ENVIRONMENTAL PRODUCT DECLARATION

as per /ISO 14025/ and /EN 15804/

Owner of the Declaration	Monier Roofing Components GmbH
Programme holder	Institut Bauen und Umwelt e.V. (IBU)
Publisher	Institut Bauen und Umwelt e.V. (IBU)
Declaration number	EPD-MON-20190047-IBA1-EN
Issue date	23/04/2019
Valid to	22/04/2024

Flexible Wall and Chimney Flashing - Wakaflex

Monier Roofing Components GmbH

Institut Bauen und Umwelt e.V.

www.ibu-epd.com / https://epd-online.com

1. General Information

Monier Roofing Components GmbH	Wakaflex
Programme holder IBU - Institut Bauen und Umwelt e.V. Panoramastr. 1 10178 Berlin Germany	**Owner of the declaration** Monier Roofing Components GmbH Frankfurter Landstraße 2-4 D-61440 Oberursel
Declaration number EPD-MON-20190047-IBA1-EN	**Declared product / declared unit** 1 m² of manufactured Wakaflex roof flashing.
This declaration is based on the product category rules: Plastic and elastomer roofing and sealing sheet systems, 07.2014 (PCR checked and approved by the SVR)	**Scope:** This document applies to Wakaflex manufactured by MONIER Roofing Components GmbH in Berlin, Germany. The declared unit is 1 m². The data collection is based on the annual production data from 2016 collected by MONIER. The declarant is responsible for the underlying data and their verification.
Issue date 23/04/2019	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.
Valid to 22/04/2024	**Verification** The standard /EN 15804/ serves as the core PCR Independent verification of the declaration and data according to /ISO 14025:2010/ ☐ internally ☒ externally
Prof. Dr.-Ing. Horst J. Bossenmayer (President of Institut Bauen und Umwelt e.V.)	Patricia Wolf (Independent verifier appointed by SVR)
Dr. Alexander Röder (Head of Board IBU)	

2. Product

2.1 Product description / Product definition

Wakaflex is a flexible flashing and sealing roll available in different colours, lengths and widths. It is used as an universal and handicraft abutment for walls, chimneys and other rising structures of the roof construction, substituting the processing of rolled lead.
Wakaflex is composed of two-layer laminate consisting of Polyisobutylene (PIB), including functional additives; one in the middle fully embedded aluminum expanded mesh insert and an adhesive layer. It has a smooth stable surface, is UV- and temperature resistant, stretchable in both directions (50% longitudinal and 15% transverse) and self-fusing. A fully embedded aluminum expanded mesh insert contributes to mechanical safety and lasting dimensional stability.

For the placing on the market of the product in the European Union / European Free Trade Association (/EU/EFTA) (with exception of Switzerland) Regulation (EU) Nr. 305/2011 (CPR)/ applies. The product needs a declaration of performance taking into consideration /DIN EN 13956:2012/, Flexible sheets for waterproofing - Plastic and rubber sheets for roof waterproofing - Definitions and characteristics and the CE-marking.
For use, the respective national regulations apply.

2.2 Application

Wakaflex is used for the manual connection to walls, chimneys, rising components and other connections on the sloping roof.

2.3 Technical Data

Performance data of the product in accordance with the declaration of performance with respect to its essential characteristics according to /EN 13956:2013/, Flexible sheets for waterproofing - Plastic and rubber sheets for roof waterproofing - Definitions and characteristics
In addition the following technical data should be taken into consideration.

Constructional data

Name	Value	Unit
Peel resistance of the seam joint acc. to /DIN 53 357-A/	≥75	N/50mm
Shear resistance of the seam joint acc. to /DIN 53 357/	≥50	N/50mm
Tear propagation resistance acc. to /DIN ISO 34-1/	≥38	N
Artificial ageing acc. to /DIN EN 1297/	class 0 (5000h)	-
Dimensional stability acc. to /DIN EN 1107-2/	≤6	%

