

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)
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EcoSheetPiles™
ArcelorMittal

www.ibu-epd.com / <https://epd-online.com>



General Information

<p>ArcelorMittal Commercial RPS S.à r.l.</p> <hr/> <p>Programme holder IBU - Institut Bauen und Umwelt e.V. Panoramastr. 1 10178 Berlin Germany</p> <hr/> <p>Declaration number EPD-ARM-20180069-IBD1-EN</p> <hr/> <p>This Declaration is based on the Product Category Rules: Structural steels, 07.2014 (PCR tested and approved by the SVR)</p> <hr/> <p>Issue date 28.06.2018</p> <hr/> <p>Valid to 27.06.2023</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>Dipl. Ing. Hans Peters (Managing Director IBU)</p>	<p>EcoSheetPiles™</p> <hr/> <p>Owner of the Declaration ArcelorMittal Commercial RPS S.à r.l. 66, rue de Luxembourg L-4221 Esch-sur-Alzette Luxembourg</p> <hr/> <p>Declared product / Declared unit The declared unit is 1 metric ton of EcoSheetPiles™.</p> <hr/> <p>Scope: The declaration applies to 1 metric ton of EcoSheetPiles™. It covers hot rolled steel sheet piling (Z-shaped, U-shaped, straight-web, and H-shaped) produced by ArcelorMittal. This environmental product declaration is valid for steel sheet piling produced by ArcelorMittal sites Differdange and Esch-Belval in Luxembourg and refers to 100% of the production volumes of 2015. 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>Verification</p> <table border="1"> <tr> <td colspan="2">The CEN Norm /EN 15804/ serves as the core PCR</td> </tr> <tr> <td colspan="2">Independent verification of the declaration according to /ISO 14025/</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 CEN Norm /EN 15804/ serves as the core PCR		Independent verification of the declaration according to /ISO 14025/		<input type="checkbox"/> internally	<input checked="" type="checkbox"/> externally
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Product

Product description / Product definition

Steel sheet piling are rolled steel profiles with longitudinal clutches at each side. Sheet piles can be connected to each other through these clutches creating a mechanical connection (i.e. interlock) between the profiles allowing the construction of a continuous wall.

This EPD applies to 1 metric ton of EcoSheetPiles™. EcoSheetPiles™ are produced at the ArcelorMittal sites Differdange and Esch-Belval in Luxembourg from ca. 100% scrap in an electric arc furnace route and are 100% reusable and recyclable. The types of EcoSheetPiles™ available are: Z-shaped, U-shaped, straight-web, and H-shaped.

Application

Sheet pile walls resist to high pressure and can support massive height of soil with a small quantity of steel compared to the applied loads. Steel piling products are used worldwide in many kinds of permanent or temporary structures: quay walls and breakwaters in harbors and locks, bank reinforcement on rivers and canals, pumping stations, bridge abutments, retaining walls for underpasses or underground car parks, impervious containment walls,

temporary cofferdams in land and in water, containment barriers, and load bearing foundations, among others.

Technical Data

This EPD is valid for EcoSheetPiles™ steel piling products of varied grades and geometries, as well as different forms of delivery. Specific information on dimension tolerances, constructional data and mechanical and chemical properties can be found in the relevant standards /EN 10248/.

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 10248/ Hot rolled sheet piling of non-alloy steels
- ASTM international standards /ASTM A328/, /A572/, /A690/

- Canadian standard association (CSA) /Gr 260W/, /Gr 300 W/, /Gr 350W/, /Gr 400W/
- Japanese Industrial Standards (JIS) /JIS SY 295/, /SY 390/
- ArcelorMittal mill specifications: /S460AP/, /AMLoCor Blue/

Base materials / Ancillary materials

Steel piling products according to /EN 10248/ are non-alloy steel products, except for AMLoCor and ASTM A690 products.

Iron is the main component of steel piling products. Alloying elements are added on 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 the steel. The composition of these elements depends on the steel designation/grade.

Reference service life

A reference service life for steel piling products is not declared. Steel piling products are construction products with many different application purposes.

LCA: Calculation rules

Declared Unit

The declaration refers to the functional unit of 1 metric ton of EcoSheetPiles™ as specified in Part B requirements on the EPD for structural steels.

Declared unit

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

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 EcoSheetPiles™ 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.

