

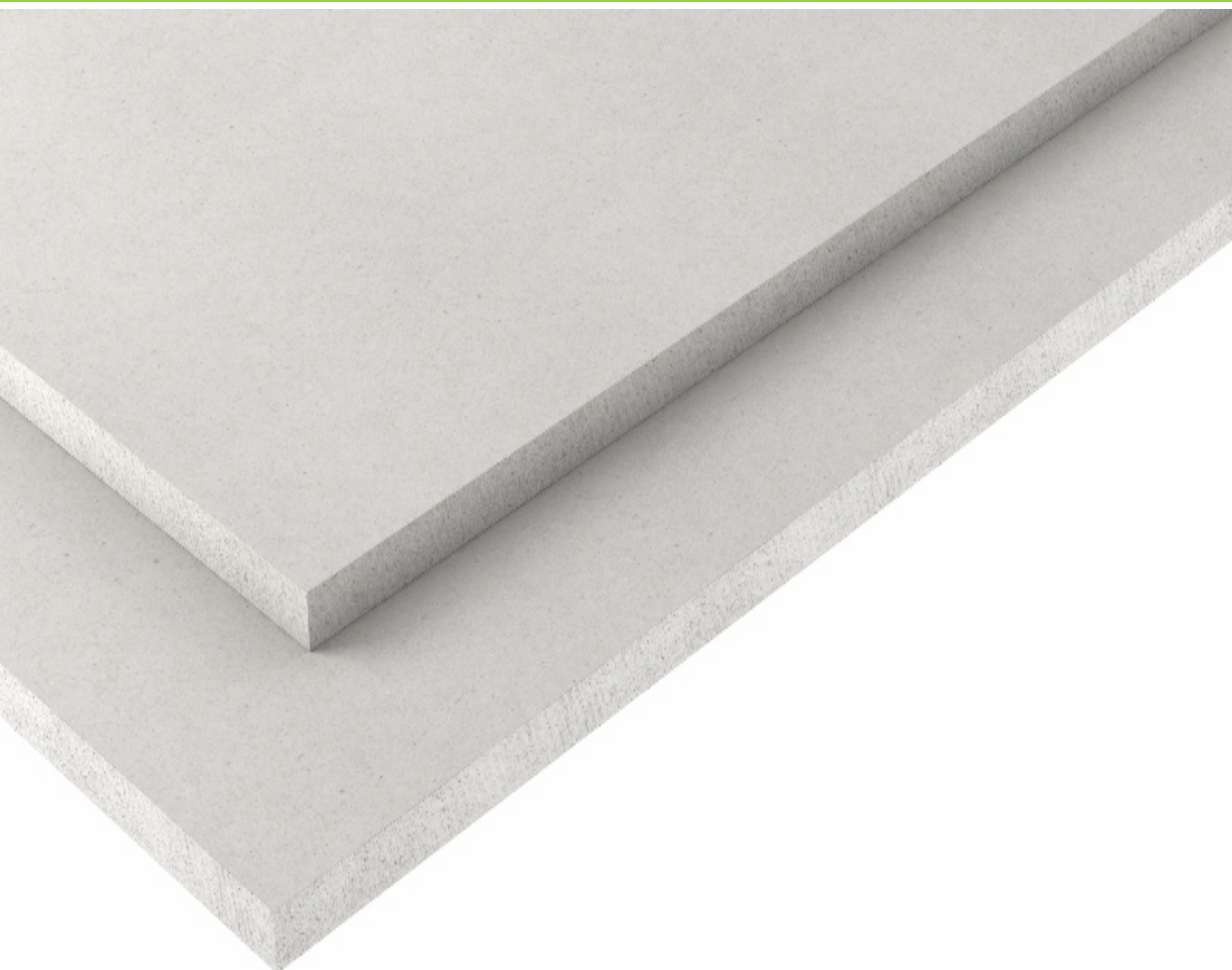
ENVIRONMENTAL PRODUCT DECLARATION

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)
Publisher	Institut Bauen und Umwelt e.V. (IBU)
Declaration number	EPD-BVG-20140070-IAG1-EN
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Valid to	19.08.2020

DRY SCREED GYPSUM FIBREBOARD 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-20140070-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)

DRY SCREED GYPSUM FIBREBOARD

Owner of the Declaration

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

Declared product / Declared unit

Dry screed gypsum fibreboard
1m² (24 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-20140070-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 comprises dry screed made from gypsum fibreboard which can be manufactured in the plant as multi-layer elements offset-bonded (rabbit edge) gypsum fibreboards or as monolithic elements with profiled edges and a surface weight of 24 kg/m².

