Steel Wide Flange Beam

manufactured from steel scrap

Environmental Product Declaration
In accordance with ISO 14025:2006 and EN 14804:2012

Programme:	The International EPD® System EPD registered through the fully aligned regional programme/hub: EPD Latin America
Programme operator:	EPD International AB Regional Hub: EPD Latin America
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Geographical scope:	Mexico

Content

1. DEACERO

DEACERO is a world-class company that produces a wide range of steel products. Through productivity, excellence in quality and innovation in its products, as well as the focus on customer service, DEACERO has managed to meet the needs of local and international markets, positioning itself as a leader in the field.

DEACERO is a 100% Mexican company that has managed to transform and grow firmly to efficiently respond to the demands of an international market of high level of competition in more than 20 countries in America and Europe.

The quality of DEACERO is a tradition in the market, therefore, it has invested in more training, better products and in integrated production processes that allow serving the agricultural, industrial, construction and domestic sectors.

DEACERO conceives sustainability in its three dimensions: social, economic and environmental, in relation to the latter, it is a company that takes care of the environment of the communities through advanced water, air and soil protection systems. DEACERO conceives progress as productivity that develops with an ecological sense.

DEACERO is strongly committed to a sustainable strategy of growth that benefits the company, the environment, their employees and the communities in which operates. DEACERO is a fully integrated company with an infrastructure for recycling, processing waste, steel mills, finished product plants and distribution centers.

As an organization DEACERO strives for physical health and implementation of values, smart use of natural resources, and stable growth together with their customers and suppliers. The company

owns developments in advanced technology for steel recycling facilities and its transformation to finish products.

With its new steel plant and hot roll mills in Ramos Arizpe, Coahuila, Mexico. DEACERO has become a new source for customers seeking high quality bars, shapes and beams. DEACERO produces hot rolled ASTM-grade products including: ASTM A36 | ASTM A529-50 | ASTM A529-55 | ASTM A572-50 | ASTM A992 | 44 & 50W Canadian spec.

This Environmental Product Declaration (EPD) is in accordance with ISO 14025 and EN 15804, for Steel Wide Flange Beam manufactured from steel scrap.
EPD of constructions products may not be comparable if they do not comply with EN 15804 Sustainability of constructions works – Environmental product declarations – Core rules for product category of construction products.

Environmental product declarations within the same product category from different programs may not be comparable.

2. General Information

Product	Steel Wide Flange (WF) beam manufactured from steel scrap
Declaration owner	DEACERO S.A.P.I. de C.V. Avenida Lázaro Cárdenas, Zona Loma Larga Oriente, San Pedro Garza García, Nuevo León, México. C.P. 66266 www.deacero.com Contact person: Daniel Armando Guajardo Hernández dguajardo@deacero.com
Description of the construction product	Steel Wide Flange (WF) beam is a steel shape finished in an "H" shape to be used as a structural reinforcement in construction and manufacture projects
Declared Unit	1 ton of steel wide flange beam manufactured from steel scrap
Construction product identification	Central Product Classification (CPC) 421 Structural metal products and parts thereof
Description of the main product components and or materials	100% steel manufactured from steel scrap
Life cycle stages not considered	Distribution, use, end of life
Content of the declaration	This EPD is based on information modules that do not cover the aspects of use and end of life of the product. It contains in detail, for Module A1, A2 and A3: -Product definition and physical data -Information about raw materials and origin -Specifications on manufacturing of the product -Notes on product processing -LCA based on a declared unit, cradle-to-gate -LCA results -Evidence and verifications
For more information consult	www.deacero.com
Site for which this EPD is representative	Ramos Arizpe plant: Carretera a Monclova Km 4 #2125 tramo Santa Cruz - Ojo Caliente, Ramos Arizpe, Coahuila, C.P. 25903, México
Public intended	B2B (Business to Business)

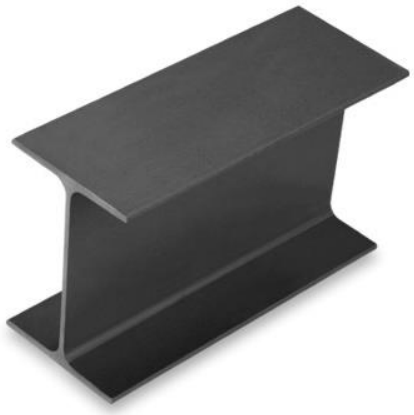
3. Product Description

Steel Wide Flange (WF) beam is a steel shape finished in an “H” shape to be used as a structural reinforcement in construction and manufacture projects. DEACERO produces the steel WF beam with electric arc furnace using steel scrap.

