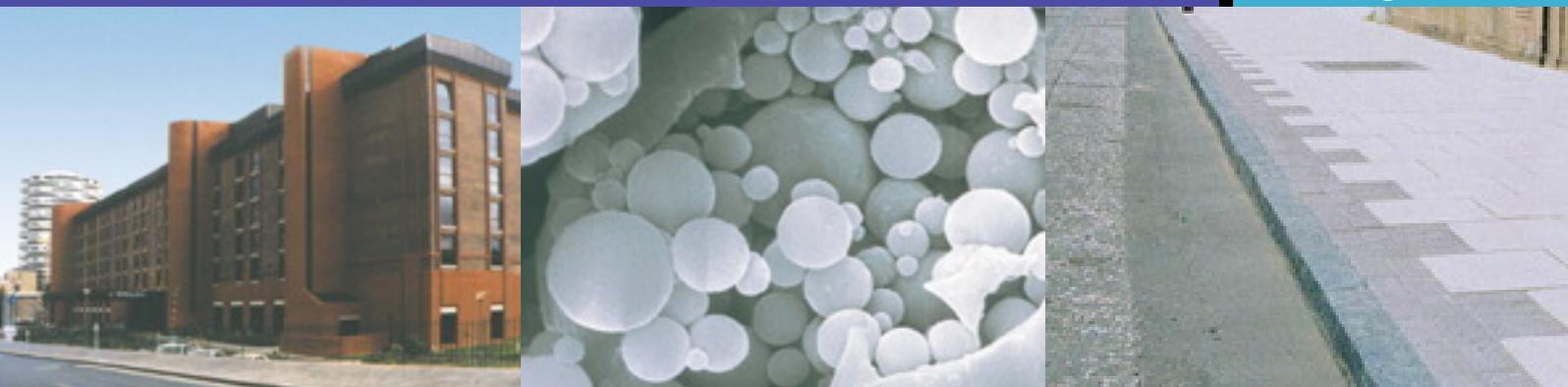


ScotAsh BS EN 13055 fly ash

Sustainable solutions for construction specialists

August 2009



Description

Pulverised Fuel Ash (PFA) is the 'fine' ash fraction produced in the furnaces of coal-fired power stations when pulverised coal is fed into the boilers and burnt at high temperatures and pressures.

As combustion takes place, the ash within the coal melts and solidifies in flight as rounded glassy particles. These are carried out in the flue gasses and subsequently captured in the electrostatic precipitators. The PFA particles are mostly extremely fine, glassy spheres and can resemble cement in appearance. When used correctly, PFA can offer many benefits in both the casting and the finished surface of concrete products.

Specification

There are many different classes of PFA, which are used at varying percentages and for different uses.

Presently BS EN 13055 (latest edition) allows PFA to be specified for use in concrete, mortar and grouts.

This datasheet is only intended for fly ash and not Furnace Bottom Ash, which may also be controlled by BS EN 13055.

The table below outlines the typical values for ScotAsh fly ash material:

Moisture content (%)	Zero
Loss-on-ignition (%)	5-14
Fineness on 45µm (%)	15-25
Sulfuric Anhydride as SO ₂ (%)	< 1.0
Chlorides (%)	< 0.01
Bulk density (Kg/m ³)	800-1000

BS EN 13055 from ScotAsh is a sustainable alternative to primary aggregates, saving CO₂ emissions from aggregate processing and conserving natural resources

Quality Assurance

ScotAsh products are manufactured under a total Quality Management System (QMS) which complies with the requirements of BS EN ISO 9001. The QMS is registered and audited by BSI.

ScotAsh self certify their Run Of station ash and CE mark it to BS EN 13055.

Health & Safety

PFA is not considered to be hazardous to health but it should be handled in accordance with good occupational hygiene and safety practices.

High concentrations of dust may cause irritation. It is recommended that Personal Protective Equipment is worn which includes eye protection, hand and skin protection and a dust mask. Further details are included in the Health and Safety Information Sheet for PFA.



