

Environmental Product Declaration



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

XCarb[®] recycled and renewably produced steel Heavy Plates

from

ArcelorMittal Europe – Flat Products



Programme:	The International EPD [®] System, www.environdec.com
Programme operator:	EPD International AB
EPD registration number:	S-P-10991
Publication date:	2023-10-10
Revision date:	2024-02-19 (Version 1.1)
Valid until:	2028-10-09

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

XCarb[®]

Recycled and renewably
produced



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. The product group classification for the assessed products is UN CPC 412.*

PCR review was conducted by: The Technical Committee of the International EPD® System. See <https://www.environdec.com/about-us/the-international-epd-system-about-the-system> 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: *Leonardo Guimarães Ribeiro, ArcelorMittal Europe*
leonardo.guimaraesribeiro@arcelormittal.com

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: Dr Matthew 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

The Environmental Product Declaration (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 – Flat Products.

Contact: ArcelorMittal Europe – Flat Products: flateurope@arcelormittal.com.

Description of the organisation: ArcelorMittal Europe – Flat Products is the largest producer of flat steel in Europe and produces hot rolled coils, cold rolled coils, coated products, tinplate, plate and hot-dip galvanised products, and enamelled and electrical steels. Flat Products has 11 integrated and mini-mill sites, and primary facilities in five countries. It sells to a wide range of industries including packaging, general industry (civil engineering, construction, domestic appliances, oil & gas, renewable energies, yellow & green goods) and automotive. ArcelorMittal Europe's target is to reduce Scope 1 and 2 greenhouse gas emissions by 35% by 2030, with a further ambition to be net zero by 2050. Its strategy is consistent with limiting global warming to 1.5°C above pre-industrial levels, and it is committed to having our targets officially validated by the Science Based Targets Initiative (SBTi).

Product-related or management system-related certifications: ArcelorMittal Asturias (Gijon) is covered by CE-marking including Declaration of Performances, ISO 9001, ISO 14001, ISO 45001, and UK CA certificates.

Name and location of production site(s): ArcelorMittal Industeel Belgium, Rue de Châtelet 266, 6030 Charleroi, Belgium & ArcelorMittal Asturias (Gijon), Verina de Abajo 570, 33200 Gijon, Spain.

Product information

Product name: XCarb[®] recycled and renewably (RRP) produced steel Heavy Plates.

Product identification: Heavy Plates included into this EPD are covered by one of the following names: XCarb[®] RRP steel Heavy Plates; XCarb[®] recycled and renewably produced steel Heavy Plates. These products have the XCarb[®] recycled and renewably produced steel brand name and the associated certificates to prove the traceability.

Product description:

This EPD refers to steel heavy plates, hot rolled products produced on dedicated quarto plate mill. Steel grade range for construction include low alloy structural steels, as-rolled and normalized.

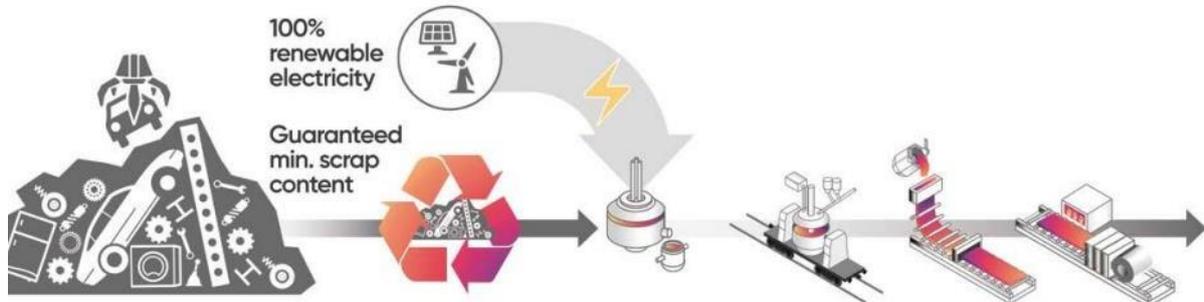
Mean thickness value is at 20 mm, but the declaration covers the whole range from 5 mm up to 120 mm. Width range is from 1,400 mm up to 3,300 mm.

