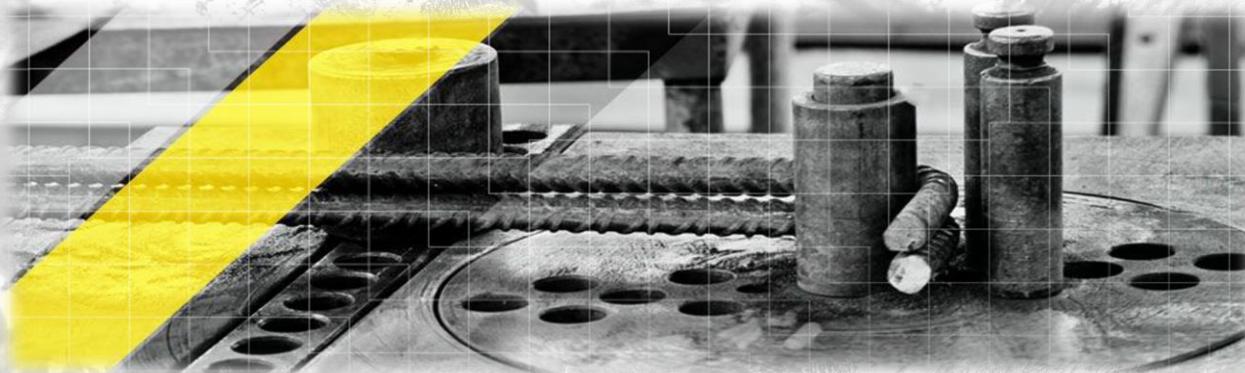




Issuance date: 26.05.2023
Valid to: 26.05.2028

Reinforcing steel



Owner of the EPD

TOM2 Sp. z o. o.
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EPD Program Operator

Instytut Techniki Budowlanej (ITB)
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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 environmental impacts of the declared construction materials. 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 according to EN 15804+A2 (Cradle to Gate with options)
The year of preparing the EPD	2023
Product standard	PN-H-93220; PN-EN 10080; DIN 488; PN-EN1992-1-1
Reference Service Life	Over the service life of building/construction (ca. 60-100 years)
PCR	ITB-PCR A v. 1.6 (PCR based on EN 15804)
Declared unit	1 kg of reinforcing steel
Reasons for performing LCA B2B	B2B
Representativeness	Polish products. 2022

MANUFACTURER

TOM2 Sp. z o. o. as a long-term supplier of steel products, in response to customer demand started in 2007 the production of reinforcements in its own plant located in Szczecin (Poland) at Pomorska Street. Modern computer-controlled machines, cutting lines, automatic stirrup machines, double bending machines and bending tables enable the execution of construction reinforcements in accordance with all expectations. The monthly manufacturing capacity amounts to 5.000 tonnes of processed output. TOM2 accomplish sales volumes which exceed 100.000 tonnes of steel (trade and cut&bent steel) per year.

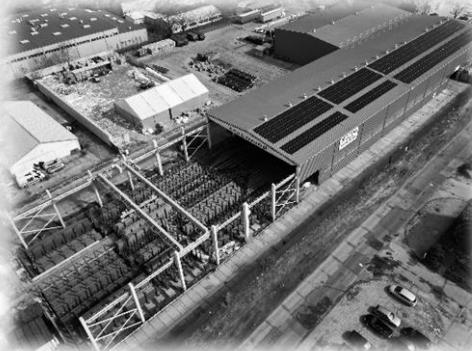
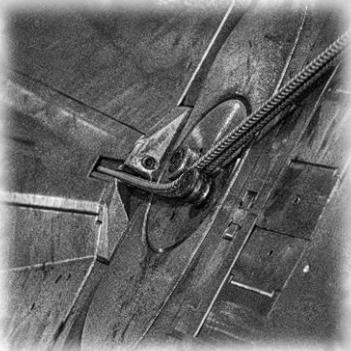


PRODUCT DESCRIPTION AND APPLICATION



The **reinforcing steel** produced by TOM2 is available in a wide range of tailor-made products (Table 1). The machine park owned by TOM2 Sp. z o.o. ensures the production of elements in any shapes. made of ribbed steel in diameters ranging between 8 mm and 32 mm and also spatial figures (3D) such as. baskets. piles and beams based on technical documentation presented by the client. The steel used for the production purposes in TOM2 production plant is provided with all the required certificates and approvals from the Road and Bridge Research Institute (IBDiM) and Building Research Institute (ITB). Each batch of material that leaves TOM2 Sp. z o.o. plant is provided with the necessary goods

dispatched notes and metallurgical certificates. The certificated and technical documentation are available on TOM2 website. The steel purchased for production contains a high recycled content of about 95%.



