Environmental Product Declaration

for multiple products (based on the average results of the product group, with different diameters and lengths and with identical environmental profiles per declared unit), in accordance with ISO 14025:2006 and EN 15804:2012+A2:2019/AC:2021 for:

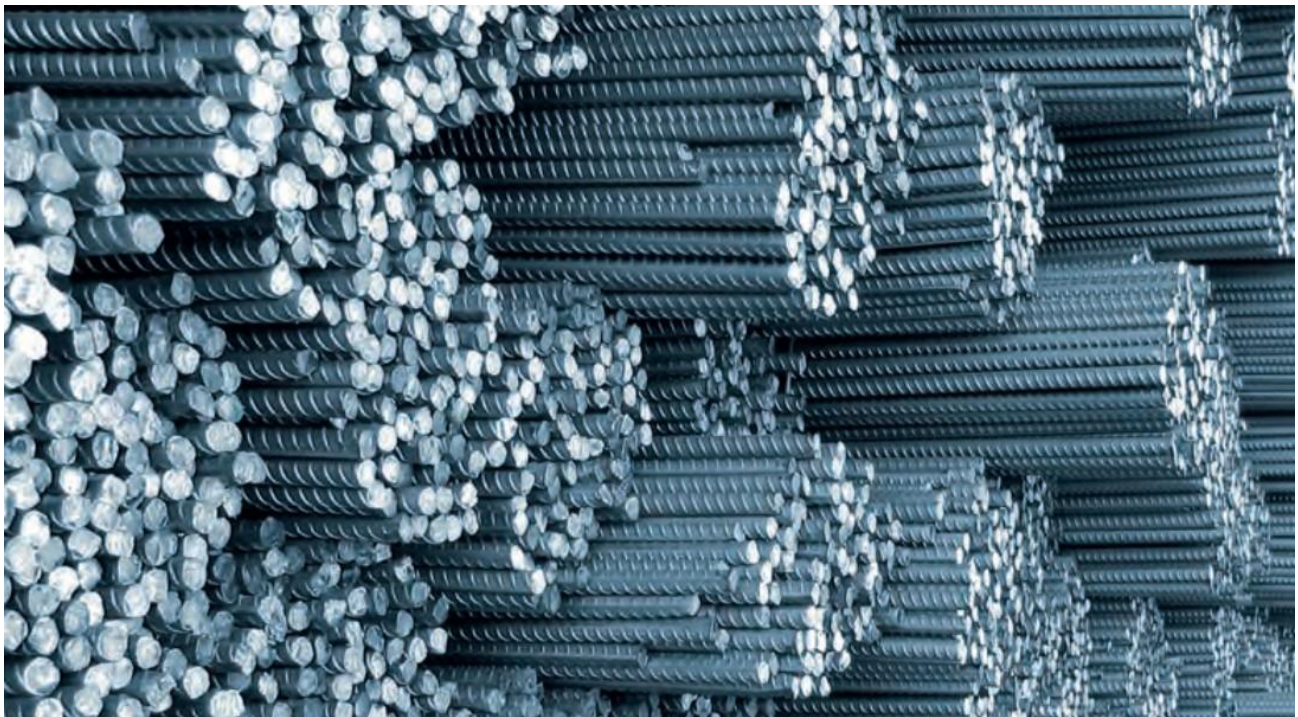
Ribbed reinforcing bars

from

ÓAM Ózd Steelworks Ltd.

