Environmental Product Declaration (EPD) for Cement Produced at Mitchell Cement Plant

GENERAL INFORMATION

This cradle to gate Environmental Product Declaration covers three cement products produced at the Mitchell, IN Cement Plant. The Life Cycle Assessment (LCA) was prepared in conformity with ISO 21930, ISO 14025, ISO 14040, and ISO 14044. This EPD is intended for business-to-business (B-to-B) audiences.

LEHIGH CEMENT

Mitchell Cement Plant and Terminal
180 N. Meridian Road
Mitchell, IN 47446

PROGRAM OPERATOR

National Ready Mixed Concrete Association
900 Spring Street
Silver Spring, MD 20910
https://www.nrmca.org/

NRMCAEPD: 20064

DATE OF ISSUE

July 22, 2022 (valid for 5 years until July 21, 2027)

ENVIRONMENTAL IMPACTS

Lehigh Mitchell Plant: Product-Specific Type III EPD

Declared Cement Products (three):
Type IL; Type I/II; Type III

Declared Unit: One metric tonne of cement

	CEMENT PRODUCTS Type IL	Type I/II	Type III
Global Warming Potential (kg CO_2-eq)	*1045*	*1093*	*1162*
Ozone Depletion Potential (kg CFC-11-eq)	*1.44E-05*	*1.48E-05*	*1.54E-05*
Eutrophication Potential (kg N-eq)	*1.57*	*1.63*	*1.72*
Acidification Potential (kg SO^2-eq)	*3.89*	*4.03*	*4.31*
Photochemical Ozone Creation Potential (kg O_3-eq)	*74.8*	*78.0*	*83.0*
Abiotic Depletion, nonfossil (kg Sb-eq)	*1.23E-04*	*1.26E-04*	*1.31E-04*
Abiotic Depletion, fossil (MJ)	*274*	*282*	*295*
Product Components:			
Clinker	*85%*	*88%*	*94%*
Limestone, Gypsum and Others	*15%*	*12%*	*6%*

Additional detail and impacts are reported on page 5

ISO 21930:2017 Sustainability in Building Construction-Environmental Declaration of Building Products: serves as the core PCR
NSF PCR for Portland, Blended, Masonry, Mortar, and Plastic (Stucco) Cements V3.2: serves as the sub-category PCR

Sub-category PCR review was conducted by
Thomas P. Gloria, PhD. (t.gloria@industrial-ecology.com) • Industrial Ecology Consultants

Independent verification of the declaration, according to ISO 21930:2017 and ISO 14025:2006.: ☐ internal ☑ external

Third party verifier • Jack Geibig. • EcoForm Consulting

For additional explanatory material
Manufacture Representative: Jeff Hook (jeff.hook@lehighhanson.com)
This EPD was prepared using the pre-verified GCCA Tool by: Athena Sustainable Materials Institute

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

PRODUCER

Lehigh Cement, a leading supplier of cementitious construction materials in North America, has been manufacturing cement in Mitchell, Indiana for more than 100 years, making us a pillar of our community while providing employment and economic benefit to surrounding small towns and cities.

At Mitchell, we now are operating what we call “Plant 3,” which went into full production in July of 1961. In 1975, there was a production expansion at the Mitchell Plant, with the addition of our Kiln 3 system as well as the installation of our 4th Finish Mill. The Mitchell Plant is strategically located near the raw materials required for cement production, which combined with the rail access from our Plant helps to mitigate our environmental impacts through efficient and more sustainable transportation of raw materials to the Plant. The rail access also helps with delivery of cement to many terminals we supply. Lehigh Cement’s commitment to sustainable construction includes actively working to create lower carbon cements through use of supplementary cementitious materials (SCMs) and alternative raw materials, and fuels. Consistent with HeidelbergCement’s vision of reducing greenhouse gas (GHG) emissions to have carbon neutral concrete by 2050, Lehigh has developed product and plant specific EPDs as baselines for its embodied carbon.

The health and well-being of our employees, communities and the natural environment are vital to our success, so we work hard to give back through sponsorship of the local Little League baseball and softball fields, annual food drives to help supplement our local food bank, and donations to several local organizations and foundations with a focus on conservation and community development.

PRODUCT

The cement products covered in this EPD meet UN CPC 3744 classification and the following standards:

Product Type	Applicable Standard	Standard Designation
Portland Limestone Cement	ASTM C595, AASHTO M240	Type IL
Portland Cement	ASTM C150, AASHTO M85	Type I/II
Portland Cement	ASTM C150, AASHTO M85	Type III

PRODUCT DESCRIPTION

This EPD reports environmental transparency information for three cement products, produced by Lehigh Cement at its Mitchell, IN facility. These cements are hydraulic binders and are manufactured by grinding cement clinker and other main or minor constituents into a finely ground, usually grey colored mineral powder. Cement is just one ingredient in the mixture that creates concrete, but it is the most chemically active ingredient and crucial to the quality of the final product. When mixed with water, cement acts as a glue to bind together the sand, gravel or crushed stone to form concrete, one of the most durable, resilient and widely used construction materials in the world. Our Type IL is branded as **EcoCem*PLC*™** and was developed to be more environmentally friendly by reducing its carbon footprint (reduction measured through GWP). This product is a general use product for concrete and mortar as well as all the other various applications for cement, including engineered soils and solidification/stabilization of materials and wastes.

