

ENVIRONMENTAL PRODUCT DECLARATION

as per ISO 14025 and EN 15804+A2

Owner of the Declaration	Rieder Smart Elements GmbH & Co KG
Publisher	Institut Bauen und Umwelt e.V. (IBU)
Programme holder	Institut Bauen und Umwelt e.V. (IBU)
Declaration number	EPD-RSE-20250354-IBI3-EN
Issue date	16.09.2025
Valid to	15.09.2030

Glass Fibre Reinforced Concrete Facade concrete skin and öko skin (Matrix 2.2)

Rieder Smart Elements GmbH & Co KG

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1. General Information

Rieder Smart Elements GmbH & Co KG

Programme holder

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

Declaration number

EPD-RSE-20250354-IBI3-EN

This declaration is based on the product category rules:

Fibre cement / Fibre concrete, 01.08.2021
 (PCR checked and approved by the SVR)

Issue date

16.09.2025

Valid to

15.09.2030



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



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

Glass Fibre Reinforced Concrete Facade concrete skin and öko skin (Matrix 2.2)

Owner of the declaration

Rieder Smart Elements GmbH & Co KG
 Glemmerstrasse 21
 5751 Maishofen
 Austria

Declared product / declared unit

The declaration applies to 1 m² glass fibre reinforced concrete facade concrete skin and öko skin with 13 mm thickness.

Scope:

The declaration covers the glass fibre reinforced concrete slabs made in Kolbermoor (Germany) by Rieder Faserbeton-Elemente GmbH, which are used as facade elements. A representative average product is declared. 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 14025:2011	
<input type="checkbox"/>	internally
<input checked="" type="checkbox"/>	externally



Erik Poppe,
 (Independent verifier)

2. Product

2.1 Product description/Product definition

concrete skin and öko skin are facade slabs made from the material fibreC glass fibre reinforced concrete. fibreC is a glass fibre reinforced concrete which consists of sand, cement, glass fibres, pigments, and concrete additives. The material is dyed through with iron oxide based pigments and natural additives. The product concrete skin is a large-format slab, while öko skin are elements in a slat format. In either case, the slabs have a standard thickness of 13 mm.

The declaration applies to the finishes ferro, ferro light and matt, as well as to 24 colours: polar white, off-white, ivory, silver grey, chrome, anthracite, liquid black, cotton, vanilla, Sahara, sandstone, almond, coral, terracotta, oxide red, merlot, burgundy red, larch, oak, walnut, terra, ebony, green, pine green. *Regulation (EU) No 305/2011 (CPR)* applies for putting the product on the market in the EU/EFTA (with the exception of Switzerland). The product requires a declaration of performance in compliance with *DIN EN 12467* in the version of 2018-07, Fibre-cement flat sheets – Product specification and test methods, and the CE label. The respective national regulations apply to its use. Proof of suitability for use in Germany is provided by general construction type approval no. Z-31.4-166 issued by the DIBt (German Institute for Building Technology).

2.2 Application

The glass fibre reinforced concrete slabs are used as cladding material for rear-ventilated curtain facades, as interior and exterior cladding, and for roofing. This means that a complete building shell (including cornice coverings, window cladding and reveals, attics, balcony cladding, plinth, pillar and column cladding, sun protection elements, etc.) can be created using a single material.

2.3 Technical Data

The data shown below applies to the declared product in its delivery condition.

Constructional data

Name	Value	Unit
Thermal conductivity	2	W/(mK)
Gross density	2000 - 2400	kg/m ³
Grammage	26 - 31.5	kg/m ²
Flexural strength	> 18	N/mm ²
Modulus of elasticity (for calculating deformation)	10000	N/mm ²
Modulus of elasticity (for calculating constraint forces))	30000	N/mm ²
Coefficient of thermal expansion	10	10 ⁻⁶ K ⁻¹
Permanent temperature resistance (according to core moisture)	up to 350	°C
Swelling (air-dry to water-saturated)	0.5	mm/m

Product performance values according to the declaration of performance (No. *F02/2019-07-17*) with regard to its essential characteristics in accordance with *DIN EN 12467*, version 2018-07, Fibre-cement flat sheets – Product specification and test methods. The product meets the provisions of *DIN EN 12467*, Category A, Class 4. Fire Class A.