For more details of technical specifications such as: dimensions, properties and steel grade of steel WF beam visit: https://www.deacero.com

Uses

- Metallic barriers and structural supports
- Industrial buildings
- Stringer and automobile bodywork manufacturing



Features

- Hot rolled laminated
- Depth from 6” to 10”
- Meets ASTM A36, A529-50 and A572-50/992-50

Advantages

- Meets ASTM dual standards.
- Highly ductile
- Consistent and uniform steel properties

4. Content declaration

The WF beam manufactured by DEACERO is made of 100% low alloyed steel manufactured in electric arc furnace with 90% of recycled material.

The typical composition of the low alloyed is presented in Table 1.

Table 1. Typical content of low-alloyed steel manufactured by DEACERO

Element	Typical content
Iron	94.6 %
Carbon	3.4 %
Manganese	1.4 %
Silicon	0.2 %
Phosphorus	0.1 %
Sulfur	< 0.1 %
Copper	0.3 %

5. LCA Rules

Environmental potential impacts were calculated according to EN 15804:2012 and PCR 2012:01 Construction products and construction services Version 2.2 (2017-05-30). This EPD is in accordance with ISO 14025:2006.

Environmental potential impacts were calculated through Life Cycle Assessment (LCA) methodology according to ISO 14040:2006 and ISO 14044:2006. An external third party critical review process of the LCA was conducted according to ISO/TS 14071:2014.

5.1 Declared unit

One metric ton of steel wide flange (WF) beam manufactured from steel scrap.

5.2 System boundary

This is a cradle to gate EPD. The following life cycle stages were considered:

A1 – Raw material supply.

A2 – Transport.

A3 – Manufacturing.

Description of the system boundary is in Table 2.

Table 2. Steel WF beam product system

Life cycle environmental information of steel WF beam							Other environmental information
A1 - A3			A4 - A5		B1 - B7	C1 - C4	D
Product stage			Construction process stage		Use stage	End of life stage	Reuse recovery stage
A1	A2	A3	A4	A5	B1 - B7	C1 - C4	
Preprocessing of steel scrap, production of ferroalloys, lime, among others. Generation of electricity and production and processing of natural gas and diesel used during manufacturing.	Transport of steel scrap, transport of other raw materials, transport of auxiliary inputs from the production site to the DEACERO plant and internal transports.	Production and consumption of auxiliary materials: oxygen, argon, nitrogen, oil, grease, etc. Waste transport and waste treatment. Emissions to air and water from the operations of DEACERO.	Product distribution	Construction and instalation	Use, maintenance, replacement, refurbishment on, repair, use of energy and water during the operation.	Demolition, deconstruc-tion, transport, waste processing and final disposal.	Reuse- recovery-recycling potential
X	X	X	MND	MND	MND	MND	MND

(X = included in LCA; MND = Module Not Declared).

5.3 Manufacturing process

The manufacturing process is described in Figure 1:

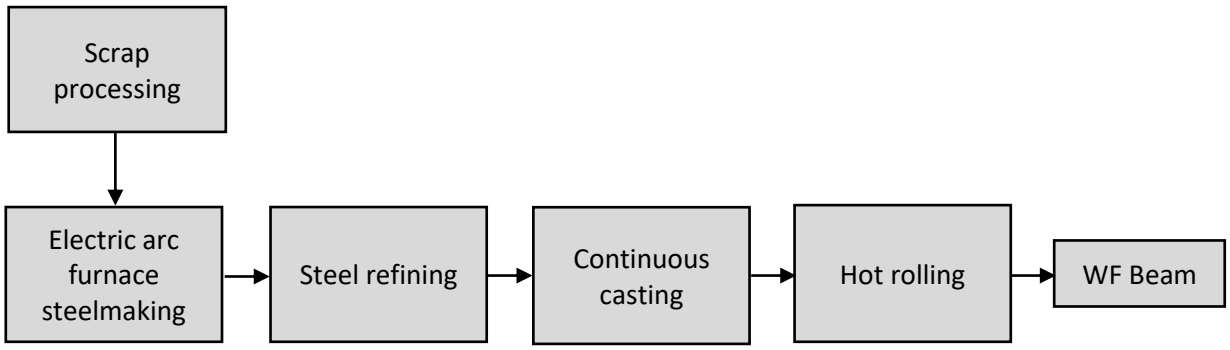


Figure 1. Flow diagram of steel WF beam manufacturing process

5.4 Assumptions

- The most representative scrap yard is Guadalupe, is assumed all scrap yards operate in the same way.
- Packaging materials of raw materials are polypropylene bags.

