ENVIRONMENTAL PRODUCT DECLARATION

after *ISO 14025* and *EN15804+A2*

declaration holder	Federal Association of the German Brick and Tile Industry eV
editor	Institute Building and Environment eV (IBU)
program holder	Institut Bauen und Umwelt eV (IBU)
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date of issue	
Date of Expiry	08/03/2026

Bricks (filled with insulation)

Federal Association of the German Brick Industry eV

1. General Information

Federal Association of the German Brick Industry eV

program holder

IBU – Institute Building and Environment eV
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10178 Berlin
Germany

declaration number

EPDBDZ20210071ICG1DE

This declaration is based on the product category rules:

Brick, 11.2017
(PCR tested and approved by the independent Advisory Council (SVR))

date of issue

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Bricks (filled with insulation)

holder of the declaration

Federal Association of the German Brick Industry eV
Reinhardtstraße 1216
10117 Berlin
Germany

Declared product/declared unit

1 m³ brick (filled with insulating material)

Scope:

The application of this document is restricted to filled hollow bricks made by member companies of the Federal Association of the German Brick and Tile Industry eV in Germany. For this declaration, data from 2019 was provided by 17 member companies. These members represent 90% of the members in the Federal Association of the German Brick and Tile Industry

merged manufacturer of filled hollow bricks. The production volume of these companies is around 90% of the German market in terms of production volume.

The underlying hollow brick is based on an EPD in which 20 member companies of the Federal Association of the German Brick Industry eV were involved.

The owner of the declaration is liable for the information and evidence on which it is based; liability of the IBU with regard to manufacturer information, life cycle assessment data and evidence is excluded.

The EPD was created according to the specifications of the *EN15804+A2* created. In the following, the norm is simplified as *EN15804* designated.

verification

The European standard *EN15804* serves as core PCR
Independent verification of the declaration and Entries referred to *ISO 14025:2010*
☐ internal X external

dr Eva Schmincke,
Independent Verifier

2. product

2.1 Company Description The Federal Association of the German Brick Industry eV is an association of companies that produce bricks. For this EPD, the data from the plants that produce hollow bricks (unfilled) are evaluated.

2.2 Product Description/Product Definition Bricks are a building material made of baked clay. They can be filled with perlite, mineral wool cuttings, mineral wool pads, wood wool or polystyrene. Bricks filled with insulating material are used in the outer walls of buildings. There is a separate EPD for bricks. The values in this EPD relate to average filled bricks, with the filling representing an average mix of all the filling materials mentioned.

The life cycle assessment results in this EPD are based on an average of all German plants, which is calculated as a weighted average based on the share of the individual production sites in the
total annual production. A brick with a bulk density of 605 kg/m³ was selected as a representative product.

For placing the product on the market in the EU/EFTA (with the exception of Switzerland), the *Regulation (EU) No.305/2011 (CPR)*. The product requires a declaration of performance at
consideration of*DIN EN 7711:2015-11, Specifications for bricks - Part 1: Bricks* and the CE marking

The respective national regulations apply to the use, in Germany the
DIN 20000401,
Sample list of technical building regulations *MVVTB,*
General building authority approval from the German Institute for Building Technology of the respective manufacturer,
General type approval from the German Institute for Structural Engineering of the respective manufacturer,
External and in-house monitoring of the products with general technical approval or general type approval from the respective manufacturer.

2.3 Application
Bricks filled with insulating material are usually used as load-bearing masonry in the outer walls of buildings due to their very good thermal insulation. Filled facade elements are used as facing shells for external walls or as
Interior insulation used in the old building.

2.4 Specifications

Relevant structural data

Bezeichnung	Werte für repräsentatives Produkt	Werte für Gesamtprodukt-portfolio	Einheit
Druckfestigkeit nach DIN EN 772-1	6 - 12	6 - 18	N/mm²
Rohdichte nach DIN EN 772-13	605	550 - 900	kg/m³
Wärmeleitfähigkeit nach DIN EN 1745	0,07 - 0,08	0,06 - 0,12	W/(mK)
Ausgleichsfeuchte bei 23 °C, 80 % nach DIN EN 4108-4	0,5	0,5 - 1,5	M.-%
Wasserdampfdiffusionswiderstandszahl nach DIN 4108-4	5/10	5/10	-

performance values of the product accordingly

- *DIN 20000401*
- Sample list of technical building regulations*MVV TB*
- General building authority approval from the German Institute for Building Technology of the respective manufacturer
- General type approval from the German Institute for Structural Engineering of the respective manufacturer
- External and internal monitoring of the products with general building authority approval or the general type approval of the respective manufacturer

2.5 Delivery condition

geometric data
Wall bricks filled with insulation material are available in different formats and sizes depending on the application. The respective dimensions are regulated in the approval notices of the German Institute for Building Technology of the respective manufacturer.

