Environmental Product Declaration

Environmental Product Declaration for various ready mix concrete products produced by Holcim México Operaciones S.A. de C.V. at their Tultitlán facility in Tultitlán, Estado de 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.labelinsustainability.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)
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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 35 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 Lafarge 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 CO2 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 44 concrete mixes manufactured at the Holcim Mexico Operaciones S.A. de C.V. Tultitlán concrete facility in Estado de México, 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#	Unique name/ID	Short description	Product type	28 day strength, MPa	H2O to cement ratio
1	24005NB0524	0.5 MPa 28d strength mortars and fillers	Mortars and fillers	0.5	4.66
2	24007NB0518	0.7 MPa 28d strength mortars and fillers	Mortars and fillers	0.7	4.84
3	24010NB0514	1 MPa 28d strength mortars and fillers	Mortars and fillers	1.0	4.28
4	24015NB0518	1.5 MPa 28d strength mortars and fillers	Mortars and fillers	1.5	3.42
5	24020NB0520	2 MPa 28d strength mortars and fillers	Mortars and fillers	2.0	3.05
6	24025NB0520	2.5 MPa 28d strength mortars and fillers	Mortars and fillers	2.5	2.75
7	24030NB0520	2.9 MPa 28d strength mortars and fillers	Mortars and fillers	2.9	2.51
8	77035ND4010	3.4 MPa 28d strength Ready mix concrete	Ready mix concrete	3.4	0.88
9	24035NB0520	3.4 MPa 28d strength mortars and fillers	Mortars and fillers	3.4	2.31
10	39036ND2006	3.5 MPa 28d strength Ready mix concrete	Ready mix concrete	3.5	0.75

11	39038ND4012	3.7 MPa 28d strength Ready mix concrete	Ready mix concrete	3.7	0.73
12	39040NB4012	3.9 MPa 28d strength Ready mix concrete	Ready mix concrete	3.9	0.72
13	24040NB0520	3.9 MPa 28d strength mortars and fillers	Mortars and fillers	3.9	2.21
14	39042ND2006	4.1 MPa 28d strength Ready mix concrete	Ready mix concrete	4.1	0.63
15	39045ND4010	4.4 MPa 28d strength Ready mix concrete	Ready mix concrete	4.4	0.61
16	39048ND4006	4.7 MPa 28d strength Ready mix concrete	Ready mix concrete	4.7	0.57
17	77050ND4010	4.9 MPa 28d strength Ready mix concrete	Ready mix concrete	4.9	0.61
18	24050NB0518	4.9 MPa 28d strength mortars and fillers	Mortars and fillers	4.9	2.02
19	70100NB2014	9.8 MPa 28d strength Ready mix concrete	Ready mix concrete	9.8	1.13
20	73100NB0518	9.8 MPa 28d strength mortars and fillers	Mortars and fillers	9.8	1.48
21	71150ND1214	14.7 MPa 28d strength Ready mix concrete	Ready mix concrete	14.7	0.94

Mix designs: 15 to 20 MPa

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

Mix#	Unique name/ID	Short description	Product type	28 day strength, MPa	H2O to cement ratio
22	70175NB2014	17.2 MPa 28d strength Ready mix concrete	Ready mix concrete	17.2	0.92
23	70200NB2014	19.6 MPa 28d strength Ready mix concrete	Ready mix concrete	19.6	0.87

Mix designs: 21 to 25 MPa

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

Mix#	Unique name/ID	Short description	Product type	28 day strength, MPa	H2O to cement ratio
24	70210NB2014	20.6 MPa 28d strength Ready mix concrete	Ready mix concrete	20.6	0.8500000
25	70250ND2014	24.5 MPa 28d strength Ready mix concrete	Ready mix concrete	24.5	0.7700000
32	40250NB1210	24.5 MPa 28d strength special concrete	Special concrete	24.5	0.8826212
33	73250NB0514	24.5 MPa 28d strength mortars and fillers	Mortars and fillers	24.5	0.8466106

Mix designs: 26 to 30 MPa

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

Mix#	Unique name/ID	Short description	Product type	28 day strength, MPa	H2O to cement ratio
26	70280NB2014	27.5 MPa 28d strength Ready mix concrete	Ready mix concrete	27.5	0.7000000
27	70300ND2014	29.4 MPa 28d strength Ready mix concrete	Ready mix concrete	29.4	0.6600000
34	04280NB2012	27.5 MPa 28d strength Ready mix concrete	Ready mix concrete	27.5	0.7217949
35	02300NB2018	29.4 MPa 28d strength Ready mix concrete	Ready mix concrete	29.4	0.7039785
36	40300NB1214	29.4 MPa 28d strength special concrete	Special concrete	29.4	0.7850083
37	73300NB0518	29.4 MPa 28d strength mortars and fillers	Mortars and fillers	29.4	0.7599827

