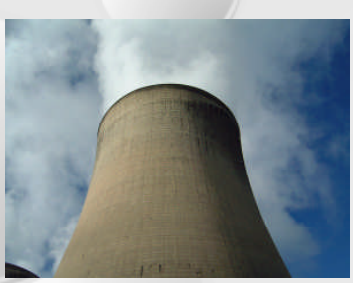
UNITED KINGDOM QUALITY ASH ASSOCIATION

Best Practice
Quality Protocol
Grouting Applications

 # (Recommendations in this datasheet are given in good faith and are presented for consideration and adoption by the responsible engineer concerned)

Introduction



The Quality Protocol produced by WRAP and the Environment Agency for England & Wales and Northern Ireland defines End of Waste Criteria for PFA and FBA in specific applications. Customers are expected by the Quality Protocol to follow good practice. This Best Practice guidance is for the users of PFA and FBA within Grouting applications. Further Best Practice sheets within this series provide advice on the use in Bound (3.1) and Unbound (3.3) applications.

General

The user should ensure they comply with all the Health and Safety Executive requirements relating to the use of ash. Each producer should be able to supply detailed H&S information upon request and UKQAA technical Datasheet 9.0 gives generic Chemical and H&S Information on PFA/FBA.

There are two ways in which PFA/FBA may be supplied, dry or moist. Dry PFA will be supplied in cement tankers. Such materials should only be discharged into silos specifically designed for the purpose; Best Practice Guidance No. 4 gives recommendations for both the tanker driver and customer.

PFA may be supplied as a 'conditioned' material, depending on customer preference. Conditioned ash, ash in which a small quantity of water has been added to prevent dust, is delivered in sheeted vehicles similar to natural aggregates. Lagoon ash is also moist and should be treated in a similar manner to conditioned ash. The precautions that should be taken with PFA are no different than should be taken when stockpiling any fine grained material. The significant risks are dust blow and contamination of water courses or surface drainage systems.

When stored on stockpiles, conditioned PFA may require the surface addition of further water after delivery, especially in windy/drying weather conditions to prevent dust problems. Mist spraying is effective in maintaining the moist surface preventing dust blow concerns. Such stockpiles should be kept as small as is practicable and used as quickly as is possible. As with all materials stored outside, there should be suitable drainage systems in place to prevent water run off entering sensitive water courses or the PFA contaminating surface water drainage with the material following rain. Of course, if covered storage is possible, this is preferable.

Depending on the nature and location of the construction being carried out, appropriate consideration should be given to the potential risks to the environment. With grouting the PFA is likely to be one constituent used in combination with cement and possibly admixtures. Clearly it is the resulting product that could have an impact on the environment in the final construction. However, temporary stockpiles of PFA could potentially contaminate groundwater or surface drainage systems in extremes of inclement weather. Consideration should be given to minimising such risks. In order to characterise a site and locate aquifers, reference should be made to the list of suggested sources of relevant maps given in Part 3 of the Environment Agency publication "*Underground under Threat. Groundwater protection: policy and practice."* This would normally be done in conjunction with the main contractor, site owner or consulting engineer as appropriate.

Grouting

The PFA/FBA producer compliant with the Quality Protocol (QP) should supply the ash complying with BS EN 12715: 2000[i]. This should be marked on the delivery ticket. In addition the customer may request compliance with one or more other standards as listed in Appendix B of the QP, e.g. BS 3892-3[ii] or BS EN 13055-1[iii]

Methods of mix design, properties, etc are given in detail within UKQAA Technical Datasheet 3.0, which should be consulted.

The Quality Protocol states;

Follow the advice given in the 2009 edition of Stabilising mine workings with PFA grouts – environmental code of practice (BR488) published by BRE. This document can be purchased from BRE bookshop www.brebookshop.com; to find the document, search on the document number.

NB: The Code of Practice is actually reference BR509, not BR488, which is in fact the 1st edition. Search the BRE Book Shop web site using BR509 – not BR488 as stated in the Quality Protocol.

This environmental code of practice provides guidance on selecting environmentally compatible and cost-effective materials and techniques, with authoritative guidance on good practice, based on information in the literature, laboratory studies at BRE, data from the use of pfa grouts and expertise from an industry steering group. It was first published in 2006 (BR488), and has been revised to ensure consistency with recent developments, in particular, a new quality protocol for PFA, developed by WRAP and the Environment Agency in partnership with industry.

A report on a detailed BRE laboratory study to assess the leaching characteristics, permeability and physical properties of pfa grouts is included on the accompanying CD Rom. It draws on field experience, and includes a review of groundwater risk assessment models and a specification for mine infilling works.

The BRE Code provides a three tier risk assessment approach. Firstly a graduated Preliminary environmental assessment is required, the result of which depend on the size of the contract, information about the PFA, the pathways for groundwater movement in the area and the quality of the groundwater in the area. From this a decision whether to proceed with the grouting can be made, which will be sufficient for many smaller contracts. However, this preliminary assessment may lead to the conclusion that a more detailed assessment is needed.

The second tier is a Simple Assessment may be carried out, which considers the dilution factors and source/receptor aspects of the site in more detail. Again a decision can be made whether to proceed with the grouting or whether a more detailed Complex Risk Assessment is needed. The third tier is the Complex Risk Assessment, which considers all the factors involved in detail, including the materials, the site, the local groundwater, etc.

Conclusions

The BRE Code of Practice provides a logical and measured method of carrying out an Environmental Risk Assessment. This should give the customer, the local EA officer and client the confidence that the environment has been considered and appropriate precautions taken.

Compliance

As shown in Figure 1 of the Quality Protocol (Page 7), compliance is partially the responsibility of the producer and partially that of the user/customer, see section 6 in the figure. The producer tests and assesses the PFA against the appropriate product standards, whereas the user/customer is responsible for carrying out good practice, as described above. While the PFA producer will provide as much assistance to the user/customer as practicable, ultimately it is the responsibility of the user/customer to demonstrate compliance as appropriate to the end use of the ash once it has been dispatched from the production site, e.g. the power station.

The producer cannot accept any liability if the PFA/FBA is misused or good practice is not followed.

In general usage the term 'fly ash' is used for pulverized coal ash but it can also cover ash from burning other materials. Such 'fly ash' may have significantly differing properties and might not offer the same advantages as ash from burning pulverized coal. UKQAA datasheets only refer to PFA / fly ash produced from the burning of predominantly coal in power stations.

References

NB: All British Standards are available from BSI, London at ***http://shop.bsigroup.com/***

[i] BS EN 12715: 2000 Execution of special geotechnical work. Grouting.

[ii] BS 3892-3: 1997 Pulverized fuel-ash. Specification for pulverized-fuel ash for use in cementitious grouts.

[iii] BS EN 13055-1: 2002 Lightweight aggregates. Lightweight aggregates for concrete, mortar and grout.