

Custom-engineered, high performance, ASTM C-1866 Glass Pozzolans for use in white and grey cement, mortar, and concrete products

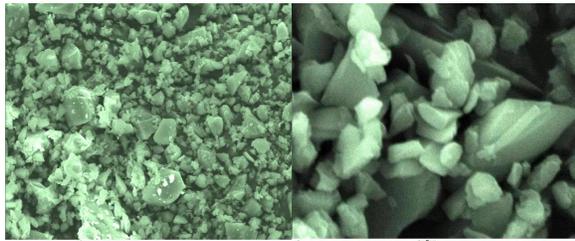
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Product Description

ASTM published a new standard for ground glass pozzolans in March, 2020, known as ASTM C-1866/C-1866M-20. The standard recognizes two types glass: high alkali *Type GS* derived from containers and windows; and low alkali *Type GE* derived from fiberglass reinforcement glass. Both types are recycled and have cement replacement levels of 10-40% depending on the application.

VCAS™ is the Vitro tradename for Type GE glass pozzolans, and **ACAS™** is the Vitro tradename for Type GS glass pozzolans.

Currently, the VCAS™ patented technology produces white pozzolans in three grades, **VCAS-140**, **VCAS-160** and **VCAS-Ultra200**, engineered with fineness tailored for the demands of the applications as described in this technical summary.

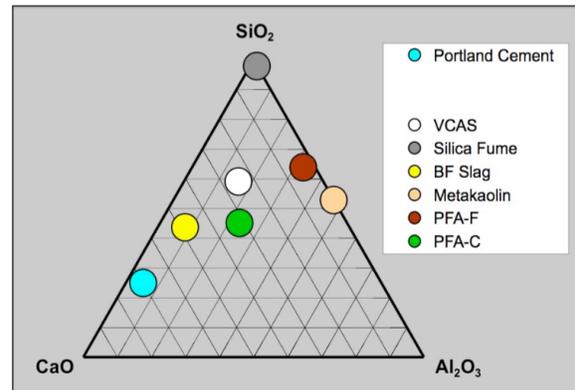


Unlike silica fume, coal fly ash, ground granulated blast furnace slag, and other by-products, VCAS™ White Pozzolans are free of iron, manganese, and other undesirable color-inducing impurities, making them ideally suited for all applications using white cement and in decorative and pigmented concrete.

VCAS™ pozzolans are value-added supplementary cementing materials that exhibit pozzolanic activity comparable to silica fume and metakaolin when tested in accordance with ASTM C618 and ASTM C1240. VCAS™ pozzolans react with calcium hydroxide produced during the hydration of Portland cement to form additional cementitious compounds such as calcium silicate and alumino-silicate hydrates. Pozzolans are widely used in cement and concrete technology to increase concrete strength, density, and resistance to chemical attack as well as control efflorescence.

Chemical Composition of VCAS™ Pozzolans (%)			
Silica, SiO ₂	55-65	Titania, TiO ₂	< 1
Alumina, Al ₂ O ₃	10-15	Phosphorus oxide, P ₂ O ₅	< 0.1
Iron Oxide, Fe ₂ O ₃	< 1	Manganese oxide, MnO	< 0.02
Calcium, CaO	18-25	Boron oxide, B ₂ O ₃	0-5
Magnesia, MgO	2-5	Sulphur oxide, SO ₃	< 0.1
Sodium oxide, Na ₂ O	< 4	Chloride	< 0.01
Potassium oxide, K ₂ O	< 0.2	Loss on ignition, LOI	< 0.5

Chemically, VCAS™ pozzolans are comprised largely of oxides of silicon, aluminum and calcium with no deleterious impurities. The CaO-SiO₂-Al₂O₃ proportions, the low alkali metal content, and the amorphous structure are ideal for a pozzolanic additive in hydraulic concrete. The low iron content makes them particularly well suited for applications using white cement, such as mortars, stuccos, terrazzo, artificial stone, and cast-in-place or precast concrete products.



Ternary diagram (CaO-SiO₂-Al₂O₃) for the composition of VCAS™ pozzolans relative to Portland cement and the common pozzolans.

VCAS™ pozzolans have superior powder handling compared with silica fume and metakaolin. Tight process control provides consistent product quality and physical properties.

