

# ENVIRONMENTAL PRODUCT DECLARATION

as per /ISO 14025/ and /EN 15804/

Owner of the Declaration	ArcelorMittal Commercial RPS S.à r.l.
Programme holder	Institut Bauen und Umwelt e.V. (IBU)
Publisher	Institut Bauen und Umwelt e.V. (IBU)
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**Cold formed steel sheet piles**  
**ArcelorMittal**

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## General Information

### ArcelorMittal Commercial RPS S.à r.l.

#### Programme holder

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

#### Declaration number

EPD-ARC-20180161-CBD1-EN

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

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

#### Issue date

14/03/2019

#### Valid to

13/03/2024



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



Dr. Alexander Röder  
(Head of Board IBU)

### Cold formed steel sheet piles

#### Owner of the declaration

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L-4221 Esch-sur-Alzette  
Luxembourg

#### Declared product / declared unit

The declared unit is 1 metric ton of cold formed steel sheet piles.

#### Scope:

The declaration applies to 1 metric ton of cold formed steel sheet piles. The Life Cycle Assessment is based on data collected from the steel shops involved in the production of the coils used to fabricate the cold formed steel sheet piles (Dunkerque in France, Ostrava in the Czech Republic). Data collected from the cold roll forming in Messempré in France is also considered. The data refers to the production volumes of 2017.

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

Cold formed steel sheet piles are steel profiles with longitudinal connections at each side formed by bending. Sheet piles can be connected to each other allowing for the construction of a continuous wall. Trench sheets are cold formed steel sheet profiles used to form a continuous wall through the overlapping of the different members, as they lack connections on their sides.

This EPD applies to 1 metric ton of cold formed steel sheet piles. They are produced from coils, 100% supplied from the integrated steel route. There are three types of cold formed steel sheet piles: Omega-shaped, Z-shaped, and Trench sheets.

### Application

Cold formed steel sheet piles are used for permanent and temporary applications, like waterfront structures, dykes, river embankments, cofferdams, etc. They are mainly used as low height retaining walls, or structures requiring low water tightness.

### Technical Data

This EPD is valid for cold formed steel sheet piles of varied grades and geometries, as well as different forms of delivery. Specific information on dimension tolerances, steel characteristics, and mechanical and chemical properties can be found in the relevant standards /EN 10249/.

### 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	48	W/(mK)
Melting point	1536	°C

### Product standards and national certifications:

European standard /EN 10249/ "Cold formed sheet piling of non alloy steels"

### Base materials / Ancillary materials

Steel piling products according to /EN 10249/ are non-alloy steel products.

Cold formed steel sheet piles are fabricated from ca. 100% coils that are produced using the blast furnace process and cold formed in a profiling line.

There is no modification in the chemical composition during the forming process, only the mechanical properties may marginally be improved.

### Reference service life

A reference service life for steel sheet piling products is not declared. Steel sheet piling products are construction products with many different application purposes. The lifetime therefore will be limited by the service life of the construction work.

## LCA: Calculation rules

### Declared Unit

The declaration refers to the functional unit of 1 metric ton of cold formed steel sheet piles.

### Declared unit

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

### 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 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 sheet pile, including reuse and recycling. In module D the recycled material gets a credit in accordance to the "value of scrap" methodology by /Worldsteel/ and the reused material receives a credit as avoided manufacturing of cold formed steel sheet piles.

### 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.

All relevant background datasets are taken from the 2018 version of the /GaBi Database/. Regarding foreground data, this study is based on high quality of primary data, collected by ArcelorMittal. The GaBi-database contains consistent and documented datasets which can viewed in the online GaBi-documentation /GaBi Documentation/..

## LCA: Scenarios and additional technical information

The end of life for average steel sheet pile products consists of 2% reuse, 97% recycling and 1% landfill, with the corresponding benefits and burdens.