2.4 Delivery status

The standard dimensions for the product concrete skin are 2500 x 1310 x 13 mm, 3100 x 1310 x 13 mm and 3600 x 1310 x 13 mm. Custom cutting and maximum sizes of up to 5000 mm

in length and 1510 mm in width are possible. The standard format for the product öko skin is 1800 x 147 x 13 mm, although custom adjustments are possible here too, taking into account the length to width ratio.

The slabs are delivered to the construction site by truck on individually packed pallets. Foam film is used as a separating layer between the panels to prevent damage. Smaller cut-to-size pieces are placed on top of larger ones, while transport safety is ensured by edge protection and an appropriate number of lashing straps. The truck can only be unloaded with a forklift and/or crane.

2.5 Base materials/Ancillary materials

Composition by mass

Name	Value	Unit
Natural crushed limestone sand	approx 50	%
Cement	approx. 25	%
Additives	approx. 6	%
Pigments	approx. 5	%
Reinforcement	approx. 3	%
Water	approx. 11	%

The product/at least one partial product contains substances included in the *ECHA Candidate List* Substances of Very High Concern (SVHC) (dated 14/03/2023) at a mass % of more than 0.1: **no**.

The product or at least one partial product contains further CMR Category 1A or 1B substances which are not on the *ECHA Candidate List* in quantities above 0.1 mass % in at least one part product: **no**.

The construction product in question has biocides added or was treated with biocidal products (making it a treated good in the meaning of the *Biocidal Products Regulation (EU) No. 528/2012*): **no**.

2.6 Manufacture

The production process for fibreC glass fibre reinforced concrete begins with the storage of raw materials. The first step in the manufacturing process is known as the concrete preparation process. The extrusion process using computer-controlled equipment ensues: the concrete mixture is shaped (wet production). In the ensuing first curing phase, the fluid product solidifies and is moved through a drying tunnel. The solidified product requires a second curing phase on the shelf. In the next step, the protective film is removed. The surface finishing process (finish) – matting or sandblasting – is followed by the cutting phase. In the final step, the sheets are washed and dried, and the surface protection is applied. The last step is the final quality assurance. Finally, safe storage and delivery on Euro pallets is ensured by customised packaging.

A quality management system in accordance with *ISO 9001* is in place.

2.7 Environment and health during manufacturing

Throughout the entire manufacturing process, no health protection measures beyond those stipulated by law for commercial enterprises are required.

An environmental management system in accordance with *ISO 14001* is in place.

2.8 Product processing/Installation

As a rule, the panels are delivered to the construction site already cut to size and drilled. Products can in principle be further processed at the construction site, but the specifications in the handling guidelines available online must be observed.

The slabs are mounted on a metal substructure. Fastening options are:

- Rivets (visible)
- Undercut anchor (not visible)
- Rieder power anchor (not visible)
- Bonding (not visible)

2.9 Packaging

The product is delivered on wood pallets which can be reused or recycled. In addition, cardboard edge protectors and various plastic sheets and films (PE, PP, PVC, EPS) are used for packaging. After use, these packaging materials can be recycled or thermally recovered.

2.10 Condition of use

During the service life of the facade slabs, no changes in material quality are to be expected when used as intended. The recommended cleaning intervals can be found in the handling guidelines.

2.11 Environment and health during use

When used as intended, no negative effects on the environment or health are to be expected.

2.12 Reference service life

No reference service life (RSL) pursuant *ISO 15686* is declared in this EPD.

According to the manufacturer's specifications (including confirmation by an external test), the technical properties of the declared product remain unchanged over a service life of more than 50 years Normal wear and tear as well as visual impairments caused by environmental influences do not affect

the guaranteed mechanical properties or the safety of the elements.

2.13 Extraordinary effects

Fire

The declared product's fire behaviour acc. to *EN 13501-1* is defined as follows:

Fire protection

Name	Value
Building material class	A2
Burning droplets	d0
Smoke gas development	s1

Water

In the event of unforeseen exposure of the product to water, e.g. flooding, no water-polluting substances will be washed out.

Mechanical destruction

There will be no negative consequences for the environment in the event of unforeseen mechanical destruction.

