

## Environmental Product Declaration



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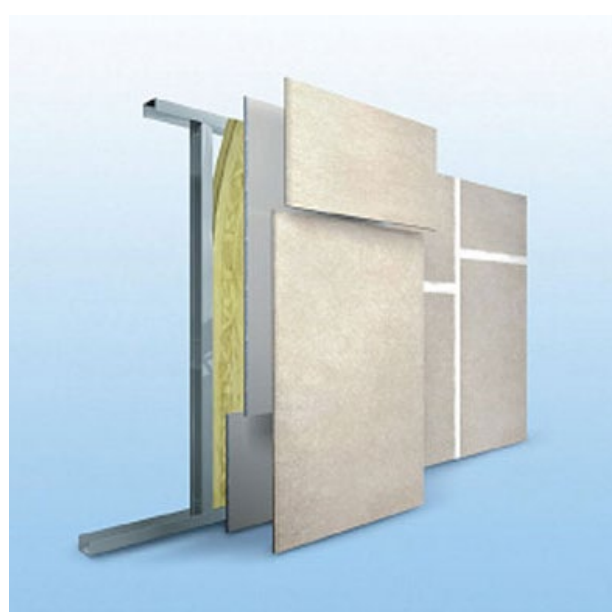
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### EPD program operator

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[www.itb.pl](http://www.itb.pl); [www.zb.itb.pl/epd](http://www.zb.itb.pl/epd)

### Manufacturer

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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 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, RIGIPS systems are expect-

ed to last the service life of a building (60 years)

PCR: ITB PCR A (PCR based on EN 15804)

Declared unit: 1 m<sup>2</sup> of wall or another building elements such as: shaft walls, walls lining, suspended ceilings, ceilings lining, attics lining

Reasons for performing LCA: B2B

Representativeness: Polish products

## Manufacturer and Product Information

RIGIPS (SAINT GOBAIN group) exists on the Polish market since 1994 and is engaged in manufacturing gypsum products (from own natural stone mined). RIGIPS offers a full range of building elements such as: lightweight partition walls, walls lining, shaft walls, suspended ceilings, ceilings linings, attics lining. Standard systems are non-loadbearing and constructed using drylining techniques. All systems can be used in all types of buildings including private housing, flats and apartments, commercial, institutional, recreational and industrial properties. They cover all applications, from simple space division through to high performance systems designed to meet the most demanding fire resistance, sound insulation, impact and height requirements. The impact of wide range of RIGIPS products is assessed, verified and presented in international ITB EPDs ([www.zb.itb.pl/epd](http://www.zb.itb.pl/epd)).

RIGIPS systems are constructed using lightweight Saint-Gobain group materials (covered by EPDs), which can give

rise to significant savings in structural design compared to masonry alternatives. Big benefits also include the speed of installation and reduction to overall build costs. A full range of solutions is available to meet specific performance specifications (see <http://www.rigips.pl/>).

The subject of this EPD is based on the actual technical documents for all Rigips systems such as Technical Approvals and Fire Classifications. All actual technical documents are always available on website [www.rigips.pl](http://www.rigips.pl). Set of products for the Rigips partition system walls that is actual for the date of edition of this document is Technical Approval AT-15-4679/2010. System of wall partition includes wall frame construction of cold-formed steel sections (CW and UW) with linings of plasterboard. The space between the sheets of plasterboards can be filled with plates or mats of glass wool or rock wool. All Rigips systems must consist of three main elements:

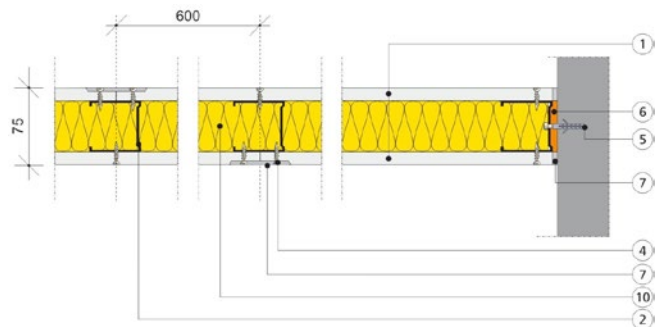
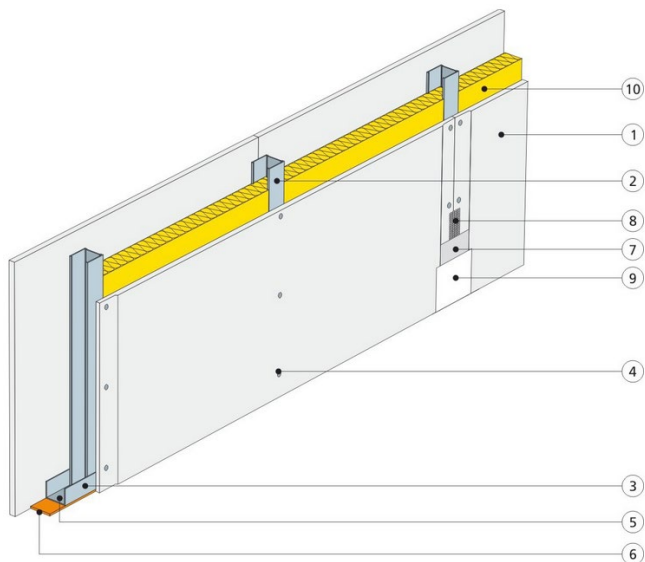
cold formed steel sections, Rigips plasterboards and glass or rock wool.

