

ENVIRONMENTAL PRODUCT DECLARATION

as per ISO 14025 and EN 15804

Owner of the Declaration	Bundesverband der Gipsindustrie e.V.
Programme holder	Institut Bauen und Umwelt e.V. (IBU)
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GYPSUM BLOCKS IN ACCORDANCE WITH DIN EN 12859 Bundesverband der Gipsindustrie e.V.

www.bau-umwelt.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-20140116-IAG1-EN

This Declaration is based on the Product Category Rules:

Plasterboard, 07.2014
(PCR tested and approved by the SVR)

Issue date

20.08.2014

Valid to

19.08.2020



Prof. Dr.-Ing. Horst J. Bossenmayer
(President of Institut Bauen und Umwelt e.V.)



Dr. Burkhard Lehmann
(Managing Director IBU)

GYPSUM BLOCKS IN ACCORDANCE WITH DIN EN 12859

Owner of the Declaration

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

Declared product / Declared unit

Gypsum blocks in accordance with /DIN EN 12859/
1m² (84 kg)

Scope:

The EPD applies for all member companies of the Bundesverband der Gipsindustrie e.V. in accordance with the current list of members on www.gips.de and for products manufactured in Germany. The LCA considers specific information supplied by the manufacturers and suppliers of components exclusively for the cradle-to-gate production stage. This document is translated from the German Environmental Product Declaration into English. It is based on the German original version EPD-BVG-20140116-IAG1-DE. The verifier has no influence on the quality of the translation. 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.

Verification

The CEN Norm /EN 15804/ serves as the core PCR

Independent verification of the declaration
according to /ISO 14025/

☐ internally ☒ externally



Dr.-Ing. Wolfram Trinius
(Independent verifier appointed by SVR)

2. Product

2.1 Product description

The declaration refers to 1m² gypsum blocks with a surface weight of 84 kg/m².

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

2.2 Application

Gypsum blocks are primarily used in the construction of non-load-bearing interior partitions in accordance with /DIN 4103-2/ in residential and non-residential buildings.

Apart from single- and double-layer partitions with particularly high levels of sound insulation, other possible applications for gypsum blocks include installation walls, shaft walls, facing layers and upright support cladding.

Applications of gypsum blocks as non-load-bearing single- or double-layer partitions are outlined in the ESD-BVG-2013121-D Environmental System Declaration /IBU ESD-BVG-2013121-D/.

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).

Up-to-date technical information can be requested from manufacturers for gypsum blocks listed on www.gips.de.

2.4 Placing on the market / Application rules

Regulation (EU) No. 305/2011 dated 9 March 2011 applies for placing on the market within the EU/EFTA. The products require a Declaration of Performance considering DIN EN 12859:2011-05: Gypsum blocks – Definitions, requirements and test methods; German version EN 12859:2011 and CE marking.

Use is governed by the respective national regulations. The design of interior partitions made of gypsum blocks is regulated in Germany by /DIN 4103-2/.

2.5 Delivery status

Gypsum blocks can be supplied in various formats considering various thicknesses and individual requirements.

Gypsum blocks are supplied in various dimensions, thicknesses and gross densities. An overview is provided in Tables 1 and 2:

Table 1: Bulk density class, bulk density to DIN EN 12859 (excerpt)

Board type	Bulk density class	Bulk density (kg/m ³)
Average bulk density	M (medium)	800 ≤ ρ < 1,100
Average bulk density, water-repellent		
High bulk density	D (dense)	1,100 ≤ ρ < 1,500
High bulk density, water-repellent		

Table 2: Dimensions, colour coding to DIN EN 12859 (excerpt)

Board type	Strength ¹⁾ (mm)	Format ¹⁾ (mm)	Colouration
Average bulk density	60, 80, 100	666 x 500	Natural white
Average bulk density, water-repellent			Blueish
High bulk density	100	500 x 500	Reddish
High bulk density, water-repellent			Blueish

¹⁾ preferred dimensions for the German market

2.6 Base materials / Ancillary materials

Gypsum blocks are manufactured in automated production plants. Stucco and water are combined in dosing and mixing devices to form a homogeneous, viscous mass which swiftly binds in stainless steel moulding boxes. The blocks are then dried and packed. They are delivered to the construction site in packages.

