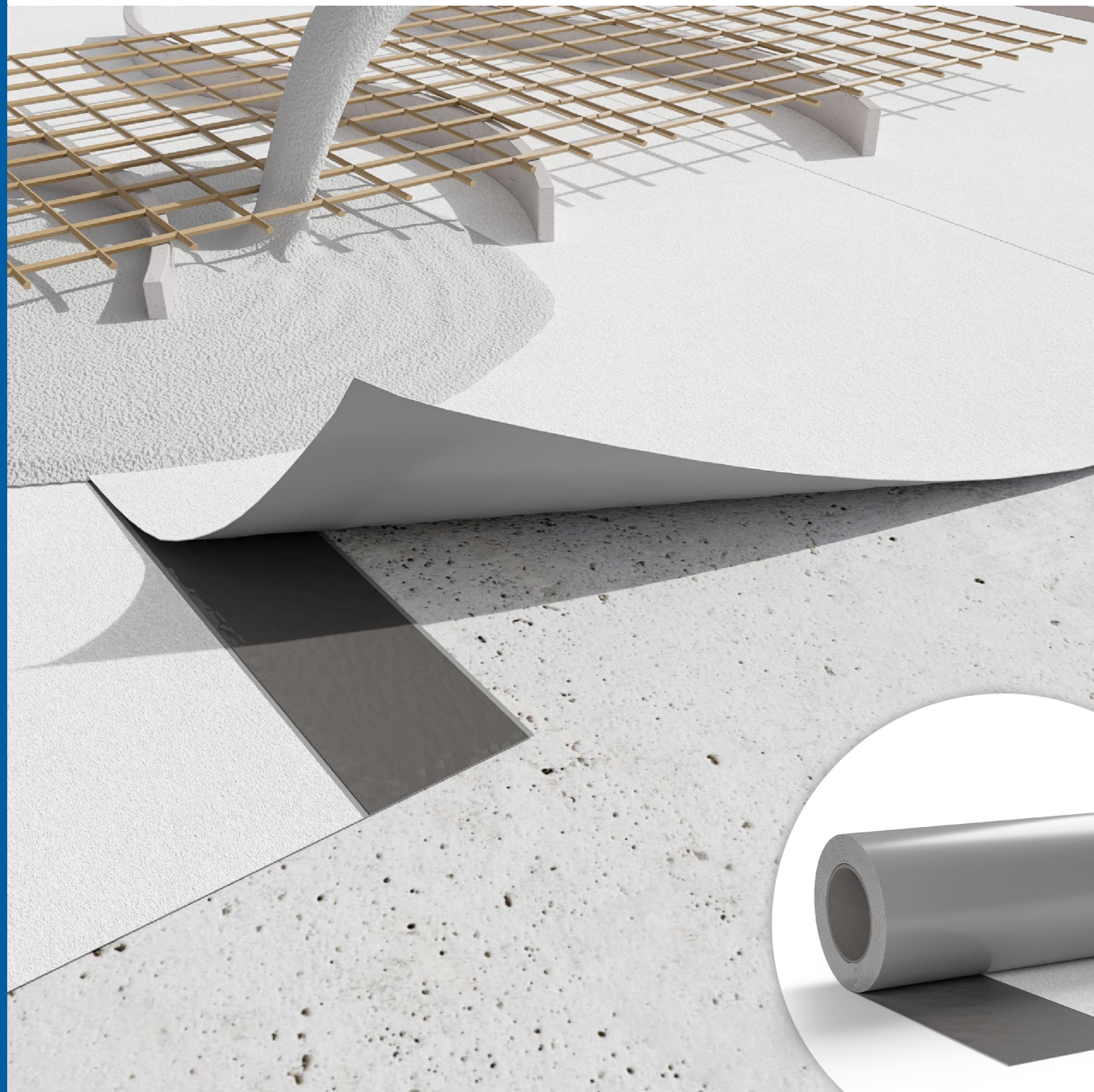
Environmental Product Declaration (EPD)
According to ISO 14025 and EN 15804

Doubleflex White Fully Bonded Sheet Membrane



Registration number:	EPD-Kiwa-EE-182630-EN
Issue date:	25-02-2025
Valid until:	25-02-2030
Declaration owner:	Gebrüder Jaeger GmbH
Publisher:	Kiwa-Ecobility Experts
Programme operator:	Kiwa-Ecobility Experts
Status:	verified

1 General information

1.1 PRODUCT

Doubleflex White Fully Bonded Sheet Membrane

1.2 REGISTRATION NUMBER

EPD-Kiwa-EE-182630-EN

1.3 VALIDITY

Issue date: 25-02-2025

Valid until: 25-02-2030

1.4 PROGRAMME OPERATOR

Kiwa-Ecobility Experts
Wattstraße 11-13
13355 Berlin
DE

Raoul Mancke

(Head of programme operations, Kiwa-Ecobility Experts)

Dr. Ronny Stadie

(Verification body, Kiwa-Ecobility Experts)

1.5 OWNER OF THE DECLARATION

Manufacturer: Gebrüder Jaeger GmbH

Address: Otto-Hahn-Straße 7, 42369 Wuppertal, Germany

E-mail: entwicklungjde@jaeger-ttc.com

Website: https://jaeger-ttc.com/

Production location: Gebrüder Jaeger GmbH

Address production location: Otto-Hahn-Straße 7, 42369 Wuppertal, Germany

1.6 VERIFICATION OF THE DECLARATION

The independent verification is in accordance with the ISO 14025:2011. The LCA is in compliance with ISO 14040:2006 and ISO 14044:2006. The EN 15804:2012+A2:2019 serves as the core PCR.

☐ Internal ☒ External

Kripanshi Gupta, Kiwa GmbH

1.7 STATEMENTS

The owner of this EPD shall be liable for the underlying information and evidence. The programme operator Kiwa-Ecobility Experts shall not be liable with respect to manufacturer data, life cycle assessment data and evidence.

