Gypsum plasterboard
RIGIPS PRO and RIGIPS 4PRO™

Environmental Product Declaration

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ECO PLATFORM

ITB is the member of The European Platform for EPD program operators.

EPD program operator

Building Research Institute (ITB), 00-611 Warsaw, Filtrowa 1
www.itb.pl; www.zb.itb.pl/epd

Manufacturer

Saint-Gobain Construction Products Polska Sp. z o.o.
Rigips Office: 9 Cybernetyki St., 02-677 Warsaw
Factory: Szarbków 73, 28-400 Pińczów
Telephone number: +48 22 457 14 57
Fax number: +48 22 457 14 55
Internet address: www.rigips.pl
E-mail address: rigips.polska@saint-gobain.com

Rigips SAINT-GOBAIN

Basic information

This declaration is the type III Environmental Product Declaration (EPD) based on EN 15804 and verified according to ISO 14025 by external auditor. It contains the information on the impacts of declared construction materials on environment and their aspects verified by the independent Advisory Body according to ISO 14025. Basically, a comparison or evaluation of EPD data is possible only if all the compared data were created according to EN 15804 (see point 5.3 of the standard).

Life cycle: A1-A3 modules in accordance with EN 15804 (Cradle to Gate)

The year of preparing the characteristic: 2014

Declared durability: Under normal conditions, gypsum plasterboard is expected to last the service life of a building (60 years)

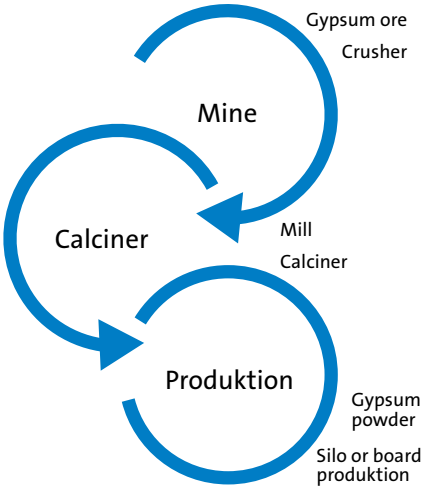
PCR: PCR-24-PL/EN 15804

Declared unit: 1 kg of gypsum plasterboard

(recalculation to 1m^2 by product's type weight; from 5,5 to 18 kg/m^2)

Manufacturer and Product Information

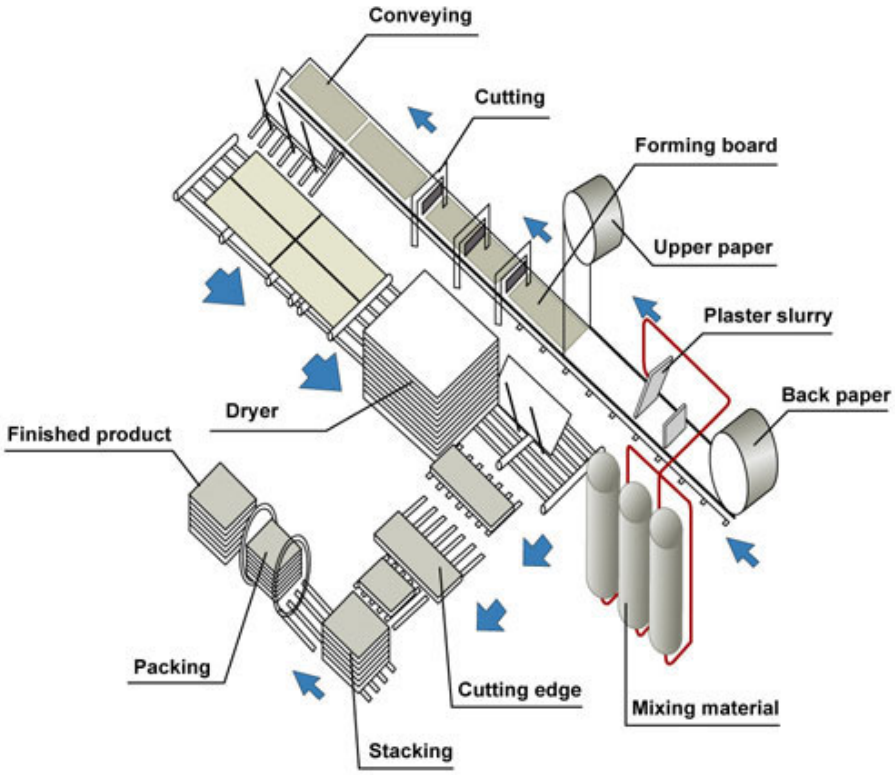
Rigips exists on the Polish market since 1994 and is engaged in manufacturing gypsum products (from own natural stone mined); plaster – plasterboards and drywall systems: walls, shaft walls, ceilings and other building elements.



