



Issuance date: 30.08.2019  
Revision date: 07.07.2021  
Validity date: 30.08.2024

## Sandwich panels PIRTECH



ECO EPD Ref. No. 00000971

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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 an external auditor. It contains the information on the impacts of the declared construction materials on the environment. Their aspects were verified by the independent 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 analysis (LCA):** A1-A3, C3, C4 and D modules in accordance with EN 15804 (Cradle to Gate with options)

**The year of preparing the EPD:** 2019

**Product standard:** EN 14509

**Service Life:** 45 years

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

**Declared unit:** 1 m<sup>2</sup>

**Reasons for performing LCA:** B2B

**Representativeness:** Polish product

## MANUFACTURER



Fig. 1. A view of the Pruszyński Sp. z o.o. production hall in Sokolów (Poland).

**Pruszyński Sp. z o. o.** the Polish producer of construction products. The core of the activities are: steel roofing, elevation, trapezoidal steel sheets, sandwich panels and cold-formed profiles.

Since the beginning of the activity, Pruszyński Sp. z o. o. has paid the attention to the importance of the highest quality of its products and long-term relationships with customers. The commercial offer is wide therefore the products can be combined into systems that provide investors with complete solutions at site and shorten the finishing of the project.

## PRODUCT DESCRIPTION

### Wall panels

Sandwich panels system with rigid polyisocyanurate (PIR) foam core (density  $40 \text{ kg/m}^3 \pm 3 \text{ kg/m}^3$ ) in steel facings from production of Pruszyński Sp. z o. o. includes wall panels with visible joint (PWS - PIR - ST), wall panels with hidden joint (PWS - PIR - PL), roof panels (PWD - PIR) and cold storage (PWS - PIR - CH).

Basic modular widths are:

- wall plate with visible joints, with hidden joints and cold storage 1000 mm, 1150 mm,
- roof panels 1050 mm.

The longitudinal contacts ("joints") of the wall panels have a conical shape:

- facilitates assembly (saving time and minimizing risk of damage),
- provides water and air tightness,
- improves fire resistance, reaction to fire,

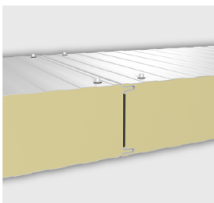
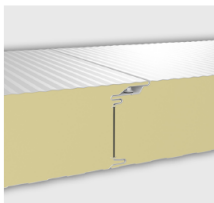
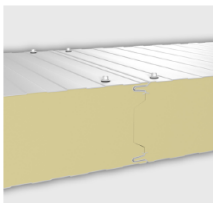
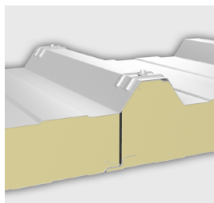
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- increases the longitudinal rigidity of the boards - thus improving the bearing capacity and performance rigidity.

**In the case of wall panels with hidden joint - it has unique geometry thanks to application, so called "triple" feather - groove. This way you can get even better fire safety properties or properties mechanical.**

### Roof panels

As for the roof panels, the external facing has been shaped (the main fold 40 mm high) that the load capacity is comparable to the roof plates with the main fold height 45 mm.

Types of PIRTECH panels				
Name	STANDARD - ST	PLUS - PL	COLD STORAGE - CH	ROOF
joint				
designation	<b>PWS-PIR-ST</b>	<b>PWS-PIR-PL</b>	<b>PWS-PIR-CH</b>	<b>PWD-PIR</b>
core	<b>PIR polyurethane</b>			
thickness (mm)	<b>40/50/60/80/100/120</b>	<b>60/80/100/120</b>	<b>120/160/180/200/220</b>	<b>40/60/80/100/120/160</b>
effective width (mm)	1000,1150	1000,1150	1000,1150	1050
thickness of the facing (mm)	0,50	0,50	0,50	0,50
range of external profiling	trapezoidal - T / micro - M / wave - F			<b>trapezoidal T40</b>
range of internal profiling	trapezoidal - T			
anti-corrosion coating	Polyester / mat, polyurethane, HPS, PVDF			

### TECHNICAL PROPERTIES and CERTIFICATES

All technical properties of PIRTECH sandwich panels in the field of:

- fire reaction,
- fire resistance,
- flame propagation,
- thermal physics,
- acoustic insulation,
- corrosion resistance,
- statics

are detailed in the technical catalog *PIRTECH sandwich panels with rigid polyurethane foam core PIR in steel facings* which can be downloaded at [www.pruszynski.com.pl](http://www.pruszynski.com.pl).

PIRTECH sandwich panels are manufactured in accordance with EN 14509, CE marked and the Declaration of Performance is issued.

In addition:

- PIRTECH panels have HYGIENIC CERTIFICATE No 137/322/137/2021
- The company Pruszyński Sp. z o. o. has the CERTIFICATE No J - 1581/4/2019 according to PN – EN ISO 9001:2015-10

### APPLICATIONS

Sandwich panels are constructed from materials which consist of construction elements (external steel facings) and construction – insulation layers (core of the panel). The idea of sandwich panels is permanent connection construction of facings with core on whole surface in order to get the static collaboration among them.

#### **Sandwich panels are used in the buildings industry as:**

- curtain walls,
- roofs,
- internal partition walls,
- occasionally as load-bearing walls (in the case of single-storey small buildings such a small cubic chambers, backyard facilities, rarely cottages),
- suspended ceiling elements.

#### **In the buildings of various uses, which include objects:**

- one-storey (multi-storey) industrial buildings,
- public utilities (sport and entertainment halls, large commercial halls, swimming pools, etc.),
- agricultural construction,
- special construction (e.g. cooling towers, back office buildings construction, floating military containers, etc.).

### LIFE CYCLE ASSESSMENT (LCA) – general rules applied

#### **Allocation**

The allocation rules used for this EPD are based on general ITB PCR A. Production of the sandwich panels PIRTECH is a line process in one factory of Pruszyński Sp. z o.o. in Sokołów (Poland). Allocation was done on product mass basis. All impacts from raw materials extraction are allocated in A1 module of the LCA. 100% of impacts from line production of Pruszyński Sp. z o.o. were inventoried and 4.2% were allocated to the sandwich panels PIRTECH production. Utilization of packaging material was taken into consideration. Module A2 includes transport of raw materials such as steel products, chemicals, additives and ancillary materials from their suppliers to Pruszyński Sp. z o.o. in Sokołów. Municipal wastes of factory were allocated to module A3. Energy supply was inventoried for whole factory and 4.2% was allocated to the sandwich panels PIRTECH production. Emissions in the factory are measured and were allocated to module A3.

#### **System limits**

The life cycle analysis of the declared products covers “Product Stage”, A1-A3, C3, C4 and D modules (Cradle to Gate with options) accordance with EN 15804+A1 and ITB PCR A. The details of systems limits are provided in product technical report. All materials and energy consumption inventoried in factories and were included in calculation. In the assessment, all significant parameters from gathered production data are considered, i.e. all material used per formulation,

utilized thermal energy, internal fuel and electric power consumption, direct production waste, and all available emission measurements. It can be assumed that the total sum of omitted processes does not exceed 5% of all impact categories. In accordance with EN 15804+A1, machines and facilities (capital goods) required for and during production are excluded, as is transportation of employees.

### **A1 and A2 Modules: Raw materials supply and transport**

Steel products used as facings of the sandwich panels PIRTECH come from Polish and foreign steelmaking plants while chemicals needed for manufacturing of polyurethane foam (PIR) core come from foreign suppliers. Ancillary materials and packaging materials come from local suppliers. Data on transport of the different products to the manufacturing plants is collected and modelled for factory by assessor. Means of transport include trucks. For calculation purposes Polish and European fuel averages are applied.

### **A3: Production**

Production of PIRTECH sandwich panels with rigid polyurethane foam core (PIR) was launched in mid-2016. The production process is carried out continuously, fully automated line. Pentane is used as a foaming agent. Other components of foam are: polyol - polyurethane resin, isocyanate - hardener and activators and additives.

