THINK pozzotive®

Environmental Product Declaration

This document is a product-specific Type III Environmental Product Declaration (EPD) for Pozzotive® a type GS ground glass pozzolan produced from 100% post-consumer glass.

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General Information

This cradle to gate Environmental Product Declaration covers Pozzotive®, a ground-glass pozzolan produced by Urban Mining CT, LLC meeting the ASTM C1886 specification for Type GS Ground-Glass Pozzolan for Use in Concrete (ASTM, 2020). This study was conducted in accordance with ISO 14040 (ISO 14040, 2006), and 14044 (ISO 14044, 2006) and the requirements of the ISO 21930 (ISO 21930, 2017). ISO 21930 (ISO 21930, 2017) provides the core rules for the Type III Environmental Product Declaration (EPD) produced from this study. No sub-category Product Category Rule (PCR) has been developed for ground-glass pozzolans meeting ASTM C1866 specification.

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Independent verification of the declaration and data, according to ISO 14025:

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Product Description

Pozzotive® meets the ASTM C1866 limits for a Type GS Ground Glass Pozzolan

Table 1: Pozzotive® Product specifications

	Pozzotive®	ASTM C1866 Limits
Chemical Composition (mass%)		
Silicon Oxide SiO2	72.46	60 min
Aluminum Oxide (Al2O3)	1.85	5 max
Calcium Oxide (CaO)	10.75	15 max
Iron Oxide (Fe2O3(T))	0.3	1 max
Sulfur Trioxide (SO3	0.12	1 max
Total Alkalis, Na2Oeq	13.11	15 max
Moisture Content	0.11	0.5 max
Loss on Ignition	0.33	0.5 max
Physical Tests		
Fineness		
Retained on 45-m (No. 325) sieve (%)	0.7	5 max
Strength Activity Index		
Percentage of Control @ 7 days (%)	85	75 min
Percentage of Control @ 28 days (%)	92	85 min
Water Requirement (% of Control)	93	Report Only
Relative Density	2.51	Report only

Figure 1: Pozzotive®

Pozzotive® is shipped in bulk tankers.

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The process of adding Pozzotive® into a concrete mix is the same as for slag cement and fly ash. Pozzotive® is transported to the concrete plant from the Urban Mining Beacon Falls, CT plant in a pneumatic displacement tanker that then transports and transfers the material into a customer's silo. When concrete is batched, Pozzotive®, like the other basic elements of a concrete mix is weighed and conveyed into either a batching device which loads a concrete truck with premixed concrete or directly into the concrete truck along with all other components which are mixed by the truck's rotating drum.

Pozzotive® replaces cement in concrete on a pound for pound basis. The replacement percent varies depending on the specific mix design which is a function of many concrete performance variables along with the targeted GWP reduction goal.

Production of Pozzotive® starts with the receipt of MRF glass. Large metal is removed via a magnet before the raw material enters a dryer. The dried material is then sorted and separated, and the glass is then crushed, milled, classified, and conveyed to silos for storage and shipment.

Non-glass residue from the sorting (metal, paper, plastic and inorganic materials) is picked up by the MRF supplier who handles its transport to final end of life treatment.

Declared Unit: 1 metric ton of ground-glass pozzolan.

Product Components: 100% post-consumer glass

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System boundary

This study is cradle-to-gate covering A1-A3 stages of the life cycle as illustrated in Figure 3.

- **A1 – Raw Material Supply** (upstream processes): Extraction, handling, and processing of the materials used in the production of glass powder.
- **A2 – Transportation:** Transportation of these materials from the supplier to the 'gate' of the Beacon Falls, CT Plant. Note the transport of the MRF glass and source separated glass is not included in system boundary because the supplier trucks the material to the facility and then picks up the unused material to bring back to their plant.
- **A3 – Manufacturing** (core processes): Manufacturing of the product including drying, grinding, waste handling and treatment. Note the waste handling and treatment of the sorted MRF glass is not included in system boundary since the supplier picks up the unused material and brings back to their plant for final waste processing.

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

Figure 2: Life-cycle stages and modules

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

Except as noted above, all other life cycle stages as described in Figure 2 are excluded from the LCA study. The following processes are also excluded from the study:

1. Production, manufacture, and construction of manufacturing capital goods and infrastructure.
2. Production and manufacture of production equipment and material, delivery vehicles.
3. Personnel-related activities (travel, furniture, office supplies).
4. 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 main processes included in the system boundary are illustrated in Figure 3.