Gypsum is a material used in construction for thousands of years. This material is not only durable, easy to be handled, hygienic but also completely renewable. Gypsum is calcium sulfate dihydrate ($CaSO_4$ $2H_2O$) naturally occurring mineral. Gypsum ore is mined in RIGIPS open mine near (2 km) manufacturing plant in Pińczów. RIGIPS is a manufacturer of gypsum and anhydrite for further processing (dry powder products). Raw gypsum stone is reprocessed into a variety of products such as a portland cement additive, industrial and building plasters, and RIGIPS plasterboard, ceiling tiles and gypsum blocks. Natural gypsum is inert, non-toxic materials, harmless to human life in its natural state.

To produce RIGIPS plasterboard, gypsum is milled and calcined to produce calcium sulfate hemihydrates ($CaSO_4$ $½H_2O$), commonly called Stucco. Calcination occurs at approximately 120 to 150°C and 0,908 Megagrams (Mg) (1 ton) of gypsum calcines to about 0,77 Mg (0,85 ton) of stucco. In calciner, the gypsum is heated by hot combustion gas passed through flues in the kettle, and the stucco product is separated in the bug filter and finally stored in the silo. Ready for use stucco is transferred from one process to next (gypsum board and blocks production) by means of screw conveyors.

Later in the manufacture of plasterboard, stucco from calcinator is first mixed with dry additives such as starch, fiberglass and others. This dry mix is combined with water, foam, accelerators and pulpwood in a pin mixer at the head of a board forming line. The slurry is then spread on the moving belt conveyor between 2 paper sheets. The edges of the paper are scored to allow precise folding of the paper to form the edges of the board. As the wet board travels the length of a conveying line, the calcium sulfate hemihydrate combines with the water in the slurry to form solid calcium sulfate dihydrate, resulting in rigid board. The board is rough-cut to length, and it enters a multideck dryer, where it is dried by direct contact with hot combustion gases The dried plasterboard is conveyed to the board end sawing area and it is trimmed and bundled for shipment.



Rigips from the beginning of its operation shows continuous concern on issues related to proper working conditions, care for the environment and the highest quality of products. Result of these efforts was the implementation of:

- quality management systems based on ISO 9001
- occupational health and safety based on PN-EN 18001
- environmental protection based on ISO 14001

The mentioned systems have been integrated in 2010 into Integrated Quality Management System after audits carried out by SGS Poland Sp. z o.o., which is part of the SGS - the world leader operating in the field of control, verification, testing and certification. Rigips certificates issued by SGS Poland are accredited by United Kingdom Accreditation Service (UKAS).

Product type

According to PN-EN 520 + A1:2010 standard:

Standard designation	Type of application	Commercial name
Gypsum plasterboard	• light systems used for wall coverings, partitions, walls, shafts, suspended ceilings and attics • recommended for large intensely lit surfaces with crosswise edge joints	RIGIPS PRO and 4PRO™ Type A, F, D, H1, H2, H3, R, E, I, P – and combinations thereof

Technical parameters

Description	• Gypsum plasterboard RIGIPS PRO and RIGIPS 4PRO™
Standard designation	• PN-EN 520 + A1:2010
Thickness	• From 6,5 to 18 mm
Weight	• From 5,5 to 18 kg/m^2
Width	• 1200 mm
Length	• 2000mm, 2500 mm, 2600 mm, 3000 mm (other on request)
Reaction to fire	• Nonflammable, Class A2-s1,d0 compliant as regards reaction to fire of construction materials (according to PN-EN 13501-1)
Colour	• Assigned to the type of plasterboard
Product reference document	• Declaration of Performance (DoP)
Manufacturing site	• Szarbków 73, Poland

Allocation

In manufacture of plasterboard, stucco from calciner is mixed with dry additives such as starch, fiberglass and others. This dry mix is combined with water, foam, silicone, accelerators and shredded paper in a mixer at the head of a board forming line. The slurry is then spread on a moving belt conveyor between 2 paper sheets that serve as a mold. The edges of the paper are scored, chamfered, to allow precise folding of the paper to form the edges of the board. As the wet board travels the length of a conveying line, the calcium sulfate hemihydrate combines with the water in the slurry to form solid calcium sulfate dihydrate, resulting in rigid board. The board is rough-cut to length, and it enters a multideck kiln dryer, where it is dried by direct contact with hot combustion gases. The dried board is conveyed to the board end sawing area and is trimmed and bundled for shipment or for further processing of CASO products.

