Environmental Product Declaration

For ekkomaxx™ Cement Concrete

This Environmental Product Declaration (EPD) covers 1 concrete mix produced for an industry-average, generic concrete plant. The additive plant is located in Rosenburg, Tex.

Incorporated in 2002, CeraTech Inc. develops additives that, when mixed with fly ash, are used as a substitute portland cement. CeraTech does not own any concrete plants. Instead, it ships its additives throughout the U.S. to ready-mix plants that produce the ekkomaxx™ cement concrete.

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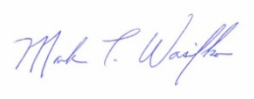
Plants Covered: CeraTech Inc. manufacturers its additives at 445 Texas 36, Rosenburg, Tex. 77471.

NRMCA CERTIFIED EPD

NRMCA Certified Environmental Product Declaration

This environmental product declaration was conducted in accordance with ISO 14025:2006
☐ Internal Verification ☒ External Verification

Declared Product:	This Environmental Product Declaration (EPD) covers ekkomaxx™ cement concrete for one industry-average mixes produced in the U.S.
Declaration Owner:	**CeraTech USA** 703-894-1130 www.ceratechinc.com  Mark Wasilko
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Product Category Rule:	North America Product Category Rules (PCR) for ISO 14025 Type III Environmental Product Declarations (EPDs) and GHG Protocol Compliant Product 'Carbon Footprint' of Concrete, Version 1.0 dated 11/30/2012, The Carbon Leadership Forum www.carbonleadershipforum.org.
Date of Issue:	Issued January 31, 2014.
Period of Validity:	5 Years (until January 31, 2019)
EPD Number	NRMCAEPD:10002

Note: The results and conclusion of the study are the sole responsibility of the LCA team and they do not represent the opinions or positions of the verifier.

PRODUCT DESCRIPTION

Ekkomaxx™ cement concrete serves the same function as portland cement concrete, but instead of portland cement and water as a binder, ekkomaxx cement concrete uses trademark additives mixed with fly ash to serve as the binder. Ekkomaxx cement concrete is included in UNSPSC product code 30111500 and CSI Specification Section 03 30 00. Ekkomaxx cement concrete is produced in accordance with ASTM C94 Standard Specification for Ready-Mixed Concrete, and the binder conform to ASTM C1157 Standard Performance Specification for Hydraulic Cement. This EPD is for ekkomaxx cement concrete with a design compressive strength of 6000 psi at 28 days.

Concrete is used to make all types of structures including: bridges, buildings, dams, foundations, pipes, roads, sidewalks, and storage tanks. Concrete is basically a mixture of two components: aggregate and paste. The paste of ekkomaxx cement concrete, comprised of a trademark combination of three chemicals, fly ash, and water, binds the aggregate (usually sand and gravel or crushed stone) into a rock-like mass as the paste hardens. The paste hardens because of the chemical reaction of the trademark additives, fly ash, and water. Other supplementary cementitious materials and chemical admixtures may also be included in the paste.

This EPD covers the life cycle phases A1–A3 (‘cradle-to-gate’).

Life cycle stages not included in this EPD:

- A4: Transportation to the construction site
- A5: Construction (reinforcement, forming, placing, curing, etc.)
- B1-7: Building use and maintenance
- C1-4: End of life

DECLARED UNIT

The declared unit is 1 m^3 of ekkomaxx cement concrete produced in the United States from domestically produced trademark additives, fly ash, and aggregates.

LIFE-CYCLE ASSESSMENT

A summary of life-cycle stages included in the LCA is as follows:

- Raw Material Supply (upstream processes): Extraction, handling, and processing of the raw materials used in production of concrete: trademark additives, supplementary cementitious materials, aggregate (coarse and fine), and water used in ekkomaxx cement concrete.
- Transportation: Transportation of these materials from supplier to the 'gate' of the concrete producer.

- Manufacturing (core processes): The core processes result from the energy used to store, batch, mix, and distribute the ekkomaxx cement concrete and operate the facility (ready-mixed concrete plant)
- Water use in mixing and distributing ekkomaxx cement concrete.