1.8 PRODUCT CATEGORY RULES

Kiwa-Ecobility Experts (Kiwa-EE) – General Product Category Rules (2022-02-14)

Institut Bauen und Umwelt e.V. (IBU) - PCR Teil B: Anforderungen an die EPD für Dach- und Dichtungsbahnsysteme aus Kunststoffen und Elastomeren (en.: EPD requirements for roofing and waterproofing membrane systems made of plastics and elastomers) (v4, 2023-10-19)

1.9 COMPARABILITY

In principle, a comparison or assessment of the environmental impacts of different products is only possible if they have been prepared in accordance with EN 15804+A2. For the evaluation of the comparability, the following aspects have to be considered in particular: PCR used, functional or declared unit, geographical reference, the definition of

1 General information

the system boundary, declared modules, data selection (primary or secondary data, background database, data quality), scenarios used for use and disposal phases, and the life cycle inventory (data collection, calculation methods, allocations, validity period). PCRs and general program instructions of different EPD program operators may differ. Comparability needs to be evaluated. For further guidance, see EN 15804+A2 (5.3 Comparability of EPD for construction products) and ISO 14025 (6.7.2 Requirements for comparability).

1.10 CALCULATION BASIS

LCA method R<THINK: Ecobility Experts | EN15804+A2

LCA software*: Simapro 9.1

Characterization method: EN 15804 +A2 Method v1.0

LCA database profiles: EcoInvent version 3.6

Version database: v3.17 (2024-05-22)

** Simapro is used for calculating the characterized results of the Environmental profiles within R<THINK.*

1.11 LCA BACKGROUND REPORT

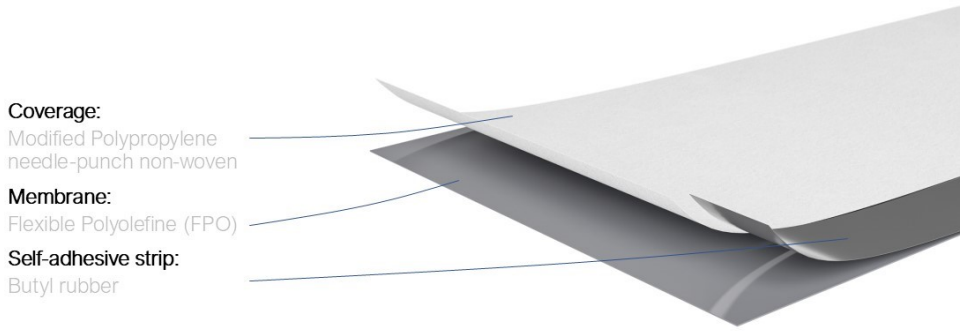
This EPD is generated on the basis of the LCA background report 'Doubleflex White Fully Bonded Sheet Membrane' with the calculation identifier ReTHiNK-82630.

2 Product

2.1 PRODUCT DESCRIPTION

Doubleflex White Fully Bonded Sheet Membrane is a self-sealing membrane. It is made of a flexible polyolefine sealing layer covered on one-side with a polypropylene non-woven and a self-adhesive stripe on the side out of butyl rubber which is in turn covered by a release foil.

Raw material	Unit	Value
Modified polypropylene (PP) non-woven	%	2,5 - 6,5
Flexible polyolefine (FPO/LDPE) sealing layer	%	87,5-93,5
Butyl rubber	%	2 - 6
Siliconized polypropylene (PP) release foil	%	0,5 - 3,5
Printing Ink and solvent	%	< 0,5



2.2 APPLICATION (INTENDED USE OF THE PRODUCT)

Doubleflex White Fully Bonded Sheet Membrane is used for damp-protection, waterproofing and concrete protection for basements and other below ground concrete structures against ground water.

2.3 REFERENCE SERVICE LIFE

RSL PRODUCT

The Doubleflex White Fully Bonded Sheet Membrane has a RSL of 50 years derived by the RSL of the flexible polyolefine sealing material which has a RSL of 50 years confirmed by an external material test. The flexible polyolefine material guarantees the waterproofing property of the product while the non-woven is only necessary for the installation.

USED RSL (YR) IN THIS LCA CALCULATION:

50

2.4 TECHNICAL DATA

Doubleflex White Fully Bonded Sheet Membrane contains a FPO sealing layer, a PP non-woven, a butyl rubber stripe, printing ink and solvent.

Essential characteristics		Unit	Performance
Resistance to temperature: min./max.		°C	- 30 °C / + 60 °C
Application temperature:		°C	+5°C / + 35°C
Physical Properties:	**DIN**		**Value**
Total width:	Internal	mm	1000 (+/- 5)*
Thickness:	Internal	mm	1,7 (+/- 0,2)
Thickness (Waterproofing membrane)	DIN EN 1849-2	mm	1,2 (+/- 25)
Total weight (without butyl)	Internal	g/m²	1400 (± 100 g)

2 Product

Length per roll:	Internal	m	15**
Breaking load longitudinal	DIN EN 12311-2 (Method A)	N/50mm	590 (≥ 400)
Breaking load lateral	DIN EN 12311-2 (Method A)	N/50mm	420 (≥ 250)
Extension break longitudinal	DIN EN 12311-2 (Method A)	%	40 (≥ 25)
Extension break lateral	DIN EN 12311-2 (Method A)	%	40 (≥ 25)
Resistance to tearing (nail shank)-longitudinal	DIN EN 12310-1	N	565 (≥ 400)
Resistance to tearing lateral	DIN EN 12310-2	N	525 (≥ 380)
Water vapour permeability-sd value	DIN EN 1931 Method B	m	120 (≥ 80)
Water tightness	DIN EN 1928-A-60 kPa/24 Std. DIN EN 1928-B-400 kPa/72 Std.		watertight watertight
Water migration test (non-woven area)	External		tight
Reaction to fire	DIN ISO 11925-2 EN 13501-1		Class E
Resistance to impact	DIN EN 12691	A: Alu plate	≥ 300 mm
Shear resistance of the joint seams	DIN EN 12317-2		≥ 200 N/50 mm

