ENVIRONMENTAL PRODUCT DECLARATION

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

Owner of the Declaration	ArcelorMittal Brasil
Programme holder	Institut Bauen und Umwelt e.V. (IBU)
Publisher	Institut Bauen und Umwelt e.V. (IBU)
Declaration number	EPD-ARM-20210054-CBC1-EN
ECO EPD Ref. No.	
Issue date	26/07/2021
Valid to	25/07/2026

Reinforcing steel in bars

ArcelorMittal Brasil

Institut Bauen und Umwelt e.V.

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

ECO PLATFORM EPD EN 15804 VERIFIED

General Information

ArcelorMittal Brasil	Reinforcing steel in bars
Programme holder IBU – Institut Bauen und Umwelt e.V. Panoramastr. 1 10178 Berlin Germany	**Owner of the declaration** ArcelorMittal Brasil Avenida Carandaí, 1115 Funcionários - 16º andar 30130-915 - Belo Horizonte Brasil
Declaration number EPD-ARM-20210054-CBC1-EN	**Declared product / declared unit** 1 metric ton of reinforcing steel bars produced by ArcelorMittal in Brazil
This declaration is based on the product category rules: Reinforcing Steel, 30.11.2017 (PCR checked and approved by the SVR)	**Scope:** The declaration applies to 1 metric ton of reinforcing steel bar produced by ArcelorMittal Brasil, representing 100% of the annual production of 2019.
Issue date 26/07/2021	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 *EN 15804+A1*. In the following, the standard will be simplified as *EN 15804*.
Valid to 25/07/2026	**Verification** The standard *EN 15804* serves as the core PCR Independent verification of the declaration and data according to *ISO 14025:2010* ☐ internally ☒ externally
Dipl. Ing. Hans Peters (chairman of Institut Bauen und Umwelt e.V.)	
Dr. Alexander Röder (Managing Director Institut Bauen und Umwelt e.V.))	Dr. Eva Schmincke (Independent verifier)

Product

Information about the enterprise
ArcelorMittal is the **world's leading steel and mining company**. Guided by a philosophy to produce safe, sustainable steel, it is the leading supplier of quality steel products in all major markets including automotive, construction, household appliances and packaging. ArcelorMittal is present in 60 countries.

Product description/Product definition
Rebar is short for reinforcing (steel) bar, used for the reinforcement of concrete according to *EN10080* standard (as weldable reinforcing steel in bars and coils).

For the use and application of the product, the respective national provisions at the place of use apply, being

- *ABNT NBR 6118*
- *ABNT NBR 6215*
- *ABNT NBR 7477*
- *ABNT NBR 7478*
- *ABNT NBR 7480*
- *ISO 6892*
- *ISO 15630*
- *NB 732*
- *NTP 339*
- *NTP 341*
- *NCh 204*
- *NTC 2289*
- *IRAM 500-207*
- *IRAM 500-528*
- *PNA 4-007-99*
- *FONDONORMA 316*
- *ASTM A615*
- *ASTM A706*

Application
Reinforcing steel bars (rebar) 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 (infrastructure, superstructures etc.).

Technical Data
Technical specifications are listed below.

Constructional data
Rebar can be produced either by an Electric Arc Furnace (EAF) of a Basic Oxygen Furnace (BOF) route.

Name	Value	Unit
Tensile strength (CA25)	30	N/mm^2
Tensile strengh (CA50/AP 500/AH 500)	540/550/600	N/mm^2
Type of steel (Bar, coil, welded fabric, lattice grinders)	-	-
Production route (EAF or BOF)	-	-
Weldability (max)	0.55	Ceq
Yield strength (CA25)	250	N/mm^2
Yield strength (CA50/AP 500/AH 500)	500	N/mm^2
Surface geometry (fR or PRA) (CA25)	Flat	-
Surface geometry (fR or PRA) (CA50/AP 500/AH 500)	Rib	
Elongation (Agt) (CA25)	18	%
Elongation (Agt) (CA50/AP 500/AH 500)	8	%

Performance data of the product with respect to its characteristics in accordance with the relevant technical provision (no CE-marking).

Base materials/Ancillary materials
The base material for the rebar is iron. Alloying elements are added in the form of ferroalloys or metal, the most common elements are manganese, chromium and vanadium. Other elements like copper may be present in steel.