Applications

Chemically, fly ash is similar to Portland Cement (PC), being made up of the same basic oxides but in differing proportions and mineralogy.

However BS EN 13055 is nearly inert and therefore cannot be counted towards the cementitious content, though PFA offers the following advantages:

- Increased durability
- Improved dimensional stability
- Lower unit cost
- Reduced efflorescence.

Concrete Products

PFA is used as a filler/aggregate in the manufacture of various concrete products. However it can give some pozzolanic reaction towards the strength.

Concrete Blocks

A key product used in the construction of houses, warehouses and retail units is concrete blocks – dense, lightweight or aerated. In dense and lightweight blocks, PFA does not count towards the cementitious content but can contribute many

benefits. Aerated or Autoclaved blocks are typically manufactured from PFA (>50%), cement, sand, lime and aluminium – the latter two reacting to form millions of tiny pockets of air before curing.

Precast Products

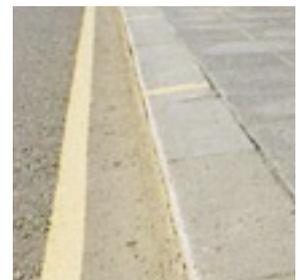
In addition to building blocks, BS EN 13055 PFA can be used as a filler/aggregate in precast concrete products, for example:

- Concrete roof tiles and concrete bricks
- Kerbs, edgings, flags and paving units
- Fence posts.

Generally, concrete products are manufactured using BS EN 13055 PFA at levels of 15% and 40%.

Deciding on the PFA content depends on factors such as:

- Cementitious content
- Manufacturing method
- Strength requirements
- Durability requirements
- Cost parameters.



Concrete Properties

Performance

The ultra fine nature of PFA leads to improved rheology, reduced bleeding and will normally demand less water, making the concrete more thixotropic.

Concrete products and, in particular, slip formed products, benefit greatly from the unique shape and lower density of PFA.

Bleeding of concrete can be caused due to a lack of suitably graded sands.

When PFA is used, the higher fine material content and reduced water demand results in a more cohesive mix – particularly useful for pressed concrete products.

Admixtures

Normal admixtures can be used with concrete containing PFA, but many manufacturers supply specially-tailored chemicals for the finer particle size of PFA.

Hardened Concrete Properties

Strength Development

The typical early strength development of concrete containing PFA can be slightly slower although this does depend on total cementitious content.

However, if heated curing processes are

used, PFA will perform better than straight PC concrete mixes.

Drying Shrinkage

The use of PFA in concrete will normally reduce shrinkage, with values of up to 30% being reported.

Surface Finish

The incorporation of PFA within concrete mixes gives a very dense, smooth and blemish-free surface.

Efflorescence

PFA can, through its pozzolanic reactivity, combine much of the free lime into non-soluble reactive products, reducing efflorescence.

Colour

PFA in general tends to be slightly darker than Portland Cement concrete. However, PFA concrete can be coloured in a manner similar to Portland Cement concretes.

Environmental Benefits

Using products made from PFA instead of quarried materials and sand creates strong environmental benefits.

It saves an equivalent or greater amount of natural aggregates, conserving valuable resources, and because little processing is required, PFA-based products also save energy and have a lower embodied carbon

content than quarried materials.

Due to its low density, a smaller tonnage of PFA-based material is required.

This helps to reduce the number of vehicle movements that are required, cutting fuel use and vehicle emissions.

The spherical nature of the ash particles means that less water is required in a mix, creating another environmental benefit and stronger, more durable concrete.

Durability

Durability performance of PFA-based concrete exceeds that of plain Portland Cement concretes.

Sulfate Resistance

Although specifications do not recognise that BS EN 13055 can help in the resistance to sulfate attack, research and testing shows it offers resistance up to Class 2.

Chloride Ingress

The correct use of PFA in concrete can reduce chloride ingress by 50% to 90%.

Alkali-silica Reaction

PFA in concrete can reduce the risk of ASR where aggregates cannot be classified as non-reactive.

Please consult Concrete Society Guidelines or contact ScotAsh.

To contact ScotAsh please telephone, fax or visit our website

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