ENVIRONMENTAL PRODUCT DECLARATION

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

Owner of the Declaration	**JACKON Insulation GmbH**
Programme holder	Institut Bauen und Umwelt e.V. (IBU)
Publisher	Institut Bauen und Umwelt e.V. (IBU)
Declaration number	EPD-JAC-20220062-IBB1-EN
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Valid to	05.07.2027

JACKOBOARD® Building Slab from Extruded Rigid Polystyrene Foam (XPS), coated on both sides with cement mortar and glass-fibre fabric

JACKON Insulation GmbH

Institut Bauen und Umwelt e.V.

www.ibu-epd.com | https://epd-online.com

ECO PLATFORM EPD VERIFIED

1. General Information

JACKON Insulation GmbH

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

Declaration number
EPD-JAC-20220062-IBB1-EN

This declaration is based on the product category rules:
Insulating materials made of foam plastics, 01.2019
(PCR checked and approved by the SVR)

Issue date
06.07.2022

Valid to
05.07.2027

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

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

JACKOBOARD®-Bauplatte

Owner of the declaration
JACKON Insulation GmbH
Carl-Benz-Straße 8
33803 Steinhagen
Deutschland

Declared product / declared unit
JACKOBOARD is a cement mortar-coated polystyrene rigid foam slab treated with plastic for interior construction. It is manufactured in Germany by JACKON Insulation. The declaration refers to 1 m^2 of a 20 mm thick JACKOBOARD slab (including coating) and a medium density of the XPS core of 33.35 kg/m^3.

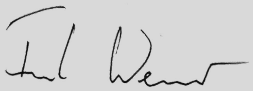
Scope:
The life cycle assessment is based on data from 2020 from the JACKON Insulation Factory Arendsee, Germany.

The owner of the declaration shall be liable for the underlying information and evidence; the IBU shall not be liable with respect to manufacturer information, life cycle assessment data and evidences.

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

Verification

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



Dr. Frank Werner
(Independent verifier)

2. Product

2.1 Product description/Product definition

JACKOBOARD® building slabs are made of extruded polystyrene rigid foam (XPS) slabs, with a coating of special mortar and glass fibre on both sides.
XPS is a plastic foam insulating material that complies with *EN 13164,* which is produced in the form of slabs with a mean gross density of 33.35 kg/m^3. The imputed density of the building slab including the coating is 186 kg/m^3.
The slabs are supplied in a thickness range from 4 to 80 mm and with smooth edges.
The relevant national regulations where the product is being used apply to the use of the product, in Germany, for example, the building codes of the federal states and the technical regulations based on these rules.

2.2 Application

The relevant national regulations apply to use.
JACKOBOARD® building slabs can be coated with all types of plaster and tiles. The surfaces of the JACKOBOARD® system provide a a strong primer surface and can be used on practically any substrate. They are water-repellent, heat-insulating, lightweight and pressure-resistant.
The JACKOBOARD® building slab is therefore ideally suited to the bathroom and spa sector, especially for wet areas. It is used both in new builds and in renovations. It is used as a carrier board for tiles, on partition wall structures and on floors. It is also used as a carrier board for tiles and structural board in the spa area, e.g., for bathroom furniture, vanity units, benches, loungers, shelves and niches.
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2.3 Technical Data

Constructional Data of the XPS Core* and the Building Slab**

Name	Value	Unit
Gross density *	>30	kg/m³
Thermal conductivity according to EN 12667 and EN 13164 Annex C* for slabs < 80mm	0.034	W/(mK)
Thermal conductivity Thermal conductivity according to EN 12667 and EN 13164 Annex C* for slabs 80mm thick 0,035	0,035	W/(mK)
Deformation behaviour according to EN 1605**	≤ 5	%
Compressive stress or pressure resistance at 10% compression according to EN 826 **	200 - 300	kPa
Water vapour diffusion resistance factor according to EN 12088**	60 - 200	-
Water absorption with long-term immersion according to EN 12087*	≤ 1	Vol.-%
Dimensional stability according to EN 1604**	≤ 5	Vol.-%
Tensile strength according to EN 1607**	>200	kPa

Performance values of the product with respect to these features according to the key technical provision (no CE labelling).

