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Sandwich panels with mineral wool cores (PWW)



Owner of the EPD:

PaNELTECH Sp. z o.o.
Address: Michałkowiecka 24
41-508 Chorzów, Poland
Contact: info@paneltech.pl
Website: www.paneltech.pl

EPD Program Operator:

Instytut Techniki Budowlanej (ITB)
Address: Filtrowa 1
00-611 Warsaw, Poland
Website: www.itb.pl
Contact: energia@itb.pl

ITB is the verified member of The European Platform for EPD program operators and LCA practitioner www.eco-platform.org

Basic information

This declaration is the Type III Environmental Product Declaration (EPD) based on EN 15804+A2 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+A2.

Life cycle analysis (LCA): A1-A3, C1-C4 and D modules in accordance with EN 15804+A2 (Cradle-to-Gate with options)

The year of preparing the EPD: 2023

Product standard: PN-EN 14509: 2013

Service Life: 50 years

PCR: ITB-PCR A

Declared unit: 1 m²

Reasons for performing LCA: B2B

Representativeness: Polish, European

MANUFACTURER

PaNELTECH Sp. z o.o. has been on the market since 1989 with the headquarters located in Chorzów (Fig.1). PaNELTECH exports products to almost 30 countries across five continents. The company specializes in the production of construction materials, including sandwich panels, expanded polystyrene, industrial doors, modular coldrooms or elevation cassettes. Moreover, PaNELTECH offers products, such as: PIR soft insulation panels, foamed polystyrene elements, styrofoam boards, styrodur, aluminium and PVC joinery, stainless steel products or doors and loading systems.



Figure 1. A view of the PaNELTECH Sp. z o.o production plant located in Chorzów (Poland)

The PaNELTECH's offer includes specialized services in the scope of:

- general contracting of industrial facility and livestock buildings;
- fitting sandwich panels, coldroom doors and steel structures;
- welding and metal sheet processing and PUR polyurethane foam filling.

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In 2018, the company launched another modern production line (Fig.2), dedicated to the production of sandwich panels with PUR, PIR, polystyrene and mineral wool core.

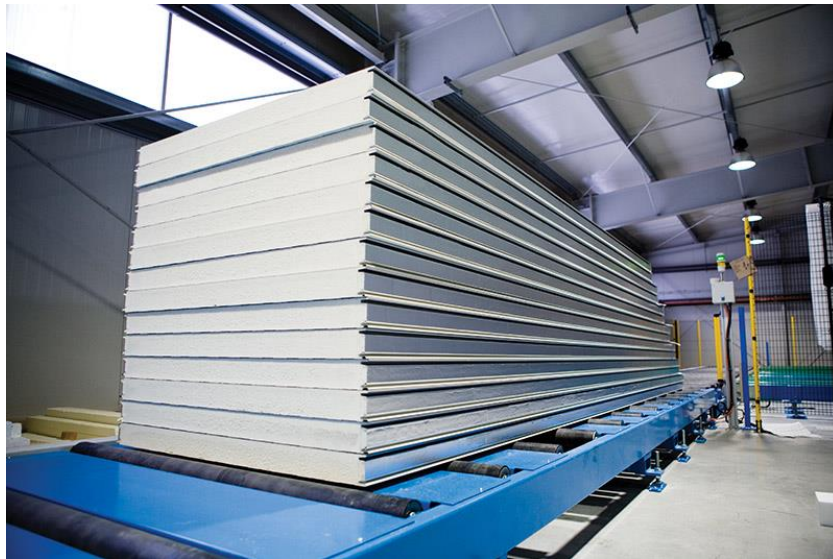


Figure 2. PaNELTECH Sp. z o.o production line for sandwich panels located in Chorzów (Poland).

PRODUCTS DESCRIPTION AND APPLICATION

Sandwich panels with mineral wool cores have three types:

- 1) **Wall panel with visible joint, type PWW-S/ PWW-S LITE**, available thickness: 60, 80, 100, 120, 140, 150, 160, 180, 200 [mm]



The panels are used to construct external walls and internal partitions in the single- or multiple-span shell structure. The panels can be installed both vertically and horizontally. The core of the panel comprises mineral wool of 100 kg/m^3 (PWW-S) or 85 kg/m^3 (PWW-S lite). Thanks to their properties, i.e. high fire-resistance parameters, the panels can be used to construct buildings with high fire ratings.

In particular PWW-S / PWW-S lite panels can be applied in industrial buildings, store houses and logistic centres, commercial buildings and offices, food industry facilities, agricultural objects or sport halls.

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The panels can be executed both in standard modular width of 1130 mm, and in non-standard sizes: 1050 and 1000 mm. The lengths of PWW-S / PWW-S lite panels are from 2000 to 10000 mm and their available thicknesses are: 60, 80, 100, 120, 140, 150, 160, 180, 200 mm. The technical parameters and properties of the panels are presented in Tab. 1.

Table 1. Table of technical parameters of the PWW-S / PWW-S Lite panels.

