POZBRUK

Tworzymy dla pokoleń

PREFABRICATED FILIGREE SLABS

TEOLIN PLANT

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

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TYPE III ENVIRONMENTAL PRODUCT DECLARATION NO. 494/2023

ECO PLATFORM EPD VERIFIED

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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.

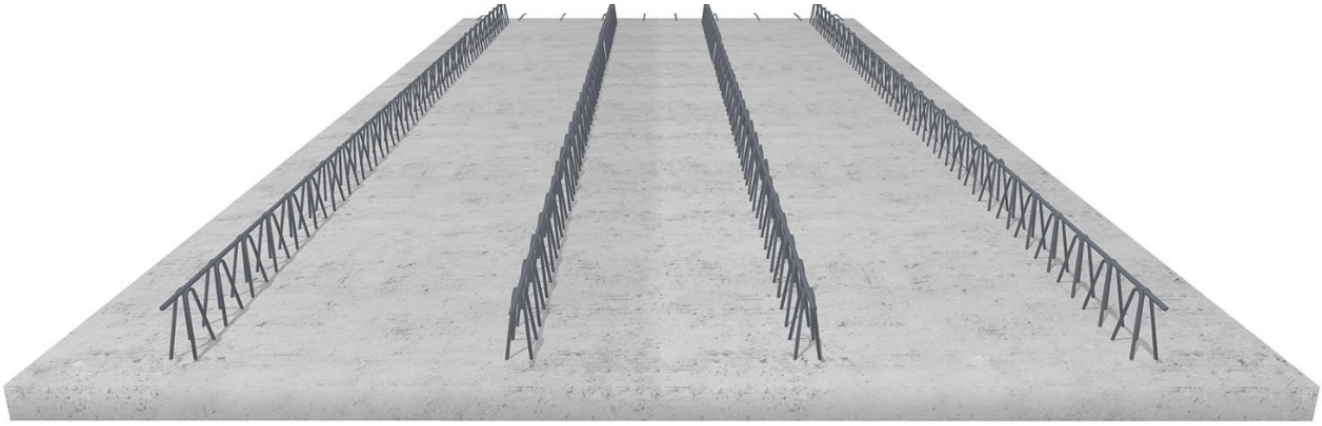
Life cycle analysis (LCA): A1-A3, C1-C4 and D modules in accordance with EN 15804 (Cradle-to-Gate with options)
The year of preparing the EPD: 2023
Product standard: PN-EN1992-1-2
Service Life: 100 years
PCR: ITB-PCR A
Declared unit: 1 ton
Reasons for performing LCA: B2B
Representativeness: Poland, European, 2022

MANUFACTURER

POZ BRUK Sp. z o. o. Sp. J. is a Polish manufacturer of a wide range of construction products with nearly 40 years of experience in the production of concrete elements. Established in 1985, the company gradually transformed from a workshop into a production company with machine parks in 5 factories in central, north-western and western Poland. The first factory was opened in Janikowo near Poznań. The range of products sold was systematically expanded with new designs, thicknesses and colors. The popularity of paving stones and the constantly growing demand led to the opening of a second plant in 1997 in Sobota near Poznań. Other plants were opened in 1999 in Kalisz, 2000 in Teolin and 2002 in Szczecin. The continuous development of the company resulted in the creation of prefabrication production halls in the plants in Sobota and Teolin.

PRODUCTS DESCRIPTION

This EPD covers prefabricated filigree slabs produced in Teolin manufacturing plant in Poland.



The filigree slab (produced in Teolin plant) is one of the variations of the traditional reinforced concrete floor. It consists of prefabricated filigree slabs, prepared according to an individual design. Filigree slab is prefabricated element which consists of a smooth concrete slab with integrated lattice as reinforcement and cross reinforcement. The load-bearing longitudinal reinforcement is installed in the slab element at the factory. Prefabricated elements are created in cooperation with the manufacturer's design office, which, taking into account the dimensions and specifics of the object in question, including the required bearing capacity of the floor, calculates the appropriate thickness of the slab and the required reinforcement. At this stage, the necessary floor openings are also designed, for example, for staircases.

