Environmental Product Declaration

In accordance with ISO 14025:2006 and EN 15804:2012+A2:2019/AC:2021 for:

EcoSheetPile™ – Steel Sheet Piles

from

ArcelorMittal Europe – Long Products

Programme:	The International EPD® System, www.environdec.com
Programme operator:	EPD International AB
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An EPD should provide current information and may be updated if conditions change. The stated validity is therefore subject to the continued registration and publication at www.environdec.com

General information

Programme information

Programme:	The International EPD® System
Address:	EPD International AB Box 210 60 SE-100 31 Stockholm Sweden
Website:	www.environdec.com
E-mail:	info@environdec.com

Accountabilities for PCR, LCA and independent, third-party verification
Product Category Rules (PCR)
CEN standard EN 15804 serves as the Core Product Category Rules (PCR)
Product Category Rules (PCR): *PCR 2019:14 Construction products, version 1.3.1 Published on 2023.06.20. Based on CEN standard EN 15804. ISO standard ISO 21930 and CEN standard EN 15804 serves as the core PCR.*
PCR review was conducted by: The Technical Committee of the International EPD®System. See www.environdec.com/TCfor a list of members. Review chair: Claudia A. Peña, University of Concepción, Chile. The review panel may be contacted via the Secretariat www.environdec.com/contact.
Life Cycle Assessment (LCA)
LCA accountability: *Leonardo Guimarães Ribeiro, ArcelorMittal Global R&D*
Third-party verification
Independent third-party verification of the declaration and data, according to ISO 14025:2006, via: ☒ EPD verification by individual verifier Third party verifier: *Matt Fishwick, Fishwick Environmental Ltd*      Approved by: The International EPD® System
Procedure for follow-up of data during EPD validity involves third party verifier: ☒ Yes ☐ No [Procedure for follow-up the validity of the EPD is at minimum required once a year with the aim of confirming whether the information in the EPD remains valid or if the EPD needs to be updated during its validity period. The follow-up can be organized entirely by the EPD owner or together with the original verifier via an agreement between the two parties. In both approaches, the EPD owner is responsible for the procedure being carried out. If a change that requires an update is identified, the EPD shall be re-verified by a verifier]

The EPD owner has the sole ownership, liability, and responsibility for the EPD.

EPDs within the same product category but registered in different EPD programmes, or not compliant with EN 15804, may not be comparable. For two EPDs to be comparable, they must be based on the same PCR (including the same version number) or be based on fully-aligned PCRs or versions of PCRs; cover products with identical functions, technical performances and use (e.g. identical declared/functional units); have equivalent system boundaries and descriptions of data; apply equivalent data quality requirements, methods of data collection, and allocation methods; apply identical cut-off rules and impact assessment methods (including the same version of characterisation factors); have equivalent content declarations; and be valid at the time of comparison.

For further information about comparability, see EN 15804 and ISO 14025.