2.14 Re-use phase

After appropriate conditioning, the material can be used in dam and road construction.

2.15 Disposal

The material is approved for disposal in construction waste and bulk waste landfills in accordance with the *Landfill Ordinance*, provided that it is generated during demolition or renovation work.

Waste code acc. to the European Waste Catalogue (AVV):
170101 Concrete

2.16 Further information

More information is available on www.rieder.cc.

3. LCA: Calculation rules

3.1 Declared Unit

The declared unit for this environmental product declaration is a 1 m² panel with a thickness of 13 mm and a weight per unit area of 28.73 kg/m². Conversion to a tonne is possible using the factor specified in the table below. Conversion to slabs with a different weight per unit area within the specified range (acc. to section 2.3) is also possible using the corresponding ratio (target weight per unit area / weight per unit area of the declared unit).

declared unit and mass reference

Name	Value	Unit
Declared unit	1	m ²
Grammage	28.73	kg/m ²
Layer thickness	0.013	m
conversion factor to 1 t	34.807	-

The declared results constitute a representative average based on the sales volumes of the individual products.

3.2 System boundary

This is a 'cradle-to-gate with options' life cycle assessment.

A1–A3 | Product stage

The product stage includes the processes for extracting and processing of the raw materials, auxiliary materials as well as the packaging materials, and the manufacture of the fibre-reinforced concrete elements, including the required energy. The transport of raw and auxiliary materials to the production

plant in Kolbermoor is also assessed. The treatment of production waste is also part of this stage.

C1–C4 | Disposal stage

Two scenarios are considered in the disposal stage, with dismantling/demolition using excavators (C1) being taken into account equally in both scenarios. This stage also includes transport to the waste treatment plant (C2 or C2/1). For the recycling scenario, a shredding process (C3) is considered and a recycling rate of 100% is assumed, which is why no waste disposal processes are considered in C4. In the landfill disposal scenario, all material is sent to landfill. The associated landfill expenditures are accounted for in C4/1.

D | Benefits and loads outside the system boundary

The benefits and loads arising from the recycling and thermal recovery of the production waste are taken into account here (module D and D/1). In addition, the advantages and burdens associated with the recycling scenario at the end of the product's service life are also included (module D only).

3.3 Estimates and assumptions

For environmental impact, the use of green electricity was calculated taking into account the residual electricity mix for the remaining electricity. The share of the electricity requirements covered with green power in the overall electricity requirements is 100%.

The GWP of the electricity mix actually assessed and used in A1–A3 is 21.5 g CO₂eq/kWh, taking into account direct and

indirect emissions.

3.4 Cut-off criteria

All inputs and outputs for which data is available and which are expected to make a significant contribution are included in the life cycle assessment model. Only data with a contribution of less than 1% was excluded, mainly auxiliary materials such as flocculants and blasting agents, as well as the packaging of the preliminary products. Disregarding these material flows is justified in light of the insignificance of the expected effects in combination with an insufficient data basis. No processes, materials or emissions were neglected that are expected to make a significant contribution to the environmental impact of the products under consideration. It can be assumed that the total amount of disregarded input flows does not exceed 5% of the energy and mass input. Expenses for machinery and infrastructure were not considered.

3.5 Background data

Modelling was done using the software *LCA for Experts* (version 10.9.0.31) sold by Sphera Solutions, Inc., based on the integrated database *Managed LCA Content (2024.2)* and complemented in some cases by the database *ecoinvent* (version 3.10.1).

3.6 Data quality

Data was collected in accordance with the principles laid down in *ISO 14044*. In selecting the background data, attention was paid to the technological, geographical and temporal representativeness of the data basis. In the absence of specific data, generic data sets or a representative average were used.

The declared average results can be assumed to be highly robust, as only the input materials vary to a small extent. Only one production site is considered, with the production process being practically identical for all products from a technical point of view.

3.7 Period under review

The foreground production data was collected for the year 2023. All values therefore represent an average over this period.

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: Germany

3.9 Allocation

General information

The product's material-inherent properties are allocated according to the physical criterion of mass.