The board production is a single line process without co-products. All impacts from mine are allocated in gypsum stone (separated RIGIPS EPD) and taken into consideration in A1 module of plasterboard EPD. 100% of input products to the board production were inventoried and allocated. Calcination process is included in Stucco production – A1 (separated RIGIPS EPD). 100% of impacts from line production were inventoried and allocated to plasterboards. Other Rigips product as Rigips gypsum blocks are inventoried as separated production line. Municipal waste and waste water of whole factory were allocated on mass basis between all co-products (blocks and boards). Electricity and gas consumption was inventoried for every production process separately.

System limits

The life cycle analysis of the examined products covers “Product Stage”, A1-A3 modules (Cradle to Gate) in accordance with EN 15804+A1. It includes production, including: mixing of gypsum with additives, forming the boards, drying, cutting and pelleting. All raw materials and energy consumption inventoried in RIGIPS factory all sub products were included in calculation. Office impacts were also taken into consideration.

Data collection period

The data for manufacture of the examined products refer to the year 2013. The life cycle assessments were prepared for Poland as reference area (officially published statistical national electricity mix for 2013).

Data quality

The values determined to calculate the LCIA originate from verified LCI RIGIPS inventory data. This data was verified by ISO auditor.

Assumptions and estimates

Impacts for each product stage and factory process were inventoried and calculated separately. All raw material consumption, emission water used were specific. Emission into air from gas heat production was estimated using formal conversion factors.

Databases

The data for the A1 processes come from the following databases: Gypsum (EPD Rigips), Paper (specific), LCI questionnaire (Energy, Waste, Water, Emissions), Ecoinvent (additives), ITB (additives, sand, glass fiber), Ullmann's (additives), Tauron (Electricity), Heat (Górzyński) and other scientific literature sources (Sugar). Data quality analysis was a part of external audit.

Note

Specific information on application and other actions with these products are described in detail in the technical data sheet available on the producers website.

Raw materials and energy

Table 1. Raw materials

No	Name of raw material	Total used in production kg	Approx. % in product
1	Gypsum powder	302 509 226,0	94,56
2	Additive 1	1 116 929,0	0,35
3	Additive 2	155 346,0	0,05
4	Additive 3	51 421,0	0,02
5	Additive 4	55 751,0	0,02
6	Additive 5	243 941,0	0,08
7	Additive 6	676 139,0	0,21
8	Glucose	288 613,0	0,10
9	Additive 7	16 642,0	0,005
10	Paper	14 716 626,8	4,60

Table 2. Energy consumption

No	Name of raw material	Total used in production	Approx. on 1 m²
1	Electricity	13534503 kWh	0,38 kWh
2	Gas	16369792 m³	0,46 m³

Emissions (LCI) and their impact on the environment

Table 3. Emissions into air generated during production stage A3

Air emission	Unit	Used on product [kg/m²]
CO_2	kg	0,3
SO_2	kg	0,001
NO_X	kg	0,0001

Table 4. Emissions into water generated during production stage A3

Water emission	Unit	Total
Water consumption	m³	6662
Waste water	m³	6662
BOD	mg/l	19,0
COD	mg/l	67,5
Suspended matter	mg/l	36

Table 5. Waste generated in the phase of product manufacturing A3

Waste code	Unit	Total in production [Mg]	Destination
150101	Mg	99,5	Recycling
150102	Mg	10,47	Recycling
170201	Mg	5,3	Energy recovery
170407	Mg	3,94	Recycling
160213	Mg	0,156	Dangerous
150110	Mg	0,43	Dangerous
160304	Mg	0,4	Landfill
190805	Mg	4,0	Landfill

Environmental characteristics (LCA)

Table 6. Environmental characteristic for RIGIPS PRO and RIGIPIS 4PRO™ (1kg)*

Environmental assessment information (MND – Module not declared, MD – Module Declared, INA – Indicator Not Assessed)																
Product stage			Construction process		Use stage							End of life				Benefits and loads beyond the system boundary
Raw material supply	Transport	Manufacturing	Transport to construction site	Construction-installation process	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	Deconstruction 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**
MD	**MD**	**MD**	**MND**	**MND**	**MND**	**MND**	**MND**	**MND**	**MND**	**MND**	**MND**	**MND**	**MND**	**MND**	**MND**	**MND**

