

Environmental Product Declaration



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

Fencing and Agriculture Products EAF-Base

from

ArcelorMittal Europe – Long Products



Programme:	The International EPD® System, www.environdec.com
Programme operator:	EPD International AB
EPD registration number:	S-P-05041
Publication date:	2024-01-15
Valid until:	2029-01-14

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. UN CPC code 41261*

PCR review was conducted by: The Technical Committee of the International EPD®System. See www.environdec.com/TC for 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: *Luxemburg Institute of Science and Technology (LIST)*

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.

66, rue de Luxembourg
L-4221 Esch-sur-Alzette
Luxembourg

Contact: ws@arcelormittal.com

Description of the organisation:

ArcelorMittal Europe – Long Products operates different production sites in ten countries and is a leader in the manufacture of sections, sheet piles, rails, quality wire rod, rebars, bars and wires drawing. (Wires Solutions).

ArcelorMittal Wires Solutions is part of ArcelorMittal Europe – Long Products.

Wires Solutions is one of the Europe's largest wire drawers.

It is composed of 9 plants and 2 warehouses able to propose a large range of solution and products as, the steel fibres, the CHQ products, FSW, bars, industrial wires, wires for fencing, ropes and CRW. This wide range of products makes it possible to meet mainly the demands of the markets, construction, energy, automotive, industry or agriculture.

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 CO₂ emissions in its European operations by 35% by 2030.

Product-related or management system-related certifications:

Fencing and Agriculture Products EAF-Base mills are covered by ISO 9001, ISO 14001, ISO 45001 and EN 16120-1 to 4 /EN10244-1 and 2/ EN 10223-1 standard.

Name and location of production site(s): ArcelorMittal Bissen & Bettembourg in Luxembourg, ArcelorMittal Syców in Poland and ArcelorMittal Sheffield in UK.

Product information

Product name: Fencing and Agriculture Products EAF-Base.

Product identification: The Fencing and Agriculture Products EAF-Base is a group of products including, Vineyard wires, Barbed wire, Chain link, Field fence, Welded mesh, and X-Knot fencing.

Product description:

All Fencing and Agriculture Products EAF-Base are produced with Hot-Dip Coated Steel Wire EAF-Base who enjoys a worldwide reputation for its corrosion resistant, Crapo® coatings and Crapal® coatings.

Crapal® technology combines zinc, aluminium and, in the case of Crapal®Premium, magnesium to provide a highly protective anti-corrosive coating.

Crapo® is Hot-Dip Coated Steel Wire EAF-Base with zinc coating, Crapal® (2 or 4) is Hot-Dip Coated Steel Wire EAF-Base with a Zinc- Aluminium coating composed of a mix of approx. 95% Zn and 5% Al. Crapal®Optimum / Crapal®Premium is Hot-Dip Coated Steel Wire EAF-Base with advanced zinc-aluminium-magnesium alloy. This alloy, composed of a mix of approx. 95% Zn, 5% Al and <1% of Mg, is applied by a continuous hot dip galvanizing process. This chemical composition has been selected to provide an excellent corrosion protection in demanding areas.

<https://barsandrods.arcelormittal.com/wiresolutions/fencingagribusiness/3972/EN>

https://barsandrods.arcelormittal.com/repository2/fanny/Trellising-Crapal_EN.pdf

<https://barsandrods.arcelormittal.com/repository2/EstateWire/Downloads/Estatewire%20Product%20Brochure.pdf>

This EPD is valid for of various grades and geometries.

Delivered product may contain many types of alloys, depending on the intended performance and characteristic of the steel product.

Fencing and Agriculture Products EAF-Base produced with Hot-Dip Coated Steel Wire EAF-Base:

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
Electrical conductivity at 20°C	21692	Ω ⁻¹ m ⁻¹
Minimum yield strength	340	N/mm ²
Minimum tensile strength	350	N/mm ²
Minimum elongation	3	%
Tensile strength	350 - 1860	N/mm ²
Grade of material according to the delivery standards	C4D-C82D	-

Content information

Typical chemical composition of Fencing and Agriculture Products EAF-Base:

Typical analysis of steel		
C	Mn	Si
0.05-0.09	0.3-0.6	≤0.3

Properties

Corrosion resistant solution

- ▶ Durable smooth surface
- ▶ Less damage to the plant

Concentricity

- ▶ The required protection is only guaranteed if the protective layer is constant all around the wire

Environment

- ▶ Less zinc oxides in the ground
- ▶ CO₂ Footprint over time



Economical advantages

When you buy Crapal[®]

- ▶ More meters per kg of wire

When you install Crapal[®]