They do not contain any substances > 0.1% by weight which are included in the "Candidate List of Substances of Very High Concern" /ECHA 2013/.

2.7 Manufacture

Gypsum blocks are manufactured in automated production plants. Stucco and water are combined in dosing and mixing devices to form a homogeneous, viscous mass which swiftly binds in stainless steel moulding boxes. The blocks are then dried and packed. They are delivered to the construction site in packages /Gypsum Data Book/.

The manufacturing companies implement a Quality Management System and are certified to /DIN EN ISO 9001/.

2.8 Environment and health during manufacturing

Gypsum blocks are manufactured in plants permitted by emission laws in accordance with the specifications of the Federal Immission Control Act.

The plants implement an Energy Management System in accordance with /DIN EN ISO 50001/.

2.9 Product processing/Installation

The products are processed in accordance with the relevant information leaflets issued by 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/ "Occupational Exposure Limit Values" (issued in January 2006, last amended and supplemented by GMBI 2012, p. 11 [No. 1]). If necessary, dust-reducing measures or organisational measures must be taken which are oriented towards the /TRGS 559/ "Mineral Dust" (issued in February 2010) and the exposure categories outlined therein.

2.10 Packaging

Gypsum blocks are supplied in foil-wrapped, waterproof packages on Euro pallets.

2.11 Condition of use

The useful life of the gypsum blocks for interior applications reviewed here generally complies with the overall useful life of the building.

They are not subject to any exterior exposure.

2.12 Environment and health during use

During the use phase, no hazardous substances are emitted which exceed the limit values of the /AgBB/ test scheme.

Gypsum blocks are examined by the Institut für Bauphysik /Scherer 2010/.

The test result indicates that the gypsum blocks are not associated with any adverse effects on the interior.

2.13 Reference service life

Reference Service Lives depend on the respective applications.

The Reference Service Life in accordance with the BBSR "Nutzungsdauern von Bauteilen für Lebenszyklusanalysen nach dem Bewertungssystem Nachhaltiges Bauen (BNB)" (Useful lives of components for life cycle analyses in accordance with the Sustainable Building (BNB) evaluation system) table, last revised 03.11.2011, amounts to > 50 years

for partitions, for example, in accordance with code number 342.511 "Non-load-bearing interior partitions – Gypsum blocks" /BBSR Reference Service Life/. There are no influences on ageing when the recognised rules of technology are applied.

2.14 Extraordinary effects

Fire

Apart from partitions made from gypsum blocks, shaft walls, facing layers or upright support cladding are also distinguished by their solid, homogeneous design featuring gypsum as a construction material providing protection against fire. All boards are classified as construction product class A1 (non-flammable) in accordance with /DIN 4102-1/. Single-layer partitions with a thickness of 60 mm achieve fire resistance level F 30 while 80 mm corresponds with F 120 and 100 mm corresponds with F 180. Double-layer partitions are regarded as two individual single-layer partitions with the result that the thicker single layer determines the respective level of fire resistance. Due to the homogeneous design displayed by the partitions, fire resistance applies for protection against fire on both sides which is particularly interesting in the case of shaft walls which can be built without working on the interior side of the shaft which is generally difficult to access.

Water

Unless expressly designated by the manufacturer, all gypsum products must be protected from permanent humidity.

A leaflet is available from the Bundesverband der Gipsindustrie e.V. on restoration of components made of gypsum after flooding damage /Flooding Leaflet/.

Mechanical destruction

As a general rule, mechanical damage can be offset using jointing compound due to the ease of repair

associated with gypsum blocks without any adverse effects on function.

Gypsum blocks can easily be replaced with new boards in the event of more extensive damage. No environmental consequences are to be anticipated in the event of unforeseen mechanical destruction.

