

ENVIRONMENTAL PRODUCT DECLARATION

as per ISO 14025 and EN 15804+A2

Owner of the Declaration	Simpson Strong-Tie Europe
Programme holder	Institut Bauen und Umwelt e.V. (IBU)
Publisher	Institut Bauen und Umwelt e.V. (IBU)
Declaration number	EPD-SST-20210033-CBA1-EN
Issue date	23.03.2021
Valid to	22.03.2026

S&P Carbophalt® G 200/200 (0.52 kg/m²) Simpson Strong-Tie Europe / S&P Clever Reinforcement

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General Information

Simpson Strong-Tie Europe / S&P Clever Reinforcement

Programme holder

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

Declaration number

EPD-SST-20210033-CBA1-EN

This declaration is based on the product category rules:

Reinforcing and securing systems made from glass fibre composite materials, 04.2018
(PCR checked and approved by the SVR)

Issue date

23.03.2021

Valid to

22.03.2026



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



Dr. Alexander Röder
(Managing Director Institut Bauen und Umwelt e.V.)

S&P Carbophalt® G 200/200

Owner of the declaration

Simpson Strong-Tie Europe
Le Moulin des Ardillers
85400 Sainte Gemme La Plaine
France

Declared product / declared unit

1 m² of S&P Carbophalt® G 200/200 with the grammage of 0.52 kg/m².

Scope:

This document refers to the manufacture, transport and end of life stages of S&P Carbophalt® G 200/200 for asphalt reinforcement by Simpson Strong-Tie Europe / S&P Clever Reinforcement. This product is produced at the manufacturing plant S&P Polska Sp. z. o.o. in Malbork for the S&P Group. The production data were recorded for the year 2019. This EPD declares the life cycle analysis (LCA) for a specific product from the manufacturer's plant.

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.

Verification

The standard EN 15804 serves as the core PCR

Independent verification of the declaration and data according to ISO 14025:2010

internally externally



Angela Schindler
(Independent verifier)

Product

Information about the enterprise

S&P Clever Reinforcement Company AG emerged from Scherer & Partner Bausysteme in 1995 in Brunnen, Switzerland. The company develops, produces and sells products that reinforce structures. S&P moved into a new administration building with a large warehouse in Seewen/SZ in 2010. S&P also has a branch in western Switzerland and companies in the Netherlands, France, Germany, Poland, Portugal, Spain, Denmark and Sweden.

S&P focuses on the strengthening of structures and the development of reinforcement solutions. Our products are manufactured at S&P production facilities and are sold directly to end-users. The core competence of the company lies in the static consulting of the systems that are sold. S&P also offers design programs for the static design of the reinforcement systems.

S&P is part of the Simpson Manufacturing Co., Inc., headquartered in Pleasanton, California, through its subsidiary, Simpson Strong-Tie Company Inc., designs, engineers and is a leading manufacturer of wood construction products, including connectors, fastening systems, fasteners and shearwalls, as well as concrete construction products, including adhesives, specialty chemicals, mechanical anchors, powder actuated tools and reinforcing fibre materials. The Company's common stock trades on the New York Stock Exchange under the symbol "SSD".

Product description/Product definition

S&P Carbophalt® G 200/200 is a pre-bituminised asphalt reinforcement grid made of carbon fibres for local and/or complete surface reinforcement of bituminous surfaces.

WHERE TO USE

- Increases the load-bearing capacity of asphalt surfaces
- Surface reinforcement on roads where the layer height is limited
- Local application on existing cracks/joints or complete surface application
- Effectiveness at a cover layer of min. 2 cm

PERFORMANCE FEATURES

- Measurable improvement of the structural value due to high tensile strength at small elongation
- Minimises crack formation and prevents crack reflection
- Prevents fatigue cracks
- The pre-bituminisation guarantees the required layer bonding between old and new road surfaces (no fixed knots)
- Lower consumption of tack coat thanks to the prebituminised grid
- Easy and efficient application with unrolling equipment (also in curves)
- No waiting time - immediate road construction possible
- Can be milled and recycled without problems
- Reduces maintenance costs

Products according to the CPR based on an ETA

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 15381:2008*, Geotextiles and geotextile-related products – Characteristics required for use in pavements and asphalt overlays and the CE-marking.

For the application and use the respective national provisions apply.

