

CAC CRETE™

Hybrid Calcium Aluminate Rehabilitation Mortar

PRODUCT DATA SHEET

Document reference	Issue	Manufacturer	Application class
SAAM-CACCRETE-PDS-001	Issue 1, 2025	Shotcrete Africa Advanced Materials	Sewer rehabilitation, biogenic corrosion protection

1 GENERAL DESCRIPTION

CAC CRETE™ is a proprietary, factory pre-blended hybrid calcium aluminate cement (CAC) repair mortar engineered for the long-term rehabilitation and corrosion protection of wastewater infrastructure exposed to biogenic sulphuric acid attack. The product is formulated for high-velocity wet-shotcrete application and provides structural restoration, chemical resistance and biological suppression in a single monolithic lining.

CAC CRETE™ is typically used for the protection and rehabilitation of:

- Concrete and masonry sewer pipes and outfalls
- Manholes, junction chambers and inspection chambers
- Pump stations, wet wells and lift stations
- Wastewater treatment plant structures, channels and digester components

The product combines a hybrid 70% calcium aluminate / 30% Portland cement binder system, a dolomitic and siliceous sacrificial aggregate skeleton, and a proprietary admixture suite incorporating integral crystalline waterproofing, antimicrobial protection and a high-performance shrinkage-reducing admixture.

Engineered defence mechanisms

Unlike single-binder systems, CAC CRETE™ delivers four engineered defence mechanisms in one monolithic application:

- Chemical resistance — the high-aluminate binder fraction forms protective hydration products stable in low-pH biogenic environments
- Biological suppression — an EPA-registered antimicrobial agent (Penetron BioMIC) inhibits sulphate-oxidising bacteria within the matrix
- Crack mitigation and self-sealing — integral crystalline waterproofing (Penetron Admix) reacts with moisture and free calcium hydroxide to seal capillaries and any cracks that subsequently form, for the life of the structure
- Shrinkage control — a high-performance shrinkage-reducing admixture (Chryso Serenis) reduces drying shrinkage strain to mitigate early-age crack formation

The retention of 30% Portland cement in the binder system is an engineered design choice. Calcium hydroxide liberated by the Portland fraction is required to drive the ongoing crystalline reaction of the integral waterproofing admixture; pure calcium aluminate systems do not generate calcium hydroxide and therefore cannot support this self-sealing mechanism.

CAC CRETE™ contains no chlorides, no free crystalline silica admixture and no metallic accelerators that may attack reinforcement.

2 SPECIFICATIONS

2.1 Binder system

Component	Proportion of binder mass
High-aluminous Calcium Aluminate Cement (CAC)	70%
Ordinary Portland Cement (CEM I 52.5N or equivalent)	30%

2.2 Aggregate system

Aggregate	Primary function
Dolomite crusher sand (calcium-magnesium carbonate)	Sacrificial acid neutraliser
Silica filler sand	Matrix density and particle packing

2.3 Mechanical performance

Property	Value	Method
Specified compressive strength @ 28 days	60 MPa	SANS 5863
Target compressive strength @ 28 days	67 MPa	SANS 5863
Typical compressive strength range @ 28 days	60 – 75 MPa	SANS 5863
Bond strength to sound concrete substrate	> 2.0 MPa	ASTM D7234
Permeability (rapid chloride)	Very Low	ASTM C1202
Acid resistance (H ₂ SO ₄ pH 1.0, 42 days)	Mass retained; structural integrity maintained	SAAM internal protocol
Abrasion resistance	High	ASTM C779

2.4 Application and physical properties

Property	Value
Application method	Wet mortar spray (shotcrete) by progressive cavity pump
Typical application thickness	25 mm (project-specific design for larger structures and severe H ₂ S environments)
Maximum water/binder ratio	0.45
Hardened density	2 200 – 2 350 kg/m ³
Return to service	Typically 8 – 12 hours, ambient and project dependent

Note on hybrid binder chemistry: The 70/30 CAC/OPC blend is engineered as a complete factory-controlled formulation. The presence of Portland cement is intentional and necessary to support the integral crystalline waterproofing reaction (which requires free calcium hydroxide), the shrinkage-reducing admixture system, and the antimicrobial agent. The product is supplied as a complete blended system; site addition of Portland cement, lime, accelerators or any other admixture is not permitted and will invalidate the system warranty.

3 PERFORMANCE VERIFICATION

3.1 Accelerated acid deterioration test

To validate chemical resistance in conditions representative of severe biogenic corrosion, CAC CRETE™ was tested in parallel with a 60 MPa standard concrete control under identical immersion in a sulphuric acid solution maintained at pH 1.0 for 42 consecutive days. Mass and visual condition were recorded at 7-day intervals.

