TYASA®

LATIN AMERICA EPD®

Environmental Product Declaration

In accordance with ISO 14025:2006 and EN 15804:2012

Steel reinforcing bar manufactured from steel scrap by T A 2000

Programme:	The International EPD® System / www.environdec.com EPD registered through the fully aligned regional programme/hub: EPD Latin America, www.epd-latinamerica.com
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Regional Hub:	EPD Latin America
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Revision date:	2018-07-06
Geographical scope:	Mexico

EPD Content

T A 2000 S.A. de C.V. is a 100% Mexican steel company, specializing in the manufacture of steel products for construction, thin steel sheet, special bar quality (SBQ) and commercial profiles.

T A 2000 has more than 30 years of experience in the manufacture of steel. Innovation and optimization in production processes, have driven the company to renew and diversify its product catalog. In 2014 a cutting-edge technology has been implemented in T A 2000's steelmaking plant: an electric arc furnace (EAF) QUANTUM. The EAF QUANTUM, based on an optimized preheating and melting concept, delivers minimum conversion costs, maximized output, and environmental compliance.

T A 2000's value proposal is to offer its customers quality steel. T A 2000 has been granted with ISO 9001:2015 certification and above all the company focus on offering an unparalleled service, characterized by competitive delivery times and optimal business conditions for the growth of its clients.

T A 2000 is permanently committed to offer the market a dynamic, competitive and quality option. So that, the company has its main production plant in Orizaba; three distribution centers: Mérida, Arriaga, Silao and a commercial office in Mexico City.

1. General information

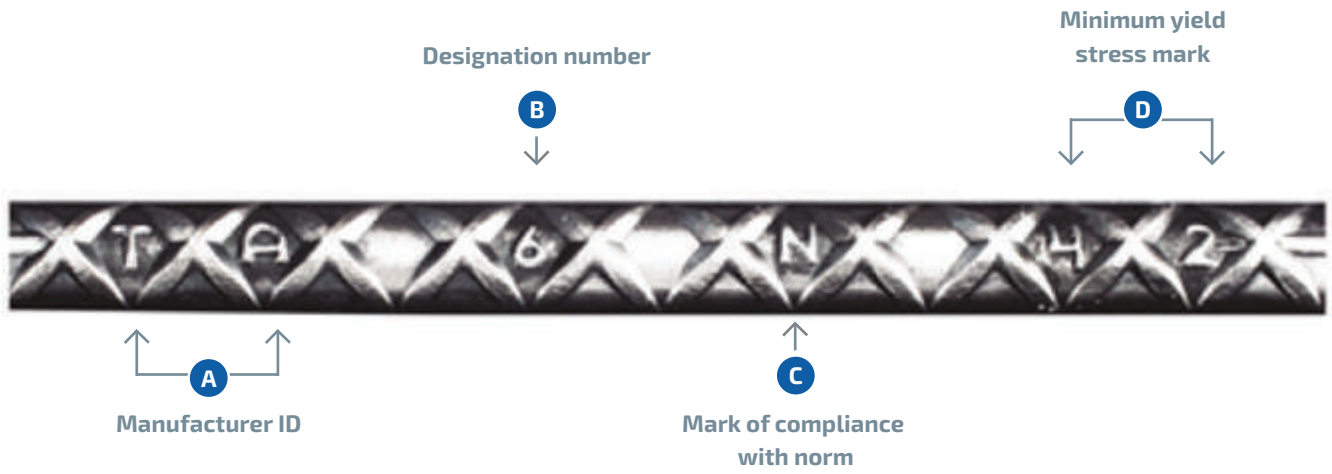
Product:	Steel reinforcing bar of several calibers manufactured from steel scrap
Name of the manufacturer:	T A 2000 S.A. de C.V.
Description of the product:	Steel rebar used to reinforce concrete in the construction industry. The surface of the rebar is corrugated to limit the relative longitudinal movement between the steel and the surrounding concrete.
Declared unit:	1 metric ton of steel reinforcing bar manufactured from steel scrap.
Construction product identification:	Central Product Classification: CPC 4124 Bars and rods, hot rolled, of iron or steel
Description of the main product components and or materials:	100% Steel manufactured using scrap steel as source of iron.
Programme:	International EPD® System, www.environdec.com EPD® EPD registered through the fully aligned regional programme/hub: EPD Latin America, www.epdlatinamerica.com LATIN AMERICA EPD®
Programme operator:	EPD International AB, Box 210 60, SE-100 31 Stockholm, Sweden EPD Latin America Chile: Alonso de Arcilla 2996, Ñuñoa, Santiago Chile Mexico: Boulevard de los Continentes No. 66 Colonia Valle Dorado. C.P. 54040 Tlalnepantla de Baz, Estado de México. México.
Date of issue:	2018-08-23
Valid to:	2023-07-05
Life cycle stages not considered:	Distribution, use, end of life.
Comparability of EPD of construction products	a. EPD of construction products may not be comparable if they do not comply with EN 15804. b. Environmental product declarations within the same product category from different programs may not be comparable
For more information consult	www.tyasa.com
Sites for which this EPD is representative	Manufacturing Plant ORIZABA: Carretera Federal México-Veracruz Km. 321, s/n, interior 2, Ixtaczoquitlán, Veracruz, C.P. 94450 Tel. 01 (272) 72 4 47 00 Ventas: Ext. 306 Steel Scrap Collection and pre-processing Plant MÉRIDA: Carretera Federal Mérida- Umán Km. 8.3, s/n, Colonia Ampliación Ciudad Industrial, Umán, Yucatán, C.P. 97390. Tel. 01 (999) 91 9 25 01 Ventas: Ext. 101 Steel Scrap Collection and pre-processing Plant ARRIAGA: Carretera Arriaga-Tapanatepec Km. 28.5, No. 250, Colonia Emiliano Zapata, Arriaga, Chiapas, C.P. 30462. Tel. (045) 96 61 13 56 88 Ventas: (045) 96 66 64 02 82 Steel Scrap Collection and pre-processing Plant SILAO: Carretera Silao-León Km. 157, s/n, Colonia Bustamante, Silao, Guanajuato, C.P. 36100. Tel. 01 (472) 72 3 94 32 / 01 (472) 72 3 94 35 Ventas: Ext. 107