- ▶ Labor cost (less coils used per ha)
- ▶ Less re-tensioning required
- ▶ No breaks if correct use

Savings over time

- ▶ Long life span of Crapal[®]
- ▶ Even if coating is damaged, Crapal[®] resists to corrosion much longer than traditional wire

Crapal[®]Optimum

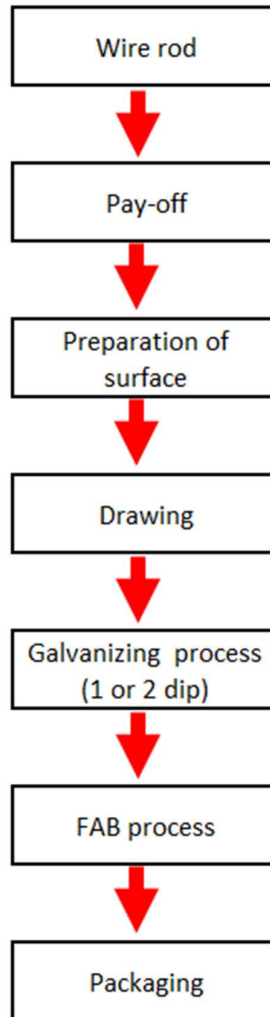
Crapal[®]2

Crapal[®]Color

The base material of Fencing and Agriculture Products EAF-Base is Hot-Dip Coated Steel Wire EAF-Base, produced with the wire Rod from EAF route using mainly scrap and DRI. The most common elements are carbon, manganese, and silicon. Other elements like copper may be present in the steel. The composition of these elements depends on the steel designation/grade.

Manufacturing process:

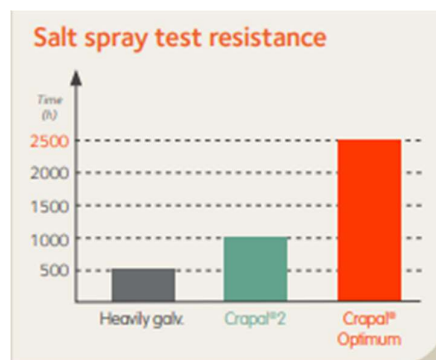
Manufacturing process of Fencing and Agriculture Products EAF-Base:



Fabrication standards: EN 16120-1 to 4 / EN10244-1 and 2 / EN 10223-1 standard.

Quality control: /ISO 9001/ Monitoring according to the product standards and certifications.

The corrosion resistance performance can be evaluated with different indoor and outdoor tests. One of the most common tests is the 'salt spray test' defined according to EN ISO 9227.



Applications:

Fencing and Agriculture Products EAF-Base can be used in various Agriculture applications:

- Vineyard and fruits wires,



- Barbed wire,



- Fencing



Chain link

Field fence

X-Knot.

- Welded mesh,



Railway protection

Motorway protection

- Agriculture accessories,



The size of the delivery is functions of the intended application and project.

Additional information on Fencing and Agriculture Products EAF-Base can be found at:

<https://barsandrods.arcelormittal.com/wiresolutions/fencingagribusiness/3972/EN>

<https://barsandrods.arcelormittal.com/wiresolutions/fencingagribusiness/sheffield/products/4046/chainlink>

UN CPC code: 41261.

Geographical scope: Europe.

LCA information

Functional unit / declared unit: 1 metric tonne of Fencing and Agriculture Products EAF-Base.

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: Cradle-to-gate with options, modules C1–C4, and module D.

