Environmental Product Declaration

Environmental Product Declaration for ready mix concrete products produced by Holcim Colombia at their Palmira facility in Valle del Cauca, 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 7-45 Calle 13, Piso 12, Torre B, Ed. Teleport Business Park Bogotá, Colombia www.holcim.com.co
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 Rul (PCR) for Environmental Product Declarations (EPD) PCR for Concrete, v2.1 Sub PCR Program Operator: NSF International Sub-category PCR review was conducted by: Thomas P. Gloria, Ph. D. of Industrial Ecology Consultants: 35 Bracebridge, Rd., Newton, MA 02459-1728, t.gloria@industrial-ecology.com. Dr. Michael Overcash of Environmental Clarity: 2908 Chipmunk Lane, Raleigh, NC 27607-3117, mrovercash@earthlink.net. Mr. Bill Stough of Sustainable Research Group: PO Box 1684, Grand Rapids, MI 49501-1684, bstough@sustainableresearchgroup.com. Mr. Jack Geilbig, EcoForm: 2624 Abelia Way, Suite 611, Knoxville, TN 37931, jgeilbig@ecoform.com.
Independent LCA Reviewer and EPD Verifier:	This EPD was independently verified in accordance with ISO 14025 and ISO 21930. The life cycle assessment was independently reviewed in accordance ISO 14044 and the referenced PCR. Independent verification of the declaration, according to ISO 14025:2006 Internal ☐ ; External X Third Party Verifier Geoffrey Guest, Certified 3rd Party Verifier under the International EPD Program (www.environdec.com), CSA Group (www.csaregistries.ca)
Date of Issue:	19 July 2023
Period of Validity:	5 years; valid until 18 July 2028
EPD Number:	4bbd249a-5a65-4a8a-a23f-c4cad877e5f3

TABLE OF CONTENTS

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 107 concrete mixes manufactured at the Holcim Colombia, Palmira, concrete facility in Valle del Cauca, 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 cement 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	10062910	3 MPa 28d strength ready mix concrete.	Ready Mix	3.0	1.1764706
2	10046643	3.5 MPa 28d strength ready mix concrete.	Ready Mix	3.5	0.5932203
3	10010936	3.6 MPa 28d strength ready mix concrete.	Ready Mix	3.6	0.5737705
4	10018650	3.6 MPa 28d strength ready mix concrete.	Ready Mix	3.6	0.4264706
5	10020868	3.7 MPa 28d strength ready mix concrete.	Ready Mix	3.7	0.5555556
6	10010937	3.8 MPa 28d strength ready mix concrete.	Ready Mix	3.8	0.5384615
7	10063986	3.8 MPa 28d strength ready mix concrete.	Ready Mix	3.8	0.4729730
8	10017091	3.8 MPa 28d strength ready mix concrete.	Ready Mix	3.8	0.3928571
9	10010939	3.9 MPa 28d strength ready mix concrete.	Ready Mix	3.9	0.5223881
10	10061660	3.9 MPa 28d strength ready mix concrete.	Ready Mix	3.9	0.4125000
11	10019751	4 MPa 28d strength ready mix concrete.	Ready Mix	4.0	0.5072464
12	10044717	4 MPa 28d strength ready mix concrete.	Ready Mix	4.0	0.4216867
13	10010938	4.1 MPa 28d strength ready mix concrete.	Ready Mix	4.1	0.4929577
14	10010941	4.2 MPa 28d strength ready mix concrete.	Ready Mix	4.2	0.4729730
15	10032559	4.2 MPa 28d strength ready mix concrete.	Ready Mix	4.2	0.3882353
16	10011183	4.2 MPa 28d strength ready mix concrete.	Ready Mix	4.2	0.3473684

17	10011096	4.3 MPa 28d strength ready mix concrete.	Ready Mix	4.3	0.3763441
18	10010942	4.3 MPa 28d strength ready mix concrete.	Ready Mix	4.3	0.4605263
19	10010944	4.5 MPa 28d strength ready mix concrete.	Ready Mix	4.5	0.4320988
20	10027517	4.5 MPa 28d strength ready mix concrete.	Ready Mix	4.5	0.3763441
21	10046922	4.5 MPa 28d strength ready mix concrete.	Ready Mix	4.5	0.2844037
22	10058843	4.8 MPa 28d strength ready mix concrete.	Ready Mix	4.8	0.3932584
23	10067623	5 MPa 28d strength ready mix concrete.	Ready Mix	5.0	0.2222222
24	10056981	5 MPa 28d strength ready mix concrete.	Ready Mix	5.0	0.3398058
25	10051692	5 MPa 28d strength ready mix concrete.	Ready Mix	5.0	0.2391304
26	10049224	7 MPa 28d strength ready mix concrete.	Ready Mix	7.0	0.9210526
27	10068394	10.5 MPa 28d strength ready mix concrete.	Ready Mix	10.5	0.8750000
28	10057308	10.5 MPa 28d strength ready mix concrete.	Ready Mix	10.5	0.6363636
29	10030458	12.5 MPa 28d strength ready mix concrete.	Ready Mix	12.5	0.6714286
30	10010797	12.5 MPa 28d strength ready mix concrete.	Ready Mix	12.5	0.7049180
31	10053402	14 MPa 28d strength ready mix concrete.	Ready Mix	14.0	0.7291667
32	10010798	14 MPa 28d strength ready mix concrete.	Ready Mix	14.0	0.6615385

Mix Designs: 15 to 20 MPa

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

Mix#	Unique name/ID	Short description	Product type	28 day strength, MPa	H2O to cement ratio
33	10064969	15 MPa 28d strength ready mix concrete.	Ready Mix	15.0	0.6231884
34	10010860	17.5 MPa 28d strength ready mix concrete.	Ready Mix	17.5	0.6481481
35	10010792	17.5 MPa 28d strength ready mix concrete.	Ready Mix	17.5	0.6666667
36	10010799	17.5 MPa 28d strength ready mix concrete.	Ready Mix	17.5	0.6056338

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
37	10059555	21 MPa 28d strength ready mix concrete.	Ready Mix	21.0	0.4655172
38	10010726	21 MPa 28d strength ready mix concrete.	Ready Mix	21.0	0.5781250
39	10017007	21 MPa 28d strength ready mix concrete.	Ready Mix	21.0	0.5555556
40	10062631	21 MPa 28d strength ready mix concrete.	Ready Mix	21.0	0.4375000
41	10010762	21 MPa 28d strength ready mix concrete.	Ready Mix	21.0	0.4432990
42	10010739	24.5 MPa 28d strength ready mix concrete.	Ready Mix	24.5	0.5303030
43	10061282	24.5 MPa 28d strength ready mix concrete.	Ready Mix	24.5	0.4520548
44	10018570	24.5 MPa 28d strength ready mix concrete.	Ready Mix	24.5	0.5000000
45	10010772	24.5 MPa 28d strength ready mix concrete.	Ready Mix	24.5	0.3944954

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	H2O to cement ratio
46	10056433	28 MPa 28d strength ready mix concrete.	Ready Mix	28	0.4383117
47	10056525	28 MPa 28d strength ready mix concrete.	Ready Mix	28	0.3676471
48	10064084	28 MPa 28d strength ready mix concrete.	Ready Mix	28	0.4666667
49	10019800	28 MPa 28d strength ready mix concrete.	Ready Mix	28	0.4878049
50	10054610	28 MPa 28d strength ready mix concrete.	Ready Mix	28	0.4725275
51	10063456	28 MPa 28d strength ready mix concrete.	Ready Mix	28	0.3838384
52	10035811	28 MPa 28d strength ready mix concrete.	Ready Mix	28	0.3628319
53	10063454	28 MPa 28d strength ready mix concrete.	Ready Mix	28	0.3140496
71	10067123	28 MPa 28d strength ready mix concrete.	Ready Mix	28	0.8536585