For the placing of the product on the market in the European Union/European Free Trade Association (EU/EFTA) (with the exception of Switzerland) Regulation (EU) No. 305/2011 (CPR) applies. The product has a declaration of performance taking into consideration EN 10025-1:2004 - Hot rolled products of structural steels - Part 1: General technical delivery conditions.

Manufacturing process:

XCarb[®] RRP Heavy Plates are produced at ArcelorMittal Asturias (Gijon), in Spain. They come from a production process flow which only uses slabs from Industeel Charleroi, Belgium, a subsidiary of ArcelorMittal specialized in the production of hot rolled as well as forged steel plate, ingots and formed pieces. These slabs will only be transported by sea to ArcelorMittal Asturias (Gijon).

For XCarb® RRP Heavy Plates, slabs are produced using nearly 100% scrap as source of metal in the metallic charge in the Electric Arc Furnace and 100% renewable electricity covered with Guarantees of Origins, according to the European regulations.



More specifically, this EPD covers XCarb® RRP Heavy Plates which come from one category of slab, named Slab 355. This is a carbon-manganese steels grade with guaranteed minimum mechanical properties (yield strength and tensile strength) and with satisfactory ductility. It covers the following grades:

- S355JR/J0/J2/K2+N in accordance with EN10025-2;
- S355N in accordance with EN10025-3;
- AH36 and DH36 for shipbuilding.

Applications:

Heavy plates can cover a large range of applications in construction sector, such as:

- Buildings: structural and built-up welded sections, trusses, box girders, for heavy industrial steel frame, high rise buildings, long span structure for transport and infrastructure terminals.
- Road and railway bridges: steel & composite structure made of welded built-up sections or box girders or trusses, arch and bow-string bridges, pedestrian and bicycles bridges, cable stayed and suspension deck & pylons bridges.
- Onshore and offshore wind towers and substations.
- Shipbuilding: cruise ships, commercial and special vessels.
- Art Sculpture and other industrial applications.

Heavy Plates can be processed by conventional processing operations used for steelwork fabrication: oxy-cutting, bending, drilling, welding etc.

UN CPC code: 412 Products of iron or steel.

Geographical scope: Europe.

LCA information

Functional unit / declared unit:

1 metric ton XCarb[®] recycled and renewably produced steel Heavy Plate.

Reference service life:

Not applicable.

Time representativeness:

The collection of the foreground data refers to the year 2021.