The set of products which this EPD includes consist of:

- old formed steel sections  
ULTRASTIL CW 50, CW 75, CW 100; ULTRASTIL AKU CW 50, CW 75, CW 100;  
ULTRASTIL UW 50, UW 75, UW 100;  
UA 50, UA 75, UA 100;  
UD 30 ULTRASTIL; C RIGISTIL, U RIGISTIL;  
Brackets: elastic bracket, hat profile, ES, ES acoustic, GL2, GL9;
- and another Rigips cold frame steel components which are part of substructure of Rigips systems
- RIGIPS plasterboards PRO or 4PRO™ types: A, F, D, H1, H2, H3, R, E, I, P and combinations thereof filling a plate or mat of non-combustible glass mineral wool or rock mineral wool

## SYSTEM PARTS

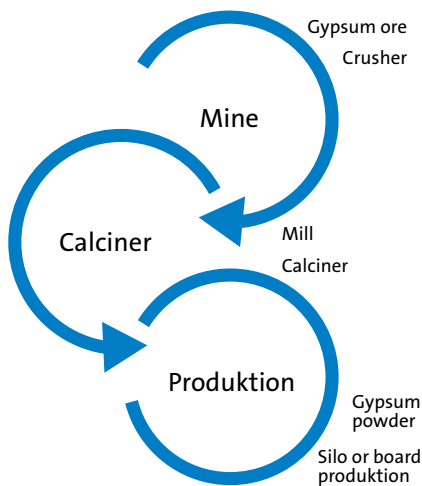
The basic solution of lightweight partition wall presented below is a high-performance wall system consisting of a steel frame, cover with gypsum plasterboards on either side attached with self-drilling drywall screws. The joints are then taped and finished with gypsum jointing compounds (see basic system scheme).



- 1 Gypsum Plasterboard RIGIPS PRO or 4PRO™
- 2 Profil RIGIPS CW ULTRASTIL
- 3 Profil RIGIPS UW ULTRASTIL
- 4 Screw RIGIPS TN 25
- 5 Dowel/fixing
- 6 Foam tape RIGIPS
- 7 Gypsum plaster RIGIPS
- 8 Sealing tape RIGIPS
- 9 Gypsum plaster RIGIPS
- 10 ISOVER Wool

## RIGIPS gypsum plasterboards

### A1 module for gypsum plasterboards (EN 15804)



ferred from described process to next the next: gypsum board by means of screw conveyors.

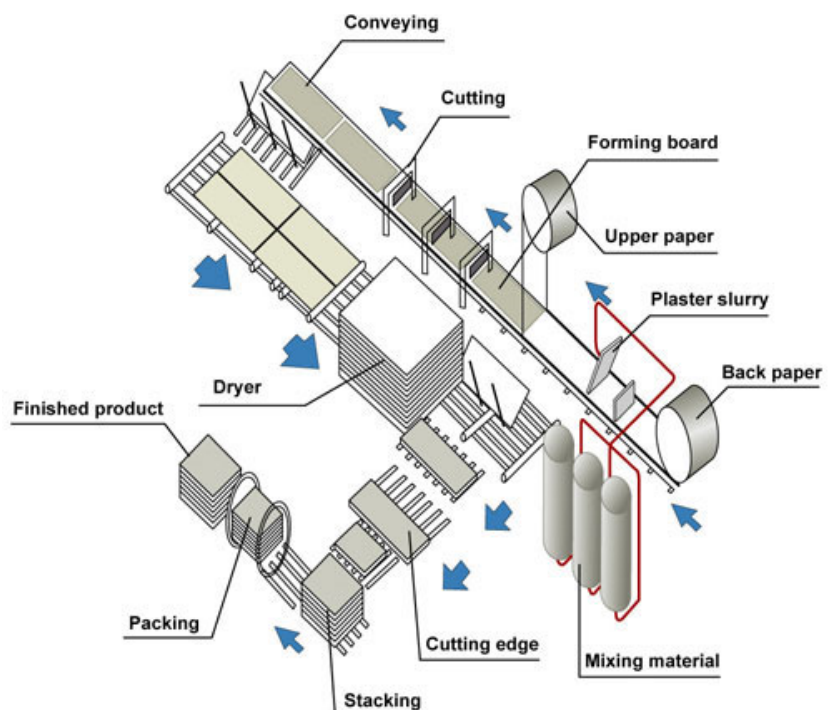
### A3 module for gypsum boards production (EN 15804)

