Environmental Product Declaration

Environmental Product Declaration for various ready mix concrete products produced by Holcim México Operaciones S.A. de C.V. at their Cancun II facility in Quintana Roo, México

ADMINISTRATIVE INFORMATION

International Certified Environmental Product Declaration

Declared Product:	This Environmental Product Declaration (EPD) covers concrete products produced by Holcim México Operaciones S.A. de C.V.. Declared unit: 1 m3 of concrete
Declaration Owner:	Holcim México Operaciones S.A. de C.V. Av. Prolongación Vasco de Quiroga #4800 Torre II Ofic. 101 Piso 1, Santa Fe Cuajimalpa de Morelos Ciudad de México, México www.holcim.com.mx
Program Operator:	Labeling Sustainability 11670 W Sunset Blvd. Los Angeles, CA www.labelingsustainability.com/
Product Category Rule:	Core PCR: ISO 21930:2017 Sustainability in buildings and civil engineering works – Core rules for environmental product declarations of construction products and services SubPCR: NSF International (March 2020). Product Category Rul (PCR) for Environmental Product Declarations (EPD) PCR for Concrete, v2.1 Sub PCR Program Operator: NSF International Sub-category PCR review was conducted by: Thomas P. Gloria, Ph. D. of Industrial Ecology Consultants: 35 Bracebridge, Rd., Newton, MA 02459-1728, t.gloria@industrial-ecology.com. Dr. Michael Overcash of Environmental Clarity: 2908 Chipmunk Lane, Raleigh, NC 27607-3117, mrovercash@earthlink.net. Mr. Bill Stough of Sustainable Research Group: PO Box 1684, Grand Rapids, MI 49501-1684, bstough@sustainableresearchgroup.com. Mr. Jack Geilbig, EcoForm: 2624 Abelia Way, Suite 611, Knoxville, TN 37931, jgeilbig@ecoform.com.
Independent LCA Reviewer and EPD Verifier:	This EPD was independently verified in accordance with ISO 14025 and ISO 21930. The life cycle assessment was independently reviewed in accordance ISO 14044 and the referenced PCR. Independent verification of the declaration, according to ISO 14025:2006 Internal ☐ ; External X Third Party Verifier Geoffrey Guest, Certified 3rd Party Verifier under the International EPD Program (www.environdec.com), CSA Group (www.csaregistries.ca)
Date of Issue:	24 July 2023, Update 12 September 2024
Period of Validity:	5 years; valid until 24 July 2028
EPD Number:	eba3739f-f6e4-404f-b367-4d2170d4cdf4

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COMPANY DESCRIPTION

Holcim Mexico produces and markets cement, ready-mix concrete, and other products and services for construction. The company has a nationwide presence through 7 cement plants with a current installed capacity to produce 12.6 million tons per year, 23 cement distribution centers, two maritime terminals, 1 Corporate Office, plus 57 ready-mix concrete plants, seven platforms, and a Geocycle transfer center, 26 commercial partners with more than 90 ready-mix concrete plants, more than 500 mixing pots, one aggregates plant and a Technological Innovation Center for Construction (CITEC).

Sustainable Development is an integral part of Holcim's strategy around the world. Holcim Mexico has a clear vision of the future it wants for our country, which contributes to its development. Holcim Mexico's main objective is to create value. Creating value ensures long-term business success in covering the triple bottom line (i.e., social, economic, environmental values). Finally, good operating performance and a solid return on invested capital go hand in hand with sustainable development.

Holcim continues to invest in research and development. They have the Innovation and Development Center, located in Lyon (France), with satellite locations in various regions developing a comprehensive portfolio of innovators and sustainable solutions. These include different categories: inclusive business models, water management solutions, urban mining solutions (recycled aggregates), waste treatment services, energy-efficient solutions (insulating building materials), resource-efficient solutions (high recycled content, bags soluble cement), and low CO_2 building materials.

Holcim operates with the belief that they can gain an advantage by developing knowledge and brand equity in the green building segment.

STUDY GOAL

The intended application of this life cycle assessment (LCA) is to comply with the procedures for creating a Type III environmental product declaration (EPD) and publish the EPD for public review on the website, http://labelingsustainability.com/. This level of study is in accordance with EPD Product Category Rule (PCR) for Ready Mix Concrete published by NSF International (2019) and is a sub-PCR of International Standards Organization (ISO) 21930:2017 Sustainability in buildings and civil works - Core rules for EPDs of construction products and services; International Standards Organization (ISO) 14025:2006 Environmental labels and declarations, Type III environmental declarations-Principles and procedures; ISO 14044:2006 Environmental management, Life cycle assessment- Requirements and guidelines; and ISO 14040:2006 Environmental management, Life cycle assessment-Principles and framework. The performance of this study and its subsequent publishing is in alignment with the business-to-business (B2B) communication requirements for the environmental assessment of building products. The study does not intend to support comparative assertions and is intended to be disclosed to the public.

This project report was commissioned to differentiate Holcim México Operaciones S.A. de C.V. from their competition for the following reasons: generate an advantage for the organization; offer customers information to help them make informed product decisions; improve the environmental performance of Holcim México Operaciones S.A. de C.V. by continuously measuring, controlling and reducing the environmental impacts of their products; help project facilitators working on Leadership in Energy and Environmental Design (LEED) projects achieve their credit goal; and to strengthen Holcim México Operaciones S.A. de C.V.'s license to operate in the community. The intended audience

for this LCA report is Holcim México Operaciones S.A. de C.V.'s employees, their suppliers, project specifiers of their products, architects, and engineers. The EPD report is also available for policy makers, government officials interested in sustainability, academic professors, and LCA professionals. This LCA report does not include product comparisons from other facilities.

DESCRIPTION OF PRODUCT AND SCOPE

This EPD reports on 64 concrete mixes manufactured at the Holcim Mexico Operaciones S.A. de C.V. Cancun II concrete facility in Quintana Roo, México.

This LCA assumes the impacts from products manufactured in accordance with the standards outlined in this report. This LCA is a cradle-to-gate study, and therefore, stages extending beyond the plant gate are not included in this LCA. Excluded stages include transportation of the manufactured material to the construction site; on-site construction processes and components; building (infrastructure) use and maintenance; and "end-of-life" effects.

READY MIX CONCRETE DESIGN SUMMARY

The following tables provide a list of the ready mix concrete products considered in this EPD along with key performance parameters.

Mix designs: 0 to 15 MPa

Table 1: **Declared products with Mix designs: 0 to 15MPa considered in this environmental product declaration**

Mix#	ID	Unique name	Short description	Product type	28 day strength, MPa	H2O to cement ratio
5	24020NB0518		2.26 MPa 28d strength mortars and fillers	mortars and fillers	2.26	1.64
6	24025NB0518		2.75 MPa 28d strength mortars and fillers	mortars and fillers	2.75	1.54
7	24030NB0518		3.33 MPa 28d strength mortars and fillers	mortars and fillers	3.33	1.24
8	77035ND2014		3.53 MPa 28d strength Ready mix concrete	Ready mix concrete	3.53	0.67
9	77036ND2010		3.73 MPa 28d strength Ready mix concrete	Ready mix concrete	3.73	0.64
10	77038ND2010		4.02 MPa 28d strength Ready mix concrete	Ready mix concrete	4.02	0.59
11	77040ND2014		4.22 MPa 28d strength Ready mix concrete	Ready mix concrete	4.22	0.59

12	77042ND2010		4.41 MPa 28d strength Ready mix concrete	Ready mix concrete	4.41	0.59
13	77045ND2010		4.71 MPa 28d strength Ready mix concrete	Ready mix concrete	4.71	0.58
14	77048ND2010		5.1 MPa 28d strength Ready mix concrete	Ready mix concrete	5.10	0.53
15	77050ND2010		5.1 MPa 28d strength Ready mix concrete	Ready mix concrete	5.10	0.50
16	73050NB0514		5.39 MPa 28d strength mortars and fillers	mortars and fillers	5.39	1.24
17	70100ND2014		11.77 MPa 28d strength Ready mix concrete	Ready mix concrete	11.77	1.09
18	73100NB0518		11.77 MPa 28d strength mortars and fillers	mortars and fillers	11.77	1.19
62	038ND2014	ECOPact PAVEX MR 038 28 días revenimiento 14	3.8 MPa 28d strength Ready mix concrete	Ready mix concrete	3.80	0.67
63	040ND2010	ECOPact PAVEX MR 040 28 días revenimiento 10	4 MPa 28d strength Ready mix concrete	Ready mix concrete	4.00	0.64

Mix designs: 15 to 20 MPa

Table 2: **Declared products with Mix designs: 15 to 20MPa considered in this environmental product declaration**