72	10066968	28 MPa 28d strength ready mix concrete.	Ready Mix	28	0.8536585
73	10067129	28 MPa 28d strength ready mix concrete.	Ready Mix	28	0.8409091
74	10069339	28 MPa 28d strength ready mix concrete.	Ready Mix	28	0.7142857
75	10069374	28 MPa 28d strength ready mix concrete.	Ready Mix	28	0.7142857
76	10067124	28 MPa 28d strength ready mix concrete.	Ready Mix	28	0.7142857
77	10069241	28 MPa 28d strength ready mix concrete.	Ready Mix	28	0.7142857
78	10069215	28 MPa 28d strength ready mix concrete.	Ready Mix	28	0.7142857
79	10074340	28 MPa 28d strength ready mix concrete.	Ready Mix	28	0.6862745
80	10067200	28 MPa 28d strength ready mix concrete.	Ready Mix	28	0.7115385
81	10069344	28 MPa 28d strength ready mix concrete.	Ready Mix	28	0.7115385
82	10067127	28 MPa 28d strength ready mix concrete.	Ready Mix	28	0.7115385
83	10069330	28 MPa 28d strength ready mix concrete.	Ready Mix	28	0.6363636
84	10067125	28 MPa 28d strength ready mix concrete.	Ready Mix	28	0.6363636
85	10069244	28 MPa 28d strength ready mix concrete.	Ready Mix	28	0.6363636
86	10066980	28 MPa 28d strength ready mix concrete.	Ready Mix	28	0.6363636
87	10069245	28 MPa 28d strength ready mix concrete.	Ready Mix	28	0.6363636
88	10069264	28 MPa 28d strength ready mix concrete.	Ready Mix	28	0.6140351
89	10069218	28 MPa 28d strength ready mix concrete.	Ready Mix	28	0.6140351
90	10069269	28 MPa 28d strength ready mix concrete.	Ready Mix	28	0.6140351
91	10067201	28 MPa 28d strength ready mix concrete.	Ready Mix	28	0.6379310
92	10069318	28 MPa 28d strength ready mix concrete.	Ready Mix	28	0.6379310
93	10067128	28 MPa 28d strength ready mix concrete.	Ready Mix	28	0.6379310
94	10069326	28 MPa 28d strength ready mix concrete.	Ready Mix	28	0.5645161
95	10069029	28 MPa 28d strength ready mix concrete.	Ready Mix	28	0.5645161
96	10069327	28 MPa 28d strength ready mix concrete.	Ready Mix	28	0.5645161
97	10069249	28 MPa 28d strength ready mix concrete.	Ready Mix	28	0.5645161

98	10066981	28 MPa 28d strength ready mix concrete.	Ready Mix	28	0.5645161
99	10069347	28 MPa 28d strength ready mix concrete.	Ready Mix	28	0.5468750
100	10074348	28 MPa 28d strength ready mix concrete.	Ready Mix	28	0.5468750
101	10069248	28 MPa 28d strength ready mix concrete.	Ready Mix	28	0.5468750
102	10069010	28 MPa 28d strength ready mix concrete.	Ready Mix	28	0.5468750
103	10069025	28 MPa 28d strength ready mix concrete.	Ready Mix	28	0.5692308
104	10069325	28 MPa 28d strength ready mix concrete.	Ready Mix	28	0.5692308
105	10069009	28 MPa 28d strength ready mix concrete.	Ready Mix	28	0.5692308
106	10069345	28 MPa 28d strength ready mix concrete.	Ready Mix	28	0.5522388
107	10069019	28 MPa 28d strength ready mix concrete.	Ready Mix	28	0.5522388

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	H2O to cement ratio
54	10072378	31.5 MPa 28d strength ready mix concrete.	Ready Mix	31.5	0.4605263
55	10064968	31.5 MPa 28d strength ready mix concrete.	Ready Mix	31.5	0.4352941
56	10010788	31.5 MPa 28d strength ready mix concrete.	Ready Mix	31.5	0.4019608
57	10048608	31.5 MPa 28d strength ready mix concrete.	Ready Mix	31.5	0.3148148
58	10010752	35 MPa 28d strength ready mix concrete.	Ready Mix	35.0	0.4268293
59	10062634	35 MPa 28d strength ready mix concrete.	Ready Mix	35.0	0.3888889
60	10049029	35 MPa 28d strength ready mix concrete.	Ready Mix	35.0	0.4300000
61	10051564	35 MPa 28d strength ready mix concrete.	Ready Mix	35.0	0.3839286
62	10062580	35 MPa 28d strength ready mix concrete.	Ready Mix	35.0	0.3333333

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
63	10010877	38.5 MPa 28d strength ready mix concrete.	Ready Mix	38.5	0.393617

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
64	10010925	42 MPa 28d strength ready mix concrete.	Ready Mix	42	0.357143
65	10047946	42 MPa 28d strength ready mix concrete.	Ready Mix	42	0.436364
66	10071856	42 MPa 28d strength ready mix concrete.	Ready Mix	42	0.333333
67	10070074	42 MPa 28d strength ready mix concrete.	Ready Mix	42	0.207143

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
68	10045182	49 MPa 28d strength ready mix concrete.	Ready Mix	49	0.377193
69	10043611	50 MPa 28d strength ready mix concrete.	Ready Mix	50	0.307018

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
70	10068703	56 MPa 28d strength ready mix concrete.	Ready Mix	56	0.305085

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:

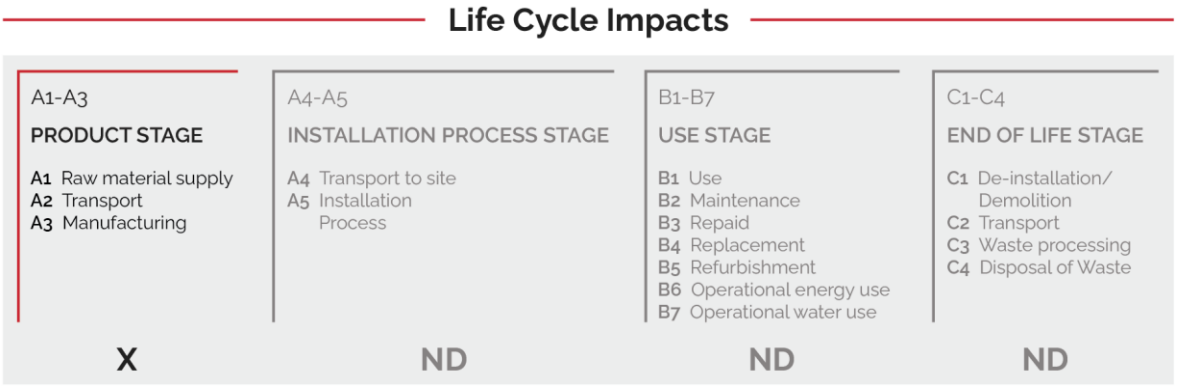

Figure 1: **General life cycle phases for consideration in a construction works system**