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. The boards are main part of the RIGIPS wall systems. RIGIPS plasterboard's impacts are presented in the ITB-EPD No 25 (table 5).

Gypsum stone for (for RIGIPS plasterboard production) is mined in RIGIPS open mine near (2 km) manufacturing plant in Pińczów (Poland). RIGIPS is a manufacturer of gypsum and anhydrite for further processing (dry powder products).

To produce RIGIPS plasterboard, gypsum is milled and calcined to produce calcium sulfate hemihydrates ( $\text{CaSO}_4 \cdot \frac{1}{2}\text{H}_2\text{O}$ ), commonly called Stucco. Calcination occurs at approximately 120 to 150°C and 0,908 (Mg) (1 ton) of gypsum calcines to about 0,77 Mg (0,85 ton) of stucco. In the 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 trans-



## ISOVER mineral wool

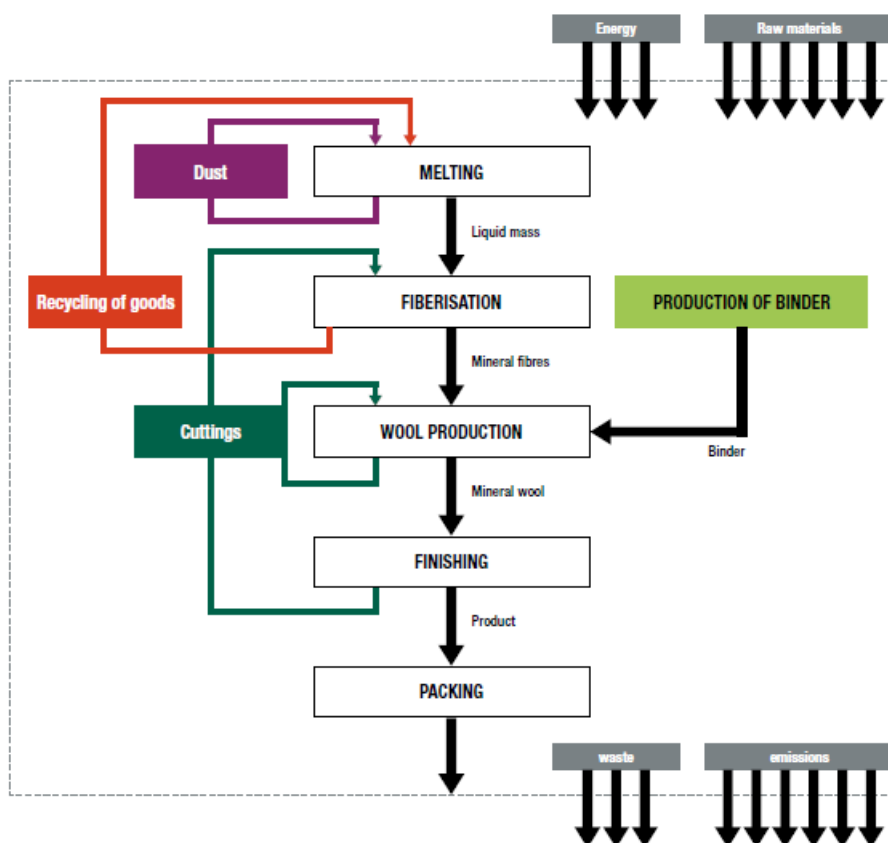
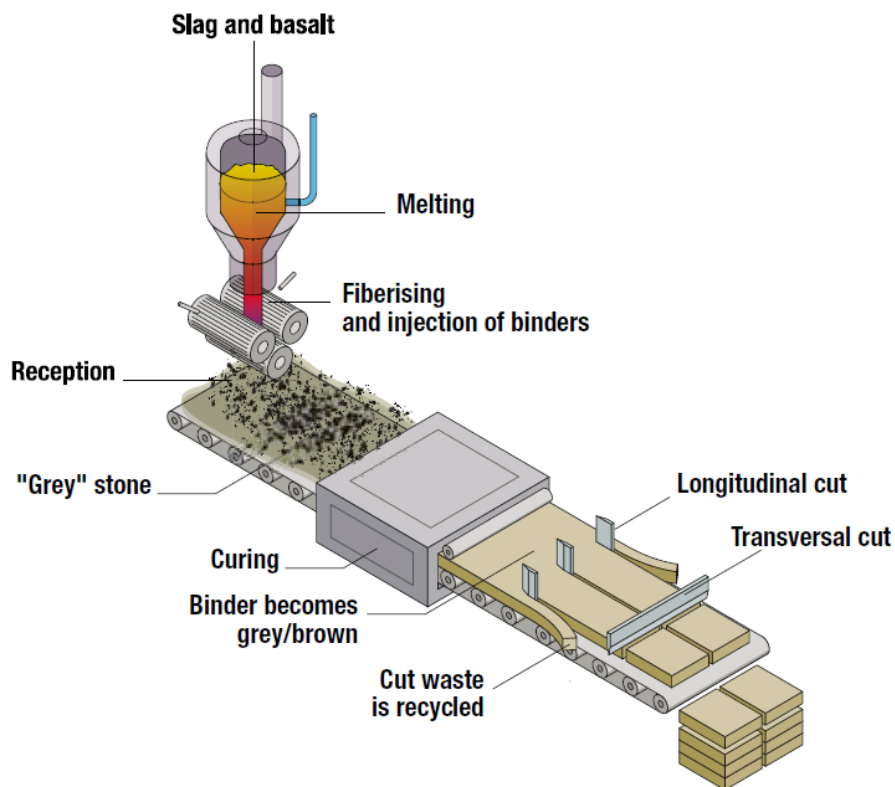
ISOVER wool products are made in Gliwice (Poland) from volcanic rock – stone wool or from sand and glass – glass wool. The raw materials for a stone wool are 97% natural, and include basalt, diabase and similar igneous rocks, which are melted in a furnace with fuelling and fluxing agents. Up to 30% recycled stonewool waste is added to the mix. ISOVER stone-wool products combine mechanical resistance with good insulation performance, high temperature suitability and cost-efficiency and come in a range of thicknesses specially tailored for individual applications. Isover Mineral Wool has ITB-EPD No1 and Isover Glass Wool ITB EPD No2.

