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Panels with PIR insulation layer



Owner of the EPD:

Balex Metal Sp. z o. o.
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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-A3, C1-C4 and D modules in accordance with EN 15804+A2 (Cradle-to-Gate with options)

The year of preparing the EPD: 2024

Product standards: EN 14509: 2013, EN 14782: 2006

Service Life: > 50 years

PCR: ITB-PCR A, v. 1.6

Declared unit: 1 m²

Reasons for performing LCA: B2B

Representativeness: Polish, European

MANUFACTURER

Balex Metal Sp. z o.o. is a manufacturer of sandwich panels, roofing sheets, thermal insulation, cold-formed profiles, guttering and trapezoidal sheets. For more than 25 years it has been present in the market of building materials manufacturers, providing solutions for industrial, residential and agricultural construction.

Balex Metal Sp. z o.o. is a building materials manufacturer in this part of the globe, with their materials sold to destinations across the planet, from the USA to New Zealand. Balex Metal Sp. z o.o. has production facilities in Poland and Slovakia: Bolszewo, Tomaszów Mazowiecki, Długoleka (near Wrocław), Zylina (Slovakia). They have 11 sales branches:

Poland

- Bolszewo
- Tomaszów Mazowiecki
- Wrocław
- Pustków

Slovakia

- Zylina

Czech Republic

- Hradec Kralove
- Plzen-Slovany
- Luka na Jihlavou

Latvia

- Riga
- Broceni



Figure 1 A view of Balex Metal production plant located in Bolszewo (Poland).

PRODUCTS DESCRIPTION AND APPLICATION

Standard EN 14509:2013

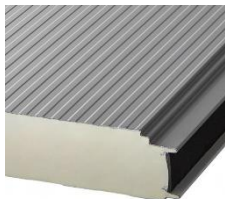
Product name	Unique Identification code	Thickness [mm]	Thermal insulation [kg / m ³]	Type of profile: external / internal
PIR STANDARD sandwich panel	PU-PIR-W-ST	40 - 130	40	Lined, Microprofile, Smooth, Clearline, Double Clearline / Lined, Smooth
PIR PLUS sandwich panel	PU-PIR-W-PLUS	60 - 120	40	Lined, Microprofile, Smooth, Clearline, Double Clearline, Softline, Grooved / Lined, Smooth
PIR FROST sandwich panel	PU-PIR-F	110 - 200	40	Lined, Microprofile, Smooth, Clearline, Double Clearline / Lined, Smooth
PIR STANDARD roof sandwich panel	PU-PIR-R	40 - 160	40	Box profile / Lined, Smooth
PIR LIGHT sandwich panel	PIR LIGHT	50 - 100	37	Lined / Lined

PIR sandwich panels have steel cladding on both sides and the core is made of rigid polyurethane foam. The different types of panels are described below:

- **PIR STANDARD** sandwich panel – panel with “standard” lock. The most standard wall panel.



- **PIR PLUS** sandwich panel – panel with “hidden” lock. Allows to hide fasteners.



- **PIR FROST** sandwich panel – panel with an improved lock for reducing thermal bridge.



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- **PIR STANDARD roof** sandwich panel – panel dedicated for roofs coverings.



- **PIR LIGHT** sandwich panel – panel with lower core density. Allows for reduced cost.



Standard EN 14782:2006

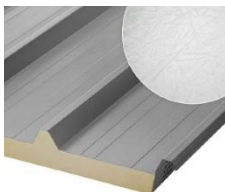
Product name	Unique Identification code	Thickness [mm]	Thermal insulation [kg / m ³]	Type of profile: external / internal
PIR ALU	PIR ALU	40-120	40	Box profile / Smooth
PIR FIBER	PIR FIBERGLASS	40-120	40	Box profile / Smooth

PIR panels have steel cladding on outer side. The other cladding is made out of non-steel. Thermal insulation layer is made of rigid polyurethane foam. The different types of panels are described below:

- **PIR ALU** – panel where inner cladding is made out of aluminium foil.