Application

- Apply S&P Carbophalt® G 200/200 on dry surface, either by machine or manually, and if possible immediately before the installation of the road surface
- Apply at temperatures > 3 °C. Observe relevant norms for application of layers
- Ensure overlapping lengths of 10–20 cm are observed
- Overlapping of the reinforcement mesh should be optimised, according to the nature and location of joints/cracks, as well as wheel loading
- If the mesh is applied only on local areas, it shall be covered manually with an asphalt layer. This prevents debonding caused by passing vehicles
- Minimum covering of 2 cm above S&P Carbophalt® G 200/200

Technical Data

S&P Carbophalt® G 200/200 meets the requirements of *EN 15381* and is a carbon fibre open grid which is fully penetrated and impregnated with bitumen to ensure an optimal bond between asphalt layers.

Constructional Data

Name	Value	Unit
E-Modulus (Longitudinal Carbon Fibres)	≥240000	N/mm ²
Elongation (Longitudinal Carbon Fibres)	1.5 (+0.2)	%
Tensile Force (Longitudinal Carbon Fibres)	200	kN/m
Fibre Cross Section (Longitudinal Carbon Fibres)	46 (51 Fibre Strands)	mm ² /m
E-Modulus (Transverse Carbon Fibres)	≥265000	N/mm ²
Elongation (Transverse Carbon Fibres)	1.5 (+0.2)	%
Tensile Force (Transverse Carbon Fibres)	200	kN/m
Fibre Cross Section (Transverse Carbon Fibres)	46 (52 Fibre Strands)	mm ² /m

(CE-marking according to *EN 15381:2008*)

Performance data of the product in accordance with the declaration of performance with respect to its essential characteristics according to *EN 15381:2008*, Geotextiles and geotextile-related products – Characteristics required for use in pavements and asphalt overlays.

Base materials/Ancillary materials

- Carbon fibres ~ 38 %
- Bitumen ~ 41 %
- Quartz sand ~ 19 %
- Other ~ 2 %

(percentages by weight)

S&P Carbophalt® G 200/200 is manufactured with carbon fibres in both the longitudinal and transverse direction totalling 0.2 kg/m². The grids are manufactured with no fixed-knots, therefore making them freely moveable when heated up. Following the manufacture of the grids, they are fully penetrated and impregnated with bitumen at a rate of approximately 0.215 kg/m². A sprinkling of quartz sand at a rate of approximately 0.1 kg/m² is applied onto the wet bitumen to reduce the risk of vehicle tyres bonding to the grid during the application process.

- 1) "This product contains substances listed in the *candidate list* (25.06.2020) exceeding 0.1 percentage by mass: **"No"**
- 2) "This product contains other carcinogenic, mutagenic, reprotoxic (CMR) substances in categories 1A or 1B which are not on the *candidate list*, exceeding 0.1 percentage by mass: **"No"**

3) "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"

Reference service life

The reference service life (RSL) is not declared. A calculation according to ISO 15686 is not applied.

LCA: Calculation rules

Declared Unit

This declaration refers to the production of 1 m² of S&P Carbophalt® G 200/200 reinforcement grid with a grammage of 0.52 kg/m².

Declared unit

Name	Value	Unit
Declared unit	1	m ²
Grammage	0.52	kg/m ²
Conversion factor to 1 kg	0.52	-

It is a specific EPD.

System boundary

It is a cradle to gate EPD with options wherein module A1-A5, C1-C4 and D life cycle stages are considered.

Production

A1-A3: Extraction and manufacturing of all raw materials (basic and auxiliary) including packaging material followed by the transportation of raw materials and energy consumption from grid electricity and natural gas within manufacturing plant and landfill of wastes generated during manufacturing are considered in the scope of this module.

Transport to manufacturing site

A4: Average distance considered for the transport from the manufacturing plant to various construction sites

Installation

A5: It is estimated that there are no wastes disposed of during implementation as the waste generated are used as overlaps. Therefore, no losses are declared. The use of packaging material for the product is declared in EPDs in Module A1-A3 which is sent to waste incineration plant during installation stage

(Module A5). Subsequent energy recovery credits are declared in module D.

End-of-life Scenario: Recycling

C1: Dismantling / Demolition - As the products are used under pavements, they are collected as mixed construction waste for recycling after the end-of -life of the surface structures.

C2: Transport to treatment/disposal site - Average transport distance from demolition site to waste treatment (recycling) site.