Programme:	The International EPD® System, www.environdec.com
Programme operator:	EPD International AB
EPD registration number:	EPD-IES-0010698
Publication date:	2024-09-06
Revision date:	2024-11-15
Valid until:	2029-09-06

An EPD should provide current information and may be updated if conditions change. The stated validity is therefore subject to the continued registration and publication at www.environdec.com



General information

Programme information

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

Accountabilities for PCR, LCA and independent, third-party verification
Product Category Rules (PCR)
CEN standard EN 15804 serves as the Core Product Category Rules (PCR)
Product Category Rules (PCR) – Construction Products (PCR 2019:14, version 1.3.4)
PCR review was conducted by: *Version 2.0.0: IVL Swedish Environmental Research Institute, the Secretariat of the International EPD System, CTME, Concrete NZ, Monk Spaces, Aquafil SpA; Version 1.0.0: IVL Swedish Environmental Research Institute, the Secretariat of the International EPD System*
Life Cycle Assessment (LCA)
LCA accountability: *Balázs Gál, Bay Zoltán Nonprofit Ltd. for Applied Research, balazs.gal@bayzoltan.hu*
Third-party verification
Independent third-party verification of the declaration and data, according to ISO 14025:2006, via: ☒ EPD verification by individual verifier Third-party verifier: *Jan Weinzettel, weinzettel@seznam.cz* Approved by: The International EPD® System
Procedure for follow-up of data during EPD validity involves third party verifier: ☐ Yes ☒ No

The EPD owner has the sole ownership, liability, and responsibility for the EPD.

EPDs within the same product category but registered in different EPD programmes, or not compliant with EN 15804, may not be comparable. For two EPDs to be comparable, they must be based on the same PCR (including the same version number) or be based on fully-aligned PCRs or versions of PCRs; cover products with identical functions, technical performances and use (e.g. identical declared/functional units); have equivalent system boundaries and descriptions of data; apply equivalent data quality requirements, methods of data collection, and allocation methods; apply identical cut-off rules and impact assessment methods (including the same version of characterisation factors); have equivalent content declarations; and be valid at the time of comparison. For further information about comparability, see EN 15804 and ISO 14025.

Company information

Owner of the EPD: ÓAM Ózd Steelworks Ltd, https://www.oamkft.hu/en/home
Contact: Jácint Sipos, (jacint.sipos@oamkft.hu)

Description of the organisation: ÓAM Ózd Steelworks Ltd. (OAM) is a factory in Hungary, which was established to produce and distribute hot-rolled reinforcing steel, steel wire rope, wire rod and welded reinforcing steel mesh. The steel plant was built as a greenfield investment and started to operate in August 2000. The OAM can be seen as a continuation of the 150-year-old tradition of the steel industry in Ózd.
The assets of OAM were acquired by the German Max Aicher GmbH & Co. through privatisation on 23 May 1997. The Max Aicher Group has gained recognition and a reputation that extends beyond the continent throughout decades of successful businesses in the construction, real estate, steel and environmental industries.
The raw material at the plant is waste steel, supplemented by various additives. The plant is able to produce rod and wire products according to MSZ and DIN standards by hot rolling. The rolling mill is a 360000-tonne nominal capacity continuous pass mill suitable for the production of reinforcing bars and rounds in the 8-40 mm range and wire rods in the 5,5-16 mm range.

Product-related or management system-related certifications: The company is certified by ISO 9001 and ISO 14001, part of the ISO 14000 family of standards for environmental management systems.
Name and location of production site(s):
ÓAM Ózd Steelworks Ltd. (H-3600 ÓZD, Max Aicher street 1.)

Product information

Product name: **Ribbed reinforcing bars**
Chemical composition of the product

Component name	Weight (%)
Steel	96.12-98.26-
Carbon	0.19-0.24
Manganese	0.70-1.60
Silicon	0.65-0.70
Phosphorous	0.05-0.55
Sulphur	0.05-0.055
Copper	0.65-0.80
Nitrogen	0.013-0.12-

Product identification: Highly- weldable and strength Euro conforming products according to the standards of:

- B 500 B, B 500 C, B 500 SP
- German Din 488
- MSZ 339
- Polish PN-H 93220 and MSZEN 10025

Product description: The purpose of reinforcing steel is to strengthen the structure of concrete in the following diameters of 8-40mm. In such structures, the concrete always carries the compressive and the steel the tensile forces. It is necessary to use the steel because, while concrete is very strong and does not fail under high pressure, once it is subjected to tensile forces, i.e. lateral forces, it is far from being a durable surface and will crack and split, which can be easily prevented by the steel structure inside.

