Environmental Product Declaration Version 3.0

In accordance with ISO 14025 and EN 15804:2012+A2:2019 for:

CAST MANGANESE CROSSING

CPC 41253 – "Railway or tramway track construction material of iron or steel"

From ***voestalpine Railway Systems JEZ, S.L.***

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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
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CEN standard EN 15804 serves as the Core Product Category Rules (PCR)
Product category rules (PCR): PCR 2019:14 Construction products (EN 15804:A2) Version 1.1
PCR review was conducted by: PCR review was conducted by: The Technical Committee of th 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 Secretaria www.environdec.com/contact.
Independent third-party verification of the declaration and data, according to ISO 14025:2006: ☐ EPD process certification ☒ EPD verification
Third party verifier: Marcel Gómez Ferrer. Marcel Gómez Consultoría Ambiental. info@marcelgomez.com. Approved by: The International EPD® System
Procedure for follow-up of data during EPD validity involves third party verifier: ☒ Yes ☐ No

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EPDs within the same product category but from different programs may not be comparable. EPDs of construction products may not be comparable if they do not comply with EN 15804. For further information about comparability, see EN 15804 and ISO 14025.

Company information

Owner of the EPD: voestalpine Railway Systems JEZ S.L.

Description of the organisation:

voestalpine Railway Systems JEZ, originated from the company Talleres y Fundiciones JEZ S.A., which was founded in 1924 under the names Jemein Errazti and Zenitagoya, produces track work such as point blades, union rails, crossovers and other railway equipment and also moulded cast steel parts for general industry.

In 1948, the founders bought land in Llodio, moved the production facilities there and started production in 1949, where they still remain. In 1994, the company joined voestalpine VAE Group, which led to the creation of JEZ Sistemas Ferroviarios S.L. and became part of the voestalpine, the global leader for railway infrastructure system solutions, offering outstanding products, logistics and services for rails, turnouts, signaling and monitoring applications in 2020.

voestalpine Railway Systems MFA was set up in 2008, a subsidiary company which established its production in France. It contributes to a qualitative advance due to its degree of automation of the production process for standardised crossovers.

voestalpine Railway Systems JEZ, a leading company due to its high profitability and its high level of technology in the field of cast frogs, switches and crossings, helping to define and achieve the vision and strategies of voestalpine.

We want our company to be recognised for its quality of service, its innovative nature and for managing itself based on the principles of business excellence.

Product-related or management system-related certifications:

The development of projects for improvement of Environmental Management (ISO 14001), Energy management (ISO 50001) and Total Quality (ISO 9001) guarantee product excellence, as well as respect for the environment. JEZ is committed to occupational risk prevention and holds the Health and Safety Management Systems certificate (ISO 45001).

Figure1.ISO 9001, ISO 14001, ISO 45001, ISO 50001 *Certifications.*

Name and location of production site(s):

voestalpine Railway Systems JEZ S.L.
Arantzar s/n - ES01400 Laudio-Llodio – Alava, Spain

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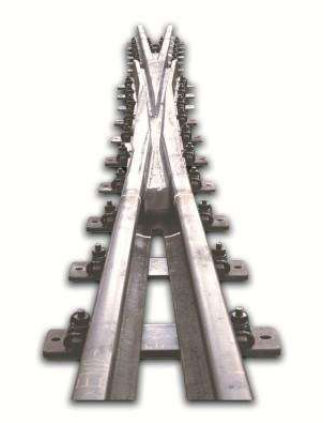
Product information

Product name: Cast Managanese Crossing

Product description: The analysed product is a manganese-crossing frog manufactured at the JEZ production plant, in Laudio-Llodio. The crossing block is the centre part of the crossing and the function is to guide the wheels in the intersection through the crossing area of a turnout.



Manganese Crossing

The cast manganese crossing complies with regulation "EN 15689 Railway applications -Track - Switches and crossings -Crossing components made of cast austenitic manganese steel".

UN CPC code: CPC 41253 –"Railway or tramway track construction material of iron or steel".