Resistance to static loads	DIN EN 12730 Method A: EPS panel Method B: Substrate concrete		≥ 20 kg ≥ 20 kg
Radon barrier	Following DIN ISO 11665-13 Radon diffusion coefficient Radon diffusion length	D = 2,92 E-13m2s-1 L = 0,37 mm The material can be described as radonproof.	2,52E-13-3,43 E-13m2s-1 0,35-0,40
UV Resistance	Outside storing – direct sunlight	max. 4 weeks	

* Additional widths upon request
** Additional make ups upon request

2.5 SUBSTANCES OF VERY HIGH CONCERN

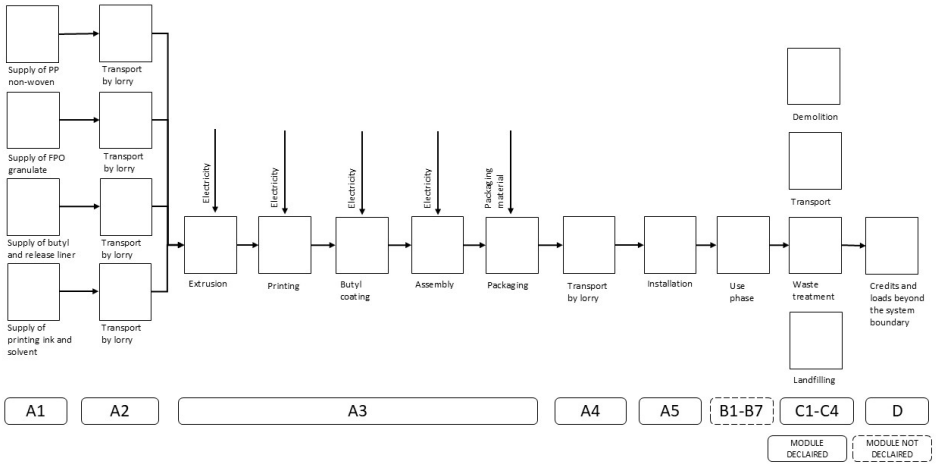
Substances from the “Candidate list of substances of very high concern for authorisation” (SVHC) in the product are lower than 0.1% according to REACH.

2.6 DESCRIPTION PRODUCTION PROCESS

The manufacturing is located at Gebrüder Jaeger GmbH, Otto-Hahn-Str. 7, 42369 Wuppertal, Germany. The flexible polyolefine (FPO) granulate is extruded as a sealing layer and laminated on one side with the polypropylene (PP) non-woven while leaving an uncovered space on one edge. The non-woven is already supplied and delivered as a finished product. After extrusion and lamination, the surface of the non-woven is printed.

2 Product

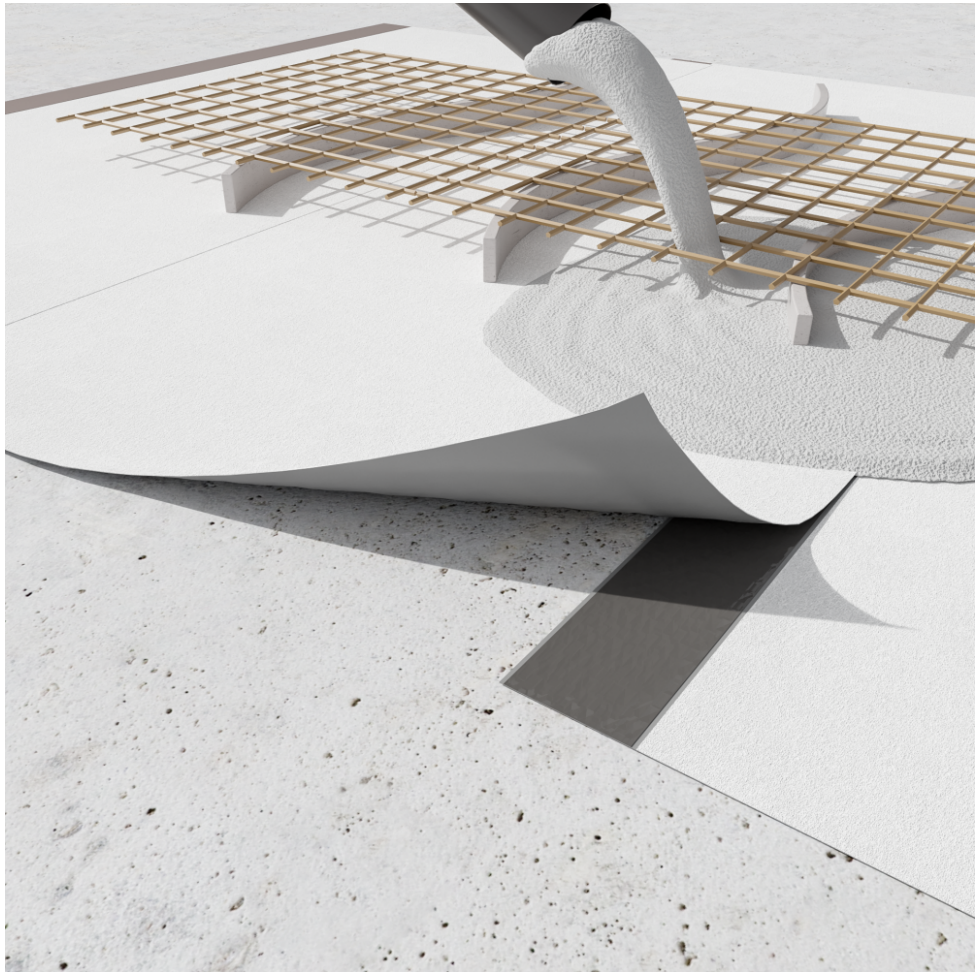
Subsequently, a butyl stripe is coated on the uncovered space next to the non-woven directly on the sealing layer. Finally, the membrane is cutted and winded, the rolls are stacked on reusable pallets and packed in foil.