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

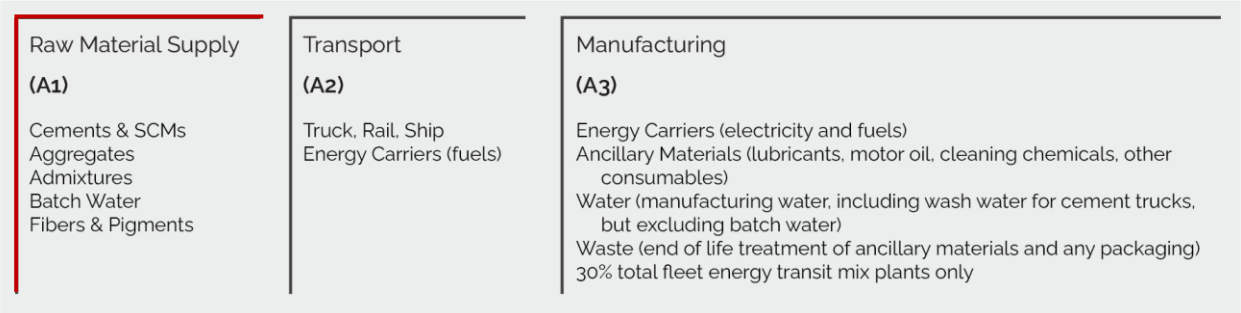

Figure 2: **General system inputs considered in the product system and categorized by modules in scope**

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 Colombia, is located at their Palmira 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 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 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 the ecoinvent 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	Valle del Cauca	v3.8 in 2021	2	3	2	3	3
Cement	HE Cement	Progam Operator: Labeling Sustainability- EPD ID: 6328e320-6cab-4d85-83f4-dca33374d11b	Boaycá	06 January 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	Valle del Cauca	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	Valle del Cauca	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

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

TOTAL IMPACT SUMMARY

The following table reports the total LCA results for each product produced at the given 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 CO2-Eq	kg CFC-11-Eq	kg NOx-Eq	kg Sb-Eq	MJ, net calorific value
Minimum	31.4	0.15	232	2.22e-05	0.466	0.000874	1560
Maximum	88.4	0.241	676	6.31e-05	1.25	0.00282	4440
Mean	56.2	0.189	424	3.96e-05	0.806	0.00172	2780
Median	54.9	0.188	416	3.92e-05	0.788	0.00168	2750
10062910	31.4	0.15	232	2.22e-05	0.466	0.000874	1560
10046643	46.5	0.174	347	3.23e-05	0.672	0.00139	2270
10010936	47.7	0.175	357	3.32e-05	0.689	0.00143	2330
10018650	52.4	0.183	392	3.65e-05	0.754	0.00158	2560
10020868	48.9	0.178	367	3.41e-05	0.706	0.00147	2390
10010937	50.2	0.18	376	3.5e-05	0.723	0.00151	2460
10063986	55.9	0.189	422	3.94e-05	0.803	0.00171	2770
10017091	62.1	0.199	470	4.37e-05	0.888	0.00192	3070
10010939	51.4	0.182	386	3.59e-05	0.74	0.00156	2520
10061660	59.8	0.195	452	4.22e-05	0.856	0.00184	2960
10019751	52.7	0.184	396	3.68e-05	0.757	0.0016	2580
10044717	61.4	0.198	465	4.33e-05	0.878	0.0019	3040
10010938	53.9	0.186	406	3.78e-05	0.775	0.00164	2650
10010941	55.8	0.189	420	3.91e-05	0.8	0.00171	2740
10032559	62.7	0.2	474	4.41e-05	0.896	0.00194	3100
10011183	69	0.21	524	4.88e-05	0.982	0.00216	3430

10011096	67.7	0.208	514	4.78e-05	0.963	0.00211	3360
10010942	57.1	0.191	430	4e-05	0.817	0.00175	2810
10010944	60.2	0.196	455	4.23e-05	0.86	0.00186	2970
10027517	67.7	0.208	514	4.78e-05	0.963	0.00211	3360
10046922	77.8	0.224	592	5.52e-05	1.1	0.00246	3880
10058843	65.3	0.204	495	4.62e-05	0.93	0.00203	3250
10067623	88.4	0.241	676	6.31e-05	1.25	0.00282	4440
10056981	73.9	0.218	563	5.24e-05	1.05	0.00233	3680
10051692	67.3	0.207	510	4.75e-05	0.959	0.00209	3340
10049224	33.6	0.153	246	2.31e-05	0.497	0.000943	1620
10068394	35	0.155	257	2.42e-05	0.516	0.00099	1700
10057308	50.6	0.18	383	3.58e-05	0.727	0.00154	2520
10030458	54	0.187	411	3.92e-05	0.775	0.00165	2760
10010797	47.5	0.176	360	3.37e-05	0.684	0.00144	2370
10053402	39.9	0.163	296	2.78e-05	0.584	0.00116	1950
10010798	50.1	0.18	380	3.56e-05	0.721	0.00152	2510

ECOpact 0 to 15 MPa

b) Inventory Metrics:

Indicator/LCI Metric	**TPE**	**RE**	**NRE**	**NRR**	**RR**	**WDP**	**LFW**	**LFHW**	**CBWC**	**CWWC**	**CHW**	**CNHW**
Unit	**MJ-Eq**	**MJ-Eq**	**MJ-Eq**	**kg**	**m3**	**m3**	**kg waste**	**kg waste**	**m3**	**m3**	**kg**	**kg**
Minimum	1760	89.2	1670	42.5	0.000749	5.34	121	0.00283	0.116	5.65e-05	0.0416	60.8
Maximum	5020	269	4750	120	0.00212	15	231	0.00668	0.247	5.65e-05	0.0416	60.8
Mean	3140	167	2970	75.2	0.00135	7.44	168	0.00441	0.184	5.65e-05	0.0416	60.8
Median	3110	164	2950	74.4	0.00133	6.63	167	0.00436	0.184	5.65e-05	0.0416	60.8
10062910	1760	89.2	1670	42.5	0.000749	14	121	0.00285	0.21	5.65e-05	0.0416	60.8
10046643	2560	136	2430	61.6	0.00111	6.97	149	0.00369	0.184	5.65e-05	0.0416	60.8
10010936	2620	141	2480	62.8	0.00111	6.8	151	0.00376	0.184	5.65e-05	0.0416	60.8
10018650	2900	154	2740	69.3	0.00125	6.79	160	0.00411	0.152	5.65e-05	0.0416	60.8
10020868	2710	143	2550	64.4	0.00118	6.72	154	0.00386	0.184	5.65e-05	0.0416	60.8
10010937	2770	148	2620	66.4	0.00119	6.66	156	0.00394	0.184	5.65e-05	0.0416	60.8
10063986	3130	166	2960	74.8	0.00131	7.65	168	0.0044	0.184	5.65e-05	0.0416	60.8
10017091	3470	187	3280	83.2	0.0015	6.1	180	0.00479	0.173	5.65e-05	0.0416	60.8

