

Environmental Product Declaration



Environmental Product Declaration for ready mix concrete products produced by Holcim Colombia at their Bello facility in Antioquia, Colombia

ADMINISTRATIVE INFORMATION

International Certified Environmental Product Declaration

Declared Product:	This Environmental Product Declaration (EPD) covers concrete products produced by Holcim Colombia. Declared unit: 1 m3 of concrete
Declaration Owner:	Holcim Colombia
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	Bogotá, Colombia
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Program Operator:	Labeling Sustainability
	Address, 11670 W Sunset Blvd.
	City, State, 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 Rule (PCR) for Environmental Product Declarations (EPD) PCR for Concrete, v2.1
	Sub PCR Program Operator: NSF International
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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 Colombia, as part of Grupo Holcim, a world leader in innovative and sustainable solutions for construction, is making it possible to have greener cities, smarter infrastructures and improve the standard of living of people around the world. With sustainability at the heart of its strategy, Holcim is becoming a Net Zero company, where its people and communities are the foundation of its success. The company is driving circular construction as a world leader in recycling to build more with less.

Holcim Colombia produces and markets cement, ready-mix concrete, aggregates (gravel and sand) and other products and solutions for construction. Additionally, it offers the GacoFlex TechoProtec waterproofing line and the Tector family of adhesives and mortars. The company has a team passionate about building progress for people and the planet. It has a national presence through 1 cement plant, 10 ready-mix concrete plants, 1 Geocycle platform, 1 aggregates plant, its own network of hardware stores, Disensa, with more than 400 stores nationwide; and offers specialized services for transporting materials or products through Transcem.

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 Colombia 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 Colombia 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 Colombia's license to operate in the community. The intended audience for this LCA report is Holcim Colombia'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 87 concrete mixes manufactured at the Holcim Colombia, Bello concrete facility in Antioquia, Colombia.



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 15MPa

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	10044508	3 MPa 28d strength ready mix concrete.	Ready Mix	3.0	0.750988
2	10010674	3.5 MPa 28d strength ready mix concrete.	Ready Mix	3.5	0.708955
3	10010675	3.6 MPa 28d strength ready mix concrete.	Ready Mix	3.6	0.695971
4	10010676	3.8 MPa 28d strength ready mix concrete.	Ready Mix	3.8	0.627063
5	10060826	3.8 MPa 28d strength ready mix concrete.	Ready Mix	3.8	0.523416
6	10010677	3.9 MPa 28d strength ready mix concrete.	Ready Mix	3.9	0.607029
7	10062370	3.9 MPa 28d strength ready mix concrete.	Ready Mix	3.9	0.432099
8	10047455	3.9 MPa 28d strength ready mix concrete.	Ready Mix	3.9	0.414847
9	10034624	4 MPa 28d strength ready mix concrete.	Ready Mix	4.0	0.597484
10	10070134	4 MPa 28d strength ready mix concrete.	Ready Mix	4.0	0.349515
11	10063712	4.1 MPa 28d strength ready mix concrete.	Ready Mix	4.1	0.579268
12	10047020	4.1 MPa 28d strength ready mix concrete.	Ready Mix	4.1	0.516304
13	10062860	4.1 MPa 28d strength ready mix concrete.	Ready Mix	4.1	0.456790
14	10051841	4.1 MPa 28d strength ready mix concrete.	Ready Mix	4.1	0.422222
15	10047006	4.1 MPa 28d strength ready mix concrete.	Ready Mix	4.1	0.381526
16	10010684	4.2 MPa 28d strength ready mix concrete.	Ready Mix	4.2	0.570571



17	10053308	4.2 MPa 28d strength ready mix concrete.	Ready Mix	4.2	0.294906
18	10070516	4.2 MPa 28d strength ready mix concrete.	Ready Mix	4.2	0.404494
19	10071220	4.2 MPa 28d strength ready mix concrete.	Ready Mix	4.2	0.363289
20	10010685	4.3 MPa 28d strength ready mix concrete.	Ready Mix	4.3	0.523416
21	10047470	4.3 MPa 28d strength ready mix concrete.	Ready Mix	4.3	0.366795
22	10010687	4.4 MPa 28d strength ready mix concrete.	Ready Mix	4.4	0.483461
23	10010688	4.5 MPa 28d strength ready mix concrete.	Ready Mix	4.5	0.471464
24	10046925	4.5 MPa 28d strength ready mix concrete.	Ready Mix	4.5	0.349908
25	10060157	4.8 MPa 28d strength ready mix concrete.	Ready Mix	4.8	0.395833
26	10055833	8.5 MPa 28d strength ready mix concrete.	Ready Mix	8.5	0.915751
27	10031099	10.5 MPa 28d strength ready mix concrete.	Ready Mix	10.5	0.911111
28	10010704	10.5 MPa 28d strength ready mix concrete.	Ready Mix	10.5	0.860000
29	10010802	10.5 MPa 28d strength ready mix concrete.	Ready Mix	10.5	0.868056
30	10070383	13 MPa 28d strength ready mix concrete.	Ready Mix	13.0	0.666667
31	10064864	14 MPa 28d strength ready mix concrete.	Ready Mix	14.0	0.857143
32	10010859	14 MPa 28d strength ready mix concrete.	Ready Mix	14.0	0.872340
33	10051133	14 MPa 28d strength ready mix concrete.	Ready Mix	14.0	0.807692
34	10052236	14 MPa 28d strength ready mix concrete.	Ready Mix	14.0	0.811688

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
35	10010861	17.5 MPa 28d strength ready mix concrete.	Ready Mix	17.5	0.7647059
36	10065072	17.5 MPa 28d strength ready mix concrete.	Ready Mix	17.5	0.6890459
37	10067696	17.5 MPa 28d strength ready mix concrete.	Ready Mix	17.5	0.6410256



38	10010765	17.4 MPa 28d strength ready mix concrete.	Ready Mix	17.4	0.5633803
76	10074358	17.5 MPa 28d strength ready mix concrete.	Ready Mix	17.5	0.6497078

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
39	10010865	21 MPa 28d strength ready mix concrete.	Ready Mix	21.0	0.6964286
40	10034570	21 MPa 28d strength ready mix concrete.	Ready Mix	21.0	0.4354839
41	10051988	21 MPa 28d strength ready mix concrete.	Ready Mix	21.0	0.5976676
42	10010882	21 MPa 28d strength ready mix concrete.	Ready Mix	21.0	0.5291005
43	10048540	21 MPa 28d strength ready mix concrete.	Ready Mix	21.0	0.4705882
44	10011133	21 MPa 28d strength ready mix concrete.	Ready Mix	21.0	0.4148936
45	10010869	24.5 MPa 28d strength ready mix concrete.	Ready Mix	24.5	0.6610169
46	10010729	24.5 MPa 28d strength ready mix concrete.	Ready Mix	24.5	0.6153846
47	10067720	24.5 MPa 28d strength ready mix concrete.	Ready Mix	24.5	0.5479452
48	10010887	24.5 MPa 28d strength ready mix concrete.	Ready Mix	24.5	0.4901961
49	10010774	24.5 MPa 28d strength ready mix concrete.	Ready Mix	24.5	0.3995902
77	10074327	21 MPa 28d strength ready mix concrete.	Ready Mix	21.0	0.5739412
78	10074328	21 MPa 28d strength ready mix concrete.	Ready Mix	21.0	0.5911239
79	10074359	21 MPa 28d strength ready mix concrete.	Ready Mix	21.0	0.5750862
80	10074360	21 MPa 28d strength ready mix concrete.	Ready Mix	21.0	0.5920710
81	10074361	21 MPa 28d strength ready mix concrete.	Ready Mix	21.0	0.5980175
82	10074362	21 MPa 28d strength ready mix concrete.	Ready Mix	21.0	0.5607184



