Environmental Product Declaration

This Environmental Product Declaration (EPD) covers thirty (30) concrete mixes produced by CEMEX México, México City Business Unit at Central Plant in México City, México.

Company

CEMEX is a global building materials company that provides high-quality products and reliable service to customers and communities in more than 50 countries throughout the world, and maintains trade relationships in over 100 nations. We work hard to develop and deliver the best solutions in cement, ready-mix, admixtures and aggregates...so we can transform ideas into reality.

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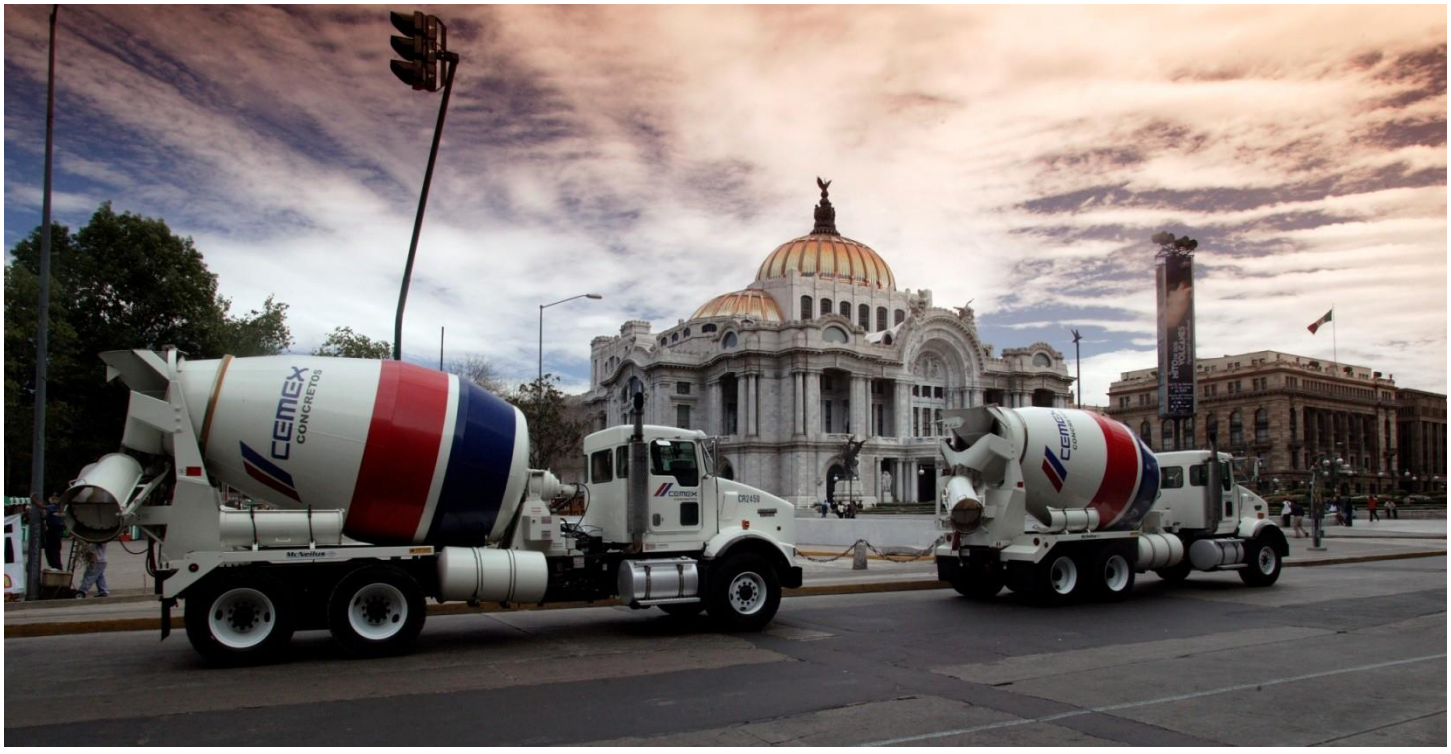

NRMCA Certified Environmental Product Declaration

This environmental product declaration was conducted in accordance with ISO 14025:2006

