



CarbiCrete

Cement-free concrete technology

Environmental Product Declaration for
Manufactured Concrete and Masonry Products
PATIO DRUMMOND PLANT

CarbiCrete
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General Information

This Environmental Product Declaration (EPD) reports the impacts for 1 m³ of concrete formed into manufactured concrete and masonry products meeting the following specifications:

ASTM C90, Concrete Masonry Unit, Load-Bearing

CarbiCrete

1730 55th Avenue
Lachine, Quebec H8T 3J5



Production Facility Patio Drummond

8435 Bd Saint-Joseph
Saint-Nicéphore, Quebec J2A 3W8

EPD # 668

Valid from September 30, 2024 to
September 30, 2029



Program Operator

ASTM International
100 Barr Harbor Drive
West Conshohocken, PA 19428
610-832-9500
<https://www.astm.org>

Limitations

Environmental declarations from different programs (ISO 14025) may not be comparable. EPDs are comparable only if they use the same PCR (or sub-category PCR where applicable), include all relevant information modules and are based on equivalent scenarios with respect to the context of construction works. This PCR allows EPD comparability only when the same functional requirements between products are ensured and the requirements of ISO 21930:2017 §5.5 are met. However, variations and deviations are possible. Example of variations: different LCA software and background LCI datasets may lead to different results for the life cycle stages declared.

Environmental Attributes

Carbon credits or other environmental credits representing the environmental attributes of CarbiCrete's manufactured concrete and masonry products may be issued through voluntary carbon markets for the greenhouse gas emission reductions or removals. Unless the end-user of the CarbiCrete products additionally purchases these environmental attributes and can demonstrate ownership of these environmental benefits, the end user shall not make any quantifiable claim towards their own greenhouse gas emission reduction targets or inventory.



General Program Instructions	ASTM Program Operator for Product Category Rules (PCRs) and Environmental Product Declarations (EPDs), General Program Instructions. Version 8.0, revised April 29, 2020.
Reference PCR	Part B: Concrete Masonry and Segmental Concrete Paving Product EPD Requirements, November 11 2020. V1.0
The sub-category PCR review was conducted by:	Jack Geibig, Ecoform, LLC, Terrie Boguski, Harmony Environmental, LLC, Christine Subasic, P.E., LEED AP, Consulting Architectural Engineer
Product RSL	N/A
Markets of Applicability	North America
EPD Type	Product Specific
Declared Unit	One cubic meter (m ³) of concrete formed into manufactured concrete products
Dataset Variability	N/A
EPD Scope	Cradle to Gate
Year(s) of Reported Manufacturer Primary Data	1/2/2022 - 1/1/2023
LCI Database(s)	Ecoinvent, USLCI, US-EI
LCIA Methodology	TRACI 2.1 v1.04
<p>This declaration was independently verified in accordance with ISO 14025:2006. The UL Environment "Part A: Calculation Rules for the Life Cycle Assessment and Requirements on the Project Report," v3.2 (December 2018), in conformance with ISO 21930:2017, serves as the core PCR, with additional considerations from the USGBC/UL environment Part A Enhancement (2017).</p> <p><input type="checkbox"/> internal <input checked="" type="checkbox"/> external</p>	<p>Thomas P. Gloria (t.gloria@industrial-ecology.com) Industrial Ecology Consultants</p>
<p>This life cycle assessment was conducted in accordance with ISO 14044 and the reference PCR by:</p>	<p>Climate Earth Inc. 137 Park Place, Suite 204. Pt Richmond, CA 94801 415-391-2725 support@climateearth.com</p>
<p>This life cycle assessment was independently verified in accordance with ISO 14044 and the reference PCR by:</p>	<p>Thomas P. Gloria (t.gloria@industrial-ecology.com) Industrial Ecology Consultants</p>

General Information

Producer

CarbiCrete™ is a cement-free concrete technology company developing scalable building solutions that reduce embodied carbon in the built environment.

The company's groundbreaking technology eliminates the use of cement as the binder in concrete by replacing it with steel slag, a steel-making byproduct, and uses carbon mineralization to permanently lock away CO₂ in concrete products.

The technology involves injecting CO₂ into a curing chamber where it reacts with the steel slag present in the concrete. This reaction results in the permanent conversion of CO₂ into stable calcium carbonates.

By replacing cement with steel slag and using captured CO₂ during curing, CarbiCrete is using two waste streams to create decarbonized concrete that reduces emissions, removes CO₂ and lowers the embodied carbon of any project where the CMUs are specified.

