

# Natural gypsum stone, anhydrite and Stucco gypsum (dry powder products)



Environmental Product Declaration No 24/2014



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## EPD program operator

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## Manufacturer

Saint-Gobain Construction Products Polska Sp. z o.o.  
Rigips Office: 9 Cybernetyki St., 02-677 Warsaw  
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## 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 information about the impact of declared construction materials on environment and their aspects verified by the independent Advisory Board 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 norm).

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

The year of preparing the characteristic: 2014

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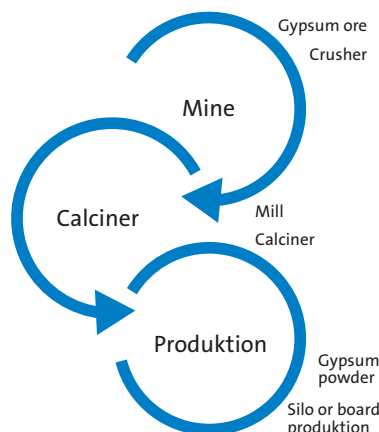
Declared durability: Under normal conditions, gypsum binders have an expected service life well in excess of 60 years.

PCR: PCR-17-PL/EN 15804

Declared unit : 1 kg of gypsum stone and 1kg of gypsum dry powder

## 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<sub>4</sub> 2H<sub>2</sub>O) 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<sub>4</sub> ½H<sub>2</sub>O), 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.

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

Gypsum natural stone has no reference documents. This material is used as a semi-product for further gypsum production. Anhydrite binder has no reference documents. There is a kind of high burn gypsum used as a semi-product.

According to EN 13279-1:2008 standard:

Standard designation	Type of application	Commercial name
Gypsum binder	for further processing, e.g. dry powder products, gypsum blocks and plasterboards	Gypsum, Rigips

## Application for which the product is to be used

Natural gypsum stone, anhydrite and Stucco gypsum	
Description	dry powder
Characteristic	<ul style="list-style-type: none"> <li>• for direct use or further processing e.g. dry powder products, gypsum blocks, gypsum plasterboards etc.</li> <li>• Anhydrite – semi-product for gypsum plasters</li> </ul>
Colour	Gypsum, Anhydrite –grey

## Technical parameters

Natural gypsum stone, anhydrite and Stucco gypsum	
Description	<b>Gypsum - natural</b>
Standard designation	A1 – EN 13279-1:2008
Bulk density	850 kg/m <sup>3</sup>
Dry density	1250 kg/m <sup>3</sup>
Reaction to fire	A1
Product literature	DoP
Manufacturing site	Szarbków 73
Description	<b>Anhydrite binder</b>
Standard designation	No standard reference. It is semi-product for gypsum plasters production
Bulk density	850 kg/m <sup>3</sup>
Dry density	-
Reaction to fire	A1
Product literature	DoP
Manufacturing site	Szarbków 73

### Allocation

First the gypsum stone is transported from mine. After that a mechanical process is started. The mechanical process consists of: stones breaking, grinding and drying in a bowl mill. Depending on mill separator speed, different graining rock is obtained and that is what determines its further use. When the gypsum stone is milled and dried the gypsum stone is dispensed

to calcinators where is heat treated. For various type of binders, some or all crystallization water is removed. In this way, gypsum hemihydrate ( $\text{CaSO}_4 \cdot \frac{1}{2}\text{H}_2\text{O}$ ) or anhydrite binder ( $\text{CaSO}_4$  - high-burn gypsum) are obtained. Next the gypsum is pneumatically transported to the further process e.g. cardboards or gypsum blocks production. In the mixing plant gypsum

and anhydrite are blended in the mixer with different additives. The production of gypsum or anhydrite is a single line process. All impacts from mine are allocated in gypsum stone. Gypsum stone impact is allocated in dry gypsum product production as A1 module. 100% impact is allocated to one final product. All stages of production and its impacts are presented in this EPD separately.

### System limits

The life cycle analysis of the examined products covers A1-A3 modules (Cradle to Gate) in accordance with EN 15804+A1. Its include production, including raw materials extraction and energy provision up to the finished

product at the factory gate. All raw materials and energy consumption inventoried in Factory and Mine were included in calculation. All inventory processes for gypsum stone mining as explosive substances, detonators, waste

water production and gas emissions in explosion were included. For gypsum all processes as: crushing, milling, drying, calcination, transport, and storage processes were included. 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: LCI questionnaire, Ullmann's (chemicals),

WAT (explosives), Tauron (Energy) and scientific literature sources

(Transport). 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	used on Mg of product
<b>Gypsum stone(mine)</b>			
1	Explosives [kg] (Riohit LS, Hanal, Riobooster)	62978	0,14
2	Diesel [l]	176 657	2,97
3	Electricity [kWh]	1015000	1,93

**Table 2. Energy consumption**

No	Name of raw material	total used in production	used on Mg of product
<b>Mill and crushing process</b>			
1	Electricity [kWh]	5643000	10,75
<b>Calcinator</b>			
2	Gas [kWh]	143266206	0,45

## Emissions (LCI) and their impact on the environment

**Table 3. Emissions into air generated during production stage A3** **Table 4. Emissions into water generated during production stage A3**

Air emission	Unit	Used on product kg/kg
CO <sub>2</sub>	kg	0,12
SO <sub>2</sub>	kg	0,00001
NO <sub>x</sub>	kg	0,0011