Mix Designs: 26 to 30 MPa

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

Mix#	Unique name/ID	Short description	Product type	28 day strength, MPa	H ₂ O to cement ratio
50	10011155	26.4 MPa 28d strength ready mix concrete.	Ready Mix	26.4	0.4656863
51	10010872	28 MPa 28d strength ready mix concrete.	Ready Mix	28.0	0.5909091
52	10011483	28 MPa 28d strength ready mix concrete.	Ready Mix	28.0	0.5570652
53	10060169	28 MPa 28d strength ready mix concrete.	Ready Mix	28.0	0.5269608
54	10071879	28 MPa 28d strength ready mix concrete.	Ready Mix	28.0	0.4444444
55	10056671	28 MPa 28d strength ready mix concrete.	Ready Mix	28.0	0.3904762
56	10071620	30 MPa 28d strength ready mix concrete.	Ready Mix	30.0	0.5194805
57	10060232	30 MPa 28d strength ready mix concrete.	Ready Mix	30.0	0.3644860
83	10074345	28 MPa 28d strength ready mix concrete.	Ready Mix	28.0	0.5849231
84	10074352	28 MPa 28d strength ready mix concrete.	Ready Mix	28.0	0.5849538
85	10074563	28 MPa 28d strength ready mix concrete.	Ready Mix	28.0	0.5850769
86	10074347	28 MPa 28d strength ready mix concrete.	Ready Mix	28.0	0.5760909
87	10074349	28 MPa 28d strength ready mix concrete.	Ready Mix	28.0	0.5760606

Mix Designs: 31 to 35 MPa

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

Mix#	Unique name/ID	Short description	Product type	28 day strength, MPa	H ₂ O to cement ratio
58	10048531	31.5 MPa 28d strength ready mix concrete.	Ready Mix	31.5	0.5479452
59	10010858	31.5 MPa 28d strength ready mix concrete.	Ready Mix	31.5	0.5086849
60	10071530	31.5 MPa 28d strength ready mix concrete.	Ready Mix	31.5	0.4333333
61	10056202	31.5 MPa 28d strength ready mix concrete.	Ready Mix	31.5	0.4118774
62	10059879	34 MPa 28d strength ready mix concrete.	Ready Mix	34.0	0.3861386



63	10010754	35 MPa 28d strength ready mix concrete.	Ready Mix	35.0	0.5063291
64	10049923	35 MPa 28d strength ready mix concrete.	Ready Mix	35.0	0.2988506
65	10058010	35 MPa 28d strength ready mix concrete.	Ready Mix	35.0	0.3958333
66	10034356	35 MPa 28d strength ready mix concrete.	Ready Mix	35.0	0.3752345

Mix Designs: 36 to 40 MPa

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

Mix#	Unique name/ID	Short description	Product type	28 day strength, MPa	H2O to cement ratio
67	10067591	38 MPa 28d strength ready mix concrete.	Ready Mix	38.0	0.4494382
68	10048532	38.5 MPa 28d strength ready mix concrete.	Ready Mix	38.5	0.4545455

Mix Designs: 41 to 45 MPa

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

Mix#	Unique name/ID	Short description	Product type	28 day strength, MPa	H2O to cement ratio
69	10010756	42 MPa 28d strength ready mix concrete.	Ready Mix	42	0.4123711
70	10071113	42 MPa 28d strength ready mix concrete.	Ready Mix	42	0.3738318
71	10071256	45 MPa 28d strength ready mix concrete.	Ready Mix	45	0.3921569

Mix Designs: 46 to 50 MPa

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

Mix#	Unique name/ID	Short description	Product type	28 day strength, MPa	H2O to cement ratio
72	10053583	49 MPa 28d strength ready mix concrete.	Ready Mix	49	0.3738318
73	10070562	49 MPa 28d strength ready mix concrete.	Ready Mix	49	0.3442623



Mix Designs: 56 to 60 MPa

Table 9: Declared products with Mix designs: 56 to 60 MPa considered in this environmental product declaration

Mix#	Unique name/ID	Short description	Product type	28 day strength, MPa	H2O to cement ratio
74	10056481	56 MPa 28d strength ready mix concrete.	Ready Mix	56	0.3448276
75	10022460	56 MPa 28d strength ready mix concrete.	Ready Mix	56	0.8936170

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 10: Ready mix concrete 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:

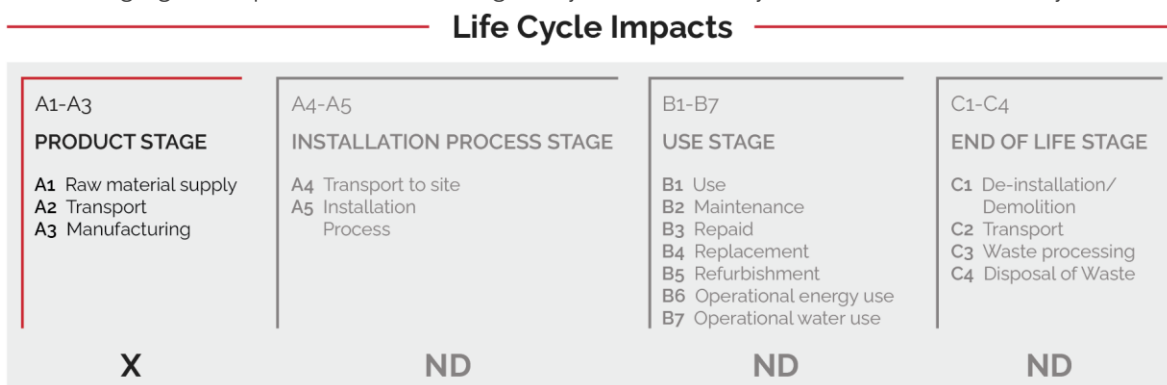


Figure 1: General life cycle phases for consideration in a construction works system

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 cement products and is not necessarily exhaustive.

System Boundary

Raw Material Supply (A1)	Transport (A2)	Manufacturing (A3)
Cements & SCMs Aggregates Admixtures Batch Water Fibers & Pigments	Truck, Rail, Ship Energy Carriers (fuels)	Energy Carriers (electricity and fuels) Ancillary Materials (lubricants, motor oil, cleaning chemicals, other consumables) Water (manufacturing water, including wash water for cement trucks, but excluding batch water) Waste (end of life treatment of ancillary materials and any packaging) 30% total fleet energy transit mix plants only

Figure2: **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 Colombia, is located at their Planta Bello facility in Colombia. All operating data is formulated using the actual data from Holcim Colombia'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 Colombia 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 whereasecoinvent default multi-modal market mix distances were assumed for other inputs where no original data could be provided.

Electricity: Electricity consumption values are for Colombia in calendar year 2021. These values were direct reported from Colombia records. The unit process "market for electricity, medium voltage/electricity, medium voltage/CO/kWh" was used to represent the Colombia 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. This plant does not have electricity therefore it uses diesel to power generators.

Waste generation: Waste generation values are directly reported from Holcim operations for 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 Colombia for 2021.

Recovered energy: Not applicable.

Recycled/reused material/components: The amount of returned concrete is based on Holcim primary data for the reference year, 2021.

Module A1 material losses: Due to lack of data, default loss factors were assumed.

Direct A3 emissions accounting: Direct emissions for the on-site machinery use the actual fuel consumption and theecoinvent database to calculate those emissions.

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 2021.



Product transport requirements: The diesel fuel used by the mixing trucks is direct primary information reported from Holcim Colombia records for the year 2021. Holcim records their fuel for their trucks in L/km and therefore the information was converted with the following formula: (Ave. km to site)* 2 for return L diesel/km /(ave. m3 of concrete in a load) total concrete volume in m3 * fraction allocated to A3. A4 is outside the scope of this study.