In connection with the features, it is also important to mention the diameter. The reinforced steel bars with higher diameter have higher load-bearing capacity. With this feature, all other abilities are also increasing. A large diameter means:

- more raw material,
- and increased weight for the finished product.

UN CPC code: 4124 - Bars and rods, hot-rolled, of iron or steel

Geographical scope: The materials used for production, originating mainly from Europe (A1, A2), 70% of the materials are imported from the surrounding European region. The graphite electrodes are imported from overseas. Production takes place in Hungary (A3), by using the Hungarian energy mix. Most of the finished products are also sold in Europe.

LCA information

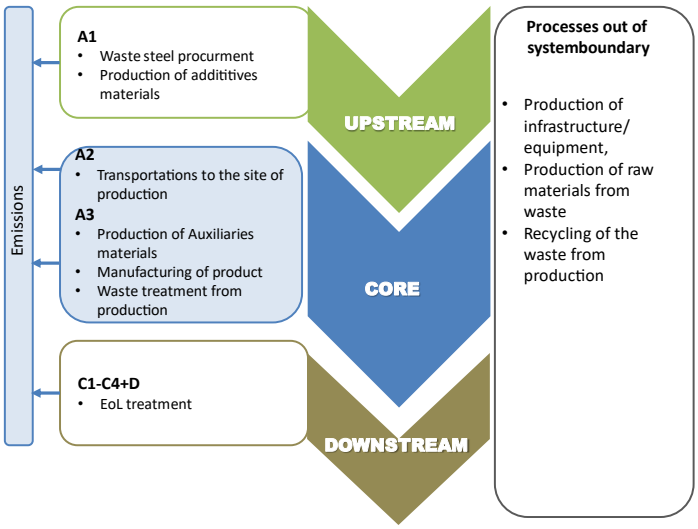
This is an EPD of multiple products, as they differ in their dimensions. However, all the products have identical inputs and outputs to their product system in the LCA modelling per declared unit, hence they all have identical environmental impacts per declared unit. Therefore, the variation among products is 0% and all variants are average product.

Declared unit: 1 tonne of average rebar with a diameter of 8-40mm, the products have identical inputs and outputs per the declared unit.
Reference service life: The expected reference service life for Reinforcing steel is 100-120 year.
Reference year: 2022.
Database(s) and LCA software used: The LCA model for production was made using the LCA for Experts software (LCA FE, formerly known as GaBi Professional) system for life cycle engineering, developed by Sphera (version 10, 2024).
Applied databases are:

- Managed LCA content (GaBi database, Sphera) database (version 10, 2024)
- Ecoinvent database (version 3.9.1, 2023)

Description of system boundaries:
The applied system boundary of this LCA cover a “Cradle to gate (A1-A3) with options (modules C1–C4, module D). Infrastructure/capital goods are excluded in upstream, core and downstream processes.

System diagram:



Product system description:

A1-A2 raw materials supply: Waste metal (steel) serving as raw material. It is delivered by freight train and road vehicle to the production site.

A3 manufacturing: For the manufacturing, electric arc furnace route is used, where the scrap will be melted with additives (alloying materials) and cast into billet. The finished billet is further shaped in the rolling mill until the rebar is ready.

C1-C4 end of life:

According to statistical data, around 88% of construction and demolition waste was recovered on average in the European Union (in 2020).[1] A metal part of construction waste is assumed to be collected as separate waste during the demolition phase. 0,25 MJ/kg[2], energy (is the maximum) needs for the deconstruction of the structure (module C1) in order to be recovered the materials. Default distance is 50km between the location of the demolition and the waste management site. The waste processing (C3 and C4) module includes the data of final waste treatment according to usual European case scenario[3], where 99.77% of separated collected metal waste will be recovered (recycling and backfilling), which means that the 87,8% of metal waste can be recovered. In case of the remaining part required landfilling.

