

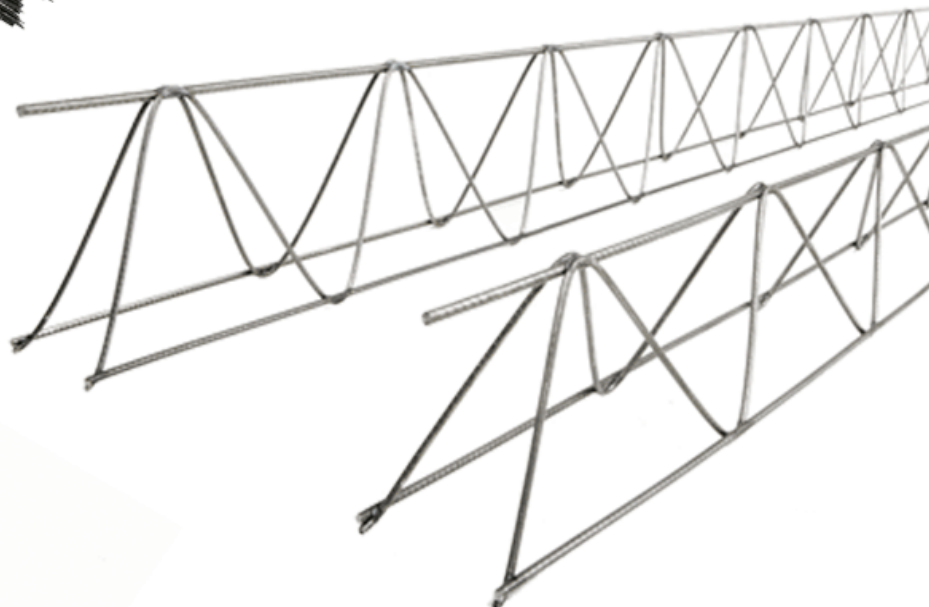
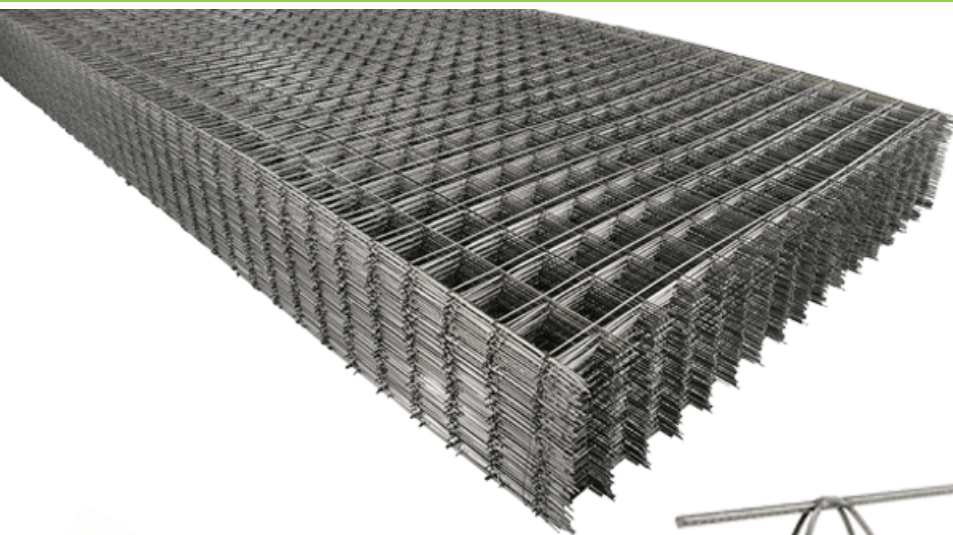
# ENVIRONMENTAL PRODUCT DECLARATION

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 CA60 rebar, welded mesh and truss  
ArcelorMittal Brasil