Technological process of production of sandwich panels with polyurethane foam core (PIR) consists of injecting the mixed components, which then form a rigid core Polyurethane with a density of  $40 \pm 3$  [kg/m<sup>3</sup>], between two moving continuously steel facings (with preformed edges and main profile) with simultaneous application of gasket and aluminum foil to the longitudinal joint.

Maximum production speed is up to 15 m per min. CONTIMAT (tunnel) is 45 m long. The line was fitted with 2 crowns - for the bottom plate (external facings) and for the upper plate (internal facing). Currently, the standard is only one such device installed in the production line. It improves the adhesion of the core to the metal facings. Better adhesion gives higher mechanical properties of the panels - bearing capacity and stiffness. In addition to this, to improve the quality of the produced panels, was designed in detail the cooling part, that is, the so-called "hedgehog". Thanks to this solution, the produced panels spend relevant time to cool down. In this way, the risk of thermal shock is avoided, as it has a very negative effect on appearance of panels and their mechanical properties. Also, in the hall directly to the production hall, there is the magazine for the panels for further cooling down for 24 hours. After such time, being in the "hedgehog" and on the halls, the panels are sent to recipients. The production line of roofing panels is equipped with so-called overlapping - preparing panels for easy and fast joining on the length. The main raw material base - isocyanates and polyols, are stocked in two batteries tanks - 4 pieces each, each with a volume of 40 m<sup>3</sup>. Such quantity of tanks ensures continuous maintenance of production - risk of production stops are practically eliminated to zero.

Steel facings are produced from thicknesses from 0.40 mm to 0.70 mm and covered with metallic and organic protective coatings. In addition, the protective coatings are offered in number of different colours so that they can meet the most sophisticated investors expectations.

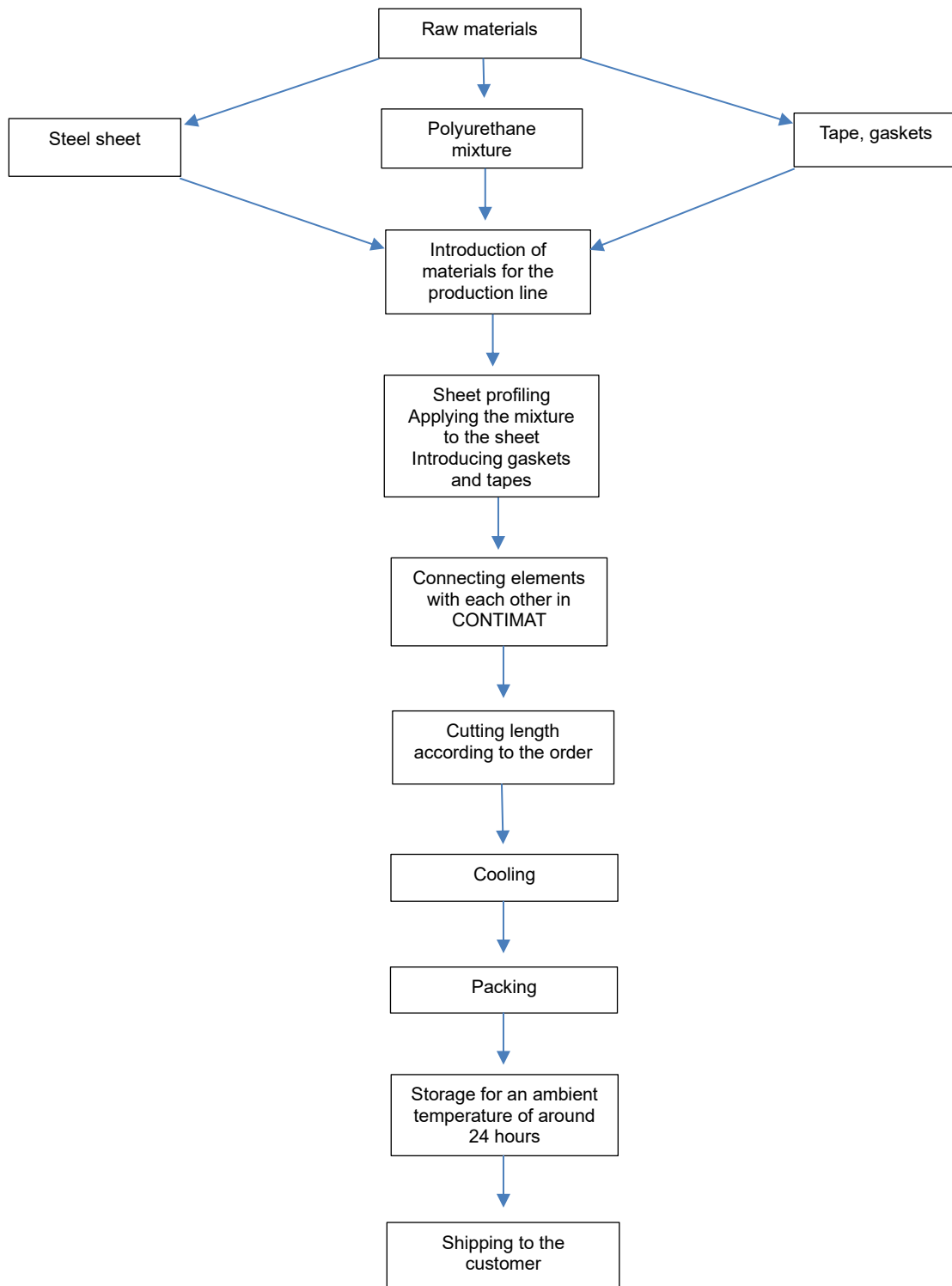


Fig. 2. A scheme of manufacturing of the sandwich panels PIRTECH by Pruszyński Sp. z o. o. in factory in Sokołów (Poland).

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### C3 – C4: End of life

Parameter	Contribution	Value
Collection rate	100%	9.4 – 16.6 kg
Recycling	98% of facing	7.7 kg
Landfilling	2%	0.2 – 0.3 kg
Incineration	99% of PIR core	1.6 – 8.7 kg

### D: Re-use, recovery, recycling potential

Benefits and loads beyond the system boundary were calculated for steel facing using a net scrap formulation proposed by World Steel Association where the net scrap is determined as a difference between the amount of steel recycled at end-of-life and the scrap input from previous product life cycle (assumed 85%).

#### Data collection period

The data for manufacture of the declared products refer to period between 01.01.2018 – 31.12.2018 (1 year). The life cycle assessments were prepared for Poland as reference area.

#### Data quality

The values determined to calculate the LCA originate from verified Pruszyński Sp. z o.o. inventory data.

#### Assumptions and estimates

The impacts of the sandwich panels PIRTECH were aggregated using weighted average. Impacts were inventoried and calculated for all products of the sandwich panels PIRTECH

#### Calculation rules

LCA was done in accordance with ITB PCR A document.

#### Databases

The data for the processes come from the following databases: Ecoinvent v.3.5, specific EPDs, ELCD, Ullmann's, ÖKOBAUDAT, ITB-Data. Specific data quality analysis was a part of external ISO 14001 audit. Characterization factors are CML ver. 4.2 based on EN 15804:2013+A1 version (PN-EN 15804+A1:2014-04).

## LIFE CYCLE ASSESSMENT (LCA) – Results

### Declared unit

The declaration refers to declared unit (FU) – 1 m<sup>2</sup> of the sandwich panels PIRTECH (facing: 0.5 mm) manufactured by Pruszyński Sp. z o.o.

Table 1. System boundaries for the environmental characteristic of the sandwich panels PIRTECH.

