

# Environmental Product Declaration



In accordance with ISO 14025:2006 and EN 15804:2012+A2:2019/AC:2021 for:

## HOT ROLLED REINFORCEMENT BARS IN LONG/COIL FORM

from

**Emirates Steel Industries Co. PJSC**



Programme:

The International EPD® System, [www.environdec.com](http://www.environdec.com)

Programme operator:

EPD International AB

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2030-04-21

*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](http://www.environdec.com)*



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## General information

### Programme information

<b>Programme:</b>	The International EPD® System
<b>Address:</b>	EPD International AB Box 210 60 SE-100 31 Stockholm Sweden
<b>Website:</b>	<a href="http://www.environdec.com">www.environdec.com</a>
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### 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): *PCR 2019:14 Construction products, version 1.3.4 published on 2024.04.30. Based on CEN Standard 15804. CEN Standard EN 15804 serves as the core PCR.*

PCR review was conducted by: *The Technical Committee of The International EPD® System. See [www.environdec.com/TC](http://www.environdec.com/TC) for the list of members. Review Chair: Paola Borla, Professional Consultant, Life Cycle Engineering, Italy. The review panel may be contacted via The Secretariat, [www.environdec.com/contact](http://www.environdec.com/contact).*

#### Life Cycle Assessment (LCA)

LCA accountability: *Mr. Abdelmoneim Tawfik – EMSTEEL, QA Department.*

#### Third-party verification

Independent third-party verification of the declaration and data, according to ISO 14025:2006, via:

☒ EPD verification by accredited certification body

Third-party verification Bureau Veritas Certification Sweden AB is an approved certification body accountable for the third-party verification

The certification body is accredited by: SWEDAC & accreditation number is 1236

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: Emirates Steel Industries Co. PJSC

Contact:

Telephone: +971 2 5511187

Email: contactus@emsteel.com

Description of the organisation:

Emirates Steel Industries Co. PJSC (ES) is the operator of Emirates Steel Plants located at the Industrial City of Abu Dhabi (ICAD). ES is one of the leading steel manufacturers in the Middle East region with the capacity to produce almost 3.5 million tons per year of rebar, wire rod, sheet piles and heavy sections. The ES Plants are in the Industrial City of Abu Dhabi (ICAD) in Mussafah.

We have embarked on a journey to become Carbon Neutral by 2050, and in line with the Paris Agreement Goals, ES is committed to reducing its Emissions Intensity significantly from its 2019 levels by 2030.

Product-related or management system-related certifications:

Emirates Steels Hot Rolled Reinforcement Bars Production facilities are covered under ISO 9001, ISO 14001, ISO 45001, and CARES Sustainability management system.

Name and location of production site(s): Emirates Steel Industries PJSC, P.O. Box 9022  
Abu Dhabi, United Arab Emirates



### Product information

Product name: Hot Rolled Reinforcement Bars in Long/Coil Form

Product identification: The Product included in this EPD are covered by the following term, Reinforcement Bars

### **Product Description:**

#### **Reinforcement Bars**

Emirates steel Reinforcement Bars are made in an electric arc furnace using clean and renewable power and a mixture of scrap and direct reduced iron ore pellets. These Reinforcement Bars are produced in a range of sizes, lengths, steel grades, and standards. The declaration covers the complete range of Reinforcement Bars manufactured at Emirates Steel Abu Dhabi manufacturing site, including straight bars and Reinforcement Bars in coil form.

This EPD is valid for all grades and geometrics as covered by the following standards:

End Use /Application	Standard	Grade
Reinforcement Bars	BS449:2005+A3:2016	
	ASTM A615/A615M-22	
	ASTM A706/A706M-22a	
	SASO-ASTM A615/A615M-21	
	SASO-ASTM A706-/A706M-18	
	ES Internal Standard	ASTM GR60RS
	ISO 6935-2:2019	
	KWS GSO-ISO-6935-2-2012	
	ES Internal Standard	B500BWR HM
		ES 600
		ASTM GR60 Q
		ASTM GR60 S
		ASTM GR60 Q HV
		B460B HM
		B500B HM
	CS2-2012	
	SS560:2016	
	SS 212540:2014	
	SFS 1300:2020	
	DS EN 1992-1-1 Annex C	
	SI 4466	
	MS 146:2014	
	SS560:2016	

Refer to section "more information" for further details of these grades.