Company information

Owner of the EPD: ArcelorMittal Europe – Long Products

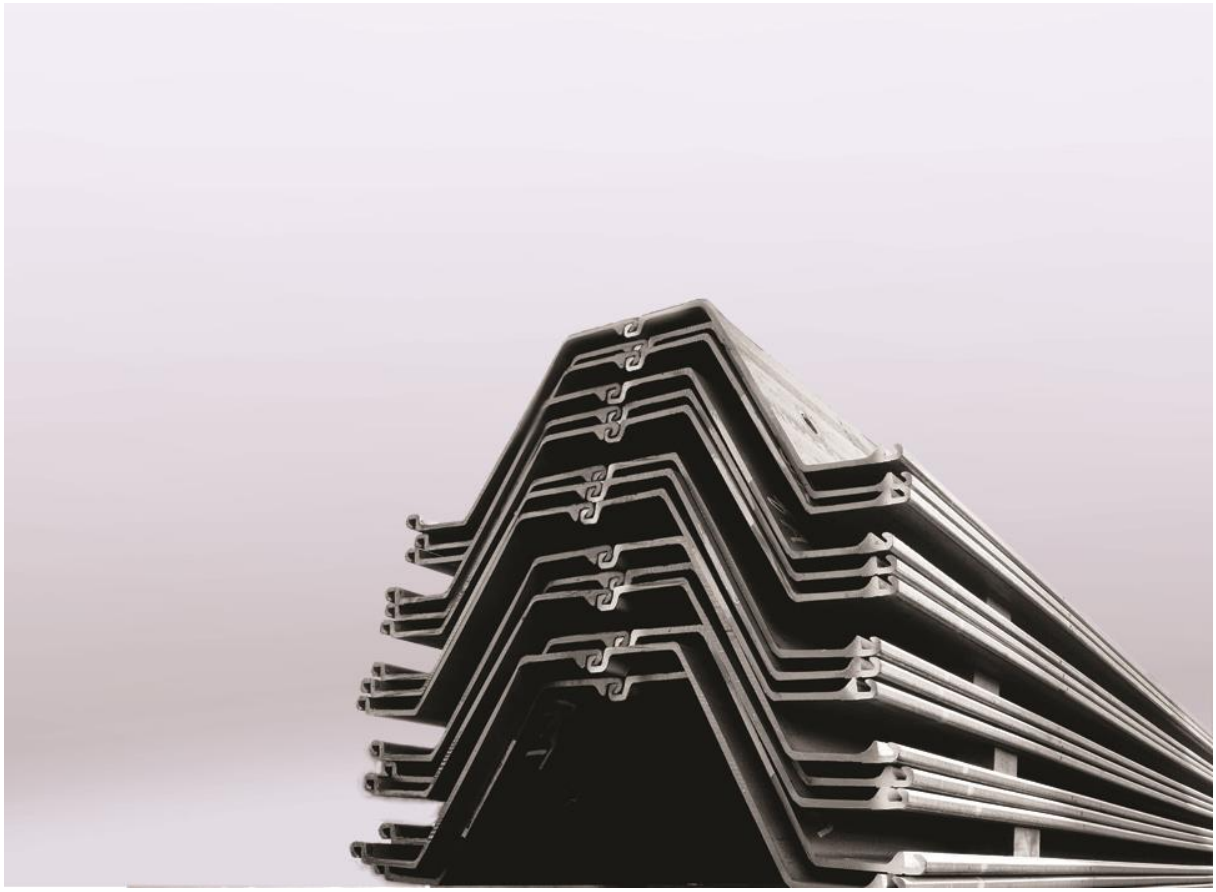
Contact: sheetpiling@arcelormittal.com, Tel.: +352 5313 3105

Description of the organisation:
ArcelorMittal Europe – Long Products operates 27 production sites in ten countries and is a leader in the manufacture of sections, sheet piles, rails, quality wire rod, rebars, and bars. ArcelorMittal is the world's largest supplier of cost-effective tailor-made steel foundation solutions, as well as the largest manufacturer of sustainable hot-rolled steel sheet piles. ArcelorMittal Sheet Piling is in charge of sales, marketing and promotion of hot rolled and cold formed steel sheet piles, HP bearing piles and steel tubes produced in its European mills, as well as accessories used for installation.

Our journey towards becoming carbon neutral by 2050 is well underway. In line with the Paris Climate Goals and the European Green Deal, ArcelorMittal has also committed to reduce CO_2 emissions in our European operations by 35% by 2030.

Product-related or management system-related certifications:
ArcelorMittal's sheet piling mills are covered by ISO 9001, ISO 14001, ISO 45001, ISO 50001, and *Responsible Steel*™

Name and location of production site(s): ArcelorMittal Belval & Differdange S.A. (AMBD), Luxembourg



AZ sheet piles produced at ArcelorMittal Belval & Differdange S.A.

Product information

Product name: EcoSheetPile™ - Steel Sheet Piles

Product identification: EcoSheetPile™ - Steel Sheet Piles included in this EPD are covered by one of the following names: EcoSheetPile™ or steel sheet piles.

Product description:
An EcoSheetPile™ is a hot rolled steel sheet pile used in various construction and infrastructure applications. It is produced from 100 % scrap input in an electric arc furnace. EcoSheetPile™ can be produced in a wide range of shapes and dimensions, lengths, steel grades and specifications. The declaration covers the whole range of steel sheet piles produced in the Luxemburgish production site ArcelorMittal Belval & Differdange (AMBD), especially the mills of Belval and Differdange: Z-type, U-type, straight-web and H-type. EcoSheetPile™ is a final product ready to be installed.

This EPD is valid for EcoSheetPile™ of various grades and geometries as covered by following standards:

- European Standards: EN 10248-1, EN 10248-2;
- ASTM International: ASTM A6, ASTM A572, ASTM A690;
- Canadian Standard Association (CSA): G40.20/G.40/21 260W, 300W, 350W, 400W, 450W.

EcoSheetPile™ can also be delivered according to following ArcelorMittal mill specification: steel grade AMLoCor.

Manufacturing process:
EcoSheetPile™ is a hot-rolled steel sheet pile, manufactured on the site of ArcelorMittal Belval & Differdange. The steel for the production of sheet piles at Belval and Differdange originates mainly from the EAF in Differdange and marginally from the EAF in Belval.

EcoSheetPile™ applies to steel sheet piles made via the Electric Arc Furnace route using 100% scrap input.