Parameter	Standard 60 MPa concrete	CAC CRETE™
Test medium	H ₂ SO ₄ at pH 1.0	H ₂ SO ₄ at pH 1.0
Exposure duration	42 days	42 days
Final mass	2 111.55 g	2 404.06 g

Visual condition	Significant mass loss; surface crumbling; aggregate exposure	Minimal surface erosion; structural integrity maintained; mass retained
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The test demonstrates that under aggressive biogenic-equivalent acid conditions, CAC CRETE™ retains both mass and structural form, while a standard high-strength Portland concrete suffers progressive matrix dissolution.

4 PACKAGING AND SHELF LIFE

- Supplied as a factory pre-blended dry mortar
- Standard packaging: paper bags, palletised under shrink film (bag size to be confirmed with Shotcrete Africa Advanced Materials)
- Shelf life: 12 months from manufacture in original sealed packaging when stored in dry, cool conditions off the ground
- Each batch is supplied with batch number, manufacture date and mix verification documentation

5 GUIDELINES FOR APPLICATION

5.1 Substrate preparation

- Remove all loose, deteriorated, contaminated or chemically weakened concrete to expose sound substrate
- Clean by high-pressure water jetting at a minimum pressure of 30 MPa; supplement with abrasive blasting where required
- Confirm cleaned substrate pH ≥ 8.5 (phenolphthalein indicator)
- Where exposed, clean reinforcement to AS 1627.2 Class St3 / PSt3 and coat with a corrosion-resistant zinc-rich primer within 4 hours
- Saturate the substrate to a saturated-surface-dry (SSD) condition immediately before application; no standing water

5.2 Mixing

- Add to clean potable water in accordance with Shotcrete Africa Advanced Materials' batching protocol
- Water/binder ratio shall not exceed 0.45
- Site addition of Portland cement, lime, accelerators, retarders or any other admixture is not permitted
- Mixing and pumping equipment must be clean and free of contamination from other cementitious systems

5.3 Application

- Apply by wet-spray (shotcrete) using a progressive cavity (eccentric worm) pump or equivalent
- Minimum applied thickness: 25 mm in a single pass for standard manholes
- Thickness for larger structures and severe biogenic environments to be specified per project, with reference to anticipated H₂S concentration
- Light steel-trowel finish recommended where a surface profile of ≤ 2 mm is required
- Application to be carried out only by applicators trained and approved by Shotcrete Africa Advanced Materials

5.4 Curing

- Cure immediately after finishing
- Apply approved curing compound or maintain moist curing for a minimum of 24 hours
- In live sewer environments, replace structure covers as soon as practical to maintain humidity
- In hot, dry or windy conditions, supplement with water mist application or polythene sheeting

5.5 Return to service

- Typical return to flow: 8 – 12 hours from completion of application, dependent on ambient conditions and project specification
- Where ultra-rapid return is required, contact Shotcrete Africa Advanced Materials regarding accelerator use

6 LIMITATIONS

- Not for use in continuously immersed potable water service without prior consultation
- Not for use at ambient temperatures below 5 °C or above 35 °C without modified application procedures
- Not to be over-coated on the spray-applied surface with Portland cement-based products
- System warranty is conditional on use of approved applicators and adherence to the application procedures specified herein

7 COMPLIANCE AND REFERENCES

CAC CRETE™ is engineered and tested with reference to the following internationally recognised standards and methodologies:

- Sydney Water SS 208 — Rehabilitation and Corrosion Protection of Sewers using Calcium Aluminate Cement Mortar (Version 2, March 2020): used as a benchmark performance specification
- EN 14647 — Calcium aluminate cement: composition, specification and conformity criteria
- EN 196-2 — Methods of testing cement: chemical analysis
- SANS 5863 — Concrete tests: compressive strength of hardened concrete
- ASTM D7234 — Pull-off adhesion strength of coatings on concrete
- ASTM C1202 — Electrical indication of concrete's ability to resist chloride ion penetration
- ASTM C779 — Abrasion resistance of horizontal concrete surfaces
- South African Life Factor Method (LFM) for biogenic acid corrosion service life prediction, as developed and revised by the University of Cape Town COMSIRU

8 HEALTH AND SAFETY

CAC CRETE™ is a cementitious product. Refer to the CAC CRETE™ Safety Data Sheet (SDS) before handling, storage, mixing or application. Approved personal protective equipment shall be worn at all times, including dust mask or respirator, eye protection, alkali-resistant gloves and overalls. In the event of skin or eye contact, flush thoroughly with clean water and seek medical attention.

9 MANUFACTURER AND TECHNICAL CONTACT

Manufacturer	Technical consultant
Shotcrete Africa Advanced Materials <i>Chemistry · Science · Performance</i> Tel: 079 0495 4337dustin@shotcrete.co.za	Jaco du Plessis (B.Eng Civil) Concrete Technologist, Go Consult Tel: 082 554 3694

Disclaimer

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