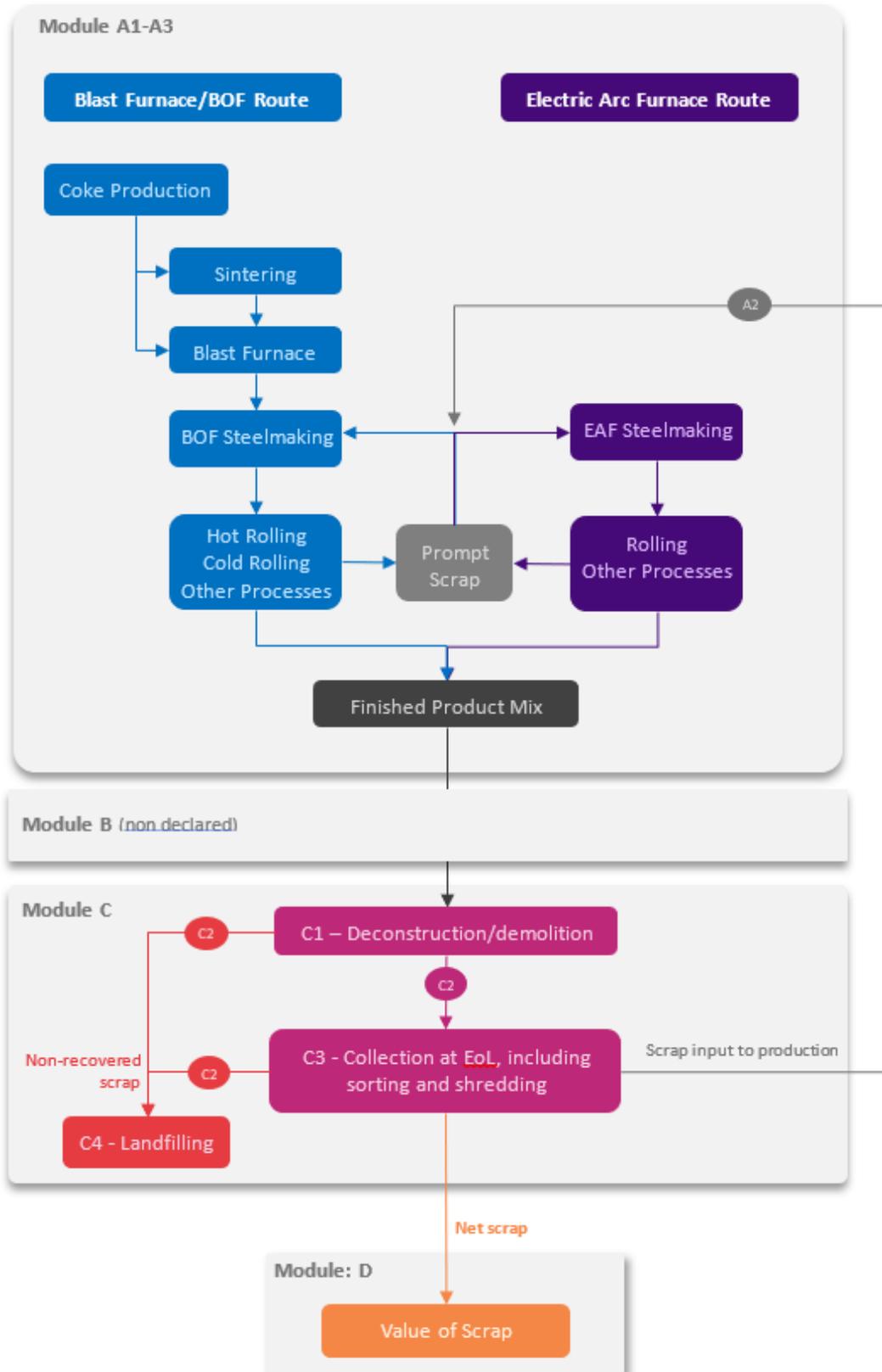
Database(s) and LCA software used:

The background data has been taken from the latest available Sphera LCA FE (GaBi) database, 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. Impacts on raw material transportation, including external scrap, and intermediate products are included.

These modules consider the production of slabs at the site ArcelorMittal Industeel Charleroi, in Belgium and the transport to ArcelorMittal Avilés-Gijón in Spain for Hot Rolling. No packaging is considered.

For the modelling, the electricity supply was based on a renewable electricity grid mix (1kV-60kV) from the 2023.2 Managed LCA Content (Sphera) database. The emission factor for the GWP-GHG indicator is 9.97 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, 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 included. Based on common practices, the considered EoL scenario for the steel material is 93% recycling and 7% reuse.

Category	Subcategory	Unit	Quantity
Collection process	Collected separately	kg	1000
	Collected with mixed construction waste	kg	0
Recovery	Reuse	kg	70
	Recycling	kg	930
	Landfill	kg	0
	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 declared benefits and loads resulting from the net flow of secondary fuels or materials exiting the product system. This excludes flows that have been allocated as co-products.

Metals are assumed to reach the end of waste state after they have gone through a sorting and shredding process. 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, calculated as follows:

Net scrap = Amount of steel recycled at end-of-life – Scrap input from previous product life cycles.