2.15 Re-use phase

Re-use

The gypsum blocks can not be re-used for the same application without undergoing some change. For the remaining re-uses/disposals, segregation of building materials on the building site is recommended.

Further use

In agreement with the customer, gypsum blocks which are as good as new (e.g. leftover cuttings) can be used after crushing as recultivation material in mining areas, for use on landfills, as soil conditioner, fertiliser components or acceleration agents for cement, considering any official specifications.

Recycling

After treatment in special recycling plants for gypsum waste, recycled gypsum can be added to the manufacturing process for new boards following crushing.

Alternatively, the recycled gypsum can be used in the areas outlined for further use.

These recycling facilities for gypsum waste also ensure separation of typical contamination associated with construction (metal, tiles, wallpaper etc.).

2.16 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.

2.17 Further information

www.gips.de

3. LCA: Calculation rules

3.1 Declared Unit

Declared Unit

Name	Value	Unit
Declared unit	1	m ²
Conversion factor to 1 kg	0.0119	-

3.2 System boundary

The EPD refers to the production phase in accordance with /DIN EN 15804/, i.e. it comprises the manufacturing steps from the cradle to the factory gate.

Modules A1-A3 include the production of raw materials and transport thereof, the provision of energy and the manufacturing processes required for the production of all components for the gypsum block product.

3.3 Estimates and assumptions

Assumptions regarding transportation were made for all materials required and for disposal.

Packaging materials are not considered in the LCA; data applies to unpackaged products.

3.4 Cut-off criteria

All components for manufacturing the gypsum blocks as well as all electricity and water required were considered.

Accordingly, material and energy flows with a share of less than 1 per cent were also considered.

It can be assumed that the processes neglected would have contributed less than 5% to the impact categories under review.

3.5 Background data

“GaBi 5” – the software system for comprehensive analysis (GaBi 5 2012) developed by PE INTERNATIONAL AG – was used for modelling the production of all components.

The Life Cycle Assessment was modelled for Germany as a reference area. Consequently, apart from the production processes under these framework conditions, the upstream stages of relevance for Germany such as the provision of electricity or energy were also used. The electricity mix for Germany 2008 is used.

3.6 Data quality

All background data sets of relevance were taken from the GaBi 5 software data base.

3.7 Period under review

The data used by PE INTERNATIONAL AG complies with the current level of knowledge at the time of modelling the LCA in early 2013.

3.8 Allocation

Allocations were used in the background data for modelling the requisite components, e.g. for the provision of electricity. An allocation was avoided for the provision of FGD gypsum which is sometimes used for the production of calcium sulphate beta hemi-hydrate.

3.9 Comparability

Basically, a comparison or an evaluation of EPD data is only possible if all the data sets to be compared were created according to /EN 15804/ and the building context, respectively the product-specific characteristics of performance, are taken into account.

4. LCA: Scenarios and additional technical information

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

For gypsum blocks, for example, such scenarios are already available for single- and double-layer non-load-bearing interior partitions made of gypsum blocks /IBU ESD-BVG-2013121-D/.

Due to the wide variety of possible applications, scenarios are not developed within the framework of this cradle-to-gate declaration; instead, reference is made to the Environmental System Declarations available on gypsum blocks.

5. LCA: Results

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

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	MND	MND	MND	MNR	MNR	MNR	MND	MND	MND	MND	MND	MND	MND

RESULTS OF THE LCA - ENVIRONMENTAL IMPACT: 1 m² = 84 kg gypsum blocks

Parameter	Unit	A1-A3
Global warming potential	[kg CO ₂ -Eq.]	20.97
Depletion potential of the stratospheric ozone layer	[kg CFC11-Eq.]	1.17E-9
Acidification potential of land and water	[kg SO ₂ -Eq.]	2.26E-2
Eutrophication potential	[kg (PO ₄) ³ -Eq.]	2.70E-3
Formation potential of tropospheric ozone photochemical oxidants	[kg ethene-Eq.]	2.71E-3
Abiotic depletion potential for non-fossil resources	[kg Sb-Eq.]	1.30E-3
Abiotic depletion potential for fossil resources	[MJ]	329.68