- Plastic waste is recycled in the same location of Ramos Arizpe.
- Supplier and location of auxiliary items are the same in Ramos Arizpe and in Celaya (other plant of DEACERO).
- The efficiency is the same in the plant Ramos Arizpe and in plant Celaya.
- The hazardous waste from lamination at the Ramos plant consists of used oil.
- The diesel consumed in the plant is from Cadereyta refinery in Nuevo León.
- The natural gas consumed in the plant is from complex Burgos, Tamaulipas.

5.5 Cut-off criteria

A minimum of 95% of the total flows (matter and energy) in the A1 and A3 modules were included. Company infrastructure, employee's transportation and administrative activities were kept out of the scope of this study.

5.6 Allocation

Allocation of inputs and outputs of the system between product and coproducts was based on a mass relation, considering the quantity produced per year of each product and coproduct at the level of unit process.

Table 3 shows the coproducts generated during steel WF beam manufacturing.

Table 3. Coproduct generated in steel WF beam manufacturing

Unit process	Coproduct
Electric Arc Furnace	Slag and steel scale
Hot Rolling	Steel scale

The polluter pays principle was applied for the allocation procedure during recycling. In this way, in each case when there was an input of secondary material to the steel WF beam's product system, recycling process and transportation to the site were included in life cycle inventory (for example, steel scrap). In those cases, in which output of material to recycling were presented, material transportation to recycling plant was included. This principle was applied to plastic and metal containers recycled by a third party. For generic data Mexicaniuh and Ecoinvent 3.3 (Allocation - Recycled Content version) databases were used.

5.7 Time representativeness

Direct data obtained from DEACERO is representative for 2017.

5.8 Data quality assessment

Data quality assessment per information module is provided in Tables 4, 5 and 6.

Table 4. Raw material supply module data quality assessment

Data	Time related coverage	Geographical coverage	*Technological covegare*	*Data Source*	*Measured or estimated*
Raw materials consumption	2017	Mexico	Modern	DEACERO	M
Distance of scrap transportation to recycling center	2017	Mexico	Modern	DEACERO	M
Energy and materials consumption of scrap processing in recycling center, as well as waste and generated emissions	2017	Mexico	Modern	DEACERO	M
Fuels consumption and emissions related to electricity generation and distribution in Mexico	2016	Mexico	Mexican energy mix	Mexicaniuh	M&E
Energy consumption and generation of emissions related to natural gas production in Mexico	2016	Mexico	Mexican context	Mexicaniuh	M&E
Energy and materials consumption to raw materials production for the steelworks	1990-2016	European	Modern	Mexicaniuh	M&E

Table 5. Transportation module data quality assessment

Data	Time related coverage	Geographical coverage	*Technological covegare*	*Data Source*	*Measured or estimated*
Distance of scrap and others raw materials transportation	2017	Mexico	Not Applicable	DEACERO	M
Distance of auxiliary items transportation	2017	Mexico	Not Applicable	DEACERO	M
Distance of natural gas transportation	2017	Mexico	Not Applicable	DEACERO	M
Consumption of materials and energy and emissions related to the transport requirements of raw materials and auxiliary inputs	1992-2014	World average based on Europe	World average based on Europe	Ecoinvent 3.3	M&E