C3: Waste processing for reuse, recovery or recycling - Processing of construction waste to recycled material. The wastes are 100% recyclable according to an investigation commissioned by S&P (Report No.: 14-7974-01).

C4: Disposal - Since the products are recycled and reused in asphalt layers, there are no disposals.

Benefits and loads beyond the product system boundary

D: The potential benefits from packaging material in module A5 are declared. For waste incineration, combustion in a waste incineration plant (R1 > 0.6) with energy recuperation is considered. Recycling credits after the end-of-life of the product are considered.

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.

GaBi software serves as background database for the calculation..

LCA: Scenarios and additional technical information

Characteristic product properties

Information on biogenic Carbon

The mass of packaging is declared in module A5 and associated biogenic carbon content is listed in the table below. There is no biogenic carbon content in the product.

Information on describing the biogenic Carbon Content at factory gate

Name	Value	Unit
Biogenic carbon content in product	0	kg C
Biogenic carbon content in accompanying packaging (Wooden Pallet)	0.0049	kg C

The following technical information is the basis for the declared modules:

Transport from the gate to the site (A4)

Name	Value	Unit
Amount of fuel	0.000886	kg/100km
Transport distance	500	km
Capacity utilisation (including empty runs)	61	%

Installation (A5)

The following packaging materials are considered on construction site:

Name	Value	Unit
Wooden pallet for Packaging	0.01	Kg/m ²

Installation of the product is done manually. Hence, no additional energy or material is required. Waste generated from offcuts during installation, is used again as overlaps. The packaging wooden pallet goes into incineration after installation of the product. The impacts of incineration are considered in A5 module and subsequent credits of energy recovery from packaging wooden pallet are considered in module D.

End of life (C1-C4)

Name	Value	Unit
Collected as mixed construction waste	0.52	kg
Recycling	0.52	kg
Transport (To Waste processing Site)	100	km
Amount of fuel (For transport to Waste processing Site)	0.00101	kg/100km
Capacity utilisation of Trucks (including empty runs)	50	%

According to an investigation commissioned by S&P (*Report No.: 14-7974-01*), milled material with reinforcement residues of S&P Carbophalt® G 200/200 can be easily recycled and reused in asphalt layers according to the *German Recycling Management Act*.

Reuse, recovery and/or recycling potentials (D), relevant scenario information

The potential benefits from packaging material in module A5 are declared. For waste incineration, combustion in a waste incineration plant (R1 > 0.6) with energy recuperation is considered. Recycling credits after the end-of-life of the product are considered.

LCA: Results

The following table depicts the results of the indicators with the associated magnitude of impact, use of resources as well as waste and other output flows in relation to 1 m² of S&P Carbophalt® G 200/200 with the grammage of 0.52 kg/m².

As End-of-life scenario (EoL) of 100% recycling is considered and subsequent credits are considered in stage D. Since, after the end of life of the product, it is sent to recycling, the impacts in stage C4 (Disposal) is "zero".

In Table 1 "Description of the system boundary", all declared modules shall be indicated with an "X"; all modules that are not declared shall be indicated with "MND" (As default the modules B3, B4, B5 are marked as MNR – module not relevant)

Note: The results declared for EP-freshwater are declared in the unit "P eq." according to the European Platform on Life Cycle Assessment (<http://eplca.jrc.ec.europa.eu/LCDN/developerEF.xhtml>). This web-link is provided in EN 15804+A2, clause 6.3.8.2.

DESCRIPTION OF THE SYSTEM BOUNDARY (X = INCLUDED IN LCA; ND = 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	ND	ND	MNR	MNR	MNR	ND	ND	X	X	X	X	X

RESULTS OF THE LCA - ENVIRONMENTAL IMPACT according to EN 15804+A2: 1 m² S&P Carbophalt® G 200/200