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## General Information

<p><b>ArcelorMittal Brasil</b></p> <hr/> <p><b>Programme holder</b>          IBU - Institut Bauen und Umwelt e.V.          Panoramastr. 1          10178 Berlin          Germany</p> <hr/> <p><b>Declaration number</b>          EPD-ARC-20180141-CBD1-EN</p> <hr/> <p><b>This declaration is based on the product category rules:</b>          Reinforcing Steel, 07.2014          (PCR checked and approved by the SVR)</p> <hr/> <p><b>Issue date</b>          04/02/2019</p> <hr/> <p><b>Valid to</b>          03/02/2024</p> <hr/> <p></p> <hr/> <p>Prof. Dr.-Ing. Horst J. Bossenmayer          (President of Institut Bauen und Umwelt e.V.)</p> <hr/> <p></p> <hr/> <p>Dr. Alexander Röder          (Head of Board IBU)</p>	<p><b>Steel CA60 rebar, welded mesh and truss</b></p> <hr/> <p><b>Owner of the declaration</b>          ArcelorMittal Brasil          Av. Carandaí, 1115          Funcionários 25 o andar          30130 -915 - Belo Horizonte          Brazil</p> <hr/> <p><b>Declared product / declared unit</b>          1 metric ton of steel CA60 rebar, welded mesh and truss produced by ArcelorMittal in Brazil</p> <hr/> <p><b>Scope:</b>          The declaration applies to 1 metric ton of steel CA60 rebar, welded mesh and truss produced by ArcelorMittal in Brazil, representing 100% of the annual production of 2014.</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.</p> <hr/> <p><b>Verification</b></p> <table border="1"> <tr> <td colspan="2">The standard /EN 15804/ serves as the core PCR</td> </tr> <tr> <td colspan="2">Independent verification of the declaration and data according to /ISO 14025:2010/</td> </tr> <tr> <td><input type="checkbox"/> internally</td> <td><input checked="" type="checkbox"/> externally</td> </tr> </table> <hr/> <p></p> <hr/> <p>Dr.-Ing. Wolfram Trinius          (Independent verifier appointed by SVR)</p>	The standard /EN 15804/ serves as the core PCR		Independent verification of the declaration and data according to /ISO 14025:2010/		<input type="checkbox"/> internally	<input checked="" type="checkbox"/> externally
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## Product

### Product description / Product definition

Steel CA60 rebar, welded mesh and truss are low carbon steel 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.

The product does not bear the CE-mark. For the use and application of the product, the respective national provisions at the place of use apply.

In Brasil the standard /ABNT 7480/ - Aço destinado a armaduras para estruturas de concreto armado - Especificação - Steel for the reinforcement of concrete structures - Specifications by the Brazilian National Standards Organization.

### Application

The steel rebar, which is a short for reinforcing steel, used for the reinforcement of concrete, is also the material used to create the steel CA60 rebar, welded mesh and truss. The welded mesh offers great resistance used in the manufacture of slabs and concrete floors. The truss are used in the manufacture

of prefabricated slab joists, concrete floor slabs and transfer bar support on concrete floors.

Typical applications are in the construction of buildings, bridges, roads and other civil works (infrastructure, superstructures, etc.).

For the use and application of the product the respective national provisions at the place of use apply: /ABNT 7477, ABNT 7478, ABNT 7480, ABNT 7481, ABNT 14859-3, ISO 6892/.

### 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 steel rebar, CA60 welded mesh and truss are supplied in rolls or in bundles using a wire rod with low carbon levels (7 mm), which can be recycled after collection and sorting as steel scrap. The rebar also have a plastic tag with information needed for product identification and tracking. The mesh and truss are finished in packages tied with wire rod. These bindings are also used in package handling.

The dimensions of the declared steel CA60 rebar, mesh and truss may vary according to the intended application. For steel CA60 rebar, lengths may be of 3 or 6 meters. Welded mesh are delivered with in rolls of 60 or 120 meters, in widths of 2,45 meters and length of either 3 or 6 meters. Truss is sold in packs of 60 pieces, where length varies from 6 to 12 meters.

### Manufacture

To obtain the final products steel CA60 rebar, welded mesh and truss, the wire rod goes to a drawing mill plant. By wire drawing process and a further heat treatment (annealing) the wire rod 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 is produced following either of the following routes:

- iron ore and coke are fed to a blast furnace to produce liquid iron, which is then converted into steel in a basic oxygen furnace.
- 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.