CarbiCrete cement-free, decarbonized CMU

- Uses locally-sourced materials: recycled steel slag and captured biogenic CO₂
- Reduces landfill waste
- Conserves water
- Reduces primary material consumption
- Reduces a project's embodied carbon
- Reduces carbon emissions
- Permanently removes CO₂
- Contributes to LEED points

Declared Unit

The declared unit is one 1 m³ of concrete formed into manufactured concrete and masonry products.

System Boundary

This EPD is a cradle-to-gate EPD covering A1-A3 stages of the life cycle.

Products

This EPD reports environmental information for the products produced by Patio Drummond, using CarbiCrete technology, at Patio Drummond's masonry and hardscape facility, located in Drummondville, Quebec. The products covered in this EPD meet the following standards:

Product Name

CarbiCrete CMU

Description

Normal weight CMUs made with steel slag binder, regular (stone and sand) aggregates, and mineralized CO₂. Produced by Patio Drummond using CarbiCrete's cement-free, decarbonized concrete technology. Dimensional properties as defined by ASTM C90.

Applicable Standard

ASTM C90



PRODUCTION Stage (Mandatory)			CONSTRUCTION Stage		USE STAGE					END-OF-LIFE Stage			
Extraction and upstream production	Transport to factory	Manufacturing	Transport to site	Installation	Use	Maintenance	Repair	Replacement	Refurbishment	De-construction/ Demolition	Transport to waste processing or disposal	Waste processing	Disposal of waste
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	C1	C2	C3	C4
X	X	X	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND

MND: Module not declared X: Module included

The production stages and primary unit processes included in the study by product stage are:

SYSTEM BOUNDARY

RAW Material Supply (A1)

Steel Slag
Sand/Eco-Sand
Aggregates
Admixture

Transport (A2)

Truck
Rail
Energy Carriers (fuels)

Manufacturing (A3)

Energy Carriers
Emissions (fuel combustion)
Propane
Ancillary Materials
Packaging Materials
Waste (end-of-life treatment of ancillary material & waste)

Relevant Information for product stages not included in system boundary (A4-C4):

Other products not included in assessment needed for the product to serve intended function in the construction work can include mortar, grout, and reinforcement for concrete masonry product; Product packaging waste per declared unit include: 21.82 kg pallet waste, 8.02 kg stretch wrap waste, 6.24 kg paper waste.

Typical end of life treatment is unknown but can include landfill or crushing and then re-use as a recycled aggregate or as road base; The reference service life for concrete masonry is 75 years and for segmental concrete paving is 50 years.

Cut-Off

Items excluded from system boundary include: production, manufacture, and construction of manufacturing capital goods and infrastructure; production and manufacture of production equipment, delivery vehicles, and laboratory equipment; personnel-related activities (travel, furniture, and office supplies); and energy and water use related to company management and sales activities that may be located either within the factory site or at another location. No known flows were deliberately excluded from this EPD.

Allocation Procedure

Allocation follows the requirements and guidance Part A: Life Cycle Assessment Calculation Rules and Report Requirements, section 3.3.

The product category rules for this EPD recognize fly ash, silica fume and slag as recovered materials and thus the environmental impacts allocated to these materials are limited to the treatment and transportation required to use as a concrete material input.

Primary Sources of LCIA Data

- Admixture (other): Highest impact in each impact category of the six EFCA admixture EPD, 2015
- Admixture (retarding): EFCA EPD, 2015
- Aggregate (crushed): US-EI (2020): "Gravel, crushed, at mine/US", 2001
- Aggregate (recycled concrete): custom process, based on US-EI (2016) "Gravel, crushed, at mine/US", 2001
- Cleaning Chemicals: Ecoinvent 3.4: 50% Citric acid and 50% Phosphoric acid, industrial grade, without water, in 70% solution state, market for/GLO, 2017
- Diesel: USLCI (2015): "Diesel, combusted in industrial equipment/NREL/US", 2007
- Electricity (NPCC): Ecoinvent 3.4: "Electricity, medium voltage, market for, cut-off", 2015
- Municipal Water: US-EI (2020): "Tap water, at user/US", 2000
- Natural Gas: USLCI (2015): "Natural gas, combusted in industrial boiler/NREL/US", 2007
- Non-Hazardous Solid Waste: US-EI (2016): Disposal, municipal solid waste, 2008
- Oils, Lubricants and Greases: Ecoinvent 3.5: Lubricating oil, GLO, market for, cut-off, 2011
- Portland Cement: Portland Concrete Association, Industry Average EPD, 2021
- Propane: USLCI (2015): "Liquefied petroleum gas, at refinery/NREL/US, 2007
- Steel slag: Supplier specific primary data, 2024
- Truck transport: USLCI (2015): "Transport, combination truck, long-haul, diesel powered/tkm/RNA", 2010
- Truck transport: USLCI (2015): "Transport, combination truck, short-haul, diesel powered/tkm/RNA", 2010

Interpretation

Life cycle impact assessment (LCIA) results are relative expressions and do not predict impacts on category endpoints, the exceeding of thresholds, safety margins or risks (ISO 14044, ISO 14040). EPDs are comparable only if they comply with ISO 21930 (2017), use the same, sub-category PCR where applicable, include all relevant information modules and are based on equivalent scenarios with respect to the context of construction works.