2.4 Delivery status

Length: 1200 - 2600 mm / Width: 600 - 1200 mm / Thickness: 4 - 100 mm. A thickness of 20 mm is used as a basis for this declaration.

2.5 Base materials/Ancillary materials

The JACKOBOARD building slab has a surface weight of 3.72 kg/m² and is made up of the following components:

- Mortar: 3.022 kg/m²
- XPS core with 33.35 kg/m3: 0.584 kg/m²
- Glass reinforcement fabric: 0.114 kg/m²

The XPS core has the following composition:

Name	Value	Unit
Polystyren	90-95	%
Blowing agent	5-8	%
of which carbon dioxide	40-80	%
and Co-blowing agnet	20-60	%
Flame retardants	0-2	%
Additives (e.g., colourants)	<1	%

The main raw material used for the XPS core is standard polystyrene (GPPS) [CAS 9003-53-6] with 90 to 95 mass %. This is expanded using a blowing agent with approx. 7 mass %. The blowing agent is made of carbon dioxide [CAS 124-38-9] and halogen-free co-blowing agents.

Brominated flame retardants (CAS No.: 1195978-93-8, 97416-84-7, 21850-44-2) are used as additives. Furthermore, additives (such as processing aids, colourants) below 1 % are added to the extrusion process. Polystyrene and the co-blowing agents are made of mineral oil and natural gas.

The glass fabric is bought in and is made of coated glass fibres.

The special mortar is made of the following basic materials:

Raw Materials/Auxiliary Materials	Mass Fraction
Cement	40%
Sand	40%
Quicklime	10%
Gypsum	4%
Additives	6%

The product/at least a subassembly contains substances on the ECHA list of Substances of Very High Concern - SVHC) *(REACH,* Date: 05.08.2021) above 0.1 mass %: **no.**

The product/at least a subassembly contains more CMR substances of category 1A or 1B that are not on the list of candidates, above 0.1 mass % in at least one subassembly: **no**.

Biocidal products have been added to this construction product or it has been treated with biocidal products (it is therefore a treated item within the meaning of the Biocidal Product Regulation (EU): **no**.

2.6 Manufacture

XPS is manufactured in a continuous extrusion process with electricity as the main fuel. Polystyrene granulate is melted together with the above-mentioned auxiliary materials in the extruder under high pressure. The blowing agent is added to the molten mass and dissolved in it. The molten mass is applied with a slot die. Due to the falling counterpressure in the process, the blowing agent foams the molten mass, while cooling it and the polystyrene sets. The result is an endless stream of homogeneous and closed-cell rigid polystyrene foam. It is cooled further and the extrusion skin is removed.

For mortar coating, the mortar is mixed with water and applied to the XPS core together with the glass fabric, dried and the slabs are then dimensioned. They are packed on wooden pallets wrapped in polyethylene foam.

XPS from production off-cuts and production rejects can be directly recycled in production and used again for the production of XPS. Polystyrene is a thermoplastic material and can therefore be easily and cheaply recycled by melting.

The production site is certified according to *ISO 9001*.

2.7 Environment and health during manufacturing

During the manufacture of JACKOBOARD, no measures beyond the national industrial health and safety regulations are required to protect employees' health.

The production site is certified according to *ISO 14001*.

2.8 Product processing/Installation

Product- and use-dependent installation recommendations are described in brochures,

processing tips and product data sheets from JACKON Insulation. They can be obtained directly from the manufacturer or from the internet. No special personal protective equipment is needed when working with JACKOBOARD. Waste material that accumulates as offcuts on the building site should be collected separately and disposed of appropriately.

2.9 Packaging

The packaging is made of polyethylene films, which should be collected separately and disposed of appropriately. Polyethylene can then be recycled.

2.10 Condition of use

All of the materials used are ageing-resistant and moisture-resistant in the installation condition, as a result of which the insulation performance and the mechanical properties are maintained without change for the entire useful life.

Mortar recarbonised over the decades. This does not result in any negative impact on the product properties.

2.11 Environment and health during use

In most applications, JACKOBOARD is not in direct contact with the environment or indoor air.