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

Input	LCI.activity	Data.source	Geo	Year	Technology	Time	Geography	Reliability	Completeness
Water	tap water production, conventional treatment/tap water/RoW/kg	ecoinvent v3.8	Antioquia	v3.8 in 2021	2	3	2	3	3
Additives	market for chemical, organic/chemical, organic/GLO/kg	ecoinvent v3.8	Cundinamarca	v3.8 in 2021	2	3	2	3	3
Additives	market for fibre, cotton, organic/fibre, cotton, organic/GLO/kg	ecoinvent v3.8	Cundinamarca	v3.8 in 2021	2	3	2	3	3
Cement	HE Cement	Progam Operator: Labeling Sustainability- EPD ID: 6328e320-6cab-4d85-83f4-dca33374d11b	Boaycá	30 April 2023	3	3	3	3	3
Sand	sand quarry operation, extraction from river bed/sand/BR/kg; Note: modifications made (see ecoinvent activity changes table)	ecoinvent v3.8	Cundinamarca	v3.8 in 2021	2	3	2	3	3
Gravel	gravel production, crushed/gravel, crushed/BR/kg; Note: modifications made (see ecoinvent activity changes table)	ecoinvent v3.8	Cundinamarca	v3.8 in 2021	2	3	2	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 Cement 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 2021-01-01 to 2021-12-31.
- 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 cement facility on a per 1m³ of concrete basis.



Mix Designs: 0 to 15 MPa

Table 12: Total life cycle (across modules in scope) impact results for All declared products, 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	37.5	0.136	273	2.62e-05	0.549	0.00109	1840
Maximum	74.8	0.354	569	5.2e-05	1.07	0.00235	3660
Mean	53.8	0.168	402	3.76e-05	0.775	0.00164	2640
Median	51.6	0.159	384	3.66e-05	0.746	0.00156	2580
10044508	40.7	0.141	298	2.82e-05	0.594	0.0012	1980
10010674	42.5	0.144	313	2.96e-05	0.619	0.00126	2080
10010675	43	0.145	316	2.98e-05	0.626	0.00127	2090
10010676	46.9	0.151	347	3.28e-05	0.68	0.00141	2310
10060826	55.9	0.354	404	3.75e-05	0.783	0.00164	2640
10010677	47.3	0.152	351	3.26e-05	0.686	0.00142	2290
10062370	59	0.17	443	4.12e-05	0.85	0.00182	2900
10047455	64.9	0.18	490	4.51e-05	0.932	0.00202	3170
10034624	48.3	0.153	358	3.34e-05	0.699	0.00145	2350
10070134	71.7	0.19	544	5e-05	1.03	0.00225	3510
10063712	49.8	0.156	370	3.48e-05	0.721	0.00151	2450
10047020	53.9	0.162	404	3.74e-05	0.778	0.00165	2630
10062860	58.9	0.17	442	4.11e-05	0.847	0.00181	2890
10051841	64.2	0.179	484	4.48e-05	0.921	0.00199	3150
10047006	68.9	0.185	524	4.76e-05	0.986	0.00216	3350
10010684	49.9	0.156	371	3.45e-05	0.723	0.00151	2420
10053308	56.2	0.166	416	3.93e-05	0.813	0.00171	2760
10070516	63.8	0.178	481	4.47e-05	0.916	0.00198	3140
10071220	72.4	0.191	551	5.04e-05	1.04	0.00227	3540
10010685	53.3	0.161	398	3.68e-05	0.77	0.00162	2580
10047470	71.9	0.191	546	5e-05	1.03	0.00226	3520
10010687	57.1	0.167	428	3.96e-05	0.822	0.00175	2780
10010688	58	0.168	435	4e-05	0.835	0.00178	2810
10046925	74.8	0.195	569	5.2e-05	1.07	0.00235	3660
10060157	67.2	0.183	509	4.66e-05	0.964	0.0021	3280
10055833	44.7	0.149	332	3.28e-05	0.646	0.00135	2320
10031099	37.5	0.136	273	2.62e-05	0.549	0.00109	1840
10010704	40.3	0.141	296	2.82e-05	0.586	0.00119	1980
10010802	47.5	0.154	353	3.54e-05	0.684	0.00145	2510
10070383	48.3	0.154	359	3.39e-05	0.699	0.00146	2390
10064864	40.2	0.141	295	2.84e-05	0.586	0.00118	2000
10010859	38.7	0.138	282	2.7e-05	0.565	0.00113	1900
10051133	41.8	0.143	308	2.95e-05	0.606	0.00124	2080
10052236	49.3	0.157	369	3.65e-05	0.708	0.00151	2590



b) Inventory Metrics:

Indicator/LCI Metric	TPE	RE	NRE	NR R	RR	WD P	LFW	LFHW	CBW C	CWW C	CHW	CNH W
Unit	MJ-Eq	MJ - Eq	MJ-Eq	kg	m3	m3	kg waste	kg waste	m3	m3	kg	kg
Minimum	2060	101	1960	49.8	0.000902	5.4	120	0.00308	0.116	6.16e-05	0.0275	46.8
Maximum	4140	227	3890	99	0.00179	15.3	187	0.00523	0.262	6.16e-05	0.0275	46.8
Mean	2970	156	2820	71.4	0.00129	7.59	150	0.00406	0.205	6.16e-05	0.0275	46.8
Median	2900	148	2760	70	0.00127	7.16	148	0.004	0.2	6.16e-05	0.0275	46.8
10044508	2220	110	2110	53.2	0.000955	6.65	125	0.00321	0.2	6.16e-05	0.0275	46.8
10010674	2330	117	2200	55.9	0.00102	7.11	129	0.00335	0.2	6.16e-05	0.0275	46.8
10010675	2350	117	2230	56.2	0.000998	6.5	129	0.00333	0.2	6.16e-05	0.0275	46.8
10010676	2600	131	2470	62.4	0.00114	7.66	137	0.00366	0.2	6.16e-05	0.0275	46.8
10060826	3030	227	2820	71.1	0.00132	7.21	150	0.00404	0.2	6.16e-05	0.0275	46.8
10010677	2560	133	2440	61.8	0.00109	5.85	137	0.00353	0.2	6.16e-05	0.0275	46.8
10062370	3260	170	3090	78.3	0.00141	7.47	159	0.00437	0.184	6.16e-05	0.0275	46.8
10047455	3580	191	3380	85.8	0.00155	6.79	169	0.00466	0.2	6.16e-05	0.0275	46.8
10034624	2640	135	2510	63.3	0.00113	6.51	139	0.00364	0.2	6.16e-05	0.0275	46.8
10070134	3980	212	3750	94.9	0.00172	6.98	182	0.00508	0.189	6.16e-05	0.0275	46.8
10063712	2740	141	2610	66	0.00123	7.42	142	0.00382	0.2	6.16e-05	0.0275	46.8
10047020	2960	156	2820	71.1	0.00129	6.36	149	0.00397	0.2	6.16e-05	0.0275	46.8
10062860	3250	171	3080	78	0.00143	7.38	159	0.00435	0.194	6.16e-05	0.0275	46.8
10051841	3540	187	3370	85	0.00151	7.26	168	0.00466	0.2	6.16e-05	0.0275	46.8
10047006	3790	206	3580	90.4	0.00162	5.4	176	0.00478	0.2	6.16e-05	0.0275	46.8
10010684	2730	141	2570	65.2	0.00118	6.1	141	0.00371	0.2	6.16e-05	0.0275	46.8
10053308	3120	158	2950	74.7	0.00131	8.23	154	0.00429	0.116	6.16e-05	0.0275	46.8
10070516	3550	187	3350	84.9	0.00154	7.79	168	0.00469	0.189	6.16e-05	0.0275	46.8