Mix designs: 31 to 35 MPa

Table 5: **Declared products with Mix designs: 31 to 35MPa considered in this environmental product declaration**

Mix#	Unique name/ID	Short description	Product type	28 day strength, MPa	H2O to cement ratio
28	70320ND2010	31.4 MPa 28d strength Ready mix concrete	Ready mix concrete	31.4	0.6200000
29	04350NB2012	34.3 MPa 28d strength Ready mix concrete	Ready mix concrete	34.3	0.5600000
38	71350ND1210	34.3 MPa 28d strength Ready mix concrete	Ready mix concrete	34.3	0.5756524
39	73350NB0514	34.3 MPa 28d strength mortars and fillers	Mortars and fillers	34.3	0.6787856

Mix designs: 36 to 40 MPa

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

Mix#	Unique name/ID	Short description	Product type	28 day strength, MPa	H2O to cement ratio
30	04360ND2012	35.3 MPa 28d strength Ready mix concrete	Ready mix concrete	35.3	0.5500000
31	70400ND2014	39.3 MPa 28d strength Ready mix concrete	Ready mix concrete	39.3	0.5200000
40	13400ND2012	39.3 MPa 28d strength Ready mix concrete	Ready mix concrete	39.3	0.4609932

Mix designs: 41 to 45 MPa

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

Mix#	Unique name/ID	Short description	Product type	28 day strength, MPa	H2O to cement ratio
41	13450ND2012	44.2 MPa 28d strength Ready mix concrete	Ready mix concrete	44.2	0.4225727

Mix designs: 46 to 50 MPa

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

Mix#	Unique name/ID	Short description	Product type	28 day strength, MPa	H2O to cement ratio
42	13500ND2012	49.1 MPa 28d strength Ready mix concrete	Ready mix concrete	49.1	0.3966257

Mix designs: 51 to 55 MPa

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

Mix#	Unique name/ID	Short description	Product type	28 day strength, MPa	H2O to cement ratio
43	13550ND2012	54 MPa 28d strength Ready mix concrete	Ready mix concrete	54	0.357288

Mix designs: 56 to 60 MPa

Table 10: **Declared products with Mix designs: 56 to 60MPa considered in this environmental product declaration**

Mix#	Unique name/ID	Short description	Product type	28 day strength, MPa	H2O to cement ratio
44	13600ND2012	58.9 MPa 28d strength Ready mix concrete	Ready mix concrete	58.9	0.3210425

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: **Design composition**

Product Components	Raw Material, weight%
Cement	Proprietary
Aggregates	30-60.00
Others	0.01-5.00
Total	100.00

SYSTEM BOUNDARIES

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

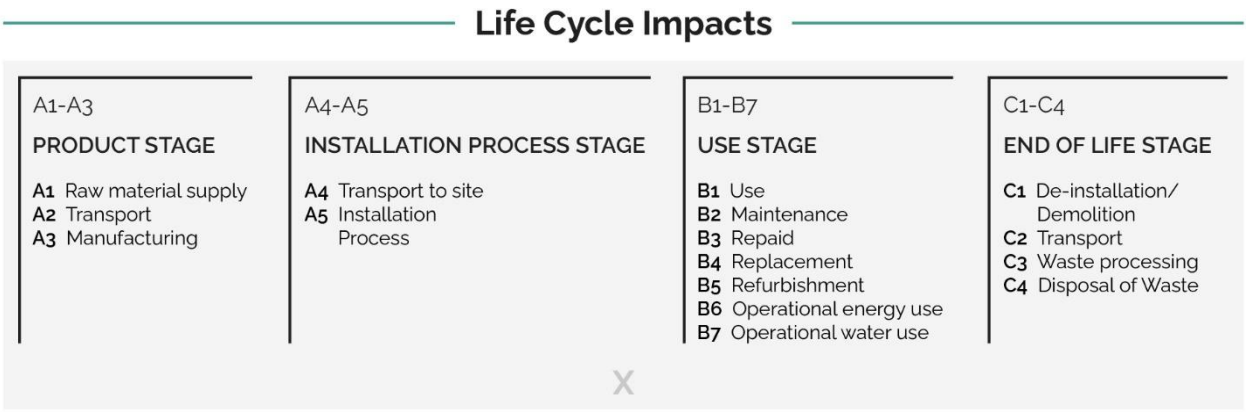

Figure 1: **General life cycle phases for consideration in a construction works system**

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.