☐ Internal Verification ☒ External Verification

Declared Product:	This Environmental Product Declaration (EPD) covers thirty (30) concrete mixes produced by CEMEX at the Central Plant in Mexico City.
Declared Owner:	CEMEX México/CEMEX SAB 52(55)5626-8374 www.cemexmexico.com
Program Operator:	National Ready Mix Concrete Association 900 Spring St., Silver Spring, MD 20910 www.nrmca.org/sustainability Lionel Lemay
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Product Category Rule:	*North American Product Category Rules (PCR) for ISO 14025 Type III Environmental Product Declarations (EPDs) for Concrete*, Version 1.1, dated 12/4/2013 (including clarifications #1, #2, and #3) The Carbon Leadership Forum www.carbonleadershipforum.org
Date of Issue:	September 1, 2017
Period of Validity:	September 2017 – September 2022
EPD Number:	NRMCAEPD:10013

Product description

This EPD reports the impacts for the product “ready-mixed concrete” meeting the following specifications:

- NMX-C-155 –ONNCCE - Industria de la Construcción – Concreto Hidráulico – Dosificado en Masa – Especificaciones y Métodos de Ensayo.

Declared unit

The declared unit is 1 m^3 of CEMEX concrete mix, at plant, for the CEMEX mixes names given in the table below:

#	Mixture name	Compressive strength @ x days (kgf/cm^2)	Water/ Cement Ratio	Slump (cm)	Other Characteristics
1	**Concreto Convencional 250**	250@28 days	0.64	18	Conventional Concrete. Pumpable
2	**Concreto de Alta Resistencia, FORTIS, 400**	400@28 days	0.46	20	High Strength Concrete. Pumpable
3	**Concreto de Alta Resistencia, FORTIS, 450**	450@28 days	0.42	22	High Strength Concrete. Pumpable
4	**Concreto de Alta Resistencia, FORTIS, 550**	550@28 days	0.37	20	High Strength Concrete. Pumpable
5	**Concreto de Alta Resistencia, FORTIS, 600**	600@28 days	0.31	20	High Strength Concrete. Pumpable
6	**Concreto de Alta Resistencia, FORTIS, 600 GC1**	600@28 days	0.30	24	High Strength Concrete. Pumpable
7	**Concreto Antibacterial BIOCRETE 250**	250@28 days	0.45	18	Antibacterial Concrete. Pumpable
8	**Concreto Arquitectónico APARENTIA, 200 3FX**	200@28 days	0.71	10	Colored Architectural Concrete. Pumpable
9	**Concreto Arquitectónico APARENTIA, 200 331**	200@28 days	0.71	10	Colored Architectural Concrete. Pumpable
10	**Concreto Autocompactable EVOLUTION 500**	500@78 days	0.30	60**	Selfconsolidating Concrete. Pumpable
11	**Concreto Autocompactable EVOLUTION 600 75**	600@14 days	0.30	75**	Selfconsolidating Concrete. Pumpable
12	**Concreto Autocompactable EVOLUTION 600 65**	600@92 days	0.28	65**	Selfconsolidating Concrete. Pumpable
13	**Concreto Autosellante DURAMAX 250**	250@28 days	0.54	70**	Durable, Self-repair and Selfconsolidating Concrete. Pumpable

#	Mixture name	Compressive strength @ x days (kgf/cm2)	Water/ Cement Ratio	Slump (cm)	Other Characteristics
14	**Concreto Autosellante DURAMAX 300**	300@28 days	0.43	70**	Durable, Self-repair and Selfconsolidating Concrete. Pumpable
15	**Concreto Autosellante DURAMAX 350**	350@28 days	0.43	70**	Durable, Self-repair Selfconsolidating Concrete. Pumpable
16	**Concreto de Baja Contracción PISOCRET 038**	38@28 days*	0.60	10	Low Shrinkage Concrete for Floors. Pumpable
17	**Concreto de Baja Contracción PISOCRET 040**	40@28 days*	0.56	10	Low Shrinkage Concrete for Floors. Pumpable
18	**Concreto DURAMAX 33V 250**	250@28 days	0.57	14	Durable Concrete. Pumpable
19	**Concreto DURAMAX 34T 250**	250@28 days	0.50	14	Durable Concrete. Pumpable
20	**Concreto DURAMAX 3GG 300**	300@28 days	0.44	14	Durable Concrete. Pumpable
21	**Concreto DURAMAX 300 355**	300@28 days	0.45	14	Durable Concrete. Pumpable
22	**Concreto DURAMAX 0G6 350**	350@28 days	0.43	14	Durable Concrete. Pumpable
23	**Concreto DURAMAX 3G6 350**	350@28 days	0.45	14	Durable Concrete. Pumpable
24	**Concreto DURAMAX 400**	400@28 days	0.37	18	Durable Concrete. Pumpable
25	**Concreto Lanzado INGENIA, 22E 250**	25@28 days	0.56	14	Shotcrete. Pumpable
26	**Concreto Ligero INSULARIS, 100**	100@28 days	0.38	14	Lightweight Concrete. Pumpable
27	**Concreto Llancreto ECO Plus 150**	150@28 days	0.97	14	Ecological Concrete with crushed tires. Pumpable
28	**Mortero Estabilizado INGENIA 20Y 125**	125@28 days	1.18	14	Stabilized Mortar. Pumpable
29	**Concreto de Trabajabilidad Extendida INGENIA 250**	250@83 days	0.65	14	Pumpable
30	**Concreto de Trabajabilidad Extendida INGENIA 300**	300@83 days	0.58	18	Pumpable