Parameter	Value								
thickness [mm]	60 ¹⁾	80 ¹⁾	100	120	140	150	160	180	200
modular width [mm]	1130 (optionally 1000 or 1050)								
length ²⁾ [mm]	2000 ÷ 10000								
weight for PWW-S [kg/m ²]	14,1	16,1	18,1	20,1	22,1	23,1	24,1	26,1	28,1
weight for PWW-S lite [kg/m ²]	-	-	16,6	18,3	20	20,9	21,7	23,4	25,1
heat transfer coefficient U _c for PWW-S [W/m ² K]	0,66	0,49	0,39	0,33	0,28	0,27	0,25	0,22	0,20
heat transfer coefficient U _c for PWW-S lite [W/m ² K]	-	-	0,38	0,32	0,27	0,25	0,24	0,21	0,19
acoustic insulation Rw [dB]	31		33	31				34	
reaction to fire	A2-s1,d0								
resistance to external fire	NRO								
PWW-S wall fire rating ²⁾	NPD	EI 30 (o ↔ i) ²⁾	EI 60 (o ↔ i) ²⁾				EI 120 (o ↔ i) ²⁾		
PWW-S lite wall fire rating ²⁾	-		EI 60 (o ↔ i) ²⁾						
anti-corrosive protection	external C1, C2, C3 (C4 ÷ C5), internal A1 (A2 ÷ A5)								
organic coatings	SP 25, PU, AGRO, FOOD SAFE and other								
external facing	galvanized steel 0,5 ÷ 0,6 mm								
internal facing	galvanized steel 0,5 ÷ 0,6 mm								
available profilation types	external facing L, ML, MF, G; internal facing L, R, G								
insulating core	rock, inflammable mineral wool with a lamella fiber structure 85 kg/m ³ (PWW-S Lite) and 100 kg/m ³ (PWW-S)								
application	non-continuous application on external walls and as wall cladding, on the structural parts of walls and ceilings								
wall application layout	vertical or horizontal								

¹⁾ applies to sandwich panels PWW-S

²⁾ for more details on the General Terms of Sale and Delivery, go to www.paneltech.pl

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- 2) **Wall panel with hidden joint, type PWW-SU**, available thickness: 60, 80, 100, 120, 150, 160, 180, 200 [mm]



The panels are used to construct external walls and internal partitions in the single- or multiple-span shell structure. The panels can be installed both vertically and horizontally. The core of the panel comprises mineral wool of 100 kg/m³. Thanks to their properties, i.e. high fire-resistance parameters, the panels can be used to construct buildings with high fire ratings.

In particular PWW-SU / PWW-SU lite panels can be applied in industrial buildings, store houses and logistic centres, commercial buildings and offices, food industry facilities, agricultural objects or sport halls.

The panels can be executed both in standard modular width of 1050 mm, and in non-standard sizes: 1000 mm. The lengths of PWW-SU panels are from 2000 to 10000 mm and their available thicknesses are: 60, 80, 100, 120, 150, 160, 180, 200 mm. The technical parameters and properties of the panels are presented in Tab. 2.

Table 2. Table of technical parameters of the PWW-SU panels.

Parameter	Value							
thickness [mm]	60	80	100	120	150	160	180	200
modular width [mm]	1050 (optionally 1000)							
length ² [mm]	2000 ÷ 10000							
weight for PWW-SU [kg/m ²]	14,4	16,4	18,4	20,4	23,4	24,4	26,4	28,4
heat transfer coefficient U _c for PWW-SU [W/m ² K]	0,74	0,51	0,41	0,34	0,27	0,25	0,23	0,20
acoustic insulation R _w [dB]	31							
reaction to fire	A2-s1,d0							
resistance to external fire	NRO							
PWW-SU wall fire rating ²	NPD	EI 30 (o ↔ i) ²	EI 60 (o ↔ i) ²					
anti-corrosive protection	external C1, C2, C3 (C4 ÷ C5), internal A1 (A2 ÷ A5)							
organic coatings	SP 25, PU, AGRO, FOOD SAFE and other							
external facing	galvanized steel 0,5 ÷ 0,6 mm							
internal facing	galvanized steel 0,5 ÷ 0,6 mm							
available profilation types	external facing L, ML, MF, G; internal facing L, R, G							
insulating core	rock, inflammable mineral wool with a lamella fiber structure 100 kg/m ³							
application	non-continuous application on external walls and as wall cladding, on the structural parts of walls and ceilings							
wall application layout	vertical or horizontal							

¹) Minimum Production Quantity (MPQ) is from 300m² up to 500m² and depends on thickness of the panel. In order to verify production possibilities of specific order please contact our Customer Service or Sales Representative.

²) for more details on the General Terms of Sale and Delivery, go to www.paneltech.pl

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3) Roof panel, type PWW-D, available thickness: 80, 100, 120, 150, 160, 180, 200 [mm]



The PWW-D panel is intended for roofs and roofing. The core of the panel comprises mineral wool of 100 kg/m^3 . Thanks to their properties, i.e. high fire-resistance parameters, the panels can be used to construct buildings with high fire ratings.

In particular the PWW-D panels can be applied in industrial buildings, store houses and logistic centres, commercial buildings and offices, food industry facilities, agricultural objects or sport halls.

The modular width of the PWW-D panel is 1050 mm. The lengths of PWW-D panels are from 2000 to 10000 mm and their available thicknesses are: 80, 100, 120, 150, 160, 180 mm. The technical parameters and properties of the panels are presented in Tab. 3.

Table 3. Table of technical parameters of the PWW-D panels.

Parameter	Value						
thickness [mm]	80	100	120	150	160	180	200
modular width [mm]	1050						
length ²⁾ [mm]	2000 ÷ 10000						
weight [kg/m ²]	16,8	18,8	20,8	23,8	24,8	26,8	28,8
heat transfer coefficient U_c [W/m ² K]	0,46	0,38	0,32	0,26	0,24	0,22	0,20
acoustic insulation R_w [dB]	31						
reaction to fire	A2-s1,d0						
resistance to external fire	B_{roof} ; $B_{roof}(t_1)$ and $B_{roof}(t_2)$ and $B_{roof}(t_3)$						
roof fire rating ²⁾	NPD	REI 120 ²⁾					
anti-corrosive protection	external C1, C2, C3 (C4 ÷ C5), internal A1 (A2 ÷ A5)						
organic coatings	SP 25, PU, AGRO, FOOD SAFE and other						
external facing	galvanized steel 0,5 ÷ 0,6 mm						
internal facing	galvanized steel 0,5 ÷ 0,6 mm						
available profilation types	external facing T; internal facing L, R, G						
insulating core	rock, inflammable mineral wool with a lamella fiber structure 100 kg/m^3						
application	non-continuous application on roofs and roof covers						

¹⁾ Minimum Production Quantity (MPQ) is from 300m² up to 500m² and depends on thickness of the panel. In order to verify production possibilities of specific order please contact our Customer Service or Sales Representative.