Tear resistance (lenghtwise) acc. to. /DIN EN ISO 527 T 1/2/3/	2	N/mm²
Tear resistance (across) acc. to. /DIN EN ISO 527 T 1/2/3/	2,5	N/mm²
Cohesive resistance acc. to /DIN 53357/	>1	N/mm²
Tensile strength (lengthwise) acc. to /DIN EN ISO 527 T 1/2/3/	200	N/50mm
Tensile strength (across) acc. to /DIN EN ISO 527 T 1/2/3/	250	N/50mm
Tensile strain performance (lengthwise) acc. to /DIN EN ISO 527 T 1/2/3/	45	%
Tensile strain performance (across) acc. to /DIN EN ISO 527 T 1/2/3/	10	%
Waterproofness acc. to /DIN EN 20811:1992-08/	10	kPa
Water absoprtion acc. to /DIN EN ISO 62/	0	%
Folding in the cold acc. to /EN 495-5/ (Dachbahnen)	not applicable	°C
Bitumen compatibility acc. to /EN 1548/ (Dachbahnen)	not applicable	-
Resistance to root penetration (for green roofs) acc. to /EN 13948/ bzw. FLL (Dachbahnen)	not applicable	-
Ozone resistance (for EPDM/IIR) acc. to /EN 1844/ (Dachbahnen)	not applicable	-
Resistance to impact loads acc. to /EN 12691/ (Dichtungsbahnen)	not applicable	mm
Seam strength acc. to /12317-2/ (Dachbahnen)	not applicable	-

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2.4 Delivery status

Wakaflex is available in 8 colours as packaged rolls with the following sizes:

- 5 m (Length) x 280 mm (Width)
- 10 m (Length) x 280 mm (Width)
- 10 m (Length) x 180 mm (Width)

Custom Wakaflex widths can also be ordered (140mm, 370mm, 500mm and 560mm). The nominal thickness is 2mm.

2.5 Base materials / Ancillary materials

Wakaflex is a double-layer laminate with aluminium mesh. The main ingredients of Wakaflex are:

- Polyisobutylene (PIB): 75–80 M.-%
- Aluminium-mesh: 10–15 M.-%
- Adhesive: < 5 M.-%
- Release-Foil: < 5 M.-%
- Pigmens and UV-stabilizers: < 1 M.- %

This product/ at least one partial article contains substances listed in the candidate list (23.10.2018) exceeding 0.1 percentage by mass: no.

This product/ at least one partial article contains other carcinogenic, mutagenic and reprotoxic (CMR) substances in categories 1A or 1B which are not on the candidate list, exceeding 0.1 percentage by mass: no.

Biocide products were added to this construction product or it has been treated with biocide products (this then concerns a treated product as defined by the (EU) /Ordinance on Biocide Products No. 528/2012/): no.

2.6 Manufacture

Production of the roof flashing roll is certified to /DIN EN ISO 9001/. Ready-to-use Wakaflex is produced in four process steps:

Semi-finished product manufacturing
The pre-products of the top and bottom film are produced in the same production process. All components are blended in a kneading machine. Surpluses from previous production and edge trimming are added to the other components as reclaimed material. The kneading mass is shaped into film form using an extruder. The top film differs from the lower film in thickness and by presence of colour pigments. In addition, UV stabilizers are also added to the top film.

Thermal lamination
In this process step, the top and bottom film and the intermediate aluminium mesh are joined together using heat and pressure, then cooled and passed on by a conveyor system.

Lamination application
Onto the now functional Wakaflex sheet, fuse adhesive (applied over the entire surface for later fusing of overlapping sheets), two adhesive beads applied on the longitudinal side (for securing to the surface underneath with additional protection for rain, snow and dust penetration) and release sheet (removable protective film for transportation) are applied.

Trimming and packaging
After the edge trim, the Wakaflex film passes through a knife station to be cut to the desired sizes. Subsequently, the films are rolled up via a winding system.

2.7 Environment and health during manufacturing

All raw materials used are fed into the production system without causing any environmental harm. Contamination of the environment by extracted air, waste and waste water is excluded in the case of proper plant operation and in line with specifications. Water is used exclusively for cooling and does not come into contact with the product. During the production and packaging, no dust emissions are generated that need to be purified. Production personnel are at no time exposed to health risks during the production of Wakaflex.
Residues resulting from production delivery transition are returned to the ongoing operation of the plant.