Mix#	ID	Unique name	Short description	Product type	28 day strength, MPa	H2O to cement ratio
19	70150NB2018		17.65 MPa 28d strength Ready mix concrete	Ready mix concrete	17.65	0.85
20	73150NB0514		17.65 MPa 28d strength mortars and fillers	mortars and fillers	17.65	0.94
34	84150ND2014	ECOPact 150 kg/cm2 28 días revenimiento 14	15 MPa 28d strength Ready mix concrete	Ready mix concrete	15.00	0.87
35	84150NB2014	ECOPact 150 kg/cm2 28 días revenimiento 14	15 MPa 28d strength Ready mix concrete	Ready mix concrete	15.00	0.86
36	84150NB2018	ECOPact 150 kg/cm2 28 días revenimiento 18	15 MPa 28d strength Ready mix concrete	Ready mix concrete	15.00	0.86
37	84200ND2014	ECOPact 200 kg/cm2 28 días revenimiento 14	20 MPa 28d strength Ready mix concrete	Ready mix concrete	20.00	0.78

38	84200NB2014	ECOPact 200 kg/cm2 28 días revenimiento 14	20 MPa 28d strength Ready mix concrete	Ready mix concrete	20.00	0.78
39	84200NB2018	ECOPact 200 kg/cm2 28 días revenimiento 18	20 MPa 28d strength Ready mix concrete	Ready mix concrete	20.00	0.78
57	150ND1014	ECOPact FLUIDIUM 150 kg/cm2 28 días revenimiento 14	15 MPa 28d strength Ready mix concrete	Ready mix concrete	15.00	0.88
58	150NB1018	ECOPact FLUIDIUM 150 kg/cm2 28 días revenimiento 18	15 MPa 28d strength Ready mix concrete	Ready mix concrete	15.00	0.88
59	200NB1018	ECOPact FLUIDIUM 200 kg/cm2 28 días revenimiento 18	20 MPa 28d strength Ready mix concrete	Ready mix concrete	20.00	0.79

Mix designs: 21 to 25 MPa

Table 3: **Declared products with Mix designs: 21 to 25MPa considered in this environmental product declaration**

Mix#	ID	Unique name	Short description	Product type	28 day strength, MPa	H2O to cement ratio
21	70200ND2010		22.06 MPa 28d strength Ready mix concrete	Ready mix concrete	22.06	0.75
22	68200NB1018		22.56 MPa 28d strength special concrete	special concrete	22.56	0.65
23	73200NB0518		22.06 MPa 28d strength mortars and fillers	mortars and fillers	22.06	0.77
40	84250ND2010	ECOPact 200 kg/cm2 28 días revenimiento 10	25 MPa 28d strength Ready mix concrete	Ready mix concrete	25.00	0.71
41	84250ND2014	ECOPact 250 kg/cm2 28 días revenimiento 14	25 MPa 28d strength Ready mix concrete	Ready mix concrete	25.00	0.71
42	84250NB2014	ECOPact 250 kg/cm2 28 días revenimiento 14	25 MPa 28d strength Ready mix concrete	Ready mix concrete	25.00	0.71
43	84250NB2018	ECOPact 250 kg/cm2 28 días revenimiento 18	25 MPa 28d strength Ready mix concrete	Ready mix concrete	25.00	0.71
48	250NB2014	ECOPact ESTRUCTO 250 kg/cm2 28 días revenimiento 14	25 MPa 28d strength Ready mix concrete	Ready mix concrete	25.00	0.69
49	250NB2018	ECOPact ESTRUCTO 250 kg/cm2 28 días revenimiento 18	25 MPa 28d strength Ready mix concrete	Ready mix concrete	25.00	0.69

55	2507B2018	ECOPact ESTRUCTO 250 kg/cm2 7 días revenimiento 18	25 MPa 28d strength Ready mix concrete	Ready mix concrete	25.00	0.58
60	250NB1014	ECOPact FLUIDIUM 250 kg/cm2 28 días revenimiento 14	25 MPa 28d strength Ready mix concrete	Ready mix concrete	25.00	0.71
61	250NB1018	ECOPact FLUIDIUM 250 kg/cm2 28 días revenimiento 18	25 MPa 28d strength Ready mix concrete	Ready mix concrete	25.00	0.71

Mix designs: 26 to 30 MPa

Table 4: **Declared products with Mix designs: 26 to 30MPa considered in this environmental product declaration**

Mix#	ID	Unique name	Short description	Product type	28 day strength, MPa	H2O to cement ratio
4	37.58NB2018		29.42 MPa 28d strength ready mix concrete	ready mix concrete	29.42	0.58
24	70250ND2010		27.95 MPa 28d strength Ready mix concrete	Ready mix concrete	27.95	0.66
25	81250ND1000		27.46 MPa 28d strength special concrete	special concrete	27.46	0.24
26	73250NB0514		26.97 MPa 28d strength mortars and fillers	mortars and fillers	26.97	0.65
44	84300NB2014	ECOPact 300 kg/cm2 28 días revenimiento 14	30 MPa 28d strength Ready mix concrete	Ready mix concrete	30.00	0.63
45	84300NB2018	ECOPact 300 kg/cm2 28 días revenimiento 18	30 MPa 28d strength Ready mix concrete	Ready mix concrete	30.00	0.63
50	300NB2014	ECOPact ESTRUCTO 300 kg/cm2 28 días revenimiento 14	30 MPa 28d strength Ready mix concrete	Ready mix concrete	30.00	0.61
51	300NB2018	ECOPact ESTRUCTO 300 kg/cm2 28 días revenimiento 18	30 MPa 28d strength Ready mix concrete	Ready mix concrete	30.00	0.62
54	300RB2018	ECOPact ESTRUCTO 300 kg/cm2 14 días revenimiento 18	30 MPa 28d strength Ready mix concrete	Ready mix concrete	30.00	0.57
56	3007B2018	ECOPact ESTRUCTO 300 kg/cm2 7 días revenimiento 18	30 MPa 28d strength Ready mix concrete	Ready mix concrete	30.00	0.52

Mix designs: 31 to 35 MPa

Table 5: **Declared products with Mix designs: 36 to 40MPa considered in this environmental product declaration**

Mix#	ID	Unique name	Short description	Product type	28 day strength, MPa	H2O to cement ratio
27	70300ND2014		32.36 MPa 28d strength Ready mix concrete	Ready mix concrete	32.36	0.61
28	73300NB0518		32.36 MPa 28d strength mortars and fillers	mortars and fillers	32.36	0.57
46	84350NB2014	ECOPact 300 kg/cm2 28 días revenimiento 18	35 MPa 28d strength Ready mix concrete	Ready mix concrete	35.00	0.55
47	84350NB2018	ECOPact 350 kg/cm2 28 días revenimiento 14	35 MPa 28d strength Ready mix concrete	Ready mix concrete	35.00	0.55
52	350NB2014	ECOPact ESTRUCTO 350 kg/cm2 28 días revenimiento 14	35 MPa 28d strength Ready mix concrete	Ready mix concrete	35.00	0.54
53	350NB2018	ECOPact ESTRUCTO 350 kg/cm2 28 días revenimiento 18	35 MPa 28d strength Ready mix concrete	Ready mix concrete	35.00	0.54

Mix designs: 36 to 40 MPa

Table 6: **Declared products with Mix designs: 36 to 40MPa considered in this environmental product declaration**

Mix#	ID	Unique name	Short description	Product type	28 day strength, MPa	H2O to cement ratio
29	70350ND2014		38.25 MPa 28d strength Ready mix concrete	Ready mix concrete	38.25	0.61
30	73350NB0514		36.77 MPa 28d strength mortars and fillers	mortars and fillers	36.77	0.50

Mix designs: 41 to 45 MPa

Table 7: **Declared products with Mix designs: 41 to 45MPa considered in this environmental product declaration**

Mix#	ID	Unique name	Short description	Product type	28 day strength, MPa	H2O to cement ratio
2	3745NB2018		44.13 MPa 28d strength ready mix concrete	ready mix concrete	44.13	0.45

3	3755NB2018		44.13 MPa 28d strength ready mix concrete	ready mix concrete	44.13	0.54
31	13400NB2018		44.13 MPa 28d strength Ready mix concrete	Ready mix concrete	44.13	0.48

Mix designs: 46 to 50 MPa

Table 8: **Declared products with Mix designs: 46 to 50MPa considered in this environmental product declaration**

Mix#	ID	Unique name	Short description	Product type	28 day strength, MPa	H2O to cement ratio
32	13450NB2018		47.07 MPa 28d strength Ready mix concrete	Ready mix concrete	47.07	0.40

Mix designs: 51 to 55 MPa

Table 9: **Declared products with Mix designs: 51 to 55MPa considered in this environmental product declaration**

Mix#	ID	Unique name	Short description	Product type	28 day strength, MPa	H2O to cement ratio
1	3735NB2018		53.94 MPa 28d strength ready mix concrete	ready mix concrete	53.94	0.26

Mix designs: >60 MPa

Table 10: **Declared products with Mix designs: >60MPa considered in this environmental product declaration**

Mix#	ID	Unique name	Short description	Product type	28 day strength, MPa	H2O to cement ratio
33	14650NB2018		66.68 MPa 28d strength Ready mix concrete	Ready mix concrete	66.68	0.19
64	100NB0514	ECOPact MORPLUZ 100 kg/cm2 28 días revenimiento 14	100 MPa 28d strength Ready mix concrete	Ready mix concrete	100.00	1.05

READY MIX CONCRETE DESIGN COMPOSITION

The following figures provide mass breakdown (kg per functional unit) of the material composition of each ready mix concrete design considered. Please note that the presented breakdown has been randomly altered by +/-10%, and is therefore only an approximation; this manipulation is to ensure confidentiality.