Hazards to health when using JACKOBOARD for insulating interior spaces are insignificant according to recognised measurements from *AgBB* etc. (see 7.1 VOC Emissions).

2.12 Reference service life

The useful life of JACKOBOARD is the same as the useful life of the part of the building in which it is used. The reason for this is the mechanical strengths and resistance to water ingress.

2.13 Extraordinary effects

Fire

JACKOABOARD is classed as Euroclass E according to *EN 13501-1*.

Fire Protection

Name	Value
Building material class nach EN 13501-1	E
Burning droplets	-
Smoke gas development	-

In Scandinavia JACKOBOARD is classed as Euroclass F according to *EN 13501-1*.

JACKOBOARD coated with tiles is classed as Euroclass Bd0s1 according to *EN 13501-1*.

Water

JACKOBOARD is chemically neutral, not water-soluble and does not give off any water-soluble substances if used correctly, that could result in pollution of the groundwater, rivers and seas. The heat conductivity of the XPS is practically not influenced by the effect of water or water vapour.

Mechanical destruction

Not relevant for JACKOBOARD.

2.14 Re-use phase

The manufacturer recommends disposal of the product by means of thermal recovery. The energy contained in the foam as a calorific value is thus recovered, which also saves any necessary auxiliary firing in waste incineration plants. The energy from 1 kg XPS rigid foam corresponds to that of approx. 1.1 litres of heating oil. In addition, the incidental waste heat in waste incineration can be used to generate electricity as well as district heating.

2.15 Disposal

Waste code according to the European Waste Catalogue/ List of Waste Ordinance [Abfallverzeichnis-Verordnung *AVV]:*
17 06 04 Insulating materials with the exception of those that come under 17 06 01 and 17 06 03.

2.16 Further information

You can find more information at
www.jackon-insulation.com

3. LCA: Calculation rules

3.1 Declared Unit

This declaration refers to 1 m2 JACKOBOARD slabs, comprising a 18.5 mm thick XPS slab and two-sided coating with glass reinforcement fabric and mortar, each 0.75 mm thick. The surface weight is 3.72 kg/m2.

Declared Unit

Name	Value	Unit
Declared unit	1	m^2
Grammage	3.72	kg/m^2
Layer thickness	0.02	m

Declaration type according to *PCR Part A:*

1a) Declaration of a specific product from a manufacturer's factory

3.2 System boundary

Type of EPD: Cradle to factory gate (A1-A3) - with options, Modules C1-4 and Module D,
The life cycle assessment considers the following points of the life cycle:

- Extraction and processing of raw materials (A1)
- Transport to manufacture (A2)
- Manufacture of the JACKOBOARD slab (A3)
- Manufacture of the packaging (A3)
- Transport to use (A4)
- Disposal of the packaging (A5), offcuts are not considered,
- they can vary depending on the type of application
- Dismantling is manual (C1)
- Transport to EoL (C2)

- End-of-Life with two scenarios:

1. Landfill for all components (C4)
2. Thermal recovery in a plant with an efficiency R1 greater than 0.6 and subsequent landfill of the inorganic components as slag (C3)

- Recovery and recycling potentials (D) - outside the system limits

3.3 Estimates and assumptions

The environmental profile of the flame retardant is based on a sound assessment on the basis of literature, in particular *Ullmanns.*
The weighing and mixing of the mortar at the supplier's premises has been omitted due to a lack of data and its probable insignificance for the environmental result.

3.4 Cut-off criteria

In the study, all key production data, both of the XPS manufacture and the subsequent coating, are considered, including raw materials, electricity consumption, waste and the use of packaging. Individual additives (pigments) with a low percentage by weight are not considered separately, but are estimated in the calculation with polystyrene. The total of these additives is below 1 % of the XPS formulation. The coating materials are taken into account fully.

3.5 Background data

Data from the GaBi database has been used as background data *GaBi ts.* Documentation of the individual background data sets are described on www.gabi-software.com/databases.

3.6 Data quality

The production data, such as quantity of raw materials and electricity consumption, come from measurements at the Arendsee site of JACKON Insulation GmbH.

The data on mass and energy data has been checked for plausibility. The software model created in the study was checked in an internal quality assurance process.