2.6 Raw Materials/Excipients Masonry bricks consist of the basic materials clay/loam (over 90%) and mineral additives (around 4%). The chambers of the filled bricks are filled with perlite, mineral wool cuttings, mineral wool granules, polystyrene or wood wool. The mass fraction of the chamber filling is on average in the middle single-digit percentage range.

Clay/Clay:
Natural soils of different, natural mineralogical composition (aluminum oxide Al_2O_3, silicon dioxide SiO_2, iron(III) oxide FE_2O_3). The raw materials are mined near the surface in selected deposits.

Other natural clay components: Clays/loams contain geologically deposited natural components in fluctuating proportions, such as e.g. B. coloring iron oxides. Therefore, depending on the clay, yellowish to dark red firing colors can occur. Furthermore, clays/ loams can contain lime and dolomite.

perlite:
A natural mineral formed by submarine volcanic activity. After grinding and heating the perlite rock to 1000°C, the perlite expands to around 15-20 times its original volume. The perlite of the infill bricks is

water-repellent (hydrophobic).

Mineral wool pads:
These are made-up mineral wool slabs made from only certified fibers according to the quality and conformity criteria
Test regulations of the Quality Association for Mineral Wool eV (*RAL*).

Mineral wool granulate:
Mineral wool granules.

polystyrene:
A petroleum product.

wood wool:
Flowable wood wool from FSC-certified softwood.

Sand:
Used as a leaning agent to balance the natural fluctuations in mineralogical

Composition of the raw clay added to very fat (fine-grained) clays.

Auxiliaries: porosity agents:
Additional porosity is required in the production of highly thermally insulating bricks. This porosity is achieved through the addition of polystyrene beads and/or fine cellulose fibers such as e.g. B. untreated sawdust or paper fibers. Suppliers are sawmills and the paper industry.

SVHC:
The product contains substances on the ECHA list (*REACH*) Substances of Very High Concern (SVHC) (date: February 1, 2021) that are eligible for authorization above 0.1% by mass:**no.**

CMR substances:
The product contains other CMR substances of category 1A or 1B, which are not on the candidate list, above 0.1% by mass in at least one part article:**no.**

Biocides:
Biocidal products have been added to this construction product or it has been treated with biocidal products (this is treated goods within the meaning of the Biocidal Products Regulation (EU) No. 528/2012):**no.**

2.7 Manufacturing
After the clay has been mined in open-pit mining, it is transported to interim storage on the factory premises. The mechanical processing of the clay, such as crushing and mixing, takes place in pan mills and rolling mills. The above-mentioned raw materials are crushed (processed), mixed and moistened in certain optimized ratios. Storage in the swamp house follows. The addition of
Porosity is done before or after storage in the sump house. After passing through the fine rolling mill and adding more water, the blanks are shaped by extrusion with appropriate dies and a downstream cutter.
The material shaped in this way goes into the dryer, which is essentially operated with the waste heat from the tunnel kiln. The drying time varies depending on the format and bulk density and is usually 24 hours. The dried blanks are then fired at around 1000 °C in a tunnel kiln for a maximum of 24 hours. The combustion of the porosity substances causes fine porosity. To produce flat bricks, the bricks are ground flat. The bricks are stacked, sealed in recyclable polyethylene (PE) foil or strapped with polyester or steel straps. The energy requirements for brick production mainly relate to the firing process and drying. The electrical energy is mainly consumed in processing.

Filling with perlite:
After delivery to the plant, the expanded perlite is temporarily stored in large silos. For backfilling, it is drawn from the silos and mixed with a water-based binder. The perlite is poured into the supplied raw bricks and compacted via a feeder. The brick filled with hydrophobic perlite then passes through two stations in which the top and bottom of the backfilled brick are recompacted, consolidated and cleaned. The filled bricks then go through a dryer. The insulation filling is dried at a temperature of approx. 120 °C.

Filling with mineral wool pads:
Conventionally manufactured panels made of mineral wool, which are cut according to the hole geometry of the brick, serve as the basis for filling the perforations in the bricks. The plate sections (cuttings) produced in this way are picked up by a robot with grippers in another station and inserted into the perforation of the bricks via a die. The mineral fiber boards used are already adapted to the filling of the bricks when they are delivered in terms of bulk density and geometry. In this way, among other things, waste caused by cuttings can be completely avoided.