** Flexion strength @ 28 days (kgf/cm^2), **Slump Flow(cm)*

Product components

The components of the mixes included in this EPD meet the following standards:

Component	Standard	Specification for:
Portland Cement	NMX-C-414	Portland Cement
Aggregates	NMX-C-111	Concrete Aggregates (Fine and Coarse Aggregate) – Specifications and Test Methods
Lightweight Aggregates	NMX-C-299	Lightweight Aggregates - Specifications and Test Methods
Admixtures	NMX-C-255	Admixtures – Specifications and Test Methods
Water	NMX-C-122	Water - Specifications
Fibers	ASTM-C-1116	Standard Specification for Fiber-Reinforced Concrete

Life-cycle assessment

This EPD is based on a 'cradle-to-gate' life cycle assessment (LCA) of various ready mixed concrete. The life cycle processes included in the EPD are as follows:

- Raw material supply (upstream processes): Extraction, handling, and processing of the raw materials used in production of concrete: cement, supplementary cementitious materials, aggregate (coarse and fine), water, admixtures, and other materials or chemicals used in concrete mixtures.
- Transportation: Transportation of these materials from supplier to the gate of the concrete producer. And from the concrete plant to a delivery of 14 kilometer ratio to the client projects.
- Manufacturing (core processes): Energy used to store, batch, mix, and distribute the concrete and operate the facility (concrete plant).
- Water use in mixing and distributing concrete.

A summary of cradle-to-gate life cycle processes excluded from the EPD is as follows:

- Production, manufacture, and construction of buildings, capital goods, and infrastructure.
- Production and manufacture of concrete production equipment, concrete delivery vehicles, earthmoving equipment, and laboratory equipment.
- Personnel-related activities (travel, furniture, office supplies).
- Energy and water use related to company management and sales activities.

A summary of the limitations of this EPD include the following:

- This EPD does not report all of the environmental impacts due to manufacturing of the product, but rather environmental impacts for categories with established LCA-based methods to track and report. Unreported environmental impacts include (but are not limited to) factors attributable to human health, land use change, water use in the upstream manufacturing process, and habitat destruction.
- This EPD reports the results of an LCA for 'cradle-to-gate' analysis. Thus, declarations themselves are not comparative assertions, defined as an environmental claim regarding the superiority or equivalence of one product versus a competing product that performs the same function. An EPD does not make any statements that the product covered by the EPD is better or worse than any other product.
- In order to assess the local impacts of product manufacturing, additional analysis is required.
- Life cycle impact assessment results are relative expressions and do not predict impacts on category endpoints, the exceeding of thresholds, safety margins, or risks.

This EPD has been developed using the Quantis 2016 (WBCSD-CSI tool for EPD of concrete and cement v1.3 - U.S. version, concrete-epd-tool.org).

Data quality, variability, and comparability

This EPD was created using plant-specific data for upstream materials. Potential variations due to supplier locations, manufacturing processes, and efficiencies and fuel use are thus accounted for in this EPD.

EPDs of concrete mixtures may not be comparable if they do not comply with this standard and data from this EPD. While EPDs can be used to compare concrete mixes, the data cannot be used to compare between construction products or concrete mixes used in different concrete products unless the data is integrated into a comprehensive LCA. For example, precast concrete, concrete masonry units, and site-cast concrete all have different manufacturing processes whose impacts are attributed to different LCA stages. This precludes direct comparison between mixes used in these different products until all life cycle phases are included.