Module A1–A3

Upstream processes in the supply chain (A1–A3) are mapped using MLC Professional background data sets. The gathered foreground data exclusively relates to the declared product. No co-products are created during production so that no allocation is necessary in this context. In the background data used, co-product allocations may be part of the system.

Modules C and D

At the end of its life cycle, the declared product is either recycled or disposed of in a landfill. No allocation is necessary for the recycling scenario. The data set selected for landfill disposal is a multi-input process. Allocation is therefore based on the selected MLC background data set.

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 (2024.2)* is used as the background database.

4. LCA: Scenarios and additional technical information

Characteristic product properties of biogenic carbon

No biogenic carbon is stored in the declared product itself. Due to carbon storage in the packaging (wooden pallet & cardboard box), the absorption of 1.1620 kg of biogenic C/m² is taken into account in module A1–A3. The stored carbon is released when the packaging is recycled. However, as the corresponding module A5 is not declared, the stored carbon in A1–A3 is considered 'CO₂-neutral' according to the *PCR Part A* specifications.

Information describing the biogenic carbon content at the factory gate

Name	Value	Unit
Biogenic carbon content in product	-	kg C
Biogenic carbon content in accompanying packaging	1.162	kg C

Note: 1 kg of biogenic carbon is equivalent to 44/12 kg of CO₂.

The following technical information is the basis for the declared modules or can be used for the development of specific scenarios in the context of a building assessment if no modules are declared (MND). Unless otherwise specified, the values in the following tables refer to the declared unit of 1 m² (= 28.73 kg).

Installation into the building (A5)

Module A5 is not declared in this EPD. The table below therefore only lists the quantities of packaging materials per m² as technical scenario information.

Name	Value	Unit
Wood packaging	2.5200	kg
Cardboard packaging	0.0919	kg
PE film	0.073	kg
PP film	0.0431	kg
PVC film	0.0115	kg
EPS packaging	0.0086	kg

End of life (C1-C4)

Two scenarios are considered at the end of the product life cycle. First, a recycling scenario (processing by shredding) and second, a landfill disposal scenario in which all of the material is deposited. As for transport, a distance of 100 km by truck (capacity utilisation = 55%) is considered for both scenarios.

Name	Value	Unit
Collected separately waste type mineral waste	28.73	kg
Recycling in scenario C3	28.73	kg
Landfilling in scenario C4/1	28.73	kg

Reuse, recovery and recycling potential (D), relevant scenario details

For the recycling scenario, module D assesses the substitution of aggregate with crushed concrete granulate (from C3). In addition, both D and D/1 take into account the impacts and benefits from the module A1-A3 outputs.

As no secondary raw materials are used in the manufacture of the product, the gross outputs from modules A3 and C3 correspond in principle to the net flows assessed in modules D and D/1. The exception to this is metal waste from A3, as this enters the system without any burdens on the input side and is

therefore not taken into account in module D.

Name	Value	Unit
Recovered material from C3	28.73	kg
Recovered material from A3	9.17	kg
Energy recovered (elec.) from A3	1.94	MJ
Energy recovered (therm.) from A3	4.49	MJ

5. LCA: Results

The results for 1 m² of glass fibre reinforced concrete facade slabs with a thickness of 13 mm and a weight per unit area of 28.73 kg/m² are shown below.

The characterisation factors according to EN 15804, EF 3.1 are used for the calculations.

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	MND	MND	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 glass fibre reinforced concrete facade

