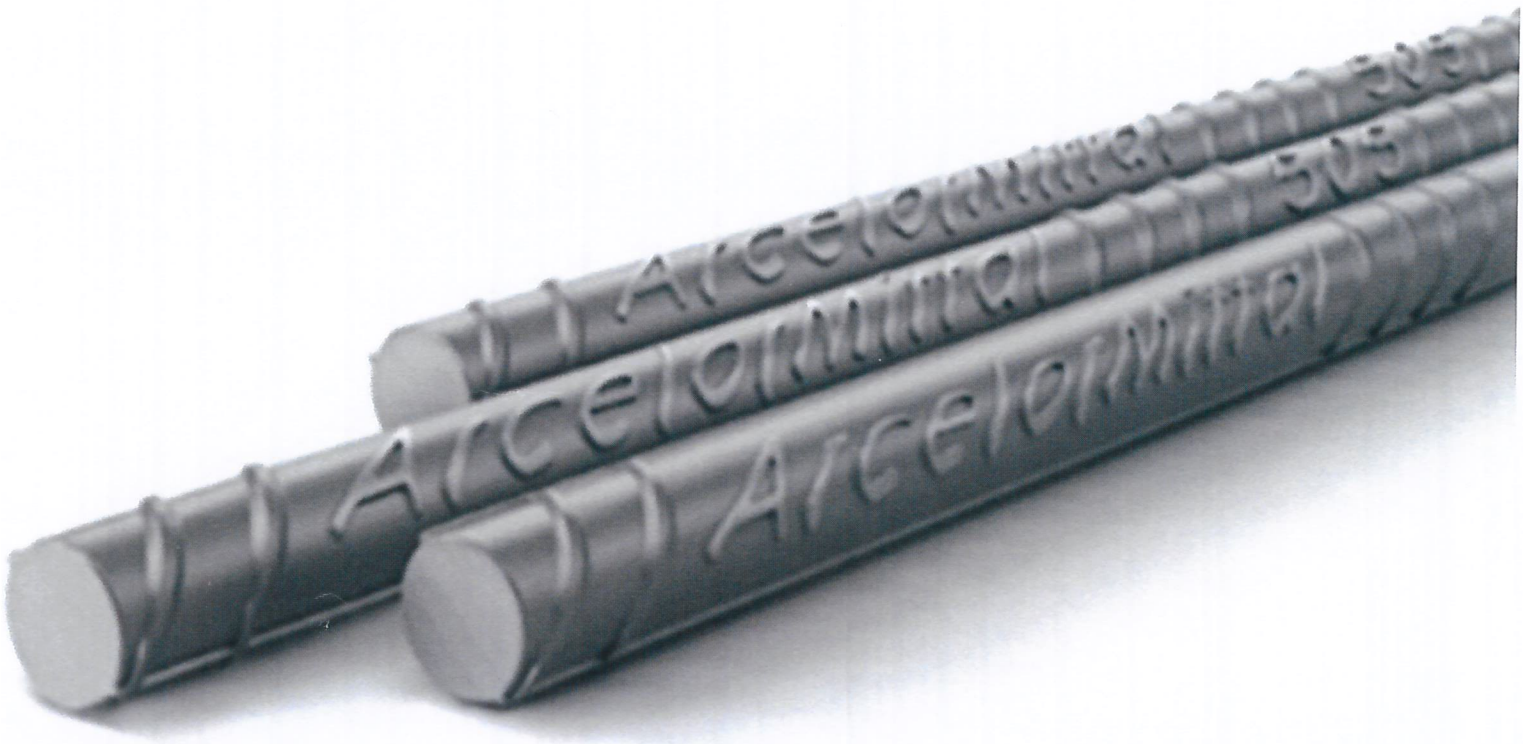
# Environmental Product Declaration – EPD Like

