ENVIRONMENTAL PRODUCT DECLARATION

as per ISO 14025 and EN 15804

Owner of the Declaration	
Programme holder	Institut Bauen und Umwelt e.V. (IBU)
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Valid to	13.09.2022

Sikaplan VGWT

Sika Deutschland GmbH

Institut Bauen und Umwelt e.V.

www.bau-umwelt.com / https://epd-online.com

ECO PLATFORM EPD VERIFIED

BUILDING TRUST

1. General Information

Sika Deutschland GmbH

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Germany

Declaration number
EPD-SIK-20160088-IBA1-EN

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 SVR)

Issue date
14.09.2016

Valid to
13.09.2022

Prof. Dr.-Ing. Horst J. Bossenmayer
(President of Institut Bauen und Umwelt e.V.)

Dr. Burkhart Lehmann
(Managing Director IBU)

Sikaplan VGWT

Owner of the Declaration
Sika Deutschland GmbH
Kornwestheimer Straße 103-107
70439 Stuttgart
Germany

Declared product / Declared unit
1 m² Sikaplan VGWT polymeric waterproofing membrane

Scope:
This document applies to Sikaplan VGWT polymeric waterproofing membrane manufactured by Sika Manufacturing AG in Duedingen, Switzerland. The life cycle assessment data are based on production data from 2015 collected by Sika Services AG. 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.

Verification

The CEN Norm /EN 15804/ serves as the core PCR
Independent verification of the declaration according to /ISO 14025/
☐ internally ☒ externally

Dr.-Ing. Andreas Ciroth
(Independent verifier appointed by SVR)

2. Product

2.1 Product description

Sikaplan VGWT is multi-layer synthetic roof waterproofing sheet based on polyvinyl chloride (PVC) with embedded polyester scrim reinforcing (DE/E1 PVC-P-NB-V-PG).
Sikaplan VGWT waterproofing sheets are available in these thicknesses: 1.2 mm, 1.5 mm and 1.8 mm.
For the calculation of the Life Cycle Assessment no average values were taken for the various thicknesses of Sikaplan VGWT waterproofing sheets. Rather, all values given apply to Sikaplan VGWT-12; a formula for individually calculating values for other thicknesses is given in Chapter 5.

2.2 Application

Sikaplan VGWT waterproofing sheets are used mainly for waterproofing flat roofs. The sheets can be loosely laid and mechanically fastened to roofs with any slope.

2.3 Technical Data

In the following table, only technical data relevant to Sikaplan VGWT waterproofing sheets are given.

Technical data

Name	Value	Unit
Waterproof as per /DIN V 20000-201/ /EN 1928/	400	kPa
Watertightness as per /EN 1928/	Passed	
Tensile strain performance as per /EN 12311-2/	≥ 15	%
Peel resistance of the seam joint as per /EN 12316-2/	≥ 300	N/50mm
Shear resistance of the seam joint as per /EN 12317-2/	≥ 600	N/50mm
Shear resistance of the seam joint as per DIN V 20000-201 / EN 12317-2	Tear outside the seam joint	-
Tear propagation resistance as per /EN 12310-2/	≤ 200	N
Artificial ageing as per /EN 1297/	Passed (> 5000 h)	-
Dimensional stability as per /EN 1107-2/	≤ |0.5|	%
Folding in the cold as per /EN 495-5/	≤ -25	°C

2.4 Placing on the market / Application rules

Placement on the market in the EU/EFTA (except for Switzerland) is subject to /Regulation (EU) No. 305/2011/ dated 9 March 2011. The products require a Declaration of Performance taking into consideration the harmonised standard /EN 13956:2012/ and the CE marking.

For the application and use the respective national provisions apply, in Germany /DIN V 20000-201/ applies.

2.5 Delivery status
The products are delivered palletised: 20 m x 2 m or 20 m x 1.54 m, each 21 rolls per pallet.

2.6 Base materials / Ancillary materials
The base materials and ancillary materials of Sikaplan VGWT polymeric waterproofing membrane are:

- Polyvinyl chloride / PVC: 50 - 70%
- Plasticiser (Phthalate): 34 - 40%
- Stabiliser (UV/Heat): 0 - 2%
- Fire retardant (inorganic): 2 - 4%
- Carrier (Polyester scrim): 1 - 3%
- Pigments: 0 - 8%

In accordance with current knowledge, this product contains no substances of very high concern (SVHC) on the /REACH Candidate List/ published by the European Chemicals Agency in a concentration exceeding 0.1% (by unit weight).