Physical Properties of VCAS™ Pozzolans	VCAS-140	VCAS-160	VCAS-Ultra200
Specific Gravity	2.6	2.6	2.6
Bulk Density, Loose lb/ft ³	50-55	45-50	40-45
Passing No. 325 Mesh, %	95	98	>99
Median particle size, d50, μm	12	9	6
Pozzolanic Strength Index, % control	104	110	122
Brightness, %	82-85	82-85	87-90
Melting Point, °C	1200	1200	1200
Hardness, Mohs	5.5	5.5	5.5

New high brightness, high fineness grade

Benefits of VCAS™ Pozzolans

Fresh Concrete:

- Improved workability
- Reduction in water requirements
- Ease of dispersability
- Reduction in superplasticizer
- Reduction in bleeding
- Reduction in aggregate segregation

Hardened Concrete:

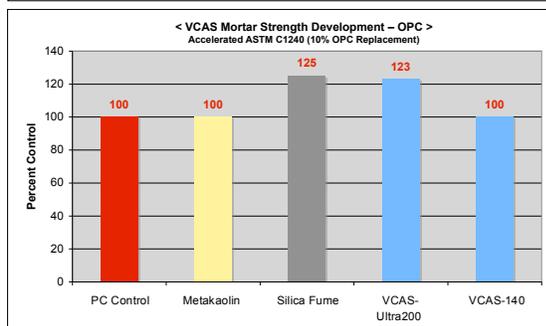
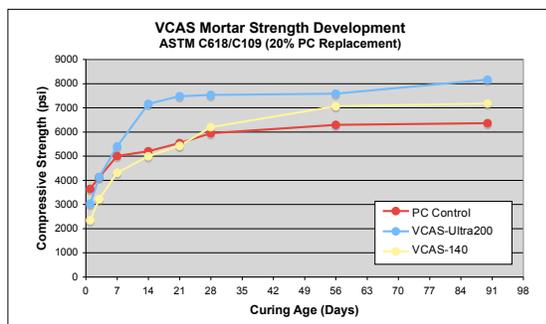
- Increased compressive strength
- Decreased permeability
- Increased durability

Added-Value:

- Mix-color neutrality and brightness
- Improved retention of mold detail
- Sustainability

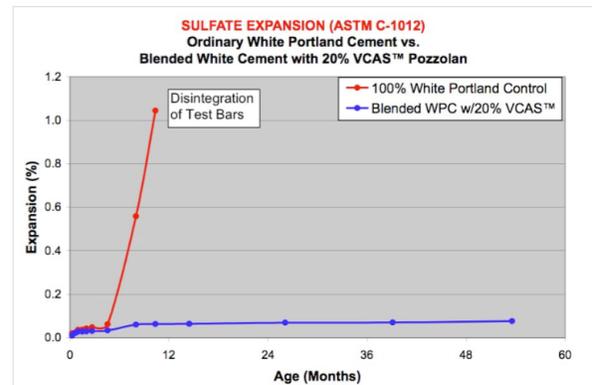
High Performance

VCAS™ White Pozzolans meet the technical requirements of ASTM C618 for use as supplementary cementitious materials in concrete. Blended pozzolanic cements produced with VCAS pozzolans also comfortably exceed the requirements of ASTM C1157: Standard Performance Specification for Hydraulic Cement. Typical strength curves at 20% cement replacement are shown below. VCAS-Ultra200™ exceeds the control in 3-5 days, making it an excellent choice for high performance applications where high early strength and excellent color are required. VCAS-Ultra200™ also meets the accelerated pozzolanic activity index, ASR control, and sulfate resistance requirements of ASTM C1240 for silica fume. Coupled with low water demand, reduced efflorescence, and improved chloride resistance, VCAS™ pozzolans are extremely cost effective.



Enhanced Durability

VCAS™ pozzolans provide white Portland cement with superior resistance to sulfate attack (ASTM C1012). The graph below shows the excellent dimensional stability of a white cement mortar with 20% VCAS replacement after over 4 years of exposure. Under these harsh test conditions, the 100% white cement control mortar disintegrated in less than 200 days. VCAS is also very effective at controlling expansion due to the alkali-silica reaction (AASHTO TP-110) and reducing chloride ion penetration (ASTM C1202).



Comparison with Other Pozzolans

VCAS™ pozzolans are excellent high reactivity materials for use with white cement to produce durable, high performance architectural concrete structures and reflective highway barriers.

Pozzolan	% Replacement	Reactivity	Color	Water Demand	Environmental
VCAS-140™	10-30	Mod	White	Reduction	Positive
VCAS-Ultra200™	10-30	High	White	Reduction	Positive
Silica fume	5-8	High	Dark grey	Large Increase	Positive
Metakaolin	5-8	High	Cream/pink	Large Increase	Negative
Blastfurnace slag	25-50	Mod	Buff	Neutral	Positive
Fly ash	10-30	Low	Dark	Reduction	Positive

Environmental, Health & Safety

VCAS™ pozzolans have an important role to play in sustainable construction by increasing service life and reducing the net greenhouse gas emissions (GHG) for a cubic yard of concrete.

VCAS™ pozzolans are non-toxic, contain no crystalline silica, and are classed as a nuisance dust, in common with other common fine particulate industrial minerals.

Product Availability

VCAS™ pozzolans are sold in bulk tankers, 2500 lb supersacks, or 50 lb bags FOB Jackson TN.

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