System Diagram

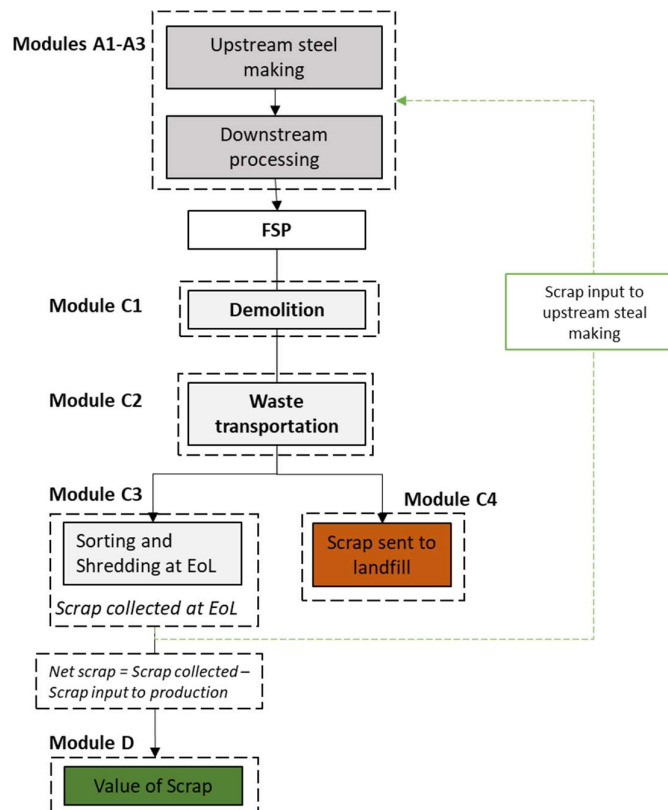


Figure 1: Life cycle stages and unit processes of the product

- 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 steel wire, the transport within the site as well as the manufacturing of Fencing and Agriculture Products EAF-Base in Bissen & Bettembourg, Syców and Sheffield.

Except for Luxembourg processing plant, the electricity mixes considered for the various downstream processing sites are country-specific (national generic background data) and are representative of the average consumption mix for the country. They were chosen according to the plant location.

For Luxembourg processing plant located in Bissen, the electricity consumed is directly purchased and imported from the French (93%) and Belgian (7%) country-specific mixes, so it was modelled accordingly.

The resulting weighted average emission factor for the GWP-GHG indicator for the residual mix is 141.4 gCO₂eq./kWh.

The modelling is based on datasets from the 2023.2 Managed LCA Content (Sphera) database.

- *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 EoL scenario for the steel material is 90% recycling and 10% landfill.

Category	Subcategory	Unit	Quantity
Collection process	Collected separately	kg	900
	Collected with mixed construction waste	kg	100
Recovery	Reuse	kg	0
	Recycling	kg	900
	Landfill	kg	0
	Incineration	kg	0
	Incineration with energy recovery	kg	0
	Energy conversion efficiency rate	kg	0
Disposal	Material for final disposal	kg	100
Transport	Deconstruction site to scrap processing plant	km	0
	Scrap processing plant to site for end of waste	km	300

- *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.

The amount of steel for avoided production (0.44 t/t) is calculated by the difference between scrap collected (0.90 t/t) and scrap input to production (0.46 t/t).

This End-of-Life scenario represents an average use of the entire ArcelorMittal's Fencing and Agriculture Products EAF-Base.

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 upstream and downstream steel production processes are also assumed to have negligible impacts and were neglected.

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 results for GWP-total and GWP-GHG indicators would increase marginally 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)

(✓ = included; ND = module not declared)

	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	Europe			-	-	-	-	-	-	-	-	-	GLO	GLO	GLO	GLO	GLO
Specific data used	>95%			-	-	-	-	-	-	-	-	-	-	-	-	-	-
Variation – products	0%			-	-	-	-	-	-	-	-	-	-	-	-	-	-
Variation – sites	26%			-	-	-	-	-	-	-	-	-	-	-	-	-	-

Considering the high recyclability of steel products, the system boundaries are cradle-to-gate with modules C1–C4 and module D. The system boundaries include the product manufacturing (raw materials supply (A1), transport of raw materials to production site (A2), manufacturing (A3)), demolition (C1), waste transportation (C2), waste processing and disposal (C3 & C4), and the benefits and loads beyond the product system boundary are also declared (D).

Based on average figures provided by ArcelorMittal, it was considered that 10% of the Fencing and Agriculture Products EAF-Base are disposed in landfill (C4) at their end of life, and 90% are recycled into new steel products. Impacts and aspects related to waste are considered in the module in which the waste occurs.

The impacts linked to the transportation (A4) and the installation (A5) of the product were excluded because the related inventory was too context dependent to be averaged in a representative way, and the use stage has been neglected, as basically no maintenance is needed (modules B1 to B7 excluded).

Content information

Product content	Weight, kg	Post-consumer material, weight-%	Biogenic material, weight-% and kg C / kg
Steel	1000	0% ¹	0% and 0 kg C / kg
Chemical composition of product (%)	Average	Range	
Iron	97	-	-
Carbon	0.07	0.05-0.09	-
Manganese	0.45	0.3-0.6	-
Silicon	0.15	< 0.3	-
Copper	< 0.25	-	-
Other	< 2.3	-	-
Packaging materials		Weight-% (versus the product)	Weight biogenic carbon, kg C / kg
Wood palette	43.08	4%	1.92E-03
Cardboard	0.70	< 1%	
Plastic wire	1.50	< 1%	
Steel wire	0.69	< 1%	
Stretch foil	0.06	< 1%	

¹ The total value of recycled content is 90% but the post-consumer part is unknown.