LCA information

Declared unit: 1 metric ton (1000 kg) of manganese crossing bloc.

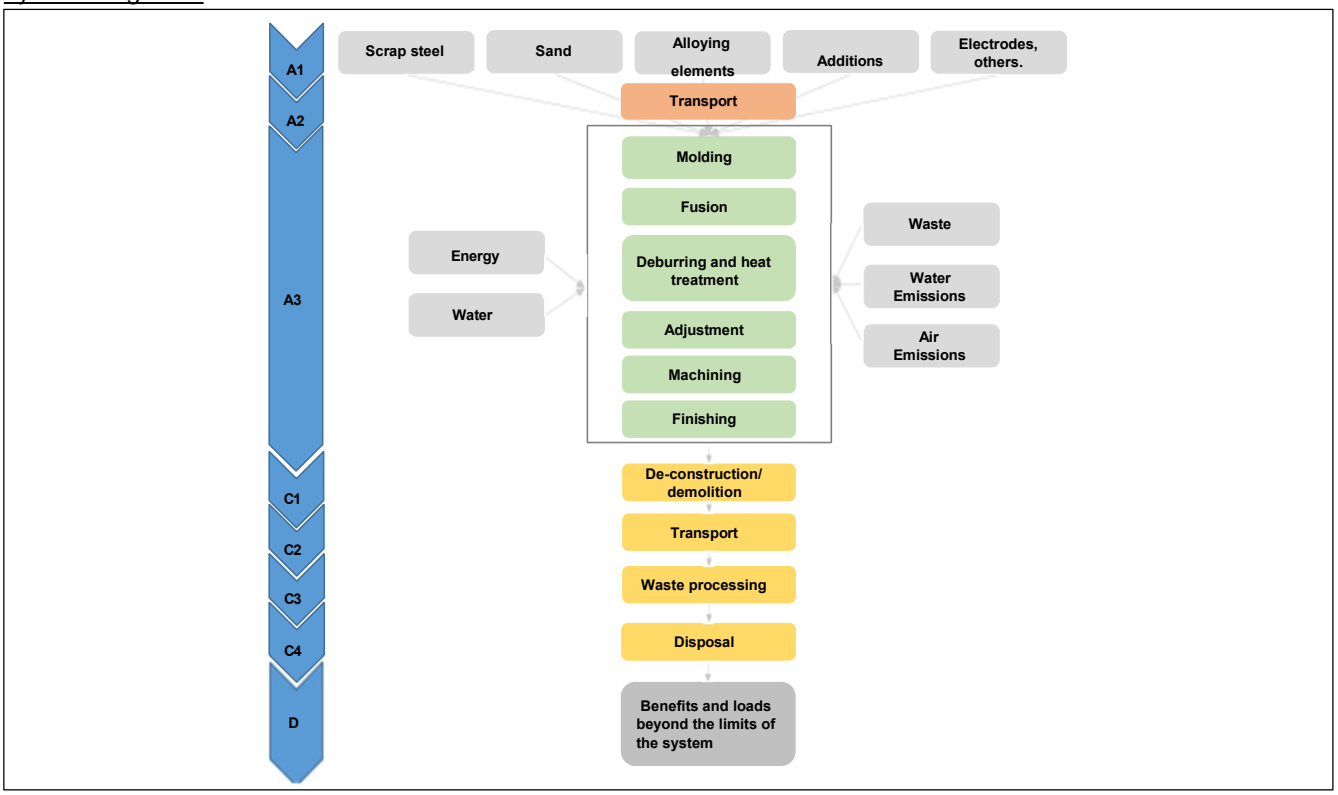
Reference service life: not relevant for this EPD.

Time representativeness: The data collection from factory (primary data) and electricity mix are from 2019. In this study, no datasets older than 10 years were used.