²⁾ for more details on the General Terms of Sale and Delivery, go to www.paneltech.pl

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 with mineral wool core (PWW) in metal plates lining is a line process conducted in the factory of PaNELTECH Sp. z o.o., located in Chorzów (Poland). Allocation was done on product mass basis. All impacts from raw materials extraction and processing are allocated in module A1 of the LCA. Impacts from the global line production PaNELTECH Sp. z o.o. were inventoried and 21% were allocated to the production of sandwich panels with mineral wool core and in metal plates lining based on the annual production volume expressed in m². Water and energy consumption, associated emissions and generated wastes are allocated to module A3. Packaging materials were taken into consideration.

System limits

The life cycle analysis (LCA) of the declared products covers: product stage – modules A1-A3, end of life – modules C1-C4 and benefits and loads beyond the system boundary – module D (cradle-to-gate with options) in accordance with EN 15804+A2 and ITB PCRA. Energy and water consumption, emissions as well as information on generated wastes were inventoried and were included in the calculations. It can be assumed that the total sum of omitted processes does not exceed 5% of all impact categories. In accordance with EN 15804+A2, machines and facilities (capital goods) required for the production as well as transportation of employees were not included in LCA.

Modules A1 and A2: Raw materials supply and transport

Steel sheet substrates used to produce the mineral wool core (PWW), additives, auxiliary materials and packaging materials come from both local and foreign suppliers. Means of transport include small trucks < 10 t (e.g. couriers), average trucks (10-16 t) and big trucks (>16 t).

Module A3: Production

A scheme of the sandwich panels with mineral wool core (PWW) production process is presented in Figure 3.

Modules C1-C4 and D: End-of-life (EoL)

It is assumed that at the end-of-life, 100% of the sandwich panels demounted using electric tools (module C1) and is transported to waste processing plant distant by 50 km > 10 t loaded lorry with 90% capacity utilization (module C2). It is assumed that 98% of steel plates lining are recycled and 60% of the recovered mineral wool cores are re-used. The residue wastes are forwarded to a landfill in the form of mixed construction and demolition wastes (40% mineral wool and 2% steel plates). Environmental burdens declared in module C4 are associated with waste-specific emissions to air and groundwater. A potential credit resulting from the recycling of the steel scrap were calculated using World Steel Association approach and are presented in module D.

Table 4. End-of-life scenario for the sandwich panels with mineral wool core manufactured by PaNELTECH Sp. z o.o.

Material	Re-using	Recycling	Landfilling
Mineral wool	60%	0%	40%
Steel plates lining	0%	98%	2%

Data quality

The data selected for LCA analysis originates from ITB-LCI questionnaires completed by PaNELTECH Sp. z o.o. using the inventory data, ITB and Ecoinvent database v. 3.9. No specific data collected is older than five years and no generic datasets used are older than ten years. The representativeness, completeness, reliability, and consistency are judged as good.

Data collection period

Primary data provided by PaNELTECH Sp. z o.o. covers a period of 01.01.2022 – 31.12.2022 (1 year). The life cycle assessments were prepared for Poland and Europe as reference area.

Assumptions and estimates

The impacts of the representative of sandwich panels with mineral wool core were aggregated using weighted average. Impacts were inventoried and calculated for all products of the sandwich panels with mineral wool core and presented in Tables 6-17 for the representative thicknesses of 80 mm, 120 mm and 200 mm.

Calculation rules

LCA was performed using ITB-LCA tool developed in accordance with EN 15804 + A2.

Databases

The data for the processes come from Ecoinvent v. 3.9 database. The data for the processes comes from Ecoinvent v. 3.9 and ITB-Database. Specific data quality analysis was a part of external audit. Polish electricity mix used (production) is 0.698 kg CO₂/kWh (KOBIZE 2021). European electricity mix used is 0.430 kg CO₂/kWh for the end of life (Ecoinvent v. 3.9, RER).