D Benefits:

In this case there will be no benefits in module D. Instead, module D will report environmental burden from the production of 1,03% virgin steel, as that was lost during the product life cycle.

General allocation procedures:

Allocation on incoming raw material in A1 Module: The allocation method of the assessment in case of incoming pre-consumer scrap was based on an economic value of the reference year.

Allocation in A3 Module: Allocation was required in the modelling of the rolling mill operations and the incoming scrap. In the OAM production processes, all products go through the same steps until they reach the exit of the steel plant, however during the rolling process there can be differences in the final shapes and material thicknesses.

Data quality:

At the selection of the most suitable process, it is important to apply the local – country specific – process. Therefore, the country-specific processes were chosen for example in case of the electricity, natural gas, etc., but in other cases – when there was not typical country specific process available – average European processes were selected. In some cases, only processes from other European countries were available.

- Generic data used in the LCA study are not older than 5 years and
- Site-specific data are not older than 2 years.

[1] Recovery rate of construction and demolition waste (CDW) in the European Union (EU-27) in 2020, by country (Source https://www.statista.com/statistics/1316268/recovery-rate-of-construction-and-demolition-waste-eu-by-country/)
[2] Rakes& Keshava (2019) A study on Embodied energy of recycled aggregates obtained from processed demolition waste (Source: researchgate.net)
[3] Statistics | Eurostat (europa.eu)

Hungarian “Electricity, high voltage, residual mix” LCIA data has been used in A3 for the generation of electricity.

Electricity grid factors used (kg CO_2 eq./ kWh) Source: GaBi professional 10. Characterisation factor: EN15804+A2 (based on EF3.1), GWP-GHG

Name of the process	Developer of process	CO_2e/kWh[4]
HU: electricity, high voltage, residual mix	Ecoinvent 3.9.1	0,402
RER: Electricity grid mix	Sphera	0,299

Modules declared, geographical scope, share of specific data (in GWP-GHG results) and data variation (in GWP-GHG results):

	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	ND	ND	ND	ND	ND	ND	ND	ND	ND	X	X	X	X	X
Geography	EU	EU	EU	-	-	-	-	-	-	-	-	-	RER	GLO	RER	RER	RER
Specific data used	47,15%			-	-	-	-	-	-	-	-	-	-	-	-	-	-
Variation – products	0%			-	-	-	-	-	-	-	-	-	-	-	-	-	-
Variation – sites	0%			-	-	-	-	-	-	-	-	-	-	-	-	-	-

When a module is accounted for, the box is marked with an ”X”.
When a module is not accounted for, the box is marked with ”ND”, not declared.

[4] Source: GaBi professional 10. Characterisation factor: EN15804+A2 (based on EF3.1), GWP-GHG

Content information

Product components	Weight, kg	Post-consumer material, weight-%	Biogenic material, weight-% and kg C/kg
Steel	961,20-982,60	89,03*	0
Alloying materials (C, Mn, Si, Cu and others)	38,80-17,40	54	0
TOTAL	1000	87,67-88,42	0
Packaging materials	**Weight, kg**	**Weight-% (versus the product)**	**Weight biogenic carbon, kg C/kg**
TOTAL	0**		

* Based on the annual data of the company, about 89,03% of the steel scrap comes from post-consumer sources and up to 10,97% from pre-consumer.
**The product is sold without packaging.

Environment/ hazardous properties: No substance listed under the REACH Regulation is present in this product, either above the limits for registration with the European Chemicals Agency or in excess of 0,1 weight-% of the product.

Results of the environmental performance indicators

The environmental impacts of the declared unit for the following impact categories were reported in the EPD according to EN15804:2012+A2:2020 (2020), JRC characterization factors (based on EF3.1). The estimated impact results are only relative statements which do not indicate the end points of the impact categories, exceeding threshold values, safety margins or risks.