2. The product

The steel reinforcing bar (rebar) manufactured by T A 2000 SA de CV is used as reinforcement of concrete structures in the construction industry.

Steel rebar is a steel product with semi-circular cross section. The surface of the rebar is corrugated to limit the relative longitudinal movement between the steel and the surrounding concrete.

TA 2000 produces TA42 and TA52 rebar with state-of-the-art technology (EAF QUANTUM) in the city of Ixtaczoquitlán, Veracruz. The process starts from the steelworks to the final product, which allows the full control on the factors involved in production which guarantees compliance with the international standard ASTM-A-615-G-60 and the Mexican standard NMX-B-506-CANACERO-2011 required by regulations of the construction industry in Mexico



Technical specifications:

Caliber* mm	Caliber* Inches	Designation number	Weight (kg/m)	Length (m)	Presentation Bent	Presentation Straight	No. of pieces per pack
9.5	3/8”	3	0.56	12	✓	✓	150
12.7	1/2”	4	0.99	12	✓	✓	84
15.9	5/8”	5	1.55	12	✓	✓	53
19	3/4”	6	2.24	12	✓	✓	37
22.2	7/8”*	7	3.04	12	✓	✓	27
25.4	1”	8	3.97	12	✓	✓	21
28.6	1 1/8”*	9	5.03	12	–	✓	16
31.8	1 1/4”	10	6.23	12	–	✓	13
34.9	1 3/8”*	11	7.50	12	–	✓	11
38.1	1 1/2”	12	8.94	12	–	✓	9

* Special calibers (7/8", 1 1/8" and 1 3/8") may be manufactured under client request

Mechanical properties:

Ultimate tensile strength	63 kg/mm²	72 kg/mm²
Minimum yield stress	**42 kg/mm²**	**52 kg/mm²**
Minimum elongation in 200 mm	**TA42**	**TA52**
3/8", 1/2", 5/8", 3/4"	9%	7%
1", 7/8”	8%	7%
1 1/4", 1 1/2", 1 1/8”, 1 3/8”	7%	6%

Characteristics of tests for mechanical properties determination:

Caliber	Mandrel diameter TA42	Mandrel diameter TA52
3/8", 1/2", 5/8"	3.5 d	5 d
3/4", 1", 7/8”	5 d	5 d
1 1/4", 1 1/8”, 1 3/8”	7 d	7 d
1 1/2"	8 d	8 d

Characteristic	Value
Temperature	16 ° C
Steering angle	180°
Other characteristics	Always keep the mandrel in contact with the rebar during bending. Apply a continuous and uniform force.

