ENVIRONMENTAL PRODUCT DECLARATION

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

Owner of the Declaration	Bundesverband der Deutschen Ziegelindustrie e.V.
Publisher	Institut Bauen und Umwelt e.V. (IBU)
Programme holder	Institut Bauen und Umwelt e.V. (IBU)
Declaration number	EPD-BDZ-20230090-ICG3-EN
Issue date	06.10.2023
Valid to	04.04.2028

Brick Slips

Bundesverband der Deutschen Ziegelindustrie e.V.

Institut Bauen und Umwelt e.V.

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Röben TONBAUSTOFFE

Presented by the participant company:

Röben Tonbaustoffe GmbH, 26340 Zetel, www.roeben.com

1. General Information

Bundesverband der Deutschen Ziegelindustrie e.V.

Programme holder

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

Declaration number

EPD-BDZ-20230090-ICG3-EN

This declaration is based on the product category rules:

Bricks, 01.08.2021
(PCR checked and approved by the SVR)

Issue date

06.10.2023

Valid to

04.04.2028

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

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

Brick Slips

Owner of the declaration

Bundesverband der Deutschen Ziegelindustrie e.V.
Reinhardtstraße 12-16
10117 Berlin
Germany

Declared product / declared unit

1 m² brick slips

Scope:

Application of this document is restricted to brick slips manufactured by member companies of the Bundesverband der Deutschen Ziegelindustrie e.V. For this Declaration, data from 2021 was made available by 3 member companies and a total of 3 production locations. These members represent around 65% of the manufacturers of brick slips united in the federal association. Depending on their respective production quantities, the production volume of these companies accounts for approx. 80% of the German market.
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
☐ internally ☒ externally

Matthias Klingler,
(Independent verifier)

2. Product

2.1 Product description/Product definition

Brick slips belong to the group of coarse ceramic fired clay building materials.
Based on mass-related annual production, the shares contributed to overall production by the individual companies were identified and used to calculate the weighted average values. This EPD presents the LCA results for one square metre (1 m²) of brick slips. EU) Directive No. 305/2011 (CPR) applies for placing the product on the market in the EU/EFTA (with the exception of Switzerland). The products require a Declaration of Performance taking consideration of the DIN EN 14411: 2016-12: Ceramic tiles – Definitions, classification, characteristics, assessment and verification of constancy of performance and marking for brick slips and CE marking.

2.2 Application

Brick slips are used as exterior or interior cladding on wall constructions.

2.3 Technical Data

Structural data

Name¤	Value¤	Representative·product¤	Unit¤
Resistance·to·frost/dew·acc.·to·DIN·52252-1·or·DIN·EN·ISO·10545-12¤	fulfilled¤	fulfilled¤	-¤
Water·absorption·acc.·to·DIN·EN·772-·21·or·DIN·DIN·10545-3¤	no·restriction¤	no·restriction¤	%·by·mass¤
Bulk·density·acc.·to·DIN·EN·772-13¤	1600·-·2500¤	2100¤	kg/m³¤
Active·soluble·salts·acc.·to·DIN·EN·772-5¤	S2-S3¤	S3¤	-¤

DIN 18515-1: 2017, applies for use; DIN EN 14411 and/or DIN EN 771-1 apply for the brick slips.

2.4 Delivery status

Brick slips are available in various shapes and sizes depending on the respective application. The respective dimensions and permissible tolerances are regulated in the following standard:

- DIN EN 14411 and/or EN 771-1.

2.5 Base materials/Ancillary materials

Brick slips comprise the base materials of clay/loam (around 92%) and sand (around 8%).

Clay/loam: natural earth of varying natural mineralogical composition (aluminium oxide (Al2O3), silicon oxide (SiO2), iron(III)oxide (Fe2O3)). Materials are quarried close to the surface in selected natural mineral deposits.

Other natural clay components: Clay/loam contains natural deposit components of varying percentages such as colouring ferrous oxide, for example.
For this reason, various fired colours can arise depending on the clay involved. Clay/loam can also contain lime and dolomite.

Sand and firing waste are added as shortening material for offsetting the natural fluctuations in the mineralogical composition of the raw clay for very plastic (fine-grain) clays.

Manganese oxide and iron oxide are used to achieve certain colours.