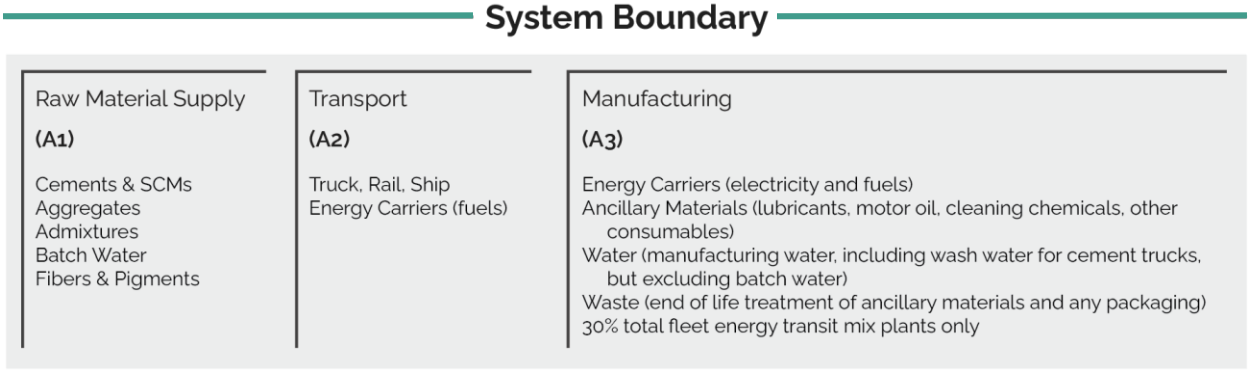

Figure 2: **General system inputs considered in the product system and categorized by modules in scope**

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 Tultitlán 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 v3.8 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

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 2022. 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 2022.

Recovered energy: Not applicable.

Recycled/reused material/components: The amount of returned concrete is based on Holcim primary data for the reference year, 2022..

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 2022.

Product transport requirements: The diesel fuel used by the mixing trucks is direct primary information reported from Holcim México records for the year 2022. 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 12: **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
Andesite sand	basalt quarry operation/basalt/RoW/kg; Note: modifications made (see ecoinvent activity changes table)	ecoinvent v3.8	Edo de Mexico	v3.8 in 2021	2	3	1	3	3
Water	tap water production, conventional with	ecoinvent v3.8	Edo de Mexico	v3.8 in 2021	2	3	1	3	3

	biological treatment/tap water/RoW/kg								
Limestone Gravel	limestone quarry operation/limestone, unprocessed/RoW/kg ; Note: modifications made (see ecoinvent activity changes table)	ecoinvent v3.8	Estado de México	v3.8 in 2021	2	3	1	3	3
Additives	market for chemical, organic/chemical, organic/GLO/kg	ecoinvent v3.8	Edo de Mexico	v3.8 in 2021	2	3	1	3	3
Cement (CPC 40) - PROVEEDOR: HOLCIM APAXCO (Apasco)	CPC 40	Progam Operator: Labeling Sustainability- EPD ID: e38f688d-1fa5-41b0-a9b1-e5b1422ea654	Estado de México	very good, 3rd party verfied facility - specific EPD dataset	3	3	3	3	3
Cement CPC 40R PROVEEDOR: HOLCIM APAXCO (Apasco)	CPC 40R	Progam Operator: Labeling Sustainability- EPD ID: e38f688d-1fa5-41b0-a9b1-e5b1422ea654	Estado de México	very good, 3rd party verfied facility - specific EPD dataset	3	NA	3	3	3
Cement (CPO 30R R) PROVEEDOR: HOLCI Orizaba	CPC 30R	Progam Operator: Labeling Sustainability- EPD ID: 565b7deb-ebd6-4cb3-9aa6-a585381c41f3	Veracruz	25 February 2023	3	3	3	3	3
Natural River sand	sand quarry operation, extraction from river bed/sand/BR/kg; Note: modifications made (see ecoinvent activity changes table)	ecoinvent v3.8	Morelos	v3.8 in 2021	2	3	1	3	3

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 v3.8 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 v3.8 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 2022-01-01 to 2022-12-31.
- Upstream (background) LCI data was either the PCR specified default (if applicable) or more appropriate LCI datasets as found in the country-adjusted ecoinvent v3.8 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 (see tables below).

