

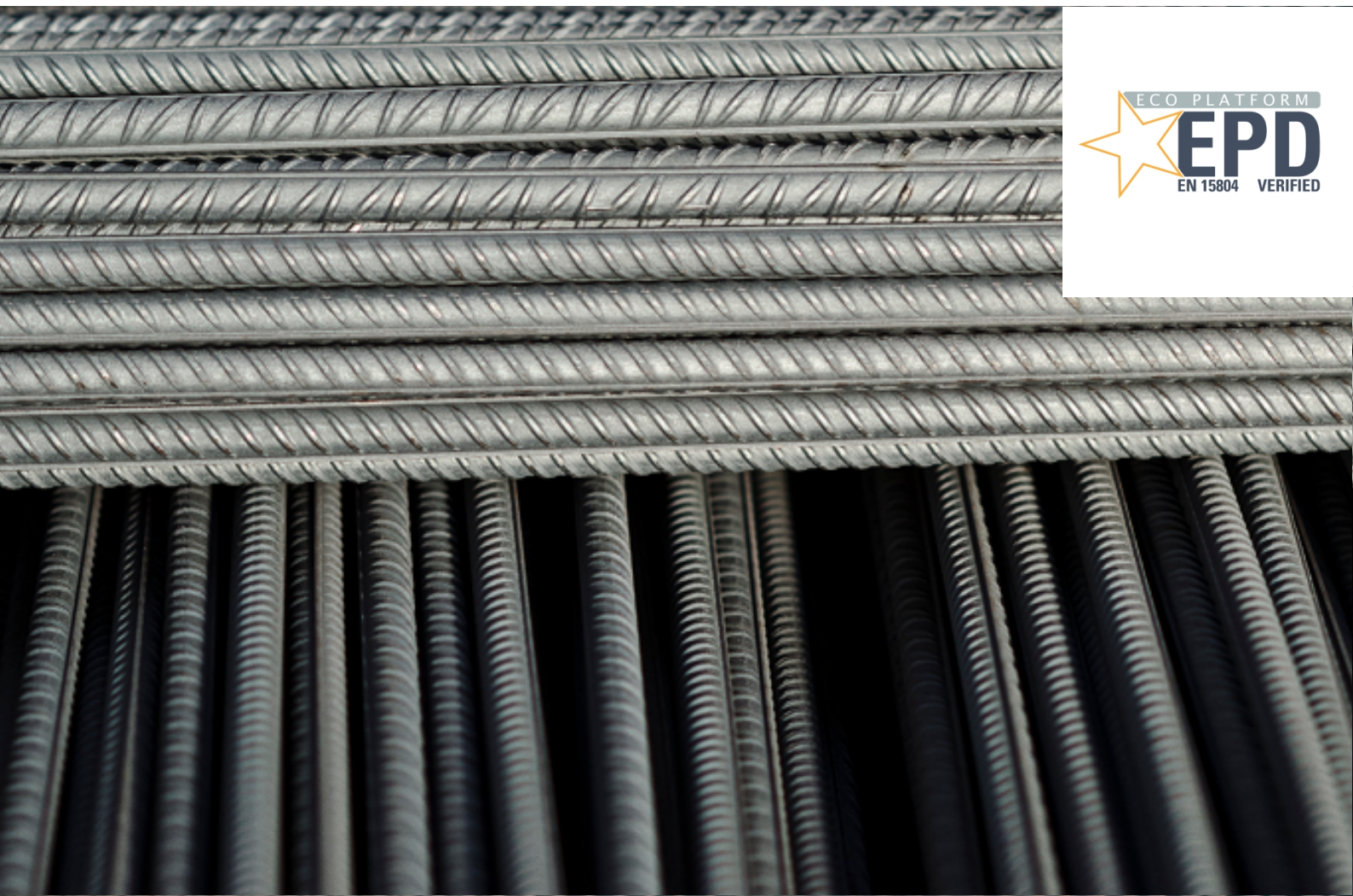
ENVIRONMENTAL PRODUCT DECLARATION

as per *ISO 14025* and *EN 15804+A1*



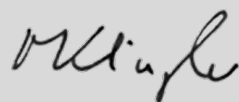
Owner of the Declaration	ArcelorMittal Europe
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Reinforcing steel in Bars (Rebars)
ArcelorMittal Europe

