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The Norwegian EPD Foundation

Institut Bauen und Umwelt e.V.

ENVIRONMENTAL PRODUCT DECLARATION

in accordance with ISO 14025, ISO 21930 and EN 15804

Owner of the Declaration:	Sika Deutschland GmbH
Program operator:	Institut Bauen und Umwelt e.V. (IBU)
Publisher:	The Norwegian EPD Foundation
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Valid to:	21.05.2019

Sarnafil TS 77-E

Sika Deutschland GmbH

www.epd-norge.no

BUILDING TRUST

ECO PLATFORM EPD EN 15804 VERIFIED

1. General Information

Sika Deutschland GmbH

Programme holder

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

Declaration number

EPD-SIK-20130202-IBA1-EN

This Declaration is based on the Product Category Rules:

Plastic and elastomer roofing and sealing sheet systems, 07-2012
(PCR tested and approved by the independent expert committee)

Issue date

22.05.2014

Valid to

21.05.2019

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

Dr. Burkhart Lehmann
(Managing Director IBU)

Sarnafil TS 77-E

Owner of the Declaration

Sika Deutschland GmbH
Kornwestheimer Straße 103-107
70439 Stuttgart
Germany

Declared product / Declared unit

1 m^2 Sarnafil TS 77-E
polymeric waterproofing membrane

Scope:

This document applies to Sarnafil TS 77-E polymeric waterproofing membrane manufactured by Sika Manufacturing AG in CH-6060 Sarnen (Switzerland). The LCA data were compiled using production data from the year 2011 by Sika Services AG. The declaration holder is responsible for the underlying data and its verification. This document is a translation from the German Environmental Product Declaration into English. It is based on the German original version EPD-SIK-20130202-IBA1-DE. The verifier has no influence on the quality of the translation.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. Eva Schmincke
(Independent tester appointed by SVA)

2. Product

2.1 Product description

Sarnafil TS 77-E polymeric waterproofing membrane is made of flexible polyolefin (FPO) and is treated with flame retardant and stabilizers against UV radiation. An inlay of glass non-woven and polyester reinforcement is encapsulated within the sheet. Sarnafil TS 77-E polymeric waterproofing membrane is available in the following thicknesses: 1.5 mm (TS 77-15 E), 1.8 mm (TS 77-18 E) and 2.0 mm (TS 77-20 E).

2.2 Application

Sarnafil TS 77-E polymeric waterproofing membrane is used exclusively to seal unballasted flat or pitched roofs. The roofing sheets are loose laid and mechanically fastened. Sarnafil TS 77-E polymeric waterproofing membrane provides elevated protection against fire.

2.3 Technical Data

Technical Data

Name	Value	Unit
Waterproof as per /EN 1928/	passed	kPa
Tensile strain performance as per /EN 12311-2/	12	%
Tear resistance as per /EN 12310-2/	300	N
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/	≥ 500	N/50mm
Shear resistance of joint as per /EN 12317-2 / DIN V 20000-201/	Tear outside joint	-
Artificial ageing as per /EN 1297/	passed (> 5,000 hrs.)	-
Dimensional stability as per /EN 1107-2/	≤ |0,2| bis ≤ |0,1|	%
Folding in the cold as per /EN 495-5/	≤ -20	°C
Bitumen compatibility as per /EN 1548/	passed	-

2.4 Placing on the market / Application rules

For the placing in the market in the EU/EFTA the commission regulation (EU) Nr 305/2011 of March 9 2011 shall apply. The products require a declaration of performance, taking into account the harmonized standard /EN 13956:2012/ "Flexible sheets for waterproofing. Plastic and rubber sheets for roof waterproofing" and the CE mark.
For the use in Germany the relevant national provisions apply, standard /DIN V 20000-201/.

2.5 Delivery status

The product is delivered in various sizes, depending on the material thickness, on pallets with 21 rolls:

- Sarnafil TG 77-15 E: 20 m x 2 m.
- Sarnafil TG 77-18 E: 15 m x 2 m.
- Sarnafil TG 77-20 E: 15 m x 2 m.