This product/article/at least one partial article contains substances listed in the candidate list (date: 27.06.2018) exceeding 0.1 percentage by mass: no”

Maximum content on the following elements are established by the Brazilian National Standard *ABNT NBR 7480*:

- % Carbon: 0,35 maximum;
- % Manganese: 1,50 maximum;
- % Phosphorus: 0,050 maximum;
- % Sulphur: 0,050 maximum;
- % Silicon: 0,50 maximum.

The standard *ABNT NBR 7480*, also allows for ferroalloy content of elements like niobium, vanadium, but with a Carbon Equivalent Value (CEV) not exceeding 0,55% analysis in the ladle furnace, according the following equation:

CE=C+Mn/6+ (Cr+V+Mo)/5+ (Cu+Ni)/15

Manufacture

In ArcelorMittal Brasil rebars are produced by the following process steps:

- Iron ore and charcoal are fed to a blast furnace to produce pig iron;
- Pig iron and scrap are converted into steel in an electric arc furnace;
- Produced steel refined in a ladle furnace with addition of ferroalloys and metals to obtain the required steel characteristics;
- Steel is then casted at a continuous caster and then rolled to obtain the rebars.

The first step is either performed internally or by external suppliers.

Environment, Health and Safety (EHS)

Environmental, occupational health, safety and quality management at the different plants of ArcelorMittal in Brasil are in accordance with the following standards:

- *ISO 14001*;
- *ISO 45001*;
- Environmental labelling – Type I, provided by the *Associação Brasileira de Normas Técnicas – ABNT (Brazilian National Standards Organization),* developed according to the standards *ISO 14020* and *ISO 14024*.

End of life scenario - Re-use phase

Deconstruction

Reinforcing steel bars (rebar) are not reused at the end of life but can be easily separated from the concrete and recycled into similar steel products.

Recycling and recovery

Reinforcing steel bar (rebar) is 100% recyclable and can be recycled to the same (or higher/lower) quality of steel depending upon the metallurgy and processing of the recycling route. Recycling routes are well established in Brasil and recycling should be preferred (as) at end of life.

The efficiency of the recycling process is 85% (ArcelorMittal 2016). Reuse, Recovery and Recycling potential of this fraction of rebar is reported in module D.

Disposal

Reinforcing steel bars (rebar) is a valuable resource and therefore should not be disposed. ArcelorMittal has scrap yards and partners working all over Brazil to enable scrap collection and to provide logistic support.

The fraction of steel scraps that cannot be recovered (due to collection loss) is landfilled. The *Brazilian Waste Index* for iron and steel is 17 04 05.

Reference service life

As rebar is used in concrete structures to give additional mechanical resistance, its lifetime will be limited by the service life of the building.

The documentation of the RSL, under this circumstance, is not required for the current EPD

according to the relevant ISO standards and *EN 15804*.

Additional information

Additional information on reinforcing steel bars (rebar) can be found at:

- https://brasil.arcelormittal.com/produtos-solucoes/catalogos
- https://brasil.arcelormittal.com.br/produtos-solucoes/construcao-civil/vergalhao-arcelormittal-ca-50-s-soldavel

LCA: Calculation rules

Declared Unit

The declared unit is 1 metric tonne of reinforcing steel bars, packed and ready to be transported from ArcelorMittal Brasil to their clients as specified in Part B: Requirements on the EPD for Structural Steel, Institut Bauen und Umwelt e.V (*PCR 2017, Part B*).

Declared unit

Name	Value	Unit
Declared unit	1	t
Density	7825	kg/m^3
Conversion factor to 1 kg	1000	-

The data for the life cycle inventory are based on data covering 100% of the production volume of rebar in Brazil in 2019.

All reported data are calculated as total value per site averaged across all production sites based on production volume per site.

System boundary

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

Modules A1-A3 of hot-dip coated steel wire production 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, thus becomes the input to the product system in the inventory.

Module C3 takes into account the sorting and shredding of after-use steel that is recycled, as well as the non-recovered scrap due to sorting efficiency which is landfilled. A conservative value of 1% landfill is considered.

Module D refers to the end-of-life of hot-dip coated steel wire, including reuse and recycling. For recycling, the net amount of steel scrap made available over the whole life cycle is considered.

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.

The background database used for this EPD is GaBi, SP 30..

LCA: Scenarios and additional technical information

End of life (C1 - C4)

This module considers the scrap preparation after initial sorting and shredding of the end-of-life steel, as well as the non-recovered scrap due to sorting efficiency, which ends up in landfills. The end-of-life scenario for concrete steel bars considers that after use 15% is landfilled.

