

Environmental Product Declaration

Product-specific information for assessing the environmental impact of a building in accordance with ISO 14025 and EN 15804

DANO® Feuer
DANO® Massiv
DANO® Schall DF
DANO® Ausbau DF



danogips

FREIHEIT FÜR DEN TROCKENBAU

danogips

Environmental Product Declaration (EPD) for building materials and building products

In an **E**nvironmental **P**roduct **D**eclaration (EPD) the **l**ife **c**ycle **a**ssessment (LCA) of a product is calculated.

The life cycle of a building product as well as building physics and generally relevant information are presented.

Example:

How much carbon dioxide (CO₂) did the product emit until it left the factory gate or what was the energy requirement (renewable/non-renewable) for a product during manufacture.

EPDs are mainly used to assess the sustainable use of resources and to evaluate the impact of buildings on the environment.

EPDs are therefore an important source of information for the various building certification systems.

Transferability of this EPD „Gypsum board - building board“ to Danogips products

The EPD applies according to the scope of application for gypsum boards with the following labeling:

Type DF according to the EN 520

The characteristic values of this EPD apply to the following DANO® products:

- **DANO®** Feuer DF/GKF
- **DANO®** Massiv DF/GKF
- **DANO®** Schall DF/GKF-SSP
- **DANO®** Ausbau DF/GKF

ENVIRONMENTAL PRODUCT DECLARATION

in accordance with *ISO 14025* and *EN 15804+A2*

Owner of the Declaration	Bundesverband der Gipsindustrie e.V.
Publisher	Institut Bauen und Umwelt e.V. (IBU)
Programme holder	Institut Bauen und Umwelt e.V. (IBU)
Declaration number	EPD-BVG-20210343-IBE1-EN
Issue date	4 April 2022
Valid until	3 April 2027

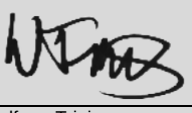
FIRE-RESISTANT PLASTERBOARD

Bundesverband der Gipsindustrie e.V.

www.ibu-epd.com / <https://epd-online.com>



1. General information

Bundesverband der Gipsindustrie e.V.	FIRE-RESISTANT PLASTERBOARD
Programme holder IBU – Institut Bauen und Umwelt e.V. Panoramastr. 1 10178 Berlin Germany	Holder of the Declaration Bundesverband der Gipsindustrie e.V. Kochstrasse 6-7 10969 Berlin
Declaration number EPD-BVG-20210343-IBE1-EN	Declared product/unit Gypsum plasterboards in accordance with <i>DIN EN 520</i> and <i>DIN 18180</i> 1 m ² (10 kg)
This Declaration is based on the product category rules: Gypsum plasterboards, 01.2019 (PCR checked and approved by the independent Expert Council (SVR))	Scope: The EPD applies for all member companies of the Bundesverband der Gipsindustrie e.V. in accordance with the current list of members on https://www.gips.de/epd-ansprechpartner/gipsplatten/ for products manufactured in Germany. The LCA takes into account specific information from the manufacturers and suppliers of components for the entire life cycle.
Issue date 4 April 2022	The owner of the Declaration shall be liable for the underlying information and proof; IBU shall not be liable with respect to manufacturer information, life cycle assessment data, or proof. This EPD was drawn up in accordance with the specifications of the <i>EN 15804+A2</i> . This standard is referred to as <i>EN 15804</i> hereinafter.
Valid until 3 April 2027	Verification The <i>EN 15804</i> European standard serves as the core PCR. Independent verification of the Declaration and information provided in accordance with <i>ISO 14025:2010</i> ☐ internally ☒ externally
 Dipl.-Ing. Hans Peters (Chairman of Institut Bauen und Umwelt e.V.)	 Dr.-Ing. Wolfram Trinius (Independent verifier)
 Dr. Alexander Röder (Managing Director Institut Bauen und Umwelt e.V.)	

2. Product

2.1 Product description / Product definition

The Declaration refers to 1 m² plasterboard with a weight per unit area of 10 kg/m².

(EU) Directive No. 305/2011 (CPR) applies for placing the product on the market in the EU/EFTA (with the exception of Switzerland). The products require a Declaration of Performance taking consideration of the DIN EN 520: 2009-12, Gypsum plasterboards – Definitions, requirements and test methods, and CE marking. Use is governed by the respective national regulations.

2.2 Application

Plasterboards are directly pasted to the subsurface as dry plaster, as panelling for wall and ceiling cladding, mounting walls and suspended ceilings made of wood

or galvanised metal and for manufacturing prefabricated components such as those screwed or nailed in the prefabricated building industry.