10071220	3980	216	3770	95.5	0.00173	6.51	183	0.00509	0.2	6.16e-05	0.0275	46.8
10010685	2890	154	2740	69.6	0.00127	5.85	147	0.00389	0.2	6.16e-05	0.0275	46.8
10047470	3970	214	3770	95.2	0.00173	6.63	182	0.00507	0.2	6.16e-05	0.0275	46.8
10010687	3130	166	2960	74.8	0.00137	6.43	155	0.00416	0.2	6.16e-05	0.0275	46.8
10010688	3160	169	2980	75.7	0.00136	5.55	156	0.00415	0.2	6.16e-05	0.0275	46.8
10046925	4140	223	3890	99	0.00179	6.51	187	0.00523	0.2	6.16e-05	0.0275	46.8
10060157	3690	199	3500	88.4	0.00161	6.22	173	0.00475	0.2	6.16e-05	0.0275	46.8
10055833	2590	123	2470	62.8	0.00114	12.7	138	0.00395	0.262	6.16e-05	0.0275	46.8
10031099	2060	101	1960	49.8	0.000902	7.46	120	0.00308	0.215	6.16e-05	0.0275	46.8
10010704	2220	110	2110	53.6	0.000963	7.56	125	0.00325	0.226	6.16e-05	0.0275	46.8
10010802	2800	130	2680	68.5	0.00124	15.3	145	0.00432	0.262	6.16e-05	0.0275	46.8
10070383	2670	135	2550	64.2	0.00119	7.93	140	0.00377	0.22	6.16e-05	0.0275	46.8
10064864	2240	109	2130	53.9	0.000992	8.45	126	0.00333	0.22	6.16e-05	0.0275	46.8
10010859	2130	104	2020	51.2	0.000946	7.38	122	0.00314	0.215	6.16e-05	0.0275	46.8
10051133	2330	114	2200	56.1	0.00103	8.4	129	0.00341	0.22	6.16e-05	0.0275	46.8
10052236	2910	137	2770	70.4	0.00127	14.5	148	0.00436	0.262	6.16e-05	0.0275	46.8

Mix Designs: 15 to 20 MPa

Table 13: Total life cycle (across modules in scope) impact results for All declared products, 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	41.2	0.142	301	2.88e-05	0.6	0.00121	2020
Maximum	53.4	0.162	398	3.76e-05	0.77	0.00163	2650
Mean	47.4	0.153	351	3.36e-05	0.685	0.00143	2360
Median	48.2	0.154	358	3.4e-05	0.697	0.00146	2390
10010861	41.2	0.142	301	2.88e-05	0.6	0.00121	2020
10065072	44.4	0.148	329	3.13e-05	0.644	0.00133	2200
10067696	48.2	0.154	358	3.4e-05	0.697	0.00146	2390



10010765	53.4	0.162	398	3.76e-05	0.77	0.00163	2650
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ECOpact 15 to 20 MPa

Indicator/LCI Metric	AP	EP	GWP	ODP	PCOP	ADPe
Unit	moles of H+-Eq	kg N	kg CO2-Eq	kg CFC-11-Eq	kg NOx-Eq	kg Sb-Eq
10074358	49.8	0.157	367	3.62e-05	0.714	0.00151

b) Inventory Metrics:

Indicator/LCI Metric	TPE	RE	NRE	NR	RR	WD P	LFW	LFHW	CBW C	CWW C	CHW	CNH W
Unit	MJ-Eq	MJ-Eq	MJ-Eq	kg	m3	m3	kg waste	kg waste	m3	m3	kg	kg
Minimum	2270	112	2160	54.6	0.000997	7.46	127	0.0033	0.205	6.16e-05	0.0275	46.8
Maximum	2980	152	2830	71.7	0.0013	8.59	150	0.00428	0.21	6.16e-05	0.0275	46.8
Mean	2650	132	2520	63.9	0.00117	8.26	140	0.00381	0.208	6.16e-05	0.0275	46.8
Median	2680	135	2550	64.5	0.00116	8.56	140	0.00381	0.21	6.16e-05	0.0275	46.8
10010861	2270	112	2160	54.6	0.000997	7.46	127	0.0033	0.205	6.16e-05	0.0275	46.8
10065072	2470	124	2350	59.4	0.00111	8.13	133	0.00355	0.205	6.16e-05	0.0275	46.8
10067696	2680	135	2550	64.5	0.00116	8.59	140	0.00381	0.21	6.16e-05	0.0275	46.8
10010765	2980	152	2830	71.7	0.0013	8.56	150	0.00412	0.21	6.16e-05	0.0275	46.8
10074358	2870	136	2720	69.2	0.00127	8.56	148	0.00428	0.21	6.16e-05	0.0275	46.8



Mix Designs: 21 to 25 MPa

Table 14: Total life cycle (across modules in scope) impact results for All declared products, 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	44	0.147	324	3.06e-05	0.639	0.00131	2150
Maximum	68.6	0.186	520	4.79e-05	0.982	0.00215	3370
Mean	54.4	0.164	406	3.84e-05	0.782	0.00167	2710
Median	53.8	0.163	399	3.83e-05	0.77	0.00165	2690
10010865	44	0.147	324	3.06e-05	0.639	0.00131	2150
10034570	48.8	0.155	359	3.45e-05	0.707	0.00146	2430
10051988	51.2	0.158	383	3.57e-05	0.739	0.00156	2510
10010882	54.3	0.163	410	3.75e-05	0.782	0.00167	2640
10048540	61.5	0.175	464	4.32e-05	0.883	0.00191	3040
10011133	66.6	0.183	504	4.67e-05	0.955	0.00208	3290
10010869	45.7	0.149	338	3.18e-05	0.663	0.00137	2230
10010729	49.7	0.156	369	3.49e-05	0.718	0.0015	2460
10067720	54.4	0.163	407	3.83e-05	0.784	0.00167	2690
10010887	58.3	0.169	440	4.04e-05	0.838	0.0018	2840
10010774	68.6	0.186	520	4.79e-05	0.982	0.00215	3370

ECOpact 21 to 25 MPa

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
10074327	52.4	0.161	389	3.74e-05	0.752	0.0016	2640
10074328	53	0.162	395	3.78e-05	0.761	0.00163	2660
10074359	54.5	0.165	404	3.95e-05	0.78	0.00168	2790
10074360	53.3	0.163	395	3.87e-05	0.764	0.00164	2730
10074361	53.8	0.164	399	3.9e-05	0.77	0.00165	2750
10074362	54.6	0.165	405	3.96e-05	0.781	0.00168	2800



b) Inventory Metrics:

Indicator/L CI Metric	TPE	RE	NRE	NR R	RR	WD P	LFW	LFHW	CBW C	CWW C	CHW	CNH W
Unit	MJ- Eq	MJ - Eq	MJ- Eq	kg	m3	m3	kg waste	kg waste	m3	m3	kg	kg
Minimum	240 0	122	229 0	57.9	0.0010 5	5.41	131	0.0034 4	0.142	6.16e- 05	0.027 5	46.8
Maximum	381 0	20 2	361 0	91.2	0.0016 9	9.34	177	0.0049 4	0.215	6.16e- 05	0.027 5	46.8
Mean	304 0	155	289 0	73.1	0.0013 3	7.67	153	0.0042 3	0.205	6.16e- 05	0.027 5	46.8
Median	302 0	15 0	287 0	72.9	0.0013 2	7.85	152	0.0042 2	0.21	6.16e- 05	0.027 5	46.8
10010865	240 0	122	229 0	57.9	0.0010 5	7.13	131	0.0034 4	0.205	6.16e- 05	0.027 5	46.8
10034570	272 0	135	259 0	65. 6	0.0012 1	9.34	142	0.0039 2	0.142	6.16e- 05	0.027 5	46.8
10051988	282 0	145	268 0	67. 6	0.0012 4	7.15	145	0.0038 6	0.215	6.16e- 05	0.027 5	46.8
10010882	296 0	158	281 0	70. 9	0.0012 8	5.41	149	0.0039	0.21	6.16e- 05	0.027 5	46.8
10048540	342 0	18 0	323 0	82.5	0.0014 7	8.31	165	0.0045 9	0.21	6.16e- 05	0.027 5	46.8
10011133	372 0	197	350 0	88. 6	0.0016	7.85	173	0.0048 5	0.205	6.16e- 05	0.027 5	46.8
10010869	251 0	127	238 0	60. 2	0.0010 9	6.96	134	0.0035 3	0.205	6.16e- 05	0.027 5	46.8
10010729	275 0	139	263 0	66. 4	0.0012 1	8.29	143	0.0038 8	0.21	6.16e- 05	0.027 5	46.8
10067720	302 0	156	287 0	72.9	0.0013 4	8.4	152	0.0041 7	0.21	6.16e- 05	0.027 5	46.8
10010887	3210	170	303 0	76. 4	0.0013 7	5.9	157	0.0041 9	0.21	6.16e- 05	0.027 5	46.8
10010774	381 0	20 2	361 0	91.2	0.0016 9	7.43	177	0.0049 4	0.205	6.16e- 05	0.027 5	46.8
10074327	296 0	147	283 0	71.2	0.0012 8	6.92	151	0.0042 2	0.205	6.16e- 05	0.027 5	46.8
10074328	300 0	15 0	285 0	71.8	0.0013 1	6.77	152	0.0042 3	0.215	6.16e- 05	0.027 5	46.8
10074359	3120	152	297 0	75.5	0.0013 8	8.57	157	0.0045 7	0.21	6.16e- 05	0.027 5	46.8
10074360	308 0	149	292 0	74	0.0013 2	8.63	155	0.0045	0.21	6.16e- 05	0.027 5	46.8
10074361	310 0	15 0	293 0	74.5	0.0013 5	8.57	155	0.0045 1	0.215	6.16e- 05	0.027 5	46.8
10074362	314 0	152	299 0	75.7	0.0013 8	8.68	157	0.0045 9	0.205	6.16e- 05	0.027 5	46.8



Mix Designs: 26 to 30 MPa

Table 15: Total life cycle (across modules in scope) impact results for All declared products, 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	49.7	0.156	370	3.45e-05	0.719	0.0015	2430
Maximum	74.8	0.196	570	5.29e-05	1.07	0.00236	3730
Mean	57.8	0.17	434	4.11e-05	0.83	0.00179	2900
Median	54.6	0.164	409	3.83e-05	0.786	0.00167	2700
10011155	60.4	0.174	454	4.32e-05	0.867	0.00187	3050
10010872	49.7	0.156	370	3.45e-05	0.719	0.0015	2430
10011483	54.6	0.164	409	3.83e-05	0.786	0.00167	2690
10060169	58.6	0.17	443	4.09e-05	0.842	0.00182	2880
10071879	64.1	0.179	485	4.49e-05	0.919	0.002	3160
10056671	72.1	0.191	551	5.02e-05	1.03	0.00228	3530
10071620	56.8	0.167	427	4e-05	0.818	0.00175	2820
10060232	74.8	0.196	570	5.29e-05	1.07	0.00236	3730

ECOpact 26 to 30 MPa

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
10074345	51.9	0.161	383	3.77e-05	0.744	0.00159	2660
10074352	51.9	0.161	384	3.77e-05	0.745	0.00159	2670
10074563	52	0.161	384	3.78e-05	0.746	0.00159	2670
10074347	52.5	0.162	388	3.82e-05	0.753	0.00161	2700
10074349	52.5	0.162	388	3.81e-05	0.752	0.0016	2690

b) Inventory Metrics:

Indicator/LCI Metric	TPE	RE	NRE	NR	RR	WD	LFW	LFHW	CBW	CWW	CHW	CNH
Unit	MJ-Eq	MJ-Eq	MJ-Eq	kg	m ³	m ³	kg waste	kg waste	m ³	m ³	kg	Kg
Minimum	2730	141	2600	65.3	0.0012	6.38	142	0.00375	0.2	6.16e-05	0.0275	46.8
Maximum	4210	222	4000	101	0.00187	10.8	190	0.00549	0.226	6.16e-05	0.0275	46.8
Mean	3260	166	3090	78.3	0.00142	8.33	160	0.00451	0.207	6.16e-05	0.0275	46.8
Median	3030	157	2880	73.1	0.00134	8.69	153	0.00445	0.205	6.16e-05	0.0275	46.8



10011155	343 0	174	324 0	82.2	0.0014 9	10.8	165	0.0047 3	0.2	6.16e- 05	0.027 5	46.8
10010872	273 0	141	260 0	65. 3	0.0012	6.79	142	0.0037 5	0.205	6.16e- 05	0.027 5	46.8
10011483	303 0	157	287 0	72.7	0.0013 1	7.92	152	0.0041 4	0.215	6.16e- 05	0.027 5	46.8
10060169	324 0	171	308 0	77.8	0.0014 3	6.89	158	0.0042 9	0.226	6.16e- 05	0.027 5	46.8
10071879	357 0	18 8	338 0	85. 4	0.0015 3	7.57	169	0.0046 8	0.21	6.16e- 05	0.027 5	46.8
10056671	401 0	217	378 0	95. 4	0.0017 3	6.38	182	0.0050 5	0.215	6.16e- 05	0.027 5	46.8
10071620	319 0	163	300 0	76	0.0014	8.62	156	0.0043 3	0.21	6.16e- 05	0.027 5	46.8
10060232	421 0	222	400 0	101	0.0018 7	9.61	190	0.0054 9	0.205	6.16e- 05	0.027 5	46.8
10074345	298 0	143	283 0	72.2	0.0012 8	8.69	152	0.0044 2	0.2	6.16e- 05	0.027 5	46.8
10074352	299 0	143	285 0	72	0.0012 9	8.71	152	0.0044 3	0.2	6.16e- 05	0.027 5	46.8
10074563	299 0	144	285 0	72.3	0.0013 1	8.83	153	0.0044 5	0.2	6.16e- 05	0.027 5	46.8
10074347	302 0	146	288 0	73.1	0.0013 2	8.72	153	0.0044 7	0.2	6.16e- 05	0.027 5	46.8
10074349	301 0	145	287 0	72.6	0.0013 4	8.7	153	0.0044 5	0.2	6.16e- 05	0.027 5	46.8

Mix Designs: 31 to 35 MPa

Table 16: Total life cycle (across modules in scope) impact results for All declared products, 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	54.1	0.163	405	3.78e-05	0.78	0.00165	2660
Maximum	72.8	0.192	556	5.11e-05	1.04	0.00229	3600
Mean	64.5	0.179	488	4.5e-05	0.925	0.00201	3170
Median	64	0.178	483	4.46e-05	0.918	0.00199	3140
10048531	54.1	0.163	405	3.78e-05	0.78	0.00165	2660
10010858	57.9	0.168	437	4.02e-05	0.833	0.00179	2830
10071530	64	0.178	483	4.46e-05	0.918	0.00199	3140
10056202	72.6	0.192	554	5.11e-05	1.04	0.00229	3600
10059879	71.4	0.191	542	5.06e-05	1.02	0.00225	3560
10010754	57.6	0.168	433	4.03e-05	0.829	0.00177	2830
10049923	62.8	0.176	471	4.37e-05	0.904	0.00194	3070
10058010	67.1	0.183	510	4.68e-05	0.961	0.0021	3290



10034356	72.8	0.192	556	5.03e-05	1.04	0.00229	3540
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b) Inventory Metrics:

Indicator/LCI Metric	TPE	RE	NRE	NR	RR	WD	LFW	LFHW	CBW	CWW	CHW	CNH
Unit	MJ-Eq	MJ-Eq	MJ-Eq	kg	m3	m3	kg waste	kg waste	m3	m3	kg	kg
Minimum	2990	155	2840	71.8	0.00129	5.19	150	0.00408	0.136	6.16e-05	0.0275	46.8
Maximum	4060	219	3840	97.7	0.00177	9.78	185	0.0053	0.226	6.16e-05	0.0275	46.8
Mean	3570	190	3390	85.7	0.00155	7.31	169	0.00468	0.202	6.16e-05	0.0275	46.8
Median	3540	188	3350	84.6	0.00156	7.29	168	0.00463	0.21	6.16e-05	0.0275	46.8
10048531	2990	155	2840	71.8	0.00129	7.57	150	0.00408	0.21	6.16e-05	0.0275	46.8
10010858	3190	170	3020	76.4	0.00139	6.33	156	0.0042	0.215	6.16e-05	0.0275	46.8
10071530	3540	188	3350	84.6	0.00156	7.05	168	0.00463	0.205	6.16e-05	0.0275	46.8
10056202	4060	218	3840	97.7	0.00177	8.32	185	0.00524	0.226	6.16e-05	0.0275	46.8
10059879	4020	210	3800	96.7	0.00171	9.78	184	0.0053	0.205	6.16e-05	0.0275	46.8
10010754	3190	167	3030	76.5	0.00139	7.49	157	0.00429	0.21	6.16e-05	0.0275	46.8
10049923	3470	181	3280	83.2	0.0015	7.29	166	0.00459	0.136	6.16e-05	0.0275	46.8
10058010	3710	201	3530	88.9	0.00162	6.77	174	0.00478	0.2	6.16e-05	0.0275	46.8
10034356	4000	219	3780	95.1	0.0017	5.19	182	0.00499	0.21	6.16e-05	0.0275	46.8

Mix Designs: 36 to 40 MPa

Table 17: Total life cycle (across modules in scope) impact results for All declared products, 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	62.9	0.177	475	4.4e-05	0.903	0.00195	3090
Maximum	63.3	0.177	479	4.42e-05	0.908	0.00197	3110
Mean	63.1	0.177	477	4.41e-05	0.906	0.00196	3100



Median	63.1	0.177	477	4.41e-05	0.906	0.00196	3100
10067591	63.3	0.177	479	4.42e-05	0.908	0.00197	3110
10048532	62.9	0.177	475	4.4e-05	0.903	0.00195	3090

b) Inventory Metrics:

Indicator/LCI Metric	TPE	RE	NRE	NR R	RR	WD P	LFW	LFHW	CBW C	CWW C	CHW	CNH W
Unit	MJ-Eq	MJ-Eq	MJ-Eq	kg	m3	m3	kg waste	kg waste	m3	m3	kg	kg
Minimum	3490	184	3300	83.1	0.00155	7.11	166	0.00459	0.21	6.16e-05	0.0275	46.8
Maximum	3510	185	3320	84.1	0.00155	7.41	167	0.0046	0.21	6.16e-05	0.0275	46.8
Mean	3500	184	3310	83.6	0.00155	7.26	166	0.0046	0.21	6.16e-05	0.0275	46.8
Median	3500	184	3310	83.6	0.00155	7.26	166	0.0046	0.21	6.16e-05	0.0275	46.8
10067591	3510	184	3320	84.1	0.00155	7.11	167	0.0046	0.21	6.16e-05	0.0275	46.8
10048532	3490	185	3300	83.1	0.00155	7.41	166	0.00459	0.21	6.16e-05	0.0275	46.8

Mix Designs: 41 to 45 MPa

Table 18: Total life cycle (across modules in scope) impact results for All declared products, 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	68	0.185	516	4.74e-05	0.974	0.00213	3340
Maximum	73.3	0.193	560	5.09e-05	1.05	0.00231	3580
Mean	70.7	0.189	538	4.92e-05	1.01	0.00222	3470
Median	70.9	0.189	539	4.94e-05	1.01	0.00223	3480
10010756	68	0.185	516	4.74e-05	0.974	0.00213	3340
10071113	73.3	0.193	560	5.09e-05	1.05	0.00231	3580
10071256	70.9	0.189	539	4.94e-05	1.01	0.00223	3480



b) Inventory Metrics:

Indicator/LCI Metric	TPE	RE	NRE	NR R	RR	WD P	LFW	LFHW	CBW C	CWW C	CHW	CNH W
Unit	MJ-Eq	MJ-Eq	MJ-Eq	kg	m3	m3	kg waste	kg waste	m3	m3	kg	kg
Minimum	3760	202	3560	90.2	0.00161	5.9	175	0.00486	0.21	6.16e-05	0.0275	46.8
Maximum	4030	220	3820	96.8	0.00175	6.93	184	0.00508	0.21	6.16e-05	0.0275	46.8
Mean	3910	211	3700	93.7	0.00168	6.58	180	0.00499	0.21	6.16e-05	0.0275	46.8
Median	3930	211	3710	94.1	0.00168	6.9	180	0.00503	0.21	6.16e-05	0.0275	46.8
10010756	3760	202	3560	90.2	0.00161	6.93	175	0.00486	0.21	6.16e-05	0.0275	46.8
10071113	4030	220	3820	96.8	0.00175	5.9	184	0.00508	0.21	6.16e-05	0.0275	46.8
10071256	3930	211	3710	94.1	0.00168	6.9	180	0.00503	0.21	6.16e-05	0.0275	46.8

Mix Designs: 46 to 50 MPa

Table 19: Total life cycle (across modules in scope) impact results for All declared products, 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	73.8	0.194	562	5.14e-05	1.06	0.00232	3620
Maximum	81.9	0.206	629	5.68e-05	1.17	0.0026	3990
Mean	77.8	0.2	596	5.41e-05	1.12	0.00246	3800
Median	77.8	0.2	596	5.41e-05	1.12	0.00246	3800
10053583	73.8	0.194	562	5.14e-05	1.06	0.00232	3620
10070562	81.9	0.206	629	5.68e-05	1.17	0.0026	3990



b) Inventory Metrics:

Indicator/LCI Metric	TPE	RE	NRE	NR R	RR	WD P	LFW	LFHW	CBW C	CWW C	CHW	CNH W
Unit	MJ-Eq	MJ-Eq	MJ-Eq	kg	m3	m3	kg waste	kg waste	m3	m3	kg	kg
Minimum	4100	220	3860	97.7	0.00177	5.49	186	0.00519	0.21	6.16e-05	0.0275	46.8
Maximum	4520	249	4270	108	0.00195	6.79	199	0.00556	0.22	6.16e-05	0.0275	46.8
Mean	4310	234	4060	103	0.00186	6.14	192	0.00538	0.215	6.16e-05	0.0275	46.8
Median	4310	234	4060	103	0.00186	6.14	192	0.00538	0.215	6.16e-05	0.0275	46.8
10053583	4100	220	3860	97.7	0.00177	6.79	186	0.00519	0.21	6.16e-05	0.0275	46.8
10070562	4520	249	4270	108	0.00195	5.49	199	0.00556	0.22	6.16e-05	0.0275	46.8

Mix Designs: 56 to 60 MPa

Table 26: Total life cycle (across modules in scope) impact results for All declared products, 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	39	0.139	285	2.75e-05	0.568	0.00114	1940
Maximum	79.1	0.202	605	5.52e-05	1.13	0.00251	3880
Mean	59	0.17	445	4.14e-05	0.849	0.00182	2910
Median	59	0.17	445	4.14e-05	0.849	0.00182	2910
10056481	79.1	0.202	605	5.52e-05	1.13	0.00251	3880
10022460	39	0.139	285	2.75e-05	0.568	0.00114	1940

b) Inventory Metrics:

Indicator/LCI Metric	TPE	RE	NRE	NR R	RR	WD P	LFW	LFHW	CBW C	CWW C	CHW	CNH W
Unit	MJ-Eq	MJ-Eq	MJ-Eq	kg	m3	m3	kg waste	kg waste	m3	m3	kg	kg
Minimum	2170	105	2050	52.2	0.00095	6.79	123	0.00324	0.21	6.16e-05	0.0275	46.8
Maximum	4400	237	4150	105	0.00186	8.4	195	0.00551	0.22	6.16e-05	0.0275	46.8



Mean	328 0	171	310 0	78. 6	0.0014	7.6	159	0.0043 8	0.215	6.16e- 05	0.027 5	46.8
Median	328 0	171	310 0	78. 6	0.0014	7.6	159	0.0043 8	0.215	6.16e- 05	0.027 5	46.8
10056481	440 0	23 7	415 0	105	0.0018 6	6.79	195	0.0055 1	0.21	6.16e- 05	0.027 5	46.8
10022460	217 0	10 5	205 0	52.2	0.0009 5	8.4	123	0.0032 4	0.22	6.16e- 05	0.027 5	46.8

ADDITIONAL ENVIRONMENTAL INFO

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

The PCR allows for the grouping of similar products. Examples of grouping for concrete products include performance categories of compressive strength and high early strength, material characteristics of lightweight concrete, and production categories of ready-mix and central mix. Alternately, if a single value is chosen for each impact category for all products, the value reported should be the highest impact within the range of variation; therefore, the EPD would report the highest single value for each impact category amongst all of the products or plants included in the average EPD analysis." (PCR for Concrete v2.1)

All the ready-mix concrete products manufactured at the plant are listed below. A complete LCA with resulting impacts for the study was performed on all highlighted mixes. The non-highlighted mixes listed below are grouped by characteristics and then the amount of cement. The highest value for the GWP for each mix that was not part of the LCA but is within the 10% range is taken from the LCA mix as part of the study. The table outlines the GWP for all mixes produced at this plant as allowed by the PCR.

Mix Designs: 0 to 15 MPa

Mix	GWP	MPa
10047489	298	3
10044508	298	3
10010674	313	3,5
10010675	316	3,6
10011182	316	3,6
10047451	316	3,6
10047474	316	3,6
10068599	316	3,6
10030972	316	3,6
10010676	347	3,8
10047452	347	3,8
10060774	347	3,8
10060826	404	3,8
10010677	351	3,9
10043185	351	3,9
10028157	351	3,9



10047454	351	3,9
10047482	351	3,9
10064796	351	3,9
10033964	351	3,9
10034377	351	3,9
10062370	443	3,9
10047484	443	3,9
10063354	443	3,9
10075341	443	3,9
10047455	443	3,9
10058263	443	3,9
10010679	443	3,9
10051136	443	3,9
10034624	358	4
10028495	358	4
10047457	358	4
10047473	358	4
10047476	358	4
10047480	358	4
10047481	358	4
10047485	358	4
10010680	358	4
10029161	358	4
10032581	358	4
10033220	358	4
10033727	358	4
10047472	358	4
10047477	358	4
10027864	358	4
10032672	358	4
10070099	358	4
10070393	358	4
10070134	544	4
10063712	370	4,1
10010681	370	4,1
10027863	370	4,1
10035426	370	4,1
10047020	404	4,1
10047458	404	4,1
10047469	404	4,1
10047471	404	4,1
10047486	404	4,1
10054155	404	4,1
10065075	404	4,1
10065076	404	4,1
10051841	484	4,1



10062860	484	4,1
10065077	484	4,1
10060830	484	4,1
10047006	524	4,1
10047460	524	4,1
10047491	524	4,1
10010682	524	4,1
10047088	524	4,1
10047461	524	4,1
10047492	524	4,1
10010683	524	4,1
10047089	524	4,1
10010684	371	4,2
10053308	371	4,2
10028483	371	4,2
10032991	371	4,2
10047357	371	4,2
10047358	371	4,2
10033965	371	4,2
10035425	371	4,2
10042941	371	4,2
10047463	371	4,2
10047490	371	4,2
10048550	371	4,2
10062633	371	4,2
10070515	371	4,2
10044578	371	4,2
10070516	481	4,2
10071220	551	4,2
10010685	398	4,3
10047464	398	4,3
10047475	398	4,3
10047483	398	4,3
10057587	398	4,3
10032412	398	4,3
10034266	398	4,3
10047470	546	4,3
10047465	546	4,3
10010686	546	4,3
10064080	546	4,3
10010850	546	4,3
10047466	428	4,4
10010687	428	4,4
10010688	435	4,5
10027984	435	4,5
10047467	435	4,5



10047487	435	4,5
10065484	435	4,5
10043502	435	4,5
10046925	569	4,5
10064798	569	4,5
10059899	569	4,5
10060157	509	4,8
10055833	332	8,5
10055834	332	8,5
10031099	276	10,5
10011102	276	10,5
10048526	276	10,5
10010704	276	10,5
10010705	276	10,5
10010706	276	10,5
10010802	353	10,5
10070383	359	10,5
10064864	295	14
10051133	295	14
10065448	295	14
10010707	295	14
10011066	295	14
10064863	295	14
10010708	295	14
10021211	295	14
10010709	295	14
10019490	295	14
10010859	282	14
10055642	282	14
10052236	282	14
10055593	282	14
10055594	282	14
10060180	282	14

Mix Designs: 16 to 20 MPa

Mix	GWP	MPa
10010861	301	17,5
10010715	301	17,5
10010716	301	17,5
10048530	301	17,5
10065072	329	17,5
10032591	329	17,5
10034884	329	17,5



10010932	329	17,5
10048521	329	17,5
10067696	329	17,5
10010710	329	17,5
10010711	329	17,5
10010712	329	17,5
10018170	329	17,5
10010714	329	17,5
10064866	329	17,5
10048038	329	17,5
10048545	329	17,5
10010806	329	17,5
10010765	398	17,5
10046862	398	17,5
10055595	398	17,5
10055596	398	17,5

ECOpact 16 to 20 MPa

Mix	GWP	MPa
10074358	367	17,5

Mix Designs: 21 to 25 MPa

Mix	GWP	MPa
10010865	324	21
10010726	324	21
10064844	324	21
10010727	324	21
10010862	324	21
10027364	324	21
10033872	324	21
10034570	324	21
10010728	324	21
10011170	324	21
10047254	324	21
10047324	324	21
10048529	324	21
10048552	324	21
10048553	324	21



10051166	324	21
10061185	324	21
10062079	324	21
10062106	324	21
10062522	324	21
10063500	324	21
10064497	324	21
10064745	324	21
10064845	324	21
10070401	324	21
10070410	324	21
10071224	324	21
10033046	324	21
10049200	324	21
10010718	324	21
10010719	324	21
10011930	324	21
10033517	324	21
10034316	324	21
10051972	324	21
10064867	324	21
10065073	324	21
10010720	324	21
10010721	324	21
10010722	324	21
10011008	324	21
10011153	324	21
10010723	324	21
10010724	324	21
10010725	324	21
10019241	324	21
10048523	324	21
10060163	324	21
10064868	324	21
10065074	324	21
10017363	324	21
10010795	324	21
10047345	324	21
10053814	324	21
10060166	324	21
10061856	324	21
10010701	324	21
10010857	324	21



10061182	324	21
10064840	324	21
10010882	410	21
10012656	410	21
10048191	410	21
10049027	410	21
10010767	410	21
10065053	410	21
10010768	410	21
10048254	410	21
10010769	410	21
10010770	410	21
10047342	410	21
10048543	410	21
10064804	410	21
10064830	410	21
10065054	410	21
10067690	410	21
10067692	410	21
10070254	410	21
10067584	410	21
10071912	410	21
10067698	410	21
10073830	410	21
10051988	382	21
10063583	382	21
10067649	382	21
10053785	382	21
10061854	382	21
10047049	382	21
10048547	382	21
10051096	382	21
10010790	382	21
10064799	382	21
10071216	382	21
10073563	382	21
10010808	382	21
10059283	382	21
10011133	504	21
10010761	504	21
10065051	504	21
10010762	504	21
10010880	504	21



