

# ENVIRONMENTAL PRODUCT DECLARATION

as per ISO 14025 and EN 15804




Owner of the Declaration	<b>Sika Deutschland GmbH</b>
Programme holder	Institut Bauen und Umwelt e.V. (IBU)
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Valid to	21.05.2019

Sarnafil TG 76 Felt  
**Sika Deutschland GmbH**

[www.bau-umwelt.com](http://www.bau-umwelt.com) / <https://epd-online.com>



## 1. General Information

<p><b>Sika Deutschland GmbH</b></p> <p><b>Programme holder</b> IBU - Institut Bauen und Umwelt e.V. Panoramastr. 1 10178 Berlin Germany</p> <p><b>Declaration number</b> EPD-SIK-20130204-IBA1-EN</p> <p><b>This Declaration is based on the Product Category Rules:</b> Plastic and elastomer roofing and sealing sheet systems, 07-2012 (PCR tested and approved by the independent expert committee)</p> <p><b>Issue date</b> 22.05.2014</p> <p><b>Valid to</b> 21.05.2019</p> <p></p> <p>Prof. Dr.-Ing. Horst J. Bossenmayer (President of Institut Bauen und Umwelt e.V.)</p> <p></p> <p>Dr. Burkhard Lehmann (Managing Director IBU)</p>	<p><b>Sarnafil TG 76 Felt</b></p> <p><b>Owner of the Declaration</b> Sika Deutschland GmbH Kornwestheimer Straße 103-107 D-70439 Stuttgart</p> <p><b>Declared product / Declared unit</b> 1 m<sup>2</sup> Sarnafil TG 76 Felt polymeric waterproofing membrane</p> <p><b>Scope:</b> This document applies to Sarnafil TG 76 Felt 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-20130204-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.</p> <p><b>Verification</b></p> <p>The CEN Norm EN 15804 serves as the core PCR</p> <p>Independent verification of the declaration according to ISO 14025</p> <p><input type="checkbox"/> internally <input checked="" type="checkbox"/> externally</p> <p></p> <p>Dr. Eva Schmincke (Independent tester appointed by SVA)</p>
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## 2. Product

### 2.1 Product description

Sarnafil TG 76 Felt polymeric waterproofing membrane is made of flexible polyolefin (FPO) and is treated with flame retardant and stabilizers against UV radiation. A glass non-woven inlay is encapsulated in the sheet. Polyester fleece backing serves as a bonding and leveling layer for adhered application. Sarnafil TG 76 Felt polymeric waterproofing membrane is available in the following thicknesses: 1.5 mm (TG 76-15 Felt), 1.8 mm (TG 76-18 Felt) and 2.0 mm (TG 76-20 Felt).

### 2.2 Application

Sarnafil TG 76 Felt polymeric waterproofing membrane is used chiefly to seal flat roofs. The roofing sheets can be fully adhered to unballasted roofs with a pitch up to < 20°. The Sika adhesives Sarnacol 2142 S or Sikaplan C 300 are recommended for adhered application of the membrane. Application on roofs with gravel ballast or in green roof systems is also possible.

### 2.3 Technical Data

#### Technical Data

Name	Value	Unit
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Waterproof as per /EN 1928/	passed	kPa
Tensile strain performance as per /EN 12311-2/	≥ 50	%
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/	≤ -30	°C
Bitumen compatibility as per /EN 1548/	passed	-
Resistance to root penetration (for green roofs) as per /EN 13948/ or /Test procedure for determining root resistance of sheets and coatings for green roofs by the	FLL passed	-

Forschungs-Gesellschaft Landschaftsentwicklung Landschaftsbau e.V. (FLL)/		
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## 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 14 rolls:

- Sarnafil TG 76-15 Felt: 20 m x 2 m.
- Sarnafil TG 76-18 Felt: 15 m x 2 m.
- Sarnafil TG 76-20 Felt: 15 m x 2 m.

## 2.6 Base materials / Ancillary materials

The raw materials and additives of Sarnafil TG 76 Felt polymeric waterproofing membrane can be given as follows:

- Thermoplastic polyolefins: 50-70 %
- Stabilizers (UV/Hheat): 0-1 %
- Flame retardant (inorganic): 15-30 %
- TCarrier material (glass nonwoven): 1-3 %
- Felt (polyester): 5-9 %
- 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 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 TG 76 Felt 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 TG 76 Felt polymeric waterproofing membrane is adhered to unballasted roofs with a pitch up to < 20°. It is also suitable on roofs with gravel ballast and in green roof systems. The individual sheets are joined by means of hot-air welding. The Sika adhesives Sarnacol 2142 S or Sikaplan C 300 are recommended for adhered application. In general, the latest product data sheet for each product is available at [www.sika.de/Dachabdichtung](http://www.sika.de/Dachabdichtung)

## 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 packing materials can be sorted and collected for recycling.

## 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 TG 76 Felt 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 TG 76 Felt polymeric waterproofing membrane is at least 30 years. Based on the study "Durability of Sarnafil T Polymeric Waterproofing Membrane" from 2009 and experience to date with Sarnafil polymeric waterproofing membranes, if the standard requirements and the application and maintenance recommendations are observed, a service life of over 50 years can be expected.

