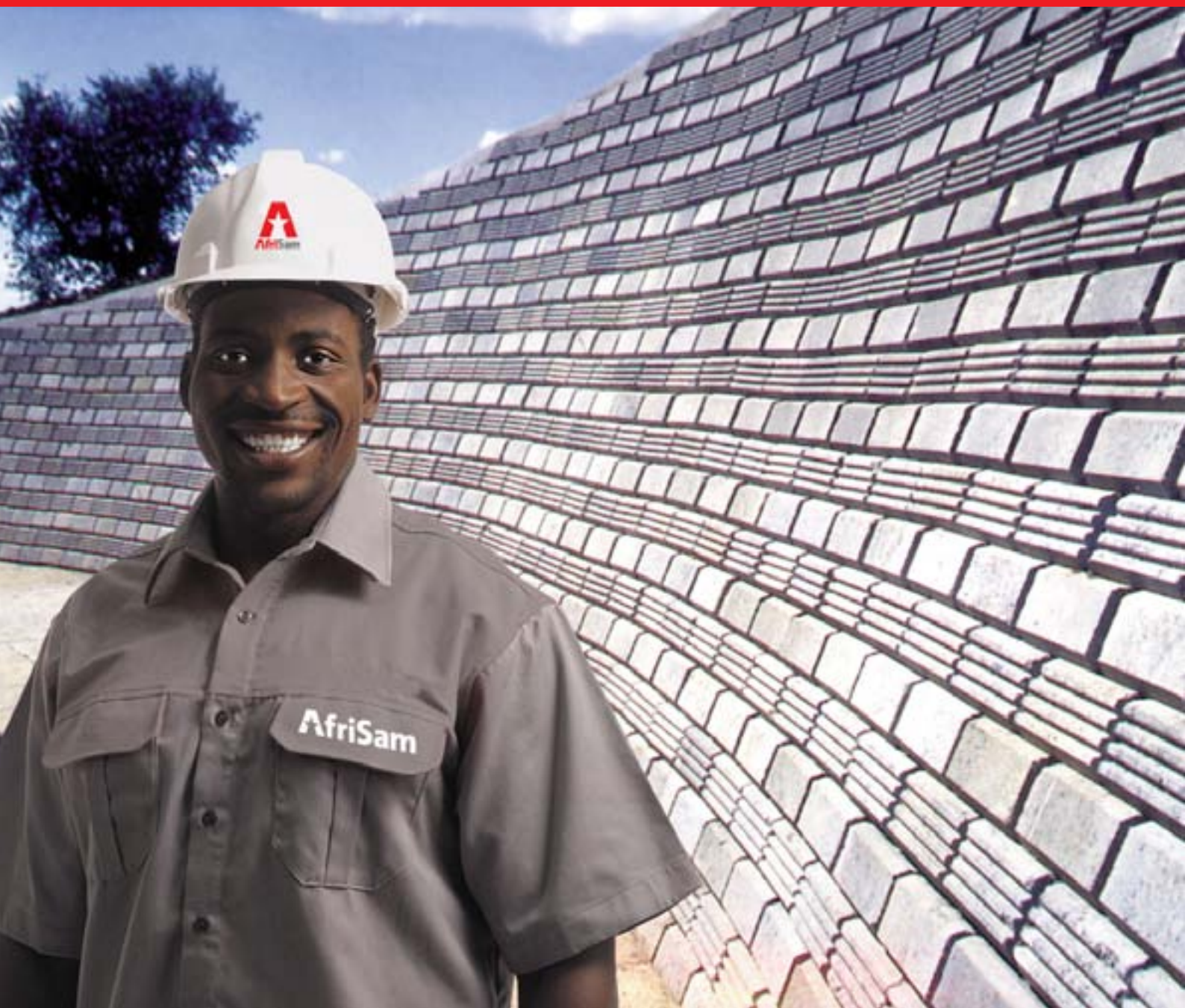


Your guide to the use of Rapid Hard Cement

Cement product guide of AfriSam (South Africa) Ltd.



Guide to the use of Rapid Strength Cement

CEM I 52,5N

The advent of precast concrete and fast-track construction has resulted in an increasing demand for a high early-strength specialist product. AfriSam Rapid Hard Cement offers a consistent, superior performance in all applications where quick mould turn-around or formwork stripping times are required.