### A1 and A2 Modules: Raw material supply and transport

The raw material supply covers production of all binder components and sourcing of raw materials for fibre production – basalt and diabase for a stone wool. The main product components are inorganic minerals (stone) and a low percentage of organic binder. Mineral wool is free from substances of very high concern (SVHC). No additives like fire retardants are needed to ensure or improve the fire

safety of mineral wool, as the mineral composition provides a non-combustible product. Neither is there a need to add substances to keep the insulation free from mould and insects. Data on transport of the different

raw materials to the manufacturing plant are collected and modelled for Gliwice plant by ITB. Means of transport include truck, train and ship, and for Polish and European fuel averages are applied.



### A3: Production

Manufacture covers all processes linked to production, which comprises various related operations besides on-site activities, including melting, fiberisation, wool production, finishing, packaging and internal transportation. The manufacturing process also yields data on the combustion of refinery products, such as diesel and gasoline, related to the production process. Use of electricity, fuels and auxiliary materials in the production of stone wool products is taken into account using national data. The environmental profile of these energy carriers is modelled by ITB for average Polish conditions. Packaging-related flows in the production process and all upstream packaging are included in the manufacturing module, i.e. wooden pallets and PE-LD film (cradle-to-gate). Apart from production of packaging material, the supply and transport of packaging material are also considered in the LCA model. In accordance



with EN 15804, they are reported and allocated to the modules where the packaging is applied in EPD-ITB no1 and no2. Data on packaging waste created during this step are then

generated. It is assumed that packaging waste generated in the course of production and up-stream processes is 100% collected and incinerated based on a multi-input and multi-out-

put process specific to the elementary composition of the waste. Energy (e.g. steam, electricity) are credited using national production averages.

### **Cold formed steel RIGIPS CW and UW ULTRASTIL profiles (as a representation of Rigips cold formed steel profiles)**

CW&UW profiles are prefabricated in RIGIPS BUDMAT Factory in Płock. Products are the thin-walled profiles made of hot-dip coated slit strip. The CW 75 profile with length of 300 cm was selected as a representative product for all CW profiles as it is an average product in terms of geometry and also displays the most popular shape and average values for all RIGIPS. Use of this profile can be regarded as a worst-case scenario as it is heavier at 0,7 kg/m than the average weight of all profiles. RIGIPS CW and UW profiles are used as substructures for non-bearing single or dual-layer RIGIPS partition walls and wall linings in accordance with AT-14-4679. The constructions are suitable for use in normal air-conditioned interior rooms. Corrosion protection complies with PN EN 14195. Placing on the market is governed by Directive

(EU) No. 305/2011. The Declaration of Performance number is DoP Ultrastil 2013/1 consideration of PN EN 14195 and CE marking.