- **PIR FIBER** – panel where inner cladding is made out of fiberglass



More information can be found on the Balex Metal Sp. z o.o. website : [https:// www.balex.eu/](https://www.balex.eu/)

LIFE CYCLE ASSESSMENT (LCA) – general rules applied

Declared Unit

The declaration refers to declared unit (DU) – 1 m² of panels with PIR insulation layer

Allocation

The allocation rules used for this EPD are based on general ITB PCR A, v. 1.6. Production of panels with PIR insulation layer is a line process conducted in the factory of Balex Metal Sp. z o.o., located in Bolszewo and Tomaszów Mazowiecki, both are located in Poland. Allocation was done on product mass basis.

All impacts from raw materials extraction and processing are allocated in module A1 of LCA. Impacts from the Balex Metal Sp. z o.o. production were inventoried on the annual production volume expressed in mass units. 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 PCR A, v. 1.6. All materials and energy consumption inventoried in factory were included in calculation. Office impacts were also taken into consideration. In the assessment, all significant parameters from gathered production data were inventoried and were included in the calculations, i.e. all material used per formulation, utilised thermal energy, internal fuel and electric power consumption, direct production waste, water consumption and all available emission measurements.

It can be assumed that the total sum of omitted processes does not exceed 5% of all impact categories. In accordance with EN 15804+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

Raw materials such as steel sheets, polyols, isocyanates, catalysts and others additives, gaskets, wooden materials, tapes, protective foil or packaging materials come from both local and foreign suppliers. Means of transport include big trucks (> 16 t), train and ship are applied. European standards for average combustion were used for calculations.

Module A3: Production

A scheme of the panels with PIR insulation layer production process is presented in Figure 2. Raw materials such as steel sheets, polyols, isocyanates, catalysts and others additives, gaskets, wooden materials, tapes, protective foil or packaging materials are delivered to factory located in Bolszewo and Tomaszów Mazowiecki, where are manufacturing in a few step process including mixing and blend core components, steel decoiling, metal claddings profiling, sandwich panel's laminating or stacking. Then the panels are packing, palleting and shipment.

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

It is assumed that at the end-of-life, 100% of panels with PIR insulation layer are demounted using electric tools (module C1) and is transported to waste processing plant which is 100 km away, on 16-32 t lorry EURO 5 (module C2). It is assumed that 50 % of PIR cores and 98 % of steel sheets are energy/material recovery. The residue wastes are forwarded to a landfill in the form of mixed construction and demolition wastes (50 % PIR cores and 2 % steel sheets). End-of-life scenario was