2.2 Application

Dry screeds made from gypsum fibreboards are used for floors in new buildings and in the refurbishment of residential and office buildings as well as in public buildings. Dry screeds are applied on a separation or insulation layer on even, load-bearing sub-surfaces. Uneven sub-surfaces are levelled prior to installation. The elements are pasted and screwed if necessary in the joint area. Dry screeds can be installed for all standard floor coverings and are suitable for underfloor heating systems.

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 the following manufacturers:

Fermacell GmbH	www.fermacell.de
Knauf Gips KG	www.knauf.de
Saint-Gobain Rigips GmbH	www.rigips.de

2.4 Placing on the market / Application rules

DIN EN 15283-2: 2009-12, Gypsum boards with fibrous reinforcement – Definitions, requirements and test methods – Part 2: Gypsum fibreboards; German version EN 15283-2:2008+A1:2009 /DIN EN 15283-2/

2.5 Delivery status

Dry screeds made from gypsum fibreboards can be supplied as single or several bonded boards of varying sizes. The surface density ranges between 21.5 and 30 kg/m². The selected reference unit is typical for element thicknesses of 20 mm. Installations cover 500 x 1,500 mm for multi-layer elements and 600 x 1,200 mm for monolithic elements.

2.6 Base materials / Ancillary materials

Gypsum fibreboards comprise gypsum and recycled paper fibres. These two raw materials are combined and, after adding water as the only binding agent, are

formed as boards and dried. The water binds the gypsum as well as penetrating and enveloping the fibres. This contributes to the high degree of stability and non-combustibility offered by gypsum fibreboards. Gypsum fibreboards for dry screeds are either edge-profiled or offset bonded in the factory.

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

The manufacturing process comprises the steps depicted in Figure 1.

