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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Sikaplan SGmA

Sika Deutschland GmbH

Institut Bauen und Umwelt e.V.

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

ECO PLATFORM EPD EN 15804 VERIFIED

BUILDING TRUST

1. General Information

Sika Deutschland GmbH

Programme holder
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Declaration number
EPD-SIK-20140213-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
12/01/2015

Valid to
11/01/2021

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

Dr. Burkhart Lehmann
(Managing Director IBU)

Sikaplan SGmA

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

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

Scope:
This document applies to Sikaplan SGmA polymeric waterproofing membrane manufactured by Sika Trocal GmbH in 53840 Troisdorf, Germany. The lifecycle assessment data are based on production data from 2014 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

Manfred Russ
(Independent verifier appointed by SVR)

2. Product

2.1 Product description

Sikaplan SGmA is a multi-layer polymeric waterproofing sheet based on polyvinyl chloride (PVC) with an embedded fleece layer (DE/E1 PVC-P-NB-E-GV).
Sikaplan SGmA polymeric waterproofing sheets are available in the following thicknesses: 1.5 mm (SGmA 15), 1.8 mm (SGmA 18), 2.0 mm (SGmA 20) and 2.4 mm (SGmA 24).

An average value of the various thicknesses of Sikaplan SGmA waterproofing membrane was not used for the calculation of the life cycle assessment. Rather, all values given apply to Sikaplan SGmA 15, and a formula for individually calculating values for the other thicknesses is given in Chapter 5.

2.2 Application

Sikaplan SGmA waterproofing sheets are used mainly for waterproofing flat roofs. They sheets are loose laid in all types of ballasted roofing systems, green roof systems and in gravel-ballasted roof systems. The sheets must not be left exposed; the ballast covering must be applied within three months.

2.3 Technical Data

In the following table, only technical data relevant to Sikaplan SGmA 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/	≥ 200	%
Shear resistance of the seam joint as per /EN 12317-2/ (hot-air welding)	≥ 500	N/50mm
Joint shear resistance as per /EN 12317-2/ (swelling welding)	≥ 400	N/50mm
Shear resistance of the seam joint as per /DIN V 20000-201 / EN 12317-2/	Tear outside seam joint	-
Dimensional stability as per /EN 1107-2/	≤ |0,3|	%
Folding in the cold as per /EN 495-5/	≤ -25	°C
Resistance to root penetration (for green roofs) as per /EN 13948/ or /Test procedure for determining the root resistance of sheets and	FLL passed	-

coatings for green roofs by the Forschungsgesellschaft Landschaftsentwicklung Landschaftsbau e.V. (FLL)/		

2.4 Placing on the market / Application rules

Placement on the market in the EU/EFTA (except for Switzerland) is subject to EU Regulation No. 305/2011 dated 9 March 2011. The products require a Declaration of Performance in accordance with the harmonized standard /EN 13956:2012/ "Flexible sheets for waterproofing – Plastic and rubber sheets for roof waterproofing – Definitions and characteristics" and /EN 13967:2012/ "Flexible sheets for waterproofing - Plastic and rubber damp proof sheets including plastic and rubber basement tanking sheet - Definitions and characteristics" and the CE marking. Application is subject to the regulations of each specific country; in Germany the application standards /DIN V 20000-201/ and /DIN V 20000-202/ apply.

2.5 Delivery status

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

- **Sikaplan SGmA 15:** 15 m x 2 m or 20 m x 2 m, 26 or 17 rolls per pallet respectively
- **Sikaplan SGmA 18:** 15 m x 2 m, 21 or 14 rolls per pallet
- **Sikaplan SGmA 20:** 15 m x 2 m, 21 or 12 rolls per pallet
- **Sikaplan SGmA 24:** 15 m x 2 m, 9 rolls per pallet

2.6 Base materials / Ancillary materials

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

- Polyvinyl chloride (PVC): 50-70 %
- Plasticiser (Phthalate plasticiser): 36-41 %
- Stabilisers (UV/heat): 0-2 %
- Carrier/reinforcing material, embedded (glass fleece): 1-3 %
- Colourant (pigments): 0-4 %

The recipe contains no hazardous substances. To the best of 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 SGmA polymeric waterproofing sheets are manufactured in the following steps:

- Dosing of the various raw materials and classification of the mixture in an extruder
- Rolling the melt into sheets by calendar pressing
- Cooling and reeling the sheets
- Heat fusing of two sheets (top and bottom layers), embedding a glass fleece layer, on a lamination machine
- Trimming the sheets and winding them onto cardboard spools made of recycled paper
- Wrapping the roles 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 SGmA polymeric waterproofing membrane, the regulatory standards for exhaust gases, waste water and solid waste as well as for noise emissions are fully met and the corresponding limits are not exceeded. The health of production personnel is not put it risk during production.
Waste gases from the production process or collected and filtered in exhaust gas scrubbers.
Water used is used exclusively for cooling and does not come into contact with the waterproofing membrane.