Filling with mineral wool granulate: With this type of filling, mineral wool granules are inserted into the bricks.

Filling with polystyrene:
Loose styrofoam balls serve as the basis for filling the perforations in the bricks, which are filled into the brick chambers and bonded to the core using steam and pressure. No waste is generated during backfilling.

Filling with wood wool:
The wood fiber filler is vibrated into the vertical holes in the bricks.

2.8 Environment and health during manufacture
Health protection during production:
The regulations of the professional associations apply, special measures to protect the health of employees do not have to be taken.
Special regulations must be observed for perforated bricks filled with mineral wool:
With the*RAL quality mark*Marked mineral fiber insulation materials meet the criteria of Annex IV No. 22 Paragraph 2*Hazardous Substances Ordinance.* Also for glass and rock wool fibers marked with the RAL quality mark
Minimum protective measures are taken to protect employees from dust (see also No. 4 and 5 of the*TRGS 500).*The application of the minimum protective measures protects in particular against health impairments
respiratory organs and skin-irritating effects of the fibers. The minimum protective measures correspond to the instructions of the*BG Bau: Dealing with mineral wool insulating materials*(glass wool, rock wool)"

Environmental protection during production:

water/soil:
Water and soil are not polluted. The process is waste-free. The mixing water used is released again during the drying process in the form of steam. The waste heat from the tunnel kiln is used to dry the

Brick blanks used (energy network).

Air:

The emissions from the combustion process are below the limit values of the *TA air*. Environmental protection measures are aimed at the lowest possible energy consumption and low-emission exhaust air. If necessary, emissions are reduced by post-combustion of the smoldering gases, the operation of limestone bed filters and the choice of fuels used for CO_2 contribute to a reduction (e.g. natural gas). Furthermore, the fire control was improved by computer-aided optimization.

Noise:
Due to noise protection measures, the measured values (workplace and outdoor space) are far below the required values.

2.9 Product Processing/Installation

Processing recommendations:
The bricks are connected to each other and to other standardized building materials with mortar (normal, light, medium, or thin-bed mortar) or Dryfix plane brick adhesive. When selecting the mortar, care must be taken to ensure that it has the health and safety properties described
Do not adversely affect the environmental compatibility of the bricks (see the manufacturer's recommendation available from the manufacturer).
The processing of bricks filled with insulating material is described in brochures and data sheets depending on the product and system. On possible
Health effects during processing analogous to the instructions for use *BG Bau: Dealing with mineral wool insulating materials* (glass wool, rock wool) should be pointed out.

Occupational safety/environmental protection:
The weight of the individual tiles is below the 25 kg recommended by the building trade association.
When bricking the bricks
Occupational safety measures in accordance with the regulations of the trade association and in accordance with the manufacturer's recommendations are observed. Wet processes are generally prescribed for cutting and cutting work. A dust mask (P3/FFP 3) must be worn for dry cutting work.

When laying bricks filled with mineral wool, occupational health and safety measures must be observed in accordance with the regulations of the professional associations and the manufacturer's recommendations.
For example, no high-speed, motor-driven saws without extraction may be used for cutting and cutting work. Furthermore, with mineral wool-filled bricks
Occupational safety measures according to Section 3 of the instructions *BG Bau: Dealing with mineral wool insulating materials* (glass wool, rock wool) of the trade association for construction.

rest material:
Masonry leftovers on the construction site are to be collected separately. Sorted brick residues can be taken back from the manufacturing plants and used as raw material or in various ways (for details, see 2.15).

2.10 Packaging
The polyethylene films are recyclable. Unsoiled PEF foils (it is important to collect them according to type must be observed) and reusable pallets made of wood are taken back via the building material trade (reusable pallets against reimbursement in the deposit system) and returned by them to the brickworks, which also forward the PE films via a contractual agreement
waste disposal companies to these.

2.11 Condition of Use

Ingredients:
As listed under 2.6 "Basic materials", bricks mainly consist of clay, loam, sand and the fillers perlite, mineral wool, polystyrene and wood wool. The brick ingredients are in
Condition of use bound as solid materials (ceramic bond).
Filled hollow bricks have better thermal insulation properties than unfilled hollow bricks.

Durability in use: Wall bricks no longer change after leaving the tunnel kiln. When used as intended, they are resistant indefinitely. Wall bricks are vermin resistant,

Rot-resistant, fouling-resistant, acid and alkali-resistant.

