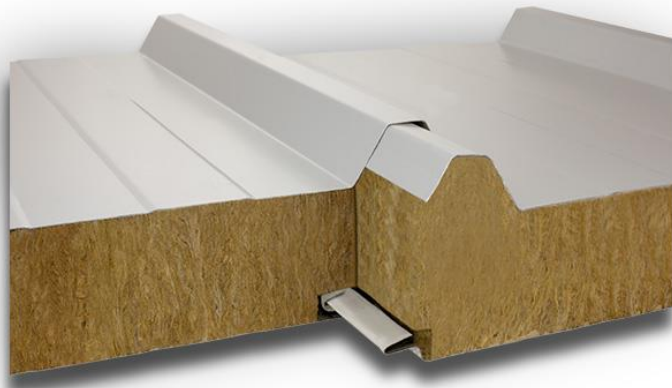




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Sandwich panels

with MWF cores in metal plates lining



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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-A5, C1-C4 and D modules in accordance with EN 15804+A2 (Cradle-to-Gate with options)

The year of preparing the EPD: 2022

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

IZOPANEL Sp. z o.o. with the headquarters located in Gdańsk has 15 branches within the country and offices outside Poland. Over the years it successfully delivers nearly 2.5 million m² of panels per year to customers. For the production it uses 4 fully automated PIR, MWF, EPS production lines. Currently, it is implementing production in another hall dedicated to panels with a core MWF and is also preparing plans for further expansion of the machine park.

In 2000, the company underwent a capital transformation related to establishment of a limited liability company self-generated 100% Polish capital, which guarantees full decision-making and independence in market activities.

Consulting services offered by qualified company specialists, investment development, implementation of innovative and proprietary solutions that are environmentally friendly and protect natural resources and make IZOPANEL Sp.z o.o. delivers products that meet the requirements of the construction industry.



Fig. 1. A view of the IZOPANEL Sp. z o.o production plant located in Gdańsk (Poland)

PRODUCTS DESCRIPTION AND APPLICATION

Sandwich panels are a building material used for construction of walls and roofs of buildings, but also for the production of technological casings of industrial and air-conditioning devices etc. These panels are created in a continuous production process consisting in joining the insulation core with external, most often metal cladding. The result is a (sandwich) panel made of several layers. The function of metal layers is protecting against such weather factors like rainwater or snow, while also having a decorative function. They are also resistant to corrosive factors. They keep their parameters in contact with moisture, water vapor, snow, chemicals and other nuisances.

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Currently, mineral wool is usually produced from basalt stone which is melted at a temperature of +1400°C and undergoes a process of defibering. A binder is added to stone fibres prepared this way. Fibres also undergo the process of hydrophobisation, as a result of which mineral wool products do not absorb water and form a spatial and stable base of insulation. The core is made of hard incombustible lamella mineral wool with density of $100 \pm 20 \text{ kg/m}^3$.

Wall panels are available in single IzoWall type.

Standard wall panel. Thickness range: 60 to 200 mm. Suitable for walls, to be installed vertically or horizontally. Fastening to the structure with screws through the panels. The IzoWall sandwich panels are designed for use on external walls, suspended ceilings and internal walls. They may be installed vertically or horizontally. Fastening to the supporting structure is carried out with use of self-drilling screws.



Figure 2. Construction of IzoWall sandwich panel with MWF core.

Table 1. Specification of IzoWall sandwich panel with MWF core manufactured by IZOPANEL Sp. z o.o

g [mm]	λ [W/m·K]	U [W/(m ² ·K)]	Weight [kg/m ²]		
			0.5/0.5 mm	0.5/0.6 mm	0.6/0.6 mm
60	0.040	0.64	15.4	16.2	17.1
80		0.48	17.6	18.4	19.3
100		0.39	19.8	20.6	21.5
120		0.33	22.0	22.8	23.7
140		0.28	24.2	25.0	25.9
150		0.26	25.3	26.1	27.0
160		0.23	26.4	27.2	28.1
175		0.22	28.0	28.9	29.8
200		0.20	30.8	31.6	32.5

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Thickness [mm]	Reaction to fire	Fire propagation fire	Fire resistance
60	A2 - s1, d0	NRO	-
80			EI 45
100-140			EI 60
150-200			EI 120

Waterproofness	Air permeability	
A class	thrust	suction
	n = 0.8388, C = 0,0116	n = 1.1072 , C = 0.0074

Parameters according to PN-EN ISO 717-1:1999		
$R_w \geq$	$R_{A1} \geq$	$R_{A2} \geq$
31	30	28

Roof panels are available in single IzoRoof type.

The IzoRoof sandwich panels are designed for use as roofs for various buildings. Suitable for pitched roof with small and medium pitch angle. These panels have trapezoidal outer surface. Thickness range: 60 to 250 mm. On request IzoRoof panels may be produced with a lap joint which enables longitudinal assembly. The lap joint may be left-sided or right-sided. Fastening to the supporting structure is carried out with use of self-drilling screws.



Figure 3. Construction of IzoRoof sandwich panel with MWF core.

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Table 2. Specification of IzoRoof sandwich panel with MWF core manufactured by IZOPANEL Sp. z o.o

g [mm]	λ [W/m·K]	U [W/(m ² ·K)]	Weight [kg/m ²]		
			0.5/0.5 mm	0.5/0.6 mm	0.6/0.6 mm
60	0.040	0.63	15.6	16.5	17.4
80		0.48	17.8	18.7	19.6
100		0.39	20.0	20.9	21.8
120		0.33	22.2	23.1	24.0
140		0.28	24.2	25.3	26.2
150		0.26	25.5	26.4	27.3
160		0.25	26.6	27.5	28.4
175		0.23	28.3	29.2	30.1
200		0.20	31.0	31.9	32.8

Thickness [mm]	Reaction to fire	Fire propagation fire	Fire resistance
60	A2 - s1, d0	B _{ROOF} (t ₁)	-
80 - 250			≥ REI 60

Waterproofness	Air permeability	
	thrust	suction
A class	n = 0.6662, C = 0,0177	n = 1.2430 , C = 0.0044

Parameters according to PN-EN ISO 717-1:1999		
R _w ≥	R _{A1} ≥	R _{A2} ≥
32	31	28

More information can be found on the IZOPANEL Sp. z o.o. website <https://www.izopanel.pl/>.

LIFE CYCLE ASSESSMENT (LCA) – general rules applied

Allocation

The allocation rules used for this EPD are based on general ITB PCRA. Production of the sandwich panels with mineral wool (MWF) core in metal plates lining is a line process conducted in the factory of IZOPANEL Sp. z o.o., located in Gdańsk (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 IZOPANEL Sp. z o.o. were inventoried and 7.9% were allocated to the production of sandwich panels with MWF 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, construction stage – modules A4 and A5, end of life – modules C2-C4 and benefits and loads beyond the system boundary – module D (cradle-to-gate with options) in accordance with EN 15804+A2 and ITB PCR A. 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 MWF core, additives, auxiliary materials and packaging materials come from both local and foreign suppliers. Means of transport include average (10-16 t) and big trucks (>16 t) and container ships are applied.

Module A3: Production

A scheme of the sandwich panels with mineral wool core (MWF) production process is presented in Figure 4.

Module A4: Transport to construction site

The sandwich panels produced by IZOPANEL Sp. z o.o. are delivered to Polish as well as foreign recipients. An average distance of 500 km from the factory gate to a construction site is assumed. Means of transport include truck with payload up to 32 t (Euro 5), loaded in 90%.

Module A5: Construction-installation process

The sandwich panels are delivered to a construction site in the form of elements ready for assembly. The installation process must be performed according to the instruction provided by IZOPANEL Sp. z o.o. For fixing it is recommended to use steel anchors or pins, screws made of stainless or galvanized steel and support blocks. Mineral wool, assembly foams, steam-permeable tape, steam-tight foil, polymer-based sealants and/or expanding tapes can be used to insulate the system. Considered environmental burdens are associated with the removal of the protection foil, the use of ancillary materials (steel anchors and screws, protective tapes, sealing tapes and sealing PU foam) and energy consumption associated the use of power assembly tools.

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 75 km on 32 t lorry 24 t (Euro 5) with 90% capacity utilization (module C2). It is assumed that 20% of the recovered mineral wool MWF core and 98% of the steel strap are recycled. The residue wastes are forwarded to a landfill in the form of mixed construction and demolition wastes (80% MWF and 2% steel scrap). 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 3. End-of-life scenario for the sandwich panels with MWF core manufactured by IZOPANEL Sp. z o.o.

Material	Material recovery	Recycling	Landfilling
MWF core	100%	20%	80%
Steel scrap	100%	98%	2%

Data quality

The data selected for LCA analysis originate from ITB-LCI questionnaires completed by IZOPANEL Sp. z o.o. using the inventory data, ITB and Ecoinvent database v. 3.8. 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 IZOPANEL Sp. z o.o. covers a period of 12.2020 – 11.2021 (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 MWF core were aggregated using weighted average. Impacts were inventoried and calculated for all products of the sandwich panels with MWF core.

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. 3.8 database. The data for the processes comes from Ecoinvent v. 3.8 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. 3.8, RER).

