

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 Benito Juarez

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 m ³ 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 Rule (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 <input type="checkbox"/> ; External <input checked="" type="checkbox"/>
	Third Party Verifier Geoffrey Guest, Certified 3rd Party Verifier under the International EPD Program (www.environdec.com), CSA Group (www.csaregistry.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 33 concrete mixes manufactured at the Holcim Mexico Operaciones S.A. de C.V. Cancun II concrete facility in Q. 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#	Unique name/ID	Short description	Product type	28 day strength, MPa	H ₂ O to cement ratio
5	24020NB0518	2.26 MPa 28d strength mortars and fillers	mortars and fillers	2.26	1.6336634
6	24025NB0518	2.75 MPa 28d strength mortars and fillers	mortars and fillers	2.75	1.5446429
7	24030NB0518	3.33 MPa 28d strength mortars and fillers	mortars and fillers	3.33	1.2378049
8	77035ND2014	3.53 MPa 28d strength Ready mix concrete	Ready mix concrete	3.53	0.6710963
9	77036ND2010	3.73 MPa 28d strength Ready mix concrete	Ready mix concrete	3.73	0.6430868
10	77038ND2010	4.02 MPa 28d strength Ready mix concrete	Ready mix concrete	4.02	0.5898305
11	77040ND2014	4.22 MPa 28d strength Ready mix concrete	Ready mix concrete	4.22	0.5822368
12	77042ND2010	4.41 MPa 28d strength Ready mix concrete	Ready mix concrete	4.41	0.5889968
13	77045ND2010	4.71 MPa 28d strength Ready mix concrete	Ready mix concrete	4.71	0.5833333
14	77048ND2010	5.1 MPa 28d strength Ready mix concrete	Ready mix concrete	5.10	0.5250660



15	77050ND2010	5.1 MPa 28d strength Ready mix concrete	Ready mix concrete	5.10	0.5037783
16	73050NB0514	5.39 MPa 28d strength mortars and fillers	mortars and fillers	5.39	1.2378049
17	70100ND2014	11.77 MPa 28d strength Ready mix concrete	Ready mix concrete	11.77	1.0893855
18	73100NB0518	11.77 MPa 28d strength mortars and fillers	mortars and fillers	11.77	1.1918605

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	H ₂ O to cement ratio
19	70150NB2018	17.65 MPa 28d strength Ready mix concrete	Ready mix concrete	17.65	0.8454936
20	73150NB0514	17.65 MPa 28d strength mortars and fillers	mortars and fillers	17.65	0.9411765

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	H ₂ O to cement ratio
21	70200ND2010	22.06 MPa 28d strength Ready mix concrete	Ready mix concrete	22.06	0.7446809
22	68200NB1018	22.56 MPa 28d strength special concrete	special concrete	22.56	0.6507353
23	73200NB0518	22.06 MPa 28d strength mortars and fillers	mortars and fillers	22.06	0.7745455

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	H ₂ O to cement ratio
4	37.58NB2018	29.42 MPa 28d strength ready mix concrete	ready mix concrete	29.42	0.5823171
24	70250ND2010	27.95 MPa 28d strength Ready mix concrete	Ready mix concrete	27.95	0.6602317
25	81250ND1000	27.46 MPa 28d strength special concrete	special concrete	27.46	0.2400000
26	73250NB0514	26.97 MPa 28d strength mortars and fillers	mortars and fillers	26.97	0.6463415



Mix designs: 31 to 35 MPa

Table 5: 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	H ₂ O to cement ratio
27	70300ND2014	32.36 MPa 28d strength Ready mix concrete	Ready mix concrete	32.36	0.6094276
28	73300NB0518	32.36 MPa 28d strength mortars and fillers	mortars and fillers	32.36	0.5710227