Mandatory impact category indicators according to EN15804:2012+A2:2020 (based on EF3.1)

Results per 1000kg of rebar							
Indicator	**Unit**	**A1-A3**	**C1**	**C2**	**C3**	**C4**	**D**
GWP-total	kg CO_2 eq.	4,80E+02	1,84E+01	5,91E+00	0,00E+00	8,73E-03	1,77E+01
GWP-fossil	kg CO_2 eq.	4,79E+02	1,83E+01	5,65E+00	0,00E+00	8,68E-03	1,77E+01
GWP-biogenic	kg CO_2 eq.	4,42E-01	1,64E-01	1,68E-01	0,00E+00	0,00E+00	0,00E+00
GWP-luluc	kg CO_2 eq.	3,10E-01	2,77E-03	9,24E-02	0,00E+00	5,21E-05	2,53E-03
ODP	kg CFC 11 eq.	2,52E-06	4,14E-10	8,10E-13	0,00E+00	2,34E-14	3,23E-11
AP	mol H^+ eq.	1,25E+00	3,53E-02	1,23E-02	0,00E+00	6,16E-05	5,73E-02
EP-freshwater	kg P eq.	2,17E-02	7,58E-05	2,35E-05	0,00E+00	1,97E-08	1,58E-05
EP-marine	kg N eq.	4,12E-01	8,81E-03	5,22E-03	0,00E+00	1,59E-05	8,60E-03
EP-terrestrial	mol N eq.	3,32E+00	9,22E-02	5,98E-02	0,00E+00	1,75E-04	8,88E-02
POCP	kg NMVOC eq.	1,11E+00	2,33E-02	1,20E-02	0,00E+00	4,86E-05	3,07E-02
ADP-minerals& metals*	kg Sb eq.	-2,10E-05	3,42E-06	4,79E-07	0,00E+00	5,63E-10	-4,24E-05
ADP-fossil*	MJ	6,16E+03	3,83E+02	7,25E+01	0,00E+00	1,14E-01	2,09E+02
WDP*	m^3	5,76E+01	5,05E+00	8,52E-02	0,00E+00	9,94E-04	5,45E+00
Acronyms	GWP-fossil = Global Warming Potential fossil fuels; GWP-biogenic = Global Warming Potential biogenic; GWP-luluc = Global Warming Potential land use and land use change; ODP = Depletion potential of the stratospheric ozone layer; AP = Acidification potential, Accumulated Exceedance; EP-freshwater = Eutrophication potential, fraction of nutrients reaching freshwater end compartment; EP-marine = Eutrophication potential, fraction of nutrients reaching marine end compartment; EP-terrestrial = Eutrophication potential, Accumulated Exceedance; POCP = Formation potential of tropospheric ozone; ADP-minerals&metals = Abiotic depletion potential for non-fossil resources; ADP-fossil = Abiotic depletion for fossil resources potential; WDP = Water (user) deprivation potential, deprivation-weighted water consumption						

** Disclaimer: The results of this environmental impact indicator shall be used with care as the uncertainties of these results are high or as there is limited experience with the indicator. If module C is included in the EPD there are not allowed the use of the results of modules A1-A3 (A1-A5 for services) without considering the results of module C.*
The negative values of ADP minerals and HWD impact categories in Modules A1-A3 originated from the applied "Steel wire rod" process, which documentation is transparently available at Sphera database (Link). The largest contributors to the negative results in the process are elementary flows as Zinc, Lead, Antimony, Silver, Cadmium. Other details of this process are not available to explain the negative results

Additional mandatory and voluntary impact category indicators according to EN15804:2012+A2:2020 (based on EF3.1)

