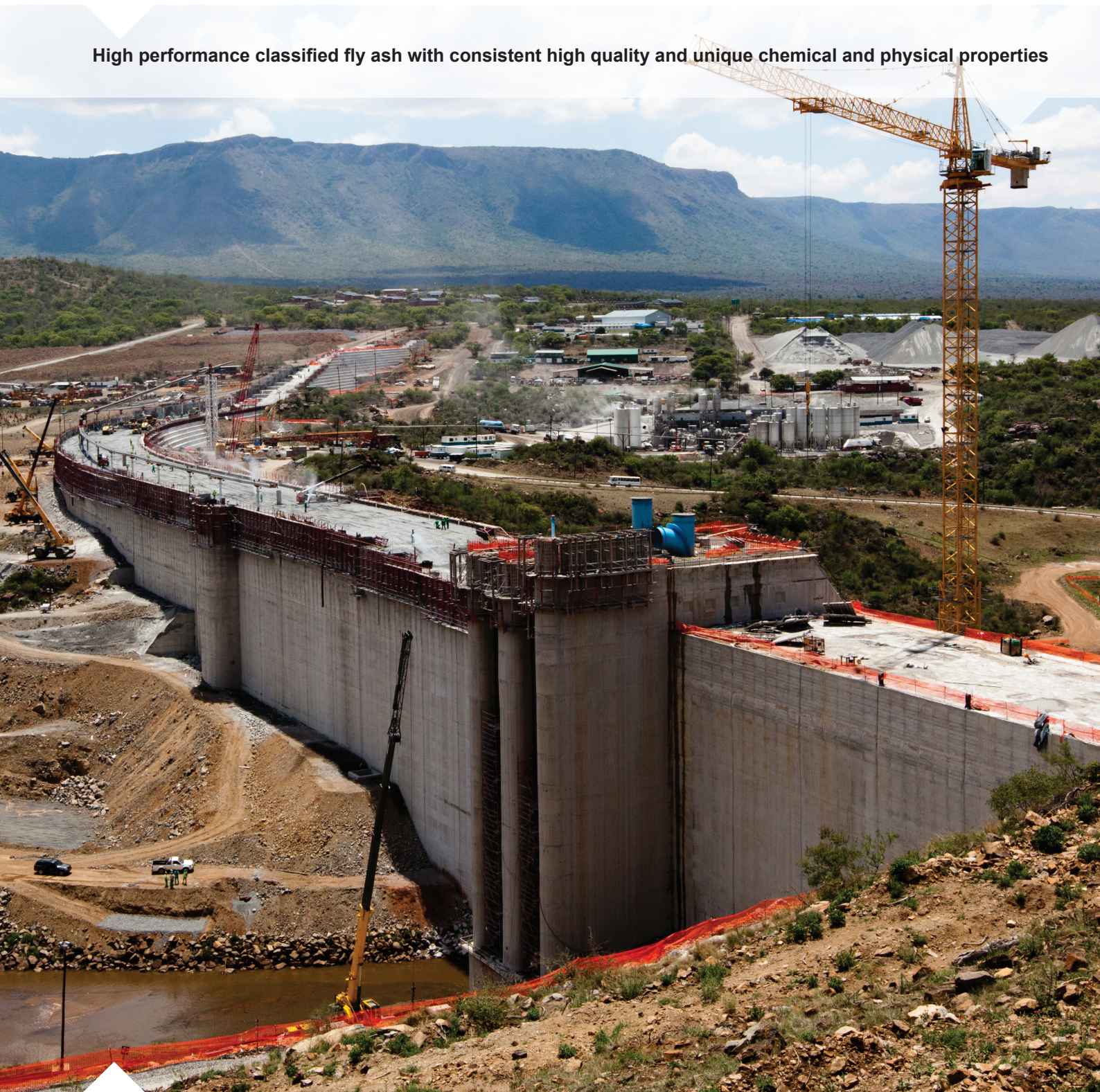


DuraPozz[®] Pro

Product information sheet

High performance classified fly ash with consistent high quality and unique chemical and physical properties



AshResources
Fly ash products

A SUBSIDIARY OF AFRIMAT

AFRIMAT[®]

The power of innovation

For over thirty years, innovation at Ash Resources has driven the development of fly ash for the South African construction industry. Focusing our unequalled technical resources on satisfying the needs of a competitive market and creating extra value for our customers, we introduced a high performance classified fly ash: DuraPozz®Pro™.