Sika maintains an environmental management system certified in accordance with /ISO 14001/.

2.9 Product processing/Installation

Sikaplan SGmA waterproofing sheets are loose laid and ballasted (with e.g. gravel, concrete pavers, a green roof layer). Seams between sheets are hot-air welded or swell welded.

The current product data sheet for each product is available at the local Sika organisation's website and should be consulted.

2.10 Packaging

The membrane rolls are wrapped in PE stretch film and loaded onto pallets for shipping. 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 SGmA waterproofing membrane remains unchanged throughout its service life. This was confirmed in 2012 by the external study /*Sika Roof Waterproofing Systems – Sika-Trocal Lose Laid and Ballasted System – Sika-Trocal SGmA*/.

2.12 Environment and health during use

Throughout its service life, Sikaplan SGmA polymeric waterproofing membrane has no negative influence on the environment or on the health of users.

2.13 Reference service life

The reference service life of Sikaplan SGmA waterproofing membrane is at least 30 years.
Based on the study /*Sika Roof Waterproofing Systems – Sika-Trocal Loose-Laid and Ballasted System –*

Sika-Trocal SGmA/ from 2012, experience to date with Sikaplan waterproofing membrane 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 ageing of the product when properly used.

2.14 Extraordinary effects

Fire
Sikaplan SGmA 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 SGmA waterproofing membrane.

Mechanical destruction
Sikaplan SGmA 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 SGmA 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 SGmA 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 fully recycled by Roofcollect in numerous recycling plants and new products are manufactured from the recovered material.
Sikaplan SGmA 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 the local Sika organisation's website.

3. LCA: Calculation rules

3.1 Declared Unit
This declaration applies to 1 m² of Sikaplan SGmA 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	1.9	kg/m^2
Type of sealing	Hot-air weld	-
Conversion factor to 1 kg	0.5263157	-

3.2 System boundary
Type of EPD: Cradle to gate with options

The system boundaries of the EPD follow the modular structuring 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 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.

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 waterproofingsheets, 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	1266.67	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	%
Overlap (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 theroofing membrane is about 30 years provided it is professionally installed and properly used.

End-of-life stage (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 SGmA 15. To calculate results for other thicknesses, please use this formula:

$I_x = ((x+0.23)/1.73)\ I_{1.5}$

[Ix = the unknown parameter value for Sikaplan SGmA 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	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.]	5.50E+0	4.45E-2	6.29E-1	IND	3.24E-2	2.36E-1	IND	-4.09E+0
ODP	[kg CFC11-Eq.]	7.02E-8	1.06E-13	5.62E-9	IND	1.55E-13	9.39E-12	IND	-1.73E-9
AP	[kg SO_2-Eq.]	1.22E-2	1.62E-4	1.17E-3	IND	1.64E-4	2.56E-4	IND	-8.60E-3
EP	[kg $(PO_4)^{3-}$-Eq.]	1.54E-3	3.72E-5	1.36E-4	IND	3.75E-5	3.40E-5	IND	-1.02E-3
POCP	[kg ethene-Eq.]	3.08E-3	1.93E-5	2.54E-4	IND	1.75E-5	1.74E-5	IND	-2.83E-3
ADPE	[kg Sb-Eq.]	2.14E-5	2.09E-9	1.76E-6	IND	1.22E-9	2.47E-8	IND	-1.72E-5
ADPF	[MJ]	128.70	0.61	10.70	IND	0.45	1.16	IND	-97.80

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]	5.16	IND	0.41	IND	IND	IND	IND	IND
PERM	[MJ]	1.46	IND	0.12	IND	IND	IND	IND	IND
PERT	[MJ]	6.61E+0	3.62E-2	5.76E-1	IND	1.76E-2	3.41E-1	IND	-5.48E+0
PENRE	[MJ]	94.77	IND	7.58	IND	IND	IND	IND	IND
PENRM	[MJ]	45.05	IND	3.60	IND	IND	IND	IND	IND
PENRT	[MJ]	139.81	0.61	11.65	IND	0.45	1.64	IND	-107.00
SM	[kg]	IND	IND	IND	IND	IND	IND	IND	IND
RSF	[MJ]	IND	IND	IND	IND	IND	IND	IND	IND
NRSF	[MJ]	IND	IND	IND	IND	IND	IND	IND	IND
FW	[m³]	1.03E-2	2.34E-5	1.25E-3	IND	1.24E-5	8.27E-4	IND	-1.82E-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