Type III Environmental Product Declaration ITB No. 458/2023

Table 1. Specification of the reinforcing steel covered by this EPD

Product	Type	Class	Standard
Reinforcing steel Ø 8-32 mm	B500B B500C K500C-T	B and C	PN-EN-1992-1-1:2008 PN-EN 10080:2007 DIN 488-1:2009 PN-H-93220:2018-02 EN10080:2005 SS212540:2014

The reinforcing steel is intended for dozens of various applications in construction, such as:

- prefabrication,
- industrial facilities,
- residential facilities,
- roads,
- viaducts and bridges,
- foundations,
- wind farms.

LIFE CYCLE ASSESSMENT (LCA) – general rules applied

Unit

The declaration refers to the functional unit of 1 kg of steel product.

Allocation

The allocation rules used for this EPD are based on a product mass basis in accordance with ITB PCR A v.1.6.. Production of the reinforcing steel is a line process in the manufacturing plant of TOM2 located in Szczecin (Poland). All impacts from raw materials extraction and processing were allocated in module A1 of the LCA. All impacts from TOM2 Sp. z o.o. line production were inventoried and 100% was allocated to the production of the reinforcing steel (module A3). Module A2 includes transport of raw materials from their suppliers to TOM2 Sp. z o.o. manufacturing plant in Szczecin (Poland). Water and energy consumption, as well as associated emissions and generated wastes were allocated to module A3.

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. A4- Transport to Site. A5- Installation. 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. 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.

System limits

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 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 use and mass per modules. Machines and facilities required during production are neglected. The production of etiquettes was not considered. Electromechanical elements such as levellers were not taken into account in the calculations.

Modules A1 and A2: Raw materials supply and transport

Steel semi-products such as coils and bars (specific low impact, EAF, 95% scrap), additives (connectors, spacers) and packaging materials (big-bags, lifting slings and pallets) come from specified both Polish and foreign suppliers. Means of transport include trucks and sea freight. For calculation purposes Polish and European fuel averages were applied.

Module A3: Production

The production scheme of the reinforcing steel is presented in Fig. 2. 100% solar made electricity (own by TOM2) is used for a production.

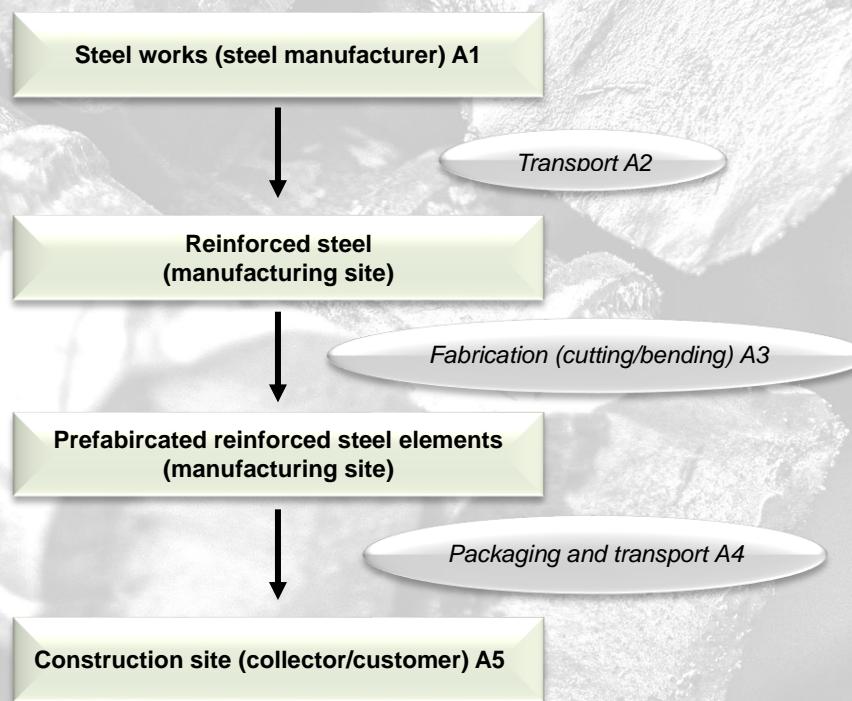


Fig. 2. The production scheme of the reinforcing steel by TOM2 Sp. z o.o.

