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Reinforcing steel



Owner of the EPD

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EPD Program Operator

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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 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 (see point 5.3 of the standard).

Life cycle analysis (LCA): A1-A3, C3, C4 and D according to EN 15804 (Cradle to Gate with options)

The year of preparing the EPD: 2021

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 (PCR based on EN 15804)

Declared unit: 1 tonne of reinforcing steel

Reasons for performing LCA: B2B

Representativeness: Polish products

MANUFACTURER



Fig 1. A view of TOM2 Sp. z o.o. in Szczecin (Poland).

TOM2 Sp. z o. o. is a manufacturer of construction reinforcements as well as a supplier of steel products. An additional area of business for the company is the production of spatial figures such as: columns, beams and piles. In the business seat in Szczecin, TOM2 has own modern machine park which ensures the production of elements in any shapes. The monthly manufacturing capacity of the rebar shop amounts to 2,000 tonnes of processed output. There are about 5,000 tonnes of steel on continuous sale in our warehouses. TOM2 accomplishes sales volumes which exceed 50,000 tonnes of steel per year and also deals with the sale of steel products.

PRODUCT DESCRIPTION AND APPLICATION

The reinforcing steel produced by TOM2 Sp. z o.o. is available in a wide range of tailor-made prefabricated products. Computer-controlled machines, cutting lines, automatic machines for stirrups, double bending machines and bending tables enable the provision of broad range of construction reinforcements in accordance with client's expectations. 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 Sp. z o.o. production plant is provided with all the required certificates and approvals from the Instytut Badawczy Dróg i Mostów (IBDiM) and Instytut Techniki Budowlanej (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 Sp. z o.o. website (<http://www.tom2.pl/>).

Table 1. Specification of the reinforcing steel

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

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

Allocation

The allocation rules used for this EPD are based on a product mass basis and net calorific value in accordance with ITB PCR A. Production of the reinforcing steel is a line process in the manufacturing plant of TOM2 Sp. z o.o. 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

The life cycle analysis (LCA) of the declared product covers modules A1-A3, C3, C4 and D (Cradle-to-Gate with options) in accordance with EN 15804:2012+A1:2013 and ITB PCR A. The details of the system limits are provided in the background report. Energy and water consumption, emissions to air, soil and water 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 5% of all impact categories. In accordance with EN 15804:2012+A1:2013, capital goods (e.g. machines and facilities) required for the production and transportation of employees were not included in LCA.

Modules A1 and A2: Raw materials supply and transport

Steel semi-products such as coils and bars (EAF, 95% scrap), additives (connectors, spacers) and packaging materials (big-bags, lifting slings and pallets) come from both Polish and foreign suppliers. Means of transport include trucks with load: <10t, 10 – 16t and >16t. 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.

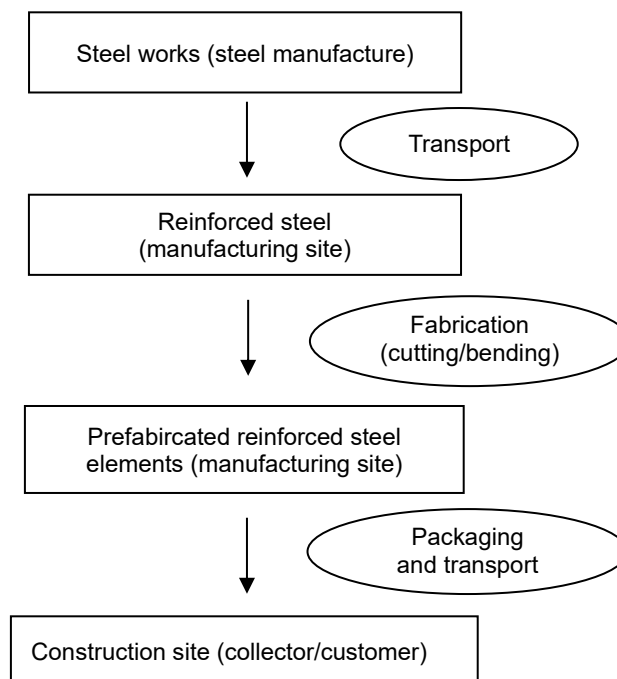


Fig. 2. The production scheme of the reinforcing steel by TOM2 Sp. z o. o.

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

At the end-of-life the reinforcing steel is deconstructed with the use of electrical tools. It is assumed that 100% of the resulting steel scrap is recovered and undergo recycling after sorting 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 occurring 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%	99%	1%

Data collection period

The inventoried data refer to the period between 01.01.2019 and 31.12.2019 (1 year). The life cycle assessments were prepared for Poland as reference area.

Data quality

The values used to calculate the LCA originate from verified TOM2 Sp. z o.o. inventory data and were audited by ITB.

Calculation rules

LCA was done in accordance with ITB PCR A document.

Databases

The data for the processes come: Ecoinvent database v.3.7. specific EPDs and ITB-LCI database. Specific data quality analysis was a part of external ISO 14001 audit.