Environmental assessment information (MNA – Module not assessed, 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	MNA	MNA	MNA	MNA	MNA	MNA	MNA	MNA	MNA	MNA	MNA	MD	MD	MD



**Sandwich panels PIRTECH  
with thickness 40 mm**

<b>Environmental impacts: (DU) 1 m<sup>2</sup></b>								
<b>Indicator</b>	<b>Unit</b>	<b>A1</b>	<b>A2</b>	<b>A3</b>	<b>A1-A3</b>	<b>C3</b>	<b>C4</b>	<b>D</b>
Global warming potential	[kg CO <sub>2</sub> eq.]	2.39E+01	5.72E-01	1.35E-01	2.46E+01	1.12E+00	4.29E-04	-8.90E+00
Depletion potential of the stratospheric ozone layer	[kg CFC 11 eq.]	7.97E-06	0.00E+00	0.00E+00	7.97E-06	1.15E-08	1.49E-10	8.88E-08
Acidification potential of soil and water	[kg SO <sub>2</sub> eq.]	1.46E-01	4.18E-03	1.16E-06	1.50E-01	5.55E-03	3.20E-06	-1.97E-02
Formation potential of tropospheric ozone	[kg Ethene eq.]	2.73E-02	3.04E-04	0.00E+00	2.76E-02	7.29E-04	2.94E-07	-2.49E-03
Eutrophication potential	[kg (PO <sub>4</sub> ) <sup>3-</sup> eq.]	1.20E-02	7.38E-04	4.37E-10	1.27E-02	3.93E-03	6.69E-07	-2.90E-03
Abiotic depletion potential (ADP-elements) for non-fossil resources	[kg Sb eq.]	1.70E-03	0.00E+00	4.99E-07	1.70E-03	1.44E-07	4.70E-10	7.40E-04
Abiotic depletion potential (ADP-fossil fuels) for fossil resources	[MJ]	2.75E+02	4.66E+00	1.58E+00	2.81E+02	1.26E+00	1.29E-02	-7.34E+01
<b>Environmental aspects on resource use: (DU) 1 m<sup>2</sup></b>								
<b>Indicator</b>	<b>Unit</b>	<b>A1</b>	<b>A2</b>	<b>A3</b>	<b>A1-A3</b>	<b>C3</b>	<b>C4</b>	<b>D</b>
Use of renewable primary energy excluding renewable primary energy resources used as raw materials	[MJ]	INA	INA	INA	INA	INA	INA	INA
Use of renewable primary energy resources used as raw materials	[MJ]	INA	INA	INA	INA	INA	INA	INA
Total use of renewable primary energy resources (primary energy and primary energy resources used as raw materials)	[MJ]	1.47E+01	3.26E-01	7.52E-02	1.51E+01	1.05E-01	3.02E-04	7.71E+00
Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials	[MJ]	INA	INA	INA	INA	INA	INA	INA
Use of non-renewable primary energy resources used as raw materials	[MJ]	INA	INA	INA	INA	INA	INA	INA
Total use of non-renewable primary energy resources (primary energy and primary energy resources used as raw materials)	[MJ]	2.94E+02	4.89E+00	1.66E+00	3.00E+02	1.40E+00	1.35E-02	-5.13E+01
Use of secondary material	[kg]	6.39E-01	0.00E+00	0.00E+00	6.39E-01	0.00E+00	0.00E+00	0.00E+00
Use of renewable secondary fuels	[MJ]	2.57E-05	2.45E-01	0.00E+00	2.45E-01	0.00E+00	0.00E+00	0.00E+00
Use of non-renewable secondary fuels	[MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Net use of fresh water	[m <sup>3</sup> ]	INA	INA	INA	INA	INA	INA	INA
<b>Other environmental information describing waste categories: (DU) 1 m<sup>2</sup></b>								
<b>Indicator</b>	<b>Unit</b>	<b>A1</b>	<b>A2</b>	<b>A3</b>	<b>A1-A3</b>	<b>C3</b>	<b>C4</b>	<b>D</b>
Hazardous waste disposed	[kg]	1.12E-03	2.66E-04	8.75E-04	2.26E-03	1.15E-06	8.50E-09	-2.36E-03
Non-hazardous waste disposed	[kg]	2.47E-01	2.47E-01	8.18E-07	4.94E-01	2.45E-01	1.74E-03	-6.47E-01
Radioactive waste disposed	[kg]	2.58E-03	0.00E+00	0.00E+00	2.58E-03	4.07E-05	8.67E-08	-5.13E-03
Components for re-use	[kg]	0.00E+00	0.00E+00	6.27E-02	6.27E-02	7.67E-02	0.00E+00	0.00E+00
Materials for recycling	[kg]	0.00E+00	0.00E+00	5.91E-03	5.91E-03	7.52E+00	0.00E+00	0.00E+00
Materials for energy recover	[kg]	0.00E+00	0.00E+00	1.29E-02	1.29E-02	0.00E+00	0.00E+00	0.00E+00
Exported energy	[MJ per energy carrier]	INA	INA	INA	INA	INA	INA	INA



**Sandwich panels PIRTECH**  
with thickness 50 mm

Environmental impacts: (DU) 1 m <sup>2</sup>								
Indicator	Unit	A1	A2	A3	A1-A3	C3	C4	D
Global warming potential	[kg CO <sub>2</sub> eq.]	2.48E+01	5.72E-01	1.35E-01	2.56E+01	1.39E+00	4.29E-04	-8.90E+00
Depletion potential of the stratospheric ozone layer	[kg CFC 11 eq.]	9.99E-06	0.00E+00	0.00E+00	9.99E-06	1.44E-08	1.49E-10	8.88E-08
Acidification potential of soil and water	[kg SO <sub>2</sub> eq.]	1.48E-01	4.18E-03	1.16E-06	1.53E-01	6.93E-03	3.20E-06	-1.97E-02
Formation potential of tropospheric ozone	[kg Ethene eq.]	2.78E-02	3.04E-04	0.00E+00	2.81E-02	9.10E-04	2.94E-07	-2.49E-03
Eutrophication potential	[kg (PO <sub>4</sub> ) <sup>3-</sup> eq.]	1.23E-02	7.38E-04	4.37E-10	1.31E-02	4.91E-03	6.69E-07	-2.90E-03
Abiotic depletion potential (ADP-elements) for non-fossil resources	[kg Sb eq.]	1.70E-03	0.00E+00	4.99E-07	1.70E-03	1.78E-07	4.70E-10	7.40E-04
Abiotic depletion potential (ADP-fossil fuels) for fossil resources	[MJ]	2.99E+02	4.66E+00	1.58E+00	3.05E+02	1.53E+00	1.29E-02	-7.34E+01
Environmental aspects on resource use: (DU) 1 m <sup>2</sup>								
Indicator	Unit	A1	A2	A3	A1-A3	C3	C4	D
Use of renewable primary energy excluding renewable primary energy resources used as raw materials	[MJ]	INA	INA	INA	INA	INA	INA	INA
Use of renewable primary energy resources used as raw materials	[MJ]	INA	INA	INA	INA	INA	INA	INA
Total use of renewable primary energy resources (primary energy and primary energy resources used as raw materials)	[MJ]	1.57E+01	3.26E-01	7.52E-02	1.61E+01	1.12E-01	3.02E-04	7.71E+00
Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials	[MJ]	INA	INA	INA	INA	INA	INA	INA
Use of non-renewable primary energy resources used as raw materials	[MJ]	INA	INA	INA	INA	INA	INA	INA
Total use of non-renewable primary energy resources (primary energy and primary energy resources used as raw materials)	[MJ]	3.21E+02	4.89E+00	1.66E+00	3.28E+02	1.69E+00	1.35E-02	-5.13E+01
Use of secondary material	[kg]	6.39E-01	0.00E+00	0.00E+00	6.39E-01	0.00E+00	0.00E+00	0.00E+00
Use of renewable secondary fuels	[MJ]	2.57E-05	2.45E-01	0.00E+00	2.45E-01	0.00E+00	0.00E+00	0.00E+00
Use of non-renewable secondary fuels	[MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Net use of fresh water	[m <sup>3</sup> ]	INA	INA	INA	INA	INA	INA	INA
Other environmental information describing waste categories: (DU) 1 m <sup>2</sup>								
Indicator	Unit	A1	A2	A3	A1-A3	C3	C4	D
Hazardous waste disposed	[kg]	1.35E-03	2.66E-04	8.75E-04	2.49E-03	1.44E-06	8.50E-09	-2.36E-03
Non-hazardous waste disposed	[kg]	2.86E-01	2.47E-01	8.18E-07	5.33E-01	2.67E-01	1.74E-03	-6.47E-01
Radioactive waste disposed	[kg]	2.71E-03	0.00E+00	0.00E+00	2.71E-03	4.20E-05	8.67E-08	-5.13E-03
Components for re-use	[kg]	0.00E+00	0.00E+00	6.27E-02	6.27E-02	7.67E-02	0.00E+00	0.00E+00
Materials for recycling	[kg]	0.00E+00	0.00E+00	5.91E-03	5.91E-03	7.52E+00	0.00E+00	0.00E+00
Materials for energy recover	[kg]	0.00E+00	0.00E+00	1.29E-02	1.29E-02	0.00E+00	0.00E+00	0.00E+00
Exported energy	[MJ per energy carrier]	INA	INA	INA	INA	INA	INA	INA