2.12 Environment and health during use

Bricks filled with insulating material do not emit any substances that are harmful to the environment or health. The natural ionizing radiation of the bricks is extremely low and harmless to health.
The concentration of mineral wool fiber dust indoors is:

- usually not increased in the usage phase if the processing has been carried out properly.
- usually only moderately increased if the mineral wool products are installed in such a way that they are in direct air exchange with the interior

2.13 Reference Use Period
The reference service life is 150 years when installed in accordance with the rules of technology (PCR document of the European
Brick Industry Association: *TBE PCR document*).

Buildings constructed with bricks can operate for the same amount of time.

2.14 Extraordinary Impacts

fire
Bricks filled with insulating material are individually tested and approved by the building authorities with regard to their fire resistance and fire wall properties.

REI 30 to REIM 120 (*EN 13501 2*). The specific data can be found in the respective approval

Fire protection

designation	value
Building material class brick	A1
Building material class filler	the respective permit to remove n

water
Under the influence of water (e.g. flooding), no water-polluting ingredients can be washed out due to the firm, ceramic bond.

mechanical destruction
There are no known risks to the environment or living organisms from unforeseen mechanical destruction.

2.15 Post-Use Phase
reuse and reuse
Bricks filled with insulating material have only been produced since 2001 and have not yet been reused or reused due to their durability. Perlite-filled bricks can be used in ground form in the production process as a leaning agent. Filling material and bricks can be separated by crushing with subsequent sifting. Pure mineral wool can be returned to the manufacturing process. Polystyrene can be in "*waste to energy*" Plants are converted into electricity, as a porosity agent the brick clay are added or are proportionately added again during the production of insulation boards. Single-variety bricks from dismantling can be taken back by the brick manufacturers and reused in ground form as a leaning agent in production. This has been practiced for production breaks for decades.

Possibilities of further use exist as an aggregate for crushed brick concrete, as filling or bulk material in roads and civil engineering, material for the backfilling of pits and quarries, in the construction of noise protection walls as well as tennis flour and tennis sand.

2.16 Disposal
Leftover bricks, broken bricks and bricks from demolition on the construction site can be disposed of without any problems if the above-mentioned recycling options are not practicable and do not represent any exceptional burden on the environment. Due to the chemically neutral, inert and immobile behavior of the bricks, they can go to landfills according to landfill class I
Landfill Ordinance stored or used in pits and quarries according to Z1.1. The waste key number is AVV 17 01 02 Bricks / Waste List Ordinance. Masonry bricks filled with insulating materials must be disposed of as mixed construction and demolition waste according to waste code 170904.

2.17 More information Further information can be found at www.ziegel.de

3. LCA: Calculation Rules

3.1 Declared Unit
The declaration refers to one cubic meter of brick with a bulk density of 605 kg/m³. The life cycle assessment results in this EPD are based on an average of all German plants, which is calculated as a weighted average based on the share of the individual production sites in the total annual production.

Declared unit

designation	value	unit
Declared unit	1	m_3
bulk density	605	kg/m_3
Conversion factor to 1 kg	605	
Conversion factor to 1 t	1.6529	

3.2 System Boundary
Type of EPD: cradle to factory gate - with options. The life cycle assessment takes into account the extraction of raw materials, the transport of raw materials and the actual
Product manufacture including the packaging materials (modules A1-A3). The transport to the construction site (module A4) and the treatment of packaging materials in waste incineration plants after installation of the product (module A5) are also part of the system boundaries. After the useful life has expired, the product is dismantled (module C1). After the transport of the dismantled product (module C2). landfilling on an inert material landfill is planned for around 6% of the bricks (module C4), 94% can be recycled. Credits resulting from the recycling of broken bricks are declared in Module D. Credits for electricity and thermal energy as a result of thermal recycling of the packaging within Module A5 are also taken into account in Module D1.

3.3 Estimates and Assumptions
Not for all raw materials or preliminary products are in the *GaBi 9*database records. For some substances, the processes with preliminary products that are similar in terms of production and environmental impact were estimated. For example, the raw material clay was substituted with the data set clay. CO_2Emissions from sawdust and biogenic additives are mapped on the input side with a data set and the previously stored CO is shown on the output side$_2$
give up completely.

3.4 Truncation Rules
All data from the operational data collection is taken into account, ie all starting materials and auxiliary materials used according to the recipe, as well as the thermal and electrical energy. This means that material and energy flows with a share of < 1% are also taken into account. All data provided will be converted into the
Integrated life cycle assessment model. Transport expenses are calculated for all basic materials, shipping the products (A4) and in the end-of-life scenario (C2)

included. The wear factor of the wooden pallet as well as the machines, systems and infrastructure required in production are neglected.
It can be assumed that the neglected processes would each have contributed less than 5% to the impact categories considered.