Data sources and quality by source

This section provides the sources of data used to compute the upstream material life-cycle inventory (LCI) in this study accompanied by qualitative data quality assessments using the five indicators outlined in the “Product Life Cycle Accounting and Reporting Standard” [GHG Protocol 2011]. Data quality is rated “very good”, “good”, “fair”, or “poor” for each indicator.

Primary data

Quality of primary data is very good throughout all indicators as the data describe the technologies, processes, and outputs analyzed in this study. All primary data refers to the full calendar year 2015.

Secondary data

Secondary data are data provided by a trade association, from a national survey or report or industry report, or a database and is based on data from more than one supplier or from an estimation of the data.

In this study the secondary data are part of the WBCSD-CSI tool for EPDs of concrete and cement (v1.2), U.S. version [Quantis 2016]. Quantis as the authors of the tool consider that the overall quality of the data in the tool is good to very good; although they use a slightly different framework for quality assessment it is considered that this ranking is equivalent to the same ranking in the framework used here.

The following table summarizes the data sources used in WBCSD-CSI tool for EPDs of concrete and cement (v1.2), U.S. version for the main inputs at the readymix plant, and shows corresponding quality assessments.

Process (unit)	LCI data source	Data quality assessment
Portland Cement (kg)	• **name:** CEMEX México S.A. de C.V. (Barrientos Plant) • **database:** calculated in the tool from plant-specific data • **year:** 2015	• **technology:** very good • **time:** very good • **geography:** very good • **completeness:** very good • **reliability:** very good
Fly ash (kg)	No additional processing of fly ash necessary for use as secondary recovered material; upstream impacts solely from transportation by rail and truck.	
Crushed coarse aggregate (kg)	• **name:** Gravel, crushed • **database:** ecoinvent v3.1 • **geography:** rest of world (excluding Switzerland) • **year:** 2001	• **technology:** fair; process represents current technology (as of 2001) for gravel and sand quarry operations in Switzerland • **time:** poor; data is older than ten years • **geography:** fair; Process models production based on Swiss data and is adjusted for the rest of the world • **completeness:** very good; process is 100% representative of Swiss production • **reliability:** fair; Date is verified by ecoinvent with the following caveat: "This is a dataset automatically generated based on a dataset transferred from ecoSpold v1 / ecoinvent database version 2. It may not in all aspects fulfill the requirements of the ecoinvent data quality guideline for version 3."
Sand (kg)	• **name:** Sand • **database:** ecoinvent v3.1 • **geography:** rest of world (excluding Switzerland) • **year:** 2001	
Accelerating admixture (kg)	• **name:** 300 Accelerator EPD • **reference:** [EFCA 2006a] • **geography:** Europe • **year:** 2006	• **technology:** very good; process represents manufacture of chemical admixtures for concrete • **time:** poor; data is older than 10 years • **geography:** fair; process models European production (no US data in US LCI database) • **completeness:** good; data is based on figures from four of Europe's largest admixture producers • **reliability:** fair; EPDs are not ISO-compliant
Air-entraining admixture (kg)	• **name:** 301 Air Entrainer EPD • **reference:** [EFCA 2006b] • **geography:** Europe • **Year:** 2006	
Retarding admixture (kg)	• **name:** 302 Retarder EPD • **reference:** [EFCA 2006c] • **geography:** Europe • **year:** 2006	
Plasticizing admixture (kg)	• **name:** 324 Plasticiser EPD • **reference:** [EFCA 2006d] • **geography:** Europe • **year:** 2006	
Superplasticizing admixture (kg)	• **name:** 325 Superplasticiser EPD • **reference:** [EFCA 2006e] • **geography:** Europe • **year:** 2006	

Process (unit)	LCI data source	Data quality assessment
Shredded tires (kg)	• **name:** Recycled Rubber • **reference:** Quantis 2016 • **geography:** worldwide • **year:** --	Process is a proxy that considers that the material is secondary recovered material; given the small volumes used in the products in question this approach is deemed acceptable.
Antibacterial admixture (kg)	• **name:** Other admixture • **reference:** Quantis 2016 • **geography:** worldwide • **year:** --	Process is a proxy that is based on the production of generic chemicals; given the small volumes used in the products in question this approach is deemed acceptable.
Fibers (kg)	• **name:** Fibers, polypropylene • **database:** ecoinvent v3.1 • **geography:** Europe • **year:** 2001	• **technology:** good; process covers only production of the material which is assumed to cause vast majority of environmental impacts • **time:** poor; data is older than 10 years • **geography:** fair • **completeness:** good; data set based on 28 producers • **reliability:** fair; Date is verified by ecoinvent with the following cave at: "This is a dataset automatically generated based on a dataset transferred from ecoSpold v1 / ecoinvent database version 2. It may not in all aspects fulfill the requirements of the ecoinvent data quality guideline for version 3."
Electricity (kWh)	• **name:** supplier plant-specific electricity mix • **database:** calculated in the tool from plant-specific data • **Year:** 2015	• **technology:** very good • **time:** very good • **geography:** very good • **completeness:** very good • **reliability:** very good

