

# ENVIRONMENTAL PRODUCT DECLARATION

as per /ISO 14025/ and /EN 15804/

Owner of the Declaration	ArcelorMittal Europe – Long Products
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Structural steel sections and merchant bars  
**ArcelorMittal**

[www.ibu-epd.com](http://www.ibu-epd.com) / <https://epd-online.com>



Institut Bauen  
und Umwelt e.V.



## General Information

### ArcelorMittal Europe – Long Products

#### Programme holder

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

#### Declaration number

EPD-ARM-20190015-CBD1-EN

#### This declaration is based on the product category rules:

Structural steels, 07.2014  
(PCR checked and approved by the SVR)

#### Issue date

07/02/2019

#### Valid to

06/02/2024



Prof. Dr.-Ing. Horst J. Bossenmayer  
(President of Institut Bauen und Umwelt e.V.)



Dr. Alexander Röder  
(Head of Board IBU)

### Structural steel sections and merchant bars

#### Owner of the declaration

ArcelorMittal Europe – Long Products  
66, rue de Luxembourg  
L-4221 Esch-sur-Alzette  
Luxembourg

#### Declared product / declared unit

1 metric ton of structural steel sections and merchant bars

#### Scope:

The declared unit is 1 metric ton of structural steel sections and merchant bars produced by ArcelorMittal. The Life Cycle Assessment is based on data collected from the plants involved in the production: Differdange, Belval & Rodange in Luxembourg; Hunedoara in Romania; Bergara & Olaberria in Spain and Dabrowa in Poland. The data used represent >95% of annual production.

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.

#### Verification

The standard /EN 15804/ serves as the core PCR  
Independent verification of the declaration and data  
according to /ISO 14025:2010/

internally  externally



Dr.-Ing. Wolfram Trinius  
(Independent verifier appointed by SVR)

## Product

### Product description / Product definition

This EPD applies to 1 metric ton of hot rolled structural steel sections and merchant bars in structural steel grades.

For the placing on the market of the product in the EU/EFTA (with the exception of Switzerland) Regulation (EU) No. 305/2011 (CPR) applies. The product needs a Declaration of Performance taking into consideration /EN 10025-1:2004 Hot rolled products of structural steels – Part 1: General technical delivery conditions/ and the CE-marking. For the application and use the respective national provisions apply.

### Application

Structural steel sections and merchant bars are intended for bolted, welded or otherwise connected constructions of buildings, bridges and other structures, as well as in composite steel and concrete structures. For example:

- Single-storey buildings (industrial and storage halls, etc.)
- Multi-storey buildings (offices, residential, shops, car parks, high rise, etc.)
- Bridges (railway, road, pedestrian, etc.)
- Other structures (pylons, power plants, stadiums, convention centers, airports, stations, etc.)

### Technical Data

This EPD is valid for structural sections and merchant bars of various steel grades and different forms of delivery. Performance data of the product in accordance with the Declaration of Performance.

### Constructional data

Name	Value	Unit
Density	7850	kg/m <sup>3</sup>
Modulus of elasticity	210000	N/mm <sup>2</sup>

Coefficient of thermal expansion	12	10 <sup>-6</sup> K <sup>-1</sup>
Thermal conductivity (at 20°C)	48	W/(mK)
Melting point (depending on the alloy proportions up to)	1536	°C
Shear modulus	81000	N/mm <sup>2</sup>

Specific information on dimension tolerances, constructional data, as well as mechanical and chemical properties can be found in the relevant literature and/or the following standards:

- **Design standards:** The standards of /EN 1993/ and /EN 1994/, respectively of /ANSI/AISC 36/ apply to the design of steel structures and composite steel and concrete structures. They include the requirements regarding serviceability, bearing capacity, durability and fire resistance of steel structures (/EN 1993/, /ANSI/AISC 360/) and composite steel and concrete structures (/EN 1994/, /ANSI/AISC 360/).
- **Product standards:** /EN 10025/, /ASTM A36/, /A572/, /A588/, /A709/, /A913/A913M/ and /A992/.
- **Fabrication standards:** /EN 1090-2/, /AISC 303-10/, /AWS D1.1/D1.1M/. The Standard /EN 1090-2/ applies to the execution of steel

structures and includes the requirements for factory production control.

Additional information on structural steel and constructing with steel can be obtained from ArcelorMittal /Sales Programme Sections & Merchant Bars/ available at <http://sections.arcelormittal.com>.

#### Base materials / Ancillary materials

The base material of structural steel sections and merchant bars is iron. Alloying elements are added in the form of ferroalloys or metals (most common elements are Manganese, Chromium and Vanadium). Other elements such as Nitrogen or Copper may be present in the steel, depending on the steel designation/grade. No substances listed on the "Candidate List of Substances of Very High Concern for Authorisation" by the European Chemicals Agency /EC 1907-2006/ are contained in the steel in declarable quantities.

#### Reference service life

A reference service life for structural steel sections and merchant bars is not declared. These are construction products with many different applications purposes. The lifetime therefore will be limited by the service life of the work.

## LCA: Calculation rules

#### Declared Unit

The declaration refers to the functional unit of 1 metric ton of structural steel sections and merchant bars as specified in Part B requirements on the EPD for structural steels.

