GRUPO INDI
GAMI INGENIERIA E INSTALACIONES S.A. DE C.V.

LATIN AMERICA EPD®

Environmental Product Declaration

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

Precast Steel & Concrete Piles

GAMI INGENIERIA E INSTALACIONES, S.A. DE C.V.

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
EPD registration number	S-P-01231
Issue date:	2018-07-18
Validity date:	2023-07-17 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
Revision date:	2018-08-08
Geographical scope:	Mexico

EPD Content

GAMI INGENIERÍA E INSTALACIONES, S.A. de C.V. (GAMI), is the engineering and construction unit of Grupo Indi. It is dedicated to infrastructure and construction in Mexico.

The company began operations in 1977 and their processes are certified with the highest international quality standards.

GAMI manufacture precast piles of steel and concrete, which are used in building base (www.grupoindi.mx).

This Environmental Product Declaration (EPD) is in accordance with ISO 14025 and EN 15804.

This 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.

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

2. General information

Product:	Precast Steel & Concrete Piles.
Name of the manufacturer:	GAMI INGENIERIA E INSTALACIONES, S.A. DE C.V.
Description of the product:	Precast piles manufactured with steel & concrete.
Declared unit:	An item (piece).
Construction product identification:	CPC 421 Structural metal products and parts thereof.
Description of the main product components and or materials: Programme:	Precast Steel & Concrete Piles are of different sizes: • Pile 40 cm x 40 cm. Which one is a weighted average of different lengths and weights: 13.5 m 5 841 kg, 15.25 m 6 594 kg, 19.5 m 8 420 kg, and 22.0 m 9 371 kg. • Pile 50 cm x 50 cm. Which one is a weighted average of different lengths and weights: 14.0 m 9 129 kg, 16.0 m 10 426 kg, 17.0 m 11 073 kg, 20.8 m 13 509 kg, 21.2 m 13 767 kg, 21.9 m 14 220 kg, 22.8 m 14 768 kg, and 23.3 m 15 087 kg.
Programme operator:	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® 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:	2018-07-18
Valid to:	2023-07-17
Life cycle stages not considered:	Construction process stage, Use stage, End of life stage, Recovery stage
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 information in detail for modules A1, A2 and A3: • Product definition and physical data • Information about raw materials and origin • Specifications on manufacturing 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.grupoindi.com
Sites for which this EPD is representative	Zapotecas 17 PB, Col. Santa Cruz Acatlán, Naucalpan, Estado de México, CP 53150
Management System: Product Category Rules (PCR):	Environmental Management System ISO 14001:2004 Quality Management System ISO 9001:2008 PCR according to ISO 14025 date 2016-03-09. Constructions products and construction services. Product group classification: multiple un CPC codes 2012:01 version 2.01 Valid until: 2019-03-03
Public intended:	B2B (Business to Business)
Verification date:	2018-07-09
External verification:	In accordance with EN 15804 by Bárbara María Civit.
Practitioner LCA:	Center for Life Cycle Assessment and Sustainable Design (CADIS)

2.1 Verification

The CEN Standard EN 15804 serves as the core PCR

Independent verification of the declaration and data according to ISO 14025

Internally ☐ Externally ☑

Verifier: Dr. Bárbara María Civit

Independent verifier appointed by International EPD® System

3. Precast Steel & Concrete Piles Description

GAMI manufactures steel and concrete piles of different lengths and sections, section 40x40 cm and section 50x50 cm; both sections have concrete cover of 7.50 cm. Plie cap of 30 cm., is adapted in the bottom pile, from the break point at the end of this. The Figure 1 shows pile geometry, where D means the pile section (DxD).

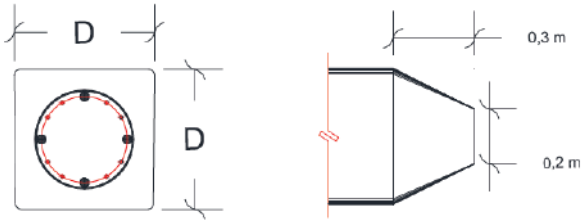


Figure 1. Pile geometry (Grupo Indi, 2017).