RESULTS OF THE LCA - RESOURCE USE: 1 m² = 84 kg gypsum blocks

Parameter	Unit	A1-A3
Renewable primary energy as energy carrier	[MJ]	5.32
Renewable primary energy resources as material utilization	[MJ]	0.00
Total use of renewable primary energy resources	[MJ]	5.32
Non-renewable primary energy as energy carrier	[MJ]	329.68
Non-renewable primary energy as material utilization	[MJ]	0.00
Total use of non-renewable primary energy resources	[MJ]	329.68
Use of secondary material	[kg]	45.30
Use of renewable secondary fuels	[MJ]	0.00
Use of non-renewable secondary fuels	[MJ]	0.00
Use of net fresh water	[m ³]	0.08

RESULTS OF THE LCA – OUTPUT FLOWS AND WASTE CATEGORIES:

1 m² = 84 kg gypsum blocks

Parameter	Unit	A1-A3
Hazardous waste disposed	[kg]	0.00
Non-hazardous waste disposed	[kg]	0.07
Radioactive waste disposed	[kg]	0.00
Components for re-use	[kg]	IND
Materials for recycling	[kg]	IND
Materials for energy recovery	[kg]	IND
Exported electrical energy	[MJ]	IND
Exported thermal energy	[MJ]	IND

6. LCA: Interpretation

In calculating the LCA, a generic national raw material mix for gypsum is applied for the upstream chain in order to comply with the various levels of availability in the individual plants and the interchangeability and/or combination possibilities offered by raw gypsum. Gypsum can be procured as a raw material from nature or as a by-product from desulphurisation of coal-fired power stations (FGD gypsum). While all material and energy flows are considered for natural gypsum, the cut-off limit for FGD gypsum is represented by the expenses associated with the manufacture of FGD gypsum following desulphurisation (e.g. electricity consumption by the belt filter but not the use of limestone in the flue gas scrubber or the disposal of FGD waste water). Delivery to the gypsum plant is initially followed by the manufacture of calcium sulphate beta hemi-hydrate

(stucco) through combustion of the raw gypsum (calcination) below 180 °C.

This stucco is then combined with water and additives before being poured into a moulding box to produce the block. This process is followed by thermal removal of the excess moisture in a drier.

Production significantly dominates the LCA impact categories due to the calcination of the raw gypsum associated with the consumption of fossil energy sources and drying the boards; these two sub-processes are responsible for approximately 85% of the GWP.

There is no scarcity of resources of the raw materials used, i.e. gypsum.

Almost all of the ADPE is dominated by the use of natural gypsum for which the sulphur content of the

earth's crust is applied as a criterion for calculating the Sb equivalent. As the LCA has been recorded from the

cradle to the factory gate, no credits are considered for possible recycling of gypsum at the end of life.

7. Requisite evidence

7.1 Leaching (sulphate + heavy metals)

On analysis according to the Landfilling 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, and must be determined by the waste producer responsible.

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 in accordance with the AgBB test scheme, version 2008, are satisfied with regard to all existing test items /Scherer 2010/:

TVOC 3 ≤ 10 mg/m³

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

TVOC 28 < 1.0 mg/m³

SVOC28 ≤ 0.1 mg/m³

Carcinogens 28 EU cat. 1 and 2 ≤ 0.001 mg/m³

Total VOC 28 excl. LCI ≤ 0.1 mg/m³

Total VOC incl. LCI $R = \sum Ci/LCi < 1$

8. References

Institut Bauen und Umwelt

Institut Bauen und Umwelt e.V., Berlin(pub.):
Generation of Environmental Product Declarations (EPDs);

General principles

for the EPD range of Institut Bauen und Umwelt e.V. (IBU), 2013/04
www.bau-umwelt.de