### **Manufacturing Process:**

The Manufacturing of the Reinforcement Bars follows the DR-EAF-CCM-RM process. ES has facilities for the production of DRI at its facilities and this is mixed with plant generated scrap and purchased scrap and charged to the Electric arc Furnace. The complete manufacturing process is as below:

Direct reduced iron (DRI) is produced as a first step from imported iron ore pellets using reformed Natural Gas as reducing agent. This DRI is then melted in an Electric Arc Furnace (EAF,) along with plant return scrap and purchased scrap, to obtain liquid metal. This is then refined in the Ladle Refining Furnace (LRF) to remove impurities and alloying additives can be added to give the required properties of the steel. Hot metal (molten steel) from the LRF is then cast into steel billets / blooms / beam-blanks before being sent to the rolling mill where they are rolled and shaped to the required forms for structural steel.

The production of these products takes place at the Manufacturing facilities of ES at Abu Dhabi, comprising of DRPs – SMPs – RMs. The Electricity used in the steelmaking process is independently verified that it is from Renewable sources. This is ensured by our purchasing Renewable Energy Certificates (RECs), a market-based

offering that certifies that the bearer owns a certain amount (in mega watt hours) of electricity generated from clean and renewable energy sources.

The Production process comprises of the following steps:

- DRI Production in gas based DRI production process
- Melting of Hot DRI and Scrap in Electric Arc Furnace
- Refining of the Steel in Ladle Refining Furnace
- Continuous Casting
- Hot Rolling
- Cooling and Finishing

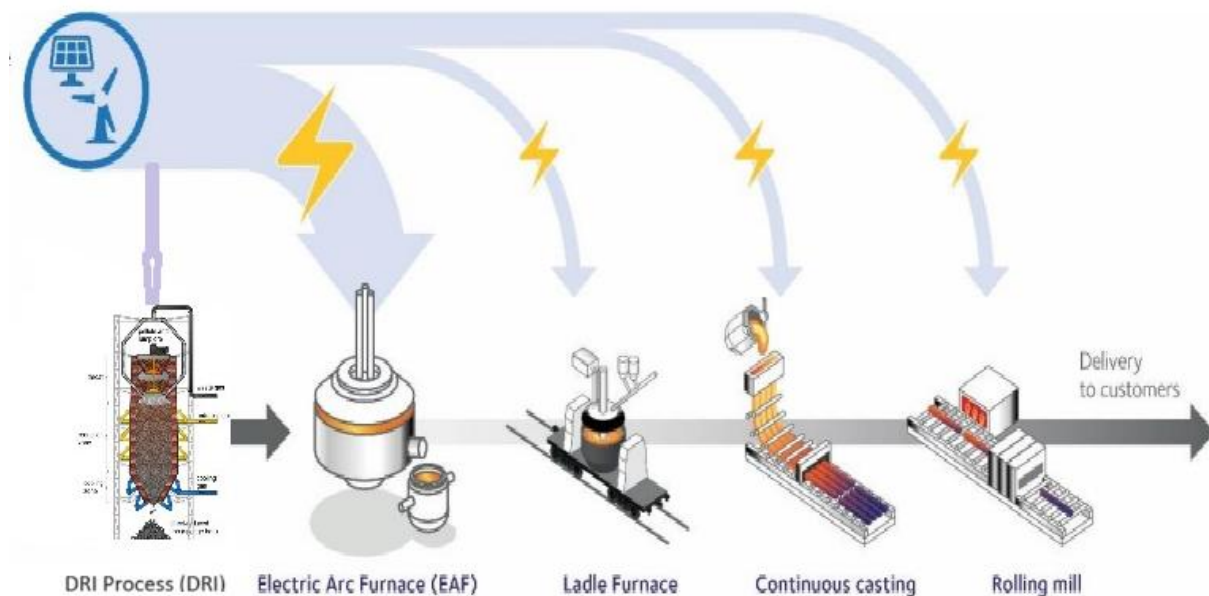
#### Applications

The Reinforcement Bars are hot rolled steel products that are used for various construction applications used exclusively in Civil Engineering, rebars are designed to provide tensile strength to concrete. In case of mechanical destruction of these structures, no risks are expected to occur in terms of the environment and human health. The product does not cause any adverse health effects or releases any VOC's into the atmosphere or indoor areas.

At the end of its life, the products can be recovered, remelted and recycled into a new steel product.

