ENVIRONMENTAL PRODUCT DECLARATION

as per ISO 14025 and EN 15804

Owner of the Declaration	**Sika Deutschland GmbH**
Programme holder	Institut Bauen und Umwelt e.V. (IBU)
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Valid to	11.01.2020

Sikaplan G

Sika Deutschland GmbH

Institut Bauen und Umwelt e.V.

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

1. General Information

Sika Deutschland GmbH

Programme holder

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Germany

Declaration number

EPD-SIK-20140212-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 independent expert committee)

Issue date

12.01.2015

Valid to

11.01.2020

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

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(Managing Director IBU)

Sikaplan G

Owner of the Declaration

Sika Deutschland GmbH
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Declared product / Declared unit

1 m² Sikaplan G polymeric waterproofing membrane

Scope:

This document applies to Sikaplan G polymeric waterproofing membrane manufactured by Sika Trocal GmbH in DE-53840 Troisdorf (Germany). The life cycle assessment data are based on production data from 2014 collected by Sika Services AG. This document is a translation from the German Environmental Product Declaration into English. It is based on the German original version EPD-SIK-20140212-IBA1-DE. 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

Manfred Russ
(Independent verifier appointed by SVR)

2. Product

2.1 Product description

Sikaplan G 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 G waterproofing sheets are available in these thicknesses: 1.5 mm (15 G), 1.8 mm (18 G), 2.0 mm (20 G) and 2.4 mm (24 G).

For the calculation of the life cycle assessment no average values were taken for the various thicknesses of Sikaplan G waterproofing sheets. Rather, all values given apply to Sikaplan 15 G; a formula for individually calculating values for other thicknesses is given in Chapter 5.

2.2 Application

Sikaplan G waterproofing sheets are used mainly for waterproofing flat roofs. The sheets can be loose laid and mechanically fastened to roofs with a slope ≤ 20°.

2.3 Technical Data

In the following table, only technical data relevant to Sikaplan G 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 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 in accordance with the harmonised standard /EN 13956:2012/ “Flexible sheets for waterproofing – Plastic and rubber sheets for roof waterproofing – Definitions and characteristics” and the CE marking.
Application is subject to the regulations of each specific country; in Germany the application standard /DIN V 20000-201/.

2.5 Delivery status

The products are delivered palletised; product format varies according to material thickness:

- **Sikaplan 15 G:** 20 m x 2 m, 20 m x 1,54 m, 20 m x 1 m oder 20 m x 0,77 m, each 21 rolls per pallet, and 20 m x 1,54 m, 11 rolls per pallet
- **Sikaplan 18 G:** 15 m x 2 m, 15 m x 1 m, 20 m x 1,54 m oder 20 m x 0,77 m, each 21 rolls per pallet
- **Sikaplan 20 G:** 15 m x 2 m, 15 m x 1 m oder 20 m x 1,54 m, each 21 rolls per pallet
- **Sikaplan 24 G:** 15 m x 2 m, 15 rolls per pallet

2.6 Base materials / Ancillary materials

The base materials and ancillary materials of Sikaplan G polymeric waterproofing membrane are:

- Polyvinyl chloride (PVC): 50-70 %
- Plasticiser (Phthalate plasticiser): 34-40 %
- Stabilisers (UV/heat): 0-2 %
- Flame retardant (inorganic): 0-1 %
- Carrier/reinforcing material, embedded (polyester scrim): 1-3 %
- Colorant (pigments): 0-8 %

The recipe contains no hazardous substances. 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 G 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 scrim, 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 G 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.
Sika maintains an environmental management system certified in accordance with /ISO 14001/.

2.9 Product processing/Installation

Sikaplan G polymeric waterproofing sheets are loose laid with mechanical fastening for unballasted roofs with a slope up to 20°. Seams between sheets are hot-air welded; linear fastening is recommended.
In principle, the current product data sheet available 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 G polymeric waterproofing membrane remains unchanged throughout its service life. This was confirmed in 2010 by the external study /*Sika Roof Waterproofing Systems – Sika Mechanically Fastened System – Sikaplan G*/.

2.12 Environment and health during use

During their service life, Sikaplan G synthetic waterproofing sheets have no negative influence on the environment and the health of users.

2.13 Reference service life

The reference service life of Sikaplan G synthetic waterproofing sheets is at least 30 years.
Based on the study /*Sika Roof Waterproofing Systems – Sika Mechanically Fastened System – Sikaplan G*/ from 2010, 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 G polymeric waterproofing membrane is classified in Construction Material Class E, as defined by /EN 13501-1/.