3.5 Background Data
The software system developed by thinkstep for holistic accounting is used to model the bricks *GaBi 9* deployed. The consistent data sets contained in the GaBi database are documented online in the GaBi documentation. The basic data of the GaBi database are used for energy, transport and auxiliary materials. In addition, for the filling material: wood fiber, the EPD wood fiber blow-in insulation STEICOzell from STEICO SE, declaration number: *EPDSTE20200172IBA1DE* used. The life cycle assessment is created for the reference area of Germany. This means that in addition to the

Production processes also include the pre-stages relevant for Germany, such as electricity or
Energy supply, are used. The StromMix and Strom aus
Hydropower, thermal energy from natural gas, heating oil and biomass for Germany with the reference year 2016 taken into account. Emissions from the firing process are recorded as primary data based on measurements by members of the Federal Association of the German Brick and Tile Industry.

3.6 Data Quality
Data for the production year 2019 is used to model the product stage of the bricks. All other relevant background records are in the software's database *GaBi 9* removed. The database was last updated in 2020. The data for the products examined is recorded directly in the factories by the member companies of the Federal Association of the German Brick and Tile Industry. The majority of the data for the upstream chains comes from industrial sources, which were collected under consistent temporal and methodical boundary conditions. A high level of completeness in the recording of environmentally relevant material and energy flows is important. The data quality is thus considered good too

describe.

3.7 Observation Period
The period under consideration is 2019. The data represent an annual average over 12 months.

3.8 Allocation
A wide variety of materials, e.g. B. sawdust used. The sawdust represents a by-product in the sawing process

economic allocation applied to separate the effects of sawdust from those of lumber. In the case of sawdust and biogenic additives, the carbon content is determined by the corresponding uptake of CO_2 taken into account. These materials burn during the manufacturing process. The resulting CO_2 Emissions are calculated according to the theoretical complete conversion of carbon into carbon dioxide.

A wide variety of secondary materials are used in the manufacture of the bricks, such as e.g. B. Sludge from paper recycling, paper fiber waste, secondary polystyrene and filter cake. In the model, these materials are introduced into the system without any loads.

The production process does not provide any by-products. In this respect, no allocation is integrated in the life cycle assessment model used. Scraps from production can be reused in production, but also find application in
various areas (road construction, tennis courts, etc.). The broken bricks used internally remain within A1–A3 (closed loop).

3.9 Comparability
In principle, a comparison or evaluation of EPD data is only possible if all data sets to be compared are *EN15804* were created and the building context or the product-specific performance characteristics are taken into account.

From the *GaBi 9* Database 2019, service pack 39, is where the background data comes from. .

4. LCA: Scenarios and other technical information

Characteristic product properties
Biogenic carbon
The total mass of biogenic carbonaceous materials and associated packaging is less than 5% of the total mass of the product. The mass of the packaging containing biogenic carbon is 0.00031 kg.

Transport to construction site (A4)

designation	value	unit
liters of fuel	1:19	l/100 km
transportation distance	107	km
Utilization (including empty runs)	85	%
Bulk density of the transported products	500-900	kg/m^3

Installation in the building (A5)

designation	value	unit
Output materials as a result of waste treatment on site	0.6	kg
loss of material	please refer declarations below	

Environmental impacts from installation losses are not included in the LCA results, as these depend on the construction project and therefore vary. To calculate the additional environmental burdens caused by the production and disposal of the installation losses

arise, the LCA results can be calculated for a specific installation loss (e.g. installation loss 3%, multiply the LCA results by 1.03). If the user of the EPD does not have any specific information for the installation losses, a share of 3% can be expected (*TBE PCR document*).

Reference useful life

designation	value	unit
Service life (according to BBSR)	50	a
Service life according to the manufacturer	150	a

The reference service life is 150 years when installed in accordance with the rules of technology.

End of Life (C1-C4)

designation	value	unit
Collected as mixed construction waste	605	kg
For recycling	567.49	kg
For landfill	37.51	kg

The basic materials clay and loam contain lime and dolomite, which are
burning process and it becomes CO_2free (which is taken into account in A1 to A3). A large part of the resulting calcium and magnesium oxides is bound in silicates. However, a small proportion is present as free alkali or alkaline earth oxides in burnt shards. These free oxides recarbonate with the help of $CO_2$from the air. This process begins after leaving the oven. At the latest, the treatment in the dismantling phase leads to a complete recarbonation of the free alkali and alkaline earth oxides, which result in an average of 2 M% CO_2 report per kg of fired bricks from credit in module C3 (*recarbonation)*

Reuse, recovery and recycling potential (D), relevant scenario information See information in Chapter 3.
Scenario D: Credits as a result of the recycling of construction waste processing
Scenario D1: Credits resulting from the recycling of the packaging materials (from module A5) are shown in module D1.

