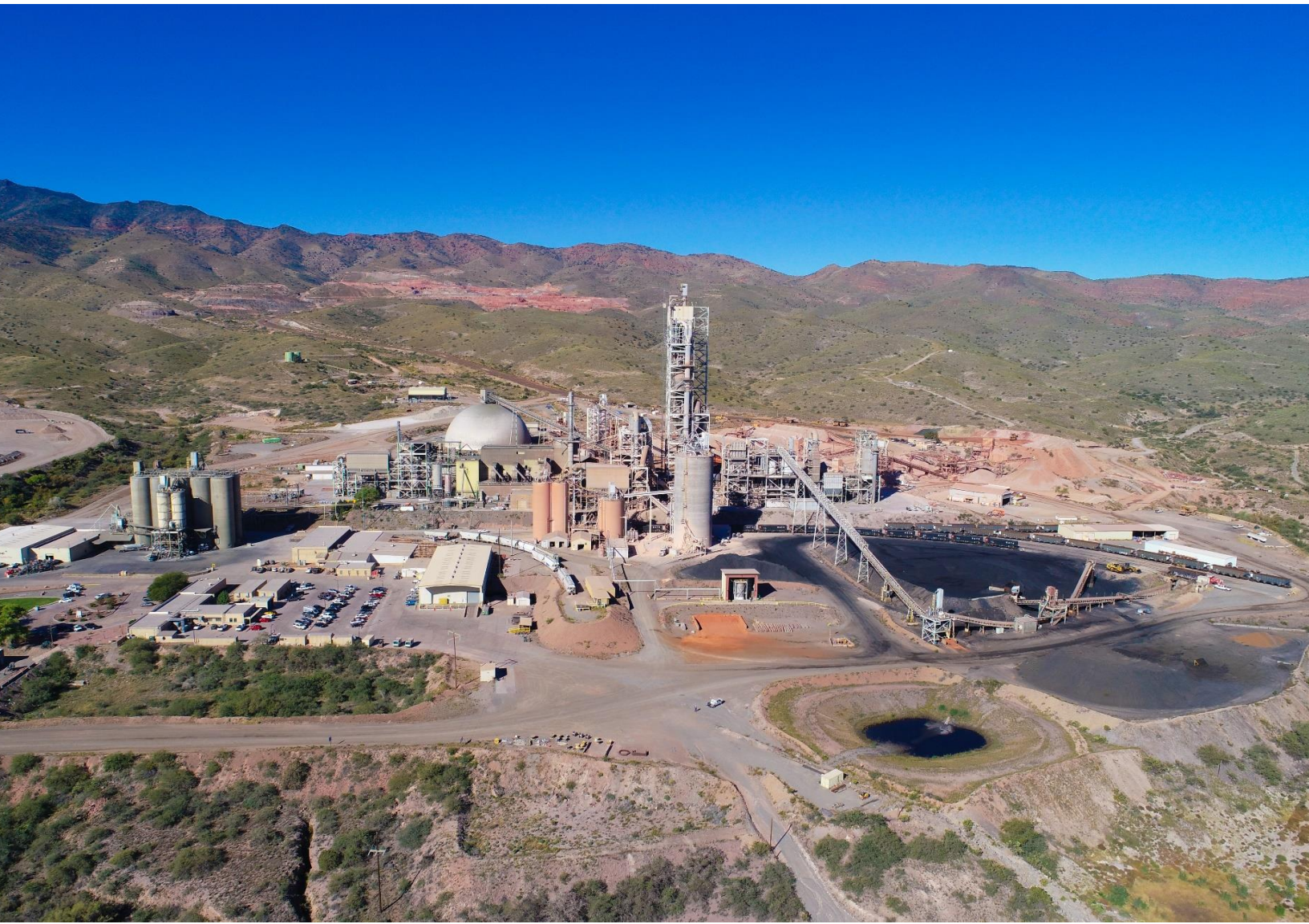
SALT RIVER MATERIALS GROUP

ENVIRONMENTAL PRODUCT DECLARATION

Clarkdale Cement Plant

TYPE I/II/V CEMENT | TYPE IP(25) PORTLAND POZZOLAN CEMENT

TYPE S MASONRY CEMENTS | PLASTIC CEMENT



This cradle to gate Environmental Product Declaration covers bulk cement products produced at the Clarkdale 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.

