Type III Environmental Product Declaration No. 647/2024

BIAŁE BŁOTA

Issuance date: 19.07.2024
Validation: 19.08.2024
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Prefabricated prestressed elements: girders, beams, purlins

Owner of the EPD:

DBB Białe Błota Sp. z o.o. Sp. k.
Address: ul. Betonowa 1
86-005 Białe Błota, Poland
Tel.: +48 604 452 700
Website https://www.dbb-prefabrykaty.pl
Contact: biuro@dbb-prefabrykaty.pl

EPD Program Operator:

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

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

Basic information

This declaration is the Type III Environmental Product Declaration (EPD) based on EN 15804+A2 and verified according to ISO 14025 by an external auditor. It contains the information on the impacts of the declared construction materials on the environment 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-A4, C1-C4 and D modules in accordance with EN 15804+A2
(Cradle-to-Gate with options)
Product standards: EN 13225:2013, EN 1168:2005+A3:2011, EN 14992:2007+A1:2012
The year of preparing the EPD: 2024
Service Life: 100 years for standard product
PCR: ITB-PCR A (PCR based on EN 15804+A2)
Declared unit: 1 ton
Reasons for performing LCA: B2B
Representativeness: Poland, European, 2023

MANUFACTURER

Figure 1. View of DBB Białe Błota Sp. z o.o. Sp. k.

DBB Białe Błota Sp. z o.o. Sp. k. was established as a response to the demand of the construction services market for structural elements of buildings such as beams, columns, girders and slabs. The company's goal is to produce prefabricated concrete products of the highest quality, including prestressed ones. The company plant located in Białe Błota (Poland) produces prefabricated concrete elements - structural elements of buildings such as beams, columns, girders and slabs. Its goal is to produce prefabricated concrete products of the highest quality, including prestressed ones, which are sold to the Polish and European markets. Prefabricated concrete elements are used as structural elements of large-scale warehouse and industrial facilities constructed as general contractor by Depenbrock Polska.

PRODUCTS DESCRIPTION AND APPLICATION

EPD covers wide range of prefabricated prestressed elements: girders, beams, purlins made of concrete and steel. The basic element of the cover structure are prestressed girders. The most popular spans offered are 12-25 meters. They rest on columns, constituting a system that braces them horizontally. Moreover, they also provide support for the roof structure.The I-section is most often used. Type I girders are an element of constant height, the cross-section of which consists of a lower flange, a web and an upper flange. The cross-section dimensions are designed to achieve maximum load-bearing capacity in an effective and economical way. Application of roof girders: production facilities, warehouse facilities, commercial facilities.
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 (averaged).

System boundary

The life cycle analysis (LCA) of the declared products covers: product stage – modules A1-A4, 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) . 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 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 prefabricated prestressed elements: girders, beams, purlins is a line process (as presented in Figure

2) conducted in the manufacturing plant located in Białe Błota (Poland). Input and output data from the production is inventoried and allocated to the production on the mass basis. The declaration covers prefabricated prestressed elements: girders, beams, purlins products manufactured in the plant. Their production resources and processing stages are similar to production other prefabricated elements in the plant, so it is possible to average the production by product weight.

System limits

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 is not used for manufactured elements.

Modules A1 and A2: *Raw materials supply and transport*

Modules A1 and A2 present the extraction and processing of raw materials (cement, aggregates, steel reinforcement, water, additives) and transport to the production site. Mainly steel elements and concrete are used to produce prefabricated elements. The plant has its own concrete production plant. Supporting materials come from local Polish suppliers (specific). Data regarding the transportation of various products to manufacturing plants is collected and modeled for the factory by the assessor. Module A2 (transport) covers truck and rail transport and uses Polish and European averages for fuel data.

Module A3: *Production*

The production of prefabricated reinforced concrete elements consists mainly of two materials: concrete (cement, aggregates, additives, water, based on recipes delivered by manufacturer)) and steel reinforcing, which is prepared in advance. The production of concrete consisting of aggregate, cement and water takes place in the company's concrete mixing plant. Prefabricated elements are first formed, after the concrete has matured, the elements are demolded and then transported to the finished products warehouse. The next stage is loading and transport to the recipient of the product. The production processes carried out at DBB Białe Błota Sp. z o.o. Sp. k. are shown in Figure 2.

