ENVIRONMENTAL PRODUCT DECLARATION

as per *ISO 14025* and *EN 15804+A2*

Owner of the Declaration	CQLT SaarGummi Deutschland GmbH
Publisher	Institut Bauen und Umwelt e.V. (IBU)
Programme holder	Institut Bauen und Umwelt e.V. (IBU)
Declaration number	EPD-CQL-20250278-IBC1-EN
Issue date	03.06.2025
Valid to	02.06.2030

EPDM roofing and waterproofing membranes NovoProof® DA, FA, DA-F, DA-K, DA-S, DA-G, DA-FG, DA-SK

CQLT SaarGummi Deutschland GmbH

Institut Bauen und Umwelt e.V.

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1. General Information

CQLT SaarGummi Deutschland GmbH

EPDM roofing and waterproofing membranes NovoProof® DA, FA, DA-F, DA-K, DA-S, DA-G, DA-FG, DA-SK

Programme holder

IBU – Institut Bauen und Umwelt e.V.
Hegelplatz 1
10117 Berlin
Germany

Owner of the declaration

CQLT SaarGummi Deutschland GmbH
Eisenbahnstr. 24
66687 Wadern-Büschfeld
Germany

Declaration number

EPD-CQL-20250278-IBC1-EN

Declared product / declared unit

The declared unit is one (1) m² at factory gate of the roofing and waterproofing membrane NovoProof®. This is an average product of the product variants NovoProof® DA, DA-F, DA-K, DA-S, DA-G, DA-FG, DA-SK and FA.
The roofing and waterproofing membrane includes

- the fixing material,
- the relevant packaging material.

The average was calculated on the basis of production-weighted data.

This declaration is based on the product category rules:

Plastic and elastomer roofing and sealing sheet systems, 01.08.2021
(PCR checked and approved by the SVR)

Scope:

This EPD covers the whole life cycle of the roofing and waterproofing membranes NovoProof® DA, DA-F, DA-K, DA-S, DA-G, DA-FG, DA-SK and FA. The production takes place at the plant of CQLT SaarGummi Deutschland GmbH in Wadern-Büschfeld, Germany.
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.

The EPD was created according to the specifications of EN 15804+A2. In the following, the standard will be simplified as *EN 15804*.

Issue date

03.06.2025

Valid to

02.06.2030

Verification

The standard EN 15804 serves as the core PCR
Independent verification of the declaration and data according to ISO 14025:2011
☐ internally ☒ externally

Dipl.-Ing. Hans Peters
(Chairman of Institut Bauen und Umwelt e.V.)

Florian Pronold
(Managing Director Institut Bauen und Umwelt e.V.)

Matthias Klingler,
(Independent verifier)

2. Product

2.1 Product description/Product definition

NovoProof® is made of fully cross-linked elastomer membranes based on EPDM (ethylene-propylene-diene monomer rubber).

The covered roofing and waterproofing membranes are rubber damp proof sheets from EPDM according to /EN 13956/ (NovoProof® DA, DA-F, DA-K, DA-S, DA-G, DA-FG, DA-SK), rubber sheets for roof waterproofing from EPDM according to /EN 13967/ (NovoProof® DA, DA-K, DA-S, DA-FG, DA-SK, FA), and rubber vapour control layers from EPDM according to /EN 13984/ (NovoProof® FA).
The NovoProof® product group includes many variants:
NovoProof® DA
Homogeneous roofing membrane
NovoProof® DA-F
Flame-retardant roofing membrane
NovoProof® DA-K
Flame-retardant roofing membrane with fleece-backing
NovoProof® DA-S
Flame-retardant roofing membrane with thick non-woven backing
NovoProof® DA-G
Light grey, flame-retardant roofing membrane with fleece-backing
NovoProof® DA-FG
Flame-retardant roofing backed with glass fibre
NovoProof® DA-SK
Flame-retardant sealing sheet laminated with glass fabric and a full-area self-adhesive layer
NovoProof® FA
Homogeneous facade sealing sheet made of EPDM For the placing on the market of the product in the European Union/European Free Trade Association (EU/EFTA) (with the exception of Switzerland) Regulation (EU) No. 305/2011 (*CPR*) applies. The product needs a declaration of performance taking into consideration

- EN 13956: 2013-03, Flexible sheets for waterproofing — Plastic and rubber sheets for roof waterproofing — Definitions and characteristics,
- EN 13967: 2017-08, Flexible sheets for waterproofing. Plastic and rubber damp proof sheets including plastic and rubber basement tanking sheet. Definitions and characteristics,
- EN 13859-2: 2014-07, Flexible sheets for waterproofing - Definitions and characteristics of underlays - Part 2: Underlays for walls,
- EN 13984: 2013-05, Flexible sheets for waterproofing - Plastic and rubber vapour control layers - Definitions and characteristics,
- and the CE-marking.