They can be used in buildings for public, private or commercial applications.

2.3 Technical data

Technical information is available in the information supplied by the manufacturers. Due to continuous updating of technical standards or approvals, such information is not listed within the framework of the Environmental Product Declaration. Details on essential requirements can be taken from the CE mark and/or Declaration of Performance /Construction Products Regulation/.

The latest technical information can be queried from the manufacturers: <https://www.gips.de/epd-ansprechpartner/gipsplatten/>.

The product's performance values correspond with the Declaration of Performance in terms of its essential properties in accordance with DIN EN 520: 2009-12, Gypsum plasterboards – Definitions, requirements and test methods.

For example, reaction to fire, shear strength, water vapour diffusion resistance, thermal conductivity, hazardous substances, impact resistance or sound absorption can be declared.

Use is governed by the respective national provisions; in Germany, this is the */DIN 18180/* as a national application standard. */DIN 18181/* applies for processing the plasterboards.

As a general rule, */DIN 4103-1/* applies for non-load-bearing interior partition walls, */DIN 4103-4/* applies for wooden stud systems, and */DIN 18183-1/* applies for metal stud systems; */DIN 18168-1/* and */DIN 18168-2/* must be observed for suspended ceilings and ceiling panelling.

2.4 Delivery status

Plasterboards can be supplied in various formats taking consideration of various thicknesses and individual requirements.

Fire-resistant plasterboards (type F as per */DIN EN 520/*) are plasterboards with an improved cohesive core structure at high temperatures indicated by the

red marking. This is offered in versions with or without a reduced water absorption rate.

2.5 Base materials / Ancillary materials

Plasterboards are manufactured in a continuous process from moulding plaster and additives for the gypsum core (incl. starch and foaming agent) as well as high-quality, multi-pressed cardboard (board liner) on large conveyor systems.

The quantity of basic materials used for an average analysis comprises around 93% gypsum, 3.5% recycled paper (for board liner) and 3.5% mineral aggregates and construction chemical compounds.

Details on SVHC, CMR substances cat. 1A or 1B, and biocides:

The product contains substances from the ECHA candidate list of Substances of Very High Concern (SVHC) (date: 16.04.2021) exceeding 0.1% by mass */ECHA2021/*: no

The product contains other CMR substances in categories 1A or 1B which are not on the candidate list exceeding 0.1% by mass in at least one partial product: no

Biocide products were added to this construction product, or it has been treated with biocide products (this then concerns a treated product as defined by the (EU) Regulation on Biocide Products No 528/2012): no

2.6 Manufacture

The manufacturing process comprises the steps depicted in Figure 1.

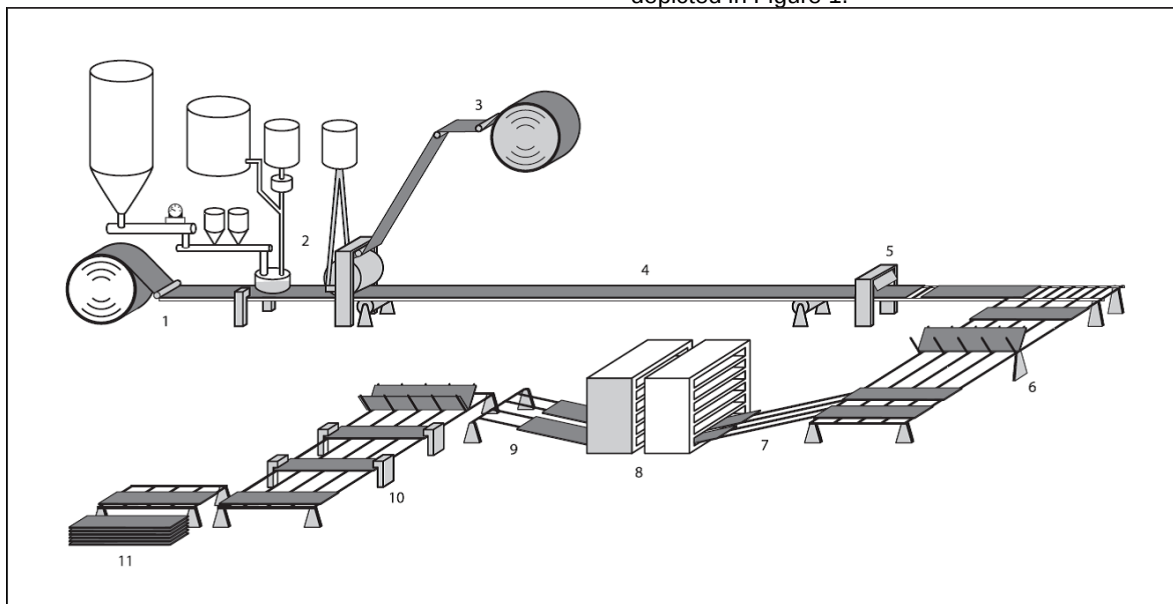


Fig. 1: Plasterboard manufacturing process in accordance with the */Gypsum Data Book/*

