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Steel structures



Owner of the EPD:

Smulders Polska 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 and their aspects verified by the independent body according to ISO 14025. Basically, 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)

Product standards: PN-EN 1090-1+A1:2012, PN-EN 1090-2:2018-09, PN-EN 1090-4:2018-09

The year of preparing the EPD: 2024

Service Life: 100 years for standard product

PCR: ITB-PCR A

Declared unit: 1 ton

Reasons for performing LCA: B2B

Representativeness: Poland, Europe, 2023

MANUFACTURER

Smulders Polska Sp. z o.o. is a producer of steel structures since 2011. The company designs, manufactures and assembles non-residential and industrial buildings such as stadiums, logistics centers, production halls and warehouses. Smulders Polska Sp. z o.o. has two production plants. The company's headquarters is located in the plant in Chocianów, the second plant, which is a branch of the company, is located in Zielona Góra. The production area of both plants is over 20,000 m². Smulders Polska Sp. z o.o. provides its services to customers from Poland and abroad, including from the Netherlands, Belgium, Germany and Switzerland. Smulders Polska Sp. z o.o. has a qualified staff that combines professional knowledge with experience, which results in efficient implementation of investments.



Figure 1 View from the street of Smulders Polska Sp. z o.o.

PRODUCTS DESCRIPTION AND APPLICATION

The manufactured products are various types of steel structures, which are most often elements of warehouses, factories, transport and energy infrastructure. The structures are made in a quality class EXC2-EXC4 consistent with the customer's requirements. The structures are protected against corrosion according to the customer's requirements, most often it is painting in the full range from C1L to C5I, appropriate wet painting systems to obtain a dry coating thickness of 80-120 µm or surface protection by hot-dip galvanizing. Shipping elements weigh from 300 g to 15 tons. Information on the main groups of products produced is presented in Table 1.

Table 1. Information on the main groups manufactured by Smulders Polska Sp. z o.o.

Product type	Steel grade	Product standard
Roof structure elements	S235/S355	EN-1090-2
Poles	S235/S355	EN-1090-2
Other structures	S235/S355	EN-1090-2

All additional technical information about the product is available on the [manufacturer's website](#).

LIFE CYCLE ASSESSMENT (LCA) – general rules applied

Unit

The declared unit is 1 ton of product. However, the same manufacturing process and the similarities of product allow a declared unit based on mass unit of products.

System boundary

The life cycle analysis of the declared products covers “Product Stage” A1-A3, A4-A5, C2-C4+D modules in accordance with EN 15804 and ITB PCR A (cradle to gate with options). Energy and water consumption, emissions as well as information on generated wastes were inventoried and were included in the calculation. It can be assumed that the total sum of omitted processes does not exceed 2% 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.

Allocation

The allocation rules used for this EPD are based on general ITB 's document PCR A. Production of the covered steel structures is a line process (as presented in Figure 2) conducted in the manufacturing plants located in Chocianów and Zielona Góra Poland. Input and output data from the production is inventoried and allocated to the production on the mass basis. The declaration covers all steel structure products (presented in Table 1) manufactured in the plant. Their production resources and processing stages are basically similar, so it is possible to average the production by product weight.

System limits

Minimum 99.0% input materials and 100% energy consumption (electricity, gas, LPG, other) were inventoried in a processing plant and were included in the calculation. In the assessment, all available data from production have been considered, i.e. all raw materials/elements used as per formulation process, utilized thermal energy for heating , and electric power consumption. Thus, material and energy flows contributing less than 1 % of mass or energy have been considered. It can be assumed that the total sum of neglected processes does not exceed 1 % of energy usage and mass per modules A or D. Machines and facilities required during production are neglected The packaging products (stretch foil, wooden pallets , etc.) are included.

Modules A1 and A2: Raw materials supply and transport

Modules A1 and A2 represent the extraction and processing of raw materials (mainly steel elements) and transport to the production site. Steel sheets, profiles and flat bars are commonly used semi-finished products for the production of steel structures. The steel used comes from domestic suppliers producing steel using EAF and BOF technology. Module A2 (transport) includes truck transport and uses Polish and European averages for fuel data.