UN CPC code: 412 Products of Iron or Steel.

Geographical scope: Global



*Use of Renewable Energy at Emirates Steel*

## LCA information

Declared unit: 1(One) ton of Reinforcement Bars used for industrial applications

Reference Service Life: Not Applicable

Time representativeness: The collection of the foreground data refers to the calendar year 2023.

### Database(s) and LCA software used:

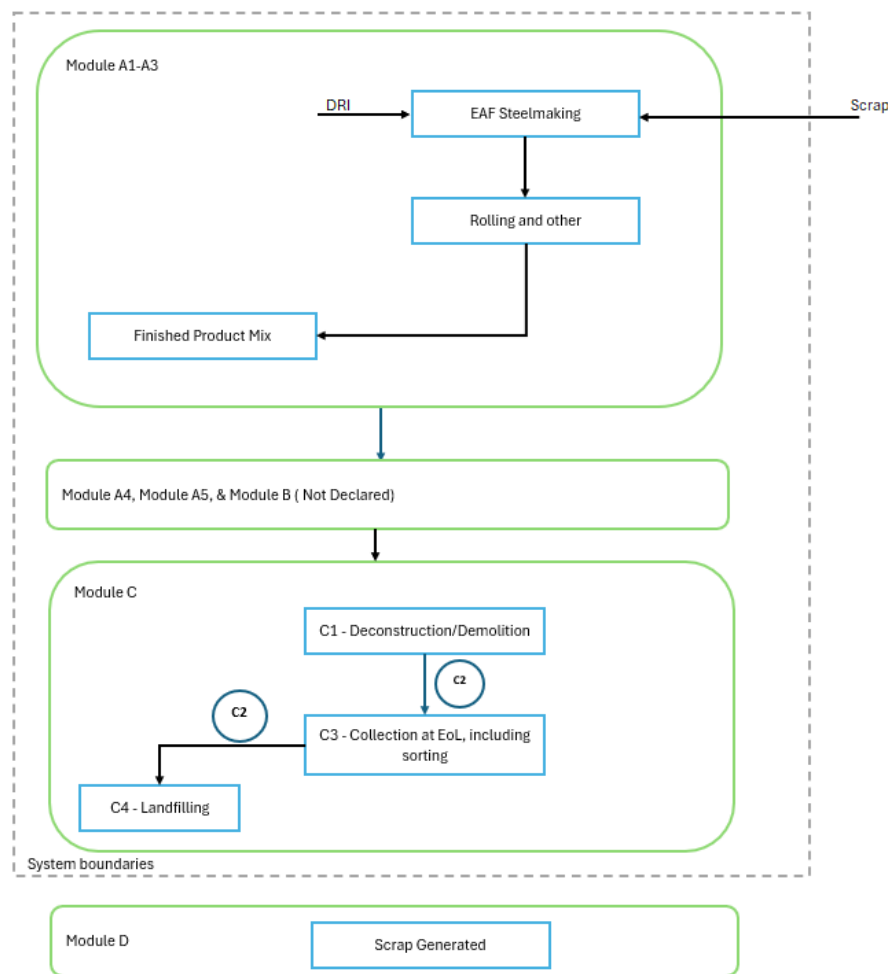
The background data has been taken from the latest available SimaPro database (Converted ecoinvent 3.9.1 data as unit processes, with links to other processes. Compiled January 2023) and the LCA model was created using LCA SimaPro Experts software, version 9.5.0.2.

LCIA method used is EN 15804 +A2 (adapted) V1.00 / EF 3.1 normalization and weighting set.

### Description of system boundaries:

The system boundaries are cradle-to-gate with modules C1-C4 and module D.

### System diagram:



#### Module A1 – A3:

The product stage considers the provision for all the raw materials, energies and products, and waste processing up to the end of waste stage or disposal of fines during the product stages.

These modules consider the production of Billets in SMP1 & SMP2 and the transportation within the site and the production of Reinforcement Bars at RM1, RM2, RM3 & RM5. No emissions or waste from packaging is considered in modules A1-A3 as all raw materials, semi products are transported in bulk / loose state and the final product is with steel wire or steel straps.

The chosen electricity mix and its modelling is market based. The databases are consistent and representative temporally of the processes, while few of the databases have been assumed for completeness geographically and technologically. The electricity mix considered is 16% from the grid and 84% from clean sources, breakup of clean sources is 25.72% from the solar and 74.28% from nuclear pressure water reactor.

