Environmental Product Declaration Type III ITB No. 129/2020

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STAL-SERVICE Sp. z o.o.

Steel products for concrete reinforcement

EPD Program Operator:

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Basic information

This declaration is the type III Environmental Product Declaration (EPD) based on EN 15804:2012+A1 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. Their aspects were verified by the independent auditoraccording to ISO 14025. Basically, a comparison or evaluation of EPD data is possible only if all the compared data were created according to EN 15804:2012+A1 (see point 5.3 of the standard).

Life cycle analysis (LCA): A1-A3, C1-C4 and D modules in accordance with EN 15804:2012+A1 (Cradle to Gate with options)

The year of preparing the EPD: 2020

Service Life: not declared by producer**,** calculation in accordance to EN 1990:2004

PCR: ITB-PCR A (PCR based on EN 15804+A1)

Declared Unit (DU): 1 kg of steel product

Reasons for performing LCA: B2B

Representativeness: Polish production, year 2019

MANUFACTURER AND PRODUCTS DESCRIPTION

Stal-Service Sp. z o.o. has been established in 1997. Its production capacity continues to grow thanks to modern, fully computerised production lines and productivity. Currently, the production plant of Stal-Service produces about 90,000 tons of reinforcement and 10,000 tons of prefabricated elements annually, which are delivered to domestic and foreign markets, as shown by numerous deliveries to customers in Poland, Sweden, the Czech Republic, and Norway. The machine park allows the production of elements in any shape and format. Stal-Service become one of the largest suppliers of reinforcement to major infrastructure projects, such as the A1 and A2 motorways in Poland, and many sections of expressways, national, provincial and local roads along with associated engineering structures (bridges, viaducts and tunnels). The portfolio includes prestigious infrastructure projects as: New Łódź Fabryczna Railway Station, Sky Tower in Wrocław, II line of Warsaw Metro, Złota 44, Galeria Północna and Galeria Młociny in Warsaw, Varso Tower, A8 Hjulsta-Stockholm motorway, Harfa Gallery in Prague and southern bypass of Warsaw.

List of steel products produced at the manufacturing site.

Group	Product description	% of whole mass production in factory
Steel construction reinforcement	cut bars	55
	bars cut / bent • Ø 6÷8 grade B500A (ductility class A) • Ø 8÷40 grade B500B (ductility class B) • Ø 10÷40 grade B500SP (ductility class C)	40
	prefabricated spatial elements for concrete • cages for d-walls • reinforcement for piles • other spatial elements: retaining walls, columns, lintels.	5
	TOTAL	100

The input material for the production of construction reinforcements is reinforcing steel, which is delivered (mainly (mass based) from largest steel producers in Poland) to the Production Site in two forms;

1)
straight bars in steel bundles (in so-called commercial lengths) in the following diameters:
Ø 8 , 10 , 12 , 14 , 16 , 18 , 20 , 22 , 25 , 28 , 32, (36) , 40, (45) mm

2)
bars in coils in diameters:
Ø 6 , 8 , 10 , 12 , 14 , 16 , 20 mm

The production line includes the following basic processes:

1. Cutting process runs on cutting stations. It is cutting a reinforcing steel bar, supplied in steel bundles in commercial lengths, to the desired length using machine with scissors. The final product of the cutting process is a straight bar with a given parameter (length).
2. The bending process takes place at the bending stations. It is bending a reinforcing steel bar, previously cut to the appropriate length at the cutting station, to the desired shape with the use of machine - bender. . The final product of the bending process is a figurewith specific parameters (shape, side lengths, angles between the sides).
3. Cutting&bending process runs on cutting and bending stations using wire rod delivered in coils (spools). It consists of: straightening and cutting the bar to the required length (in the case of straight bars); straightening, cutting and bending the bar (in the case of figures).. The final product of the cutting&bending process is a straight bar with a given length parameter or a figure with specific parameters (shape, side lengths, angles between the sides).
4. The process of packing the reinforcements it is appropriate packing straight bars from bundlesof reinforcing steel delivered in commercial lengths.
5. The final product of the cutting process is the deducted number of straight bars of the required factory length (so-called bars in commercial length).
6. Last process is prefabricated spatial elements production for concrete (hereinafter: "prefabricated"). It is elements connection made from reinforcing steel and elements so-called "fixtures" (eg brands, anchorage sleeves, spacers, etc.) on the form. Joiningelements is made by using the following techniques individually or together: welding, binding with binding wire, screw connections (couplings, U-bolts, etc.).