DuraPozz®Pro™: **a new generation of classified fly ash**

DuraPozz®Pro™ takes the unrivalled performance and track record of South Africa's leading Portland cement enhancer, DuraPozz®, to new heights. The product features:

- A world-ranked classified fly ash with consistent high quality, unique chemical and physical properties
- Performance that does not come at the expense of the environment. Our range of fly ash products are possibly amongst the most important contributors to 'greener' building materials in South Africa.
- Extends the boundaries of cement and concrete performance. Designed for the professional end-user who demands concrete with added strength and durability at optimum cost.

DuraPozz®Pro™ reflects our extensive research into the benefits of superfine fly ash for high performance, high durability concretes.

Where cost-effective, extra performance is the key requirement, DuraPozz®Pro™ gives:

- A significantly improved particle size distribution
- A finer grade than required by SANS 50450 Category 'S' fly ash (typical average fineness on a 45 micron sieve for the product is 6%)
- Higher reactivity resulting from a higher concentration of the amorphous (glass) phase
- Good Loss-on-Ignition (LOI) values
- Improved colour consistency

Applications

DuraPozz®Pro™ is the ideal solution for:

- Ensuring increased strength and durability due to its pozzolanic activity. With a unique particle size distribution and spherical shape DuraPozz®Pro™ is the preferred material where improved workability and/or water reduction is required.
- Excellent total cost solution for the production of all readymix, precast or site-batched within-mixer binder combination concretes
- Lower w/c ratio DuraPozz®Pro™ concrete exhibits decreased permeability reducing chloride and sulphate attack, and reducing alkali-silica reactivity (ASR)
- Reduced shrinkage: the lubricating action of DuraPozz®Pro™ reduces water content and drying shrinkage
- Higher strength gain after 28 days

Supply source

By working closely with Eskom, our power utility partner, we are able to offer the cement and concrete industries the premium classified fly ash product, DuraPozz®Pro™.

Continual improvements to our production and sourcing efficiency enable us to offer the enhanced benefits of DuraPozz®Pro™ with better value to our customers.





Composition

QUALITY THAT YOU CAN COUNT ON

DuraPozz®Pro™ is produced exclusively at our Matla classified fly ash plant in Mpumalanga. As with all our facilities, Matla is SANS/ISO 9001:2008 listed, our Quality Management System which is registered and audited by the South African Bureau of Standards (SABS).

DuraPozz®Pro™ carries the SANS 50450 'S' Mark.

We pride ourselves on consistent, high-quality products, allowing our customers to optimise their cement formulations or concrete mix designs with higher confidence and adding value to their business.

DuraPozz®Pro™ is carefully selected and processed by air-cyclone classification to produce its unique particle size, shape and distribution. Being a siliceous fly ash, it has a total SiO₂ content of approximately 50%.

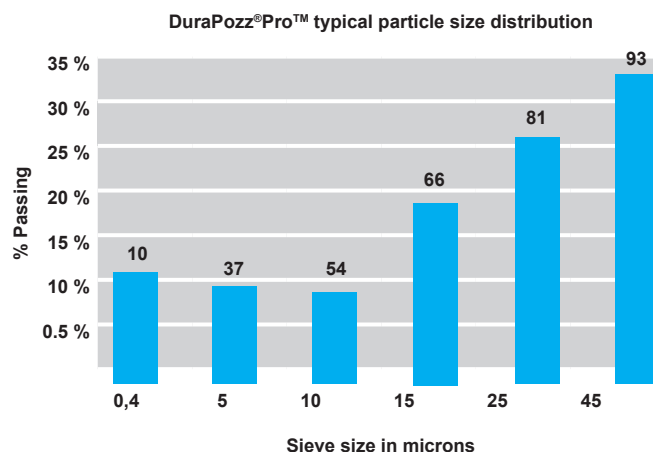
| Typical product characteristics | |
|--|-----------------|
| Relative density | 2,0 - 2,4 |
| Calculated surface area cm ² /g | 9000 - 11000 |
| pH in water | 11 |
| *Moisture content % | <0,2 |
| Colour | pale grey/white |
| LOI (Loss-on-Ignition) % | 1,75 |
| Carbon content % | 1,25 |