2.7 Manufacture
Sikaplan VGWT polymeric waterproofing sheets are manufactured in the following steps:

- Dosing of the various raw materials and plastification of the mixture in an extruder
- Rolling the melt into sheets by calendar processing
- Cooling and reeling the sheets
- Heat fusing of two sheets (top and bottom layers), embedding a polyester mesh, on a lamination machine
- Trimming the sheets and winding them onto cardboard spools made of recycled paper
- Wrapping the rolls in PE stretch film, palletising

Production waste such as scrap is recycled by feeding it directly back into the manufacturing process.
Sika maintains a quality management system certified in accordance with /ISO 9001/.

2.8 Environment and health during manufacturing
In the production of Sikaplan VGWT polymeric waterproofing membrane, the regulatory standards for exhaust gasses, waste water and solid waste as well as for noise emissions are fully met and the various limits are not exceeded. The health of production personnel is not put at risk during production.
Waste gasses from the production process are collected and filtered in exhaust gas scrubbers.
Water used is used exclusively for cooling and does not come into contact with the polymeric waterproofing membrane. There are no hazardous goods according to REACH listing.
In addition to national requirements, there are Sika strategic goals for waste, energy and water reduction, as well as for zero personal accidents at work. There are regular meetings with the neighbourhood for feedback regarding, e.g. noise. Employees receive regular training for process standards, and for safety and hazards.
Sika maintains an environmental management system certified in accordance with /ISO 14001/.

2.9 Product processing/Installation
Sikaplan VGWT polymeric waterproofing sheets are loose laid with mechanical fastening for unballasted roofs with any slope. Seams between sheets are hot-air welded; linear fastening is recommended.

In principle, the current product data sheet should be consulted. Please request further information from your local Sika organisation.

2.10 Packaging
The rolls of polymeric waterproofing sheets are wrapped in PE stretch foil and shipped on pallets. The cardboard spools are made of recycled paper. The packaging materials can be sorted and collected for recycling.

2.11 Condition of use
Professionally installed and properly used, the condition of Sikaplan VGWT polymeric waterproofing membrane remains unchanged throughout its service life. This was confirmed in 2005 by the internal study /Radar/.

2.12 Environment and health during use
During their service life, Sikaplan VGWT synthetic waterproofing sheets have no negative influence on the environment and health of users.

2.13 Reference service life
The reference service life of Sikaplan VGWT synthetic waterproofing sheets is at least 30 years.
Based on the study /Radar/ from 2005, experience to date with Sikaplan synthetic waterproofing sheets indicates that a service life of over 30 years can be expected, provided the standard requirements and the application and maintenance recommendations are observed.

This conclusion reflects the high resistance to weathering and aging of the product when properly used.

2.14 Extraordinary effects

Fire
Sikaplan VGWT polymeric waterproofing membrane is classified in Construction Material Class E, as defined by /EN 13501-1/.

Water
No environmental impact due to water exposure of installed Sikaplan VGWT polymeric waterproofing membrane is known.

Mechanical destruction
Sikaplan VGWT polymeric waterproofing membrane possesses good mechanical strength and is highly robust. No environmental impact is known to result from unexpected mechanical damage.

2.15 Re-use phase
At the end of the service life or when roofing sheets must be replaced, Sikaplan VGWT waterproofing sheets can be selectively removed and recycled. This makes for a closed-loop material cycle.

Sika Deutschland GmbH and Sika Supply Center AG are affiliated with Roofcollect, the recycling system for polymeric roofing and waterproofing membranes. This enables increasingly more material recovery from sorted polymeric waterproofing membranes.

2.16 Disposal

Sikaplan VGWT polymeric waterproofing sheets can be recycled at the end of the use stage.
The sheets are completely recycled by Roofcollect in numerous recycling systems and new products are manufactured from the recovered material.
Sikaplan VGWT polymeric waterproofing membrane can be classified under /Waste Code 170904/ as defined by the /European Waste Catalogue/.