2.8 Product processing/Installation

No special tools are required for installation. Scissors or a knife and a hand-held press roller are sufficient. Wakaflex is rolled out on the roof joint, fitted to size and secured to the underlying surface using the adhesive bead. Overlapping sheets are self-fusing.

Observe the manufacturer's laying instructions when working with the product.

2.9 Packaging

Wakaflex is wrapped in 2 or 4 rolls cartons and is batched on wooden palletts. The wooden pallets can be used by the recipient.
The packaging materials can be sorted and collected for recycling, using the system /Green Dot – German Dual System/ (as in Germany "Der Grüne Punkt – Duales System Deutschland GmbH (DSD)". All packaging materials are recyclable.

2.10 Condition of use

The material composition does not change during the service life.

2.11 Environment and health during use

During its service life, Wakaflex has no negative influence or harmful effects on air quality, the environment and the health of users. No release of emissions from the product into air or water is known.

2.12 Reference service life

Based on the /BBSR-table 2017/, Service lives of components for life cycle assessment according to BNB, the service life of sealing rolls exceeds 30 years. The service life underlies the assessment system of the Federal Institute for Research on Building, Urban Affairs and Spatial Development.

2.13 Extraordinary effects

Fire

The declared product Wakaflex corresponds to the building material class E regarding its fire performance according to /EN 13501:1/. According to /DIN 4102-2/ Wakaflex corresponds to the building material class B. The test results B roof (t1) according to /DIN V EN V 1187/ are valid for those of Monier Roofing Components tested roof structures.

Fire protection

Name	Value
Building material class according to /EN 13501-1:2007/	E
Building material class according to /DIN 4102-2/	B
Burning droplets according to /DIN EN 11925-2/, /DIN EN 13501-1/	no
Smoke gas development	-
Characteristics in the event of external fire exposure according to /DIN V EN V 1187/, /DIN EN 13501-5:2006/	B roof (t1) / passed

Water

Wakaflex is resistant to water. Classification according to / DIN EN 1928 (method B)/. The installation instructions must be followed. Neither does the material dissolve in water nor toxic substances are exposed to the environment and water.

Mechanical destruction

There are no relevant environmental impacts associated with mechanical destruction.

2.14 Re-use phase

Wakaflex is not intended to be reused in its original form at the end of its useful life. It can be thermally utilized. Due to the small areas that occur when using Wakaflex as a wall and chimney connection, it is usually fed directly to the household waste as a valuable material, a material recovery usually does not take place.

2.15 Disposal

Disposal must be carried out according to legal regulations. Wakaflex can be disposed as Plastic (disposel code /EWL 17 09 04/).
Wakaflex does not require special handling or waste disposal procedures. The material should be given preference for thermal utilization in suitable installation.

2.16 Further information

On the BRAAS-MONIER-website processing instructions, product data sheets, safety information and other technical information are available for download in the latest edition. These must be noted:
www.braas-monier.com

3. LCA: Calculation rules

3.1 Declared Unit

This declaration applies to 1 m² of Wakaflex roof flashing material.

Declared unit

Name	Value	Unit
Declared unit	1	m^2
Thickness	2	mm
Grammage	3.54	kg/m^2
Conversion factor to 1 kg	0.2824	-

3.2 System boundary

The Life Cycle Assessment considers the system boundaries "cradle to gate - with options" and follows the modular construction system described outlined in /EN 15804/. The LCA takes into account the following modules:

- A1: Raw material supply (Production of precursors, packaging)
- A2: Transport of precursors
- A3: Manufacturing (energy supply and waste handling)
- C2: Transport to waste-processing facility
- C3: Waste processing for reuse, recovery and/or recycling
- D: Potential for reuse, recovery and/or recycling as net flows and benefit

3.3 Estimates and assumptions
Specific data regarding the production process was provided by MONIER. Missing data was supplemented by estimates based on comparable substitutes or data used from the secondary literature and the database /GaBi 8:2018/. Missing data was modelled by the Life Cycle Analyst, including the UV and thermo stabilizer with a mass percentage rate of <2 %. For the adhesive an estimate on polyisobutylene (PIB) was made. For the used pigments a customary cross-industry composition was modelled.