Core Indicator	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
GWP-total	[kg CO ₂ -Eq.]	5.84E+0	1.60E-2	1.82E-2	1.45E-4	3.63E-3	1.39E-3	0.00E+0	-1.34E-2
GWP-fossil	[kg CO ₂ -Eq.]	5.84E+0	1.59E-2	2.70E-4	1.38E-4	3.61E-3	1.38E-3	0.00E+0	-1.33E-2
GWP-biogenic	[kg CO ₂ -Eq.]	-1.79E-2	0.00E+0	1.79E-2	6.42E-6	0.00E+0	2.64E-6	0.00E+0	-5.12E-5
GWP-luluc	[kg CO ₂ -Eq.]	3.18E-3	1.29E-4	1.75E-7	3.33E-9	2.92E-5	5.10E-6	0.00E+0	-2.43E-5
ODP	[kg CFC11-Eq.]	4.62E-14	1.91E-18	2.21E-18	1.48E-20	4.34E-19	5.89E-18	0.00E+0	-2.40E-16
AP	[mol H ⁺ -Eq.]	1.49E-2	1.63E-5	2.60E-6	1.87E-6	3.82E-6	1.30E-5	0.00E+0	-2.21E-5
EP-freshwater	[kg PO ₄ -Eq.]	9.46E-6	4.84E-8	3.29E-10	2.99E-11	1.10E-8	3.31E-9	0.00E+0	-3.45E-8
EP-marine	[kg N-Eq.]	4.45E-3	4.75E-6	8.47E-7	8.50E-7	1.14E-6	6.41E-6	0.00E+0	-6.87E-6
EP-terrestrial	[mol N-Eq.]	4.66E-2	5.72E-5	1.23E-5	9.31E-6	1.37E-5	7.04E-5	0.00E+0	-7.56E-5
POCP	[kg NMVOC-Eq.]	1.26E-2	1.32E-5	2.30E-6	2.55E-6	3.11E-6	1.86E-5	0.00E+0	-1.79E-5
ADPE	[kg Sb-Eq.]	9.12E-7	1.14E-9	3.52E-11	4.19E-12	2.59E-10	1.52E-9	0.00E+0	-3.27E-9
ADPF	[MJ]	1.14E+2	2.12E-1	3.90E-3	1.98E-3	4.81E-2	2.61E-2	0.00E+0	-1.95E-1
WDP	[m ³ world-Eq deprived]	2.44E-1	1.42E-4	1.88E-3	2.74E-7	3.23E-5	2.34E-4	0.00E+0	-1.87E-3

Caption: GWP = Global warming potential; ODP = Depletion potential of the stratospheric ozone layer; AP = Acidification potential of land and water; EP = Eutrophication potential; POCP = Formation potential of tropospheric ozone photochemical oxidants; ADPE = Abiotic depletion potential for non-fossil resources; ADPF = Abiotic depletion potential for fossil resources; WDP = Water (user) deprivation potential

RESULTS OF THE LCA - INDICATORS TO DESCRIBE RESOURCE USE according to EN 15804+A2: 1 m² S&P Carbophalt® G 200/200

Indicator	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
PERE	[MJ]	1.54E+1	1.19E-2	1.51E-1	6.25E-6	2.70E-3	2.20E-3	0.00E+0	-6.48E-2
PERM	[MJ]	1.50E-1	0.00E+0	-1.50E-1	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
PERT	[MJ]	1.55E+1	1.19E-2	7.27E-4	6.25E-6	2.70E-3	2.20E-3	0.00E+0	-6.48E-2
PENRE	[MJ]	1.00E+2	2.12E-1	3.91E-3	1.98E-3	4.81E-2	1.45E+1	0.00E+0	-1.95E-1
PENRM	[MJ]	1.45E+1	0.00E+0	0.00E+0	0.00E+0	0.00E+0	-1.45E+1	0.00E+0	0.00E+0
PENRT	[MJ]	1.14E+2	2.12E-1	3.91E-3	1.98E-3	4.81E-2	2.61E-2	0.00E+0	-1.95E-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
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
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
FW	[m ³]	2.37E-2	1.38E-5	4.41E-5	1.12E-8	3.13E-6	6.83E-6	0.00E+0	-7.51E-5

Caption: PERE = Use of renewable primary energy excluding renewable primary energy resources used as raw materials; PERM = Use of renewable primary energy resources used as raw materials; PERT = Total use of renewable primary energy resources; PENRE = Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials; PENRM = Use of non-renewable primary energy resources used as raw materials; PENRT = Total use of non-renewable primary energy resources; SM = Use of secondary material; RSF = Use of renewable secondary fuels; NRSF = Use of non-renewable secondary fuels; FW = Use of net fresh water