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.

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 13: **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	AP	EP	GWP	ODP	PCOP	ADPe	ADPf
Unit	**moles of H+-Eq**	**kg N**	**kg CO2-Eq**	**kg CFC-11-Eq**	**kg NOx-Eq**	**kg Sb-Eq**	**MJ, net calorific value**
Minimum	27.3	0.0437	96.5	6.65e-06	0.329	0.00038	591
Maximum	411	0.447	399	3.24e-05	9.72	0.0014	2450
Mean	128	0.147	232	1.48e-05	2.86	0.000615	1190
Median	109	0.122	221	8.6e-06	2.51	0.000535	724
24005NB0524	87.3	0.0977	99.9	6.65e-06	1.99	0.00039	591
24007NB0518	81.9	0.0921	96.5	6.88e-06	1.85	0.00038	609
24010NB0514	88.3	0.0992	103	7.15e-06	2.01	0.000404	633
24015NB0518	109	0.122	120	7.18e-06	2.51	0.000464	642

24020NB0520	122	0.135	130	7.23e-06	2.81	0.000501	650
24025NB0520	133	0.147	140	7.36e-06	3.08	0.000535	664
24030NB0520	144	0.159	149	7.47e-06	3.34	0.000568	676
77035ND4010	291	0.317	275	9.92e-06	6.84	0.00104	875
24035NB0520	155	0.17	158	7.59e-06	3.6	0.000601	688
39036ND2006	28.8	0.0492	315	2.65e-05	0.336	0.000472	2000
39038ND4012	29.9	0.0511	331	2.76e-05	0.346	0.00049	2090
39040NB4012	30.6	0.0523	342	2.84e-05	0.352	5e-04	2150
24040NB0520	162	0.178	164	7.66e-06	3.76	0.000621	696
39042ND2006	31.8	0.0543	359	2.96e-05	0.363	0.000518	2240
39045ND4010	33.6	0.0573	385	3.14e-05	0.38	0.000548	2380
39048ND4006	34.5	0.059	399	3.24e-05	0.389	0.000561	2450
77050ND4010	411	0.447	376	1.09e-05	9.72	0.0014	986
24050NB0518	173	0.19	174	7.85e-06	4.03	0.000658	715
70100NB2014	233	0.256	221	8.6e-06	5.48	0.000859	724
73100NB0518	27.3	0.0437	262	2.25e-05	0.329	0.000402	1750
71150ND1214	282	0.308	268	9.85e-06	6.62	0.00101	878

b) Inventory Metrics:

Indicator/LCI Metric	**TPE**	**RE**	**NRE**	**NRR**	**RR**	**WDP**	**LFW**	**LFHW**	**CBWC**	**CWWC**	**CHW**	**CNHW**
Unit	**MJ-Eq**	**MJ-Eq**	**MJ-Eq**	**kg**	**m3**	**m3**	**kg waste**	**kg waste**	**m3**	**m3**	**kg**	**kg**
Minimum	655	29	624	17.7	0.000512	0.528	14.9	0.00124	0.233	2.5e-05	0.0025	0.05
Maximum	2680	75.9	2630	64.7	0.00517	3.81	37.9	0.00309	0.376	2.5e-05	0.0025	0.05
Mean	1320	43.3	1270	33.5	0.00176	1.44	23.9	0.00193	0.308	2.5e-05	0.0025	0.05
Median	814	42.5	764	21.8	0.00152	0.608	21.7	0.00163	0.348	2.5e-05	0.0025	0.05
24005NB0524	655	29.1	624	17.7	0.00126	0.549	14.9	0.00124	0.376	2.5e-05	0.0025	0.05
24007NB0518	670	29	647	18.1	0.00118	0.532	15.4	0.00129	0.361	2.5e-05	0.0025	0.05
24010NB0514	699	30.5	670	18.9	0.00128	0.528	16	0.00134	0.349	2.5e-05	0.0025	0.05
24015NB0518	711	33.1	679	19.3	0.00152	0.556	16.2	0.00134	0.356	2.5e-05	0.0025	0.05
24020NB0520	725	35.1	687	19.5	0.00171	0.571	16.4	0.00135	0.358	2.5e-05	0.0025	0.05
24025NB0520	740	36.6	702	20.1	0.00186	0.581	16.7	0.00137	0.356	2.5e-05	0.0025	0.05
24030NB0520	761	39.1	714	20.6	0.00197	0.591	17	0.00139	0.354	2.5e-05	0.0025	0.05
77035ND4010	988	58.2	928	26.8	0.0038	0.65	24	0.00186	0.271	2.5e-05	0.0025	0.05
24035NB0520	771	40.7	730	20.9	0.00211	0.601	17.3	0.00141	0.353	2.5e-05	0.0025	0.05