The product / At least one partial product contains substances from the ECHA list of candidates of Substances of Very High Concern (SVHC) (date: 15.11.2022) exceeding 0.1% by mass: no
The product / At least one partial product contains other CMR substances in categories 1A or 1B which are not on the candidate list, exceeding 0.1% by mass in at least one partial product: no
Biocide products were added to this construction product or it has been treated with biocide products (this then concerns a treated product as defined by the (EU) Ordinance on Biocide Products No. 528/2012): no

2.6 Manufacture

Pit operation
The main components (loam and clay) are extracted in opencast mines. After the topsoil has been removed and, if necessary, archaeological sites have been processed, extraction is usually carried out with excavators. Depending on the road conditions, transport entails the use of suitable trucks. Conveyor belts can be used for short distances. When the pits are exhausted, they are recultivated in accordance with nature conservation guidelines and, if necessary, returned to their previous use.

Processing raw materials
The individual raw material components are sampled and analysed in the laboratory for their ceramic properties and their mineralogical and chemical compositions. In the processing stage, the components are combined into the operating mass according to their ceramic properties, homogenised and stored.

Forming
The production mass is extruded and cut to the respective formats using cutters.
Various parameters such as press vacuum, moisture and plasticity are checked regularly. Excess operating mass and faulty pressings are returned in full to the mass circuit.

Drying
Drying serves as preparation of the plastic brick slip for the subsequent firing process and takes place over 1–2 days at approx. 60–-120 °C, depending on the model. Due to its shrinkage behaviour, the ceramic material reacts very sensitively and must therefore be dried under defined conditions. Various drying parameters and the residual moisture are constantly monitored. Dried brick slips that have been sorted out (dry quarry) are returned to the production mass in the raw material preparation department.

Firing
The brick slips are fired in tunnel kilns and bogie hearth furnaces at approx. 1000–1200 °C using natural gas. The firing time incl. the heating and cooling phase is approx. 1–2 days. The firing process gives the brick slips their ceramic properties, which make them durable and long-lasting.

Quality control The requisite ceramic quality properties according to EN 14411 and/or EN 771-1 and the product dimensions to be adhered to are regularly controlled internally in the factory's own production control and additionally

monitored externally at least once a year.

2.7 Environment and health during manufacturing

Health protection during manufacturing

Safety experts are appointed for occupational health and safety and company doctors are available in the factories with regular consultation hours.
If necessary, the flue gas from the fire is purified in flue gas purification plants. The emission values are monitored regularly and fall below the limits permitted under the Federal Immission Control Act (BImSchG). Noise and dust emissions are also controlled and the limits are strictly observed. Waste generated during the production of brick slips is collected separately, recycled or disposed of properly according to the waste codes. The energy input for brick slip production is kept as low as possible and the specific energy requirement is constantly improved.
Energy management systems according to ISO 50001 or alternative systems according to SpaEfv for SMEs are operated at all production sites.

2.8 Product processing/Installation

Brick slips are glued or mortared to solid substrates or insulating materials.

2.9 Packaging

The polyethylene (PE) foils are recyclable. Non-contaminated PE foils (ensure single-variety collection) and reusable pallets made of wood are taken back by the building trade (reusable pallets against deposit payments) and returned to the brickworks which redirect foils to disposal companies via a contractual agreement.

2.10 Condition of use

Brick slips are regarded as being very durable and resilient. Material composition is not altered during use.

2.11 Environment and health during use

Cutting, drilling and grinding of ceramic building materials such as brick slips releases dust that may contain respirable quartz components. Wet cutting equipment or equipment with dust extraction should be used to avoid the release of dust. For protection, a suitable dust mask should be worn as personal protective equipment in addition to gloves, safety goggles and ear protection.

2.12 Reference service life

When installed in accordance with the rules of technology, the Reference Service Life (RSL) is 150 years (PCR document issued by the European Brick and Tile Industry Association (TBE)).

2.13 Extraordinary effects

Fire

In the event of a fire, no toxic gases and vapours can arise which impair visibility. Brick slips comply with the requirements of building material class A1 in accordance with DIN 4102 (and/or EN 13501-2) 'not flammable'.

fire protection

Name	Value
Building material class	A1
Burning droplets	
Smoke gas development	

Water

When influenced by water (e.g. driving rain), no water-polluting components can be washed out thanks to the solid, ceramic bond.