Module A4, A5: transport to construction site and Installation

Transport of the packed product from factory gate to the place of installation is considered. Delivery of the final product over a distance of 500 km by truck (Euro 5) was assumed. Installation is done with support of power tools, assuming only electricity consumption.

Modules C3, C4 and D: End-of-life

At the end-of-life the reinforcing steel is deconstructed with the use of machines, electrical tools and separators. It is assumed that 100% of the resulting steel scrap is recovered and undergo recycling after cutting and shredding while the remaining waste is forwarded to landfill in the form of mixed construction and demolition wastes. Environmental burdens declared in module C4 are associated with waste-specific emissions to air and groundwater via landfill gas incineration and landfill leachate. Loads and benefits beyond the system boundary were calculated using a net scrap formulation. A potential credit presented in module D results from a net output of 7.2 kg scrap assuming that 1092 kg of input was used in the manufacturing of 1 tonne of steel semi-product.

Table 2. End-of-life scenario for reinforcing steel produced by TOM2 Sp. z o. o.

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

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 C) has been modelled. 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 inventoried data refer to the period between 01.01.2022 and 31.12.2022 (1 year). The life cycle assessments were prepared for Poland as reference area.

Data quality

The data selected for LCA originate from ITB-LCI questionnaires (1 manufacturing plants) completed by producer and verified via 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 (additives, transport, energy and packaging) and specific EPDs (steel). The background data for energy is national based on KOBiZE/GUS reports (Polish electricity mix and combustion factors for fuels). Specific (LCI) data quality analysis was a part of the input data verification. Where no background data was available, data gaps were complemented by literature research.

Assumptions and estimates

The impacts of the representative gates products were aggregated using mass averaged approach per unit.

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

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Additional information

Polish electricity mix used is 0.698 kg CO₂/kWh (KOBiZE 2021). European electricity mix used is 0.430kg CO₂/kWh for the end of life (Ecoinvent v3.9. RER). Production process electricity impact (solar panels, 100% RWE) used is 0.1 kg CO₂/kWh (Ecoinvent v3.9, for Poland).

LIFE CYCLE ASSESSMENT (LCA) – Results

Declared unit

The LCA indicators refer to declared unit (DU) – 1 kg of the reinforcing steel produced by TOM2 Sp. z o.o.

Table 3. System boundaries for the environmental characteristic of the reinforcing steel produced by TOM2 Sp. z o.o.

Environmental assessment information (MNA – Module not assessed. MD – Module Declared. INA – Indicator Not Assessed)																
Product stage			Construction press		Use stage							End of life				Benefits and loads beyond the system boundary
Raw material supply	Transport	Manufacturing	Transport to construction	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	MNA	MNA	MNA	MNA	MNA	MNA	MNA	MD	MD	MD	MD	MD

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 (17065/17025 certified).

ITB is the recognized and registered member of The European Platform for EPD program operators and LCA practitioner. The ITB-EPD program meets the requirements of the third-party verification. EPD declarations are verified by external LCA experts associated in the EPD program in compliance with ISO 14025.

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Table 4. Life cycle assessment (LCA) results for reinforcing steel product – environmental impacts (DU: 1 kg)

