



Environmental Product Declaration (EPD) for Concrete



Miraflores Ready Mix Plant, Panama

About Cementos Argos Panama

Argos Panamá S.A., is a Panamanian cement and concrete supplier that is the market leader in the country.

Through its network of ten Argos concrete plants located in the country, its annual concrete production reaches 480,000 m³. As for cement, its installed capacity is of 1,340,280 tons per year.

Argos Panamá S.A. is part of Cementos Argos S.A., a company whose headquarters are located in Colombia. For the second consecutive year, Argos has been included in the Dow Jones Sustainability Index.

Cementos Argos Panama

Torre Argos, 5th floor.
Juan Diaz, Complejo Santa María Business District
Llano Bonito, Ciudad de Panamá

Planta Miraflores

Transístmica, Vía Simón Bolívar, Ciudad de Panamá.

EPD Program Operator
National Ready Mixed Concrete Association
900 Spring Street, Silver Spring, MD 20910
301-587-1400
www.nrmca.org/sustainability

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NRMCA Certified Environmental Product Declaration



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

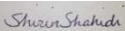

Internal Verification External Verification

Declared Product: This Environmental Product Declaration (EPD) covers 2 concrete mixes produced at the Miraflores concrete plant owned and operated by Cementos Argos Panama in Panama.

Declaration Owner:	Cementos Argos Panamá Torre Argos, 5th floor. Juan Díaz, Complejo Santa María Business District Llano Bonito, Ciudad de Panamá (507) 366-1690 www.argos.co/panama	
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Program Operator:	National Ready Mix Concrete Association 301-587-1400 www.nrmca.org/sustainability  Lionel Lemay	
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LCA and EPD Developer:	PRé (202) 728-5087 www.pre-sustainability.com/  Cashion East	
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Independent Verifier:	Climate Earth, Inc. 415-391-2725 www.climateearth.com  Shirin Shahidi	
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Product Category Rule: Product Category Rules (PCR) for ISO 14025 Type III Environmental Product Declarations (EPDs) for Concrete meeting the requirements of one of the following:
 ASTM C94, ASTM C90, CSA A23.1/A23.2, UNSPSC code 30111500, Version 1.1 dated December 4, 2013, The Carbon Leadership Forum www.carbonleadershipforum.org

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ENVIRONMENTAL PRODUCT DECLARATION: DETAILED VERSION

Product Description

Products covered by this Environmental Product Declaration (EPD) are for general purpose concrete for commercial applications developed and produced by Cementos Argos Panama at Miraflores Plant. This EPD reports the impacts for the product “ready-mix concrete” meeting the following specifications:

- ASTM C94: Standard Specification for Ready-Mixed Concrete
- UNSPSC code 30111500 Ready Mix Concrete
- Concrete CSI Section 03 30 00: Cast-in-Place

Product Components

Component	Standard	Specification for:
Portland Cement	ASTM C1157	Hydraulic Cement
Fly Ash	ASTM C618	Coal fly ash and raw or calcined Natural pozzolan for use in concrete
Slag Cement	ASTM C989	Slag cement for use in concrete and mortars
Natural and Crushed Aggregates	ASTM C33	Concrete aggregates
Admixtures	ASTM C494	Chemical Admixtures for Concrete
Batch Water	ASTM C1602	Mixing water used in the production of hydraulic cement concrete

Declared Unit

The declared unit is 1m³ of Argos concrete that corresponds to the Argos mix numbers and plants given in the tables below:

Mix Code	Strength Class (psi)	Slump (in)
10014375	4000 @ 28 days	5 ± 1½
10019170	8000 @ 56 days	8½ ± 1½

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Life Cycle Assessment (LCA)

The LCIA results are relative expressions and do not predict impacts on category endpoints, the exceeding of thresholds, safety margins or risks.

A summary of the life cycle stages included in the EPD is as follows:

1. Raw Material Supply (upstream processes): Extraction, handling and processing of the raw materials used in production of concrete: cement, supplementary cementitious materials, aggregate (course and fine), water, admixtures and other materials or chemicals used in concrete mixtures.
2. Transportation: Transportation of these materials from supplier to the 'gate' of the concrete producer.
3. Manufacturing (core processes): The core processes result from the energy used to store, batch, mix and distribute the concrete and operate the facility (concrete plant).
4. Water use in mixing and distributing concrete.