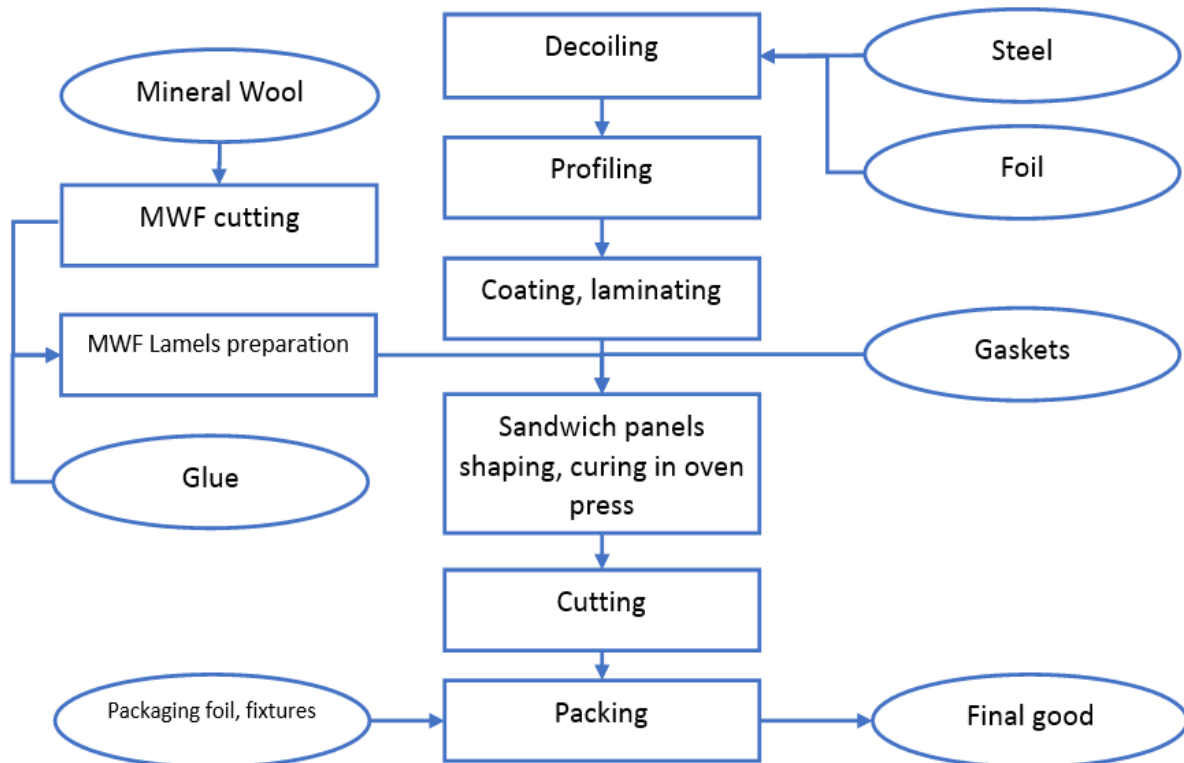


Figure 4. The scheme of the sandwich panels with MWF core production process by IZOPANEL Sp. z o.o.

LIFE CYCLE ASSESSMENT (LCA) – Results

Declared unit

The declaration refers to declared unit (DU) – 1 m² of the sandwich panels with MWF core and metal plates linings manufactured by IZOPANEL Sp. z o.o.

Table 4. System boundaries for the environmental characteristic of the sandwich panels with MWF core production process by IZOPANEL 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	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	MD	MD	MND	MND	MND	MND	MND	MND	MND	MD	MD	MD	MD	MD

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Table 5. Life cycle assessment (LCA) results of the sandwich panels with MWF core (thickness 60 mm) and metal plates lining manufactured by IZOPANEL Sp. z o.o. – environmental impacts (DU: 1 m²)

Indicator	Unit	A1	A2	A3	A1-A3	A4	A5	C1	C2	C3	C4	D
Global Warming Potential	eq. kg CO ₂	2.93E+01	1.27E+00	7.50E-01	3.14E+01	1.39E+00	1.65E-01	2.48E-02	9.39E-03	1.79E-01	2.79E-02	-1.05E+01
Greenhouse gas potential - fossil	eq. kg CO ₂	2.97E+01	1.27E+00	7.39E-01	3.17E+01	1.38E+00	1.59E-01	2.44E-02	9.35E-03	1.79E-01	2.79E-02	-1.06E+01
Greenhouse gas potential - biogenic	eq. kg CO ₂	-4.16E-01	4.04E-03	1.08E-02	-4.01E-01	4.72E-03	6.70E-03	4.40E-04	3.20E-05	1.54E-04	1.46E-05	7.21E-02
Global warming potential - land use and land use change	eq. kg CO ₂	2.05E-02	6.04E-04	1.49E-04	2.13E-02	5.42E-04	7.92E-05	5.73E-06	3.67E-06	1.77E-05	1.68E-05	-5.84E-03
Stratospheric ozone depletion potential	eq. kg CFC ₁₁	6.24E-07	2.53E-07	4.23E-08	9.20E-07	3.20E-07	8.51E-08	4.38E-10	2.16E-09	3.80E-08	8.07E-10	-2.05E-07
Soil and water acidification potential	eq. mol H ⁺	1.66E-01	9.53E-03	6.22E-03	1.82E-01	5.61E-03	8.55E-04	2.42E-04	3.79E-05	8.94E-04	2.10E-04	-5.16E-02
Eutrophication potential - freshwater	eq. kg P	9.94E-03	8.54E-05	1.01E-03	1.10E-02	9.29E-05	1.01E-04	4.15E-05	6.29E-07	5.51E-06	2.32E-06	-4.79E-03
Eutrophication potential - seawater	eq. kg N	3.27E-02	2.59E-03	8.90E-04	3.62E-02	1.69E-03	1.77E-04	3.44E-05	1.15E-05	3.48E-04	8.06E-05	-9.44E-03
Eutrophication potential - terrestrial	eq. mol N	3.29E-01	2.84E-02	7.75E-03	3.65E-01	1.85E-02	1.52E-03	2.95E-04	1.25E-04	3.81E-03	8.64E-04	-1.11E-01
Potential for photochemical ozone synthesis	eq. kg NMVOC	1.32E-01	8.21E-03	2.25E-03	1.43E-01	5.65E-03	5.06E-04	8.28E-05	3.83E-05	1.08E-03	3.01E-04	-4.76E-02
Potential for depletion of abiotic resources - non-fossil resources	eq. kg Sb	1.69E-04	4.62E-06	9.10E-07	1.74E-04	4.90E-06	1.06E-06	3.30E-08	3.31E-08	9.27E-08	3.93E-08	-2.49E-05
Abiotic depletion potential - fossil fuels	MJ	5.15E+02	1.83E+01	1.20E+01	5.45E+02	2.05E+01	2.92E+00	3.73E-01	1.39E-01	2.39E+00	6.99E-01	-1.18E+02
Water deprivation potential	eq. m ³	1.55E+01	8.54E-02	1.88E-01	1.58E+01	9.48E-02	9.92E-02	7.57E-03	6.42E-04	6.41E-03	2.17E-03	-3.42E+00

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Table 5.1. Life cycle assessment (LCA) results of the sandwich panels with MWF core (thickness 60 mm) and metal plates lining manufactured by IZOPANEL Sp. z o.o.– additional impacts indicators (DU: 1 m²)

Indicator	Unit	A1	A2	A3	A1-A3	A4	A5	C1	C2	C3	C4	D
Particulate matter	disease incidence	INA	INA	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	INA	INA
Potential comparative toxic unit for ecosystems	CTUe	INA	INA	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	INA	INA
Potential comparative toxic unit for humans (non-cancer effects)	CTUh	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Potential soil quality index	dimensionless	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA

Table 5.2. Life cycle assessment (LCA) results of the sandwich panels with MWF core (thickness 60 mm) and metal plates lining manufactured by IZOPANEL Sp. z o.o. - environmental aspects related to resource use (DU: 1 m²)

Indicator	Unit	A1	A2	A3	A1-A3	A4	A5	C1	C2	C3	C4	D
Consumption of renewable primary energy - excluding renewable primary energy sources used as raw materials	MJ	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Consumption of renewable primary energy resources used as raw materials	MJ	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Total consumption of renewable primary energy resources	MJ	3.17E+01	2.69E-01	6.69E-01	3.26E+01	2.94E-01	3.31E-01	2.70E-02	1.99E-03	1.37E-02	5.87E-03	-9.06E+00
Consumption of non-renewable primary energy - excluding renewable primary energy sources used as raw materials	MJ	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Consumption of non-renewable primary energy resources used as raw materials	MJ	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Total consumption of non-renewable primary energy resources	MJ	5.15E+02	1.83E+01	1.28E+01	5.46E+02	2.05E+01	2.95E+00	3.95E-01	1.39E-01	2.59E+00	6.99E-01	-1.18E+02
Consumption of secondary materials	kg	5.11E+00	7.00E-03	0.00E+00	5.12E+00	6.87E-03	1.60E-01	0.00E+00	4.65E-05	9.36E-04	1.69E-04	-4.90E+00
Consumption of renewable secondary fuels	MJ	1.56E-01	6.99E-05	0.00E+00	1.56E-01	7.57E-05	1.52E-05	0.00E+00	5.13E-07	3.06E-06	3.61E-06	-2.05E-02
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	0.00E+00	0.00E+00
Net consumption of freshwater resources	m ³	3.07E-01	2.27E-03	3.43E-03	3.13E-01	2.58E-03	2.32E-03	1.21E-04	1.75E-05	4.29E-05	7.23E-04	-8.14E-02

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Table 5.3. Life cycle assessment (LCA) results of the sandwich panels with MWF core (thickness 60 mm) and metal plates lining manufactured by IZOPANEL Sp. z o.o. - environmental information describing waste categories (DU: 1 m²)

Indicator	Unit	A1	A2	A3	A1-A3	A4	A5	C1	C2	C3	C4	D
Hazardous waste. neutralized	kg	1.86E+00	2.07E-02	5.74E-06	1.88E+00	2.30E-02	6.10E-02	7.71E-08	1.04E-04	6.67E-06	3.36E-04	-1.23E+00
Non-hazardous waste neutralised	kg	4.05E+01	3.73E-01	1.83E-01	4.11E+01	4.08E-01	1.38E-01	2.20E-03	1.84E-03	3.25E-03	1.00E-02	-1.87E+01
Radioactive waste	kg	4.29E-04	1.11E-04	1.62E-05	5.57E-04	1.41E-04	2.18E-06	3.19E-07	6.91E-09	1.69E-05	2.39E-07	-1.99E-04
Components for re-use	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.58E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Materials for recycling	kg	6.68E-03	2.83E-04	3.71E-01	3.78E-01	6.35E-05	3.83E-02	6.92E+00	2.86E-07	3.18E-06	3.13E-06	-2.37E-03
Materials for energy recovery	kg	4.58E-05	4.60E-07	2.32E-02	2.32E-02	5.13E-07	5.63E-08	2.63E+00	2.32E-09	5.10E-08	1.13E-08	-9.22E-06
Energy exported	MJ	3.02E-01	1.90E-02	0.00E+00	3.21E-01	2.28E-02	4.81E-02	0.00E+00	0.00E+00	1.04E-02	6.23E-05	-1.43E-01