- Board liner is fed in facing downwards forming the face side of the board and scored to form the edges (1).
- Addition of gypsum slurry which is spread in the forming station as the board liner is fed in from above (2-3).
- Setting section with shears for cutting (4- 5)
- Turning table with input in a multi-rack drier (6- 8)

- Board discharge with trimming of transverse edges and bundling (9-11)

The manufacturing companies have implemented a quality management system and are certified to */DIN EN ISO 9001/*.

2.7 Environment and health during manufacturing

Plasterboards are manufactured in plants permitted by emission laws in accordance with the specifications of the Federal Immission Control Act. The plants have implemented an energy management system in

accordance with */DIN EN ISO 50001/*. As of an aggregated rated thermal input of > 20 MW, gypsum plants are subordinated to European emissions trading. Below this threshold, compliance with climate protection targets is monitored via German fuel emissions trading.

2.8 Product processing / Installation

Products are processed in accordance with the relevant leaflets of the Bundesverband der Gipsindustrie e.V. and the manufacturers.

During the cutting, sawing or grinding processes for gypsum products, the occupational exposure limit value of 6 mg/m³ alveolar dust (A-dust) must be observed for calcium sulphate as a time-weighted average in accordance with */TRGS 900/*.

The glass fibres used in the fire-resistant boards are so-called continuous filament glass fibres which are manufactured with a defined diameter. Fibres with a diameter of more than 3 micrometres are not respirable. Only such fibres are used in fire-resistant panels; they do not splice even when subjected to further processing with the result that no "fibre dust" arises as per */TRGS 521/*.

2.9 Packaging

Plasterboards are stored on pallets and delivered without packaging. The wooden pallets used are available as reusable or disposable pallets.

2.10 Condition of use

The plasterboards considered here are generally used indoors as an element of interior constructions for wall, ceiling or floor areas.

2.11 Environment and health during use

During the use phase, no hazardous substances are emitted which exceed the limit values of the */AgBB/* evaluation scheme. Plasterboards were examined by the Institut für Bauphysik */Scherer 2010/*. The test result indicates that the plasterboards are not associated with any adverse effects on the interior.

2.12 Reference service life

Reference service lives depend on the respective applications. In accordance with the BBSR table "Nutzungsdauern von Bauteilen für Lebenszyklusanalysen nach dem Bewertungssystem Nachhaltiges Bauen (BNB)" (Useful lives of components for LCAs in accordance with the Sustainable Building evaluation system (BNB)), last revised 24.02.2017, this is > 50 years for walls, for example, in accordance with code number 342.411 "Nichttragende Innenwände – Ständersysteme" (Non-load-bearing interior walls – Stud systems) */BBSR service life/*.

There are no influences on ageing when the recognised rules of technology are applied. The useful life complies with the overall useful life of the building. They are not subject to any exterior exposure.

2.13 Extraordinary effects

Fire

Plasterboards offer very good fire resistance with regard to their low density. This is due to the fact that the gypsum core contains approx. 20% crystal water which evaporates when exposed to fire thereby consuming energy by means of conversion. The temperature on the side facing away from the fire remains constant at approx. 110 °C over a longer period of time depending on the board thickness. The resulting dehydrated gypsum layer offers increased thermal insulation.

In accordance with Annex B of */DIN EN 520/*, plasterboards are usually classified as A2-s1, d0 in terms of their reaction to fire. This classification to */DIN EN 13501-1/* means:

A2 = non-flammable, s1 = no smoke, d0 = no flaming droplets/particles.

Water

All gypsum products must be protected from permanent moisture penetration unless expressly designated by the manufacturer for this purpose. A */Code of Practice Flooding/* is available from the Bundesverband der Gipsindustrie e.V. on remedying damage to components made of gypsum following flooding.

Mechanical destruction

As a general rule, mechanical damage can be compensated for using jointing compound thanks to the ease of repair associated with plasterboards without impairing their functional use. Plasterboards can be easily replaced with new boards in the event of major damage. No environmental consequences are to be anticipated in the event of unforeseen mechanical destruction.