Environmental impacts

This EPD covers the required set of environmental impact categories in accordance with the PCR, Section 3.2 [Carbon Leadership Forum 2013]:

Impact category	Unit	Abbreviation	Impact Assessment Method
Life-cycle inventory items			
Non-renewable primary energy consumption	MJ	nPE	Gross Calorific (Higher Heating)
Renewable primary energy consumption	MJ	rPE	Gross Calorific (Higher Heating)
Total primary energy consumption	MJ	tPE	Gross Calorific (Higher Heating)
Concrete batching water consumption	m^3	bCW	
Concrete washing water consumption	m^3	wCW	
Total concrete water consumption	m^3	tCW	
Non-renewable material resource consumption	kg	nMR	
Renewable material resource consumption	kg	rMR	
Hazardous waste production	kg	hWP	
Non-hazardous waste production	kg	nWP	
Impact Categories			
Global Warming	kg CO_2-eq	GWP	TRACI 2.1
Ozone Depletion	kg CFC-11-eq	OCP	TRACI 2.1
Acidification	kg SO_2-eq	AP	TRACI 2.1
Eutrophication	kg N-eq	EP	TRACI 2.1
Photochemical ozone creation	kg O_3-eq	POCP	TRACI 2.1

The calculation for computing the total primary energy consumption uses Gross Calorific Values (GCV), also known as Higher Heating Values (HHV).

The following table shows environmental impacts per m^3 of the CEMEX concrete mixes covered in this EPD using the abbreviations and units from the previous table.

Mix Number	nPE	rPE	tPE	bCW	wCW	tCW	nMR	rMR	hWP	nWP	GWP	ODP	AP	EP	POCP
Concreto Convencional, 250	2223.25	94.4	2317.60	0.190	0.120	5.38	2358	0.278	0.00121	0.00389	317	1.4E-05	0.661	0.32	14.6
Concreto de Alta Resistencia, FORTIS, 400	3142.73	115.9	3258.62	0.182	0.120	6.42	2500	0.347	0.00121	0.00389	469	1.8E-05	0.909	0.45	19.4
Concreto de Alta Resistencia, FORTIS, 450	3510.06	125.8	3635.90	0.186	0.120	6.77	2527	0.372	0.00121	0.00389	527	1.9E-05	1.005	0.51	21.5
Concreto de Alta Resistencia, FORTIS, 550	4058.17	145.0	4203.18	0.199	0.120	7.24	2536	0.409	0.00121	0.00389	619	2.1E-05	1.146	0.59	24.3
Concreto de Alta Resistencia, FORTIS, 600	4510.02	159.9	4669.96	0.184	0.120	7.74	2616	0.445	0.00121	0.00389	695	2.3E-05	1.258	0.66	26.8