#### Module A4-A5 & Module B: Not Disclosed

The electricity mix used in the manufacturing process comprises of Nuclear, Photo-voltaic and Natural gas based grid electricity. The impact is 0.772 kg CO2e/kWh.

#### Module C1-C4:

Within this EPD the module C1-C4 are included. These modules consider the dismantling of the considered products (C1), The transportation of the dismantled product to their End of Life (EoL) destination (C2), the waste processing for recovery or recycling (C3) and finally the disposal (C4). At EoL the steel material leaves the product system in stage C3 and goes to Module D for recycling.

The dismantling of the product is considered using power saw for de-construction of the various structures. Module C2 considers the transportation of the dismantling scrap to and from the recycling station from the sorting facility. Module C3 considers the pre treatment of post consumer scrap for melting -C4 is landfilling of the waste material.

Module D is the recycling of the Scrap generated in C3.

The considered End of Life scenario is 70% recycling and 30% landfilling.

Category	Sub Category	Unit	Quantity
Collection Process	Collected Separately	kg	1000
	Collected with mixed construction waste	kg	0
Recovery	Reuse	Kg	0
	Recycling	Kg	700
	Incineration with energy recovery	Kg	0
	Energy Conversion efficiency rate	kg	0
Disposal	Material for Final Disposal	kg	300
Transport	Deconstruction site to Scrap Processing Plant	km	150
	Scrap processing plant to site for end of waste	km	350

#### Module D:

This module includes any benefits and loads from net flows leaving the product system that have not been allocated as co-products and that have passed the end-of-waste state in the form of reuse, recovery and/or recycling potentials.

Metals are assumed to reach the end of waste status directly at the construction site. The treatment as well as the net benefits and loads of reuse and recycling potentials (for the net scrap amounts only) are grouped in module D.

Modules A4-A5-B are generally not included in any LCA modelling in the Steel industry as these flows are difficult to track. Hence the scenario considered is currently used in the Steel industry.

The products do not contain any of the substances of very high concern (SVHC) regulated by the Regulation (EC) No 1907/2006 (REACH) or the Regulation No 1272/2008 of the European Parliament. Also no packaging has been considered for the Steel Products.

#### Cut off criteria

Cut-off criteria were employed to include all the environmental impact sources while ensuring the study to be complete, relevant, accurate and consistent. Cut-off criteria considered for this study are below:

- Mass – For mass flow less than 1% of the total mass flow environmental impact source may be eliminated with the stipulation that impact would be marginal.
- Energy – For energy flow less than 1% of the total energy flow environmental impact source may be eliminated under that condition that environmental impact is not a concern.
- Environment – For those flows (mass or energy flow) less than 1% of the total respective flow with significant environmental concern impact source must be included for the study.

The production of capital equipment, facilities and infrastructure required for manufacture are not considered.

More information: <https://www.emsteel.com/>

#### Data quality and sources:

Data quality is consistent with the requirements of ISO 14025:2006. All primary data have been collected for 2023 from Phase 1, Phase 2 & Phase 3 production facilities of Emirates Steel.

#### Allocation:

Allocation used in Ecoinvent 3.9 environmental data sources follows the methodology allocation, cut-off by classification/unit processes.

The rule pertaining to allocation applies only when there are two or more by-products produced from a single stream. In this study allocation rule was not considered, as the operation in Emirates Steel unit resulted in no more than one product from each stream except in SMP2.

The allocation of input and output flows in SMP2 is split between Billets and Beam Blanks produced in SMP2, in the ratio of their relative mass fractions in the output from SMP2. Since the monetary value of the product is the same at this stage, the allocation is done on the mass basis.

As per the rules of allocation, the allocation shall be based on physical properties (e.g. mass, volume) when (i) there is a relevant underlying physical relationship between the products and co-products, and (ii) the difference in revenue per mass (or per energy unit in case of electricity, heat or similar) from the products and co-products is low. A relevant underlying physical relationship exists when the amounts of inputs and outputs are changed by quantitative changes in the amounts of products or functions delivered by the system. The combi-caster in SMP2 casts Billets & Beam Blanks at the same time from the same raw material. Hence, there is no difference between the various products and the allocation is done based on physical properties (mass). The same is true in the case of RM1,2,3&5.