The background data are taken from /GaBi ts Documentation/.

#### Declared unit

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

For IBU core EPDs (where clause 3.6 is part of the EPD); for average EPDs, an estimate of the robustness of the LCA values must be made, e.g. concerning variability of the production process, geographical representativity and the influence of background data and preliminary products compared to the environmental impacts caused by actual production.

#### 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 structural steel 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 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 the structural steel sections and merchant bars, including reuse and recycling.

#### 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

The end of life for average structural steel sections and merchant bar products consists of 11% reuse, 88% recycling and 1% landfill, with the corresponding benefits and burdens. This is based on the /European Commission Technical Steel Research/, the /German Ministry of Environmental Affairs/ and internal documentation within ArcelorMittal.

### End of life (C3)

Name	Value	Unit
Landfilling	1	%

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

Name	Value	Unit
Recycling	88	%
Reuse	11	%

## 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 sections and merchant bars

Parameter	Unit	A1-A3	C3	D
Global warming potential	[kg CO <sub>2</sub> -Eq.]	8.42E+2	1.84E+0	-9.78E+1
Depletion potential of the stratospheric ozone layer	[kg CFC11-Eq.]	2.46E-9	6.85E-12	2.86E-8
Acidification potential of land and water	[kg SO <sub>2</sub> -Eq.]	1.98E+0	5.84E-3	-2.28E-1
Eutrophication potential	[kg (PO <sub>4</sub> ) <sup>3-</sup> -Eq.]	1.88E-1	6.69E-4	-2.15E-2
Formation potential of tropospheric ozone photochemical oxidants	[kg ethene-Eq.]	2.41E-1	4.01E-4	-2.89E-2
Abiotic depletion potential for non-fossil resources	[kg Sb-Eq.]	1.78E-4	8.92E-7	-3.45E-5
Abiotic depletion potential for fossil resources	[MJ]	8.21E+3	2.04E+1	-9.54E+2

### RESULTS OF THE LCA - RESOURCE USE: 1 metric ton of steel sections and merchant bars

Parameter	Unit	A1-A3	C3	D
Renewable primary energy as energy carrier	[MJ]	1.45E+3	1.09E+1	-1.56E+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]	1.45E+3	1.09E+1	-1.56E+2
Non-renewable primary energy as energy carrier	[MJ]	1.03E+4	3.22E+1	-1.18E+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]	1.03E+4	3.22E+1	-1.18E+3
Use of secondary material	[kg]	9.85E+2	0.00E+0	0.00E+0
Use of renewable secondary fuels	[MJ]	0.00E+0	0.00E+0	0.00E+0
Use of non-renewable secondary fuels	[MJ]	0.00E+0	0.00E+0	0.00E+0
Use of net fresh water	[m <sup>3</sup> ]	4.46E+0	1.49E-2	-4.84E-1

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

#### 1 metric ton of steel sections and merchant bars

Parameter	Unit	A1-A3	C3	D
Hazardous waste disposed	[kg]	5.08E-6	1.81E-7	-3.94E-6
Non-hazardous waste disposed	[kg]	5.76E+0	1.00E+1	-7.77E-2
Radioactive waste disposed	[kg]	8.31E-1	4.67E-3	-9.14E-2
Components for re-use	[kg]	0.00E+0	1.10E+2	0.00E+0
Materials for recycling	[kg]	0.00E+0	8.80E+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

#### Note:

985 kg scrap is used in the manufacturing of 1 metric ton of steel sections and merchant bars. After use, 880 kg steel is recycled, 110 kg is reused. The potential environmental impact calculated for module D depends on the net amount of scrap left in the system, which is  $880 - 985 + 108 = 3$  kg.

This means that the system has a net output of 3 kg scrap, which carries a potential credit. All in all module D shows an environmental benefit.

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**/ASTM A913/913M-15/,** Standard specification for high-strength low-alloy steel shapes of structural quality, produced by quenching and self-tempering process (QST)

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**/AWS D1.1/D1.1M:2015/,** Structural Welding Code–Steel

**/AISC 303-10/,** Code of Standard Practice for Steel Buildings and Bridges

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**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](mailto:info@ibu-epd.com)  
Web [www.ibu-epd.com](http://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](mailto:info@ibu-epd.com)  
Web [www.ibu-epd.com](http://www.ibu-epd.com)



thinkstep

**Author of the Life Cycle****Assessment**

thinkstep AG  
Hauptstraße 111- 113  
70771 Leinfelden-Echterdingen  
Germany

Tel +49 711 341817-0  
Fax +49 711 341817-25  
Mail [info@thinkstep.com](mailto:info@thinkstep.com)  
Web <http://www.thinkstep.com>

**Owner of the Declaration**

ArcelorMittal Europe – Long  
Products – Sections  
Rue de Luxembourg 66  
4221 Esch-sur-Alzette  
Luxembourg

Tel +352 5313 3010  
Fax -  
Mail [sections.tecom@arcelormittal.com](mailto:sections.tecom@arcelormittal.com)  
om  
Web [sections.arcelormittal.com](http://sections.arcelormittal.com)