2.14 Reuse phase

Recycling

According to the Commercial Waste Ordinance, gypsum waste must be recycled. After treatment of the boards in special recycling plants for gypsum waste, recycled gypsum can be added to the manufacturing process for new boards following shredding and separation of the board liner. Alternatively, the reclaimed gypsum can be used in other areas suitable for gypsum (setting regulators for cement, agriculture, fertiliser production). The recycling plants for gypsum waste also ensure that any screws or nails are removed by a magnetic separator.

Separated cardboard can be used as a secondary fuel or directed to the paper recycling circuit while separated metal is recycled as scrap.

2.15 Disposal

Disposal in accordance with the */waste code/*: 17 08 02 Gypsum-based construction materials other than those mentioned in 17 08 01

Gypsum-based construction materials adhere to the disposal conditions from landfill class 1 of the */Landfill Ordinance/* in the case of landfilling.

2.16 Further information

www.gips.de

3. LCA: Calculation rules

3.1 Declared unit

The declared unit is 1m² fire-resistant plasterboard in accordance with /DIN EN 520/ and /DIN 18180/ with a weight per unit area of 10 kg.

Declared unit

Name	Value	Unit
Declared unit	1	m ²

The results relate to a representative formulation valid for the members of the Bundesverband der Gipsindustrie e.V. with production in Germany, which comprises several thicknesses and weights per unit area, in the form of standardisation to be applied for statistical reports.

3.2 System threshold

EPD type in accordance with /EN 15804/: Cradle to gate, with

- options (A4–A5),
- Modules C1–C4 and
- Module D

(A1–A3 + C + D and additional Modules: A4 and A5)

Modules A1–A3 (Product stage) include the production of raw materials taking consideration of German framework conditions and transport thereof, the provision of energy (German electricity mix), and the manufacturing processes required for the production of all components for the plasterboard product. As the plasterboards are generally transported to the construction site on reusable pallets with load-securing straps, no packaging is taken into account.

Module A4 comprises transport to the construction site.

Module A5 includes installation on the construction site. Disposal of any packaging is not required here (unpacked product on reusable pallets).

Module C1 declares the manual deconstruction process.

Module C2 concerns transport to the recycling site.

Module C3 comprises the shredding and preparation of gypsum products.

Module C4 is generally not considered, as the Commercial Waste Ordinance provides for plasterboards to be sent for recycling. In this LCA, a landfill scenario is also calculated in order to cover legal exceptions to the Commercial Waste Ordinance.

Module D contains potential credits from gypsum recycling.

3.3 Estimates and assumptions

Approximations and estimates for the processes and materials were made in the corresponding modules for modelling the scenarios in the life cycle.

For Module C1, loss-free (100%) manual removal with hand-held tools is assumed. No losses (e.g. collection losses) during deconstruction are taken into account in the calculation of the end-of-life. The entire quantity produced is processed within the recycling process (scenario 1). In a further scenario, a landfill scenario is declared (scenario 2).

3.4 Cut-off criteria

In accordance with the target definition, all relevant input and output flows that occur in connection with the product under consideration were identified and quantified.

All available data from the production process is therefore taken into account in the LCA, i.e. all of the raw materials used, the thermal energy used, and the electricity consumption.

This also takes into account material and energy flows that contribute less than 1% of the mass or energy.

The requirement that a maximum of 5% of the energy and mass input may be neglected is therefore complied with.

3.5 Underlying data

The data sets used are taken from the /GaBi/ databases.

The underlying database is based on the /GaBi/ 2021, Service Pack 40/CUP 2020.1 version. The /GaBi/ database provides the life cycle inventory data for raw and process materials, transport and energy.

3.6 Data quality

The data quality of the life cycle inventories is assessed based on their precision (measured, calculated, literature values or estimated), completeness (e.g. unreported emissions), consistency (degree of uniformity of the methods used), and representativeness (geographical, temporal, technological).

In order to comply with these aspects and thus ensure reliable results, first-hand industry data was used together with consistent underlying data from the /GaBi/ 2021 databases.

3.7 Period under review

The primary data recorded refers to 2020.

3.8 Allocation

The allocation methods used in underlying data (materials and energy) originating from the /GaBi/ databases are documented online at <http://www.gabi-software.com>.

All incineration processes are depicted by partial flow analyses of the respective materials.

An R1 factor of greater than 0.6 is assumed for all waste incineration plants.

Environmental loads from combustion processes in the construction, utilisation and disposal stages are allocated to the module in which they arise. Potential benefits from these processes are allocated to Module D.