A summary of life-cycle stages excluded from the LCA is as follows:

- Production, manufacture, and construction of buildings, capital goods, and infrastructure with an expected lifespan of over 5 years.
- Production and manufacture of concrete production equipment, concrete delivery vehicles, earthmoving equipment, and laboratory equipment with an expected lifespan of over 5 years.
- Personnel—related activities (travel, furniture, office supplies).
- Energy and water use related to company management and sales activities.
- Water use in upstream manufacturing processes and in placement and curing of concrete.

Limitations of this LCA:

- This LCA does not report all of the environmental impacts due to manufacturing of the product, but rather reports the environmental impacts for those categories with established life cycle assessment based methods to track and report. Unreported environmental impacts include (but are not limited to) factors attributable to human health, land use change, and habitat destruction.
- This LCA reports the results of a 'cradle-to-gate' analysis. Thus, it is not suitable for comparative assertions, defined as an environmental claim regarding the superiority or equivalence of one product versus a competing product that performs the same function.
- In order to assess the local impacts of product manufacturing, additional analysis is required.
- The product manufacturer has the option of declaring additional information about their product in an environmental product declaration (EPD) including conformance with any other sustainability certification programs that often have performance and prescriptive requirements that aim to illustrate environmental best practices that cannot be captured by LCA.
- Life cycle impact assessment results are relative expressions and do not predict impacts on category endpoints, the exceeding of thresholds, safety margins, or risks.

LIFE-CYCLE INVENTORY

Table 1. Summary of ekkomaxx LCI Results

Inventory category	Per cubic meter	Per cubic yard
Total Primary Energy Consumption, MJ	1248	972
Water (batch)	0.085 m^3	17 gal.
Water (process)	0.064 m^3	13 gal.

DATA QUALITY AND VARIABILITY

This EPD was created from an LCA that used industry average data for upstream materials, except the manufacture and transportation related to the trademark additives. Variation can result from differences in supplier locations, manufacturing processes, manufacturing efficiency, and fuel type used. Table 2 lists the primary sources of data used to compute the upstream material LCI. The table includes a qualitative data quality assessment as required by the CLF concrete PCR.

Table 2. Primary Data Sources

Process	LCI data source	Geography	Year	Data quality assessment
BA100	**CeraTech** LCI survey	CeraTech facility in Texas	2012	• **Technology**: *very good* Process represents manufacturing based on CeraTech operations. • **Time**: *very good* Data is within three years. • **Geography**: *very good* • **Completeness**: *very good* There is only one CeraTech facility; data compiled from one facility. • **Reliability**: *fair* Non-verified data based on survey completed by expert within company.
M300	**CeraTech** LCI survey	CeraTech facility in Texas	2012	• **Technology**: *very good* Process represents manufacturing based on CeraTech operations. • **Time**: *very good* Data is within three years. • **Geography**: *very good* • **Completeness**: *very good* There is only one CeraTech facility; data compiled from one facility. • **Reliability**: *fair* Non-verified data based on survey completed by expert within company.
Fly ash	*No additional processing of fly ash is necessary for use as a secondary material.*			

Table 2. Primary Data Sources (continued)

Process	LCI data source	Geography	Year	Data quality assessment
Fine aggregate	**Ecoinvent** process: "Gravel, round, at mine" (Ecoinvent Centre 2007)	Switzerland	2004	• **Technology**: *good* Process represents aggregate manufacture • **Time**: *fair* Data is within ten years. • **Geography**: *fair* Processes model Swiss production (no U.S. process in USLCI database). • **Completeness**: *very good* Data is 100% representative of Swiss production. • **Reliability**: *good* Data is verified by Ecoinvent. Dust emissions are estimate from limestone mining.
Coarse aggregate	**Ecoinvent** process: "Gravel, round, at mine" (Ecoinvent Centre 2007)	Switzerland	2004	
Water	**NREL** process: "Proxy_Water, at user"	U.S.	unknown	• **Technology**: *good* • **Time**: *fair* Data is within ten years. • **Geography**: *good* • **Completeness**: *good* • **Reliability**: *fair* Unknown if data is verified.
Electricity	**NREL** process: "at grid, US/US WITH US ELECTRICITY"	U.S.	2004	• **Technology**: *good* • **Time**: *fair* Data is within ten years. • **Geography**: *good* • **Completeness**: *good* • **Reliability**: *fair* Unknown if data is verified.
Natural gas	**NREL** process: "combusted in industrial boiler NREL/US"	U.S.	2006	• **Technology**: *good* • **Time**: *fair* Data is within ten years. • **Geography**: *good* • **Completeness**: *good* • **Reliability**: *fair* Unknown if data is verified.
Diesel (for heating)	**NREL** process: "Diesel, combusted in industrial boiler, NREL/US"	U.S.	2006	• **Technology**: *good* • **Time**: *fair* Data is within ten years. • **Geography**: *good* • **Completeness**: *good* • **Reliability**: *fair* Unknown if data is verified.
Diesel (for equipment)	**NREL** process: "combusted in industrial equipment NREL/US"	U.S.	2006	• **Technology**: *good* • **Time**: *fair* Data is within ten years. • **Geography**: *good* • **Completeness**: *good* • **Reliability**: *fair* Unknown if data is verified.

