

Environmental Product Declaration



PCR 2012:01 Construction Products and Construction Services (Version 2.3)

According to standards ISO 14025 y EN 15804+A1

1tn of MANGANESE CROSSING

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

For AMURRIO FERROCARRIL y EQUIPOS S.A.



Program:	The International EPD® System, www.environdec.com
Program Operator:	EPD International AB
Reg. Number:	S-P-01765
Publication Date:	2019-12-18
Valid until:	2024-12-18



Program Information

CEN Standard EN 15804 serves as the core PCR	
EPD owner:	<p>Amurrio Ferrocarril y Equipos, S.A.</p> <p>Maskuribai 10. 01470 AMURRIO (Spain) T.+34 945891600</p> <p>www.amufer.es luis.delrio@amufer.es</p>
LCA Author:	<p>Ingurumenaren Kideak Ingeniería Avenida Cervantes 51, Edificio 10, 5ª planta Departamento 7 48970 Basauri (Bizkaia) Tel. +34 94 418 17 46</p> <p>www.ik-ingenieria.com ik@ik-ingenieria.com</p>
EPD Programme:	<p>The International EPD® System</p> <p>EPD International AB Box 210 60 SE-100 31 Stockholm Sweden</p> <p>www.environdec.com info@environdec.com</p>
Product category rules (PCR):	PCR - "2012:01 CONSTRUCTION PRODUCTS AND CONSTRUCTION SERVICES" (Version 2.3)
PCR review was conducted by:	<p>The Technical Committee of the International EPD® System. Chair: Massimo Marino. Contact via info@environdec.com</p>
Independent third-party verification of the declaration and data, according to ISO 14025:2006:	<p><input type="checkbox"/> EPD process certification <input checked="" type="checkbox"/> EPD verification</p>
Third party verifier:	<p>Tecnalia R&I Certificación, SL Auditor: Maria Feced itxaso.pinilla@tecnaliacertificacion.com Accredited by: ENAC nº125/C-PR283 accreditation.</p>
Procedure for follow-up of data during EPD validity involves third party verifier:	<p><input type="checkbox"/> Yes <input checked="" type="checkbox"/> No</p>
Date of EPD publication	2019-12-18
EPD validity	2024-12-18
EPD valid within the following geographical area	International

EPDs of construction products may not be comparable if they do not comply with EN 15804. EPDs within the same product category but from different programmes may not be comparable.

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

The verifier and the program operator do not have any claim nor have any responsibility of the legality of the product.

Company overview

Since its founding in 1880, AMUFER has been the leader in the national market of fixed railway equipment and one of the leading manufacturers of capital goods. At AMUFER we are one of the European leaders in the design and manufacture of mono block crossings in manganese steel. We develop solutions for all types of layouts, using in each case the most appropriate type of crossing for the technical and economic parameters of the project.

Our policy has been to offer quality products that meet our customers' needs within the required deadlines. This philosophy has become a key to survival in a changing and complex market, where our competition strives to increase its market share.

Similarly, AMUFER considers the active support of measures to improve the surroundings and the environment to be essential, as a way of contributing to the future of our society. Therefore, the General Management expresses its total commitment to further improving the quality of its products and the efficiency of its operations, all of this safeguarded by compliance with the legal and regulatory requirements that apply to the organisation. It also expresses its commitment to reducing the environmental impact that might be created by this activity.

The General Management understands that it is not possible to maintain the position of leadership without sufficient effort aimed at:

- Fulfilling the needs and expectations of our customers at all times.
- Manufacturing products more efficiently.
- Faithfully meeting quality commitments.
- Reducing the environmental impacts of our business.
- Preventing contamination throughout the life-cycle.
- Reinforcing the commitment to continuous improvement in all areas of our activity.

AMUFER has implemented management systems based on the UNE-EN-ISO-9001 and UNE-EN-ISO-14001 standards. AMUFER's commitment to the environment stems from the conviction that, if we want to continue in business for many years, we must contribute to the conservation, recovery and improvement of the condition of our environment.

We strictly comply with all environmental aspects of legal regulations, and where possible we are proactive when it comes to adapting to future requirements. Each of our products is designed and manufactured in a way which will minimise its environmental impact.



Figure 1. ISO 9001 and ISO 14001 certifications for AMUFER S.A.