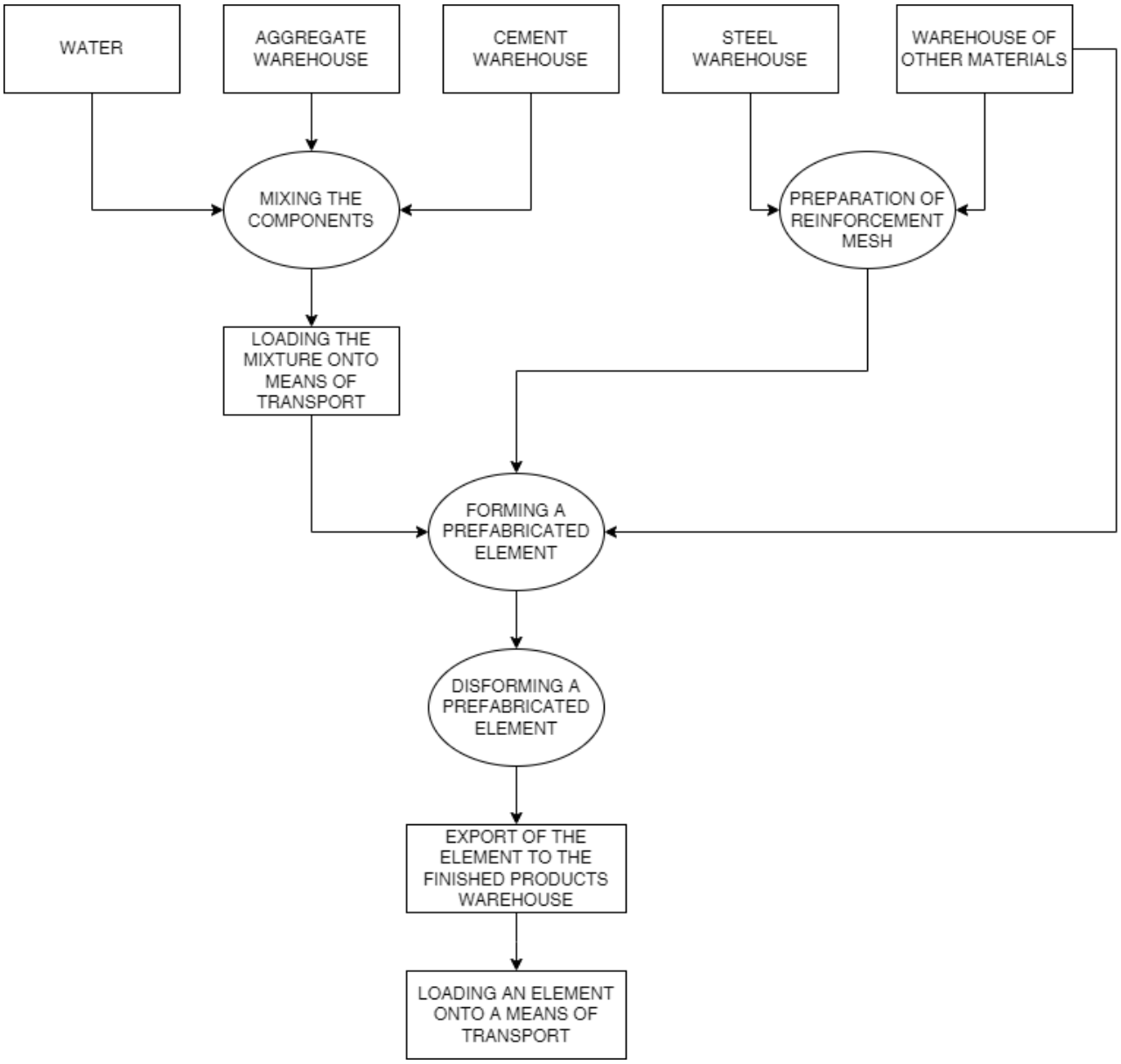

Figure 2. Diagram of the manufacturing process of prefabricated prestressed elements: girders, beams, purlins

Module A4: *Transport to consumer*

Vehicle transport at distance 100 km is considered (emission standard: Euro 5) with 100% load capacity.

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

Prefabricated reinforced elements constitutes intermediate products. Versatile application of prefabricated reinforced elements excludes the possibility of precise modeling of the occurring at the de construction stage thus the module C1 is estimated within this EPD based on approx. energy consumption for demolition process. In the adapted end of life scenario, the de constructed products are transported to a waste processing plant distant by 50 km on > 16t lorry EURO 5, where undergo shredding with the use of crawler gear crusher equipped with magnetic separator (115 kW, electric drive) module C3. Recovered materials undergo re use, recycling and landfilling according to the Polish treatment practice of industrial wastes Table 1. The remaining materials are classified as inert

wastes in the European list of waste products and are forwarded to a landfill in the form of mixed construction and demolition wastes. Environmental impacts declared in module C4 are associated with exchanges to process specific burdens. Module D presents potential credits resulting from the use of crushed concrete wastes as aggregates for road foundation or ballast and the recycling of the steel reinforcement. Module D presents credits resulting from the recycling of the primary steel scrap, calculated in accordance with the net scrap approach developed by World Steel Association. Impacts of materials that constitute less than 1.0% of the total system flows were not taken into consideration.