Steel CA50 Rebar XCarb® Recycled and Renewably Produced

ArcelorMittal Brasil



ArcelorMittal

## GENERAL INFORMATION

| ArcelorMittal S.A. | XCarb® Recycled and Renewably Produced Steel CA50 Rebar |
|---|---|
| **Programme holder**<br>N/A | **Owner of the declaration**<br>ArcelorMittal Brasil<br>Av. Carandaí, 1115<br>Funcionários 25 o andar<br>30130 -915 - Belo Horizonte<br>Brazil |
| **This declaration is based on the product category rules:**<br>Reinforcing Steel | **Declared product / declared unit**<br>1 metric ton of XCarb® Recycled and Renewably Produced Steel CA50 rebar.<br><br>This EPD attests that ArcelorMittal Brazil - Long Carbon has produced 1.028 of XCarb® recycled and renewably produced rebars at ArcelorMittal Resnde and ArcelorMittal Piracicaba |
| **Issue date**<br>10/05/2024 | **Scope**<br>The declaration applies to 1 metric ton of XCarb® Recycled and Renewably Produced by ArcelorMittal Resende and ArcelorMittal Piracicaba.<br><br>The Life Cycle Assessment is based on data collected in 2022 and 2023 for deliveries based on Guarantee of Origins renewable electricity supply. |
| **Valid to**<br>09/05/2029 | |
| Guilherme Corrêa Abreu<br>General Manager Sustainability | **Verification**<br>The standard /EN 15804/ serves as the core PCR<br>Independent verification of the declaration and data according to /ISO 14025:2010/<br>[x] internally [ ] externally |
| Paula Couri Cornagliotti Gonçalves<br>Marketing & Products Director | |

## Product

**Product description / Product definition**
This Environmental Product Declaration refers to XCarb® Recycled and Renewably Produced Steel CA50 rebar. These are low carbon steel products fabricated in rolling mills, which use as main input billets produced from 100% scrap melted in Electric Arc Furnace using 100% renewable electricity supply with Guarantee of Origins (GoO).

XCarb® Recycled and Renewably Produced Steel CA50S rebars are produced at ArcelorMittal Resende and ArcelorMittal Piracicaba in Brazil; their production is based on Electric Arc Furnace (EAF).

**Application**
The XCarb® Recycled and Renewably Produced Steel CA50 rebar is used for the reinforcement of concrete, and others typical applications in the construction of Buildings, towers, bridges, roads and other civil works (infrastructure, superstructures, real-state, etc.).

For the use, technical tests and application of the product the respective national provisions at the place of use apply: ABNT NBR 17005, ABNT NBR 6215, ABNT NBR 7477, ABNT NBR 7478, ABNT NBR 7480 , ABNT NBR 7481, ABNT 14859-3, ABNT NBR ISO 6892-1, ABNT NBR ISO 15630-1, ABNT NBR 6118, ABNT NBR 14931.

**Technical Data**
The safety of a building is directly linked to the quality of the materials employed in its construction. The use of standardized materials and proper handling procedures is one of the ways construction industries ensure a building's safety.

ArcelorMittal on-site laboratories perform chemical and mechanical tests guaranteeing compliance of the final products to technical standard requirements.

**Constructional data**
The XCarb® Recycled and Renewably Produced Steel CA50-rebar are supplied in coils or in bundles, using steel billets and hot rolling process to produce the bars (diameter 6.3 to 40 mm) with low carbon levels, which can be recycled after collection and sorting as steel scrap. The XCarb® Recycled and Renewably Produced Steel CA50 rebar also have a plastic tag with information needed for product identification and tracking.

The dimensions of the declared XCarb® Recycled and Renewably Produced Steel CA50S rebar may vary according to the intended application. For XCarb® Recycled and Renewably Produced Steel CA50 rebar, lengths may be of 12 meters or special lengths.

**Manufacture**
To obtain the final XCarb® Recycled and Renewably Produced Steel CA50 rebar products, the rebars goes to a rolling mill plant after the steel mill process. By the rolling mill process and quality control the rebar can be packed in coils or bundles of straight bars.

In ArcelorMittal Resende and ArcelorMittal Piracicaba, the XCarb® Recycled and Renewably Produced Steel CA50 rebar is produced following route:

- Scrap steel is fed to an electric arc furnace to be converted into steel and after Ladle Furnace.
- The steel produced into the electric arc furnace and Ladle Furnace is then casted and rolled to obtain rebars.