2.7 CONSTRUCTION DESCRIPTION

The installation of the Doubleflex White Fully Bonded Sheet Membrane is usually conducted manually. A reject or unused portion of 5% of the waterproofing membrane is assumed during the installation process (Module A5).

Doubleflex White Fully Bonded Sheet Membrane is a pre-installed fresh concrete composite membrane for areas in contact with the ground for pressing and non-pressing water. Fully bonded waterproofing is achieved by a mechanical bond between the concrete and the membrane through the interlocking of the non-woven. The concrete is casted immediately after laying the membrane by means of adhesive overlapping and the subsequent laying of the reinforcement. As the concrete hardens, a mechanical interlock is created which prevents lateral migration.



3 Calculation rules

3.1 DECLARED UNIT

1 m²

Declared unit: 1 square meter of Doubleflex White Fully Bonded Sheet Membrane.

Reference unit: square meter (m2)

3.2 CONVERSION FACTORS

Description	Value	Unit
Reference unit	1	m2
Weight per reference unit	1.404	kg
Conversion factor to 1 kg	0.712327	m2

3.3 SCOPE OF DECLARATION AND SYSTEM BOUNDARIES

This is a Cradle to gate with options, modules C1-C4 and module D EPD. The life cycle stages included are as shown below:

(X = module included, ND = module not declared)

A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
X	X	X	X	X	ND	ND	ND	ND	ND	ND	ND	X	X	X	X	X

The modules of the EN15804 contain the following:

Module A1 = Raw material supply	Module B5 = Refurbishment
Module A2 = Transport	Module B6 = Operational energy use
Module A3 = Manufacturing	Module B7 = Operational water use
Module A4 = Transport	Module C1 = De-construction / Demolition
Module A5 = Construction - Installation process	Module C2 = Transport
Module B1 = Use	Module C3 = Waste Processing
Module B2 = Maintenance	Module C4 = Disposal
Module B3 = Repair	Module D = Benefits and loads beyond the product system boundaries
Module B4 = Replacement	

3.4 REPRESENTATIVENESS

This EPD is representative for Doubleflex White Fully Bonded Sheet Membrane, a product of Gebrüder Jaeger GmbH. The results of this EPD are representative for Germany.

3.5 CUT-OFF CRITERIA

Production Stage (Modules A1-A3)

All input flows (e.g. raw materials, transportation, energy use, packaging, etc.) and output flows (e.g. production waste) are considered in this LCA. The total neglected input flows do therefore not exceed the limit of 5% of energy use and mass.

3 Calculation rules

The following processes are excluded:
Manufacturing of equipment used in production, buildings or any other capital asset
Transportation of personnel to the plant
The transportation of personnel within the plant
Research and development activities
Long-term emissions

Construction Stage (Modules A4-A5)

All input flows (e.g. transportation to the construction site, additional raw material use for construction, installation energy (use)of energy use for assembly , etc.) and output flows (e.g. construction waste, packaging waste, etc.) are considered in this LCA. The total neglected input flows do therefore not exceed the limit of 5% of energy use and mass.

Product end-of-life Stage (Modules C1-C4)

All input flows (e.g. energy use for demolition or disassembly, transport to waste processing, etc.) and output flows (e.g. end-of-life waste processing of the product, etc.) are considered in this LCA. The total neglected input flows do therefore not exceed the limit of 5% of energy use and mass.

Benefits and Loads beyond the Product System Boundaries (Module D)

All benefits and loads beyond the system boundary resulting from reusable products, recyclable materials and/or useful energy carriers leaving the product system are considered in this LCA.

3.6 ALLOCATION

Allocations were avoided as far as possible. There are no coproducts or byproducts in the manufacturing of the waterproofing membranes Doubleflex White Fully Bonded Sheet Membrane. Based on energy consumption measurements, the energy requirements of production were allocated to the individual products. Recyclable production waste (PP and PE) is collected and sold to third party.

3.7 DATA COLLECTION & REFERENCE PERIOD

The data for this life cycle assessment was collected in June to November 2024.

3.8 ESTIMATES AND ASSUMPTIONS

All datasets chosen for the LCA refer to the EU as the geographic reference. Transport distances for all raw materials used (raw materials, operating materials, packaging) could be recorded. A payload factor of 50 percent was used for all truck transports (suppliers, disposal transports and internal transports), which corresponds to a full delivery and empty return trip. An EcoInvent data set for a non-specific truck was used for phase A2. For the end-of-life waste scenario 100% landfilling has been assumed. The end-of-life waste scenario per input material has been chosen and for each raw material 100% landfilling has been modeled. No CO2 certificates were considered.

The scenarios included are currently in use and are representative for one of the most likely scenario alternatives.

3.9 DATA QUALITY

For all processes primary data was collected and provided by Gebrüder Jaeger GmbH. The primary data refers to years 2023-2024. For the data, which is not influenced by the manufacturer, generic data was used. The secondary data was taken from the database EcoInvent (version 3.6). The database is maintained on a regular basis and thus meets the requirements of EN 15804 (background data not older than 10 years). The power sources were chosen from data for Germany in 2022, in accordance with the geographical and time representativeness. The data quality is very good, because all process specific data could be documented and modelled by using the generic data.

RETHiNK EPD web application from the company NIBE was used to model the life cycle for the production and disposal of the declared product systems. To ensure that the results are comparable, consistent background data from the international database EcoInvent was used in the LCA (e.g. data rec-ords on energy, transport, auxiliary materials, and supplies). Almost all consistent data sets contained in the EcoInvent database are documented and can be viewed online.

3.10 POWER MIX

The 'market-based approach' was taken into account for this life cycle assessment for the stated production location. The GWP impact of the electricity mix is approximately 0.079

3 Calculation rules

kgCo2e/kWh. The electricity mix is based on the energy supplier mix (contractual instrument proven).

4 Scenarios and additional technical information

4.1 TRANSPORT TO CONSTRUCTION SITE (A4)

For the transport from production place to assembly/user, the following scenario is assumed for module A4 of this EPD.