**Sandwich panels PIRTECH**  
with thickness 60 mm

Environmental impacts: (DU) 1 m <sup>2</sup>								
Indicator	Unit	A1	A2	A3	A1-A3	C3	C4	D
Global warming potential	[kg CO <sub>2</sub> eq.]	2.58E+01	5.72E-01	1.35E-01	2.65E+01	1.67E+00	4.29E-04	-8.90E+00
Depletion potential of the stratospheric ozone layer	[kg CFC 11 eq.]	1.20E-05	0.00E+00	0.00E+00	1.20E-05	1.72E-08	1.49E-10	8.88E-08
Acidification potential of soil and water	[kg SO <sub>2</sub> eq.]	1.51E-01	4.18E-03	1.16E-06	1.55E-01	8.31E-03	3.20E-06	-1.97E-02
Formation potential of tropospheric ozone	[kg Ethene eq.]	2.83E-02	3.04E-04	0.00E+00	2.86E-02	1.09E-03	2.94E-07	-2.49E-03
Eutrophication potential	[kg (PO <sub>4</sub> ) <sup>3-</sup> eq.]	1.27E-02	7.38E-04	4.37E-10	1.34E-02	5.89E-03	6.69E-07	-2.90E-03
Abiotic depletion potential (ADP-elements) for non-fossil resources	[kg Sb eq.]	1.70E-03	0.00E+00	4.99E-07	1.70E-03	2.13E-07	4.70E-10	7.40E-04
Abiotic depletion potential (ADP-fossil fuels) for fossil resources	[MJ]	3.23E+02	4.66E+00	1.58E+00	3.29E+02	1.81E+00	1.29E-02	-7.34E+01
Environmental aspects on resource use: (DU) 1 m <sup>2</sup>								
Indicator	Unit	A1	A2	A3	A1-A3	C3	C4	D
Use of renewable primary energy excluding renewable primary energy resources used as raw materials	[MJ]	INA	INA	INA	INA	INA	INA	INA
Use of renewable primary energy resources used as raw materials	[MJ]	INA	INA	INA	INA	INA	INA	INA
Total use of renewable primary energy resources (primary energy and primary energy resources used as raw materials)	[MJ]	1.66E+01	3.26E-01	7.52E-02	1.70E+01	1.19E-01	3.02E-04	7.71E+00
Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials	[MJ]	INA	INA	INA	INA	INA	INA	INA
Use of non-renewable primary energy resources used as raw materials	[MJ]	INA	INA	INA	INA	INA	INA	INA
Total use of non-renewable primary energy resources (primary energy and primary energy resources used as raw materials)	[MJ]	3.49E+02	4.89E+00	1.66E+00	3.55E+02	1.97E+00	1.35E-02	-5.13E+01
Use of secondary material	[kg]	6.39E-01	0.00E+00	0.00E+00	6.39E-01	0.00E+00	0.00E+00	0.00E+00
Use of renewable secondary fuels	[MJ]	2.57E-05	2.45E-01	0.00E+00	2.45E-01	0.00E+00	0.00E+00	0.00E+00
Use of non-renewable secondary fuels	[MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Net use of fresh water	[m <sup>3</sup> ]	1,66E+01	INA	INA	INA	INA	INA	INA
Other environmental information describing waste categories: (DU) 1 m <sup>2</sup>								
Indicator	Unit	A1	A2	A3	A1-A3	C3	C4	D
Hazardous waste disposed	[kg]	1.58E-03	2.66E-04	8.75E-04	2.72E-03	1.72E-06	8.50E-09	-2.36E-03
Non-hazardous waste disposed	[kg]	3.27E-01	2.47E-01	8.18E-07	5.74E-01	2.88E-01	1.74E-03	-6.47E-01
Radioactive waste disposed	[kg]	2.85E-03	0.00E+00	0.00E+00	2.85E-03	4.34E-05	8.67E-08	-5.13E-03
Components for re-use	[kg]	0.00E+00	0.00E+00	6.27E-02	6.27E-02	7.67E-02	0.00E+00	0.00E+00
Materials for recycling	[kg]	0.00E+00	0.00E+00	5.91E-03	5.91E-03	7.52E+00	0.00E+00	0.00E+00
Materials for energy recover	[kg]	0.00E+00	0.00E+00	1.29E-02	1.29E-02	0.00E+00	0.00E+00	0.00E+00
Exported energy	[MJ per energy carrier]	INA	INA	INA	INA	INA	INA	INA

**Sandwich panels PIRTECH**  
with thickness 80 mm

Environmental impacts: (DU) 1 m <sup>2</sup>								
Indicator	Unit	A1	A2	A3	A1-A3	C3	C4	D
Global warming potential	[kg CO <sub>2</sub> eq.]	2.78E+01	5.72E-01	1.35E-01	2.85E+01	2.22E+00	4.29E-04	-8.90E+00
Depletion potential of the stratospheric ozone layer	[kg CFC 11 eq.]	1.61E-05	0.00E+00	0.00E+00	1.61E-05	2.30E-08	1.49E-10	8.88E-08
Acidification potential of soil and water	[kg SO <sub>2</sub> eq.]	1.55E-01	4.18E-03	1.16E-06	1.59E-01	1.11E-02	3.20E-06	-1.97E-02
Formation potential of tropospheric ozone	[kg Ethene eq.]	2.93E-02	3.04E-04	0.00E+00	2.96E-02	1.45E-03	2.94E-07	-2.49E-03
Eutrophication potential	[kg (PO <sub>4</sub> ) <sup>3-</sup> eq.]	1.34E-02	7.38E-04	4.37E-10	1.42E-02	7.86E-03	6.69E-07	-2.90E-03
Abiotic depletion potential (ADP-elements) for non-fossil resources	[kg Sb eq.]	1.71E-03	0.00E+00	4.99E-07	1.71E-03	2.82E-07	4.70E-10	7.40E-04
Abiotic depletion potential (ADP-fossil fuels) for fossil resources	[MJ]	3.71E+02	4.66E+00	1.58E+00	3.77E+02	2.36E+00	1.29E-02	-7.34E+01
Environmental aspects on resource use: (DU) 1 m <sup>2</sup>								
Indicator	Unit	A1	A2	A3	A1-A3	C3	C4	D
Use of renewable primary energy excluding renewable primary energy resources used as raw materials	[MJ]	INA	INA	INA	INA	INA	INA	INA
Use of renewable primary energy resources used as raw materials	[MJ]	INA	INA	INA	INA	INA	INA	INA
Total use of renewable primary energy resources (primary energy and primary energy resources used as raw materials)	[MJ]	1.85E+01	3.26E-01	7.52E-02	1.89E+01	1.34E-01	3.02E-04	7.71E+00
Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials	[MJ]	INA	INA	INA	INA	INA	INA	INA
Use of non-renewable primary energy resources used as raw materials	[MJ]	INA	INA	INA	INA	INA	INA	INA
Total use of non-renewable primary energy resources (primary energy and primary energy resources used as raw materials)	[MJ]	4.03E+02	4.89E+00	1.66E+00	4.10E+02	2.54E+00	1.35E-02	-5.13E+01
Use of secondary material	[kg]	6.39E-01	0.00E+00	0.00E+00	6.39E-01	0.00E+00	0.00E+00	0.00E+00
Use of renewable secondary fuels	[MJ]	2.57E-05	2.45E-01	0.00E+00	2.45E-01	0.00E+00	0.00E+00	0.00E+00
Use of non-renewable secondary fuels	[MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Net use of fresh water	[m <sup>3</sup> ]	INA	INA	INA	INA	INA	INA	INA
Other environmental information describing waste categories: (DU) 1 m <sup>2</sup>								
Indicator	Unit	A1	A2	A3	A1-A3	C3	C4	D
Hazardous waste disposed	[kg]	2.04E-03	2.66E-04	8.75E-04	3.18E-03	2.30E-06	8.50E-09	-2.36E-03
Non-hazardous waste disposed	[kg]	4.06E-01	2.47E-01	8.18E-07	6.53E-01	3.31E-01	1.74E-03	-6.47E-01
Radioactive waste disposed	[kg]	3.11E-03	0.00E+00	0.00E+00	3.11E-03	4.61E-05	8.67E-08	-5.13E-03
Components for re-use	[kg]	0.00E+00	0.00E+00	6.27E-02	6.27E-02	7.67E-02	0.00E+00	0.00E+00
Materials for recycling	[kg]	0.00E+00	0.00E+00	5.91E-03	5.91E-03	7.52E+00	0.00E+00	0.00E+00
Materials for energy recover	[kg]	0.00E+00	0.00E+00	1.29E-02	1.29E-02	0.00E+00	0.00E+00	0.00E+00
Exported energy	[MJ per energy carrier]	INA	INA	INA	INA	INA	INA	INA