ISO 14025

DIN EN ISO 14025:2011-10: Environmental labels and declarations — Type III environmental declarations — Principles and procedures

EN 15804

EN 15804:2012-04+A1 2013: Sustainability of construction works — Environmental Product Declarations — Core rules for the product category of construction products

/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 4.4.2011

/BBSR Reference Service Life/
BBSR table "Service lives of components for LCA in accordance with BNB"
"Sustainable Building Information Portal" by the Federal Ministry of Transport, Building and Urban Affairs:
<http://www.nachhaltigesbauen.de/baustoff-und-gebaeuedaten/nutzungsdauern-von-bauteilen.html>, last revised: 03.11.2011

/BfS report/

Natural radioactivity in construction materials and the resulting radiation exposure
Field of radiation protection and environment
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Federal Office for Radiation Protection, Salzgitter, November 2012
http://doris.bfs.de/jspui/bitstream/urn:nbn:de:0221-201210099810/3/BfS_2012_SW_14_12.pdf

DIN EN 4102-1

DIN 4102-1:1998-05

Title (German): Fire behaviour of building materials and building components – Part 1: Building materials; concepts, requirements and tests

DIN EN 4103-2

DIN 4103-2:2010-11

Title (German): Internal non-load-bearing partitions – Part 2: Partitions made of gypsum blocks

/DIN EN ISO 9001/

DIN EN ISO 9001:2008-12: Quality management systems – Requirements (ISO 9001:2008); trilingual version EN ISO 9001:2008

DIN EN 12859

DIN EN 12859:2011-05

Title (German): Gypsum blocks – Definitions, requirements and test methods; German version EN 12859:2011

DIN EN 15804

DIN EN 15804/A1:2013-05

Title (German): Sustainability of construction works – Environmental product declarations – Core rules for the construction products product category; German version EN 15804:2012/FprA1:2013

/DIN EN ISO 50001/
 DIN EN ISO 50001:2011-12
 Environmental management systems – Requirements
 with guidance for use (ISO 50001:2011)

/ECHA 2013/
 European Chemicals Agency (ECHA)
 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: 20 June 2013

GaBi 5 2012
 GaBi 5: Software and data base for comprehensive
 analysis, LBP, University of Stuttgart and PE
 International
 GaBi 5 documentation
<http://documentation.gabi-software.com/>, (2012)

/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 ESD-BVG-2013121-D/
 Environmental System Declaration in accordance with
 ISO 14025 and EN 15804

Non-load-bearing partitions made of gypsum blocks
 Declaration number ESD-BVG-2013121-D
 Bundesverband der Gipsindustrie e.V.
 Pub.: Institut Bauen und Umwelt (IBU), 14.01.2013

/Flooding Leaflet/
 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) and Test Report HoE-
 O28/2010/281 Examination of a gypsum block for
 emissions of organic compounds

TRGS 900 "Occupational exposure limit values"
 (issued January 2006, last amended and
 supplemented GMBI 2012, p. 11 [No. 1])

TRGS 559 "Mineral dust" (issued February 2010)

**Publisher**

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

Tel +49 (0)30 3087748- 0
Fax +49 (0)30 3087748- 29
Mail info@bau-umwelt.com
Web www.bau-umwelt.com

**Programme holder**

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

Tel +49 (0)30 - 3087748- 0
Fax +49 (0)30 - 3087748 - 29
Mail info@bau-umwelt.com
Web www.bau-umwelt.com



PE INTERNATIONAL

Author of the Life Cycle Assessment

PE INTERNATIONAL AG
Hauptstraße 111
70771 Leinfelden-Echterdingen
Germany

Tel +49 (0)711 34817-0
Fax +49 (0)711 341817-25
Mail info@pe-international.com
Web www.pe-international.com

**Owner of the Declaration**

Bundesverband der Gipsindustrie e.V.
Kochstraße 6-7
10969 Berlin
Germany

Tel +49 (0)30 31169822-0
Fax +49 (0)30 31169822-9
Mail info@gips.de
Web www.gips.de