DECLARED UNIT

The declared unit is one metric tonne of Type IL (ASTM C595), Type I/II and Type III cement (ASTM C150).

SYSTEM BOUNDARY

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

PRODUCTION STAGE			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	Operational energy use	Operational water use	Deconstruction / Demolition	Transport	Waste Processing	Disposal of Waste
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4
X	X	X	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND

Note: MND = module not declared; X = module included.

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.

CUT-OFF CRITERIA

The cut-off criteria as per NSF PCR, Section 7.1.8 and ISO 21930, 7.1.8 were followed. All input/output data required were collected and included in the LCI modelling. No substances with hazardous and toxic properties that pose a concern for human health and/or the environment were identified in the framework of this EPD.

DATA COLLECTION AND SOURCES

Gate-to-gate input/output flow data were collected for the following processes for the reference year 2020: Limestone quarry, clinker production and cement manufacture – Mitchell, IN

All applicable North American background LCI data are publicly available in the GCCA LCA Database [4] - https://demo.gcca.quantis.solutions/.
This sub-category PCR recognizes fly ash, silica fume, granulated blast furnace slag, cement kiln dust, flue gas desulfurization (FGD) gypsum, and post-consumer gypsum as recovered materials and thus the environmental impacts allocated to these materials are limited to the treatment and transportation required to use as a cement material input.

ALLOCATION PROCEDURE

Allocation follows the requirements and guidance of ISO 14044:2006, Clause 4.3.4; NSF PCR:2020; and ISO 21930:2017 section 7.2. Recycling and recycled content is modeled using the cut-off rule [5].

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REFERENCES

1. ASTM C150 / C150M – 20 Standard Specification for Portland Cement.
2. ASTM C595 / C595M – 21 Standard Specification for Blended Hydraulic Cements
3. Global Cement and Concrete Association (GCCA) 2021. N.A. version of Industry EPD tool for Cement and Concrete – v3.1. https://concrete-epd-tool.org/
4. Global Cement and Concrete Association (GCCA) 2021. LCA Database, North American version – v3.1, Prepared by Quantis. https://demo.gcca.quantis.solutions/
5. Global Cement and Concrete Association (GCCA) 2021. LCA Model, North American version – v3.1, Prepared by Quantis https://demo.gcca.quantis.solutions/
6. ISO 21930:2017 Sustainability in buildings and civil engineering works — Core rules for environmental product declarations of construction products and services
7. ISO 14044:2006 Environmental Management - Life Cycle Assessment - Requirements and Guidelines
8. ISO 14040:2006 Environmental Management - Life Cycle Assessment - Principles and Framework
9. NSF 2020: PCR for Portland, Blended, Masonry, Mortar and Plastic (Stucco) Cements v3.2, September 2021
10. USLCI: 2015 The U.S. Life Cycle Inventory Database
11. WBCSD CSI 2013: CO2 and Energy Protocol Version 3.1 of 9 December 2013; https://www.cement-co2-protocol.org/en/
12. WCI: 2010 WCI, Final Essential Requirements of Mandatory Reporting

LIFE CYCLE IMPACT ASSESSMENT RESULTS – Mitchell Cement Products: Type IL named EcoCemPLC™, Type I/II and Type III; per 1 metric tonne

Impact Assessment	Unit	Type IL	Type I/II	Type III
Global warming potential (GWP)[1]	kg CO_2 eq	1045	1093	1162
Depletion potential of the stratospheric ozone layer (ODP)	kg CFC-11 eq	1.44E-05	1.48E-05	1.54E-05
Eutrophication potential (EP)	kg N eq	1.57	1.63	1.72
Acidification potential of soil and water sources (AP)	kg SO_2 eq	3.89	4.03	4.31
Formation potential of tropospheric ozone (POCP)	kg O_3 eq	74.8	78.0	83.0
Resource Use				
Abiotic depletion potential for non-fossil mineral resources (ADPelements)*	kg Sb eq	1.23E-04	1.26E-04	1.31E-05
Abiotic depletion potential for fossil resources (ADPfossil)	MJ, NCV	274	282	295
Renewable primary energy resources as energy (fuel), (RPRE)*	MJ, NCV	70	72	76
Renewable primary resources as material, (RPRM)*	MJ, NCV	0.00	0.00	0.00
Non-renewable primary resources as energy (fuel), (NRPRE)*	MJ, NCV	5130	5336	5636
Non-renewable primary resources as material (NRPRM)*	MJ, NCV	0.00	0.00	0.00
Consumption of fresh water	m3	0.61	0.63	0.66
Secondary Material, Fuel and Recovered Energy				
Secondary Materials, (SM)*	kg	123.3	137.2	121.7
Renewable secondary fuels, (RSF)*	MJ, NCV	0.00	0.00	0.00
Non-renewable secondary fuels (NRSF)*	MJ, NCV	0.00	0.00	0.00
Recovered energy, (RE)*	MJ, NCV	0.00	0.00	0.00
Waste & Output Flows				
Hazardous waste disposed*	kg	0.00	0.00	0.00
Non-hazardous waste disposed*	kg	30.2	28.8	32.2
High-level radioactive waste*	kg	n/c	n/c	n/c
Intermediate and low-level radioactive waste*[2]	kg	n/c	n/c	n/c
Components for reuse*	kg	0.00	0.00	0.00
Materials for recycling*	kg	0.00	0.00	0.00
Materials for energy recovery*	kg	0.00	0.00	0.00
Recovered energy exported from the product system*	MJ, NCV	0.00	0.00	0.00
Additional Inventory Parameters for Transparency				
CO_2 emissions from calcination and uptake from carbonation	kg CO_2 eq	444	465	495
Biogenic CO_2, reporting the removals and emissions associated with biogenic carbon content contained within biobased products	kg CO_2 eq	0.00	0.00	0.00