**Sandwich panels PIRTECH**  
with thickness 100 mm

Environmental impacts: (DU) 1 m <sup>2</sup>								
Indicator	Unit	A1	A2	A3	A1-A3	C3	C4	D
Global warming potential	[kg CO <sub>2</sub> eq.]	2.97E+01	5.72E-01	1.35E-01	3.04E+01	2.77E+00	4.29E-04	-8.90E+00
Depletion potential of the stratospheric ozone layer	[kg CFC 11 eq.]	2.02E-05	0.00E+00	0.00E+00	2.02E-05	2.88E-08	1.49E-10	8.88E-08
Acidification potential of soil and water	[kg SO <sub>2</sub> eq.]	1.59E-01	4.18E-03	1.16E-06	1.64E-01	1.38E-02	3.20E-06	-1.97E-02
Formation potential of tropospheric ozone	[kg Ethene eq.]	3.03E-02	3.04E-04	0.00E+00	3.06E-02	1.82E-03	2.94E-07	-2.49E-03
Eutrophication potential	[kg (PO <sub>4</sub> ) <sup>3-</sup> eq.]	1.42E-02	7.38E-04	4.37E-10	1.49E-02	9.82E-03	6.69E-07	-2.90E-03
Abiotic depletion potential (ADP-elements) for non-fossil resources	[kg Sb eq.]	1.71E-03	0.00E+00	4.99E-07	1.71E-03	3.51E-07	4.70E-10	7.40E-04
Abiotic depletion potential (ADP-fossil fuels) for fossil resources	[MJ]	4.19E+02	4.66E+00	1.58E+00	4.26E+02	2.92E+00	1.29E-02	-7.34E+01
Environmental aspects on resource use: (DU) 1 m <sup>2</sup>								
Indicator	Unit	A1	A2	A3	A1-A3	C3	C4	D
Use of renewable primary energy excluding renewable primary energy resources used as raw materials	[MJ]	INA	INA	INA	INA	INA	INA	INA
Use of renewable primary energy resources used as raw materials	[MJ]	INA	INA	INA	INA	INA	INA	INA
Total use of renewable primary energy resources (primary energy and primary energy resources used as raw materials)	[MJ]	2.04E+01	3.26E-01	7.52E-02	2.08E+01	1.49E-01	3.02E-04	7.71E+00
Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials	[MJ]	INA	INA	INA	INA	INA	INA	INA
Use of non-renewable primary energy resources used as raw materials	[MJ]	INA	INA	INA	INA	INA	INA	INA
Total use of non-renewable primary energy resources (primary energy and primary energy resources used as raw materials)	[MJ]	4.58E+02	4.89E+00	1.66E+00	4.64E+02	3.10E+00	1.35E-02	-5.13E+01
Use of secondary material	[kg]	6.39E-01	0.00E+00	0.00E+00	6.39E-01	0.00E+00	0.00E+00	0.00E+00
Use of renewable secondary fuels	[MJ]	2.57E-05	2.45E-01	0.00E+00	2.45E-01	0.00E+00	0.00E+00	0.00E+00
Use of non-renewable secondary fuels	[MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Net use of fresh water	[m <sup>3</sup> ]	INA	INA	INA	INA	INA	INA	INA
Other environmental information describing waste categories: (DU) 1 m <sup>2</sup>								
Indicator	Unit	A1	A2	A3	A1-A3	C3	C4	D
Hazardous waste disposed	[kg]	2.50E-03	2.66E-04	8.75E-04	3.64E-03	2.87E-06	8.50E-09	-2.36E-03
Non-hazardous waste disposed	[kg]	4.86E-01	2.47E-01	8.18E-07	7.33E-01	3.74E-01	1.74E-03	-6.47E-01
Radioactive waste disposed	[kg]	3.38E-03	0.00E+00	0.00E+00	3.38E-03	4.88E-05	8.67E-08	-5.13E-03
Components for re-use	[kg]	0.00E+00	0.00E+00	6.27E-02	6.27E-02	7.67E-02	0.00E+00	0.00E+00
Materials for recycling	[kg]	0.00E+00	0.00E+00	5.91E-03	5.91E-03	7.52E+00	0.00E+00	0.00E+00
Materials for energy recover	[kg]	0.00E+00	0.00E+00	1.29E-02	1.29E-02	0.00E+00	0.00E+00	0.00E+00
Exported energy	[MJ per energy carrier]	INA	INA	INA	INA	INA	INA	INA

