-pressing water. The membranes are bonded or loose laid according to requirements as described above. When applying, the manufacturer installation instructions must be adhered to.

2.3 Technical data

2.3.1 For membranes with backing

EVALON® V, VG, VSK, VGSK roofing and waterproofing membrane

Constructional data

Name	Value	Unit
Watertightness acc. to EN 1928 (roofing membranes)	400	kPa
Elongation at max. tensile force acc. to EN 12311-2 (roofing membranes)	60	%
Peel resistance of the seam joint acc. to EN 12316-2 (roofing membranes)	150	N/50mm
Shear resistance of the seam joint acc. to EN 12317-2 (roofing membranes)	400	N/50mm
Tear propagation resistance acc. to EN 12310-2 (roofing membranes)	300	N
Artificial ageing acc. to EN 1297 (roofing membranes)	class 0	-
Dimensional stability acc. to EN 1107-2 (roofing membranes)	0.5	%
Folding in the cold acc. to EN 495-5 (roofing membranes)	-30	°C

Bitumen compatibility acc. to EN 1548 (roofing membranes)	passed	-
Resistance to root penetration (for green roofs) acc. to EN 13948 or FLL (roofing membranes)	passed	-
Ozone resistance (for EPDM/IIR) acc. to EN 1844 (roofing membranes)	passed	-
Watertightness acc. to EN 1928 (waterproofing membranes)	400	-
Elongation at max. tensile force acc. to EN 12311-2 (waterproofing membranes)	60	%
Resistance to impact loads acc. to EN 12691 (waterproofing membranes)	300	mm
Shear resistance of the seam joint acc. to EN 12317-2 (waterproofing membranes)	400	N/50mm
Tear propagation resistance acc. to EN 12310-1 (waterproofing membranes)	300	N

2.3.1 For reinforced membranes

EVALON® dual roofing and waterproofing membrane

Constructional data

Name	Value	Unit
Max. tensile force acc. to EN 12311-2 (A)	1000	N/50mm
Elongation at max. tensile force acc. to EN 12311-2 (A)	15	%
Peel resistance of the seam joint acc. to EN 12316-2	150	N/50mm
Shear resistance of the seam joint acc. to EN 12317-2	400	N/50mm
Tear propagation resistance acc. to EN 12310-1	200	N
Resistance to static load acc. to EN 12730 (B)	20	kg
Water tightness acc. to EN 1928	400	kPa
Artificial ageing acc. to EN 1297	class 0	-
Folding in the cold acc. to EN 495-5	-30	°C
Bitumen compatibility acc. to EN 1548	passed	-
Resistance to root penetration (for green roofs) acc. to EN 13948 or FLL (roofing membranes)	passed	-

Performance values of the product according to the Declaration of Performance in relation to its essential characteristics in accordance with *DIN EN 13956:2013-03* or *EN 13967:2017-08*.

For application, the respective national regulations shall apply; in Germany, application standard *DIN SPEC 20000-201* or *DIN SPEC 20000-202* shall apply.

Roofing membranes according to *DIN EN 13956* and application standard *DIN SPEC 20000-201*

Description/markings:

EVALON® V

DE/E1 EVA-BV-K-PV-1,2 (1,5)

EVALON® VG

DE/E1 EVA-BV-K-GV/PV-1,2 (1,5)

EVALON® VSK

DE/E1 EVA-BV-K-PV-1,2 (1,5)-SK

EVALON® VGSK

DE/E1 EVA-BV-K-GV/PV-1,2 (1,5)-SK

EVALON® dual

DE/E1 EVA-BV-V-PG-1,5

Waterproofing membranes according to *DIN EN 13967* and application standard *DIN SPEC 20000-202*

Description/markings

EVALON® V

BA EVA-BV-K-PV-1,5

EVALON® VG

BA EVA-BV-K-GV/PV-1,2 (1,5)

EVALON® VSK

BA EVA-BV-K-PV-1,5-SK

EVALON® VGSK

BA EVA-BV-K-GV/PV-1,5-SK

FPC (Factory Production Control) Certificate No.:
1343 - BPR - 06-1432

2.4 Delivery status

Standard sizes

EVALON® V (1.2/1.5)

Length: 25 m

Width: 1.05/1.55/2.05m

EVALON® VG (1.2/1.5)

Length: 25 m

Width: 1.05/1.55m

EVALON® VSK/VGSK (1.2/1.5)