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	H ₂ O to cement ratio
29	70350ND2014	38.25 MPa 28d strength Ready mix concrete	Ready mix concrete	38.25	0.6094276
30	73350NB0514	36.77 MPa 28d strength mortars and fillers	mortars and fillers	36.77	0.4942263

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	H ₂ O to cement ratio
2	3745NB2018	44.13 MPa 28d strength ready mix concrete	ready mix concrete	44.13	0.4514673
3	3755NB2018	44.13 MPa 28d strength ready mix concrete	ready mix concrete	44.13	0.5368421
31	13400NB2018	44.13 MPa 28d strength Ready mix concrete	Ready mix concrete	44.13	0.4784689

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	H ₂ O to cement ratio
32	13450NB2018	47.07 MPa 28d strength Ready mix concrete	Ready mix concrete	47.07	0.390873



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	H ₂ O to cement ratio
1	3735NB2018	53.94 MPa 28d strength ready mix concrete	ready mix concrete	53.94	0.2633333

Mix designs: >60 MPa

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

Mix#	Unique name/ID	Short description	Product type	28 day strength, MPa	H ₂ O to cement ratio
33	14650NB2018	66.68 MPa 28d strength Ready mix concrete	Ready mix concrete	66.68	0.1860119

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:

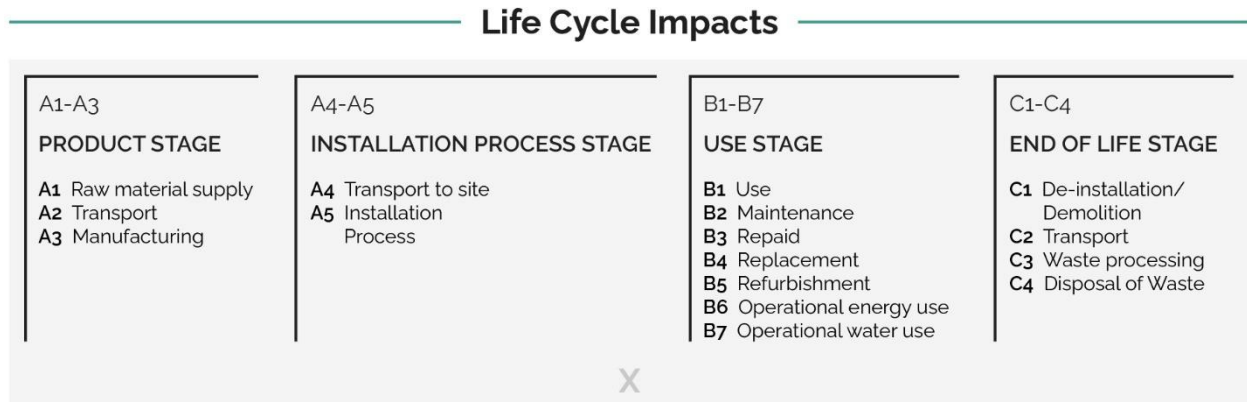


Figure 1: **General life cycle phases for consideration in a construction works system**

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.