2.6 Base materials / Ancillary materials

The raw materials and additives of Sarnafil TS 77-E polymeric waterproofing membrane can be given as follows:

- Thermoplastic polyolefins: 40-60%
- Stabilizers (UV/heat): 0-1 %
- Flame retardant (inorganic): 30-45 %
- Carrier material (glass nonwoven/polyester): 3-6%
- Pigment: 0-5 %

The recipe contains no hazardous substances. According to current knowledge, the product contains no substances of very high concern (SVHC) in a concentration exceeding 0.1 % (by unit weight) on the REACH candidate list, issued by the European Chemicals Agency (ECHA).

2.7 Manufacture

Sarnafil TS 77-E polymeric waterproofing sheets are manufactured on production lines developed in-house in the following stages:

- Melting of the polymeric components and additives in extruders
- Dispersing of the molten materials
- Coating of the carrier or the reinforcing in layers, producing homogenous encapsulation
- Cooling of the polymeric waterproofing sheet
- Winding of the sheets onto cardboard spools made of recycled paper
- Individually wrapping each roll in PE foil

The quality management system of the Sarnen plant has been /ISO 9001/ certified since 1993.

2.8 Environment and health during manufacturing

In the production of Sarnafil TS 77-E polymeric waterproofing membrane, governmental standards regarding emissions to air, wastewater and waste as well as noise emissions are completely fulfilled and the respective limits not exceeded. The manufacturing process poses no risk to the health and safety of production personnel.
The product stage produces no emissions that must be filtered from waste gases.
Water is used for cooling purposes only and does not come into contact with the polymeric waterproofing sheets.
Sika maintains an environmental management system certified in accordance with /ISO 14001/ and an occupational health and safety management system certified in accordance with /OHSAS 18001/.

2.9 Product processing/Installation

Sarnafil TS 77-E polymeric waterproofing membrane is loose laid and mechanically fastened to unballasted roofs preferably with a slope > 20°. The individual sheets are joined by means of hot-air welding. The Sika fastening systems Sarnabar or Sarnafast are recommended for fastening. In general, the latest product data sheet for each product available at www.sika.de/Dachabdichtung is to be observed.

2.10 Packaging

The rolls of polymeric waterproofing membrane are individually wrapped in PE foil and shipped on pallets. The spools are cardboard made from recycled paper. The packaging materials can be sorted and collected for recycling.
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2.11 Condition of use

Based on the external study "Durability of Sarnafil T Polymeric Waterproofing Membrane" from 2009, one can reasonably expect the condition and material composition of Sarnafil TS 77-E polymeric waterproofing membrane to remain unchanged throughout the service life, given professional installation and proper use and maintenance.

2.12 Environment and health during use

The product contains no substances that are released during normal use. Neither the environment nor the health of users is negatively influenced during the service life. No environmental emissions are known to occur.

2.13 Reference service life

The reference service life of Sarnafil TS 77-E polymeric waterproofing membrane is at least 30 years.
Based on the study "Durability of Sarnafil T Polymeric Waterproofing Membrane" from 2009, experience to date with Sarnafil polymeric waterproofing membranes indicates that a service life of over 50 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
Sarnafil TS 77-E 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 Sarnafil TS 77-E polymeric waterproofing membrane.

Mechanical destruction
Sarnafil TS 77-E polymeric waterproofing membrane possesses good mechanical strength and is highly robust. No environmental impact is known to result from unexpected mechanical damage.
Based on the study "Durability of Sarnafil T Polymeric Waterproofing Membrane" from 2009, no significant change in the mechanical properties of the roofing membrane is to be expected even after 20 years.

2.15 Re-use phase
At the end of the service life or when roofing sheets must be replaced, Sarnafil TS 77-E waterproofing sheets can be selectively removed and recycled. This allows 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
Sarnafil TS 77-E membrane 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 m^3 capacity) or in containers. Then the roofing sheets are completely recycled by Roofcollect in numerous recycling systems and new products are manufactured from the recovered material.

Sarnafil TS 77-E polymeric waterproofing membrane can be classified under Waste Code 170904 according to the European Waste Catalogue.