The production of EcoSheetPile™ goes through following main technological steps:

- scrap melting in Electric Arc Furnace;
- steel refining in Ladle Furnace;
- continuous casting;
- hot rolling;
- cooling and finishing.

Applications:
EcoSheetPile™ is a hot rolled steel sheet pile used to build quite impervious retaining walls and cut-off walls, in permanent or temporary applications in the construction and infrastructure field. The main goal is to retain soil and/or water. Typical applications are:

- ports and waterways: quay walls, jetties, breakwaters, riverbanks, embankments, flood protection walls, locks, temporary cofferdams.
- on land: retaining walls, underground car parks, basements, underpasses, bridge abutments, cut-off walls (polluted soils), pit excavations.

In case of mechanical destruction, no risks are expected to occur in terms of environment and human health. The product does not cause any adverse health effects or release of VOCs to indoor air.

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.

At the end of life, they will be recovered and recycled in a new steel product.

UN CPC code: 412 Products of iron or steel

Geographical scope: Europe

LCA information

Functional unit / declared unit: 1 metric tonne of EcoSheetPile™ - Steel Sheet Piles.

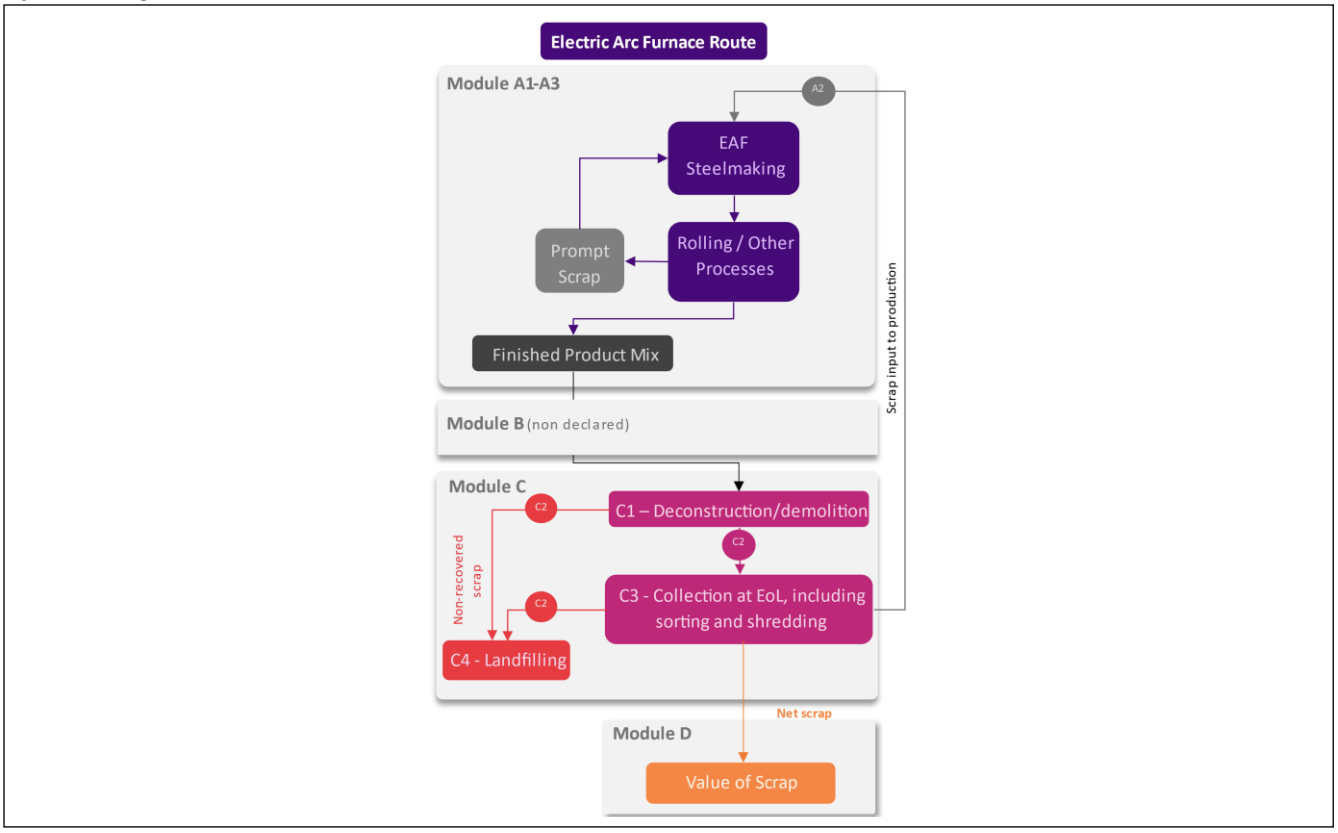
Reference service life: Not applicable

Time representativeness: The collection of the foreground data refers to the year 2021.