The product 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 ton of Fencing and Agriculture Products EAF-Base, 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 Fencing and Agriculture Products EAF-Base							
Indicator	Unit	A1-A3	C1	C2	C3	C4	D
GWP-fossil	kg CO ₂ eq.	1.47E+03	0.00E+00	2.11E+01	1.53E+00	1.49E+00	-7.64E+02
GWP-biogenic	kg CO ₂ eq.	6.81E+01	0.00E+00	1.53E-02	4.83E-03	-4.42E-02	3.90E-01
GWP-luluc	kg CO ₂ eq.	1.21E+00	0.00E+00	1.45E-01	9.15E-04	2.75E-03	-1.58E-02
GWP-total	kg CO ₂ eq.	1.55E+03	0.00E+00	2.13E+01	1.53E+00	1.45E+00	-7.63E+02
ODP	kg CFC 11 eq.	5.03E-09	0.00E+00	2.12E-12	1.99E-11	3.51E-12	-1.67E-12
AP	mol H ⁺ eq.	3.93E+00	0.00E+00	1.27E-01	3.77E-03	1.06E-02	-1.64E+00
EP-freshwater	kg P eq.	3.26E-03	0.00E+00	7.70E-05	4.47E-06	2.53E-06	-1.39E-04
EP-marine	kg N eq.	1.09E+00	0.00E+00	6.20E-02	1.03E-03	2.71E-03	-2.88E-01
EP-terrestrial	mol N eq.	1.18E+01	0.00E+00	6.87E-01	1.11E-02	2.97E-02	-2.53E+00
POCP	kg NMVOC eq.	3.15E+00	0.00E+00	1.20E-01	2.83E-03	8.22E-03	-1.17E+00
ADP-minerals&metals*	kg Sb eq.	6.09E-02	0.00E+00	2.17E-06	3.85E-07	1.53E-07	-1.90E-03
ADP-fossil*	MJ	2.23E+04	0.00E+00	2.83E+02	2.68E+01	1.95E+01	-7.01E+03
WDP*	m ³	1.68E+02	0.00E+00	2.41E-01	3.12E-01	1.64E-01	-1.42E+02
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 Fencing and Agriculture Products EAF-Base							
Indicator	Unit	A1-A3	C1	C2	C3	C4	D
PERE	MJ	3.79E+03	0.00E+00	1.96E+01	1.39E+01	2.93E+00	4.42E+02
PERM	MJ	4.47E-06	0.00E+00	8.61E-11	-6.77E-10	6.51E-11	9.15E-05
PERT	MJ	3.79E+03	0.00E+00	1.96E+01	1.39E+01	2.93E+00	4.42E+02
PENRE	MJ	2.24E+04	0.00E+00	2.84E+02	2.68E+01	1.96E+01	-7.01E+03
PENRM	MJ	7.01E+00	0.00E+00	1.23E-02	1.98E-03	6.16E-04	-2.14E-01
PENRT	MJ	2.24E+04	0.00E+00	2.84E+02	2.68E+01	1.96E+01	-7.01E+03
SM	kg	1.16E+03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.00E+02
RSF	MJ	7.35E-04	0.00E+00	1.89E-07	4.12E-08	3.20E-08	-2.36E-01
NRSF	MJ	1.28E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
FW	m ³	6.49E+00	0.00E+00	2.27E-02	1.32E-02	4.97E-03	-3.20E+00
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 resources; 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 Fencing and Agriculture Products EAF-Base							
Indicator	Unit	A1-A3	C1	C2	C3	C4	D
Hazardous waste disposed	kg	2.51E-03	0.00E+00	1.50E-09	1.20E-07	1.00E-09	-5.42E-08
Non-hazardous waste disposed	kg	9.48E+01	0.00E+00	4.63E-02	1.88E-02	1.00E+02	1.06E+02
Radioactive waste disposed	kg	9.99E-01	0.00E+00	5.27E-04	3.95E-03	2.17E-04	8.72E-04

Output flow indicators according to EN 15804+A2:2019

Results per one metric tonne of Fencing and Agriculture Products EAF-Base							
Indicator	Unit	A1-A3	C1	C2	C3	C4	D
Components for re-use	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Material for recycling	kg	4.81E+01	0.00E+00	0.00E+00	9.00E+02	0.00E+00	0.00E+00
Materials for energy recovery	kg	1.24E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Exported energy, electricity	MJ	2.39E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Exported energy, thermal	MJ	4.12E+01	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 Fencing and Agriculture Products EAF-Base							
Indicator	Unit	A1-A3	C1	C2	C3	C4	D
GWP-GHG	kg CO ₂ eq.	1.48E+03	0.00E+00	2.13E+01	1.53E+00	1.49E+00	-7.64E+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	5.00E-02	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 - Requirements 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>)
- 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.
- 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

