ENVIRONMENTAL PRODUCT DECLARATION

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

Owner of the Declaration	CALSITHERM Silikatbaustoffe GmbH
Publisher	Institut Bauen und Umwelt e.V. (IBU)
Programme holder	Institut Bauen und Umwelt e.V. (IBU)
Declaration number	EPD-CAL-20240411-IBC3-EN
Issue date	22.11.2024
Valid to	21.11.2029

Microporous calcium silicate thermal insulation

CALSITHERM Silikatbaustoffe GmbH

Institut Bauen und Umwelt e.V.

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1. General Information

CALSITHERM Silikatbaustoffe GmbH

Programme holder

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

Declaration number

EPD-CAL-20240411-IBC3-EN

This declaration is based on the product category rules:

Calcium silicate insulating materials, 01.08.2021
(PCR checked and approved by the SVR)

Issue date

22.11.2024

Valid to

21.11.2029

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

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

Microporous calcium silicate thermal insulation

Owner of the declaration

CALSITHERM Silikatbaustoffe GmbH
Hermann-Löns-Str. 170
33104 Paderborn-Sennelager
Germany

Declared product / declared unit

1 tonne with an average bulk density of 259 kg/m³ valid for the Calsitherm products Silca, Silcal, Microcal calcium silicate boards; Calsitherm climate board; Redboard. The boards are manufactured in thicknesses ranging from 15 to 150 mm with bulk densities of 170 to 550 kg/m³.

Scope:

This Environmental Product Declaration refers to the following Calsitherm products from the Paderborn plant:

- CALSITHERM Klimaplatte-F, -WF;
- Redboard pro; Redboard basic;
- Silcal -900; -1000; -1100;
- Silca -170 SB; -200; -250; -250 KM; -250 SB; -T300; -T500,
- Clima Solid.

This is an average EPD for a Calsitherm product with an average bulk density; the product-specific bulk densities are specified under "2.3 Technical data".
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

Silca, Silcal, Microcal calcium silicate boards, Calsitherm Klimaplatte, Clima Solid and Redboard (hereinafter referred to as CSP) are white to light grey insulation boards made of calcium silicate hydrates with a low embedded proportion (< 0.6 % by volume) of cellulose that are resistant to continuous temperatures of up to 1100 °C.

The products differ in terms of their bulk densities and the proportions of the same raw materials used.
Regulation (EU) No. 305/2011/ (CPR) applies to the placing on the market of the product in the EU/EFTA (with the exception of Switzerland). The product requires a declaration of performance taking into account the::

- *ETA-15/0340,* dated 9 July 2015,
- *ETA-19/0559,* dated 30 October 2019,
- *ETA-24/1060,* dated 25 October 2024

and the CE-mark.

The respective national regulations apply for use.

2.2 Application

The calcium silicate boards can be used in the following applications:

- boards for high-temperature insulation for thermal engineering systems.
- thermal and fire protection boards for all building construction, especially fireplace and tiled stove construction.
- boards for interior construction, renovation of old buildings, half-timbered houses and damp rooms. In particular for insulation and moisture regulation with a mould-inhibiting effect.
- improvement of the moisture and heat balance in rooms used for short periods, e.g. in schools, churches and conference rooms.
- in the preservation of historical monuments to maintain the façade design, as interior insulation.

2.3 Technical Data

Constructional data

Name	Value	Unit
Gross density acc. to EN 1094-4	170 - 550	kg/m^3
Compressive strength acc. to EN 1094-5	≥ 1	N/mm^2
Flexural strength acc. to EN 12089, lenghtwise	≥ 0.5	N/mm^2
Thermal conductivity acc. to EN 12939, for RT	0.06 - 0.1	W/(mK)
Thermal conductivity acc. to EN 12939, at 800 °C	0.12 - 0.15	W/(mK)
Water vapour diffusion resistance factor acc. to EN 12086, µ-value	3 - 6	-
Water absorption Wip (24h) acc. to EN 12087, at 20 mm thickness	17	kg/m²
Open porosity acc. to EN 1094-4	≥ 80	Vol.-%
Mass-based moisture content acc. to EN ISO 12571, (bei 23°C; 80 % humidity)	ca. 7.5	mass-%
Sound insulation acc. to EN 140-16; reference wall +50 mm CSP; Rw-value	57	dB

The application limit temperature is up to 1100°C. Shrinkage of ≤ 2 % at the application limit temperature is to be expected.

All declared products belong to building material class A1 according to *EN 13501-1*, non-combustible.