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 of prefabricated filigree slab.

System boundary

Type of the EPD is: cradle to gate - with options. The following life cycle stages were considered. Production stage including: A1 – Raw material extraction and processing, A2 – Transport to the manufacturer and A3 – Manufacturing, End-of-life stage: C1- Deconstruction, C2 – Transport to waste processing, C3 – Waste processing, C4 – Disposal (landfill). This includes provision of all materials, products and energy, packaging processing and its transport, as well as waste processing up to the end-of waste state or disposal of final residues. EPD includes D module- declaration of all benefits and loads beyond product system. Energy and water consumption, emissions as well as information on generated wastes were inventoried and were included

Allocation

The allocation rules used for this EPD are based on general ITB PCR A v.1.6.. Manufacturing of the products is a line process conducted in factory Teolin (Poland). Allocation was done on product mass basis. To determine the recipe for the production of products, the exact specifications (concrete reicepe) was used (based on producer declaration and data from production/formulation process). All impacts associated with the extraction and processing of raw materials used for the production of elements are allocated in module A1 of the LCA. Impacts were inventoried and 100% were allocated to the products production. Water and energy consumption, associated emissions and generated wastes are allocated to module A3.

System limits

It can be assumed that the total sum of omitted processes does not exceed 1% 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. 99.8% materials submitted for the formulations and production data were taken into consideration. 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 0.5 % of mass or energy have been considered. It can be assumed that the total sum of neglected processes does not exceed 0.5 % of energy use and mass per modules. Machines and facilities required during production are neglected. The production of etiquettes/printing was not considered.

Modules A1 and A2: Raw materials supply and transport

Raw materials such as aggregates, cement and steel come from national manufacturers. Manufacturing plant Teolin uses cement and steel from the national suppliers. Data on transport of the different products to the manufacturing plants was collected and modelled. Means of transport include trucks and Polish and European fuel averages are applied.

Module A3: Production

Production process of prefabricated filigree starts immediately after the work is completed design. All of the components for precast production are coming by wheels deliveries or by train and stored in designated for it places. The central place in the technological line is occupied by the working table. It is on it, after the system has loaded the project, that the robot arranges metal formwork, securing their position. The prepared formwork is covered with anti-adhesive. This procedure makes it easier to pull out later of the finished product from the formwork, while guaranteeing smoothness prefabricated surface.

Reinforcement mesh is placed on the table. In the next step, machine with concrete drives up to the table with reinforced formwork. Employees follows the process of concreting the mold, vibrating and mass compaction. The concreted and vibrated element is transported to concrete curing chamber. After cured finished element is checked by the quality control department, and then taken to a warehouse, and directly to the customer. The production process is depicted schematically as can be seen below.

