



450-S

FINENESS CATEGORY S; LOSS ON IGNITION CATEGORY B



BS EN 450-1 FLY ASH FOR CONCRETE

CEMEX 450-S is a controlled fineness fly ash that can be used in conjunction with Portland cement (CEM I) to produce Portland-Fly Ash and Pozzolanitic cements.

The pozzolanic properties of 450-S enable it to react with lime released during cement hydration to form further cementitious phases. The two materials are, thus, complementary.

When combined at the concrete mixer, blends of 450-S and CEM I cement may comply with the designated combinations given in BS 8500 (UK complementary standard to BS EN 206-1 Concrete – Part 1). Typically, 25 – 30% of CEM I cement may be replaced by 450-S, whilst still achieving 28 day strengths consistent with class 42,5 performance.

Higher replacement levels may be utilised for specific durability / low heat applications. Concretes containing 450-S are economical and also provide lower water / binder ratios and enhanced durability / chemical resistance, compared to those made with CEM I cements alone. Although early age strengths are reduced (for 28 day equivalence) relative to CEM I cement performance, strength development beyond 28 days is considerably improved.

Fly ash is a by-product of the combustion of higher-ranking coals (and permitted co-combustion materials) for electricity generation and has been generally known in the UK as pulverized-fuel ash (pfa).

Fly ash is a fine powder consisting of mainly spherical particles composed of alumino-silicate glass. Expressed as major oxides, it is approximately 50% silica and 26% alumina.

450-S conforms to the special fineness (S) Category of BS EN 450-1 and is consistent in both composition and fineness. It is selected or classified for a controlled residue of less than 12% on a 45 μ sieve. The powder has a bulk density normally in the range of 800-1000 kg/m³.

The fineness of the material and the spherical particle shape both act to improve particle packing and impart water reducing properties within concrete (when compared to CEM I cement).



FEATURES

- LONGER-TERM STRENGTH DEVELOPMENT
- ENHANCED SULFATE-RESISTANCE
- CONSISTENT IN CHARACTERISTICS AND PERFORMANCE

BENEFITS

- EFFECTIVE IN MINIMISING RISK OF DAMAGING ALKALI-SILICA REACTION
- REDUCED CHLORIDE DIFFUSION RATES

APPLICATIONS

- FOR USE IN BOTH GENERAL AND SPECIALISED CONCRETES

PRODUCT APPLICATIONS

HEALTH AND SAFETY

Contact with wet concrete or mortar may cause irritation, dermatitis or severe alkali burns. Contact between fly ash powder and body fluids (e.g. sweat and eye fluids) may also cause irritation. There is risk of damage to the eyes. Wear suitable protective clothing, gloves and eye / face protection. In case of contact with eyes, rinse immediately with plenty of clean water and seek medical advice.

After contact with skin, wash immediately with plenty of clean water. Keep out of reach of children. Contains chromium (VI), may cause allergic reaction.

DELIVERY, STORAGE AND HANDLING

Delivered in pressurised bulk powder tankers by road, the standard load size is 28 – 30 tonnes. Silo identity disks can be provided for individual products by calling Customer Services on 0800 353 433. Make sure you're ready to receive and store your bulk material by viewing the checklist shown on – www.cemex.co.uk All CEMEX drivers are fully trained and experienced in the discharging of our vehicles, please do all you can to ensure your site is accessible with no obstructions.

If you are in any doubt, we can send an engineer to advise you – just ask. Fly ash is finer than Portland cement and, therefore, tends to bulk more in the silo. As the particle shape is rounded, the particles must remain dry and segregated to enable ease of flow. Sometimes additional aeration will be required to maintain the flow characteristics of the fly ash and, in difficult situations, installation of a Vibra-Jet aerator will be necessary. The Vibra-Jet is a low cost solution to the problem of fly ash compaction that functions by means of air discharge in a circular pattern along the silo wall, undercutting the material. CEMEX is able to advise on the installation and positioning of the Vibra-Jet aeration system if required.

PRODUCT APPLICATIONS - CONCRETE

General

450-S may be combined with CEM I cements for general concreting operations. When selecting aggregates, separate (sharp) sand and coarse aggregate is preferable to all-in aggregate (ballast). Use the minimum mixing water consistent with placement and full compaction of the concrete; excess water reduces both strength and durability. 450-S is compatible with the normal range of concrete admixtures, however, dosages of air entraining agents may need to be altered, or an air-entrainer selected that is specifically designed for use with fly ash. Note that an extended setting time may be experienced with concrete containing fly ash.

Once placed, concrete requires moisture to develop its full strength and premature drying out must be avoided. In normal conditions and at temperatures in excess of 10°C, concrete should be cured under damp conditions for 1 to 3 days (cover with curing membrane, plastic sheeting or wet hessian); at temperatures below 10°C, this curing time should be doubled. Protection of fresh concrete against freezing is essential and placement under such conditions should be avoided if possible. Curing of concrete containing fly ash is particularly important due to the lower early age strength development. Striking of formwork may need to be delayed relative to CEM I cement concrete with equivalent 28 day strength.

Colour

Concrete made with replacement of CEM I cement by 450-S will be darker in colour than CEM I cement concrete.

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Strength development / heat release

Concrete containing 450-S gains greater strength beyond 28 days than equivalent CEM I concrete. With moderate replacement levels of 450-S, desired ultimate concrete strengths can be achieved without excessive early age heat release and temperature rise.

Use of 450-S is, therefore, beneficial in reducing risk of thermal cracking in thick section or mass concrete construction.

CHEMICAL RESISTANCE

Chlorides

Chlorides penetrate concrete by a process of diffusion and can cause localised pitting and corrosion of steel reinforcement. Incorporation of 450-S in concrete may reduce chloride diffusion rates by an order of magnitude compared to CEM I cement.

Sulfate-resistance

Binders containing fly ash are more chemically resistant than CEM I cements and those containing between 25% and 40% have parity with sulfate-resisting Portland cement (srPc) in BRE Special Digest No. 1 (Concrete in aggressive ground). Use of 450-S, therefore, represents a cost effective alternative to srPc in ground conditions up to Design Chemical class 4 (see BRE SD1 and BS 8500).

Alkali silica reaction (ASR)

Incorporation of fly ash in concrete, is acknowledged as an effective means of reducing the risk of expansive damage arising from ASR where aggregates are known to contain reactive silica. The contribution of alkalis from 450-S does not need to be taken into account in the overall concrete alkali content, provided that it constitutes at least 26% of the binder. Higher binder contents may, thus, be achieved relative to CEM I cements for equivalent sodium oxide limits in concrete.

PRODUCT CERTIFICATION

450-S has EC certification via BSi Product Services and bears the CE marking to indicate conformity to all requirements of its harmonised technical specification and a presumption of conformity to the essential requirements of the Construction Products Directive.

CERTIFICATION SCHEME FEATURES

- Independent confirmation that products conform fully to technical specification
- Independent audit testing of products by UKAS accredited laboratories
- Independent evaluation of test data and appraisal of factory production control
- Traceability of cement deliveries to the manufacturing works
- Most rigorous AVCP system (1+) specified in the Construction Products Regulation



PRODUCT TEST DATA

Provision of both BS EN 450-1 test reports and certification of CEM I / CEMEX 450-S combinations to BS 8500 is available on request.

For further information please contact Customer Services on:

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