Performance values of the product according to the declaration of performance in relation to its essential characteristics in accordance with:

- *DIN EN 14306:2016-03* or *ETA-15/0340,* dated 9 July 2015.
- for Redboard: *ETA-19/0559,* dated 30 October 2019
- for Clima Solid: *ETA-24/1060,* dated 25 October 2024

2.4 Delivery status

Lenght: up to 3000 mm

Broadness: up to 1250 mm

Thickness: 15 - 150 mm

Tolerances according to *ISO 2768-1*

2.5 Base materials/Ancillary materials

The product consists of the following base materials:

- Lime [CaO] 36 - 60 M.-%
- Sand [SiO_2] 15 - 40 M.-%
- Mikrosilica 15 - 35 M.-%
- Silicate aggregates 0 - 15 M.-%
- Cellulose 1 - 5 M.-%

The mixture is made with a 0.1 % water/pulp suspension.

The product/product/at least one partial product contains substances on the *ECHA Candidate* List of Substances of Very High Concern (SVHC) (19.04.2024) above 0.1 % weight by weight:

- no

The product/product/at least one part of the product contains other CMR substances ('carcinogenic, mutagenic, reprotoxic') of category 1A or 1B, which are not on the *ECHA Candidate List*, above 0.1 % by mass in at least one part of the product:

- no

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

- no

2.6 Manufacture

The calcium silicate boards are produced using the post-autoclaving method. The raw materials stored in silos are dosed using scales and mixed with the addition of water. The amount of water - in addition to the particle size distribution of the raw materials, the application temperature and the compression - controls the bulk density of the boards produced. A pre-reaction takes place in the reactors, whereby the first calcium silicate hydrate (CSH) phases are already formed. The resulting gel-like suspension is partially dewatered using a belt press and moulded into individual slabs.
The 'green plates' produced by pressing are then exposed to a saturated steam atmosphere in autoclaves for 15 to 25 hours at pressures of 10 to 20 bar. Here, crystallisation at temperatures between 150 °C and 200 °C solidifies the raw materials into calcium silicate hydrates. The boards are then dried to a specified residual moisture content of less than 10 %.
They can then be sanded and sawn. The sanding dust

produced during sanding is reused as a raw material (see assumption for the calculation in section 3.3).

Process certification in accordance with *DIN EN ISO 9001* is available.

2.7 Environment and health during manufacturing

The dust generated during production is extracted in compliance with the occupational exposure limit values (OEL) and flows back into the production process. No further exhaust air purification is required.
The process air is dedusted to well below the legal limits of the AWG values.
Natural gas is used as the energy source for steam curing.
In the process water circuit, condensate water from autoclaving and press water partially flows back into the production process.
Alkaline excess water is neutralised with combustion gases and then discharged into the municipal sewage system. Previously filtered solids are continuously fed back into the production cycle.
Sound level measurements have shown that all values determined inside and outside the production facilities are far below the values required by the technical standards due to the sound insulation measures taken.

CALSITHERM Silikatbaustoffe GmbH offsets the CO_2 emissions associated with the combustion of natural gas directly with the energy supply company by means of CO_2 certificates.

2.8 Product processing/Installation

Calcium silicate boards are generally installed in the requested / supplied dimensions. The connection and joint areas are cut to size using commercially available cutting tools.
Depending on the area of application, the panels are dowelled in drywall construction or laid with special adhesive.
The panels can be connected or attached to components made of other standardised and approved building materials. The connection is generally made by gluing or screwing.
The products can be hydrophobised on site, plastered, coated with smooth lime or lime plaster.
When selecting additional products (e.g. adhesives) required for construction purposes, care must be taken to ensure that these do not adversely affect the environmental and health compatibility properties of the building products described.

2.9 Packaging

The dried boards are packed in cardboard boxes on a packing line or shrink-wrapped in polythene film and stacked on wooden pallets. In some cases, hardboard and chipboard are used to reinforce the sheathing.

The polythene shrink film and cardboard boxes are recyclable. Hardboard and chipboard can be disposed of thermally using energy. Packaging waste is collected from Calsitherm for material recycling.

2.10 Condition of use

Calcium silicate boards are rot-proof, resistant to ageing and, due to the alkaline pH value, rot-resistant and resistant to insects and rodents (determined after after many years of outdoor testing).

2.11 Environment and health during use

Due to the stable calcium silicate hydrate (CSH) bond and the solid structure, emissions are not possible. There are no adverse health effects if the products described are used normally and in accordance with their intended purpose.
Hazards to water, air and soil cannot arise if the products are used as intended.