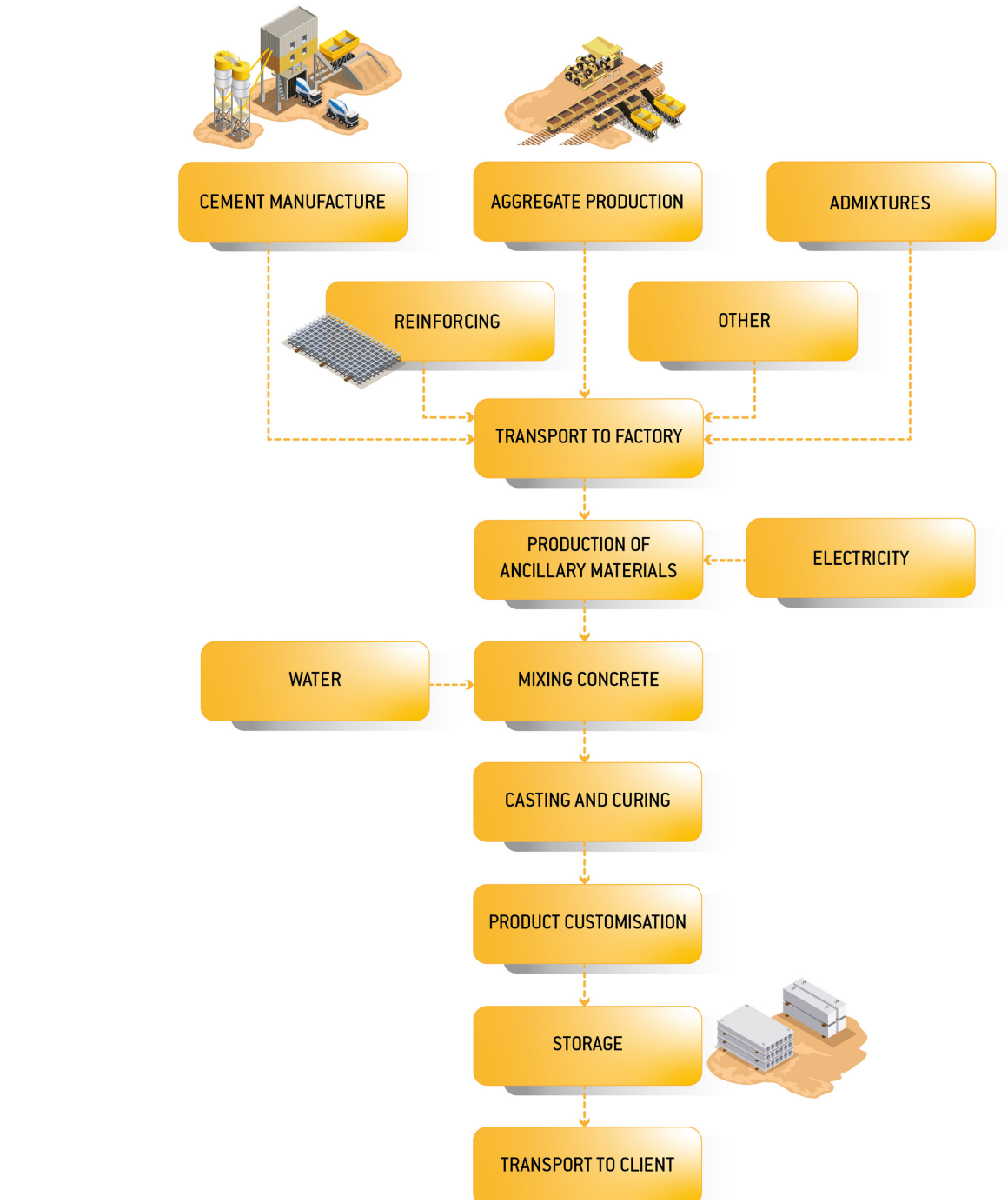


Figure 1 Manufacturing process scheme

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

In the adapted scenario, dismantling of products (C1) is performed as part of demolition processes, where environmental impacts from declared products can be considered as minor (<1%), the work of the excavator and its fuel consumption is assumed for the calculations. During the demolition process the major amount of the products contribute to the construction and demolition wastes which can be in a waste processing plant. It is assumed that 95% of steel and concrete may recovered at the EoL cycle. Recovered material is transported to either to landfill or recycling site distant by approx.. 100 km, on 16-32t lorry (EURO 5) with fuel consumption of 35 l per 100 km. In the adapted scenario 70% of the end of life product is recycled (steel and crushed concrete) and further used as aggregate for road foundation or ballast and for new steel production (credits presented in module D) while remaining 30% is forwarded to landfill in the form of mixed construction and demolition wastes. Environmental burdens declared in module C4 (landfill) are associated with waste-specific emissions to air, soil and groundwater. Regarding the recycling material of metals, the metal parts in the EoL are declared as end-of-waste status. Electricity at end-of-life (module D) has been modelled using an average EU-27 electricity mix as the location where the product reaches end-of-life is unknown.

Data collection period

The data for manufacture of the declared products refer to period between 01.09.2021 – 01.09.2022 (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 POZ BRUK Sp. z o. o. Sp. j. 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.3.9.1 (sand, gravel, basalt, cement, dolomite, reinforcing steel, steel, insulation material, adhesive fluid). 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 (Eocinvent v 3.9.1 supplemented by actual national KOBIZE data) emission factor used is 0.702 kg CO2/kWh. 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 prefabricated slab produced in Teolin, Poland. The following life cycle modules (Table 1) were included in the analysis.The following tables 2-5 show the environmental impacts of the life cycle of selected modules (A1-A3, C1+C4+D).