Database(s) and LCA software used:
The background data has been taken from the latest available Sphera Managed LCA Content 2023.2 and the LCA model was created using LCA Sphera for Experts software, version 10.7.1.28

Description of system boundaries:
The system boundaries are: Cradle to gate with options, modules C1–C4, and module D.

System diagram:



- *Module A1 to A3:*

The product stage includes provision of all materials, products and energy, as well as waste processing up to the end-of waste state or disposal of final residues during the product stage.

These modules consider the production of beam blanks in Belval and Differdange, the transport within the site as well as the manufacturing of sheet piles in Belval and Differdange. No emissions or waste from packaging is considered in modules A1-A3, as all raw materials, semi-products as well as the final products are transported bulk/loose.

For the modelling, the electricity supply was based on a electricity grid mix (1kV-60kV) from the 2023.2 Managed LCA Content (Sphera) database. The emission factor for the GWP-GHG indicator is 67,8 g CO2eq./kWh.

- *Module C1 to C4:*

Within this EPD, the modules C1-C4 are included. These modules consider the dismantling of the considered product (C1), the transportation of the dismantled components to their End of Life (EoL) destination (C2), the waste processing for recovery or recycling (C3) as well as the disposal (C4), if given. At EoL, the steel material leaves the product system in C3 for recycling in Module D. The environmental impacts from grinding, sorting and transportation of steel scrap are not included.
The considered End-of-Life scenario for the steel material is 60 % recycling, 25 % reuse, and 15 % landfill.

Category	Subcategory	Unit	Quantity
Collection process	Collected separately	kg	1000
	Collected with mixed construction waste	kg	0
Recovery	Reuse	kg	250
	Recycling	kg	600
	Landfill	kg	150
	Incineration	kg	0
	Incineration with energy recovery	kg	0
	Energy conversion efficiency rate	kg	0
Disposal	Material for final disposal	kg	0
Transport	Deconstruction site to scrap processing plant	km	100
	Scrap processing plant to site for end of waste	km	200

- *Module D:*

Module D includes any declared benefits and loads from net flows leaving the product system that have not been allocated as co-products and that have passed the end-of-waste state in the form of reuse, recovery and/or recycling potentials.

Metals are assumed to reach the end of waste status directly at the construction site. The treatment as well as net benefits and loads of reuse or recycling potentials (for the net scrap amount only) are grouped to module D.

Potential environmental benefits are given for the net steel scrap that is produced at the end of a final product's life. This net scrap is determined as follows:
Net scrap = Amount of steel recycled at end-of-life – Scrap input from previous product life cycles.

For the product under study, in case of 60 % recycling, 25 % reuse, and 15 % landfill:
In the production of EcoSheetPiles™, 1192 kg of external scrap material was utilized. Upon reaching the end of its life cycle, 600 kg of scrap is reclaimed for recycling, and an additional 250 kg is set aside for reuse. The decision to reuse helps prevent the need for manufacturing new steel, thereby saving 298 kg of scrap (calculated as 1192/1000*250). Consequently, the system demonstrates a net flow of - 294 kg of scrap (calculated as 600 + 298 - 1192). This net value is reflected in module D and can be considered as either an environmental credit or burden, depending on the specific impact category.

This End-of-Life scenario represents an average use of the entire sheet pile production of ArcelorMittal. To describe more specific application purposes (e.g.: reuse in temporary applications), further End-of-Life scenarios are provided in the Annex B.

Cut-off criteria:
The environmental impact of the product studied has been assessed by considering all significant processes, materials, and emissions. Excluded flows are assumed to have a negligible impact, contributing less than 5% to the cumulative impact assessment categories. The production of capital equipment, facilities, and infrastructure required for manufacture has not been considered.

More information: https://sheetpiling.arcelormittal.com/

Data quality and sources: Data quality is compliant with ISO 14025:2006. All primary data were collected for 2021. All background data come from the Sphera Managed LCA Content 2023.2 databases and are representative for the years 2018-2023.

Allocation:
Primary data are allocated using the partitioning approach developed by worldsteel/EUROFER. The result for GWP-total and GWP-GHG indicators would increase by less than 2.6 % if no allocation was applied. Scrap inputs in module A1-A3, including pre-consumer scrap, are treated as ‘burden free’. Scrap produced and used internally within the company but in a different product system has been considered without any value (economic allocation, with a value of zero). Externally sourced pre-consumer scrap was treated as post-consumer scrap meaning that the only burdens considered are a transport burden, taken into account in A2, and a burden on the end-of-life scenarios (waste processing, transport, and destination). For such scraps, economic allocation was deemed not feasible. For all background data used in the model, the standard allocation assumptions of the used datasets were maintained.