Module A3: Production

The production process takes place in both production plants. The plant in Chocianów is the main production plant where steel sheets are processed. Then, the prepared sheet metal parts are sent to the plant in Zielona Góra or remain for further production on site. Further production, consisting of preparing flat bars and profiles and connecting and with sheet metal parts, takes place in both plants independently. The following processes are used in production: cutting, perforating, shot-blasting, tacking, welding and applying an anti-corrosion coating. After passing quality control, the finished products are initially stored, then packed and sent to the recipient. The block diagram of the production process is shown in Figure 2. The manufacturer uses purchased renewable electricity energy which is included in the total production in accordance with certificates of origin.

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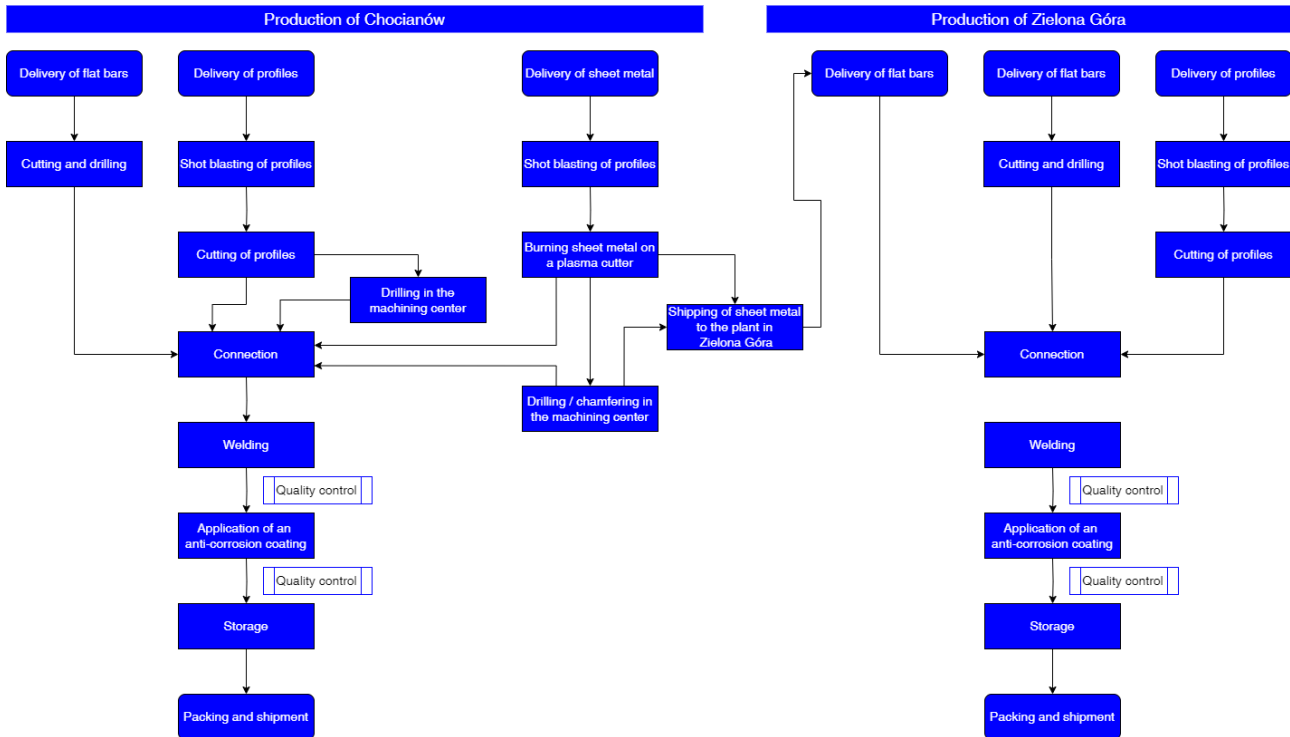


Figure 2. Diagram of the manufacturing process of steel structures

Module A4: Transport to consumer

Transport of the steel structure from the Factory to the construction site is carried out using specialized vehicles at customer's request, depending on the terms of the contract. Loads on trucks are secured with belts with tensioners or chains. Anti-slip mats and/or pads will be used on the car under the structure elements and between the structure and the chains or belts to protect the anti-corrosion coating against damage. Vehicle transport at distance 100 km is considered (emission standard: Euro 5) with 100% load capacity.