www.ibu-epd.com | <https://epd-online.com>



General Information

<p>ArcelorMittal Europe</p> <hr/> <p>Programme holder IBU – Institut Bauen und Umwelt e.V. Panoramastr. 1 10178 Berlin Germany</p> <hr/> <p>Declaration number EPD-ARM-20210338-CBB1-EN</p> <hr/> <p>This declaration is based on the product category rules: Reinforcing Steel, 11.2017 (PCR checked and approved by the SVR)</p> <hr/> <p>Issue date 13/04/2022</p> <hr/> <p>Valid to 12/04/2027</p> <hr/> <p></p> <hr/> <p>Dipl. Ing. Hans Peters (chairman of Institut Bauen und Umwelt e.V.)</p> <hr/> <p></p> <hr/> <p>Dr. Alexander Röder (Managing Director Institut Bauen und Umwelt e.V.)</p>	<p>Reinforcing steel</p> <hr/> <p>Owner of the declaration ArcelorMittal Europe-Long Products 66, rue de Luxembourg L-4221 Esch-sur-Alzette Luxembourg</p> <hr/> <p>Declared product / declared unit 1 metric ton of Reinforcing steel.</p> <hr/> <p>Scope: The declaration applies to 1 metric ton of Reinforcing steel produced by ArcelorMittal.</p> <p>The Life Cycle Assessment is based on annual data collected from the plants involved in the production: Warsaw in Poland and Hamburg in Germany.</p> <p>The owner of the declaration shall be liable for the underlying information and evidence; the IBU shall not be liable with respect to manufacturer information, life cycle assessment data and evidences. The EPD was created according to the specifications of <i>EN 15804+A1</i>. In the following, the standard will be simplified as <i>EN 15804</i>.</p> <hr/> <p>Verification</p> <table border="1"> <tr> <td colspan="2">The standard <i>EN 15804</i> serves as the core PCR</td> </tr> <tr> <td colspan="2">Independent verification of the declaration and data according to <i>ISO 14025:2010</i></td> </tr> <tr> <td><input type="checkbox"/> internally</td> <td><input checked="" type="checkbox"/> externally</td> </tr> </table> <hr/> <p></p> <hr/> <p>Matthias Klingler (Independent verifier)</p>	The standard <i>EN 15804</i> serves as the core PCR		Independent verification of the declaration and data according to <i>ISO 14025:2010</i>		<input type="checkbox"/> internally	<input checked="" type="checkbox"/> externally
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Independent verification of the declaration and data according to <i>ISO 14025:2010</i>							
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Product

Product description/Product definition

This EPD applies to 1 metric ton of steel for the reinforcement of concrete according to *EN 10080* standard (as weldable reinforcing steel in bars and coils), which is obtained from scrap and direct reduced iron (DRI) melted in Electric Arc Furnace, followed by hot rolling process and cold working, where appropriate.

Reinforcing Steel, also called rebar (including standard rebars, special rebars – Krybar®, rock bolt, tie bars and threaded bars) covers carbon steel for geotechnical use and the reinforcement of concrete. The surface of rebars is patterned to form a better bond with soil and concrete, in addition the ribs on threaded bars, rock bolts and tie bars allow for bolting.

For the placing on the market in the European Union/European Free Trade Association (EU/EFTA) (with the exception of Switzerland) the following legal provisions apply:

EN 10080:2005, Steel for the reinforcement of

concrete - Weldable reinforcing steel - General

The CE-marking takes into account the proof of conformity with the respective harmonised standards based on the legal provisions above.

For the application and use the respective national provisions apply.

Application

Rebars are steel rods that are used as a tension device in concrete. Typical applications are in the construction of buildings, bridges, roads and other civil works (infrastructures, superstructures, etc.) as well as mining.

Technical Data

This EPD is valid for Reinforcing steel of various steel grades and different forms of delivery. Performance data of the product in accordance with the Declaration of Performance.

Constructional data

Name	Value	Unit
Density	7850	kg/m ³
Modulus of elasticity	210000	N/mm ²
Coefficient of thermal expansion	12	10 ⁻⁶ K ⁻¹
Thermal conductivity	48	W/(mK)
Melting point	1536	°C
Minimum yield strength	460 - 900	N/mm ²
Tensile strength	483 - 1100	N/mm ²
Type of steel	Bar	-
Production route	EAF and DRI-EAF	-
Shear modulus	81000	N/mm ²

Product not harmonised in accordance with the CPR but in accordance with other provisions for harmonisation of the EU, such as *EN 10080*.

For the application and use the respective national provisions apply, as well as normally used standards such as (not exhaustive list): *EN 1992-1-1*, *EN 1992-1-2*, *EN 1992-2*, *EN 1992-3*, *DIN 488-1* and *BS4449*.

LCA: Calculation rules

Declared Unit

The declaration refers to the declared unit of 1 metric ton of Reinforcing steel as specified in Part B requirements on the EPD for reinforcing steel.