Environmental impacts: 1 kg					
Indicator	**Unit**	**A1**	**A2**	**A3**	**A1-A3**
Global warming potential	[kg CO_2 eq.]	0,133	0,003	0,045	0,181
Depletion potential of the stratospheric ozone layer	[kg CFC 11 eq.]	1,79E-08	6,50E-10	3,80E-10	1,90E-08
Acidification potential of soil and water	[kg SO_2 eq.]	7,35E-04	2,25E-05	2,70E-04	1,03E-03
Eutrophication potential	[kg $(PO_4)^{3-}$ eq.]	1,53E-04	3,97E-06	1,10E-05	1,68E-04
Formation potential of tropospheric ozone	[kg Ethene eq.]	3,61E-05	1,64E-06	1,04E-05	4,82E-05
Abiotic depletion potential (ADP-elements) for non-fossil resources	[kg Sb eq.]	1,52E-03	1,48E-04	3,45E-04	2,01E-03
Abiotic depletion potential (ADP-fossil fuels) for fossil resources	[MJ]	1,970	0,169	0,378	2,517

Environmental aspects on resource use: 1 kg					
Indicator	**Unit**	**A1**	**A2**	**A3**	**A1-A3**
Use of renewable primary energy excluding renewable primary energy resources used as raw materials	[MJ]	INA	INA	INA	INA
Use of renewable primary energy resources used as raw materials	[MJ]	INA	INA	INA	INA
Total use of renewable primary energy resources (primary energy and primary energy resources used as raw materials)	[MJ]	1,00E-01	0,003	0,042	0,146
Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials	[MJ]	INA	INA	INA	0,000
Use of non-renewable primary energy resources used as raw materials	[MJ]	INA	INA	INA	0,000
Total use of non-renewable primary energy resources (primary energy and primary energy resources used as raw materials)	[MJ]	2,069	0,178	0,41	2,654
Use of secondary material	[kg]	0,000	0,000	0,00	0,000
Use of renewable secondary fuels	[MJ]	0,000	0,000	0,00	0,000
Use of non-renewable secondary fuels	[MJ]	0,000	0,000	0,00	0,000
Net use of fresh water	[dm^3]	0,021	0,000	0,0039	0,025

Other environmental information describing waste categories: 1 kg					
Indicator	Unit	A1	A2	A3	A1-A3
Hazardous waste disposed	[kg]	2,20E-07	0,000	1,90E-06	2,12E-06
Non-hazardous waste disposed	[kg]	3,43E-03	0,001	2,17E-05	4,05E-03
Radioactive waste disposed	[kg]	0,000	0,000	0,000	0,000
Components for re-use	[kg]	0,000	0,000	0,000	0,000
Materials for recycling	[kg]	8,01E-06	0,000	0,002	2,29E-03
Materials for energy recovery	[kg]	0,000	0,000	3,69E-04	3,69E-04
Exported energy	[MJ]	0,000	0,000	0,000	0,00
Use of renewable secondary fuels	[MJ]	0,000	0,000	0,00	0,000
Use of non-renewable secondary fuels	[MJ]	0,000	0,000	0,00	0,000
Net use of fresh water	[dm^3]	0,021	0,000	0,0039	0,025

* To re-calculate 1kg of Gypsum plasterboard to $1m^2$, please multiply the impact values from table 6 by the board weight of $1m^2$. All weights of the different board types are allowed in the product information lables or on the RIGIPS web-site.

Note: RIGIPS plasterboards are designed and estimated not to contain VOC content including formaldehyde which exceed the requirements of European voluntary labeling schemes established for the indoor air quality (IAQ) assessment.

Verification

The process of verification of an EPD is in accordance with EN ISO 14025, clause 8 and ISO 21930, clause 9. After verification, this EPD is valid for a 5-year-period. EPD does not have to be recalculated after 5 years, if the underlying data have not changed significantly.

The basis for LCA analysis was EN 15804		
Independent verification corresponding to ISO 14025 & 8.3.1.	[X] external	[ ] internal
Verification of EPD: PhD. Eng. Aleksander Panek / Prof. Dariusz Heim		
LCI audit and input data verification: M.Sc. Eng. Dominik Bekierski		
LCA: PhD. Eng. Michał Piasecki, m.piasecki@itb.pl		
Verification of procedures and declaration: PhD. Eng Halina Prejzner		

Normative references

- ISO 14025:2006, Environmental management – Type III environmental declarations – Principles and procedure
- ISO 21930:2007, Sustainability in building and construction – Environmental declaration of building products
- ISO 14044:2006, Environmental management – Life cycle assessment – Requirements and guidelines
- ISO 15686-1:2000, Buildings and constructed assets — Service life planning — Part 1: General principles
- ISO 15686-8:2008, Buildings and constructed assets – Service life planning – Part 8: Reference service life
- EN 15804:2012+A1:2013, Sustainability in construction works – Environmental product declarations – Core rules for the product category of construction products.
- EN15942:2011, Sustainability of construction – Environmental product declarations. Communication format business-to-business