The potential credits arising from energy substitution are awarded via average German data for electric energy and thermal energy from natural gas.

3.9 Comparability

As a general rule, EPD data can only be compared or evaluated when all of the data records to be compared have been drawn up in accordance with EN 15804 and the building context and/or product-specific characteristics are taken into consideration.

The /GaBi/ ts underlying database was used (SP40).

4. LCA: Scenarios and additional technical information

Characteristic product features Biogenic carbon

Information describing the biogenic carbon content at the plant gate

Name	Value	Unit
Biogenic carbon in the product	0.15	kg C

The proportion of biogenic carbon results from the board liner layer of the plasterboard. A carbon content of approx. 0.43 kg per kg of board liner is assumed.

Technical information on the application forms the basis for developing specific scenarios within the context of a building evaluation.

Transport to construction site (A4)

Name	Value	Unit
Transport distance	100	km
Capacity utilisation (including empty runs)	60	%

The EPD declares a transport distance of 100 km for A4. This permits easy conversion of specific transport distances at building level.

Construction installation process (A5)

Installation in the building includes the electricity consumption for screw fastening the plasterboards. The actual screws are not included in the calculation.

Construction installation process (A5)

Name	Value	Unit
Power consumption	0.0025	kWh

End of Life (C1–C4)

The plasterboards are removed manually and transported by truck to a recycling plant (scenario 1) or to landfill (scenario 2). Module C2 is calculated at 50 km in each case.

Name	Value	Unit
For recycling (scenario 1)	10	kg
For landfill (scenario II:	10	kg

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

Module D contains potential credits for the substitution of natural gypsum from the recycling process (Module C3).

5. LCA: Results

The following table depicts the LCA results for the life cycle of 1m² plasterboards. It should be noted that two scenarios are calculated at the disposal stage for the plasterboards, which start after the same deconstruction stage (C1) for both scenarios and differ in terms of disposal costs:

Scenario 1 includes the assumption of a 100% recycling scenario with steps **C2**, **C3/1** and **D/1**. In this scenario, no landfilling takes place, so there are no contributions to indicators in **C4/1** (disposal), which are listed as zero in the table below.

Scenario 2 includes complete disposal in a landfill with steps **C2** and **C4/2**. No waste treatment is required for landfilling, which is why Module **C3/2** has a zero value for all indicators and is listed as such in the table below. Similarly, there are no credits in Module **D/2**, which is therefore also shown as zero.

Important:

EP freshwater: This indicator was calculated as "kg P equiv." in accordance with the characterisation model (EUTREND model, Struijs et al., 2009b, as implemented in ReCiPe; <http://eplca.jrc.ec.europa.eu/LCDN/developerEF.xhtml>).

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

Product stage			Construction process stage		Use stage							End-of-life stage				Benefits and loads beyond the system thresholds
Raw material supply	Transport	Manufacturing	Transport from the manufacturer to the site	Assembly	Use / Application	Maintenance	Repairs	Replacement	Renewal	Operational energy use	Operational water use	Deconstruction / Demolition	Transport	Waste treatment	Landfilling	Reuse, 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

LCA RESULTS – ENVIRONMENTAL IMPACTS according to EN 15804+A2: 1 m² = 10 kg fire-resistant plasterboard