Database(s) and LCA software used: All the data used to model the process and obtain the Life Cycle Inventory are specific data and have been obtained by measurements made during the year 2019. They are representative of the different processes implemented during the manufacturing process. The data has been measured directly at the company's own premises. In addition, the most complete and highest quality European life cycle inventory database, Ecoinvent 3.6, has been used, as this database contains the most extensive and updated information and its scope coincides with the geographical, technological and temporal area of the project. The LCA was modelled with Simapro 9.1.1.1.

Description of system boundaries: Cradle to gate with modules C1–C4 and module D (A1–A3 + C + D). The life cycle stages A4-A5, B1-B7 were excluded from the LCA study.

System diagram:



Manufacturing process:

The manufacturing process of the frogs is divided into the following stages:

- ✓ **Molding:** The sand used in the mold is silica sand and chromite sand. The mold cavity is painted with colour that is then burned to remove the solvent it contains, for a high quality surface finish.
- ✓ **Fusion:** In order to pour the metal into the molds, the raw material (scrap metal) must go through a fusion process (electric arc, by electrodes) in which the temperature will rise to its melting point, bringing it to a state liquid and supplying the necessary ferroalloys (manganese) which will lead to obtaining the desired metal composition and characteristics. The molten metal is poured into the mould cavity where its cools down. In the break of the mould, sand is released that is recovered by magnetic separation for reuse in the moulding process.
- ✓ **Deburring and heat treatment:** Elimination of sprues and feeders of the piece, heat treatment and rapid cooling to achieve the required mechanical characteristics. Shot blasting to remove remains of calcined sand. Elimination of surface defects and burrs by grinding. The consumptions of this stage are natural gas, electricity and water consumption. Visual inspection and non-destructive tests (penetrating liquids) for highest quality of the final product and repair by welding if necessary.
- ✓ **Machining:** Machining of parts by chip removal or abrasive grinding.
- ✓ **Finishing:** Elimination of edges by grinding. Final dimensional control.

More information: For more information please visit www.jez.es

Author of the Life Cycle Assessment:

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Data quality

The environmental impact of the crossing frogs has been calculated based on the international standards established for the development of environmental product declarations, such as ISO 14025 for the preparation of the environmental product declaration, ISO 14040 and ISO 14044 for the preparation ofthe life cycle analysis, UNE-EN 15804_2012+A2_2020 (MARCH 2020) and the Product Category Rules PCR -"2019:14 CONSTRUCTION PRODUCTS " (Version 1.1) of the CPC 41253. Data has been collected in 2019 and is representativeof that year. Data for raw material supply, transport to fabrication plant and production (A1-A3) is based on specific consumption data for the factory at Laudio. Generic background datasets were used for the downstream processes. Sima. Pro v9.1.1.1. software was used to prepare the life cycle analysis together with the Ecoinvent 3.6 database. Characterization factors from EN15804: 2012 + A2:2019.

Assumptions

The modularity principle, as well as the polluter-payer principle have been followed.The following assumptionshave been made in this EPD:

- ✓ It does not include the manufacturing processes of the capital goods or spare parts and/or maintenance with a life of more than three years.
- ✓ The environmental impact of infrastructure for general management, office, and headquarters operations is not included.
- ✓ The impact caused by people (common activities, travel for work...) will not be considered.
- ✓ The processes associated with fuel production are intrinsically included in the indicators in ECOINVENT's database used in carrying out the LCA.
- ✓ The environmental impact of external transport has been calculated using lorries from the ECOINVENT 3.6 database. These lorries have been selected to reflect the most realistic scenario possible.
- ✓

Cut-off rules

The standard ISO 14025 and the PCR -"2019:14 CONSTRUCTION PRODUCTS" indicate that the life cycle inventory data should include a minimum of 99% of the total inputs (materials and energy) for each stage. This cut-off rule does not apply for hazardous materials and substances. No such cut-off criteria have been taken into account in this study.

Allocation

Where necessary an allocation based in mass has been used.

Greenhous gas emission from the use of electricity in the manufacturing phase

100% wind energy mix (as purchased from an electricity supplier), high voltage (included losses in grid) electricity is considered for the manufacturing process.