Life Cycle Assessment

Declaration of environmental indicators derived from LCA

Declared Unit: 1 m³ of concrete formed into manufactured concrete masonry product (CMU)

IMPACT ASSESMENT	UNIT	A1	A2	A3	TOTAL
Global warming potential (GWP)	kg CO ₂ eq	16.6	33.51	-38.36	11.7
Depletion potential of the stratospheric ozone layer (ODP)	kg CFC-11 eq	1.21E-06	1.42E-09	4.28E-06	5.50E-06
Eutrophication potential (EP)	kg N eq	0.05	0.02	0.04	0.11
Acidification potential of soil and water sources (AP)	kg SO ₂ eq	0.07	0.39	0.06	0.52
Formation potential of tropospheric ozone (POCP)	kg O ₃ eq	1.15	9.92	0.51	11.58
Resource Use					
Abiotic depletion potential for non-fossil mineral resources (ADPelements)*	kg Sb eq	2.86E-06	0	2.00E-06	0
Abiotic depletion potential for fossil resources (ADPfossil)	MJ, NCV	208.7	480.7	278.5	967.9
Renewable primary energy resources as energy (fuel), (RPRE)*	MJ, NCV	162.1	0	117.61	279.7
Renewable primary resources as material, (RPRM)*	MJ, NCV	0	0	0	0
Non-renewable primary resources as energy (fuel), (NRPRE)*	MJ, NCV	247.2	480.7	592.3	1320.2
Non-renewable primary resources as material (NRPRM)*	MJ, NCV	3.56	0	0	3.56
Consumption of fresh water	m ³	2.86	0	0.81	3.67
Secondary Material, Fuel and Recovered Energy					
Secondary Materials, (SM)*	kg	0	0	0	0
Renewable secondary fuels, (RSF)*	MJ, NCV	0	0	0	0
Non-renewable secondary fuels (NRSF)*	MJ, NCV	0	0	0	0
Recovered energy, (RE)*	MJ, NCV	0	0	0	0
Waste and Output Flows					
Hazardous waste disposed*	kg	6.55E-06	0	0	6.55E-06
Non-hazardous waste disposed*	kg	0.04	0	0.47	0.51
High-level radioactive waste*	m ³	2.11E-08	0	3.91E-07	4.12E-07
Intermediate and low-level radioactive waste*	m ³	1.27E-07	0	1.38E-06	1.50E-06
Components for reuse*	kg	0	0	0	0
Materials for recycling*	kg	0	0	0.18	0.18
Materials for energy recovery*	kg	0	0	0	0
Recovered energy exported from the product system*	MJ	0	0	0	0
Additional Inventory Parameters for Transparency					
Emissions from calcination and uptake from carbonation*	kg CO ₂ eq	0	0	0	0

* 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 these categories.

- Not all LCA datasets for upstream materials include these impact categories and thus results may be incomplete.



References

- ISO 14025: 2006 – Environmental labels and declarations – Type III environmental declarations – Principles and procedures
- ISO 14040: 2006 – Environmental management – Life cycle assessment – Principles and framework
- ISO 14044: 2006/Amd 2:2020 – Environmental management – Life cycle assessment – Requirements and guidelines
- ISO 21930:2017 Sustainability in buildings and civil engineering works — Core rules for environmental product declarations of construction products and services
- Part A: Life Cycle Assessment Calculation Rules and Report Requirements
UL Environment (December 2018, version 3.2)
- Part B: Concrete Masonry and Segmental Concrete Paving Product EPD Requirements
UL Environment (November 2020, v1.0)
- PRé Sustainability. (2020). SimaPro Vers. 9.1.0.8. www.pre-sustainability.com/simapro.
- US EPA. (2014). Tool for the Reduction of Assessment of Chemical and Other Environmental Impacts (TRACI).
- US EPA. (2022). Emissions & Generation Resource Integrated Database (eGRID).

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Fully Supported Cement-Free Concrete Technology™

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