3.4 Cut-off criteria
All relevant data, i.e. all applied materials according to the recipe and the energy used, originate from the production data acquisition and have been considered within the inventory analysis. For the considered in- and outputs the actual transport distances were used. Material- and energy flows with a proportion of less than 1 % were collected. Waste of upstream products, which accumulate in small quantities (<1 %) during the manufacturing process, was neglected.
It can be assumed, that the sum of the neglected processes does not exceed 5 % of the impact categories.

3.5 Background data
Primary data has been provided by MONIER. All background data required for the Life Cycle Assessment originates form the database of the GaBi-Software /GaBi 8:2018/. For the UV- and thermal stabilizers, estimates were made with the help of secondary literature.

3.6 Data quality
For modelling the Life Cycle of Wakaflex production, data has been collected by MONIER in the manufacturing plant from the production year 2016. All other relevant background data has been taken from the database of the /GaBi 8:2018/ software. For the Life Cycle Inventory Analysis all input and output flows have been respected. The representativeness and data quality is therefore rated as good. The background data is not older than 5 years.

3.7 Period under review
The amount of raw materials, input energy and the volume of waste relate to the year 2016. Additional data was taken from the database of /GaBi 8:2018/. It corresponds to the best currently available technology and thus is representative for the considered time period. The reference area is Germany.

3.8 Allocation
On the same production line another sealing tape with partly different production inputs, is generated. The predominant amount of production material does not differ from Wakaflex and can therefore be assigned to the products through allocation. Energy consumption is recorded by MONIER product-specifically.

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.

The background database /GaBi 8:2018/ of Service Pack 36 was used.

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4. LCA: Scenarios and additional technical information

The following technical information models the basis for the declared modules or can be used for developing specific scenarios within the context of a building assessment if modules are not declared (MND).

The reference service life according to /ISO 15686-1/ could not have been determined. The declaration of the reference service life underlies the assessment system of the Federal Institute for Research on Building, Urban Affairs and Spatial Development.

Within the modeling of the End-of-Life, a collection rate of 100% was assumed for later thermal utilization in a waste incineration plant with an R1 factor of > 0.6.

Reference service life

Name	Value	Unit
Life Span (according to BBSR)	30	a

End of life (C1-C4)

Name	Value	Unit
Energy recovery	3.54	kg

5. LCA: Results

The table displayed below summarizes the results of the Life Cycle Assessment (LCA). The results of the impact assessment do not provide any information on endpoints of the impact categories, exceedances of thresholds, safety margins or risks. The results refer to the declared unit of 1 m² Wakaflex roof flashing material. The LCA and Life Cycle Impact Assessment are based on the specifications of the European Standard using the /CML method 2001/ – April 2015.

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	MND	MND	MND	MND	MNR	MNR	MNR	MND	MND	MND	X	X	MND	X

RESULTS OF THE LCA - ENVIRONMENTAL IMPACT: 1 m² Wakaflex

Parameter	Unit	A1	A2	A3	C2	C3	D
Global warming potential	[kg CO_2-Eq.]	8.70E+0	1.91E-1	4.66E-1	2.59E-2	4.00E+0	-3.48E+0
Depletion potential of the stratospheric ozone layer	[kg CFC11-Eq.]	6.85E-4	4.03E-15	5.14E-13	5.47E-16	8.96E-14	-3.70E-12
Acidification potential of land and water	[kg SO_2-Eq.]	2.91E-2	7.87E-4	2.59E-4	9.92E-5	1.67E-3	-1.25E-2
Eutrophication potential	[kg $(PO_4)^{3-}$-Eq.]	2.21E-3	2.00E-4	9.05E-5	2.51E-5	3.25E-4	-8.59E-4
Formation potential of tropospheric ozone photochemical oxidants	[kg ethene-Eq.]	3.69E-3	-3.01E-4	1.94E-5	-3.73E-5	9.75E-5	-7.14E-4
Abiotic depletion potential for non-fossil resources	[kg Sb-Eq.]	1.04E-5	1.99E-8	2.55E-7	2.70E-9	3.57E-7	-1.59E-6
Abiotic depletion potential for fossil resources	[MJ]	1.59E+2	2.57E+0	2.83E+0	3.49E-1	1.71E+0	-4.01E+1