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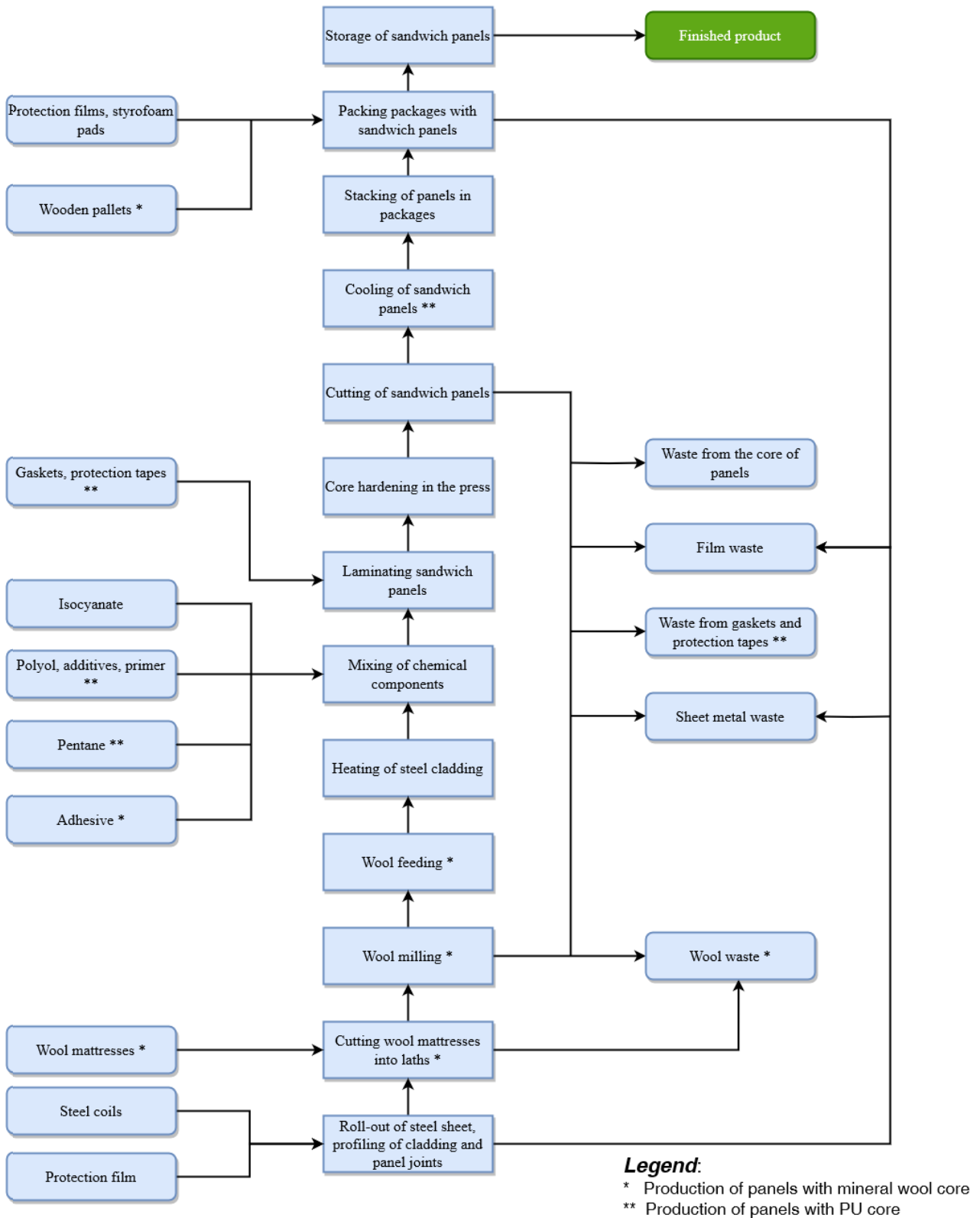


Figure 3. The scheme of the sandwich panels with mineral wool core production process by PaNELTECH Sp. z o.o.

LIFE CYCLE ASSESSMENT (LCA) – Results

Declared unit

The declaration refers to declared unit (DU) – 1 m² of the sandwich panels with mineral wool core (PWW) and metal plates linings manufactured by PaNELTECH Sp. z o.o. for the representative thicknesses of 80 mm, 120 mm and 200 mm.

Table 5. System boundaries for the environmental characteristic of the sandwich panels with mineral wool core (PWW) production process by PaNELTECH Sp. z o.o.

Environmental assessment information (MD – Module Declared, MND – Module Not 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	MD	MD	MD	MD	MD

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Table 6. Life cycle assessment (LCA) results of the sandwich panels with mineral wool core (PWW) and metal plates lining with thickness of 80 mm manufactured by PaNELTECH Sp. z o.o. - environmental impacts (DU: 1 m²)

Indicator	Unit	A1	A2	A3	A1-A3	C1	C2	C3	C4	D
Global Warming Potential	eq. kg CO ₂	2.14E+01	9.69E-01	1.20E+00	2.36E+01	1.91E-02	1.36E-01	2.25E-01	1.95E-02	-1.07E+02
Greenhouse gas potential - fossil	eq. kg CO ₂	2.18E+01	9.66E-01	1.17E+00	2.39E+01	1.87E-02	1.35E-01	2.25E-01	1.94E-02	-1.08E+02
Greenhouse gas potential - biogenic	eq. kg CO ₂	-3.77E-01	3.52E-03	2.09E-02	-3.53E-01	3.38E-04	4.63E-04	1.84E-04	1.02E-05	1.70E+00
Global warming potential - land use and land use change	eq. kg CO ₂	1.17E-02	4.05E-04	2.84E-04	1.24E-02	4.40E-06	5.31E-05	3.63E-05	1.17E-05	-5.81E-02
Stratospheric ozone depletion potential	eq. kg CFC 11	3.94E-07	2.21E-07	1.72E-07	7.88E-07	3.59E-10	3.13E-08	4.26E-08	5.63E-10	-1.97E-06
Soil and water acidification potential	eq. mol H ⁺	1.35E-01	3.89E-03	3.86E-01	5.25E-01	1.98E-04	5.50E-04	1.19E-03	1.47E-04	-6.47E-01
Eutrophication potential - freshwater	eq. kg P	8.14E-03	6.88E-05	1.93E-03	1.01E-02	3.40E-05	9.10E-06	8.37E-06	1.62E-06	-4.15E-02
Eutrophication potential - seawater	eq. kg N	2.17E-02	1.16E-03	1.99E-03	2.49E-02	2.82E-05	1.66E-04	4.63E-04	5.63E-05	-1.07E-01
Eutrophication potential - terrestrial	eq. mol N	2.62E-01	1.27E-02	1.66E-02	2.92E-01	2.42E-04	1.81E-03	5.06E-03	6.03E-04	-1.28E+00
Potential for photochemical ozone synthesis	eq. kg NMVOC	9.83E-02	3.89E-03	5.47E-02	1.57E-01	6.79E-05	5.54E-04	1.48E-03	2.10E-04	-4.87E-01
Potential for depletion of abiotic resources - non-fossil resources	eq. kg Sb	9.22E-05	3.79E-06	1.67E-06	9.77E-05	2.70E-08	4.80E-07	1.41E-07	2.74E-08	-4.31E-04
Abiotic depletion potential - fossil fuels	MJ	2.74E+02	1.43E+01	2.62E+01	3.14E+02	3.06E-01	2.01E+00	3.33E+00	4.88E-01	-1.35E+03
Water deprivation potential	eq. m ³	8.88E+00	6.90E-02	3.96E-01	9.34E+00	6.21E-03	9.29E-03	9.22E-03	1.52E-03	-4.35E+01

