Environmental Product Declaration

In accordance with ISO 14025 and EN 15804 for:

Hot rolled concrete steel rebar

from

Metalfer Steel Mill doo

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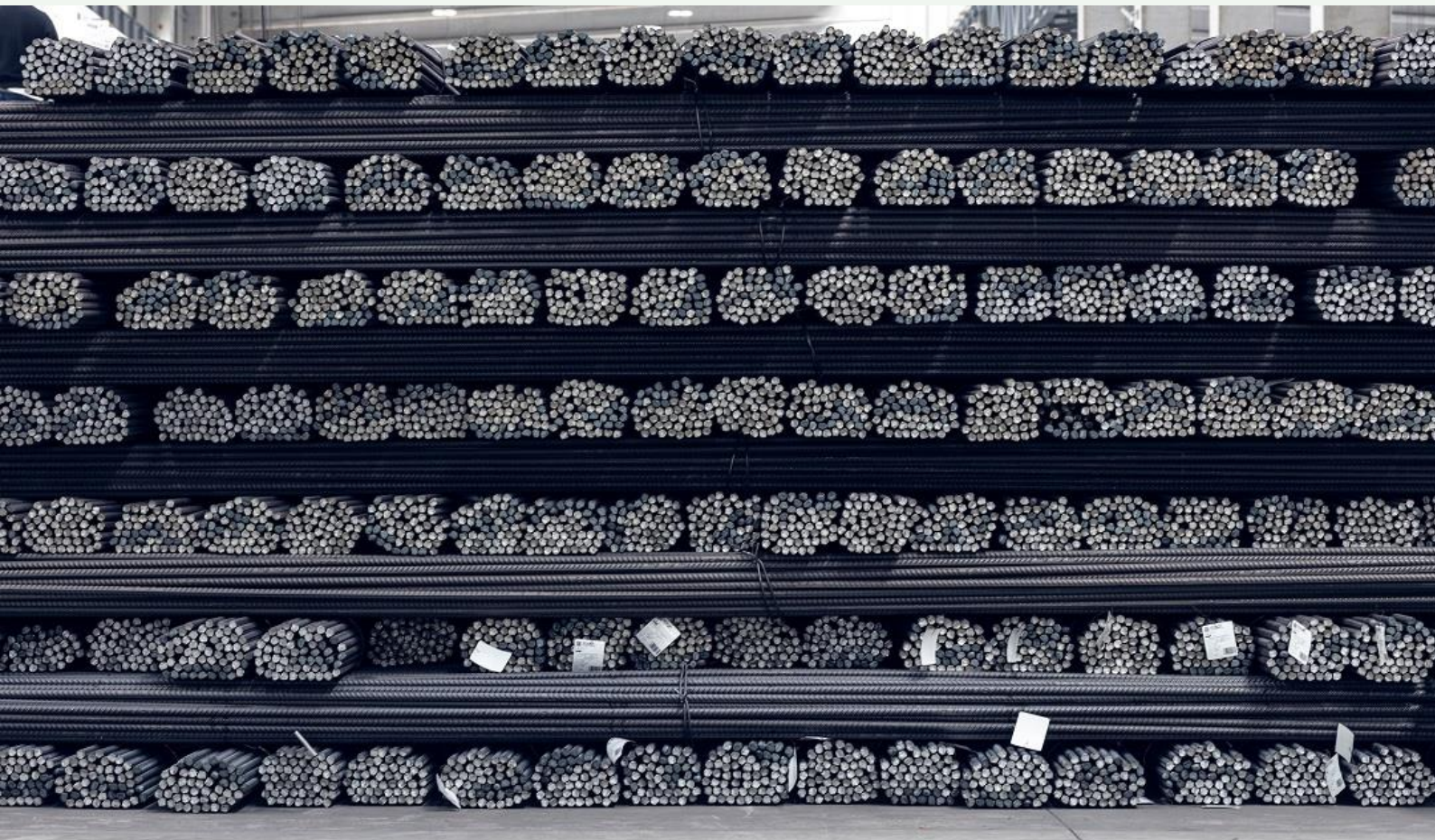

Programme information

Programme:	The International EPD® System EPD International AB Box 210 60 SE-100 31 Stockholm Sweden www.environdec.com info@environdec.com

Product category rules (PCR): *PCR 2012:01 Construction products and construction services (EN 15804:A1)*
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Third party verifier: Prof. Ing Vladimír Kočí, PhD., Prague, Czech Republic, vladimir.koci@lca.cz Approved by: The International EPD® System
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Company information

Owner of the EPD:
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Description of the organisation:
Metalfer Steel Mill (MSM) has been developed as a green field investment. It was completed in 2008 and still is the only rebar producer in Serbia.

The steel products are also exported to the neighboring markets of Montenegro, Bosnia and Herzegovina, Croatia, Macedonia, Romania and Hungary. Metalfer Steel Mill holds the following Product-related and management system- related certifications: ISO 14001; ISO 9001; ISO45001 (OH&S).

