

ENVIRONMENTAL-PRODUCT DECLARATION

as per ISO 14025 and EN 15804+A1

Owner of the Declaration	ArcelorMittal Commercial RPS – Sheet piling
Publisher	Institut Bauen und Umwelt e.V. (IBU)
Programme holder	Institut Bauen und Umwelt e.V. (IBU)
Declaration number	EPD-ARC-20180161-CBD2-EN
Issue date	14.03.2019
Valid to	13.09.2024

Cold formed steel sheet piles ArcelorMittal

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General Information

ArcelorMittal

Programme holder

IBU – Institut Bauen und Umwelt e.V.
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Germany

Declaration number

EPD-ARC-20180161-CBD2-EN

This declaration is based on the product category rules:

Structural steels, 01.08.2021
(PCR checked and approved by the SVR)

Issue date

14.03.2019

Valid to

13.09.2024



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Cold formed steel sheet piles

Owner of the declaration

ArcelorMittal Commercial RPS – Sheet piling
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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.

The EPD was created according to the specifications of EN 15804+A1. In the following, the standard will be simplified as *EN 15804 bezeichnet*.

Verification

The standard EN 15804 serves as the core PCR		
Independent verification of the declaration and data according to ISO 14025:2011		
<input type="checkbox"/>	internally	<input checked="" type="checkbox"/> externally



Dr.-Ing. Wolfram Trinius,
(Independent verifier)

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. Please select one of the following options and delete the header of the selected [alternative]:

[Alternative 1a: Product according to the CPR based on a hEN]:

For the placing on the market of the product in the European Union/European Free Trade Association (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 xyz:date, title and the CE-marking.

For the application and use the respective national provisions apply.

[Alternative 1b: Products according to the CPR based on an ETA]:

For the placing of the product on the market in the European Union/European Free Trade Association /EU/EFTA) (with the exception of Switzerland) the Regulation (EU) No. 305/2011 (CPR) applies. The product needs a declaration of performance taking into consideration ETA no. xyz:date, title and the CE-marking.

For the application and use the respective national provisions apply.

[Alternative 2a: Product not harmonised in accordance with the CPR but in accordance with other provisions for harmonisation of the EU]:

For the placing on the market in the European Union/European Free Trade Association (EU/EFTA) (with the exception of Switzerland) the following legal provisions apply:

- Directive no. xyz: date, title
- Regulation no. xyz: date, title
- and the harmonised standards based on these provisions:
- EN xyz: date, title

The CE-marking takes into account the proof of conformity with the respective harmonized standards based on the legal provisions above.

For the application and use the respective national provisions apply.

[Alternative 2b: Product harmonized as well in accordance with the CPR as with other provisions for harmonisation of the EU]:

For the placing of the product on the market in the European Union/European Free Trade Association (EU/EFTA) (with the exception of Switzerland) the Regulation (EU) No. 305/2011 (CPR) and the following other provisions for harmonisation apply:

- Directive (EU) xyz: date, title
- Regulation (EU) no. xyz: date, title

The product needs a declaration of performance in accordance with the CPR taking into consideration /EN xyz: date/, title or /ETA no. xyz/:date, title respectively and the CE-marking.

The CE-marking for the product takes into account the Declaration of Performance in accordance with the CPR and the proof of conformity with the following harmonised standards or based on the other provisions for harmonisation:

- EN xyz: date, title
- Source, date, title

For the application and use the respective national provisions apply.

[Alternative 3: Product for which no legal provisions for harmonisation of the EU exist]:

For the use and application of the product the respective national provisions at the place of use apply, in Germany for example the building codes of the federal states and the corresponding national specifications.

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 ³
Modulus of elasticity	210000	N/mm ²
Coefficient of thermal expansion	12	10 ⁻⁶ K ⁻¹
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.

Environment and health during use

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 ³

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 representativeness 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 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.

Geographic Representativeness

Land or region, in which the declared product system is manufactured, used or handled at the end of the product's lifespan: Europe

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

In case a **reference service life** according to applicable ISO standards is declared then the assumptions and in-use conditions underlying the determined RSL shall be declared. In addition, it shall be stated that the RSL applies for the reference conditions only.

The same holds for a service life declared by the manufacturer. Corresponding information related to in-use conditions needs not be provided if a service life taken from the list on service life by BNB is declared.