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 equiv.]	1.17E+0	1.16E-1	1.01E-3	0.00E+0	6.29E-2	6.92E-1	0.00E+0	0.00E+0	7.23E-1	-3.09E-2	0.00E+0
GWP fossil	[kg CO ₂ equiv.]	1.72E+0	1.11E-1	1.01E-3	0.00E+0	6.01E-2	6.91E-1	0.00E+0	0.00E+0	7.22E-1	-3.08E-2	0.00E+0
GWP biogenic	[kg CO ₂ equiv.]	-5.55E-1	5.09E-3	3.35E-6	0.00E+0	2.77E-3	5.21E-2	0.00E+0	0.00E+0	5.17E-2	1.14E-4	0.00E+0
GWP luluc	[kg CO ₂ equiv.]	3.06E-3	2.62E-6	1.46E-6	0.00E+0	1.42E-6	1.75E-4	0.00E+0	0.00E+0	4.37E-4	-2.24E-4	0.00E+0
ODP	[kg CFC11 equiv.]	1.66E-10	1.16E-17	2.21E-17	0.00E+0	6.32E-18	2.66E-15	0.00E+0	0.00E+0	5.62E-16	-5.95E-17	0.00E+0
AP	[mol H ⁺ equiv.]	2.97E-3	1.04E-4	2.22E-6	0.00E+0	5.64E-5	2.67E-4	0.00E+0	0.00E+0	1.09E-3	-1.14E-4	0.00E+0
EP freshwater	[kg PO ₄ equiv.]	1.12E-5	2.36E-8	2.69E-9	0.00E+0	1.28E-8	3.23E-7	0.00E+0	0.00E+0	2.60E-7	-1.05E-7	0.00E+0
EP marine	[kg N equiv.]	9.04E-4	3.15E-5	4.93E-7	0.00E+0	1.71E-5	5.92E-5	0.00E+0	0.00E+0	2.80E-4	-4.77E-5	0.00E+0
EP terrestrial	[mol N equiv.]	9.45E-3	3.52E-4	5.18E-6	0.00E+0	1.92E-4	6.22E-4	0.00E+0	0.00E+0	3.08E-3	-5.44E-4	0.00E+0
POCP	[kg NMVOC equiv.]	2.41E-3	9.20E-5	1.35E-6	0.00E+0	5.00E-5	1.62E-4	0.00E+0	0.00E+0	8.48E-4	-1.21E-4	0.00E+0
ADPE	[kg Sb equiv.]	2.37E-7	3.30E-9	2.91E-10	0.00E+0	1.79E-9	3.50E-8	0.00E+0	0.00E+0	1.36E-8	-3.00E-9	0.00E+0
ADPF	[MJ]	2.52E+1	1.56E+0	1.77E-2	0.00E+0	8.48E-1	2.12E+0	0.00E+0	0.00E+0	1.99E+0	-4.24E-1	0.00E+0
WDP	[m ³ world equiv., extracted]	1.26E-1	2.16E-4	2.19E-4	0.00E+0	1.17E-4	2.63E-2	0.00E+0	0.00E+0	1.59E-2	-1.85E-3	0.00E+0

Legend: GWP = Global warming potential; ODP = Ozone depletion potential; AP = Acidification potential of soil and water; EP = Eutrophication potential; POCP = Photochemical ozone creation potential; ADPE = Abiotic depletion potential – non-fossil resources (ADP substances); ADPF = Abiotic depletion potential – fossil fuels (ADP fossil fuels); WDP = Water deprivation potential (users)

LCA RESULTS – INDICATORS TO DESCRIBE RESOURCE USE according to EN 15804+A2: 1 m² = 10 kg fire-resistant plasterboard

Indicator	Unit	A1-A3	A4	A5	C1	C2	C3/1	C3/2	C4/1	C4/2	D/1	D/2
PERE	[MJ]	3.53E+0	4.92E-3	7.84E-3	0.00E+0	2.68E-3	5.84E+0	0.00E+0	0.00E+0	5.16E+0	-4.39E-2	0.00E+0
PERM	[MJ]	4.90E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	4.90E+0	0.00E+0	0.00E+0	4.90E+0	0.00E+0	0.00E+0
PERT	[MJ]	8.43E+0	4.92E-3	7.84E-3	0.00E+0	2.68E-3	9.41E-1	0.00E+0	0.00E+0	2.61E-1	-4.39E-2	0.00E+0
PENRE	[MJ]	2.52E+1	1.56E+0	1.77E-2	0.00E+0	8.49E-1	2.12E+0	0.00E+0	0.00E+0	1.99E+0	-4.26E-1	0.00E+0
PENRM	[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

PENRT	[MJ]	2.52E+1	1.56E+0	1.77E-2	0.00E+0	8.49E-1	2.12E+0	0.00E+0	0.00E+0	1.99E+0	-4.26E-1	0.00E+0
SM	[kg]	5.30E+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	[m³]	6.16E-3	8.83E-6	9.07E-6	0.00E+0	4.80E-6	1.09E-3	0.00E+0	0.00E+0	5.02E-4	-6.05E-5	0.00E+0
Legend	PERE = Renewable primary energy as primary energy carrier; PERM = Renewable primary energy resources as material utilisation; PERT = Total use of renewable primary energy resources; PENRE = Non-renewable primary energy as energy carrier; PENRM = Non-renewable primary energy as material utilisation; PENRT = Total use of non-renewable primary energy resources; SM = Use of secondary materials; RSF = Use of renewable secondary fuels; NRSF = Use of non-renewable secondary fuels; FW = Use of net fresh water											

LCA RESULTS – WASTE CATEGORIES AND OUTPUT FLOWS according to EN 15804+A2: 1 m² = 10 kg fire-resistant plasterboard