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

Indicator	Unit	A1	A2	A3	A1-A3	A4	A5	C1	C2	C3	C4	D
Global Warming Potential	eq. kg CO ₂	3.18E+01	1.27E+00	7.50E-01	3.38E+01	1.54E+00	1.65E-01	2.48E-02	1.25E-02	1.79E-01	3.69E-02	-1.05E+01
Greenhouse gas potential - fossil	eq. kg CO ₂	3.23E+01	1.27E+00	7.39E-01	3.43E+01	1.54E+00	1.59E-01	2.44E-02	1.25E-02	1.79E-01	3.69E-02	-1.06E+01
Greenhouse gas potential - biogenic	eq. kg CO ₂	-5.09E-01	4.04E-03	1.08E-02	-4.94E-01	5.25E-03	6.70E-03	4.40E-04	4.26E-05	1.54E-04	1.93E-05	7.21E-02
Global warming potential - land use and land use change	eq. kg CO ₂	2.21E-02	6.04E-04	1.49E-04	2.29E-02	6.03E-04	7.92E-05	5.73E-06	4.89E-06	1.77E-05	2.23E-05	-5.84E-03
Stratospheric ozone depletion potential	eq. kg CFC 11	6.75E-07	2.53E-07	4.23E-08	9.71E-07	3.55E-07	8.51E-08	4.38E-10	2.88E-09	3.80E-08	1.07E-09	-2.05E-07
Soil and water acidification potential	eq. mol H ⁺	1.89E-01	9.53E-03	6.22E-03	2.04E-01	6.23E-03	8.55E-04	2.42E-04	5.06E-05	8.94E-04	2.78E-04	-5.16E-02
Eutrophication potential - freshwater	eq. kg P	1.07E-02	8.54E-05	1.01E-03	1.18E-02	1.03E-04	1.01E-04	4.15E-05	8.38E-07	5.51E-06	3.07E-06	-4.79E-03
Eutrophication potential - seawater	eq. kg N	3.53E-02	2.59E-03	8.90E-04	3.88E-02	1.88E-03	1.77E-04	3.44E-05	1.53E-05	3.48E-04	1.07E-04	-9.44E-03
Eutrophication potential - terrestrial	eq. mol N	3.68E-01	2.84E-02	7.75E-03	4.05E-01	2.05E-02	1.52E-03	2.95E-04	1.67E-04	3.81E-03	1.14E-03	-1.11E-01
Potential for photochemical ozone synthesis	eq. kg NMVOC	1.45E-01	8.21E-03	2.25E-03	1.55E-01	6.28E-03	5.06E-04	8.28E-05	5.10E-05	1.08E-03	3.98E-04	-4.76E-02
Potential for depletion of abiotic resources - non-fossil resources	eq. kg Sb	1.84E-04	4.62E-06	9.10E-07	1.90E-04	5.44E-06	1.06E-06	3.30E-08	4.42E-08	9.27E-08	5.19E-08	-2.49E-05
Abiotic depletion potential - fossil fuels	MJ	5.46E+02	1.83E+01	1.20E+01	5.76E+02	2.28E+01	2.92E+00	3.73E-01	1.85E-01	2.39E+00	9.25E-01	-1.18E+02
Water deprivation potential	eq. m ³	1.62E+01	8.54E-02	1.88E-01	1.65E+01	1.05E-01	9.92E-02	7.57E-03	8.56E-04	6.41E-03	2.88E-03	-3.42E+00

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Table 6.1. Life cycle assessment (LCA) results of the sandwich panels with MWF core (thickness 80 mm) and metal plates lining manufactured by IZOPANEL Sp. z o.o.– additional impacts indicators (DU: 1 m²)

Indicator	Unit	A1	A2	A3	A1-A3	A4	A5	C1	C2	C3	C4	D
Particulate matter	disease incidence	INA	INA	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	INA	INA
Potential comparative toxic unit for ecosystems	CTUe	INA	INA	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	INA	INA
Potential comparative toxic unit for humans (non-cancer effects)	CTUh	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Potential soil quality index	dimensionless	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA

Table 6.2. Life cycle assessment (LCA) results of the sandwich panels with MWF core (thickness 80 mm) and metal plates lining manufactured by IZOPANEL Sp. z o.o. - environmental aspects related to resource use (DU: 1 m²)

Indicator	Unit	A1	A2	A3	A1-A3	A4	A5	C1	C2	C3	C4	D
Consumption of renewable primary energy - excluding renewable primary energy sources used as raw materials	MJ	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Consumption of renewable primary energy resources used as raw materials	MJ	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Total consumption of renewable primary energy resources	MJ	3.48E+01	2.69E-01	6.69E-01	3.57E+01	3.27E-01	3.31E-01	2.70E-02	2.65E-03	1.37E-02	7.77E-03	-9.06E+00
Consumption of non-renewable primary energy - excluding renewable primary energy sources used as raw materials	MJ	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Consumption of non-renewable primary energy resources used as raw materials	MJ	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Total consumption of non-renewable primary energy resources	MJ	5.46E+02	1.83E+01	1.28E+01	5.77E+02	2.28E+01	2.95E+00	3.95E-01	1.85E-01	2.59E+00	9.25E-01	-1.18E+02
Consumption of secondary materials	kg	5.13E+00	7.00E-03	0.00E+00	5.13E+00	7.64E-03	1.60E-01	0.00E+00	6.20E-05	9.36E-04	2.23E-04	-4.90E+00
Consumption of renewable secondary fuels	MJ	1.76E-01	6.99E-05	0.00E+00	1.76E-01	8.42E-05	1.52E-05	0.00E+00	6.84E-07	3.06E-06	4.78E-06	-2.05E-02
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	0.00E+00	0.00E+00
Net consumption of freshwater resources	m ³	3.23E-01	2.27E-03	3.43E-03	3.28E-01	2.87E-03	2.32E-03	1.21E-04	2.33E-05	4.29E-05	9.56E-04	-8.14E-02

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Table 6.3. Life cycle assessment (LCA) results of the sandwich panels with MWF core (thickness 80 mm) and metal plates lining manufactured by IZOPANEL Sp. z o.o. - environmental information describing waste categories (DU: 1 m²)

Indicator	Unit	A1	A2	A3	A1-A3	A4	A5	C1	C2	C3	C4	D
Hazardous waste. neutralized	kg	1.98E+00	2.07E-02	5.74E-06	2.00E+00	2.56E-02	6.10E-02	7.71E-08	2.08E-04	6.67E-06	4.44E-04	-1.23E+00
Non-hazardous waste. neutralised	kg	4.42E+01	3.73E-01	1.83E-01	4.48E+01	4.54E-01	1.38E-01	2.20E-03	3.69E-03	3.25E-03	1.33E-02	-1.87E+01
Radioactive waste	kg	4.49E-04	1.11E-04	1.62E-05	5.77E-04	1.57E-04	2.18E-06	3.19E-07	1.38E-08	1.69E-05	2.72E-07	-1.99E-04
Components for re-use	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.58E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Materials for recycling	kg	7.36E-03	2.83E-04	3.71E-01	3.79E-01	7.05E-05	3.83E-02	6.92E+00	5.73E-07	3.18E-06	4.14E-06	-2.37E-03
Materials for energy recovery	kg	5.12E-05	4.60E-07	2.32E-02	2.33E-02	5.71E-07	5.63E-08	2.63E+00	4.63E-09	5.10E-08	1.49E-08	-9.22E-06
Energy exported	MJ	3.14E-01	1.90E-02	0.00E+00	3.33E-01	2.53E-02	4.81E-02	0.00E+00	0.00E+00	1.04E-02	8.25E-05	-1.43E-01

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Table 7. Life cycle assessment (LCA) results of the sandwich panels with MWF core (thickness 100 mm) and metal plates lining manufactured by IZOPANEL Sp. z o.o. – environmental impacts (DU: 1 m²)

Indicator	Unit	A1	A2	A3	A1-A3	A4	A5	C1	C2	C3	C4	D
Global Warming Potential	eq. kg CO ₂	3.43E+01	1.27E+00	7.50E-01	3.63E+01	1.70E+00	1.65E-01	2.48E-02	1.56E-02	1.79E-01	4.59E-02	-1.05E+01
Greenhouse gas potential - fossil	eq. kg CO ₂	3.48E+01	1.27E+00	7.39E-01	3.68E+01	1.69E+00	1.59E-01	2.44E-02	1.56E-02	1.79E-01	4.58E-02	-1.06E+01
Greenhouse gas potential - biogenic	eq. kg CO ₂	-6.01E-01	4.04E-03	1.08E-02	-5.87E-01	5.77E-03	6.70E-03	4.40E-04	5.33E-05	1.54E-04	2.40E-05	7.21E-02
Global warming potential - land use and land use change	eq. kg CO ₂	2.38E-02	6.04E-04	1.49E-04	2.45E-02	6.63E-04	7.92E-05	5.73E-06	6.12E-06	1.77E-05	2.77E-05	-5.84E-03
Stratospheric ozone depletion potential	eq. kg CFC 11	7.26E-07	2.53E-07	4.23E-08	1.02E-06	3.91E-07	8.51E-08	4.38E-10	3.61E-09	3.80E-08	1.33E-09	-2.05E-07
Soil and water acidification potential	eq. mol H ⁺	2.11E-01	9.53E-03	6.22E-03	2.27E-01	6.85E-03	8.55E-04	2.42E-04	6.32E-05	8.94E-04	3.45E-04	-5.16E-02
Eutrophication potential - freshwater	eq. kg P	1.15E-02	8.54E-05	1.01E-03	1.26E-02	1.14E-04	1.01E-04	4.15E-05	1.05E-06	5.51E-06	3.82E-06	-4.79E-03
Eutrophication potential - seawater	eq. kg N	3.78E-02	2.59E-03	8.90E-04	4.13E-02	2.07E-03	1.77E-04	3.44E-05	1.91E-05	3.48E-04	1.33E-04	-9.44E-03
Eutrophication potential - terrestrial	eq. mol N	4.08E-01	2.84E-02	7.75E-03	4.44E-01	2.26E-02	1.52E-03	2.95E-04	2.08E-04	3.81E-03	1.42E-03	-1.11E-01
Potential for photochemical ozone synthesis	eq. kg NMVOC	1.57E-01	8.21E-03	2.25E-03	1.68E-01	6.91E-03	5.06E-04	8.28E-05	6.38E-05	1.08E-03	4.95E-04	-4.76E-02
Potential for depletion of abiotic resources - non-fossil resources	eq. kg Sb	2.00E-04	4.62E-06	9.10E-07	2.05E-04	5.99E-06	1.06E-06	3.30E-08	5.52E-08	9.27E-08	6.46E-08	-2.49E-05
Abiotic depletion potential - fossil fuels	MJ	5.76E+02	1.83E+01	1.20E+01	6.07E+02	2.51E+01	2.92E+00	3.73E-01	2.31E-01	2.39E+00	1.15E+00	-1.18E+02
Water deprivation potential	eq. m ³	1.69E+01	8.54E-02	1.88E-01	1.72E+01	1.16E-01	9.92E-02	7.57E-03	1.07E-03	6.41E-03	3.58E-03	-3.42E+00

