ENVIRONMENTAL PRODUCT DECLARATION

as per /ISO 14025/ and /EN 15804/

Owner of the Declaration	ArcelorMittal Brasil
Programme holder	Institut Bauen und Umwelt e.V. (IBU)
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Steel annealed wire and nails

ArcelorMittal Brasil

Institut Bauen und Umwelt e.V.

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ECO PLATFORM EPD EN 15804 VERIFIED

General Information

ArcelorMittal Brasil	Steel annealed wire and nails
Programme holder IBU - Institut Bauen und Umwelt e.V. Panoramastr. 1 10178 Berlin Germany	**Owner of the declaration** ArcelorMittal Brasil Av. Carandaí, 1115 Funcionários 25 o andar 30130 -915 - Belo Horizonte Brazil
Declaration number EPD-ARC-20180140-CBD1-EN	**Declared product / declared unit** 1 metric ton of steel annealed wire and nails produced by ArcelorMittal in Brazil
This declaration is based on the product category rules: Reinforcing Steel, 07.2014 (PCR checked and approved by the SVR)	**Scope:** The declaration applies to 1 metric ton of steel annealed wire and nails produced by ArcelorMittal in Brazil, representing 100% of the annual production of 2014. 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.
Issue date 04/02/2019	
Valid to 03/02/2024	**Verification** The standard /EN 15804/ serves as the core PCR Independent verification of the declaration and data according to /ISO 14025:2010/ ☐ internally ☒ externally
Prof. Dr.-Ing. Horst J. Bossenmayer (President of Institut Bauen und Umwelt e.V.)	
Dr. Alexander Röder (Head of Board IBU)	Dr.-Ing. Wolfram Trinius (Independent verifier appointed by SVR)

Product

Product description / Product definition
Annealed wire and nails are low carbon steel products fabricated in wire drawing plants, which use as main input wire rod produced from scrap/pig iron melted in Electric Arc Furnace or iron-ore based blast furnace and basic oxygen furnace followed by hot rolling process and cold working, where appropriate.
(no CE-marking)
For the use and application of the product, the respective national provisions at the place of use apply.

Application
Annealed wire is pliable and easy to use in applications that require bending and/or twisting. It is widely used in construction to secure reinforced concrete in works of any size and binding of industrial parts. In less common cases, annealed wires go through transformation processes (example: retraining for slightly thinner gauges than the original one). Nails are used mainly for binding materials. There are specific nails for each type of material to be fixed.

Technical Data
The technical specifications of the products within the scope of the EPD is valid for the various nails and annealed wires produced and different forms of delivery.

ArcelorMittal on-site laboratories perform chemical and mechanical tests guaranteeing compliance of the final products to technical standard requirements. National technical product specification is set by Associação Brasileira de Normas Técnicas – ABNT (Brazilian National Standards Organization).

Constructional data
The dimensions of the declared annealed wire and nails may vary according to the intended application. For annealed wires bundles dimensions may vary from 0,5 to 800 kg. Packages vary according to weight of the product and may be constituted from metal strips, PVC sheets and metal bands with lifting links.
As for nails, the primary packaging is composed of a carton box holding a plastic bag. Wooden pallets are also used for delivering the products

Manufacture
To obtain the final products annealed wire and nails, the wire rod goes to a drawing mill plant. By wire drawing process and a further heat treatment (annealing) the wire road is transformed into annealed

wire with diameters of 1.24 to 4.18 mm, whereas for the production of the nails the wire passed after the drawing process through a nails machine to obtain the desired size

In ArcelorMittal Brasil wire rod used for the annealed wire and nails production is manufactured following the above reported route:

- iron ore and charcoal are fed to a blast furnace to produce liquid iron, steel scrap is added and the energy of liquid iron is used to melt the scrap, which is then converted into steel in an electric arc furnace.

The steel is then casted and rolled to obtain wire rods.

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 norms:

- /ISO 14001/;
- /ISO 9001/;
- /OHSAS 18001/;
- 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
Annealed wire and nails 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
Annealed wire and nails 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 steel scraps which cannot be recovered (due to collection loss) is sent to landfill without any preventative measures.

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:

- http://longos.arcelormittal.com.br/produtos/construcao-civil/fundacoes-contencoes/pregos
- http://longos.arcelormittal.com.br/produtos/construcao-civil/fundacoes-contencoes/arames-recozidos

Base materials / Ancillary materials
The base material for the annealed wire and nails is the wire rod. The main input for the production of annealed wire and nails is the wire rod produced in Juiz de Fora plant.

Alloying elements are added in the form of ferroalloys or metal, the most common elements are manganese, chromium and vanadium. Other elements like nitrogen or copper may be present in steel. The composition of these elements depends on the steel designation/grade. Substances listed on the “Candidate list of substances of very high concern for authorisation” from the /European Chemicals Agency/ are not contained in the steel in declarable quantities.

As for annealed the chemical composition refers to internal standards that are equivalent to the /SAE 1006/ grade of the /SAE J403/ standard. Nails chemical composition are based on internal standards which are equivalent to /SAE 1010/ grade of the /SAE J403/ standard.