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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 V3.1 serves as the sub-category PCR Inclusion of API SPEC 10A under the scope of PCA PCR effective 9/11/2020 per NSF Deviation #2020-037
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 Thomas P. Gloria, PhD. (t.gloria@industrial-ecology.com) • Industrial Ecology Consultants
For additional explanatory material Manufacture Representative: Brett Lindsay (blindsay@srmaterials.com) This LCA EPD was prepared by: Melissa Díaz Segura, LCA and EPD Project Manager • Climate Earth (www.climateearth.com)
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.

PRODUCER

Salt River Materials Group (SRMG) is the commercial trade name for marketing activities of Phoenix Cement Company and Salt River Sand and Rock. SRMG, headquartered at the Salt River Pima-Maricopa Indian Community's Chaparral Business Park near Scottsdale, Arizona, is the only Native American-owned producer of portland cement in the U.S., and is also a major manufacturer and marketer of sand and gravel and recycled coal combustion products (fly ash) and pozzolans throughout Arizona and the southwestern United States

Over the five-plus decades of Phoenix Cement's existence, it has undergone many changes. Upgrades in almost every phase of the cement operation have led to great improvements in quality, production, and safety. Today, the company has completed a major modernization project that has changed the face of the Clarkdale operation. With new, state-of-the-art kiln and milling systems, Phoenix Cement is well positioned to meet the challenges of the construction industry.

PRODUCT

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

Product Type	Applicable Standard	Standard Designation
Portland Cement	ASTM C 150 and C 1157 GU and MS	Type I/II/V
Portland Pozzolan Type IP Portland Cement	ASTM C 150 & ASTM C 1157	Type IP
Type S Masonry Cement	ASTM C 91 for Type S	Type S
Plastic (stucco) Cement	ASTM C 1328 & ASTM C 91	Type S

This EPD reports environmental transparency information for three cement types produced by Salt River Materials Group at its Clarkdale, AZ plant.

Phoenix Cement® Type I/II/V(LA)
Phoenix Cement® Type I/II/V(LA) meets all chemical and physical requirements of the current ASTM Specification C 150 for Type I, II, and V low alkali cements and C 1157 for Type GU, MS, and HS. Type I/II/V(LA) is an all-purpose cement for use in most general construction applications including those requiring high sulfate resistance products.

Phoenix Cement® Portland Pozzolan Type IP(25)
Phoenix Cement® Portland Pozzolan Type IP(25) meets all chemical and physical requirements of the current ASTM Specification C 595 and ASTM C 1157, as well as the requirements for Types IP and IP(HS) blended hydraulic cements. Phoenix Cement® Portland Pozzolan Type IP(25) is a blend of Phoenix Cement® Type I/II/V(LA) and ASTM C 618 Class F fly ash which is interground at the mill. It is a general, all purpose cement for use in most general construction applications where a typical Type I/II/V cement would be used.

Supermortar® and Dynamortar® Type S
Supermortar® and Dynamortar® are all-purpose masonry cements suitable for use in the production of ASTM C 270 Type S masonry mortar and meet all requirements of the current ASTM Specification C 91 for Type S masonry cement.

Phoenix Cement® Plastic Cement
Phoenix Cement® Plastic Cement is manufactured specifically for the plaster/stucco industry. It meets all the chemical and physical requirements of ASTM C 1328 as well as UBC Standard 25-1 and IBC 2511 and 2512 for plastic (stucco) cement. In addition, Phoenix Cement® Plastic Cement meets all requirements of the current ASTM Specification C 91 and UBC Standard 21-11 and IBC 2103.7 for Type S masonry cement.