2.17 Further information

More information about the company and its products is available on the internet at **www.sika.com**.
Detailed information on the polymeric waterproofing membranes is available at your local Sika organisation website.

3. LCA: Calculation rules

3.1 Declared Unit

This declaration applies to 1 m^2 of Sikaplan VGWT polymeric waterproofing membrane, thickness 1.2 mm. A formula is given for independent calculation of the values for other thicknesses.

Declared unit

Name	Value	Unit
Declared unit	1	m^2
Grammage	1.5	kg/m^2
Type of sealing	Hot-air weld	-
Conversion factor to 1 kg	1.5	-

3.2 System boundary

Type of EPD: Cradle-to-gate with options

The system boundaries of the EPD follow the modular construction system described by /EN 15804/. The LCA takes into account the following modules:

- A1-A3: Manufacturing of pre-products, packaging, ancillary materials, transport to the factory, production including energy supply and waste handling
- A4: Transport to the building site
- A5: Installation into the building (welding energy, disposal of packaging C1: Deconstruction and demolition
- C2: Transport to waste-processing facility
- C3: Waste processing for reuse, recovery and/or recycling
- C4: Disposal (waste incineration)
- D: Potential for reuse, recovery and/or recycling as net flows and benefits

3.3 Estimates and assumptions

Various stabilisers were approximated with a general chemical dataset or proxies were built. The percentage by mass is < 3 %.
The membrane is assumed to be removed by hand at the end of life, so no inputs/outputs are considered.

3.4 Cut-off criteria

All data were taken into account (recipe constituents, thermal energy used, electricity used). Transport expenses were considered for all inputs and outputs. The manufacturing of the production machines and systems and associated infrastructure was not taken into account in the LCA. Additionally, inputs (solvents, lubricant oils) needed for maintenance of the production line, lighting, hygiene related water use, transportation of employees were considered as negligible and excluded from the analysis.

3.5 Background data

The primary data provided by Sika derive from the plant at Duedingen, Switzerland. The underlying data were collected in the databases of /GaBi software/ and /ecoinvent/ Version 3.1. The Swiss Electrical Energy Mix was applied.

3.6 Data quality

To simulate the product stage, data recorded by Sika from production year 2015 were used. All other relevant background datasets were taken from generic data not older than 10 years, using as much as possible datasets for raw materials and processes with technological and geographical representativeness. For the stabilisers, approximations were necessary.

3.7 Period under review

The period under review is the year 2015.

3.8 Allocation

Production waste that was reclaimed and reused internally has been modelled as closed-loop recycling in Modules A1-A3.
Regarding the recycling of the polymeric waterproofingsheets, the amount of recyclable membrane was treated as a corresponding PVC benefit. Benefits for the disposal of packaging (incineration), scrap and roofing membrane are credited in Module D; this also applies to the reuse of wooden pallets.

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 serves as a basis for the declared modules or can be used for the development of specific scenarios in the context of a building assessment.

Transport to the building site (A4)

Name	Value	Unit
Litres of fuel (truck)	0.0034	l/100km
Transport distance (truck)	1600	km
Gross density of products transported	1250	kg/m^3
Transport distance (boat)	160	km
Litres of fuel (boat)	0.0008	l/100km

Installation into the building (A5)

Name	Value	Unit
Electricity consumption	0.016	kWh
Material loss (membrane)	2	%
Overlaps (membrane)	8	%

Reference service life

Name	Value	Unit
Reference service life	30	a

Experience shows that the reference service life of the roofing membrane is about 30 years provided it is professionally installed and properly used.

End of life (C1-C4)

Name	Value	Unit
Recycling	100	%
Transport to recycling (truck)	1240	km
Transport to recycling (boat)	160	km

5. LCA: Results

The results displayed below apply to Sikaplan VGWT-12. To calculate results for other thicknesses, please use this formula:

$I_x = ((x+0.55)/1.75) * I_{1.2}$

[I_x = the unknown parameter value for Sikaplan VGWT products with a thickness of "x" mm (e.g. 1.5 mm)]

DESCRIPTION OF THE SYSTEM BOUNDARY (X = INCLUDED IN LCA; MND = MODULE NOT DECLARED)