Results per 1000kg of rebar							
Indicator	**Unit**	**A1-A3**	**C1**	**C2**	**C3**	**C4**	**D**
GWP-GHG[5]	kg CO_2 eq.	4,80E+02	1,83E+01	5,74E+00	0,00E+00	8,73E-03	1,77E+01

Additional voluntary indicators e.g. the voluntary indicators from EN 15804 or the global indicators according to ISO 21930:2017

The results of a supplementary indicator for climate impact shall be declared: GWPGHG There was no need to add additional voluntary indicators.[6]

Results of the LCA - indicators to describe resource use according to EN15804:2012+A2:2020 (based on EF3.1)

Results per 1000kg of rebar							
Indicator	**Unit**	**A1-A3**	**C1**	**C2**	**C3**	**C4**	**D**
PERE	MJ	4,79E+02	2,77E+02	6,24E+00	0,00E+00	2,00E-02	2,73E+01
PERM	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
PERT	MJ	4,79E+02	2,77E+02	6,24E+00	0,00E+00	2,00E-02	2,73E+01
PENRE	MJ	6,16E+03	3,83E+02	7,25E+01	0,00E+00	1,14E-01	2,09E+02
PENRM	MJ	1,36E-02	-6,99E-12	0,00E+00	0,00E+00	0,00E+00	2,80E-11
PENRT	MJ	6,16E+03	3,83E+02	7,25E+01	0,00E+00	1,14E-01	2,09E+02
SM	kg	1,10E+03	0,00E+00	0,00E+00	0,00E+00	0,00E+00	-8,79E+02
RSF	kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
NRSF	kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
FW	m^3	4,36E+01	2,12E-01	6,95E-03	0,00E+00	3,03E-05	1,45E+01
Acronyms	PERE = Use of renewable primary energy excluding renewable primary energy resources used as raw materials; PERM = Use of renewable primary energy resources used as raw materials; PERT = Total use of renewable primary energy resources; PENRE = Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials; PENRM = Use of non-renewable primary energy resources used as raw materials; PENRT = Total use of non-renewable primary energy re-sources; SM = Use of secondary material; RSF = Use of renewable secondary fuels; NRSF = Use of non-renewable secondary fuels; FW = Use of net fresh water						

Waste indicators according to EN15804:2012+A2:2020 (based on EF3.1)

Results per 1000kg of rebar							
Indicator	**Unit**	**A1-A3**	**C1**	**C2**	**C3**	**C4**	**D**
Hazardous waste disposed	kg	-1,40E-06	5,54E-07	2,77E-09	0,00E+00	2,85E-11	-6,48E-07
Non-hazardous waste disposed	kg	4,05E+00	3,16E-01	1,18E-02	0,00E+00	5,81E-01	2,93E-01
Radioactive waste disposed	kg	3,37E-02	6,12E-02	1,32E-04	0,00E+00	1,20E-06	3,40E-26

[5] https://eplca.jrc.ec.europa.eu/LCDN/EN15804.html
JRC Publications Repository: https://publications.jrc.ec.europa.eu › JRC130796
[6] GWP-GHG indicator is termed GWP-IOBC/GHG in the ILCD+EPD+ data format

Output flow indicators according to EN15804:2012+A2:2020 (based on EF3.1)

Results per 1000kg of rebar							
Indicator	**Unit**	**A1-A3**	**C1**	**C2**	**C3**	**C4**	**D**
Components for re-use	kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Material for recycling	kg	1,58E+02	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Materials for energy recovery	kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Exported energy, electricity	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Exported energy, thermal	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00

Additional mandatory and voluntary impact category indicators according to EN15804:2012+A2:2020 (based on EF3.1)