Modules C and D: End-of-life (EOL)

Due to the fact that the declaration covers a wide range of steel products for various purposes and usage scenarios, it is not possible to directly specify the de-construction technology and the amount of energy for disassembly in C1 module (so this module is very generic based on literature). In the adapted end-of-life scenario, the de-constructed steel products are transported to a steel mill distant by 100 km on > 16t lorry EURO 5 where are used as steel scrap to produce a new steel. The recycling potential of C3 module is 98% and it is assumed that only 2% of the products will end up in a landfill – C4 module (Table 2). Module D presents credits resulting from the recycling of the steel scrap (used for steel production), calculated in accordance with the approach developed by World Steel Association.

Table 2. End-of-life scenario for a steel structures

Material	Material recovery	Recycling	Landfilling
Steel scrap	100%	98%	2%

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Data collection period

The data for manufacture of the declared products refer to period between 01.01.2023 – 31.12.2023 (1 year). The life cycle assessments were prepared for Poland and Europe as reference area.

Data quality

The data selected for LCA originate from ITB-LCI questionnaires completed by Smulders Polska Sp. z o.o. (from two plants) and verified during data audit. No data collected is older than five years and no generic datasets used are older than ten years. The representativeness, completeness, reliability, and consistency is judged as good. The background data for the processes come from the following resources database Ecoinvent v.3.10 and specific suppliers (EPDs). Specific (LCI) data quality analysis was a part of the input data verification.

Assumptions and estimates

The impacts of the representative products were aggregated using weighted average.

Calculation rules

LCA was performed using ITB-LCA tool developed in accordance with EN15804+A2. Emission of greenhouse gases was calculated using the IPCC 2013 GWP method with a 100-year horizon. Emission of acidifying substances, Emission of substances to water contributing to oxygen depletion, Emission of gases that contribute to the creation of ground-level ozone, Abiotic depletion, and ozone depletion emissions where all calculated with the CML-IA baseline method

Additional information

Polish electricity (Ecoinvent v 3.10 supplemented by actual national KOBiZE data) emission factor used is 0.685 kg CO₂/kWh (National, 2023). As a general rule, no particular environmental or health protection measures other than those specified by law are necessary.

LIFE CYCLE ASSESSMENT (LCA) – Results

Declared unit

The declaration refers to declared unit (DU) – 1 ton of steel structures produced in Poland. The following life cycle modules (Table 3) were included in the analysis. The following tables 4-7 show the environmental impacts of the life cycle of selected modules (A1-A5+C1-C4+D).

Table 3 System boundaries for the environmental characteristic of the product.

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	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	MD	MND	MD	MD	MD	MD	MD

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Table 4 Life cycle assessment (LCA) results for stainless steel product – environmental impacts of (DU: 1 ton)