3 Content declaration

A list of materials and chemical substances including information about their hazardous properties is provided hereafter.

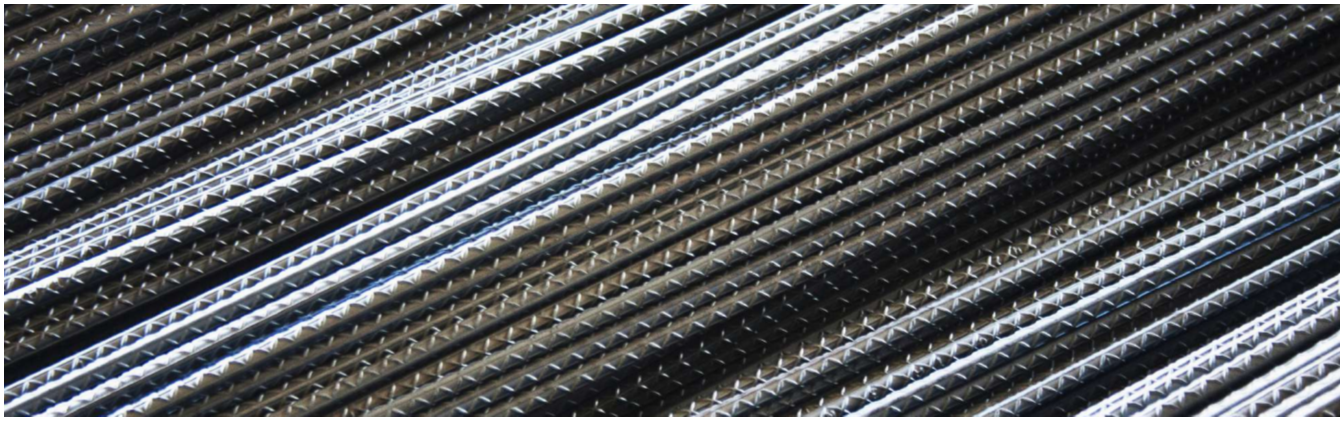
Materials for steel manufacturing			
Material	Function	Weight (%)	Health class[1]
Low Alloyed Steel	Reinforcement of concrete structures	100 %	Non hazardous

1According to EN15804 declaration of material content of the product shall list Substance of Very High Concern (SVHC) that are listed by European Chemicals Agency.

Steel manufactured in the Industrial Center of T A 2000 uses 100% steel scrap as source of iron.

4 Declared unit

1 metric ton of steel rebar manufactured from steel scrap ready to distribution.



5 Flow diagram and system boundary

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). The declared EPD is a "Cradle-to gate EPD" in line 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. The following figure describes the scope of the inventory performed in the LCA.

Life cycle environmental information of steel reinforcing bar manufactured from steel scrap							Other environmental information
Product stage			Construction process stage		Use stage	End of life stage	Reuse recovery stage
A1	A2	A3	A4	A5	B1 - B7	C1 - C4	D
Steel scrap pre-processing, production of ferroalloys, lime, carbon, graphite electrodes, calcium carbide and packaging of raw materials. Electricity generation and natural gas production used during manufacturing.	Transportation of scrap steel to production plant. Transportation of other raw materials. Transportation of ancillary materials. Internal transportation requirements.	Fresh water consumption. Production and consumption of ancillary materials: chemicals for water treatment, textiles, lubricating oils and grease for cleaning and maintenance Waste transportation, waste treatment and direct emissions to air and water.	Product distribution	Construction and installation	Use, maintenance, repair, replacement, refurbishment, operational energy use, operational water use	De-construction, demolition, transport, waste processing, disposal	Re-use-Recovery-Recycling-potential
Included	Included	Included	Not declared	Not declared	Not declared	Not declared	Not declared
Cradle-to-gate Declared unit							

5.1 Description of information modules

Description of information modules included in this EPD.

A1) Raw materials supply

Pre-processing of steel scrap.