Indicator	Unit	A1-A3	A4	A5	C1	C2	C3/1	C3/2	C4/1	C4/2	D/1	D/2
HWD	[kg]	1.23E-6	1.52E-10	7.32E-12	0.00E+0	8.24E-11	8.79E-10	0.00E+0	0.00E+0	3.03E-8	-2.15E-8	0.00E+0
NHWD	[kg]	2.36E-2	1.60E-4	1.26E-5	0.00E+0	8.68E-5	1.51E-3	0.00E+0	0.00E+0	1.00E+1	-9.01E-5	0.00E+0
RWD	[kg]	3.49E-4	1.68E-6	2.69E-6	0.00E+0	9.11E-7	3.22E-4	0.00E+0	0.00E+0	2.26E-5	-7.58E-6	0.00E+0
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	3.90E+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	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
EET	[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
Legend	HWD = Hazardous waste for disposal; NHWD = Non-hazardous waste for disposal; RWD = Radioactive waste for disposal; CRU = Components for reuse; MFR = Materials for recycling; MER = Materials for energy recovery; EEE = Exported electrical energy; EET = Exported thermal energy											

LCA RESULTS – Additional impact categories acc. to EN 15804+A2 – optional: 1 m² = 10 kg fire-resistant plasterboard

Indicator	Unit	A1-A3	A4	A5	C1	C2	C3/1	C3/2	C4/1	C4/2	D/1	D/2
PM	[Disease incidences]	7.55E-8	5.63E-10	1.86E-11	0.00E+0	3.06E-10	2.24E-9	0.00E+0	0.00E+0	1.35E-8	-5.18E-8	0.00E+0
IRP	[kBq U235 equiv.]	4.47E-2	2.40E-4	4.41E-4	0.00E+0	1.30E-4	5.29E-2	0.00E+0	0.00E+0	2.32E-3	-1.39E-3	0.00E+0
ETP-fw	[CTUe]	1.49E+1	1.11E+0	7.57E-3	0.00E+0	6.01E-1	9.08E-1	0.00E+0	0.00E+0	1.14E+0	-2.99E-1	0.00E+0
HTP-c	[CTUh]	2.31E-10	2.08E-11	2.09E-13	0.00E+0	1.13E-11	2.51E-11	0.00E+0	0.00E+0	1.68E-10	-6.46E-12	0.00E+0
HTP-nc	[CTUh]	1.24E-8	8.90E-10	7.70E-12	0.00E+0	4.84E-10	9.24E-10	0.00E+0	0.00E+0	1.86E-8	-3.62E-10	0.00E+0
SQP	[-]	7.60E+0	4.01E-3	5.63E-3	0.00E+0	2.18E-3	6.76E-1	0.00E+0	0.00E+0	4.15E-1	-1.33E-1	0.00E+0
Legend	PM = Potential incidence of disease due to particulate matter emissions; IR = Potential effect of human exposure to U235; ETP fw = Potential toxicity comparison unit for ecosystems; HTP c = Potential toxicity comparison unit for humans (carcinogenic effect); HTP nc = Potential toxicity comparison unit for humans (non-carcinogenic effect); SQP = Potential soil quality index											

Limitation note 1 – applies to the indicator “Potential impact of exposure to people to U235”: This impact category mainly addresses the potential impact of low-dose ionising radiation on human health in the nuclear fuel cycle. This does not consider impacts attributable 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.

Limitation note 2 – applies for the indicators: “Potential for Abiotic Resource Depletion – Non-Fossil Resources”, “Potential for Abiotic Resource Depletion – Fossil Fuels”, “Water Depletion Potential (User)”, “Potential Ecosystem Toxicity Comparison Unit”, “Potential Human Toxicity Comparison Unit – Carcinogenic Effect”, “Potential Human Toxicity Comparison Unit – 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 there is only limited experience with the indicator.

6. LCA: Interpretation

The juxtaposition of the declared modules shows that the manufacturing phase (A1-A3) dominates the Life Cycle Assessment. Greenhouse gas emissions also play a role in Module C3.

Transport to the construction site (A4) and to recycling or landfill (C2) at the end of life are of minor importance.

Module D shows the potential credits from the recycling process.

7. Proof

7.1 Leaching (sulphate + heavy metals)

On analysis according to the /Landfill Ordinance/, the product displays the sulphate concentration in the saturation range which is typical for gypsum (approx. 1500 mg/l), resulting in disposal options only from landfill class I upwards.

Gypsum is classified as a listed substance in Water Hazard Class 1 (slightly hazardous for water). Heavy metal content is significantly below the corresponding criteria for landfill class I.