Indicator	Unit	A1	A2	A3	A1-A3	A4	A5	C1	C2	C3	C4	D
Global Warming Potential	eq. kg CO ₂	1.49E+03	7.38E+01	6.94E+01	1.63E+03	1.67E+01	1.37E+00	3.43E+00	8.34E+00	6.39E+01	1.06E-01	-4.71E+02
Greenhouse potential - fossil	eq. kg CO ₂	1.49E+03	7.35E+01	5.14E+04	5.30E+04	1.66E+01	1.37E+03	3.43E+03	8.31E+00	6.38E+01	1.05E-01	-4.75E+02
Greenhouse potential - biogenic	eq. kg CO ₂	-1.75E+01	2.51E-01	1.58E+00	-1.56E+01	5.68E-02	4.00E-02	1.00E-01	2.84E-02	1.33E-02	2.68E-04	4.83E+00
Global warming potential - land use and land use change	eq. kg CO ₂	1.49E+01	2.89E-02	2.12E-02	1.50E+01	6.52E-03	4.80E-04	1.20E-03	3.26E-03	1.01E-02	9.94E-05	-1.76E-03
Stratospheric ozone depletion potential	eq. kg CFC 11	1.00E-05	1.70E-05	6.33E-06	3.33E-05	3.85E-06	2.80E-08	7.00E-08	1.92E-06	7.80E+02	4.26E-08	2.93E-06
Soil and water acidification potential	eq. mol H+	6.47E+00	2.98E-01	6.20E-01	7.39E+00	6.75E-02	1.52E-02	3.80E-02	3.37E-02	5.32E-01	9.90E-04	-1.92E+00
Eutrophication potential - freshwater	eq. kg P	4.58E-01	4.94E-03	9.88E-02	5.62E-01	1.12E-03	2.60E-03	6.50E-03	5.59E-04	4.32E-04	9.81E-06	-2.01E-01
Eutrophication potential - seawater	eq. kg N	1.29E+00	9.01E-02	9.41E-02	1.47E+00	2.04E-02	2.20E-03	5.50E-03	1.02E-02	1.81E+00	3.45E-04	-4.34E-01
Eutrophication potential - terrestrial	eq. mol N	1.33E+01	9.83E-01	7.74E-01	1.51E+01	2.22E-01	1.86E-02	4.65E-02	1.11E-01	3.42E+00	3.77E-03	-4.75E+00
Potential for photochemical ozone synthesis	eq. kg NMVOC	4.54E+00	3.01E-01	2.26E-01	5.07E+00	6.80E-02	5.20E-03	1.30E-02	3.40E-02	7.46E-01	1.10E-03	-2.67E+00
Potential for depletion of abiotic resources - non-fossil resources	eq. kg Sb	1.44E-02	2.61E-04	3.27E-04	1.50E-02	5.89E-05	6.68E-06	1.67E-05	2.95E-05	1.45E-05	2.42E-07	-4.51E-03
Abiotic depletion potential - fossil fuels	MJ	1.85E+04	1.09E+03	1.26E+03	2.08E+04	2.47E+02	2.32E+01	5.80E+01	1.23E+02	6.05E+01	2.89E+00	-4.07E+03
Water deprivation potential	eq. m ³	6.19E+02	5.05E+00	2.07E+01	6.44E+02	1.14E+00	4.80E-01	1.20E+00	5.70E-01	1.42E+00	9.16E-03	-4.85E+01

Table 1 Life cycle assessment (LCA) results for product – additional impacts indicators (DU: 1 ton)

Indicator	Unit	A1-A3	A4-A5	C1-C4	D
Particulate matter	disease incidence	INA	INA	INA	INA
Potential human exposure efficiency relative to U235	eg. kBq U235	INA	INA	INA	INA
Potential comparative toxic unit for ecosystems	CTUe	INA	INA	INA	INA
Potential comparative toxic unit for humans (cancer effects)	CTUh	INA	INA	INA	INA
Potential comparative toxic unit for humans (non-cancer effects)	CTUh	INA	INA	INA	INA
Potential soil quality index	dimensionless	INA	INA	INA	INA

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Table 2 Life cycle assessment (LCA) results for specific product - the resource use (DU: 1 ton)

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	3.40E+03	1.57E+01	1.82E+02	3.60E+03	3.54E+00	1.72E+00	4.30E+00	1.77E+00	1.11E+00	2.51E-02	-6.41E+03
Consumption of renewable primary energy resources used as raw materials	MJ	1.66E+02	0.00E+00	0.00E+00	1.66E+02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total consumption of renewable primary energy resources	MJ	3.56E+03	1.57E+01	1.83E+02	3.76E+03	3.54E+00	1.72E+00	4.30E+00	1.77E+00	1.11E+00	2.51E-02	-3.45E+02
Consumption of non-renewable primary energy - excluding renewable primary energy sources used as raw materials	MJ	1.82E+04	1.09E+03	1.29E+03	2.06E+04	2.47E+02	2.33E+01	5.82E+01	1.23E+02	-2.95E+03	2.89E+00	-2.14E+04
Consumption of non-renewable primary energy resources used as raw materials	MJ	2.54E+02	0.00E+00	0.00E+00	2.54E+02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.01E+03	0.00E+00	0.00E+00
Total consumption of non-renewable primary energy resources	MJ	1.85E+04	1.09E+03	1.29E+03	2.09E+04	2.47E+02	2.33E+01	5.82E+01	1.23E+02	6.06E+01	2.89E+00	-3.88E+03
Consumption of secondary materials	kg	8.10E+02	3.66E-01	1.28E-01	8.11E+02	8.27E-02	2.12E-03	5.30E-03	4.14E-02	2.74E-02	6.07E-04	-6.75E+01
Consumption of renew. secondary fuels	MJ	2.07E+00	4.03E-03	1.20E-03	2.08E+00	9.11E-04	1.18E-05	2.95E-05	4.56E-04	3.72E-04	1.59E-05	-9.09E-02
Consumption of non-renewable secondary fuels	MJ	1.12E-16	0.00E+00	7.04E-01	7.04E-01	0.00E+00	1.88E-02	4.70E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Net consumption of freshwater	m ³	1.56E+01	1.37E-01	7.42E-01	1.65E+01	3.10E-02	6.30E-03	1.58E-02	1.55E-02	5.36E-02	3.16E-03	-3.26E+00