Table 11: **Ready mix concrete composition.**

Product Components	Raw Material, weight%
Cement	Proprietary
Mineral Additions (River sand and Gravel)	30-60.00
Others	0.01-5.00
Total	100.00

A1 RAW MATERIAL RECYCLED CONTENT AND MATERIAL LOSSES

The following table provides a list of the raw material inputs (module A1) across all products considered, their recyclability content and assumed material losses.

Table 12: **Module A1 raw material inputs, the recyclability content and assumed material losses (dry basis)**

Product.name	Mix.category	Primary.content	Post.industrial. content	Post.consumer. content	Material. losses
Cement (CPC 40) - PROVEEDOR: HOLCIM MACUSPANA	cement, unspecified	1	0	0	0
Cement (CPC 30) - PROVEEDOR: HOLCIM MACUSPANA	cement, unspecified	1	0	0	0
Silica fume	silica fume, densified	1	0	0	0
Water	tap water	1	0	0	0.05
Limestone Gravel	limestone, unprocessed	1	0	0	0.05
Limestone Sand	limestone, unprocessed	1	0	0	0.05
Additives	chemical, organic	1	0	0	0.05

SYSTEM BOUNDARIES

The following figure depicts the cradle-to-gate system boundary considered in this study:

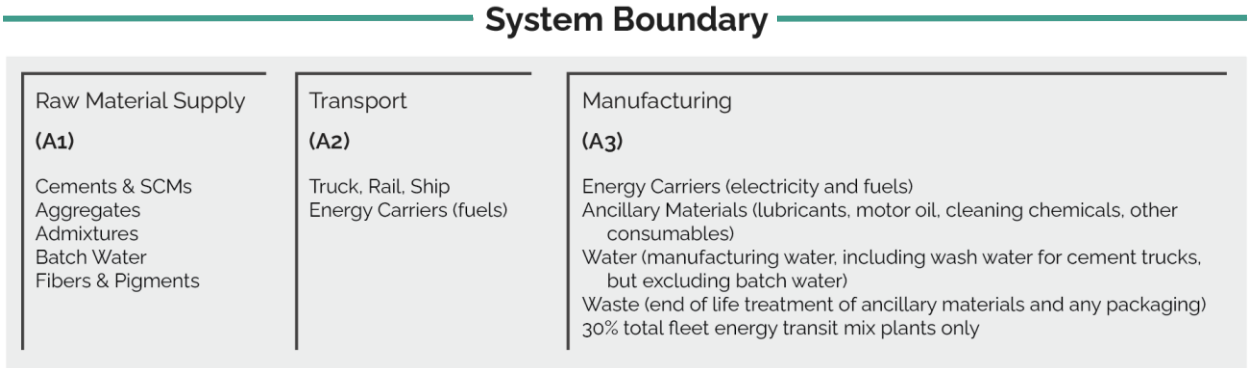

Figure 1: **General life cycle phases for consideration in a construction works system**

This is a Cradle-to-gate life cycle assessment and the following life cycle stages are included in the study:

- A1: Raw material supply (upstream processes) - Extraction, handling, and processing of the materials used in manufacturing the declared products in this LCA.
- A2: Transportation - Transportation of A1 materials from the supplier to the "gate" of the manufacturing facility (i.e. A3).
- A3: Manufacturing (core processes)- The energy and other utility inputs used to store, move, and manufacturer the declared products and to operate the facility.

As according to the PCR, the following figure illustrates the general activities and input requirements for producing ready mix concrete products and is not necessarily exhaustive.

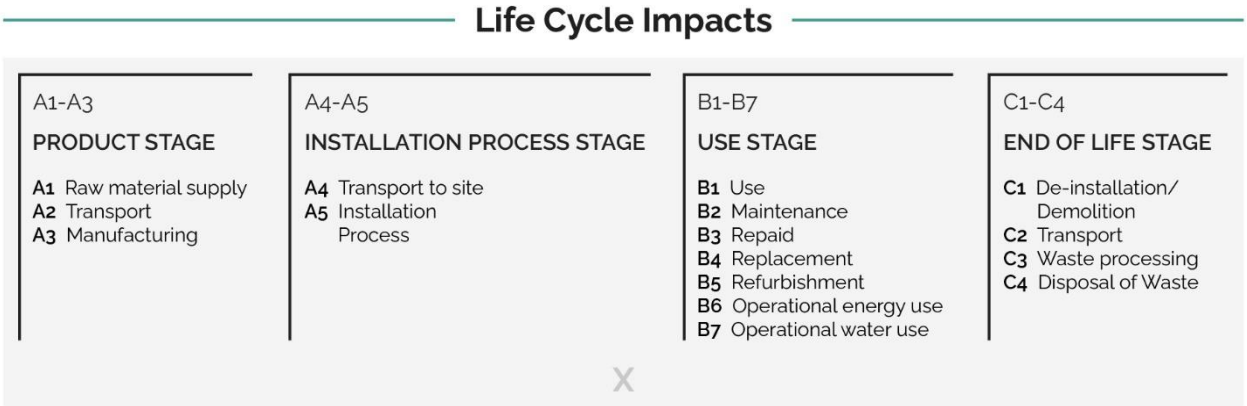

Figure 2: **General system inputs considered in the product system and categorized by modules in scope**

In addition, as according to the relevant PCR, the following requirements are excluded from this study:

- Production, manufacture and construction of A3 building/capital goods and infrastructure;
- Production and manufacture of steel production equipment, steel delivery vehicles, earth-moving equipment, and laboratory equipment;
- Personnel-related activities (travel, furniture, office supplies);
- Energy use related to company management and sales activities.

For this LCA the manufacturing plant, owned and operated by Holcim México Operaciones S.A. de C.V., is located at their Planta Cancun II facility in México. All operating data is formulated using the actual data from Holcim México Operaciones S.A. de C.V.'s plant at the above location, including water, energy consumption and waste generation. All inputs for this system boundary are calculated for the plant.

This life cycle inventory was organized in a spreadsheet and was then input into an RStudio environment where pre-calculated LCIA results for relevant products/activities stemming from the ecoinvent v3.10 database and a local EPD database in combination with primary data from Holcim México Operaciones S.A. de C.V. were utilized. Explanations of the contribution of each data source to this study are outlined in the section 'Data Sources and Quality'. Further LCI details for each declared product are provided in the sections 'Detailed LCI tables' and 'Transport tables' of the detailed LCA report. A parameter uncertainty analysis was also performed where key statistical results (e.g. min/mean/max etc.) are provided in the detailed LCA report.

CUT-OFF CRITERIA

ISO 14044:2006 and the focus PCR requires the LCA model to contain a minimum of 95% of the total inflows (mass and energy) to the upstream and core modules be included in this study. The cut-off criteria were applied to all other processes unless otherwise noted above as follows. A 1% cut-off is considered for all renewable and non-renewable primary energy consumption and the total mass of inputs within a unit process where the total of the neglected inputs does not exceed 5%.

DATA SOURCES AND DATA QUALITY ASSESSMENT

The following table summarizes the facility's (i.e. A3) electricity consumption and on-site generation or off-site contractual procurement (if applicable), process/space heating requirements, fuel inputs for on-site machinery, and waste generation.

