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-ARC-20190176-CBC2-EN
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Valid to	08/03/2025

Hot-Rolled Coil

ArcelorMittal Brasil

Institut Bauen und Umwelt e.V.

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General Information

ArcelorMittal Brasil	Hot-Rolled Coil
Programme holder IBU – Institut Bauen und Umwelt e.V. Panoramastr. 1 10178 Berlin Germany	**Owner of the declaration** ArcelorMittal Brasil Av. Carandaí, 1115 30130-915 - Belo Horizonte - MG Brazil
Declaration number EPD-ARC-20190176-CBC2-EN	**Declared product / declared unit** 1 metric ton Hot-Rolled Coil produced by ArcelorMittal in Brazil
This declaration is based on the product category rules: Structural steels, 07.2014 (PCR checked and approved by the SVR)	**Scope:** This declaration and its LCA study are relevant to 1 metric ton of Hot Rolled Coil steel manufactured by ArcelorMittal Brasil, representing 100% of the production in 2017.
Issue date 09/03/2020	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 08/03/2025	**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.-Ing. Wolfram Trinius (Independent verifier appointed by SVR)
 Dr. Alexander Röder (Managing Director Institut Bauen und Umwelt e.V.))	

Product

Product description/Product definition

The Hot Rolled Coils (HRC) are produced at ArcelorMittal Brasil in thickness up to 19mm and width up to 1,880mm which can be produced in different steel grades to meet a variety of applications, such as, structural quality steel with chemical composition and mechanical properties guarantee; good toughness and weldability; high resistance to atmospheric corrosion. HRC may or may not contain micro-alloying elements. It is ideal for structural components which need mechanical performance allied with good weldability characteristics.

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

Application

Metal structures for civil construction, bridge structures, machine structures, large and small diameter pipes, agricultural and road implements, pressure vessels, shipbuilding, containers, rail cars, etc.

Other applications are also possible in other market segments.

Technical Data

Name	Value	Unit
Density	7850	kg/m³
Thermal conductivity	12	W/(mK)
Modulus of elasticity	48	N/mm²
Melting point	1536	°C

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

Base materials/Ancillary materials

Iron is the main component of Hot Rolled Coil. Alloying elements may be added in order to reach some specific characteristics such as toughness, strength and weldability. The composition of these elements depends on the steel designation/grade.

Reference service life

Reference service life is not relevant due to cradle-to-gate with options (C3 and D) boundary conditions

LCA: Calculation rules

Declared Unit

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

System boundary

The study is performed from 'cradle-to-gate' + module C3 and module D (cradle to gate – with Options). The following life cycle stages are considered:

- Product stage
- End-of-life through Waste processing
- Benefits and loads beyond the product system boundary

Modules A1-A3 include the following:

- The provision of resources, additives and energy;
- Transport of resources 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, as well as the non-recovered scrap due to sorting efficiency which is landfilled. A conservative value of 2% landfill is considered.

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

Data Quality

The life cycle inventory data used in this study comply with the quality requirements set out in *ISO 14044*.

All relevant background datasets are taken from *GaBI ts Software* database - Service Pack 37 and comprise the year 2018. Such database contains consistent and documented datasets which can be viewed in the online *GaBI ts documentation*.

Regarding foreground data, this study is based on a high quality of primary data for the year 2017, collected by ArcelorMittal.

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.

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LCA: Scenarios and additional technical information

End of life (C3)
Due to the absence of official national references and recommendation of the Brazilian context, Recycling and Reuse rates adopted for this EPD were defined according to the recommendations of *European Commission Technical Steel Research* for "Other steel": 99% (Recycling and Reuse) and 1% (Landfill). Such assumptions are similar to current practices and rates in the Brazilian market, which would not result in visible changes of the EPD results.

Name	Value	Unit
Landfilling	10	kg

Reuse, recovery and/or recycling potentials (D), relevant scenario information
18,2 kg scrap is used in the manufacturing of 1 ton of Hot Rolled Coil steel. After use, 990 kg steel is recycled.