Foreground data for the production are integrated into the software model for the considered production site/company. The LCI is assessed as per the annual production data of ArcelorMittal Europe at the sites Warszawa (Poland) and Hamburg (Germany). The background data are taken from *GaBi* Documentation.

Declared unit

Name	Value	Unit
Declared unit	1	t
Density	7850	kg/m ³

System boundary

Type of the EPD: cradle-to-gate - with options. Module A1-A3, Modules C3-C4 and Module D were considered.

Modules A1-A3 include the following:

- The provision of resources, additives, and energy
- Transport of resources and additives to the production site
- Production processes on-site including energy, production of additives, disposal of production residues, and consideration of related emissions
- Recycling of production/manufacturing scrap. Steel scrap is assumed to reach the end-of-waste status once it is shredded and sorted,

Base materials/Ancillary materials

The base material of Reinforcing steel is iron. Alloying elements are added in the form of ferroalloys or metals (most common elements are Manganese and Silicon). Some small quantities of other elements may be present in the steel.

No substances listed on the “*Candidate List of Substances of Very High Concern for Authorisation*” by the European Chemicals Agency EC 1907-2006 are contained in the steel in declarable quantities.

This product contains substances listed in the *candidate list* (date: 22.2.2021) exceeding 0.1 percentage by mass: no

Reference service life

A reference service life for Reinforcing steel is not declared. These are construction products with many different applications purposes. The lifetime therefore will be limited by the service life of the work.

thus becoming input to the product system in the inventory.

Modules C3-C4 take into account the sorting and shredding of after-use steel, as well as the nonrecovered scrap due to sorting efficiency which is landfilled. A conservative value of 10% landfill is considered.

Module D refers to the End-of-Life, including recycling.

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.

For the life cycle modelling of the product under study, the *GaBi Software System* for Life Cycle Engineering, content version 2021.2, is used (*GaBi*).

LCA: Scenarios and additional technical information

Current practice for the average rebar product consists of 91 % recycling, 1 % reuse and 8 % landfill according to *SteelConstruction-info*.

This EPD considers as a conservative approach 90% recycling and 10 % landfill:

End of life (C3 - C4)

Name	Value	Unit
Landfilling	10	%

Reuse, recovery and/or recycling potentials (D), relevant scenario information

Name	Value	Unit
Recycling	90	%

LCA: Results

DESCRIPTION OF THE SYSTEM BOUNDARY (X = INCLUDED IN LCA; MND = MODULE NOT DECLARED; MNR = MODULE NOT RELEVANT)

PRODUCT STAGE			CONSTRUCTION PROCESS STAGE		USE STAGE							END OF LIFE STAGE				BENEFITS AND LOADS BEYOND THE SYSTEM BOUNDARIES
Raw material supply	Transport	Manufacturing	Transport from the gate to the site	Assembly	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	De-construction 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
X	X	X	MND	MND	MND	MND	MNR	MNR	MNR	MND	MND	MND	MND	X	X	X

RESULTS OF THE LCA - ENVIRONMENTAL IMPACT according to EN 15804+A1: 1 ton reinforcing steel

Parameter	Unit	A1-A3	C3	C4	D
Global warming potential	[kg CO ₂ -Eq.]	8.18E+2	1.60E+0	1.43E+0	4.11E+2
Depletion potential of the stratospheric ozone layer	[kg CFC11-Eq.]	2.15E-12	4.69E-14	7.83E-15	1.37E-12
Acidification potential of land and water	[kg SO ₂ -Eq.]	1.65E+0	2.99E-3	8.57E-3	6.40E-1
Eutrophication potential	[kg (PO ₄) ³ -Eq.]	1.56E-1	4.48E-4	9.72E-4	4.63E-2
Formation potential of tropospheric ozone photochemical oxidants	[kg ethene-Eq.]	1.33E-1	2.60E-4	6.58E-4	1.91E-1
Abiotic depletion potential for non-fossil resources	[kg Sb-Eq.]	8.90E-5	4.70E-7	1.44E-7	1.07E-3
Abiotic depletion potential for fossil resources	[MJ]	8.43E+3	1.82E+1	1.95E+1	4.25E+3

RESULTS OF THE LCA - INDICATORS TO DESCRIBE RESOURCE USE according to EN 15804+A1: 1 ton reinforcing steel