* 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.

Only EPDs prepared from cradle-to-grave life-cycle results and based on the same function, quantified by the same functional unit, and taking account of replacement based on the product reference service life (RSL) relative to an assumed building service life, can be used to assist purchasers and users in making informed comparisons between products.

[1] GWP 100; 100-year time horizon GWP factors are provided by the IPCC 2013 Fifth Assessment Report (AR5).
CO2 from biomass secondary fuels (wood chips made from construction waste as well as whole wood construction waste) used in kiln are climate-neutral (CO2 sink = CO2 emissions), ISO 21930, 7.2.7.
2 Not calculated by GCCA Tool

ADDITIONAL ENVIROMENTAL INFORMATION

The Mitchell Plant has an EMS in place. The EMS identifies environmental impacts and compliance requirements and ensures that these are continually updated to reflect current environmental knowledge and regulations. Environmental requirements are documented in the EMS which serves as a reference and provides operating personnel with relevant information and compliance deadlines. For environmental reporting the plant complies with the U.S. EPA and Indiana Department of Environmental Management requirements:

- Toxics Release Inventory (TRI) Program
- Greenhouse Gas Reporting Program
- Portland Cement MACT (40 CFR 63 Subpart LLL) Semi-annual Reporting
- Air Permit Compliance Monitoring Reporting, Compliance Certification, Emission Statement
- Toxic Substances Control Act (TSCA) Chemical Data Reporting
- NPDES Discharge Monitoring Reports

Air Permit

The Mitchell Plant has been issued a Part 70 Title V Operating Permit from the Indiana Department of Environmental Management's Office of Air Quality. The permit details all state and federal regulations and pollution control requirements applicable to the Mitchell Plant.

Oil, Used Oil, Waste Chemicals, and Anti-Freeze:

The Mitchell Plant stores these materials and wastes in appropriate storage containers in a containment area and in compliance with Spill Containment, Control and Countermeasure (SPCC) requirements. The facility maintains an SPCC Plan that is in compliance with all applicable regulations and has been certified by a Professional Engineer. A third-party contractor removes these wastes and properly recycles or disposes of them in accordance with Federal, State, and Local regulations. Documentation of final disposal is provided to the Mitchell Plant.

Recycling Programs

The Mitchell Plant has instituted a recycling program to ensure that the following materials are recycled: used batteries, spent fluorescent bulbs, discarded paper, cardboard, aluminum and other scrap metals, and outdated or damaged electronic hardware and parts. Used vehicle batteries are collected and sent off-site for recycling.

Sustainability Commitments

Lehigh Cement, a Lehigh Hanson affiliated company, is a part of the HeidelbergCement Group, a leading construction materials company worldwide. HeidelbergCement's Sustainability Commitments 2030 define the key topics and core principles of Lehigh Cement's sustainability strategies, aligning with the UN Assembly Sustainable Development Goals (SDGs). Company sustainability performance ratings and ranking are publicly available at https://www.heidelbergcement.com/en/sustainability-report.

Lehigh Cement supports HeidelbergCement's Sustainability Commitments 2030. HeidelbergCement's goal of a 30% carbon footprint reduction as compared to 1990, encourages the discovery of innovative approaches and thought processes to reduce environmental impacts and ensure a sustainable business model. Working to incorporate knowledge and practices learned from global resources for local applications, Lehigh Cement continuously innovates to improve services and products that increase efficiency on the jobsite. Lehigh Cement also strives for effective management of all processes and resources and works with the local communities to promote resilient infrastructure and provide increased transparency. Lehigh Cement aligns and works globally with HeidelbergCement to push toward carbon neutral concrete by 2050. To learn more about Lehigh Cement's sustainability commitment, visit https://www.lehighhanson.com/about/sustainability.