Production of raw materials: ferroalloys, lime, carbon, graphite electrodes, calcium carbide.

Production of packaging materials for raw materials.

Generation and distribution of the electricity consumed in manufacturing.

Production and processing of natural gas used as fuel during the manufacturing process.

A2) Transportation

Transportation of scrap steel.

Transportation of other raw materials.

Transportation of ancillary materials.

Internal transportation requirements.

A3) Manufacturing

Consumption of fresh water.

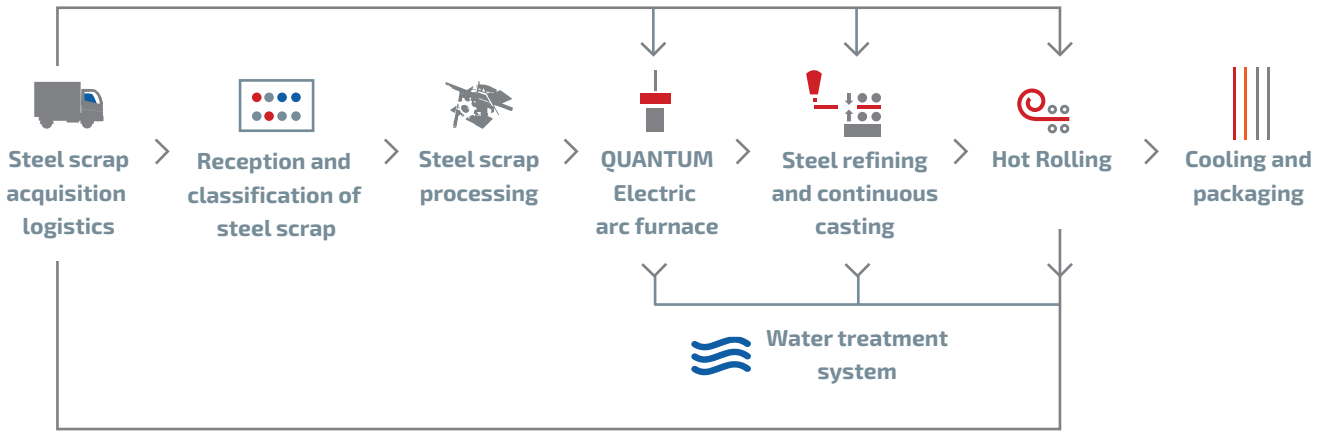
Production and consumption of ancillary materials: oxygen, nitrogen, chemicals for water treatment, textiles for cleaning and maintenance, lubricating oils and grease.

Waste generation and waste management processes.

Emissions to air and water.

Transport of waste to the treatment and final disposal site.

The manufacturing process is described in the following diagram:



5.2 Data quality assessment

T A 2000 collected primary (specific) data from annual internal records of the year 2016 for the following aspects:

- Distance for transportation of raw materials and ancillary materials for steel reinforcing bar manufacturing
- Raw materials consumption for manufacturing
- Energy consumption for manufacturing
- Production yield and generation of by products
- Consumption of ancillary materials during manufacturing
- Waste generation and waste management
- Emissions to air during manufacturing process
- Distance for transportation of waste to treatment

Secondary (generic) data for upstream processes were used for the following elements:

- Energy and materials consumption and emissions related to the production of raw materials for steelmaking
- Materials and energy consumption, emissions related to transport of raw materials and ancillary materials
- Energy and materials consumption and emissions related to the production of ancillary inputs
- Materials and energy consumption, emissions and waste management related to transport of waste and waste treatment

Electricity generation was modeled considering the technology mix at country level for the year 2016.

The assessment of data quality is provided in the following Tables:

A list of materials and chemical substances including information about their hazardous properties is provided hereafter.