Contact information

For more information on these or other products please contact:

Luis del Río
Head of Quality and Environment
 Amurrio Ferrocarril y Equipos, S.A.
 Maskuribai 10. 01470 AMURRIO (Spain)
 Email: luis.delrio@amufer.es
 www.amufer.es

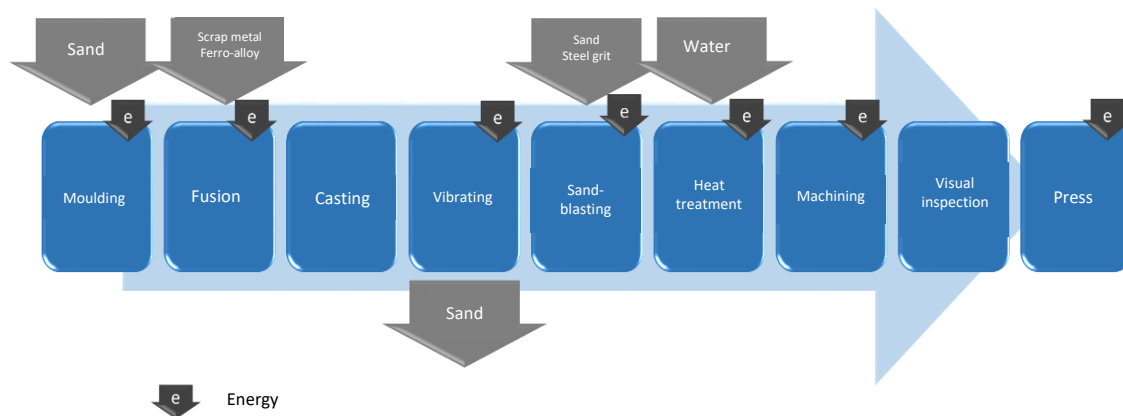
Product information

This study deals with the life cycle analysis that has been carried out for the manganese crossings produced at the Amurrio plant. The function of the crossing is to guide the wheels in the intersection within the crossing area of a turnout.

The code of the crossings corresponds to "CPC 41253 – 'Railway or tramway track construction material of iron or steel' ". The crossing crossings comply with regulation "EN 15689 Railway applications - Track - Switches and crossings - Crossing components made of cast austenitic manganese steel".

Description of the production processes

The crossings follow the following manufacturing process:



After the pressing stage, the unfinished crossing follows a series of machining processes (deburring, finishing, straightening and quality control) before the machined crossing is sent to the customer.

The electricity used in the manufacturing process comes entirely from renewable energy sources.

Product LCA information

Declared Unit

The unit declared is the measurement to which all system inputs and outputs will refer. The declared unit is 1 metric ton (1000 kg) of manganese crossing:

Declared Unit:

- ✓ 1 metric ton (1000 kg) of manganese crossing

The results have been declared according to this declared unit.

Calculation of the environmental performance of the product

The environmental impact of the different crossings 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 of the life cycle analysis, UNE-EN 15804: 2012 and the Product Category Rules PCR - "2012:01 CONSTRUCTION PRODUCTS AND CONSTRUCTION SERVICES" (Version 2.3) of the CPC 41253; by the body Environdec. SimaPro 9.0 software was used to prepare the life cycle analysis together with the Ecoinvent 3.5 database. The methodology used to calculate the impact values was CML IA in the August 2016 version, EDIP for the calculation of waste indicators, CED for energy-related indicators and ReCiPe for net fresh water consumption.

System limit and data quality

This EPD considers a "Cradle to Gate" scope, following the guidelines of the PCR 2012:01 document for crossings:

Product phase			Construction phase		Usage phase							End of Life				Recovery of resources
Raw materials	Transport	Manufacture	Transport	Construction	Use	Maintenance	Repair	Substitution	Renovation	Energy use	Water use	Deconstruction and demolition	Transport	Waste management	Disposal	Reuse, recovery, recycling
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
X	X	X	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND

X = Included in the EPD; MND = Module Not Declared in the EPD

The modules considered are described below:

A1) Supply of raw materials:

- ✓ Extraction and processing of raw materials, and recycling processes to recycle materials from the waste streams of a previous product system (does not include any waste treatment processes which are not related to recycling).
- ✓ Fuel extraction and processing.

A2) Transport to the factory:

- ✓ External and internal transport of raw materials to the factory.