All actual Declarations of Performance of all cold formed steel profiles are available on Rigips website [www.rigips.pl](http://www.rigips.pl).

#### **A3 Module Profiles Production (as a representation of Rigips cold formed steel profiles)**

RIGIPS CW and UW profiles are manufactured from hot-dip coated steel sheet as DX 51+Z, d= 0.6 mm (nominal) slit strip in accordance with PN EN 10346 and PN EN 10143 with Z 100 hot-dip galvanising. The slit strip is manufactured with an average of 40% steel recycling share and delivered wound on coils (diameter 800-1800 mm). Acetone ink is used for

marking the profiles. Volume, converted to 1 running meter of profile: 0,02 mg. During the profile manufacturing process lubricant and cleaning agent is also used: water-based emulsion.

RIGIPS profiles are manufactured from hot-dip coated steel slit strip in a cutting and forming process. The slit strip is added continuously in a conveyor process. The first step involves cutting and stamping the central section followed by continuous splaying by a suitable device. The folded area of the strip is rolled smooth and then the modified slit strip is roll-formed. This step is followed by marking by ink jet lettering before the profiles are cut to length in a shearing process and packed in bundles of 8. The material is processed without waste.

“Cardle to gate” average assessment for RIGIPS profiles was done by ITB using European generic data (table 7).

### **RIGIPS System processing / Installation (as a representation of all Rigips system)**

RIGIPS CW and UW profiles are used as stud and runner profiles in RIGIPS substructures for multi-layer partition walls and wall linings. Installation involves the following steps:

1. UW profiles are cut to length using suitable cutting tools (e.g. lever shears) and self-adhesive connection seals, e.g. made of mineral wool, are applied.
2. UW profiles are secured to the floor and ceiling of the bearing structure using the appropriate plugs and spaced
3. If the CW profiles have been delivered in the correct dimensions, they are inserted in the UW profiles. In all other cases, CW profiles are cut to the room height minus 1 cm using suitable cutting tools and inserted in the UW profiles
4. Cladding by gypsum boards is applied in accordance with the processing guidelines supplied by the RIGIPS

## Product type

Table 1. RIGIPS wall system 3.40.01 as a representative of Rigips systems:

Partition Wall 3.40.01 (example)						
Filling				Mineral stone or glass wool		
Commercial name of filling (example)				Isover Aku-Płyta	Isover Polterm UNI	
Thickness, mm				50	50	
Acoustic insulation of wall with the filling of stone wool $14 \div 60 \text{ kg/m}^3$ , with claddings of RIGIPS gypsum, dB		1 x 12,5 mm		$R_w$	44	44
				$R_{A1}$	38	38
				$R_{A2}$	30	30
Fire resistant walls with wool with density $i \geq 10 \text{ kg/m}^3$ PN-EN 13501-2	Claddings by g-k Rigips	1 x 12,5 mm: type A or H2 Board weight $\geq 8,50 \text{ kg/m}^2$		EI	15 <sup>1)</sup>	15 <sup>1)</sup>
		1 x 12,5 mm: type F, type DF or DFH2 Board weight $\geq 9,00 \text{ kg/m}^2$		EI	30	30
		1 x 12,5 mm: type DF or DFH2 Board weight $\geq 10,00 \text{ kg/m}^2$		EI	30	60 <sup>2)</sup>
		1 x 15 mm: type F or type DF or DFH2 Board weight $\geq 11,00 \text{ kg/m}^2$		EI	60	60
Use category – impact resistance According to ETAG 003		Wall with board g-c 12,5 mm		-	II	
		Wall with board g-c 15 mm			II	
Wall thickness, mm		Wall with board g-c 12,5 mm		G	75	
		Wall with board g-c 15 mm			80	
Maximum wall height <sup>3)</sup> , mm		1		HMAX	3000	
		2			2750	
Wall weight, kg/m <sup>2</sup>		With board g-k 12,5 mm		M	26	
		With board g-k 15 mm			30	
<sup>1)</sup> concerns wall without filling or with any non-flamable mineral wool <sup>2)</sup> concerns walls with the mineral stone wool with density $\geq 30 \text{ kg/m}^3$ <sup>3)</sup> concerns scope of use 1) i 2) in accordance to Technical Approval						

Table 2. Gypsum Plaster Boards according to PN-EN 520 + A1:2010 standard:

Standard designation	Type of application	Commercial name
Gypsum plasterboard	<ul style="list-style-type: none"> <li>light systems used for wall coverings, partitions, walls, shafts, suspended ceilings and attics</li> <li>recommended for large intensely lit surfaces with crosswise edge joints</li> </ul>	RIGIPS PRO and 4PRO™ Type A, F, D, H1, H2, H3, R, E, I, P – and combinations thereof

Table 3. Gypsum Plaster Boards technical parameters according to PN-EN 520 + A1:2010 standard

Description	<ul style="list-style-type: none"> <li>Gypsum plasterboard RIGIPS PRO and RIGIPS 4PRO™</li> </ul>
Standard designation	<ul style="list-style-type: none"> <li>PN-EN 520 + A1:2010</li> </ul>
Thickness	<ul style="list-style-type: none"> <li>From 6,5 to 18 mm</li> </ul>
Weight	<ul style="list-style-type: none"> <li>From 5,5 to 18 kg/m<sup>2</sup></li> </ul>
Width	<ul style="list-style-type: none"> <li>1200 mm</li> </ul>
Length	<ul style="list-style-type: none"> <li>2000mm, 2500 mm, 2600 mm, 3000 mm (other on request)</li> </ul>
Reaction to fire	<ul style="list-style-type: none"> <li>Nonflammable, Class A2-s1,d0 compliant as regards reaction to fire of construction materials (according to PN-EN 13501-1)</li> </ul>
Colour	<ul style="list-style-type: none"> <li>Assigned to the type of plasterboard</li> </ul>
Product reference document	<ul style="list-style-type: none"> <li>Declaration of Performance (DoP)</li> </ul>
Manufacturing site	<ul style="list-style-type: none"> <li>Szarbów 73, Poland</li> </ul>

## Allocation

The RIGIPS system impact is “generic”, calculation is based on the impacts from specific EPDs of RIGIPS and ISOVER products. The allocation rules used for this EPD are based on ITB-PCR A. Specific allocations for system’s product are provided in ITB-EPD No 25 for Gypsum Boards and EPD No1 and No2 for Insulation Materials. Allocation for CW and UW profiles are in accordance to ITB-PCR A. The RIGIPS 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 Stuco production – A1 (separated RIGIPS EPD). 100% of impacts from line production were inventoried and allocated to plasterboards. 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. The ISOVER mineral stone and glass wool production in Gliwice are separated line processes

without co-products so the allocation is avoided. Emissions are measured separately as well and presented in A3 module. 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.

## 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 and ITB-PCR A. Details on systems limits are provided in product specific ITB-EPDs. For example for RIGIPS Plasterboards system 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. In the assessment, all significant parameters from gathered production data (Plasterboards, Wool, CW&UW profiles) are considered, i.e. all raw material used per formulation, utilised thermal energy, internal fuel and electric power consumption, direct production waste, and all available emission measurements. This study also takes into account some material flows of less than 1% and

energy flows with a proportion of less than 1 energy-%. It can be assumed that the total sum of omitted processes does not exceed 5% of all impact categories. Technically in the RIGIPS wall system not-significant mass based products like: screws, dowels and tapes are not taken into LCA. In accordance with EN 15804, machines and facilities (capital goods) required for and during production are excluded, as is transportation of employees.

## Data collection period

The data for manufacture of the examined products (Gypsum Plasterboards) refer to the year 2013, Isover

mineral wool refers to 2011 and cold formed Rigips steel profiles refers to 2012. The life cycle assessments were

prepared for Poland as the reference area.

## Data quality

The values determined to calculate the LCIA originate from verified LCI RIGIPS, LCI Isover Saint-Gobain inventory data. This data was verified by ISO

auditor and was presented for external auditor. The data for CW and UW profiles and other cold formed steel Rigips profiles is generic and modeled

by ITB based on production process (and by comparison to other European data on process)

## Assumptions and estimates

Impacts for each product and factory process were inventoried and calculated separately. All raw material con-

sumption, emission water used were specific and presented in specific EPD. Emission into air from gas heat pro-

duction was estimated using formal conversion factors for carriers.

## Databases

The data for LCA comes from the following databases: Gypsum (EPD Rigips), Insulation (ISOVER SAINT-GOBAIN specific EPD for stone and glass), CW&UW profiles and other cold formed steel Rigips profiles (Generic- ITB modeled by international EPDs), Tauron (Electricity), Heat (Górzyński). Specific data quality analysis was a part of external ISO audit. Characterization factors are CML ver. 4.2 based on EN 15804:2013+A1 version.

## Calculation rules

LCA was done in accordance to PCR A document. To re-calculate the impacts of the system's product declared on 1kg (plasterboard, wool, CW&UW profiles) to 1m<sup>2</sup> of wall system, please multiply the product impact values (1 kg of product) by the product mass/m<sup>2</sup> taken from technical document or for provided examples form table 1. Calculation example is presented in table 8.