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Table 7.1. Life cycle assessment (LCA) results of the sandwich panels with MWF core (thickness 100 mm) and metal plates lining manufactured by IZOPANEL Sp. z o.o.– additional impacts indicators (DU: 1 m²)

Indicator	Unit	A1	A2	A3	A1-A3	A4	A5	C1	C2	C3	C4	D
Particulate matter	disease incidence	INA	INA	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	INA	INA
Potential comparative toxic unit for ecosystems	CTUe	INA	INA	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	INA	INA
Potential comparative toxic unit for humans (non-cancer effects)	CTUh	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Potential soil quality index	dimensionless	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA

Table 7.2. Life cycle assessment (LCA) results of the sandwich panels with MWF core (thickness 100 mm) and metal plates lining manufactured by IZOPANEL Sp. z o.o. - environmental aspects related to resource use (DU: 1 m²)

Indicator	Unit	A1	A2	A3	A1-A3	A4	A5	C1	C2	C3	C4	D
Consumption of renewable primary energy - excluding renewable primary energy sources used as raw materials	MJ	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Consumption of renewable primary energy resources used as raw materials	MJ	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Total consumption of renewable primary energy resources	MJ	3.79E+01	2.69E-01	6.69E-01	3.88E+01	3.60E-01	3.31E-01	2.70E-02	3.32E-03	1.37E-02	9.66E-03	-9.06E+00
Consumption of non-renewable primary energy - excluding renewable primary energy sources used as raw materials	MJ	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Consumption of non-renewable primary energy resources used as raw materials	MJ	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Total consumption of non-renewable primary energy resources	MJ	5.76E+02	1.83E+01	1.28E+01	6.08E+02	2.51E+01	2.95E+00	3.95E-01	2.31E-01	2.59E+00	1.15E+00	-1.18E+02
Consumption of secondary materials	kg	5.14E+00	7.00E-03	0.00E+00	5.15E+00	8.40E-03	1.60E-01	0.00E+00	7.75E-05	9.36E-04	2.77E-04	-4.90E+00
Consumption of renewable secondary fuels	MJ	1.96E-01	6.99E-05	0.00E+00	1.96E-01	9.26E-05	1.52E-05	0.00E+00	8.55E-07	3.06E-06	5.95E-06	-2.05E-02
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	0.00E+00	0.00E+00
Net consumption of freshwater resources	m ³	3.38E-01	2.27E-03	3.43E-03	3.44E-01	3.15E-03	2.32E-03	1.21E-04	2.91E-05	4.29E-05	1.19E-03	-8.14E-02

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Table 7.3. Life cycle assessment (LCA) results of the sandwich panels with MWF core (thickness 100 mm) and metal plates lining manufactured by IZOPANEL Sp. z o.o. - environmental information describing waste categories (DU: 1 m²)

Indicator	Unit	A1	A2	A3	A1-A3	A4	A5	C1	C2	C3	C4	D
Hazardous waste neutralized	kg	2.11E+00	2.07E-02	5.74E-06	2.13E+00	2.81E-02	6.10E-02	7.71E-08	2.60E-04	6.67E-06	5.53E-04	-1.23E+00
Non-hazardous waste neutralised	kg	4.79E+01	3.73E-01	1.83E-01	4.84E+01	4.99E-01	1.38E-01	2.20E-03	4.61E-03	3.25E-03	1.65E-02	-1.87E+01
Radioactive waste	kg	4.69E-04	1.11E-04	1.62E-05	5.97E-04	1.73E-04	2.18E-06	3.19E-07	1.73E-08	1.69E-05	3.05E-07	-1.99E-04
Components for re-use	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.58E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Materials for recycling	kg	8.04E-03	2.83E-04	3.71E-01	3.79E-01	7.76E-05	3.83E-02	6.92E+00	7.16E-07	3.18E-06	5.16E-06	-2.37E-03
Materials for energy recovery	kg	5.66E-05	4.60E-07	2.32E-02	2.33E-02	6.28E-07	5.63E-08	2.63E+00	5.79E-09	5.10E-08	1.86E-08	-9.22E-06
Energy exported	MJ	2.67E-01	1.90E-02	0.00E+00	2.86E-01	2.78E-02	4.81E-02	0.00E+00	0.00E+00	1.04E-02	1.03E-04	-1.43E-01

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Table 8. Life cycle assessment (LCA) results of the sandwich panels with MWF core (thickness 120 mm) and metal plates lining manufactured by IZOPANEL Sp. z o.o. – environmental impacts (DU: 1 m²)

Indicator	Unit	A1	A2	A3	A1-A3	A4	A5	C1	C2	C3	C4	D
Global Warming Potential	eq. kg CO ₂	3.67E+01	1.27E+00	7.50E-01	3.87E+01	1.85E+00	1.65E-01	2.48E-02	1.88E-02	1.79E-01	5.49E-02	-1.05E+01
Greenhouse gas potential - fossil	eq. kg CO ₂	3.74E+01	1.27E+00	7.39E-01	3.94E+01	1.84E+00	1.59E-01	2.44E-02	1.87E-02	1.79E-01	5.48E-02	-1.06E+01
Greenhouse gas potential - biogenic	eq. kg CO ₂	-6.94E-01	4.04E-03	1.08E-02	-6.79E-01	6.30E-03	6.70E-03	4.40E-04	6.39E-05	1.54E-04	2.88E-05	7.21E-02
Global warming potential - land use and land use change	eq. kg CO ₂	2.54E-02	6.04E-04	1.49E-04	2.61E-02	7.23E-04	7.92E-05	5.73E-06	7.34E-06	1.77E-05	3.31E-05	-5.84E-03
Stratospheric ozone depletion potential	eq. kg CFC 11	7.78E-07	2.53E-07	4.23E-08	1.07E-06	4.26E-07	8.51E-08	4.38E-10	4.33E-09	3.80E-08	1.59E-09	-2.05E-07
Soil and water acidification potential	eq. mol H ⁺	2.33E-01	9.53E-03	6.22E-03	2.49E-01	7.48E-03	8.55E-04	2.42E-04	7.59E-05	8.94E-04	4.13E-04	-5.16E-02
Eutrophication potential - freshwater	eq. kg P	1.23E-02	8.54E-05	1.01E-03	1.34E-02	1.24E-04	1.01E-04	4.15E-05	1.26E-06	5.51E-06	4.56E-06	-4.79E-03
Eutrophication potential - seawater	eq. kg N	4.04E-02	2.59E-03	8.90E-04	4.39E-02	2.26E-03	1.77E-04	3.44E-05	2.29E-05	3.48E-04	1.59E-04	-9.44E-03
Eutrophication potential - terrestrial	eq. mol N	4.47E-01	2.84E-02	7.75E-03	4.83E-01	2.46E-02	1.52E-03	2.95E-04	2.50E-04	3.81E-03	1.70E-03	-1.11E-01
Potential for photochemical ozone synthesis	eq. kg NMVOC	1.70E-01	8.21E-03	2.25E-03	1.80E-01	7.54E-03	5.06E-04	8.28E-05	7.65E-05	1.08E-03	5.92E-04	-4.76E-02
Potential for depletion of abiotic resources - non-fossil resources	eq. kg Sb	2.15E-04	4.62E-06	9.10E-07	2.21E-04	6.53E-06	1.06E-06	3.30E-08	6.63E-08	9.27E-08	7.73E-08	-2.49E-05
Abiotic depletion potential - fossil fuels	MJ	6.07E+02	1.83E+01	1.20E+01	6.37E+02	2.73E+01	2.92E+00	3.73E-01	2.78E-01	2.39E+00	1.38E+00	-1.18E+02
Water deprivation potential	eq. m ³	1.77E+01	8.54E-02	1.88E-01	1.79E+01	1.26E-01	9.92E-02	7.57E-03	1.28E-03	6.41E-03	4.28E-03	-3.42E+00

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Table 8.1. Life cycle assessment (LCA) results of the sandwich panels with MWF core (thickness 120 mm) and metal plates lining manufactured by IZOPANEL Sp. z o.o.– additional impacts indicators (DU: 1 m²)

Indicator	Unit	A1	A2	A3	A1-A3	A4	A5	C1	C2	C3	C4	D
Particulate matter	disease incidence	INA	INA	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	INA	INA
Potential comparative toxic unit for ecosystems	CTUe	INA	INA	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	INA	INA
Potential comparative toxic unit for humans (non-cancer effects)	CTUh	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Potential soil quality index	dimensionless	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA

Table 8.2. Life cycle assessment (LCA) results of the sandwich panels with MWF core (thickness 120 mm) and metal plates lining manufactured by IZOPANEL Sp. z o.o. - environmental aspects related to resource use (DU: 1 m²)

Indicator	Unit	A1	A2	A3	A1-A3	A4	A5	C1	C2	C3	C4	D
Consumption of renewable primary energy - excluding renewable primary energy sources used as raw materials	MJ	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Consumption of renewable primary energy resources used as raw materials	MJ	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Total consumption of renewable primary energy resources	MJ	4.10E+01	2.69E-01	6.69E-01	4.19E+01	3.92E-01	3.31E-01	2.70E-02	3.98E-03	1.37E-02	1.16E-02	-9.06E+00
Consumption of non-renewable primary energy - excluding renewable primary energy sources used as raw materials	MJ	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Consumption of non-renewable primary energy resources used as raw materials	MJ	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Total consumption of non-renewable primary energy resources	MJ	6.07E+02	1.83E+01	1.28E+01	6.38E+02	2.73E+01	2.95E+00	3.95E-01	2.78E-01	2.59E+00	1.38E+00	-1.18E+02
Consumption of secondary materials	kg	5.15E+00	7.00E-03	0.00E+00	5.16E+00	9.17E-03	1.60E-01	0.00E+00	9.31E-05	9.36E-04	3.32E-04	-4.90E+00
Consumption of renewable secondary fuels	MJ	2.16E-01	6.99E-05	0.00E+00	2.16E-01	1.01E-04	1.52E-05	0.00E+00	1.03E-06	3.06E-06	7.11E-06	-2.05E-02
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	0.00E+00	0.00E+00
Net consumption of freshwater resources	m ³	3.54E-01	2.27E-03	3.43E-03	3.60E-01	3.44E-03	2.32E-03	1.21E-04	3.49E-05	4.29E-05	1.42E-03	-8.14E-02