10010939	2860	152	2700	68.1	0.00122	6.6	159	0.00404	0.184	5.65e-05	0.0416	60.8
10061660	3340	178	3170	80.4	0.00141	7.36	175	0.00467	0.173	5.65e-05	0.0416	60.8
10019751	2920	156	2770	69.9	0.0013	6.51	161	0.00412	0.184	5.65e-05	0.0416	60.8
10044717	3440	184	3240	82.7	0.00152	6.17	178	0.00475	0.184	5.65e-05	0.0416	60.8
10010938	3000	160	2810	71.7	0.00128	6.49	164	0.00421	0.184	5.65e-05	0.0416	60.8
10010941	3100	166	2940	74	0.00137	6.23	167	0.00433	0.184	5.65e-05	0.0416	60.8
10032559	3500	188	3300	83.9	0.0015	5.86	181	0.00482	0.173	5.65e-05	0.0416	60.8
10011183	3870	209	3660	93.2	0.00169	5.8	193	0.00528	0.173	5.65e-05	0.0416	60.8
10011096	3810	204	3610	90.9	0.00162	5.82	190	0.00518	0.184	5.65e-05	0.0416	60.8
10010942	3170	171	3020	76.4	0.00136	6.32	170	0.00443	0.184	5.65e-05	0.0416	60.8
10010944	3350	180	3170	80.8	0.00145	6.17	176	0.00465	0.184	5.65e-05	0.0416	60.8
10027517	3810	204	3580	90.5	0.00161	5.82	190	0.00518	0.184	5.65e-05	0.0416	60.8
10046922	4380	235	4130	105	0.0019	5.34	210	0.0059	0.163	5.65e-05	0.0416	60.8
10058843	3670	195	3460	88.1	0.00158	6.71	186	0.00504	0.184	5.65e-05	0.0416	60.8
10067623	5020	269	4750	120	0.00212	5.38	231	0.00668	0.147	5.65e-05	0.0416	60.8
10056981	4160	224	3930	99.3	0.00182	5.44	203	0.00563	0.184	5.65e-05	0.0416	60.8
10051692	3760	202	3570	90	0.00162	6.08	190	0.00517	0.116	5.65e-05	0.0416	60.8
10049224	1820	95.4	1730	43.8	0.000793	9.08	124	0.00283	0.184	5.65e-05	0.0416	60.8
10068394	1920	99.3	1810	46	0.000802	10.1	127	0.00297	0.184	5.65e-05	0.0416	60.8
10057308	2850	150	2700	68	0.00125	8.88	158	0.00406	0.22	5.65e-05	0.0416	60.8
10030458	3120	161	2960	75.4	0.00135	15	167	0.00455	0.247	5.65e-05	0.0416	60.8
10010797	2680	141	2540	64.1	0.00119	9.91	153	0.00388	0.226	5.65e-05	0.0416	60.8
10053402	2190	115	2080	52.7	0.000944	9.37	137	0.0033	0.184	5.65e-05	0.0416	60.8
10010798	2820	150	2690	67.9	0.00124	10	158	0.00407	0.226	5.65e-05	0.0416	60.8

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 CO2-Eq**	**kg CFC-11-Eq**	**kg NOx-Eq**	**kg Sb-Eq**	**MJ, net calorific value**
Minimum	43.7	0.169	325	3.05e-05	0.635	0.00129	2140
Maximum	53.9	0.186	409	3.84e-05	0.772	0.00165	2700
Mean	49.4	0.179	373	3.5e-05	0.713	0.00149	2460
Median	50.1	0.18	378	3.56e-05	0.722	0.00151	2500
10064969	53.2	0.185	403	3.82e-05	0.765	0.00162	2690
10010860	43.7	0.169	325	3.05e-05	0.635	0.00129	2140
10010792	47	0.175	354	3.31e-05	0.679	0.00141	2320
10010799	53.9	0.186	409	3.84e-05	0.772	0.00165	2700

b) Inventory Metrics:

Indicator/LCI Metric	TPE	RE	NRE	NRR	RR	WDP	LFW	LFHW	CBWC	CWWC	CHW	CNHW
Unit	**MJ-Eq**	**MJ-Eq**	**MJ-Eq**	**kg**	**m3**	**m3**	**kg waste**	**kg waste**	**m3**	**m3**	**kg**	**kg**
Minimum	2410	128	2290	58.1	0.00101	8.72	144	0.00356	0.184	5.65e-05	0.0416	60.8
Maximum	3050	162	2890	73.3	0.00131	12.7	165	0.0044	0.226	5.65e-05	0.0416	60.8
Mean	2780	146	2640	66.9	0.00118	10.1	156	0.00402	0.212	5.65e-05	0.0416	60.8
Median	2840	148	2680	68.1	0.00121	9.41	158	0.00407	0.218	5.65e-05	0.0416	60.8
10064969	3040	158	2880	73.3	0.0013	12.7	164	0.0044	0.226	5.65e-05	0.0416	60.8
10010860	2410	128	2290	58.1	0.00101	9.01	144	0.00356	0.184	5.65e-05	0.0416	60.8
10010792	2630	138	2490	62.9	0.00112	8.72	151	0.0038	0.21	5.65e-05	0.0416	60.8
10010799	3050	162	2890	73.3	0.00131	9.8	165	0.00434	0.226	5.65e-05	0.0416	60.8

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 CO2-Eq**	**kg CFC-11-Eq**	**kg NOx-Eq**	**kg Sb-Eq**	**MJ, net calorific value**
Minimum	46.1	0.173	344	3.23e-05	0.667	0.00137	2270
Maximum	77.4	0.224	592	5.51e-05	1.1	0.00245	3880
Mean	58.3	0.193	441	4.12e-05	0.835	0.00179	2890
Median	55.5	0.188	418	3.9e-05	0.797	0.00169	2740
10059555	46.1	0.173	344	3.23e-05	0.667	0.00137	2270
10010726	49.6	0.179	373	3.49e-05	0.715	0.0015	2450
10017007	54.6	0.187	412	3.85e-05	0.783	0.00167	2700
10062631	59.7	0.195	452	4.22e-05	0.854	0.00184	2970
10010762	69.9	0.211	533	4.96e-05	0.992	0.0022	3490
10010739	51.2	0.181	384	3.6e-05	0.738	0.00154	2530
10061282	55.5	0.188	418	3.9e-05	0.797	0.00169	2740
10018570	60.7	0.197	460	4.29e-05	0.866	0.00188	3010
10010772	77.4	0.224	592	5.51e-05	1.1	0.00245	3880

b) Inventory Metrics:

Indicator/LCI Metric	TPE	RE	NRE	NRR	RR	WDP	LFW	LFHW	CBWC	CWWC	CHW	CNHW
Unit	**MJ-Eq**	**MJ-Eq**	**MJ-Eq**	**kg**	**m3**	**m3**	**kg waste**	**kg waste**	**m3**	**m3**	**kg**	**kg**
Minimum	2550	135	2430	61.6	0.00111	5.71	149	0.00373	0.142	5.65e-05	0.0416	60.8
Maximum	4410	236	4130	105	0.00189	8.87	210	0.00589	0.226	5.65e-05	0.0416	60.8
Mean	3270	175	3090	78.4	0.00141	7.54	173	0.00457	0.195	5.65e-05	0.0416	60.8
Median	3100	165	2920	74	0.00137	7.76	167	0.00437	0.194	5.65e-05	0.0416	60.8
10059555	2550	135	2430	61.6	0.00111	8.87	149	0.00373	0.142	5.65e-05	0.0416	60.8
10010726	2770	148	2610	66.5	0.00119	8.23	156	0.00396	0.194	5.65e-05	0.0416	60.8
10017007	3060	163	2900	73.3	0.00132	7.76	165	0.00431	0.21	5.65e-05	0.0416	60.8
10062631	3340	179	3160	80.2	0.00147	7.56	175	0.00467	0.184	5.65e-05	0.0416	60.8
10010762	3930	213	3720	94.5	0.00171	6.09	195	0.00536	0.226	5.65e-05	0.0416	60.8

10010739	2860	152	2700	68.6	0.00123	8.86	159	0.0041	0.184	5.65e-05	0.0416	60.8
10061282	3100	165	2920	74	0.00137	7.87	167	0.00437	0.173	5.65e-05	0.0416	60.8
10018570	3410	182	3220	81.6	0.00142	6.89	177	0.00471	0.215	5.65e-05	0.0416	60.8
10010772	4410	236	4130	105	0.00189	5.71	210	0.00589	0.226	5.65e-05	0.0416	60.8