PRODUCT STAGE			CONSTRUCTION PROCESS STAGE		USE STAGE							END OF LIFE STAGE				BENEFITS AND LOADS BEYOND THE SYSTEM BOUNDARIES
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	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	MNR	MNR	MNR	MND	MND	X	X	X	X	X

RESULTS OF THE LCA - ENVIRONMENTAL IMPACT: 1 m2 membrane

Parameter	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
GWP	[kg CO_2-Eq.]	4.49	0.15	0.62	0.00	0.13	0.07	0.10	-3.24
ODP	[kg CFC11-Eq.]	4.89E-9	6.82E-13	4.96E-10	0.00E+0	6.03E-13	4.90E-11	5.44E-13	-3.34E-9
AP	[kg SO_2-Eq.]	3.97E-2	6.10E-4	4.18E-3	0.00E+0	7.33E-4	1.92E-4	4.17E-5	-5.51E-3
EP	[kg $(PO_4)^{3-}$-Eq.]	2.57E-3	1.29E-4	2.79E-4	0.00E+0	1.62E-4	1.72E-5	7.66E-6	-1.81E-3
POCP	[kg ethene-Eq.]	4.11E-3	7.32E-5	4.23E-4	0.00E+0	7.62E-5	1.32E-5	2.64E-6	-2.25E-3
ADPE	[kg Sb-Eq.]	1.04E-5	9.82E-9	1.08E-6	0.00E+0	8.64E-9	2.25E-8	4.48E-9	-1.39E-5
ADPF	[MJ]	102.73	2.05	10.73	0.00	1.81	0.75	0.04	-78.70

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

RESULTS OF THE LCA - RESOURCE USE: 1 m2 membrane

Parameter	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
PERE	[MJ]	8.76	IND	0.88	IND	IND	IND	IND	IND
PERM	[MJ]	1.74	IND	0.17	IND	IND	IND	IND	IND
PERT	[MJ]	10.49	0.11	1.13	0.00	0.10	0.34	0.01	-8.40
PENRE	[MJ]	74.79	IND	7.48	IND	IND	IND	IND	IND
PENRM	[MJ]	35.99	IND	3.59	IND	IND	IND	IND	IND
PENRT	[MJ]	110.78	2.05	11.61	0.00	1.82	1.20	0.05	-85.10
SM	[kg]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
RSF	[MJ]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NRSF	[MJ]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-0.01
FW	[m^3]	2.68E-2	2.85E-4	3.14E-3	0.00E+0	2.52E-4	5.19E-4	3.02E-4	-1.49E-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

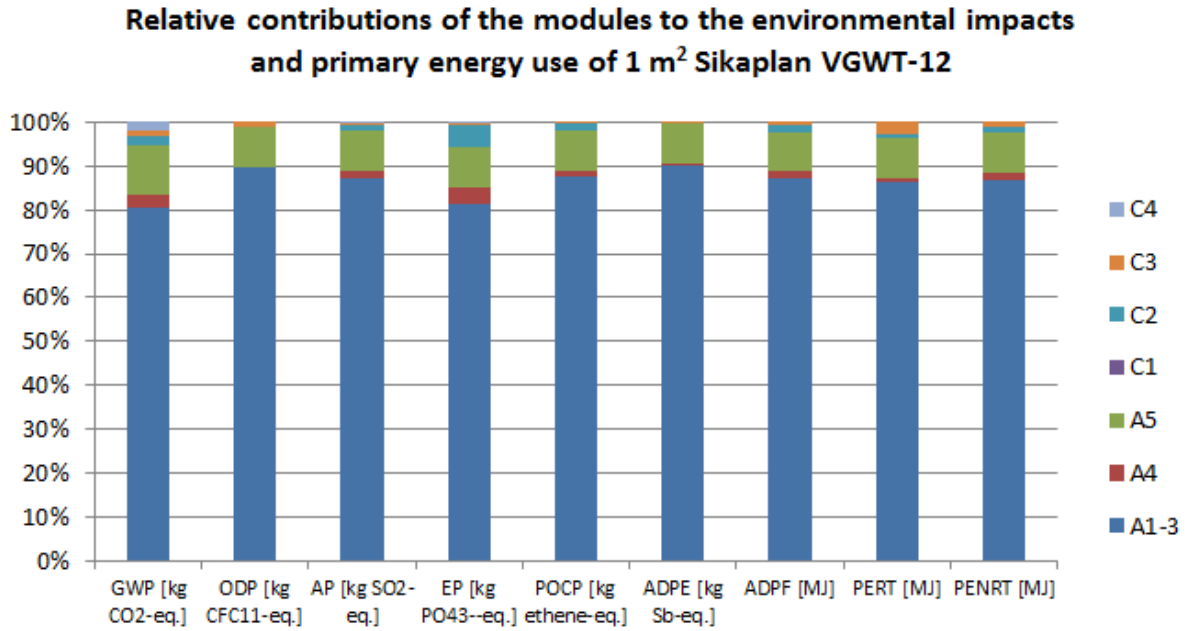
RESULTS OF THE LCA – OUTPUT FLOWS AND WASTE CATEGORIES: 1 m2 membrane