**Sandwich panels PIRTECH**  
with thickness 120 mm

Environmental impacts: (DU) 1 m <sup>2</sup>								
Indicator	Unit	A1	A2	A3	A1-A3	C3	C4	D
Global warming potential	[kg CO <sub>2</sub> eq.]	3.16E+01	5.72E-01	1.35E-01	3.24E+01	3.32E+00	4.29E-04	-8.90E+00
Depletion potential of the stratospheric ozone layer	[kg CFC 11 eq.]	2.43E-05	0.00E+00	0.00E+00	2.43E-05	3.45E-08	1.49E-10	8.88E-08
Acidification potential of soil and water	[kg SO <sub>2</sub> eq.]	1.64E-01	4.18E-03	1.16E-06	1.68E-01	1.66E-02	3.20E-06	-1.97E-02
Formation potential of tropospheric ozone	[kg Ethene eq.]	3.13E-02	3.04E-04	0.00E+00	3.16E-02	2.18E-03	2.94E-07	-2.49E-03
Eutrophication potential	[kg (PO <sub>4</sub> ) <sup>3-</sup> eq.]	1.49E-02	7.38E-04	4.37E-10	1.56E-02	1.18E-02	6.69E-07	-2.90E-03
Abiotic depletion potential (ADP-elements) for non-fossil resources	[kg Sb eq.]	1.72E-03	0.00E+00	4.99E-07	1.72E-03	4.20E-07	4.70E-10	7.40E-04
Abiotic depletion potential (ADP-fossil fuels) for fossil resources	[MJ]	4.68E+02	4.66E+00	1.58E+00	4.74E+02	3.47E+00	1.29E-02	-7.34E+01
Environmental aspects on resource use: (DU) 1 m <sup>2</sup>								
Indicator	Unit	A1	A2	A3	A1-A3	C3	C4	D
Use of renewable primary energy excluding renewable primary energy resources used as raw materials	[MJ]	INA	INA	INA	INA	INA	INA	INA
Use of renewable primary energy resources used as raw materials	[MJ]	INA	INA	INA	INA	INA	INA	INA
Total use of renewable primary energy resources (primary energy and primary energy resources used as raw materials)	[MJ]	2.22E+01	3.26E-01	7.52E-02	2.26E+01	1.63E-01	3.02E-04	7.71E+00
Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials	[MJ]	INA	INA	INA	INA	INA	INA	INA
Use of non-renewable primary energy resources used as raw materials	[MJ]	INA	INA	INA	INA	INA	INA	INA
Total use of non-renewable primary energy resources (primary energy and primary energy resources used as raw materials)	[MJ]	5.12E+02	4.89E+00	1.66E+00	5.19E+02	3.67E+00	1.35E-02	-5.13E+01
Use of secondary material	[kg]	6.39E-01	0.00E+00	0.00E+00	6.39E-01	0.00E+00	0.00E+00	0.00E+00
Use of renewable secondary fuels	[MJ]	2.57E-05	2.45E-01	0.00E+00	2.45E-01	0.00E+00	0.00E+00	0.00E+00
Use of non-renewable secondary fuels	[MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Net use of fresh water	[m <sup>3</sup> ]	INA	INA	INA	INA	INA	INA	INA
Other environmental information describing waste categories: (DU) 1 m <sup>2</sup>								
Indicator	Unit	A1	A2	A3	A1-A3	C3	C4	D
Hazardous waste disposed	[kg]	2.96E-03	2.66E-04	8.75E-04	4.10E-03	3.45E-06	8.50E-09	-2.36E-03
Non-hazardous waste disposed	[kg]	5.66E-01	2.47E-01	8.18E-07	8.13E-01	4.17E-01	1.74E-03	-6.47E-01
Radioactive waste disposed	[kg]	3.65E-03	0.00E+00	0.00E+00	3.65E-03	5.15E-05	8.67E-08	-5.13E-03
Components for re-use	[kg]	0.00E+00	0.00E+00	6.27E-02	6.27E-02	7.67E-02	0.00E+00	0.00E+00
Materials for recycling	[kg]	0.00E+00	0.00E+00	5.91E-03	5.91E-03	7.52E+00	0.00E+00	0.00E+00
Materials for energy recover	[kg]	0.00E+00	0.00E+00	1.29E-02	1.29E-02	0.00E+00	0.00E+00	0.00E+00
Exported energy	[MJ per energy carrier]	INA	INA	INA	INA	INA	INA	INA

**Sandwich panels PIRTECH  
with thickness 160 mm**

<b>Environmental impacts: (DU) 1 m<sup>2</sup></b>								
<b>Indicator</b>	<b>Unit</b>	<b>A1</b>	<b>A2</b>	<b>A3</b>	<b>A1-A3</b>	<b>C3</b>	<b>C4</b>	<b>D</b>
Global warming potential	[kg CO <sub>2</sub> eq.]	3.54E+01	5.72E-01	1.35E-01	3.62E+01	4.43E+00	4.29E-04	-8.90E+00
Depletion potential of the stratospheric ozone layer	[kg CFC 11 eq.]	2.41E-05	0.00E+00	0.00E+00	2.41E-05	4.60E-08	1.49E-10	8.88E-08
Acidification potential of soil and water	[kg SO <sub>2</sub> eq.]	1.64E-01	4.18E-03	1.16E-06	1.68E-01	2.21E-02	3.20E-06	-1.97E-02
Formation potential of tropospheric ozone	[kg Ethene eq.]	3.13E-02	3.04E-04	0.00E+00	3.16E-02	2.91E-03	2.94E-07	-2.49E-03
Eutrophication potential	[kg (PO <sub>4</sub> ) <sup>3-</sup> eq.]	1.48E-02	7.38E-04	4.37E-10	1.56E-02	1.57E-02	6.69E-07	-2.90E-03
Abiotic depletion potential (ADP-elements) for non-fossil resources	[kg Sb eq.]	1.71E-03	0.00E+00	4.99E-07	1.72E-03	5.59E-07	4.70E-10	7.40E-04
Abiotic depletion potential (ADP-fossil fuels) for fossil resources	[MJ]	4.65E+02	4.66E+00	1.58E+00	4.72E+02	4.58E+00	1.29E-02	-7.34E+01
<b>Environmental aspects on resource use: (DU) 1 m<sup>2</sup></b>								
<b>Indicator</b>	<b>Unit</b>	<b>A1</b>	<b>A2</b>	<b>A3</b>	<b>A1-A3</b>	<b>C3</b>	<b>C4</b>	<b>D</b>
Use of renewable primary energy excluding renewable primary energy resources used as raw materials	[MJ]	INA	INA	INA	INA	INA	INA	INA
Use of renewable primary energy resources used as raw materials	[MJ]	INA	INA	INA	INA	INA	INA	INA
Total use of renewable primary energy resources (primary energy and primary energy resources used as raw materials)	[MJ]	2.21E+01	3.26E-01	7.52E-02	2.25E+01	1.93E-01	3.02E-04	7.71E+00
Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials	[MJ]	INA	INA	INA	INA	INA	INA	INA
Use of non-renewable primary energy resources used as raw materials	[MJ]	INA	INA	INA	INA	INA	INA	INA
Total use of non-renewable primary energy resources (primary energy and primary energy resources used as raw materials)	[MJ]	5.10E+02	4.89E+00	1.66E+00	5.16E+02	4.80E+00	1.35E-02	-5.13E+01
Use of secondary material	[kg]	6.39E-01	0.00E+00	0.00E+00	6.39E-01	0.00E+00	0.00E+00	0.00E+00
Use of renewable secondary fuels	[MJ]	2.57E-05	2.45E-01	0.00E+00	2.45E-01	0.00E+00	0.00E+00	0.00E+00
Use of non-renewable secondary fuels	[MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Net use of fresh water	[m <sup>3</sup> ]	INA	INA	INA	INA	INA	INA	INA
<b>Other environmental information describing waste categories: (DU) 1 m<sup>2</sup></b>								
<b>Indicator</b>	<b>Unit</b>	<b>A1</b>	<b>A2</b>	<b>A3</b>	<b>A1-A3</b>	<b>C3</b>	<b>C4</b>	<b>D</b>
Hazardous waste disposed	[kg]	2.94E-03	2.66E-04	8.75E-04	4.08E-03	4.60E-06	8.50E-09	-2.36E-03
Non-hazardous waste disposed	[kg]	5.62E-01	2.47E-01	8.18E-07	8.09E-01	5.03E-01	1.74E-03	-6.47E-01
Radioactive waste disposed	[kg]	3.64E-03	0.00E+00	0.00E+00	3.64E-03	5.70E-05	8.67E-08	-5.13E-03
Components for re-use	[kg]	0.00E+00	0.00E+00	6.27E-02	6.27E-02	7.67E-02	0.00E+00	0.00E+00
Materials for recycling	[kg]	0.00E+00	0.00E+00	5.91E-03	5.91E-03	7.52E+00	0.00E+00	0.00E+00
Materials for energy recover	[kg]	0.00E+00	0.00E+00	1.29E-02	1.29E-02	0.00E+00	0.00E+00	0.00E+00
Exported energy	[MJ per energy carrier]	INA	INA	INA	INA	INA	INA	INA