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 CO2-Eq**	**kg CFC-11-Eq**	**kg NOx-Eq**	**kg Sb-Eq**	**MJ, net calorific value**
Minimum	35.3	0.156	260	2.43e-05	0.52	0.001	1700
Maximum	85.3	0.236	653	6.09e-05	1.2	0.00272	4290
Mean	48.6	0.177	365	3.41e-05	0.701	0.00146	2390
Median	45.8	0.173	343	3.21e-05	0.664	0.00137	2250
10056433	48.4	0.177	362	3.4e-05	0.7	0.00145	2380
10056525	52.4	0.183	394	3.69e-05	0.755	0.00159	2600
10064084	56.8	0.191	429	4.02e-05	0.815	0.00174	2820
10019800	60.7	0.197	461	4.31e-05	0.867	0.00188	3030
10054610	66.1	0.205	505	4.7e-05	0.94	0.00207	3310
10063456	71.6	0.214	545	5.09e-05	1.02	0.00225	3580
10035811	79.6	0.227	611	5.67e-05	1.12	0.00254	3990
10063454	85.3	0.236	653	6.09e-05	1.2	0.00272	4290
10066968	35.3	0.156	260	2.43e-05	0.52	0.001	1700
10069244	44.2	0.17	329	3.08e-05	0.641	0.00131	2170
10067201	45.8	0.173	343	3.21e-05	0.664	0.00137	2250
10069318	45.8	0.173	343	3.21e-05	0.664	0.00137	2250
10069327	48.6	0.177	364	3.41e-05	0.702	0.00146	2400
10069347	49.5	0.179	373	3.49e-05	0.713	0.0015	2450
10074348	49.4	0.178	372	3.47e-05	0.711	0.00149	2440
10069025	50.3	0.18	378	3.53e-05	0.724	0.00152	2480
10069019	51	0.181	386	3.58e-05	0.733	0.00155	2510

b) Inventory Metrics:

Indicator/LCI Metric	TPE	RE	NRE	NRR	RR	WDP	LFW	LFHW	CBWC	CWWC	CHW	CNHW
Unit	MJ-Eq	MJ-Eq	MJ-Eq	kg	m3	m3	kg waste	kg waste	m3	m3	kg	kg
Minimum	1920	101	1810	46.1	0.000818	4.89	127	0.00294	0.131	5.65e-05	0.0416	60.8
Maximum	4840	261	4590	116	0.00208	9.86	225	0.00649	0.226	5.65e-05	0.0416	60.8
Mean	2710	144	2560	64.8	0.00116	8.24	154	0.00389	0.187	5.65e-05	0.0416	60.8
Median	2560	136	2410	61.1	0.0011	8.43	148	0.00369	0.184	5.65e-05	0.0416	60.8
10056433	2700	142	2530	64.6	0.00114	8.76	153	0.0039	0.142	5.65e-05	0.0416	60.8
10056525	2930	156	2780	70.3	0.00126	8.77	161	0.00419	0.131	5.65e-05	0.0416	60.8
10064084	3210	168	3030	76.4	0.00139	8.69	170	0.00451	0.184	5.65e-05	0.0416	60.8
10019800	3430	184	3240	82.1	0.00146	7.86	178	0.00476	0.21	5.65e-05	0.0416	60.8
10054610	3760	201	3540	89.5	0.00162	6.93	188	0.00512	0.226	5.65e-05	0.0416	60.8
10063456	4050	217	3810	97.3	0.00173	7.23	199	0.00553	0.2	5.65e-05	0.0416	60.8
10035811	4510	245	4270	108	0.00197	4.89	214	0.00602	0.215	5.65e-05	0.0416	60.8
10063454	4840	261	4590	116	0.00208	6.46	225	0.00649	0.2	5.65e-05	0.0416	60.8
10067123	1940	102	1840	46.6	0.000837	9.86	128	0.003	0.184	5.65e-05	0.0416	60.8
10066968	1920	101	1810	46.1	0.000818	8.63	127	0.00294	0.184	5.65e-05	0.0416	60.8
10067129	2030	107	1930	48.8	0.000879	8.82	131	0.00308	0.194	5.65e-05	0.0416	60.8
10069339	2240	118	2110	53.6	0.000986	9.12	138	0.00333	0.184	5.65e-05	0.0416	60.8
10069374	2230	117	2110	53.3	0.000951	9.12	138	0.00333	0.184	5.65e-05	0.0416	60.8
10067124	2230	117	2110	53.3	0.000955	9.12	138	0.00333	0.184	5.65e-05	0.0416	60.8
10069241	2210	117	2090	52.8	0.000957	8.42	137	0.00329	0.184	5.65e-05	0.0416	60.8
10069215	2210	117	2090	53	0.000971	8.42	137	0.00329	0.184	5.65e-05	0.0416	60.8
10074340	2280	121	2160	54.8	0.00102	8.7	140	0.00339	0.184	5.65e-05	0.0416	60.8
10067200	2330	123	2200	55.7	0.000993	8.43	141	0.00343	0.194	5.65e-05	0.0416	60.8

10069344	2320	122	2200	55.6	0.000978	8.43	141	0.00343	0.194	5.65e-05	0.0416	60.8
10067127	2330	123	2200	55.6	0.00099	8.46	141	0.00343	0.194	5.65e-05	0.0416	60.8
10069330	2440	130	2310	58.8	0.00102	8.78	145	0.00359	0.184	5.65e-05	0.0416	60.8
10067125	2460	129	2310	58.7	0.00104	8.78	145	0.00359	0.184	5.65e-05	0.0416	60.8
10069244	2450	129	2310	58.5	0.00103	8.65	145	0.00358	0.184	5.65e-05	0.0416	60.8
10066980	2440	130	2320	58.5	0.00106	8.65	145	0.00358	0.184	5.65e-05	0.0416	60.8
10069245	2440	129	2310	58.7	0.00105	8.65	145	0.00358	0.184	5.65e-05	0.0416	60.8
10069264	2490	132	2360	59.7	0.00108	7.87	147	0.00362	0.184	5.65e-05	0.0416	60.8
10069218	2500	133	2370	59.7	0.00108	7.87	147	0.00362	0.184	5.65e-05	0.0416	60.8
10069269	2500	133	2350	59.7	0.00107	7.87	147	0.00362	0.184	5.65e-05	0.0416	60.8
10067201	2560	135	2400	61	0.00107	8.29	148	0.00369	0.194	5.65e-05	0.0416	60.8
10069318	2540	136	2400	60.7	0.0011	8.29	148	0.00369	0.194	5.65e-05	0.0416	60.8
10067128	2540	135	2410	61.1	0.0011	8.29	148	0.00369	0.194	5.65e-05	0.0416	60.8
10069326	2720	144	2560	64.9	0.00115	8.8	154	0.00391	0.184	5.65e-05	0.0416	60.8
10069029	2710	143	2560	65.1	0.00116	8.8	154	0.00391	0.184	5.65e-05	0.0416	60.8
10069327	2700	144	2560	64.9	0.00116	8.8	154	0.00391	0.184	5.65e-05	0.0416	60.8
10069249	2700	143	2540	64.7	0.00117	8.45	154	0.0039	0.184	5.65e-05	0.0416	60.8
10066981	2710	143	2570	64.7	0.00119	8.65	154	0.00391	0.184	5.65e-05	0.0416	60.8
10069347	2760	147	2620	66.3	0.00117	8.4	156	0.00397	0.184	5.65e-05	0.0416	60.8
10074348	2770	146	2590	66	0.00117	7.56	155	0.00392	0.184	5.65e-05	0.0416	60.8
10069248	2750	146	2610	66.1	0.00117	7.73	155	0.00393	0.184	5.65e-05	0.0416	60.8
10069010	2750	147	2620	66.2	0.0012	7.75	155	0.00393	0.184	5.65e-05	0.0416	60.8
10069025	2810	148	2640	67.2	0.00123	8.34	157	0.00401	0.194	5.65e-05	0.0416	60.8
10069325	2810	149	2660	67	0.00121	8.34	157	0.00401	0.194	5.65e-05	0.0416	60.8
10069009	2800	149	2640	66.9	0.00119	8.03	157	0.004	0.194	5.65e-05	0.0416	60.8
10069345	2860	152	2700	68.5	0.00121	7.29	159	0.00404	0.194	5.65e-05	0.0416	60.8