*Ex Matla plant



Micrograph of DuraPozz®Pro™

PARTICLE SIZE DISTRIBUTION



Sphericity and particle size distribution (PSD) are key to the pozzolanic potential of DuraPozz®Pro™. In this respect:

- The concentration of particles in the 0-5 µm range (see bar chart) provides more surface area for the pozzolanic reaction (improved reactivity)
- The fineness of the morphology facilitates ingress into the minute cavities present in concrete as it hardens (resulting in more dense and durable concrete)
- The 0-5 µm particles are also almost exclusively spherical. Higher sphericity is indicative of a more amorphous structure i.e. improved pozzolanicity

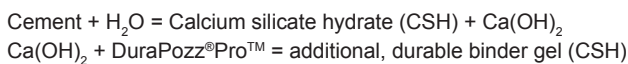
DuraPozz®Pro™ particles are predominantly spherical in shape compared to the angular crystalline form of Portland cement. The particles are also typically smaller than those of cement. Chemically the product contains the same basic components but with differing proportions and mineralogy:

| Typical analysis % | CaO | SiO ₂ | Al ₂ O ₃ | Fe ₂ O ₃ | MgO |
|--------------------|-----|------------------|--------------------------------|--------------------------------|---------|
| Portland cement | 66 | 21 | 5 | 2,5 | 1,5 |
| DuraPozz®Pro™ | 4-7 | 48-55 | 31-35 | 2,5-4 | 1,2-2,0 |



Reactive component

DuraPozz®Pro™ is able to react with Ca(OH)_2 liberated by Portland cement hydration i.e. the pozzolanic reaction to form additional cementitious products;



Calcium silicate hydrates (C-S-H) provide durable, strong concrete. Without the pozzolanic reaction of DuraPozz®Pro™, the Ca(OH)_2 would carbonate and become a weak component of the concrete, making it susceptible to chemical attack and reducing its durability.

As with Portland cement, adequate curing is important in order to achieve the full benefits of using DuraPozz®Pro™ in concrete. The pozzolanic reactivity of DuraPozz®Pro™ is controlled by its amorphous or reactive silica content. The international norms (EN 450 'S' and EN 197) require that this shall exceed 25%. The amorphous silica content of DuraPozz®Pro™ is, at 40%, higher than this value, making it an eminently suitable reactive pozzolan.

Carbon content

The carbon content of a fly ash primarily determines its colour. A high proportion of unburned carbon results in a very dark product, which can be problematic where cured concrete aesthetics are important. In the case of air-entrained concrete, high carbon fly ash may cause problems when using certain types of air-entraining admixtures.

Whilst the Loss-on-Ignition (LOI) value expressed for a particular fly ash includes the carbon content, it does not signify carbon only. Due to the importance of minimising the carbon content of fly ash, and working in conjunction with Eskom to maximise the calorific value of coal, DuraPozz®Pro™ is produced under optimal combustion conditions.

Accurate monitoring of carbon during coal combustion ensures that the resultant DuraPozz®Pro™ has the lowest possible carbon content, contributing to an overall lower LOI value.

Compatibility

WITH OTHER CEMENTITIOUS MATERIALS AND ADMIXTURES

DuraPozz®Pro™ is suitable for use with all types of Portland cement and cement replacement materials e.g. ground granulated blast furnace slag (GGBS), limestone, silica fume and meta-kaolin. DuraPozz®Pro™ is compatible with a wide range of admixtures working particularly well in high performance concretes when used in conjunction with plasticisers and superplasticisers.