2.12 Reference service life

The reference service life of the panels is 80 years. It can be assumed that the useful life of the product generally corresponds to that of the building.

2.13 Extraordinary effects

Fire

The declared products fulfil the requirements of building material class A1, "non-combustible", in accordance with *EN 13501-1*.
Due to the heat generated when surrounding components catch fire, traces of combustion gases (similar to the combustion of pure paper) can be released due to the low proportion of cellulose (< 0.6% by volume) in the product.

Fire protection

Name	Value
Building material class	A1
Burning droplets	not applicable
Smoke gas development	not applicable

Water

No relevant release of water-soluble substances. The products mentioned are structurally stable and do not change shape due to the effects of water and drying.

Mechanical destruction

No siginifcant impacts on the environment.

2.14 Re-use phase

If calcium silicate boards are not bonded or plastered, they can easily be collected separately in the event of selective demolition when a building is remodelled or at the end of its service life.
After selective demolition from buildings, the materials can be reused in accordance with their original purpose in terms of their durability.
After grinding, the unmixed material can be reused as a filler, e.g. for high-temperature bulk sealing or insulation.

2.15 Disposal

If the above-mentioned recycling options are not practicable, the products mentioned can be disposed of without any problems and do not represent an exceptional burden on the environment.
The material can be disposed of as construction waste in accordance with the European waste codes (*AVV*):

- 170101 (concrete)
- 170107 (concrete parts up to 2 m edge length)

For the end-of-life, in addition to the scenario calculated in Chapter 5 (landfill), the current options for material recycling are indicated here in text form.
The first option is the substitution of a common porosifying agent for brick production (low-grade recycling).
The second option is to add it to clay insulating plasters (high-quality recycling). In this case, the calcium silicate insulation boards do not have to be separated from adhering materials such as lime adhesive and lime plasters during dismantling. These materials have no influence on the use mentioned here.
The calcium silicate insulation boards are first mechanically crushed. This is possible without additional energy input, as a shovel can be used for coarse crushing so that the boards are slurried in water-filled barrels. The calcium silicate then replaces the clay in ecological insulating plasters, as it is added to a certain percentage of the clay insulating plasters. Thanks to this mixture, cracking is minimised and thermal insulation is maximised, so that the clay plaster is upgraded.

2.16 Further information

Further information on our products can be found under www.calsitherm.de.

3. LCA: Calculation rules

3.1 Declared Unit

The declared unit is 1 tonne of calcium silicate boards with an average weighted bulk density of 259 kg/m³. The gross densities of the three main products SILCAL (incl. MICROCAL), KLIMAPLATTE and REDBOARD (combined sales share 95 %) were used to calculate the average. The gross densities of SILCA, Clima Solid and MICROCAL are also stated below:

- SILCAL 225-275 kg/m³
- KLIMAPLATTE 170-250 kg/m³
- REDBOARD 170-250 kg/m³
- MICROCAL 260 kg/m³
- SILCA 180-550 kg/m³
- Clima Solid 235-253 kg/m³

Declared unit

Name	Value	Unit
Declared unit	1	t
Gross density	259	kg/m^3

3.2 System boundary

Type of EPD: "from the cradle to the gate with options, i.e. modules C1-C4 and module D (A1-A3, C, D and additional modules. The additional modules may be A4 and/or A5 and/or B1-B7)".

The life cycle assessment takes into account the extraction of raw materials and energy, the transport of raw materials and the actual product manufacture (modules A1-A3).

Module A4 is not declared; transport from the factory in Paderborn to the construction site can be added on a property-specific basis.

No inputs and outputs are calculated for the actual installation in module A5, as manual installation is essentially assumed. In accordance with EN 16783, a flat rate of 2% installation waste is charged.

Module A5 therefore also includes the disposal of transport packaging, whereby it is assumed that the plastics polyethylene (PE) and polyethylene terephthalate (PET) are thermally utilised in a waste incineration plant and the cardboard is recycled.
The recycled cardboard reaches the system boundary at the construction site sorted by type; the plastics are transported to a waste incineration plant and incinerated there.

Module C1 comprises mechanical deinstallation.

Module C2 comprises the transport of the Calsitherm calcium silicate boards to a landfill site for construction waste.

As a landfill scenario is declared, the values for module C3 are 'zero'.

For waste disposal, Module C4 describes the transport of Calsitherm calcium silicate boards to a construction waste landfill.

Module D includes the calculation of the benefits resulting from the energy recovery of the plastics; no benefit is calculated for the recycling of the cardboard. The characteristic values of the waste incineration plant are described in clause 4 for Module A5. Similarly, there are no benefits in Module D from the landfilling of the Calsitherm board.