2.17 Further information
More information about the company and its products is available in the internet at **www.sika.com**

3. LCA: Calculation rules

3.1 Declared Unit
This declaration applies to 1 m^2 of Sarnafil TS 77-E polymeric waterproofing membrane, thickness 2.0mm. A formula is given for independent calculation of the values for other thicknesses

Deklarierte Einheit

Name	Value	Unit
Declared unit	1	m^2
Grammage	2.4	kg/m^2
Type of sealing	hot-air weld	-
Conversion factor to 1 kg	0,416666667	-

3.2 System boundary
Type of EPD: Cradle to gate with options
The system boundaries of the EPD follow the modular construction system as 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 zur Baustelle
- A5: Installation into the building (welding energy, disposal of packaging and roof membrane scraps)
- 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 (benefits for incineration and recovery of packaging materials)

3.3 Estimates and assumptions
Various stabilizers 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 consideration (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 were not taken into account in the LCA.

3.5 Background data
The primary data provided by Sika derive from the plant at Sarnen, Switzerland. The underlying data were collected in the databases of GaBi software and ecoinvent Version 2.2. The Swiss Electrical Energy Mix was applied.

3.6 Data quality
To simulate the product stage, data recorded by Sika from the production year 2011 were used. All other relevant underlying data sets were taken from generic data not older than 10 years.

3.7 Period under review
The period of study encompasses the year 2011.

3.8 Allocation
Mass allocation was applied for production.
Production waste that was reclaimed and reused internally was simulated as closed-loop recycling in Modules A1-A3, including the thermal use of waste (calorific value).
Regarding the incineration of production waste, benefits taking into account the basic composition and the calorific value were input-specifically taken into account for electrical and thermal energy in Modules A1-A3. Here it is assumed that the material for manufacturing the product has the same quality as the production waste.
Regarding the recycling of the polymeric waterproofing sheets, the amount of recyclable membrane was treated as a corresponding polypropylene 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	0.45	l/100km
Transport distance	600	km
Coefficient of utilitzation	85	%
Gross density of products transported	1198	kg/m^3
Volume-utilization factor	100	%

Installation into the building (A5)

Name	Value	Unit
Electricity consumption	0,016	kWh/m^2
Installation losses (membrane)	4	%
Overlap (membrane)	6	%

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 kept.

End-of-life stage (C1-C4)

Name	Value	Unit
For recycling	100	%
Transport to recycling facility	500	km

5. LCA: Results

The results displayed below apply to Sarnafil TS 77-20 E. To calculate results for other thicknesses, please use this formula:

$Ix = ((x + 0.5)/2.5)I_{2.0}$

[Ix = the unknown parameter value for Sarnafil TS 77-E products with a thickness of "x" mm (e.g. 1.5mm)]

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 BOUNDARYS
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.]	4.050E+0	7.940E-2	8.450E-1	0.000E+0	8.150E-2	3.020E-1	0.000E+0	-4.980E+0
ODP	[kg CFC11-Eq.]	0.000E+0	1.660E-12	0.000E+0	0.000E+0	1.430E-12	8.490E-11	0.000E+0	-1.560E-9
AP	[kg SO_2-Eq.]	1.200E-2	2.760E-4	1.400E-3	0.000E+0	4.100E-4	3.230E-4	0.000E+0	-1.550E-2
EP	[kg $(PO_4)^{3-}$- Eq.]	2.000E-3	6.390E-5	2.000E-4	0.000E+0	9.430E-5	3.940E-5	0.000E+0	-1.860E-3
POCP	[kg Ethen Eq.]	2.000E-3	3.200E-5	2.000E-4	0.000E+0	4.340E-5	2.230E-5	0.000E+0	-2.320E-3
ADPE	[kg Sb Eq.]	0.000E+0	3.660E-9	0.000E+0	0.000E+0	3.040E-9	2.730E-8	0.000E+0	-3.840E-7
ADPF	[MJ]	110.700	1.090	12.519	0.000	1.130	2.100	0.000	-172.000

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]	4.815	-	0.535	-	-	-	-	-
PERM	[MJ]	1.746	-	0.194	-	-	-	-	-
PERT	[MJ]	6.570E+0	6.450E-2	7.622E-1	0.000E+0	4.430E-2	4.020E-1	0.000E+0	-3.020E+0
PENRE	[MJ]	55.170	-	6.130	-	-	-	-	-
PENRM	[MJ]	56.430	-	6.270	-	-	-	-	-
PENRT	[MJ]	111.600	1.090	12.619	0.000	1.130	2.100	0.000	-172.000
SM	[kg]	0.000	-	-	-	-	-	-	-
RSF	[MJ]	2.240E-3	8.110E-6	2.750E-4	0.000E+0	7.140E-6	5.530E-5	0.000E+0	-6.290E-5
NRSF	[MJ]	2.313E-2	8.480E-5	2.840E-3	0.000E+0	7.480E-5	5.660E-4	0.000E+0	-6.590E-4
FW	[m^3]	1.008E+1	4.850E-3	1.150E+0	0.000E+0	4.410E-3	3.630E-1	0.000E+0	-5.220E-1