The data quality can be classed as good. The foreground data was recorded carefully, all relevant energy and material flows were taken into account
.
The life cycle assessment inventories of the background processes, e.g., external electricity generation and the basic materials used in the formulation, are part of the GaBi database, which was most recently revised in 2021.

3.7 Period under review

Production data from the factory in Arendsee from 2020 are used as a data basis.

3.8 Allocation

Allocation to the Foreground Data
JACKON's total production comprises other XPS products of varying densities and forms as well as the product considered. When collecting data, the values for thermal and electrical energy as well as auxiliary materials are applied accordingly to the product to be declared. Depending on the process state, this allocation can be according to mass, surface, item or dwell time in the machine.
In XPS production (uncoated JACKOBOARD), the expenses - mainly energy, raw materials and auxiliary materials - are distributed according to mass.

In JACKOBOARD production, the coating materials and the energy consumption are allocated according to area. Allocation of the product packaging is volume-related.

Allocation of Wastes
The inert production waste incurred during production is disposed of at landfill. It is mainly mortar residue. Environmental contamination from burning the product in the EoL1 scenario is assigned to Module C3/1; resultant uses for thermal and electrical energy are declared in Module D1.

The use is calculated on the basis of European average data for electricity and thermal energy from natural gas.

Allocation to Upstream Processes
For all refinery products, allocations are used according to mass and lower calorific value. The environmental pollution is specifically calculated for every refinery product.

For other materials, whose inventory is consulted for the manufacture calculation, the allocation rules are applied that are suitable in each case. Information on the individual data sets are documented at http://www.gabi- software.com/databases.

3.9 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.

4. LCA: Scenarios and additional technical information

Characteristic product properties
Information on biogenic carbon

Characteristic Product Properties of Biogenic Carbon

Name	Value	Unit
Biogenic carbon content in product	0	kg C
Biogenic carbon content in accompanying packaging	0.27	kg C

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 evaluation if modules are not declared (MND).

Transport to building site (A4)

Name	Value	Unit
Transport distance	500	km

Installation in the building (A5)

The following packaging materials accumulate on the building site:

Name	Value	Unit
Polyethylenfolie	0,011	kg/m²
Holzpalette	0,542	kg/m²

These are thermally recovered within Module A5. Resultant potential credits for electricity and thermal energy are declared in Module D.

End of Life (C1-C4)

Two EoL scenarios (End of Life) are considered: Scenario 1 considers the expenses for landfill. Scenario 2 analyses the environmental pollution caused by burning the product. Non-combustible components are subsequently disposed of an a landfill (mortar and glass reinforcement fabric).

Name	Value	Unit
Collected separately	0	kg
Collected as mixed construction waste Collected as mixed construction waste JACKOBOARD slab	3.72	kg
Reuse	0	kg
Recycling	0	kg
Energy recovery (Szenario 2)	3.72	kg
Landfilling (Szenario 1)	3.72	kg

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

Module D/1 contains the potential benefits from burning the packaging material. Module D/2 also contains additionally the potential benefits from burning the XPS slabs after use.

Credits for electricity and thermal energy are considered on the basis of European marginal conditions.

5. LCA: Results

The tables below depict the environmental impact and inventory parameters according to the standard *EN 15804* for the life of 1 m² JACKOBOARD slab. Modules C3, C4 and D are shown for two EoL scenarios: C3/1, C4/1 and D/1 refer to complete landfill in the post-user phase. Module D contains potential credits as a result of the thermal recovery of the packaging (resulting from Module A5). Modules C3/2, C4/2 and D/2 refer to thermal recovery of the product.

However, non-combustible components are sent to landfill. Within the context of Scenario 2, Module D/2 contains credits from the thermal recovery of the XPS core as well as potential credits from the thermal recovery of the packaging.