Table 6. Manufacture module data quality assessment

Data	Time related coverage	Geographical coverage	*Technological covegare*	*Data Source*	*Measured or estimated*
Production efficiency and generation of by-products	2017	Mexico	Modern	DEACERO	M
Consumption of auxiliary items	2017	Mexico	Modern	DEACERO	M&E
Energy and materials consumption of auxiliary items production	1990 - 2016	World average based on Europe	World average based on Europe	Ecoinvent 3.3	M&E
Waste generation	2017	Mexico	Modern	DEACERO	M
Waste treatment process	1990 - 2016	World average based on Europe	World average based on Europe	Ecoinvent 3.3	M&E
Air emissions and waste water generation	2017	Mexico	Modern	DEACERO EPA AP42	M&E
Distance of waste transportation	2017	Mexico	Modern	DEACERO & Google Maps	M&E
Requirements of waste transportation	1992-2014	World average based on Europe	World average based on Europe	Ecoinvent 3.3	M&E

6. Environmental performance

SimaPro 8.4 was used for Life Cycle Impact Assessment.

6.1 Use of resources

Parameters describing resource use were evaluated with the Cumulated Energy Demand method version 1.09 (Frischknecht et al. 2007) except for the indicator of use of net fresh water that was evaluated with Recipe 2016 Midpoint (H) version 1.00 (Huijbregts et al. 2017). The detailed description of the use of resources is provided in Table 7.

Table 7. Resource Indicators per metric ton of steel WF beam

Parameter	Unit	Total	A1) Raw material supply	A2) Transportation	A3) Manufacturing
Use of renewable primary energy excluding renewable primary energy resources used as raw materials	MJ	654	618	4.07	31.2
Use of renewable primary energy as raw materials	MJ	0	0	0	0
Total use of renewable primary energy resources	MJ	654	618	4	31
Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials	MJ	12 975	12 168	242	566
Use of non-renewable primary energy used as raw materials	MJ	0	0	0	0
Total use of non-renewable primary energy resources	MJ	12 975	12 168	242	566
Use of secondary material	kg	913	0	0	913
Use of renewable secondary fuels	MJ	0	0	0	0
Use of non-renewable secondary fuels	MJ	0	0	0	0
Use of net fresh water	m^3	3.35	2.42	0.05	0.88

6.2 Potential environmental impact

Parameters describing environmental potential impacts were calculated using CML-IA method version 3.04 (Guinee et al. 2001; Huijbregts et al. 2003; Wegener et al. 2008) as implemented in SimaPro 8.4. Water scarcity potential was calculated using AWARE method (Boulay et al. 2018). Table 8 below shows the LCA results per the declared unit and Figure 2 depicts the impact contribution per module.

Table 8. Potential environmental impact indicators per metric ton of steel WF beam

Impact category	Unit	A1) Raw materials supply	A2) Transportation	A3) Manufacturing	Total (A1 - A3)	A4-A5, B1-B2, CI-C4, D
Abiotic resource depletion (minerals)	kg Sb eq	1.82E-04	2.90E-05	5.07E-06	2.17E-04	Modules not declared
	%	84%	13%	2%	100%	
Abiotic resource depletion (fossil)	MJ	11 203	238	528	11 969	
	%	94%	2%	4%	100%	
Global warming (100y)	kg CO_2 eq	580	15.4	259	855	
	%	68%	2%	30%	100%	
Ozone layer depletion potential	kg CFC-11 eq	6.93E-05	2.67E-06	3.57E-06	7.55E-05	
	%	92%	4%	5%	100%	
Photochemical oxidant formation	kg C_2H_4 eq	0.59	3.22E-03	0.99	1.58	
	%	37%	0%	63%	100%	
Acidification	kg SO_2 eq	5.08	0.08	0.43	5.59	
	%	91%	1%	8%	100%	
Eutrophication	kg PO_4--- eq	0.59	0.02	0.03	0.65	
	%	92%	3%	5%	100%	
Water scarcity	m^3 eq	95.5	1.08	175	271	
	%	35%	0.0%	64%	100%	