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

In Table 1 "Description of the system boundary", all declared modules shall be indicated with an "X"; all modules that are not declared shall be indicated with "MND" (As default the modules B3, B4, B5 are marked as MNR – module not relevant). In the following tables, columns can be deleted for modules that are not declared. Indicator values should be declared with three valid digits (eventually using exponential form (e.g. 1,23E-5 = 0,0000123). A uniform format should be used for all values of one indicator.

If several modules are not declared and therefore have been deleted from the table, the abbreviations for the indicators can be replaced by the complete names, while the readability and clear arrangement should be maintained; the legends can then be deleted. If due to relevant data gaps, an indicator cannot be declared in a robust way, then the abbreviation "IND" (indicator not declared) should be used for this indicator.

- 0 - calculated value is 0
- 0 - value falls under the cut-off
- 0 - assumption which exclude any flows (e.g. exported electricity A1-A3)
- IND – in cases where the inventory does not support the methodological approach or the calculation of the specific indicator IND shall be used.

If no reference service life is declared (see chapter 2.13 "Reference Service Life"), the LCA results of the modules B1-B2 and B6-B7 shall refer to a period of one year. This shall then be indicated as an explanatory text below the tables. In addition, the formula for the quantification of such B-modules over the total life cycle shall be provided.

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: 1 metric ton of cold formed steel sheet piles

Parameter	Unit	A1-A3	C3	D
Global warming potential (GWP)	kg CO ₂ eq	2.44E+03	1.84E+00	-1.68E+03
Depletion potential of the stratospheric ozone layer (ODP)	kg CFC11 eq	4.45E-09	6.85E-12	2.32E-10
Acidification potential of land and water (AP)	kg SO ₂ eq	5.01E+00	5.84E-03	-4.04E+00
Eutrophication potential (EP)	kg PO ₄ ³ eq	4.56E-01	6.69E-04	-3.46E-01
Formation potential of tropospheric ozone photochemical oxidants (POCP)	kg Ethen eq	4.84E-01	4.01E-04	-5.16E-01
Abiotic depletion potential for non fossil resources (ADPE)	kg Sb eq	7.57E-05	8.92E-07	1.66E-04
Abiotic depletion potential for fossil resources (ADPF)	MJ	2.37E+04	2.04E+01	-1.34E+04

RESULTS OF THE LCA - INDICATORS TO DESCRIBE RESOURCE USE according to EN 15804+A1: 1 metric ton of cold formed steel sheet piles

Parameter	Unit	A1-A3	C3	D
Renewable primary energy as energy carrier (PERE)	MJ	2.33E+02	1.09E+01	1.18E+03
Renewable primary energy resources as material utilization (PERM)	MJ	0	0	0
Total use of renewable primary energy resources (PERT)	MJ	2.33E+02	1.09E+01	1.18E+03
Non renewable primary energy as energy carrier (PENRE)	MJ	2.39E+04	3.22E+01	-1.27E+04
Non renewable primary energy as material utilization (PENRM)	MJ	0	0	0
Total use of non renewable primary energy resources (PENRT)	MJ	2.39E+04	3.22E+01	-1.27E+04
Use of secondary material (SM)	kg	1.15E+02	0	0
Use of renewable secondary fuels (RSF)	MJ	0	0	0
Use of non renewable secondary fuels (NRSF)	MJ	0	0	0
Use of net fresh water (FW)	m ³	3.02E+00	1.49E-02	5.12E-01

RESULTS OF THE LCA – WASTE CATEGORIES AND OUTPUT FLOWS according to EN 15804+A1: 1 metric ton of cold formed steel sheet piles

Parameter	Unit	A1-A3	C3	D
Hazardous waste disposed (HWD)	kg	1.43E-05	1.81E-07	-8.86E-06
Non hazardous waste disposed (NHWD)	kg	8.04E+00	1E+01	-2.61E+01
Radioactive waste disposed (RWD)	kg	6.29E-02	4.67E-03	2.9E-01

Components for re-use (CRU)	kg	0	2E+01	0
Materials for recycling (MFR)	kg	0	9.7E+02	0
Materials for energy recovery (MER)	kg	0	0	0
Exported electrical energy (EEE)	MJ	0	0	0
Exported thermal energy (EET)	MJ	0	0	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 $970 - 115 + 20 = 875$. This means that the system has a net output of 875 kg scrap, which carries a potential credit. All in all module D shows an environmental benefit.

References

/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

/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/>
The literature referred to in the Environmental Product Declaration must be listed in full. Standards already fully quoted in the EPD do not need to be listed here again. The current version of PCR Part A and PCR Part B of the PCR document on which they are based must be referenced.



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