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

PRODUCT STAGE			CONSTRUCTION PROCESS STAGE		USE STAGE							END OF LIFE STAGE				BENEFITS AND LOADS BEYOND THE SYSTEM BOUNDARIES
Raw material supply	Transport	Manufacturing	Transport from the gate to the site	Assembly	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	De-construction demolition	Transport	Waste processing	Disposal	Reuse-Recovery-Recycling-potential
A1	**A2**	**A3**	**A4**	**A5**	**B1**	**B2**	**B3**	**B4**	**B5**	**B6**	**B7**	**C1**	**C2**	**C3**	**C4**	**D**
X	X	X	X	X	ND	ND	MNR	MNR	MNR	ND	ND	X	X	X	X	X

RESULTS OF THE LCA - ENVIRONMENTAL IMPACT according to EN 15804+A2: 1 m² JACKOBOARD-Platte mit 20 mm Dicke (3,72 kg/m²)

Core Indicator	Unit	A1-A3	A4	A5	C1	C2	C3/1	C3/2	C4/1	C4/2	D/1	D/2
GWP-total	[kg CO_2-Eq.]	4.02E+0	1.33E-1	1.01E+0	1.87E-1	2.31E-2	0.00E+0	2.34E+0	5.66E-2	0.00E+0	-3.44E-1	-1.16E+0
GWP-fossil	[kg CO_2-Eq.]	4.78E+0	1.27E-1	4.20E-2	1.85E-1	2.21E-2	0.00E+0	2.33E+0	5.63E-2	0.00E+0	-3.42E-1	-1.16E+0
GWP-biogenic	[kg CO_2-Eq.]	-7.67E-1	5.80E-3	9.71E-1	1.57E-3	1.01E-3	0.00E+0	1.63E-3	1.98E-4	0.00E+0	-1.72E-3	-5.81E-3
GWP-luluc	[kg CO_2-Eq.]	5.74E-3	2.98E-6	1.03E-5	2.62E-4	5.20E-7	0.00E+0	4.72E-4	1.65E-4	0.00E+0	-2.37E-4	-8.05E-4
ODP	[kg CFC11-Eq.]	1.56E-11	1.44E-17	1.37E-16	4.43E-15	2.51E-18	0.00E+0	3.98E-15	2.19E-16	0.00E+0	-3.92E-15	-1.33E-14
AP	[mol H^+-Eq.]	9.99E-3	3.94E-4	1.43E-4	3.85E-4	6.86E-5	0.00E+0	1.09E-3	4.01E-4	0.00E+0	-4.48E-4	-1.52E-3
EP-freshwater	[kg P-Eq.]	1.03E-5	2.67E-8	1.89E-8	4.96E-7	4.66E-9	0.00E+0	1.26E-6	9.44E-8	0.00E+0	-4.49E-7	-1.52E-6
EP-marine	[kg N-Eq.]	2.69E-3	1.85E-4	4.68E-5	9.14E-5	3.22E-5	0.00E+0	3.73E-4	1.04E-4	0.00E+0	-1.27E-4	-4.31E-4
EP-terrestrial	[mol N-Eq.]	2.73E-2	2.03E-3	6.81E-4	9.59E-4	3.54E-4	0.00E+0	4.42E-3	1.14E-3	0.00E+0	-1.36E-3	-4.62E-3
POCP	[kg NMVOC-Eq.]	1.30E-2	3.65E-4	1.27E-4	2.48E-4	6.36E-5	0.00E+0	1.02E-3	3.15E-4	0.00E+0	-3.57E-4	-1.21E-3
ADPE	[kg Sb-Eq.]	6.72E-7	4.40E-9	2.08E-9	5.44E-8	7.66E-10	0.00E+0	5.95E-8	5.31E-9	0.00E+0	-5.70E-8	-1.93E-7
ADPF	[MJ]	8.35E+1	1.78E+0	2.24E-1	3.29E+0	3.10E-1	0.00E+0	5.92E+0	7.46E-1	0.00E+0	-5.94E+0	-2.01E+1
WDP	[m^3 world-Eq deprived]	2.35E-1	2.09E-4	1.04E-1	2.97E-2	3.63E-5	0.00E+0	5.43E-1	6.04E-3	0.00E+0	-2.63E-2	-8.93E-2

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

RESULTS OF THE LCA - INDICATORS TO DESCRIBE RESOURCE USE according to EN 15804+A2: 1 m² JACKOBOARD-Platte mit 20 mm Dicke (3,72 kg/m²)