**RESULTS OF THE LCA – WASTE CATEGORIES AND OUTPUT FLOWS according to EN 15804+A2:
1 m² S&P Carbophalt® G 200/200**

Indicator	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
HWD	[kg]	1.71E-6	9.87E-9	2.72E-12	1.92E-13	2.24E-9	5.50E-10	0.00E+0	-7.48E-10
NHWD	[kg]	4.17E-2	3.24E-5	1.30E-4	2.03E-7	7.36E-6	7.86E-6	0.00E+0	-1.08E-4
RWD	[kg]	5.53E-3	2.62E-7	2.23E-7	2.13E-9	5.95E-8	2.10E-7	0.00E+0	-1.38E-5
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
MFR	[kg]	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	5.20E-1	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
EEE	[MJ]	0.00E+0	0.00E+0	2.62E-2	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
EET	[MJ]	0.00E+0	0.00E+0	4.70E-2	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0

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

**RESULTS OF THE LCA – additional impact categories according to EN 15804+A2-optional:
1 m² S&P Carbophalt® G 200/200**

Indicator	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
PM	[Disease Incidence]	1.10E-7	9.71E-11	1.31E-11	1.00E-10	2.24E-11	2.99E-10	0.00E+0	-4.25E-10
IR	[kBq U235-Eq.]	9.03E-1	3.79E-5	3.53E-5	3.04E-7	8.61E-6	1.89E-5	0.00E+0	-1.82E-3
ETP-fw	[CTUe]	3.94E+1	1.50E-1	1.70E-3	1.41E-3	3.40E-2	2.06E-2	0.00E+0	-6.53E-2
HTP-c	[CTUh]	3.03E-9	3.14E-12	1.13E-13	2.64E-14	7.12E-13	4.90E-13	0.00E+0	-2.44E-12
HTP-nc	[CTUh]	3.37E-8	1.61E-10	3.91E-12	1.84E-12	3.65E-11	2.64E-11	0.00E+0	-1.07E-10
SQP	[-]	1.40E+1	7.43E-2	1.09E-3	5.09E-6	1.69E-2	5.78E-3	0.00E+0	-5.81E-2

Caption 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 IRP

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 – for the indicators ADPE, ADPF, WDP, ETP-fw, HTP-c, HTP-nc, SQP

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 experience with the indicator.

References

Standards

EN 15381

EN 15381:2008, Geotextiles and geotextile-related products – Characteristics required for use in pavements and asphalt overlays

ISO 14025

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

ISO 15686

ISO 15686:2011-05, Buildings and constructed assets - Service life planning

EN 15804 +A2

EN15804:2019+A2 (in press), Sustainability of construction works — Environmental Product Declarations — Core rules for the product category of construction products.

IBU

Institut Bauen und Umwelt e.V.: General Programme Instructions for the Preparation of EPDs at the Institut Bauen und Umwelt e.V. Version 1.1, Berlin: Institut Bauen und Umwelt e.V., 2016.
www.ibu-epd.com

Candidate list

List of those eligible for approval substances of very high concern to the European Chemicals Agency, as of June 25, 2020.

CPR

Regulation (EU) No. 305/2011 Construction Product Regulation (CPR)

(EU) Ordinance on Biocide Products No. 528/2012

Regulation (EU) No 528/2012 of the European Parliament and of the Council of 22 May 2012 concerning the making available on the market and use of biocidal products Text with EEA relevance.

GaBi Software

Software & Documentation (Service Pack 40), 2019 Sphera solutions GmbH,
Documentation of GaBi data sets
<http://www.gabi-software.com/international/databases/>

German Recycling Management Act

Kreislaufwirtschaftsgesetz (KrWG), German Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU), 2012

PCR guideline texts for building-related products and services (PCR)

PCR - Part A: Calculation Rules for the Life Cycle Assessment and Requirements on the Project Report, version 1.8, Institut Bauen und Umwelt e.V., www.bau-umwelt.com, 2019

PCR – Part B: Requirements of the EPD Reinforcing and securing systems made from glass fibre composite materials, version 1.6, Institut Bauen und Umwelt e.V., www.bau-umwelt.com, 2017

REACH Regulation

(EC) No. 1907/2006 of the European Parliament and Council of December 18, 2006 for Registration, evaluation, admission and Restriction of chemical substances. List of those eligible for approval substances of very high concern to the European Chemicals Agency, as of June 25, 2020.

Report No.: 14-7974-01

Gogolin, D., Wirkung und Nachhaltigkeit von Asphaltarmierungen, An investigation report commissioned by S&P Clever Reinforcement GmbH, 2015

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