For the application and use the respective national provisions apply.

2.2 Application

NovoProof® roofing and waterproofing membranes are suitable for alle single-layer covering systems on flat roofs.
The products NovoProof® DA, DA-F, DA-K, DA-S, DA-G, DA-FG and DA-SK can be applied

- all flat roofs with a substructure made of wood, concrete and trapezoidal profiled sheets,
- for the construction of new buildings or renovation,
- as well as other use cases.

NovoProof® DA is delivered as pre-fabricated sealing sheet and laid under load (gravel, slabs) or under green roofs.
NovoProof® DA-F is delivered as pre-fabricated sealing sheet. Because of the flame-retardant composition, a load is not necessary.
NovoProof® DA-K/S/G/FG are applied without load by mechanical fixing or partial bonding.
NovoProof® DA-SK are applied without load by full-area bonding.

The product **NovoProof® FA** can be used in exterior applications as permanently elastic, airtight and watertight window and facade seals, on all standard building substrates (concrete, sandstone, brick, clinker, plaster), wood, steel (blank, galvanized, powder-coated). The sheet is fixed to the outer wall and/or the window by gluing.

2.3 Technical Data

For the technical data, the information in the declaration of performance apply.

Property	Unit	NovoProof®						
		DA	DA-F	DA-K	DA-G	DA-S	DA-FG/ DA-SK	FA
Waterproof EN 1928	-	passed						
Tensile strain EN 12311-2	%	≥ 350	≥ 400			≥ 40[1]	≥ 4[1]	≥ 350
Peel resistance of the seam joint	N/50mm	≥ 100						n. r.
Shear resistance of the seam joint	N/50mm	≥ 250			≥ 190	≥ 250		N. A.
Seam strength EN 12317-2	-	N. A.						
Tear propagation resistance EN 12310-2	N	≥ 35[1]		≥ 50[1]	≥ 45[1]	≥ 220	≥ 120	≥ 35
Tear propagation resistance EN 12310-1	N	≥ 110[1]	n. r.	≥ 130	n. r.	≥ 220	≥ 220	≥ 70[1]
Artifical ageing EN 1297	-	passed						n. r.
Dimensional stability EN 1107-2	%	≤ 0.3	≤ 0.5					n. r.
Folding in the cold EN 495-5	°C	≤ -40						n. r.
Bitumen compatibility EN 1548	-	passed						n. r.
Resistance to root penetration (for green roofs) EN 13948 or FLL	-	passed			N. A.	passed		n. r.
Ozone resistance (for EPDM/IIR) EN 1844	-	passed						n. r.
Resistance to impact loads EN 12691	mm	≥ 2,000						N. A.

[1] Minimum value, higher depending on thickness

N. A. = Data are available on request from the manufacturer
n.r. = not relevant

Performance data of the product in accordance with the declaration of performance with respect to its essential characteristics according to
EN 13956: 2013-03, Flexible sheets for waterproofing
EN 13967: 2017-08, Flexible sheets for waterproofing
EN 13984: 2013-05, Flexible sheets for waterproofing

2.4 Delivery status

NovoProof® membranes are delivered from the factory rolled up on cardboard tubes and wrapped in a protective film.
An additional separation film is applied to the unlaminated NovoProof® sheets DA, DA-F and FA. The NovoProof® sheets are sold in various thicknesses. The width of the membranes is 0.43 m to 1.42 m. The length is equally variable.
The NovoProof® sheets can have the following sizes:

- NovoProof® DA (thickness 1.3 / 1.5 / 2.0 mm)
- NovoProof® DA-F (thickness 1.3 / 1.5 mm)

- NovoProof® DA-K (thickness 1.3 / 1.5 mm)
- NovoProof® DA-G (thickness 1.5 mm)
- NovoProof® DA-S (thickness 2.5 / 2.7 mm)
- NovoProof® DA-FG (thickness 1.3 / 1.5 mm)
- NovoProof® DA-SK (thickness 1.3 / 1.5 mm)
- NovoProof® FA (Dicke 0.60 / 0.75 / 1.00 / 1.30 / 1.50 / 2.0mm)

The grammage varies between 0.700 kg/m² and 2.420 g/m², with an average of 1.551 g/m².