Length: 25 m

Width: 1.05 m

EVALON® dual

Length: 20 m

Width: 1.50 m

Standard colours

white, light grey, slate grey

2.5 Base materials / Ancillary materials

EVALON® roofing and waterproofing membranes consist of:

Ethylene vinyl acetate terpolymer EVAC 25 - 50 %

Polyvinyl chloride PVC 25 - 40 %

Mineral flame retardant 12 - 18 %

Stabiliser 1 - 2 %

Epoxidised soybean oil 2.5 - 7.5 %

Additives, carbon black, pigments -
depending on colour 8 - 20 %

Titanium dioxide 0 - 7.5 %

Backing and self-adhesive coating.

1) The product contains substances of the ECHA Candidate List of Substances of Very High Concern (16.07.2019) above 0.1 mass-%, relevant for approval: **no**

2) The product contains other CMR substances of category 1A or 1B, which are not on the candidate list, above 0.1 mass-% in at least one part of the product: **no**

3) Biocidal products have been added to this construction product or it has been treated with biocidal products (it is therefore a treated product within the meaning of the Biocidal Products Regulation (EU) No 528/2012): **no**

2.6 Manufacture

The basic materials and the pre-products (except the backing and the self-adhesive coating) are pre-mixed in a mixing machine and subsequently plastified in an extruder together with the other formulation ingredients. The plastics composition as an intermediate is fed over a mixing mill into a calander, where it is rolled out into a homogeneous membrane, and (depending on the membrane type) an underside backing layer (with self-adhesive coating and separation foil, where applicable) is applied. The finished membrane is cooled down over special chill rolls and subsequently cut to its final size and fabricated into rolls. At the reinforced type of membrane, a polyester scrim is applied in the middle. All unbacked production residues (cut-off edge strips) are recycled, *i.e.* directly re-fed into the production process.

Manufacture is subject to the established Quality Management System according to *ISO 9001*. Further external quality controls (external monitoring) are carried out by the Staatliche Materialprüfungsanstalt Darmstadt, Germany

2.7 Environment and health during manufacturing

Compliance with the national and system-specific environmental protection requirements during the manufacturing process is guaranteed. Emissions produced in the calander do not exceed the limits stipulated in the Technical Instructions on Air Pollution Control (TA Luft) and are released to the environment without any filtering.

Manufacture is also subject to the established Environmental Management System according to *ISO 14001* and the Energy Management System according to *ISO 50001*.

2.8 Product processing / Installation

Due to their thermoplastic properties EVALON® roofing and waterproofing membranes are easy to handle and to process. Usually, the overlap welding is carried out with hot air (warm gas). On the roof, no specific health protection measures for staff are required.

When joining the seam with solvent-welding agent or cleaning seams with roofing membrane cleaner, the following must be observed:

- avoid skin and eye contact,
- wear gloves,
- no smoking, no open fire, avoid sparking,
- do not inhale vapours, use only outdoors or in well ventilated spaces.

Homogeneous seam welding is advantageous for a permanent waterproof functionality of the parts/membranes to be connected. When applying, the pertinent standards as well as the installation instructions and manufacturer information must be adhered to.

The following application methods are possible depending on the type of membrane:

Loose laying with ballast

(advantage: unproblematic removal of unmixed material)

The membranes are rolled out on a suitable substrate (on a protection layer, if required), aligned and welded in the overlap area.

Example of green roof:

The declared product is used for green roofs as a waterproofing and, at the same time, as a protection against root penetration, as the corresponding certificate is available (resistant to root/rhizome penetration according to *FLL* testing - also without application of biocides).

Mechanical fastening

(advantage: unproblematic removal of unmixed material)

The membranes are rolled out on a suitable substrate (on a protection layer, if required), aligned and usually fastened with approved fastening systems on the supporting structure according to the manufacturer's specification. Usually, the fastening is carried out in the membrane overlap (seam area). After installation of the fasteners, the membranes are welded together. Fastening can also be carried out outside the seam overlap. These fastenings must then be waterproofed according to the system. With mechanical fastening, the complete layer build-up is fixed (incl. thermal insulation, vapour control layer, etc.)