Mechanical destruction

Unforeseen mechanical destruction is not associated with any risks for the environment or living organisms.

2.14 Re-use phase

Single-variety brick slips can be taken back by the manufacturers and reused in ground form as leaning agents in production. This practice has been applied with broken product for decades. The possibilities of further use are as aggregate for crushed brick concrete, as filling or bulk material in the area of road construction and civil engineering, as substrate in garden design and landscape gardening, as material for refilling mines and quarries, when building sound barriers and as tennis powder and tennis sand.

2.15 Disposal

Where these recycling options are not practical, brick slip residue, broken brick slips and leftover brick slips incurred on the building site are easy to dispose of and do not pose any extraordinary risks for the environment. Owing to the chemically neutral, inert and immobile nature of brick slips, they can be stored in class I landfills in accordance with the Landfill Ordinance and/or used in mines and quarried in accordance with Z 1.1. The waste code is AVV 17 01 02 Bricks and Tiles (List of Wastes Ordinance (AVV)).

2.16 Further information

More information is available at www.ziegel.de.

3. LCA: Calculation rules

3.1 Declared Unit

The Declaration refers to 1 m² wall comprising brick slips (brick slip size (mm): 240 x 71 x 14, mortar joint: 12, joint material not considered).

declared unit

Name	Value	Unit
Gross density	2100	kg/m^3
conversion factor	0,024	t/m²
declared unit	1	m²
layer thickness	0,014	m
grammage	24	kg/m2

Other declared units are allowed if the conversion is shown transparently.

3.2 System boundary

Type of EPD: cradle to plant gate – with options. The Life Cycle Assessment takes into account the extraction of raw materials, the transport of raw materials and actual product manufacturing, including packaging materials (Modules A1–A3). Transport to the construction site (Module A4) and treatment of the packaging materials in the waste incineration plants following installation of the product (Module A5) are also part of the system boundaries. At the end of its useful life, the product is deconstructed using a digger (Module C1). After transport of the deconstructed product (Module C2), about 6% of the brick slips are to be disposed of in an inert waste landfill (Module C4), 94% can be reused after processing (Module C3). Credits incurred by recycling firing waste are declared in Module D. Credits for electricity and thermal energy following thermal utilisation of packaging within Module A5 are also considered in Module D/1.

3.3 Estimates and assumptions

Data sets are not available for all raw materials or preliminary products in the GaBi 10 database. For some substances, the processes were estimated with preliminary products similar in production and environmental impact. Assumptions are made regarding the collated production-related emissions. For companies that are not subject to monitoring by the competent authorities for selected parameters and thus cannot provide measured values, an estimate is made based on the information provided by the other companies.

3.4 Cut-off criteria

All data from the operating data survey is taken into consideration, i.e. all starting materials used according to the formula, auxiliary materials as well as the thermal and electrical energy used. Accordingly, material and energy flows accounting for a share < 1% are also considered. All data provided is integrated in the LCA model.
Transport costs are included for all basic materials, the shipping of products (A4) and in the end-of-life scenario (C2). The wear factor of the wooden pallet as well as the machinery, equipment and infrastructure required in production are neglected. It can be assumed that the processes ignored would each have contributed less than 5% to the impact categories under review.

3.5 Background data

The GaBi 10 software system for comprehensive analysis developed by thinkstep AG was used for modelling the brick slip manufacturing process. The consistent data sets contained in the GaBi 10 database are documented in the online GaBi documentation. The basic data in the GaBi database was applied for energy, transport and consumables. The Life Cycle Assessment was modelled for Germany as a reference area. This means that apart from the production processes, the preliminary stages also of relevance for Germany, such as provision of electricity or energy carriers, are used. The general electricity mix, thermal energy from natural gas and liquid gas for Germany with the reference year 2018 are taken into account. Emissions from the firing process are recorded as primary data on the basis of measurements taken by members of the Bundesverband der Deutschen Ziegelindustrie e.V.