	Value and unit
Vehicle type used for transport	1 km Transport, freight, lorry, unspecified {GLO}| market group for transport Cut-off, U + Transport, freight, sea, bulk carrier for dry goods {GLO}| market for transport | Cut-off, U
Fuel type and consumption of vehicle	
Distance	1098 km
Capacity utilisation (including empty returns)	
Bulk density of transported products	
Volume capacity utilisation factor	

4.2 ASSEMBLY (A5)

The following information describes the scenarios for flows entering the system and flows leaving the system at module A5.

FLOWS ENTERING THE SYSTEM

There are no significant environment impacts as a result of materials or energy used in the construction stage (A5).

FLOWS LEAVING THE SYSTEM

The following output flows leaving the system at module A5 are assumed.

Description	Value	Unit
Output materials as result of loss during construction	5	%
Output materials as result of waste processing of materials used for installation/assembly at the building site	0.000	kg
Output materials as result of waste processing of used packaging	0.169	kg

4.3 DE-CONSTRUCTION, DEMOLITION (C1)

No inputs are needed for the product at the de-construction / demolition phase

4 Scenarios and additional technical information

4.4 TRANSPORT END-OF-LIFE (C2)

The following distances and transport conveyance are assumed for transportation during end of life for the different types of waste processing.

Waste Scenario	Transport conveyance	Not removed (stays in work) [km]	Landfill [km]	Incineration [km]	Recycling [km]	Re-use [km]
Gebrüder Jaeger Landfill PP	Lorry (Truck), unspecified (default) | market group for (GLO)	0	100	150	50	0
Gebrüder Jaeger Landfill FPO	Lorry (Truck), unspecified (default) | market group for (GLO)	0	100	150	50	0
Gebrüder Jaeger Landfill Paint and Diluent	Lorry (Truck), unspecified (default) | market group for (GLO)	0	100	150	50	0
Gebrüder Jaeger Landfill Butyl	Lorry (Truck), unspecified (default) | market group for (GLO)	0	100	150	50	0
Gebrüder Jaeger LDPE/PP foil	Lorry (Truck), unspecified (default) | market group for (GLO)	0	100	150	50	0

The transport conveyance(s) used in the scenario(s) for transport during end of life has the following characteristics.

	Value and unit
Vehicle type used for transport	Lorry (Truck), unspecified (default) | market group for (GLO)
Fuel type and consumption of vehicle	not available
Capacity utilisation (including empty returns)	50 % (loaded up and return empty)
Bulk density of transported products	inapplicable
Volume capacity utilisation factor	1

4.5 END OF LIFE (C3, C4)

The scenario(s) assumed for end of life of the product are given in the following tables. First the assumed percentages per type of waste processing are displayed, followed by the assumed amounts.

4 Scenarios and additional technical information

Waste Scenario	Region	Not removed (stays in work) [%]	Landfill [%]	Incineration [%]	Recycling [%]	Re-use [%]
Gebrüder Jaeger Landfill PP	DE	0	100	0	0	0
Gebrüder Jaeger Landfill FPO	DE	0	100	0	0	0
Gebrüder Jaeger Landfill Paint and Diluent	DE	0	100	0	0	0
Gebrüder Jaeger Landfill Butyl	DE	0	100	0	0	0
Gebrüder Jaeger LDPE/PP foil	DE	0	10	85	5	0

Waste Scenario	Not removed (stays in work) [kg]	Landfill [kg]	Incineration [kg]	Recycling [kg]	Re-use [kg]
Gebrüder Jaeger LDPE/PP foil	0.000	0.001	0.009	0.001	0.000
Gebrüder Jaeger Landfill PP	0.000	0.063	0.000	0.000	0.000
Gebrüder Jaeger Landfill FPO	0.000	1.270	0.000	0.000	0.000
Gebrüder Jaeger Landfill Paint and Diluent	0.000	0.003	0.000	0.000	0.000
Gebrüder Jaeger Landfill Butyl	0.000	0.058	0.000	0.000	0.000
Total	**0.000**	**1.395**	**0.009**	**0.001**	**0.000**

4.6 BENEFITS AND LOADS BEYOND THE SYSTEM BOUNDARY (D)

The presented Benefits and loads beyond the system boundary in this EPD are based on the following calculated Net output flows in kilograms and Energy recovery displayed in MJ Lower Heating Value.

Waste Scenario	Net output flow [kg]	Energy recovery [MJ]
Gebrüder Jaeger Landfill PP	0.000	0.000
Gebrüder Jaeger Landfill FPO	0.000	0.000
Gebrüder Jaeger Landfill Paint and Diluent	0.000	0.000
Gebrüder Jaeger Landfill Butyl	0.000	0.000
Gebrüder Jaeger LDPE/PP foil	0.001	0.288
Total	**0.001**	**0.288**

5 Results

For the impact assessment, the characterization factors of the LCIA method EN 15804 +A2 Method v1.0 are used. Long-term emissions (>100 years) are not considered in the impact assessment. The results of the impact assessment are only relative statements that do not make any statements about end-points of the impact categories, exceedance of threshold values, safety margins or risks. The following tables show the results of the indicators of the impact assessment, of the use of resources as well as of waste and other output flows.

