

Environmental Product Declaration

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

DANO® FUGENFÜLLER
DANO® FÜLL UND FLÄCHE
DANO® ANSETZGIPS



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 FILLER AND GYPSUM-BASED ADHESIVE (SETTING PLASTER)“ to Danogips products

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

Gypsum bases Setting Plaster for powdered products in accordance with standard DIN EN 13279-1 and material for filling gypsum board joints (filler, fine filler and joint filler) in accordance with DIN EN 13963.

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

- **DANO® FUGENFÜLLER**
- **DANO® FÜLL UND FLÄCHE**
- **DANO® ANSETZGIPS**

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-20210319-IBE1-EN
Issue date	04 April 2022
Valid until	03 April 2027

GYPSUM FILLER AND GYPSUM-BASED ADHESIVE (SETTING PLASTER) **Bundesverband der Gipsindustrie e.V.**

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



1. General information

Bundesverband der Gipsindustrie e.V.

Programme holder

IBU – Institut Bauen und Umwelt e.V.
Panoramastr. 1
10178 Berlin
Germany

Declaration number

EPD-BVG-20210319-IBE1-EN

This Declaration is based on the product category rules:

Mineral factory mortar, 11.2017
(PCR checked and approved by the independent Expert Council (SVR))

Issue date

04 April 2022

Valid until

03 April 2027



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



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

GYPSUM FILLER AND GYPSUM-BASED ADHESIVE (SETTING PLASTER)

Holder of the Declaration

Bundesverband der Gipsindustrie e.V.
Kochstrasse 6-7
10969 Berlin

Declared product/unit

1 kg gypsum binder for powder products according to /DIN EN 13279-1/, as bulk goods (unpackaged)

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/baugipse/> for products manufactured in Germany. The LCA takes into account specific information from the manufacturers and suppliers of components for the entire life cycle.

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 *EN 15804+A2*. This standard is referred to as *EN 15804* hereinafter.

Verification

The *EN 15804* European standard serves as the core PCR.

Independent verification of the Declaration and information provided in accordance with *ISO 14025:2010*

☐ internally ☒ externally



Dr.-Ing. Wolfram Trinius
(Independent verifier)

2. Product

2.1 Product description / Product definition

Gypsum binder in accordance with /DIN EN 13279-1/ is the base product for industrial manufacturing of various gypsum plasters but also for all prefabricated elements made of gypsum. It is extracted through calcination of calcium sulphate dihydrate ($\text{CaSO}_4 \cdot 2 \text{H}_2\text{O}$) and comprises calcium sulphate in its various hydrate phases, e.g. hemi-hydrate ($\text{CaSO}_4 \cdot \frac{1}{2} \text{H}_2\text{O}$) and anhydrite (CaSO_4).

Gypsum binder is a bindable material ground to powder whose curing process is triggered by the addition of water. This can be carried out at the construction site (gypsum plaster, gypsum filler and gypsum-based adhesive) or in the plant within the framework of board production.

Gypsum binder forms the basis for manufacturing gypsum plaster (for automatic or manual plastering), gypsum filler material and gypsum-based adhesives as well as for model plaster, stucco and fixing plaster.

(EU) Directive No. 305/2011 (CPR) applies for placing the product on the market in the EU/EFTA (with the exception of Switzerland). The product requires a Declaration of Performance considering /DIN EN 13279-1:2008-11, Gypsum binders and gypsum plasters – Part 1: Definitions and requirements /DIN EN 13279-1/, and CE marking.

Use is governed by the respective national regulations.

2.2 Application

Gypsum binders can be manufactured for various applications which are indicated by the respective name in accordance with European standards or traditional, possibly deviating, names combined with applications indicated by the manufacturer only. An overview is provided by the Gypsum Data Book issued by the Bundesverband der Gipsindustrie e.V. /Gypsum Data Book/ and the IGB Stucco Manual /IGB/ published by the building plaster industrial group of the Bundesverband der Gipsindustrie e.V.