Results per 1000kg of rebar							
Indicator	**Unit**	**A1-A3**	**C1**	**C2**	**C3**	**C4**	**D**
PM	Disease incidences	3,19E-04	2,95E-07	1,03E-07	0,00E+00	7,73E-10	2,45E-06
IR	kBq U235 eq.	6,29E+01	1,01E+01	1,91E-02	0,00E+00	1,39E-04	4,69E-01
ET	CTUe	6,86E+02	1,11E+02	5,38E+01	0,00E+00	6,59E-02	2,61E+01
HT-c	CTUh	1,90E-07	6,24E-09	1,09E-09	0,00E+00	1,56E-12	2,83E-09
HT-nc	CTUh	3,60E-06	9,56E-08	4,88E-08	0,00E+00	6,02E-11	6,25E-08
LU	Pt	1,14E+03	1,61E+02	3,56E+01	0,00E+00	3,15E-02	2,02E+01
Acronyms	PM = Potential incidence of disease due to PM emissions; IR = Potential Human exposure efficiency relative to U235; ETP-fw = Potential comparative Toxic Unit for ecosystems; HTP-c = Potential comparative Toxic Unit for humans (cancerogenic); HTP-nc = Potential comparative Toxic Unit for humans (not cancerogenic); SQP = Potential soil quality index						

** Disclaimer: The IR impact category deals mainly with the eventual impact of low dose ionizing radiation on human health of the nuclear fuel cycle. It does not consider effects due to possible nuclear accidents, occupational exposure nor due to radioactive waste disposal in underground facilities. Potential ionizing radiation from the soil, from radon and from some construction materials is also not measured by this indicator.*

The A1 module has the second most important role in case of the environmental impacts. The impacts from this module, on average, are responsible for about ~23% of the total environmental loads. Only the RU (minerals and metals) impact category has reached more than 85 % of burdens.
The A2 module, is the least significant issue during the production (on average ~3,5%), the transportation of component and additives by truck, ship and train is significant only in one category: GWP_{luluc} (30 %).
Considering most of the declared parameters, the A3 module is the most significant life cycle phase. This module contains the impacts of rebar production and has a very significant contribution to the inventory and impact assessment results (12,33%-97,67%).
Overall, the production phase (A1-A3), is the most critical part of the life cycle. This includes the impacts of the impact assessment results between 33,04%-99,98%.
The LCA study is complete; there are no relevant life cycle phases or processes excluded. Consistency of the used data is good: high quality specific data have been collected for the A3 module, while the best available generic data have been selected for A1 and for all other life cycle processes.

Version history - Differences versus previous versions

The present version (2024.11.15) changed compared to the previous published version (2024.09.06) of the EPD in the following:

- the source of raw materials was clarified with measured data
    - pre- and post-consumer scrap rate: based on the annual data of the company, 89,03% of the steel scrap comes from post-consumer sources and up to 10,97% from pre-consumer (the pre-consumer scrap was 5% in the previous version)
    - economic allocation was applied for modelling the pre-consumer scrap raw material – based on the annual average prices.
- modification on the end-of-life (C) module:
    - C3 - 87,8% of metal waste can be recovered
    - C4 – 12,2% of metal waste goes to landfill.
- modification on the benefit (D) module:
    - D - 1,03% virgin steel is lost during the product life cycle.

The environmental results changed in every impact category compared to the previous version:

- A1-A3: total climate changes (91,67%),
- A1-A3: The values of Eutrophication freshwater and Water use categories increased (100,17%-119,97%)
- A1-A3: the values of other categories decreased (99,9%-94,75%)
- D - total climate changes (increased with 1530kgCO_2 equivalent).

References

General Programme Instructions of the International EPD® System. Version 4.0.
Product Category Rules (PCR) – Construction Products PCR2019:14; version 1.3.4
ISO 14040:2006. Environmental management – Life cycle assessment – Principles and framework. (2006).
ISO 14044:2006. Environmental management – Life cycle assessment – Requirements and guidelines. ISO. (2006).
EN15804:2012+A2:2020. Sustainability in construction. Product environmental statements. Commodity category rules for construction products.
ISO – 21930:2017 – Sustainability in buildings and civil engineering works – Core rules for environmental product declarations of construction product and services

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