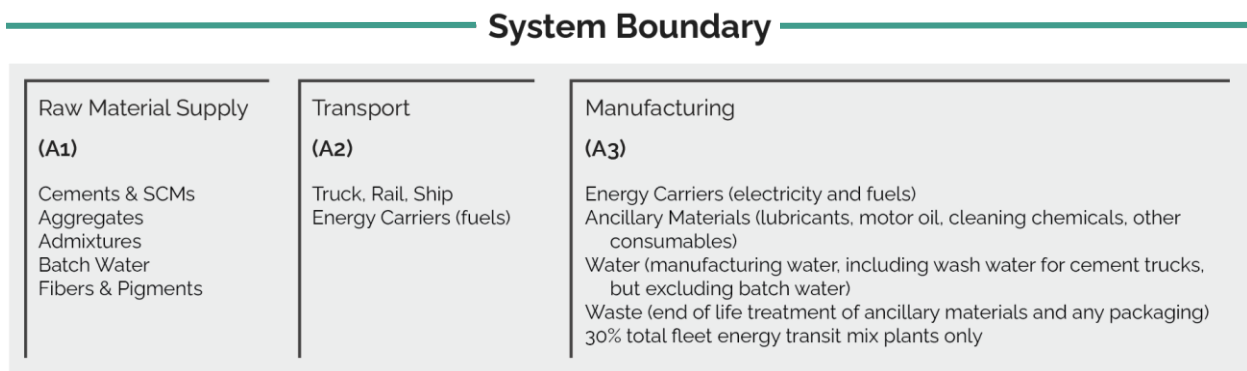


Figure 2: **General system inputs considered in the product system and categorized by modules in scope**

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 Isla Blanca 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
Water	tap water production, conventional with biological treatment/tap water/RoW/kg	ecoinvent v3.8	Quintana Roo	v3.8 in 2021	2	3	1	3	3
Limestone Gravel	limestone quarry operation/limestone, unprocessed/RoW/kg ; Note: modifications made (see ecoinvent activity changes table)	ecoinvent v3.8	Yucatan, Quintana Roo	v3.8 in 2021	2	3	1	3	3



Additives	market for chemical, organic/chemical, organic/GLO/kg	ecoinvent v3.8	Estado de Mexico	v3.8 in 2021	2	3	1	3	3
Cement (CPC 40) - PROVEEDOR : HOLCIM MACUSPAN A	CPC 40	Progam Operator: Labeling Sustainability-EPD ID: 09cddb67-dd75-4879-9c7d-74d4664d8e10	Tabasco	30 November 2021	3	NA	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 v3.8 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.

LIMITATIONS

This EPD is a declaration of potential environmental impact and does not support or provide definitive comparisons of the environmental performance of specific products. Only EPDs prepared from cradle-to-grave life cycle results and based on the same function and reference service life and quantified by the same functional unit can be used to assist purchasers and users in making informed comparisons between products.



LCIA results are relative expressions and do not predict impacts on category endpoints, the exceeding of thresholds, safety margins or risks. Further, LCA offers a wide array of environmental impact indicators, and this EPD reports a collection of those, as specified by the PCR.

In addition to the impact results, this EPD provides several metrics related to resource consumption and waste generation. While these data may be informational in other ways, they do not provide a measure of impact on the environment

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 CO ₂ -Eq	kg CFC-11-Eq	kg NO _x -Eq	kg Sb-Eq	MJ, net calorific value
Minimum	23.8	0.0828	167	2e-05	0.336	0.000498	1450
Maximum	58.7	0.14	467	4.79e-05	0.816	0.00126	3470
Mean	41.7	0.112	320	3.44e-05	0.582	0.000891	2490
Median	47.7	0.122	370	3.92e-05	0.666	0.00102	2840
24020NB0518	23.8	0.0828	167	2e-05	0.336	0.000498	1450
24025NB0518	24.5	0.0838	176	2.05e-05	0.345	0.000514	1490
24030NB0518	30.1	0.0928	226	2.5e-05	0.422	0.00064	1810
77035ND2014	47.8	0.122	372	3.93e-05	0.667	0.00102	2840
77036ND2010	49	0.124	382	4.02e-05	0.683	0.00105	2910
77038ND2010	47.6	0.122	368	3.91e-05	0.664	0.00102	2830
77040ND2014	48.6	0.124	377	3.99e-05	0.677	0.00104	2890
77042ND2010	49.1	0.124	381	4.04e-05	0.685	0.00105	2920
77045ND2010	51.2	0.128	401	4.2e-05	0.713	0.0011	3030
77048ND2010	56.7	0.137	450	4.63e-05	0.788	0.00122	3360
77050ND2010	58.7	0.14	467	4.79e-05	0.816	0.00126	3470
73050NB0514	30.1	0.0928	226	2.5e-05	0.422	0.00064	1810
70100ND2014	34.1	0.1	251	2.84e-05	0.479	0.000723	2050
73100NB0518	32.7	0.0975	241	2.71e-05	0.458	0.000695	1970

b) Inventory Metrics:

Indicator/LCI Metric	TPE	RE	NRE	NR	RR	WD	LFW	LFHW	CBW	CWW	CH	CNH
Unit	MJ-Eq	MJ-Eq	MJ-Eq	kg	m ³	m ³	kg waste	kg waste	m ³	m ³	kg	kg



Minimum	160 0	40. 6	155 0	39	0.0018 1	0.33 7	79.6	0.0030 4	0.173	1.26e- 05	0.20 4	24.3
Maximum	389 0	125	376 0	93.3	0.0057 9	0.66 4	126	0.006	0.215	1.26e- 05	0.20 4	24.3
Mean	277 0	83.1	269 0	66. 9	0.0038 7	0.51 3	104	0.0045 8	0.2	1.26e- 05	0.20 4	24.3
Median	316 0	96. 9	306 0	76	0.0045 4	0.54 6	113	0.0051 2	0.207	1.26e- 05	0.20 4	24.3
24020NB05 18	160 0	40. 6	155 0	39	0.0018 1	0.33 7	79.9	0.0030 4	0.173	1.26e- 05	0.20 4	24.3
24025NB05 18	164 0	43. 3	1610	40.1	0.0018 6	0.35 4	79.6	0.0030 5	0.182	1.26e- 05	0.20 4	24.3
24030NB05 18	201 0	57. 5	195 0	48. 7	0.0025 9	0.43 5	86.2	0.0034 8	0.213	1.26e- 05	0.20 4	24.3
77035ND20 14	317 0	97. 4	306 0	76.2	0.0047 1	0.57 4	113	0.0051 1	0.212	1.26e- 05	0.20 4	24.3
77036ND20 10	326 0	101	314 0	78	0.0047 1	0.58 2	114	0.0052 2	0.21	1.26e- 05	0.20 4	24.3
77038ND20 10	315 0	96. 4	306 0	75. 8	0.0044 5	0.54	113	0.0051 4	0.183	1.26e- 05	0.20 4	24.3
77040ND20 14	321 0	98. 3	312 0	77.9	0.0046 6	0.55 2	114	0.0052 2	0.186	1.26e- 05	0.20 4	24.3
77042ND20 10	326 0	100	315 0	78.7	0.0046 2	0.56 2	115	0.0052 6	0.191	1.26e- 05	0.20 4	24.3
77045ND20 10	338 0	105	328 0	81.5	0.005	0.59 2	117	0.0054	0.202	1.26e- 05	0.20 4	24.3
77048ND20 10	376 0	117	364 0	90. 3	0.0056 8	0.64 6	124	0.0058 4	0.209	1.26e- 05	0.20 4	24.3
77050ND20 10	389 0	125	376 0	93.3	0.0057 9	0.66 4	126	0.006	0.21	1.26e- 05	0.20 4	24.
73050NB05 14	201 0	57. 5	196 0	48. 8	0.0026 4	0.43 5	86.2	0.0034 8	0.213	1.26e- 05	0.20 4	24.3
70100ND20 14	227 0	63. 8	2210	55.2	0.0029	0.45 1	95.7	0.0040 2	0.205	1.26e- 05	0.20 4	24.3
73100NB05 18	219 0	61	2120	53.1	0.0027 7	0.45 2	92.4	0.0038 3	0.215	1.26e- 05	0.20 4	24.3

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

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	36.6	0.104	274	3.03e-05	0.512	0.00078	2200
Maximum	41.2	0.112	309	3.41e-05	0.577	0.000877	2470
Mean	38.9	0.108	292	3.22e-05	0.544	0.000828	2340