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Table 8.3. Life cycle assessment (LCA) results of the sandwich panels with MWF core (thickness 120 mm) and metal plates lining manufactured by IZOPANEL Sp. z o.o. - environmental information describing waste categories (DU: 1 m²)

Indicator	Unit	A1	A2	A3	A1-A3	A4	A5	C1	C2	C3	C4	D
Hazardous waste. neutralized	kg	2.24E+00	2.07E-02	5.74E-06	2.26E+00	3.07E-02	6.10E-02	7.71E-08	3.11E-04	6.67E-06	6.61E-04	-1.23E+00
Non-hazardous waste. neutralised	kg	5.16E+01	3.73E-01	1.83E-01	5.21E+01	5.45E-01	1.38E-01	2.20E-03	5.53E-03	3.25E-03	1.98E-02	-1.87E+01
Radioactive waste	kg	4.90E-04	1.11E-04	1.62E-05	6.17E-04	1.88E-04	2.18E-06	3.19E-07	2.07E-08	1.69E-05	3.38E-07	-1.99E-04
Components for re-use	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.58E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Materials for recycling	kg	8.72E-03	2.83E-04	3.71E-01	3.80E-01	8.47E-05	3.83E-02	6.92E+00	8.59E-07	3.18E-06	6.17E-06	-2.37E-03
Materials for energy recovery	kg	6.21E-05	4.60E-07	2.32E-02	2.33E-02	6.85E-07	5.63E-08	2.63E+00	6.95E-09	5.10E-08	2.22E-08	-9.22E-06
Energy exported	MJ	3.38E-01	1.90E-02	0.00E+00	3.57E-01	3.03E-02	4.81E-02	0.00E+00	0.00E+00	1.04E-02	1.23E-04	-1.43E-01

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Table 9. Life cycle assessment (LCA) results of the sandwich panels with MWF core (thickness 140 mm) and metal plates lining manufactured by IZOPANEL Sp. z o.o. – environmental impacts (DU: 1 m²)

Indicator	Unit	A1	A2	A3	A1-A3	A4	A5	C1	C2	C3	C4	D
Global Warming Potential	eq. kg CO ₂	3.92E+01	1.27E+00	7.50E-01	4.12E+01	2.00E+00	1.65E-01	2.48E-02	2.19E-02	1.79E-01	6.39E-02	-1.05E+01
Greenhouse gas potential - fossil	eq. kg CO ₂	3.99E+01	1.27E+00	7.39E-01	4.20E+01	2.00E+00	1.59E-01	2.44E-02	2.18E-02	1.79E-01	6.38E-02	-1.06E+01
Greenhouse gas potential - biogenic	eq. kg CO ₂	-7.87E-01	4.04E-03	1.08E-02	-7.72E-01	6.82E-03	6.70E-03	4.40E-04	7.46E-05	1.54E-04	3.35E-05	7.21E-02
Global warming potential - land use and land use change	eq. kg CO ₂	2.70E-02	6.04E-04	1.49E-04	2.77E-02	7.84E-04	7.92E-05	5.73E-06	8.56E-06	1.77E-05	3.85E-05	-5.84E-03
Stratospheric ozone depletion potential	eq. kg CFC 11	8.29E-07	2.53E-07	4.23E-08	1.12E-06	4.62E-07	8.51E-08	4.38E-10	5.05E-09	3.80E-08	1.85E-09	-2.05E-07
Soil and water acidification potential	eq. mol H ⁺	2.56E-01	9.53E-03	6.22E-03	2.72E-01	8.10E-03	8.55E-04	2.42E-04	8.85E-05	8.94E-04	4.81E-04	-5.16E-02
Eutrophication potential - freshwater	eq. kg P	1.31E-02	8.54E-05	1.01E-03	1.42E-02	1.34E-04	1.01E-04	4.15E-05	1.47E-06	5.51E-06	5.31E-06	-4.79E-03
Eutrophication potential - seawater	eq. kg N	4.29E-02	2.59E-03	8.90E-04	4.64E-02	2.45E-03	1.77E-04	3.44E-05	2.67E-05	3.48E-04	1.85E-04	-9.44E-03
Eutrophication potential - terrestrial	eq. mol N	4.86E-01	2.84E-02	7.75E-03	5.23E-01	2.67E-02	1.52E-03	2.95E-04	2.92E-04	3.81E-03	1.98E-03	-1.11E-01
Potential for photochemical ozone synthesis	eq. kg NMVOC	1.82E-01	8.21E-03	2.25E-03	1.93E-01	8.17E-03	5.06E-04	8.28E-05	8.93E-05	1.08E-03	6.89E-04	-4.76E-02
Potential for depletion of abiotic resources - non-fossil resources	eq. kg Sb	2.31E-04	4.62E-06	9.10E-07	2.37E-04	7.08E-06	1.06E-06	3.30E-08	7.73E-08	9.27E-08	8.99E-08	-2.49E-05
Abiotic depletion potential - fossil fuels	MJ	6.38E+02	1.83E+01	1.20E+01	6.68E+02	2.96E+01	2.92E+00	3.73E-01	3.24E-01	2.39E+00	1.60E+00	-1.18E+02
Water deprivation potential	eq. m ³	1.84E+01	8.54E-02	1.88E-01	1.86E+01	1.37E-01	9.92E-02	7.57E-03	1.50E-03	6.41E-03	4.98E-03	-3.42E+00

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Table 9.1. Life cycle assessment (LCA) results of the sandwich panels with MWF core (thickness 140 mm) and metal plates lining manufactured by IZOPANEL Sp. z o.o.– additional impacts indicators (DU: 1 m²)

Indicator	Unit	A1	A2	A3	A1-A3	A4	A5	C1	C2	C3	C4	D
Particulate matter	disease incidence	INA	INA	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	INA	INA
Potential comparative toxic unit for ecosystems	CTUe	INA	INA	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	INA	INA
Potential comparative toxic unit for humans (non-cancer effects)	CTUh	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Potential soil quality index	dimensionless	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA

Table 9.2. Life cycle assessment (LCA) results of the sandwich panels with MWF core (thickness 140 mm) and metal plates lining manufactured by IZOPANEL Sp. z o.o. - environmental aspects related to resource use (DU: 1 m²)

Indicator	Unit	A1	A2	A3	A1-A3	A4	A5	C1	C2	C3	C4	D
Consumption of renewable primary energy - excluding renewable primary energy sources used as raw materials	MJ	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Consumption of renewable primary energy resources used as raw materials	MJ	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Total consumption of renewable primary energy resources	MJ	4.41E+01	2.69E-01	6.69E-01	4.51E+01	4.25E-01	3.31E-01	2.70E-02	4.64E-03	1.37E-02	1.35E-02	-9.06E+00
Consumption of non-renewable primary energy - excluding renewable primary energy sources used as raw materials	MJ	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Consumption of non-renewable primary energy resources used as raw materials	MJ	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Total consumption of non-renewable primary energy resources	MJ	6.38E+02	1.83E+01	1.28E+01	6.69E+02	2.96E+01	2.95E+00	3.95E-01	3.24E-01	2.59E+00	1.60E+00	-1.18E+02
Consumption of secondary materials	kg	5.16E+00	7.00E-03	0.00E+00	5.17E+00	9.93E-03	1.60E-01	0.00E+00	1.09E-04	9.36E-04	3.86E-04	-4.90E+00
Consumption of renewable secondary fuels	MJ	2.36E-01	6.99E-05	0.00E+00	2.36E-01	1.09E-04	1.52E-05	0.00E+00	1.20E-06	3.06E-06	8.28E-06	-2.05E-02
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	0.00E+00	0.00E+00
Net consumption of freshwater resources	m ³	3.69E-01	2.27E-03	3.43E-03	3.75E-01	3.73E-03	2.32E-03	1.21E-04	4.07E-05	4.29E-05	1.66E-03	-8.14E-02

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Table 9.3. Life cycle assessment (LCA) results of the sandwich panels with MWF core (thickness 140 mm) and metal plates lining manufactured by IZOPANEL Sp. z o.o. - environmental information describing waste categories (DU: 1 m²)

Indicator	Unit	A1	A2	A3	A1-A3	A4	A5	C1	C2	C3	C4	D
Hazardous waste neutralized	kg	2.37E+00	2.07E-02	5.74E-06	2.39E+00	3.33E-02	6.10E-02	7.71E-08	3.63E-04	6.67E-06	7.69E-04	-1.23E+00
Non-hazardous waste neutralised	kg	5.52E+01	3.73E-01	1.83E-01	5.58E+01	5.90E-01	1.38E-01	2.20E-03	6.45E-03	3.25E-03	2.30E-02	-1.87E+01
Radioactive waste	kg	5.10E-04	1.11E-04	1.62E-05	6.37E-04	2.04E-04	2.18E-06	3.19E-07	2.42E-08	1.69E-05	3.72E-07	-1.99E-04
Components for re-use	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.58E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Materials for recycling	kg	9.40E-03	2.83E-04	3.71E-01	3.81E-01	9.17E-05	3.83E-02	6.92E+00	1.00E-06	3.18E-06	7.18E-06	-2.37E-03
Materials for energy recovery	kg	6.75E-05	4.60E-07	2.32E-02	2.33E-02	7.42E-07	5.63E-08	2.63E+00	8.11E-09	5.10E-08	2.58E-08	-9.22E-06
Energy exported	MJ	3.50E-01	1.90E-02	0.00E+00	3.69E-01	3.29E-02	4.81E-02	0.00E+00	0.00E+00	1.04E-02	1.43E-04	-1.43E-01

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Table 10. Life cycle assessment (LCA) results of the sandwich panels with MWF core (thickness 150 mm) and metal plates lining manufactured by IZOPANEL Sp. z o.o. – environmental impacts (DU: 1 m²)