2.3 Technical data

The technical data is based on the following standards: Requirements on gypsum plaster in accordance with DIN EN 13279-1:2008-11, Gypsum binders and gypsum plasters – Part 1: Definitions and requirements /DIN EN 13279-1/.

DIN EN 13963:2014-09, Jointing materials for gypsum boards – Definitions, requirements and test methods also applies for filler, fine filler and jointing compound /DIN EN 13963/.

Additional technical data refers to the hardened products after finishing with water at the construction site. This technical construction data, which refers to downstream processing after the plant gate, results from following the manufacturer's information for construction of the building. These properties are therefore not listed here for systematic reasons.

If necessary, more information is available in the standards, the Gypsum Data Book issued by the Bundesverband der Gipsindustrie e.V. /Gypsum Data Book/, and information supplied by the manufacturers (member companies of the Bundesverband der Gipsindustrie e. V. on <https://www.gips.de/epd-ansprechpartner/baugipse/>).

Performance values of the product according to the Declaration of Performance with regard to its essential characteristics can be, e.g. fire behaviour, adhesive tensile strength, thermal resistance, or hazardous substances.

2.4 Delivery status

The product is delivered in powder form. The product can be procured in various pack sizes, e.g. in sacks or as bulk goods from silos, depending on the manufacturer's respective offers.

The list of manufacturers is available on the Bundesverband der Gipsindustrie website: <https://www.gips.de/epdansprechpartner/baugipse/>.

2.5 Base materials / Ancillary materials

As a general rule, gypsum binder comprises calcium sulphate of various hydrate stages, whereby the binding and processing characteristics are based on their respective combinations and possibly the addition of retarders and water retention agents.

A distinction can generally be made between products containing non-hazardous substances and alkaline gypsum products.

Gypsum binders with added lime hydrate of 1 to 10% by weight bear the CLP label eye damage / eye irritation category 1 with the GHS05 pictogram, the signal word "Danger" and the H318 hazard statement "Causes serious eye damage".

A safety data sheet is available for all products from the respective manufacturer or from the /GefkommBau/ database.

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

During the manufacturing process, raw gypsum is burned as gypsum binder where it is available as hemi-hydrate, anhydrite III and anhydrite II gypsum phases. Gypsum plaster is also admixed with powdered limestone, sand or perlite, and additives such as binding retarders or cellulose derivatives which are added in dry form to the calcined calcium sulphate.

2.7 Environment and health during manufacturing

Gypsum products are manufactured in the "Installations for burning gypsum" which are outlined in the 4th Federal Immission Control Ordinance in the Annex to installations subject to approval. The immission control requirements comprise the guidelines outlined in the Federal Immission Control Act and the technical requirements on air as outlined in the /TA Air/.

Gypsum industry plants are only subject to emissions trading if the cumulated rated thermal input is > 20 MW. This threshold value is only achieved by larger plants and/or joint production of several gypsum products.

The plants have implemented an energy management system in accordance with /DIN EN ISO 50001/.

2.8 Product processing / Installation

The substrate must fulfil the following requirements for the professional manufacture of plaster surfaces:

- Even surface in accordance with the requirements of /DIN 18202/
- Load-bearing, solid and sufficiently inherently stable
- Dry, non-water-repellent and evenly absorbent
- Free of dust, soiling and harmful efflorescence
- Frost-free and/or tempered above +5 °C
- Free of sintered layers and release agent residue

Where concrete is used as a plaster base, residual moisture must not exceed 3% by weight. Moisture release by concrete must be finished in the surface zone and the plaster base must be absorbent. Freshly-plastered rooms must be protected from frost.

Other key information includes the absorptivity of the plaster base, material requirements and yield, water values when sprinkling the product into water, plaster layer and thickness, processing times, drying out, the

requisite quality levels of surfaces and details on suitable/unsuitable coatings.