Bonding

If membranes are to be bonded, for environmental reasons, self-adhesive membranes should be applied. The declared products are bitumen-free and solvent-free. After rolling out and aligning the membranes on a suitable substrate (clean, even, solid, with wash primer, if required), the release film is removed from one end of the membrane (approx. 80 - 100 cm). The end of the membrane is bonded to the substrate, the release film is pulled out flat to the side from under the membrane and the membrane is simultaneously pressed on (bonded) over the full size with a broom in a single operation. Subsequently, the laps are welded.

Usage of system adhesives and processing aids

The handling instructions and information on container labels and Safety Data Sheets for adhesives and processing aids such as solvent-welding agent, primer or solvent-containing adhesives must be followed, e.g.

- ensure proper ventilation at the workplace
- keep away ignition sources - no smoking
- using skin protection lotion for preventive skin protection is recommended.

2.9 Packaging

The packing materials used made of wood, paper/cardboard, polyethylene (PE foil) and PP strapping are recyclable.

If sorted [RS1], collection is carried out by INTERSEROH (INTERSEROH certificate 25288). Upon request of the sites, INTERSEROH collects the packing materials at the sites of waste generation in containers taking into account legal requirements.

- strapping: PP
- returnable / non-returnable pallets, wood
- boxes, cardboard/paper
- plastic foil (polyethylene foils - LDPE - recyclable)

2.10 Condition of use

Due to the material composition, for the usage period of the declared products no toxic substances (fungicides/biocides) for the elimination of pest biota (fungi, plants, bacteria) or special root control additives (e.g. when used as root-resistant waterproofing) are used in the declared products.

2.11 Environment and health during use

There is no evidence of any possible emission of substances during the service life of any type of EVALON® membranes.

2.12 Reference service life

The declared roofing and waterproofing membranes have been in use for approx. 35 years. If exposed to standard load, professionally installed and applied in accordance with the intended use in compliance with the generally accepted engineering standards, the declared products can reach a service life of 35 years and more.

If professionally applied under an ecological protection/wearing layer (e.g. green roof) this service life can be still extended.

The in-use conditions will be significantly enhanced when installed with alwitra system parts as the system parts used in the waterproofing such as rainwater outlets, vents, coated metal sheets or rooflights are flashed against the declared membranes in a homogeneous, waterproof connection. The waterproofing of adjacent constructional elements is complemented by additional components of the product system, e.g. roof edge trim and wall connection profiles.

If the waterproofing consists of the declared products, it will not be necessary to remove it in case of restoration/refurbishment. In fact, the old waterproofing usually can serve as a substrate for the new refurbishment layer.

2.13 Extraordinary effects

Fire

Fire protection

Name	Value
Building material class - reaction to fire EN11925-2 / EN 13501	class E / passed
External fire performance CEN TS 1187 / EN 13501	B _{roof} (t ₁) passed

Note:

The test results for B_{roof}(t₁) are valid for the roof build-ups tested by alwitra

Water

The substances of the sealing layer used for EVALON® membranes are not water-soluble.

Mechanical destruction

In case of an unexpected mechanical destruction of EVALON® membranes, no adverse environmental impacts have been reported.

2.14 Re-use phase

EVALON® membranes are not re-used in their original form after their service life. When sorted, EVALON® membranes can be collected by the "ROOFCOLLECT" system (recycling system for synthetic roofing and waterproofing membranes). The recycled materials gained from the old roofing membranes can be reintroduced into the cycle of materials, e.g. usage in inspection walkway tiles. These inspection walkway tiles are used to protect the waterproofing and to mark the maintenance walkways on flat roofs. The textured surface provides a strong grip, even on sloped and wet areas.

At the end of service life thermal utilisation is also possible. The energy contained in the declared products is recovered, thus saving on additional back-up firing in the waste incineration plant.

2.15 Disposal

If possible, recycling of the declared products, or at least their thermal utilisation should be used as a way of disposal. See also 2.14.

Roofing and waterproofing membranes or residues thereof can be classified as AVV No. 170904 or No. 200139.

2.16 Further information

For further information on the EVALON® product system, e.g. brochures, Declaration of Performance, installation instructions, see the alwitra web page (www.alwitra.de).

Product specific accessories are also available online

3. LCA: Calculation rules

3.1 Declared unit

The declared unit is 1 m² of average produced, installed and disposed of/recycled EVALON® roofing and waterproofing membrane system with a thickness of 1.5 mm. The averaging was based on annual production data (total inputs and outputs per year). The values calculated in this way were scaled to a representative thickness and correspond to approx. 90% market share of the delivered products. The approximate calculation of other thicknesses can be done by the following formula:

$$I_{d,new} = (I_{decl} * d_{new}) / 1,2, \text{ where}$$

I_{d,new}: indicator result in relation to a new thickness

I_{decl}: indicator result of the respective life cycle phase

d_{new}: thickness to be calculated in mm

The life cycle assessment deviations within the produced product varieties can be classified as low (< 5 %).