## Power Mix

Selection of the power mix for 2012-2014 in accordance with formal National Mix published by annual GUS report. Specific data for power production impact- Tauron provider for emissions (907 kg CO<sub>2</sub>/MWh)

## Note

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

## Environmental characteristics (LCA)

**Table 4. Environmental characteristic for RIGIPS PRO and RIGIPS 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 <sub>2</sub> 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 <sub>2</sub> eq.]		7,35E-04	2,25E-05	2,70E-04	1,03E-03									
Eutrophication potential		[kg (PO <sub>4</sub> ) <sup>3-</sup> 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 <sup>3</sup> ]		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	

\* To re-calculate the impacts of the system's product declared on 1 kg (plasterboard -table 4, wool- table 5, CW&UW profiles- table 6) to 1m<sup>2</sup> of RIGIPS wall system (see example in table 7), please multiply the product impact values (1 kg of product form table 4-6) by the product mass/m<sup>2</sup> taken from technical document or for provided examples form table 1. All weights of the products in the different system types are allowed in the product information labels or on the RIGIPS web-site as well in Technical Approval no AT-15-4679/2010

**Table 5. Environmental characteristic for ISOVER Mineral Wool (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.]	0,355	0,028	1,151	1,534	
Depletion potential of the stratospheric ozone layer	[kg CFC 11 eq.]	6,50E-08	0,00E+00	5,00E-09	7,00E-08	
Acidification potential of soil and water	[kg SO <sub>2</sub> eq.]	1,50E-03	1,37E-04	4,41E-03	0,006	
Eutrophication potential	[kg (PO <sub>4</sub> ) <sup>3-</sup> eq.]	1,40E-04	1,40E-05	5,80E-05	2,12E-04	
Formation potential of tropospheric ozone	[kg Ethene eq.]	2,00E-04	2,40E-05	4,30E-04	0,001	
Abiotic depletion potential (ADP-elements) for non-fossil resources	[kg Sb eq.]	1,60E-04	0,00E+00	2,00E-05	1,80E-04	
Abiotic depletion potential (ADP-fossil fuels) for fossil resources	[MJ]	3,693	0,376	12,048	16,117	

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]	0,406	0,041	1,325	1,773
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	INA
Total use of non-renewable primary energy resources (primary energy and primary energy resources used as raw materials)	[MJ]	4,099	0,417	13,373	17,890
Use of secondary material	[kg]	0,000	0,000	0,000	0,000
Use of renewable secondary fuels	[MJ]	0,000	0,000	0,000	0,000
Use of non-renewable secondary fuels	[MJ]	0,000	0,000	0,000	0,000
Net use of fresh water	[dm <sup>3</sup> ]	0,003	1,00E-04	2,70E-04	0,003

Other environmental information describing waste categories: 1 kg						
Indicator	Unit	A1	A2	A3	A1-A3	
Hazardous waste disposed	[kg]	1,14E-05	0,000	3,70E-05	4,94E-05	
Non-hazardous waste disposed	[kg]	3,32E-02	0,003	1,08E-01	1,44E-01	
Radioactive waste disposed	[kg]	0,00E+00	0,000	0,00E+00	0,00E+00	
Components for re-use	[kg]	0,000	0,000	0,000	0,000	
Materials for recycling	[kg]	0,000	0,000	0,000	0,000	
Materials for energy recovery	[kg]	0,000	0,000	0,000	0,000	
Exported energy	[MJ]	0,000	0,000	0,000	0,000	

**Table 6. Environmental characteristic for RIGIPS CW/UW profiles (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.]	0,447	0,061	1,523	2,030	
Depletion potential of the stratospheric ozone layer	[kg CFC 11 eq.]	1,73E-10	7,88E-10	2,63E-08	3,50E-08	
Acidification potential of soil and water	[kg SO <sub>2</sub> eq.]	2,88E-05	1,31E-04	4,36E-03	5,81E-03	
Eutrophication potential	[kg (PO <sub>4</sub> ) <sup>3-</sup> eq.]	2,70E-06	1,23E-05	4,10E-04	5,46E-04	
Formation potential of tropospheric ozone	[kg Ethene eq.]	4,44E-06	2,02E-05	6,72E-04	8,96E-04	
Abiotic depletion potential (ADP-elements) for non-fossil resources	[kg Sb eq.]	1,59E-07	7,25E-07	2,42E-05	3,22E-05	
Abiotic depletion potential (ADP-fossil fuels) for fossil resources	[MJ]	1,37E-01	6,21E-01	2,07E+01	27,580	