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

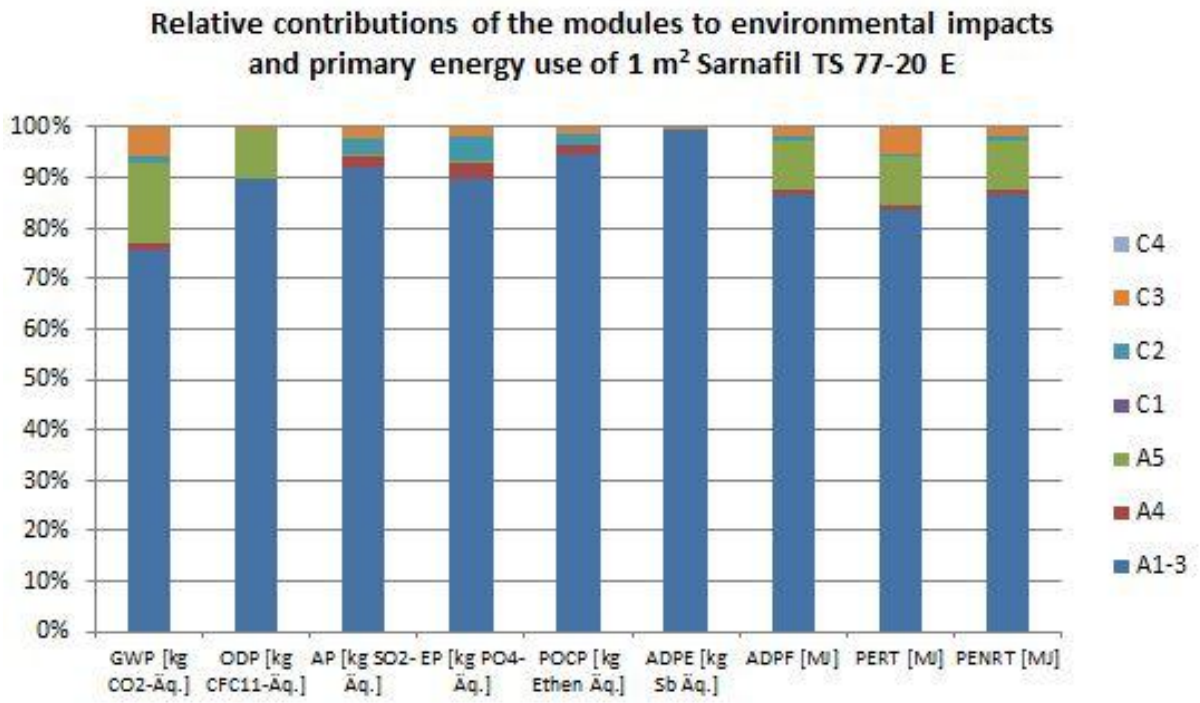
RESULTS OF THE LCA – OUTPUT FLOWS AND WASTE CATEGORIES: 1 m² membrane

Parameter	Unit	A1 - A3	A4	A5	C1	C2	C3	C4	D
HWD	[kg]	1.000E-3	0.000E+0	1.000E-4	0.000E+0	0.000E+0	0.000E+0	0.000E+0	-1.970E-3
NHWD	[kg]	5.589E+0	6.740E-3	6.875E-1	0.000E+0	4.020E-3	8.480E-1	0.000E+0	-8.480E-1
RWD	[kg]	3.000E-3	1.560E-6	4.000E-4	0.000E+0	1.570E-6	2.410E-4	0.000E+0	-2.350E-4
CRU	[kg]	-	-	-	-	-	-	-	-
MFR	[kg]	-	-	-	-	-	2.410	-	-
MER	[kg]	-	-	-	-	-	-	-	-
EEE	[MJ]	-	-	0.677	-	-	0.147	-	-
EET	[MJ]	-	-	1.850	-	-	0.429	-	-

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, pre-product manufacturing (38 %), packaging (34 %) and the manufacturing process (29 %) account for the total of the use of renewable primary energy resources (PERT). The manufacturing of polymers in the product stage (82 %) has the greatest impact on the use of nonrenewable primary energy resources (PENRT), while the impact of the production process (electrical energy) measures 4 %.