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

General

Depending upon the type of installation, it is possible to recover and reuse up to 100% of steel piling products. In general steel piling products are 100% recyclable. In this EPD a rate of 99% after dismantling is used, thanks to the magnetic properties of steel according to the /European Commission Technical Steel Research/ and the /German Ministry of Environmental Affairs/.

Reuse

Steel piling products can be reused several times. Part of the production is used for temporary works (lasting up to 3 years). Steel piling products can be reused from 3 to 10 times, without loss of their properties. The frequency of reuse varies depending on the use case. For instance, the same steel piling product can be used successively for different parts of a construction site or stocked by a company between two usages. According to internal documentation within ArcelorMittal, currently part of the sheet piles are reused several times, leading to an overall reuse rate of 25%.

Recycling

Steel can be recycled to the same (or higher/lower) quality of steel depending upon the metallurgy and

processing of the recycling route. Steel piling products can be recycled without any problem after dismantling, and recycling routes are well established.

99% of the sheet piles are recovered for reuse and recycling. Since 25% of the sheet piles are reused, the remaining 74% is considered as recycled with the corresponding benefits and burdens. In module D the recycled material gets a credit based on the “value of scrap” methodology by /Worldsteel/ and the reused material receives a credit as avoided manufacturing of EcoSheetPiles™.

For specific case studies, dedicated scenarios can be calculated by contacting ArcelorMittal or using the data provided in this document.

End of life (C3)

Name	Value	Unit
Landfilling	1	%

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

Name	Value	Unit
Recycling	74	%
Reuse	25	%

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 EcoSheetPiles™

Parameter	Unit	A1-A3	C3	D
Global warming potential	[kg CO ₂ -Eq.]	5.20E+2	2.03E+0	-3.23E+0
Depletion potential of the stratospheric ozone layer	[kg CFC11-Eq.]	6.37E-7	1.22E-9	-1.60E-7
Acidification potential of land and water	[kg SO ₂ -Eq.]	1.94E+0	6.30E-3	9.79E-4
Eutrophication potential	[kg (PO ₄) ³⁻ -Eq.]	1.51E-1	6.96E-4	5.59E-4
Formation potential of tropospheric ozone photochemical oxidants	[kg ethene-Eq.]	1.70E-1	4.89E-4	2.82E-2
Abiotic depletion potential for non-fossil resources	[kg Sb-Eq.]	2.69E-4	6.22E-7	-7.77E-5
Abiotic depletion potential for fossil resources	[MJ]	6.15E+3	2.27E+1	-3.53E+2

RESULTS OF THE LCA - RESOURCE USE: 1 metric ton of EcoSheetPiles™

Parameter	Unit	A1-A3	C3	D
Renewable primary energy as energy carrier	[MJ]	8.54E+2	8.76E+0	-2.75E+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]	8.54E+2	8.76E+0	-2.75E+2
Non-renewable primary energy as energy carrier	[MJ]	9.69E+3	3.41E+1	-1.29E+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]	9.69E+3	3.41E+1	-1.29E+3
Use of secondary material	[kg]	1.09E+3	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 ³]	3.92E+0	1.36E-2	-8.97E-1

RESULTS OF THE LCA – OUTPUT FLOWS AND WASTE CATEGORIES:

1 metric ton of EcoSheetPiles™

Parameter	Unit	A1-A3	C3	D
Hazardous waste disposed	[kg]	6.59E-6	3.34E-7	-4.41E-8
Non-hazardous waste disposed	[kg]	7.14E+0	1.00E+1	1.13E-2
Radioactive waste disposed	[kg]	1.40E+0	4.54E-3	-3.71E-1
Components for re-use	[kg]	0.00E+0	2.50E+2	0.00E+0
Materials for recycling	[kg]	0.00E+0	7.40E+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: 1085 kg scrap is used to manufacture 1000 kg of EcoSheetPiles™. After use, 740 kg steel is recycled, 250 kg is reused. The potential environmental impact calculated for module D depends on the net amount of scrap left in the system, which is 740 - 1085 + 271 kg = -74 kg

This means that the system requires a net input of 74 kg of steel scrap, which contributes as an environmental burden in module D; this is overcompensated by the benefit of reuse, thus overall module D shows an environmental benefit.

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