

# ENVIRONMENTAL PRODUCT DECLARATION

as per ISO 14025 and EN 15804+A1

Owner of the Declaration	ArcelorMittal Tubular Products Europe
Programme holder	Institut Bauen und Umwelt e.V. (IBU)
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Structural Hollow Section  
ArcelorMittal

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Institut Bauen  
und Umwelt e.V.



## General Information

### ArcelorMittal Tubular Products Europe

#### Programme holder

IBU – Institut Bauen und Umwelt e.V.  
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10178 Berlin  
Germany

#### Declaration number

EPD-ARC-20190180-CBD1-EN

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

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

#### Issue date

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### Structural Hollow Section

#### Owner of the declaration

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#### Declared product / declared unit

This EPD applies to 1 ton of structural hollow section.

#### Scope:

The declaration applies to 1 ton of structural hollow section produced by ArcelorMittal.

The life cycle assessment is based on data from the welding and punching process occurring in the following ArcelorMittal production plants:

- Lexy (FR),
- Iasi (RO),
- Krakow (PL),
- Karvina (CZ),
- Rettel (FR),
- Roman (RO).

Production has been modelled using annual production data from the period 2014-2018. The weighting of production volumes of the different production sites is based on 2018 data.

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*.

#### 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. Frank Werner  
(Independent verifier appointed by SVR)

## Product

#### Product description/Product definition

This EPD describes structural hollow sections either "cold-formed", or "hot-finished" produced by ArcelorMittal. When referring to hot-finished structural hollow sections, there exist three production paths

possible to follow: cold-forming plus subsequent full body annealing, hot-forming or seamless).

For the placing of the product on the market in the European Union/European Free Trade Association (EU/EFTA) (with the exception of Switzerland)

Regulation (EU) No. 305/2011 (CPR) applies. The product has a declaration of performance taking into consideration EN 10210-1: 2006- Hot finished & EN 10219-1: 2006- Cold formed welded. For the application and use the respective national provisions apply.

### Application

ArcelorMittal's structural hollow sections can be used as structural elements in any many diverse applications such as agricultural equipment, furniture and/or any kind of structure in construction.

Being widely used in the construction industry, these products are all considered in EN 1993 (Eurocode 3), the European reference code for steel structures design, in EN 1090, the European reference standard for steel structures execution, as well as in the Regulation (EU) No 305/2011, the European Construction Products Regulation.

### Technical Data

The dimensions (wall thickness and outside dimensions), section properties (minimum yield strength, tensile strength, minimum elongation, minimum impact energy) and chemical composition vary according to the grade and quality of the steel, to be chosen and also depending on the structural design needs.

For a given product, the geometrical tolerances will be fully controlled by the product standards (EN 10219 for cold-formed hollow sections and EN 10210 for any other ArcelorMittal's - hot-finished - hollow section) and they will be consistent with execution and design rules in order to assure a safe and suitable tubular structure/element.

### 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	53.3	W/(mK)
Melting point	1450	°C
Minimum yield strength	235 - 460	N/mm <sup>2</sup>
Tensile strength Rm	360 - 720	N/mm <sup>2</sup>
Elongation A	15-26	%

Performance data of the product in accordance with the declaration of performance with respect to its essential characteristics according to EN 10210-1: 2006- Hot finished and EN 10219-1: 2006- Cold formed welded.

For both welded cold-formed or hot-finished hollow sections (with the exception of seamless), the product is supplied in coils that are cut longitudinal to become slitting coils prior to going to the manufacture mill entrance. For seamless (one of the production routes for hot-finished) hollow sections, the product is supplied in billets.

### Base materials/Ancillary materials

The basic materials for the manufacture of ArcelorMittal's hollow sections is non-alloyed and fine grain steel. Different steel grades and qualities are possible, these being recorded in the specific product standards – EN 10210 or EN 10219.

This product contains substances listed in the candidate list (date: 26.2.2020) exceeding 0.1 percentage by mass: no

### Reference service life

A reference service life for ArcelorMittal's structural hollow sections is not declared, since the lifetime will depend on specific applications as well as environmental conditions.

## LCA: Calculation rules

### Declared Unit

The declaration refers to the functional unit of 1 metric ton of structural hollow section.

### Declared unit

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

The life cycle assessment is based on data from the welding and punching process occurring in various ArcelorMittal production sites: Welding is done in Lexy (FR), Iasi (RO), Krakow (PL), Karvina (CZ) and Rettel (FR). Punching is done in Roman (RO). Production has been modelled using annual production data from the period 2014-2018. The weighting of production volumes of the different production sites is based on 2018 data.

### 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 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 it is shredded and sorted, thus becomes an 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 sheet pile, including reuse and recycling. In module D the avoided benefits and burdens of the recycled material are calculated in accordance to the “value of scrap” methodology by *Worldsteel* and avoided benefits and

burdens of the reused material are quantified as avoided manufacturing of structural hollow sections.

**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.

. Used Database is *GaBi ts*.

**LCA: Scenarios and additional technical information**

**End of life (C3)**

The end of life for average structural hollow section products consist of 11% reuse, 88% recycling and 1% landfill.