5. LCA: results

The following tables show the results of the indicators of the impact assessment, the use of resources as well as waste and other output flows related to one cubic meter of brick. To convert the results to one ton of bricks, the results can be calculated using the specific density (605 kg/m3) of the brick and multiplied by 1,000. Environmental impacts from installation losses are not included in the LCA results, as these depend on the construction project and therefore vary. In order to calculate the additional environmental burdens caused by the production and disposal of the installation losses, the LCA results can be calculated for a specific installation loss (e.g. installation loss 3%, multiplying the LCA results by 1.03).

Important NOTE:
EPfreshwater: This indicator has been defined as "kg PEq." calculated.

STATEMENT OF SYSTEM BOUNDARIES (X = INCLUDED IN LCA; ND = MODULE OR INDICATOR NOT DECLARED; MNR = MODULE NOT RELEVANT)

production stage			stage of erection of building		usage stage							disposal stage				credits and loads except for system boundary
raw material supply	transport	manufacturing	Transport from manufacturer to place of use	Assembly	use/application	maintenance	repair	replacement	renovation	use of energy for that operating the building	use of water for that operating the building	dismantling/demolition	transport	waste treatment	elimination	recycling, recovery or 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 m³ brick (605 kg/m³)

core indicator	unit	A1-A3	A4	A5	C1	C2	C3	C4	D	D/1
GWPtotal	[kg CO_2eq.]	1.46E+2	4.15E+0	8.24E1	3.52E1	9.42E1	1.01E+1	5.00E1	1.46E+0	1.06E+0
GWfossil	[kg CO_2eq.]	1.46E+2	4.13E+0	8.30E1	3.66E1	9.38E1	1.44E+0	5.41E1	1.45E+0	1.05E+0
GWPbiogenic	[kg CO_2eq.]	2.91E1	1.66E3	3.90E3	1.56E2	3.77E4	1.15E+1	4.29E2	9.09E3	4.39E3
GWPluluc	[kg CO_2eq.]	7.95E2	1.73E2	1.32E3	1.47E3	3.92E3	5.29E3	1.56E3	4.84E3	1.35E3
ODP	[kg CFC11eq.]	2.91E11	1.01E15	1.59E14	8.61E17	2.30E16	6:11E15	2.03E15	2.07E14	1.61E14
AP	[mol H^+eq.]	2.79E1	3.83E3	8.66E4	1.73E3	8.71E4	1.35E2	3.88E3	4.61E3	1.16E3
EPfreshwater	[kg PO_4eq.]	1.40E4	8.99E6	2.17E6	7.64E7	2.04E6	3.43E6	9.32E7	4.41E6	2.20E6
EPmarine	[kg NEq.]	4.73E2	1.19E3	3.29E4	8:16E4	2.71E4	6.64E3	9.99E4	1.75E3	3.75E4
EPterrestrial	[mol NEq.]	1.00E+0	1.45E2	2.65E3	9.04E3	3.29E3	7.30E2	1.10E2	1.92E2	4.00E3
POCP	[kg NMVOCeq.]	1.35E1	3.15E3	8.81E4	2.28E3	7.17E4	1.93E2	3.02E3	4.14E3	1.01E3
ADPE	[kg SbEq.]	1.62E5	3.43E7	2.25E7	2.92E8	7.79E8	1.58E6	4.88E8	3.14E7	2.28E7
ADPF	[MJ]	1.58E+3	5.48E+1	1.49E+1	4.66E+0	1.25E+1	2.71E+1	6.90E+0	1.91E+1	1.51E+1
WDP	[m^3 world eq. withdrawn]	4.89E+0	1.78E2	1.61E1	1.51E3	4.04E3	2.42E1	5.65E2	3.55E2	1.20E2

Legend	GWP = Global Warming Potential; ODP = Stratospheric Ozone Depletion Potential; AP = acidification potential of soil and Water; EP = Eutrophication Potential; POCP = tropospheric ozone formation potential; ADPE = Potential for Depletion of Abiotic Resources - Non-Fossil Resources (ADP - Substances); ADPF = Abiotic Resource Depletion Potential – Fossil fuels (ADP – fossil fuels); WDP = Water Withdrawal Potential (User)