The deviations are due to e.g. different backings and/or self-adhesive coatings of low mass

Declared unit

Name	Value	Unit
Declared unit	1	m ²
Weight per unit area	2	kg/m ²
Conversion factor to 1 kg	0.5	-

3.2 System boundary

In addition to the life cycle stages of the product manufacture (cradle to gate), this life cycle assessment also addresses further options as listed below:

- extraction and supply of raw materials (A1)
- transport of basic materials (A2)
- backing, if applicable (A1)
- membrane manufacture (A3)
- membrane packaging (including transport of the packing materials and end of life)
- transport to site (A4)
- installation on site (fixing with adhesives and seam welding) (A5)
- end of life of the membranes (incl. transport) - material and thermal utilisation (module C2, C3 and D)

3.3 Estimates and assumptions

Scenarios have been designed for the respective modules. Unless otherwise indicated, estimates of these scenarios have been provided by alwitra GmbH for calculation purposes.

Module A4: Transport to site, (on average 361 km),
Module A5: Transport distance and quantities of packing materials (50 km)

Module C2: Transport after removal from the roof for scenario C2 360 km classified as "worst case" (C2/1 50 km to waste incineration plant and C2/2 737 to material EoL recycling)

Module C3: In scenario 1 100% thermal utilisation and in scenario 2 100% material recycling of the membranes after removal from the roof (current percentage of scenario 1: 70% of the overall quantity, percentage of scenario 2: 30% of the overall quantity)

Module D: In the case of thermal utilisation of old roofing membranes, power and steam is generated. Credits for these two energy flows have been indicated by the German data sets „DE: Electricity Mix PE" and „DE: Process Steam from Natural Gas PE". Material recycling is to be understood as the manufacture of inspection walkway tiles.

3.4 Cut-off criteria

In the LCA, all collected operational data, i.e. all raw materials used according to the formulation, the thermal energy used as well as the power and the water consumption, have been taken into account.

Transportation expenditures for all inputs and outputs have been considered. Thus, according to PCR Part A also material and energy flows with a percentage of less than 1 percent of the total mass of the product have been taken into account.

3.5 Background data

The primary data has been provided by alwitra GmbH. The background data has been taken from the data base of the GaBi software from PE INTERNATIONAL (GaBi 9 (SP39)). The German electricity mix has been applied. The last revision of the used data has been carried out less than 3 years ago

3.6 Data quality

The used data originates from the data collection performed by the manufacturer. In addition to the primary data on the manufacture of roofing and waterproofing membranes at alwitra GmbH, necessary background data on the used basic materials has been specifically modelled or taken from the GaBi database. Production data of the manufacturer has been measured or calculated (power consumption, thermal energy, amounts of basic materials used), transport distances, however, have been partly estimated. For modelling the product stage of synthetic roofing membranes, the data collected by alwitra GmbH during the production year 2018 for the different membrane types have been used. All other relevant background data sets have been taken from the *GaBi 9* software database and are not older than 6 years. The representativeness can be rated very good. For the basic material of zinc borate data sets had to be modelled.

3.7 Period under review

The data base of this LCA refers to data collected in 2018. The quantities used of raw materials, energy as well as auxiliary and operating materials are taken into account as average values from 12 months of production at the production plant in Hermeskeil, Germany.

3.8 Allocation

In modules A1-A3, internally re-used production residues (edge strips cut off during production) are modelled as closed-loop recycling. Within the defined system boundaries, in the manufacturing process production data for the product was determined with respect to the overall produced area. During production no further by-products occur. In case of thermal utilisation in a waste incineration plant, depending on the specific input and considering the elementary composition as well as the calorific value, credits for electricity and thermal energy from module A5 and C3 are taken into account in module D. Considering the locations of the production sites, the processes credited refer to the territory of Germany. In Module D, there is also a credit for the recycling of the roofing membranes.

3.9 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.

4. LCA: Scenarios and additional technical information

The following technical information provides the basis for the declared modules or can be used for the design of specific scenarios within the context of a building assessment, if modules are not declared (MND).