10069019	2850	152	2690	68.4	0.00124	6.61	159	0.00401	0.194	5.65e-05	0.0416	60.8

ECOpact 26 to 30 MPa

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**
10067129	37.1	0.159	275	2.57e-05	0.544	0.00107	1800
10067123	35.5	0.156	262	2.46e-05	0.522	0.00101	1730
10067200	42.1	0.167	314	2.93e-05	0.612	0.00124	2060
10069344	42.1	0.167	314	2.93e-05	0.612	0.00124	2060
10069339	40.4	0.164	300	2.81e-05	0.59	0.00118	1980
10069374	40.4	0.164	300	2.81e-05	0.59	0.00118	1980
10067124	40.4	0.164	300	2.81e-05	0.59	0.00118	1980
10074340	41.4	0.165	309	2.89e-05	0.602	0.00122	2030
10069330	44.2	0.17	330	3.09e-05	0.641	0.00131	2170
10067125	44.2	0.17	330	3.09e-05	0.641	0.00131	2170
10069325	50.3	0.18	378	3.53e-05	0.724	0.00152	2480
10069345	51.1	0.181	387	3.6e-05	0.734	0.00156	2530
10069326	48.6	0.177	364	3.41e-05	0.702	0.00146	2400
10069029	48.6	0.177	364	3.41e-05	0.702	0.00146	2400
10067127	42.1	0.167	314	2.93e-05	0.612	0.00124	2060
10069241	40.3	0.164	299	2.8e-05	0.589	0.00118	1960
10069215	40.3	0.164	299	2.8e-05	0.589	0.00118	1960
10067128	45.8	0.173	343	3.21e-05	0.664	0.00137	2250
10069264	45	0.171	338	3.15e-05	0.652	0.00134	2210
10066980	44.2	0.17	329	3.08e-05	0.641	0.00131	2170
10069218	45	0.171	338	3.15e-05	0.652	0.00134	2210
10069245	44.2	0.17	329	3.08e-05	0.641	0.00131	2170
10069269	45	0.171	338	3.15e-05	0.652	0.00134	2210
10069009	50.2	0.18	378	3.53e-05	0.723	0.00152	2480
10069248	49.4	0.178	372	3.47e-05	0.712	0.00149	2440
10069249	48.5	0.177	364	3.41e-05	0.701	0.00146	2390
10066981	48.6	0.177	364	3.41e-05	0.702	0.00146	2400
10069010	49.4	0.178	372	3.47e-05	0.712	0.00149	2440

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 CO2-Eq**	**kg CFC-11-Eq**	**kg NOx-Eq**	**kg Sb-Eq**	**MJ, net calorific value**
Minimum	57.4	0.191	433	4.06e-05	0.823	0.00176	2850
Maximum	86.2	0.238	662	6.17e-05	1.22	0.00276	4340
Mean	70.4	0.213	537	5.01e-05	1	0.00221	3520
Median	71.8	0.215	549	5.12e-05	1.02	0.00227	3600
10072378	57.4	0.191	433	4.06e-05	0.823	0.00176	2850
10064968	62.5	0.2	476	4.43e-05	0.89	0.00194	3120
10010788	73.2	0.217	559	5.21e-05	1.04	0.00231	3660
10048608	76.8	0.223	587	5.46e-05	1.09	0.00243	3840
10010752	61.1	0.197	462	4.33e-05	0.874	0.00189	3040
10062634	65.6	0.205	500	4.66e-05	0.934	0.00205	3280
10049029	71.8	0.215	549	5.12e-05	1.02	0.00227	3600
10051564	79.3	0.227	607	5.65e-05	1.12	0.00252	3980
10062580	86.2	0.238	662	6.17e-05	1.22	0.00276	4340

b) Inventory Metrics:

Indicator/LCI Metric	TPE	RE	NRE	NRR	RR	WDP	LFW	LFHW	CBWC	CWWC	CHW	CNHW
Unit	**MJ-Eq**	**MJ-Eq**	**MJ-Eq**	**kg**	**m3**	**m3**	**kg waste**	**kg waste**	**m3**	**m3**	**kg**	**kg**
Minimum	3220	171	3050	77.2	0.00137	5.27	171	0.00454	0.178	5.65e-05	0.0416	60.8
Maximum	4920	265	4660	118	0.0021	8.5	227	0.00654	0.226	5.65e-05	0.0416	60.8
Mean	3980	214	3770	95.5	0.0017	6.78	196	0.00543	0.201	5.65e-05	0.0416	60.8
Median	4070	219	3870	97.5	0.00174	6.87	199	0.00553	0.194	5.65e-05	0.0416	60.8
10072378	3220	171	3050	77.2	0.00137	8.5	171	0.00454	0.184	5.65e-05	0.0416	60.8
10064968	3510	189	3340	84.1	0.00148	7.31	181	0.00487	0.194	5.65e-05	0.0416	60.8
10010788	4140	221	3910	99.2	0.00175	6.4	202	0.00562	0.215	5.65e-05	0.0416	60.8
10048608	4370	234	4120	104	0.00184	5.27	209	0.00583	0.178	5.65e-05	0.0416	60.8
10010752	3440	183	3260	82.4	0.00145	8.26	178	0.0048	0.184	5.65e-05	0.0416	60.8

10062634	3700	199	3510	89.2	0.00162	6.95	187	0.00508	0.184	5.65e-05	0.0416	60.8
10049029	4070	219	3870	97.5	0.00174	6.87	199	0.00553	0.226	5.65e-05	0.0416	60.8
10051564	4480	244	4240	108	0.00193	5.61	214	0.00603	0.226	5.65e-05	0.0416	60.8
10062580	4920	265	4660	118	0.0021	5.84	227	0.00654	0.215	5.65e-05	0.0416	60.8

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**
10010877	68.4	0.209	520	4.86e-05	0.973	0.00214	3420

b) Inventory Metrics:

Indicator/LCI Metric	**TPE**	**RE**	**NRE**	**NRR**	**RR**	**WDP**	**LFW**	**LFHW**	**CBWC**	**CWWC**	**CHW**	**CNHW**
Unit	**MJ-Eq**	**MJ-Eq**	**MJ-Eq**	**kg**	**m3**	**m3**	**kg waste**	**kg waste**	**m3**	**m3**	**kg**	**kg**
10010877	3860	207	3670	92.7	0.00165	7.22	193	0.0053	0.194	5.65e-05	0.0416	60.8

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	71.1	0.214	541	5.06e-05	1.01	0.00223	3560
Maximum	97	0.255	746	6.96e-05	1.37	0.00312	4900
Mean	82.6	0.232	634	5.92e-05	1.17	0.00263	4160
Median	81.2	0.23	624	5.82e-05	1.14	0.00259	4100
10010925	71.1	0.214	541	5.06e-05	1.01	0.00223	3560
10047946	77.9	0.225	599	5.58e-05	1.1	0.00248	3930

10071856	84.6	0.235	649	6.06e-05	1.19	0.0027	4270
10070074	97	0.255	746	6.96e-05	1.37	0.00312	4900

b) Inventory Metrics:

Indicator/LCI Metric	TPE	RE	NRE	NRR	RR	WDP	LFW	LFHW	CBWC	CWWC	CHW	CNHW
Unit	**MJ-Eq**	**MJ-Eq**	**MJ-Eq**	**kg**	**m3**	**m3**	**kg waste**	**kg waste**	**m3**	**m3**	**kg**	**kg**
Minimum	4030	216	3810	96.5	0.00169	5.75	198	0.00551	0.152	5.65e-05	0.0416	60.8
Maximum	5540	298	5230	133	0.0024	7.76	248	0.00733	0.252	5.65e-05	0.0416	60.8
Mean	4710	253	4440	113	0.00203	7.02	220	0.00633	0.2	5.65e-05	0.0416	60.8
Median	4640	250	4370	111	0.00202	7.29	218	0.00623	0.197	5.65e-05	0.0416	60.8
10010925	4030	216	3810	96.5	0.00169	7.76	198	0.00551	0.184	5.65e-05	0.0416	60.8
10047946	4450	240	4200	106	0.00195	7.2	212	0.00599	0.252	5.65e-05	0.0416	60.8
10071856	4820	259	4540	116	0.00208	7.38	224	0.00648	0.21	5.65e-05	0.0416	60.8
10070074	5540	298	5230	133	0.0024	5.75	248	0.00733	0.152	5.65e-05	0.0416	60.8

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	80.6	0.229	618	5.76e-05	1.14	0.00257	4060
Maximum	81	0.229	618	5.77e-05	1.15	0.00257	4060
Mean	80.8	0.229	618	5.76e-05	1.14	0.00257	4060
Median	80.8	0.229	618	5.76e-05	1.14	0.00257	4060
10045182	80.6	0.229	618	5.76e-05	1.14	0.00257	4060
10043611	81	0.229	618	5.77e-05	1.15	0.00257	4060

b) Inventory Metrics:

Indicator/LCI Metric	TPE	RE	NRE	NRR	RR	WDP	LFW	LFHW	CBWC	CWWC	CHW	CNHW
Unit	MJ-Eq	MJ-Eq	MJ-Eq	kg	m3	m3	kg waste	kg waste	m3	m3	kg	kg
Minimum	4570	245	4330	110	0.00193	6.45	216	0.00616	0.184	5.65e-05	0.0416	60.8
Maximum	4580	246	4340	110	0.00199	6.69	217	0.00618	0.226	5.65e-05	0.0416	60.8
Mean	4580	246	4340	110	0.00196	6.57	216	0.00617	0.205	5.65e-05	0.0416	60.8
Median	4580	246	4340	110	0.00196	6.57	216	0.00617	0.205	5.65e-05	0.0416	60.8
10045182	4580	246	4330	110	0.00199	6.69	216	0.00616	0.226	5.65e-05	0.0416	60.8
10043611	4570	245	4340	110	0.00193	6.45	217	0.00618	0.184	5.65e-05	0.0416	60.8

Mix Designs: 56 to 60 MPa

Table 20: **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
10050520	83.7	0.234	643	5.99e-05	1.18	0.00267	4220

b) Inventory Metrics:

Indicator/LCI Metric	TPE	RE	NRE	NRR	RR	WDP	LFW	LFHW	CBWC	CWWC	CHW	CNHW
Unit	MJ-Eq	MJ-Eq	MJ-Eq	kg	m3	m3	kg waste	kg waste	m3	m3	kg	kg
10050520	4780	257	4530	114	0.00202	6.46	223	0.00638	0.226	5.65e-05	0.0416	60.8

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
10062910	232	3
10062185	232	3
10046643	232	3,5
10049839	232	3,5
10067104	232	3,5
10067800	232	3,5
10045316	232	3,5
10018650	357	3,6
10010936	357	3,6
10047474	357	3,6
10020868	367	3,7
10010937	376	3,8
10020425	376	3,8
10048850	376	3,8
10062694	376	3,8
10017091	470	3,8
10063985	470	3,8
10063986	470	3,8
10050844	470	3,9
10050849	470	3,9
10010939	470	3,9
10046063	470	3,9
10049091	470	3,9
10049277	470	3,9
10050843	470	3,9
10050846	470	3,9
10058640	470	3,9
10061660	470	3,9
10043806	396	4
10019751	396	4

10043797	396	4
10043832	396	4
10043833	396	4
10045317	396	4
10062693	396	4
10073582	396	4
10073602	396	4
10044700	465	4
10044717	465	4
10050550	465	4
10010938	406	4,1
10042732	406	4,1
10054155	406	4,1
10054350	406	4,1
10059213	406	4,1
10060267	406	4,1
10043622	406	4,1
10043742	406	4,1
10043798	474	4,2
10043808	474	4,2
10032559	474	4,2
10010941	474	4,2
10044313	474	4,2
10044314	474	4,2
10045318	474	4,2
10048808	474	4,2
10048809	474	4,2
10051233	474	4,2
10056691	474	4,2
10057503	474	4,2
10061225	474	4,2
10067650	474	4,2
10074061	474	4,2
10074604	474	4,2
10011183	524	4,2
10060332	524	4,2
10062105	524	4,2
10011176	524	4,2
10045017	524	4,2
10074092	524	4,2
10010942	430	4,3
10012947	514	4,3
10011096	514	4,3
10010944	455	4,5
10053024	455	4,5
10061076	455	4,5

10075465	455	4,5
10044884	514	4,5
10027517	514	4,5
10061078	514	4,5
10021060	514	4,5
10046922	592	4,5
10042828	592	4,5
10058843	495	4,8
10056981	563	5
10010945	563	5
10051692	563	5
10067623	676	5
10075158	676	5
10049224	246	7
10068394	257	10,5
10010705	257	10,5
10010706	257	10,5
10067123	257	10,5
10066968	257	10,5
10067103	257	10,5
10071859	257	10,5
10010704	257	10,5
10071893	257	10,5
10074490	383	10,5
10045441	383	10,5
10057308	383	10,5
10030458	411	12,5
10010797	411	12,5
10075121	411	12,5
10053402	296	14
10010708	296	14
10010709	296	14
10019490	296	14
10075463	296	14
10069339	296	14
10069374	296	14
10067124	296	14
10069241	296	14
10069215	296	14
10020592	296	14
10068491	296	14
10068492	296	14
10010707	296	14
10011066	296	14
10010798	380	14
10060409	380	14

10064969	403	15

ECOpact 0 to 15 MPa

Mix	GWP	MPa
10067129	275	10,5
10067200	314	14
10074340	309	14
10067127	314	14
10069344	314	14

Mix Designs: 16 to 20 MPa

Mix	GWP	MPa
10010860	325	17,5
10010710	325	17,5
10010711	325	17,5
10010712	325	17,5
10010714	325	17,5
10010715	325	17,5
10010716	325	17,5
10010792	325	17,5
10067201	325	17,5
10069318	325	17,5
10069330	325	17,5
10067125	325	17,5
10067128	325	17,5
10069244	325	17,5
10069264	325	17,5
10066980	325	17,5
10069218	325	17,5
10069245	325	17,5
10069269	325	17,5
10010799	409	17,5
10065280	409	17,5
10062987	409	17,5

Mix Designs: 21 to 25 MPa

Mix	GWP	MPa
10059555	344	21
10062632	373	21

10062538	373	21
10068245	373	21
10010726	373	21
10031531	373	21
10047389	373	21
10050625	373	21
10056297	373	21
10060690	373	21
10061392	373	21
10062537	373	21
10062636	373	21
10072369	373	21
10074160	373	21
10010727	373	21
10010862	373	21
10028190	373	21
10030633	373	21
10072370	373	21
10010728	373	21
10011170	373	21
10045313	373	21
10047324	373	21
10048552	373	21
10061073	373	21
10061074	373	21
10071890	373	21
10072371	373	21
10049200	373	21
10010718	373	21
10010719	373	21
10011930	373	21
10062409	373	21
10010720	373	21
10010721	373	21
10010722	373	21
10054278	373	21
10010723	373	21
10010724	373	21
10010725	373	21
10019241	373	21
10049185	373	21
10059024	373	21
10020864	373	21