Indicator	Unit	A1	A2	A3	A1-A3	A4	A5	C1	C2	C3	C4	D
Global Warming Potential	eq. kg CO ₂	4.47E-01	3.28E-02	5.32E-04	4.80E-01	8.34E-02	4.65E-05	6.98E-03	1.10E-02	6.39E-02	1.06E-04	-4.41E-02
Greenhouse potential - fossil	eq. kg CO ₂	8.13E-03	7.60E-02	5.10E-04	8.47E-02	8.31E-02	4.57E-05	6.85E-03	1.10E-02	6.38E-02	1.05E-04	-4.30E-02
Greenhouse potential - biogenic	eq. kg CO ₂	4.39E-01	3.81E-04	2.23E-05	4.39E-01	2.84E-04	1.33E-06	2.00E-04	3.76E-05	1.33E-05	2.68E-07	-1.04E-03
Global warming potential - land use and land use change	eq. kg CO ₂	4.36E-04	4.56E-05	8.99E-07	4.82E-04	3.26E-05	1.60E-08	2.40E-06	4.32E-06	1.01E-05	9.94E-08	-5.50E-05
Stratospheric ozone depletion potential	eq. kg CFC 11	4.85E-08	1.65E-08	3.29E-11	6.51E-08	1.92E-08	9.33E-13	1.40E-10	2.55E-09	7.80E-01	4.26E-11	-3.08E-09
Soil and water acidification potential	eq. mol H ⁺	3.55E-03	4.00E-01	4.01E-06	4.04E-01	3.37E-04	5.07E-07	7.60E-05	4.47E-05	5.32E-04	9.90E-07	-1.63E-04
Eutrophication potential - freshwater	eq. kg P	2.81E-05	7.32E-06	3.91E-07	3.58E-05	5.59E-06	8.67E-08	1.30E-05	7.40E-07	4.32E-07	9.81E-09	-2.69E-05
Eutrophication potential - seawater	eq. kg N	1.06E-03	9.01E-05	2.38E-06	1.15E-03	1.02E-04	7.33E-08	1.10E-05	1.35E-05	1.81E-03	3.45E-07	-3.89E-05
Eutrophication potential - terrestrial	eq. mol N	1.31E-02	1.91E-04	6.53E-06	1.33E-02	1.11E-03	6.20E-07	9.30E-05	1.47E-04	3.42E-03	3.77E-06	-3.85E-04
Potential for photochemical ozone synthesis	eq. kg NMVOC	3.02E-03	3.00E-04	2.07E-06	3.33E-03	3.40E-04	1.73E-07	2.60E-05	4.50E-05	7.46E-04	1.10E-06	-1.61E-04
Potential for depletion of abiotic resources - non-fossil resources	eq. kg Sb	1.52E-08	4.75E-07	2.91E-08	5.19E-07	2.95E-07	2.23E-10	3.34E-08	3.90E-08	1.45E-08	2.42E-10	-6.17E-07
Abiotic depletion potential - fossil fuels	MJ	8.38E+00	1.11E+00	6.44E-03	9.49E+00	1.23E+00	7.73E-04	1.16E-01	1.63E-01	6.05E-02	2.89E-03	-6.46E-01
Water deprivation potential	eq. m ³	1.06E-01	6.82E-03	9.30E-04	1.14E-01	5.70E-03	1.60E-05	2.40E-03	7.55E-04	1.42E-03	9.16E-06	-4.40E-02

Table 5. Life cycle assessment (LCA) results for steel products – additional impacts indicators (DU: 1 kg)

Indicator	Unit	A1-A5	C1-C4	D
Particulate matter	disease incidence	INA	INA	INA
Potential human exposure efficiency relative to U235	eq. 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

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Table 6. Life cycle assessment (LCA) results for reinforcing steel products – the 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	1.31E-01	2.37E-02	1.90E-02	1.74E-01	1.77E-02	5.73E-05	8.60E-03	2.34E-03	1.11E-03	2.51E-05	-4.09E-02
Consumption of renewable primary energy resources used as raw materials	MJ	2.63E+00	0.00E+00	0.00E+00	2.63E+00	0.00E+00						
Total consumption of renewable primary energy resources	MJ	2.76E+00	2.37E-02	1.90E-02	2.80E+00	1.77E-02	5.73E-05	8.60E-03	2.34E-03	1.11E-03	2.51E-05	-4.09E-02
Consumption of non-renewable primary energy - excluding renewable primary energy sources used as raw materials	MJ	2.18E+00	1.11E+00	6.44E-03	3.29E+00	1.23E+00	7.76E-04	1.16E-01	1.63E-01	3.30E+00	0.00E+00	0.00E+00
Consumption of non-renewable primary energy resources used as raw materials	MJ	6.64E+00	0.00E+00	0.00E+00	6.64E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.01E+00	0.00E+00	0.00E+00
Total consumption of non-renewable primary energy resources	MJ	8.81E+00	1.11E+00	6.44E-03	9.93E+00	1.23E+00	7.76E-04	1.16E-01	1.63E-01	6.06E-02	2.89E-03	-6.88E-01
Consumption of secondary materials	kg	1.27E+00	5.83E-04	8.79E-06	1.27E+00	4.14E-04	7.07E-08	1.06E-05	5.48E-05	2.74E-05	6.07E-07	-1.75E-03
Consumption of renew. secondary fuels	MJ	5.30E-03	6.90E-06	3.20E-07	5.31E-03	4.56E-06	3.94E-10	5.91E-08	6.03E-07	3.72E-07	1.59E-08	-7.97E-06
Consumption of non-renewable secondary fuels	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.26E-07	9.39E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Net consumption of freshwater	m ³	3.17E-03	1.81E-04	1.04E-04	3.46E-03	1.55E-04	2.10E-07	3.15E-05	2.05E-05	5.36E-05	3.16E-06	-1.11E-04