Modules declared, geographical scope, share of specific data (in GWP-GHG results) and data variation (in GWP-GHG results)

	Product stage			Construction process stage		Use stage							End of life stage				Resource recovery stage
	Raw material supply	Transport	Manufacturing	Transport	Construction installation	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	De-construction demolition	Transport	Waste processing	Disposal	Reuse-Recovery-Recycling-potential
Module	**A1**	**A2**	**A3**	**A4**	**A5**	**B1**	**B2**	**B3**	**B4**	**B5**	**B6**	**B7**	**C1**	**C2**	**C3**	**C4**	**D**
Modules declared	X	X	X	NR	NR	NR	NR	NR	NR	NR	NR	NR	X	X	X	X	X
Geography	EU	EU	EU	-	-	-	-	-	-	-	-	-	GLO	GLO	GLO	GLO	GLO
Specific data used	>95%			-	-	-	-	-	-	-	-	-	-	-	-	-	-
Variation – products	0%			-	-	-	-	-	-	-	-	-	-	-	-	-	-
Variation – sites	0%			-	-	-	-	-	-	-	-	-	-	-	-	-	-

NR- Not reported. MNR- Module not declared.

Content information

EcoSheetPile™ - Steel Sheet Piles

Product content	**Weight, kg**	**Post-consumer material, weight**[1]	**Biogenic material, weight**
Steel	1000	66%	0% and 0 kg C / kg
Chemical composition			
Iron	> 971,8		
Carbon	< 2,00	-	-
Manganese	< 17,00	-	-
Silicon	< 5,50	-	-
Copper	< 5,50	-	-
Other	< 2,2	-	-

[1]According to ISO 14021:2016, the average recycled content, which includes pre- and post-consumer recycled scrap and additional sources of Fe (such as Ferro alloys), is approximately 98%.

The products do not contain any of the substances of very high concern (SVHC) regulated by the Regulation (EC) No 1907/2006 (REACH) or the Regulation (EC) No 1272/2008 of European parliament. Also, no packaging is considered in the scenario.

Results of the environmental performance indicators

The environmental performance of the functional unit of one metric tonne of EcoSheetPile™ - Steel Sheet Piles are reported below using the parameters and units as specified in PCR 2019:14.

The estimated impact results are only relative statements, which do not indicate the endpoints of the impact categories, exceeding threshold values, safety margins and/or risks.

Mandatory impact category indicators according to EN 15804+A2:2019

Results per one metric tonne of EcoSheetPile™ - Steel Sheet Piles							
Indicator	**Unit**	**A1-A3**	**C1**	**C2**	**C3**	**C4**	**D**
GWP-total	kg CO_2 eq.	4,39E+02	4,30E+01	2,63E+01	1,34E+00	2,23E+00	4,01E+02
GWP-fossil	kg CO_2 eq.	4,39E+02	4,26E+01	2,61E+01	1,34E+00	2,22E+00	4,01E+02
GWP-biogenic	kg CO_2 eq.	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
GWP-luluc	kg CO_2 eq.	3,03E-01	3,73E-01	2,45E-01	1,04E-03	7,00E-03	-7,93E-03
ODP	kg CFC 11 eq.	2,24E-09	1,54E-11	3,45E-12	2,20E-11	5,73E-12	-1,25E-09
AP	mol H^+ eq.	1,34E+00	2,46E-01	1,92E-01	3,30E-03	1,60E-02	9,14E-01
EP-freshwater	kg P eq.	3,52E-04	1,50E-04	9,69E-05	4,80E-06	4,54E-06	3,09E-05
EP-marine	kg N eq.	3,59E-01	1,19E-01	9,51E-02	9,70E-04	4,13E-03	1,11E-01
EP-terrestrial	mol N eq.	3,85E+00	1,32E+00	1,05E+00	1,04E-02	4,54E-02	8,36E-01
POCP	kg NMVOC eq.	1,05E+00	2,31E-01	1,82E-01	2,63E-03	1,25E-02	5,52E-01
ADP-minerals&metals*	kg Sb eq.	1,13E-04	2,77E-06	1,76E-06	1,95E-07	1,04E-07	2,86E-03
ADP-fossil*	MJ	1,10E+04	5,81E+02	3,61E+02	2,71E+01	3,00E+01	2,34E+03
WDP*	m^3	1,09E+02	6,23E-01	3,20E-01	2,66E-01	2,47E-01	7,12E+00
Acronyms	GWP-fossil = Global Warming Potential fossil fuels; GWP-biogenic = Global Warming Potential biogenic; GWP-luluc = Global Warming Potential land use and land use change; ODP = Depletion potential of the stratospheric ozone layer; AP = Acidification potential, Accumulated Exceedance; EP-freshwater = Eutrophication potential, fraction of nutrients reaching freshwater end compartment.EP-marine = Eutrophication potential, fraction of nutrients reaching marine end compartment; EP-terrestrial = Eutrophication potential, Accumulated Exceedance; POCP = Formation potential of tropospheric ozone; ADP-minerals&metals = Abiotic depletion potential for non-fossil resources; ADP-fossil = Abiotic depletion for fossil resources potential; WDP = Water (user) deprivation potential, deprivation-weighted water consumption						