The long sides have a joining edge to link neighbouring sheets.

2.5 Base materials/Ancillary materials

NovoProof® membranes are based on EPDM rubber. Different product variants (black or grey, flame-retardant) consist of different mixtures of raw materials in the following ranges:

Name	Value	Unit
EPDM	25-30	%
Carbon black	0-35	%
Filler	0-32	%
Plasticizer (paraffinic)	10-20	%
Flame retardant (metal hydroxide)	0-35	%
Cross-linking system and processing aids	1-6	%

This product/article/at least one partial article contains substances listed in the *candidate list* (SVHC, date: 21.01.2025)exceeding 0.1 percentage by mass: **no**.

This product/article/at least one partial article contains other 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 atreated product as defined by the (EU) Ordinance on BiocideProducts No. 528/2012): **no**.

2.6 Manufacture

Depending on the product variant, initially application-specific rubber blends are produced. The required raw materials are dosed into automatic scales and supplied to an internal mixer via suitable conveyor systems. The result of the mixing process is a homogeneous raw rubber blend.During production, quality characteristics, like strength, elongation, hardness, density, rheology curve, are tested for all rubber blends.
The resulting rubber mixture is further processed in a roller-head-plant. The continuous production process starts with extrusion, where the materials is brought in the desired thickness and width via wide spray head and calander. Subsequently, and depending on the product, the Thermo-Fast® edge, the non-woven backing (DA-K, DA-G and DA-S) or glass fibre backing (DA-FG and DA-SK) are applied, and the surface is embossed.
In the next process step, the sheet is vulcanised (cross-linked) continuously in a hot-air duct, which creates a permanent connection between EPDM layer and Thermofast® edge. After vulcanisation, the sheet is cooled to room temperature in a cooling zone, labeled if necessary, and rolled up.
For some variants, there is an additional internal or external post-processing. If necessary, the sheets can be precut. Subsequently the products are packed and stored until they are transported to the client.
The development and production are conducted according to the requirements of the quality management system according to *ISO 9001*. The quality of the finished products is regularly checked by own production control and by external quality monitoring.

2.7 Environment and health during manufacturing

In addition to the general occupational health and safety measures for companies, preventive measures are offered and implemented. The manufacturer operates an environmental management system that is certified in accordance with *ISO 14001*.

2.8 Product processing/Installation

NovoProof® sheets are joined using hot air welding or adhesive to create a tight bond. The membranes are overlapped at the edges. In addition, offcuts are produced when fitting the sheets to the surface to be sealed, which are disposed of.

2.9 Packaging

The EPD roofing and sealing membranes are rolled up on cardboard or plastic tubes and wrapped in a protective film. For the unlaminated NovoProof® sheets DA, DA-F and FA, a separation film is applied as well.
The packed rolls are delivered from the factory on wooden pallets. The pallets are recyclable and reusable.

2.10 Condition of use

The properly installed membranes are virtually maintenance-free. During use, the NovoProof® membranes stay elastic and fully functional. There are no relevant material changes.

2.11 Environment and health during use

The EPDM roofing and waterproofing membrane NovoProof® has no negative influence on environment and health during the use.

2.12 Reference service life

No reference service life is declared. With proper installation and use, a service life (manufacturer information) of NovoProof® EPDM of more than 50 years is expected (according to final report *SKZTeConA No. 37236/99X* and long-term stability test report *DEKRA No. 0607/1891215981/15*).

2.13 Extraordinary effects

Fire

The membranes meet the requirements of *EN 13501-5* for behaviour in the event of external fire effects. Fire protection of the EPDM membranes is classified in class E according to *EN ISO 11925-2* and *EN 13501-1*.

Fire protection

Name	Value
Building material class	E
Burning droplets	-
Smoke gas development	-

Water

When used as intended, the declared EPDM roofing and waterproofing membranes are insoluble in water and resistant to the effects of water. Watertightness is tested according to *EN 1928*.

Mechanical destruction

No danger to the environment is to be expected in the event of mechanical destruction of NovoProof®.

2.14 Re-use phase

NovoProof® EPDM roofing and waterproofing membranes are deconstructed after the end of the service life. On one hand, incineration with energy recovery can be carried out. This means that some of the energy contained in the declared products can be recovered. On the other hand, material recycling is also possible.
Loosely laid roof structures are suitable for separate dismantling. Adhesive residues and fleece adhesion are

unavoidable with bonded roof structures. After thorough cleaning, the material can be recycled.