Product description

AfriSam Rapid Hard Cement complies fully with the SANS 50197 cement specification for common cements. The fineness and chemical composition of this specialist product are carefully controlled to ensure consistent performance in the 52,5 N strength class. It thus falls into the SANS 50197 specification as a CEM I 52,5 N. In both strength categories the initial 2 day strength hurdle required by the standard is the same at 20 MPa.

Specification

CEM I 52,5N Portland Cement

Descriptor	Meaning
CEM I	Denotes that the product is a pure Portland Cement and contains no mineral components.
52,5	Denotes the minimum allowable 28-day strength (in MPa) of a mortar prism tested in accordance with SANS 50196.
N	Denotes the early strength when tested in accordance with SANS 50196.

Product features and benefits

AfriSam Rapid Hard Cement is milled to a carefully controlled fineness and contains a chloride-based strength modifier to ensure higher early strengths. The higher fineness of this product implies that a larger surface area is available to react with water. This increases the rate of hydration, resulting in higher early-strength development.

High early-strength

AfriSam Rapid Hard Cement is ideal for use in the precast concrete industry, where quicker demoulding times are required, as well as for fast-track construction projects to facilitate earlier stripping of formwork, earlier bridge launching or higher sliding rates.

Cold-weather concreting

AfriSam Rapid Hard Cement is often used for cold-weather concreting, where its rapid liberation of heat due to hydration can offset the set retardation effect of low temperatures. The early heat of hydration is a result of the rate of reaction of the fine cement particles. In applications where durability is paramount, it

can be further blended with mineral components such as ground granulated blastfurnace slag, fly ash or condensed silica fume. This offsets the set retardation sometimes associated with composite cements, especially in cold weather. AfriSam can also supply customised bulk blends from the Gauteng plants.

Consistent quality

AfriSam South Africa stake their reputation on the consistency of their high quality products. The manufacturing facilities of AfriSam South Africa are ISO 9001 certified and boast the highest possible Quality Management Systems, which subject the cement manufacturing process to strict quality control at every stage. These controls ensure high levels of consistency, resulting in minimal adjustments to mix designs during manufacture or construction.

Applications

Feature	Application
High early-strength	Precast concrete. Post tensioned and prestressed members. Early stripping of formwork.
High heat of hydration	Concrete in cold weather.
Blends with mineral components	Cold weather concreting in aggressive environments. Precast concrete applications in aggressive environments (eg. concrete sewage pipes).

The peak temperature developed due to the heat of hydration of AfriSam Rapid Hard Cement is much higher when used on its own than when blended with mineral components. When used in massive structures such as dam walls, thermal cracking can result if precautionary measures are not taken. The cracking is a result of the large thermal stresses generated by the temperature differentials that develop between the surface and the core of the element because of the exothermic hydration reaction and the subsequent contraction during cooling. Blending mineral components with AfriSam Rapid Hard Cement reduces peak temperatures developed during hydration.

Product availability

AfriSam Rapid Hard Cement is available from AfriSam factories and blending plants, as well as depots serviced by these facilities. Subject to location, this product is available in bulk and in 50 kg bags.



AfriSam product availability		
Facility	Rapid Hard Cement	
	Bag	Bulk
Dudfield	-	-
Lichtenburg	-	-
Mokopane	-	-
Roodepoort	✓	✓
Brakpan	✓	✓
Middelburg	-	-
Waltloo	✓	-
Swaziland	-	-
Ulco	✓	✓
Bloemfontein	-	-
Maseru	-	-
Queenstown	-	-
East London	-	-
Windhoek	✓	✓

Performance

The typical performance of AfriSam Rapid Hard Cement in relation to the criteria specified in SANS 50196 is tabulated below.

Criterion	CEM I 52,5 N	
	SANS 50196 requirement	Typical performance
Physical		
2 - day strength (MPa)	> 20	≥ 27
28 - day strength (MPa)	≥ 52,5	60
Initial setting time (minutes)	≥ 45	90
Soundness - Le Chatelier Expansion (mm)	≤ 10	< 2
Chemical		
Loss on ignition (%)	≤ 5	1.6
Sulphate (SO ₃) content (%)	≤ 4.0	2.5
Chloride content (%)	≤ 0.1	< 0.1

Physical characteristics

The physical characteristics of AfriSam Rapid Hard Cement listed in the following table are approximate. Actual values may vary.