Table 7. Life cycle assessment (LCA) results for steel products – waste categories (DU: 1 kg)

Indicator	Unit	A1	A2	A3	A1-A3	A4	A5	C1	C2	C3	C4	D
Hazardous waste	kg	1.17E-04	1.75E-03	1.68E-04	2.04E-03	1.38E-03	8.00E-09	1.20E-06	1.83E-04	4.35E-09	3.07E-06	-1.55E-06
Non-hazardous waste	kg	1.03E-01	3.21E-02	1.40E-03	1.37E-01	2.46E-02	4.16E-07	6.24E-05	3.25E-03	1.14E-02	4.32E-05	-3.45E-02
Radioactive waste	kg	5.33E-05	1.20E-07	7.84E-09	5.35E-05	9.21E-08	5.80E-10	8.70E-08	1.22E-08	3.23E-07	1.92E-08	-4.15E-06
Components for re-use	kg	0.00E+00										
Materials for recycling	kg	1.74E-01	6.17E-06	1.13E-02	1.85E-01	3.82E-06	8.00E-10	1.20E-07	5.06E-07	4.04E-07	5.78E-09	0.00E+00
Materials for energy recovery	kg	3.35E-09	3.43E-08	7.13E-10	3.84E-08	3.09E-08	7.00E-12	1.05E-09	4.09E-09	5.04E-09	6.85E-11	0.00E+00
Exported Energy	MJ	8.72E-04	2.00E-05	2.62E-05	9.18E-04	0.00E+00	2.31E-06	3.46E-04	0.00E+00	6.17E-02	0.00E+00	0.00E+00

Type III Environmental Product Declaration ITB No. 458/2023

Verification

The process of this EPD verification 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 this validity period, 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.)

external

internal

External verification of EPD: Ph.D. eng. Halina Prejzner

Verification of LCI/LCA: Ph.D. D.Sc. eng. Michał Piasecki. m.piasecki@itb.pl

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: 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 (17065/17025 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. V1.6 General Product Category Rules for Construction Products (2023)
- 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.
- EN 15942:2012 Sustainability of construction works - Environmental product declarations - Communication format business-to-business.
- PN-EN 1992-1-1:2008 Eurokod 2 -- Projektowanie konstrukcji z betonu -- Część 1-1: Reguły ogólne i reguły dla budynków.
- PN-EN 10080:2007 Stal do zbrojenia betonu. Spajalna stal zbrojeniowa. Postanowienia ogólne.
- DIN 488-1:2009-08 Reinforcing steels - Part 1: grades, properties, marking.
- PN-H-93250:2018-02 Stal do zbrojenia betonu -- Spajalna stal zbrojeniowa B500SN -- Pręty i walcówka żebrowana.
- World Steel Association 2017 Life Cycle inventory methodology report for steel products.
- KOBIZE Wskaźniki emisjyjności CO₂, SO₂, NO_x, CO i pyłu całkowitego dla energii elektrycznej. grudzień 2020.
- <https://ecoinvent.org/>



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

CERTIFICATE № 458/2023 of TYPE III ENVIRONMENTAL DECLARATION

Products:

Reinforcing steel

Manufacturer:

TOM2 Sp. z o.o.

ul. Pomorska 112, 70-812 Szczecin, 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

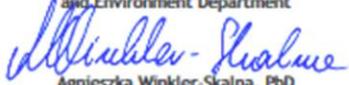
Sustainability of construction works.

Environmental product declarations.

Core rules for the product category of construction products.

This certificate, issued on 26th May 2023 is valid for 5 years
or until amendment of mentioned Environmental Declaration

Head of the Thermal Physics, Acoustics
and Environment Department


Agnieszka Winkler-Skalna, PhD



Deputy Director
for Research and Innovation

Krzysztof Kuczyński, PhD

Warsaw, May 2023