** Disclaimer: The results of this environmental impact indicator shall be used with care as the uncertainties of these results are high or as there is limited experience with the indicator. We discourage the use of the results of modules A1-A3 without considering the results of module C.*

Resource use indicators according to EN 15804+A2:2019

Results per one metric tonne of EcoSheetPile™ - Steel Sheet Piles							
Indicator	**Unit**	**A1-A3**	**C1**	**C2**	**C3**	**C4**	**D**
PERE	MJ	9,41E+02	4,68E+01	2,63E+01	1,51E+01	4,89E+00	-4,36E+02
PERM	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
PERT	MJ	9,41E+02	4,68E+01	2,63E+01	1,51E+01	4,89E+00	-4,36E+02
PENRE	MJ	1,10E+04	5,83E+02	3,62E+02	2,71E+01	3,00E+01	2,34E+03
PENRM	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
PENRT	MJ	1,10E+04	5,83E+02	3,62E+02	2,71E+01	3,00E+01	2,34E+03
SM	kg	1,19E+03	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
RSF	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
NRSF	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
FW	m^3	4,05E+00	4,96E-02	2,88E-02	1,22E-02	7,58E-03	5,06E+01
Acronyms	PERE = Use of renewable primary energy excluding renewable primary energy resources used as raw materials; PERM = Use of renewable primary energy resources used as raw materials; PERT = Total use of renewable primary energy resources; PENRE = Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials; PENRM = Use of non-renewable primary energy resources used as raw materials; PENRT = Total use of non-renewable primary energy re-sources; SM = Use of secondary material; RSF = Use of renewable secondary fuels; NRSF = Use of non-renewable secondary fuels; FW = Use of net fresh water						

Waste indicators according to EN 15804+A2:2019

Results per one metric tonne of EcoSheetPile™ - Steel Sheet Piles							
Indicator	**Unit**	**A1-A3**	**C1**	**C2**	**C3**	**C4**	**D**
Hazardous waste disposed	kg	7,30E-07	9,53E-10	1,12E-09	-1,96E-09	6,54E-10	3,78E-05
Non-hazardous waste disposed	kg	2,66E+01	9,69E-02	5,52E-02	1,87E-02	1,50E+02	-6,81E+01
Radioactive waste disposed	kg	1,94E+00	2,88E-03	6,78E-04	3,99E-03	3,42E-04	-4,84E-01

Output flow indicators according to EN 15804+A2:2019

Results per one metric tonne of EcoSheetPile™ - Steel Sheet Piles							
Indicator	**Unit**	**A1-A3**	**C1**	**C2**	**C3**	**C4**	**D**
Components for re-use	kg	0,00E+00	0,00E+00	0,00E+00	2,50E+02	0,00E+00	0,00E+00
Material for recycling	kg	0,00E+00	0,00E+00	0,00E+00	6,00E+02	0,00E+00	0,00E+00
Materials for energy recovery	kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Exported energy, electricity	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Exported energy, thermal	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00

Other environmental performance indicators according to EN 15804+A2:2019

Results per one metric tonne of EcoSheetPile™ - Steel Sheet Piles							
Indicator	**Unit**	**A1-A3**	**C1**	**C2**	**C3**	**C4**	**D**
GWP-GHG	kg CO_2 eq.	4,40E+02	4,27E+01	2,62E+01	1,36E+00	2,23E+00	4,01E+02
Biogenic carbon content in product	kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Biogenic carbon content in packaging	kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00