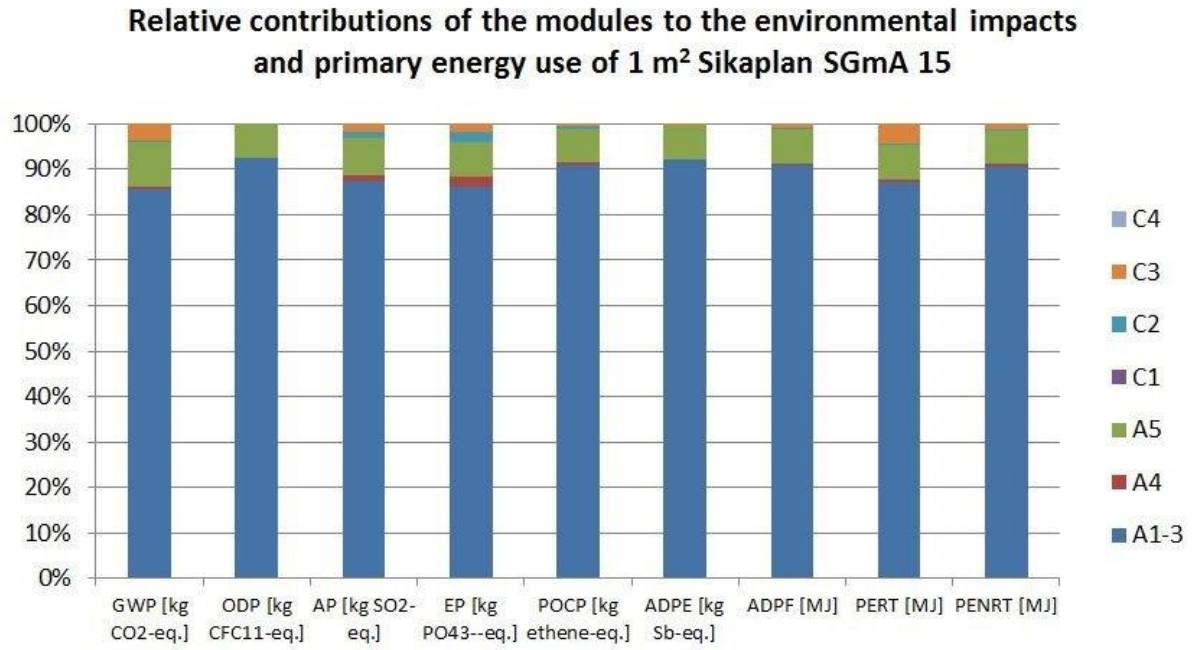
RESULTS OF THE LCA – OUTPUT FLOWS AND WASTE CATEGORIES: 1 m² membrane

Parameter	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
HWD	[kg]	4.87E-3	2.70E-6	4.49E-4	IND	1.02E-6	4.92E-4	IND	-6.34E-3
NHWD	[kg]	1.28E-1	1.17E-4	7.54E-2	IND	5.64E-5	4.74E-3	IND	-3.22E-2
RWD	[kg]	3.40E-3	8.50E-7	2.96E-4	IND	5.87E-7	1.90E-4	IND	-3.67E-3
CRU	[kg]	IND	IND	IND	IND	IND	IND	IND	IND
MFR	[kg]	IND	IND	IND	IND	IND	1.91	IND	IND
MER	[kg]	IND	IND	IND	IND	IND	IND	IND	IND
EEE	[MJ]	IND	IND	0.18	IND	IND	0.12	IND	IND
EET	[MJ]	IND	IND	0.52	IND	IND	0.34	IND	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 use, the production process (11%), pre-product manufacturing (61%) and packaging (28%) 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 (91.3%) on the use of non-renewable primary energy resources (PENRT), while the impact of the production process (electrical energy) measures 3.6%.

Indicators of the impact assessment:
The dominant influence in all impact categories comes from pre-product manufacturing, measuring at least 91% in each case. Within pre-product manufacturing, polymers play an important role regarding Global Warming Potential (GWP) (42%), Acidification Potential of soil and water (AP) (40%), Eutrophication Potential (EP) (40%), Formation Potential of Tropospheric Ozone (POCP) (51%), Abiotic Depletion Potential for non-fossil resources (ADPE) (44%) and Abiotic Depletion Potential for fossil fuels (ADPF) (42%). Plasticisers significantly influence GWP (50%), Depletion Potential of the Stratospheric Ozone layer (ODP) (97%), AP (39%), EP (31%), POCP (36%) and ADPF (53%). The influence of stabilisers is seen in EP (17%) and ADPE (15%).
In addition, the carrier material impacts the parameter ADPE (38%). The raw materials with the greatest effect on the impacts also show the greatest percentage by mass of the polymeric waterproofing membrane: polymers and plasticizers. The manufacturing process (due to electricity use) contributes the most to AP (4.3%), EP (4.1%) and GWP (6%).

7. Requisite evidence

No requisite evidence is required for Sikaplan SGmA polymeric waterproofing 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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DIN EN ISO 14001: Environmental management systems – Requirements with guidance for use, German and English version EN ISO 14001:2004 + AC:2009.

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