**Environment and health during manufacturing**
Environmental, occupational health, safety and quality management at the different plants of ArcelorMittal in Brazil are in accordance with the following standards:

- ISO 14001;
- ISO 9001;
- ISO 45001;
- Health Product Declaration Standard;
- ResponsibleSteel™ Core Site Certification Standard
- Environmental labeling 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.

**Re-use phase**
XCarb® Recycled and Renewably Produced Steel CA50 rebar are not reused at the end of life but can be easily separated from other materials and recycled into similar steel products to the same (or higher/lower) quality of steel depending upon the metallurgy and processing of the recycling route.

**Disposal**
XCarb® Recycled and Renewably Produced Steel CA50S rebar are valuable resources and therefore should not be disposed of. In this perspective, ArcelorMittal has implemented a network all over Brazil to enable scrap collection and to provide logistic support.

The small fraction of impurities which cannot be recovered (due to collection loss) is sent to landfill without any preventative measures with all due care as federal, state and municipal legislation allows.

The Brazilian Waste Index code for iron and steel products is 17 04 05.

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

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

**Base materials / Ancillary materials**
The base material for the XCarb® Recycled and Renewably Produced Steel CA50 rebar is steel hot rolling produced in ArcelorMittal Resende and ArcelorMittal Piracicaba plants.

Alloying elements are added in the form of ferroalloys or metal, the most common elements are carbon, manganese and residual elements like, chromium and molibidenum. Other elements like nitrogen or copper may be present in steel. The composition of these elements depends on the steel designation/grade.

**Reference service life**
Reinforcing XCarb® Recycled and Renewably Produced Steel CA50 rebar are used in concrete to give additional mechanical resistance. The lifetime of reinforcing XCarb® Recycled and Renewably Produced Steel CA50 rebar therefore will be limited by the service life of the building. Under these circumstances, no RSL according to the relevant ISO standards and /EN 15804/ can be declared.

## LCA: Calculation rules

**Declared Unit**
The declaration refers to the functional unit of 1 metric ton XCarb® Recycled and Renewably Produced Steel CA50 rebar as specified in Part B requirements on the EPD for Reinforcing Steel.

**Declared unit**

| Name | Value | Unit |
|---|---|---|
| Declared unit | 1000 | kg |
| Density | 7850 | kg/m$^3$ |
| Conversion factor to 1 kg | 0.001 | - |

XCarb® Recycled and Renewably Produced Steel CA50S rebar are produced by two ArcelorMittal plants in Brazil: ArcelorMittal Resende and ArcelorMittal Piracicaba. The data for the life cycle inventory are based on 9 heats in Piracicaba and Resende for the production of XCarb® Recycled and Renewably Produced Steel CA50S rebar in 2022 and 2023.

All reported data are calculated as total XCarb® Recycled and Renewably Produced Steel CA50 rebar value produced per site.

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

**Modules A1-A3** of the steel annealed wire and nails 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 is shredded and sorted, thus becomes input to the product system in the inventory.

**Module C3** takes into account the sorting and shredding of after-use steel and as well the non-recovered scrap due to sorting efficiency which ends up in landfilling. Recycling should be understood as the preferred way to treat the product after use.

**Module D** refers to the net benefits and loads of the net flow leaving the product system.

**Cut-off criteria**
A cut-off in mass has been applied on the packaging used for delivering the finished products.

**Background data**
Background data from think step professional database were used for modules A1, A2, C3 and D.

**Allocation**
The facility level data were allocated to the XCarb® Recycled and Renewably Produced Steel CA50-rebar using the production volume of this product (physical relationship).

Materials and chemicals used were modelled using the allocation rule most suitable for the respective product. For further information on a specific product check *Gabi Documentation* and *Worldsteel Association Methodology Report*

**Data quality**
All relevant background datasets are taken from the GaBi Software System for Life Cycle database, using the most updated processes.
Regarding foreground data, high quality primary data was collected by ArcelorMittal Brasil.