Transportation to site (A4)

Name	Value	Unit
Litres of fuel	0.002	l/100 km
Transport distance	361	km
Capacity utilisation (including empty runs)	85	%
Gross density of products transported	1293	kg/m ³
Capacity utilisation volume factor	100	-

Integration into the building (A5)

Name	Value	Unit
Electricity consumption	0.013	kWh
VOC into the air	0.015	kg
Loss of material (due to overlaps)	5	%

Reference service life

Name	Value	Unit
Reference service life depending on the local conditions and in combination with a maintenance service contract	35	a

End of life (C1-C4)

Name	Value	Unit
For recycling (in scenario 2)	1.96	kg
For energy recovery (in scenario 1)	1.96	kg

5. LCA: Results

DESCRIPTION OF SYSTEM BOUNDARIES (X = INCLUDED IN LCA; MND = MODULE NOT DECLARED; MNR = MODULE NOT RELEVANT)

Product stage			Construction process stage		Use stage							End-of-life stage				Benefits and loads beyond the system boundary
Raw material supply	Transport	Manufacturing	Transport from the gate to the site	Assembly	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	De-construction / demolition	Transport	Waste processing	Disposal	Re-use, recovery or 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	MNR	MNR	MNR	MND	MND	MND	X	X	MND	X

RESULTS OF THE LCA - ENVIRONMENTAL IMPACT according to EN 15804+A1: 1 m² of average produced and installed EVALON

Parameter	Unit	A1-A3	A4	A5	C2/1	C2/2	C3/1	C3/2	D/1	D/2
GWP	[kg CO ₂ eq.]	6.76E+0	3.37E-2	5.59E-1	4.58E-3	6.76E-2	3.60E+0	8.35E-1	-2.20E+0	-4.79E+0
ODP	[kg CFC11 eq.]	1.24E-10	1.15E-17	6.21E-12	1.56E-18	2.30E-17	2.48E-15	3.21E-14	-4.59E-14	-8.49E-11
AP	[kg SO ₂ eq.]	1.69E-2	6.99E-5	8.98E-4	9.50E-6	1.40E-4	9.28E-4	1.33E-3	-2.32E-3	-1.16E-2
EP	[kg (PO ₄) ³⁻ eq.]	3.08E-3	1.74E-5	1.63E-4	2.36E-6	3.48E-5	9.02E-5	2.28E-4	-3.93E-4	-2.10E-3
POCP	[kg ethene eq.]	1.91E-3	-2.40E-5	3.23E-4	-3.26E-6	-4.81E-5	3.80E-5	3.04E-5	-2.00E-4	-1.31E-3
ADPE	[kg Sb eq.]	3.34E-5	3.18E-9	1.67E-6	4.33E-10	6.38E-9	5.32E-7	3.27E-7	-5.18E-7	-2.29E-5
ADPF	[MJ]	1.45E+2	4.50E-1	7.51E+0	6.11E-2	9.01E-1	1.50E+0	8.38E+0	-2.87E+1	-9.98E+1

Caption GWP = Global warming potential; ODP = Depletion potential of the stratospheric ozone layer; AP = Acidification Potential for Soil and Water; EP = Eutrophication Potential; POCP = Photochemical Ozone Creation Potential; ADPE = Abiotic depletion potential for non-fossil resources (ADP - substances); ADPF = Abiotic depletion potential for fossil fuels (ADP - fossil energy sources)

RESULTS OF THE LCA - RESOURCE USE according to EN 15804+A1: 1 m² of average produced and installed EVALON

Parameter	Unit	A1-A3	A4	A5	C2/1	C2/2	C3/1	C3/2	D/1	D/2
PERE	[MJ]	2.38E+1	2.75E-2	2.62E+0	3.73E-3	5.50E-2	4.20E-1	5.35E+0	-7.58E+0	-1.61E+1
PERM	[MJ]	1.31E+0	0.00E+0	-1.31E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
PERT	[MJ]	2.51E+1	2.75E-2	1.31E+0	3.73E-3	5.50E-2	4.20E-1	5.35E+0	-7.58E+0	-1.61E+1
PENRE	[MJ]	1.02E+2	4.51E-1	8.43E+0	6.13E-2	9.04E-1	5.39E+1	1.07E+1	-3.21E+1	-1.07E+2
PENRM	[MJ]	5.26E+1	0.00E+0	-3.57E-1	0.00E+0	0.00E+0	-5.22E+1	0.00E+0	0.00E+0	0.00E+0
PENRT	[MJ]	1.55E+2	4.51E-1	8.07E+0	6.13E-2	9.04E-1	1.68E+0	1.07E+1	-3.21E+1	-1.07E+2
SM	[kg]	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
RSF	[MJ]	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
NRSF	[MJ]	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
FW	[m ³]	7.63E-2	3.15E-5	4.37E-3	4.28E-6	6.31E-5	8.84E-3	2.92E-3	-4.10E-3	-5.23E-2