RESULTS OF THE LCA - RESOURCE USE: 1 m² Wakaflex

Parameter	Unit	A1	A2	A3	C2	C3	D
Renewable primary energy as energy carrier	[MJ]	3.02E+1	1.73E-1	2.05E+0	2.36E-2	3.78E-1	-1.67E+1
Renewable primary energy resources as material utilization	[MJ]	1.74E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
Total use of renewable primary energy resources	[MJ]	3.19E+1	1.73E-1	2.05E+0	2.36E-2	3.78E-1	-1.67E+1
Non-renewable primary energy as energy carrier	[MJ]	1.14E+2	2.58E+0	4.01E+0	3.50E-1	-5.43E+1	-4.69E+1
Non-renewable primary energy as material utilization	[MJ]	5.68E+1	0.00E+0	0.00E+0	0.00E+0	5.62E+1	0.00E+0
Total use of non-renewable primary energy resources	[MJ]	1.71E+2	2.58E+0	4.01E+0	3.50E-1	1.91E+0	-4.69E+1
Use of secondary material	[kg]	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
Use of renewable secondary fuels	[MJ]	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
Use of non-renewable secondary fuels	[MJ]	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
Use of net fresh water	[m³]	7.54E-2	2.01E-4	7.39E-4	2.73E-5	0.00E+0	-3.66E-2

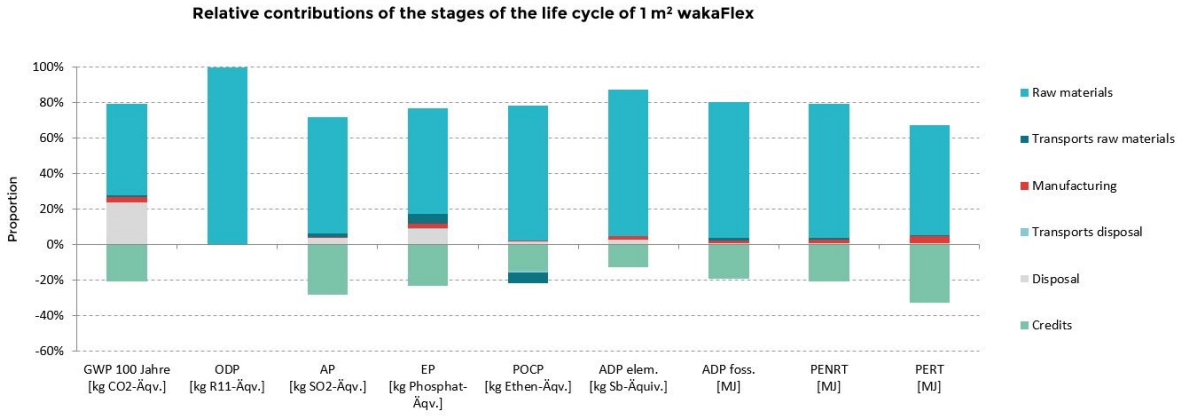
RESULTS OF THE LCA – OUTPUT FLOWS AND WASTE CATEGORIES: 1 m² Wakaflex

Parameter	Unit	A1	A2	A3	C2	C3	D
Hazardous waste disposed	[kg]	3.91E-3	1.65E-7	4.36E-9	2.24E-8	9.18E-9	-3.25E-8
Non-hazardous waste disposed	[kg]	1.24E+1	1.39E-2	2.44E+0	1.89E-3	6.44E-1	-6.41E+0
Radioactive waste disposed	[kg]	4.66E-3	3.11E-6	4.68E-4	4.22E-7	7.85E-5	-2.68E-3
Components for re-use	[kg]	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
Materials for recycling	[kg]	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	2.98E-1
Materials for energy recovery	[kg]	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
Exported electrical energy	[MJ]	0.00E+0	0.00E+0	0.00E+0	0.00E+0	3.64E+0	0.00E+0
Exported thermal energy	[MJ]	0.00E+0	0.00E+0	0.00E+0	0.00E+0	8.45E+0	0.00E+0

*Module not declared

6. LCA: Interpretation

The following figure shows the relative contributions of different Life Cycle processes and the primary energy demand in the form of a dominance analysis.