2.15 Disposal

The waste codes in accordance with the European Waste Index (AVV 2020) for the different product components are

Packaging

- AVV 15 01 01 Packaging from pulp and paper
- AVV 15 01 02 Packaging from plastics
- AVV 15 01 03 Packaging from wood

Installation and End of Life

Residues from roofing and waterproofing membranes can be disposed of as

- AVV 17 09 04 mixed construction waste.

In general, material recycling is preferred over incineration with energy recovery.

2.16 Further information

Further information on NovoProof® EPDM are available online (www.novoproof.de).

3. LCA: Calculation rules

3.1 Declared Unit

The declared unit is defined according to *IBU 2021* as 1 m² of weighted average product of roofing and waterproofing membranes NovoProof® DA, DA-F, DA-K, DA-G, DA-S, DA-FG, DA-SK and FA. The average product was calculated from data of the different product variants by weighting with the produced product area.
The declared unit relates to the amount at factory gate including packaging materials and fixing material. This corresponds to 0.94 m² of installed product (including losses and overlap).

Declared unit and mass reference

Name	Value	Unit
Declared unit	1	m^2
Grammage (range)	0.7 – 2.42	kg/m^2
Grammage Average product (from roll)	1.55	kg/m^2
Grammage Average product (installed)	1,63	kg/m^2
Layer thickness (effective thickness, range)	0.6 – 2.0	mm
Layer thickness Average product (effective thickness)	1.26	mm
Layer thickness Average product (effective thickness)	0.00126	m
Packaging	0,066	kg/m^2
Type of sealing DA, DA-F, DA-K, DA-S, DA-G, DA-FG, DA-SK	thermal welding	-
Type of sealing FA	with different system adhesives	-

The scaling of the LCA results to specific product variants is possible via the grammage.

3.2 System boundary

Type of EPD: cradle to gate – with options, with the moduls A1-A3, A4, A5, C1, C2, C3, C4 and D. The production stage modules A1, A2 und A3 are declared as aggregate module A1-A3.
The system boundary is defined modular according to *EN15804*, and comprises the following modules and processes:

Module A1-A3 production

- External production of raw materials, auxiliaries, packaging material
- Transport to production, zur Produktion, return transport of reusable packaging
- Provision of energy for production
- Production processes including internal and external post-processing and packaging
- External processing or incineration of wastes including transport

Modules A4 and A5 construction

- Transport of the packed final product to construction site
- Provision of energy and auxiliaries for installation
- Transport and treatment of wastes

Module C1, C2, C3, C4 end-of-life

- Impacts of deconstruction are considered at the building level. The membranes are collected to 100% as mixed construction waste.
- Transport to waste processing
- Waste processing, incineration with energy recovery or material recycling
- Disposal of residual waste

Module D Reuse, recovery and recycling potentials

- Benefits from recovery of energy and materials from modules A5 and C3

For the environmental impact, the use of green electricity was calculated taking into account the residual electricity mix for the remaining electricity. The proportion of the electricity demandcovered by green electricity in the total electricity demand is 100 %. The GWP value of green electricity is 0.065 kg CO_2-e/kWh.
The roofing and waterproofing membranes are made in Germany, but can be used globally. The main area of application is Europe. The waste treatment at the end-of-life depends on the location of the use. Hence, a european scenario was considered for end-of-life.

3.3 Estimates and assumptions

The primary data for the composition of the product, for energy use, transport distances and packaging of product and raw materials are from *CQLT SaarGummi Deutschland GmbH*. In the case of missing data, statistical average data or expert judgement was employed.

3.4 Cut-off criteria

In this EPD, all relevant inputs and outputs were included in the assessment. Due to their very low relevance, individual processes and materials for which no data was available were not included. All processes not included have an individual mass and energy share of <1% and a combined mass and energy share of <5% in relation to the declared unit (requirement by *EN15804* and *IBU 2024*).
This applies to:

- Internal transport at plant in Wadern-Büschfeld
- Transport of auxiliaries (lubricants)
- Transport of intermediate product to external post-processing
- Some packaging materials
- Losses of cooling water

Due to the detailed collection of production data for NovoProof®, it is assumed that no relevant mass or energy flows were neglected.

3.5 Background data

For the LCA, exclusively background data from the database Managed LCA Content (Version 2024.2, *Sphera 2024a*) were used. The modeling was done in the software LCA for Experts

(Version 10.9, *Sphera 2024b*).

3.6 Data quality

The specific foreground data for the production of NovoProof® are from CQLT SaarGummi Deutschland GmbH. The geographical and time-related representativity are judged as very good. The technology-related representativity is rated as good to very good. In total, more than 80% of specific date are rated as good or very good.
The background data form the database Managed LCA Content exhibit a good to very good representativity (geographical, technology-related, time-related) for more than 80% of the contributions to the core indicators.