In the manufacturing of heavy plates, 1,047.4kg of external scrap was used. At the end-of-life, 930 kg of scrap are recovered for recycling and 70 kg for reuse. As reuse avoids the manufacturing of steel, it

also avoids the consumption of 73.32 kg of scrap ($1,047.4/1000*70$). This means that the system has a net output of -44.1 kg of scrap ($930+73.32 - 1047.4$), which is shown in module D as an environmental credit or burden depending on the impact category.

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. No packaging was considered for the final product, while packaging materials and their transportation for intermediate products have been neglected due to their low contribution to the overall life cycle results. The production of capital equipment, facilities, and infrastructure required for manufacture has not been considered.

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 LCA FE (GaBi) 2023.2 databases and are representative for the years 2018-2023.

Allocation: No allocation was applied for coproducts generated in the processes under ArcelorMittal ownership. This includes materials such as slag, dust and sludge. Scrap inputs in module A1-A3, including pre-consumer scrap, are treated as 'burden free'. 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.

More information: https://industry.arcelormittal.com/products-solutions/Products_in_the_spotlight/heavy-plate

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	Not relevant			-	-	-	-	-	-	-	-	-	-	-	-	-	-
Variation – sites	Not relevant			-	-	-	-	-	-	-	-	-	-	-	-	-	-

NR- Not reported. MNR- Module not declared.

Content information

XCarb® recycled and renewably produced steel Heavy Plates

Product content	Weight, kg	Post-consumer material, weight ¹	Biogenic material, weight
Steel	1,000	20.6%	0% and 0 kg C / kg
Chemical composition			
Iron	> 974	-	-
Manganese	< 14.5	-	-
Silicon	< 2.5	-	-
Carbon	< 1.6	-	-
Other	< 7.1	-	-

¹ Post-consumer material according to this PCR excludes pre-consumer scrap. According to ISO 14021:2016, the average recycled content, which includes external pre- and post-consumer recycled scrap, is approximately 87%. The figures provided represent our best estimate at the time of publication.

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 1 metric ton of XCarb® recycled and renewably produced steel Heavy Plate 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 1 metric ton of XCarb® recycled and renewably produced steel Heavy Plate							
Indicator	Unit	A1-A3	C1	C2	C3	C4	D
GWP-fossil	kg CO ₂ eq.	9.13E+02	4.26E+01	2.61E+01	1.34E+00	0.00E+00	1.27E+01
GWP-biogenic	kg CO ₂ eq.	3.43E-01	-1.44E-01	-1.08E-01	9.82E-03	0.00E+00	-4.76E-01
GWP-luluc	kg CO ₂ eq.	3.06E-01	3.73E-01	2.45E-01	1.04E-03	0.00E+00	-1.13E-02
GWP-total	kg CO ₂ eq.	9.14E+02	4.28E+01	2.63E+01	1.36E+00	0.00E+00	1.22E+01
ODP	kg CFC 11 eq.	1.11E-06	1.54E-11	3.45E-12	2.20E-11	0.00E+00	-7.79E-08
AP	mol H ⁺ eq.	2.47E+00	2.46E-01	1.92E-01	3.30E-03	0.00E+00	1.43E-02
EP-freshwater	kg P eq.	3.40E-03	1.50E-04	9.69E-05	4.80E-06	0.00E+00	-2.20E-04
EP-marine	kg N eq.	7.87E-01	1.19E-01	9.51E-02	9.70E-04	0.00E+00	-2.49E-02
EP-terrestrial	mol N eq.	8.62E+00	1.32E+00	1.05E+00	1.04E-02	0.00E+00	-3.33E-01
POCP	kg NMVOC eq.	2.20E+00	2.31E-01	1.82E-01	2.63E-03	0.00E+00	-3.19E-02
ADP-minerals&metals*	kg Sb eq.	4.21E-04	2.77E-06	1.76E-06	1.95E-07	0.00E+00	4.04E-04
ADP-fossil*	MJ	8.11E+03	5.81E+02	3.61E+02	2.71E+01	0.00E+00	1.94E+02
WDP*	m ³	4.55E+01	6.23E-01	3.20E-01	2.66E-01	0.00E+00	1.99E+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 1 metric ton of XCarb® recycled and renewably produced steel Heavy Plate							
Indicator	Unit	A1-A3	C1	C2	C3	C4	D
PERE	MJ	7.95E+03	4.68E+01	2.63E+01	1.51E+01	0.00E+00	-5.87E+02
PERM	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PERT	MJ	7.95E+03	4.68E+01	2.63E+01	1.51E+01	0.00E+00	-5.87E+02
PENRE	MJ	8.12E+03	5.83E+02	3.62E+02	2.71E+01	0.00E+00	1.94E+02
PENRM	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PENRT	MJ	8.12E+03	5.83E+02	3.62E+02	2.71E+01	0.00E+00	1.94E+02
SM	kg	1.05E+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	1.59E+00	4.96E-02	2.88E-02	1.22E-02	0.00E+00	7.64E+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 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 1 metric ton of XCarb® recycled and renewably produced steel Heavy Plate							
Indicator	Unit	A1-A3	C1	C2	C3	C4	D
Hazardous waste disposed	kg	-4.33E-06	9.53E-10	1.12E-09	-1.96E-09	0.00E+00	6.00E-06
Non-hazardous waste disposed	kg	2.96E+01	9.69E-02	5.52E-02	1.87E-02	0.00E+00	-1.13E+01
Radioactive waste disposed	kg	2.51E-01	2.88E-03	6.78E-04	3.99E-03	0.00E+00	-1.77E-02