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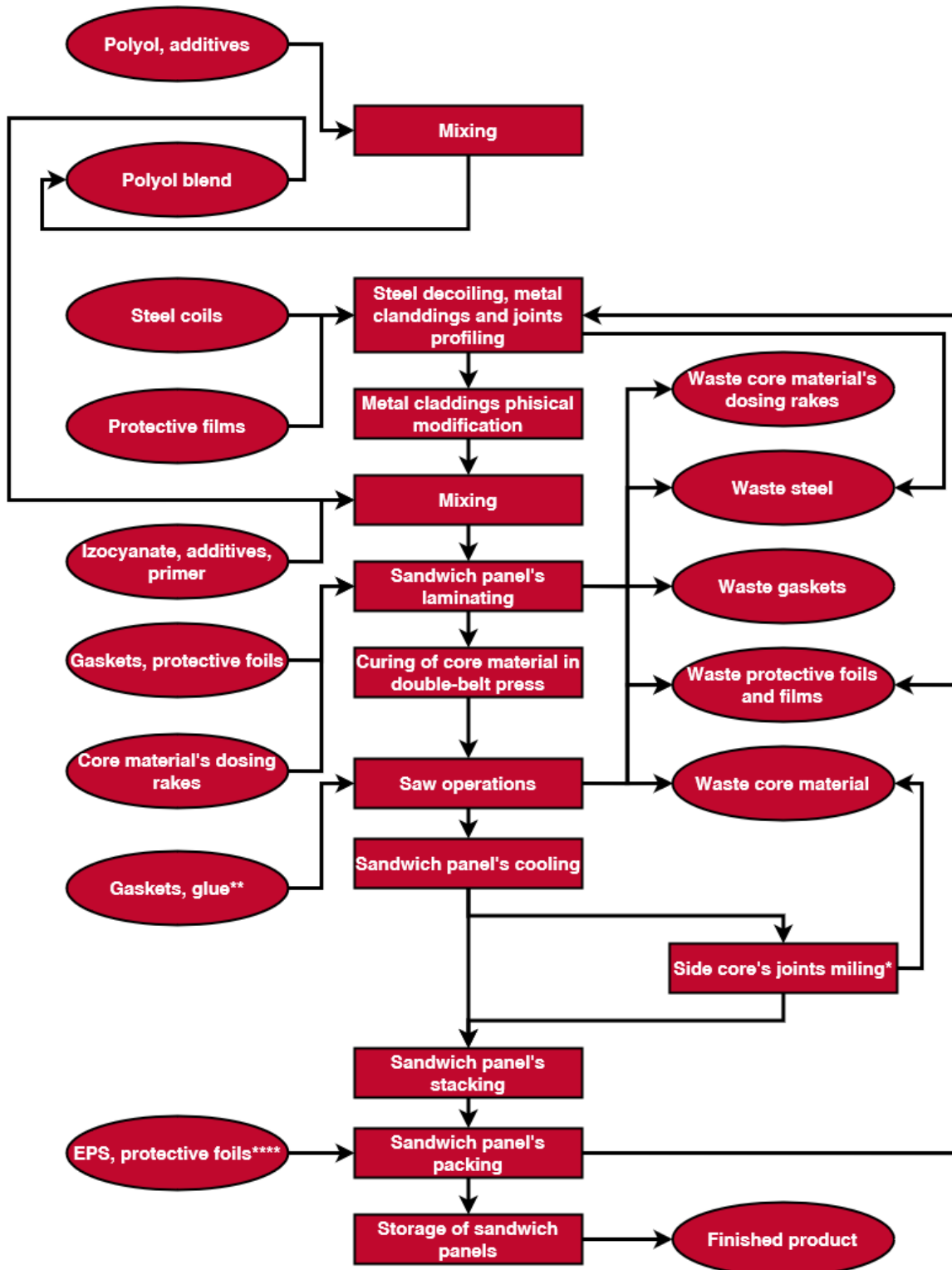
summarized in Table 1. Environmental burdens declared in module C4 are associated with waste-specific emissions to air and groundwater. A potential credit resulting from the recycling are presented in module D.

Table 1. End-of-life scenario for panels with PIR insulation layer manufactured by Balex Metal Sp. z o.o.

Material	Waste processing (energy / material recovery)	Landfilling
PIR core	50 %	50 %
Steel sheets	98 %	2 %

Data quality

The data selected for LCA analysis originates from ITB-LCI questionnaires completed by Balex Metal Sp. z o.o. using the inventory data, ITB database, Ecoinvent database v. 3.10 and KOBiZE. KOBiZE data is supplemented with Ecoinvent v. 3.10 data on the national electricity mix impact where no specific indicator data is provided. 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.



* Only for PU-R-F wall sandwich panels

** Only for specific orders

*** EPS - expanded polystyrene

**** Manufacturing of PIR LIGHT sandwich panels possible only at Balex Metal Sp. z o.o. Production Plant in Tomaszów Mazowiecki

Figure 2. The scheme of panels with PIR insulation layer production process by Balex Metal Sp. z o.o. production plants in Bolszewo and Tomaszów Mazowiecki

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Data collection period

Primary data provided by Balex Metal 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 for representative of panels with PIR insulation layer were inventoried and calculated based on consumption for all these products. The results are presented in Tables 4-7 for the PIR core with densities of 40 kg/m³ and representative thickness of 100 mm. Conversion factors for different panel thicknesses are presented in Table 2.

Table 2. Conversion factors for estimation of environmental impact for different panel thicknesses about density of 40 kg/m³. Multiply the LCA-result of each impact category in the environmental impact table with the corresponding factors.