RESULTS OF THE LCA - INDICATORS TO DESCRIBE THE USE OF RESOURCES according to EN 15804+A2: 1 m³ brick (605 kg/m³)

indicator	unit	A1-A3	A4	A5	C1	C2	C3	C4	D	D/1
PERE	[MJ]	2.43E+2	3.10E+0	5.59E2	2.71E1	7.25E1	2.28E+0	1.70E+0	5.45E+0	3.78E+0
PERM	[MJ]	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
PERT	[MJ]	2.43E+2	3.10E+0	5.59E2	2.71E1	7.25E1	2.28E+0	1.70E+0	5.45E+0	3.78E+0
PENRE	[MJ]	1.59E+3	5.33E+1	5.59E2	4.66E+0	1.25E+1	2.71E+1	1.29E+1	1.91E+1	1.51E+1
PENRM	[MJ]	1.23E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
PENT	[MJ]	1.59E+3	5.33E+1	5.59E2	4.66E+0	1.25E+1	2.71E+1	1.29E+1	1.91E+1	1.51E+1
SM	[kg]	1.42E+2	0.00E+0	0.00E+0	0.00E+0	0.00E+0	5.67E+2	0.00E+0	0.00E+0	0.00E+0
RSF	[MJ]	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
NRSF	[MJ]	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
fw	[m^3]	2.05E1	2.78E3	4.05E3	2.43E4	6.50E4	7.09E3	3.26E3	3.54E3	2.06E3

Legend	PERE = renewable primary energy as an energy source; PERM = renewable primary energy for material use; PERT = Total Renewable Primary Energy; PENRE = non-renewable primary energy as an energy source; PENRM = Non-Renewable Primary Energy for material use; PENRT = Total non-renewable primary energy; SM = use of secondary materials; RSF = Renewables secondary fuels; NRSF = Non-Renewable Recoverable Fuels; FW = net use of freshwater resources

RESULTS OF THE LCA – WASTE CATEGORIES AND OUTPUT FLOW according to EN 15804+A2: 1 m³ brick (605 kg/m³)

indicator	unit	A1-A3	A4	A5	C1	C2	C3	C4	D	D/1
HWD	[kg]	1.68E3	2.05E6	2.28E10	1.74E7	4.66E7	5.70E7	1.08E7	3.60E7	7.95E9
NHWD	[kg]	7.84E+0	9.62E3	7.61E3	8:18E4	2.19E3	8.15E3	3.57E+1	1.12E+1	7.12E3
RWD	[kg]	2.88E2	5.77E5	8.10E6	4.91E6	1.31E5	2.17E4	7.96E5	7.12E4	5.48E4
CRU	[kg]	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
MFR	[kg]	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	5.67E+2	0.00E+0	0.00E+0	0.00E+0
MER	[kg]	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
EEE	[MJ]	0.00E+0	0.00E+0	3.42E+0	0.00E+0	5.00E2	0.00E+0	0.00E+0	0.00E+0	0.00E+0
EET	[MJ]	0.00E+0	0.00E+0	7.88E+0	0.00E+0	1.10E1	0.00E+0	0.00E+0	0.00E+0	0.00E+0

Legend	HWD = Hazardous Waste to Landfill; NHWD = Discarded Non-Hazardous Waste; RWD = Discarded Radioactive Waste; CRU = Components for Reuse; MFR = materials for recycling; MER = materials for energy recovery; EEE = Exported energy - electric; EET = Energy Exported - Thermal

RESULTS OF THE LCA – additional impact categories according to EN 15804+A2-optional: 1 m³ brick (605 kg/m³)

indicator	unit	A1-A3	A4	A5	C1	C2	C3	C4	D	D/1
p.m	[disease all]	ND	ND	ND	ND	ND	ND	ND	ND	ND
IR	[kBq U235 eq.]	ND	ND	ND	ND	ND	ND	ND	ND	ND
ETPfw	[CTUe]	ND	ND	ND	ND	ND	ND	ND	ND	ND
HTPc	[CTUh]	ND	ND	ND	ND	ND	ND	ND	ND	ND
HTPnc	[CTUh]	ND	ND	ND	ND	ND	ND	ND	ND	ND
SQP	[]	ND	ND	ND	ND	ND	ND	ND	ND	ND

Legend	PM = Potential disease occurrence due to particulate matter emissions; IR = Potential effect from human exposure to U235; ETPfw = Potential Comparative Toxicity Unit for Ecosystems; HTPc = Potential comparative toxicity unit for humans (carcinogenicity); HTPnc = Potential Comparative Toxicity Unit for humans (non-carcinogenic); SQP = Potential Soil Quality Index

* GWP in module C3 includes 20 kg CO_2Eq./t by carbonation.