The allocation of input and output flows in RM is split between Rebar & Wire Rod produced from the Billets from SMP1 & SMP2, in the ratio of their relative mass fractions in the output from the rolling mills. Since the monetary value of the product is the same at this stage, the allocation is done on the mass basis.

The allocation of water used in the unit process for the manufacture of Reinforcement Bars is in the mass ratio of the annual production of Reinforcement Bars in Rolling Mill 1, 2, 3 & 5 to the total annual production of Sheet Piles, Heavy Sections, Reinforcement Bars and Wire rods. The monetary value of the products from the various process routes are not significantly different, hence we have used a mass balance approach for the allocation of water in this unit process.

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	GL O	GL O	UAE	ND	ND	ND	ND	ND	ND	ND	ND	ND	GL O	GL O	GL O	GL O	GLO
Specific data used	<10%			ND	ND	ND	ND	ND	ND	ND	ND	ND	GL O	GL O	GL O	GL O	GLO
Variation – products	0%*			ND	ND	ND	ND	ND	ND	ND	ND	ND	GL O	GL O	GL O	GL O	GLO
Variation – sites	0%			ND	ND	ND	ND	ND	ND	ND	ND	ND	GL O	GL O	GL O	GL O	GLO

ND – Not Declared

\*Variation – products: The process flow is identical for both the products with the only difference being **the form of the final product**.

## Content information

Product components	Weight, kg	Post-consumer material <sup>1</sup> , weight-%	Biogenic material, weight-% and kg C/kg
STEEL	1000	5%	0% and 0 kg C / kg
<b>Chemical Composition</b>			
Iron	>970		
Carbon	<2		
Manganese	<15		
Silicon	<5		
Others	<6		

<sup>1</sup>According to ISO 14021:2016, the average recycle content, which includes pre- and post- consumer recycled scrap and additional sources of Fe (such as Ferro Alloys), is approximately 98%.

The products do not contain any of the substances of very high concern (SVHC) regulated by the Regulation (EC) No 1907/2006 (REACH) or the Regulation No 1272/2008 of the European Parliament. Also no packaging has been considered for the Steel Products.

## Results of the environmental performance indicators

The Environmental performance of the functional unit of one metric ton of Sheet Piles and Heavy Sections, are reported below using the parameters and units as specified in PCR 2019:14.

The estimated impact results are only relative statements, which do not indicate the end points of the impact categories, exceeding threshold values, safety margins and/or risks.

**Mandatory impact category indicators according to EN 15804 + A2:2019**

Indicator	Results per One ton of Reinforcement Bars used for industrial applications						
	Unit	A1-A3	C1	C2	C3	C4	D
GWP-fossil	kg CO <sub>2</sub> eq.	5.79E+02	3.56E+01	5.32E+01	2.22E+02	1.82E+00	-2.62E+02
GWP-biogenic	kg CO <sub>2</sub> eq.	2.47E+00	0.00E+00	1.89E-02	1.68E+00	1.04E-03	-6.48E-02
GWP-luluc	kg CO <sub>2</sub> eq.	5.20E-01	1.07E+01	2.60E-02	2.24E-01	1.10E-03	-2.00E-01
GWP-total	kg CO <sub>2</sub> eq.	5.82E+02	4.64E+01	5.33E+01	2.24E+02	1.83E+00	-2.62E+02
ODP	kg CFC 11 eq.	3.77E-05	7.35E-07	8.37E-07	1.53E-06	5.28E-08	-3.55E-05
AP	mol H <sup>+</sup> eq.	5.01E+00	1.44E-01	3.19E-01	8.84E-03	6.87E-03	-3.65E+00
EP-freshwater	kg P eq.	1.86E-02	1.38E-01	4.97E-04	4.53E-03	1.78E-05	-1.21E-02
EP-Marine	kg N eq.	1.27E+00	9.14E-02	1.30E-01	1.73E-01	5.24E-03	-1.02E+00
EP-terrestrial	mol N eq.	1.45E+01	4.80E-01	1.41E+00	1.96E+00	5.65E-02	-1.17E+01
POCP	kg NMVOC eq.	5.18E+00	2.77E+00	4.53E-01	6.24E-01	1.97E-02	-4.29E+00
ADP-minerals&metals*	kg Sb eq.	2.83E-03	5.03E-05	1.43E-04	4.67E-03	2.53E-06	-3.84E-03
ADP-fossil*	MJ	2.72E+04	5.70E+02	7.80E+02	1.49E+03	4.54E+01	-2.50E+04
WDP*	m <sup>3</sup>	1.47E+02	8.84E+00	3.94E+00	2.23E+01	2.01E+00	-1.16E+02
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.*