Indicator	Unit	A1	A2	A3	A1-A3	A4	A5	C1	C2	C3	C4	D
Global Warming Potential	eq. kg CO ₂	4.04E+01	1.27E+00	7.50E-01	4.24E+01	2.08E+00	1.65E-01	2.48E-02	2.35E-02	1.79E-01	6.84E-02	-1.05E+01
Greenhouse gas potential - fossil	eq. kg CO ₂	4.12E+01	1.27E+00	7.39E-01	4.32E+01	2.07E+00	1.59E-01	2.44E-02	2.34E-02	1.79E-01	6.83E-02	-1.06E+01
Greenhouse gas potential - biogenic	eq. kg CO ₂	-8.33E-01	4.04E-03	1.08E-02	-8.18E-01	7.09E-03	6.70E-03	4.40E-04	7.99E-05	1.54E-04	3.58E-05	7.21E-02
Global warming potential - land use and land use change	eq. kg CO ₂	2.78E-02	6.04E-04	1.49E-04	2.85E-02	8.14E-04	7.92E-05	5.73E-06	9.18E-06	1.77E-05	4.13E-05	-5.84E-03
Stratospheric ozone depletion potential	eq. kg CFC 11	8.54E-07	2.53E-07	4.23E-08	1.15E-06	4.80E-07	8.51E-08	4.38E-10	5.41E-09	3.80E-08	1.98E-09	-2.05E-07
Soil and water acidification potential	eq. mol H ⁺	2.67E-01	9.53E-03	6.22E-03	2.83E-01	8.41E-03	8.55E-04	2.42E-04	9.49E-05	8.94E-04	5.15E-04	-5.16E-02
Eutrophication potential - freshwater	eq. kg P	1.35E-02	8.54E-05	1.01E-03	1.46E-02	1.39E-04	1.01E-04	4.15E-05	1.57E-06	5.51E-06	5.69E-06	-4.79E-03
Eutrophication potential - seawater	eq. kg N	4.42E-02	2.59E-03	8.90E-04	4.77E-02	2.54E-03	1.77E-04	3.44E-05	2.86E-05	3.48E-04	1.98E-04	-9.44E-03
Eutrophication potential - terrestrial	eq. mol N	5.06E-01	2.84E-02	7.75E-03	5.42E-01	2.77E-02	1.52E-03	2.95E-04	3.12E-04	3.81E-03	2.12E-03	-1.11E-01
Potential for photochemical ozone synthesis	eq. kg NMVOC	1.89E-01	8.21E-03	2.25E-03	1.99E-01	8.48E-03	5.06E-04	8.28E-05	9.57E-05	1.08E-03	7.37E-04	-4.76E-02
Potential for depletion of abiotic resources - non-fossil resources	eq. kg Sb	2.39E-04	4.62E-06	9.10E-07	2.44E-04	7.35E-06	1.06E-06	3.30E-08	8.29E-08	9.27E-08	9.63E-08	-2.49E-05
Abiotic depletion potential - fossil fuels	MJ	6.53E+02	1.83E+01	1.20E+01	6.83E+02	3.08E+01	2.92E+00	3.73E-01	3.47E-01	2.39E+00	1.72E+00	-1.18E+02
Water deprivation potential	eq. m ³	1.87E+01	8.54E-02	1.88E-01	1.90E+01	1.42E-01	9.92E-02	7.57E-03	1.60E-03	6.41E-03	5.33E-03	-3.42E+00

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Table 10.1. Life cycle assessment (LCA) results of the sandwich panels with MWF core (thickness 150 mm) and metal plates lining manufactured by IZOPANEL Sp. z o.o.– additional impacts indicators (DU: 1 m²)

Indicator	Unit	A1	A2	A3	A1-A3	A4	A5	C1	C2	C3	C4	D
Particulate matter	disease incidence	INA	INA	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	INA	INA
Potential comparative toxic unit for ecosystems	CTUe	INA	INA	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	INA	INA
Potential comparative toxic unit for humans (non-cancer effects)	CTUh	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Potential soil quality index	dimensionless	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA

Table 10.2. Life cycle assessment (LCA) results of the sandwich panels with MWF core (thickness 150 mm) and metal plates lining manufactured by IZOPANEL Sp. z o.o. - environmental aspects related to resource use (DU: 1 m²)

Indicator	Unit	A1	A2	A3	A1-A3	A4	A5	C1	C2	C3	C4	D
Consumption of renewable primary energy - excluding renewable primary energy sources used as raw materials	MJ	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Consumption of renewable primary energy resources used as raw materials	MJ	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Total consumption of renewable primary energy resources	MJ	4.57E+01	2.69E-01	6.69E-01	4.66E+01	4.41E-01	3.31E-01	2.70E-02	4.98E-03	1.37E-02	1.44E-02	-9.06E+00
Consumption of non-renewable primary energy - excluding renewable primary energy sources used as raw materials	MJ	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Consumption of non-renewable primary energy resources used as raw materials	MJ	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Total consumption of non-renewable primary energy resources	MJ	6.53E+02	1.83E+01	1.28E+01	6.84E+02	3.08E+01	2.95E+00	3.95E-01	3.47E-01	2.59E+00	1.72E+00	-1.18E+02
Consumption of secondary materials	kg	5.17E+00	7.00E-03	0.00E+00	5.18E+00	1.03E-02	1.60E-01	0.00E+00	1.16E-04	9.36E-04	4.13E-04	-4.90E+00
Consumption of renewable secondary fuels	MJ	2.46E-01	6.99E-05	0.00E+00	2.46E-01	1.14E-04	1.52E-05	0.00E+00	1.28E-06	3.06E-06	8.86E-06	-2.05E-02
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	0.00E+00	0.00E+00
Net consumption of freshwater resources	m ³	3.77E-01	2.27E-03	3.43E-03	3.83E-01	3.87E-03	2.32E-03	1.21E-04	4.37E-05	4.29E-05	1.77E-03	-8.14E-02

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Table 10.3. Life cycle assessment (LCA) results of the sandwich panels with MWF core (thickness 150 mm) and metal plates lining manufactured by IZOPANEL Sp. z o.o. - environmental information describing waste categories (DU: 1 m²)

Indicator	Unit	A1	A2	A3	A1-A3	A4	A5	C1	C2	C3	C4	D
Hazardous waste neutralized	kg	2.43E+00	2.07E-02	5.74E-06	2.45E+00	3.45E-02	6.10E-02	7.71E-08	3.89E-04	6.67E-06	8.23E-04	-1.23E+00
Non-hazardous waste neutralised	kg	5.71E+01	3.73E-01	1.83E-01	5.76E+01	6.13E-01	1.38E-01	2.20E-03	6.91E-03	3.25E-03	2.46E-02	-1.87E+01
Radioactive waste	kg	5.20E-04	1.11E-04	1.62E-05	6.47E-04	2.12E-04	2.18E-06	3.19E-07	2.59E-08	1.69E-05	3.88E-07	-1.99E-04
Components for re-use	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.58E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Materials for recycling	kg	9.74E-03	2.83E-04	3.71E-01	3.81E-01	9.53E-05	3.83E-02	6.92E+00	1.07E-06	3.18E-06	7.68E-06	-2.37E-03
Materials for energy recovery	kg	7.02E-05	4.60E-07	2.32E-02	2.33E-02	7.71E-07	5.63E-08	2.63E+00	8.69E-09	5.10E-08	2.76E-08	-9.22E-06
Energy exported	MJ	3.56E-01	1.90E-02	0.00E+00	3.75E-01	3.41E-02	4.81E-02	0.00E+00	0.00E+00	1.04E-02	1.53E-04	-1.43E-01

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Table 11. Life cycle assessment (LCA) results of the sandwich panels with MWF core (thickness 160 mm) and metal plates lining manufactured by IZOPANEL Sp. z o.o. – environmental impacts (DU: 1 m²)

Indicator	Unit	A1	A2	A3	A1-A3	A4	A5	C1	C2	C3	C4	D
Global Warming Potential	eq. kg CO ₂	4.16E+01	1.27E+00	7.50E-01	4.37E+01	2.16E+00	1.65E-01	2.48E-02	2.50E-02	1.79E-01	7.29E-02	-1.05E+01
Greenhouse gas potential - fossil	eq. kg CO ₂	4.25E+01	1.27E+00	7.39E-01	4.45E+01	2.15E+00	1.59E-01	2.44E-02	2.49E-02	1.79E-01	7.28E-02	-1.06E+01
Greenhouse gas potential - biogenic	eq. kg CO ₂	-8.80E-01	4.04E-03	1.08E-02	-8.65E-01	7.35E-03	6.70E-03	4.40E-04	8.52E-05	1.54E-04	3.82E-05	7.21E-02
Global warming potential - land use and land use change	eq. kg CO ₂	2.86E-02	6.04E-04	1.49E-04	2.93E-02	8.44E-04	7.92E-05	5.73E-06	9.79E-06	1.77E-05	4.40E-05	-5.84E-03
Stratospheric ozone depletion potential	eq. kg CFC 11	8.80E-07	2.53E-07	4.23E-08	1.18E-06	4.98E-07	8.51E-08	4.38E-10	5.77E-09	3.80E-08	2.11E-09	-2.05E-07
Soil and water acidification potential	eq. mol H ⁺	2.78E-01	9.53E-03	6.22E-03	2.94E-01	8.73E-03	8.55E-04	2.42E-04	1.01E-04	8.94E-04	5.49E-04	-5.16E-02
Eutrophication potential - freshwater	eq. kg P	1.39E-02	8.54E-05	1.01E-03	1.50E-02	1.45E-04	1.01E-04	4.15E-05	1.68E-06	5.51E-06	6.06E-06	-4.79E-03
Eutrophication potential - seawater	eq. kg N	4.55E-02	2.59E-03	8.90E-04	4.90E-02	2.63E-03	1.77E-04	3.44E-05	3.05E-05	3.48E-04	2.11E-04	-9.44E-03
Eutrophication potential - terrestrial	eq. mol N	5.26E-01	2.84E-02	7.75E-03	5.62E-01	2.87E-02	1.52E-03	2.95E-04	3.33E-04	3.81E-03	2.26E-03	-1.11E-01
Potential for photochemical ozone synthesis	eq. kg NMVOC	1.95E-01	8.21E-03	2.25E-03	2.05E-01	8.80E-03	5.06E-04	8.28E-05	1.02E-04	1.08E-03	7.86E-04	-4.76E-02
Potential for depletion of abiotic resources - non-fossil resources	eq. kg Sb	2.47E-04	4.62E-06	9.10E-07	2.52E-04	7.62E-06	1.06E-06	3.30E-08	8.84E-08	9.27E-08	1.03E-07	-2.49E-05
Abiotic depletion potential - fossil fuels	MJ	6.68E+02	1.83E+01	1.20E+01	6.99E+02	3.19E+01	2.92E+00	3.73E-01	3.70E-01	2.39E+00	1.83E+00	-1.18E+02
Water deprivation potential	eq. m ³	1.91E+01	8.54E-02	1.88E-01	1.94E+01	1.48E-01	9.92E-02	7.57E-03	1.71E-03	6.41E-03	5.68E-03	-3.42E+00