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

## 2.14 Extraordinary effects

### Fire

Sarnafil TG 76 Felt 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 TG 76 Felt polymeric waterproofing membrane.

## Mechanical destruction

Sarnafil TG 76 Felt 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

It is not possible to separate adhered Sarnafil TG 76 membrane into its component parts after the service life of the roof has expired. Therefore, after roof replacement or at the end of the service life, the material should be incinerated for its calorific value.

## 2.16 Disposal

Because it is not possible to separate adhered Sarnafil TG 76 membrane into its component parts, the material should be disposed of by incineration for its calorific value.

Disposal of Sarnafil TG 76 Felt polymeric waterproofing sheets is handled by Interseeroh Dienstleistungs GmbH (Contract No. 27704). The sheets are picked up from the building site in so-called big bags (1 m<sup>3</sup> capacity) or in containers and transported to an incinerator.

Sarnafil TG 76 Felt 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](http://www.sika.com)

## 3. LCA: Calculation rules

### 3.1 Declared Unit

This declaration applies to 1 m<sup>2</sup> of Sarnafil TG 76 Felt polymeric waterproofing membrane, thickness 2.0mm. A formula is given for independent calculation of the values for other thicknesses.

#### Declared unit

Name	Value	Unit
Declared unit	1	m <sup>2</sup>
Grammage	2.4	kg/m <sup>2</sup>
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 consumption, electricity consumption). 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.

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 utilization	85	%
Gross density of products transported	1182	kg/m <sup>3</sup>
Volume-utilization factor	100	%

### Installation into the building (A5)

Name	Value	Unit
Electricity consumption	0,016	kWh/m <sup>2</sup>
Installation losses (membrane)	4	%
Installation losses (overlap)	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 energy recovery	100	%
Transport to energy recovery facility	50	km

## 5. LCA: Results

The results displayed below apply to Sarnafil TG 76-20 Felt. To calculate results for other thicknesses, please use this formula:

$$I_x = ((x+1.125)/3.125) I_{2,0}$$

[I<sub>x</sub> = the unknown parameter value for Sarnafil TG 76 Felt 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 BOUNDARIES
Raw material supply	Transport	Manufacturing	Transport from the gate to the site	Assembly	Use	Maintenance	Repair	Replacement <sup>(1)</sup>	Refurbishment <sup>(1)</sup>	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 m<sup>2</sup> membrane

Parameter	Unit	A1 - A3	A4	A5	C1	C2	C3	C4	D
GWP	[kg CO <sub>2</sub> -Eq.]	5.000E+0	7.830E-2	9.460E-1	0.000E+0	8.030E-3	0.000E+0	7.840E+0	-5.150E+0
ODP	[kg CFC11-Eq.]	3.480E-8	1.640E-12	3.880E-9	0.000E+0	1.410E-13	0.000E+0	3.440E-11	-2.980E-9
AP	[kg SO <sub>2</sub> -Eq.]	1.950E-2	2.720E-4	2.200E-3	0.000E+0	4.040E-5	0.000E+0	5.660E-4	-7.270E-3
EP	[kg (PO <sub>4</sub> ) <sup>3-</sup> -Eq.]	1.300E-3	6.310E-5	2.000E-4	0.000E+0	9.300E-6	0.000E+0	1.070E-4	-8.300E-4
POCP	[kg Ethen Eq.]	2.350E-3	3.160E-5	3.000E-4	0.000E+0	4.280E-6	0.000E+0	6.720E-5	-7.090E-4
ADPE	[kg Sb Eq.]	8.630E-6	3.620E-9	9.630E-7	0.000E+0	3.000E-10	0.000E+0	3.760E-8	-7.710E-7
ADPF	[MJ]	141.000	1.080	15.918	0.000	0.111	0.000	1.000	-81.400