3.3 Estimates and assumptions

The raw material microsilica was modelled without environmental impacts in production, as it is used as a secondary raw material. The raw material 'cellulose' was estimated using the data set for cellulose.

3.4 Cut-off criteria

All data from the detailed operating data survey was taken into account in the life cycle assessment.
Inputs/outputs for management, research and development, administration and marketing are not taken into account where known.
With this approach, material and energy flows with a share of less than 1% of the total material and total energy flows used in the production of Calsitherm calcium silicate boards were also accounted for.
The production of any packaging for the raw materials and additives was neglected. If packaging is used at all, reusable containers are used, the quantities and environmental impacts of which are not relevant for the life cycle assessment.
Furthermore, no material or energy flows were neglected in the LCA that are known to the project managers and that could be expected to have a significant environmental impact with regard to the indicators shown. It can therefore also be assumed that the sum of the neglected processes does not exceed 5 % of the impact categories. This means that the criteria for the exclusion of inputs and outputs in accordance with *EN 15804+A2* are fulfilled.

3.5 Background data

ecoinvent v3.10 is used as the background database

3.6 Data quality

The foreground data was collected without significant data gaps and linked to current background data.
Methodological deviations of the background data from the requirements of *EN 15804* are not known for the LCA of this product.
No methodological decisions had to be made that are not supported by *EN 15804*. Against this background, there are no methodological or data-related restrictions on the use of the results in this EPD.

3.7 Period under review

The data of the life cycle assessment represent the year 2023.

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

When modelling the actual processes for the production of Calsitherm calcium silicate boards, there are no process steps that would require a co-product allocation.
The allocation of inputs/outputs in the plant to the production of the declared products was based on detailed measurements of electricity and heat requirements. Within the production of the declared products, the allocation was based on mass.
No processes were modelled that would have required a multi-

input allocation.
Reuse, recycling and recovery were modelled in accordance with *EN 15804*.
The manufacture of Calsitherm calcium silicate boards does not generate any waste or secondary materials or raw materials that are used in a subsequent product system.

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. *ecoinvent v3.10* is used as the background database.

4. LCA: Scenarios and additional technical information

Characteristic product properties of biogenic carbon

Description of the biogenic carbon content at the plant gate

Name	Value	Unit
Biogenic carbon content in product	14.8	kg C
Biogenic carbon content in accompanying packaging	1.23	kg C

Note: 1 kg of biogenic carbon is equivalent to 44/12 kg of CO_2.

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

Module A5
No inputs and outputs are charged for the actual installation in module A5, as manual installation is essentially assumed. In accordance with *EN 16783*, a flat rate of 2 % installation waste is charged.
Module A5 therefore also includes the disposal of transport packaging, whereby it is assumed that the plastics polyethylene (PE) and polyethylene terephthalate (PET) are thermally utilised in a waste incineration plant and the cardboard is recycled.
The recycled cardboard reaches the system boundary at the construction site sorted by type; the plastics are transported over 50 km to a waste incineration plant and incinerated there. The waste incineration plant is assumed to be an incineration plant with an efficiency R1 > 0.6 (according to *CEWEP Energy Report III*); the recovered energy is declared as exported energy; according to the same report, an efficiency of 28.3 % for heat generation and 14.8 % for electricity generation is assumed for quantification purposes (always with reference to the lower calorific value of the waste).

Module C1
Diesel consumption of 0.0359 MJ/kg and dust emissions from mechanical dismantling are analysed for deinstallation in Module C1

Module C2
Module C2 comprises the transport of the Calsitherm calcium silicate boards over 50 km to a landfill for construction waste.

Module C3
As a landfill scenario is declared, the values for Module C3 are "zero".

Module C4
Module C4 describes the transport of Calsitherm calcium silicate boards to a landfill site for waste disposal.

Name	Value	Unit
Collected separately waste type	1000	kg
Landfilling	1000	kg

Module D
Module D includes the calculation of the benefits resulting from the energy recovery of the plastics; no benefit is calculated for the recycling of the cardboard. Similarly, there are no benefits in Module D from the landfilling of the Calsitherm board.

5. LCA: Results

The characterisation factors EF3.1 were used to assess the environmental impact.