Parameter	Unit	A1-A3	C1	C2	C2/1	C3	C3/1	C4	C4/1	D	D/1
GWP-total	kg CO ₂ eq	2.13E+01	1.82E-02	2.92E-01	2.92E-01	1.73E-02	0	0	4.34E-01	-6.13E-01	-5.57E-01
GWP-fossil	kg CO ₂ eq	2.12E+01	1.78E-02	2.87E-01	2.87E-01	1.67E-02	0	0	4.3E-01	-6.1E-01	-5.53E-01
GWP-biogenic	kg CO ₂ eq	7.08E-02	7.04E-05	6.86E-04	6.86E-04	3.14E-04	0	0	1.37E-03	-2.19E-03	-3.42E-03
GWP-luluc	kg CO ₂ eq	3.28E-02	2.99E-04	4.83E-03	4.83E-03	2.91E-04	0	0	2.58E-03	-7.83E-04	-3.26E-04
ODP	kg CFC11 eq	1.06E-10	1.8E-15	4.23E-14	4.23E-14	1.75E-15	0	0	1.17E-12	-7.49E-12	-7.08E-12
AP	mol H ⁺ eq	3.68E-02	8.88E-05	4.31E-04	4.31E-04	1.75E-04	0	0	3.05E-03	-8.93E-04	-6.02E-04
EP-freshwater	kg P eq	6.09E-05	7.61E-08	1.23E-06	1.23E-06	7.4E-08	0	0	9.8E-07	-1.7E-06	-1.47E-06
EP-marine	kg N eq	1.01E-02	4.17E-05	1.62E-04	1.62E-04	8.5E-05	0	0	7.86E-04	-3.26E-04	-2.22E-04
EP-terrestrial	mol N eq	1.05E-01	4.63E-04	1.92E-03	1.92E-03	9.38E-04	0	0	8.66E-03	-3.52E-03	-2.37E-03
POCP	kg NMVOC eq	2.94E-02	1.19E-04	4.29E-04	4.29E-04	2.5E-04	0	0	2.41E-03	-8.54E-04	-5.71E-04
ADPE	kg Sb eq	3.81E-06	1.52E-09	2.5E-08	2.5E-08	1.48E-09	0	0	2.79E-08	-6.31E-08	-5.69E-08
ADPF	MJ	2.09E+02	2.33E-01	3.79E+00	3.79E+00	2.26E-01	0	0	5.67E+00	-9.2E+00	-8.34E+00
WDP	m ³ world eq deprived	9.46E-01	2.65E-04	4.45E-03	4.45E-03	2.58E-04	0	0	4.91E-02	-1.48E-02	-7.95E-03

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 glass fibre reinforced concrete facade

Parameter	Unit	A1-A3	C1	C2	C2/1	C3	C3/1	C4	C4/1	D	D/1
PERE	MJ	9.56E+01	1.97E-02	3.26E-01	3.26E-01	1.91E-02	0	0	9.93E-01	-3.74E+00	-3.42E+00
PERM	MJ	4.56E+01	0	0	0	0	0	0	0	0	0
PERT	MJ	1.41E+02	1.97E-02	3.26E-01	3.26E-01	1.91E-02	0	0	9.93E-01	-3.74E+00	-3.42E+00
PENRE	MJ	2.05E+02	2.33E-01	3.79E+00	3.79E+00	2.26E-01	0	0	5.67E+00	-9.2E+00	-8.34E+00
PENRM	MJ	4.03E+00	0	0	0	0	0	0	0	0	0
PENRT	MJ	2.09E+02	2.33E-01	3.79E+00	3.79E+00	2.26E-01	0	0	5.67E+00	-9.2E+00	-8.34E+00
SM	kg	0	0	0	0	0	0	0	0	3.79E+01	9.17E+00
RSF	MJ	0	0	0	0	0	0	0	0	0	0
NRSF	MJ	0	0	0	0	0	0	0	0	0	0
FW	m ³	8.7E-02	2.21E-05	3.63E-04	3.63E-04	2.15E-05	0	0	1.5E-03	-1.39E-03	-1.11E-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 glass fibre reinforced concrete facade

Parameter	Unit	A1-A3	C1	C2	C2/1	C3	C3/1	C4	C4/1	D	D/1
HWD	kg	4.68E-04	7.52E-12	1.45E-10	1.45E-10	7.32E-12	0	0	1.42E-09	-8.45E-09	-7.9E-09
NHWD	kg	1.14E+00	3.62E-05	6.18E-04	6.18E-04	3.52E-05	0	0	2.88E+01	-1.39E+00	-1.96E-01
RWD	kg	3.81E-03	3.01E-07	6.9E-06	6.9E-06	2.92E-07	0	0	5.87E-05	-3.6E-04	-3.04E-04
CRU	kg	0	0	0	0	0	0	0	0	0	0

MFR	kg	9.26E+00	0	0	0	2.87E+01	0	0	0	0	0
MER	kg	0	0	0	0	0	0	0	0	0	0
EEE	MJ	1.94E+00	0	0	0	0	0	0	0	0	0
EET	MJ	4.49E+00	0	0	0	0	0	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 glass fibre reinforced concrete facade