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

Mechanical destruction
Sikaplan G 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 G waterproofing sheets can be selectively removed and recycled. This makes for a closed-loop material cycle.
Sika Deutschland GmbH is 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 G polymeric waterproofing sheets are recycled at the end of the use stage. Collection of the sheets is organized by Interseroh Dienstleistungs GmbH (Contract No. 27704), which has been collaborating with Roofcollect since 2003.
For recycling, the coarsely cleaned and rolled up waterproofing sheets are picked up at the building site by Interseroh in so-called big bags (1 m3 capacity) or in containers. The sheets are completely recycled by Roofcollect in numerous recycling systems and new products are manufactured from the recovered material.
Sikaplan G 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 m2 of Sikaplan G polymeric waterproofing membrane, thickness 1.5 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	1.8	kg/m^2
Type of sealing	Hot-air weld	-
Conversion factor to 1 kg	0.555555556	-

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 and scrap membrane)
- 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 and pigments were valued with a general chemical data set (conservative approach). The percentage by mass is < 1 %.

3.4 Cut-off criteria
All data was 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.

3.5 Background data
The primary data provided by Sika derive from the plant at Troisdorf (Germany). The background data were collected in the databases of /GaBi software/ and /ecoinvent Version 2.2/. The German Electrical Energy Mix was applied.

3.6 Data quality
To simulate the product stage, data recorded by Sika from production year 2014 were used. All other relevant background data sets were taken from generic data not older than 10 years.

3.7 Period under review
The period under review is the year 2014.

3.8 Allocation
Production waste that was reclaimed and reused internally has been simulated as *closed-loop* recycling in Modules A1-A3.
Regarding the recycling of the polymeric waterproofing sheets, the amount of recyclable membrane was treated as a corresponding PVC benefit. Benefits for the disposal of packaging, 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	0.0034	l/100km
Transport distance	400	km
Capacity utilisation (including empty runs)	85	%
Gross density of products transported	1200	kg/m^3
Capacity utilisation volume factor	100	%

Installation into the building (A5)

Name	Value	Unit
Auxiliary	-	kg
Water consumption	-	m^3
Other resources	-	kg
Electricity consumption	0,016	kWh/m²
Other energy carriers	-	MJ
Material loss (membrane)	2	%
Overlaps (membrane)	6	%
Output substances following waste treatment on site	-	kg
Dust in the air	-	kg
VOC in the air	-	kg

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
Collected separately	-	kg
Collected as mixed construction waste	-	kg
Reuse	-	kg
For recycling	100	%
Transport to recycling facility	250	km
Energy recovery	-	kg
Landfilling	-	kg

5. LCA: Results

The results displayed below apply to Sikaplan 15 G. To calculate results for other thicknesses, please use this formula:

$I_x = ((x-0,17)/1,33)\ I_{1,5}$

[I_x =the unknown parameter value for Sikaplan G products with a thickness of "x" mm (e.g. 2.0 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[1)]	Refurbishment[1)]	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	MND	MND	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.]	5.39E+0	4.23E-2	6.14E-1	-	3.07E-2	2.24E-1	-	-3.70E+0
ODP	[kg CFC11-Eq.]	6.08E-8	1.02E-13	4.87E-9	-	1.47E-13	8.89E-12	-	-1.70E-9
AP	[kg SO_2-Eq.]	1.30E-2	1.54E-4	1.22E-3	-	1.55E-4	2.42E-4	-	-7.81E-3
EP	[kg $(PO_4)^{3-}$- Eq.]	1.57E-3	3.53E-5	1.39E-4	-	3.55E-5	3.22E-5	-	-9.26E-4
POCP	[kg Ethen Eq.]	2.72E-3	1.82E-5	2.25E-4	-	1.66E-5	1.65E-5	-	-2.57E-3
ADPE	[kg Sb Eq.]	8.69E-4	1.99E-9	6.95E-5	-	1.16E-9	2.34E-8	-	-1.60E-5
ADPF	[MJ]	123.15	0.58	10.24	-	0.42	1.10	-	-88.80

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]	5.70	-	0.46	-	-	-	-	-
PERM	[MJ]	1.46	-	0.12	-	-	-	-	-
PERT	[MJ]	7.16E+0	3.44E-2	5.75E-1	-	1.67E-2	3.23E-1	-	-5.07E+0
PENRE	[MJ]	94.20	-	7.54	-	-	-	-	-
PENRM	[MJ]	40.06	-	3.20	-	-	-	-	-
PENRT	[MJ]	134.26	0.58	11.63	-	0.43	1.56	-	-97.20
SM	[kg]	-	-	-	-	-	-	-	-
RSF	[MJ]	-	-	-	-	-	-	-	-
NRSF	[MJ]	-	-	-	-	-	-	-	-
FW	[m³]	1.13E-2	2.22E-5	1.32E-3	-	1.18E-5	7.83E-4	-	-1.65E-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