In both cases 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

## LCA: Calculation rules

### Declared Unit

The declaration refers to the functional unit of 1 metric ton of steel CA60 rebar, welded mesh and truss as specified in Part B requirements on the EPD for Reinforcing Steel.

### Declared unit

Steel CA60 rebar, welded mesh and truss are not reused at the end of life but can be easily separated from others 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

Steel CA60 rebar, welded mesh and truss 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 steel CA60 rebar, welded mesh and truss can be found at:

- <http://longos.arcelormittal.com.br/produtos/construcao-civil/arcelormittal-60-nervurado>
- <http://longos.arcelormittal.com.br/produtos/construcao-civil/telas-soldadas-nervuradas/10/jun/2015>
- <http://longos.arcelormittal.com.br/produtos/construcao-civil/trelicas-nervuradas/10/jun/2015>

### Base materials / Ancillary materials

The base material for the steel CA60 rebar, welded mesh and truss is steel 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.

### Reference service life

Reinforcing steel CA60 rebar, welded mesh and truss are used in concrete to give additional mechanical resistance. The lifetime of reinforcing steel CA60 welded mesh and truss 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.

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

Steel CA60 rebar, welded mesh and truss are produced ArcelorMittal Juiz de Fora and ArcelorMittal

São Paulo plants in Brazil. The data for the life cycle inventory are based on data covering 100% of the production volume of steel CA60 rebar, welded mesh and truss 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 CA60 rebar, welded mesh and truss 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 the main differences between the 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 CA60 rebar, welded mesh and truss 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/.

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 ArcelorMittal 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.

## LCA: Scenarios and additional technical information

### End of life (C1 - C4)

The waste processing of the steel CA60 rebar, welded mesh and truss 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 CA60 rebar, welded mesh and truss 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 CA60 rebar, welded mesh and truss

Parameter	Unit	A1-A3	C3	D
Global warming potential	[kg CO <sub>2</sub> -Eq.]	1.62E+3	1.34E+0	-8.44E+2
Depletion potential of the stratospheric ozone layer	[kg CFC11-Eq.]	-9.81E-7	6.24E-13	-3.86E-9
Acidification potential of land and water	[kg SO <sub>2</sub> -Eq.]	8.10E+0	9.44E-3	-3.24E+0
Eutrophication potential	[kg (PO <sub>4</sub> ) <sup>3</sup> -Eq.]	1.38E+0	7.50E-4	-2.47E-1
Formation potential of tropospheric ozone photochemical oxidants	[kg ethene-Eq.]	6.82E-1	5.92E-4	-4.67E-1
Abiotic depletion potential for non-fossil resources	[kg Sb-Eq.]	4.59E-4	4.14E-7	1.60E-5
Abiotic depletion potential for fossil resources	[MJ]	1.81E+4	1.20E+1	-7.93E+3

### RESULTS OF THE LCA - RESOURCE USE: 1 metric ton of steel CA60 rebar, welded mesh and truss

Parameter	Unit	A1-A3	C3	D
Renewable primary energy as energy carrier	[MJ]	2.14E+3	1.58E+1	4.78E+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]	2.14E+3	1.58E+1	4.78E+2
Non-renewable primary energy as energy carrier	[MJ]	1.83E+4	1.32E+1	-7.60E+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]	1.83E+4	1.32E+1	-7.60E+3
Use of secondary material	[kg]	3.65E+2	0.00E+0	0.00E+0
Use of renewable secondary fuels	[MJ]	3.00E-19	2.94E-28	0.00E+0
Use of non-renewable secondary fuels	[MJ]	3.52E-18	3.46E-27	0.00E+0
Use of net fresh water	[m <sup>3</sup> ]	2.77E+1	1.67E-1	1.23E+0

### RESULTS OF THE LCA – OUTPUT FLOWS AND WASTE CATEGORIES:

#### 1 metric ton of steel CA60 rebar, welded mesh and truss

Parameter	Unit	A1-A3	C3	D
Hazardous waste disposed	[kg]	3.49E-3	1.32E-8	-5.71E-6
Non-hazardous waste disposed	[kg]	5.91E+1	1.50E+2	-1.17E+1
Radioactive waste disposed	[kg]	8.41E-2	4.42E-4	1.31E-1
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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**ISO 14024**

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