10010794	373	21
10022312	373	21
10023333	373	21
10042697	373	21
10049158	373	21
10056457	373	21
10010795	373	21
10018393	373	21
10042626	373	21
10067109	373	21
10010828	373	21
10047347	373	21
10010691	373	21
10067710	373	21
10010692	373	21
10011193	373	21
10010694	373	21
10017007	412	21
10010790	412	21
10068072	412	21
10010701	412	21
10010857	412	21
10069025	378	21
10069347	373	21
10069327	364	21
10074348	372	21
10069019	386	21
10062631	452	21
10056414	452	21
10012656	452	21
10062863	452	21
10062912	452	21
10069650	452	21
10063783	452	21
10049027	452	21
10049181	452	21
10056455	452	21
10010767	452	21
10027310	452	21
10048503	452	21
10010768	452	21
10032855	452	21
10062757	452	21

10010769	452	21
10010770	452	21
10032464	452	21
10074746	452	21
10010909	452	21
10065529	452	21
10010960	452	21
10018509	452	21
10052583	452	21
10019120	452	21
10010808	452	21
10010800	452	21
10010761	533	21
10019065	533	21
10073561	533	21
10010762	533	21
10073679	533	21
10010764	533	21
10064185	533	24,5
10023233	533	24,5
10058420	533	24,5
10058538	533	24,5
10010739	533	24,5
10072372	533	24,5
10010922	533	24,5
10058537	533	24,5
10067515	533	24,5
10072373	533	24,5
10010730	533	24,5
10010731	533	24,5
10010732	533	24,5
10010733	533	24,5
10010734	533	24,5
10010736	533	24,5
10070036	533	24,5
10070064	533	24,5
10022314	533	24,5
10010696	533	24,5
10010702	533	24,5
10012429	533	24,5
10061282	418	24,5
10061283	418	24,5
10064086	418	24,5

10056101	418	24,5
10053025	418	24,5
10010776	418	24,5
10034671	418	24,5
10034877	418	24,5
10018570	418	24,5
10010775	418	24,5
10071405	418	24,5
10010695	418	24,5
10058072	418	24,5
10065524	418	24,5
10070320	418	24,5
10049026	418	24,5
10043090	418	24,5
10034429	418	24,5
10010791	418	24,5
10057177	418	24,5
10057178	418	24,5
10057356	418	24,5
10057357	418	24,5
10010885	592	24,5
10010772	592	24,5
10062753	592	24,5
10010774	592	24,5

ECOpact 21 to 15 MPa

Mix	GWP	MPa
10069010	372	21
10066981	364	21
10069249	364	21
10069248	372	21
10069009	378	21
10069029	364	21
10069326	364	21
10069345	387	21
10069325	378	21

Mix Designs: 26 to 30 MPa

Mix	GWP	MPa
10064085	362	28
10010871	362	28

10010959	362	28
10035768	362	28
10048562	362	28
10072375	362	28
10010747	362	28
10048541	362	28
10052992	362	28
10072376	362	28
10010744	362	28
10010969	362	28
10010740	362	28
10010746	362	28
10056525	362	28
10056433	362	28
10010703	362	28
10011483	362	28
10054017	429	28
10060781	429	28
10062420	429	28
10062985	429	28
10064410	429	28
10073583	429	28
10073907	429	28
10062466	429	28
10064084	429	28
10049028	429	28
10056456	429	28
10067516	429	28
10069152	429	28
10012149	429	28
10028245	429	28
10034541	429	28
10053733	429	28
10055818	429	28
10061849	429	28
10062638	429	28
10068073	429	28
10072374	429	28
10073162	429	28
10062045	429	28
10045314	429	28
10056610	429	28
10061501	429	28

10068074	429	28
10071891	429	28
10072323	429	28
10035684	429	28
10049201	429	28
10010741	429	28
10010742	429	28
10010870	429	28
10021446	429	28
10062540	429	28
10010743	429	28
10010745	429	28
10055852	429	28
10033644	429	28
10019800	429	28
10049159	429	28
10056458	429	28
10071852	429	28
10018528	429	28
10071857	429	28
10047321	429	28
10048702	429	28
10061190	429	28
10061497	429	28
10071380	429	28
10062553	429	28
10010698	429	28
10035779	429	28
10074131	429	28
10033740	429	28
10052619	429	28
10011040	429	28
10056803	429	28
10057179	429	28
10056804	429	28
10063452	545	28
10063453	545	28
10063456	545	28
10063457	545	28
10050357	545	28
10062110	545	28
10033911	545	28
10054610	545	28

10013119	545	28
10048354	545	28
10063782	545	28
10049186	545	28
10047134	545	28
10060291	545	28
10010783	545	28
10010785	545	28
10010784	545	28
10010786	545	28
10017018	545	28
10073603	545	28
10061107	545	28
10034102	545	28
10052617	545	28
10052618	545	28
10068240	545	28
10064493	545	28
10063450	653	28
10063451	653	28
10063454	653	28
10063455	653	28
10053300	653	28
10010778	653	28
10046031	653	28
10046541	653	28
10067708	653	28
10069933	653	28
10010779	653	28
10043511	653	28
10010781	653	28
10062779	653	28
10019060	653	28
10047322	653	28
10035811	653	28

Mix Designs: 31 to 35 MPa

Mix	GWP	MPa
10064968	476	31,5
10057779	476	31,5
10074161	476	31,5

10010968	476	31,5
10072377	476	31,5
10072378	476	31,5
10010873	476	31,5
10011173	476	31,5
10010750	476	31,5
10065388	559	31,5
10010788	559	31,5
10062243	559	31,5
10065426	559	31,5
10048608	587	31,5
10062421	462	35
10010989	462	35
10035359	462	35
10035718	462	35
10048257	462	35
10056299	462	35
10061393	462	35
10072379	462	35
10075461	462	35
10010752	462	35
10072380	462	35
10072381	462	35
10049202	462	35
10010751	462	35
10010953	462	35
10056296	462	35
10010875	462	35
10011063	462	35
10010754	462	35
10010983	462	35
10047251	462	35
10045625	500	35
10045626	500	35
10062634	500	35
10061756	500	35
10053780	500	35
10017291	500	35
10046914	500	35
10064962	500	35
10049029	500	35
10010700	500	35
10045315	500	35

10033645	500	35
10028436	500	35
10071853	500	35
10024161	500	35
10071855	500	35
10054420	500	35
10057330	500	35
10057331	500	35
10047299	500	35
10071851	500	35
10066824	607	35
10011026	607	35
10051564	607	35
10051565	607	35
10051693	607	35
10010910	607	35
10062580	607	35
10062539	607	35
10058176	607	35
10069950	607	35
10010789	607	35

Mix Designs: 36 to 40 MPa

Mix	GWP	MPa
10010877	520	38,5

Mix Designs: 41 to 45 MPa

Mix	GWP	MPa
10072001	541	42
10051226	541	42
10061737	541	42
10071894	541	42
10072572	541	42
10010925	541	42
10064495	541	42
10071892	541	42
10010878	541	42
10024262	541	42

10010755	541	42
10010756	541	42
10065425	541	42
10047946	541	42
10049030	541	42
10071858	541	42
10065527	541	42
10071854	541	42
10065528	541	42
10071856	541	42
10065525	541	42
10065526	541	42
10070074	746	42

Mix Designs: 46 to 50 MPa

Mix	GWP	MPa
10045182	618	49
10064490	618	49
10051093	618	49
10072470	618	49
10067504	618	49
10067505	618	49
10043611	618	50

Mix Designs: 51 to 56 MPa

Mix	GWP	MPa
10050520	643	56
10068703	643	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:

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- 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
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- CSA S806 Design and construction of building structures with fiber-reinforced polymers

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- ISO 14021:1999 Environmental Labels and Declarations - Self-declared Environmental Claims (Type II Environmental Labeling)
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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
- 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
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