**Period under review**
The reference year for the present EPD is 2022 and 2023.

**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 2021.1, is used (GaBi ts).

## 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 | 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 | Value | Unit |
|---|---|---|
| Recycling | 850 | kg |

## LCA: Results

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

| 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: 1 metric ton of steel XCarb® Recycled and Renewably Produced Steel CA50S rebar**

| Parameter | Unit | A1-A3 | C3 | C4 | D |
|---|---|---|---|---|---|
| Climate Change - total | [kg CO2 eq.] | 2,84E+02 | 1,36E+00 | 7,42E-01 | 2,90E+02 |
| Climate Change, fossil | [kg CO2 eq.] | 2,84E+02 | 1,34E+00 | 7,40E-01 | 2,90E+02 |
| Climate Change, biogenic | [kg CO2 eq.] | 5,16E-02 | 9,82E-03 | 0,00E+00 | 0,00E+00 |
| Climate Change, land use and land use change | [kg CO2 eq.] | 2,24E-01 | 1,04E-03 | 2,33E-03 | 3,86E-02 |
| Ozone depletion | [kg CFC-11 eq.] | 4,88E-07 | 2,20E-11 | 1,91E-12 | -3,90E-10 |
| Acidification | [Mole of H+ eq.] | 1,00E+00 | 3,30E-03 | 5,33E-03 | 7,10E-01 |
| Eutrophication, freshwater | [kg P eq.] | 4,30E-03 | 4,80E-06 | 1,51E-06 | 6,76E-05 |
| Eutrophication, marine | [kg N eq.] | 2,75E-01 | 9,70E-04 | 1,38E-03 | 1,14E-01 |
| Eutrophication, terrestrial | [Mole of N eq.] | 2,99E+00 | 1,04E-02 | 1,51E-02 | 1,02E+00 |
| Photochemical ozone formation, human health | [kg NMVOC eq.] | 8,27E-01 | 2,63E-03 | 4,15E-03 | 4,63E-01 |
| Resource use, mineral and metals | [kg Sb eq.] | 1,43E-04 | 1,95E-07 | 3,47E-08 | 1,64E-03 |
| Resource use, fossils | [MJ] | 3,27E+03 | 2,71E+01 | 1,00E+01 | 2,89E+03 |
| Water use | [m³ world equiv.] | 9,38E+01 | 2,66E-01 | 8,25E-02 | 1,96E+01 |

**RESULTS OF THE LCA - RESOURCE USE: 1 metric ton of XCarb® Recycled and Renewably Produced Steel CA50S rebar**

| Parameter | Unit | A1-A3 | C3 | C4 | D |
|---|---|---|---|---|---|
| Renewable primary energy as energy carrier | [MJ] | 4,02E+03 | 1,51E+01 | 1,63E+00 | -1,14E+02 |
| Renewable primary energy resources as material utilization | [MJ] | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 |
| Total use of renewable primary energy resources | [MJ] | 4,02E+03 | 1,51E+01 | 1,63E+00 | -1,14E+02 |
| Non-renewable primary energy as energy carrier | [MJ] | 3,28E+03 | 2,71E+01 | 1,00E+01 | 2,89E+03 |
| Non-renewable primary energy as material utilization | [MJ] | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 |
| Total use of non-renewable primary energy resources | [MJ] | 3,28E+03 | 2,71E+01 | 1,00E+01 | 2,89E+03 |
| Use of secondary material | [kg] | 1,12E+03 | 0,00E+00 | 0,00E+00 | 0,00E+00 |
| Use of renewable secondary fuels | [MJ] | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 |
| Use of non-renewable secondary fuels | [MJ] | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 |
| Use of net fresh water | [m³] | 2,39E+00 | 1,22E-02 | 2,53E-03 | 2,93E+01 |