Indicator	Unit	A1-A3	A4	A5	C1	C2	C3/1	C3/2	C4/1	C4/2	D/1	D/2
PERE	[MJ]	1.17E+1	5.87E-3	8.17E+0	1.52E+0	1.02E-3	0.00E+0	1.34E+0	1.01E-1	0.00E+0	-1.35E+0	-4.57E+0
PERM	[MJ]	8.13E+0	0.00E+0	-8.13E+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]	1.99E+1	5.87E-3	4.37E-2	1.52E+0	1.02E-3	0.00E+0	1.34E+0	1.01E-1	0.00E+0	-1.35E+0	-4.57E+0
PENRE	[MJ]	5.98E+1	1.78E+0	6.64E-1	3.29E+0	3.11E-1	0.00E+0	5.92E+0	7.47E-1	0.00E+0	-5.94E+0	-2.01E+1
PENRM	[MJ]	2.38E+1	0.00E+0	-4.40E-1	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
PENRT	[MJ]	8.35E+1	1.78E+0	2.24E-1	3.29E+0	3.11E-1	0.00E+0	5.92E+0	7.47E-1	0.00E+0	-5.94E+0	-2.01E+1
SM	[kg]	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	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	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	0.00E+0	0.00E+0
FW	[m^3]	1.47E-2	9.44E-6	2.45E-3	1.48E-3	1.64E-6	0.00E+0	1.33E-2	1.84E-4	0.00E+0	-1.32E-3	-4.47E-3

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

RESULTS OF THE LCA – WASTE CATEGORIES AND OUTPUT FLOWS according to EN 15804+A2: 1 m² JACKOBOARD-Platte mit 20 mm Dicke (3,72 kg/m²)

Indicator	Unit	A1-A3	A4	A5	C1	C2	C3/1	C3/2	C4/1	C4/2	D/1	D/2
HWD	[kg]	3.00E-4	1.23E-11	4.04E-11	8.70E-10	2.14E-12	0.00E+0	1.19E-9	7.93E-11	0.00E+0	-1.34E-9	-4.52E-9
NHWD	[kg]	3.30E-1	1.78E-4	9.70E-3	2.33E-3	3.11E-5	0.00E+0	1.42E+0	3.72E+0	0.00E+0	-2.79E-3	-9.46E-3
RWD	[kg]	1.22E-3	1.91E-6	1.22E-5	4.90E-4	3.32E-7	0.00E+0	3.94E-4	7.84E-6	0.00E+0	-4.34E-4	-1.47E-3
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	0.00E+0	0.00E+0
MFR	[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	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	0.00E+0	0.00E+0
EEE	[MJ]	0.00E+0	0.00E+0	1.48E+0	0.00E+0	0.00E+0	0.00E+0	3.54E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
EET	[MJ]	0.00E+0	0.00E+0	2.66E+0	0.00E+0	0.00E+0	0.00E+0	6.30E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0

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

RESULTS OF THE LCA – additional impact categories according to EN 15804+A2-optional:
1 m² JACKOBOARD-Platte mit 20 mm Dicke (3,72 kg/m²)

Indicator	Unit	A1-A3	A4	A5	C1	C2	C3/1	C3/2	C4/1	C4/2	D/1	D/2
PM	[Disease Incidence]	1.90E-7	2.06E-9	7.49E-10	3.24E-9	3.58E-10	0.00E+0	1.72E-8	4.98E-9	0.00E+0	-3.85E-9	-1.31E-8
IRP	[kBq U235-Eq.]	1.29E-1	2.71E-4	1.93E-3	8.04E-2	4.71E-5	0.00E+0	6.33E-2	8.25E-4	0.00E+0	-7.11E-2	-2.41E-1
ETP-fw	[CTUe]	4.32E+1	1.29E+0	9.98E-2	1.38E+0	2.25E-1	0.00E+0	2.35E+0	4.25E-1	0.00E+0	-1.25E+0	-4.23E+0
HTP-c	[CTUh]	1.16E-9	2.40E-11	6.61E-12	3.92E-11	4.18E-12	0.00E+0	9.58E-11	6.27E-11	0.00E+0	-5.66E-11	-1.92E-10
HTP-nc	[CTUh]	6.00E-8	1.18E-9	2.66E-10	1.48E-9	2.06E-10	0.00E+0	5.69E-9	6.92E-9	0.00E+0	-2.24E-9	-7.57E-9
SQP	[-]	1.32E+2	4.56E-3	6.10E-2	1.04E+0	7.94E-4	0.00E+0	1.26E+0	1.51E-1	0.00E+0	-9.23E-1	-3.13E+0

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

Disclaimer 1 – for the indicator “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 nor due to radioactive waste disposal in underground facilities. Potential ionizing radiation from the soil, from radon and from some construction materials is also not measured by this indicator.