*Since Module C has been disclosed, it is recommended that the results of Module A1-A3 are not used without considering the results of Module C1-C4.*

#### Resource use indicators according to EN 15804 + A2:2019

Results per One ton of Reinforcement Bars used for industrial applications							
Indicator	Unit	A1-A3	C1	C2	C3	C4	D
PERE	MJ	586.44	0	0	0	0	-410.51
PERM	MJ	0	0	0	0	0	0
PERT	MJ	586.44	0	0	0	0	-410.51
PENRE	MJ	2993.83	238.71	274.51	1153.65	9.42	0
PENRM	MJ	0	0	0	0	0	0
PENRT	MJ	2933.83	238.71	274.51	1153.65	9.42	0
SM	kg	0	0	0	0	0	0
RSF	MJ	0	0	0	0	0	0
NRSF	MJ	0	0	0	0	0	0
FW	m³	114	6.7	3.94	22.5	2.01	-82.3
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 (The fresh water is produced from desalination of sea water extracted from captive sources)						
	The energy indicators are calculated using Option A in the PCR.						

#### Waste indicators according to EN 15804 + A2:2019

Results per One ton of Reinforcement Bars used for industrial applications							
Indicator	Unit	A1-A3	C1	C2	C3	C4	D
Hazardous waste disposed	kg	0.35	0	0	0	0	0
Non-hazardous waste disposed	kg	488.0	0	0	0	0	0
Radioactive waste disposed	kg	0.0804	0	0	0	0	0

## Output flow indicators according to EN 15804 + A2:2019

Results per One ton of Reinforcement Bars used for industrial applications							
Indicator	Unit	A1-A3	C1	C2	C3	C4	D
Components for re-use	kg	0	0	0	0	0	0
Material for recycling	kg	0	0	0	700	0	0
Materials for energy recovery	kg	0	0	0	0	0	0
Exported energy, electricity	MJ	0	0	0	0	0	0
Exported energy, thermal	MJ	0	0	0	0	0	0

## Other environmental performance indicators according to EN 15804 + A2:2019

Results per One ton of Reinforcement Bars used for industrial applications							
Indicator	Unit	A1-A3	C1	C2	C3	C4	D
GWP - GHG	kg CO <sub>2</sub> eq.	579.52	46.30	53.23	222.22	1.82	-262.20
Biogenic Carbon Content in Product	kg	0	0	0	0	0	0
Biogenic Carbon Content in Packaging	kg	0	0	0	0	0	0

## References

- General Programme Instructions of the International EPD® System. Version 4.0.
- PCR 2019:14. Construction Products, version 1.3.4
- Sustainability of construction works – Environmental Product Declarations – Methodology for the selection and use of Generic data; CEN/TR 15941:2010
- CPR: Regulation (EU) No. 305/2011 of the European Parliament and of the council of 9 March 2011 laying down harmonised conditions for the marketing of construction products and repealing Council Directive 89/106/EEC
- EN 15804: EN 15804:2012 + A2:2019: Sustainability of construction works – Environmental Product Declarations – core rules for the product category of construction products.
- EN ISO 14025: ISO 14025:2006 Environmental labels and declarations — Type III environmental declarations — Principles and procedures
- EN ISO 14040; ISO 14040:2006 Environmental management – Life cycle assessment – Principles and framework
- EN ISO 14044: ISO 14044:2006 Environmental management – Life cycle assessment – Requirements and guidelines
- SimaPro : SimaPro Software system and database for Life Cycle Engineering, Pre Sustainability 1990 – 2013, LCA SimaPro Experts software, version 9.5.0.2. database Converted ecoinvent 3.9.1 data as unit processes, with links to other processes. Compiled January 2023
- UNEP (2011) Recycling Rates of Metals – A Status Report, A Report of the Working Group on the Global Metal Flows to the International Resource Panel. Graedel, T.E.; Allwood, J.; Birat, J.-P.; Reck, B.K.; Sibley, S.F.; Sonnemann, G.; Buchert, M.; Hagelüken, C.



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