Plaster finishing spatulas C7 in accordance with /DIN EN 13279-1/ are primarily used for flat coatings on smooth solid substrates (plaster surfaces, plane stone masonry, smooth-formed concrete, prefabricated concrete parts) or on gypsum or gypsum fibreboard for subsequent surface treatment. Apart from full-surface coatings, textured designs are also possible. Depending on the product, plaster can be applied and processed manually or by machine. Layers have a thickness of 0.1 mm to 3 mm. Filler, fine filler and jointing compound are regulated according to /DIN EN 13963/ and are primarily used for filling plasterboard joints in accordance with /DIN EN 520/ as well as for fibre-reinforced plasterboard.

2.9 Packaging

Within the framework of this EPD, it was assumed that the unpackaged product is provided at the plant gate, e.g. made available for transport in a silo truck or construction site silo.

Powder gypsum products must be protected from moisture absorption during transport and storage. The storage times specified – usually three or six months – must be observed. Gypsum products can usually still be processed after these times, whereby the information provided by the manufacturer concerning processing times no longer apply.

2.10 Condition of use

The product is intended for use as a construction product in interior areas and/or serves as an industrial interim product for the manufacture of other gypsum products.

2.11 Environment and health during use

The requirements of the /AgBB – Version 2008/ evaluation scheme are fully met /Scherer 2010/.

All listed criteria are significantly fallen short of. Therefore, the products do not have any negative impact on the quality of indoor air.

2.12 Reference service life

Reference service lives depend on the respective applications.

The reference service lives result from the application areas in accordance with the BSSR "Nutzungsdauern von Bauteilen für Lebenszyklusanalysen nach dem Bewertungssystem Nachhaltiges Bauen (BNB) (Useful life of components for the LCA according to the Sustainable Building assessment system)" table, last revised 03.11.2011 /BBSR Service Life/ as follows: For filling compounds, adhesive binders and adhesives made of gypsum in accordance with code 342.411 "Stud wall systems" or code 342.511 "Partitions made of gypsum plasterboards" ≥ 50 years
For stucco and like-gypsum plaster in accordance with code 345.211 "Stucco, lime-gypsum plaster ..." ≥ 50 years; the same applies for code 345.221 "Plaster profiles" and code 345.222 "Plaster bases" which may be used in combination with gypsum products.
There are no influences on ageing when the recognised rules of technology are applied.

2.13 Extraordinary effects

Fire

The product is allocated to class A1 according to /DIN EN 13501-1/ (no contribution to fire load) provided that it contains less than 1% by weight or volume of organic substances (the higher value applies).

According to /DIN EN 13501-1/, this also satisfies the additional requirements concerning "no smoke gas development" (s1) and "no flaming droplets/particles" (d0).

Water

The product is intended for use in interior applications only. Permanent moisture penetration of the product with water must be avoided as recrystallisation and structural changes can arise due to the water solubility of gypsum.

In the event of any temporary moisture penetration at a later stage, strength diminishes. But the original values are achieved again after drying. This is why application in domestic kitchens and bathrooms with only occasional and temporary exposure to moisture does not present any problems.

A Code of Practice /Code of Practice Flooding/ is available from the Bundesverband der Gipsindustrie e.V. on how to repair damage caused by flooding.

Mechanical destruction

Mechanical stress does not occur during the service life of the building. As the product is only used in interior applications, there are no environmental consequences in the event of unforeseen mechanical destruction.

2.14 Reuse phase

Waste processing (recycling or disposal) depends on the respective substrate due to the low material hardness displayed by the component. The actual material is suitable for disposal in landfills from landfill class DK I in accordance with the /Landfill Ordinance/. Recycling options can be restricted by sulphate content caused by gypsum in the eluate.

2.15 Disposal

The /waste code/ for the unused material is 10 13 06 "Particulates and dust (with the exception of 10 13 12 and 10 13 13)" in category 10 13 "Waste from the manufacture of cement, unhydrated lime, gypsum and products made from these materials"

or

17 08 02 "Gypsum-based building materials other than those mentioned in 17 08 01" in category 17 08 "Gypsum-based building materials".

Neither represents hazardous waste.

After processing, the waste code must be selected depending on the respective substrate.