Physical characteristics	
Relative density	3,1
Loose bulk density when fluidised.	1 100 kg/m ³
Loose bulk density after consolidation.	1 500 kg/m ³
Residue on 90 µm sieve	0,6%

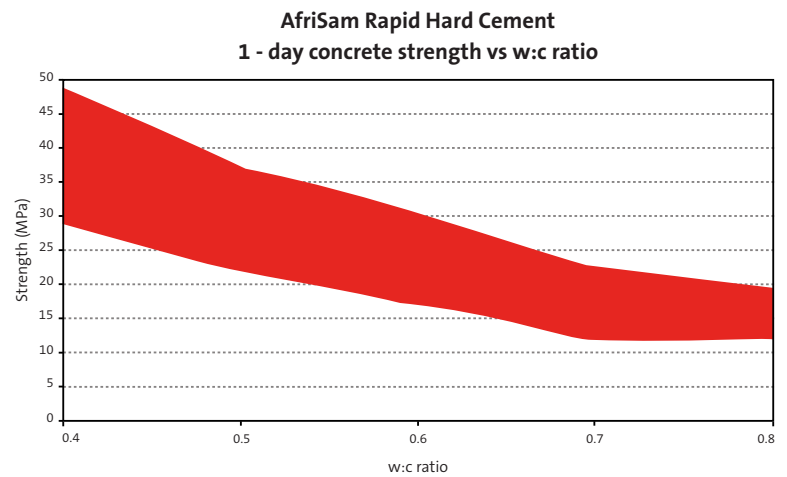
Other physical tests, such as particle size distribution or residues on specific screen sizes, can be performed to meet specific client requirements.

Performance in concrete

The compressive strength of concrete depends primarily

on the water:cement (w:c) ratio of the mix. As the water:cement ratio increases, so the concrete strength decreases proportionately.

A graphic illustration of this based on AfriSam Rapid Hard Cement is shown here. This graph should be used for trial mix design purposes only.



Typical chemical composition

The typical chemical analysis of AfriSam Rapid Hard Cement is tabulated below. As the nature of the geological deposits from which the raw materials are sourced varies with location and within the quarries, so do the above figures. Users are invited to request detailed information on the chemical composition of this product when required.

Chemical compound (as a percentage by mass - LOI free basis)	Rapid Hard Cement
	CEM I 52,5 N
Loss on ignition	1.6
Free lime	1.2
SiO ₂	22.0
Al ₂ O ₃	4.1
Fe ₂ O ₃	2.6
CaO	65.7
MgO	1.6
K ₂ O	0.3
TiO ₂	0.3
Na ₂ O	0.02
SO ₃	2.5
Mn ₂ O ₃	0.1



Quality assurance

The manufacturing facilities of AfriSam South Africa are ISO 9001 certified. This ensures that the highest possible Quality Management Systems are in place at every stage of production. AfriSam Rapid Hard Cement complies with the SANS 50197 cement specifications.

Admixtures

Trial mix evaluation is recommended to optimise performance if AfriSam Rapid Hard Cement is required to be used with specific admixtures.

Health and safety

Occupational exposure limits to cement are recommended in the Occupational Health and Safety Act. In terms of the time weighted average occupational exposure limit, the recommended limit for total inhalable dust is 10 mg/m^3 whilst the respirable recommended limit is 5 mg/m^3 .

Direct skin contact with wet concrete for extended periods can result in severe alkaline burns.

It is therefore recommended that suitable attire be worn to prevent dust inhalation and direct skin contact. A

detailed 'Safety Data Sheet' and 'Guide to the safe use of cement and concrete' is available on request.

Handling of bulk cement

Maximum loading temperature may be as high as 90°C . When cement is hot, it is fluid and in some instances provision needs to be made for this by restricting its normal flow in batching plants. For further information on the handling of bulk cement, please refer to the detailed brochure on this subject.

Colour coding

This product is colour coded with a red flash on the cement bag and the seal on the tanker is red when it is supplied in bulk.

Technical services

AfriSam South Africa offer a wide range of technical assistance, including mix designs for binary and ternary blends. This allows clients to exploit fully the entire spectrum of strength, durability and workability properties that are possible with AfriSam Rapid Hard Cement.



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