A summary of life cycle stages excluded from the EPD is as follows:

1. Transportation to the construction site.
2. Construction (reinforcement, forming, placing, curing, etc.).
3. Building use and maintenance.
4. End of life.

Additionally, the following cycle processes are excluded from this study:

1. Production, manufacturer and construction of buildings' capital goods and infrastructure.
2. Production and manufacture of concrete production equipment, concrete delivery vehicles, earthmoving equipment, and laboratory equipment.

3. Personnel-related activities (travel, furniture, office supplies).
4. Energy and water use related to company management and sales activities, which may be located either within the factory site or at another location.

A summary of the limitations of this EPD include:

1. This EPD does not report all of the environmental impacts due to manufacturing of the product, but rather reports the environmental impacts for those categories with established life cycle assessment 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.
2. This EPD report the results of an LCA for 'cradle-to-gate' analysis. Thus, declarations 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.
3. In order to assess the local impacts of product manufacturing, additional analysis is required.
4. The product manufacturer has the option of declaring additional information about their product including conformance with any other sustainability certification programs that often have performance and prescriptive requirements that aim to illustrate environmental best practices that cannot be captured by LCA.
5. Life Cycle Impact Assessment results are relative expressions and do not predict impacts on category endpoints, the exceeding of thresholds, safety margins or risks.

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EPDs of concrete mixes may not be comparable if they do not comply with this standard and data from this EPD. The data cannot be used to compare between concrete mixes, construction products or concrete mixtures 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 mixtures used in these different products unless all life cycle phases are included. Additionally, environmental declarations from different programs may not be comparable. More information about the NRMCA program can be found at <http://www.nrmca.org/sustainability/EPDProgram/>.

Data Quality and Variability

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.

Data Sources

Data for this study came from several different sources and primary data was collected for foreground processes wherever possible. This section provides a qualitative and quantitative description of data, sources of generic data or literature, validation of data (including data quality assessment) and allocation principals and procedures. Data is assessed on the following five data quality indicators Technological Representativeness, "Geographical Representativeness", "Temporal Representativeness", "Completeness" and "Reliability". Gross Calorific Values (GCV) were used where applicable.

Process	LCI Data Source	Geography	Year	Data Quality Assessment
Aggregates	Limestone, at mine (USLCI)	US	2008	<ul style="list-style-type: none"> • Technology: good Process represents extraction of aggregates • Time: fair Data is within ten years • Geography: very good • Completeness: very good Data is based on national average • Reliability: good Data is from USLCI database
Batch Water	Primary	Panama	2014	<ul style="list-style-type: none"> • Technology: very good Data represents batch water inputs specific to each mix design • Time: very good Data is within three years • Geography: very good • Completeness: very good Primary data from current Argos mix sheets • Reliability: very good Data based on actual use

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Process	LCI Data Source	Geography	Year	Data Quality Assessment
Cement	Portland cement, at plant (USLCI). Modified to include upstream impacts of fuel and energy production	US	2007	<ul style="list-style-type: none"> • Technology: good Process represents average cement production in the US • Time: fair Data is within 10 years • Geography: very good • Completeness: good Data is based on an average of national production • Reliability: good
Fly Ash	None, no incoming burden and only inbound transport was considered	N/A	N/A	N/A
Plasticizing Admixture (Type A Water Reducer)	EFCA 324 Plasticizing Eco-Profile	Europe	2006	<ul style="list-style-type: none"> • Technology: very good Process represents admixture production for use in concrete • Time: fair Data is within ten years • Geography: fair • Completeness: good Data from a federation of European admixture producers • Reliability: fair EPD is not compliant with ISO standards.
Sand	Sand {GLO}, market for (ecoinvent 3)	Global	2011	<ul style="list-style-type: none"> • Technology: very good Process represents extraction of sand for production • Time: very good Data from year of study • Geography: fair • Completeness: good Data is representative of global production • Reliability: good ecoinvent has verified the data