Mix Number	nPE	rPE	tPE	bCW	wCW	tCW	nMR	rMR	hWP	nWP	GWP	ODP	AP	EP	POCP
Concreto de Alta Resistencia, FORTIS, 600 GC1	4751.22	159.9	4911.14	0.193	0.120	8.07	2639	0.464	0.00121	0.00389	735	2.4E-05	1.321	0.70	28.2
Concreto Antibacterial, BIOCRETE, 250	3329.28	123.1	3452.35	0.187	0.120	6.62	2571	0.360	0.00121	0.00389	493	1.9E-05	0.969	0.48	20.5
Concreto Arquitectónico, APARENTIA, 200 3FX	2030.28	89.1	2119.38	0.184	0.120	5.15	2323	0.263	0.00121	0.00389	284	1.3E-05	0.614	0.29	13.5
Concreto Arquitectónico, APARENTIA, 200 331	1992.09	88.1	2080.15	0.184	0.120	5.14	2320	0.262	0.00121	0.00389	281	1.2E-05	0.601	0.29	13.2
Concreto Autocompactable, EVOLUTION, 500	4237.90	154.4	4392.26	0.194	0.120	7.59	2636	0.434	0.00121	0.00389	649	2.1E-05	1.186	0.64	25.2
Concreto Autocompactable, EVOLUTION, 600 75	4476.96	158.1	4635.06	0.200	0.120	7.67	2594	0.444	0.00121	0.00389	678	2.4E-05	1.273	0.68	26.1
Concreto Autocompactable, EVOLUTION, 600 65	5022.04	174.2	5196.20	0.210	0.120	8.25	2644	0.486	0.00121	0.00389	768	2.6E-05	1.411	0.76	29.0
Concreto Autosellante, DURAMAX, 250	2934.46	102.3	3036.72	0.190	0.120	6.16	2439	0.328	0.00121	0.00389	426	1.8E-05	0.873	0.42	18.4
Concreto Autosellante, DURAMAX, 300	3691.09	124.7	3815.81	0.203	0.120	6.99	2521	0.385	0.00121	0.00389	555	2.0E-05	1.064	0.54	22.2
Concreto Autosellante, DURAMAX, 350	3520.57	120.7	3641.26	0.190	0.120	6.83	2521	0.374	0.00121	0.00389	528	2.0E-05	1.010	0.51	21.6
Concreto de Baja Contracción, PISOCRET, 038	2467.62	102.6	2570.20	0.175	0.120	5.68	2455	0.297	0.00121	0.00389	354	1.5E-05	0.737	0.35	16.0
Concreto de Baja Contracción, PISOCRET, 040	2481.24	107.3	2588.54	0.170	0.120	5.67	2434	0.297	0.00121	0.00389	366	1.4E-05	0.722	0.36	15.9
Concreto DURAMAX, 33V 250	2496.74	100.9	2597.60	0.199	0.120	5.70	2370	0.299	0.00121	0.00389	366	1.4E-05	0.728	0.37	15.9
Concreto DURAMAX, 34T 250	2674.33	108.4	2782.74	0.190	0.120	5.86	2394	0.312	0.00121	0.00389	396	1.5E-05	0.771	0.40	16.8
Concreto DURAMAX, 3GG 300	3304.89	126.2	3431.05	0.192	0.120	6.48	2422	0.356	0.00121	0.00389	507	1.7E-05	0.926	0.48	20.3
Concreto DURAMAX, 300 355	3241.08	121.9	3363.02	0.189	0.120	6.56	2509	0.356	0.00121	0.00389	492	1.7E-05	0.917	0.47	20.1
Concreto DURAMAX, 0G6 350	3670.08	135.5	3805.57	0.220	0.120	6.79	2402	0.379	0.00121	0.00389	568	1.9E-05	1.016	0.54	22.1
Concreto DURAMAX, 3G6 350	2960.80	115.5	3076.27	0.180	0.120	6.18	2480	0.334	0.00121	0.00389	433	1.7E-05	0.870	0.44	18.3
Concreto DURAMAX, 400	3504.82	131.6	3636.42	0.175	0.120	6.65	2409	0.370	0.00121	0.00389	543	1.7E-05	0.972	0.52	21.3
Concreto Lanzado, INGENIA, 22E 250	2669.60	90.8	2760.40	0.209	0.120	6.05	2396	0.316	0.00121	0.00389	390	1.5E-05	0.782	0.39	17.0
Concreto Ligero, INSULARIS, 100	3200.04	107.6	3307.60	0.190	0.120	5.51	1523	0.346	0.00121	0.00389	499	1.5E-05	0.878	0.50	18.6
Concreto Llancreto, ECO Plus, 150	1573.94	73.7	1647.63	0.185	0.120	4.53	2150	0.222	0.00121	0.00389	214	1.1E-05	0.491	0.22	10.8
Mortero Estabilizado, INGENIA, 20Y 125	1722.42	49.5	1771.87	0.250	0.120	4.75	1938	0.236	0.00121	0.00389	236	1.1E-05	0.538	0.25	11.5
Concreto de Trabajabilidad Extendida, INGENIA, 250	2148.32	92.7	2241.05	0.185	0.120	5.37	2387	0.275	0.00121	0.00389	306	1.3E-05	0.643	0.31	14.1
Concreto de Trabajabilidad Extendida, INGENIA, 300	2397.50	100.0	2497.46	0.192	0.120	5.62	2399	0.293	0.00121	0.00389	348	1.4E-05	0.704	0.35	15.4

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