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Table 7. Life cycle assessment (LCA) results of the sandwich panels with mineral wool core (PWW) and metal plates lining with thickness of 80 mm manufactured by PaNELTECH Sp. z o.o. - additional impacts indicators (DU: 1 m²)

Indicator	Unit	A1	A2	A3	A1-A3	C1	C2	C3	C4	D
Particulate matter	disease incidence	INA	INA	INA	INA	INA	INA	INA	INA	INA
Potential human exposure efficiency relative to U235	eg. kBq U235	INA	INA	INA	INA	INA	INA	INA	INA	INA
Potential comparative toxic unit for ecosystems	CTUe	INA	INA	INA	INA	INA	INA	INA	INA	INA
Potential comparative toxic unit for humans (cancer effects)	CTUh	INA	INA	INA	INA	INA	INA	INA	INA	INA
Potential comparative toxic unit for humans (non-cancer effects)	CTUh	INA	INA	INA	INA	INA	INA	INA	INA	INA
Potential soil quality index	dimensionless	INA	INA	INA	INA	INA	INA	INA	INA	INA

Table 8. Life cycle assessment (LCA) results of the sandwich panels with mineral wool core (PWW) and metal plates lining with thickness of 80 mm manufactured by PaNELTECH Sp. z o.o. - environmental aspects related to resource use (DU: 1 m²)

Indicator	Unit	A1	A2	A3	A1-A3	C1	C2	C3	C4	D
Consumption of renewable primary energy - excluding renewable primary energy sources used as raw materials	MJ	2.27E+01	2.19E-01	1.25E+00	2.42E+01	2.22E-02	2.88E-02	2.10E-02	4.10E-03	-1.10E+02
Consumption of renewable primary energy resources used as raw materials	MJ	7.65E-01	0.00E+00	0.00E+00	7.65E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-3.49E+00
Total consumption of renewable primary energy resources	MJ	2.34E+01	2.19E-01	1.27E+00	2.49E+01	2.22E-02	2.88E-02	2.10E-02	4.10E-03	-1.13E+02
Consumption of non-renewable primary energy - excluding renewable primary energy sources used as raw materials	MJ	2.60E+02	1.43E+01	1.83E+01	2.92E+02	3.24E-01	2.01E+00	3.55E+00	4.88E-01	-1.28E+03
Consumption of non-renewable primary energy resources used as raw materials	MJ	1.39E+01	0.00E+00	0.00E+00	1.39E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-6.34E+01
Total consumption of non-renewable primary energy resources	MJ	2.74E+02	1.43E+01	2.72E+01	3.15E+02	3.24E-01	2.01E+00	3.55E+00	4.88E-01	-1.35E+03
Consumption of secondary materials	kg	5.55E+00	5.16E-03	1.92E-03	5.56E+00	2.47E-05	6.74E-04	1.20E-03	1.18E-04	-3.07E+01
Consumption of renewable secondary fuels	MJ	1.06E-01	5.79E-05	1.09E-05	1.06E-01	1.35E-07	7.42E-06	6.96E-06	2.52E-06	-4.85E-01
Consumption 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	0.00E+00	0.00E+00
Net consumption of freshwater resources	m ³	2.03E-01	1.87E-03	5.10E-03	2.10E-01	9.94E-05	2.53E-04	7.66E-04	5.05E-04	-9.99E-01

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Table 9. Life cycle assessment (LCA) results of the sandwich panels with mineral wool core (PWW) and metal plates lining with thickness of 80 mm manufactured by PaNELTECH Sp. z o.o. - environmental information describing waste categories (DU: 1 m²)

Indicator	Unit	A1	A2	A3	A1-A3	C1	C2	C3	C4	D
Hazardous waste. neutralized	kg	1.84E+00	1.69E-02	2.68E-03	1.86E+00	6.32E-08	2.26E-03	3.41E-04	2.34E-04	-9.61E+00
Non-hazardous waste neutralised	kg	3.26E+01	3.02E-01	2.15E-01	3.31E+01	1.81E-03	4.00E-02	1.36E-02	7.01E-03	-1.65E+02
Radioactive waste	kg	2.93E-04	9.80E-05	7.97E-05	4.71E-04	2.63E-07	1.38E-05	1.87E-05	2.22E-07	-1.53E-03
Components for re-use	kg	0.00E+00	0.00E+00	1.80E+00	1.80E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Materials for recycling	kg	4.91E-03	4.60E-05	9.75E-02	1.02E-01	1.86E-06	6.22E-06	6.62E-06	2.19E-06	-2.43E-02
Materials for energy recovery	kg	3.01E-05	3.69E-07	2.23E-01	2.23E-01	2.60E-09	5.03E-08	6.73E-08	7.87E-09	-1.41E-04
Energy exported	MJ	5.11E-01	1.64E-02	5.41E-02	5.81E-01	8.86E-04	2.23E-03	1.16E-02	4.35E-05	-2.47E+00

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Table 10. Life cycle assessment (LCA) results of the sandwich panels with mineral wool core (PWW) and metal plates lining with thickness of 120 mm manufactured by PaNELTECH Sp. z o.o. - environmental impacts (DU: 1 m²)