Technical data on Stal-Service steel products can be found at https://www.stalservice.com.pl/en/offer.html

Stal-Service has also a listed number of cerificates:

- DIN EN ISO 9001 certificate for the preparation of reinforcement
- EN ISO 14001: 2004 Environmental Management Certificate
- ISO 45001: 2018
- SBS A3/026 certificate allowing reinforcement delivery to the Swedish market, issued by "Nordcert AB"
- SBS A3/026 NO certificate allowing reinforcement delivery to the Norwegian market, issued by "Nordcert AB"

LIFE CYCLE ASSESSMENT (LCA) – general rules applied

Unit

The declared unit is 1 kg of Stal-Service steel products for concrete reinforcement.

System boundary

The life cycle analysis of the declared steel products covers “Product Stage” A1-A3, and End of Life stage C1, C2, C3, C4 and gains and loads beyond system in D module (Cradle to Gate with options) accordance with EN 15804:2012+A1 and ITB PCR A.

Allocation

The allocation rules used for this EPD are based on general ITB’s PCR A. Production of the Stal-Service products is a line process in one manufacturing plant located at Stanisławów Pierwszy, Poland. Allocation of impact is done on a product mass basis (100 % of whole production). All impacts from raw materials (99% is steel) extraction are allocated in A1 module of the LCA, the input contributing more than 1% to the overall mass or energy of the systemhave been not omitted. It is estimated that the sum of any excluded flows contribute less than 2% to the impact assessment categories. The manufacturing of required machinery and other infrastructure is not considered in the LCA. 100% of impacts from a line production were inventored and allocated to product covered by this declaration. Module A2 includes transport of raw materials such as steel from supplier to manufacturing plant. Energy supply was inventoried for whole factory and 100% was allocated to the product assessed. Emissions (welding and internal stransport) in the factory are assessed using national KOBIZE 2019 emission factors for energy carriers.

System limits

99% input materials and 100% energy consumption (electricity, oil) was inventoried in manufacturing plant and were included in provided declaration. In the assessment, all significant parameters from gathered production data are considered, i.e. all material used per formulation (99% of input is steel resource), utilized energy, internal fuel and electric power consumption, direct production waste, and available emission measurements. Tires consumption for transport was not taken into account. Lubricants, precomponents, chip boards, foils, labels, tapes with a percentage share (mass basis) of less than 0.2% were not included in the calculations. It is assumed that the total sum of omitted processes does not exceed 2% of all impact categories. In accordance with EN 15804 machines and facilities (capital goods) required for and during production are excluded, as is transportation of employees.

About 10% of steel entering to production A3 did not have specific environmental data for its production, therefore for this steel weighted averages were used for Polish production (A1) with the use of mass allocation.

A1 and A2 Modules: Raw materials supply and transport

Raw material (rods or rolled steel) come mainly from supplier providing environmental data (EPDs) on a steel production (Celsa, CMC, ArcelorMittal). Data on transport (100% of input material) of the different input products to the manufacturing plants were inventoried in detail and modelled by assessor. For calculation purposes European fuel averages are applied.

A3: Production

The production process A3 is cutting, bending and forming the reinforcing steel bars.

End of life scenarios (C and D modules)

The end-of-life scenario for all products has been generalized. Steel reinforcement is infinitely recyclable, typically is recycled by demolition contractors, who sell the recovered steel (bars and reinforcement) as ferrous scrap (material recovery rate in analysed case is 85%). The steel is reclaimed by crushing the concrete and retrieving the wires with hammers, breakers, and grappling hooks mounted onto heavy equipment. According to the experience, 0.2 MJ of the energy is set to recover the bars from the material derived from the demolition was assumed. It is assumed that at the end of life the transport distance from the product deconstruction place to waste processing (C2) is 50 km on > 16 t loaded lorry with 75% capacity utilization and fuel consumption of 35 l per 100 km. Materials recovered from dismantled products are recycled and landfilled according to the Polish treatment practice of industrial waste what is presented in Table 1. The reuse, recovery and recycling potential for a new product system is considered beyond the system boundaries (module D) based on World Steel recommendations (net scrap approach) and national practice (see references).

Table 1. End of life scenarios for Stal-Service products

Progress products	Material recovery	Recycling	Landfilling
Steel products	85%	100% of recovery material	15%

Data collection period

The data for manufacture of the declared products refer to period between 01.01.2019 – 31.12.2019 (1 year). The life cycle assessments were done for Poland as reference area.

Data quality - production

The values determined to calculate A3 originate from verified Progress LCI inventory data. A1 values were prepared considering specific EPDs representing Polish steel products. Allocation for steel production impacts is done in accordance with *LCI data for Steel products Report* compiled by Brian Hughes and William Hare (2012 for World Steel Association).