Indicators of the impact assessment:
The dominant influence in all impact categories comes from pre-product manufacturing, at least 80 % in each case. Within pre-product manufacturing, polymers play an important role regarding Global Warming Potential GWP (55 %), Acidification Potential of soil and water (AP) (46 %), Eutrophication Potential (EP) (26 %), Formation Potential of Tropospheric Ozone (POCP) (53 %) and Abiotic Depletion Potential for fossil fuels (ADPF) (83 %). The flame retardant has significant impact on GWP (25 %), Depletion Potential of the Stratospheric Ozone layer (ODP) (77 %), AP (26 %), EP (56 %) and POCP (16 %). Pigments (primarily titanium dioxide) impact on AP (14 %). In addition, the carrier material impacts the parameters POCP (23 %) and Abiotic Depletion Potential for non-fossil resources (ADPE) (85 %). The raw materials with the greatest effect on the impacts also show the greatest percentage by mass of the polymeric waterproofing membrane: polymers, flame retardant and carrier material. The manufacturing process (due to electricity use) contributes the most to ADPF (4 %), GWP (3 %) and ODP (8 %).

7. Requisite evidence

No requisite evidence is required for Sarnafil TS 77-E polymeric proofing membrane.

8. References

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EN 15804
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DIN EN 1297: Abdichtungsbahnen - Bitumen-, Kunststoff- und Elastomerbahnen für Dachabdichtungen - Verfahren zur künstlichen Alterung bei kombinierter Dauerbeanspruchung durch UV-Strahlung, erhöhte Temperatur und Wasser; Deutsche Fassung EN 1297:2004.

DIN EN 1107-2: Abdichtungsbahnen - Bestimmung der Maßhaltigkeit - Teil 2: Kunststoff- und Elastomerbahnen für Dachabdichtungen; Deutsche Fassung EN 1107-2:2001.

DIN EN 495-5: Abdichtungsbahnen - Bestimmung des Verhaltens beim Falzen bei tiefen Temperaturen - Teil 5: Kunststoff- und Elastomerbahnen für Dachabdichtungen; Deutsche Fassung EN 495-5:2013.

DIN EN 1548: Abdichtungsbahnen - Kunststoff- und Elastomerbahnen für Dachabdichtungen - Verhalten nach Lagerung auf Bitumen; Deutsche Fassung EN 1548:2007.

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ecoinvent Version 2.2: Datenbank für Ökobilanzdaten. Swiss Centre for Life Cycle Inventories (ecoinvent Centre), 2010.

9. Annex: Specific Norwegian requirements

The following information has been provided by the declaration owner in form of a self-declaration:

(1) Applied electricity data set used in the manufacturing phase

The electricity mix for the electricity used in manufacturing (A3) is the electricity grid mix

<0,0472 kg CO_2 eqv/MJ> (Swiss Power Mix GaBi 2014)

(2) Content of dangerous substances

☒ The product contains no substances given by the REACH Candidate list or the Norwegian priority list.
☐ The product contains substances that are less than 0.1% by weight given by the REACH Candidate or the Norwegian priority list.
☐ The product contains dangerous substances more than 0.1% by weight given in the REACH candidate list or the Norwegian Priority List, concentrations is given in the EPD:

(3) Transport from the place of manufacture to a central warehouse

Transport distance and CO_2-eqv./DU from transport of the product from factory gate to central warehouse in Oslo:

Type	Capacity utilisation (incl. return) %	Type of vehicle	Distance km	Fuel / Energy use	Unit	Value (l/t)	CO_2-eqv./DU
Boat	50	Truck 16 ton	331				0,011 kg CO_2 eqv. (1 m^2 membrane)
Truck	50	Truck 16 ton	1.480	0,019914	l/tkm	29,47	0,296 kg CO_2 eqv. (1 m^2 membrane)

(4) Impact on the indoor environment

☐ Indoor air emission testing has been performed
☐ No test has being performed
☒ Not relevant; For the Sarnafil TS 77-E polymeric waterproofing membrane indoor air emission testing is not relevant as the materials are for exterior roofing installation.

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