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Process	LCI Data Source	Geography	Year	Data Quality Assessment
Super-plasticizing Admixture (Type F Water Reducer)	EFCA 325 Super-Plasticizing Eco-Profile	Europe	2006	<ul style="list-style-type: none"> • Technology: very good Process represents admixture production for use in concrete • Time: fair Data is within ten years • Geography: fair • Completeness: good Data from a federation of European admixture producers • Reliability: fair EPD is not compliant with ISO standards
Electricity	Electricity, medium voltage {PA}, market for (modified from ecoinvent 3)	Panama	2008	<ul style="list-style-type: none"> • Technology: good Process represents energy mix of Panama electricity • Time: fair Data is within ten years • Geography: fair • Completeness: good Data is representative of Panama production • Reliability: good
Wash Water	LCI of Portland Cement Concrete	US	2006	<ul style="list-style-type: none"> • Technology: good Process uses averages for different plant types and regional areas • Time: fair Data is within ten years • Geography: fair Data is for production in the United States • Completeness: very good Data from Portland Cement Associations annual surveys • Reliability: good Data base on surveys

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Process	LCI Data Source	Geography	Year	Data Quality Assessment
Truck Transportation	Transport, combination truck, diesel powered (USLCI)	US	2008	<ul style="list-style-type: none"> • Technology: very good Process represents combustion of diesel for transportation • Time: fair Data is within ten years • Geography: fair • Completeness: good Data is representative of US conditions • Reliability: good Data is from USLCI database

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Environmental Impacts

This EPD covers the required set of environmental impact categories and metrics in accordance with the PCR, Section 3.2 (CLF 2013), given in the table below:

Inventory / Impact Metrics	Unit	Abbreviation	Method
Inventory Metric			
Total primary energy consumption	MJ	TED	Inventory Metric
Concrete batching water consumption	m ³	BW	Inventory Metric
Concrete washing water consumption	m ³	WW	Inventory Metric
Total water consumption	m ³	TW	Inventory Metric
Depletion of non-renewable energy resources	MJ	NRED	Inventory Metric
Depletion of non-renewable material resources	kg	NRMR	Inventory Metric
Use of renewable material resources	kg	RMR	Inventory Metric
Use of renewable primary energy	MJ	RED	Inventory Metric
Hazardous waste	kg	HW	Inventory Metric
Non-hazardous waste	kg	NHW	Inventory Metric
Impact Assessment Metrics			
Climate change	kg CO ₂ eq	GWP	TRACI 2.1
Ozone depletion	kg CFC-11 eq	OD	TRACI 2.1
Acidification	kg SO ₂ eq	AP	TRACI 2.1
Eutrophication	kg N eq	EP	TRACI 2.1
Photochemical ozone creation/Smog	kg O ₃ eq	SMOG	TRACI 2.1

This EPD does not cover any optional additional information specified in the PCR Section 3.2.

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LCA Miraflores

Results Categories	Unit	Mix Code 10014375 (4000 psi)	Mix Code 10019170 (8000 psi)
Inventory Metric			
Total primary energy consumption	MJ	2646	3678
Concrete batching water consumption	m ³	0.161	0.104
Concrete washing water consumption	m ³	0.061	0.064
Total water consumption	m ³	21	17.4
Depletion of non-renewable energy resources	MJ	2612	3628
Depletion of non-renewable material resources	kg	2448	2494
Use of renewable material resources	kg	0.764	1.030
Use of renewable primary energy	MJ	33.9	50.4
Hazardous waste	kg	3.36E-04	1.05E-01
Non-hazardous waste	kg	0.731	0.726
Impact Assessment Metrics			
Climate change	kg CO ₂ eq	432	633
Ozone depletion	kg CFC-11 eq	5.61E-06	8.27E-06
Acidification	kg SO ₂ eq	2.29	3.34
Eutrophication	kg N eq	0.068	0.094
Photochemical ozone creation/Smog	kg O ₃ eq	32.9	45.8

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