5.1 ENVIRONMENTAL IMPACT INDICATORS PER SQUARE METER

CORE ENVIRONMENTAL IMPACT INDICATORS EN15804+A2

Abbr.	Unit	A1	A2	A3	A1-A3	A4	A5	C1	C2	C3	C4	D
GWP-total	kg CO_2 eq.	2.97E+0	3.38E-2	2.56E-1	3.26E+0	9.93E-3	4.92E-1	0.00E+0	1.90E-2	2.36E-2	2.06E-1	-4.53E-2
GWP-f	kg CO_2 eq.	2.96E+0	3.38E-2	5.15E-1	3.50E+0	9.92E-3	2.21E-1	0.00E+0	1.90E-2	2.36E-2	2.05E-1	-4.44E-2
GWP-b	kg CO_2 eq.	1.71E-2	1.56E-5	-2.61E-1	-2.44E-1	4.50E-6	2.71E-1	0.00E+0	8.77E-6	3.58E-6	1.59E-4	-8.02E-4
GWP-luluc	kg CO_2 eq.	1.54E-3	1.24E-5	2.12E-3	3.68E-3	3.68E-6	1.89E-4	0.00E+0	6.96E-6	1.89E-6	7.30E-6	-1.14E-4
ODP	kg CFC 11 eq.	1.05E-7	7.45E-9	1.81E-8	1.30E-7	2.19E-9	9.90E-9	0.00E+0	4.19E-9	7.19E-10	4.57E-9	-5.80E-9
AP	mol H+ eq.	1.15E-2	1.96E-4	2.67E-3	1.44E-2	5.96E-5	8.18E-4	0.00E+0	1.10E-4	1.05E-5	1.29E-4	-2.63E-4
EP-fw	kg P eq.	8.04E-5	3.40E-7	3.39E-5	1.15E-4	9.96E-8	5.96E-6	0.00E+0	1.92E-7	7.05E-8	2.65E-7	-2.36E-6
EP-m	kg N eq.	1.93E-3	6.90E-5	5.98E-4	2.60E-3	2.07E-5	1.69E-4	0.00E+0	3.88E-5	2.88E-6	7.78E-5	-7.31E-5
EP-T	mol N eq.	2.15E-2	7.60E-4	7.17E-3	2.94E-2	2.28E-4	1.88E-3	0.00E+0	4.28E-4	3.20E-5	4.74E-4	-1.14E-3
POCP	kg NMVOC eq.	1.25E-2	2.17E-4	2.11E-3	1.49E-2	6.49E-5	8.65E-4	0.00E+0	1.22E-4	8.60E-6	1.81E-4	-2.26E-4
ADP-mm	kg Sb-eq.	8.59E-5	8.55E-7	1.52E-5	1.02E-4	2.50E-7	5.36E-6	0.00E+0	4.81E-7	2.98E-8	1.58E-7	-1.75E-7
ADP-f	MJ	1.03E+2	5.09E-1	8.05E+0	1.12E+2	1.49E-1	5.88E+0	0.00E+0	2.87E-1	1.80E-2	3.50E-1	-7.26E-1

GWP-total=Global Warming Potential total (GWP-total) | **GWP-f**=Global Warming Potential fossil fuels (GWP-fossil) | **GWP-b**=Global Warming Potential biogenic (GWP-biogenic) | **GWP-luluc**=Global Warming Potential land use and land use change (GWP-luluc) | **ODP**=Depletion potential of the stratosperic ozon layer (ODP) | **AP**=Acidification potential, Accumulated Exceedance (AP) | **EP-fw**=Eutrophication potential, fraction of nutrients reaching freshwater end compartment (EP-freshwater) | **EP-m**=Eutrophication potential, fraction of nutrients reaching marine end compartment (EP-marine) | **EP-T**=Eutrophication potential, Accumulated Exceedance (EP-terrestrial) | **POCP**=Formation potential of tropospheric ozone (POCP) | **ADP-mm**=Abiotic depletion potential for non fossil resources (ADP minerals&metals) | **ADP-f**=Abiotic depletion for fossil resources potential (ADP fossil) | **WDP**=Water (user) deprication potential, deprivation-weighted water consumption (WDP)

5 Results

Abbr.	Unit	A1	A2	A3	A1-A3	A4	A5	C1	C2	C3	C4	D
WDP	m3 world eq.	3.27E+0	1.82E-3	3.68E-1	3.64E+0	5.33E-4	1.86E-1	0.00E+0	1.03E-3	1.20E-3	1.50E-2	-4.94E-3

GWP-total=Global Warming Potential total (GWP-total) | **GWP-f**=Global Warming Potential fossil fuels (GWP-fossil) | **GWP-b**=Global Warming Potential biogenic (GWP-biogenic) | **GWP-luluc**=Global Warming Potential land use and land use change (GWP-luluc) | **ODP**=Depletion potential of the stratosperic ozon layer (ODP) | **AP**=Acidification potential, Accumulated Exceedance (AP) | **EP-fw**=Eutrophication potential, fraction of nutrients reaching freshwater end compartment (EP-freshwater) | **EP-m**=Eutrophication potential, fraction of nutrients reaching marine end compartment (EP-marine) | **EP-T**=Eutrophication potential, Accumulated Exceedance (EP-terrestrial) | **POCP**=Formation potential of tropospheric ozone (POCP) | **ADP-mm**=Abiotic depletion potential for non fossil resources (ADP minerals&metals) | **ADP-f**=Abiotic depletion for fossil resources potential (ADP fossil) | **WDP**=Water (user) deprication potential, deprivation-weighted water consumption (WDP)

ADDITIONAL ENVIRONMENTAL IMPACT INDICATORS EN15804+A2

Abbr.	Unit	A1	A2	A3	A1-A3	A4	A5	C1	C2	C3	C4	D
PM	disease incidence	9.01E-8	3.04E-9	2.80E-8	1.21E-7	8.87E-10	7.27E-9	0.00E+0	1.71E-9	8.42E-11	2.43E-9	-3.08E-9
IR	kBq U235 eq.	1.21E-1	2.13E-3	1.98E-2	1.42E-1	6.26E-4	7.78E-3	0.00E+0	1.20E-3	7.41E-5	1.37E-3	-1.04E-3
ETP-fw	CTUe	2.03E+1	4.54E-1	1.47E+1	3.54E+1	1.33E-1	2.22E+0	0.00E+0	2.56E-1	2.96E-1	3.71E-1	-2.08E+0
HTP-c	CTUh	7.57E-10	1.47E-11	4.07E-10	1.18E-9	4.35E-12	9.90E-11	0.00E+0	8.29E-12	4.48E-12	9.78E-12	-2.73E-11
HTP-nc	CTUh	2.09E-8	4.97E-10	9.36E-9	3.08E-8	1.45E-10	1.87E-9	0.00E+0	2.80E-10	9.34E-11	2.42E-10	-9.46E-10
SQP	Pt	5.21E+0	4.41E-1	4.74E+1	5.30E+1	1.29E-1	2.78E+0	0.00E+0	2.49E-1	6.45E-3	8.27E-1	-1.15E+1