**Sandwich panels PIRTECH**  
with thickness 180 mm

Environmental impacts: (DU) 1 m <sup>2</sup>								
Indicator	Unit	A1	A2	A3	A1-A3	C3	C4	D
Global warming potential	[kg CO <sub>2</sub> eq.]	3.74E+01	5.72E-01	1.35E-01	3.81E+01	4.98E+00	4.29E-04	-8.90E+00
Depletion potential of the stratospheric ozone layer	[kg CFC 11 eq.]	3.63E-05	0.00E+00	0.00E+00	3.63E-05	5.18E-08	1.49E-10	8.88E-08
Acidification potential of soil and water	[kg SO <sub>2</sub> eq.]	1.77E-01	4.18E-03	1.16E-06	1.81E-01	2.48E-02	3.20E-06	-1.97E-02
Formation potential of tropospheric ozone	[kg Ethene eq.]	3.43E-02	3.04E-04	0.00E+00	3.46E-02	3.27E-03	2.94E-07	-2.49E-03
Eutrophication potential	[kg (PO <sub>4</sub> ) <sup>3-</sup> eq.]	1.70E-02	7.38E-04	4.37E-10	1.78E-02	1.77E-02	6.69E-07	-2.90E-03
Abiotic depletion potential (ADP-elements) for non-fossil resources	[kg Sb eq.]	1.73E-03	0.00E+00	4.99E-07	1.73E-03	6.28E-07	4.70E-10	7.40E-04
Abiotic depletion potential (ADP-fossil fuels) for fossil resources	[MJ]	6.10E+02	4.66E+00	1.58E+00	6.16E+02	5.13E+00	1.29E-02	-7.34E+01
Environmental aspects on resource use: (DU) 1 m <sup>2</sup>								
Indicator	Unit	A1	A2	A3	A1-A3	C3	C4	D
Use of renewable primary energy excluding renewable primary energy resources used as raw materials	[MJ]	INA	INA	INA	INA	INA	INA	INA
Use of renewable primary energy resources used as raw materials	[MJ]	INA	INA	INA	INA	INA	INA	INA
Total use of renewable primary energy resources (primary energy and primary energy resources used as raw materials)	[MJ]	2.78E+01	3.26E-01	7.52E-02	2.82E+01	2.07E-01	3.02E-04	7.71E+00
Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials	[MJ]	INA	INA	INA	INA	INA	INA	INA
Use of non-renewable primary energy resources used as raw materials	[MJ]	INA	INA	INA	INA	INA	INA	INA
Total use of non-renewable primary energy resources (primary energy and primary energy resources used as raw materials)	[MJ]	6.73E+02	4.89E+00	1.66E+00	6.80E+02	5.37E+00	1.35E-02	-5.13E+01
Use of secondary material	[kg]	6.39E-01	0.00E+00	0.00E+00	6.39E-01	0.00E+00	0.00E+00	0.00E+00
Use of renewable secondary fuels	[MJ]	2.57E-05	2.45E-01	0.00E+00	2.45E-01	0.00E+00	0.00E+00	0.00E+00
Use of non-renewable secondary fuels	[MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Net use of fresh water	[m <sup>3</sup> ]	INA	INA	INA	INA	INA	INA	INA
Other environmental information describing waste categories: (DU) 1 m <sup>2</sup>								
Indicator	Unit	A1	A2	A3	A1-A3	C3	C4	D
Hazardous waste disposed	[kg]	4.32E-03	2.66E-04	8.75E-04	5.46E-03	5.17E-06	8.50E-09	-2.36E-03
Non-hazardous waste disposed	[kg]	8.02E-01	2.47E-01	8.18E-07	1.05E+00	5.46E-01	1.74E-03	-6.47E-01
Radioactive waste disposed	[kg]	4.44E-03	0.00E+00	0.00E+00	4.44E-03	5.97E-05	8.67E-08	-5.13E-03
Components for re-use	[kg]	0.00E+00	0.00E+00	6.27E-02	6.27E-02	7.67E-02	0.00E+00	0.00E+00
Materials for recycling	[kg]	0.00E+00	0.00E+00	5.91E-03	5.91E-03	7.52E+00	0.00E+00	0.00E+00
Materials for energy recover	[kg]	0.00E+00	0.00E+00	1.29E-02	1.29E-02	0.00E+00	0.00E+00	0.00E+00
Exported energy	[MJ per energy carrier]	INA	INA	INA	INA	INA	INA	INA



**Sandwich panels PIRTECH**  
with thickness 200 mm

Environmental impacts: (DU) 1 m <sup>2</sup>								
Indicator	Unit	A1	A2	A3	A1-A3	C3	C4	D
Global warming potential	[kg CO <sub>2</sub> eq.]	3.93E+01	5.72E-01	1.35E-01	4.00E+01	5.53E+00	4.29E-04	-8.90E+00
Depletion potential of the stratospheric ozone layer	[kg CFC 11 eq.]	4.04E-05	0.00E+00	0.00E+00	4.04E-05	5.75E-08	1.49E-10	8.88E-08
Acidification potential of soil and water	[kg SO <sub>2</sub> eq.]	1.81E-01	4.18E-03	1.16E-06	1.85E-01	2.76E-02	3.20E-06	-1.97E-02
Formation potential of tropospheric ozone	[kg Ethene eq.]	3.53E-02	3.04E-04	0.00E+00	3.56E-02	3.63E-03	2.94E-07	-2.49E-03
Eutrophication potential	[kg (PO <sub>4</sub> ) <sup>3-</sup> eq.]	1.77E-02	7.38E-04	4.37E-10	1.85E-02	1.97E-02	6.69E-07	-2.90E-03
Abiotic depletion potential (ADP-elements) for non-fossil resources	[kg Sb eq.]	1.73E-03	0.00E+00	4.99E-07	1.73E-03	6.97E-07	4.70E-10	7.40E-04
Abiotic depletion potential (ADP-fossil fuels) for fossil resources	[MJ]	6.58E+02	4.66E+00	1.58E+00	6.64E+02	5.68E+00	1.29E-02	-7.34E+01
Environmental aspects on resource use: (DU) 1 m <sup>2</sup>								
Indicator	Unit	A1	A2	A3	A1-A3	C3	C4	D
Use of renewable primary energy excluding renewable primary energy resources used as raw materials	[MJ]	INA	INA	INA	INA	INA	INA	INA
Use of renewable primary energy resources used as raw materials	[MJ]	INA	INA	INA	INA	INA	INA	INA
Total use of renewable primary energy resources (primary energy and primary energy resources used as raw materials)	[MJ]	2.96E+01	3.26E-01	7.52E-02	3.00E+01	2.22E-01	3.02E-04	7.71E+00
Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials	[MJ]	INA	INA	INA	INA	INA	INA	INA
Use of non-renewable primary energy resources used as raw materials	[MJ]	INA	INA	INA	INA	INA	INA	INA
Total use of non-renewable primary energy resources (primary energy and primary energy resources used as raw materials)	[MJ]	7.28E+02	4.89E+00	1.66E+00	7.34E+02	5.94E+00	1.35E-02	-5.13E+01
Use of secondary material	[kg]	6.39E-01	0.00E+00	0.00E+00	6.39E-01	0.00E+00	0.00E+00	0.00E+00
Use of renewable secondary fuels	[MJ]	2.57E-05	2.45E-01	0.00E+00	2.45E-01	0.00E+00	0.00E+00	0.00E+00
Use of non-renewable secondary fuels	[MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Net use of fresh water	[m <sup>3</sup> ]	INA	INA	INA	INA	INA	INA	INA
Other environmental information describing waste categories: (DU) 1 m <sup>2</sup>								
Indicator	Unit	A1	A2	A3	A1-A3	C3	C4	D
Hazardous waste disposed	[kg]	4.78E-03	2.66E-04	8.75E-04	5.92E-03	5.75E-06	8.50E-09	-2.36E-03
Non-hazardous waste disposed	[kg]	8.82E-01	2.47E-01	8.18E-07	1.13E+00	5.89E-01	1.74E-03	-6.47E-01
Radioactive waste disposed	[kg]	4.70E-03	0.00E+00	0.00E+00	4.70E-03	6.24E-05	8.67E-08	-5.13E-03
Components for re-use	[kg]	0.00E+00	0.00E+00	6.27E-02	6.27E-02	7.67E-02	0.00E+00	0.00E+00
Materials for recycling	[kg]	0.00E+00	0.00E+00	5.91E-03	5.91E-03	7.52E+00	0.00E+00	0.00E+00
Materials for energy recover	[kg]	0.00E+00	0.00E+00	1.29E-02	1.29E-02	0.00E+00	0.00E+00	0.00E+00
Exported energy	[MJ per energy carrier]	INA	INA	INA	INA	INA	INA	INA