Electricity mix	Amount	Units
Specific electricity mix	0,016	Kg CO2-eqv/kWh

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

	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	MND	MND	MND	MND	MND	MND	MND	MND	MND	X	X	X	X	X
Geography	EU	EU	EU	EU	MND	MND	MND	MND	MND	MND	MND	MND	EU	EU	EU	EU	EU
Specific data	>95%					-	-	-	-	-	-	-	-	-	-	-	-
Variation – products	-					-	-	-	-	-	-	-	-	-	-	-	-
Variation – sites	-					-	-	-	-	-	-	-	-	-	-	-	-

MND: Module not declared in the EPD

The modules considered are described below:

A1-A3 Product stage:

Raw materials supply (module A1):

- ✓ Extraction and processing of raw materials and the energy that is produced prior to the manufacturing process under study.

Transport (module A2):

- ✓ This module includes the transport of the different raw materials from the manufacturer to the factory.

Manufacturing (module A3):

- ✓ Manufacture of the crossings.
- ✓ Treatment of waste generated during the manufacturing process.
- ✓ Plant emissions.

C End of life stage

Dismantling/demolition (module C1):

- ✓ The consumption of energy (diesel) of excavator and for the oxyfuel process the consumption of oxigen and propane is considered. These consumptions have been based on JEZ´s experince and own data.

Transport (module C2)

- ✓ With a collection rate of 100%, the waste generated during dismantling will be considered to be transported by large-tonnage truck (usual load capacity: 32 tons) EURO 5 and managed in facilities located 50 km from the site.

Waste processing (modules C3 and C4)

- ✓ A recycling ratio of 95% is considered in accordance with the recycling rate (R2) for building steel sheets, established in the Annex C of the Environmental Footprint Method. The remaining 5% is considered to be landfilled.

D Recyclability potentials

- ✓ Module D contains the benefits from the recycling of crossing frogs in module C3.

Content information

Product components	Weight, kg	Post-consumer material, weight-%	Renewable material, weight-%
Steel	816,6	100%	0%
Alloys	183,4	0,00%	0%
TOTAL	1.000,0	81,66%	0%

No Distribution packaging: is used in the Distribution of the crossing frogs.

There are no substances affected by Regulation (EC) No. 1907/2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH).

No substances included in the Candidate List of Substances of Very High Concern for authorization under REACH Regulations are present in the steel profiles and accessories manufactured by JEZ, either above the threshold for registration with the European Chemicals Agency or above 0,1% (wt/wt).

Environmental Information

Potential environmental impact – mandatory indicators according to EN 15804

Results per functional or declared unit							
Indicator	**Unit**	**A1-A3**	**C1**	**C2**	**C3**	**C4**	**D**
GWP-fossil	kg CO_2 eq.	2,05E+03	9,32E+00	8,23E+00	3,96E-01	2,63E-01	3,12E+02
GWP-biogenic	kg CO_2 eq.	1,60E+01	2,32E-02	4,43E-03	4,21E-02	5,22E-04	-1,40E+00
GWP-luluc	kg CO_2 eq.	1,38E+00	2,27E-03	2,90E-03	9,04E-04	7,34E-05	5,64E-02
GWP-total	kg CO_2 eq.	2,06E+03	9,34E+00	8,24E+00	4,39E-01	2,64E-01	3,11E+02
ODP	kg CFC 11 eq.	1,80E-04	2,22E-06	1,89E-06	7,44E-08	1,08E-07	1,27E-05
AP	mol H^+ eq.	1,24E+01	9,37E-02	4,19E-02	2,58E-03	2,50E-03	1,33E+00
EP-freshwater	kg PO_4^{3-} eq.	2,40E+00	2,99E-03	1,87E-03	1,23E-03	8,29E-05	3,56E-01
EP-freshwater	kg P^- eq.	7,81E-01	9,74E-04	6,08E-04	4,01E-04	2,70E-05	1,16E-01
EP-marine	kg N eq.	2,66E+00	3,93E-02	1,44E-02	4,44E-04	8,64E-04	2,81E-01
EP-terrestrial	mol N eq.	2,94E+01	4,30E-01	1,57E-01	4,64E-03	9,48E-03	2,79E+00
POCP	kg NMVOC eq.	1,71E+01	1,19E-01	4,49E-02	1,13E-03	2,75E-03	1,64E+00
ADP-minerals&metals*	kg Sb eq.	1,49E-01	1,68E-05	2,25E-04	8,07E-06	2,41E-06	4,35E-04
ADP-fossil*	MJ	2,63E+04	1,52E+02	1,25E+02	1,71E+01	7,36E+00	3,09E+03
WDP	m^3	6,71E+02	1,31E+00	3,49E-01	1,44E-01	3,30E-01	-6,06E+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.*