A3) Manufacture:

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

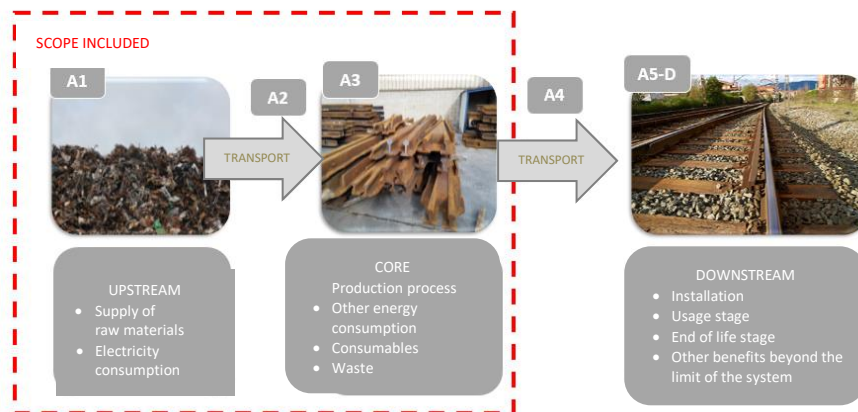


Figure 2. Scope included and excluded

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 2018. They are representative of the different processes implemented during the manufacture of the crossings. 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 3.5, 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.

Cut-off criteria

The standard ISO 14025 and the PCR - "2012:01 CONSTRUCTION PRODUCTS AND CONSTRUCTION SERVICES" indicate that the life cycle inventory data should include a minimum of 99% of the total inputs (materials and energy) for each stage. No such cut-off criteria have been taken into account in this study.

Allocation Criteria

The consumption of materials and energy, as well as machine maintenance and auxiliary materials, have been allocated by the total tons of crossings produced.

Assumptions

The following assumptions have 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, laboratory 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 validity period given to the data collected is 1 year.
- ✓ The environmental impact of external transport has been calculated using lorries from the ECOINVENT 3.5 database. These lorries have been selected to reflect the most realistic scenario possible.

Content Declaration

The declaration of the content of the crossings is shown in ranges, as the content varies depending on the type of mixture:

Material	Unfinished crossing
Steel	<88%
Manganese	12-14%

The crossing is made of 79% recycled materials. There are no substances affected by Regulation (EC) No. 1907/2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH).

Environmental profile

Below is the environmental profile of the crossings together with other environmental indicators:

ENVIRONMENTAL IMPACT for 1 metric ton of Manganese Crossing

PARAMETER	UNITS	A1	A2	A3	TOTAL
Global warming (GWP100a) - TOTAL	kg CO ₂ eq.	1,56E+03	3,97E+01	7,43E+02	2,35E+03
Ozone layer depletion	kg CFC-11 eq	1,36E-04	7,37E-06	9,76E-05	2,41E-04
Acidification	kg SO ₂ eq.	8,80E+00	1,55E-01	1,22E+00	1,02E+01
Eutrophication	kg PO ₄ ³⁻ eq.	7,61E+00	3,66E-02	3,37E-01	7,98E+00
Photochemical oxidation	kg C ₂ H ₄ eq.	4,75E-01	6,52E-03	2,05E-01	6,86E-01
Abiotic depletion (elements)	kg Sb eq	3,48E-02	1,20E-04	4,82E-04	3,54E-02
Abiotic depletion (fossil fuels)	MJ	1,46E+04	6,05E+02	1,13E+04	2,65E+04

RESOURCE USE for 1 metric ton of Manganese Crossing

PARAMETER		UNITS	A1	A2	A3	TOTAL
Use of primary energy - Renewable	Used as an energy carrier	MJ	1,52E+04	6,47E+00	8,04E+01	1,53E+04
	Used as raw material	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00
	TOTAL	MJ	1,52E+04	6,47E+00	8,04E+01	1,53E+04
Use of primary energy - NON-Renewable	Used as an energy carrier	MJ	1,79E+04	6,15E+02	1,14E+04	2,99E+04
	Used as raw material	MJ	3,76E+02	0,00E+00	0,00E+00	3,76E+02
	TOTAL	MJ	1,83E+04	6,15E+02	1,14E+04	3,03E+04
Use of secondary materials		kg	1,10E+03	0,00E+00	0,00E+00	0,00E+00
Use of renewable secondary fuels		MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Use of non-renewable secondary fuels		MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Net use of fresh water		m3	1,42E+01	1,04E-01	3,28E+00	1,76E+01

Also included are the results for the different types of waste generated, expressed by functional unit:

WASTE GENERATION for 1 metric ton of Manganese Crossing

PARAMETER	UNITS	A1	A2	A3	TOTAL
Hazardous waste	kg	3,43E-01	3,88E-04	1,37E-02	3,57E-01
Non-hazardous waste	kg	8,00E+02	2,90E+01	5,11E+01	8,80E+02
Radioactive waste	kg	7,42E-02	4,16E-03	2,09E-02	9,92E-02

The data shown in this statement will be valid as long as there are no significant changes in the process analysed.