MSM is a modern mini mill based on Electric Arc Furnace meltshop with annual capacity of 500,000 MT and a rolling mill for rebars and wire in coil.

Name and location of production site:
METALFER STEEL MILL DOO SREMSKA MITROVICA, Serbia

Product information

Product name: Hot rolled concrete steel rebar
Product identification: n/a
Product description: Used in construction to increase the load-bearing capacity of concrete structures.
UN CPC code: 412 Products of iron or steel
Geographical scope: Europe, Serbia

LCA information

Functional unit / declared unit: 1 ton of rebar
Reference service life: not applicable
Time representativeness: The reference year is July 2020 to July 2021
Database(s) and LCA software used: GaBi Professional Datenbank, Version 9.2.1, 2020
Ecoinvent Datenbank, Version 3.5, 2020

System diagram:

	Product stage			Construction process stage		Use stage							End of life stage				Resource recovery stage
	Raw material supply	Transport	Manufacturing	Transport	Construction installation	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	De-construction demolition	Transport	Waste processing	Disposal	Reuse-Recovery-Recycling-potential
Module	**A1**	**A2**	**A3**	**A4**	**A5**	**B1**	**B2**	**B3**	**B4**	**B5**	**B6**	**B7**	**C1**	**C2**	**C3**	**C4**	**D**
Modules declared	X	X	X	X	ND	ND	ND	ND	ND	ND	ND	ND	ND	X	X	ND	X

Description of system boundaries: Cradle-to-gate (A1-A3) with options: A4 (Transport to Customers), C2 (Transport to End of Life), C3 (Waste processing) and D (Reuse-Recovery-Recycling-potential).

Excluded lifecycle stages: A5 (Construction installation: no data available, Packaging waste: Packaging is recycled), all phases of the use stage (as there are no emissions during the use of the product), C1 (De-construction: no data availale), C4 (disposal, as wastes are processed and recycled).

LCA Practitioner:

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Further information:

The Metalfer Steel Mill in Sremska Mitrovica has two facilities: A melt shop (smelter) and a rolling mill. In the melt shop, steel billets are made from scrap metal and are used as input material for the rolling mill, where wire in coil is produced, among other products. They are located one next to other. The melt shop uses iron and steel waste (pre- and post-consumer scrap) as input. Steel waste is mainly from production processes of other companies and bought from waste collectors. All steel waste from the rolling mill production is also used as input for the melt shop.

After the use of the rebars in a building, the material is often recovered and recycled[1].

Based on the above descriptions the following decisions were made for the LCA calculation:

- Steel billets are considered as pre- and post-consumer waste (according to DIN EN ISO 14021:2016), therefore only impacts for reprocessing were taken into account, not impacts of the material itself.
- Information on the amount of inputs, energies and utilities needed for reprocessing the scrap into steel billets was provided by Metalfer.
- Steel waste from the rolling mill production was not considered, as it is fully reused at the melt shop. No credits were given for the reuse.
- For the end of life scenario, a recycling quota of 100% was assumed for both packaging and steel rebars. For steel rebars, burdens for the recovery of the material out of the building were considered as well.
- Credits for recycling were given only for recycling of the packaging material (steel wire rod). For recycling of the steel itself, no credits were given due to the fact that the input material was already considered burden-free.

All primary data of the production processes were considered. No cut-off rules were applied.

For the electricity used during reprocessing of steel scrap (A1) as well as for the production process of the wire coil (A3), the use of 100% of electricity from hydro power was considered, based on information from Metalfer's energy provider.

For transports to customers, an average distance of 250 km was assumed (currently, all customers are located in Serbia). For transports to the landfill, an average distance of 20 km was assumed.

[1] CRSI, 2021; SteelConstruction.info, 2021

Content declaration

Product

No substances contained in the products are listed in the “Candidate List of Substances of Very High Concern for Authorisation” (SVHC). The only input material to produce rebars are steel billets.

Packaging

Only steel wire is used for packing rebars.
No further packaging material is required.

Recycled material

Provenience of recycled materials (pre-consumer or post-consumer) in the product:
Steel billets made from metal scrap (see description on page 5)

Environmental performance

Potential environmental impact

PARAMETER	UNIT	A1	A2	A3	A4	C2	C3	D
Global warming potential (GWP)	kg CO_2 eq.	5,36E+01	2,42E+01	2,69E+02	2,05E+01	1,64E+00	6,03E+01	-2,49E+00
Depletion potential of the stratospheric ozone layer (ODP)	kg CFC 11 eq.	3,38E-13	3,97E-15	2,83E-14	3,36E-15	2,69E-16	1,06E-05	-2,75E-15
Acidification potential (AP)	kg SO_2 eq.	4,41E-02	4,70E-02	3,58E-01	3,98E-02	3,18E-03	4,50E-01	-7,39E-03
Eutrophication potential (EP)	kg PO_4^{3-} eq.	6,40E-03	1,09E-02	1,05E-01	9,20E-03	7,36E-04	1,11E-01	-5,73E-04
Formation potential of tropospheric ozone (POCP)	kg C_2H_4 eq.	5,03E-03	-1,41E-02	3,97E-02	-1,19E-02	-9,54E-04	4,64E-02	-7,73E-04
Abiotic depletion potential – Elements	kg Sb eq.	4,58E-05	1,78E-06	1,93E-05	1,51E-06	1,20E-07	2,18E-05	3,30E-06
Abiotic depletion potential – Fossil resources	MJ, net calorific value	7,76E+02	3,29E+02	4,15E+03	2,79E+02	2,23E+01	8,71E+02	-2,67E+01

