Environmental Product Declaration (EPD) for Cement

GENERAL INFORMATION

This cradle to gate Environmental Product Declaration covers five 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.

Heidelberg Materials

Mitchell Cement Plant and Terminal
200 Mill Creek Rd.
Mitchell, IN 47446

PROGRAM OPERATOR

National Ready Mixed Concrete Association
66 Canal Center Plaza, Suite 250
Alexandria, VA 22314
https://www.nrmca.org/

NRMCA EPD: 20144

Environmental Impacts

Mitchell Plant: Product-Specific Type III EPD

Declared Cement Products (five):
Type IL; Type III; Masonry Type M; Masonry Type N; Masonry Type S

Declared Unit: One metric tonne of cement

	Cement Products				
	Type IL	Type III	Masonry Type M	Masonry Type N	Masonry Type S
Global Warming Potential (kg CO_2-eq)	**798**	**842**	**554**	**413**	**498**
Ozone Depletion Potential (kg CFC-11-eq)	2.58E-05	2.68E-05	2.05E-05	1.74E-05	1.92E-05
Eutrophication Potential (kg N-eq)	0.84	0.86	0.75	0.70	0.72
Acidification Potential (kg SO^2-eq)	1.66	1.73	1.24	0.99	1.14
Photochemical Ozone Creation Potential (kg O_3-eq)	19.47	20.31	14.36	11.48	13.21
Abiotic Depletion, nonfossil (kg Sb-eq)	1.87E-04	1.95E-04	1.67E-04	1.52E-04	1.54E-05
Abiotic Depletion, fossil (MJ, NCV)	4955	5181	3800	3114	3489
Product Components:					
Clinker	88%	93%	57%	40%	51%
Limestone, Gypsum and Others	12%	7%	43%	60%	49%

Additional details and impacts are reported on page 5 and 6.

DATE OF ISSUE

May 17, 2024 - this is a 6 month version (valid for only 1 year or until the a 12 month version is developed May 17, 2025)

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 • Denice Viktoria Staaf • Labelling Sustainability
For additional explanatory material Manufacture Representative: Jeff Hook (jeff.hook@heidelbergmaterials.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

Heidelberg Materials, 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 benefits to surrounding small towns and cities.

In 2023, the k4 kiln and a new plant was commissioned. 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 the many terminals we supply.

Heidelberg Materials' commitment to sustainable construction includes actively working to create lower carbon cements through use of supplementary cementitious materials (SCMs), alternative raw materials and fuels.

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, local fire department and donations to several local organizations and foundations such as our local schools, all 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, C1157, AASHTO M240	Type IL
Portland Cement	ASTM C150, C1157, AASHTO M85	Type III
Masonry Cement	ASTM C91	Type M, S, N

PRODUCT DESCRIPTION

This EPD reports environmental transparency information for five cement products, produced by Heidelberg Materials 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.

Masonry cements are separate ingredients used in mortar mixes, each for specific purposes. When mixed with water, these cements act as a glue to bind together sand to form mortar used in concrete masonry unit and brick veneer construction techniques. Each of these Masonry cements are branded as **Brixment™**.

The table below outlines the material composition for each cement type, in order of greatest mass.

Type IL	Type III	Masonry Type M	Masonry Type N	Masonry Type S
Clinker	Clinker	Clinker	Limestone	Clinker
Limestone	Gypsum	Limestone	Clinker	Limestone
Gypsum	Other	Gypsum	Gypsum	Gypsum
Other	-	Other	Other	Other

DECLARED UNIT

The declared unit is one metric tonne of Type IL, Type III and Masonry cement.

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 Factory	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.

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.

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 2023:
Limestone quarry, clinker production and cement manufacture – Mitchell, IN
It is noted that the plant data underlying this EPD covers 6 months of operations in 2023 representing the new plant start up. It is Heidelberg Materials intent to revisit and update this EPD with a full 12 months of operating information.

All applicable North American background LCI data are publicly available in the GCCA LCA Database [4] – https://concrete-epd-tool.org/.
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:2021; 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) 2023. N.A. version of Industry EPD tool for Cement and Concrete – v4.2. https://concrete-epd-tool.org/
4. Global Cement and Concrete Association (GCCA) 2023. LCA Database, North American version – v4.2, Prepared by Quantis. https://concrete-epd-tool.org/
5. Global Cement and Concrete Association (GCCA) 2023. LCA Model, North American version – v4.2, Prepared by Quantis https://concrete-epd-tool.org/
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 2021: 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 Bulk Cement Products: Type IL named EcoCem®PLC and Type III and Masonry Cement per metric tonne