PRODUCT COMPONENTS

Inputs	Type I/II/V	Type IP	Type S
Clinker	93.31%	61.55%	65.53%
Limestone	0.00%	0.00%	6.99%
Gypsum	6.55%	10.91%	14.85%
Grinding aids	0.04%	0.06%	0.17%
Others	0.00%	27.48%	12.46%

DECLARED UNIT

The declared unit is one metric tonne of Type I/II/V, IP, and S cements.

SYSTEM BOUNDARY

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

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

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.

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.

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. Recycled and recovered materials with fuel content and used as fuels, such as scrap tires and agricultural waste, are considered nonrenewable or renewable secondary fuels. Impacts allocated to these fuels are limited to the treatment and transport required for their use from point of generation along with all emissions from combustion.

LIFE CYCLE INVENTORY (LCI)

Primary Sources of LCI Data:

Diesel: US-EI (2021) “Diesel, combusted in industrial equipment/US”
Coal: ecoinvent 3.8 (2021): “Hard coal {RNA}| hard coal mine operation and hard coal preparation”
Electricity: US-EI (2021) “Electricity, high voltage, at grid, eGrid (2021), WECC/US US-EI U”
Limestone: Manufacture specific primary data (2023)
Petroleum Coke: US-EI (2021) “Petroleum coke, at refinery US”
Truck transport: USLCI (2015) “Transport, combination truck, long-haul, diesel powered, Southwest /tkm/RNA”
Truck transport: USLCI (2015) “Transport, combination truck, short-haul, diesel powered Southwest /tkm/RNA”
Train Transport: USLCI (2015) Transport, train, diesel powered/US

Electricity grid mix includes: 34.16% Natural Gas, 17.16% Coal, 9.97% Wind, 7.72% Nuclear, 7.78% Solar, 2.15% Geothermal, 19.31% [illegible] CO2eq/kWh.

EPD | LIFE CYCLE IMPACT ASSESSMENT RESULTS

SRMG Products, bulk shipped: Type I/II/V, Type IP, and Type S per 1 metric tonne

Impact Assessment	Unit	Type I/II/V	Type IP	Type S
Global warming potential (GWP)[1]	kg CO_2 eq	969	621	655
Depletion potential of the stratospheric ozone layer (ODP)	kg CFC-11 eq	7.34E-06	3.13E-06	3.43E-06
Eutrophication potential (EP)	kg N eq	8.37E-01	5.78E-01	6.06E-01
Acidification potential of soil and water sources (AP)	kg SO_2 eq	2.48	1.06	1.05
Formation potential of tropospheric ozone (POCP)	kg O_3 eq	63.6	24.4	24.3
Resource Use				
Abiotic depletion potential for non-fossil mineral resources (ADPelements)*	kg Sb eq	5.077E-06	1.524E-06	1.728E-06
Abiotic depletion potential for fossil resources (ADPfossil)	MJ, NCV	7,162	4,237	4,431
Renewable primary energy resources as energy (fuel), (RPRE[2]) *	MJ, NCV	250	290	299
Renewable primary resources as material, (RPRM[2]) *	MJ, NCV	0.00E+00	0.00E+00	0.00E+00
Non-renewable primary resources as energy (fuel), (NRPRE[2]) *	MJ, NCV	7,389	4,483	4,685
Non-renewable primary resources as material, (NRPRM[2]) *	MJ, NCV	0.00E+00	0.00E+00	0.00E+00
Consumption of fresh water, (FW[2])	m^3	3.23	3.11	3.22
Secondary Material, Fuel and Recovered Energy				
Secondary Materials, (SM[2]) *	kg	0.00E+00	0.00E+00	0.00E+00
Renewable secondary fuels, (RSF[2]) *	MJ, NCV	0.00E+00	0.00E+00	0.00E+00
Non-renewable secondary fuels (NRSF[2]) *	MJ, NCV	0.00E+00	0.00E+00	0.00E+00
Recovered energy, (RE[2]) *	MJ, NCV	0.00E+00	0.00E+00	0.00E+00
Waste & Output Flows				
Hazardous waste disposed, (HW[2]) *	kg	0.00E+00	0.00E+00	0.00E+00
Non-hazardous waste disposed, (NHWD[2]) *	kg	1.31E-01	1.31E-01	1.31E-01
High-level radioactive waste, (HLRW[2]) *	m^3	1.24E-07	1.33E-07	1.37E-07
Intermediate and low-level radioactive waste, (ILLRW[2]) *	m^3	6.17E-07	6.56E-07	6.89E-07
Components for reuse, (CRU[2]) *	kg	0.00E+00	0.00E+00	0.00E+00
Materials for recycling, (MR[2]) *	kg	3.25E-01	3.25E-01	3.25E-01
Materials for energy recovery, (MER[2]) *	kg	1.69E-04	1.69E-04	1.69E-04
Recovered energy exported from the product system, (EE[2]) *	MJ, NCV	0.00E+00	0.00E+00	0.00E+00
Additional Inventory Parameters for Transparency				
CO_2 emissions from calcination and uptake from carbonation[3]	kg CO_2 eq	493	325	346