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 m<sup>2</sup> membrane

Parameter	Unit	A1 - A3	A4	A5	C1	C2	C3	C4	D
PERE	[MJ]	6.160	-	0.684	-	-	-	-	-
PERM	[MJ]	1.750	-	0.194	-	-	-	-	-
PERT	[MJ]	7.910E+0	6.370E-2	9.112E-1	0.000E+0	4.370E-3	0.000E+0	7.640E-2	-8.880E+0
PENRE	[MJ]	77.670	-	8.630	-	-	-	-	-
PENRM	[MJ]	65.430	-	7.270	-	-	-	-	-
PENRT	[MJ]	143.100	1.080	16.118	0.000	0.111	0.000	1.000	-81.400
SM	[kg]	-	-	-	-	-	-	-	-
RSF	[MJ]	2.890E-3	8.000E-6	3.000E-4	0.000E+0	7.040E-7	0.000E+0	3.800E-5	-1.150E-3
NRSF	[MJ]	3.000E-2	8.360E-5	3.600E-3	0.000E+0	7.380E-6	0.000E+0	3.760E-4	-1.200E-2
FW	[m <sup>3</sup> ]	1.062E+1	4.780E-3	1.211E+0	0.000E+0	4.350E-4	0.000E+0	1.140E-1	-6.560E+0

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 m<sup>2</sup> membrane

Parameter	Unit	A1 - A3	A4	A5	C1	C2	C3	C4	D
HWD	[kg]	3.830E-3	0.000E+0	4.000E-4	0.000E+0	0.000E+0	0.000E+0	0.000E+0	0.000E+0
NHWD	[kg]	8.379E+0	6.650E-3	9.974E-1	0.000E+0	3.970E-4	0.000E+0	1.220E-1	-1.520E+1
RWD	[kg]	4.100E-3	1.540E-6	5.000E-4	0.000E+0	1.550E-7	0.000E+0	6.560E-5	-4.310E-3
CRU	[kg]	-	-	-	-	-	-	-	-
MFR	[kg]	-	-	-	-	-	-	-	-
MER	[kg]	-	-	-	-	-	-	-	-
EEE	[MJ]	-	-	0.669	-	-	-	14.500	-
EET	[MJ]	-	-	1.820	-	-	-	39.300	-

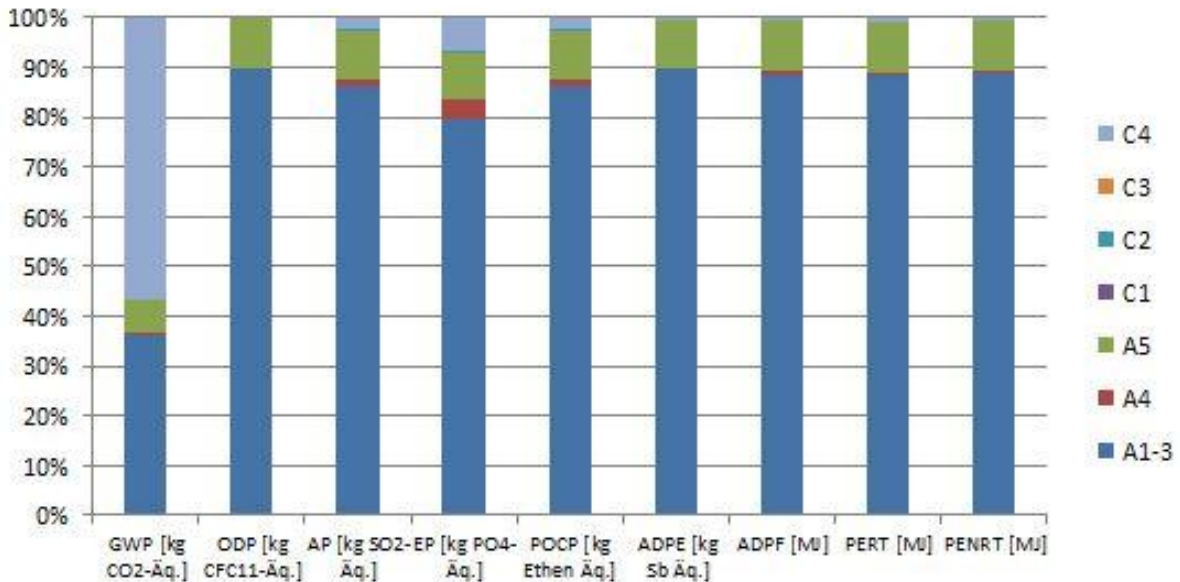
Caption: HWD = Hazardous waste disposed; NHWD = Non hazardous waste disposed; RWD = Radioactive waste disposed; CRU = Components for re-use; MFR = Materials for recycling; MER = Materials for energy recovery; EEE = Exported electrical energy; EEE = Exported thermal energy

## 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.

Relative contributions of the modules to environmental impacts and primary energy use of 1 m<sup>2</sup> Sarnafil TG 76-20 Felt



The Global Warming Potential (GWP) is influenced foremost by greenhouse gases emitted from incineration (C4). The product stage (Modules A1-A3) has by far the greatest impact on all other indicators. For this reason, this stage is examined more closely in the following interpretation.