Disclaimer 2 – for the indicators “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 or as there is limited experienced with the indicator.

6. LCA: Interpretation

As shown in the material balance sheet, the manufacture largely comprises the use of materials in the XPS core, mortar and glass reinforcement and energy costs as well as packaging and transport expenses.

The manufacture of the XPS core has a significant impact in practically every impact category. The contributions are mainly caused by the precursor product polystyrene. The energy consumption in the manufacture of the XPS core is also important to a certain degree, especially in the categories of Global Warming Potential (GWP) and Acidification Potential (AP).

The manufacture of the mortar raw materials makes significant contributions in the categories AP, Eutrophication Potential (EP), Abiotic Depletion Potential - non-fossil resources (ADPe) and GWP. The environmental impacts are mainly caused by the cements used, in particular calcium aluminate cement.

Glass reinforcement, as the third raw material, only has a minor impact on the environmental profile. The category ADPe is an exception, which is due to the use of colemanite for the manufacture of glass. Packaging materials, transport, the energy consumption for coating the insulating slabs are of minor significance for the environmental profile. Wastes and operating materials, brought together under the coating process, have a marginal impact.

Entire Life Cycle If the entire life cycle is included in the analysis, as expected, the manufacturing module A1-A3 is the part of the life cycle that is mainly responsible for the environmental impact. The expense for burning the insulating slab is also important, especially with respect to GWP and AP. The calorific value of the XPS core leads to a negative GWP value in Module D.

7. Requisite evidence

JACKOBOARD products are used for interior applications. No contact with indoor air is to be expected since the JACKOBOARD building slab is protected by systems.

7.1 VOC Emissions

Emissions of volatile organic compounds (VOCs) from JACKOBAORD according to the *AgBB* formula were tested by TÜV Rheinland, Germany in June 2018. The tested product was classed as conforming to the requirements of *DIBt* and *AgBB* for use indoors.

VOC Emissions

Name	Value	Unit
TVOC (C6 - C16)	1025	µg/m³
Sum SVOC (C16 - C22)	0	µg/m³
R (dimensionless)	0,8	-
VOC without NIK *	5	µg/m³
Carcinogenic Substances	0	µg/m³

* NIK = lowest (toxicological) concentration of interest

AgBB overview of results (28 days [µg/m³])

Name	Value	Unit
TVOC (C6 - C16)	15	µg/m³
Sum SVOC (C16 - C22)	0	µg/m³
R (dimensionless)	0.1	-
VOC without NIK	0	µg/m³
Carcinogenic Substances	0	µg/m³

* NIK = lowest (toxicological) concentration of interest

7.2 Leaching

Tests on the leaching behaviour are not relevant for the JACKOBOARD building slabs because, due to the way it is used, the product does not come into contact with rainwater or groundwater.

8. References

Standards

EN 826
DIN EN 826:2013-05: Determination of Compression Behaviour of Thermal Insulation Products.

EN 1604
DIN EN 1604:2013-05: Thermal Insulating Products for Building Applications - Determination of Dimensional Stability under Specified Temperature and Humidity Conditions.

EN 1605
DIN EN 1605:2013-05: Thermal Insulating Products for Building Applications - Determination of Deformation under Specified Compressive Load and Temperature Conditions.

EN 1606
DIN EN 1606:2013-05: Thermal Insulating Products for Building Applications - Determination of Compressive Creep Activity.

EN 1607
DIN EN 1607:2013-05 Thermal Insulating Products for Building Applications - Determination of Tensile Strength Perpendicular to Faces.