Table 4 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 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**

Table 5 Life cycle assessment (LCA) results for specific product – environmental impacts (DU: 1 ton)

Indicator	Unit	A1	A2	A3	A1-A3	C1	C2	C3	C4	D
Global Warming Potential	eq. kg CO2	1.84E+02	1.28E+01	2.57E+01	2.22E+02	3.49E+00	1.67E+01	1.67E+01	5.37E-01	-4.01E+01
Greenhouse potential - fossil	eq. kg CO2	1.81E+02	1.26E+01	2.52E+01	2.19E+02	3.42E+00	1.66E+01	1.66E+01	5.31E-01	-4.02E+01
Greenhouse potential - biogenic	eq. kg CO2	2.30E+00	1.66E-01	5.94E-01	3.06E+00	1.00E-01	5.68E-02	5.68E-02	5.32E-03	-1.21E-01
Global warming potential - land use and land use change	eq. kg CO2	7.92E-02	9.95E-03	7.28E-03	9.65E-02	1.20E-03	6.52E-03	6.52E-03	5.38E-04	-4.52E-02
Stratospheric ozone depletion potential	eq. kg CFC 11	9.06E-07	2.46E-06	9.09E-07	4.27E-06	7.00E-08	3.85E-06	3.85E-06	1.62E-07	-2.86E-06
Soil and water acidification potential	eq. mol H+	5.24E-01	6.90E-02	2.29E-01	8.22E-01	3.80E-02	6.75E-02	6.75E-02	4.49E-03	-5.21E-01
Eutrophication potential - freshwater	eq. kg P	1.90E-02	2.34E-03	3.82E-02	5.95E-02	6.50E-03	1.12E-03	1.12E-03	1.53E-04	-2.75E-02
Eutrophication potential - seawater	eq. kg N	1.53E-01	2.28E-02	3.37E-02	2.09E-01	5.50E-03	2.04E-02	2.04E-02	1.55E-03	-6.21E-02
Eutrophication potential - terrestrial	eq. mol N	1.76E+00	2.46E-01	2.84E-01	2.29E+00	4.65E-02	2.22E-01	2.22E-01	1.68E-02	-7.67E-01
Potential for photochemical ozone synthesis	eq. kg NMVOC	4.76E-01	7.11E-02	8.14E-02	6.29E-01	1.30E-02	6.80E-02	6.80E-02	4.88E-03	-2.68E-01
Potential for depletion of abiotic resources -non-fossil resources	eq. kg Sb	5.20E-04	5.10E-05	1.02E-04	6.72E-04	1.67E-05	5.89E-05	5.89E-05	1.79E-06	-3.43E-03
Abiotic depletion potential - fossil fuels	MJ	1.25E+03	1.86E+02	4.10E+02	1.84E+03	5.80E+01	2.47E+02	2.47E+02	1.23E+01	-5.85E+02
Water deprivation potential	eq. m3	3.25E+01	1.82E+00	7.18E+00	4.15E+01	1.20E+00	1.14E+00	1.14E+00	7.11E-02	-2.87E+01

Table 6 Life cycle assessment (LCA) results for specific product – additional impacts indicators (DU: 1 ton)

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

Table 7 Life cycle assessment (LCA) results for specific product - the resource use (DU: 1 ton)