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

Product stage			Construction process stage		Use stage							End of life stage				Benefits and loads beyond the system boundaries
Raw material supply	Transport	Manufacturing	Transport from the gate to the site	Assembly	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	De-construction demolition	Transport	Waste processing	Disposal	Reuse-Recovery-Recycling-potential
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
X	X	X	MND	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 t microporous calcium silicate thermal insulation

Parameter	Unit	A1-A3	A5	C1	C2	C3	C4	D
GWP-total	kg CO_2 eq	1.4E+03	4.74E+01	3.6E+00	9.51E+00	0	5.66E+01	-8.03E+00
GWP-fossil	kg CO_2 eq	1.46E+03	4.29E+01	3.6E+00	9.5E+00	0	5.89E+00	-7.65E+00
GWP-biogenic	kg CO_2 eq	-5.52E+01	4.51E+00	3.93E-04	6.58E-03	0	5.07E+01	-3.79E-01
GWP-luluc	kg CO_2 eq	2.84E-01	5.8E-03	3.12E-04	3.15E-03	0	9.39E-04	-7.3E-03
ODP	kg CFC11 eq	3.54E-05	7.2E-07	5.5E-08	1.89E-07	0	2.2E-07	-2.19E-07
AP	mol H^+ eq	2.84E+00	5.97E-02	3.25E-02	1.98E-02	0	3.67E-02	-9.81E-03
EP-freshwater	kg P eq	3.49E-02	7.01E-04	1.27E-05	7.41E-05	0	3.32E-05	-4.99E-04
EP-marine	kg N eq	8.1E-01	1.75E-02	1.5E-02	4.63E-03	0	1.56E-02	-2.39E-03
EP-terrestrial	mol N eq	8.26E+00	1.79E-01	1.65E-01	5.13E-02	0	1.71E-01	-2.68E-02
POCP	kg NMVOC eq	3.42E+00	7.28E-02	4.92E-02	3.29E-02	0	6.92E-02	-1.26E-02
ADPE	kg Sb eq	1.69E-03	3.49E-05	1.28E-06	3.09E-05	0	7.39E-06	-7.64E-06
ADPF	MJ	1.84E+04	3.77E+02	4.71E+01	1.34E+02	0	1.47E+02	-1.21E+02
WDP	m^3 world eq deprived	2.66E+02	5.39E+00	1.02E-01	5.55E-01	0	5.07E-01	-2.16E-01

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 t microporous calcium silicate thermal insulation

Parameter	Unit	A1-A3	A5	C1	C2	C3	C4	D
PERE	MJ	1.05E+03	2.12E+01	2.85E-01	2.26E+00	0	2.92E+00	-1.33E+01
PERM	MJ	5.78E+02	1.16E+01	0	0	0	0	0
PERT	MJ	1.63E+03	3.27E+01	2.85E-01	2.26E+00	0	2.92E+00	-1.33E+01
PENRE	MJ	4.68E+03	2.91E+02	1.91E+00	1.12E+01	0	5.66E+00	-4.19E+01
PENRM	MJ	1.93E+02	-1.93E+02	0	0	0	0	0
PENRT	MJ	4.88E+03	9.81E+01	1.91E+00	1.12E+01	0	5.66E+00	-4.19E+01
SM	kg	3.17E+02	6.34E+00	0	0	0	0	0
RSF	MJ	0	0	0	0	0	0	0
NRSF	MJ	0	0	0	0	0	0	0
FW	m^3	0	0	0	0	0	0	0

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 t microporous calcium silicate thermal insulation

Parameter	Unit	A1-A3	A5	C1	C2	C3	C4	D
HWD	kg	9.75E-02	2.01E-03	3.26E-04	9E-04	0	8.73E-04	-3.93E-04
NHWD	kg	1.24E+02	2.28E+01	2.9E-02	6.45E+00	0	9.99E+02	-2.5E-01
RWD	kg	2.8E-02	5.65E-04	8.65E-06	7.49E-05	0	5.22E-05	-4.55E-04
CRU	kg	0	0	0	0	0	0	0
MFR	kg	0	3E+00	0	0	0	0	0
MER	kg	0	0	0	0	0	0	0
EEE	MJ	0	2.91E+01	0	0	0	0	0

EET	MJ	0	5.57E+01	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 t microporous calcium silicate thermal insulation