COMPARISONS

EPDs of concrete mixtures may not be comparable if they do not comply with the CLF concrete PCR and data used to produce this EPD. While EPDs can be used to compare concrete mixtures, the data cannot be used to compare between construction products or concrete mixtures used in different concrete products unless the data is integrated into a comprehensive LCA. For example, precast concrete, concrete masonry units, and site cast concrete all have different manufacturing processes whose impacts are attributed to different LCA stages. This precludes direct comparison between mixtures used in these different concrete products unless all life cycle phases are included. Environmental declarations from different programs may not be comparable.

ENVIRONMENTAL IMPACTS

The life-cycle impact assessment (LCIA) was conducted using SimaPro software v8.0.1 and the TRACI v2.1 life-cycle impact assessment method. Damage assessment, normalization, and weighting were not conducted as part of this LCA. Table 3 shows the source of characterization method for the different impact categories used in TRACI v2.1.

Table 3. Parameters describing environmental impacts as per US EPA TRACI v2.1, 2012

Impact category	**Parameter**	**Unit (per FU or DU)**	**Source of the characterization method**	**Level of site specificity selected**	**Environmental media**
Climate change	Global warming potential, GWP	kg CO_2 – equiv.	TRACI 2.1, July 2012 /IPCC 2007	Global	Air
Ozone depletion	Depletion potential of the stratospheric ozone layer, ODP	kg CFC-11 equiv.	TRACI 2.1, July 2012/WMO:2003	Global	Air
Acidification	Acidification potential, AP	kg SO_2 equiv.	TRACI 2.1, July 2012	North America	Air, Water
Eutrophication	Eutrophication potential, EP	kg N equiv.	TRACI 2.1, July 2012	North America	Air, Water
Smog	Photochemical ozone creation potential, POCP	kg O_3 equiv.	TRACI 2.1, July 2012	North America	Air

Summary of the ekkomaxx LCIA results are shown per unit volume of concrete in Table 4. LCIA results are relative expressions and do not predict impacts on category endpoints, the exceeding of thresholds, safety margins, or risks. This EPD report does not cover any optional additional information specified in PCR, Clause 3.2.

Table 4a. Summary of ekkomaxx LCIA Results per Cubic Meter of Concrete* (SI units)

Impact category	Unit	Total
Climate change	kg CO_2 eq	8.26E+01
Ozone depletion	kg CFC-11 eq	4.38E-06
Acidification	kg SO_2 eq	5.60E-01
Eutrophication	kg N eq	2.00E-01
Smog	kg O_3 eq	8.82E+00

*The notation in the table is a modified scientific notation, for example 1.234E-02 means 1.234×10^{-2} which is equal to 0.01234.

Table 4b. Summary of ekkomaxx LCIA Results per Cubic Yard of Concrete* (IP units)

Impact category	Unit	Total
Climate change	kg CO_2 eq	6.33E+01
Ozone depletion	kg CFC-11 eq	3.40E-06
Acidification	kg SO_2 eq	4.29E-01
Eutrophication	kg N eq	1.53E-01
Smog	kg O_3 eq	6.77E+00

*The notation in the table is a modified scientific notation, for example 1.234E-02 means 1.234×10^{-2} which is equal to 0.01234.

Additional Environmental Information

One of the three trademark chemicals in the additives, BA100 and M300, is a biomass-based material.

QUESTIONS

For more information on the content of this EPD, please contact:
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REFERENCES

Carbon Leadership Forum (CLF). *North American Product Category Rules (PCR) for ISO 14025 TYPE III Environmental Product Declarations (EPDs) of Concrete*, CLF, November 30, 2012.

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