Indicator	Unit	A1	A2	A3	A1-A3	C1	C2	C3	C4	D
Global Warming Potential	eq. kg CO ₂	2.65E+01	9.69E-01	1.20E+00	2.87E+01	1.91E-02	1.68E-01	4.16E-02	2.87E-02	-1.90E+02
Greenhouse gas potential - fossil	eq. kg CO ₂	2.70E+01	9.66E-01	1.17E+00	2.92E+01	1.87E-02	1.67E-01	4.16E-02	2.87E-02	-1.94E+02
Greenhouse gas potential - biogenic	eq. kg CO ₂	-5.67E-01	3.52E-03	2.09E-02	-5.43E-01	3.38E-04	5.71E-04	2.18E-05	1.50E-05	3.86E+00
Global warming potential - land use and land use change	eq. kg CO ₂	1.50E-02	4.05E-04	2.84E-04	1.57E-02	4.40E-06	6.55E-05	2.51E-05	1.73E-05	-1.07E-01
Stratospheric ozone depletion potential	eq. kg CFC 11	4.99E-07	2.21E-07	1.72E-07	8.93E-07	3.59E-10	3.86E-08	1.20E-09	8.31E-10	-3.59E-06
Soil and water acidification potential	eq. mol H ⁺	1.81E-01	3.89E-03	3.86E-01	5.71E-01	1.98E-04	6.78E-04	3.13E-04	2.16E-04	-1.27E+00
Eutrophication potential - freshwater	eq. kg P	9.79E-03	6.88E-05	1.93E-03	1.18E-02	3.40E-05	1.12E-05	3.46E-06	2.39E-06	-7.13E-02
Eutrophication potential - seawater	eq. kg N	2.69E-02	1.16E-03	1.99E-03	3.01E-02	2.82E-05	2.05E-04	1.20E-04	8.30E-05	-1.92E-01
Eutrophication potential - terrestrial	eq. mol N	3.43E-01	1.27E-02	1.66E-02	3.72E-01	2.42E-04	2.23E-03	1.29E-03	8.89E-04	-2.43E+00
Potential for photochemical ozone synthesis	eq. kg NMVOC	1.24E-01	3.89E-03	5.47E-02	1.83E-01	6.79E-05	6.83E-04	4.49E-04	3.10E-04	-8.87E-01
Potential for depletion of abiotic resources - non-fossil resources	eq. kg Sb	1.24E-04	3.79E-06	1.67E-06	1.30E-04	2.70E-08	5.92E-07	5.86E-08	4.04E-08	-8.61E-04
Abiotic depletion potential - fossil fuels	MJ	3.37E+02	1.43E+01	2.62E+01	3.77E+02	3.06E-01	2.48E+00	1.04E+00	7.20E-01	-2.40E+03
Water deprivation potential	eq. m ³	1.03E+01	6.90E-02	3.96E-01	1.08E+01	6.21E-03	1.15E-02	3.24E-03	2.24E-03	-7.38E+01

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Table 11. Life cycle assessment (LCA) results of the sandwich panels with mineral wool core (PWW) and metal plates lining with thickness of 120 mm manufactured by PaNELTECH Sp. z o.o. - additional impacts indicators (DU: 1 m²)

Indicator	Unit	A1	A2	A3	A1-A3	C1	C2	C3	C4	D
Particulate matter	disease incidence	INA	INA	INA	INA	INA	INA	INA	INA	INA
Potential human exposure efficiency relative to U235	eg. kBq U235	INA	INA	INA	INA	INA	INA	INA	INA	INA
Potential comparative toxic unit for ecosystems	CTUe	INA	INA	INA	INA	INA	INA	INA	INA	INA
Potential comparative toxic unit for humans (cancer effects)	CTUh	INA	INA	INA	INA	INA	INA	INA	INA	INA
Potential comparative toxic unit for humans (non-cancer effects)	CTUh	INA	INA	INA	INA	INA	INA	INA	INA	INA
Potential soil quality index	dimensionless	INA	INA	INA	INA	INA	INA	INA	INA	INA

Table 12. Life cycle assessment (LCA) results of the sandwich panels with mineral wool core (PWW) and metal plates lining with thickness of 120 mm manufactured by PaNELTECH Sp. z o.o. - environmental aspects related to resource use (DU: 1 m²)

Indicator	Unit	A1	A2	A3	A1-A3	C1	C2	C3	C4	D
Consumption of renewable primary energy - excluding renewable primary energy sources used as raw materials	MJ	2.91E+01	2.19E-01	1.25E+00	3.05E+01	2.22E-02	3.56E-02	8.76E-03	6.04E-03	-2.05E+02
Consumption of renewable primary energy resources used as raw materials	MJ	7.65E-01	0.00E+00	0.00E+00	7.65E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-5.23E+00
Total consumption of renewable primary energy resources	MJ	2.98E+01	2.19E-01	1.27E+00	3.13E+01	2.22E-02	3.56E-02	8.76E-03	6.04E-03	-2.11E+02
Consumption of non-renewable primary energy - excluding renewable primary energy sources used as raw materials	MJ	3.23E+02	1.43E+01	1.83E+01	3.55E+02	3.24E-01	2.48E+00	1.04E+00	7.20E-01	-2.31E+03
Consumption of non-renewable primary energy resources used as raw materials	MJ	1.39E+01	0.00E+00	0.00E+00	1.39E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-9.51E+01
Total consumption of non-renewable primary energy resources	MJ	3.37E+02	1.43E+01	2.72E+01	3.78E+02	3.24E-01	2.48E+00	1.04E+00	7.20E-01	-2.40E+03
Consumption of secondary materials	kg	5.57E+00	5.16E-03	1.92E-03	5.58E+00	2.47E-05	8.31E-04	2.52E-04	1.74E-04	-4.35E+01
Consumption of renewable secondary fuels	MJ	1.47E-01	5.79E-05	1.09E-05	1.47E-01	1.35E-07	9.16E-06	5.39E-06	3.72E-06	-1.01E+00
Consumption 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	0.00E+00	0.00E+00
Net consumption of freshwater resources	m ³	2.35E-01	1.87E-03	5.10E-03	2.42E-01	9.94E-05	3.12E-04	1.08E-03	7.44E-04	-1.68E+00

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Table 13. Life cycle assessment (LCA) results of the sandwich panels with mineral wool core (PWW) and metal plates lining with thickness of 120 mm manufactured by PaNELTECH Sp. z o.o.- environmental information describing waste categories (DU: 1 m²)