Parameter	Unit	A1-A3	C1	C2	C2/1	C3	C3/1	C4	C4/1	D	D/1
PM	Disease incidence	9.8E-07	1.05E-09	4.16E-09	4.16E-09	5.13E-09	0	0	3.83E-08	-2.55E-08	-8.22E-09
IR	kBq U235 eq	4.24E-01	4.2E-05	1E-03	1E-03	4.08E-05	0	0	6.68E-03	-4.15E-02	-3.23E-02
ETP-fw	CTUe	7.35E+01	1.71E-01	2.81E+00	2.81E+00	1.67E-01	0	0	3.27E+00	-1.83E+00	-1.39E+00
HTP-c	CTUh	5.75E-09	3.43E-12	5.67E-11	5.67E-11	3.37E-12	0	0	7.72E-11	-1.06E-10	-9.16E-11
HTP-nc	CTUh	1.36E-07	1.53E-10	2.55E-09	2.55E-09	1.51E-10	0	0	2.98E-09	-3.84E-09	-3.26E-09
SQP	SQP	8.11E+02	1.15E-01	1.86E+00	1.86E+00	1.12E-01	0	0	1.62E+00	-2.7E+00	-2.34E+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 resource and waste related indicators are generally only influenced by one module (contribution > 95%). With one exception, this is module A1–A3, as expected. For the indicator relating to non-hazardous waste, landfill disposal of the declared product (module C4) is dominant.

The deviations of the results for the individual products from the declared representative averages are mostly less than 5% for module A1–A3. Significant deviations only exist for the HWD and NHWD indicators. This is due to the variable portions of concrete additives regarding the former and the different colourants regarding the latter indicator. There are no deviations in the other modules (C & D), as the same processes with identical material and energy flows are relevant in all cases.

With regard to the impact assessment indicators, it turns out

that the manufacturing phase (A1–A3) contributes the most by far. For the indicator GWP-luluc, the contribution of A1–A3 is approximately 80%; for all other indicators, it is > 90%. A more in-depth examination of module A1–A3 reveals a rather heterogeneous picture – depending on the indicator, there are various influencing factors that contribute significantly to the overall result.

The deviations of the indicators for the impact assessment for individual products in relation to the declared values for module A1–A3 are > 10% for the indicators ADPE and GWP-luluc. For GWP-luluc, the deviations are primarily caused by the different transport distances and the corresponding fuel consumption for the delivery of raw materials. Deviations with regard to ADPE are due to the pigments.

7. Requisite evidence

7.1 Radioactivity

In Germany, there are currently no legally defined limits for assessing the radioactivity of building materials. The analytical results (Seibersdorf Laboratories, analytical report LR-RS127-1/11 dated 9 April 2011) refer to a test in accordance with ÖNORM S 5200:2009 (Test A).

Radioactivity

Name	Value	Unit
K-40	227	Bq/kg
U-238 sec	28	Bq/kg
TH-232 sec	19	Bq/kg

7.2 Leaching

The leaching behaviour of fibreC concrete fibre slabs was determined in a trough test carried out in accordance with the guideline LAGA Richtlinie EW 98 T. The analyses were carried

out at the Faculty of Civil Engineering at the Leopold Franzens University of Innsbruck (analytical report B13/12 Saa dated 14 August 2012).

Leaching

Name	Value	Unit
Aluminium (as Al)	6.3	mg/kg TS
Antimony (as Sb)	< 0.01	mg/kg TS
Arsenic (as As)	< 0.01	mg/kg TS
Barium (as Ba)	0.47	mg/kg TS
Lead (as Pb)	< 0.01	mg/kg TS
Cadmium (as Cd)	< 0.005	mg/kg TS
Cobalt (as Co)	< 0.01	mg/kg TS
Chromium total (as Cr)	< 0.01	mg/kg TS
Manganese (as Mn)	< 0.02	mg/kg TS
Iron (as Fe)	0.17	mg/kg TS
Copper (as Cu)	0.025	mg/kg TS
Molybdenum (as Mo)	< 0.01	mg/kg TS
Nickel (as Ni)	< 0.01	mg/kg TS
Mercury (as Hg)	< 0.001	mg/kg TS
Selenium (as Se)	< 0.02	mg/kg TS
Zinc (as Zn)	< 0.01	mg/kg TS
Tin (as Sn)	< 0.01	mg/kg TS

8. References

Standards

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.