3.7 Period under review

The specific data for the production of NovoProof® was collected in the time period June 2023 to May 2024.

3.8 Geographic Representativeness

Land or region, in which the declared product system is manufactured, used or handled at the end of the product´s lifespan: Europe

3.9 Allocation

Module A1-A3:
During production of NovoProof®, no co-products are generated. The measured consumption of material and energy for one year was allocated to the product system via the produced amount of product (area).

Module C3/1:
For material recycling of NovoProof® at end-of-life, the impacts of recycling including grinding are allocated to the product system. As regrind, the recycled materials reaches end-of-waste and leave the system.
Module D:
It is assumed, that recycled materials can be used outside the system boundary to partially substitute virgin material. For the benefits of reusing secondary material, a substitution factor of S=0.5 related to virgin material was assumed.

3.10 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. Managed LCA Content from Sphera (version 2024.2, *Sphera2024a*)

4. LCA: Scenarios and additional technical information

Characteristic product properties of biogenic carbon
The product system contains no biogenic carbon. The product packaging from wood contains ca. 43% biogenic carbon, according to background dataset, while carton packaging contains ca. 47.7% biogenic carbon.

Information on describing the biogenic carbon content at factory gate

Name	Value	Unit
Biogenic carbon content in product	0	kg C / kg product
Biogenic carbon content in accompanying packaging	0.30	kg C / kg packaging

Note: 1 kg of biogenic carbon is equivalent to 44/12 kg of CO_2.

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

Transport to the building site (A4)

Name	Value	Unit
Transport distance	-	km
Capacity utilisation (including empty runs)	61	%

Installation into the building (A5)

Name	Value	Unit
Auxiliary (PUR adhesive)		kg
Electricity consumption	0.0475	kWh
Material loss installation	1	%
Overlap	5	%
Transport distance to waste processing	77	km

End of life (C1-C4)
Two different 100% scenarios were considered for modelling the end of life, which allow the derivation of characteristic values for specific scenarios.

Name	Value	Unit
Collected as mixed construction waste	1.6	kg
Waste treatment losses	3	%
Energy recovery (C3, C4, D)	1.55	kg
Recycling (C3/1, C4/1, D/1)	1.55	kg
Recycling yield	70	%

Reuse, recovery and/or recycling potentials (D), relevant scenario information
Benefits and loads outside the system boundary results from the utilisation of recovered energy (D) or regrind instead of virgin material (D/1). Additional benefits results from the recovery of energy from incineration of recycling losses (D/1).

Name	Value	Unit
Electrical energy (waste treatment in A5)	0.0589	MJ
Thermal energy (waste treatment in A5)	0.285	MJ
Electrical energy (incineration, C3)		MJ
Thermal energy (incineration, C3)		MJ
rubber regrind (C3/1)	1.08	kg
Substitution factor for rubber regrind	0.5	-
Electrical energy (incineration of recycling losses, C3/1)	1.32	MJ
Thermal energy (incineration of recycling losses, C3/1)	7.51	MJ

5. LCA: Results

The results of the LCA and impact assessment for NovoProof® are presented in detail. The end-of-life scenario 100% incineration includes the modules C1, C2, C3, C4 and D, while the end-of-life scenario 100% material recycling includes the modules C1, C2, C3/1, C4/1 and D/1.

DESCRIPTION OF THE SYSTEM BOUNDARY (X = INCLUDED IN LCA; MND = MODULE OR INDICATOR NOT DECLARED; MNR = MODULE NOT RELEVANT)

Product stage			Construction process stage		Use stage							End of life stage				Benefits and loads beyond the system boundaries
Raw material supply	Transport	Manufacturing	Transport from the gate to the site	Assembly	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	De-construction demolition	Transport	Waste processing	Disposal	Reuse-Recovery-Recycling-potential
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
X	X	X	X	X	MND	MND	MNR	MNR	MNR	MND	MND	X	X	X	X	X

RESULTS OF THE LCA - ENVIRONMENTAL IMPACT according to EN 15804+A2: 1 m² NovoProof® roofing and waterproofing membrane