Module A1) Raw materials supply					
Data	Time related coverage	Geographic coverage	Technological coverage	Data source	Measured or estimated
Raw materials consumption for steel rebar manufacturing	2016	Mexico	Modern	T A 2000	M
Transport distance of Steel scrap to pre-processing plants	2016	Mexico	Modern	T A 2000	M
Energy and materials consumption, waste and emissions generation from pre-processing steel scrap	2016	Mexico	Modern	T A 2000	M
Energy and materials consumption, waste and emissions generation from pre-processing steel scrap by independent providers	2016	Mexico	Modern	T A 2000	E
Energy consumption for steel rebar manufacturing	2016	Mexico	Modern	T A 2000	M
Consumption of fuels and emissions related to electricity production in Mexico at country level	2016	Mexico	Technological mix at country level	Mexicaniuh	M&E
Energy and materials consumption and emissions related to natural gas production in Mexico	2016	Mexico	Modern	Mexicaniuh	M&E
Energy and materials consumption and emissions related to the production of other raw materials for steelmaking	1990-2016	World average based on Europe	World average based on Europe	Ecoinvent 3.3	M&E

Module A2) Transportation					
Data	Time related coverage	Geographic coverage	Technological coverage	Data source	Measured or estimated
Distance for transportation of raw materials	2016	Mexico	Not applicable	T A 2000	M
Distance for transportation of ancillary inputs	2016	Mexico	Not applicable	T A 2000	M
Distance for transportation of natural gas	2016	Mexico	Not applicable	Google Maps	E
Materials and energy consumption, emissions and waste management related to transport of raw materials and ancillary materials.	1992-2014	World average based on Europe	World average based on Europe	Ecoinvent 3.3	M&E

Module A3) Manufacturing					
Data	Time related coverage	Geographic coverage	Technological coverage	Data source	Measured or estimated
Production yield and by-product generation	2016	Mexico	Modern	T A 2000	M
Consumption of ancillary materials during manufacturing	2016	Mexico	Modern	T A 2000	M
Energy and materials consumption and emissions related to the production of ancillary inputs	1990 - 2016	World average based on Europe	World average based on Europe	Ecoinvent 3.3	M&E
Waste generation during manufacturing process and management strategies	2016	Mexico	Modern	T A 2000	M
Energy and materials consumption and emissions related to waste treatment process	1990 - 2016	World average based on Europe	World average based on Europe	Ecoinvent 3.3	M&E
Emissions to air during manufacturing process	2016	Mexico	Modern	T A 2000 EPA AP42	M
Distance for transportation of waste to treatment	2016	Mexico	Modern	T A 2000 & Google Maps	E
Materials and energy consumption, emissions and waste management related to transport of waste.	1992-2014	World average based on Europe	World average based on Europe	Ecoinvent 3.3	M&E

6 Environmental performance-related information

Since this is a Cradle to Gate EPD, reference service life is not specified.