### Indicators of the inventory analysis:

Due to electricity consumption, pre-product manufacturing (48 %), packaging (28 %) and the manufacturing process (24 %) account for the total of the use of renewable primary energy resources (PERT). The manufacturing of polymers in the product stage (68 %) has the greatest impact on the use of nonrenewable primary energy resources (PENRT), while the impact of the production process (electrical energy) measures 3 %.

### Indicators of the impact assessment:

The dominant influence in all impact categories except for GWP comes from pre-product manufacturing (at

least 87 % in each case). Within pre-product manufacturing, polymers play an important role regarding GWP (47 %), Acidification Potential of soil and water (AP) (31 %), Eutrophication Potential (EP) (39 %), Formation Potential of Tropospheric Ozone (POCP) (44 %) and Abiotic Depletion Potential for fossil fuels (ADPF) (68 %). The felt has impact on GWP (27 %), EP (21 %), POCP (2 %) and ADPF (20 %). The flame retardant has significant impact on GWP (17 %), Depletion Potential of the Stratospheric Ozone layer (ODP) (84 %), AP (43 %), EP (22 %) and POCP (19 %). Pigments (primarily titanium dioxide) impact on EP (11 %). In addition, the carrier material impacts the parameter Abiotic Depletion Potential for non-fossil resources (ADPE) (72 %). 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 felt. The manufacturing process (due to electricity use) contributes the most to ADPF (3 %), GWP (3 %) and ODP (5 %).

## 7. Requisite evidence

No requisite evidence is required for Sarnafil TG 76 Felt polymeric proofing membrane.

## 8. References

### Institut Bauen und Umwelt

Institut Bauen und Umwelt e.V., Berlin (pub.):  
Generation of Environmental Product Declarations  
(EPDs);

### General principles

for the EPD range of Institut Bauen und Umwelt e.V.  
(IBU), 2013-04  
www.bau-umwelt.de

### PCR Part A

Institut Bauen und Umwelt e.V., Königswinter (pub.):  
Product Category Rules for Construction Products  
from the range of Environmental Product Declarations  
of Institut Bauen und Umwelt (IBU), Part A: Calculation  
Rules for the Life Cycle Assessment and  
Requirements on the Background Report. April 2013  
www.bau-umwelt.de

### ISO 14025

DIN EN ISO 14025:2011-10: Environmental labels and  
declarations — Type III environmental declarations —  
Principles and procedures

### EN 15804

EN 15804:2012-04+A1 2013: Sustainability of  
construction works — Environmental Product  
Declarations — Core rules for the product category of  
construction products

### Produktkategorienregeln für Bauprodukte Teil B:

PCR Anleitungstexte für gebäudebezogene Produkte  
und Dienstleistungen der Bauproduktgruppe Dach-  
und Dichtungsbahnsysteme aus Kunststoffen und  
Elastomeren, 2012.

**DIN EN 1928:** Abdichtungsbahnen - Bitumen-, Kunst-  
stoff- und Elastomerbahnen für Dachabdichtungen -  
Bestimmung der Wasserdichtheit; Deutsche Fassung  
EN 1928:2000.

**DIN EN 12311-2:** Abdichtungsbahnen - Bestimmung  
des Zug-Dehnungsverhaltens - Teil 2: Kunststoff- und  
Elastomerbahnen für Dachabdichtungen; Deutsche  
Fassung EN 12311-2:2010.

**DIN EN 12316-2:** Abdichtungsbahnen - Bestimmung  
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**DIN EN 12317-2:** Bestimmung des Scherwiderstandes  
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12317-2:2010.

**DIN V 20000-201:** Anwendung von Bauprodukten in  
Bauwerken - Teil 201: Anwendungsnorm für Abdich-  
tungsbahnen nach Europäischen Produktnormen zur  
Verwendung in Dachabdichtungen.

**DIN EN 1297:** Abdichtungsbahnen - Bitumen-, Kunst-  
stoff- 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 Elastomerbah-  
nen 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 Dachabdich-  
tungen; 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.

**DIN EN 13948:** Abdichtungsbahnen - Bitumen-, Kunst-  
stoff- und Elastomerbahnen für Dachabdichtungen -  
Bestimmung des Widerstandes gegen Wurzelpenetra-  
tion; Deutsche Fassung EN 13948:2007.

**Verfahren zur Untersuchung der Wurzelfestigkeit  
von Bahnen und Beschichtungen für Dachbegrü-  
nungen (FLL-Verfahren):** Prüfverfahren der For-  
schungsgesellschaft Landschaftsentwicklung Land-  
schaftsbau e.V. (FLL), Ausgabe 2008.

**DIN EN 13956:** Abdichtungsbahnen - Kunststoff- und  
Elastomerbahnen für Dachabdichtungen - Definitionen  
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**DIN EN ISO 9001:** Qualitätsmanagementsysteme –  
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**DIN EN ISO 14001:** Umweltmanagementsysteme –  
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