Panel thickness	40 mm	50 mm	60 mm	70 mm	80 mm	90 mm	100 mm	110 mm	120 mm
Conversion factor	0.63	0.69	0.75	0.81	0.88	0.94	1.00	1.06	1.12

Panel thickness	130 mm	140 mm	150 mm	160 mm	170 mm	180 mm	190 mm	200 mm
Conversion factor	1.19	1.25	1.31	1.37	1.43	1.49	1.56	1.62

Calculation rules

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

Databases

The data for the processes comes from Ecoinvent v. 3.10 and ITB-Database. Specific data quality analysis was a part of external audit. Polish electricity mix used (production) is 0.685 kg CO₂/kWh (KOBiZE 2023).

LIFE CYCLE ASSESSMENT (LCA) – Results

Declared unit

The declaration refers to declared unit (DU) – 1 m² of panels with PIR insulation layer about density of 40 kg/m³ and thickness of 100 mm. Conversion factors for different panel thickness are presented above (Table 2).

Table 3. System boundaries for the environmental characteristics of panels with PIR insulation layer production process by Balex Metal 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 4. Life cycle assessment (LCA) results for panels with PIR insulation layer about density of 40 kg/m³ and thickness of 100 mm manufactured by Balex Metal 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	2.63E+01	1.40E+00	8.15E-01	2.85E+01	2.31E-01	2.11E-01	5.86E+00	9.63E-03	-1.19E+01
Greenhouse gas potential - fossil	eq. kg CO ₂	2.60E+01	1.38E+00	8.10E-01	2.82E+01	2.30E-01	2.10E-01	5.65E+00	9.54E-03	-1.18E+01
Greenhouse gas potential - biogenic	eq. kg CO ₂	2.55E-01	1.27E-02	4.66E-03	2.72E-01	5.54E-04	7.19E-04	2.09E-01	8.37E-05	-5.89E-02
Global warming potential - land use and land use change	eq. kg CO ₂	1.31E-02	7.46E-04	2.54E-04	1.41E-02	2.80E-04	8.25E-05	2.49E-04	2.54E-06	-6.13E-03
Stratospheric ozone depletion potential	eq. kg CFC 11	1.34E-06	2.78E-07	3.71E-05	3.87E-05	3.65E-09	4.87E-08	3.31E-08	4.23E-09	-6.20E-08
Soil and water acidification potential	eq. mol H ⁺	1.40E-01	6.50E-03	7.71E-03	1.54E-01	1.35E-03	8.53E-04	6.14E-03	9.12E-05	-3.05E-02
Eutrophication potential - freshwater	eq. kg P	9.43E-03	2.22E-04	1.28E-03	1.09E-02	1.40E-04	1.41E-05	9.68E-05	6.21E-07	-3.21E-03
Eutrophication potential - seawater	eq. kg N	3.97E-02	1.95E-03	1.11E-03	4.28E-02	4.57E-04	2.58E-04	4.15E-03	3.45E-05	-9.24E-03
Eutrophication potential - terrestrial	eq. mol N	2.59E-01	2.11E-02	9.52E-03	2.90E-01	4.30E-03	2.81E-03	2.96E-02	3.78E-04	-8.37E-02
Potential for photochemical ozone synthesis	eq. kg NMVOC	1.20E-01	6.35E-03	2.84E-03	1.29E-01	1.41E-03	8.61E-04	7.46E-03	1.10E-04	-2.55E-02
Potential for depletion of abiotic resources - non-fossil resources	eq. kg Sb	1.87E-04	4.69E-06	1.10E-06	1.92E-04	6.03E-07	7.45E-07	6.53E-06	1.81E-08	-3.27E-05
Abiotic depletion potential - fossil fuels	MJ	4.92E+02	2.03E+01	1.37E+01	5.26E+02	3.25E+00	3.12E+00	5.74E+00	2.96E-01	-8.37E+01
Water deprivation potential	eq. m ³	2.01E+01	1.13E-01	2.38E-01	2.04E+01	1.51E-01	1.44E-02	4.24E-01	1.13E-03	-3.19E+00