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]	4,96E-03	2,26E-02	7,52E-01	1,002	
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	INA	
Total use of non-renewable primary energy resources (primary energy and primary energy resources used as raw materials)	[MJ]	1,48E-01	6,74E-01	2,25E+01	29,960	
Use of secondary material	[kg]	0,000	0,000	0,000	0,000	
Use of renewable secondary fuels	[MJ]	0,000	0,000	0,000	0,000	
Use of non-renewable secondary fuels	[MJ]	0,000	0,000	0,000	0,000	
Net use of fresh water	[dm <sup>3</sup> ]	2,36E-02	1,07E-01	3,57E+00	4,760	

Other environmental information describing waste categories: 1 kg						
Indicator	Unit	A1	A2	A3	A1-A3	
Hazardous waste disposed	[kg]	2,01E-06	9,14E-06	3,05E-04	4,06E-04	
Non-hazardous waste disposed	[kg]	4,50E-05	2,05E-04	6,83E-03	9,10E-03	
Radioactive waste disposed	[kg]	0,00E+00	0,000	0,00E+00	0,00E+00	
Components for re-use	[kg]	0,000	0,000	0,000	0,000	
Materials for recycling	[kg]	0,000	0,000	0,000	0,000	
Materials for energy recovery	[kg]	0,000	0,000	0,000	0,000	
Exported energy	[MJ]	0,000	0,000	0,000	0,000	

**Table 7. Environmental characteristic for 1 m<sup>2</sup> of RIGIPS wall basic system (example):**

Wall system thickness [mm]	Gypsum Board thickness [mm]	Board Weight [kg/m <sup>2</sup> ]	Metal Profiles	Profiles Weight [kg/m <sup>2</sup> ]	Wool Thickness [mm]	Wool [kg/m <sup>3</sup> ]	Wool [kg/m <sup>2</sup> ]
70	10	12	CW 50	4,0	40	30	1,2

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.]	5,404	0,351	8,552	14,307	
Depletion potential of the stratospheric ozone layer	[kg CFC 11 eq.]	5,09E-07	1,88E-08	1,20E-07	6,48E-07	
Acidification potential of soil and water	[kg SO <sub>2</sub> eq.]	1,96E-02	1,23E-03	2,92E-02	5,00E-02	
Eutrophication potential	[kg (PO <sub>4</sub> ) <sup>3-</sup> eq.]	3,85E-03	1,61E-04	1,97E-03	5,98E-03	
Formation potential of tropospheric ozone	[kg Ethene eq.]	1,12E-03	1,49E-04	3,45E-03	4,73E-03	
Abiotic depletion potential (ADP-elements) for non-fossil resources	[kg Sb eq.]	3,66E-02	3,57E-03	8,40E-03	4,86E-02	
Abiotic depletion potential (ADP-fossil fuels) for fossil resources	[MJ]	5,23E+01	6,99E+00	1,06E+02	165,519	

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]	2,92E+00	2,21E-01	5,61E+00	8,745	
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	INA	
Total use of non-renewable primary energy resources (primary energy and primary energy resources used as raw materials)	[MJ]	5,52E+01	7,46E+00	1,16E+02	178,341	
Use of secondary material	[kg]	0,00E+00	0,00E+00	0,00E+00	0,000	
Use of renewable secondary fuels	[MJ]	0,00E+00	0,00E+00	0,00E+00	0,000	
Use of non-renewable secondary fuels	[MJ]	0,00E+00	0,00E+00	0,00E+00	0,000	
Net use of fresh water	[dm <sup>3</sup> ]	6,02E-01	4,29E-01	1,60E+01	16,984	

Other environmental information describing waste categories: 1 kg						
Indicator	Unit	A1	A2	A3	A1-A3	
Hazardous waste disposed	[kg]	2,70E-05	3,77E-05	1,31E-03	0,001	
Non-hazardous waste disposed	[kg]	1,22E-01	1,88E-02	1,58E-01	0,299	
Radioactive waste disposed	[kg]	0,00E+00	0,00E+00	0,00E+00	0,000	
Components for re-use	[kg]	0,00E+00	0,00E+00	0,00E+00	0,000	
Materials for recycling	[kg]	1,92E-04	0,00E+00	5,48E-02	0,055	
Materials for energy recovery	[kg]	0,00E+00	0,00E+00	8,86E-03	0,009	
Exported energy	[MJ]	0,00E+00	0,00E+00	0,00E+00	0,000	

**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 this 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 and ITB PCR A		
Independent verification corresponding to ISO 14025 & 8.3.1.	<input checked="" type="checkbox"/> external	<input type="checkbox"/> internal
Verification of EPD: 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

- ITB PCR A- General Product Category Rules for Construction Products
- 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