Potential environmental impact – additional mandatory and voluntary indicators

Results per functional or declared unit						
Indicator	**A1-A3**	**C1**	**C2**	**C3**	**C4**	**D**
GWP-GHG[1]	2,06E+03	9,34E+00	8,24E+00	4,39E-01	2,64E-01	3,11E+02

Use of resources

Results per functional or declared unit							
Indicator	**Unit**	**A1-A3**	**C1**	**C2**	**C3**	**C4**	**D**
PERE	MJ	1,21E+04	3,00E+00	1,77E+00	1,08E+01	5,95E-02	5,11E+01
PERM	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
PERT	MJ	1,21E+04	3,00E+00	1,77E+00	1,08E+01	5,95E-02	5,11E+01
PENRE	MJ	2,63E+04	1,52E+02	1,25E+02	1,71E+01	7,36E+00	3,09E+03
PENRM	MJ.	2,92E-01	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
PENRT	MJ	2,63E+04	1,52E+02	1,25E+02	1,71E+01	7,36E+00	3,09E+03
SM	kg	1,14E+00	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	2,03E+01	4,10E-02	1,32E-02	3,57E-02	7,86E-03	3,37E-02
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 production and output flows

Waste production

Results per functional or declared unit							
Indicator	**Unit**	**A1-A3**	**C1**	**C2**	**C3**	**C4**	**D**
Hazardous waste disposed	kg	3,25E-02	3,61E-04	3,28E-04	8,82E-06	1,10E-05	3,22E-02
Non-hazardous waste disposed	kg	2,55E+03	2,14E-01	5,99E+00	6,10E-02	5,00E+01	2,31E+01
Radioactive waste disposed	kg	7,64E-02	1,05E-03	8,53E-04	1,95E-04	4,83E-05	2,96E-03

[1] The indicator includes all greenhouse gases included in GWP-total but excludes biogenic carbon dioxide uptake and emissions and biogenic carbon stored in the product. This indicator is thus equal to the GWP indicator originally defined in EN 15804:2012+A1:2013.

Output flows

Results per functional or declared unit							
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	4,78E-01	9,50E-01	0,00E+00	9,50E-01	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

Information on biogenic carbon content

Results per functional or declared unit		
BIOGENIC CARBON CONTENT	**Unit**	**QUANTITY**
Biogenic carbon content in product	kg C	0
Biogenic carbon content in packaging	kg C	0

Note: 1 kg biogenic carbon is equivalent to 44/12 kg CO_2.

Additional information

No additional information is provided.

Information related to Sector EPD

This is an individual EPD®

Differences versus previous versions

The name of the company was updated.

The electricity mix has been updated. The new electricity mix is 100% wind energy origin.

References

- General Programme Instruction of the International EPD®System. Version 3.01.
- ISO 14020:2000 Environmental labels and declarations-General principles.
- ISO 14025:2010 Environmental labels and declarations-Type III Environmental Declarations-Principles and procedures.
- ISO 14040:2006 Environmental management-Life Cycle Assessment-Principles and framework.
- ISO 14044:2006 Environmental management-Life Cycle Assessment-Requirements and guidelines.
- PCR 2019:14Construction products (EN 15804:A2) version 1.1
- EN 15804:2012+A2:2019Sustainability of construction works-Environmental Product Declarations-Core rules for the product category of construction products

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