Parameter	Unit	A1-A3	A4	A5	C1	C2	C3	C3/1	C4	C4/1	D	D/1
GWP-total	kg CO_2 eq	5.09E+00	6.83E-02	2.09E-01	0	1.1E-02	4.05E+00	1.32E+00	0	0	-2.13E+00	-2.58E+00
GWP-fossil	kg CO_2 eq	5.09E+00	6.7E-02	1.8E-01	0	1.08E-02	4.04E+00	1.32E+00	0	0	-2.12E+00	-2.56E+00
GWP-biogenic	kg CO_2 eq	-3.18E-03	1.6E-04	2.91E-02	0	2.59E-05	0	0	0	0	-5.52E-03	-1.3E-02
GWP-luluc	kg CO_2 eq	1.98E-03	1.13E-03	1.08E-04	0	1.82E-04	3.11E-04	1.44E-04	0	0	-1.45E-04	-3.24E-04
ODP	kg CFC11 eq	3.09E-11	9.88E-15	2.36E-13	0	1.6E-15	4.61E-13	1.5E-13	0	0	-8.11E-12	-8.1E-12
AP	mol H^+ eq	7.86E-03	1.49E-04	1.96E-04	0	2.41E-05	2.94E-03	1.03E-03	0	0	-1.53E-03	-2.45E-03
EP-freshwater	kg P eq	8.95E-06	2.86E-07	1.64E-07	0	4.63E-08	2.43E-07	1.12E-07	0	0	-1.58E-06	-2.77E-06
EP-marine	kg N eq	1.88E-03	6.35E-05	6.41E-05	0	1.03E-05	7.27E-04	2.62E-04	0	0	-5.53E-04	-7.95E-04
EP-terrestrial	mol N eq	2.03E-02	7.26E-04	7.09E-04	0	1.17E-04	8.8E-03	3.12E-03	0	0	-6.03E-03	-8.53E-03
POCP	kg NMVOC eq	6.9E-03	1.44E-04	2.44E-04	0	2.33E-05	2.03E-03	7.32E-04	0	0	-1.64E-03	-2.79E-03
ADPE	kg Sb eq	5.34E-07	5.84E-09	6.44E-08	0	9.45E-10	1.07E-08	7.62E-09	0	0	-1.05E-07	-2.99E-07
ADPF	MJ	1.21E+02	8.84E-01	2.65E+00	0	1.43E-01	1.04E+00	1.79E+00	0	0	-3.54E+01	-6.26E+01
WDP	m^3 world eq deprived	8.16E-02	1.04E-03	1.76E-02	0	1.68E-04	2.57E-01	8.57E-02	0	0	-9.88E-02	-6.23E-02

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; WDP = Water (user) deprivation potential)

RESULTS OF THE LCA - INDICATORS TO DESCRIBE RESOURCE USE according to EN 15804+A2: 1 m² NovoProof® roofing and waterproofing membrane

Parameter	Unit	A1-A3	A4	A5	C1	C2	C3	C3/1	C4	C4/1	D	D/1
PERE	MJ	1.27E+01	7.61E-02	1.79E-01	0	1.23E-02	2.8E-01	1.56E-01	0	0	-5.43E+00	-4.49E+00
PERM	MJ	4.04E-02	0	-4.04E-02	0	0	0	0	0	0	0	0
PERT	MJ	1.28E+01	7.61E-02	1.39E-01	0	1.23E-02	2.8E-01	1.56E-01	0	0	-5.43E+00	-4.49E+00
PENRE	MJ	1.22E+02	8.84E-01	3.23E+00	0	1.43E-01	4.94E+01	1.63E+01	0	0	-3.54E+01	-6.26E+01
PENRM	MJ	5.49E+01	0	4.43E-01	0	0	-5.54E+01	-5.54E+01	0	0	0	0
PENRT	MJ	1.77E+02	8.84E-01	3.67E+00	0	1.43E-01	-5.97E+00	-3.91E+01	0	0	-3.54E+01	-6.26E+01
SM	kg	2.27E-02	0	0	0	0	0	0	0	0	0	1.08E+00
RSF	MJ	0	0	0	0	0	0	0	0	0	0	0
NRSF	MJ	0	0	0	0	0	0	0	0	0	0	0
FW	m^3	1.44E-02	8.48E-05	5.56E-04	0	1.37E-05	6.2E-03	2.08E-03	0	0	-4.18E-03	-7.17E-03

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 – WASTE CATEGORIES AND OUTPUT FLOWS according to EN 15804+A2: 1 m² NovoProof® roofing and waterproofing membrane

Parameter	Unit	A1-A3	A4	A5	C1	C2	C3	C3/1	C4	C4/1	D	D/1
HWD	kg	4.27E-07	3.38E-11	4.64E-10	0	5.47E-12	5.64E-10	3.39E-10	0	0	-1.12E-08	-1.25E-08
NHWD	kg	3.69E-01	1.44E-04	2.05E-03	0	2.33E-05	5.62E-02	1.73E-02	0	0	-1.34E-02	-3.36E-02