Table 1. End-of-life scenario for the prefabricated prestressed elements: girders, beams, purlins

Material	Material recovery	Recycling	Landfilling
concrete	90%	90%	10%
steel	90%	95%	5%

Electricity at end of life (module C) has been modelled using an average Polish 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 01.01.2023 – 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 DBB Białe Błota Sp. z o.o. Sp. k. 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 (EPD for cement). 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 ver. 3.10 supplemented by actual national KOBiZE data) emission factor used is 0.698 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 the prefabricated prestressed elements: girders, beams, purlins produced by DBB Białe Błota Sp. z o.o. Sp. K. in Poland. The following life cycle modules (Table 2) were included in the analysis. The following tables 3-6 show the environmental impacts of the life cycle of selected modules (A1-A4+C1-C4+D).

Table 2. 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	MD	MND	MND	MND	MND	MND	MND	MND	MND	MD	MD	MD	MD	MD

Table 3. Life cycle assessment (LCA) results of the product – environmental impacts (DU: 1 ton)

Indicator	Unit	A1	A2	A3	A1-A3	A4	C1	C2	C3	C4	D
Global Warming Potential	eq. kg CO_2	1.57E+02	1.64E+01	7.23E+00	1.80E+02	1.67E+01	8.37E+00	8.34E+00	1.50E+01	2.12E+00	-1.05E+01
Greenhouse potential - fossil	eq. kg CO_2	1.55E+02	1.62E+01	7.12E+00	1.78E+02	1.66E+01	4.87E+00	8.31E+00	1.50E+01	2.11E+00	-1.05E+01
Greenhouse potential - biogenic	eq. kg CO_2	2.61E-01	1.72E-01	1.65E-01	5.99E-01	5.68E-02	1.09E-02	2.84E-02	5.11E-02	1.33E-02	-8.00E-03
Global warming potential - land use and land use change	eq. kg CO_2	5.08E-02	1.11E-02	2.00E-03	6.39E-02	6.52E-03	1.31E-03	3.26E-03	5.87E-03	2.06E-03	-3.93E-02
Stratospheric ozone depletion potential	eq. kg CFC 11	8.20E-07	3.31E-06	2.00E-07	4.33E-06	3.85E-06	9.77E-07	1.92E-06	3.46E-06	7.46E-07	-1.68E-06
Soil and water acidification potential	eq. mol H+	5.21E-01	8.27E-02	6.29E-02	6.67E-01	6.75E-02	6.55E-02	3.37E-02	6.07E-02	1.88E-02	-3.67E-01
Eutrophication potential - freshwater	eq. kg P	1.60E-02	2.51E-03	1.06E-02	2.91E-02	1.12E-03	2.90E-04	5.59E-04	1.01E-03	4.04E-04	-1.38E-02
Eutrophication potential - seawater	eq. kg N	6.97E-02	2.69E-02	9.36E-03	1.06E-01	2.04E-02	2.83E-02	1.02E-02	1.83E-02	6.51E-03	-3.36E-02
Eutrophication potential - terrestrial	eq. mol N	1.51E+00	2.91E-01	7.80E-02	1.88E+00	2.22E-01	3.09E-01	1.11E-01	2.00E-01	7.10E-02	-4.47E-01
Potential for photochemical ozone synthesis	eq. kg NMVOC	3.61E-01	8.48E-02	2.22E-02	4.68E-01	6.80E-02	8.12E-02	3.40E-02	6.12E-02	2.06E-02	-1.12E-01
Potential for depletion of abiotic resources - non-fossil resources	eq. kg Sb	1.56E-04	6.34E-05	2.79E-05	2.47E-04	5.89E-05	2.78E-05	2.95E-05	5.30E-05	5.98E-06	-2.59E-03
Abiotic depletion potential - fossil fuels	MJ	7.56E+02	2.40E+02	1.06E+02	1.10E+03	2.47E+02	6.30E+01	1.23E+02	2.22E+02	5.32E+01	-3.16E+02
Water deprivation potential	eq. m^3	2.66E+01	2.02E+00	2.00E+00	3.07E+01	1.14E+00	2.33E-01	5.70E-01	1.03E+00	2.33E-01	-2.25E+01

Table 4. Life cycle assessment (LCA) results of the product – additional impacts indicators (DU: 1 ton)

Indicator	Unit	A1-A4	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 5. Life cycle assessment (LCA) results of the the product - the resource use (DU: 1 ton)