Parameter	Unit	A1-A3	A5	C1	C2	C3	C4	D
PM	Disease incidence	2.32E-05	5.06E-07	8.36E-06	6.96E-07	0	9.26E-07	-4.67E-08
IR	kBq U235 eq	1.6E+01	3.22E-01	8.19E-03	6.17E-02	0	4.74E-02	-2.07E-01
ETP-fw	CTUe	3.49E-02	7.01E-04	1.27E-05	7.41E-05	0	3.32E-05	-4.99E-04
HTP-c	CTUh	2.31E-06	5E-08	1.41E-08	6.74E-08	0	2.48E-08	-1.23E-08
HTP-nc	CTUh	7.58E-06	1.71E-07	5.82E-09	8.39E-08	0	2.16E-08	-2.54E-08
SQP	SQP	1.24E+04	2.56E+02	3.31E+00	8.07E+01	0	2.97E+02	-9.82E+00

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

Caveat 1 - applies to the indicator 'Potential effect of human exposure to U235'. This impact category mainly deals with the potential effect of low dose ionising radiation on human health in the nuclear fuel cycle. It does not consider effects due to possible nuclear accidents and occupational exposure, nor to the disposal of radioactive waste in underground facilities. Potential ionising radiation from soil, radon and some building materials is also not measured by this indicator.

Caveat 2 - applies to the indicators: 'Potential for depletion of abiotic resources - non-fossil resources', 'Potential for depletion of abiotic resources - fossil fuels', 'Water depletion potential (user)', 'Potential toxicity comparator for ecosystems', 'Potential toxicity comparator for humans - carcinogenic effect', 'Potential toxicity comparator for humans - non-carcinogenic effect', 'Potential soil quality index'. The results of this environmental impact indicator must be used with caution, as the uncertainties in these results are high or because there is only limited experience with the indicator.

6. LCA: Interpretation

Figure 1 shows the contributions of the individual stages of the life cycle of Calsitherm calcium silicate boards:

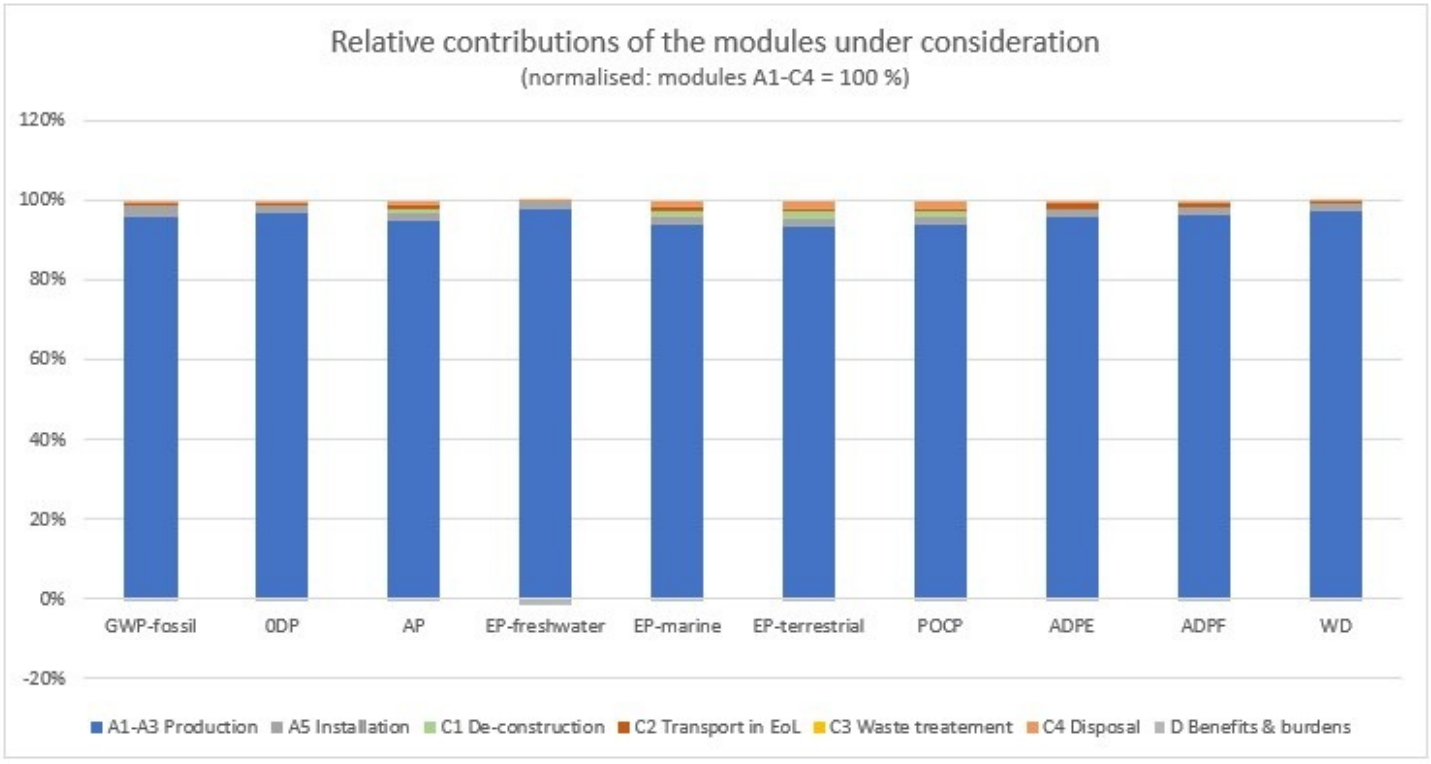

Figure: 1 Relative contributions of the individual stages of the life cycle of Calsitherm calcium silicate boards to the impact assessment indicators: Modules A1-C4 = 100%

It can be seen here that the manufacture of Calsitherm calcium silicate boards dominates the environmental impact over the life cycle by far. All other life cycle stages of Calsitherm calcium silicate boards are not relevant.
Since a landfill scenario is assumed, Module D, in which only the advantages of energy recovery from the plastic packaging are taken into account, is also not relevant.

7. Requisite evidence

7.1 Radioactivity

Measuring body: University of Paderborn, Faculty 6 - Physics, 33095 Paderborn.

Measuring method: Testing for radioactive contamination with Berthold LB 1210 B, calibrated with strontium 90 (65 Becquerel) and Frieseke/Hoepfner FH 407 V in comparison to natural ambient radiation measured.

Test report, date: University of Paderborn, Prof. Dr J. Mimkes, 08.06.1994.

Result: No increased levels of radioactivity (5 Bq) could be detected in the products mentioned compared to natural levels. The products Silcal 900, Silcal 1100 and Silca T300 are therefore not contaminated. This generally applies to products that consist of the same (raw) materials as the products mentioned.

7.2 Eluate

Measuring body: Institute for Food, Water and Environmental Technology, 33098 Paderborn.

Measuring method: According to the German standardised method for the analysis of water, waste water and sludge.

Test report, date: Institut für Lebensmittel-, Wasser- und Umwelttechnik, Dr Warnecke, 02.10.1992.

Result: The eluate is uncontaminated. The analysis showed no contamination by heavy metals (such as chromium, arsenic, cadmium, mercury), polycyclic aromatics, total phenol, hydrocarbons, fluorides and cyanides. The concentrations detected in the test procedure show that the values are far below the required limits. [...]

7.3 VOC / volatile organic compounds

Measuring body: Eurofins Product Testing A/S, accredited institute for testing product emissions according to. Eurofins Indoor Air Comfort Gold, Certification and Quality Assurance, DK-8464 Galten, Denmark

Test report, date: Test report no. G15034A dated 07/06/2012

Sampling: Eurofins selected the product Silca T300, which is representative of all products manufactured from the same raw materials, for the representative test from the large number of trade names of the products - as listed in the table below in the header.

Result: The test for total VOC was carried out in accordance with *DIN EN ISO 16000-3, DIN EN ISO 16000-6, DIN EN ISO 16000-9, DIN EN ISO 16000-11* and *ISO 16017-1*.

Results of measurement AgBB (28 days)

Sample designation: SILCA -T300

Name	Value	Unit
TVOC (C6 - C16)	< 5	µg/m³
TVOC without NIK (C6 - C16)	< 5	µg/m³
Σ SVOC (> n-C16	< 5	µg/m³
Σ Cancerogene	< 1	µg/m³
R-value	< 1	µg/m³
Formaldehyde	< 3	µg/m³

Legend: < means that all measured values are below the quantification limit.

7.4 Quarz

Measuring body: Deutsches Institut für Feuerfest und Keramik GmbH, accredited institute for product testing according to /DIN EN ISO/IEC 17025/, Höhr-Grenzhausen, D

Test report, date: Test report no. 102-254-00-04 dated 26/07/2012 and 102-254-00-03 dated 27/07/2012

Result: In order to cover the entire raw density range of the products with the trade name as listed in the above VOC table under sample designation, the test for quartz was carried out on three products with different raw densities. As all products are manufactured from the same raw materials, these results are transferable to all products and are therefore representative.

In accordance with the accredited test method, no quartz can be detected in:

- Calsitherm Klimaplatte-WF; -Redboard pro,
- Silca -200,
- Silca -T300,
- Clima Solid

as the values are below the quantification limit.

8. References

Standards

EN 140-16
DIN EN 140-16, Acoustics - Measurement of sound insulation in buildings and of building elements - Part 16: Measurement of the improvement of the sound reduction index by acoustic cladding in the test rig.