Water emission	Unit	Total
Water consumption	m <sup>3</sup>	6662
Waste water	m <sup>3</sup>	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	Dengerous
150110	Mg	0,43	Dengerous
160304	Mg	0,4	Landfil
010102	Mg	2398,5	Reuse/landfil (mine)
190805	Mg	4,0	Landfil
101381	Mg	705,5	Reuse/landfil

## Environmental characteristics (LCA)

**Table 6. Environmental characteristic for milled gypsum stone (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 <sub>2</sub> eq.]	0,002	1,53E-04	0,014	0,016
Depletion potential of the stratospheric ozone layer	[kg CFC 11 eq.]	7,80E-10	6,50E-10	6,85E-09	8,28E-09
Acidification potential of soil and water	[kg SO <sub>2</sub> eq.]	2,23E-05	1,11E-06	1,94E-04	2,17E-04
Eutrophication potential	[kg (PO <sub>4</sub> ) <sup>3-</sup> eq.]	3,73E-06	1,96E-07	5,62E-05	6,01E-05
Formation potential of tropospheric ozone	[kg Ethene eq.]	4,47E-07	8,12E-08	8,68E-07	1,40E-06
Abiotic depletion potential (ADP-elements) for non-fossil resources	[kg Sb eq.]	3,39E-06	7,37E-06	3,17E-05	4,25E-05
Abiotic depletion potential (ADP-fossil fuels) for fossil resources	[MJ]	2,50E-03	8,40E-03	0,047	0,058

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]	2,25E-04	0,00	0,00	2,25E-04
Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials	[MJ]	INA	INA	INA	INA
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]	0,003	8,82E-03	0,05	0,062
Use of secondary material	[kg]	0,00	0,00	0,00	0,000
Use of renewable secondary fuels	[MJ]	0,00	0,00	0,00	0,000
Use of non-renewable secondary fuels	[MJ]	0,00	0,00	0,00	0,000
Net use of fresh water	[dm <sup>3</sup> ]	0,0001	0,00	0,001	0,001

Other environmental information describing waste categories: 1 kg					
Indicator	Unit	A1	A2	A3	A1-A3
Hazardous waste disposed	[kg]	2,00E-07	0,00	0,00	2,00E-07
Non-hazardous waste disposed	[kg]	2,00E-06	3,00E-05	7,00E-04	7,32E-04
Radioactive waste disposed	[kg]	0,000	0,00	0,000	0,000
Components for re-use	[kg]	0,000	0,00	0,000	0,000
Materials for recycling	[kg]	0,000	0,00	0,002	2,29E-03
Materials for energy recovery	[kg]	0,000	0,00	0,000	3,69E-04
Exported energy	[MJ]	0,000	0,00	0,000	0,00

**Table 7. Environmental characteristic for gypsum (dry powder-Stucco) (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 <sub>2</sub> eq.]	0,016	3,79E-05	0,111	0,127
Depletion potential of the stratospheric ozone layer	[kg CFC 11 eq.]	8,28E-09	4,32E-11	9,45E-10	9,27E-09
Acidification potential of soil and water	[kg SO <sub>2</sub> eq.]	2,17E-04	3,62E-07	1,23E-04	3,40E-04
Eutrophication potential	[kg (PO <sub>4</sub> ) <sup>3-</sup> eq.]	6,01E-05	4,12E-08	1,39E-05	7,40E-05
Formation potential of tropospheric ozone	[kg Ethene eq.]	1,40E-06	1,53E-08	5,90E-06	7,31E-06
Abiotic depletion potential (ADP-elements) for non-fossil resources	[kg Sb eq.]	4,25E-05	1,60E-06	7,94E-04	8,38E-04
Abiotic depletion potential (ADP-fossil fuels) for fossil resources	[MJ]	0,058	5,00E-04	1,820	1,879

Environmental aspects on resource use: 1 kg <sup>2</sup>					
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]	2,25E-04	0,000	0,044	0,044
Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials	[MJ]	INA	INA	INA	INA
Use of non-renewable primary energy resources used as raw materials	[MJ]	0,000	INA	INA	INA
Total use of non-renewable primary energy resources (primary energy and primary energy resources used as raw materials)	[MJ]	0,062	6,00E-04	1,91	1,973
Use of secondary material	[kg]	0,000	0,00	0,00	0,000
Use of renewable secondary fuels	[MJ]	0,000	0,00	0,00	0,000
Use of non-renewable secondary fuels	[MJ]	0,000	0,00	0,00	0,000
Net use of fresh water	[dm <sup>3</sup> ]	0,001	0,00	0,0198	0,021

Other environmental information describing waste categories: 1 kg					
Indicator	Unit	A1	A2	A3	A1-A3
Hazardous waste disposed	[kg]	2,00E-07	0,00	0,00	2,00E-07
Non-hazardous waste disposed	[kg]	7,32E-04	1,00E-04	2,28E-03	3,12E-03
Radioactive waste disposed	[kg]	0,00	0,00	0,00	0,00
Components for re-use	[kg]	0,00	0,00	0,00	0,00
Materials for recycling	[kg]	0,00	0,00	0,00	7,28E-06
Materials for energy recovery	[kg]	0,00	0,00	0,00	0,00
Exported energy	[MJ]	0,00	0,00	0,00	0,00

## 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.	<input checked="" type="checkbox"/> external <input type="checkbox"/> internal
Verification of EPD: dr eng. Aleksander Panek (PKN KT 307 President), prof. Dariusz Heim	
LCI audit and input data verification: msc eng. Dominik Bekierski	
LCA: dr eng. Michał Piasecki	
Verification of procedures and declaration: dr 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