* 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.

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[1] GWP 100; 100-year time horizon GWP factors are provided by the IPCC 2013 Fifth Assessment Report (AR5).
CO2 from biogenic secondary fuels used in kiln are climate-neutral (CO2 sink = CO2 emissions), ISO 21930, 7.2.7.
[2] Calculated per ACLCA ISO 21930 Guidance.
[3] Calcination emissions were calculated based on the Cement CO2 and Energy Protocol detailed output method (B2) published by the World Business Council for Sustainable Development (WBCSD) Cement Sustainability Initiative (CSI).

SRMG Products, bagged shipped: Type I/II/V, Type IP, and Type S per 1 metric tonne

Impact Assessment	Unit	Type I/II/V	Type IP	Type S
Global warming potential (GWP)[4]	kg CO_2 eq	973	626	659
Depletion potential of the stratospheric ozone layer (ODP)	kg CFC-11 eq	7.58E-06	3.37E-06	3.67E-06
Eutrophication potential (EP)	kg N eq	8.47E-01	5.88E-01	6.16E-01
Acidification potential of soil and water sources (AP)	kg SO_2 eq	2.50	1.08	1.08
Formation potential of tropospheric ozone (POCP)	kg O_3 eq	64.0	24.8	24.7
Resource Use				
Abiotic depletion potential for non-fossil mineral resources (ADPelements)*	kg Sb eq	6.92E-06	3.36E-06	3.57E-06
Abiotic depletion potential for fossil resources (ADPfossil)	MJ, NCV	7,217	4,293	4,487
Renewable primary energy resources as energy (fuel), (RPRE[5]) *	MJ, NCV	369	409	418
Renewable primary resources as material, (RPRM[2]) *	MJ, NCV	0.00E+00	0.00E+00	0.00E+00
Non-renewable primary resources as energy (fuel), (NRPRE[2]) *	MJ, NCV	7,455	4,549	4,752
Non-renewable primary resources as material, (NRPRM[2]) *	MJ, NCV	0.00E+00	0.00E+00	0.00E+00
Consumption of fresh water, (FW[2])	m^3	3.63	3.51	3.63
Secondary Material, Fuel and Recovered Energy				
Secondary Materials, (SM[2]) *	kg	0.00E+00	0.00E+00	0.00E+00
Renewable secondary fuels, (RSF[2]) *	MJ, NCV	0.00E+00	0.00E+00	0.00E+00
Non-renewable secondary fuels (NRSF[2]) *	MJ, NCV	0.00E+00	0.00E+00	0.00E+00
Recovered energy, (RE[2]) *	MJ, NCV	0.00E+00	0.00E+00	0.00E+00
Waste & Output Flows				
Hazardous waste disposed, (HW[2]) *	kg	0.00E+00	0.00E+00	0.00E+00
Non-hazardous waste disposed, (NHWD[2]) *	kg	1.31E-01	1.31E-01	1.31E-01
High-level radioactive waste, (HLRW[2]) *	m^3	1.30E-07	1.39E-07	1.43E-07
Intermediate and low-level radioactive waste, (ILLRW[2]) *	m^3	6.45E-07	6.83E-07	7.17E-07
Components for reuse, (CRU[2]) *	kg	0.00E+00	0.00E+00	0.00E+00
Materials for recycling, (MR[2]) *	kg	3.25E-01	3.25E-01	3.25E-01
Materials for energy recovery, (MER[2]) *	kg	1.69E-04	1.69E-04	1.69E-04
Recovered energy exported from the product system, (EE[2]) *	MJ, NCV	0.00E+00	0.00E+00	0.00E+00
Additional Inventory Parameters for Transparency				
CO_2 emissions from calcination and uptake from carbonation[6]	kg CO_2 eq	493	325	346