39036ND2006	2180	40.7	2150	52.8	0.000512	3.58	32.8	0.00267	0.239	2.5e-05	0.0025	0.05
39038ND4012	2280	42.5	2240	55.3	0.000534	3.68	33.8	0.00275	0.245	2.5e-05	0.0025	0.05
39040NB4012	2340	43.7	2290	56.5	0.000552	3.81	34.3	0.0028	0.248	2.5e-05	0.0025	0.05
24040NB0520	780	41	738	21.1	0.00217	0.608	17.5	0.00142	0.353	2.5e-05	0.0025	0.05
39042ND2006	2440	45.6	2390	59.2	0.000562	3.34	35.4	0.00288	0.233	2.5e-05	0.0025	0.05
39045ND4010	2600	48.5	2560	62.8	0.000595	3.42	37	0.00301	0.244	2.5e-05	0.0025	0.05
39048ND4006	2680	50.2	2630	64.7	0.000615	3.34	37.9	0.00309	0.236	2.5e-05	0.0025	0.05
77050ND4010	1130	75.9	1050	30.7	0.00517	0.773	26.9	0.00203	0.271	2.5e-05	0.0025	0.05
24050NB0518	802	43.5	757	21.8	0.00232	0.617	18	0.00146	0.348	2.5e-05	0.0025	0.05
70100NB2014	814	44.3	764	21.6	0.00294	0.572	21.7	0.00163	0.278	2.5e-05	0.0025	0.05
73100NB0518	1920	43	1870	47.2	0.000534	0.596	28.2	0.00237	0.353	2.5e-05	0.0025	0.05
71150ND1214	993	58.1	932	27	0.0037	0.653	23.6	0.00184	0.278	2.5e-05	0.0025	0.05

Mix designs: 15 to 20 MPa

Table 14: **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**

Indicator/LCI Metric	AP	EP	GWP	ODP	PCOP	ADPe	ADPf
Unit	**moles of H+-Eq**	**kg N**	**kg CO2-Eq**	**kg CFC-11-Eq**	**kg NOx-Eq**	**kg Sb-Eq**	**MJ, net calorific value**
Minimum	281	0.307	262	9.11e-06	6.62	0.001	779
Maximum	296	0.323	274	9.27e-06	6.98	0.00105	797
Mean	288	0.315	268	9.19e-06	6.8	0.00102	788
Median	288	0.315	268	9.19e-06	6.8	0.00102	788
70175NB2014	281	0.307	262	9.11e-06	6.62	0.001	779
70200NB2014	296	0.323	274	9.27e-06	6.98	0.00105	797

b) Inventory Metrics:

Indicator/LCI Metric	TPE	RE	NRE	NRR	RR	WDP	LFW	LFHW	CBWC	CWWC	CHW	CNHW
Unit	**MJ-Eq**	**MJ-Eq**	**MJ-Eq**	**kg**	**m3**	**m3**	**kg waste**	**kg waste**	**m3**	**m3**	**kg**	**kg**
Minimum	879	51.4	827	23.4	0.00359	0.621	23	0.00172	0.275	2.5e-05	0.0025	0.05

Maximum	900	53.8	848	24.1	0.0038	0.636	23.4	0.00175	0.276	2.5e-05	0.0025	0.05
Mean	890	52.6	838	23.8	0.0037	0.629	23.2	0.00174	0.276	2.5e-05	0.0025	0.05
Median	890	52.6	838	23.8	0.0037	0.629	23.2	0.00174	0.276	2.5e-05	0.0025	0.05
70175NB2014	879	51.4	827	23.4	0.00359	0.621	23	0.00172	0.276	2.5e-05	0.0025	0.05
70200NB2014	900	53.8	848	24.1	0.0038	0.636	23.4	0.00175	0.275	2.5e-05	0.0025	0.05