Table 13: **Inputs required by facility from 2023-01-01 to 202-312-31 (364 days) to produce 71,137 m3 of concrete**

Activity	Value	Units
Electricity consumption and on-site generation or off-site contractual procurement (if applicable)		
Gross grid electricity:	242,180	kWh
Fuel requirements for machinery		
Diesel	268,897.9	L
Waste generation		
Wash water	2,358.8	m3
Hazardous waste	10,000	kg
Non-hazardous waste	3,693,500	kg
High-level radioactive waste	NA	kg

No recovered on-site energy occurs at this facility.

Table 14: **Reused or recycled components/materials at the A3 facility site**

Component/material for re-use/recycling	Value	Units	Re-used/recycled on-site or off-site
Returned concrete	415.5	m3	on-site

The following statements explain how the above facility requirements/generation were derived:

Raw material transport: A combination of actual mode/distance combinations were assumed for key bulk materials whereas ecoinvent default multi-modal market mix distances were assumed for other inputs where no original data could be provided.

Electricity: Electricity consumption values are for Holcim Mexico in calendar year 2023. These values were direct reported from Holcim records. The unit process "market for electricity, medium voltage/electricity, medium voltage/MX/kWh" was used to represent the Mexico grid electricity used by the concrete plant.

Process/space heating: No fuel is used for space heating at this plant.

Fuel required for machinery: Machinery-related fuel requirements were determined from direct Holcim information. The types of machinery used include generators, pumps to pump concrete to higher elevations, and transportation equipment used for moving materials.

Waste generation: Waste generation values are directly reported from Holcim operations for both bulk waste and hazardous waste. No High-level radioactive waste is generated on-site at this facility. Wash water values are direct reported water use from Holcim México for 2023.

Recovered energy: Not applicable.

Recycled/reused material/components: The amount of returned concrete is based on Holcim primary data for the reference year, 2023.

Module A1 material losses: Due to lack of data, default loss factors of 5% were assumed. The PCR states" A3 shall include an assumption of 5% material loss unless product specific data is available and transparently reported in the project LCA report underlying the EPD;"

Direct A3 emissions accounting: Direct emissions are modeled using fuel and technology appropriate ecoinvent activities. See LCI input tables for details.

Waste transport requirements: Transportation distances are using estimated values. The waste hauler cannot guarantee the exact distances traveled due to the variation of route and actual location of disposal. Most waste disposal sites are near the plant therefore the 25 km distance is a representative estimate. Returned concrete and wash water, measured in kilograms, is based on direct Holcim reporting for the reference year 2023.

Product transport requirements: The diesel fuel used by the mixing trucks is direct primary information reported from Holcim México records for the year 2023. The concrete PCR allots 30% of the overall mixing truck total for stage A3 (manufacturing) for mixing the materials.

The following tables depict a list of assumed life cycle inventory utilized in the LCA modeling to generate the impact results across the life cycle modules in scope. An assessment of the quality of each LCI activities utilized from various sources is also provided.

Table 15: **LCI inputs assumed for module A1 (i.e. raw material supply)** ***Data Quality Assessment Key Fair=1, Good=2, Very Good =3.***

Input	LCI.activity	Data.source	Geo	Year	Technology	Time	Geography	Reliability	Completeness
Water	tap water production, conventional treatment/tap water/RoW/kg	ecoinvent v3.10 in 2024	Quintana Roo	2024	2	3	1	3	3
Limestone gravel	limestone quarry operation/limestone, unprocessed/RoW/kg ; Note: modifications made (see ecoinvent activity changes table)	ecoinvent v3.10 in 2024	Quintana Roo	2024	2	3	1	3	3

Additives	chemical production, organic/chemical, organic/GLO/kg	ecoinvent v3.10 in 2024	Estado de México	2024	2	3	1	3	3
Cement (CPC 30) - PROVEEDOR: HOLCIM MACUSPANA	CPC 30	Progam Operator: Labeling Sustainability- EPD ID: 09cddb67-dd75-4879-9c7d-74d4664d8e10	Tabasco	30 November 2021	3	3	3	3	3
Cement (CPC 40) - PROVEEDOR: HOLCIM MACUSPANA	CPC 40	Progam Operator: Labeling Sustainability- EPD ID: 09cddb67-dd75-4879-9c7d-74d4664d8e10	Tabasco	30 November 2021	3	3	3	3	3
Silica fume	Waste input produced off-site	See A3 inputs	Tabasco	See A3 inputs	3	A3	3	A3	A3

DATA QUALITY ASSESSMENT

Data quality/variability requirements, as specified in the PCR, are applied. This section describes the achieved data quality relative to the ISO 14044:2006 requirements. Data quality is judged based on its precision (measured, calculated, or estimated), completeness (e.g., unreported emissions), consistency (degree of uniformity of the methodology applied within a study serving as a data source) and representativeness (geographical, temporal, and technological).

Precision: Through measurement and calculation, the manufacturers collected and provided primary data on their annual production. For accuracy, the LCA practitioner and 3rd Party Verifier validated the plant gate-to-gate data.

Completeness: All relevant specific processes, including inputs (raw materials, energy, and ancillary materials) and outputs (emissions and production volume) were considered and modeled to represent the specified and declared products. The majority of relevant background materials and processes were taken from ecoinvent v3.10 LCI datasets where relatively recent region-specific electricity inputs were utilized. The most relevant EPDs requiring key A1 inputs were also utilized where readily available.

Consistency: To ensure consistency, the same modeling structure across the respective product systems was utilized for all inputs, which consisted of raw material inputs and ancillary material, energy flows, water resource inputs, product, and co-products outputs, returned and recovered Ready Mix Concrete materials, emissions to air, water and soil, and waste recycling and treatment. The same background LCI datasets from the ecoinvent v3.10 database were used across all product systems. Crosschecks concerning the plausibility of mass and energy flows were continuously conducted. The

LCA team conducted mass and energy balances at the plant and selected process level to maintain a high level of consistency.

Reproducibility: Internal reproducibility is possible since the data and the models are stored and available in a machine readable project file for all foreground and background processes, and in Labeling Sustainability's proprietary Ready Mix Concrete LCA calculator* for all production facility and product-specific calculations. A considerable level of transparency is provided throughout the detailed LCA report as the specifications and material quantity make-up for the declared products are presented and key primary and secondary LCI data sources are summarized. The provision of more detailed publicly accessible data to allow full external reproducibility was not possible due to reasons of confidentiality.

*Labeling Sustainability has developed a proprietary tool that allows the calculation of PCR-compliant LCA results for Ready Mix Concrete product designs. The tool auto-calculates results by scaling base-unit technosphere inputs (i.e. 1 kg sand, 1 kWh electricity, etc.) to replicate the reference flow conversions that take place in any typical LCA software like openLCA or SimaPro. The tool was tested against several LCAs performed in openLCA and the tool generated identical results to those realized in openLCA across every impact category and inventory metric (where comparisons could be readily made).

Representativeness: The representativeness of the data is summarized as follows.

- Time related coverage of the manufacturing processes' primary collected data from 2023-01-01 to 2023-12-31.
- Upstream (background) LCI data was either the PCR specified default (if applicable) or more appropriate LCI datasets as found in the country-adjusted ecoinvent v3.10 database.
- Geographical coverage for inputs required by the A3 facility(ies) is representative of its region of focus; other upstream and background processes are based on US, North American, or global average data and adjusted to regional electricity mixes when relevant.
- Technological coverage is typical or average and specific to the participating facilities for all primary data.

ENVIRONMENTAL INDICATORS AND INVENTORY METRICS

Per the PCR, this EPD supports the life cycle impact assessment indicators and inventory metrics as listed in the tables below. As specified in the PCR, the most recent US EPA Tool for the Reduction and Assessment of Chemical and Other Environmental Impacts (TRACI), impact categories were utilized as they provide a North American context for the mandatory category indicators to be included in the EPD. Additionally, the PCR requires a set of inventory metrics to be reported with the LCIA indicators.

Table 16: **Life cycle impact categories and life cycle inventory metrics**

ID	LCIA.indicators	Abbreviations	Units
1	Climate change: global warming potential (GWP100)	GWP100	kg CO2-eq
2	Ozone depletion: ozone depletion potential (ODP)	ODP	kg CFC-11-eq
3	Acidification: acidification potential (AP)	AP	kg SO2-eq
4	Eutrophication: eutrophication potential	EP	kg N-eq

5	Smog formation potential	SFP	kg O3-eq
6	Energy resources: non-renewable: abiotic depletion potential (ADP): fossil fuels	ADPfossil	MJ
Inventory metrics			
7	Inventory indicators ISO21930: Cumulative Energy Demand - renewable energy resources	RPRE	MJ
8	Inventory indicators ISO21930: Renewable primary resources with energy content used as material (i.e., PERM)	PRM	MJ
9	Inventory indicators ISO21930: Cumulative Energy Demand - non-renewable energy resources	NRPRE	MJ
10	Inventory indicators ISO21930: Non-renewable primary resources with energy content used as material (i.e., PENRM)	NRPRM	kg
11	Inventory indicators ISO21930: use of secondary material	SM	MJ
12	Inventory indicators ISO21930: use of renewable secondary fuels	RSF	MJ
13	Inventory indicators ISO21930: recovered energy	RE	MJ
14	Inventory indicators ISO21930: use of net fresh water	FW	m3

It should be noted that emerging LCA impact categories and inventory items are still under development and can have high levels of uncertainty that preclude international acceptance pending further development. Use caution when interpreting data in any of the following categories.