### End of life (C3)

Name	Value	Unit
Landfilling	1	%

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

Name	Value	Unit
Recycling	97	%
Reuse	2	%

## 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 cold formed steel sheet piles

Parameter	Unit	A1-A3	C3	D
Global warming potential	[kg CO <sub>2</sub> -Eq.]	2.44E+3	1.84E+0	-1.68E+3
Depletion potential of the stratospheric ozone layer	[kg CFC11-Eq.]	4.45E-9	6.85E-12	2.32E-10
Acidification potential of land and water	[kg SO <sub>2</sub> -Eq.]	5.01E+0	5.84E-3	-4.04E+0
Eutrophication potential	[kg (PO <sub>4</sub> ) <sup>3</sup> -Eq.]	4.56E-1	6.69E-4	-3.46E-1
Formation potential of tropospheric ozone photochemical oxidants	[kg ethene-Eq.]	4.84E-1	4.01E-4	-5.16E-1
Abiotic depletion potential for non-fossil resources	[kg Sb-Eq.]	7.57E-5	8.92E-7	1.66E-4
Abiotic depletion potential for fossil resources	[MJ]	2.37E+4	2.04E+1	-1.34E+4

### RESULTS OF THE LCA - RESOURCE USE: 1 metric ton of cold formed steel sheet piles

Parameter	Unit	A1-A3	C3	D
Renewable primary energy as energy carrier	[MJ]	2.33E+2	1.09E+1	1.18E+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]	2.33E+2	1.09E+1	1.18E+3
Non-renewable primary energy as energy carrier	[MJ]	2.39E+4	3.22E+1	-1.27E+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]	2.39E+4	3.22E+1	-1.27E+4
Use of secondary material	[kg]	1.15E+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> ]	3.02E+0	1.49E-2	5.12E-1

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

#### 1 metric ton of cold formed steel sheet piles

Parameter	Unit	A1-A3	C3	D
Hazardous waste disposed	[kg]	1.43E-5	1.81E-7	-8.86E-6
Non-hazardous waste disposed	[kg]	8.04E+0	1.00E+1	-2.61E+1
Radioactive waste disposed	[kg]	6.29E-2	4.67E-3	2.90E-1
Components for re-use	[kg]	0.00E+0	2.00E+1	0.00E+0
Materials for recycling	[kg]	0.00E+0	9.70E+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

The following example illustrates the net scrap calculation for this model:

115 kg scrap is used in the manufacturing of 1 metric ton of cold formed steel sheet piles. After use, 970 kg steel is recycled, 20 kg is reused. The potential environmental impact calculated for module D depends on the net amount of scrap left in the system, which is  $970 - 115 + 3 = 858$ . This means that the system has a net output of 858 kg scrap, which carries a potential credit. All in all module D shows an environmental benefit.

## References

### /IBU 2016/

IBU (2016): General Programme Instructions for the Preparation of EPDs at the Institut Bauen und Umwelt e.V., Version 1.1 Institut Bauen und Umwelt e.V., Berlin.

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

### /ISO 14025/

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

### /EN 15804/

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

### /PCR 2016, Part A/

Product Category Rules for Building-Related Products and Services, Calculation Rules for the Life Cycle Assessment and Requirements on the Project Report. Institut Bauen und Umwelt e.V. (IBU) March 2016 [www.bauumwelt.de](http://www.bauumwelt.de)

**/PCR 2016, Part B/**

Requirements on the EPD for Structural steels - Institut Bauen und Umwelt e.V., Berlin (pub.): From the range of Environmental Product Declarations of Institute Construction and Environment e.V. (IBU), 2016

**/EN 10249:1996/**

Cold formed sheet piling of non-alloy steels. Part 1: Technical delivery conditions. Part 2: Tolerances on shape and dimensions.

**/GaBi ts Software/**

GaBi ts. Software and Databases for Life Cycle Engineering. IABP, University of Stuttgart und thinkstep AG, 2018.

**/GaBi ts Documentation/**

GaBi ts: Documentation of the GaBi datasets for Life Cycle Engineering. IABP, University of Stuttgart and thinkstep AG, 2018. <http://documentation.gabi-software.com>

**/Worldsteel, 2011/**

Life cycle assessment (LCA) methodology report <http://www.worldsteel.org/publications/>



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