3.6 Data quality

Data for the production year 2021 is used to model the product stage of the brick slips. All other background data sets of relevance were taken from the GaBi 10 software database. The database was last updated in 2022. Data is collected on the products examined by the research agency of the Bundesverband der Deutschen Ziegelindustrie e.V. in the actual plants. The deviations in the environmental impacts in the course of the averaging carried out for the raw materials used and media consumption of the participating plants are small. The majority of data for upstream chains originates from industrial sources and was collected under consistent time- and method-based constraints. Importance is attached to a high degree of completeness when collating material and energy flows of environmental relevance. The data quality can therefore be regarded as good.

3.7 Period under review

2021 is the period under review. The data represents an annual average over 12 months.

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

Production data from 3 plants was made available for manufacturing the products under review. The requisite raw materials were allocated to the respective products in line with their recipes.
Allocation of the product-specific applications entailed allocating fuels and packaging materials by volume produced while electricity and diesel requirements as well as indirectly allocable raw materials were allocated by mass.

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. The background data is taken from the GaBi 10 database 2022 (version 10.6.1.35).

4. LCA: Scenarios and additional technical information

Characteristic product properties of biogenic carbon

Biogenic carbon
The total mass of biogenic carbonaceous materials and associated packaging is less than 5% of the total mass of the product. The packaging materials contain 0.075 kg biogenic carbon.

Transport to construction site (A4)

Name	Value	Unit
Litres of fuel	0.1	l/100km
Transport distance	230	km
Capacity utilisation (including empty runs)	85	%

Construction installation process (A5)

Name	Value	Unit
Output substances following waste treatment on site	0.5	kg

Environmental impact caused by installation losses is not included in the LCA results as they are dependent on the construction project and can vary. The LCA results for a specific installation loss can be calculated for additional environmental impact caused by the manufacture and disposal of installation losses.
If a Reference Service Life is declared in accordance with the applicable ISO standards, the assumptions and conditions of use based on the RSL established must be declared. Furthermore, reference must be made to the fact that the declared RSL only applies under the reference conditions of use referred to. The same shall apply for a service life declared by the manufacturer.

The corresponding information on reference conditions of use do not need to be declared for a service life in accordance with the BNB Table.

Reference service life

Name	Value	Unit
Life Span Life cycle acc. to manufacturer	150	a

End of Life (C1-C4)

Name	Value	Unit
Collected separately waste type	24	kg
Recycling	22.54	kg
Landfilling	1.46	kg

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

Name	Value	Unit

Scenario D: Credits as a result of the recycling of building rubble processing.
At the End-of-Life stage of brick slips, a material credit for gravel is applied under this recycling scenario.

Scenario D/1: Credits resulting from the thermal utilisation of packaging materials (from Module A5) are shown in Module D/1.

5. LCA: Results

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 Riemchen

Parameter	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D	D/1
GWP-total	kg CO_2 eq	5.8E+00	3.64E-01	2.48E-01	1.48E-02	3.96E-02	5.99E-02	2.21E-02	-4.5E-02	-5.46E-01
GWP-fossil	kg CO_2 eq	5.8E+00	3.63E-01	1.77E-01	1.53E-02	3.94E-02	5.95E-02	2.15E-02	-4.48E-02	-1.05E-01
GWP-biogenic	kg CO_2 eq	1.43E-03	1.49E-04	6.98E-02	-6.49E-04	1.62E-05	1.46E-04	6.55E-04	-2.73E-05	-1.08E-03
GWP-luluc	kg CO_2 eq	1.9E-03	1.35E-03	4.42E-07	5.49E-05	1.47E-04	1.82E-04	4.09E-05	-1.03E-04	-2.54E-05
ODP	kg CFC11 eq	1.39E-09	5.16E-14	1.4E-14	2.09E-15	5.6E-15	1.61E-13	5.25E-14	-3.57E-13	-1.79E-12
AP	mol H^+ eq	4.79E-03	3.22E-04	3.33E-05	7.19E-05	3.49E-05	2.93E-04	1.57E-04	-1.49E-04	-1.11E-04
EP-freshwater	kg P eq	1.03E-05	7.48E-07	3.76E-09	3.04E-08	8.12E-08	1.37E-07	3.76E-08	-1.27E-07	-3.3E-07
EP-marine	kg N eq	1.86E-03	1.04E-04	9.44E-06	3.41E-05	1.13E-05	1.37E-04	4.01E-05	-5.84E-05	-4.05E-05
EP-terrestrial	mol N eq	2.04E-02	1.25E-03	1.54E-04	3.78E-04	1.36E-04	1.51E-03	4.4E-04	-6.42E-04	-4.28E-04
POCP	kg NMVOC eq	5.39E-03	2.79E-04	2.62E-05	9.56E-05	3.04E-05	3.68E-04	1.22E-04	-1.37E-04	-1.03E-04
ADPE	kg Sb eq	7.77E-07	3.74E-08	3.39E-10	1.52E-09	4.07E-09	6.77E-08	2.29E-09	-1.01E-08	-4.03E-08
ADPF	MJ	9.31E+01	4.81E+00	3.8E-02	1.96E-01	5.23E-01	1.13E+00	2.91E-01	-5.91E-01	-1.57E+00
WDP	m^3 world eq deprived	1.75E-01	1.42E-03	2.35E-02	5.78E-05	1.54E-04	1.01E-02	2.4E-03	-1.12E-03	-1.58E-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 Riemchen