Assumptions and estimates

The impacts of the representative products were aggregated using weighted average. Data regarding production per 1 kg of steel product were averaged for the analysed production. All production processes were assigned to different types of products in an equal way. Only one end-of-life scenario has been adopted.

Table 2. Assumptions for Stal-Service product system

Module	Scenario assumptions
A1 and A3	A1- 90% of steel input has specific EPDs, other steel was calculated on average data basis considering that rebar is produced by both EAF (50%) process and BF/BOF (50%). A3 -Actual (2019) manufacturing data form 1 production site Utilization of packaging material was not taken into consideration.
A2	Actual data form production site is provided including 100% transport of all inputs
C1	According to the best practice data (crushing the concrete and retrieving the wires with hammers, breakers, and grappling hooks mounted onto heavy equipment, magnetic collection), approx. 0.2 MJ/kg

C2	50 km on > 16 t loaded lorry with 75% capacity utilization and fuel consumption of 35 l per 100 km.
C3	Treatment of steel for recycling based on Ecoinvent v.3.5.data and model
C4	0.15 kg is landfilled.Treatment of steel for landfill- Ecoinvent v.3.5.data and model
D	85% product is recycled (0.85 kg). A potential environmental benefit is calculated for the end-of-life stage (module D) for all the considered impact categories. The net amount scrap approach provided by World Steel Association of scrap is used, thus module D shows an environmental benefit.

Calculation rules

LCA was done in accordance with ITB PCR A document. Characterization factors are CML ver. 4.2 based. ITB-LCA algorithms were used for impact calculations. A1 was calculated based on data from the database and specific EPD for steel, A3 and A2 are calculated based on the LCI questionnaire provided by the manufacturer.

Databases

The background data for the processes come from the following databases: Ecoinvent v.3.5 (end of life- steel processes), specific EPD for a steel providers, KOBiZE and Tauron (Polish electricity mix and combustion factors for fuels). Specific (LCI) data quality analysis was audited. The time related quality of the data used is valid (5 years).

Comparability

Basically, a comparison or an evaluation of EPD data is only possible if all the data sets to be compared were created according to EN 15804 and the building context, respectively the product-specific characteristics of performance, are taken into account.

LIFE CYCLE ASSESSMENT (LCA) – Results

Declared unit

The declaration refers to the unit DU – 1 kg of the Stal-Service Steel product.

Table 3. System boundaries (life stage modules included) in a product environmental assessment

Environmental assessment information (MA – Module assessed, MNA – Module not assessed, 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
MA	MA	MA	MNA	MNA	MNA	MNA	MNA	MNA	MNA	MNA	MNA	MA	MA	MA	MA	MA

Table 3. Environmental product characteristic – 1 kg of Stal-Service steel product

Environmental impacts: (DU) 1 kg of steel product									
Indicator	**Unit**	**A1**	**A2**	**A3**	**C1**	**C2**	**C3**	**C4**	**D**
Global warming potential	kg CO_2 eq.	7.24E-01	2.06E-02	3.21E-02	5.24E-02	3.23E-03	4.34E-03	9.00E-03	-3.63E-01
Depletion potential of the stratospheric ozone layer	kg CFC 11 eq.	3.45E-09	0.00E+00	0.00E+00	5.78E-10	0,00E+00	5.78E-09	1.65E-09	-3.71E-10
Acidification potential of soil and water	kg SO_2 eq.	3.64E-03	1.50E-04	4.06E-05	4.61E-05	2.36E-05	3.61E-04	7.50E-05	-1.82E-03
Formation potential of tropospheric ozone	kg Ethene eq.	9.31E-04	1.10E-05	1.30E-05	2.39E-04	1.72E-06	9.23E-07	1.65E-06	-4.67E-04
Eutrophication potential	kg $(PO_4)^{3-}$ eq.	2.24E-04	2.65E-05	1.18E-06	1.92E-06	4.16E-06	5.78E-04	1.20E-04	-1.12E-04
Abiotic depletion potential (ADP-elements) for non-fossil resources	kg Sb eq.	1.02E-03	0.00E+00	1.19E-07	3.89E-04	0,00E+00	4.41E-09	1.87E-08	-5.12E-04
Abiotic depletion potential (ADP-fossil fuels) for fossil resources	MJ	9.25E+00	2.29E-03	1.50E-01	6.00E-01	2.69E-02	5.78E-01	1.56E-01	-4.64E+00
Environmental aspects: (DU) 1 kg of steel product									
Indicator	**Unit**	**A1**	**A2**	**A3**	**C1**	**C2**	**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	INA
Use of renewable primary energy resources used as raw materials	MJ	INA	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	1.14E+00	1.15E-04	0.00E+00	9.00E-02	2.15E-03	7.23E-03	7.98E-04	-5.70E-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	INA
Use of non-renewable primary energy resources used as raw materials	MJ	INA	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	1.05E+01	2.41E-03	1.60E-01	5.04E-01	2.82E-02	6.14E-01	1.65E-01	-5.27E+00
Use of secondary material	kg	8.57E-01	0.00E+00	0.00E+00	0,00E+00	0,00E+00	0.00E+00	0.00E+00	-4.30E-01
Use of renewable secondary fuels	MJ	1.54E-01	1.20E-04	0.00E+00	0,00E+00	1.41E-03	0.00E+00	0.00E+00	-7.72E-02
Use of non-renewable secondary fuels	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
Net use of fresh water	m^3	4.86E-06	1.00E-06	3.76E-05	1.90E-04	2.55E-04	0.00E+00	0.00E+00	-2.44E-06
Other environmental information describing waste categories: (DU) 1 kg of steel product									
Indicator	**Unit**	**A1**	**A2**	**A3**	**C1**	**C2**	**C3**	**C4**	**D**
Hazardous waste disposed	kg	3.40E-05	4.60E-06	9.45E-06	8.00E-07	2.53E-08	1.08E-07	7.33E-08	-1.70E-05
Non-hazardous waste disposed	kg	1.37E-01	4.27E-03	2.18E-03	7.22E-03	2.35E-05	4.71E-05	1.50E-01	-6.88E-02
Radioactive waste disposed	kg	2.54E-04	0.00E+00	0.00E+00	8.00E-07	0.00E+00	2.76E-07	2.46E-07	-1.27E-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
Materials for recycling	kg	0.00E+00	0.00E+00	2.62E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+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	0.00E+00
Exported energy	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