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; 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: 1000 kg Structural hollow section

Parameter	Unit	A1-A3	C3	D
Global warming potential	[kg CO <sub>2</sub> -Eq.]	2.27E+3	1.84E+0	-1.32E+3
Depletion potential of the stratospheric ozone layer	[kg CFC11-Eq.]	5.03E-12	4.40E-14	6.13E-12
Acidification potential of land and water	[kg SO <sub>2</sub> -Eq.]	5.91E+0	5.80E-3	-3.15E+0
Eutrophication potential	[kg (PO <sub>4</sub> ) <sup>3</sup> -Eq.]	4.59E-1	6.40E-4	-2.72E-1
Formation potential of tropospheric ozone photochemical oxidants	[kg ethene-Eq.]	7.09E-1	4.01E-4	-4.03E-1
Abiotic depletion potential for non-fossil resources	[kg Sb-Eq.]	1.86E-4	5.58E-7	4.54E-5
Abiotic depletion potential for fossil resources	[MJ]	2.24E+4	2.07E+1	-1.09E+4

RESULTS OF THE LCA - RESOURCE USE according to EN 15804+A1: 1000 kg Structural hollow section

Parameter	Unit	A1-A3	C3	D
Renewable primary energy as energy carrier	[MJ]	1.60E+3	1.16E+1	7.10E+2
Renewable primary energy resources as material utilization	[MJ]	0.00	0.00	0.00
Total use of renewable primary energy resources	[MJ]	1.60E+3	1.16E+1	7.10E+2
Non-renewable primary energy as energy carrier	[MJ]	2.40E+4	3.20E+1	-1.07E+4
Non-renewable primary energy as material utilization	[MJ]	0.00	0.00	0.00
Total use of non-renewable primary energy resources	[MJ]	2.40E+4	3.20E+1	-1.07E+4
Use of secondary material	[kg]	3.62E+2	0.00E+0	5.58E+2
Use of renewable secondary fuels	[MJ]	0.00	0.00	0.00
Use of non-renewable secondary fuels	[MJ]	0.00	0.00	0.00
Use of net fresh water	[m <sup>3</sup> ]	1.17E+1	1.39E-2	-2.12E+0

RESULTS OF THE LCA – OUTPUT FLOWS AND WASTE CATEGORIES according to EN 15804+A1: 1000 kg Structural hollow section

Parameter	Unit	A1-A3	C3	D
Hazardous waste disposed	[kg]	9.54E-4	1.68E-7	-1.10E-4
Non-hazardous waste disposed	[kg]	4.79E+1	1.00E+1	-2.21E+1
Radioactive waste disposed	[kg]	6.46E-1	4.51E-3	1.01E-1
Components for re-use	[kg]	0.00E+0	1.10E+2	0.00E+0
Materials for recycling	[kg]	0.00E+0	5.58E+2	0.00E+0
Materials for energy recovery	[kg]	0.00	0.00	0.00
Exported electrical energy	[MJ]	0.00	0.00	0.00
Exported thermal energy	[MJ]	0.00	0.00	0.00

The following example illustrates the net scrap calculation for this model: 362 kg scrap is used in the manufacturing of 1 metric ton of structural hollow section. After use, 880 kg steel is recycled, 110 kg is reused and 10 kg are landfilled. The potential environmental impact calculated for module D depends on the net amount of scrap left in the system, which is  $880 - 362 + 40 = 558$ . This means that the system has a net output of 558 kg scrap, which carries a potential credit. All in all module D shows an environmental benefit.

## References

### Standards

#### EN 15804

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

#### EN 15804

EN 15804:2019+A2 (in press), Sustainability of construction works — Environmental Product Declarations — Core rules for the product category of construction products.

#### ISO 14025

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

## Further References

### Title of the software/database

Title of the software/database. Addition to the title, version. Place: Publisher, Date of publication [Access on access date].

### IBU 2016

Institut Bauen und Umwelt e.V.: General Programme Instructions for the Preparation of EPDs at the Institut Bauen und Umwelt e.V. Version 1., Berlin: Institut Bauen und Umwelt e.V., 2016.

[www.ibu-epd.com](http://www.ibu-epd.com)

### CPR

Regulation (EU) No 305/2011 of the European parliament and of the council of 9 March 2011 laying down harmonised conditions for the marketing of construction products and repealing Council Directive 89/106/EEC.

### EN 10210-1:2006

Hot finished structural hollow sections of non-alloy and fine grain steels – Part 1: Technical delivery conditions.

### EN 10219-1:2006

Cold formed welded structural hollow sections of non-alloy and fine grain steels – Part 1: Technical delivery conditions.

### EN 1090-2:2019

Execution of steel structures and aluminium structures - Part 2: Technical requirements for steel structures

### EN1993

#### EN 1993-1-1:2013

Eurocode 3: Design of steel structures - Part 1-1: General rules and rules for buildings German version EN 1993-1-1:2005 + AC:2009

#### EN 1090-1:2018-12

Execution of steel structures and aluminium structures - Part 1: Assessment and verification of constancy of performance of steel components and aluminium components for structural use; German and English version prEN 1090-1:2018

### GaBi ts

GaBi ts Software and Documentation: Database for integrated balancing. LBP, University of Stuttgart and thinkstep, Documentation of GaBi ts data sets <http://www.gabi-software.com/databases>, 2019

### PCR Part A

PCR - Part A: Calculation rules for the Life Cycle Assessment and Requirements on the Background Report, version 1.8, Institut Bauen und Umwelt e.V., [www.bau-umwelt.com](http://www.bau-umwelt.com), 2019

### PCR Part B

PCR – Part B: Requirements of the EPD for Structural steels, Institut Bauen und Umwelt e.V., [www.bau-umwelt.com](http://www.bau-umwelt.com), 2017

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