Parameter	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D	D/1
PERE	MJ	1.13E+01	2.85E-01	6.59E-01	1.16E-02	3.1E-02	1.11E-01	4.36E-02	-1.87E-01	-8.16E-01
PERM	MJ	6.51E-01	0	-6.51E-01	0	0	0	0	0	0
PERT	MJ	1.2E+01	2.85E-01	8.8E-03	1.16E-02	3.1E-02	1.11E-01	4.36E-02	-1.87E-01	-8.16E-01
PENRE	MJ	9.31E+01	4.81E+00	1.19E+00	1.96E-01	5.23E-01	1.13E+00	2.91E-01	-5.91E-01	-1.57E+00
PENRM	MJ	1.15E+00	0	-1.15E+00	0	0	0	0	0	0
PENRT	MJ	9.42E+01	4.81E+00	3.8E-02	1.96E-01	5.23E-01	1.13E+00	2.91E-01	-5.91E-01	-1.57E+00
SM	kg	0	0	0	0	0	2.25E+01	0	0	0
RSF	MJ	0	0	0	0	0	0	0	0	0
NRSF	MJ	0	0	0	0	0	0	0	0	0
FW	m^3	9.69E-03	2.48E-04	5.49E-04	1.01E-05	2.71E-05	2.93E-04	7.33E-05	-9.91E-05	-2.48E-04

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 Riemchen

Parameter	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D	D/1
HWD	kg	3.02E-08	2.23E-11	3.68E-12	9.05E-13	3.1E-12	1.52E-11	1.49E-11	-2.62E-11	-2.79E-10
NHWD	kg	5.85E-02	7.62E-04	2.5E-03	3.1E-05	1.06E-04	3.37E-04	1.49E+00	-4.01E-01	-1.11E-03
RWD	kg	9.69E-04	4.85E-06	2.19E-06	1.98E-07	6.75E-07	5.27E-07	3.18E-06	-1.86E-05	-7.12E-05
CRU	kg	0	0	0	0	0	0	0	0	0
MFR	kg	0	0	0	0	0	2.25E+01	0	0	0
MER	kg	0	0	0	0	0	0	0	0	0
EEE	MJ	0	0	4.63E-01	0	0	0	0	0	0
EET	MJ	0	0	8.26E-01	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 Riemchen