Proper disposal in accordance with the parameters which can depend on use, sorting depth during deconstruction, collection (separately or together with other construction waste) and treatment, among others, and must be determined by the responsible waste producer

7.2 Radioactivity

The product can be used without restriction with overall dose contributions of significantly lower than 0.3 mSv/a, determined on the basis of the index calculation to RP 112 and the radon concentration */BfS report/*.

7.3 VOC emissions

The requirements of the */AgBB/* evaluation scheme are fully met */Scherer 2010/*:

TVOC3 ≤ 10 mg/m³

Carcinogens 3 EU cat. 1 and 2 ≤ 0.01 mg/m³

TVOC28 < 1.0 mg/m³

SVOC28 ≤ 0.1 mg/m³

Carcinogens28 EU cat. 1 and 2 ≤ 0.001 mg/m³

Total VOC28 excl. LCI ≤ 0.1 mg/m³

Total VOC incl. LCI $R = \sum Ci/LC_{Li} < 1$

A current test report was attached to the underlying report to demonstrate compliance with the current */AgBB/* scheme.

8. References

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/DIN 4103-4/

DIN 4103-4:1988-11, Internal non-loadbearing partitions; Partitions with timber framing

/DIN 18168-1/

DIN 18168-1:2007-04, Ceiling linings and suspended ceilings with gypsum plasterboards – Part 1: Requirements for construction

/DIN 18168-2/

DIN 18168-2:2008-05, Ceiling linings and suspended ceilings with gypsum plasterboards – Part 2: Verification of the load-carrying capacity of metal sub-constructions and metal suspending rods

/DIN 18180/

DIN 18180:2014-09, Gypsum plasterboards – Types and requirements

/DIN 18181/

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/DIN 18183-1/

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/DIN EN 520/

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DIN EN ISO 9001:2015-11, Quality management systems – Requirements (ISO 9001:2015); German and English versions EN ISO 9001:2015

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/ISO 14025/

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

Principles and procedures (ISO 14025:2006); German and English versions EN ISO 14025:2011

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/Construction Products Regulation/

Directive (EU) No. 305/2011 of the European Parliament and Council dated 9 March 2011 establishing harmonised conditions for marketing building products and replacing Council Guideline 89/106/EEC; ABl. EU L88/5 dated 4 April 2011

/BBSR service life/

BBSR table "Service lives of components for LCA in accordance with BNB"
"Sustainable Building Information Portal" of the Federal Ministry of Transport, Building and Urban Affairs: <http://www.nachhaltigesbauen.de/baustoff-undgebaeuedaten/nutzungsdauern-von-bauteilen.html>; last revised 24 February 2017

/BfS report/

Natural radioactivity in construction materials and the ensuing radiation exposure, Field of radiation protection and environment

K. Gehrcke, B. Hoffmann, U. Schkade, V. Schmidt, K. Wichterey; Federal Office for Radiation Protection, Salzgitter, November 2012; <http://nbn-resolving.de/urn:nbn:de:0221-201210099810>

/Landfill Ordinance/

Landfill Ordinance dated 27 April 2009 (Federal Law Gazette No. I, p. 900), last amended by Article 3 of the Ordinance dated 9 July 2021 (Federal Law Gazette No. I, p. 2598)

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Candidate list of Substances of Very High Concern for Authorisation (published in accordance with Article 59(10) of the REACH Regulation); <http://echa.europa.eu/de/candidate-list-table>; last revised 16 April 2021

/Gypsum Data Book/

Gypsum Data Book
Pub.: Bundesverband der Gipsindustrie e.V., Kochstrasse 6-7, 10969 Berlin
Published on: www.gips.de (section: Publications / Books); last revised May 2013

/IBU 2021/

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/Code of Practice Flooding/

Removing damage caused by flooding to components made of gypsum or gypsum plaster, BVG Information Service No. 01

Published on: www.gips.de (section: Download, Publications, Information services); last revised: June 2013

/Scherer 2010/

Fraunhofer-Institut für Bauphysik IBP, Holzkirchen

Test report: Cross-sectional study on the emission potential of volatile organic compounds from gypsum components and gypsum products for interior applications (July 2010)

Published on: www.gips.de (section: Research association, Projects, 2010). This report has been supplemented by current proof for the underlying report.

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TRGS 521 "Demolition, renovation and maintenance work with old mineral wool" (edition: February 2008; <https://www.baua.de/DE/Angebote/Rechtstexte-und-Technische-Regeln/Regelwerk/TRGS/TRGS-521.html>)

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