Indicators of the impact assessment

The impact categories of the Wakaflex production are significantly determined by the manufacturing process (A1: raw material supply) and the thermal utilization at the end of the product life.

Global warming potential (GWP)
The Global Warming Potential is determined by the supply of raw materials, i. e. by the production of the preliminary products and the thermal utilization. In the production phase (A1-A3) of Wakaflex the raw material supply contributes with 93 % to the GWP-value. The provision of the Aluminium-mesh accounts for the largest share of the GWP, followed by the polymer polyisobutylene with 28 % GWP content. At the thermal utilization in the end of the product life high levels of greenhouse gas emissions are released, compared to other phases of the product life.

Depletion potential of the stratospheric ozone layer (ODP)
The ozone depletion factor is almost completely determined by the supply of raw materials. The main driver is the production of polymer polyisobutylene (PIB), which determines the ODP-value by more than 99 %.

Acidification potential of land and water (AP)
The AP factor is dominated by the supply of raw materials with 97 %, within which the greatest contribution of 60 % is due to the provision of Aluminium-mesh, followed by PIB, stabilizers and colorants. Stabilizers and colorants reduce oxidative processes and thus increase the aging and weathering resistance of the product. For the substitution of primary aluminium credits up to 40 % at the end of life can be granted due to the acidification potential caused by the production.

Eutrophication potential (EP)
The EP factor is determined at 88 % by the supply of raw materials, almost half of which is accounted to the aluminium-mesh. Additives such as colorants and pigments have a disproportionately large influence within the production process, despite a marginal mass fraction. Main driver within this is titanium dioxide (10 %), which is used in the product as a colorant and stabilizer.

Potential of tropospheric ozone photochemical oxidants (POCP)
The POCP-value is determined by the current input of electricity and the raw material supply. The transport of the material need for production purpose has a marginal share of the POCP-value.

Abiotic depletion potential for non-fossil resources (ADPE)
The ADPE-value of 57 % is mainly due to the use of inorganic colorants and other metal oxides in the production, followed by aluminium-mesh with 22 %.

Abiotic depletion potential for fossil resources (ADPF)
the ADPF factor is determined by the use of polymeric precursors PIB (50 %) and the fossil fuels required for the production of aluminium (26 %).

Total use of non-renewable primary energy resources (PENRT)
For the use of primary energy from non-renewable resources, the bulk of energy needs arises from the production of raw materials (A1). The proportion is due to the use of fossil organic raw materials for plastic and aluminium production. The primary energy bound in the products can be partly thermally recycled at the end of life of the product.

Total use of renewable primary energy resources (PERT)
Compared to the input of non-renewable resources, the share of renewable resources is low (ca. 16 %). Overall, the highest rate of renewable primary energy resources is in the production of precursors and upstream supply chain. For the generated electric and thermal energy during thermal utilization, energy credits can be granted.

7. Requisite evidence

No further evidence is required.

8. References

/DIN 4102-2/
DIN 4102:1977-09: Fire Behaviour of Building Materials and Building Components; Building Components; Definitions, Requirements and Tests.

/DIN 1187/
DIN CEN/TS 1187:2012-03: Test methods for external fire exposure to roofs.

/DIN 53357/
DIN 53357:1982-10: Testing of plastics sheets; adhesion test.

/ISO 62/
DIN EN ISO 62:2008-05: Plastics - Determination of water absorption (ISO 62:2008).

/ISO 34-1/
DIN ISO 34-1:2016-09: Rubber, vulcanized or thermoplastic - Determination of tear strength - Part 1: Trouser, angle and crescent test pieces (ISO 34-1:2015).

/ISO 527/
DIN EN ISO 527-1:2012-06: Plastics - Determination of tensile properties - Part 1: General principles (ISO 527-1:2012).