Table 3 Life cycle assessment (LCA) results for specific product – waste categories (DU: 1 ton)

Indicator	Unit	A1	A2	A3	A1-A3	A4	A5	C1	C2	C3	C4	D
Hazardous waste	kg	4.61E+01	1.22E+00	4.74E+00	5.21E+01	2.77E-01	2.40E-04	6.00E-04	1.38E-01	4.35E-06	3.07E-03	-1.38E+02
Non-hazardous waste	kg	3.15E+02	2.17E+01	1.30E+01	3.50E+02	4.92E+00	1.25E-02	3.12E-02	2.46E+00	1.14E+01	4.32E-02	-1.26E+03
Radioactive waste	kg	2.01E-01	8.15E-05	2.59E-03	2.03E-01	1.84E-05	1.74E-05	4.35E-05	9.21E-06	3.23E-04	1.92E-05	1.41E-02
Components for re-use	kg	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
Materials for recycling	kg	2.14E-01	3.38E-03	6.00E+01	6.02E+01	7.64E-04	2.40E-05	6.00E-05	3.82E-04	4.04E-04	5.78E-06	0.00E+00
Materials for energy recovery	kg	4.95E-03	2.73E-05	6.00E-02	6.50E-02	6.18E-06	2.10E-07	5.25E-07	3.09E-06	5.04E-06	6.85E-08	0.00E+00
Exported Energy	MJ	3.79E+01	0.00E+00	2.72E+00	4.06E+01	0.00E+00	6.92E-02	1.73E-01	0.00E+00	6.17E+01	0.00E+00	0.00E+00

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Verification

The process of verification of this EPD is in accordance with ISO 14025 and ISO 21930. After verification, this EPD is valid for a 5-year-period. EPD does not have to be recalculated after 5 years, if the underlying data have not changed significantly.

The basis for LCA analysis was EN 15804 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: PhD. Eng. Halina Prejzner LCI audit and verification: Filip Poznański, M.Sc. Eng. LCA, LCI audit and input data verification: Michał Piasecki, PhD., D.Sc., Eng.

Note 1: The declaration owner has the sole ownership, liability, and responsibility for the information provided and contained in EPD. 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.

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 (ISO 17025/17065/17029). ITB-EPD program is recognized and registered member of The European Platform - Association of EPD program operators and ITB-EPD declarations are registered and stored in the international ECO-PORTAL.

Normative references

- ITB PCR A General Product Category Rules for Construction Products
- PN-EN 1090-2:2018-09 - Wykonanie konstrukcji stalowych i aluminiowych -- Część 2: Wymagania techniczne dotyczące konstrukcji stalowych
- PN-EN 1090-4:2018-09 - Wykonanie konstrukcji stalowych i aluminiowych -- Część 4: Wymagania techniczne dotyczące profilowanych na zimno stalowych elementów konstrukcyjnych oraz konstrukcji poszycia dachów, sufitów, stropów i ścian
- PN-EN 1090-1+A1:2012 - Wykonanie konstrukcji stalowych i aluminiowych -- Część 1: Zasady oceny zgodności elementów konstrukcyjnych
- 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
- KOBiZE Wskaźniki emisyjności CO₂, SO₂, NO_x, CO i pyłu całkowitego dla energii elektrycznej. December 2023
- World Steel Association 2017 Life Cycle inventory methodology report for steel products
- <https://ecoinvent.org/>

LCA, LCI, input data verification
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CERTIFICATE № 604/2024 of TYPE III ENVIRONMENTAL DECLARATION

Products:

Steel structures

Manufacturer:

Smulders Polska Sp. z o.o.

ul. Kolonialna 13a, 59-140 Chocianów, 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.

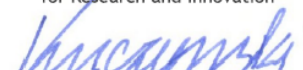
This certificate, issued on 30th September 2024 is valid for 5 years
or until amendment of mentioned Environmental Declaration

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