Median	38.9	0.108	292	3.22e-05	0.544	0.000828	2340
70150NB2018	41.2	0.112	309	3.41e-05	0.577	0.000877	2470
73150NB0514	36.6	0.104	274	3.03e-05	0.512	0.00078	2200

b) Inventory Metrics:

Indicator/LCI Metric	TPE	RE	NRE	NR	RR	WDP	LFW	LFHW	CBWC	CWWC	CHW	CNH
Unit	MJ-Eq	MJ-Eq	MJ-Eq	kg	m3	m3	kg waste	kg waste	m3	m3	kg	kg
Minimum	2510	72.2	2460	61.2	0.00329	0.457	171	0.00444	0.181	1.35e-05	0.0224	87.4
Maximum	2760	80.1	2700	66.9	0.00365	0.502	178	0.00484	0.197	1.35e-05	0.0224	87.4
Mean	2640	76.2	2580	64.1	0.00347	0.48	174	0.00464	0.189	1.35e-05	0.0224	87.4
Median	2640	76.2	2580	64.1	0.00347	0.48	174	0.00464	0.189	1.35e-05	0.0224	87.4
70150NB2014	2760	80.1	2700	66.9	0.00365	0.502	178	0.00484	0.197	1.35e-05	0.0224	87.4
73150NB0514	2510	72.2	2460	61.2	0.00329	0.457	171	0.00444	0.181	1.35e-05	0.0224	87.4

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

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	42	0.113	313	3.48e-05	0.588	0.000894	2520
Maximum	44.7	0.117	345	3.69e-05	0.624	0.000961	2670
Mean	43.8	0.116	334	3.61e-05	0.612	0.000937	2620
Median	44.7	0.117	344	3.67e-05	0.623	0.000957	2670
70200ND2010	42	0.113	313	3.48e-05	0.588	0.000894	2520
68200NB1018	44.7	0.117	344	3.69e-05	0.624	0.000957	2670
73200NB0518	44.7	0.117	345	3.67e-05	0.623	0.000961	2670

b) Inventory Metrics:

Indicator/LCI Metric	TPE	RE	NRE	NR	RR	WDP	LFW	LFHW	CBWC	CWWC	CHW	CNH
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Unit	MJ-Eq	MJ-Eq	MJ-Eq	kg	m3	m3	kg waste	kg waste	m3	m3	kg	kg
Minimum	2790	80.4	2730	67.7	0.00369	0.49	108	0.0048	0.184	1.26e-05	0.204	24.3
Maximum	2990	89.9	2880	72.1	0.00428	0.561	109	0.00488	0.224	1.26e-05	0.204	24.3
Mean	2920	86.5	2830	70.6	0.00404	0.524	108	0.00484	0.198	1.26e-05	0.204	24.3
Median	2980	89.3	2870	71.9	0.00414	0.521	108	0.00483	0.186	1.26e-05	0.204	24.3
70200ND2010	2790	80.4	2730	67.7	0.00369	0.49	108	0.0048	0.184	1.26e-05	0.204	24.3
68200NB1018	2980	89.3	2870	71.9	0.00414	0.521	109	0.00488	0.186	1.26e-05	0.204	24.3
73200NB0518	2990	89.9	2880	72.1	0.00428	0.561	108	0.00483	0.224	1.26e-05	0.204	24.3

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	43.6	0.116	333	3.6e-05	0.61	0.000932	2610
Maximum	52.3	0.13	414	4.3e-05	0.73	0.00112	3110
Mean	49.6	0.125	387	4.07e-05	0.692	0.00106	2940
Median	51.2	0.128	401	4.2e-05	0.714	0.0011	3020
37.58NB2018	52.3	0.13	405	4.3e-05	0.73	0.00112	3110
70250ND2010	43.6	0.116	333	3.6e-05	0.61	0.000932	2610
81250ND1000	51.9	0.128	414	4.25e-05	0.723	0.0011	3030
73250NB0514	50.6	0.127	397	4.14e-05	0.704	0.00109	3010

b) Inventory Metrics:

Indicator/LCI Metric	TPE	RE	NRE	NR	RR	WD	LFW	LFHW	CBW	CWW	CH	CNH
Unit	MJ-Eq	MJ-Eq	MJ-Eq	kg	m3	m3	kg waste	kg waste	m3	m3	kg	kg
Minimum	2900	87	2810	70.1	0.00414	0.483	108	0.00483	0.0882	1.26e-05	0.204	24.3
Maximum	3470	110	3360	83.8	0.00523	0.613	121	0.00561	0.223	1.26e-05	0.204	24.3



Mean	3280	102	3180	79.1	0.00484	0.548	115	0.00528	0.173	1.26e-05	0.204	24.3
Median	3380	106	3260	81.2	0.005	0.55	116	0.00533	0.19	1.26e-05	0.204	24.3
37.58NB2018	3470	106	3360	83.8	0.00508	0.595	121	0.00561	0.201	1.26e-05	0.204	24.3
70250ND2010	2900	87	2810	70.1	0.00414	0.504	108	0.00483	0.18	1.26e-05	0.204	24.3
81250ND1000	3390	110	3280	81.6	0.00523	0.483	116	0.00537	0.0882	1.26e-05	0.204	24.3
73250NB0514	3360	105	3250	80.9	0.00492	0.61	115	0.00529	0.223	1.26e-05	0.204	24.3

Mix designs: 31 to 35 MPa

Table 15: 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	47.8	0.122	370	3.93e-05	0.666	0.00102	2840
Maximum	53.2	0.131	421	4.35e-05	0.74	0.00115	3170
Mean	50.5	0.126	396	4.14e-05	0.703	0.00108	3000
Median	50.5	0.126	396	4.14e-05	0.703	0.00108	3000
70300ND2014	47.8	0.122	370	3.93e-05	0.666	0.00102	2840
73300NB0518	53.2	0.131	421	4.35e-05	0.74	0.00115	3170

b) Inventory Metrics:

Indicator/LCI Metric	TPE	RE	NRE	NR	RR	WD	LFW	LFHW	CBW	CWW	CH	CNH
Unit	MJ-Eq	MJ-Eq	MJ-Eq	kg	m3	m3	kg waste	kg waste	m3	m3	kg	kg
Minimum	3180	96.2	3080	76.6	0.00449	0.55	113	0.00515	0.19	1.26e-05	0.204	24.3
Maximum	3530	112	3420	85.3	0.00533	0.621	118	0.0055	0.211	1.26e-05	0.204	24.3
Mean	3360	104	3250	80.9	0.00491	0.586	116	0.00532	0.2	1.26e-05	0.204	24.3
Median	3360	104	3250	80.9	0.00491	0.586	116	0.00532	0.2	1.26e-05	0.204	24.3
70300ND2014	3180	96.2	3080	76.6	0.00449	0.55	113	0.00515	0.19	1.26e-05	0.204	24.3
73300NB0518	3530	112	3420	85.3	0.00533	0.621	118	0.0055	0.211	1.26e-05	0.204	24.3



Mix designs: 36 to 40 MPa

Table 16: 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 CO ₂ -Eq	kg CFC-11-Eq	kg NO _x -Eq	kg Sb-Eq	MJ, net calorific value
Minimum	47.8	0.122	370	3.93e-05	0.666	0.00102	2840
Maximum	62.5	0.146	502	5.08e-05	0.867	0.00136	3710
Mean	55.2	0.134	436	4.5e-05	0.766	0.00119	3280
Median	55.2	0.134	436	4.5e-05	0.766	0.00119	3280
70350ND2014	47.8	0.122	370	3.93e-05	0.666	0.00102	2840
73350NB0514	62.5	0.146	502	5.08e-05	0.867	0.00136	3710

b) Inventory Metrics:

Indicator/LCI Metric	TPE	RE	NRE	NR	RR	WD	LFW	LFHW	CBW	CWW	CH	CNH
Unit	MJ-Eq	MJ-Eq	MJ-Eq	kg	m ³	m ³	kg waste	kg waste	m ³	m ³	kg	kg
Minimum	3170	96.2	3080	76.6	0.00473	0.55	113	0.00515	0.19	1.26e-05	0.204	24.3
Maximum	4160	135	4020	99.4	0.00629	0.713	130	0.00626	0.225	1.26e-05	0.204	24.3
Mean	3660	116	3550	88	0.00551	0.632	122	0.0057	0.208	1.26e-05	0.204	24.3
Median	3660	116	3550	88	0.00551	0.632	122	0.0057	0.208	1.26e-05	0.204	24.3
70350ND2014	3170	96.2	3080	76.6	0.00473	0.55	113	0.00515	0.19	1.26e-05	0.204	24.3
73350NB0514	4160	135	4020	99.4	0.00629	0.713	130	0.00626	0.225	1.26e-05	0.204	24.3

Mix designs: 41 to 45 MPa

Table 17: 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 CO ₂ -Eq	kg CFC-11-Eq	kg NO _x -Eq	kg Sb-Eq	MJ, net calorific value
Minimum	56.8	0.137	451	4.64e-05	0.79	0.00122	3360
Maximum	65.5	0.151	520	5.35e-05	0.91	0.00141	3880



Mean	61.4	0.144	487	5.01e-05	0.853	0.00132	3630
Median	61.8	0.145	491	5.05e-05	0.86	0.00133	3660
3745NB2018	65.5	0.151	520	5.35e-05	0.91	0.00141	3880
3755NB2018	56.8	0.137	451	4.64e-05	0.79	0.00122	3360
13400NB2018	61.8	0.145	491	5.05e-05	0.86	0.00133	3660

b) Inventory Metrics:

Indicator/LCI Metric	TPE	RE	NRE	NR R	RR	WD P	LFW	LFHW	CBW C	CWW C	CH W	CNH W
Unit	MJ-Eq	MJ-Eq	MJ-Eq	kg	m3	m3	kg waste	kg waste	m3	m3	kg	kg
Minimum	3750	118	3630	90.5	0.00559	0.652	124	0.00585	0.21	1.26e-05	0.204	24.3
Maximum	4350	138	4190	104	0.0066	0.715	137	0.00669	0.214	1.26e-05	0.204	24.3
Mean	4070	129	3920	97.5	0.0062	0.685	131	0.00629	0.211	1.26e-05	0.204	24.3
Median	4100	132	3940	98.1	0.00641	0.687	131	0.00632	0.21	1.26e-05	0.204	24.3
3745NB2018	4350	138	4190	104	0.0066	0.715	137	0.00669	0.21	1.26e-05	0.204	24.3
3755NB2018	3750	118	3630	90.5	0.00559	0.652	124	0.00585	0.214	1.26e-05	0.204	24.3
13400NB2018	4100	132	3940	98.1	0.00641	0.687	131	0.00632	0.21	1.26e-05	0.204	24.3

Mix designs: 46 to 50 MPa

Table 18: 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
Minimum	72.3	0.162	580	5.89e-05	1	0.00156	4260
Maximum	72.3	0.162	580	5.89e-05	1	0.00156	4260
Mean	72.3	0.162	580	5.89e-05	1	0.00156	4260
Median	72.3	0.162	580	5.89e-05	1	0.00156	4260
13450NB2018	72.3	0.162	580	5.89e-05	1	0.00156	4260

b) Inventory Metrics:

Indicator/LCI Metric	TPE	RE	NRE	NR R	RR	WD P	LFW	LFHW	CBW C	CWW C	CH W	CNH W
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Unit	MJ-Eq	MJ-Eq	MJ-Eq	kg	m3	m3	kg waste	kg waste	m3	m3	kg	kg
Minimum	4770	154	4610	114	0.00771	0.768	146	0.00724	0.207	1.26e-05	0.204	24.3
Maximum	4770	154	4610	114	0.00771	0.768	146	0.00724	0.207	1.26e-05	0.204	24.3
Mean	4770	154	4610	114	0.00771	0.768	146	0.00724	0.207	1.26e-05	0.204	24.3
Median	4770	154	4610	114	0.00771	0.768	146	0.00724	0.207	1.26e-05	0.204	24.3
13450NB2018	4770	154	4610	114	0.00771	0.768	146	0.00724	0.207	1.26e-05	0.204	24.3

Mix designs: 51 to 55 MPa

Table 19: 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
Minimum	83.2	0.18	679	6.8e-05	1.15	0.00183	4970
Maximum	83.2	0.18	679	6.8e-05	1.15	0.00183	4970
Mean	83.2	0.18	679	6.8e-05	1.15	0.00183	4970
Median	83.2	0.18	679	6.8e-05	1.15	0.00183	4970
3735NB2018	83.2	0.18	679	6.8e-05	1.15	0.00183	4970

b) Inventory Metrics:

Indicator/LCI Metric	TPE	RE	NR E	NR R	RR	WD P	LFW	LFHW	CBW C	CWW C	CH W	CNH W
Unit	MJ-Eq	MJ-Eq	MJ-Eq	kg	m3	m3	kg waste	kg waste	m3	m3	kg	kg
Minimum	5580	181	5370	134	0.00889	0.823	162	0.00821	0.166	1.26e-05	0.204	24.3
Maximum	5580	181	5370	134	0.00889	0.823	162	0.00821	0.166	1.26e-05	0.204	24.3
Mean	5580	181	5370	134	0.00889	0.823	162	0.00821	0.166	1.26e-05	0.204	24.3
Median	5580	181	5370	134	0.00889	0.823	162	0.00821	0.166	1.26e-05	0.204	24.3
3735NB2018	5580	181	5370	134	0.00889	0.823	162	0.00821	0.166	1.26e-05	0.204	24.3



Mix designs: >60 MPa

Table 20: 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	AP	EP	GWP	ODP	PCOP	ADPe	ADPf
Unit	moles of H ⁺ -Eq	kg N	kg CO ₂ -Eq	kg CFC-11-Eq	kg NO _x -Eq	kg Sb-Eq	MJ, net calorific value
Minimum	89.7	0.19	740	7.24e-05	1.24	0.00195	5270
Maximum	89.7	0.19	740	7.24e-05	1.24	0.00195	5270
Mean	89.7	0.19	740	7.24e-05	1.24	0.00195	5270
Median	89.7	0.19	740	7.24e-05	1.24	0.00195	5270
14650NB2018	89.7	0.19	740	7.24e-05	1.24	0.00195	5270

b) Inventory Metrics:

Indicator/LCI Metric	TPE	RE	NRE	NR R	RR	WD P	LFW	LFHW	CBW C	CWW C	CH W	CNH W
Unit	MJ-Eq	MJ-Eq	MJ-Eq	kg	m ³	m ³	kg waste	kg waste	m ³	m ³	kg	kg
Minimum	5900	202	5700	142	0.00959	0.843	164	0.00849	0.131	1.26e-05	0.204	24.3
Maximum	5900	202	5700	142	0.00959	0.843	164	0.00849	0.131	1.26e-05	0.204	24.3
Mean	5900	202	5700	142	0.00959	0.843	164	0.00849	0.131	1.26e-05	0.204	24.3
Median	5900	202	5700	142	0.00959	0.843	164	0.00849	0.131	1.26e-05	0.204	24.3
14650NB2018	5900	202	5700	142	0.00959	0.843	164	0.00849	0.131	1.26e-05	0.204	24.3

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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