Indicator	Unit	A1	A2	A3	A1-A3	A4	C1	C2	C3	C4	D
Consumption of renewable primary energy - excluding renewable primary energy sources used as raw materials	MJ	2.86E+01	8.89E+00	7.00E+00	4.45E+01	3.54E+00	2.66E-04	1.77E+00	3.19E+00	6.78E-01	-3.58E+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	0.00E+00
Total consumption of renewable primary energy resources	MJ	2.86E+01	8.89E+00	7.03E+00	4.45E+01	3.54E+00	6.92E-01	1.77E+00	3.19E+00	6.78E-01	-3.58E+01
Consumption of non-renewable primary energy - excluding renewable primary energy sources used as raw materials	MJ	3.48E+02	2.40E+02	9.46E+01	6.82E+02	2.47E+02	7.33E-01	1.23E+02	2.22E+02	5.52E+01	-3.01E+02
Consumption of non-renewable primary energy resources used as raw materials	MJ	4.09E+02	0.00E+00	1.33E+01	4.22E+02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total consumption of non-renewable primary energy resources	MJ	7.59E+02	2.40E+02	1.08E+02	1.11E+03	2.47E+02	6.82E+01	1.23E+02	2.22E+02	5.52E+01	-3.16E+02
Consumption of secondary materials	kg	6.36E+01	1.42E-01	9.73E-03	6.38E+01	8.27E-02	0.00E+00	4.14E-02	7.44E-02	6.07E-03	-4.36E-01
Consumption of renew. secondary fuels	MJ	1.48E-03	8.79E-04	5.06E-05	2.41E-03	9.11E-04	4.09E-09	4.56E-04	8.20E-04	1.59E-04	-1.14E-02
Consumption of non-renewable secondary fuels	MJ	1.68E-01	0.00E+00	7.63E-02	2.45E-01	0.00E+00	6.89E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Net consumption of freshwater	m^3	1.20E+00	5.55E-02	3.58E-02	1.29E+00	3.10E-02	3.22E-03	1.55E-02	2.79E-02	3.54E-02	-5.58E-01

Table 6. Life cycle assessment (LCA) results of the product – waste categories (DU: 1 ton)

Indicator	Unit	A1	A2	A3	A1-A3	A4	C1	C2	C3	C4	D
Hazardous waste	kg	7.88E-01	5.17E-01	4.17E-02	1.35E+00	2.77E-01	2.13E-04	1.38E-01	2.49E-01	3.07E-02	-2.10E+00
Non-hazardous waste	kg	1.64E+01	1.12E+01	4.17E+01	6.93E+01	4.92E+00	1.62E-01	2.46E+00	4.42E+00	1.01E+02	-5.82E+01
Radioactive waste	kg	2.62E-03	5.42E-05	7.40E-05	2.75E-03	1.84E-05	4.34E-04	9.21E-06	1.66E-05	3.40E-04	-7.59E-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	0.00E+00
Materials for recycling	kg	1.05E+01	8.12E-04	2.92E+02	3.02E+02	7.64E-04	3.86E-11	3.82E-04	6.87E-04	5.78E-05	-4.07E-03
Materials for energy recovery	kg	2.86E+00	7.67E-06	9.49E-07	2.86E+00	6.18E-06	2.24E-14	3.09E-06	5.56E-06	6.85E-07	-3.78E-04
Exported Energy	MJ	5.07E-01	0.00E+00	2.89E-01	7.96E-01	0.00E+00	5.60E-06	0.00E+00	0.00E+00	0.00E+00	-8.16E-01

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.) ☒ external ☐ 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 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: 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 (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

- EN 13225:2013, Precast concrete products - Linear structural elements
- EN 1168:2005+A3:2011, Precast concrete products - Hollow core slabs
- EN 14992:2007+A1:2012, Precast concrete products - Wall elements
- ITB PCR A General Product Category Rules for Construction Products (2023, ver. 1.6)
- 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 CO_2, SO_2, NO_x, CO i pyłu całkowitego dla energii elektrycznej. December 2022
- ▪ World Steel Association 2017 Life Cycle inventory methodology report for steel products
- https://ecoinvent.org/

Instytut Techniki Budowlanej

Instytut Techniki Budowlanej
00-611 Warsaw, Filtrowa 1

Thermal Physics, Acoustics and Environment Department
02-656 Warsaw, Ksawerów 21

CERTIFICATE № 647/2024
of TYPE III ENVIRONMENTAL DECLARATION

Products:

Prefabricated prestressed elements: girders, beams, purlins

Manufacturer:

DBB Białe Błota Sp. z o.o. Sp. k.
Betonowa 1, 86-005 Białe Błota, 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 19th July 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

INSTYTUT TECHNIKI BUDOWLANEJ

Deputy Director for Research and Innovation
Krzysztof Kuczyński, PhD

Warsaw, July 2024