Name	Value	Unit
Landfilling	150	kg

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

Module D includes any declared 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 recovery and/or recycling potentials.

The benefits brought by the 85% recycling rate of scrap is applied to the net output leaving the product system since it becomes an avoided production of virgin material.

Name	Value	Unit
Recycling	850	kg

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	MND	X

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

Parameter	Unit	A1-A3	C3	D
Global warming potential	[kg CO_2-Eq.]	8.81E+2	3.43E+0	-4.82E+2
Depletion potential of the stratospheric ozone layer	[kg CFC11-Eq.]	5.53E-8	6.26E-14	2.96E-12
Acidification potential of land and water	[kg SO_2-Eq.]	2.65E+0	2.08E-2	-1.11E+0
Eutrophication potential	[kg $(PO_4)^{3-}$-Eq.]	2.60E-1	2.24E-3	-9.23E-2
Formation potential of tropospheric ozone photochemical oxidants	[kg ethene-Eq.]	2.01E-1	1.64E-3	-1.45E-1
Abiotic depletion potential for non-fossil resources	[kg Sb-Eq.]	2.08E-4	4.41E-7	1.15E-5
Abiotic depletion potential for fossil resources	[MJ]	5.95E+3	4.30E+1	-3.81E+3

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

Parameter	Unit	A1-A3	C3	D
Renewable primary energy as energy carrier	[MJ]	3.15E+3	2.11E+1	4.15E+2
Renewable primary energy resources as material utilization	[MJ]	0.00E+0	0.00E+0	0.00E+0
Total use of renewable primary energy resources	[MJ]	3.15E+3	2.11E+1	4.15E+2
Non-renewable primary energy as energy carrier	[MJ]	6.25E+3	4.51E+1	-3.64E+3
Non-renewable primary energy as material utilization	[MJ]	0.00E+0	0.00E+0	0.00E+0
Total use of non-renewable primary energy resources	[MJ]	6.25E+3	4.51E+1	-3.64E+3
Use of secondary material	[kg]	6.73E+2	0.00E+0	0.00E+0
Use of renewable secondary fuels	[MJ]	6.51E-19	3.77E-19	0.00E+0
Use of non-renewable secondary fuels	[MJ]	7.65E-18	4.43E-18	0.00E+0
Use of net fresh water	[m^3]	1.60E+1	9.60E-2	-3.28E-1

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

Parameter	Unit	A1-A3	C3	D
Hazardous waste disposed	[kg]	5.99E-5	5.43E-7	-3.08E-6
Non-hazardous waste disposed	[kg]	4.30E+0	1.50E+2	-6.93E+0
Radioactive waste disposed	[kg]	1.14E-1	7.97E-4	6.61E-2
Components for re-use	[kg]	0.00E+0	0.00E+0	0.00E+0
Materials for recycling	[kg]	0.00E+0	8.50E+2	0.00E+0
Materials for energy recovery	[kg]	0.00E+0	0.00E+0	0.00E+0
Exported electrical energy	[MJ]	0.00E+0	0.00E+0	0.00E+0
Exported thermal energy	[MJ]	0.00E+0	0.00E+0	0.00E+0

References

ABNT NBR 6118
ABNT NBR 6118:2014 - Design of concrete structures — Procedure

ABNT NBR 6215
ABNT NBR 6215:2011 - Steel products — Terminology

ABNT NBR 7477
ABNT NBR 7477:1982 - Determination of the surface conformation coefficient of steel bars and wires for reinforced concrete

ABNT NBR 7478
ABNT NBR 7478:2021 - Fatigue test method of steel bars for reinforced concrete

ABNT NBR 7480
ABNT NBR 7480:2007 - Steel for the reinforcement of concrete structures – Specification

Environmental labelling – Type I
Environmental labelling – Type I provided by Associação Brasileira de Normas Técnicas – ABNT

(Brazilian National Standards Organization) http://www.abnt.org.br/

ASTM A615
ASTM A615:2020 - Standard specification for deformed and plain carbon-steel bars for concrete reinforcement

ASTM A706
ASTM A706:2016 - Standard specification for deformed and plain low-alloy steel Bars for concrete reinforcement

Brazilian Waste Index
Normative Instruction No. 1, of January 25, 2013, regulates the National Register of Operators of Hazardous Waste (CNORP) http://www.ibama.gov.br/component/content/article?id=726

Candidate List of Substances of Very High Concern of Authorization
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

EN10080
EN10080:2005 - Steel for the reinforcement of concrete - Weldable reinforcing steel – General

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

European Chemicals Agency
https://echa.europa.eu/

FONDONORMA 316
FONDONORMA 316:2005 - Barras y rollos de acero con resaltes para uso como refuerzo estructural

GaBi ts Software
GaBi ts: Software and databasis for life cycle engineering. LBP, University of Stuttgart und PE International, 2013.