/ISO 811/
DIN EN ISO 811:2018-08:Textiles - Determination of resistance to water penetration - Hydrostatic pressure test (ISO 811:2018).

/EN 1548/
DIN EN 1548:2007-11: Flexible sheets for waterproofing - Plastic and rubber sheets for roof waterproofing - Method for exposure to bitumen.

/EN 1107-2/
DIN EN 1107-2:2001-04: Flexible sheets for waterproofing - Determination of dimensional stability - Part 2: Plastic and rubber sheets for roof waterproofing.

/EN 13948/
DIN EN 13948:2008-01Flexible sheets for waterproofing - Bitumen, plastic and rubber sheets for roof waterproofing - Determination of resistance to root penetration.

/EN 1844/
DIN EN 1844:2013-08: Flexible sheets for waterproofing - Determination of resistance to ozone - Plastic and rubber sheets for roof waterproofing.

/EN 495-5/
DIN EN 495-5:2013-08: Flexible sheets for waterproofing - Determination of foldability at low temperature - Part 5: Plastic and rubber sheets for roof waterproofing.

/EN 12691/
DIN EN 12691:2018-05: Flexible sheets for waterproofing - Bitumen, plastic and rubber sheets for roof waterproofing - Determination of resistance to impact.

/EN 12317-2/
DIN EN 12317-2:2010-12: Flexible sheets for waterproofing - Determination of shear resistance of joints - Part 2: Plastic and rubber sheets for roof waterproofing.

/EN 1297/
DIN EN 1297: 2004-12: Flexible sheets for waterproofing - Bitumen, plastic and rubber sheets for roof waterproofing - Method of artificial ageing by long term exposure to the combination of UV radiation, elevated temperature and water.

/EN 12310/
DIN EN 12310-2:2000-12: Flexible sheets for waterproofing - Determination of resistance to tearing - Part 2: Plastic and rubber sheets for roof waterproofing..

/EN 13501/
DIN EN 13501-1:2010-01: Fire classification of construction products and building elements - Part 1: Classification using data from reaction to fire tests.

/EN 13956/
DIN EN 13956:2013-03: Flexible sheets for waterproofing - Plastic and rubber sheets for roof waterproofing - Definitions and characteristics.

/EN 1928/
DIN EN 1928:2000-07: Flexible sheets for waterproofing - Bitumen, plastic and rubber sheets for roof waterproofing - Determination of watertightness.

/ISO 11925/
DIN EN ISO 11925-2:2011-02: Reaction to fire tests - Ignitability of products subjected to direct impingement of flame - Part 2: Single-flame source test (ISO 11925-2:2010).

/ISO 15686/
ISO 15686-5:2017-07: Buildings and constructed assets - Service life planning - Part 5: Life-cycle costing.

/ISO 9001/
DIN EN ISO 9001:2015-11: Quality management systems - Requirements (ISO 9001:2015).

/CML 2001/
Centrum voor Milieukunde der Universität Leiden, Institute of Environmental Sciences, Leiden University, The Netherlands: "Life Cycle Assessment. An operational guide to the ISO standards, Volume 1, 2 and 3", 2001.

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

Tel +49 (0)30 3087748- 0
Fax +49 (0)30 3087748- 29
Mail info@ibu-epd.com
Web **www.ibu-epd.com**

Programme holder
Institut Bauen und Umwelt e.V.
Panoramastr 1
10178 Berlin
Germany

Tel +49 (0)30 - 3087748- 0
Fax +49 (0)30 – 3087748 - 29
Mail info@ibu-epd.com
Web **www.ibu-epd.com**

Author of the Life Cycle Assessment
SUSTAINUM Berlin eG
Kreuzbergstr. 37/38
10965 Berlin
Germany

Tel 017681050082
Fax 03023457497
Mail i.brehm@sustainum.de
Web **www.sustainum.de**

Owner of the Declaration
Monier Roofing Components GmbH
Frankfurter Landstraße 2-4
61440 Oberursel
Germany

Tel +49 (0)6171 61-014
Fax +49 (0)6171 61-2300
Mail info.group@bmigroup.com
Web **www.bmigroup.com**