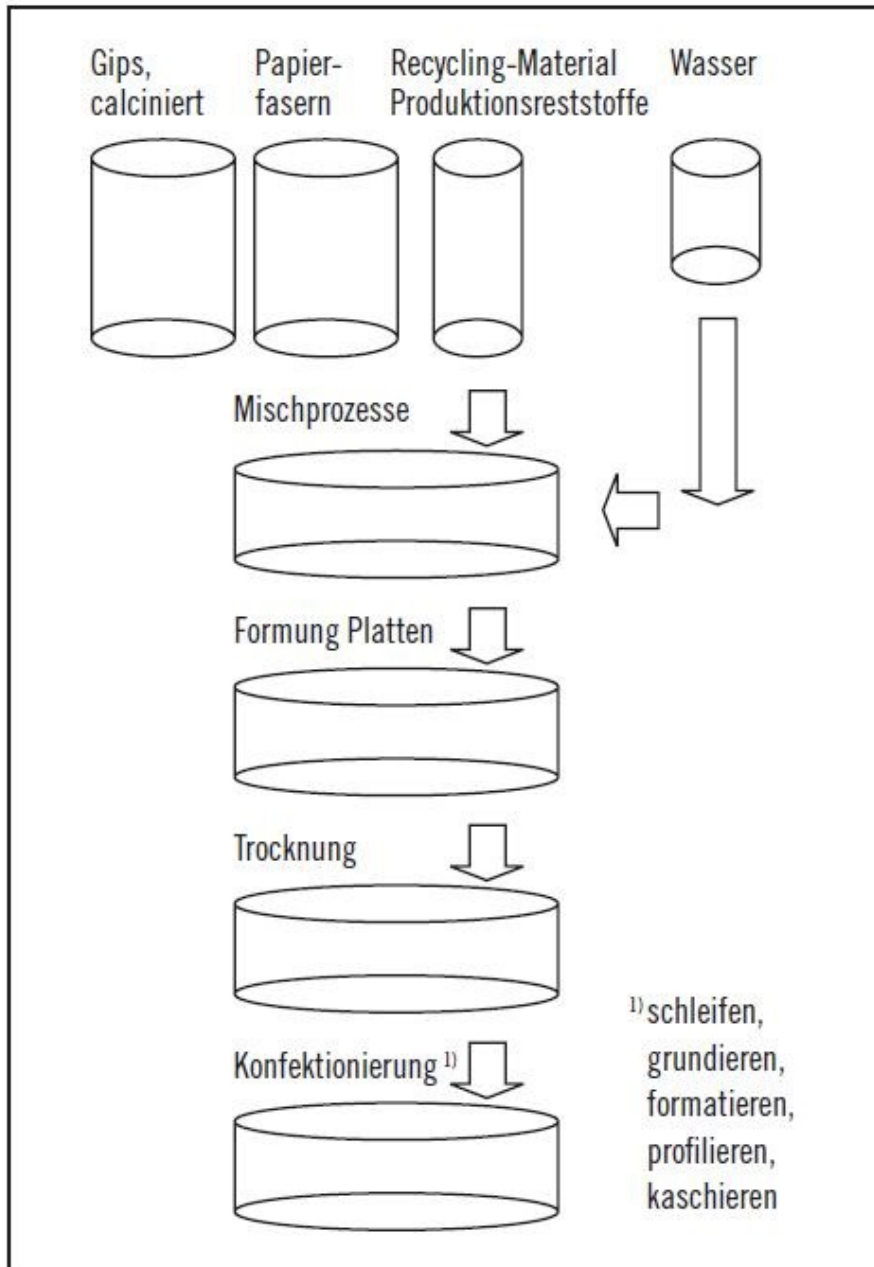


Fig. 1: Gypsum fibreboard manufacturing process in accordance with the /Gypsum Data Book/

Recycling-Material Produktionsreststoffe
Production residue recycling material

[Legend:] [German] [English]
Gips, calciniert Gypsum, calcined
Papierfasern Paper fibres

Wasser Water
Mischprozesse Mixing processes
Formung Platten Forming boards
Trocknung Drying

Konfektionierung 1) Packing 1)

- 1) schleifen, grundieren, formatieren, profilieren, kaschieren
- 1) grinding, priming, formatting, profiling, coating

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

2.8 Environment and health during manufacturing

Dry screeds made from gypsum fibreboards are manufactured in plants permitted by emission laws in accordance with the specifications of the Federal Immission Control Act. The plants 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/subject to emissions trading.

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

Dry screeds made from gypsum fibreboards are stored on pallets and delivered without packaging. The wooden pallets used are available as reusable or disposable pallets.

2.11 Condition of use

The useful life of the dry screeds made from gypsum fibreboards for construction reviewed here generally complies with the overall useful life of the building. The elements are not exposed to external stress if covered by floor coverings as standard and the manufacturer-specific information on (spot) useful loads is observed.

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 fibreboards have been tested by the Institut für Bauphysik /Scherer 2010/. The test result indicates that the gypsum fibreboards are not associated with any adverse effects on the interior.

2.13 Reference service life

Reference Service Lives depend on the respective applications. In accordance with the BBSR "Service lives of components for LCA in accordance with BNB", valid as at 03.11.2011, the /BBSR service life/ for Code 352.112 "Dry screeds (systems): ... Gypsum

fibreboards ..." >50 years. No influences on ageing are known if the rules of technology are applied.

2.14 Extraordinary effects

Fire

Dry screeds made from gypsum fibreboards are "non-flammable" and are classified as construction product class A1 or A2 on account of their fire performance in accordance with /DIN EN 13501-1/.

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 flood damage (Flooding leaflet).

Mechanical destruction

As a general rule, mechanical damage can be compensated for using jointing compound thanks to the ease of repair associated with screeds made from gypsum fibreboards without impairing their functional use. Screeds made from gypsum fibreboards can be easily replaced with new elements in the event of major damage.

2.15 Re-use phase

Re-use

The gypsum fibreboards 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

After crushing, gypsum fibreboards can be re-used in agreement with the customer as recultivation material in mining areas, for recovery on landfills, as soil conditioner, fertiliser components or acceleration agent for cement taking consideration of any official specifications.