GaBi ts Documentation
GaBi ts: Documentation of the GaBi datasets for life cycle engineering. LBP, Universitity of Stuttgart and PE International, 2011. http://documentation.gabi-software.com.

IBU 2016
Institut Bauen und Umwelt e.V.: 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.ibu-epd.com

IRAM 500-207
IRAM-IAS U 500-207:2017 - Hot rolled deformed weldable steel bars for reinforcement of concrete structures.

IRAM 500-528
IRAM-IAS U 500-528:2020 - Hot rolled deformed steel bars for reinforcement of con-crete structures

ISO 6892
ISO 6892-1:2019 - Metallic materials — Tensile testing — Part 1: Method of test at room temperature

ISO 14001
ISO 14001:2015 - Environmental management systems - Requirements with guidance for use

ISO 14020
ISO 14020:2000 - Environmental labels and declarations — General principles

ISO 14024
ISO 14024:2018 - Environmental Labels and declarations - Type I environmental labelling - Principles and Procedures

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

ISO 15630
ISO 15630-1:2019 - Steel for the reinforcement and prestressing of concrete — Test methods — Part 1: Reinforcing bars, rods and wire

ISO 45001
ISO 45001:2018 - Occupational health and safety management systems □. Requirements with guidance for use

NB 732
NB 732:2017 - Productos laminados - Barras corrugadas para hormigón armado - Definiciones, clasificación y requisitos

NCh 204
NCh 204:2020 - Steel - Hot rolled bars for reinforced concrete

NTP 339
NTP 339.186:2018 – Productos de acero. Barras de acero de baja aleación, soldables y corrugadas, para refuerzo de concreto armado. Requisitos.

NTP 341
NTP 341.031:2018 – Productos de Acero. Barras de acero al carbono, corrugadas, para refuerzo de concreto armado. Requisitos.

NTC 2289
NTC 2289:2020 - Low-alloy steel deformed and plain bars for concrete reinforcement

PCR 2016, Part A
Product Category Rules for Building-Related Products and Services, Calculation Rules for the Life Cycle Assessment and Requirements on the Project Report. Institut Bauen und Umwelt e.V. (IBU) March 2016 www.bau-umwelt.de

PCR 2017, Part B
Requirements on the EPD for Structural Steel - Institut Bauen und Umwelt e.V., Königswinter (pub.): From the range of Environmental Product Declarations of Institute Construction and Environment e.V. (IBU), 2017

PNA 4-007-99

NP 4-007:99 - Barras de acero conformadas, laminadas en caliente, para armaduras en estructuras de hormigón.

Steel Recycling
Steel recycling rates at a glance, 2007 Steel recycling rates; Steel Recycling Institute.

Worldsteel, 2017
Life cycle assessment (LCA) methodology report http://www.worldsteel.org/publications/ABNT NBR 6118:2014 - Design of concrete structures — Procedure

Publisher
Institut Bauen und Umwelt e.V.
Panoramastr. 1
10178 Berlin
Germany

Tel +49 (0)30 3087748- 0
Fax +49 (0)30 3087748- 29
Mail info@ibu-epd.com
Web **www.ibu-epd.com**

Programme holder
Institut Bauen und Umwelt e.V.
Panoramastr 1
10178 Berlin
Germany

Tel +49 (0)30 - 3087748- 0
Fax +49 (0)30 – 3087748 - 29
Mail info@ibu-epd.com
Web **www.ibu-epd.com**

Author of the Life Cycle Assessment
ArcelorMittal Brasil
Av. Carandaí, 1115 - Funcionários 25 an
30130 -915 - Belo Horizonte
Brazil

Tel 0800 015 1221
Fax -
Mail arcelormittalnet@arcelormittal.com.br
Web **http://www.arcelormittal.com.br/**

Owner of the Declaration
ArcelorMittal Brasil
Av. Carandaí, 1115 - Funcionários 25 an
30130 -915 - Belo Horizonte
Brazil

Tel 0800 015 1221
Fax -
Mail arcelormittalnet@arcelormittal.com.br
Web **http://www.arcelormittal.com.br/**