The potential environmental benefit calculated for the end-of-life stage (module D) is based on the net amount of scrap in the system: 990 – 18,2 = **971,8 kg.** The system net output carries a potential credit, thus module D shows an environmental benefit.

Name	Value	Unit
Reuse	11	%
Recycling	88	%
Landfill	1	%

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 t Hot Rolled Coil

Parameter	Unit	A1-A3	C3	D
Global warming potential	[kg CO_2-Eq.]	2.50E+3	2.54E+1	-1.56E+3
Depletion potential of the stratospheric ozone layer	[kg CFC11-Eq.]	2.25E-5	3.14E-6	8.71E-6
Acidification potential of land and water	[kg SO_2-Eq.]	1.13E+1	2.30E-1	-3.08E+0
Eutrophication potential	[kg $(PO_4)^{3-}$-Eq.]	1.60E+0	1.04E-1	-2.28E-1
Formation potential of tropospheric ozone photochemical oxidants	[kg ethene-Eq.]	1.26E+0	1.77E-2	-7.21E-1
Abiotic depletion potential for non-fossil resources	[kg Sb-Eq.]	3.39E-4	4.61E-4	-4.79E-3
Abiotic depletion potential for fossil resources	[MJ]	2.29E+4	3.55E+2	-1.52E+4

RESULTS OF THE LCA - RESOURCE USE according to EN 15804+A1: 1 t Hot Rolled Coil

Parameter	Unit	A1-A3	C3	D
Renewable primary energy as energy carrier	[MJ]	1.99E+2	5.40E+1	1.01E+3
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]	1.99E+2	5.40E+1	1.01E+3
Non-renewable primary energy as energy carrier	[MJ]	2.32E+4	4.06E+2	-1.46E+4
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]	2.32E+4	4.06E+2	-1.46E+4
Use of secondary material	[kg]	1.82E+1	0.00E+0	9.72E+2
Use of renewable secondary fuels	[MJ]	-1.86E-30	0.00E+0	0.00E+0
Use of non-renewable secondary fuels	[MJ]	-2.20E-29	0.00E+0	0.00E+0
Use of net fresh water	[m^3]	5.48E+0	1.83E-1	2.10E+0

RESULTS OF THE LCA – OUTPUT FLOWS AND WASTE CATEGORIES according to EN 15804+A1: 1 t Hot Rolled Coil

Parameter	Unit	A1-A3	C3	D
Hazardous waste disposed	[kg]	3.09E-5	3.84E-8	-1.02E-3
Non-hazardous waste disposed	[kg]	7.66E+2	1.00E+1	1.68E+2
Radioactive waste disposed	[kg]	0.00E+0	0.00E+0	0.00E+0
Components for re-use	[kg]	0.00E+0	0.00E+0	0.00E+0
Materials for recycling	[kg]	0.00E+0	9.90E+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

Interpretation

The production stage is the highest contributing stage in the life cycle of Hot Rolled Coil. Module C3 has a low contribution while module D presents negative contribution (credit) for all impact categories except ODP.

The Blast Furnace (BF) stage is the highest contributor in process for all impact assessment categories except POCP. For this category, Sintering is the process with the highest contribution, due to the emissions of carbon monoxide and other gases (SO2, NOx) that occur in this process and iron ore fines used in the stage. In BF stage, the most contributing process are the emissions of fuels burning (77%) and the most contributing materials is are iron ore (granulated and pellets, 15%) and hard coal for PCI.

Total use of renewable primary energy carrier (PERT) and total use of non-renewable primary energy (PENRT) are dominated by the extraction and processing of raw materials and the generation of electricity, steam and heat from primary energy resources, including extraction, refining and transport.

In general, the main contribution to primary energy in the blast furnace/basic oxygen furnace (BF/BOF) route comes from the use of coal/coke as an energy and carbon source.

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