Indicator	Unit	A1	A2	A3	A1-A3	C1	C2	C3	C4	D
Hazardous waste neutralized	kg	2.10E+00	1.69E-02	2.68E-03	2.12E+00	6.32E-08	2.78E-03	5.01E-04	3.46E-04	-1.56E+01
Non-hazardous waste neutralised	kg	4.01E+01	3.02E-01	2.15E-01	4.06E+01	1.81E-03	4.94E-02	1.50E-02	1.03E-02	-2.91E+02
Radioactive waste	kg	3.34E-04	9.80E-05	7.97E-05	5.12E-04	2.63E-07	1.71E-05	1.54E-07	2.56E-07	-2.48E-03
Components for re-use	kg	0.00E+00	0.00E+00	1.80E+00	1.80E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Materials for recycling	kg	6.31E-03	4.60E-05	9.75E-02	1.04E-01	1.86E-06	7.67E-06	4.67E-06	3.23E-06	-4.50E-02
Materials for energy recovery	kg	4.12E-05	3.69E-07	2.23E-01	2.23E-01	2.60E-09	6.21E-08	1.68E-08	1.16E-08	-2.86E-04
Energy exported	MJ	5.35E-01	1.64E-02	5.41E-02	6.06E-01	8.86E-04	2.75E-03	9.30E-05	6.42E-05	-3.80E+00

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Table 14. Life cycle assessment (LCA) results of the sandwich panels with mineral wool core (PWW) and metal plates lining manufactured with thickness of 200 mm by PaNELTECH Sp. z o.o. - environmental impacts (DU: 1 m²)

Indicator	Unit	A1	A2	A3	A1-A3	C1	C2	C3	C4	D
Global Warming Potential	eq. kg CO ₂	3.66E+01	9.69E-01	1.20E+00	3.88E+01	1.91E-02	2.31E-01	2.67E-01	4.72E-02	-4.26E+02
Greenhouse gas potential - fossil	eq. kg CO ₂	3.75E+01	9.66E-01	1.17E+00	3.97E+01	1.87E-02	2.30E-01	2.67E-01	4.72E-02	-4.37E+02
Greenhouse gas potential - biogenic	eq. kg CO ₂	-9.48E-01	3.52E-03	2.09E-02	-9.24E-01	3.38E-04	7.87E-04	2.06E-04	2.47E-05	1.08E+01
Global warming potential - land use and land use change	eq. kg CO ₂	2.16E-02	4.05E-04	2.84E-04	2.23E-02	4.40E-06	9.03E-05	6.13E-05	2.85E-05	-2.51E-01
Stratospheric ozone depletion potential	eq. kg CFC 11	7.09E-07	2.21E-07	1.72E-07	1.10E-06	3.59E-10	5.33E-08	4.38E-08	1.37E-09	-8.26E-06
Soil and water acidification potential	eq. mol H ⁺	2.73E-01	3.89E-03	3.86E-01	6.63E-01	1.98E-04	9.34E-04	1.51E-03	3.55E-04	-3.15E+00
Eutrophication potential - freshwater	eq. kg P	1.31E-02	6.88E-05	1.93E-03	1.51E-02	3.40E-05	1.55E-05	1.18E-05	3.92E-06	-1.53E-01
Eutrophication potential - seawater	eq. kg N	3.74E-02	1.16E-03	1.99E-03	4.06E-02	2.82E-05	2.82E-04	5.83E-04	1.36E-04	-4.34E-01
Eutrophication potential - terrestrial	eq. mol N	5.05E-01	1.27E-02	1.66E-02	5.34E-01	2.42E-04	3.08E-03	6.35E-03	1.46E-03	-5.84E+00
Potential for photochemical ozone synthesis	eq. kg NMVOC	1.76E-01	3.89E-03	5.47E-02	2.34E-01	6.79E-05	9.42E-04	1.93E-03	5.09E-04	-2.04E+00
Potential for depletion of abiotic resources - non-fossil resources	eq. kg Sb	1.89E-04	3.79E-06	1.67E-06	1.94E-04	2.70E-08	8.16E-07	2.00E-07	6.64E-08	-2.16E-03
Abiotic depletion potential - fossil fuels	MJ	4.63E+02	1.43E+01	2.62E+01	5.03E+02	3.06E-01	3.42E+00	4.37E+00	1.18E+00	-5.37E+03
Water deprivation potential	eq. m ³	1.33E+01	6.90E-02	3.96E-01	1.38E+01	6.21E-03	1.58E-02	1.25E-02	3.68E-03	-1.55E+02

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Table 15. Life cycle assessment (LCA) results of the sandwich panels with mineral wool core (PWW) and metal plates lining with thickness of 200 mm manufactured by PaNELTECH Sp. z o.o. - additional impacts indicators (DU: 1 m²)

Indicator	Unit	A1	A2	A3	A1-A3	C1	C2	C3	C4	D
Particulate matter	disease incidence	INA	INA	INA	INA	INA	INA	INA	INA	INA
Potential human exposure efficiency relative to U235	eg. kBq U235	INA	INA	INA	INA	INA	INA	INA	INA	INA
Potential comparative toxic unit for ecosystems	CTUe	INA	INA	INA	INA	INA	INA	INA	INA	INA
Potential comparative toxic unit for humans (cancer effects)	CTUh	INA	INA	INA	INA	INA	INA	INA	INA	INA
Potential comparative toxic unit for humans (non-cancer effects)	CTUh	INA	INA	INA	INA	INA	INA	INA	INA	INA
Potential soil quality index	dimensionless	INA	INA	INA	INA	INA	INA	INA	INA	INA

Table 16. Life cycle assessment (LCA) results of the sandwich panels with mineral wool core (PWW) and metal plates lining with thickness of 200 mm manufactured by PaNELTECH Sp. z o.o. - environmental aspects related to resource use (DU: 1 m²)