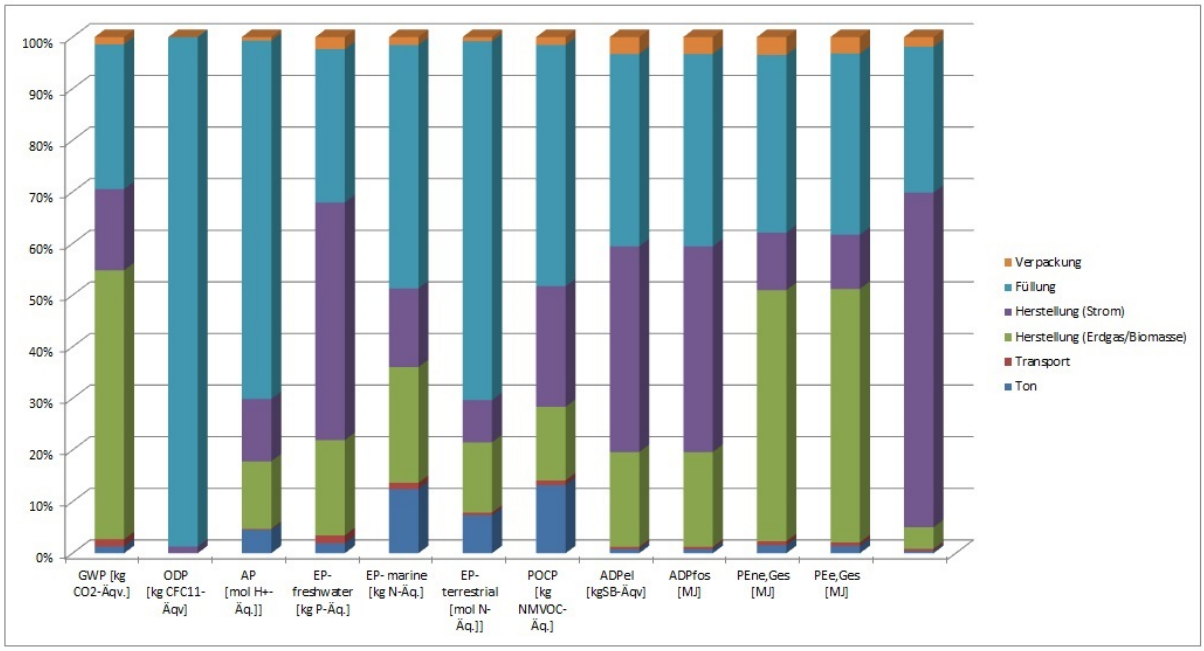
The results of the impact assessment represent relative information/potentials that do not depict any information on specific environmental impacts (endpoint); no exceeding of limit values or risk analyzes can be derived from this.

Below are the restrictions on the declaration of core and additional environmental impact indicators:

Limitation Note 2:
ILCD classification = ILCD type 3, indicator: ADP minerals and metals), ADPfossil, WDP, en: Water Deprivation Potential

Disclaimer 2 — The results of this environmental impact indicator must be used with caution because the uncertainties surrounding these results are high or because there is limited experience with the indicator.

6.LCA: Interpretation



The evaluation of the life cycle assessment results of the filled bricks shows that the environmental impacts in all environmental categories, specifically from the energy consumption during the manufacturing process (electricity and thermal energy) in the factory and the associated emissions as a result of the
Firing process and filling materials are dominated.

The process-related emissions are largely due to the raw materials. Accordingly, the nature of the clays used also plays a not inconsiderable role.

With the filled bricks, the filling plays a significant role. The environmental impacts are caused on the one hand by the upstream chains for the production of the filling materials and on the other hand by the energy (electricity and thermal energy) required for the filling process. Packaging and transport only play a very minor role.

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

Compared to the original EPD from 2015, the EPD update has all
Environmental categories have lower environmental impacts. The reasons for this are the higher renewable share in the German electricity mix compared to the electricity mix five years ago, optimizations in the production process and a higher level of detail in the data collection.

The data quality for the modeling of the filled bricks of the Federal Association of the German Brick and Tile Industry eV can be rated as good. Corresponding consistent data sets are available in the GaBi database for the basic and auxiliary materials used. For a few substances, the processes involved in the production and

Environmental impact of similar preliminary products estimated.

7.proof

The investigations and evaluations show that the natural radioactivity of bricks allows unrestricted use of this building material from a radiological point of view. Masonry bricks do not contribute to a relevant increase in indoor radon concentration, their amount in the inhalation dose is in comparison to the proportion of radon in the ground vanishingly small. (*Info sheet: Natural radionuclides in building materials*)

8th.References

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Construction Products Regulation

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EPD wood fiber blow-in insulation STEICOzell Steico SE
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