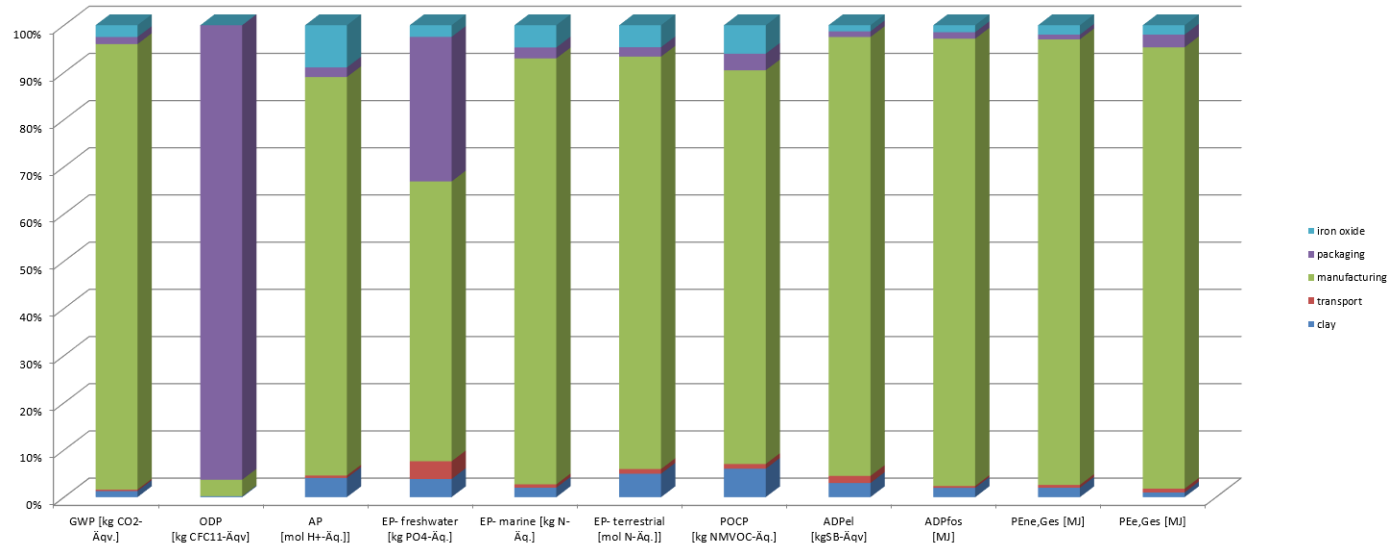
Parameter	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D	D/1
PM	Disease incidence	ND	ND	ND	ND	ND	ND	ND	ND	ND
IR	kBq U235 eq	ND	ND	ND	ND	ND	ND	ND	ND	ND
ETP-fw	CTUe	ND	ND	ND	ND	ND	ND	ND	ND	ND
HTP-c	CTUh	ND	ND	ND	ND	ND	ND	ND	ND	ND
HTP-nc	CTUh	ND	ND	ND	ND	ND	ND	ND	ND	ND
SQP	SQP	ND	ND	ND	ND	ND	ND	ND	ND	ND

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 bar chart shows the most important factors influencing key indicators of the impact and life cycle inventory analysis for production (A1-A3) for the relevant product.

The evaluation of the Life Cycle Assessment results of the brick slips shows that the environmental impacts in all environmental categories are influenced by energy consumption during the manufacturing process (electricity and thermal energy from natural gas in particular) in the factory. Packaging, transport, the clay used and the iron oxide only play a very minor to marginal role.

The majority of waste is incurred by the upstream chains of the raw materials, whereby largely non-hazardous waste is incurred. Radioactive waste is incurred within the framework of production of electrical energy.

The deviation of the impact assessment results from the declared average value is low.

The data quality for the modelling of the brick slips of the Bundesverband der Deutschen Ziegelindustrie e.V. can be rated as good. Corresponding consistent data records were available in the GaBi database for the base products and auxiliaries used. For some substances, the processes were estimated with similar preliminary products in terms of production and environmental impact.

A standardisation of the results for life cycle inventory and impact assessment is not carried out, as this could lead to misleading statements.

7. Requisite evidence

Tests and evaluations indicate that the natural radioactivity of brick slips permits unrestricted usage of these construction materials from a radiological perspective. They do not contribute towards any relevant increase in radon concentrations indoors (their contribution to the inhalation dose is negligible in comparison to the percentage of radon in soil). Info sheet: Natural radionuclides in building materials, Federal Office for Radiation Protection, 2012.

7.1 Radioactivity

Measurement of the nuclide content in Bq/kg for Ra226, Th-232 and K40. In Germany, there are currently no statutory limit values specified for assessing the radioactivity of building materials. Assessment can be performed on the basis of the
- EU Commission 'Radiation Protection 112' document
- OENORM 5200
- Nordic Countries' Recommendation 2000.

8. References

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BImSchG
Federal Immission Control Act (BImSchG): Act protecting against harmful environmental impact caused by air pollution, noise, shocks and similar processes

EWC
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