EN 12467

DIN EN 12467, Fibre-cement flat sheets – Product specification and test methods.

ISO 14025

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

ISO 14040

DIN EN ISO 14040:2021-02, Environmental management – Life cycle assessment – Principles and framework (ISO 14040:2006 + Amd 1:2020).

ISO 14044

DIN EN ISO 14044:2021-02: Environmental management – Life cycle assessment – Requirements and guidelines (ISO 14044:2006 + 1:2017 + Amd 2:2020).

EN 15804

DIN EN 15804:2022--03, Sustainability of construction works – Environmental product declarations – Core rules for the product category of construction products.

EN 15941

EN 15941:2024, Sustainability of construction works – Data quality for environmental assessment of products and construction work – Selection and use of data.

Further references

Landfill Ordinance

Ordinance on landfills and long-term storage facilities (Deponieverordnung – DepV). Landfill Ordinance of 27 April 2009 (Federal Legal Gazette I p. 900), last amended by article 3 of the law of 3 July 2024 (Federal Legal Gazette 2024 p. 225).

7.3 VOC emissions

VOC emissions were measured by the eco-Institut (Cologne) (analytical report 35964-001 dated 19 June 2012).

AgBB overview of results (28 days [$\mu\text{g}/\text{m}^3$])

Name	Value	Unit
TVOC (C6 - C16)	251	$\mu\text{g}/\text{m}^3$
Sum SVOC (C16 - C22)	-	$\mu\text{g}/\text{m}^3$
R (dimensionless)	0.904	-
VOC without NIK	-	$\mu\text{g}/\text{m}^3$
Carcinogenic Substances	-	$\mu\text{g}/\text{m}^3$

AgBB Overview of results (3 days [$\mu\text{g}/\text{m}^3$])

Name	Value	Unit
TVOC (C6 - C16)	595	$\mu\text{g}/\text{m}^3$
Sum SVOC (C16 - C22)	-	$\mu\text{g}/\text{m}^3$
R (dimensionless)	1.133	-
VOC without NIK	-	$\mu\text{g}/\text{m}^3$
Carcinogenic Substances	-	$\mu\text{g}/\text{m}^3$

AVV

Waste Catalogue Ordinance (AVV) of 10 December 2001 (Federal Legal Gazette I p. 3379), last amended by article 1 of the ordinance of 30 June 2020 (Federal Legal Gazette I p. 1533).

ECHA Candidate List

Candidate List of Substances of Very High Concern (published pursuant to article 59 (10) of the REACH Regulation).

ecoinvent

LCA database – ecoinvent (3.10.1) Ecoinvent Association, Zurich, Switzerland.

IBU 2022

General Instructions for the EPD programme of Institut Bauen und Umwelt e.V., version 2.1, dated 01/10/2022.

LCA for Experts

LCA software – LCA for Experts (10.9.0.31) Sphera Solutions Inc., Chicago, USA.

Managed LCA Content

LCA database – Managed LCA content (2024.2) Sphera Solutions Inc., Chicago, USA.

PCR part A

Product Category Rules for Building-Related Products and Services Part A: Calculation Rules for the Life Cycle Assessment and Requirements on the Project Report according to EN 15804+A2:2019, version 1.4, dated 15/04/2024.

PCR: Fibre cement / Fibre concrete

PCR Guidance-Texts for Building-Related Products and Services Requirements on the EPD for Fibre cement / Fibre concrete, version 6, dated 01/08/2024.

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

Regulation (EU) No 305/2011 of the European Parliament and Council of 9th March 2011 laying down harmonised conditions for the marketing of construction products and repealing Council Directive 89/106/EEC.

Z-31.4-166

General construction type approval (Allgemeine

Bauartgenehmigung, aBG) Nr Z-31.4-166 für Hinterlüftete
Außenwandbekleidungen aus großformatigen Glasfaserbeton

Tafeln "fibreC" acc. to DIN EN 12467.



Publisher

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