Mix designs: 21 to 25 MPa

Table 15: **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**

Indicator/LCI Metric	AP	EP	GWP	ODP	PCOP	ADPe	ADPf
Unit	moles of H+-Eq	kg N	kg CO2-Eq	kg CFC-11-Eq	kg NOx-Eq	kg Sb-Eq	MJ, net calorific value
Minimum	303	0.331	281	9.34e-06	7.16	0.00107	805
Maximum	399	0.438	424	1.6e-05	9.27	0.00191	2480
Mean	346	0.377	334	1.13e-05	8.12	0.00133	1250
Median	340	0.37	314	9.92e-06	8.03	0.00116	863
70210NB2014	303	0.331	281	9.34e-06	7.16	0.00107	805
70250ND2014	330	0.36	304	9.64e-06	7.81	0.00115	834
40250NB1210	350	0.38	325	1.02e-05	8.25	0.00118	892
73250NB0514	399	0.438	424	1.6e-05	9.27	0.00191	2480

b) Inventory Metrics:

Indicator/LCI Metric	TPE	RE	NRE	NRR	RR	WDP	LFW	LFHW	CBWC	CWWC	CHW	CNHW
Unit	MJ-Eq	MJ-Eq	MJ-Eq	kg	m3	m3	kg waste	kg waste	m3	m3	kg	kg
Minimum	911	56.2	853	24.3	0.00396	0.644	23.6	0.00176	0.22	2.5e-05	0.0025	0.05
Maximum	2760	106	2640	71.9	0.00574	0.78	29.7	0.00252	0.321	2.5e-05	0.0025	0.05
Mean	1410	73	1330	37.5	0.00462	0.698	25.5	0.002	0.272	2.5e-05	0.0025	0.05
Median	985	65	914	26.8	0.00439	0.684	24.4	0.00186	0.273	2.5e-05	0.0025	0.05
70210NB2014	911	56.2	853	24.3	0.00396	0.644	23.6	0.00176	0.275	2.5e-05	0.0025	0.05
70250ND2014	950	59	885	25.4	0.00426	0.669	24.4	0.00181	0.271	2.5e-05	0.0025	0.05
40250NB1210	1020	70.9	944	28.3	0.00453	0.78	24.3	0.0019	0.321	2.5e-05	0.0025	0.05

73250NB0514	2760	106	2640	71.9	0.00574	0.698	29.7	0.00252	0.22	2.5e-05	0.0025	0.05

Mix designs: 26 to 30 MPa

Table 16: **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	AP	EP	GWP	ODP	PCOP	ADPe	ADPf
Unit	**moles of H+-Eq**	**kg N**	**kg CO2-Eq**	**kg CFC-11-Eq**	**kg NOx-Eq**	**kg Sb-Eq**	**MJ, net calorific value**
Minimum	367	0.399	335	9.98e-06	8.68	0.00126	874
Maximum	460	0.504	486	1.75e-05	10.7	0.0022	2820
Mean	403	0.44	391	1.31e-05	9.46	0.00163	1690
Median	399	0.436	382	1.28e-05	9.37	0.00158	1590
70280NB2014	367	0.399	335	9.98e-06	8.68	0.00126	874
70300ND2014	385	0.419	350	1.02e-05	9.12	0.00132	896
04280NB2012	408	0.448	411	1.56e-05	9.5	0.00187	2370
02300NB2018	401	0.441	401	1.5e-05	9.36	0.00183	2250
40300NB1214	397	0.43	364	1.05e-05	9.38	0.00132	926
73300NB0518	460	0.504	486	1.75e-05	10.7	0.0022	2820

b) Inventory Metrics:

Indicator/LCI Metric	TPE	RE	NRE	NRR	RR	WDP	LFW	LFHW	CBWC	CWWC	CHW	CNHW
Unit	**MJ-Eq**	**MJ-Eq**	**MJ-Eq**	**kg**	**m3**	**m3**	**kg waste**	**kg waste**	**m3**	**m3**	**kg**	**kg**
Minimum	998	65.6	929	26.9	0.00468	0.712	25.3	0.00187	0.19	2.5e-05	0.0025	0.05
Maximum	3150	119	3040	81.8	0.00675	0.831	31.9	0.00271	0.325	2.5e-05	0.0025	0.05
Mean	1900	87.1	1810	49.7	0.0055	0.762	28.2	0.00223	0.248	2.5e-05	0.0025	0.05
Median	1800	85.9	1700	47	0.00534	0.759	28	0.0022	0.25	2.5e-05	0.0025	0.05
70280NB2014	998	65.6	929	26.9	0.00468	0.712	25.3	0.00187	0.275	2.5e-05	0.0025	0.05
70300ND2014	1030	67.9	952	27.6	0.00491	0.729	25.8	0.00191	0.273	2.5e-05	0.0025	0.05
04280NB2012	2640	98.5	2540	68	0.00595	0.781	30.8	0.00251	0.197	2.5e-05	0.0025	0.05
02300NB2018	2520	94.2	2410	64.5	0.00565	0.751	30.1	0.00242	0.19	2.5e-05	0.0025	0.05
40300NB1214	1070	77.6	987	29.6	0.00504	0.831	25.3	0.00197	0.325	2.5e-05	0.0025	0.05