Recycling

After treatment in special recycling plants for gypsum waste, gypsum fibreboards can be added to the manufacturing process for new boards following crushing and separation from the paper fibres. Alternatively, the recycled gypsum can be used in the areas outlined for further use.

These recycling plants for gypsum waste also ensure that any screws or nails are removed by a magnetic separator.

Paper fibres removed in these plants can be used as a secondary fuel or directed to paper recycling; separated metals are recycled as scrap.

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.

3. LCA: Calculation rules

3.1 Declared Unit

Declared Unit

Name	Value	Unit
Declared unit	1	m ²
Conversion factor to 1 kg	0.0417	-

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 dry screed product made from gypsum fibreboard.

3.3 Estimates and assumptions

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

3.4 Cut-off criteria

All components for manufacturing the gypsum fibreboards 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

The "GaBi 5" software system for comprehensive analysis developed by PE INTERNATIONAL AG was

used for modelling the production of all components (GaBi 5 2012).

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.

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

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: TDry screed gypsum fibreboards, 1 m² = 24 kg

Parameter	Unit	A1-A3
Global warming potential	[kg CO ₂ -Eq.]	7.21
Depletion potential of the stratospheric ozone layer	[kg CFC11-Eq.]	9.35E-10
Acidification potential of land and water	[kg SO ₂ -Eq.]	9.39E-3
Eutrophication potential	[kg (PO ₄) ³ -Eq.]	1.60E-3
Formation potential of tropospheric ozone photochemical oxidants	[kg ethene-Eq.]	9.82E-4
Abiotic depletion potential for non-fossil resources	[kg Sb-Eq.]	3.59E-4
Abiotic depletion potential for fossil resources	[MJ]	111.67

RESULTS OF THE LCA - RESOURCE USE: TDry screed gypsum fibreboards, 1 m² = 24 kg

Parameter	Unit	A1-A3
Renewable primary energy as energy carrier	[MJ]	4.39
Renewable primary energy resources as material utilization	[MJ]	0.00
Total use of renewable primary energy resources	[MJ]	4.39
Non-renewable primary energy as energy carrier	[MJ]	111.67
Non-renewable primary energy as material utilization	[MJ]	0.00
Total use of non-renewable primary energy resources	[MJ]	111.67
Use of secondary material	[kg]	13.98
Use of renewable secondary fuels	[MJ]	0.00
Use of non-renewable secondary fuels	[MJ]	0.00
Use of net fresh water	[m ³]	0.02

RESULTS OF THE LCA – OUTPUT FLOWS AND WASTE CATEGORIES:

TDry screed gypsum fibreboards, 1 m² = 24 kg

Parameter	Unit	A1-A3
Hazardous waste disposed	[kg]	0.00
Non-hazardous waste disposed	[kg]	0.77
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 waste paper and formed as boards. 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 70% of the GWP.

There is no scarcity of resources of the raw materials used, i.e. gypsum and waste paper. More than 90% 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 de-construction, 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).

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

TVOC $3 \leq 10 \text{ mg/m}^3$
Carcinogens 3 EU cat. 1 and 2 $\leq 0.01 \text{ mg/m}^3$
TVOC 28 $< 1.0 \text{ mg/m}^3$
SVOC 28 $\leq 0.1 \text{ mg/m}^3$
Carcinogens 28 EU cat. 1 and 2 $\leq 0.001 \text{ mg/m}^3$
Total VOC 28 excl. LCI $\leq 0.1 \text{ mg/m}^3$
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 ensuing radiation exposure

Field of radiation protection and environment

K. Gehrcke, B. Hoffmann, U. Schkade, V. Schmidt, K. Wichterey; urn:nbn:de:0221-201210099810
 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 ISO 9001/

DIN EN ISO 9001:2008-12 (D/E/F)

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

DIN EN 13501-1

DIN EN 13501-1:2010-01

Title (German): Classification of building products and types by fire performance – Part 1: Classification with the results of tests on Reaction to Fire by construction products; German version EN 13501-1:2007 + A1:2009

DIN EN 15283-2

DIN EN 15283-2:2009-12

Title (German): Gypsum boards with fibrous reinforcement – Definitions, requirements and test methods – Part 2: Gypsum fibreboards; German version EN 15283-2:2008+A1:2009

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

(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)

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

TRGS 559 "Mineral dust" (issued February 2010)

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