Parameter	Unit	A1-A3	C3	C4	D
Renewable primary energy as energy carrier	[MJ]	5.12E+2	1.22E+1	2.70E+0	-2.65E+2
Renewable primary energy resources as material utilization	[MJ]	0.00E+0	0.00E+0	0.00E+0	0.00E+0
Total use of renewable primary energy resources	[MJ]	5.12E+2	1.22E+1	2.70E+0	-2.65E+2
Non-renewable primary energy as energy carrier	[MJ]	9.07E+3	2.82E+1	2.01E+1	4.22E+3
Non-renewable primary energy as material utilization	[MJ]	0.00E+0	0.00E+0	0.00E+0	0.00E+0
Total use of non-renewable primary energy resources	[MJ]	9.07E+3	2.82E+1	2.01E+1	4.22E+3
Use of secondary material	[kg]	1.15E+3	0.00E+0	0.00E+0	0.00E+0
Use of renewable secondary fuels	[MJ]	0.00E+0	0.00E+0	0.00E+0	0.00E+0
Use of non-renewable secondary fuels	[MJ]	0.00E+0	0.00E+0	0.00E+0	0.00E+0
Use of net fresh water	[m ³]	1.48E+0	1.18E-2	4.95E-3	2.74E+1

RESULTS OF THE LCA – WASTE CATEGORIES AND OUTPUT FLOWS according to EN 15804+A1: 1 ton reinforcing steel

Parameter	Unit	A1-A3	C3	C4	D
Hazardous waste disposed	[kg]	1.03E-6	6.99E-9	2.13E-9	-9.22E-7
Non-hazardous waste disposed	[kg]	2.91E+0	1.89E-2	1.00E+2	-5.38E+1
Radioactive waste disposed	[kg]	2.16E-1	3.89E-3	2.10E-4	-4.57E-4
Components for re-use	[kg]	0.00E+0	0.00E+0	0.00E+0	0.00E+0
Materials for recycling	[kg]	0.00E+0	9.00E+2	0.00E+0	0.00E+0
Materials for energy recovery	[kg]	0.00E+0	0.00E+0	0.00E+0	0.00E+0
Exported electrical energy	[MJ]	0.00E+0	0.00E+0	0.00E+0	0.00E+0
Exported thermal energy	[MJ]	0.00E+0	0.00E+0	0.00E+0	0.00E+0

Note: 1153,8 kg of scrap are used in the manufacturing of 1 metric ton of rebar. After use, 900 kg steel are recycled, and 100 kg are landfilled. The potential environmental impact calculated for module D depends on the net amount of scrap left in the system, which is 900-1153,8 = -253,8 kg. This means that the system has a net consumption of 253,8 kg of scrap. This is shown in module D as an environmental burden.

References

Standards:

BS 4449

BS 4449:2005+A3:2016; Steel for the reinforcement of concrete. Weldable reinforcing steel. Bar, coil and decoiled product. Specification

DIN 488

DIN 488-1:2009, Reinforcing steels - Part 1: Grades, properties, marking

EN 10080

EN 10080:2005, Steel for the reinforcement of concrete - Weldable reinforcing steel - General

EN 1992-1-1

EN 1992-1-1:2004, Eurocode 2: Design of concrete structures - Part 1-1: General rules and rules for buildings

EN 1992-1-2

EN 1992-1-2:2004, Eurocode 2: Design of concrete structures - Part 1-2: General rules - Structural fire design

EN 1992-2

EN 1992-2:2005, Eurocode 2 - Design of concrete structures - Concrete bridges - Design and detailing rules

EN 1992-3

EN 1992-3:2006, Eurocode 2 - Design of concrete structures - Part 3: Liquid retaining and containment structures

EN 15804

EN 15804:2012-04+A1 2013, Sustainability of construction works — Environmental Product Declarations — Core rules for the product category of construction products.

ISO 14025

DIN EN ISO 14025:2011-10, Environmental labels and declarations — Type III environmental declarations — Principles and procedures.

Other References:

Candidate list - REACH

Regulation (EC) No 1907/2006 of the European Parliament and of the Council on the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH). <https://echa.europa.eu/candidate-list-table>

GaBi

GaBi dataset documentation for the GaBi Software System and Database for Life Cycle Engineering, thinkstep AG, Leinfelden-Echterdingen, 2021 (<http://documentation.gabi-software.com/>)

IBU 2021

General Instructions for the EPD programme of Institut Bauen und Umwelt e.V. Version 2.0, Berlin: Institut Bauen und Umwelt e.V., 2021. www.ibuepd.com

PCR Part A

PCR - Part A: Calculation rules for the Life Cycle Assessment and Requirements on the Background Report, version 1.8, Institut Bauen und Umwelt e.V., www.bau-umwelt.com, 2019

PCR Part B

PCR – Part B: Requirements of the EPD for Metal Ceilings, Institut Bauen und Umwelt e.V., www.bau-umwelt.com, 2019

SteelConstruction-info

https://www.steelconstruction.info/The_recycling_and_reuse_survey

Worldsteel 2011

Life cycle assessment (LCA) methodology report <http://www.worldsteel.org/publications/>

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