Output flow indicators according to EN 15804+A2:2019

Results per 1 metric ton of XCarb® recycled and renewably produced steel Heavy Plate							
Indicator	Unit	A1-A3	C1	C2	C3	C4	D
Components for re-use	kg	0.00E+00	0.00E+00	0.00E+00	7.00E+01	0.00E+00	0.00E+00
Material for recycling	kg	0.00E+00	0.00E+00	0.00E+00	9.30E+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 1 metric ton of XCarb® recycled and renewably produced steel Heavy Plate							
Indicator	Unit	A1-A3	C1	C2	C3	C4	D
GWP-GHG	kg CO ₂ eq.	9.13E+02	4.29E+01	2.64E+01	1.35E+00	0.00E+00	1.27E+01
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 1.3.1
- 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>)
- EN 10025-1:2004 - Hot rolled products of structural steels - Part 1: General technical delivery conditions. For the application and use the respective national provisions apply

Impact category indicators according to EN 15804+A1

To ensure consistency within the different versions of the EN 15804 for user performing a complete LCA of a building, the table below indicates the environmental performances of XCarb® recycled and renewably produced steel Heavy Plates following the version EN 15804+A1. The end-of life scenario for steel is 93% recycling and 7% reused.

Results per 1 metric ton of XCarb® recycled and renewably produced steel Heavy Plate							
Indicator	Unit	A1-A3	C1	C2	C3	C4	D
Global warming potential	kg CO ₂ eq.	9.09E+02	4.22E+01	2.59E+01	1.34E+00	0.00E+00	1.17E+01
Depletion potential of stratospheric ozone layer	kg CFC 11 eq.	9.58E-07	1.82E-11	4.06E-12	2.59E-11	0.00E+00	-6.72E-08
Acidification potential of land and water	kg SO ₂ eq.	1.90E+00	1.68E-01	1.31E-01	2.57E-03	0.00E+00	2.71E-02
Eutrophication potential	kg (PO ₄) ₃ eq.	2.84E-01	4.20E-02	3.31E-02	4.06E-04	0.00E+00	-9.63E-03
Formation potential of tropospheric ozone photochemical oxidants	kg ethene-eq.	1.14E-01	-6.19E-02	-5.10E-02	2.30E-04	0.00E+00	2.84E-02
Abiotic depletion potential for non-fossil resources	kg Sb eq.	4.22E-04	2.77E-06	1.75E-06	2.22E-07	0.00E+00	4.04E-04
Abiotic depletion potential for fossil resources	MJ	7.26E+03	5.67E+02	3.55E+02	1.56E+01	0.00E+00	2.79E+02