Use of resources

PARAMETER		UNIT	A1	A2	A3	A4	A5	C2	C4
Primary energy resources – Renewable	Use as energy carrier	MJ, net calorific value	3,59E+03	1,86E+01	8,40E+02	1,57E+01	1,26E+00	9,02E+00	-9,97E-01
	Used as raw materials	MJ, net calorific value	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
	TOTAL	MJ, net calorific value	3,59E+03	1,86E+01	8,40E+02	1,57E+01	1,26E+00	9,02E+00	-9,97E-01
Primary energy resources – Non-renewable	Use as energy carrier	MJ, net calorific value	8,50E+02	3,30E+02	4,16E+03	2,80E+02	2,24E+01	8,86E+02	-2,70E+01
	Used as raw materials	MJ, net calorific value	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
	TOTAL	MJ, net calorific value	8,50E+02	3,30E+02	4,16E+03	2,80E+02	2,24E+01	8,86E+02	-2,70E+01
Secondary material		kg	1,97E+03	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	-1,09E+00
Renewable secondary fuels		MJ, net calorific value	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Non-renewable secondary fuels		MJ, net calorific value	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	7,29E-01	2,15E-02	9,21E-01	1,82E-02	1,45E-03	1,36E-01	-7,54E-02

Waste production and output flows

Waste production

PARAMETER	UNIT	A1	A2	A3	A4	A5	C2	C4
Hazardous waste disposed	kg	5,43E-07	1,54E-05	3,76E-06	1,30E-05	1,04E-06	0,00E+00	-2,05E-06
Non-hazardous waste disposed	kg	1,07E+00	5,06E-02	2,38E+01	4,28E-02	3,42E-03	0,00E+00	-2,21E-01
Radioactive waste disposed	kg	2,93E-02	4,09E-04	1,50E-03	3,46E-04	2,77E-05	0,00E+00	-6,21E-07

Output flows

PARAMETER	UNIT	A1	A2	A3	A4	A5	C2	C4
Components for reuse	kg	INA	INA	INA	INA	INA	INA	INA
Material for recycling	kg	INA	INA	INA	INA	INA	INA	INA
Materials for energy recovery	kg	INA	INA	INA	INA	INA	INA	INA
Exported energy, electricity	MJ	INA	INA	INA	INA	INA	INA	INA
Exported energy, thermal	MJ	INA	INA	INA	INA	INA	INA	INA

Interpretation of LCA Results

The main drivers in all impact categories are modules A3, production process and C3, waste processing. For the categories Abiotic Depletion Potential – elements (ADPe), Global Warming Potential (GWP) and Abiotic Depletion Potential – fossil (ADPf), module A1, input materials, is also a of relevance (ADPe: 51%, GWP: 13%, ADPe: 12%). All other modules in all impact categories have a contribution of less than 8% to the overall results.

The share of the production phase (A3) in overall results ranges from 21% (ADPe) to 65% (ADPf), with the exception of the impact category Ozone Depletion Potential, where the impact of the production process is < 1%. Module A3 has the highest share of the overall results in the impact categories Global Warming Potential (63%) and Abiotic Depletion Potential – fossil (65%). Here, the biggest impact results from the consumption of energies, mainly from thermal energy from natural gas. Emissions to air and water (Dust, NOx, Chemical Oxygen Demand (COD), Ammonium (NH_4^+), Nitrate (NO_3^-), Nitrite (NO_2^-), Copper (Cu), Zinc (Zn), Chloride (Cl^-), Sulfate (SO_4^{2-}) and Phosphate (PO_4^{3-})) make up between 31% and 61% of environmental impacts in the categories Photochemical Ozone Creation Potential (POCP), Eutrophication Potential (EP) and Acidification Potential (AP).

The processing of waste (C3), which is relevant for recovering the steel rebars out of the construction they were built in, has the highest impact in the categories ODP, AP, EP and POCP with a share ranging from 46% to 100% of overall results.

The environmental impacts in module A1 result only from the reprocessing of the steel billets, as the material itself is considered as pre- and post-consumer waste and therefore unencumbered. In the reprocessing, the consumption of thermal energy is the main driver for environmental impacts in the categories ADPf (83%) and GWP (72%). For ADPe, the biggest impacts result from the electricity generated from hydro power (88%).

References

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