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

RESULTS OF THE LCA - OUTPUT FLOWS AND WASTE CATEGORIES according to EN 15804+A1: 1 m² of average produced and installed EVALON

Parameter	Unit	A1-A3	A4	A5	C2/1	C2/2	C3/1	C3/2	D/1	D/2
HWD	[kg]	8.82E-7	2.57E-8	4.56E-8	3.49E-9	5.15E-8	9.27E-9	5.91E-8	-1.80E-8	-5.94E-7
NHWD	[kg]	5.10E-1	3.03E-5	2.78E-2	4.12E-6	6.07E-5	3.76E-1	1.02E-2	-1.69E-2	-3.51E-1
RWD	[kg]	4.25E-3	5.36E-7	2.21E-4	7.29E-8	1.07E-6	7.17E-5	9.25E-4	-1.32E-3	-2.95E-3
CRU	[kg]	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
MFR	[kg]	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	2.00E+0	0.00E+0	0.00E+0
MER	[kg]	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	2.00E+0	0.00E+0	0.00E+0	0.00E+0
EEE	[MJ]	0.00E+0	0.00E+0	2.71E-1	0.00E+0	0.00E+0	6.70E+0	0.00E+0	0.00E+0	0.00E+0
EET	[MJ]	0.00E+0	0.00E+0	6.33E-1	0.00E+0	0.00E+0	1.54E+1	0.00E+0	0.00E+0	0.00E+0

Caption HWD = Hazardous waste disposed; NHWD = Non-hazardous waste disposed; TRWD = Total Radioactive waste disposed; CRU = Components for reuse; MFR = Materials for recycling; MER = Materials for energy recovery; EEE = Export electric energy EET = Export thermal energy

6. LCA: Interpretation

The supply of raw materials (module A1) shows a significant influence on the overall environmental profile of the roofing membranes. Between approx. 45 and 95% of the environmental impacts are caused by the raw materials used, depending on the indicator. The highest contributions for all indicators are made by

the production of the raw materials PVC and aluminium hydroxide (about 25% each in the production phase).

Transport (modules A2, A4 and C2), manufacturing (module A3) and assembly (module A5) show an overall low contribution. With few exceptions, the

relative contributions to the indicator results are well below 10%.

The combustion emissions of the "thermal recovery" scenario contribute to the greenhouse effect to a relevant extent (approx. 25% relative contribution). In all other impact categories, the influence is low. At the end of the product life cycle, the product properties allow a material conversion as inspection

walkway tiles. This possibility of "material recycling" can lead to a significant overall reduction in environmental impacts in direct comparison to "thermal recycling" in the disposal phase. In practice, it is therefore preferable to thermal recycling.

7. Requisite evidence

8. References

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**Publisher**

Institut Bauen und Umwelt e.V.
Panoramastr. 1
10178 Berlin
Germany

Tel +49 (0)30 3087748- 0
Fax +49 (0)30 3087748- 29
Mail info@ibu-epd.com
Web www.ibu-epd.com

**Programme holder**

Institut Bauen und Umwelt e.V.
Panoramastr. 1
10178 Berlin
Germany

Tel +49 (0)30 3087748- 0
Fax +49 (0)30 3087748- 29
Mail info@ibu-epd.com
Web www.ibu-epd.com



thinkstep

**Author of the Life Cycle
Assessment**

thinkstep AG
Hauptstraße 111- 113
70771 Leinfelden-Echterdingen
Germany

Tel +49 (0)711 341817-0
Fax +49 (0)711 341817-25
Mail info@thinkstep.com
Web <http://www.thinkstep.com>

**Owner of the declaration**

alwitra GmbH
Am Forst 1
54296 Trier
Germany

Tel +49 (0)651 9102-0
Fax +49 (0)651 9102-500
Mail alwitra@alwitra.de
Web <http://www.alwitra.de>