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SRMG takes pride in its commitment to environmental stewardship and maintains an active environmental program designed to monitor and manage environmental matters throughout the company. Our environmental team includes not only the environmental department staff, but each person in the company. The support and participation of our employees not only helps us maintain our compliance with all environmental regulations and has resulted in a proactive approach resulting in quantifiable environmental successes.

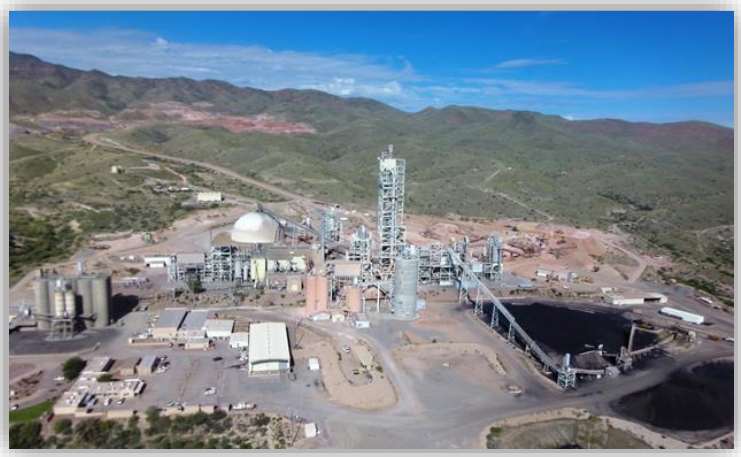
One example of our continuing environmental efforts can be seen in our successful modernization of the Clarkdale facility. Plant modifications resulted in increased production capacity of approximately 42% and at the same time air emissions per ton of cement produced, of particulates, carbon monoxide (CO), nitrous oxides (NOx), and sulfur dioxide (SO2) were reduced by an average of approximately 76% and only one constituent, volatile organic compounds (VOCs), increased slightly by approximately 3%. Carbon dioxide (CO2) emissions, often associated with global warming, have decreased by 15% per ton of clinker, and by 28% per ton of cementitious product from our 1990 levels. These reductions for CO2 already exceed the targets established by SRMG as a goal for the year 2020.

Air pollution abatement equipment used at our Clarkdale Cement Plant consists of a mix of the following technologies: high and low temperature baghouses, bin vents, watering for dust control and selective non-catalytic reduction.

Additionally, our Clarkdale Plant has earned EPA's ENERGY STAR® industrial plant certification each year since 2007, proving our team's commitment to operating more efficiently than at least 75% of similar facilities across the United States. This certification goes to the top quartile of cement manufacturing facilities around the country as it pertains to energy use and energy efficiency.

ENERGY STAR continues to update the EPI (Energy Performance Indicator) based upon both statistical improvements and industry wide data and information that accounts for energy improvements across the cement manufacturing industry. This means that the bar will continue to rise for inclusion in this top quartile, and the resultant competition will only be getting tougher.

Clarkdale Cement Plant in 1959



Clarkdale Cement Plant Now

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