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Table 5. Life cycle assessment (LCA) results for panels with PIR insulation layer about density of 40 kg/m³ and thickness of 100 mm manufactured by Balex Metal 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 6. Life cycle assessment (LCA) results for panels with PIR insulation layer about density of 40 kg/m³ and thickness of 100 mm manufactured by Balex Metal 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	2.79E+01	5.67E-01	8.37E-01	2.93E+01	-6.81E+01	4.48E-02	7.05E-02	5.81E-03	-1.18E+01
Consumption of renewable primary energy resources used as raw materials	MJ	7.70E-01	0.00E+00	0.00E+00	7.70E-01	6.82E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total consumption of renewable primary energy resources	MJ	2.87E+01	5.67E-01	8.41E-01	3.01E+01	1.01E-01	4.48E-02	2.56E-01	5.81E-03	-1.18E+01
Consumption of non-renewable primary energy - excluding renewable primary energy sources used as raw materials	MJ	3.89E+02	2.03E+01	1.27E+01	4.22E+02	3.29E+00	3.12E+00	-5.70E+01	-6.10E+01	-2.23E+01
Consumption of non-renewable primary energy resources used as raw materials	MJ	1.03E+02	0.00E+00	0.00E+00	1.03E+02	0.00E+00	0.00E+00	6.15E+01	6.13E+01	-6.15E+01
Total consumption of non-renewable primary energy resources	MJ	4.93E+02	2.03E+01	1.46E+01	5.27E+02	3.29E+00	3.12E+00	5.84E+00	2.96E-01	-8.37E+01
Consumption of secondary materials	kg	5.96E+00	8.86E-03	1.08E-03	5.97E+00	4.62E-03	1.05E-03	4.18E-03	6.18E-05	-8.43E+00
Consumption of renewable secondary fuels	MJ	2.80E-03	7.35E-05	5.61E-06	2.88E-03	5.70E-05	1.15E-05	2.47E-04	1.88E-06	-1.10E-03
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	4.80E-01	3.07E-03	3.82E-03	4.87E-01	2.83E-03	3.93E-04	8.62E-03	3.61E-04	-9.08E-02

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Table 7. Life cycle assessment (LCA) results for panels with PIR insulation layer about density of 40 kg/m³ and thickness of 100 mm manufactured by Balex Metal 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	1.58E+00	2.64E-02	1.14E-04	1.60E+00	3.78E-02	3.50E-03	1.12E-01	2.20E-04	-4.12E+00
Non-hazardous waste neutralised	kg	2.08E+01	1.03E+00	3.13E-01	2.21E+01	1.98E+01	6.22E-02	2.60E+00	2.47E-03	-1.78E+01
Radioactive waste	kg	3.51E-04	1.29E-04	1.62E-05	4.96E-04	1.29E-06	2.15E-05	1.43E-05	2.02E-06	-2.73E-04
Components for re-use	kg	0.00E+00	0.00E+00	7.98E-01	7.98E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Materials for recycling	kg	6.14E-03	1.49E-04	7.46E-05	6.36E-03	3.05E-05	9.66E-06	8.30E+00	5.46E-07	-2.39E-03
Materials for energy recovery	kg	1.18E-05	5.91E-07	2.35E-02	2.35E-02	1.95E-07	7.82E-08	6.46E-07	5.96E-09	-1.75E-05
Energy exported	MJ	1.32E+00	2.69E-02	3.44E-02	1.38E+00	2.48E-03	3.46E-03	6.22E-02	5.14E-04	-2.11E-01

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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
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, v. 1.6 General Product Category Rules for Construction Products
- EN 14509:2013 Self-supporting double skin metal faced insulating panels - Factory made products – Specification
- 14782:2006 self-supporting metal sheet for roofing, external cladding and internal lining - product specification and requirements
- 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
- KOBIZE Emissions (CO₂. SO₂. NO_x. CO and total dust) from electricity, 2023

LCA, LCI audit and input data verification

Mateusz Kozicki, PhD

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and Environment Department

Agnieszka Winkler-Skalna, PhD

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Thermal Physics, Acoustics and Environment Department

02-656 Warsaw, Ksawerów 21

CERTIFICATE № 654/2024 of TYPE III ENVIRONMENTAL DECLARATION

Products:

Panels with PIR insulation layer

Manufacturer:

Balex Metal Sp. z o.o.

Wejherowska 12C, 84-239 Bolszewo, Poland

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 3rd September 2024 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, September 2024