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	5.31E+01	8.40E+00	2.53E+01	8.67E+01	4.30E+00	3.54E+00	3.54E+00	0.00E+00	-5.95E+01
Consumption of renewable primary energy resources used as raw materials	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
Total consumption of renewable primary energy resources	MJ	5.31E+01	8.40E+00	2.54E+01	8.69E+01	4.30E+00	3.54E+00	3.54E+00	2.15E-01	-5.95E+01
Consumption of non-renewable primary energy - excluding renewable primary energy sources used as raw materials	MJ	7.58E+02	1.86E+02	4.19E+02	1.29E+03	5.82E+01	2.47E+02	2.47E+02	0.00E+00	-5.74E+02
Consumption of non-renewable primary energy resources used as raw materials	MJ	4.87E+02	0.00E+00	0.00E+00	4.87E+02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total consumption of non-renewable primary energy resources	MJ	1.25E+03	1.86E+02	4.19E+02	1.85E+03	5.82E+01	2.47E+02	2.47E+02	1.33E+01	-5.74E+02
Consumption of secondary materials	kg	5.70E+01	1.27E-01	3.69E-02	5.72E+01	5.30E-03	8.27E-02	8.27E-02	3.03E-05	-7.30E+02
Consumption of renew. secondary fuels	MJ	2.77E-03	6.83E-04	1.87E-04	3.64E-03	2.95E-05	9.11E-04	9.11E-04	7.93E-07	-1.78E-02
Consumption of non-renewable secondary fuels	MJ	0.00E+00	0.00E+00	2.76E-01	2.76E-01	4.70E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Net consumption of freshwater	m3	1.33E+00	5.00E-02	1.13E-01	1.49E+00	1.58E-02	3.10E-02	3.10E-02	2.06E-03	-8.27E-01

Table 8 Life cycle assessment (LCA) results for specific product – waste categories (DU: 1 ton)

Indicator	Unit	A1	A2	A3	A1-A3	C1	C2	C3	C4	D
Hazardous waste	kg	2.59E-03	4.69E-01	2.93E-01	7.65E-01	6.00E-04	2.77E-01	2.77E-01	1.73E-04	-2.33E+00
Non-hazardous waste	kg	8.97E+01	1.04E+01	3.38E-01	1.01E+02	3.12E-02	4.92E+00	4.92E+00	5.01E+01	-6.01E+01
Radioactive waste	kg	3.86E-06	5.20E-05	2.70E-04	3.25E-04	4.35E-05	1.84E-05	1.84E-05	7.49E-05	-3.35E-04
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
Materials for recycling	kg	1.06E+01	6.51E-04	1.31E-01	1.08E+01	6.00E-05	7.64E-04	7.64E-04	2.89E-07	-4.52E-03
Materials for energy recovery	kg	2.89E+00	6.42E-06	3.61E-06	2.89E+00	5.25E-07	6.18E-06	6.18E-06	3.42E-09	-4.20E-04
Exported Energy	MJ	2.56E+00	0.00E+00	1.05E+00	3.62E+00	1.73E-01	0.00E+00	0.00E+00	0.00E+00	-9.07E-01

Verification

IThe 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 (sub clause 8.1.3.) ☑ external ☐ internal
External verification of EPD: Halina Prejzner, PhD. 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 for the information provided and contained I 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: Note: 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 (17065/17029 certified). ITB-EPD program is recognized and registered member of The European Platform - Associationof EPD program operators and ITB-EPD declarations are registered and stored in the international ECO-PORTAL.

Normative references

- ITB PCR A General Product Category Rules for Construction Products
- ISO 14025:2006, Environmental labels and declarations – Type III environmental declarations – Principles and procedures
- ISO 21930:2017 Sustainability in buildings and civil engineering works – Core rules for environmental product declarations of construction products and services
- ISO 14044:2006 Environmental management – Life cycle assessment – Requirements and guidelines
- ISO 15686-1:2011 Buildings and constructed assets – Service life planning – Part 1: General principles and framework
- ISO 15686-8:2008 Buildings and constructed assets – Service life planning – Part 8: Reference service life and service-life estimation
- 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
- KOBiZE Wskaźniki emisyjności CO2, SO2, NOx, CO i pyłu całkowitego dla energii elektrycznej, grudzień 2020
- https://ecoinvent.org/

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CERTIFICATE № 494/2023
of TYPE III ENVIRONMENTAL DECLARATION

Products:

Prefabricated filigree slabs- Teolin Plant

Manufacturer:

POZ BRUK Sp. z o.o. Sp.j.

ul. Sobota, ul. Poznańska 43, 62-090 Rokietnica, 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 21st July 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

INSTYTUT TECHNIKI BUDOWLANEJ

Deputy Director
for Research and Innovation
Krzysztof Kuczyński, PhD

Warsaw, July 2023