The pile is a piece of prestressed concrete, where strand (torón in Spanish) is tensioned 80% of its last prestressing force (Fpu, Fuerza de pretensado última in Spanish). Concrete used in GAMI piles is Type III, which is resistant to sulphates and has a f'c = 560 kg/cm^2 (force of compression).

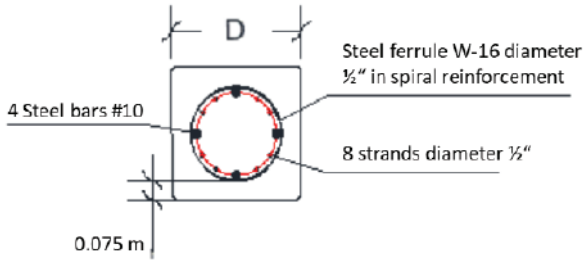


Figure 2. Pile components (Grupo Indi, 2017).

Reinforced concrete consists of four steel bars of number 10, 8 strands diameter ½" and spiral reinforcement of steel ferrule (zuncho in Spanish) W-16 diameter ½". Figure 2 shows pile componets.

Steel reinforced used is type A-52 with a yield strength (fy) equal to 5 200 kg/cm^2, steel ferrule has fy = 4 280 kg/cm2. Strand has Fpu equal to 19 000 kg/cm^2.

The pile has two or four lifting hooks depending on the length, which have 2 strands of ½". The lifting hooks were designed to absorb services loads during form removal and transporting to construction site.

4 Content declaration

Two precast steel & concrete piles are of different sizes, piles material content is presented in the following Table.
• Pile 40 cm x 40 cm. The pile declared is a weighted average of different lengths and weights: 13.5 m 5 841 kg, 15.25 m 6 594 kg, 19.5 m 8 420 kg and 22.0 m 9 371 kg.
• Pile 50 cm x 50 cm. The pile declared is a weighted average of different lengths and weights: 14.0 m 9 129 kg, 16.0 m 10 426 kg, 17.0 m 11 073 kg, 20.8 m 13 509 kg, 21.2 m 13 767 kg, 21.9 m 14 220 kg, 22.8 m 14 768 kg, and 23.3 m 15 087 kg.

Material content of 1 precast steel & concrete pile of 40 cm x 40 cm				
Material	**Weight**	**Function**	**CAS No.**	**Health class[1]**
Concrete (86.4%)	Cement Portland 25.8%	Provides adherent properties	65997-15-1	Non hazardous
	Sand 29.2%	Reduces cracks in concrete	14808-60-7	Non hazardous
	Gravel 45%	Contributes to compressive strength	1317-65-3	Non hazardous
	Water 0.01%	Hydrate and set concrete	7732-18-5	Non hazardous
Steel	10.5%	Provides greater resistance	Ferro alloy	Non hazardous
Silica	2.85%	Increases concrete chemical and mechanical resistance	7631-86-9	Non hazardous
Calcium nitrite	0.24%	Inhibits corrosion	13780-06-8	Non-hazardous
Polycarboxylate	0.0002%	Water-reducing admixtures	26530-20-1 7732-18-5	Non-hazardous
Organic salts	0.02%	Water-reducing admixtures	527-07-1 26530-20-1 7732-18-5	Non-hazardous

Material content of 1 precast steel & concrete pile of 50 cm x 50 cm				
Material	**Weight**	**Function**	**CAS No.**	**Health class[2]**
Concrete (89.5%)	Cement Portland 25.8%	Provides adherent properties	65997-15-1	Non hazardous
	Sand 29.2%	Reduces cracks in concrete	14808-60-7	Non hazardous
	Gravel 45%	Contributes to compressive strength	1317-65-3	Non hazardous
	Water 0.01%	Hydrate and set concrete	7732-18-5	Non hazardous
Steel	7.24%	Provides greater resistance	Ferro alloy	Non hazardous
Silica	2.96%	Increases concrete chemical and mechanical resistance	7631-86-9	Non hazardous
Calcium nitrite	0.25%	Inhibits corrosion	13780-06-8	Non-hazardous
Polycarboxylate	0.0002%	Water-reducing admixtures	26530-20-1 7732-18-5	Non-hazardous
Organic salts	0.02%	Water-reducing admixtures	527-07-1 26530-20-1 7732-18-5	Non-hazardous

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

Reinforcing steel contents 95.84% of recycled material, 2.86% of industrial return recycled material and 1.3% of ferro alloy material.