PM=Potential incidence of disease due to PM emissions (PM) | **IR**=Potential Human exposure efficiency relative to U235 (IRP) | **ETP-fw**=Potential Comparative Toxic Unit for ecosystems (ETP-fw) | **HTP-c**=Potential Comparative Toxic Unit for humans (HTP-c) | **HTP-nc**=Potential Comparative Toxic Unit for humans (HTP-nc) | **SQP**=Potential soil quality idex (SQP)

CLASSIFICATION OF DISCLAIMERS TO THE DECLARATION OF CORE AND ADDITIONAL ENVIRONMENTAL IMPACT INDICATORS

ILCD classification	Indicator	Disclaimer
ILCD type / level 1	Global warming potential (GWP)	None
	Depletion potential of the stratospheric ozone layer (ODP)	None
	Potential incidence of disease due to PM emissions (PM)	None

5 Results

ILCD classification	Indicator	Disclaimer
ILCD type / level 2	Acidification potential, Accumulated Exceedance (AP)	None
	Eutrophication potential, Fraction of nutrients reaching freshwater end compartment (EP-freshwater)	None
	Eutrophication potential, Fraction of nutrients reaching marine end compartment (EP-marine)	None
	Eutrophication potential, Accumulated Exceedance (EP-terrestrial)	None
	Formation potential of tropospheric ozone (POCP)	None
	Potential Human exposure efficiency relative to U235 (IRP)	1
ILCD type / level 3	Abiotic depletion potential for non-fossil resources (ADP-minerals&metals)	2
	Abiotic depletion potential for fossil resources (ADP-fossil)	2
	Water (user) deprivation potential, deprivation-weighted water consumption (WDP)	2
	Potential Comparative Toxic Unit for ecosystems (ETP-fw)	2
	Potential Comparative Toxic Unit for humans (HTP-c)	2
	Potential Comparative Toxic Unit for humans (HTP-nc)	2
	Potential Soil quality index (SQP)	2
Disclaimer 1 – This impact category deals mainly with the eventual impact of low dose ionizing radiation on human health of the nuclear fuel cycle. It does not consider effects due to possible nuclear accidents, occupational exposure nor due to radioactive waste disposal in underground facilities. Potential ionizing radiation from the soil, from radon and from some construction materials is also not measured by this indicator.		
Disclaimer 2 – The results of this environmental impact indicator shall be used with care as the uncertainties on these results are high or as there is limited experienced with the indicator.		

5 Results

5.2 INDICATORS DESCRIBING RESOURCE USE AND ENVIRONMENTAL INFORMATION BASED ON LIFE CYCLE INVENTORY (LCI)

PARAMETERS DESCRIBING RESOURCE USE

Abbr.	Unit	A1	A2	A3	A1-A3	A4	A5	C1	C2	C3	C4	D
PERE	MJ	2.69E+0	6.37E-3	9.95E+0	1.26E+1	1.87E-3	6.38E-1	0.00E+0	3.59E-3	1.84E-3	6.19E-3	-2.27E+0
PERM	MJ	0.00E+0	0.00E+0	2.38E+0	2.38E+0	0.00E+0	1.19E-1	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
PERT	MJ	2.69E+0	6.37E-3	1.23E+1	1.50E+1	1.87E-3	7.57E-1	0.00E+0	3.59E-3	1.84E-3	6.19E-3	-2.27E+0
PENRE	MJ	5.25E+1	5.40E-1	4.40E+0	5.74E+1	1.59E-1	3.17E+0	0.00E+0	3.04E-1	1.91E-2	3.72E-1	-7.41E-1
PENRM	MJ	5.79E+1	0.00E+0	4.12E+0	6.20E+1	0.00E+0	3.12E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	-5.17E-2
PENRT	MJ	1.10E+2	5.40E-1	8.52E+0	1.19E+2	1.59E-1	6.29E+0	0.00E+0	3.04E-1	1.91E-2	3.72E-1	-7.92E-1
SM	Kg	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
RSF	MJ	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
NRSF	MJ	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
FW	m^3	4.83E-2	6.20E-5	8.67E-3	5.71E-2	1.81E-5	2.99E-3	0.00E+0	3.49E-5	3.52E-5	3.65E-4	-1.36E-4

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**=Net use of fresh water

OTHER ENVIRONMENTAL INFORMATION DESCRIBING WASTE CATEGORIES

Abbr.	Unit	A1	A2	A3	A1-A3	A4	A5	C1	C2	C3	C4	D
HWD	Kg	1.35E-5	1.29E-6	2.30E-5	3.78E-5	3.77E-7	2.39E-6	0.00E+0	7.26E-7	3.44E-8	5.31E-7	-9.14E-7
NHWD	Kg	1.19E-1	3.23E-2	9.41E-2	2.46E-1	9.41E-3	9.86E-2	0.00E+0	1.82E-2	4.34E-4	1.40E+0	-4.27E-3
RWD	Kg	1.08E-4	3.34E-6	1.98E-5	1.31E-4	9.82E-7	7.46E-6	0.00E+0	1.88E-6	6.46E-8	2.08E-6	-1.42E-6

HWD=Hazardous waste disposed | **NHWD**=Non-hazardous waste disposed | **RWD**=Radioactive waste disposed

5 Results

ENVIRONMENTAL INFORMATION DESCRIBING OUTPUT FLOWS

Abbr.	Unit	A1	A2	A3	A1-A3	A4	A5	C1	C2	C3	C4	D
CRU	Kg	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
MFR	Kg	0.00E+0	0.00E+0	9.33E-3	9.33E-3	0.00E+0	5.90E-2	0.00E+0	0.00E+0	5.17E-4	0.00E+0	0.00E+0
MER	Kg	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
EET	MJ	0.00E+0	0.00E+0	-1.05E+0	-1.05E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	-5.88E-1
EEE	MJ	0.00E+0	0.00E+0	-6.10E-1	-6.10E-1	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	-3.41E-1