73300NB0518	3150	119	3040	81.8	0.00675	0.767	31.9	0.00271	0.228	2.5e-05	0.0025	0.05

Mix designs: 31 to 35 MPa

Table 17: **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	AP	EP	GWP	ODP	PCOP	ADPe	ADPf
Unit	**moles of H+-Eq**	**kg N**	**kg CO2-Eq**	**kg CFC-11-Eq**	**kg NOx-Eq**	**kg Sb-Eq**	**MJ, net calorific value**
Minimum	395	0.429	359	1.03e-05	9.35	0.00135	910
Maximum	501	0.549	526	1.84e-05	11.7	0.00237	2990
Mean	448	0.489	433	1.38e-05	10.5	0.00181	1820
Median	448	0.488	424	1.34e-05	10.6	0.00176	1680
70320ND2010	395	0.429	359	1.03e-05	9.35	0.00135	910
04350NB2012	444	0.482	403	1.11e-05	10.5	0.00153	1050
71350ND1210	451	0.495	444	1.56e-05	10.6	0.00198	2310
73350NB0514	501	0.549	526	1.84e-05	11.7	0.00237	2990

b) Inventory Metrics:

Indicator/LCI Metric	TPE	RE	NRE	NRR	RR	WDP	LFW	LFHW	CBWC	CWWC	CHW	CNHW
Unit	**MJ-Eq**	**MJ-Eq**	**MJ-Eq**	**kg**	**m3**	**m3**	**kg waste**	**kg waste**	**m3**	**m3**	**kg**	**kg**
Minimum	1040	69.7	967	28.1	0.00499	0.73	26.2	0.00194	0.178	2.5e-05	0.0025	0.05
Maximum	3340	127	3210	86.9	0.00719	0.801	33.4	0.00283	0.269	2.5e-05	0.0025	0.05
Mean	2040	94.3	1940	53.5	0.00603	0.779	29.7	0.00234	0.233	2.5e-05	0.0025	0.05
Median	1890	90.2	1800	49.5	0.00597	0.792	29.6	0.00229	0.243	2.5e-05	0.0025	0.05
70320ND2010	1040	69.7	967	28.1	0.00499	0.73	26.2	0.00194	0.263	2.5e-05	0.0025	0.05
04350NB2012	1200	78.4	1120	32.4	0.00565	0.793	27.5	0.00204	0.269	2.5e-05	0.0025	0.05
71350ND1210	2580	102	2470	66.6	0.0063	0.791	31.8	0.00254	0.178	2.5e-05	0.0025	0.05
73350NB0514	3340	127	3210	86.9	0.00719	0.801	33.4	0.00283	0.223	2.5e-05	0.0025	0.05

Mix designs: 36 to 40 MPa

Table 18: **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	AP	EP	GWP	ODP	PCOP	ADPe	ADPf
Unit	moles of H+-Eq	kg N	kg CO2-Eq	kg CFC-11-Eq	kg NOx-Eq	kg Sb-Eq	MJ, net calorific value
Minimum	451	0.489	405	1.08e-05	10.7	0.00151	963
Maximum	512	0.56	499	1.68e-05	12	0.00221	2520
Mean	486	0.529	449	1.29e-05	11.5	0.00179	1500
Median	495	0.537	443	1.12e-05	11.7	0.00165	1010
04360ND2012	451	0.489	405	1.08e-05	10.7	0.00151	963
70400ND2014	495	0.537	443	1.12e-05	11.7	0.00165	1010
13400ND2012	512	0.56	499	1.68e-05	12	0.00221	2520

b) Inventory Metrics:

Indicator/LCI Metric	TPE	RE	NRE	NRR	RR	WDP	LFW	LFHW	CBWC	CWWC	CHW	CNHW
Unit	MJ-Eq	MJ-Eq	MJ-Eq	kg	m3	m3	kg waste	kg waste	m3	m3	kg	kg
Minimum	1110	79.9	1030	30	0.00566	0.791	27.4	0.00202	0.164	2.5e-05	0.0025	0.05
Maximum	2820	115	2700	72.9	0.00712	0.85	34	0.00271	0.277	2.5e-05	0.0025	0.05
Mean	1700	93.4	1600	44.9	0.00633	0.83	30	0.00227	0.236	2.5e-05	0.0025	0.05
Median	1170	85.4	1080	31.9	0.0062	0.85	28.5	0.00209	0.266	2.5e-05	0.0025	0.05
04360ND2012	1110	79.9	1030	30	0.00566	0.791	27.4	0.00202	0.266	2.5e-05	0.0025	0.05
70400ND2014	1170	85.4	1080	31.9	0.0062	0.85	28.5	0.00209	0.277	2.5e-05	0.0025	0.05
13400ND2012	2820	115	2700	72.9	0.00712	0.85	34	0.00271	0.164	2.5e-05	0.0025	0.05

Mix designs: 41 to 45 MPa

Table 19: **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	AP	EP	GWP	ODP	PCOP	ADPe	ADPf
Unit	moles of H+-Eq	kg N	kg CO2-Eq	kg CFC-11-Eq	kg NOx-Eq	kg Sb-Eq	MJ, net calorific value
13450ND2012	568	0.622	552	1.8e-05	13.3	0.00245	2780

b) Inventory Metrics:

Indicator/LCI Metric	TPE	RE	NRE	NRR	RR	WDP	LFW	LFHW	CBWC	CWWC	CHW	CNHW
Unit	MJ-Eq	MJ-Eq	MJ-Eq	kg	m3	m3	kg waste	kg waste	m3	m3	kg	kg
13450ND2012	3110	126	2980	80.4	0.00787	0.926	36	0.00288	0.167	2.5e-05	0.0025	0.05

Mix designs: 46 to 50 MPa

Table 20: **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	AP	EP	GWP	ODP	PCOP	ADPe	ADPf
Unit	moles of H+-Eq	kg N	kg CO2-Eq	kg CFC-11-Eq	kg NOx-Eq	kg Sb-Eq	MJ, net calorific value
13500ND2012	613	0.671	595	1.9e-05	14.4	0.00264	2990

b) Inventory Metrics:

Indicator/LCI Metric	TPE	RE	NRE	NRR	RR	WDP	LFW	LFHW	CBWC	CWWC	CHW	CNHW
Unit	MJ-Eq	MJ-Eq	MJ-Eq	kg	m3	m3	kg waste	kg waste	m3	m3	kg	kg
13500ND2012	3330	136	3200	86.6	0.00854	0.987	37.6	0.00302	0.169	2.5e-05	0.0025	0.05

Mix designs: 51 to 55 MPa

Table 21: **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**

a) Midpoint Impact Categories:

Indicator/LCI Metric	AP	EP	GWP	ODP	PCOP	ADPe	ADPf
Unit	moles of H+-Eq	kg N	kg CO2-Eq	kg CFC-11-Eq	kg NOx-Eq	kg Sb-Eq	MJ, net calorific value
13550ND2012	664	0.725	642	2e-05	15.6	0.00284	3180

b) Inventory Metrics:

Indicator/LCI Metric	TPE	RE	NRE	NRR	RR	WDP	LFW	LFHW	CBWC	CWWC	CHW	CNHW
Unit	MJ-Eq	MJ-Eq	MJ-Eq	kg	m3	m3	kg waste	kg waste	m3	m3	kg	kg
13550ND2012	3570	146	3420	92.2	0.00935	1.05	39.3	0.00317	0.166	2.5e-05	0.0025	0.05

Mix designs: 56 to 60 MPa

Table 22: **Total life cycle (across modules in scope) impact results for Mix designs: 56 to 60MPa, assuming the geometric mean point values on a per 1 m3 of concrete basis**

a) Midpoint Impact Categories:

Indicator/LCI Metric	AP	EP	GWP	ODP	PCOP	ADPe	ADPf
Unit	moles of H+-Eq	kg N	kg CO2-Eq	kg CFC-11-Eq	kg NOx-Eq	kg Sb-Eq	MJ, net calorific value
13600ND2012	720	0.786	693	2.1e-05	16.9	0.00305	3370

b) Inventory Metrics:

Indicator/LCI Metric	TPE	RE	NRE	NRR	RR	WDP	LFW	LFHW	CBWC	CWWC	CHW	CNHW
Unit	MJ-Eq	MJ-Eq	MJ-Eq	kg	m3	m3	kg waste	kg waste	m3	m3	kg	kg
13600ND2012	3790	159	3620	97.8	0.0101	1.11	41.1	0.00332	0.162	2.5e-05	0.0025	0.05

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

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