2.16 Further information

www.gips.de

3. LCA: Calculation rules

3.1 Declared unit

The declared unit is 1 kg gypsum filler or gypsum-based adhesive (setting plaster) in delivery form (powder product, not mixed with water). Material requirements and yield are indicated in the product information or can be obtained from the manufacturer.

Details on declared unit

Name	Value	Unit
Declared unit (powder product)	1	kg

Material requirements comprise between 8 kg/m² and 11 kg/m² for 10 mm plaster thickness on substrates which are solidly filled and of normal absorbency.

3.2 System threshold

EPD type: in accordance with EN 15804+A2:

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 based on framework conditions inherent in Germany and transport thereof, the provision of energy (German electricity mix), and the manufacturing processes required for the production of all components for the product.

No packaging is considered for transport to the construction site as bulk goods.

Module A4 comprises transport to the construction site.

Module A5 concerns installation at the construction site, including disposal of any packaging taking consideration of framework conditions inherent in Europe.

Module C1 declares the deconstruction process (mechanical).

Module C2 concerns transport to the recycling or disposal site.

Module C4 declares landfilling.

Module D contains potential credit notes as a result of energetic recycling of packaging (in Module A5). In this case, this is "0", as the product is distributed in bulk form.

3.3 Estimates and assumptions

Packaging materials for powder products to be delivered were not considered. As a general rule, the products can be delivered in bags or as bulk goods in silos or silo trucks.

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	kg C

The product does not contain any biogenic carbon.

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

No scenarios are developed within the framework of this cradle-to-gate Declaration.

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)

Name	Value	Unit
Water consumption	0.0003	m ³
Power consumption	0.00016	kWh

End of Life (C1-C4)

Mechanical deconstruction is assumed for C1. The plaster is then transported to the landfill by truck (Module C2, 50 km).

Name	Value	Unit
For landfilling	1	kg

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

Values in Module D can result primarily from waste recycling in Module C3 or, to a lesser extent, from thermal recycling of packaging waste in A5.

The scenarios assumed here (unpacked goods, landfill) do not allow any credits in D from A5 and C3. In this case, the results for Module D appear with the value "0".

5. LCA: Results

The following table depicts the LCA results for the life cycle of 1 kg gypsum filler or gypsum-based adhesive (setting plaster). It should be noted that landfilling is assumed at the disposal stage and the corresponding LCA results are shown in the column for Module C4. Column C3 (recycling) appears in the results with the numerical values "0".

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 kg gypsum filler and gypsum-based adhesive (setting plaster)

Core indicator	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
GWP total	[kg CO2 equiv.]	9.70E-2	1.30E-2	9.31E-5	6.39E-4	6.00E-3	0.00E+0	1.50E-2	0.00E+0
GWP fossil	[kg CO2 equiv.]	9.60E-2	1.20E-2	8.98E-5	6.38E-4	6.00E-3	0.00E+0	1.50E-2	0.00E+0
GWP biogenic	[kg CO2 equiv.]	2.59E-4	5.53E-4	3.16E-6	9.33E-7	2.77E-4	0.00E+0	6.33E-7	0.00E+0
GWP luluc	[kg CO2 equiv.]	4.70E-5	2.85E-7	1.14E-7	1.45E-8	1.42E-7	0.00E+0	4.37E-5	0.00E+0
ODP	[kg CFC11 equiv.]	4.97E-16	1.26E-18	1.59E-18	6.45E-20	6.32E-19	0.00E+0	5.62E-17	0.00E+0
AP	[mol H+ equiv.]	9.90E-5	1.13E-5	1.92E-7	3.02E-6	5.64E-6	0.00E+0	1.09E-4	0.00E+0
EP freshwater	[kg PO4 equiv.]	7.55E-8	2.56E-9	3.62E-9	1.31E-10	1.28E-9	0.00E+0	2.61E-8	0.00E+0
EP marine	[kg N equiv.]	3.51E-5	3.42E-6	5.83E-8	1.42E-6	1.71E-6	0.00E+0	2.80E-5	0.00E+0
EP terrestrial	[mol N equiv.]	3.85E-4	3.83E-5	4.83E-7	1.55E-5	1.92E-5	0.00E+0	3.08E-4	0.00E+0
POCP	[kg NMVOC equiv.]	1.01E-4	1.00E-5	1.27E-7	4.02E-6	5.00E-6	0.00E+0	8.48E-5	0.00E+0
ADPE	[kg Sb equiv.]	9.94E-9	3.59E-10	2.16E-11	1.83E-11	1.79E-10	0.00E+0	1.36E-9	0.00E+0
ADPF	[MJ]	1.41E+0	1.70E-1	1.00E-3	9.00E-3	8.50E-2	0.00E+0	1.99E-1	0.00E+0
WDP	[m³ world equiv., extracted]	4.00E-3	2.35E-5	1.30E-2	1.20E-6	1.17E-5	0.00E+0	2.00E-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 kg gypsum filler and gypsum-based adhesive (setting plaster)