EN 1094-4
DIN EN 1094-4:1995-09, Refractory products for insulation purposes - Part 4: Determination of bulk density and total porosity of moulded products.

EN 1094-5
DIN EN 1094-5:1995-09, Refractory products for insulation purposes - Part 5: Determination of cold compressive strength of moulded products.

EN 12086
DIN EN 12086:1997-08, Thermal insulating products for building applications - Determination of water vapour transmission rate.

EN 12087
DIN EN 12087:1997, Thermal insulating products for building applications - Determination of water absorption by long-term immersion.

EN 12089
DIN EN 12089:2013-06, Thermal insulating products for building applications - Determination of behaviour in bending.

EN 12939
DIN EN 12939:2001-2, Thermal performance of building materials and products - Determination of thermal resistance by the slab method and the thermal flow meter - Thick products

with high and medium thermal resistance.

EN 13172
DIN EN 13172:2012, Thermal insulating products - Evaluation of conformity.

EN 13501-1
DIN EN 13501-1:2007+A1:2009, Fire classification of construction products and building elements - Part 1: Classification using the results of reaction to fire tests of construction products.

EN 14306
DIN EN 14306:2016-03, Thermal insulation products for building equipment and industrial installations - Factory made calcium silicate (CS) products - Specification.

EN 15804+A2
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EN 16783
DIN EN 16783:2017-07, Thermal insulation products - Product category rules (PCR) for factory made and in-situ thermal insulation products for the preparation of environmental product declarations.

ISO 9001
DIN EN ISO 9001:2015, Quality management systems - Requirements.

ISO 2768-1
ISO 2768-1, General tolerances; Tolerances for linear and angular dimensions without single tolerance entry.

ISO 12571
EN ISO 12571:2000, Thermal and hygric behaviour of building materials and products - Determination of hygroscopic sorption properties.

ISO 14040
DIN EN ISO 14040:2009-11, Environmental management - Life cycle assessment - Principles and framework.

ISO 14025
DIN EN ISO 14025:2011-10, Environmental labelling and declarations - Type III environmental declarations - Principles and procedures (ISO 14025:2006).

ISO 16000-3
ISO 16000-3:2009, Indoor air - Part 3: Measurement of formaldehyde and other carbonyl compounds - Sampling with a pump (ISO/DIS 16000-3:2009).

ISO 16000-6
ISO 16000-6:2011-12, Indoor air - Part 6: Determination of VOCs in indoor air and test chambers, sampling on Tenax TA®, thermal desorption and gas chromatography with MS/FID.

ISO 16000-9
ISO 16000-9:2008-04, Indoor air - Part 9: Determination of the emission of volatile organic compounds from building products and furnishing - Emission test chamber method (ISO 16000-9:2006).

ISO 16000-11
ISO 16000-11:2006-06, Indoor air - Part 11: Determination of emissions of volatile organic compounds from building products and furnishing - Sampling, storage of samples and preparation of test specimens (ISO 16000-11:2006).

ISO 16017-1
ISO 16017-1:2001-10, Indoor air, outdoor air and workplace air - Sampling and analysis of volatile organic compounds by sorbent tubes/thermal desorption/capillary gas chromatography - Part 1: Sampling with a pump (ISO 16017-1:2000); German version DIN EN ISO/IEC 17025:2005, General requirements for the competence of testing and calibration laboratories (ISO/IEC 17025:2005).

Further references

AVV
European Waste Catalogue, also AVV "Waste Catalogue Ordinance of 10 December 2001 (Federal Law Gazette I p. 3379), last amended by Article 2 of the Ordinance of 17 July 2017 (Federal Law Gazette I p. 2644)".

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Deutsches Institut für Bautechnik/Ausschuss zur gesundheitlichen Bewertung von Bauprodukten (2005).

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ETA-24/1060, Deutsches Institut für Bautechnik: Europäische Technische Bewertung vom 25. Oktober 2024.

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Institut Bauen und Umwelt e.V. (ed.): Product category rules for building-related products and services. Part A: Calculation rules for the life cycle assessment and requirements for the project report. Version 1.3, Berlin.

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Institut Bauen und Umwelt e.V. (ed.): Product category rules for building-related products and services. Part B: Requirements for the EPD for calcium silicate insulation materials. 2024-04. Berlin.

Regulation (EU) No 305/2011 (CPR)
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concerning the making available on the market and use of biocidal products.

REGULATION (EC) No 1907/2006
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 and 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.

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