5. LCA Rules

5.1 Declared unit

• One pile 40 cm x 40 cm. The pile declared is a weighted average of different lengths and weights: 13.5 m 5 841 kg, 15.25 m 6 594 kg, 19.5 m 8 420 kg, and 22.0 m 9 371 kg.
• One pile 50 cm x 50 cm. The pile declared is a weighted average of different lengths and weights: 14.0 m 9 129 kg, 16.0 m 10 426 kg, 17.0 m 11 073 kg, 20.8 m 13 509 kg, 21.2 m 13 767 kg, 21.9 m 14 220 kg, 22.8 m 14 768 kg, and 23.3 m 15 087 kg.

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

Life cycle environmental information of							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
X	X	X	MND	MND	MND	MND	MND

A flow diagram of the product system is showed below.

A1) Raw materials supply → **A2) Transportation** → **A3) Manufacturing**

Production of raw materials:
Concrete
Chemical additives
Corrosion inhibitor
Steel bar
Strand
Steel ferrule
Electricity generation and consumption
Packaging of raw materials

→

Transport from raw materials production to GAMI plant, including sea and land transportation when required.
Transport in the manufacturing site

→

Water to wash

↓

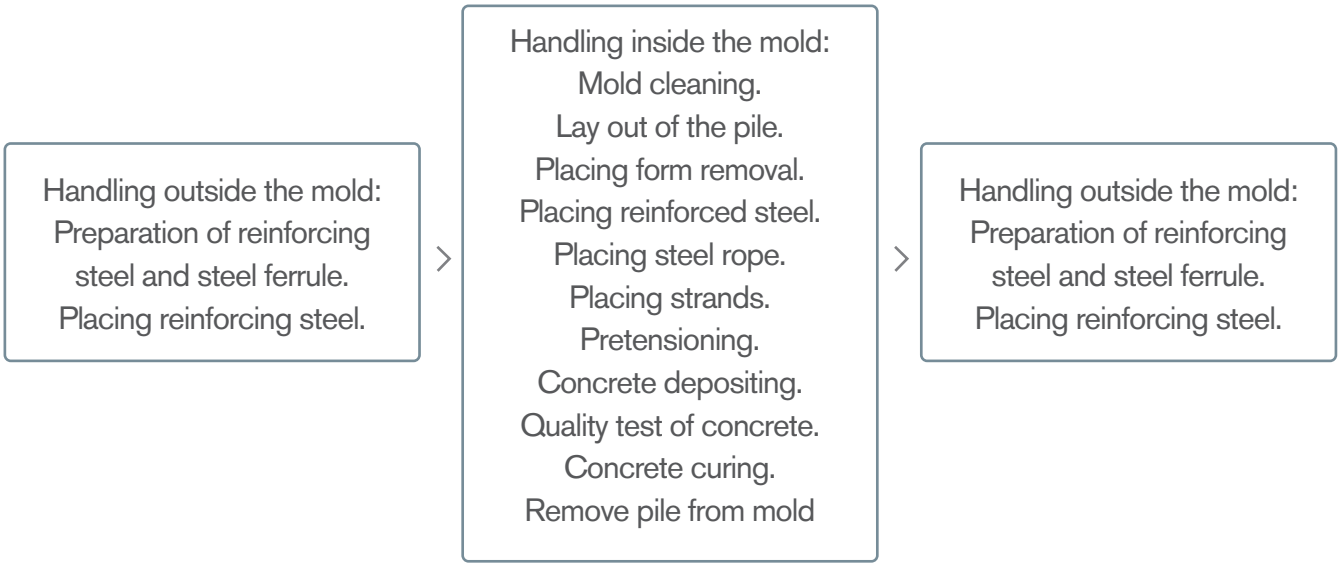
Manufacturing process of precast piles

↓

Air emissions.
Waste water.
Plastic waste generation
Transport of plastic waste to recycling.