Indicator	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
PERE	[MJ]	1.18E-1	5.35E-4	5.53E-4	2.73E-5	2.68E-4	0.00E+0	2.60E-2	0.00E+0
PERM	[MJ]	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
PERT	[MJ]	1.18E-1	5.35E-4	5.53E-4	2.73E-5	2.68E-4	0.00E+0	2.60E-2	0.00E+0
PENRE	[MJ]	1.41E+0	1.70E-1	1.00E-3	9.00E-3	8.50E-2	0.00E+0	1.99E-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
PENRT	[MJ]	1.41E+0	1.70E-1	1.00E-3	9.00E-3	8.50E-2	0.00E+0	1.99E-1	0.00E+0
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
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
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
FW	[m³]	1.47E-4	9.60E-7	3.01E-4	4.90E-8	4.80E-7	0.00E+0	5.02E-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 kg gypsum filler and gypsum-based adhesive (setting plaster)

Indicator	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
HWD	[kg]	9.39E-10	1.65E-11	1.10E-12	8.41E-13	8.24E-12	0.00E+0	3.04E-9	0.00E+0
NHWD	[kg]	5.81E-4	1.74E-5	8.64E-5	8.86E-7	8.68E-6	0.00E+0	1.00E+0	0.00E+0
RWD	[kg]	1.71E-5	1.82E-7	1.84E-7	9.30E-9	9.12E-8	0.00E+0	2.26E-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
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

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
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
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
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 kg gypsum filler and gypsum-based adhesive (setting plaster)

Indicator	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
PM	[Disease incidences]	7.55E-9	6.12E-11	2.15E-12	3.40E-11	3.06E-11	0.00E+0	1.35E-9	0.00E+0
IRP	[kBq U235 equiv.]	2.00E-3	2.61E-5	2.99E-5	1.33E-6	1.30E-5	0.00E+0	2.32E-4	0.00E+0
ETP-fw	[CTUe]	3.46E-1	1.20E-1	1.00E-3	6.00E-3	6.00E-2	0.00E+0	1.14E-1	0.00E+0
HTP-c	[CTUh]	1.52E-11	2.26E-12	3.53E-14	1.15E-13	1.13E-12	0.00E+0	1.69E-11	0.00E+0
HTP-nc	[CTUh]	6.18E-10	9.67E-11	2.48E-12	5.95E-12	4.84E-11	0.00E+0	1.86E-9	0.00E+0
SQP	[-]	1.13E-1	4.36E-4	4.16E-4	2.23E-5	2.18E-4	0.00E+0	4.10E-2	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.

Transport to the construction site (A4) and landfilling also play a role.

The other modules are negligible.

- A1 contains the contributions of the raw materials and their upstream chains.
- A2 shows the emissions from transport to the production site.
- A3 contains the emissions from energy consumption in the production plant.

The LCA within the manufacturing phase is broken down as follows:

7. Proof

7.1 Leaching

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 test scheme, version 2008, are complied with in terms of all existing test items /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 = Σ Ci/LC*i* < 1

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