References

- General Programme Instructions of the International EPD® System. Version 4.0.
- PCR 2019:14. Construction Products, Version 1.2.5
- Sustainability of construction works - Environmental product declarations - Methodology for selection and use of generic data; CEN/TR 15941:2010
- 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 15804: EN 15804:2012+A2:2019: Sustainability of construction works -Environmental Product Declarations - Core rules for the product category of construction products.
- EN ISO 14025: EN ISO 14025:2011-10 Environmental labels and declarations - Type III environmental declarations - Principles and procedures
- EN ISO 14040: EN ISO 14040:2009-11 Environmental management - Life cycle assessment - Principles and framework
- EN ISO 14044: EN ISO 14044:2006-10 Environmental management - Life cycle assessment - Require-ments and guidelines.
- LCA FE: LCA FE Software System and Database for Life Cycle Engineering, Sphera Solution GmbH, Leinfelden-Echterdingen, 2022 (https://www.gabi-software.com/support/gabi)
- EN 10248-1:2023: Hot-rolled steel sheet piles. Technical delivery conditions.
- EN 10248-2: Hot-rolled steel sheet piles. Tolerances on shape and dimensions.
- ASTM A572 / A572M-21e1:2021, Standard: Specification for High-Strength Low-Alloy Columbium- Vanadium Structural Steel, ASTM International, West Conshohocken, PA, 2021.
- ASTM A6 / A6M-22:2022, Standard: Specification for General Requirements for Rolled Structural Steel Bars, Plates, Shapes, and Sheet Piling, ASTM International, West Conshohocken, PA, 2022.
- A690M-13a:2018, Standard: Specification for High-Strength Low-Alloy Nickel, Copper, Phosphorus Steel H-Piles and Sheet Piling with Atmospheric Corrosion Resistance for Use in Marine Environments
- CSA G40.20:2013, General requirements for rolled or welded structural quality steel. Canadian Standard Association.
- CSA G40.21:2013, General requirements for structural quality steel. Canadian Standard Association.
- ISO 9001: 2015, Quality management systems — Requirements
- ISO 45001:2018, Occupational health and safety management systems — Requirements with guidance for use
- ISO 14001:2015, Environmental management systems — Requirements with guidance for use
- ISO 50001: 2018, Energy Management

Annex A

Impact category indicators according to EN 15804+A1

For additional information and transparency, this annex lists the impact category indicators according to the previous standards EN 15804+A1.

Results per one metric tonne of EcoSheetPile™ - Steel Sheet Piles							
Indicator	**Unit**	**A1-A3**	**C1**	**C2**	**C3**	**C4**	**D**
Global warming potential	kg CO_2 eq.	4,37E+02	4,22E+01	2,59E+01	1,34E+00	4,26E-01	3,79E+02
Depletion potential of stratospheric ozone layer	kg CFC 11 eq.	2,64E-09	1,82E-11	4,06E-12	2,59E-11	1,35E-12	-6,09E-10
Acidification potential of land and water	kg SO2-Eq..	1,06E+00	1,68E-01	1,31E-01	2,57E-03	2,54E-03	8,07E-01
Eutrophication potential	kg(PO4)3--Eq	1,28E-01	4,20E-02	3,31E-02	4,06E-04	2,89E-04	5,15E-02
Formation potential of tropospheric ozone photochemical oxidants	kg ethene-Eq.	6,90E-02	-6,19E-02	-5,10E-02	2,30E-04	1,92E-04	1,83E-01
Abiotic depletion potential for non-fossil resources	kg Sb-Eq.	1,27E-04	2,77E-06	1,75E-06	2,22E-07	2,12E-08	2,18E-03
Abiotic depletion potential for fossil resources	MJ	5,44E+03	5,67E+02	3,55E+02	1,56E+01	5,75E+00	3,96E+03

Annex B

Additional End-of-Life scenarios according to EN 15804+A2:2019

For additional information and transparency, this annex lists End-of-Life scenarios that could be useful, to precisely describe a project situation.

B1. LCIA results (80% Reuse, 18% recycling, 2% landfill)

Reuse / Rental / Buy back scenario: This scenario describes a typical use of sheet piles in temporary applications: 5x use in total, adapting a conservative approach including some cut-offs after each use, and landfill.