Impact Assessment	Unit	Type IL	Type III
Global warming potential (GWP)[1]	kg CO_2 eq	**798.47**	**841.78**
Depletion potential of the stratospheric ozone layer (ODP)	kg CFC-11 eq	**2.58E-05**	**2.68E-05**
Eutrophication potential (EP)	kg N eq	**0.84**	**0.86**
Acidification potential of soil and water sources (AP)	kg SO_2 eq	**1.66**	**1.73**
Formation potential of tropospheric ozone (POCP)	kg O_3 eq	**19.47**	**20.31**
Resource Use			
Abiotic depletion potential for non-fossil mineral resources (ADPelements)*	kg Sb eq	**1.87E-04**	**1.95E-04**
Abiotic depletion potential for fossil resources (ADPfossil)	MJ, NCV	**4955**	**5181**
Renewable primary energy resources as energy (fuel), (RPRE)*	MJ, NCV	**48**	**49**
Renewable primary resources as material, (RPRM)*	MJ, NCV	**0.00**	**0.00**
Non-renewable primary resources as energy (fuel), (NRPRE)*	MJ, NCV	**4955**	**5181**
Non-renewable primary resources as material (NRPRM)*	MJ, NCV	**0.00**	**0.00**
Consumption of fresh water	m3	**0.93**	**0.97**
Secondary Material, Fuel and Recovered Energy			
Secondary Materials, (SM)*	kg	**50.01**	**83.59**
Renewable secondary fuels, (RSF)*	MJ, NCV	**0.00**	**0.00**
Non-renewable secondary fuels (NRSF)*	MJ, NCV	**0.00**	**0.00**
Recovered energy, (RE)*	MJ, NCV	**0.00**	**0.00**
Waste & Output Flows			
Hazardous waste disposed*	kg	**0.00**	**0.00**
Non-hazardous waste disposed*	kg	**4.92**	**5.22**
High-level radioactive waste*[2]	kg	**n/c**	**n/c**
Intermediate and low-level radioactive waste*[2]	kg	**n/c**	**n/c**
Components for reuse*	kg	**0.00**	**0.00**
Materials for recycling*	kg	**0.14**	**0.15**
Materials for energy recovery*	kg	**0.00**	**0.00**
Recovered energy exported from the product system*	MJ, NCV	**0.00**	**0.00**
Additional Inventory Parameters for Transparency			
CO_2 emissions from calcination and uptake from carbonation	kg CO_2 eq	**460.49**	**487.82**
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**

* 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

LIFE CYCLE IMPACT ASSESSMENT RESULTS – Mitchell Bulk Cement Products: Masonry Cement Types M, N, S sold under Brixment® brand per metric tonne

Impact Assessment	Unit	Masonry Type M	Masonry Type N	Masonry Type S
Global warming potential (GWP)[1]	kg CO_2 eq	**553.88**	**412.72**	**497.75**
Depletion potential of the stratospheric ozone layer (ODP)	kg CFC-11 eq	**2.05E-05**	**1.74E-05**	**1.92E-05**
Eutrophication potential (EP)	kg N eq	**0.75**	**0.70**	**0.72**
Acidification potential of soil and water sources (AP)	kg SO_2 eq	**1.24**	**0.99**	**1.14**
Formation potential of tropospheric ozone (POCP)	kg O_3 eq	**14.36**	**11.48**	**13.21**
Resource Use				
Abiotic depletion potential for non-fossil mineral resources (ADPelements)*	kg Sb eq	**1.67E-04**	**1.52E-04**	**1.54E-04**
Abiotic depletion potential for fossil resources (ADPfossil)	MJ, NCV	**3800**	**3114**	**3489**
Renewable primary energy resources as energy (fuel), (RPRE)*	MJ, NCV	**44**	**41**	**42**
Renewable primary resources as material, (RPRM)*	MJ, NCV	**0.00**	**0.00**	**0.00**
Non-renewable primary resources as energy (fuel), (NRPRE)*	MJ, NCV	**3800**	**3114**	**3489**
Non-renewable primary resources as material (NRPRM)*	MJ, NCV	**0.00**	**0.00**	**0.00**
Consumption of fresh water	m3	**0.78**	**0.68**	**0.72**
Secondary Material, Fuel and Recovered Energy				
Secondary Materials, (SM)*	kg	**66.38**	**38.94**	**36.56**
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	**3.23**	**2.26**	**2.85**
High-level radioactive waste*[2]	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	**0.09**	**0.07**	**0.08**
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	**301.85**	**210.94**	**267.01**
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**

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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

Environmental Management System (EMS)

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.

Heidelberg Materials Sustainability Commitments 2030

The world needs smart, sustainable and resilient infrastructure, buildings, and public spaces. At Heidelberg Materials, we are transforming our business to address these challenges, and are placing sustainability at the core of what we do.

The United Nations Sustainable Development Goals (SDGs) shape our strategy and sustainability commitments. Our Sustainability Commitments 2030 support our vision to build a more sustainable future that is net zero, safe and inclusive, nature positive, and circular and resilient. Learn more at Sustainability Commitments 2030 (heidelbergmaterials.com).