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Table 11.1. Life cycle assessment (LCA) results of the sandwich panels with MWF core and metal plates lining (thickness 160 mm) manufactured by IZOPANEL Sp. z o.o.– additional impacts indicators (DU: 1 m²)

Indicator	Unit	A1	A2	A3	A1-A3	A4	A5	C1	C2	C3	C4	D
Particulate matter	disease incidence	INA	INA	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	INA	INA
Potential comparative toxic unit for ecosystems	CTUe	INA	INA	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	INA	INA
Potential comparative toxic unit for humans (non-cancer effects)	CTUh	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Potential soil quality index	dimensionless	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA

Table 11.2. Life cycle assessment (LCA) results of the sandwich panels with MWF core (thickness 160 mm) and metal plates lining manufactured by IZOPANEL Sp. z o.o. - environmental aspects related to resource use (DU: 1 m²)

Indicator	Unit	A1	A2	A3	A1-A3	A4	A5	C1	C2	C3	C4	D
Consumption of renewable primary energy - excluding renewable primary energy sources used as raw materials	MJ	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Consumption of renewable primary energy resources used as raw materials	MJ	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Total consumption of renewable primary energy resources	MJ	4.72E+01	2.69E-01	6.69E-01	4.82E+01	4.58E-01	3.31E-01	2.70E-02	5.31E-03	1.37E-02	1.53E-02	-9.06E+00
Consumption of non-renewable primary energy - excluding renewable primary energy sources used as raw materials	MJ	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Consumption of non-renewable primary energy resources used as raw materials	MJ	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Total consumption of non-renewable primary energy resources	MJ	6.68E+02	1.83E+01	1.28E+01	7.00E+02	3.19E+01	2.95E+00	3.95E-01	3.70E-01	2.59E+00	1.83E+00	-1.18E+02
Consumption of secondary materials	kg	5.18E+00	7.00E-03	0.00E+00	5.18E+00	1.07E-02	1.60E-01	0.00E+00	1.24E-04	9.36E-04	4.41E-04	-4.90E+00
Consumption of renewable secondary fuels	MJ	2.56E-01	6.99E-05	0.00E+00	2.56E-01	1.18E-04	1.52E-05	0.00E+00	1.37E-06	3.06E-06	9.45E-06	-2.05E-02
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	0.00E+00	0.00E+00
Net consumption of freshwater resources	m ³	3.85E-01	2.27E-03	3.43E-03	3.91E-01	4.02E-03	2.32E-03	1.21E-04	4.66E-05	4.29E-05	1.89E-03	-8.14E-02

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Table 11.3. Life cycle assessment (LCA) results of the sandwich panels with MWF core (thickness 160 mm) and metal plates lining manufactured by IZOPANEL Sp. z o.o. - environmental information describing waste categories (DU: 1 m²)

Indicator	Unit	A1	A2	A3	A1-A3	A4	A5	C1	C2	C3	C4	D
Hazardous waste. neutralized	kg	2.50E+00	2.07E-02	5.74E-06	2.52E+00	3.58E-02	6.10E-02	7.71E-08	4.15E-04	6.67E-06	8.78E-04	-1.23E+00
Non-hazardous waste. neutralised	kg	5.89E+01	3.73E-01	1.83E-01	5.95E+01	6.36E-01	1.38E-01	2.20E-03	7.37E-03	3.25E-03	2.63E-02	-1.87E+01
Radioactive waste	kg	5.30E-04	1.11E-04	1.62E-05	6.57E-04	2.20E-04	2.18E-06	3.19E-07	2.76E-08	1.69E-05	4.05E-07	-1.99E-04
Components for re-use	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.58E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Materials for recycling	kg	1.01E-02	2.83E-04	3.71E-01	3.81E-01	9.88E-05	3.83E-02	6.92E+00	1.15E-06	3.18E-06	8.19E-06	-2.37E-03
Materials for energy recovery	kg	7.29E-05	4.60E-07	2.32E-02	2.33E-02	7.99E-07	5.63E-08	2.63E+00	9.27E-09	5.10E-08	2.95E-08	-9.22E-06
Energy exported	MJ	3.61E-01	1.90E-02	0.00E+00	3.80E-01	3.54E-02	4.81E-02	0.00E+00	0.00E+00	1.04E-02	1.63E-04	-1.43E-01

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Table 12. Life cycle assessment (LCA) results of the sandwich panels with MWF core (thickness 180 mm) and metal plates lining manufactured by IZOPANEL Sp. z o.o. – environmental impacts (DU: 1 m²)

Indicator	Unit	A1	A2	A3	A1-A3	A4	A5	C1	C2	C3	C4	D
Global Warming Potential	eq. kg CO ₂	4.41E+01	1.27E+00	7.50E-01	4.61E+01	2.31E+00	1.65E-01	2.48E-02	2.82E-02	1.79E-01	8.19E-02	-1.05E+01
Greenhouse gas potential - fossil	eq. kg CO ₂	4.51E+01	1.27E+00	7.39E-01	4.71E+01	2.30E+00	1.59E-01	2.44E-02	2.81E-02	1.79E-01	8.18E-02	-1.06E+01
Greenhouse gas potential - biogenic	eq. kg CO ₂	-9.72E-01	4.04E-03	1.08E-02	-9.57E-01	7.87E-03	6.70E-03	4.40E-04	9.59E-05	1.54E-04	4.29E-05	7.21E-02
Global warming potential - land use and land use change	eq. kg CO ₂	3.02E-02	6.04E-04	1.49E-04	3.09E-02	9.04E-04	7.92E-05	5.73E-06	1.10E-05	1.77E-05	4.94E-05	-5.84E-03
Stratospheric ozone depletion potential	eq. kg CFC ₁₁	9.31E-07	2.53E-07	4.23E-08	1.23E-06	5.33E-07	8.51E-08	4.38E-10	6.49E-09	3.80E-08	2.37E-09	-2.05E-07
Soil and water acidification potential	eq. mol H ⁺	3.01E-01	9.53E-03	6.22E-03	3.17E-01	9.35E-03	8.55E-04	2.42E-04	1.14E-04	8.94E-04	6.16E-04	-5.16E-02
Eutrophication potential - freshwater	eq. kg P	1.47E-02	8.54E-05	1.01E-03	1.58E-02	1.55E-04	1.01E-04	4.15E-05	1.89E-06	5.51E-06	6.81E-06	-4.79E-03
Eutrophication potential - seawater	eq. kg N	4.80E-02	2.59E-03	8.90E-04	5.15E-02	2.82E-03	1.77E-04	3.44E-05	3.44E-05	3.48E-04	2.37E-04	-9.44E-03
Eutrophication potential - terrestrial	eq. mol N	5.65E-01	2.84E-02	7.75E-03	6.01E-01	3.08E-02	1.52E-03	2.95E-04	3.75E-04	3.81E-03	2.54E-03	-1.11E-01
Potential for photochemical ozone synthesis	eq. kg NMVOC	2.07E-01	8.21E-03	2.25E-03	2.18E-01	9.43E-03	5.06E-04	8.28E-05	1.15E-04	1.08E-03	8.83E-04	-4.76E-02
Potential for depletion of abiotic resources - non-fossil resources	eq. kg Sb	2.62E-04	4.62E-06	9.10E-07	2.68E-04	8.17E-06	1.06E-06	3.30E-08	9.94E-08	9.27E-08	1.15E-07	-2.49E-05
Abiotic depletion potential - fossil fuels	MJ	6.99E+02	1.83E+01	1.20E+01	7.29E+02	3.42E+01	2.92E+00	3.73E-01	4.16E-01	2.39E+00	2.05E+00	-1.18E+02
Water deprivation potential	eq. m ³	1.98E+01	8.54E-02	1.88E-01	2.01E+01	1.58E-01	9.92E-02	7.57E-03	1.93E-03	6.41E-03	6.38E-03	-3.42E+00

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Table 12.1. Life cycle assessment (LCA) results of the sandwich panels with MWF core (thickness 180 mm) and metal plates lining manufactured by IZOPANEL Sp. z o.o.– additional impacts indicators (DU: 1 m²)

Indicator	Unit	A1	A2	A3	A1-A3	A4	A5	C1	C2	C3	C4	D
Particulate matter	disease incidence	INA	INA	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	INA	INA
Potential comparative toxic unit for ecosystems	CTUe	INA	INA	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	INA	INA
Potential comparative toxic unit for humans (non-cancer effects)	CTUh	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Potential soil quality index	dimensionless	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA

Table 12.2. Life cycle assessment (LCA) results of the sandwich panels with MWF core (thickness 180 mm) and metal plates lining manufactured by IZOPANEL Sp. z o.o. - environmental aspects related to resource use (DU: 1 m²)

Indicator	Unit	A1	A2	A3	A1-A3	A4	A5	C1	C2	C3	C4	D
Consumption of renewable primary energy - excluding renewable primary energy sources used as raw materials	MJ	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Consumption of renewable primary energy resources used as raw materials	MJ	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Total consumption of renewable primary energy resources	MJ	5.03E+01	2.69E-01	6.69E-01	5.13E+01	4.90E-01	3.31E-01	2.70E-02	0.00E+00	1.37E-02	1.72E-02	-9.06E+00
Consumption of non-renewable primary energy - excluding renewable primary energy sources used as raw materials	MJ	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Consumption of non-renewable primary energy resources used as raw materials	MJ	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Total consumption of non-renewable primary energy resources	MJ	6.99E+02	1.83E+01	1.28E+01	7.30E+02	3.42E+01	2.95E+00	3.95E-01	0.00E+00	2.59E+00	2.05E+00	-1.18E+02
Consumption of secondary materials	kg	5.19E+00	7.00E-03	0.00E+00	5.19E+00	1.15E-02	1.60E-01	0.00E+00	1.40E-04	9.36E-04	4.95E-04	-4.90E+00
Consumption of renewable secondary fuels	MJ	2.76E-01	6.99E-05	0.00E+00	2.76E-01	1.26E-04	1.52E-05	0.00E+00	1.52E-03	3.06E-06	1.06E-05	-2.05E-02
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	7.78E-06	0.00E+00	0.00E+00	0.00E+00
Net consumption of freshwater resources	m ³	4.01E-01	2.27E-03	3.43E-03	4.06E-01	4.30E-03	2.32E-03	1.21E-04	-4.19E+00	4.29E-05	2.12E-03	-8.14E-02

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Table 12.3. Life cycle assessment (LCA) results of the sandwich panels with MWF core (thickness 180 mm) and metal plates lining manufactured by IZOPANEL Sp. z o.o. - environmental information describing waste categories (DU: 1 m²)