Results per one metric tonne of EcoSheetPile™ - Steel Sheet Piles							
Indicator	**Unit**	**A1-A3**	**C1**	**C2**	**C3**	**C4**	**D**
GWP-total	kg CO_2 eq.	4,39E+02	4,30E+01	2,64E+01	1,35E+00	2,97E-01	-2,50E+02
GWP-fossil	kg CO_2 eq.	4,39E+02	4,26E+01	2,61E+01	1,34E+00	2,96E-01	-2,50E+02
GWP-biogenic	kg CO_2 eq.	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
GWP-luluc	kg CO_2 eq.	3,03E-01	3,73E-01	2,45E-01	1,04E-03	9,33E-04	-2,29E-01
ODP	kg CFC 11 eq.	2,24E-09	1,54E-11	3,45E-12	2,20E-11	7,64E-13	-1,93E-09
AP	mol H^+ eq.	1,34E+00	2,46E-01	1,92E-01	3,30E-03	2,13E-03	-8,25E-01
EP-freshwater	kg P eq.	3,52E-04	1,50E-04	9,69E-05	4,80E-06	6,05E-07	-2,58E-04
EP-marine	kg N eq.	3,59E-01	1,19E-01	9,51E-02	9,70E-04	5,51E-04	-2,48E-01
EP-terrestrial	mol N eq.	3,85E+00	1,32E+00	1,05E+00	1,04E-02	6,06E-03	-2,72E+00
POCP	kg NMVOC eq.	1,05E+00	2,31E-01	1,82E-01	2,63E-03	1,66E-03	-6,80E-01
ADP-minerals&metals*	kg Sb eq.	1,13E-04	2,77E-06	1,76E-06	1,95E-07	1,39E-08	4,84E-04
ADP-fossil*	MJ	1,10E+04	5,81E+02	3,61E+02	2,71E+01	4,00E+00	-7,75E+03
WDP*	m^3	1,09E+02	6,23E-01	3,20E-01	2,66E-01	3,30E-02	-8,06E+01
Acronyms	GWP-fossil = Global Warming Potential fossil fuels; GWP-biogenic = Global Warming Potential biogenic; GWP-luluc = Global Warming Potential land use and land use change; ODP = Depletion potential of the stratospheric ozone layer; AP = Acidification potential, Accumulated Exceedance; EP-freshwater = Eutrophication potential, fraction of nutrients reaching freshwater end compartment.EP-marine = Eutrophication potential, fraction of nutrients reaching marine end compartment; EP-terrestrial = Eutrophication potential, Accumulated Exceedance; POCP = Formation potential of tropospheric ozone; ADP-minerals&metals = Abiotic depletion potential for non-fossil resources; ADP-fossil = Abiotic depletion for fossil resources potential; WDP = Water (user) deprivation potential, deprivation-weighted water consumption						

B2. LCIA results (100% recycling)

Recycling scenario: After the service life of a sheet pile, it is generally retrieved and recycled.

Results per one metric tonne of EcoSheetPile™ - Steel Sheet Piles							
Indicator	**Unit**	**A1-A3**	**C1**	**C2**	**C3**	**C4**	**D**
GWP-total	kg CO_2 eq.	4,39E+02	4,30E+01	2,64E+01	1,35E+00	0,00E+00	3,33E+02
GWP-fossil	kg CO_2 eq.	4,39E+02	4,26E+01	2,61E+01	1,34E+00	0,00E+00	3,33E+02
GWP-biogenic	kg CO_2 eq.	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
GWP-luluc	kg CO_2 eq.	3,03E-01	3,73E-01	2,45E-01	1,04E-03	0,00E+00	4,44E-02
ODP	kg CFC 11 eq.	2,24E-09	1,54E-11	3,45E-12	2,20E-11	0,00E+00	-4,48E-10
AP	mol H^+ eq.	1,34E+00	2,46E-01	1,92E-01	3,30E-03	0,00E+00	8,16E-01
EP-freshwater	kg P eq.	3,52E-04	1,50E-04	9,69E-05	4,80E-06	0,00E+00	7,77E-05
EP-marine	kg N eq.	3,59E-01	1,19E-01	9,51E-02	9,70E-04	0,00E+00	1,31E-01
EP-terrestrial	mol N eq.	3,85E+00	1,32E+00	1,05E+00	1,04E-02	0,00E+00	1,17E+00
POCP	kg NMVOC eq.	1,05E+00	2,31E-01	1,82E-01	2,63E-03	0,00E+00	5,32E-01
ADP-minerals&metals*	kg Sb eq.	1,13E-04	2,77E-06	1,76E-06	1,95E-07	0,00E+00	1,89E-03
ADP-fossil*	MJ	1,10E+04	5,81E+02	3,61E+02	2,71E+01	0,00E+00	3,31E+03
WDP*	m^3	1,09E+02	6,23E-01	3,20E-01	2,66E-01	0,00E+00	2,25E+01
Acronyms	GWP-fossil = Global Warming Potential fossil fuels; GWP-biogenic = Global Warming Potential biogenic; GWP-luluc = Global Warming Potential land use and land use change; ODP = Depletion potential of the stratospheric ozone layer; AP = Acidification potential, Accumulated Exceedance; EP-freshwater = Eutrophication potential, fraction of nutrients reaching freshwater end compartment.EP-marine = Eutrophication potential, fraction of nutrients reaching marine end compartment; EP-terrestrial = Eutrophication potential, Accumulated Exceedance; POCP = Formation potential of tropospheric ozone; ADP-minerals&metals = Abiotic depletion potential for non-fossil resources; ADP-fossil = Abiotic depletion for fossil resources potential; WDP = Water (user) deprivation potential, deprivation-weighted water consumption						

Note: 1.192 kg scrap is used to manufacture 1.000 kg of EcoSheetPile™. After use 1.000 kg is recycled. Net amount of scrap in the system: -1.192 + 1.000 kg = -192 kg.

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