RWD	kg	6.02E-04	1.61E-06	7.04E-05	0	2.6E-07	3.88E-05	1.28E-04	0	0	-1.19E-03	-6.26E-04
CRU	kg	0	0	0	0	0	0	0	0	0	0	0
MFR	kg	0	0	1.68E-02	0	0	0	1.55E+00	0	0	0	0
MER	kg	0	0	0	0	0	0	0	0	0	0	0
EEE	MJ	1.16E-01	0	5.89E-02	0	0	4.4E+00	1.32E+00	0	0	0	0
EET	MJ	6.36E-01	0	2.85E-01	0	0	2.5E+01	7.51E+00	0	0	0	0

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; EET = Exported thermal energy

RESULTS OF THE LCA – additional impact categories according to EN 15804+A2-optional:
1 m² NovoProof® roofing and waterproofing membrane

Parameter	Unit	A1-A3	A4	A5	C1	C2	C3	C3/1	C4	C4/1	D	D/1
PM	Disease incidence	1.52E-07	1.21E-09	1.71E-09	0	1.96E-10	2.85E-08	1.01E-08	0	0	-1.23E-08	-2.06E-08
IR	kBq U235 eq	6.6E-02	2.34E-04	7.59E-03	0	3.77E-05	3.8E-03	1.19E-02	0	0	-1.96E-01	-8.78E-02
ETP-fw	CTUe	6.62E+01	6.56E-01	7.42E-01	0	1.06E-01	3.78E+00	1.37E+00	0	0	-2.55E+00	-2.24E+01
HTP-c	CTUh	1.68E-09	1.33E-11	2.32E-11	0	2.14E-12	8.12E-11	3.32E-11	0	0	-3.26E-10	-6.49E-10
HTP-nc	CTUh	5.9E-08	5.95E-10	8.03E-10	0	9.61E-11	4.09E-09	1.57E-09	0	0	-9.85E-09	-2.72E-08
SQP	SQP	9.5E+00	4.35E-01	1.6E-01	0	7.03E-02	4.51E-01	2.74E-01	0	0	-3.21E+00	-2.93E+00

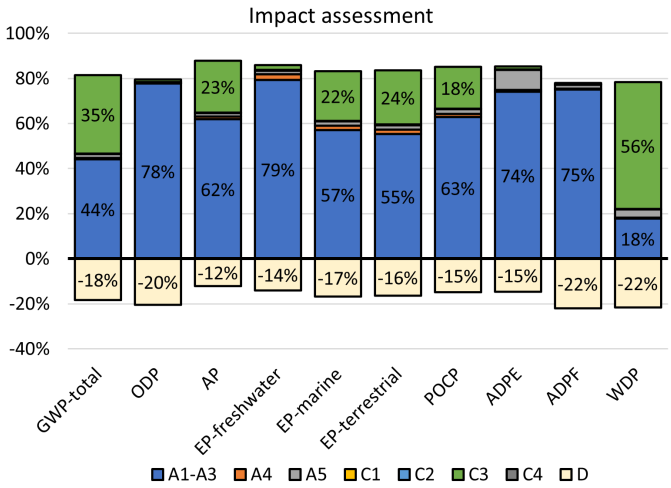
PM = Potential incidence of disease due to PM emissions; IR = Potential Human exposure efficiency relative to U235; ETP-fw = Potential comparative Toxic Unit for ecosystems; HTP-c = Potential comparative Toxic Unit for humans (cancerogenic); HTP-nc = Potential comparative Toxic Unit for humans (not cancerogenic); SQP = Potential soil quality index

Disclaimer 1 – for the indicator “Potential Human exposure efficiency relative to U235”. 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 or radioactive waste disposal in underground facilities. Potential ionizing radiation from the soil, radon and from some construction materials is also not measured by this indicator.

Disclaimer 2 – for the indicators “abiotic depletion potential for non-fossil resources”, “abiotic depletion potential for fossil resources”, “water (user) deprivation potential, deprivation-weighted water consumption”, “potential comparative toxic unit for ecosystems”, “potential comparative toxic unit for humans – cancerogenic”, “Potential comparative toxic unit for humans - not cancerogenic”, “potential soil quality index”. The results of this environmental impact indicator shall be used with care as the uncertainties on these results are high as there is limited experience with the indicator.