Indicator	Unit	A1	A2	A3	A1-A3	A4	A5	C1	C2	C3	C4	D
Hazardous waste neutralized	kg	2.62E+00	2.07E-02	5.74E-06	2.64E+00	3.84E-02	6.10E-02	7.71E-08	4.67E-04	6.67E-06	9.86E-04	-1.23E+00
Non-hazardous waste neutralised	kg	6.26E+01	3.73E-01	1.83E-01	6.31E+01	6.81E-01	1.38E-01	2.20E-03	8.30E-03	3.25E-03	2.95E-02	-1.87E+01
Radioactive waste	kg	5.50E-04	1.11E-04	1.62E-05	6.77E-04	2.36E-04	2.18E-06	3.19E-07	3.11E-08	1.69E-05	4.38E-07	-1.99E-04
Components for re-use	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.58E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Materials for recycling	kg	1.08E-02	2.83E-04	3.71E-01	3.82E-01	1.06E-04	3.83E-02	6.92E+00	1.29E-06	3.18E-06	9.20E-06	-2.37E-03
Materials for energy recovery	kg	7.84E-05	4.60E-07	2.32E-02	2.33E-02	8.56E-07	5.63E-08	2.63E+00	1.04E-08	5.10E-08	3.31E-08	-9.22E-06
Energy exported	MJ	3.73E-01	1.90E-02	0.00E+00	3.92E-01	3.79E-02	4.81E-02	0.00E+00	0.00E+00	1.04E-02	1.83E-04	-1.43E-01

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Table 13. Life cycle assessment (LCA) results of the sandwich panels with MWF core (thickness 200 mm) and metal plates lining manufactured by IZOPANEL Sp. z o.o. – environmental impacts (DU: 1 m²)

Indicator	Unit	A1	A2	A3	A1-A3	A4	A5	C1	C2	C3	C4	D
Global Warming Potential	eq. kg CO ₂	4.66E+01	1.27E+00	7.50E-01	4.86E+01	2.47E+00	1.65E-01	2.48E-02	3.13E-02	1.79E-01	9.09E-02	-1.05E+01
Greenhouse gas potential - fossil	eq. kg CO ₂	4.76E+01	1.27E+00	7.39E-01	4.96E+01	2.46E+00	1.59E-01	2.44E-02	3.12E-02	1.79E-01	9.08E-02	-1.06E+01
Greenhouse gas potential - biogenic	eq. kg CO ₂	-1.07E+00	4.04E-03	1.08E-02	-1.05E+00	8.40E-03	6.70E-03	4.40E-04	1.07E-04	1.54E-04	4.76E-05	7.21E-02
Global warming potential - land use and land use change	eq. kg CO ₂	3.18E-02	6.04E-04	1.49E-04	3.25E-02	9.65E-04	7.92E-05	5.73E-06	1.22E-05	1.77E-05	5.48E-05	-5.84E-03
Stratospheric ozone depletion potential	eq. kg CFC 11	9.82E-07	2.53E-07	4.23E-08	1.28E-06	5.69E-07	8.51E-08	4.38E-10	7.21E-09	3.80E-08	2.63E-09	-2.05E-07
Soil and water acidification potential	eq. mol H ⁺	3.23E-01	9.53E-03	6.22E-03	3.39E-01	9.97E-03	8.55E-04	2.42E-04	1.26E-04	8.94E-04	6.84E-04	-5.16E-02
Eutrophication potential - freshwater	eq. kg P	1.55E-02	8.54E-05	1.01E-03	1.66E-02	1.65E-04	1.01E-04	4.15E-05	2.10E-06	5.51E-06	7.56E-06	-4.79E-03
Eutrophication potential - seawater	eq. kg N	5.06E-02	2.59E-03	8.90E-04	5.41E-02	3.01E-03	1.77E-04	3.44E-05	3.82E-05	3.48E-04	2.63E-04	-9.44E-03
Eutrophication potential - terrestrial	eq. mol N	6.05E-01	2.84E-02	7.75E-03	6.41E-01	3.28E-02	1.52E-03	2.95E-04	4.17E-04	3.81E-03	2.82E-03	-1.11E-01
Potential for photochemical ozone synthesis	eq. kg NMVOC	2.20E-01	8.21E-03	2.25E-03	2.30E-01	1.01E-02	5.06E-04	8.28E-05	1.28E-04	1.08E-03	9.80E-04	-4.76E-02
Potential for depletion of abiotic resources - non-fossil resources	eq. kg Sb	2.78E-04	4.62E-06	9.10E-07	2.84E-04	8.71E-06	1.06E-06	3.30E-08	1.10E-07	9.27E-08	1.28E-07	-2.49E-05
Abiotic depletion potential - fossil fuels	MJ	7.30E+02	1.83E+01	1.20E+01	7.60E+02	3.65E+01	2.92E+00	3.73E-01	4.63E-01	2.39E+00	2.28E+00	-1.18E+02
Water deprivation potential	eq. m ³	2.05E+01	8.54E-02	1.88E-01	2.08E+01	1.69E-01	9.92E-02	7.57E-03	2.14E-03	6.41E-03	7.09E-03	-3.42E+00

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Table 13.1. Life cycle assessment (LCA) results of the sandwich panels with MWF core (thickness 200 mm) and metal cladding manufactured by IZOPANEL Sp. z o.o.– additional impacts indicators (DU: 1 m²)

Indicator	Unit	A1	A2	A3	A1-A3	A4	A5	C1	C2	C3	C4	D
Particulate matter	disease incidence	INA	INA	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	INA	INA
Potential comparative toxic unit for ecosystems	CTUe	INA	INA	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	INA	INA
Potential comparative toxic unit for humans (non-cancer effects)	CTUh	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Potential soil quality index	dimensionless	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA

Table 13.2. Life cycle assessment (LCA) results of the sandwich panels with MWF core (thickness 200 mm) and metal plates lining manufactured by IZOPANEL Sp. z o.o. - environmental aspects related to resource use (DU: 1 m²)

Indicator	Unit	A1	A2	A3	A1-A3	A4	A5	C1	C2	C3	C4	D
Consumption of renewable primary energy - excluding renewable primary energy sources used as raw materials	MJ	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Consumption of renewable primary energy resources used as raw materials	MJ	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Total consumption of renewable primary energy resources	MJ	5.34E+01	2.69E-01	6.69E-01	5.44E+01	5.23E-01	3.31E-01	2.70E-02	6.64E-03	1.37E-02	1.91E-02	-9.06E+00
Consumption of non-renewable primary energy - excluding renewable primary energy sources used as raw materials	MJ	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Consumption of non-renewable primary energy resources used as raw materials	MJ	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA	INA
Total consumption of non-renewable primary energy resources	MJ	7.30E+02	1.83E+01	1.28E+01	7.61E+02	3.65E+01	2.95E+00	3.95E-01	4.63E-01	2.59E+00	2.28E+00	-1.18E+02
Consumption of secondary materials	kg	5.20E+00	7.00E-03	0.00E+00	5.21E+00	1.22E-02	1.60E-01	0.00E+00	1.55E-04	9.36E-04	5.49E-04	-4.90E+00
Consumption of renewable secondary fuels	MJ	2.95E-01	6.99E-05	0.00E+00	2.95E-01	1.35E-04	1.52E-05	0.00E+00	1.71E-06	3.06E-06	1.18E-05	-2.05E-02
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	0.00E+00	0.00E+00
Net consumption of freshwater resources	m ³	4.16E-01	2.27E-03	3.43E-03	4.22E-01	4.59E-03	2.32E-03	1.21E-04	5.82E-05	4.29E-05	2.36E-03	-8.14E-02

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Table 13.3. Life cycle assessment (LCA) results of the sandwich panels with MWF core (thickness 200 mm) and metal plates lining manufactured by IZOPANEL Sp. z o.o. - environmental information describing waste categories (DU: 1 m²)

Indicator	Unit	A1	A2	A3	A1-A3	A4	A5	C1	C2	C3	C4	D
Hazardous waste. neutralized	kg	2.75E+00	2.07E-02	5.74E-06	2.77E+00	4.09E-02	6.10E-02	7.71E-08	5.19E-04	6.67E-06	1.09E-03	-1.23E+00
Non-hazardous waste. neutralised	kg	6.63E+01	3.73E-01	1.83E-01	6.68E+01	7.27E-01	1.38E-01	2.20E-03	9.22E-03	3.25E-03	3.27E-02	-1.87E+01
Radioactive waste	kg	5.70E-04	1.11E-04	1.62E-05	6.98E-04	2.51E-04	2.18E-06	3.19E-07	3.45E-08	1.69E-05	4.71E-07	-1.99E-04
Components for re-use	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.58E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Materials for recycling	kg	1.14E-02	2.83E-04	3.71E-01	3.83E-01	1.13E-04	3.83E-02	6.92E+00	1.43E-06	3.18E-06	1.02E-05	-2.37E-03
Materials for energy recovery	kg	8.38E-05	4.60E-07	2.32E-02	2.33E-02	9.13E-07	5.63E-08	2.63E+00	1.16E-08	5.10E-08	3.67E-08	-9.22E-06
Energy exported	MJ	3.85E-01	1.90E-02	0.00E+00	4.04E-01	4.05E-02	4.81E-02	0.00E+00	0.00E+00	1.04E-02	2.03E-04	-1.43E-01

Type III Environmental Product Declaration No. 406/2023

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: The declaration owner has the sole ownership, liability, and responsibility for the declaration. 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. For further information about comparability, see EN 15804 and ISO 14025.

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+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
- PN-EN 15942:2012 Sustainability of construction works – Environmental product declarations – Communication format business-to-business
- ISO 20915:2018 Life cycle inventory calculation methodology for steel products
- IZOPANEL Sp. z o.o. Instrukcja postępowania z płytami warstwowymi Izopanel po demontażu



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Thermal Physics, Acoustics and Environment Department

02-656 Warsaw, Ksawerów 21

CERTIFICATE No 406/2023 of TYPE III ENVIRONMENTAL DECLARATION

Product:

Sandwich panels with MWF cores in metal plates lining

Manufacturer:

IZOPANEL Sp. z o.o.

ul. Budowlanych 36, 80-298 Gdańsk, 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

Sustainability of construction works.

Environmental product declarations.

Core rules for the product category of construction products.

This certificate, issued for the first time on 9th January 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, January 2023



Instytut Techniki Budowlanej