5.3 Description of the manufacturing process

Manufacturing process is showed in the next diagram.



5.4 Assumptions

The plastic waste is recycled in a site near to manufacturing site, to 1.2 km of distance. The transportation load of plastic waste to recycled site is less than five tonne.

Waste water in manufacturing process is reused such as irrigation water of railyard.

5.5 Cut-off criteria

No cut-off criteria were applied to the elemental components of the piles, thus, 100% of the collected data was included.
In the corresponding LCA, no processes, materials, or emissions that make a significant contribution to the environmental impact of the doors, have been omitted. Taking this into account, there is no evidence to suggest that inputs or outputs contributing more than 1% to the overall mass or energy of the system, or that are environmentally significant, have been omitted either.

However, the following elements were not considered:

- Infrastructure in manufacturing, such as: machinery equipment and building.
- Materials for maintenance in manufacturing such as oils, tissue.
- Personal protection equipment.

5.6 Allocation

To precast steel & concrete pile 40 cm x 40 cm there are four specifications, such as, lengths, weight, and concrete volume, so weighted sum was made based on production percentage of each pile type, with this production percentage the reference flow was allocated to the LCI.

To precast steel & concrete pile 50 cm x 50 cm there are nine specifications, such as, lengths, weight, and concrete volume; the allocation was using weighted sum was made based on production percentage of each pile type.

5.7 Time representativeness

One year is the reference for data collection. Second semester 2016 and first semester 2017.

5.8 Data quality assessment

The following Tables describe data included for modules A1, A2, and A3, as well as their quality requirements and data source; applying to both piles assessed.

Data information included for module A1 – Raw materials supply				
Data	Time related coverage	Geographic coverage	Technological coverage	Data source
Cement consumption	2016 – 2017	Mexico	Current	Company's report
Cement production	2005 - 2016	USA	Current	Ecoinvent 3.3 adapted to Mexico
Gavel consumption	2016 – 2017	Mexico	Current	Company's report
Gravel production	2016 – 2017	Mexico	Current	Mexicaniuh
Sand consumption	2016 – 2017	Mexico	Current	Company's report
Sand production	2016 – 2017	Mexico	Current	Mexicaniuh
Water consumption	2016 – 2017	Mexico	Current	Company's report
Concrete consumption	2016 – 2017	Mexico	Current	Company's report
Concrete production in situ	2016 – 2017	Mexico	Current	Company's report
Steel consumption	2016 – 2017	Mexico	Current	Company's report and technical datasheets
Steel production	2010 - 2015	European Community	Current	Ecoinvent 3.3 adapted to Mexico
Polycarboxylate consumption	2016 – 2017	Mexico	Current	Company's report and technical datasheets
Polycarboxylate production	2010 - 2016	Global	Average global	Ecoinvent 3.3
Organic salts consumption	2016 – 2017	Mexico	Current	Company's report and technical datasheets
Organic salts production	2010 - 2016	European Community	Current	Ecoinvent 3.3
Micro silica consumption	2016 – 2017	Mexico	Current	Company's report and technical datasheets
Micro silica production	2010 - 2016	Switzerland	Current	Ecoinvent 3.3
Corrosion inhibitor consumption	2016 – 2017	Mexico	Current	Company's report and technical datasheets
Corrosion inhibitor production	2010 - 2016	Global	Average global	Ecoinvent 3.3
Polypropylene consumption	2016 – 2017	China	Current	Company's report
Polypropylene production	2010 - 2016	European average	Current	Ecoinvent 3.3
Electricity consumption	2016 – 2017	Mexico	Modern	Electricity consumption bill
Electricity generation	2016	Mexico	Modern	Mexicaniuh