- Renewable primary energy resources as energy (fuel);
- Renewable primary resources as material;
- Non-renewable primary resources as energy (fuel);
- Non-renewable primary resources as material;
- Secondary Materials;
- Renewable secondary fuels;
- Non-renewable secondary fuels;
- Recovered energy;
- Abiotic depletion potential for non-fossil mineral resources.
- Land use related impacts, for example on biodiversity and/or soil fertility;
- Toxicological aspects;
- Emissions from land use change [GWP 100 (land-use change)];
- Hazardous waste disposed;
- Non-hazardous waste disposed;
- High-level radioactive waste;
- Intermediate and low-level radioactive waste;
- Components for reuse;
- Materials for recycling;
- Materials for energy recovery;
- Recovered energy exported from the product system.

TOTAL IMPACT SUMMARY

The following table reports the total LCA results for each product produced at the given ready mix concrete facility on a per 1m3 of concrete basis.

Mix designs: 0 to 15 MPa

Table 17: **Total life cycle (across modules in scope) impact results for Mix designs: 0 to 15MPa, assuming the geometric mean point values on a per 1 m3 of concrete basis**

a) Midpoint Impact Categories:

Indicator/LCI Metric	Unique name	GWP100	ODP	AP	EP	SFP	ADPfossil
Unit		kg CO2-eq	kg CFC-11-eq	kg SO2-eq	kg N-eq	kg O3-eq	MJ
Minimum		138	7.55e-07	0.159	1.14	3.38	591
Maximum		424	2.37e-06	0.338	1.26	6.56	1850
Mean		289	1.64e-06	0.259	1.21	5.17	1280
Median		326	1.86e-06	0.285	1.22	5.66	1460
24020NB0518		138	7.55e-07	0.159	1.14	3.38	591
24025NB0518		148	8.08e-07	0.161	1.15	3.39	632
24030NB0518		198	1.09e-06	0.189	1.17	3.86	853
77035ND2014		332	1.85e-06	0.283	1.22	5.61	1450
77036ND2010		342	1.91e-06	0.289	1.23	5.71	1490
77038ND2010		326	1.82e-06	0.282	1.22	5.62	1420
77040ND2014		335	1.86e-06	0.287	1.22	5.7	1460
77042ND2010		340	1.89e-06	0.29	1.22	5.75	1480
77045ND2010		360	2e-06	0.299	1.23	5.9	1560
77048ND2010		407	2.28e-06	0.328	1.26	6.38	1780
77050ND2010		424	2.37e-06	0.338	1.26	6.56	1850
73050NB0514		198	1.09e-06	0.189	1.17	3.86	853
70100ND2014		214	1.19e-06	0.213	1.17	4.42	931
73100NB0518		207	1.16e-06	0.206	1.18	4.24	906
038ND2014	ECOPact PAVEX MR 038 28 días revenimiento 14	326	2.08e-06	0.317	1.26	6.2	1640
040ND2010	ECOPact PAVEX MR 040 28 días revenimiento 10	324	2.07e-06	0.316	1.26	6.2	1630

b) Inventory Metrics:

Indicator/LCI Metric	Unique name	RPRE	PRM	NRPRE	NRPRM	SM	RSF	RE	FW
Unit		**MJ**	**MJ**	**MJ**	**kg**	**MJ**	**MJ**	**MJ**	**m3**
Minimum		19	459	19	428	0.198	0.00277	0.0956	0.0888
Maximum		54.8	459	55	784	0.603	0.00706	0.287	0.33
Mean		38.6	459	38.8	613	0.423	0.0052	0.203	0.212
Median		43.4	459	43.6	652	0.476	0.00576	0.226	0.215
24020NB0518		19	459	19	428	0.198	0.00277	0.0956	0.0888
24025NB0518		20.2	459	20.3	441	0.21	0.00287	0.102	0.1
24030NB0518		26.5	459	26.6	505	0.28	0.00358	0.136	0.158
77035ND2014		43.2	459	43.4	669	0.473	0.00571	0.225	0.235
77036ND2010		44.4	459	44.6	681	0.487	0.00586	0.232	0.239
77038ND2010		42.4	459	42.6	660	0.466	0.00567	0.221	0.204
77040ND2014		43.5	459	43.7	671	0.478	0.0058	0.227	0.211
77042ND2010		44.1	459	44.3	677	0.485	0.00587	0.23	0.219
77045ND2010		46.5	459	46.7	701	0.512	0.00613	0.242	0.238
77048ND2010		52.6	459	52.8	762	0.579	0.00681	0.276	0.273
77050ND2010		54.8	459	55	784	0.603	0.00706	0.287	0.283
73050NB0514		26.5	459	26.6	505	0.28	0.00358	0.136	0.158
70100ND2014		28.5	459	28.6	522	0.309	0.00402	0.147	0.166
73100NB0518		27.9	459	28	517	0.298	0.00386	0.146	0.174
038ND2014	ECOPact PAVEX MR 038 28 días revenimiento 14	49.1	459	49.3	645	0.555	0.00679	0.274	0.33
040ND2010	ECOPact PAVEX MR 040 28 días revenimiento 10	48.7	459	48.9	642	0.551	0.00676	0.272	0.317

Mix designs: 15 to 20 MPa

Table 18: **Total life cycle (across modules in scope) impact results for Mix designs: 15 to 20MPa, assuming the geometric mean point values on a per 1 m3 of concrete basis**

a) Midpoint Impact Categories:

Indicator/LCI Metric	Unique name	GWP100	ODP	AP	EP	SFP	ADPfossil
Unit		**kg CO2-eq**	**kg CFC-11-eq**	**kg SO2-eq**	**kg N-eq**	**kg O3-eq**	**MJ**
Minimum		238	1.34e-06	0.226	1.19	4.61	1040
Maximum		337	2.15e-06	0.318	1.26	6.17	1690
Mean		290	1.81e-06	0.283	1.23	5.6	1420
Median		297	1.89e-06	0.291	1.24	5.71	1490
70150NB2018		267	1.5e-06	0.252	1.2	5.13	1170

73150NB0514		238	1.34e-06	0.226	1.19	4.61	1040
84150ND2014	ECOPact 150 kg/cm2 28 días revenimiento 14	274	1.73e-06	0.276	1.23	5.49	1360
84150NB2014	ECOPact 150 kg/cm2 28 días revenimiento 14	277	1.75e-06	0.279	1.23	5.53	1380
84150NB2018	ECOPact 150 kg/cm2 28 días revenimiento 18	284	1.8e-06	0.283	1.23	5.59	1420
84200ND2014	ECOPact 200 kg/cm2 28 días revenimiento 14	297	1.89e-06	0.294	1.24	5.79	1490
84200NB2014	ECOPact 200 kg/cm2 28 días revenimiento 14	300	1.9e-06	0.295	1.24	5.82	1500
84200NB2018	ECOPact 200 kg/cm2 28 días revenimiento 18	307	1.95e-06	0.3	1.25	5.9	1540
150ND1014	ECOPact FLUIDIUM 150 kg/cm2 28 días revenimiento 14	299	1.89e-06	0.291	1.24	5.71	1490
150NB1018	ECOPact FLUIDIUM 150 kg/cm2 28 días revenimiento 18	309	1.96e-06	0.298	1.25	5.82	1540
200NB1018	ECOPact FLUIDIUM 200 kg/cm2 28 días revenimiento 18	337	2.15e-06	0.318	1.26	6.17	1690

b) Inventory Metrics:

Indicator/LCI Metric	Unique name	RPRE	PRM	NRPRE	NRPRM	SM	RSF	RE	FW
Unit		**MJ**	**MJ**	**MJ**	**kg**	**MJ**	**MJ**	**MJ**	**m3**
Minimum		31.8	459	31.9	555	0.343	0.00434	0.167	0.178
Maximum		50.6	459	50.8	658	0.571	0.0069	0.283	0.392
Mean		42.8	459	43	605	0.48	0.00592	0.236	0.313
Median		44.7	459	44.9	610	0.504	0.0062	0.249	0.325
70150NB2018		35.2	459	35.3	587	0.386	0.00488	0.184	0.201
73150NB0514		31.8	459	31.9	555	0.343	0.00434	0.167	0.178
84150ND2014	ECOPact 150 kg/cm2 28 días revenimiento 14	41.3	459	41.5	583	0.464	0.00578	0.229	0.308
84150NB2014	ECOPact 150 kg/cm2 28 días	41.8	459	41.9	586	0.469	0.00584	0.232	0.313

	revenimiento 14								
84150NB2018	ECOPact 150 kg/cm2 28 días revenimiento 18	42.8	459	43	595	0.481	0.00596	0.238	0.325
84200ND2014	ECOPact 200 kg/cm2 28 días revenimiento 14	44.7	459	44.9	610	0.504	0.00622	0.249	0.321
84200NB2014	ECOPact 200 kg/cm2 28 días revenimiento 14	45.2	459	45.3	614	0.509	0.00627	0.251	0.326
84200NB2018	ECOPact 200 kg/cm2 28 días revenimiento 18	46.3	459	46.4	623	0.522	0.0064	0.258	0.338
150ND1014	ECOPact FLUIDIUM 150 kg/cm2 28 días revenimiento 14	45	459	45.2	613	0.505	0.0062	0.25	0.36
150NB1018	ECOPact FLUIDIUM 150 kg/cm2 28 días revenimiento 18	46.5	459	46.7	626	0.523	0.00638	0.259	0.377
200NB1018	ECOPact FLUIDIUM 200 kg/cm2 28 días revenimiento 18	50.6	459	50.8	658	0.571	0.0069	0.283	0.392

Mix designs: 21 to 25 MPa

Table 19: **Total life cycle (across modules in scope) impact results for Mix designs: 21 to 25MPa, assuming the geometric mean point values on a per 1 m3 of concrete basis**

a) Midpoint Impact Categories:

Indicator/LCI Metric	Unique name	GWP100	ODP	AP	EP	SFP	ADPfossil
Unit		kg CO2-eq	kg CFC-11-eq	kg SO2-eq	kg N-eq	kg O3-eq	MJ
Minimum		269	1.51e-06	0.257	1.2	5.25	1180
Maximum		411	2.64e-06	0.374	1.31	7.16	2070
Mean		330	2.05e-06	0.31	1.25	6.07	1610
Median		326	2.07e-06	0.314	1.26	6.14	1630
70200ND2010		269	1.51e-06	0.257	1.2	5.25	1180
68200NB1018		304	1.7e-06	0.268	1.21	5.36	1330
73200NB0518		307	1.74e-06	0.269	1.23	5.34	1350
84250ND2010	ECOPact 200 kg/cm2 28 días revenimiento 10	309	1.97e-06	0.303	1.25	5.97	1550
84250ND2014	ECOPact 250 kg/cm2 28 días revenimiento 14	319	2.03e-06	0.31	1.25	6.07	1600
84250NB2014	ECOPact 250 kg/cm2 28 días revenimiento 14	322	2.05e-06	0.312	1.26	6.1	1610
84250NB2018	ECOPact 250 kg/cm2 28 días revenimiento 18	330	2.1e-06	0.316	1.26	6.18	1650
250NB2014	ECOPact ESTRUCTO 250 kg/cm2 28 días revenimiento 14	330	2.1e-06	0.317	1.26	6.19	1650
250NB2018	ECOPact ESTRUCTO 250 kg/cm2 28 días revenimiento 18	337	2.15e-06	0.322	1.26	6.26	1690
2507B2018	ECOPact ESTRUCTO 250 kg/cm2 7 días revenimiento 18	411	2.64e-06	0.374	1.31	7.16	2070
250NB1014	ECOPact FLUIDIUM 250 kg/cm2 28 días revenimiento 14	359	2.29e-06	0.335	1.28	6.47	1800
250NB1018	ECOPact FLUIDIUM 250 kg/cm2 28 días revenimiento 18	366	2.34e-06	0.339	1.28	6.53	1840

b) Inventory Metrics:

Indicator/LCI Metric	Unique name	RPRE	PRM	NRPRE	NRPRM	SM	RSF	RE	FW
Unit		MJ	MJ	MJ	kg	MJ	MJ	MJ	m3
Minimum		35.5	459	35.7	590	0.391	0.00497	0.186	0.181
Maximum		61.6	459	61.9	747	0.7	0.00831	0.346	0.421
Mean		48.3	459	48.5	654	0.542	0.00659	0.266	0.323
Median		49	459	49.2	646	0.554	0.00674	0.274	0.34
70200ND2010		35.5	459	35.7	590	0.391	0.00497	0.186	0.181
68200NB1018		39.8	459	39.9	635	0.436	0.00534	0.208	0.196
73200NB0518		40.6	459	40.7	643	0.441	0.00535	0.215	0.24
84250ND2010	ECOPact 200 kg/cm2 28 días revenimiento 10	46.5	459	46.7	625	0.525	0.00646	0.259	0.316
84250ND2014	ECOPact 250 kg/cm2 28 días revenimiento 14	48	459	48.2	637	0.542	0.00663	0.268	0.333
84250NB2014	ECOPact 250 kg/cm2 28 días revenimiento 14	48.5	459	48.6	640	0.547	0.00668	0.27	0.338
84250NB2018	ECOPact 250 kg/cm2 28 días revenimiento 18	49.6	459	49.8	649	0.56	0.00681	0.277	0.35
250NB2014	ECOPact ESTRUCTO 250 kg/cm2 28 días revenimiento 14	49.6	459	49.8	649	0.56	0.00682	0.277	0.343
250NB2018	ECOPact ESTRUCTO 250 kg/cm2 28 días revenimiento 18	50.6	459	50.8	658	0.572	0.00694	0.283	0.354
2507B2018	ECOPact ESTRUCTO 250 kg/cm2 7 días revenimiento 18	61.6	459	61.9	747	0.7	0.00831	0.346	0.421
250NB1014	ECOPact FLUIDIUM	53.9	459	54.2	685	0.609	0.00732	0.302	0.397

	250 kg/cm2 28 días revenimiento 14								
250NB1018	ECOPact FLUIDIUM 250 kg/cm2 28 días revenimiento 18	55	459	55.2	694	0.621	0.00744	0.307	0.409

Mix designs: 26 to 30 MPa

Table 20: **Total life cycle (across modules in scope) impact results for Mix designs: 26 to 30MPa, assuming the geometric mean point values on a per 1 m3 of concrete basis**

a) Midpoint Impact Categories:

Indicator/LCI Metric	Unique name	GWP100	ODP	AP	EP	SFP	ADPfossil
Unit		**kg CO2-eq**	**kg CFC-11-eq**	**kg SO2-eq**	**kg N-eq**	**kg O3-eq**	**MJ**
Minimum		292	1.63e-06	0.263	1.19	5.3	1280
Maximum		456	2.93e-06	0.406	1.33	7.71	2300
Mean		373	2.27e-06	0.333	1.27	6.46	1780
Median		367	2.32e-06	0.341	1.28	6.6	1820
37.58NB2018		359	2.01e-06	0.309	1.24	6.13	1570
70250ND2010		292	1.63e-06	0.263	1.21	5.3	1280
81250ND1000		375	1.98e-06	0.293	1.19	5.76	1570
73250NB0514		359	2.04e-06	0.299	1.25	5.84	1580
84300NB2014	ECOPact 300 kg/cm2 28 días revenimiento 14	359	2.3e-06	0.339	1.28	6.56	1810
84300NB2018	ECOPact 300 kg/cm2 28 días revenimiento 18	367	2.34e-06	0.343	1.28	6.63	1840
300NB2014	ECOPact ESTRUCTO 300 kg/cm2 28 días revenimiento 14	367	2.34e-06	0.344	1.28	6.65	1840
300NB2018	ECOPact ESTRUCTO 300 kg/cm2 28 días revenimiento 18	374	2.39e-06	0.348	1.28	6.72	1880
300RB2018	ECOPact ESTRUCTO 300 kg/cm2 14 días revenimiento 18	422	2.71e-06	0.382	1.31	7.29	2130
3007B2018	ECOPact ESTRUCTO 300	456	2.93e-06	0.406	1.33	7.71	2300

	kg/cm2 7 días revenimiento 18						

b) Inventory Metrics:

Indicator/LCI Metric	Unique name	RPRE	PRM	NRPRE	NRPRM	SM	RSF	RE	FW
Unit		**MJ**	**MJ**	**MJ**	**kg**	**MJ**	**MJ**	**MJ**	**m3**
Minimum		38.3	459	38.4	619	0.419	0.00519	0.2	0.104
Maximum		68.3	459	68.6	800	0.777	0.00913	0.384	0.431
Mean		53.1	459	53.3	707	0.596	0.00714	0.29	0.313
Median		54.5	459	54.8	702	0.617	0.00743	0.305	0.366
37.58NB2018		46.7	459	46.9	701	0.516	0.00624	0.245	0.245
70250ND2010		38.3	459	38.4	619	0.419	0.00519	0.2	0.185
81250ND1000		47.1	459	47.3	707	0.522	0.00618	0.228	0.104
73250NB0514		47	459	47.2	708	0.513	0.00609	0.251	0.268
84300NB2014	ECOPact 300 kg/cm2 28 días revenimiento 14	54	459	54.2	685	0.611	0.00737	0.302	0.364
84300NB2018	ECOPact 300 kg/cm2 28 días revenimiento 18	55	459	55.3	694	0.623	0.00749	0.308	0.376
300NB2014	ECOPact ESTRUCTO 300 kg/cm2 28 días revenimiento 14	55	459	55.3	694	0.624	0.0075	0.308	0.369
300NB2018	ECOPact ESTRUCTO 300 kg/cm2 28 días revenimiento 18	56.2	459	56.4	702	0.636	0.00764	0.315	0.381
300RB2018	ECOPact ESTRUCTO 300 kg/cm2 14 días revenimiento 18	63.3	459	63.6	760	0.719	0.00852	0.356	0.406
3007B2018	ECOPact ESTRUCTO 300 kg/cm2 7 días revenimiento 18	68.3	459	68.6	800	0.777	0.00913	0.384	0.431

Mix designs: 31 to 35 MPa

Table 21: **Total life cycle (across modules in scope) impact results for Mix designs: 31 to 35MPa, assuming the geometric mean point values on a per 1 m3 of concrete basis**

a) Midpoint Impact Categories:

Indicator/LCI Metric	Unique name	GWP100	ODP	AP	EP	SFP	ADPfossil
Unit		**kg CO2-eq**	**kg CFC-11-eq**	**kg SO2-eq**	**kg N-eq**	**kg O3-eq**	**MJ**
Minimum		328	1.84e-06	0.284	1.22	5.65	1440
Maximum		419	2.68e-06	0.38	1.31	7.26	2110
Mean		392	2.42e-06	0.35	1.28	6.74	1900
Median		408	2.62e-06	0.372	1.31	7.14	2050
70300ND2014		328	1.84e-06	0.284	1.22	5.65	1440
73300NB0518		382	2.16e-06	0.312	1.26	6.07	1680
84350NB2014	ECOPact 300 kg/cm2 28 días revenimiento 18	404	2.59e-06	0.37	1.3	7.1	2030
84350NB2018	ECOPact 350 kg/cm2 28 días revenimiento 14	411	2.64e-06	0.375	1.31	7.18	2070
350NB2014	ECOPact ESTRUCTO 350 kg/cm2 28 días revenimiento 14	411	2.64e-06	0.376	1.31	7.19	2070
350NB2018	ECOPact ESTRUCTO 350 kg/cm2 28 días revenimiento 18	419	2.68e-06	0.38	1.31	7.26	2110

b) Inventory Metrics:

Indicator/LCI Metric	Unique name	RPRE	PRM	NRPRE	NRPRM	SM	RSF	RE	FW
Unit		MJ	MJ	MJ	kg	MJ	MJ	MJ	m3
Minimum		42.9	459	43	665	0.47	0.00571	0.224	0.214
Maximum		62.7	459	63	755	0.712	0.00845	0.352	0.41
Mean		56.5	459	56.8	731	0.636	0.00757	0.312	0.349
Median		61	459	61.4	742	0.694	0.00825	0.343	0.396
70300ND2014		42.9	459	43	665	0.47	0.00571	0.224	0.214
73300NB0518		49.9	459	50	736	0.544	0.00642	0.266	0.268
84350NB2014	ECOPact 300 kg/cm2 28 días revenimiento 18	60.5	459	60.8	738	0.687	0.00818	0.34	0.394
84350NB2018	ECOPact 350 kg/cm2 28 días revenimiento 14	61.6	459	61.9	746	0.7	0.00832	0.346	0.406
350NB2014	ECOPact ESTRUCTO 350 kg/cm2 28 días revenimiento 14	61.6	459	61.9	746	0.7	0.00833	0.346	0.399
350NB2018	ECOPact ESTRUCTO 350 kg/cm2 28 días revenimiento 18	62.7	459	63	755	0.712	0.00845	0.352	0.41

Mix designs: 36 to 40 MPa

Table 22: **Total life cycle (across modules in scope) impact results for Mix designs: 36 to 40MPa, assuming the geometric mean point values on a per 1 m3 of concrete basis**

a) Midpoint Impact Categories:

Indicator/LCI Metric	GWP100	ODP	AP	EP	SFP	ADPfossil
Unit	**kg CO2-eq**	**kg CFC-11-eq**	**kg SO2-eq**	**kg N-eq**	**kg O3-eq**	**MJ**
Minimum	328	1.84e-06	0.284	1.22	5.65	1440
Maximum	460	2.62e-06	0.361	1.3	6.9	2030
Mean	394	2.23e-06	0.322	1.26	6.28	1740
Median	394	2.23e-06	0.322	1.26	6.28	1740
70350ND2014	328	1.84e-06	0.284	1.22	5.65	1440
73350NB0514	460	2.62e-06	0.361	1.3	6.9	2030

b) Inventory Metrics:

Indicator/LCI Metric	RPRE	PRM	NRPRE	NRPRM	SM	RSF	RE	FW
Unit	MJ	MJ	MJ	kg	MJ	MJ	MJ	m3
Minimum	42.9	459	43	665	0.47	0.00571	0.224	0.214
Maximum	59.9	459	60.1	836	0.657	0.00758	0.322	0.327
Mean	51.4	459	51.6	750	0.564	0.00664	0.273	0.27
Median	51.4	459	51.6	750	0.564	0.00664	0.273	0.27
70350ND2014	42.9	459	43	665	0.47	0.00571	0.224	0.214
73350NB0514	59.9	459	60.1	836	0.657	0.00758	0.322	0.327

Mix designs: 41 to 45 MPa

Table 23: **Total life cycle (across modules in scope) impact results for Mix designs: 41 to 45MPa, assuming the geometric mean point values on a per 1 m3 of concrete basis**

a) Midpoint Impact Categories:

Indicator/LCI Metric	GWP100	ODP	AP	EP	SFP	ADPfossil
Unit	kg CO2-eq	kg CFC-11-eq	kg SO2-eq	kg N-eq	kg O3-eq	MJ
Minimum	408	2.28e-06	0.329	1.26	6.4	1780
Maximum	470	2.65e-06	0.377	1.29	7.3	2070
Mean	441	2.48e-06	0.354	1.28	6.87	1930
Median	445	2.5e-06	0.356	1.28	6.91	1950
3745NB2018	470	2.65e-06	0.377	1.29	7.3	2070
3755NB2018	408	2.28e-06	0.329	1.26	6.4	1780
13400NB2018	445	2.5e-06	0.356	1.28	6.91	1950

b) Inventory Metrics:

Indicator/LCI Metric	RPRE	PRM	NRPRE	NRPRM	SM	RSF	RE	FW
Unit	MJ	MJ	MJ	kg	MJ	MJ	MJ	m3
Minimum	52.8	459	53	764	0.581	0.00683	0.277	0.279
Maximum	60.8	459	61	841	0.673	0.00788	0.322	0.317
Mean	57	459	57.2	805	0.63	0.00738	0.301	0.298
Median	57.5	459	57.7	810	0.636	0.00744	0.304	0.299
3745NB2018	60.8	459	61	841	0.673	0.00788	0.322	0.317
3755NB2018	52.8	459	53	764	0.581	0.00683	0.277	0.279
13400NB2018	57.5	459	57.7	810	0.636	0.00744	0.304	0.299

Mix designs: 46 to 50 MPa

Table 24: **Total life cycle (across modules in scope) impact results for Mix designs: 46 to 50MPa, assuming the geometric mean point values on a per 1 m3 of concrete basis**

a) Midpoint Impact Categories:

Indicator/LCI Metric	GWP100	ODP	AP	EP	SFP	ADPfossil
Unit	kg CO2-eq	kg CFC-11-eq	kg SO2-eq	kg N-eq	kg O3-eq	MJ
13450NB2018	528	2.95e-06	0.409	1.3	7.87	2310

b) Inventory Metrics:

Indicator/LCI Metric	RPRE	PRM	NRPRE	NRPRM	SM	RSF	RE	FW
Unit	MJ	MJ	MJ	kg	MJ	MJ	MJ	m3
13450NB2018	67.6	459	67.9	909	0.753	0.00871	0.355	0.338

Mix designs: 51 to 55 MPa

Table 25: **Total life cycle (across modules in scope) impact results for Mix designs: 51 to 55MPa, assuming the geometric mean point values on a per 1 m3 of concrete basis**

b) Midpoint Impact Categories:

Indicator/LCI Metric	GWP100	ODP	AP	EP	SFP	ADPfossil
Unit	kg CO2-eq	kg CFC-11-eq	kg SO2-eq	kg N-eq	kg O3-eq	MJ
3735NB2018	632	3.7e-06	0.48	1.39	8.99	2890

b) Inventory Metrics:

Indicator/LCI Metric	RPRE	PRM	NRPRE	NRPRM	SM	RSF	RE	FW
Unit	MJ	MJ	MJ	kg	MJ	MJ	MJ	m3
3735NB2018	82.1	459	82.5	1040	0.946	0.0107	0.464	0.38

Mix designs: >60 MPa

Table 26: **Total life cycle (across modules in scope) impact results for Mix designs: >60MPa, assuming the geometric mean point values on a per 1 m3 of concrete basis**

a) Midpoint Impact Categories:

Indicator/LCI Metric	Unique name	GWP100	ODP	AP	EP	SFP	ADPfossil
Unit		**kg CO2-eq**	**kg CFC-11-eq**	**kg SO2-eq**	**kg N-eq**	**kg O3-eq**	**MJ**
Minimum		223	1.39e-06	0.234	1.2	4.72	1100
Maximum		690	3.89e-06	0.497	1.38	9.26	3030
Mean		456	2.64e-06	0.366	1.29	6.99	2060
Median		456	2.64e-06	0.366	1.29	6.99	2060
14650NB2018		690	3.89e-06	0.497	1.38	9.26	3030
100NB0514	ECOPact MORPLUZ 100 kg/cm2 28 días revenimiento 14	223	1.39e-06	0.234	1.2	4.72	1100

b) Inventory Metrics:

Indicator/LCI Metric	Unique name	RPRE	PRM	NRPRE	NRPRM	SM	RSF	RE	FW
Unit		**MJ**	**MJ**	**MJ**	**kg**	**MJ**	**MJ**	**MJ**	**m3**
Minimum		33.7	459	33.8	522	0.374	0.00476	0.184	0.256
Maximum		88.1	459	88.4	1110	0.977	0.0109	0.467	0.349
Mean		60.9	459	61.1	816	0.676	0.00783	0.326	0.302
Median		60.9	459	61.1	816	0.676	0.00783	0.326	0.302
14650NB2018		88.1	459	88.4	1110	0.977	0.0109	0.467	0.349
100NB0514	ECOPact MORPLUZ 100 kg/cm2 28 días revenimiento 14	33.7	459	33.8	522	0.374	0.00476	0.184	0.256

ADDITIONAL ENVIRONMENTAL INFO

No regulated substances of very high concern are utilized on site.

REFERENCES

ASTM Standards:

- ASTM A36/A36M Standard Specification for Carbon Structural Steel
- ASTM A108 Standard Specification for Steel Bar, Carbon and Alloy, Cold-Finished
- ASTM A123/A123M Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
- ASTM A153/A153M Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware
- ASTM A184 Standard Specification for Welded Deformed Steel Bar Mats for Concrete Reinforcement
- ASTM A307 Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60,000 PSI Tensile Strength
- ASTM A416/A416M Standard Specification for Steel Strand, Uncoated Seven-Wire for Prestressed Concrete
- ASTM A555/A555M Standard Specification for General Requirements for Stainless Steel Wire and Wire Rods
- ASTM A615/A615M Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement
- ASTM A666 Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar
- ASTM A706/A706M Standard Specification for Deformed and Plain Low-Alloy Steel Bars for Concrete Reinforcement
- ASTM A767/A767M Standard Specification for Zinc-Coated (Galvanized) Steel Bars for Concrete Reinforcement
- ASTM A775/A775M Standard Specification for Epoxy-Coated Steel Reinforcing Bars
- ASTM A820/A820M Standard Specification for Steel Fibers for Fiber-Reinforced Concrete
- ASTM A884/A884M Standard Specification for Epoxy-Coated Steel Wire and Welded Wire Reinforcement
- ASTM A934/A934M Standard Specification for Epoxy-Coated Prefabricated Steel Reinforcing Bars
- ASTM A1064/A1064M Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete
- ASTM C33/C33M Standard Specification for Concrete Aggregates
- ASTM C94 Standard Specification for Ready-Mixed Concrete
- ASTM C150/C150M Standard Specification for Portland Cement
- ASTM C260/C260M Standard Specification for Air-Entraining Admixtures for Concrete
- ASTM C595 Standard Specification for Blended Hydraulic Cements
- ASTM C618 Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete
- ASTM C979/C979M Standard Specification for Pigments for Integrally Colored Concrete
- ASTM C989/C989M Standard Specification for Slag Cement for Use in Concrete and Mortars
- ASTM C1017/C1017M Standard Specification for Chemical Admixtures for Use in Producing Flowing Concrete

- ASTM C1116/C1116M Standard Specification for Fiber-Reinforced Concrete
- ASTM C1157/C1157M Standard Performance Specification for Hydraulic Cement
- ASTM C1240 Standard Specification for Silica Fume Used in Cementitious Mixtures
- ASTM C1602/C1602M Standard Specification for Mixing Water Used in the Production of Hydraulic Cement Concrete
- ASTM G109 Standard Test Method for Determining Effects of Chemical Admixtures on Corrosion of Embedded Steel Reinforcement in Concrete Exposed to Chloride Environments
- ASTM C330/C330M Standard Specification for Lightweight Aggregates for Structural Concrete
- ASTM C494/C494M Standard Specification for Chemical Admixtures for Concrete

CSA Standards:

- CAN/CGSB-1.40 Anticorrosive Structural Steel Alkyd Primer
- CAN/CSA G30.18 Carbon steel bars for concrete reinforcement
- CAN/CSA A3000 Cementitious Materials Compendium
- CAN/CSA G40.20/G40.21 General requirements for rolled or welded structural quality steel / Structural quality steel
- CAN/CSA A23.1/A23.2 Concrete Materials and Methods of Concrete Construction/Test methods and Standard Practices for Concrete
- CAN/CSA A23.4 Precast concrete - Materials and construction
- CSA S806 Design and construction of building structures with fiber-reinforced polymers

ISO Standards:

- ISO 6707-1: 2014 Buildings and Civil Engineering Works - Vocabulary - Part 1: General Terms
- ISO 14021:1999 Environmental Labels and Declarations - Self-declared Environmental Claims (Type II Environmental Labeling)
- 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 14067:2018 Greenhouse Gases - Carbon Footprint of Products - Requirements and Guidelines for Quantification
- ISO 14050:2009 Environmental Management - Vocabulary
- ISO 21930:2017 Sustainability in Building Construction - Environmental Declaration of Building Products

EN Standards:

- EN 16757 Sustainability of construction works - Environmental product declarations - Product Category Rules for concrete and concrete elements
- EN 15804 Sustainability of construction works - Environmental product declarations - Core rules for the product category of construction products

Other References:

- US EPA Waste Reduction Model (WARM), Fly Ash Chapter: http://epa.gov/climatechange/wycd/waste/downloads/fly-ash-chapter10-28-10.pdf
- American Concrete Institute (ACI) 211: Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete.
- ACI 318-14 Building Code Requirements for Structural Concrete and Commentary. American Concrete Institute. Farmington Hills, MI, USA available at https://www.concrete.org/store/
- Mather, B & Ozyildirim, C. (2002). SP-1(02) : Concrete Primer. American Concrete Institute: SP0102. American Concrete Institute. Farmington Hills, MI, USA available at https://www.concrete.org/store/
- NSF International (February 2019). Product Category Rules (PCR) for ISO 14025 Type III Environmental Product Declarations (EPDs) of Concrete v1.2.
- Product Category Rules for Preparing an Environmental Product Declaration for Precast Concrete (UN CPC 37550), ASTM International, March 2015. https://www.astm.org/CERTIFICATION/DOCS/266.PCR_for_Precast_Concrete.pdf
- USGBC LEED v4 for Building Design and Construction, 11 Jan 2019 available at https://www.usgbc.org/resources/pcr-committee-process-resources-part-b
- USGBC PCR Committee Process & Resources: Part B, USGBC, 7 July 2017 available at https://www.usgbc.org/resources/pcr-committee-process-resources-part-b.