

Uniclass L6129	EPI/C F122	Aug 09
CI/SfB	Yp4	

Hanson BS EN 450 Fly Ash technical data sheet

Hanson Fly Ash is selected to comply with the requirements of BS EN 450 : Fly Ash for concrete. Definitions, requirements and quality control. Hanson Fly Ash can be combined with CEM1 Portland Cement to BS EN 197-1 Type CEM I Class 42,5 to produce a wide range of cementitious products including blended cements and grouting materials. BS EN 450 Fly Ash is classed as a type II addition, defined in BS EN 206-1 Concrete as a finely divided inorganic pozzolanic or latent hydraulic material used in concrete in order to improve certain properties or to achieve special properties.

Applications

Hanson Fly Ash is permitted to be used in concrete in accordance with the recommendations of BS8500 : 2002 Concrete - Complimentary British Standard to BS EN 206-1 and BS8110.

Production

Fly ash is a fine particulate mineral residue produced by the firing process in coal burning thermo-electric power stations. The temperature at combustion is around 1400°C which is above the melting point of most minerals present in the coal. In consequence, fly ash is formed when molten minerals solidify as glassy spheres around a bubble of gas. Physically it consists predominantly of finely divided spherical particles of between 1 and 150 microns. Approximately 20% of fly ash fuses and agglomerates into larger particles. The selection procedure separates these off as furnace bottom ash or as coarser fly ash which are rejected leaving a uniform fly ash complying with the fineness requirement in BS EN 450. This selected fly ash is tested in the laboratories of Hanson Cement to confirm its compliance with all of the requirements of BS EN 450.

Quality

Hanson Fly Ash is a fine grey powder with virtually no odour.

Typical chemical analysis	Average % by weight
SiO ₂	50
Al ₂ O ₃	30
Fe ₂ O ₃	7
CaO	3
MgO	1
K ₂ O	3
Na ₂ O	1
TiO ₂	1
SO ₃	0.5
Cl	0.1
Total alkali (Na ₂ Oaq)	less than 5
Loss on ignition	less than 7
Fineness (residue on 45 microns)	less than 40

Typical properties of fly ash are

- Specific gravity at approximately 2.1 is appreciably lower than those of Portland cement (3.1) or sand (2.7) permitting the formulation of products with lower weight to volume ratios.
- Particle size at between 1 and 150 microns is similar to, or slightly less than, that of Portland cement. The finest fraction improves mix grading, reduces segregation during pumping or injection, reducing voids and increasing durability in the finished works.
- Particle shape is predominantly spherical, improving the workability of concrete and grouts enabling them to be pumped and placed more easily than ones containing cement and sand only.
- Pozzolanic activity of fly ash enables it to combine with the lime liberated from Portland cement during the hydration process producing stable calcium-silicate and aluminate hydrates enhancing durability.

For further advise please contact Hanson Cement's Technical Helpline on 0845 722 7853. Reports of tests providing data on chemistry, strength and fineness are available.

Designing equal strength concrete using fly ash to BS EN 450

A mix design method has been developed at the Concrete Technology Unit (CTU), Dundee University, to build on standard mix design methods (such as BRE Design of normal concrete mixes 2nd ed.) and to take account of fly ash quality to enable the production of equal strength concrete. This is achieved by simple adjustment to either water content, binder content, or both, of the mix which might include the addition of a water-reducing admixture.

It is recommended however that trial mixes are carried out to determine optimum properties. Care should be taken to select an admixture which does not adversely affect the product colour.

Durability of equal strength fly ash concrete

The Dundee University CTU project demonstrated that concrete mixes of equal strength produced with fly ash quality varying within the BS EN 450 range possessed similar durability properties in terms of chloride diffusion, carbonation rate, sulfate resistance, abrasion resistance, permeability and freeze/thaw resistance.

The results validate the use of fly ash to BS EN 450 and the equivalent concrete performance option for durability in BS EN 206. Other work undertaken by the CTU has demonstrated that equivalence extends to engineering properties, including modulus of elasticity, creep and shrinkage, at equal strength using BS EN 450 Fly Ash.

The implications for the limits on fly ash fineness, (<10% variation on the declared mean), for control of concrete quality have been demonstrated by the CTU to result in variations in strength of approximately 3 N/mm². Further to the relationship to establish equivalent design strength shown earlier this can be extended over the BS EN 450 Fly Ash full fineness range.

The potential strength of any Portland cement based product will best develop under conditions where loss of mixing water is minimised during initial hardening.

Appropriate curing for optimum performance is essential as well as preventing moisture loss to the surrounding materials.

Curing Methods

The term curing refers to methods to prevent loss of moisture from exposed surfaces of concrete in the first 7 days after casting, the following are the most common methods.

- Covering with impermeable sheeting insuring that the edges are held down
- Covering with wet sacking but this must be keep wet by spraying with clean water
- Ponding with clean water
- Spaying with a propriety curing membrane preferably pigmented to ensure full coverage

Admixtures

Admixtures can be used to extend the properties of Hanson Fly Ash concretes, mortars and grouts. Trial mixes should be made to establish their compatibility and optimum dosage.

Please note: Reference to a Technical Standard number in this leaflet is deemed to include the latest published edition and/or any published amendments issued after the standard's publication, unless a date of issue is quoted in which case reference is to the provisions stated in that edition.

L006(Ck)/08/09/pdf

For further information please contact:

Hanson Cement
Ketton
Stamford
Lincolnshire
PE9 3SX

Technical Helpline:

Tel: 0845 722 7853
(calls charged at local rate)
Fax: 01780 727154
Email: cement.technical.help@hanson.biz

Customer Services:

Tel: 0845 600 1616
(calls charged at local rate)
Fax: 01780 727008
Email: cement.customer.services@hanson.biz