Data information included for module A2 – Transport				
Data	Time related coverage	Geographic coverage	Technological coverage	Data source
National raw materials origin	2016 – 2017	Mexico	Current	Company's report
Transport from raw materials production to GAMI plant, including sea and land transportation	2005 - 2016	USA	Current	Ecoinvent 3.3 adapted to Mexico
Diesel consumption	2016 – 2017	Mexico	Current	Company's report
Diesel production	2015	Mexico	Current	Ecoinvent 3.3 adapted to Mexico
Gasoline consumption	2016 – 2017	Mexico	Current	Company's report
Gasoline production	2015	Mexico	Current	Ecoinvent 3.3 adapted to Mexico
Air emissions	2016	European Community	Current	Emission factors from EEA*

*EEA = European Environment Agency. Emission Inventory Guidebook: Road transport.

Data information included for module A3 – Manufacturing				
Data	Time related coverage	Geographic coverage	Technological coverage	Data source
Water consumption	2016 – 2017	Mexico	Current	Company's report
Waste water generation	2016 – 2017	Mexico	Current	Company's report
Air emissions	2016	USA	Current	Emission factors from EPA*
Polypropylene waste generation	2016 – 2017	Mexico	Current	Company's report
Transport of polypropylene waste to recycling	2009 -2016	European average	Current	Ecoinvent 3.3
Plastic recycled process	2001 - 2016	Global	Current	Ecoinvent 3.3

*EPA = Environmental Protection Agency

6 Environmental performance

SimaPro 8.4 was used for Life Cycle Impact Assessment to this cradle to gate EPD.

6.1. Environmental performance: Precast steel & concrete pile 40 cm x 40 cm

Potential environmental impact - 1 precast steel & concrete pile 40 cm x 40 cm
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). The Table below shows the LCA results for the declared unit: 1 precast steel & concrete pile 40 cm x 40 cm.

Parameters describing potential environmental impact - 1 precast steel & concrete pile of 40 cm x 40 cm						
Impact Category	Unit	A1	A2	A3	(A4 – D)	Total
Global Warming	kg CO_2 eq.	1 829	162	1.3E-06	MND	1 992
Ozone Depletion	kg CFC-11 eq.	1.44E-04	2.95E-05	2.24E-13	MND	1.74E-04
Acidification for soil and water	kg SO_2 eq.	9.81	1.35	4.86E-09	MND	11.2
Eutrophication	kg $(PO_4)^{3-}$ eq.	1.18	0.24	1.48E-03	MND	1.42
Photochemical ozone creation	kg Ethene eq.	0.99	0.06	2.26E-10	MND	1.05
Depletion of abiotic resources-elements	kg Sb eq.	1.95E-03	1.57E-04	6.93E-12	MND	2.10E-03
Depletion of abiotic resources-fossil fuels	MJ, net calorific value	17 007	3 187	1.98E-05	MND	20 194
Water scarcity potential	m^3 eq.	16	10.2	1.10E-04	MND	26.2

Use of resources - 1 precast steel & concrete pile of 40 cm x 40 cm

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). Table below shows the results for the declared unit: 1 precast steel & concrete pile of 40 cm x 40 cm.

Parameters describing resource use - 1 precast steel & concrete pile of 40 cm x 40 cm						
Parameter	Unit	A1	A2	A3	(A4 – D)	Total
Primary energy resources – renewable: use as energy carrier	MJ, net calorific value	859	24.6	3.05E-07	MND	883
Primary energy resources – renewable: use as raw materials	MJ, net calorific value	0	0	0	MND	0
Total primary energy resources - renewable	MJ, net calorific value	859	24.6	3.05E-07	MND	883
Primary energy resources – Non-renewable: use as energy carrier	MJ, net calorific value	17 871	3 224	2.03E-05	MND	21 095
Primary energy resources – Non-renewable: use as raw materials	MJ, net calorific value	0	0	0	MND	0
Total primary energy resources – Non-renewable	MJ, net calorific value	17 871	3 224	2.03E-05	MND	21 095
Secondary material	kg	0	0	0	MND	0
Renewable secondary fuels	MJ, net calorific value	0	0	0	MND	0
Non-renewable secondary fuels	MJ, net calorific value	0	0	0	MND	0
Net use of fresh water	m^3	10.4	0.49	1.00E-04	MND	10.8

Waste production - 1 precast steel & concrete pile of 40 cm x 40 cm

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). The results are declared per unit: 1 precast steel & concrete pile of 40 cm x 40 cm.