DIN 4108-10
DIN 4108-10:2008-06 Thermal Insulation and Energy Economy in Buildings - Part 10: Application-Related Requirements for Thermal Insulation Materials - Factory-Made Products.

EN 12086
DIN EN 12086:2013-06: Thermal Insulating Products for Building Applications - Determination of Water Vapour Transmission Properties.

EN 12087
DIN EN 12087:2013-06: Thermal Insulating Products for Building Applications - Determination of Long-Term Water Absorption by Immersion.

EN 12088
DIN EN 12088:2013-06: Thermal Insulating Products for Building Applications - Determination of Long-Term Water Absorption by Diffusion.

EN 12091
DIN EN 12091:2013-06: Thermal Insulating Products for Building Applications - Determination of Freeze-Thaw Resistance.

EN 13501-1
DIN EN 13501-1:2010-01: Classification of Building Products and Construction Methods according to their Reaction to Fire - Part 1: Classification with the Results from Fire Reaction Tests of Building Products.

EN 12667
DIN EN 12667:2001-05: Thermal Performance of Building Materials and Products - Determination of Thermal Resistance by means of Guarded Hot Plate and Heat Flow Meter Methods - Products of High and Medium Thermal Resistance.

EN 13164
DIN EN 13164:2013-03 Thermal Insulation Products for Buildings - Factory Made Extruded Polystyrene Foam (XPS) Products.

EN 15804
DIN EN 15804:2012+A2: 2019 + AC:2021: Sustainability of Construction Works - Environmental Product Declarations - Core Rules for the Product Category of Construction Products.

ISO 9001
DIN EN ISO 9001:2015: Quality Management Systems - Requirements.

ISO 14001
DIN EN ISO 14001:2015: Environmental Management Systems - Requirements with Guidance for Use.

ISO 14025
DIN EN ISO 14025:2011-10, Environmental Labels and Declarations - Type III Environmental Declarations - Principles and Procedures.

Further documentation

AgBB
AgBB 2018, Requirements for Indoor Air in Buildings: Health Evaluation of Emissions of Volatile Organic Compounds (VVOC, VOC and SVOC) from Building Products, Committee for Health Evaluation of Building Products (AgBB).

AVV
Ordinance on the European List of Waste (Abfallverzeichnis-Verordnung - AVV): List of Waste Ordinance of 10 December 2011 (Federal Law Gazette I p. 3379), most recently amended on 30.06.2021.

DIBt
Deutsches Institut für Bautechnik, Berlin www.dibt.de

GaBi ts
GaBi ts Software & Documentation, Database on Holistic Accounting. LBP, Stuttgart university and sphera, Documentation of the GaBi ts data sets, 2021. http://www.gabi-software.com/databases

IBU 2021
Institut Bauen und Umwelt e.V. General Guidance for the IT Program of Institut Bauen und Umwelt e.V. (IBU). Version 2.0, Berlin: Institut Bauen und Umwelt e.V., 2021. www.ibu-epd.com.

PCR Part A
Product Category Rules for Building-Related Products and Services. Part A: Calculation Rules for the Life Cycle Assessment and Requirements of the Project Report according to EN 15804+A2:2021, Version 2.1. Berlin: Institut Bauen und Umwelt e.V. (Ed.), 2021 www.ibu-epd.com

PCR Part B
Product Category Rules for Building-Related Products and Services. Part B: Requirements of the IT for Insulating Materials made of Foam Plastics, Version 1.7. Berlin: Institut Bauen und Umwelt e.V. (Ed.), 2021 www.ibu-epd.com

REACH
Regulation (EC) No 1907/2006 of the European Parliament and of the Council of 18 December 2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH), establishing a European Chemicals Agency, amending Directive 1999/45/EC and repealing Council Regulation (EEC) No 793/93, Commission Regulation (EC) No 1488/94 as well as Council Directive 76/769/EEC and Commission Directives 91/155/EEC, 93/67/EEC, 93/105/EC and 2000/21/EC

TÜV
Test Report No. 60153503 001: Testing the Emissions of Volatile Organic Compounds (VOCs), Emission Test Nuremberg, TÜV Rheinland, AgBB Test Report, 6 June 2018.

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