References

- ✓ ISO14040:2006. Environmental management. Life cycle assessment. Principles and framework.
- ✓ ISO14044:2006. Environmental management. Life cycle assessment. Requirements and guidelines.
- ✓ ISO 14025:2006: Environmental labels and declarations. Type III environmental declarations. Principles and procedures.
- ✓ General Programme Instructions of the International EPD® System. Version 3.0.
- ✓ PCR - "2012:01 CONSTRUCTION PRODUCTS AND CONSTRUCTION SERVICES" (Version 2.3)
- ✓ EN 15804:2012+A1:2014. Sustainability of construction works - Environmental product declarations - Core rules for the product category of construction products.

Summary of the Environmental Product Declaration

At AMUFER, we have designed, produced and installed railway equipment since 1880, the year our company was founded in Bilbao. In 1929, we moved to a new, bigger and better equipped production facility in the neighbouring town of Amurrio. From our present facility, we have taken part in the main railway construction projects developed in Spain and in Europe throughout the 20th century.

We have secured our position as leaders in the technology applied to the design and manufacture of railway equipment for high-speed railways, tramways, metropolitan railways, conventional and heavy haul railways throughout the world. And we have become a reference model for quality in the design, manufacture and installation of track apparatus all over the world. The crossing is the key part within the area where the lines intersect, and by extension the whole turnout.

At Amurrio we are one of the European leaders in the design and manufacture of mono block crossings in manganese steel. We develop solutions for all types of layouts, using in each case the most appropriate type of crossing for the technical and economic parameters of the project.

Amurrio's quality policy can be summarised in just one word: precision. Precision in our compliance with the standards specified for each project by clients in 65 countries and the expression of a total quality system, set out in the Quality Manual in accordance with the International Standard ISO 9001:2008. Our commitment to the environment is based on the conviction that we must contribute to the conservation, recovery and improvement of our environmental conditions. We are certified according to the ISO 14001:2004 standard. Each one of our products is designed and manufactured in such a way as to minimise their environmental impact.

The objective of the development of this Environmental Declaration of Product (EPD) is to evaluate the production of the Manganese steel crossings. The crossing is the key part within the area where the lines intersect, and by extension the whole turnout. At Amurrio we are one of the European leaders in the design and manufacture of mono block crossings in manganese steel. We develop solutions for all types of layouts, using in each case the most appropriate type of crossing for the technical and economic parameters of the project. We develop manganese steel crossings with natural hardness or pre-hardened by explosion. With flash-butt welded antennae for weld-ability to the track with aluminothermic welding. For this purpose we select high quality scrap and ferroalloys and we cast these in our own electric arc furnace.

The certification is carried out in accordance with PCR 2012:01 "CONSTRUCTION PRODUCTS AND CONSTRUCTION SERVICES" version 2.3 according to the International EPD system. The EPD is based on a declared unit, with a scope of cradle-to-gate (form A1 to A3).

In this EPD, the analyzed period is 2018. The analyzed functional unit is:

✓ **1 metric ton (1000 kg) of railway crossing**

The results have been declared for each of the according to this functional unit. The environmental impact of the crossing are shown in the tables below:

ENVIRONMENTAL IMPACT for 1 metric ton of mechanized crossing

PARAMETER	UNITS	A1	A2	A3	TOTAL
Global warming (GWP100a) - TOTAL	kg CO ₂ eq.	1,56E+03	3,97E+01	7,43E+02	2,35E+03
Ozone layer depletion	kg CFC-11 eq	1,36E-04	7,37E-06	9,76E-05	2,41E-04
Acidification	kg SO ₂ eq.	8,80E+00	1,55E-01	1,22E+00	1,02E+01
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Abiotic depletion (fossil fuels)	MJ	1,46E+04	6,05E+02	1,13E+04	2,65E+04

For more information about these and other services, visit the website: www.amufer.es or contact us via the following email: info@amufer.es

More information about the certification system on the Environdec website: www.environdec.com