RESULTS INTERPRETATION

Interpretation of the results has been carried out considering the methodology, data-related assumptions and limitations declared in the EPD. The environmental impact of Stal-Service steel product (cradle to gate with options) is largely dependent on the energy-intensive production of steel on which the manufacturer has only a small influence. Thus, the environmental impact of the product largely reflects the current level of environmental impact of steel in Poland due to its dominant share. The dominant amount of raw material entering the production is produced in EAF electric furnaces with the use of recycled input, therefore the environmental impact of this steel is relatively low. The steel for production is mostly of Polish origin and the weighted distance of raw material delivery does not exceed 200 km, which translates into a low impact of transport. The impact of the production line (A3 module) mainly (80% of all energy) depends on the amount of electricity consumed by manufacturing plant. There are no significant emissions or environmental impacts in the A3 production processes alone. The production process itself does not have significant environmental impacts in the life cycle. Interrogation of the LCA results show that the cradle-to-gate A1-A3 GWP (Global Warming Potential) impact of 1 kg of steel product is 0.8 $kgCO_2$ (eq). For GWP, A1-A3 (production stage) accounts for 91% of the lifecycle impact. Manufacturing process for GWP (A3) in comparison to whole life is only 4%. The production of high-quality steel as output material (module A1) therefore has the greatest impact on the environmental characteristic. The LCA results show that the cradle-to gate primary energy demand by the declared unit is 11 MJ while A1 steel production (mainly EAF) consumes 10 MJ of primary energy. The Stal-Service products, due to the high potential for recycling (85%) has significant environmental gains - module D, which is its biggest benefit in the entire life cycle (-0.36 kg CO_2 and -5.3 MJ of non-renewable primary energy).

VERIFICATION

The process of verification of this EPD was 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 15804:2012+A1 and ITB PCR A
Independent verification corresponding to ISO 14025 (sub clause 8.1.3.) ☒ external ☐ internal
External verification of EPD: Ph.D. Eng. Halina Prejzner LCA, LCI audit and input data verification: Ph.D. Eng. Michał Piasecki, m.piasecki@itb.pl Verification of LCA: Ph.D. Eng. Justyna Tomaszewska, j.tomaszewska@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
- LCI DATA FOR STEEL PRODUCTS at https://www.worldsteel.org/en/dam/jcr:04f8a180-1406-4f5c-93ca-70f1ba7de5d4/LCI%2520study_2018%2520data%2520release.pdf
- PN-EN 10080:2007 „Stal do zbrojenia betonu - Spajalna stal zbrojeniowa - Postanowienia ogólne”

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CERTIFICATE № 129/2020
of TYPE III ENVIRONMENTAL DECLARATION

Product:

Steel products for concrete reinforcement

Manufacturer:

STAL-SERVICE Sp. z o.o.
ul. Hołubcowa 123, 02-854 Warszawa

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 7th October 2020 is valid for 5 years
or until amendment of mentioned Environmental Declaration

Deputy 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, October 2020