Parameters describing waste categories and output flows - 1 precast steel & concrete pile of 40 cm x 40 cm						
Parameter	Unit	A1	A2	A3	(A4 – D)	Total
Hazardous waste disposed	kg	0.01	1.72E-03	1.46E-11	MND	0.01
Non-hazardous waste disposed	kg	120	50	5.67E-07	MND	170
Radioactive waste disposed*	kg	0.04	0.02	1.28E-10	MND	0.06
Components for reuse	kg	0	0	0	MND	0
Materials for recycling	kg	0	0	3.70E-03	MND	3.70E-03
Materials for energy recovery	kg	0	0	0	MND	0
Exported energy	MJ	0	0	0	MND	0
Exported energy, thermal	MJ	0	0	0	MND	0

*No radioactive waste is produced during piles manufacturing operation.

6.2. Environmental performance: 1 Precast steel & concrete pile of 50 cm x 50 cm

Potential environmental impact - 1 precast steel & concrete pile of 50 cm x 50 cm

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). The Table below shows the LCA results for the declared unit: 1 precast steel & concrete pile of 50 cm x 50 cm.

Parameters describing potential environmental impact - 1 precast steel & concrete pile of 50 cm x 50 cm						
Impact Category	Unit	A1	A2	A3	(A4 – D)	Total
Global Warming	kg CO_2 eq.	2 810	281	2.28E-06	MND	3 091
Ozone Depletion	kg CFC-11 eq.	2.03E-04	5.09E-05	4.01E-13	MND	2.54E-04
Acidification for soil and water	kg SO_2 eq.	12.1	2.39	8.71E-09	MND	14.5
Eutrophication	kg $(PO_4)^{3-}$ eq.	1.73	0.42	2.66E-03	MND	2.15
Photochemical ozone creation	kg Ethene eq.	1.12	0.11	4.05E-10	MND	1.23
Depletion of abiotic resources-elements	kg Sb eq.	2.75E-03	2.61E-04	1.24E-11	MND	3.01E-03
Depletion of abiotic resources-fossil fuels	MJ, net calorific value	21 671	5 544	3.55E-05	MND	27 215
Water scarcity potential	m^3 eq.	20.3	17.5	2.20E-04	MND	37.8

Use of resources - 1 precast steel & concrete pile of 50 cm x 50 cm

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). Table below shows the results for the declared unit: 1 precast steel & concrete pile of 50 cm x 50 cm.

Parameters describing resource use - 1 precast steel & concrete pile of 50 cm x 50 cm						
Parameter	Unit	A1	A2	A3	(A4 – D)	Total
Primary energy resources – renewable: use as energy carrier	MJ, net calorific value	1 036	41.8	5.47E-07	MND	1 078
Primary energy resources – renewable: use as raw materials	MJ, net calorific value	0	0	0	MND	0
Total primary energy resources - renewable	MJ, net calorific value	1 036	41.8	5.47E-07	MND	1 078
Primary energy resources – Non-renewable: use as energy carrier	MJ, net calorific value	22 658	5 608	3.63E-05	MND	28 266
Primary energy resources – Non-renewable: use as raw materials	MJ, net calorific value	0	0	0	MND	0
Total primary energy resources – Non-renewable	MJ, net calorific value	22 658	5 608	3.63E-05	MND	28 266
Secondary material	kg	0	0	0	MND	0
Renewable secondary fuels	MJ, net calorific value	0	0	0	MND	0
Non-renewable secondary fuels	MJ, net calorific value	0	0	0	MND	0
Net use of fresh water	m^3	16.1	0.84	2.00E-04	MND	16.1

Waste production - 1 precast steel & concrete pile of 50 cm x 50 cm
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).