LIFE CYCLE ASSESSMENT (LCA) – Results

Declared unit

The LCA indicators refer to declared unit (DU) – 1 tonne 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 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	MNA	MNA	MNA	MNA	MNA	MNA	MNA	MNA	MNA	MNA	MNA	MD	MD	MD

Reinforcing steel

Environmental impacts: (DU) 1 tonne								
Indicator	Unit	A1	A2	A3	A1-A3	C3	C4	D
Global warming potential	kg CO ₂ eq.	6.91E+02	8.45E+00	5.19E+00	7.04E+02	2.80E+00	5.17E-02	-5.07E+00
Depletion potential of the stratospheric ozone layer	kg CFC 11 eq.	4.35E-05	0.00E+00	0.00E+00	4.35E-05	9.63E-08	1.71E-08	-3.13E-07
Acidification potential of soil and water	kg SO ₂ eq.	3.37E+00	2.71E-01	7.62E-03	3.64E+00	1.18E-02	3.74E-04	-2.62E-02
Formation potential of tropospheric ozone	kg Ethene eq.	2.72E-01	1.81E-02	1.70E-10	2.90E-01	4.69E-04	2.82E-05	-2.09E-03
Eutrophication potential	kg (PO ₄) ³⁻ eq.	7.67E-02	3.67E-02	5.56E-04	1.14E-01	5.25E-03	8.01E-05	-8.21E-04
Abiotic depletion potential (ADP-elements) for non-fossil resources	kg Sb eq.	7.92E-04	0.00E+00	1.92E-05	8.11E-04	4.20E-06	5.72E-07	-5.84E-06
Abiotic depletion potential (ADP-fossil fuels) for fossil resources	MJ	9.68E+03	1.03E+02	4.72E+01	9.83E+03	4.54E+01	1.47E+00	-7.08E+01
Environmental aspects on resource use: (DU) 1 tonne								
Indicator	Unit	A1	A2	A3	A1-A3	C3	C4	D
Use of renewable primary energy excluding renewable primary energy resources used as raw materials	MJ	INA	INA	INA	INA	INA	INA	INA
Use of renewable primary energy resources used as raw materials	MJ	INA	INA	INA	INA	INA	INA	INA
Total use of renewable primary energy resources (primary energy and primary energy resources used as raw materials)	MJ	2.58E+03	7.18E+00	6.54E+00	2.60E+03	1.05E+01	2.70E-02	-1.87E+01
Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials	MJ	INA	INA	INA	INA	INA	INA	INA
Use of non-renewable primary energy resources used as raw materials	MJ	INA	INA	INA	INA	INA	INA	INA
Total use of non-renewable primary energy resources (primary energy and primary energy resources used as raw materials)	MJ	1.02E+04	1.08E+02	4.95E+01	1.03E+04	3.31E+01	1.55E+00	-7.43E+01
Use of secondary material	kg	1.36E+03	0.00E+00	0.00E+00	1.36E+03	0.00E+00	0.00E+00	-9.82E+00
Use of renewable secondary fuels	MJ	5.60E-03	5.39E+00	0.00E+00	5.39E+00	0.00E+00	0.00E+00	0.00E+00
Use of non-renewable secondary fuels	MJ	3.09E-06	0.00E+00	0.00E+00	3.09E-06	0.00E+00	0.00E+00	0.00E+00
Net use of fresh water	m ³	INA	INA	INA	INA	INA	INA	INA
Other environmental information describing waste categories: (DU) 1 tonne								
Indicator	Unit	A1	A2	A3	A1-A3	C3	C4	D
Hazardous waste disposed	kg	6.01E-02	1.57E-05	0.00E+00	6.01E-02	1.52E-05	2.17E-06	-4.33E-04
Non-hazardous waste disposed	kg	1.02E+02	7.03E-03	5.97E-01	1.03E+02	2.05E-01	1.00E+01	-7.42E-01
Radioactive waste disposed	kg	6.39E-02	4.06E-05	0.00E+00	6.39E-02	1.15E-04	9.67E-06	-4.60E-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
Materials for recycling	kg	1.90E+02	0.00E+00	1.74E+01	2.08E+02	9.90E+02	0.00E+00	-1.49E+00
Materials for energy recover	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Exported energy	MJ per energy carrier	INA	INA	INA	INA	INA	INA	INA

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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.) <input checked="" type="checkbox"/> external <input type="checkbox"/> internal
External verification of EPD: Ph.D. Halina Prejzner Input data verification, LCI audit, LCA: Ph.D. Eng. Justyna Tomaszewska. j.tomaszewska@itb.pl Verification of LCA: Ph.D. Eng. Michał Piasecki. m.piasecki@itb.pl

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+A1:2013 Sustainability of construction works - Environmental product declarations - Core rules for the product category of construction products.
- 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 emisyjności CO₂, SO₂, NO_x. CO i pyłu całkowitego dla energii elektrycznej. grudzień 2020.

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dr inż. Agnieszka Winkler-Skalna
Kierownik Zakładu Fizyki Ciepłej,
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Thermal Physics, Acoustics and Environment Department
02-656 Warsaw, Ksawerów 21

CERTIFICATE No 197/2021
of TYPE III ENVIRONMENTAL DECLARATION

Product:

Reinforcing steel

Manufacturer:

TOM2 Sp. z o.o.

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

PN-EN 15804+A1

Sustainability of construction works.

Environmental product declarations.

Core rules for the product category of construction products.

This certificate, issued for the first time on 25th March 2021 is valid for 5 years
or until amendment of mentioned Environmental Declaration

Acting Head of the Thermal Physic, Acoustics
and Environment Department


Agnieszka Winkler-Skalna, PhD



Deputy Director
for Research and Innovation


Krzysztof Kuczyński, PhD

Warsaw, March 2021