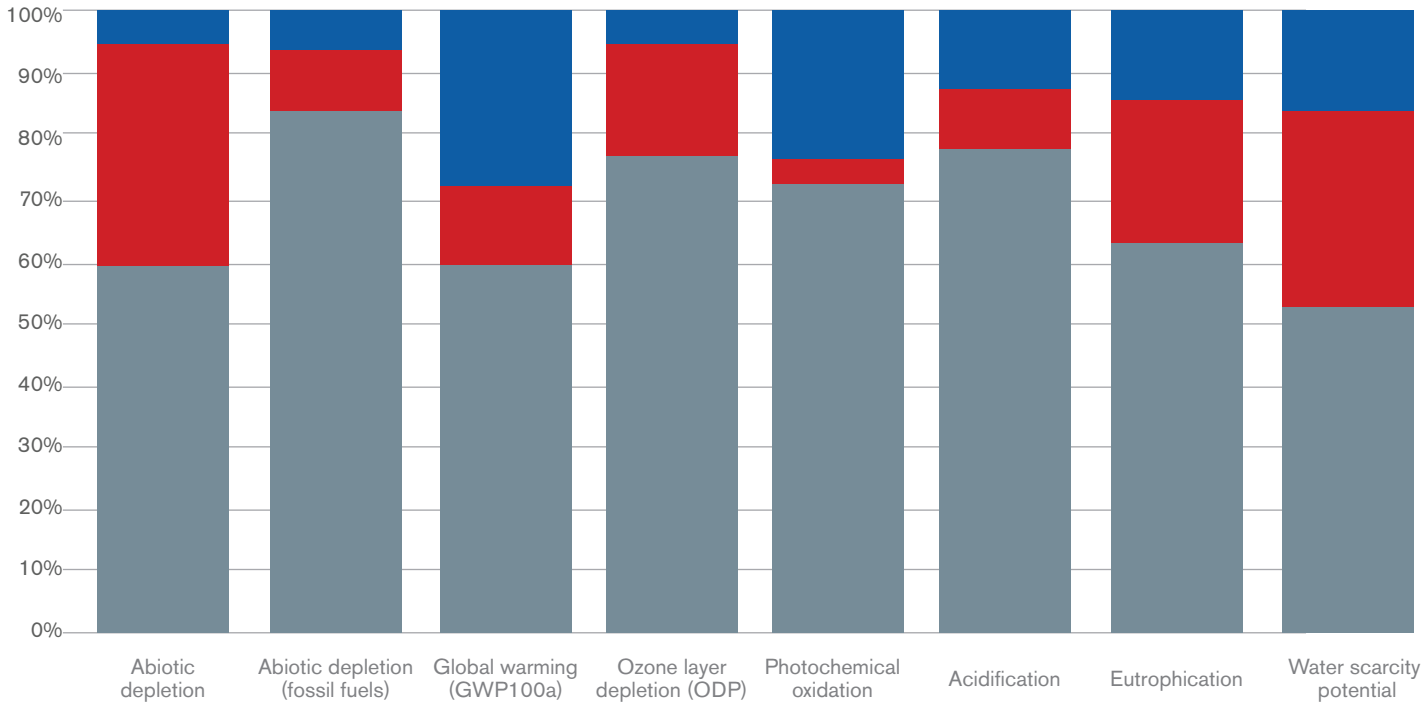
6.1 Environmental potential impact

All individual information modules are reported separately. However, as supplement information a figure for the total impact across all phases is provided.

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. 2016).

Steel rebar manufactured from steel scrap						
Impact Category	Unit	A1) Raw materials	A2) Transportation	A3) Manufacture	Total A1 - A3	A4 - A5, B1-B7, C1-C4, D
Abiotic depletion	kg Sb equiv %	2.20E-04 60.3%	1.27E-04 34.9%	1.76E-05 4.8%	3.65E-04 100%	Modules not declared
Abiotic depletion (fossil fuels)	MJ %	8 765 83.4%	1 112 10.6%	628 6.0%	10 505 100%	
Global warming (GWP100a)	kg CO_2 equiv %	359 59.3%	71 11.7%	175 29.0%	605 100%	
Ozone layer depletion (ODP)	kg CFC-11 equiv %	6.24E-05 78.7%	1.26E-05 15.9%	4.30E-06 5.4%	7.93E-05 100%	
Photochemical oxidation	kg C_2H_4 eq %	4.55E-01 73.8%	1.96E-02 3.2%	1.42E-01 23.0%	6.17E-01 100%	
Acidification	kg SO_2 equiv %	4.23E+00 79.1%	5.31E-01 9.9%	5.87E-01 11.0%	5.35E+00 100%	
Eutrophication	kg PO_4--- eq %	2.75E-01 64.6%	8.61E-02 20.3%	6.41E-02 15.1%	4.25E-01 100%	
Water scarcity potential	m^3eq %	10.0 56.4%	4.7 26.7%	3.0 16.8%	17.7 100.0%	

The graphical representation of the environmental potential impact of the Steel rebar manufactured by T A 2000 is showed in the following Figure:



A1) Raw materials supply

A2) Transportation

A3) Manufacturing

6.2 Use of resources

Environmental parameters describing the use of renewable and non-renewable material resources, renewable and non-renewable primary energy as well as the generation of materials for recycling or energy recovery are presented below.

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 (Huijbregts et al. 2017).

Parameter	Unit	Total	A1) Raw materials supply	A2) Transportation	A3) Manufacturing
Use of renewable primary energy excluding renewable primary energy resources used as raw materials	MJ	576	508	17	51
Use of renewable primary energy as raw materials	MJ	0	0	0	0
Total use of renewable primary energy resources	MJ	576	508	17	51
Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials	MJ	10 979	9 176	1 133	669
Use of non-renewable primary energy used as raw materials	MJ	0	0	0	0
Total use of non-renewable primary energy resources	MJ	10 979	9 176	1 133	669
Use of secondary material	kg	1 141	0	0	1 141
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	3.41	1.00	0.23	2.18

6.3 Other indicators describing waste categories

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). Environmental parameters describing waste generation are provided below:

Output parameter	Unit	Total	1) Raw materials supply	A2) Transportation	A3) Manufacturing (direct)**	A3) Manufacturing (indirect)**
Hazardous waste	kg	23.0	1.8	6.41E-04	10.6	10.6
Non hazardous waste	kg	223.4	68.0	58.2	92.6	4.6
Radioactive waste*	kg	2.06E-02	1.24E-02	7.16E-03	0	1.07E-03
Components for reuse	kg	0	0	0	0	0
Materials for recycling	kg	37	0	0	37	0
Materials for energy recovery	kg	0	0	0	0	0
Exported electricity	MJ	0	0	0	0	0
Exported heat	MJ	0	0	0	0	0

*No radioactive waste is produced during T A 2000 operations.

**The column "A3) Manufacturing (direct) refers to direct data from T A 2000 operations. The column "A3) Manufacturing (indirect) refers to background data regarding production of ancillary materials and other processes outside T A 2000's facilities".

6.4 Specific statements about the EPD

a) Geographical coverage: Mexico.

b) Scope of the EPD: This EPD only covers the Cradle to Gate life cycle stages because other stages are very dependent on particular scenarios and are better developed for specific building or construction works.

c) EPD Comparison:
a. EPD of construction products may not be comparable if they do not comply with EN 15804.
b. Environmental product declarations within the same product category from different programs may not be comparable.

d) Additional information can be provided on the request of the costumer.

e) Allocation rules:

a. Allocation for co-products: The first allocation procedure was performed so that it reflects the way in which the inputs and outputs change by quantitative changes in the products (or functions) delivered by the system. In this case, a mass-basis allocation procedure was applied when co-products are present in a process.

Process	By-product
Steel scrap processing yard	Metals contained in flap: aluminium, copper, bronze, etc.
Steelmaking	Slag and steel husk
Hot rolling	Steel husk

b. Allocation for recycling: Allocation of recycled material known as open loop recycling, is reported in the inventory under the Polluters Pay (PP) allocation method. In the PP allocation method, the exact boundary settings between the first and the next product systems are defined by the willingness to pay for the recycled material.

This implies that for inflow of recycled material to the product system, the recycling process and the transportation from the recycling process to where the material is used were included. If an outflow of material to recycling was reported, the transportation of the material to a sorting facility or recycling process was included.

f) Cut off criteria applied in the EPD:
a. Environmental impact from construction, production equipment, and tools that are not directly consumed in the production process are not accounted for in the LCI.
b. Personnel-related impacts, such as transportation to and from work, are also not accounted for in the LCI.

g) Key assumptions of the LCA:
a. Slag, as well as plastic, wood and paper waste are transported to their treatment or recycling site within the same municipality (34 km).
b. Natural gas is obtained from gas processing complex Matapionche-Veracruz, located 80.9 km from T A 2000 production plant (Ixtaczoquitlán).
c. Pre-processing by independent national and foreign suppliers is similar to that reported by the pre-processing plants of T A 2000.

7 Verification and registration

CEN standard EN 150804 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 Arcilla 2996, Ñuñoa, Santiago Chile Mexico: Boulevard de los Continentes No. 66 Colonia Valle Dorado. C.P. 54040 Tlalnepantla de Baz, Estado de México. México.
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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 verification
External third-party verifier and critical reviewer of the LCA:	Claudia A. Peña
Accredited or approved by:	The International EPD® System

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www.epd-latinamerica.com

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Huijbregts MAJ, Steinmann ZJN, Elshout PMF, Stam G, Verones F, Vieira M, Zijp M, Hollander A, van Zelm R. ReCiPe2016: a harmonised life cycle impact assessment method at midpoint and endpoint level. International Journal on Life Cycle Assessment Volume 22 Issue 2. pp 138-147. https://doi.org/10.1007/s11367-016-1246-y

ISO 14025:2006 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.

ISO 21930:2017 Sustainability in buildings and civil engineering works -- Core rules for environmental product declarations of construction products and services.

ISO/TS 14067:2013 Greenhouse gases -- Carbon footprint of products -- Requirements and guidelines for quantification and communication.

ISO/TS 14071:2014 Environmental management -- Life cycle assessment -- Critical review processes and reviewer competencies: Additional requirements and guidelines to ISO 14044:2006.

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