More benefits, more value

The value engineering of DuraPozz®Pro™ is helping customers control bottom-line costs. The benefits in fresh or plastic concrete include:

- The water content of the concrete can be reduced. As a guide, the mix water should be reduced by a minimum of 10 litres per cubic metre.
- The workability of the concrete is improved at the same water content
- Pumpability is significantly increased and it is often possible to pump concrete mixes without altering the fine aggregate content
- Better concrete compaction and dependable workability retention

The results in hardened concrete are:

- Increased strength gain over time due to the pozzolanic activity of DuraPozz®Pro™
- Lower heat of hydration: reduction in heat generated can be in the order of 20%
- Reduced shrinkage: the largest contributor to shrinkage is water content. Lower water demand DuraPozz®Pro™ concrete can potentially reduce shrinkage by up to 75%
- Reduced permeability leading to improved durability with greater resistance to sulphate and chloride attack
- Better aesthetics with smoother off-shutter finishes

Mix design

When using DuraPozz®Pro™ in concrete, conventional mix design procedures and guidelines can be used taking into account the product's unique features and benefits.

Additional levels

Typical addition levels of DuraPozz®Pro™ in concrete range between 10-40% by weight of the cementitious content of the mix. The International trend is moving towards high volume fly ash (HVFA) concretes where addition levels of up to 70% are not uncommon.

(Please consult Ash Resources Technical Services for professional advice on DuraPozz®Pro™ addition to concrete outside the typical range.)

Deciding on the most suitable DuraPozz®Pro™ content depends on a number of factors including design strength, placing method, durability requirements and cost.

To achieve the optimum technical benefits of DuraPozz®Pro™, proper curing in line with good concrete practice should always be followed. The product responds particularly well to heat or steam curing.



Service

DuraPozz®Pro™ is supported by the resources of Afrimat's SANAS accredited materials laboratory. Ash Resources offers its customers a mix design service, technical guidance and on-site support in all aspects of quality assurance.

DuraPozz®Pro™ is firmly established as a prime component of quality cement blends marketed by major South African cement manufacturers. Backed by the company's commitment to providing world-class technical service, Ash Resources also supplies DuraPozz®Pro™ to a wide range of concrete industry customers. These include:

- Precast concrete manufacturers
- Ready-mixed concrete producers
- Site-mix concrete production in both the civil and building sectors
- Mining industry, in particular grout packs and wet-sprayed concrete for underground support

Complementing the technical service to these sectors is Ash Resources' customised supply logistics to back up the performance demands placed on its customers.

Handling and storage

DuraPozz®Pro™ is only available in bulk and delivery to site is by dry bulk pneumatic tanker. When stored correctly, the product has an indefinite shelf life. If kept in a storage silo it is often recommended that an aeration system be installed to facilitate easy discharge. Concrete containing DuraPozz®Pro™ can be handled in terms of batching, mixing and transporting in exactly the same way as other common cement concretes using the same equipment.

Health & Safety

Our classified fly ash products are known to be non-toxic and environmentally benign. No known significant health risks are associated with DuraPozz®Pro™ but high concentrations of dust may cause irritation. It is recommended that suitable personal protective equipment (PPE) is worn. In case of contact with eyes, rinse immediately with plenty of clean water and seek medical advice.

For further details consult the Material Safety Data Sheet (MSDS) for DuraPozz®Pro™.

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Environmental benefits of our products

Ash Resources produces a range of environmentally-friendly fly ash products. By taking the ash from Eskom's bituminous coal-fired power stations and engineering its beneficial use, our products rank high in both the quest for sustainable construction and reduction of greenhouse gas emission.

We understand that our customers demand consistent, high-quality products. With innovative products such as DuraPozz®Pro™ we aim to maximise the potential of classified fly ash in the production of 'green' concrete.

We will continue to invest in the latest ash processing and beneficiation technology to meet our customers' expectations and requirements, and maintain our market leadership in promoting the fly ash industry.