**RESULTS OF THE LCA – OUTPUT FLOWS AND WASTE CATEGORIES: 1 metric ton of XCarb® Recycled and Renewably Produced Steel CA50S rebar**

| Parameter | Unit | A1-A3 | C3 | C4 | D |
|---|---|---|---|---|---|
| Hazardous waste disposed | [kg] | -2,84E-06 | -1,96E-09 | 2,18E-10 | 2,16E-05 |
| Non-hazardous waste disposed | [kg] | 5,30E+01 | 1,87E-02 | 5,00E+01 | -3,49E+01 |
| Radioactive waste disposed | [kg] | 3,31E-02 | 3,99E-03 | 1,14E-04 | -3,16E-04 |
| Components for re-use | [kg] | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 |
| Materials for recycling | [kg] | 0,00E+00 | 9,50E+02 | 0,00E+00 | 0,00E+00 |
| Materials for energy recovery | [kg] | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 |
| Exported electrical energy | [MJ] | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 |
| Exported thermal energy | [MJ] | 0,00E+00 | 0,00E+00 | 0,00E+00 | 0,00E+00 |

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## Disclaimer

This Environmental Product Declaration - EPD Like is a document of exclusive responsibility of ArcelorMittal Brasil for the disclosure of information in the production of XCarb® Recycled and Renewably Produced Steel CA50 rebar.
This Environmental Product Declaration - EPD Like will be the basis for the elaboration of the official EPD which will be submitted to audit and verification by a duly qualified third party.

The delivery of the XCarb® Recycled and Renewably Produced Steel CA50 rebar will be accompanied and monitored by the website team and at the end the XCarb® Recycled and renewably produced steel Certificate will be issued containing the information below as ArcelorMittal procedures:

- SFC + C Customer;
- Order Number;
- Order Item Number;
- Customer PO Number;
- Customer Material Number;
- Steel Grade;
- Thickness;
- Width;
- Inv weight;

## References


PCR 2013, Part A
Institut Bauen und Umwelt e.V., Berlin (pub.): Product Category Rules for Construction Products from the range of Environmental Product Declarations of Institut Bauen und Umwelt (IBU), Part A: Calculation Rules for the Life Cycle Assessment and Requirements on the Background Report. September 2013 www.bau-umwelt.de

PCR 2014, Part B
Requirements on the EPD for Reinforcing Steel, Institut Bauen und Umwelt e.V., Berlin (pub.): From the range of Environmental Product Declarations of Institute Construction and Environment e.V. (IBU) 2014

OVAM, 2013. MMG Environmental profile of building elements
http://www.ovam.be/sites/default/files/atoms/files/Environmental%20profile%20of%20buildig%20elements.pdf

ABNT 7480
ABNT NBR 7480 - Steel for the reinforcement of concrete structures – Specifications

ISO 9001
DIN EN /ISO 9001:2015/, Quality management systems – Requirements.

ISO 14001
DIN EN /ISO 14025:2015-10/, Environmental management systems — Requirements with guidance for use

ABNT NBR 7481
Welded wire cloth for concrete armature – Requirements

ABNT 14859-3
Precast Concrete Slabs - Part 3: Electrowelded Lattice Reinforcement for Precast Slabs — Requirements

ABNT NBR 6215
Steel Products — Terminology

ABNT NBR 17005
Bending test method for steel bars and wires intended for reinforcement for reinforced concrete

ABNT NBR 7477
Determination of the surface conformation coefficient of steel bars and wires intended for reinforced concrete reinforcement

ABNT NBR 7478
Fatigue test method for steel bars for reinforced concrete

ABNT NBR ISO 6892-1
Metallic materials — Tensile Test - Part 1: Test method at room temperature

ABNT NBR 6118
Design of concrete structures – Procedure

ABNT NBR 14931
Execution of concrete structures – Procedure

ISO 14020
DIN EN /ISO 14020:2002-10/, Environmental labels and declarations - General principles.

ISO 14024
DIN EN /ISO 14024:2004/, Environmental labels and declarations - Type I environmental labelling - Principles and procedures.

ISO 45001:2018, Occupational health and safety management systems – Requirements.

/IBU 2016/
IBU (2016): General Programme Instructions for the Preparation of EPDs at the Institut Bauen und Umwelt e.V., Version 1.1 Institut Bauen und Umwelt e.V., Berlin. www.ibu-epd.de

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

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

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