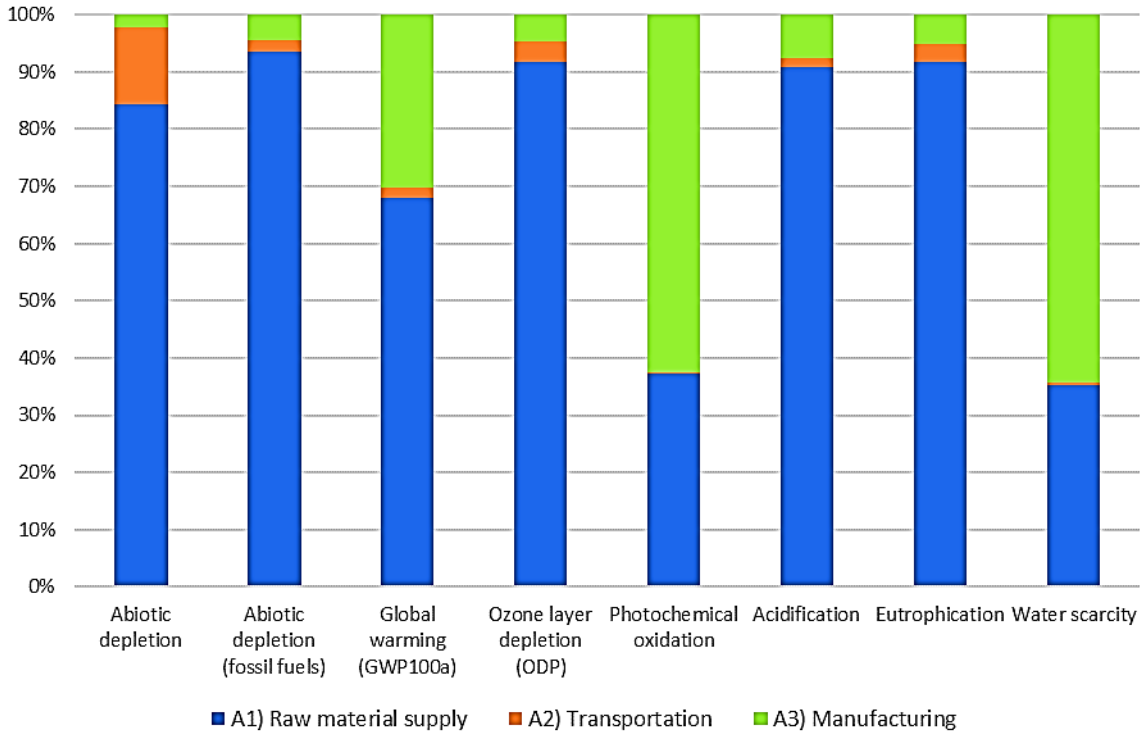


Figure 2. Potential environmental impact contribution per metric ton of steel WF beam

6.3 Waste production

Environmental indicators describing waste generation were obtained from LCI except for background information which has been calculated using EDIP 2003 method (Hauschild and Potting, 2005). Table 9 shows waste and other outputs generated during each information module.

Table 9. Waste and other outputs per metric ton of steel WF beam

Parameter	Unit	Total	A1) Raw materials supply	A2) Transportation	A3) Manufacturing
Hazardous waste	kg	0.24	0.01	0	0.23
Non hazardous waste	kg	44.0	32.0	11.8	0.21
Radioactive waste*	kg	0.02	0.02	0.00	0
Components for reuse	kg	0	0	0	0
Materials for recycling	kg	0.03	0	0	0.03
Materials for energy recovery	kg	0	0	0	0
Exported electricity	MJ	0	0	0	0
Exported heat	MJ	0	0	0	0

*No radioactive waste is produced during DEACERO operation

7. Verification and registration

CEN standard EN 15804 served as the core PCR	
Programme	International EPD® System www.environdec.com EPD registered through the fully aligned regional programme/hub: EPD Latin America www.epdlatinamerica.com
Programme operator	EPD International AB Box 210 60 SE-100 31 Stockholm, Sweden EPD Latin America Chile: Alonso de Ercilla 2996, Ñuñoa, Santiago Chile. Mexico: Av. Convento de Actopan 24 Int. 7A, Colonia Jardines de Santa Mónica, Tlalnepantla de Baz, Estado de México, México, C.P. 54050
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PCR:	PCR 2012:01 construction products and construction services, Version 2.2 (2017-05-03)
PCR review was conducted by:	The Technical Committee of the International EPD® System. Chair: Massimo Marino. Contact via info@environdec.com
Independent verification of the declaration data, according to ISO 14025:2006.	☐ EPD process certification (Internal) ☒ EPD verification (External)
External third-party verifier and critical reviewer of the LCA:	Claudia A. Peña ADDERE Research & Technology Approved EPD verifier cpena@addere.cl, claudia@epd-americalatina.com
Accredited or approved by:	The International EPD® System

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