**Sandwich panels PIRTECH**  
with thickness 220 mm

Environmental impacts: (DU) 1 m <sup>2</sup>								
Indicator	Unit	A1	A2	A3	A1-A3	C3	C4	D
Global warming potential	[kg CO <sub>2</sub> eq.]	4.13E+01	5.72E-01	1.35E-01	4.20E+01	6.08E+00	4.29E-04	-8.90E+00
Depletion potential of the stratospheric ozone layer	[kg CFC 11 eq.]	4.04E-05	0.00E+00	0.00E+00	4.04E-05	6.33E-08	1.49E-10	8.88E-08
Acidification potential of soil and water	[kg SO <sub>2</sub> eq.]	1.81E-01	4.18E-03	1.16E-06	1.85E-01	3.04E-02	3.20E-06	-1.97E-02
Formation potential of tropospheric ozone	[kg Ethene eq.]	3.53E-02	3.04E-04	0.00E+00	3.56E-02	4.00E-03	2.94E-07	-2.49E-03
Eutrophication potential	[kg (PO <sub>4</sub> ) <sup>3-</sup> eq.]	1.77E-02	7.38E-04	4.37E-10	1.85E-02	2.16E-02	6.69E-07	-2.90E-03
Abiotic depletion potential (ADP-elements) for non-fossil resources	[kg Sb eq.]	1.73E-03	0.00E+00	4.99E-07	1.73E-03	7.66E-07	4.70E-10	7.40E-04
Abiotic depletion potential (ADP-fossil fuels) for fossil resources	[MJ]	6.58E+02	4.66E+00	1.58E+00	6.64E+02	6.24E+00	1.29E-02	-7.34E+01
Environmental aspects on resource use: (DU) 1 m <sup>2</sup>								
Indicator	Unit	A1	A2	A3	A1-A3	C3	C4	D
Use of renewable primary energy excluding renewable primary energy resources used as raw materials	[MJ]	INA	INA	INA	INA	INA	INA	INA
Use of renewable primary energy resources used as raw materials	[MJ]	INA	INA	INA	INA	INA	INA	INA
Total use of renewable primary energy resources (primary energy and primary energy resources used as raw materials)	[MJ]	2.96E+01	3.26E-01	7.52E-02	3.00E+01	2.37E-01	3.02E-04	7.71E+00
Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials	[MJ]	INA	INA	INA	INA	INA	INA	INA
Use of non-renewable primary energy resources used as raw materials	[MJ]	INA	INA	INA	INA	INA	INA	INA
Total use of non-renewable primary energy resources (primary energy and primary energy resources used as raw materials)	[MJ]	7.28E+02	4.89E+00	1.66E+00	7.34E+02	6.50E+00	1.35E-02	-5.13E+01
Use of secondary material	[kg]	6.39E-01	0.00E+00	0.00E+00	6.39E-01	0.00E+00	0.00E+00	0.00E+00
Use of renewable secondary fuels	[MJ]	2.57E-05	2.45E-01	0.00E+00	2.45E-01	0.00E+00	0.00E+00	0.00E+00
Use of non-renewable secondary fuels	[MJ]	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Net use of fresh water	[m <sup>3</sup> ]	INA	INA	INA	INA	INA	INA	INA
Other environmental information describing waste categories: (DU) 1 m <sup>2</sup>								
Indicator	Unit	A1	A2	A3	A1-A3	C3	C4	D
Hazardous waste disposed	[kg]	4.78E-03	2.66E-04	8.75E-04	5.92E-03	6.32E-06	8.50E-09	-2.36E-03
Non-hazardous waste disposed	[kg]	8.82E-01	2.47E-01	8.18E-07	1.13E+00	6.32E-01	1.74E-03	-6.47E-01
Radioactive waste disposed	[kg]	4.70E-03	0.00E+00	0.00E+00	4.70E-03	6.51E-05	8.67E-08	-5.13E-03
Components for re-use	[kg]	0.00E+00	0.00E+00	6.27E-02	6.27E-02	7.67E-02	0.00E+00	0.00E+00
Materials for recycling	[kg]	0.00E+00	0.00E+00	5.91E-03	5.91E-03	7.52E+00	0.00E+00	0.00E+00
Materials for energy recover	[kg]	0.00E+00	0.00E+00	1.29E-02	1.29E-02	0.00E+00	0.00E+00	0.00E+00
Exported energy	[MJ per energy carrier]	INA	INA	INA	INA	INA	INA	INA

### Verification

The process of verification of this EPD is in accordance with ISO 14025 and ISO 21930. 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 (subclause 8.1.3.) <input checked="" type="checkbox"/> external <input type="checkbox"/> internal
External verification of EPD: Ph.D. Eng. Halina Prejzner LCA, LCI audit and input data verification: Ph.D. Eng. Justyna Tomaszewska. j.tomaszewska@itb.pl Verification of LCA: Ph.D. Eng. Michał Piasecki. m.piasecki@itb.pl

### Normative references

- ITB PCR A General Product Category Rules for Construction Products
- ISO 14025:2006. Environmental labels and declarations – Type III environmental declarations – Principles and procedures
- ISO 21930:2017 Sustainability in buildings and civil engineering works – Core rules for environmental product declarations of construction products and services
- ISO 14044:2006 Environmental management – Life cycle assessment – Requirements and guidelines
- ISO 15686-1:2011 Buildings and constructed assets – Service life planning – Part 1: General principles and framework
- ISO 15686-8:2008 Buildings and constructed assets – Service life planning – Part 8: Reference service life and service-life estimation
- EN 15804:2012+A1:2013 Sustainability of construction works – Environmental product declarations – Core rules for the product category of construction products
- PN-EN 15942:2012 Sustainability of construction works – Environmental product declarations – Communication format business-to-business
- KOBiZE Wskaźniki emisyjności CO<sub>2</sub>, SO<sub>2</sub>, NO<sub>x</sub>, CO i pyłu całkowitego dla energii elektrycznej, grudzień 2017
- PN-EN 14509:2013-12 - Samonośne izolacyjno-konstrukcyjne płyty warstwowe z dwustronną okładziną metalową -- Wyroby fabryczne -- Specyfikacje
- World Steel Association 2017 Life Cycle inventory methodology report for steel products

Deputy Head of the Thermal Physic, Acoustics  
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Justyna Tomaszewska, Ph.D. Eng.



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# **CERTIFICATE No 097/2019**

## **of TYPE III ENVIRONMENTAL DECLARATION**

Product:

**Sandwich panels PIRTECH**

Manufacturer:

**Pruszyński Sp. z o.o.**

Aleje Jerozolimskie 214, 02-486 Warsaw, Poland

confirms the correctness of the data included in the development of  
Type III Environmental Declaration and accordance with the requirements of the standard

**PN-EN 15804+A1:2014-04**

**Sustainability of construction works.**

**Environmental product declarations.**

**Core rules for the product category of construction products.**

This certificate, issued for the first time on 30<sup>th</sup> August 2019 is valid for 5 years  
or until amendment of mentioned Environmental Declaration

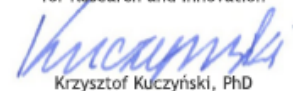
Head of the Thermal Physic, Acoustics  
and Environment Department



Barbara Pietruszka, PhD



Deputy Director  
for Research and Innovation



Krzysztof Kuczyński, PhD

Warsaw, August 2019