6. LCA: Interpretation

The following statements refer to the end-of-life scenario "incineration".
Many of the indicators on environmental impact and resource consumption are dominated by the production phase (module A1-A3). Waste treatment (Module C3) also has a significant impact on the indicators. Furthermore, the impacts within the system boundaries can be partially compensated by recovery and recycling potentials outside the system boundaries (Module D). Transportation to the construction site (Module A4), construction (Module A5), deconstruction (Module C1) and transportation for waste treatment (Module C2) only play a noticeable role for a few indicators. The following figure shows the relative shares of the modules in the results of the impact assessment. The values are scaled so that all columns are equally high.

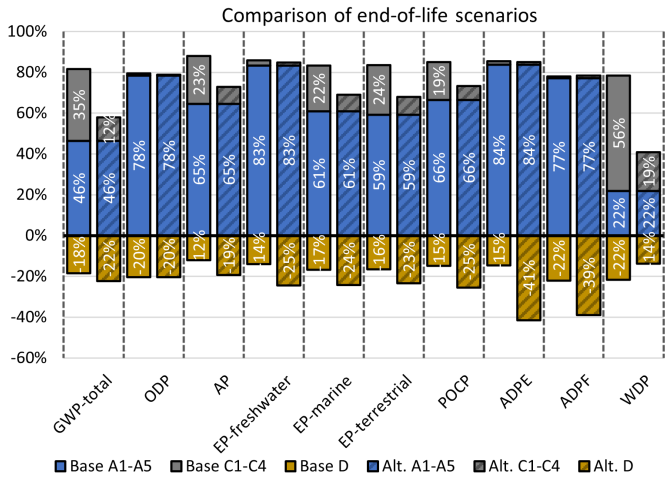


Production stage

The impacts of modules A1-A3 are dominated by the production of raw materials, with the manufacturing processes also making a significant contribution. In particular, the EPDM rubber is responsible for an average of ca. 30 % of impacts in A1-A3 to the core indicators, carbon black on average 26 %, the plasticizer 9 % and the remaining raw materials 11 %. The manufacturing processes and other materials and processes account for an average of 25% of the environmental impact. For example, ODP and EP-freshwater are largely driven by the green electricity mix.

End-of-Life

Two different scenarios for waste treatment were considered, namely incineration (baseline, modules C1, C2, C3, C4, D) and material recycling (alternative scenario, modules C1, C2, C3/1, C4/1, D/1). In the baseline case, the incineration in C3 has significant impacts. These are mainly driven by incineration processes for EPDM, carbon black and plasticizer. In the alternative scenario, the largest contributions are from incineration of recycling losses and electricity generation.
As the following figure shows, the alternative material recycling (Alt.) has lower impacts in most impact categories, which results from the much reduced impacts of waste incineration compared to the baseline incineration case (Base). At the same time, the benefits in module D are consistently higher in the recycling scenario.



A sensitivity analysis comparing the use of green electricity and residual electricity mix in the production in modules A1-A3 was conducted. Noticeable changes can be observed in some impact categories. ODP, EP-freshwater and ADPE decrease by more than 10 %. In most of the other impact categories, however, the effects increase. These results imply that the LCA needs to be recalculated if green electricity is no longer used in production.

Variation of results

With a constant formulation, the results of all modules scale linearly with the grammage to a good approximation. It is therefore possible to scale the LCA results to specific products using the grammage. Changes in the formulation primarily affect modules A1-A3 and C3. A significant underestimation of the environmental impacts due to changing formulation shares is not to be expected.

7. Requisite evidence

8. References

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EN 1548
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EN 1844
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EN 12317-2
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EN 13501-5
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EN 13948
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Further references

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Publisher

Institut Bauen und Umwelt e.V.
Hegelplatz 1
10117 Berlin
Germany

+49 (0)30 3087748- 0
info@ibu-epd.com
www.ibu-epd.com

Programme holder

Institut Bauen und Umwelt e.V.
Hegelplatz 1
10117 Berlin
Germany

+49 (0)30 3087748- 0
info@ibu-epd.com
www.ibu-epd.com

Author of the Life Cycle Assessment

SKZ - Das Kunststoff-Zentrum
Friedrich-Bergius-Ring 22
97076 Würzburg
Germany

+49 931 4104-433
kfe@skz.de
www.skz.de

Owner of the Declaration

CQLT SaarGummi Deutschland GmbH
Eisenbahnstr. 24
66687 Wadern-Büschfeld
Germany

+49 (0)6874 69 0
info.industries@saargummi.com
industries.saargummi.com