The results are declared per unit: 1 precast steel & concrete pile of 50 cm x 50 cm.

Parameters describing waste categories and output flows - 1 precast steel & concrete pile of 50 cm x 50 cm						
Parameter	Unit	A1	A2	A3	(A4 – D)	Total
Hazardous waste disposed	kg	0.01	3.00E-03	2.62E-11	MND	0.02
Non-hazardous waste disposed	kg	151	76.3	1.02E-06	MND	228
Radioactive waste disposed*	kg	0.05	0.04	2.29E-10	MND	0.09
Components for reuse	kg	0	0	0	MND	0
Materials for recycling	kg	0	0	3.70E-03	MND	3.70E-03
Materials for energy recovery	kg	0	0	0	MND	0
Exported energy	MJ	0	0	0	MND	0
Exported energy, thermal	MJ	0	0	0	MND	0

*No radioactive waste is produced during piles manufacturing operation

6.3. Interpretation of LCA Results

LCA study (cradle to gate) shows that the environmental profiles of one precast steel & concrete pile of 40 cm x 40 cm (weighted average of different lengths and weights: 13.5 m 5 841 kg, 15.25 m 6 594 kg, 19.5 m 8 420 kg, and 22.0 m 9 371 kg) and one precast steel & concrete pile of 50 cm x 50 cm (weighted average of different lengths and weights: 14.0 m 9 129 kg, 16.0 m 10 426 kg, 17.0 m 11 073 kg, 20.8 m 13 509 kg, 21.2 m 13 767 kg,

21.9 m 14 220 kg, 22.8 m 14 768 kg, and 23.3 m 15 087 kg) are similar in raw materials and transport stages. In both cases the impact of manufacture stage is the same.

Raw materials supply stage, A1, has the greatest impact in all categories with contributions greater than 75%, due to cement consumption and steel bar consumption, for both piles.

Transport stage, A2, has significant impact in the categories: depletion of abiotic resources-fossil fuels and ozone depletion due to fuels consumption and maritime transport for the silica.
Manufacturing stage, A3, has no significant environmental impact. There is a predominance of non-renewable energy consumption, according to LCA results (cradle to gate).

7. Additional information

Environment

The Environmental Management System (EMS) of GAMI INGENIERÍA E INSTALACIONES S.A. DE C.V., meets the requirements of the Standard NMX-SAA-14001-IMNC-2004 / ISO 14001:2004. The EMS applies to the following scopes: minimization of environmental impacts of construction, maintenance of civil and electromechanical works specialized for different projects: housing construction, public buildings and engineering works such as highways, roads, streets, bridges, tunnels, railways, airports, hydraulic works, marine works, industrial facilities, pipelines and power lines.

Quality

The Quality Management System (QMS) of GAMI INGENIERÍA E INSTALACIONES S.A. DE C.V., meets the requirements of the Standard NMX-CC-9001-IMNC-2008 / ISO 9001:2008. The QMS applies to the following scopes: construction, maintenance of civil and electromechanical works specialized for different projects: housing construction, public buildings and engineering works such as highways, roads, streets, bridges, tunnels, railways, airports, hydraulic works, marine works, industrial facilities, pipelines and power lines.

Safety

The Occupational Health and Safety Management System of GAMI INGENIERÍA E INSTALACIONES S.A. DE C.V., meets the requirements of the Standard NMX-SAST-001-IMNC-2008 / OHSAS 18001:2007. The Occupational Health and Safety Management System applies to the following scopes: occupational health and safety for the processes of construction, maintenance of civil and electromechanical works specialized for different projects: housing construction, public buildings and engineering works such as highways, roads, streets, bridges, tunnels, railways, airports, hydraulic works, marine works, industrial facilities, pipelines and power lines.

8 Verification and registration

CEN standard EN 15804 served as the core PCR	
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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