Indicator	Unit	A1	A2	A3	A1-A3	C1	C2	C3	C4	D
Consumption of renewable primary energy - excluding renewable primary energy sources used as raw materials	MJ	4,18E+01	2.19E-01	1.25E+00	4.33E+01	2.22E-02	4.90E-02	2.97E-02	9.94E-03	-4.83E+02
Consumption of renewable primary energy resources used as raw materials	MJ	7,65E-01	0.00E+00	0.00E+00	7.65E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-8.72E+00
Total consumption of renewable primary energy resources	MJ	4,26E+01	2.19E-01	1.27E+00	4.41E+01	2.22E-02	4.90E-02	2.97E-02	9.94E-03	-4.92E+02
Consumption of non-renewable primary energy - excluding renewable primary energy sources used as raw materials	MJ	4,49E+02	1.43E+01	1.83E+01	4.82E+02	3.24E-01	3.42E+00	4.59E+00	1.18E+00	-5.21E+03
Consumption of non-renewable primary energy resources used as raw materials	MJ	1,39E+01	0.00E+00	0.00E+00	1.39E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-1.58E+02
Total consumption of non-renewable primary energy resources	MJ	4,63E+02	1.43E+01	2.72E+01	5.04E+02	3.24E-01	3.42E+00	4.59E+00	1.18E+00	-5.37E+03
Consumption of secondary materials	kg	5,62E+00	5.16E-03	1.92E-03	5.63E+00	2.47E-05	1.15E-03	1.45E-03	2.85E-04	-6.95E+01
Consumption of renewable secondary fuels	MJ	2,29E-01	5.79E-05	1.09E-05	2.29E-01	1.35E-07	1.26E-05	1.24E-05	6.12E-06	-2.61E+00
Consumption 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	0.00E+00	0.00E+00
Net consumption of freshwater resources	m ³	2,99E-01	1.87E-03	5.10E-03	3.06E-01	9.94E-05	4.30E-04	1.84E-03	1.22E-03	-3.48E+00

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Table 17. Life cycle assessment (LCA) results of the sandwich panels with mineral wool core (PWW) and metal plates lining manufactured with thickness of 200 mm by PaNELTECH Sp. z o.o.- environmental information describing waste categories (DU: 1 m²)

Indicator	Unit	A1	A2	A3	A1-A3	C1	C2	C3	C4	D
Hazardous waste. neutralized	kg	2.63E+00	1.69E-02	2.68E-03	2.65E+00	6.32E-08	3.83E-03	8.42E-04	5.68E-04	-3.12E+01
Non-hazardous waste neutralised	kg	5.52E+01	3.02E-01	2.15E-01	5.57E+01	1.81E-03	6.81E-02	2.86E-02	1.70E-02	-6.46E+02
Radioactive waste	kg	4.17E-04	9.80E-05	7.97E-05	5.95E-04	2.63E-07	2.35E-05	1.89E-05	3.24E-07	-4.95E-03
Components for re-use	kg	0.00E+00	0.00E+00	1.80E+00	1.80E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Materials for recycling	kg	9.11E-03	4.60E-05	9.75E-02	1.07E-01	1.86E-06	1.06E-05	1.13E-05	5.30E-06	-1.06E-01
Materials for energy recovery	kg	6.35E-05	3.69E-07	2.23E-01	2.23E-01	2.60E-09	8.55E-08	8.41E-08	1.91E-08	-7.29E-04
Energy exported	MJ	5.84E-01	1.64E-02	5.41E-02	6.54E-01	8.86E-04	3.79E-03	1.16E-02	1.05E-04	-6.80E+00

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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+A2 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: Halina Prejzner, PhD Eng	
LCA, LCI audit and input data verification: Mateusz Kozicki, PhD, m.kozicki@itb.pl	
Verification of LCA: Michał Piasecki, PhD, DSc, Eng	

Note 1: The declaration owner has the sole ownership, liability and responsibility for the information provided and contained in EPD. Declarations within the same product category but from different programmes may not be comparable. Declarations of construction products may not be comparable if they do not comply with EN 15804 + A2. For further information about comparability, see EN 15804 + A2 and ISO 14025. Depending on the application, a corresponding conversion factor such as the specific weight per surface area must be taken into consideration.

Note 2: ITB is a public Research Organization and Notified Body (EC Reg. no 1488) to the European Commission and to other Member States of the European Union designated for the tasks concerning the assessment of building products' performance. ITB acts as the independent, third-party verification organization (17065/17025 certified). ITB-EPD program is recognized and registered member of The European Platform – Association of EPD program operators and ITB-EPD declarations are registered and stored in the international ECO-PORTAL.

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
- ISO 20915:2018 Life cycle inventory calculation methodology for steel products
- EN 15804:2012+A2:2019 Sustainability of construction works – Environmental product declarations – Core rules for the product category of construction products
- ISO 14067:2018 Greenhouse gases - Carbon footprint of products — Requirements and guidelines for quantification
- EN 15942:2012 Sustainability of construction works – Environmental product declarations – Communication format business-to-business



Instytut Techniki Budowlanej

00-611 Warsaw, Filtrowa 1

Thermal Physics, Acoustics and Environment Department

02-656 Warsaw, Ksawerów 21

CERTIFICATE № 462/2023 of TYPE III ENVIRONMENTAL DECLARATION

Products:

Sandwich panels with mineral wool cores (PWW)

Manufacturer:

Paneltech Sp. z o.o.

ul. Michałkowiecka 24, 41-508 Chorzów, Polska

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

EN 15804+A2

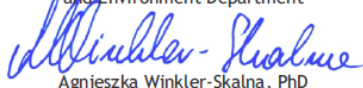
Sustainability of construction works.

Environmental product declarations.

Core rules for the product category of construction products.

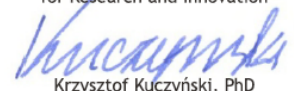
This certificate, issued on 29th June 2023 is valid for 5 years
or until amendment of mentioned Environmental Declaration

Head of the Thermal Physic, Acoustics
and Environment Department


Agnieszka Winkler-Skalna, PhD



Deputy Director
for Research and Innovation


Krzysztof Kuczyński, PhD

Warsaw, June 2023