CRU=Components for re-use | **MFR**=Materials for recycling | **MER**=Materials for energy recovery | **EET**=Exported Energy, Thermic | **EEE**=Exported Energy, Electric

5 Results

5.3 INFORMATION ON BIOGENIC CARBON CONTENT PER SQUARE METER

BIOGENIC CARBON CONTENT

The following Information describes the biogenic carbon content in (the main parts of) the product at the factory gate per square meter:

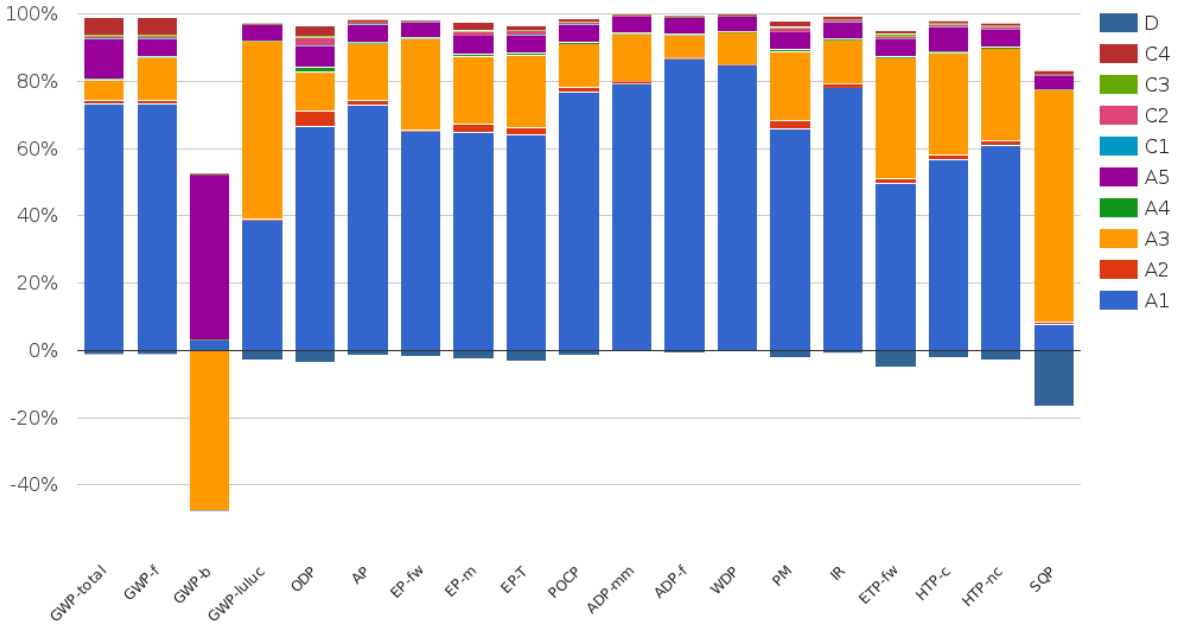
Biogenic carbon content	Amount	Unit
Biogenic carbon content in the product	0	kg C
Biogenic carbon content in accompanying packaging	0.07268	kg C

UPTAKE OF BIOGENIC CARBON DIOXIDE

The following amount of carbon dioxide uptake is taken into account. Related uptake and release of carbon dioxide in downstream processes are not taken into account in this number although they do appear in the presented results. One kilogram of biogenic Carbon content is equivalent to 44/12 kg of biogenic carbon dioxide uptake.

Uptake Biogenic Carbon dioxide	Amount	Unit
Packaging	0.2665	kg CO2 (biogenic)

6 Interpretation of results



The figure above shows the dominance analysis of different life cycle phases on environmental core indicators for the Doubleflex White Fully Bonded Sheet Membrane. A1 (raw material supply) dominates in most environmental core indicators. The highest impact on the GWP is attributed to the flexible polyolefine sealing layer, while the other raw materials only have a minor impact. Energy input related to manufacturing (A3) also has a minor impact on the GWP. Transports A2, A4 and C2 have only a minor impact within all core indicators. The installation phase (A5) contributes with around 5% to each environmental category, except GWP-b with around 40%. However, this phase is strongly dependent on the 5% construction waste assumption. Since the product is completely landfilled after reaching the end-of-life, credits beyond the system boundaries (module D) are mainly originating from the packaging material.

7 References

ISO 14040
ISO 14040:2006-10, Environmental management - Life cycle assessment - Principles and framework; EN ISO 14040:2006

ISO 14044
ISO 14044:2006-10, Environmental management - Life cycle assessment - Requirements and guidelines; EN ISO 14044:2006

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

EN 15804+A2
EN 15804+A2:2019: Sustainability of construction works — Environmental Product Declarations — Core rules for the product category of construction products

DIN 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

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

DIN EN 12311-2
DIN EN 12311-2:2013-11, Flexible sheets for waterproofing - Determination of tensile properties - Part 2: Plastic and rubber sheets for roof waterproofing

DIN EN ISO 12310-2
DIN EN 12310-2:2019-02, Flexible sheets for waterproofing - Determination of resistance to tearing - Part 2: Plastic and rubber sheets for roof waterproofing

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

DIN EN 13501-1
DIN EN 13501-1:2019-05, Fire classification of construction products and building elements - Part 1: Classification using data from reaction to fire tests

General PCR Ecobility Experts
Kiwa-Ecobility Experts (Kiwa-EE) – General Product Category Rules (2022-02-14)

PCR B
Institut Bauen und Umwelt e.V. (IBU) - PCR Teil B: Anforderungen an die EPD für Dach- und Dichtungsbahnsysteme aus Kunststoffen und Elastomeren (en.: EPD requirements

7 References

for roofing and waterproofing membrane systems made of plastics and elastomers) (v4, 2023-10-19)

8 Contact information

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Kiwa-Ecobility Experts is established member of the ECO PLATFORM