Parameter	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
HWD	[kg]	1.52E-3	1.52E-7	1.52E-4	0.00E+0	1.34E-7	7.63E-10	3.96E-10	-1.78E-6
NHWD	[kg]	3.67E-1	1.69E-4	8.56E-2	0.00E+0	1.49E-4	7.26E-4	1.33E-2	-3.17E-2
RWD	[kg]	3.09E-3	2.93E-6	3.40E-4	0.00E+0	2.59E-6	1.81E-4	2.44E-6	-2.52E-3
CRU	[kg]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	IND
MFR	[kg]	0.00	0.00	0.00	0.00	0.00	1.54	0.00	IND
MER	[kg]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	IND
EEE	[MJ]	0.00	0.00	0.17	0.00	0.00	0.00	0.10	IND
EET	[MJ]	0.00	0.00	0.39	0.00	0.00	0.00	0.24	IND

Caption	HWD = Hazardous waste disposed; NHWD = Non-hazardous waste disposed; RWD = Radioactive waste disposed; CRU = Components for re-use; MFR = Materials for recycling; MER = Materials for energy recovery; EEE = Exported electrical energy; EEE = Exported thermal energy

6. LCA: Interpretation

The following chart shows the relative contributions of the different modules to the various LCA categories and to primary energy use in a dominance analysis.



The product stage (Modules A1-A3) has by far the greatest impact on all indicators. For this reason, this stage is examined more closely in the following interpretation.

Indicators of the inventory analysis:
Due to electricity and natural gas use, the production process (15%), pre-product manufacturing (57%) and packaging (27%) account for most of the use of renewable primary energy resources (**PERT**). The manufacturing of polymers and plasticisers in the production stage has the greatest impact (74%) on the use of non-renewable primary energy resources (**PENRT**), while the impact of the production process (energy) is 3.4%.

Indicators of the impact assessment:
The dominant influence in all impact categories comes from pre-product manufacturing (at least 92% in each case), except for the Eutrophication Potential (**EP**) and Depletion Potential of the Stratospheric Ozone layer (**ODP**), where the packaging also contributes with 40% and 49%, respectively.
Within pre-product manufacturing, polymers play an important role regarding Global Warming Potential (**GWP**) (36%), Eutrophication Potential (**EP**) (27%), Formation Potential of Tropospheric Ozone (**POCP**) (27%), Abiotic Depletion Potential for fossil fuels (**ADPF**) (37%) and Abiotic Depletion Potential for non-fossil resources (**ADPE**) (61%). Plasticisers significantly influence **GWP** (33%), **EP** (21%), **POCP** (33%) and **ADPF** (42%). Flame retardants affect the Acidification Potential of soil and water (**AP**) (77%) and **POCP** (30%), and stabilisers affect **ODP** (67%) and **EP** (20%). Pigments and fillers make a low contribution to the impacts (below 7%). In addition, the carrier material contributes mostly to **GWP** (15%), **EP** (10%) and **ADPF** (12%). The raw materials with the greatest overall effect on the impacts also show the greatest percentage by mass of the waterproofing membrane: polymers and plasticisers. The manufacturing process (due to electricity use) contributes the most to **ODP** (13%) and **GWP** (4%).

7. Requisite evidence

No requisite evidence is required for Sikaplan VGWT polymeric waterproofing membrane.

8. References

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