Reference service life
Annealed wire and nails are used in concrete and, more generally, in construction work. The lifetime of annealed wire and nails 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 of steel annealed wire and nails 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	-

Steel annealed wire and nails are produced ArcelorMittal Juiz de Fora plant in Brazil. The data for the life cycle inventory are based on data covering 100% of the production volume of steel annealed wire and nails in Brazil in 2014.

All reported data are calculated as total value per site averaged across all production sites based on production volume 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 (total output scrap minus the amount of input scrap required by the manufacturing process) leaving the product system.

For the various ArcelorMittal Brasil steel products is related to the different amount of recycled materials used at the input side of the manufacturing process which also affects the contribution of module D to the overall results. This is mainly due to the different technologies used in the various facilities for the steelmaking.

Estimates and assumptions
As far as the raw material production is concerned, the Norwegian mix is used instead the Brazilian one for those datasets available only for EU context, namely for the production of nitrogen, oxygen, dolomite and limestone, in light of the similar electricity mix of the two countries (dominated by hydropower).
For raw materials supply an average Euro4 truck, with a utilization ratio of 70% was considered.

With regard to the process water used in the facilities, tap water was used as proxy of water coming from river.

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 thinkstep professional database were used for modules A1, A2, C3 and D.

Allocation
The facility level data were allocated to the steel annealed wire and nails using the annual production volume of each product (physical relationship).
As far as co-products allocation is concerned, the partitioning method was applied in accordance with Worldsteel recommendations (Worldsteel 2014).

Data quality
The life cycle inventory data used in this study complies with the quality requirements set out in ISO 14044 (ISO, 2006).
All relevant background datasets are taken from the GaBi 6 software database, using – as far as possible – the most updated processes.
Regarding foreground data, high quality primary data was collected by ArcerlorMittal Brasil and they subsequently underwent a verification process by Worldsteel.

Period under review
The reference year for the present EPD is 2014.

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 (C1 - C4)
The waste processing of the steel annealed wire and nails was modelled considering the /OVAM 2013/ MMG scenario for dismantling (C1), scenario based on the ecoinvent 2.0 record “Disposal, building, reinforced concrete, to recycling/CH U”. This scenario was adapted to the Brazilian situation with country-specific electricity mix. The end of life scenario (C4) for steel annealed wire and nails applied considers that after use 15% is landfilled.

Name	Value	Unit
Landfilling	150	kg

Reuse, recovery and/or recycling potentials (D), relevant scenario information
In module D, the benefit brought the 85% of the steel that goes to recycling after use, which becomes avoided production of virgin material, was applied to the net output of scrap leaving the product system.

Name	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	MND	X

RESULTS OF THE LCA - ENVIRONMENTAL IMPACT: 1 metric ton of steel annealed wire and nails

Parameter	Unit	A1-A3	C3	D
Global warming potential	[kg CO_2-Eq.]	9.94E+2	1.34E+0	-5.43E+2
Depletion potential of the stratospheric ozone layer	[kg CFC11-Eq.]	1.49E-7	6.24E-13	-2.48E-9
Acidification potential of land and water	[kg SO_2-Eq.]	2.34E+0	9.44E-3	-2.08E+0
Eutrophication potential	[kg $(PO_4)^{3-}$-Eq.]	2.12E-1	7.50E-4	-1.59E-1
Formation potential of tropospheric ozone photochemical oxidants	[kg ethene-Eq.]	1.46E-1	5.92E-4	-3.00E-1
Abiotic depletion potential for non-fossil resources	[kg Sb-Eq.]	1.88E-4	4.14E-7	1.03E-5
Abiotic depletion potential for fossil resources	[MJ]	6.06E+3	1.20E+1	-5.10E+3

RESULTS OF THE LCA - RESOURCE USE: 1 metric ton of steel annealed wire and nails

Parameter	Unit	A1-A3	C3	D
Renewable primary energy as energy carrier	[MJ]	1.96E+3	1.58E+1	3.07E+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]	1.96E+3	1.58E+1	3.07E+2
Non-renewable primary energy as energy carrier	[MJ]	6.25E+3	1.32E+1	-4.89E+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	1.32E+1	-4.89E+3
Use of secondary material	[kg]	5.32E+2	0.00E+0	0.00E+0
Use of renewable secondary fuels	[MJ]	1.35E-19	2.94E-28	0.00E+0
Use of non-renewable secondary fuels	[MJ]	1.58E-18	3.46E-27	0.00E+0
Use of net fresh water	[m^3]	2.26E+1	1.67E-1	7.90E-1

RESULTS OF THE LCA – OUTPUT FLOWS AND WASTE CATEGORIES: 1 metric ton of steel annealed wire and nails

Parameter	Unit	A1-A3	C3	D
Hazardous waste disposed	[kg]	6.50E-4	1.32E-8	-3.67E-6
Non-hazardous waste disposed	[kg]	8.23E+0	1.50E+2	-7.55E+0
Radioactive waste disposed	[kg]	7.24E-2	4.42E-4	8.43E-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

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