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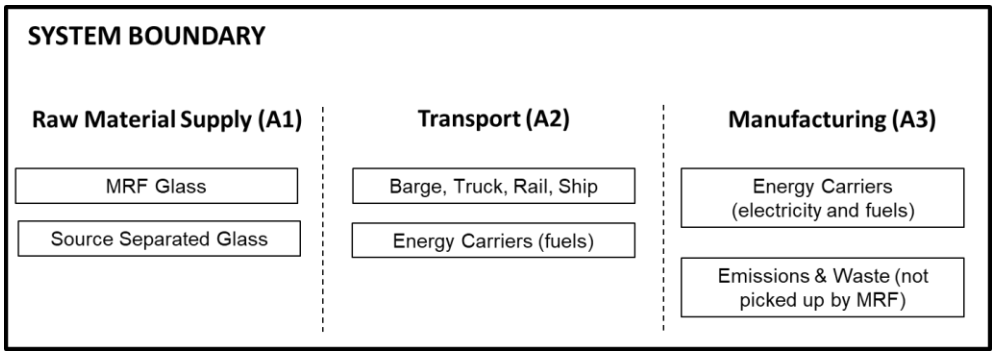

Figure 3: System Boundary for study

Electricity impacts are calculated based on electricity provided at the grid EGRID 2021 NPCC regional data. The resource mix for the NPCC region is: 49.1% natural gas 25.7% nuclear, 15.1% hydro, 3.5% wind, 3.2% biomass, 1.6% solar, and 1.8% other.

Allocation procedure

This study follows the rules of ISO 14044, 2006 section 4.3.4, avoiding allocation wherever possible, and when allocation cannot be avoided, partitioning impacts based on physical causality. Recycling procedures follow the rules of the ISO 21930:2017 Section 7.2.6 (ISO 21930, 2017). MRF glass is treated as recovered material and thus the environmental impacts allocated are limited to the treatment (sorting, drying, crushing at the Beacon Falls plant) to produce Pozzotive®.

Cutoff criteria

All inputs and outputs to a unit process have been included in the calculation, for which data are available. Data gaps have been filled by conservative assumptions with average or generic data. Any assumptions for such choices have been documented. When data was not reasonably available, the following cutoff criteria were used:

- Mass | If a flow is less than 1% of the cumulative mass of the model flows, it may be excluded, provided its environmental relevance is minor.
- Energy | If a flow is less than 1% of the cumulative energy of the system model, it may be excluded, provided its environmental relevance is minor.
- Environmental relevance | Material and energy flows known or expected to have the potential to cause environmentally relevant emissions into air, water, or soil related to the environmental indicators of the PCR shall be included unless justification for exclusion is documented.

The total of neglected input flows is less than 1% of energy usage and mass.

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Life Cycle Impact Assessment Results

Table 2:Cradle to Gate (A1-A3) impact results per metric tonne of Pozzotive®

Impact Assessment	Unit	Pozzotive®
Global warming potential (GWP)[1]	kg CO_2 e	59.6
Depletion potential of the stratospheric ozone layer (ODP)[2]	kg CFC-11 e	5.83E-06
Eutrophication potential (EP)[4]	kg N e	1.72E-02
Acidification potential of soil and water sources (AP) [4]	kg SO2 e	0.12
Formation potential of tropospheric ozone (POCP) [4]	kg O_3 e	1.51
Resource Use		
Abiotic depletion potential for fossil resources (ADPfossil)	MJ, NCV	878
Renewable primary energy resources as energy (fuel), (RPRE)[3]	MJ, NCV	207
Renewable primary resources as material, (RPRM)[3]	MJ, NCV	0
Non-renewable primary resources as energy (fuel), (NRPRE)[3]	MJ, NCV	1,568
Non-renewable primary resources as material (NRPRM)[3]	MJ, NCV	0.00
Consumption of fresh water[3]	m3	0.25
Secondary Material, Fuel and Recovered Energy		
Secondary Materials, (SM)[3]	kg	0
Renewable secondary fuels, (RSF)[3]	MJ, NCV	0
Non-renewable secondary fuels (NRSF)[3]	MJ, NCV	0
Recovered energy, (RE)[3]	MJ, NCV	0
Waste & Output Flows		
Hazardous waste disposed[3]	kg	0
Non-hazardous waste disposed[3]	kg	0
High-level radioactive waste[3]	m3	9.09E-07
Intermediate and low-level radioactive waste[3]	m3	3.04E-06
Components for reuse[3]	kg	0
Materials for recycling[3]	kg	5.42
Materials for energy recovery[3]	kg	0
Recovered energy exported from the product system[3]	MJ	0

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.

EPDs are comparable only if they comply with this document, 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.

Pozzotive® contains no materials that are considered hazardous as defined by the PCR.

LCA Interpretation

Most impacts come from the A3 life cycle stage. Electricity from the grinding operation and propane from the drying operation are the primary sources of environmental impacts.

* 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.

[1] Calculated as per U.S. EPD TRACI v2.1, with IPCC 2013 (AR 5)
[2] Calculated as per U.S. EPA TRACI v2.1 (EPA, 2014)
[3] Calculated as per ACLCA ISO 21930 Guidance (ACLCA, 2019)

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