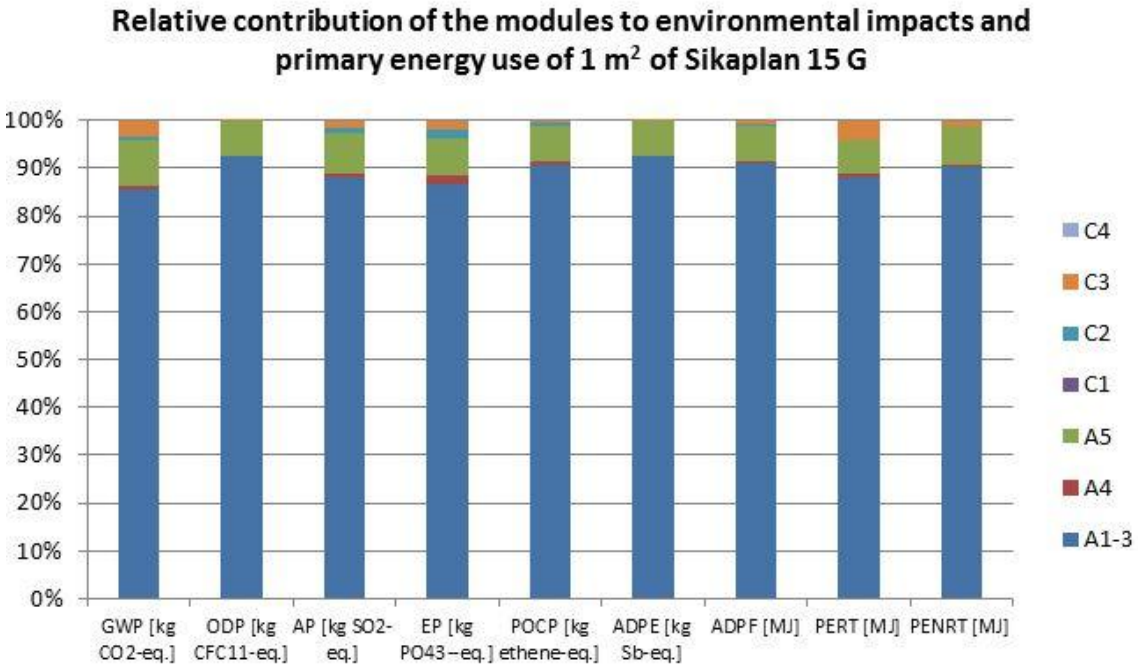
RESULTS OF THE LCA – OUTPUT FLOWS AND WASTE CATEGORIES: 1 m² membrane

Parameter	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
HWD	[kg]	5.52E-3	2.57E-6	5.00E-4	-	9.68E-7	4.66E-4	-	-5.76E-3
NHWD	[kg]	2.49E-1	1.10E-4	8.17E-2	-	5.34E-5	4.49E-3	-	-2.92E-2
RWD	[kg]	3.54E-3	8.07E-7	3.15E-4	-	5.56E-7	1.80E-4	-	-3.33E-3
CRU	[kg]	-	-	-	-	-	-	-	-
MFR	[kg]	-	-	-	-	-	1.81	-	-
MER	[kg]	-	-	-	-	-	-	-	-
EEE	[MJ]	-	-	0.18	-	-	0.11	-	-
EET	[MJ]	-	-	0.52	-	-	0.32	-	-

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 use, the production process (10 %), pre-product manufacturing (64 %) and packaging (26 %) 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 (80 %) on the use of non-renewable primary energy resources (PENRT), while the impact of the production process (electrical energy) measures 3.5 %.

Indicators of the impact assessment:
The dominant influence in all impact categories comes from pre-product manufacturing, measuring at least 92 % in each case. Within pre-product manufacturing, polymers play an important role regarding Global Warming Potential (GWP) (35 %), Acidification Potential of soil and water (AP) (31 %), Eutrophication Potential (EP) (31 %), Formation Potential of Tropospheric Ozone (POCP) (47 %) and Abiotic Depletion Potential for fossil fuels (ADPF) (36 %). Plasticisers significantly influence GWP (44 %), Depletion Potential of the Stratospheric Ozone layer (ODP) (96 %), AP (32 %), EP (26 %), POCP (34 %) and ADPF (47 %). Pigments (primarily titanium dioxide) impact on AP (21 %) and EP (11%). Flame retardants affect the Abiotic Depletion Potential for non-fossil resources (ADPE) (99 %), and stabilisers effect EP (22 %).
In addition, the carrier material impacts the parameters GWP (13 %), AP (11 %) and ADPF (10 %). The raw materials with the greatest effect on the impacts also show the greatest percentage by mass of the polymeric waterproofing membrane: polymers, plasticisers and carrier material. Der The manufacturing process (due to electricity use) contributes the most to AP (3.7 %), EP (3.7 %) und GWP (5.2 %).

7. Requisite evidence

No requisite evidence is required for Sikaplan G polymeric proofing membrane.

8. References

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DIN EN 12317-2: Flexible sheets for waterproofing - Determination of shear resistance of joints - Part 2: Plastic and rubber sheets for roof waterproofing; German version EN 12317-2:2010.

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