10010763	504	21
10010764	504	21
10048540	504	21
10048557	504	21
10051072	504	21
10051073	504	21
10064803	504	21
10065052	504	21
10061541	504	21
10045995	504	21
10048088	504	21
10047907	504	21
10057215	504	21
10073906	504	21
10071339	504	21
10052416	504	21
10052443	504	21
10048033	504	21
10010729	369	24,5
10064870	369	24,5
10010869	369	24,5
10061051	369	24,5
10067720	407	24,5
10064185	407	24,5
10010775	407	24,5
10060250	407	24,5
10061188	407	24,5
10065056	407	24,5
10067691	407	24,5
10067694	407	24,5
10050886	407	24,5
10010739	407	24,5
10010922	407	24,5
10059521	407	24,5
10061186	407	24,5
10062758	407	24,5
10064846	407	24,5
10065092	407	24,5
10010731	407	24,5
10019720	407	24,5
10064869	407	24,5
10010732	407	24,5
10010733	407	24,5



10010964	407	24,5
10010734	407	24,5
10010736	407	24,5
10060164	407	24,5
10058027	407	24,5
10012429	407	24,5
10061183	407	24,5
10064841	407	24,5
10010887	440	24,5
10048548	440	24,5
10063355	440	24,5
10064086	440	24,5
10056101	440	24,5
10010832	440	24,5
10010772	520	24,5
10010774	520	24,5
10010830	520	24,5
10058393	520	24,5
10065055	520	24,5
10041267	520	24,5
10048554	520	24,5

ECOpact 21 to 25 MPa

Mix	GWP	MPa
10074327	389	21
10074328	395	21
10074359	404	21
10074360	395	21
10074361	399	21
10074362	405	21

Mix Designs: 26 to 30 MPa

Mix	GWP	MPa
10011155	454	26,4
10061052	454	28
10010872	370	28
10064085	370	28
10069132	370	28
10069956	370	28
10050477	370	28



10055726	370	28
10061351	370	28
10067486	370	28
10071110	370	28
10012149	370	28
10064805	370	28
10010959	370	28
10033729	370	28
10048104	370	28
10048106	370	28
10010747	370	28
10042835	370	28
10047262	370	28
10048541	370	28
10048542	370	28
10048551	370	28
10050210	370	28
10051075	370	28
10052164	370	28
10058456	370	28
10061187	370	28
10061631	370	28
10062392	370	28
10063925	370	28
10064806	370	28
10064860	370	28
10065093	370	28
10067381	370	28
10070411	370	28
10073470	370	28
10049201	370	28
10010742	370	28
10010870	370	28
10021446	370	28
10064871	370	28
10064872	370	28
10010743	370	28
10010744	370	28
10010969	370	28
10022594	370	28
10010740	370	28
10010745	370	28
10010746	370	28



10048087	370	28
10048534	370	28
10060165	370	28
10064874	370	28
10064875	370	28
10052040	370	28
10053786	370	28
10062448	370	28
10053816	370	28
10010703	370	28
10011483	409	28
10051077	409	28
10064842	409	28
10067804	409	28
10060169	443	28
10061347	443	28
10061348	443	28
10047158	443	28
10048539	443	28
10054154	443	28
10054161	443	28
10064084	443	28
10064087	443	28
10054602	443	28
10056234	443	28
10049028	443	28
10010782	443	28
10065059	443	28
10010783	443	28
10010785	443	28
10010784	443	28
10010846	443	28
10017018	443	28
10047272	443	28
10049278	443	28
10052256	443	28
10064833	443	28
10064834	443	28
10065070	443	28
10067629	443	28
10071879	443	28
10071322	443	28
10048995	443	28



10071553	443	28
10010855	443	28
10010996	443	28
10010697	443	28
10010698	443	28
10051078	443	28
10051454	443	28
10051453	443	28
10056671	551	28
10056690	551	28
10057222	551	28
10010778	551	28
10065057	551	28
10010779	551	28
10010888	551	28
10010889	551	28
10027369	551	28
10010780	551	28
10010781	551	28
10048537	551	28
10048561	551	28
10052237	551	28
10052255	551	28
10064831	551	28
10065058	551	28
10071620	427	28
10060232	427	28

ECOpact 26 to 30 MPa

Mix	GWP	MPa
10074345	383	28
10074352	384	28
10074563	384	28
10074347	388	28
10074349	388	28

Mix Designs: 31 to 35 MPa

Mix	GWP	MPa
10048531	405	31,5
10047334	405	31,5



10048549	405	31,5
10062690	405	31,5
10070054	405	31,5
10010748	405	31,5
10010873	405	31,5
10011173	405	31,5
10020724	405	31,5
10024555	405	31,5
10010749	405	31,5
10048527	405	31,5
10048536	405	31,5
10048546	405	31,5
10010858	437	31,5
10032311	437	31,5
10055870	437	31,5
10010788	437	31,5
10065071	437	31,5
10032880	437	31,5
10071530	483	31,5
10056202	483	31,5
10030504	483	31,5
10059879	542	31,5
10010754	433	35
10010876	433	35
10058010	514	35
10054933	514	35
10049923	514	35
10067740	514	35
10070275	514	35
10070951	514	35
10010989	514	35
10033728	514	35
10064808	514	35
10064862	514	35
10010752	514	35
10011086	514	35
10047269	514	35
10047335	514	35
10056652	514	35
10056734	514	35
10061184	514	35
10062393	514	35
10064809	514	35



10065447	514	35
10049316	514	35
10010751	514	35
10010753	514	35
10010875	514	35
10010981	514	35
10011063	514	35
10010983	514	35
10047251	514	35
10047252	514	35
10048524	514	35
10064876	514	35
10069170	514	35
10052042	514	35
10060168	514	35
10061855	514	35
10035521	514	35
10047299	514	35
10064843	514	35
10034356	556	35
10032739	556	35
10064746	556	35
10047026	556	35
10049029	556	35
10046648	556	35
10048558	556	35
10056292	556	35
10048538	556	35
10067628	556	35

Mix Designs: 36 to 40 MPa

Mix	GWP	MPa
10067591	479	38
10048532	475	38
10010877	475	38
10021638	475	38

Mix Designs: 41 to 45 MPa



Mix	GWP	MPa
10010756	516	42
10046923	516	42
10049030	516	42
10071143	516	42
10071142	516	42
10050585	516	42
10067585	516	42
10071113	516	42
10042860	516	42
10045449	516	42
10046861	516	42
10048555	516	42
10048556	516	42
10048559	516	42
10049033	516	42
10062394	516	42
10064495	516	42
10010878	516	42
10010755	516	42
10056059	516	42
10057214	516	42
10060167	516	42
10062777	516	42
10074130	516	42
10073798	516	42
10071256	539	45

Mix Designs: 46 to 50 MPa

Mix	GWP	MPa
10053583	562	49
10053584	562	49
10057185	562	49
10067721	562	49
10070562	629	49

Mix Designs: 51 to 56 MPa

Mix	GWP	MPa
10056481	605	56



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- 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
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- ISO 14040:2006 Environmental Management - Life Cycle Assessment - Principles and Framework
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- ISO 14067:2018 Greenhouse Gases - Carbon Footprint of Products - Requirements and Guidelines for Quantification
- ISO 14050:2009 Environmental Management - Vocabulary
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EN Standards:



- EN 16757 Sustainability of construction works - Environmental product declarations - Product Category Rules for concrete and concrete elements
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