

Quality Protocol

Pulverised Fuel Ash (PFA)

End of waste criteria for the production of pulverised fuel ash (PFA) and furnace bottom ash (FBA) for use in bound and grout applications in specified construction and manufacturing uses



This Quality Protocol was funded by Defra, the Welsh Assembly Government (WAG) and the Northern Ireland Environment Agency (NIEA) as a business resource efficiency activity. It was developed by the Environment Agency and WRAP (Waste & Resources Action Programme) in consultation with Defra, WAG, industry and other regulatory stakeholders. The Quality Protocol is applicable in England, Wales and Northern Ireland. It sets end of waste criteria for the production and use of pulverised fuel ash (PFA) (including cenospheres) and furnace bottom ash (FBA) arising from the combustion of coal, with or without co-combustion materials, to be used in bound and grout applications in construction and manufacturing.

Contents

1. Introduction	04
2. Producing PFA and FBA	08
3. Providing evidence of compliance with the Quality Protocol	10
4. Application and use of PFA and FBA	11
Appendix A Definitions	12
Appendix B Approved standards and specifications for determining the quality of PFA and FBA for Bound and Grout applications	15
Appendix C Good practice for the use of PFA and FBA	19

Foreword

Background

Uncertainty over the point at which waste has been fully recovered and ceases to be waste within the meaning of Article 1(1)(a) of the EU Waste Framework Directive (2006/12/EC)¹ has inhibited the development and marketing of materials produced from waste which could otherwise be used beneficially without damaging human health and the environment. In some cases, this uncertainty has also inhibited the recovery and recycling of waste and its diversion from landfill.

Interpretation of EU legislation is ultimately a matter for the Courts and there is now a substantial body of case law on the interpretation of the definition of waste in Article 1(1)(a) of the Waste Framework Directive. Drawing on the principles established in this case law, it is possible to identify the point at which certain wastes cease to be waste and thus when the Waste Framework Directive's waste management controls no longer apply. This identification is the purpose of the Waste Protocols Project.

More specifically, depending on the circumstances of the waste stream concerned, the project seeks to achieve the following outcomes:

- to produce a Quality Protocol identifying the point at which waste, having been fully recovered, may be regarded as a non-waste product that can be either reused by business or industry, or supplied into other markets, enabling it to be used without the need for waste management controls; and/or
- to produce a statement that confirms to the business community what waste management controls they must comply with.

What is a Quality Protocol?

A Quality Protocol sets out end of waste criteria for the production and use of a product from a specific waste type. Compliance with these criteria is considered sufficient to ensure that the fully recovered product may be used without undermining the effectiveness of the Waste Framework Directive and therefore without the need for waste management controls.

In addition, the Quality Protocol indicates how compliance should be demonstrated and points to good practice for the use of the fully recovered product.

The Quality Protocol further aims to provide increased market confidence in the quality of products made from waste and so encourage greater recovery and recycling.

¹This will remain in force until it is superseded by the revised Waste Framework Directive (2008/98/EC) – anticipated to be published in December 2010.

1. Introduction

Definitions of terms that appear in *italics* when they are first used in this Quality Protocol are given in Appendix A.

1.1 What is this Quality Protocol?

- 1.1.1 This Quality Protocol has been developed by *WRAP* (Waste & Resources Action Programme) and the *Environment Agency* in consultation with industry and other regulatory stakeholders. It is applicable in England, Wales and Northern Ireland.
- 1.1.2 The Quality Protocol sets out end of waste criteria for the production and use of *pulverised fuel ash* (PFA) (including *cenospheres*) and *furnace bottom ash* (FBA) arising from combustion of coal with or without *co-combustion materials*. If these criteria are met, the resulting outputs will normally be regarded as having been fully recovered and to have ceased to be waste.
- 1.1.3 *Producers, processors* and *users* are not obliged to comply with the Quality Protocol. If they do not, the material will normally be considered to be waste and *waste management controls* will apply to its storage, handling, transport and application.²
- 1.1.4 This Quality Protocol does not affect the obligation on producers and processors to hold an *environmental permit* (in Northern Ireland a *waste management license* or a *Pollution Prevention and Control (PPC) permit* is required) and to comply with its conditions when *processing* and storing waste.
- 1.1.5 Producers should note that producing a fully recovered product may mean they must meet further legal obligations, e.g. REACH registration.³

1.2 The purpose of the Quality Protocol

- 1.2.1 This Quality Protocol has three main purposes:
- to clarify the point at which waste management controls are no longer required;
 - providing users with confidence that, where required, the PFA and FBA they use conforms to an *approved product standard*, or if specified a customer specification;
 - providing users with confidence that the material is suitable for use in *designated applications*; and
 - protecting human health and the environment (including groundwater).
- 1.2.2 In addition, the Quality Protocol describes acceptable good practice for the use of PFA and FBA (see Appendix C).

1.3 Complying with the Quality Protocol

The requirements that must be met for PFA and FBA to comply with this Quality Protocol and be regarded as having ceased to be waste vary depending on the designated application (as set out below).

²The material will remain a waste unless it has been demonstrated to have been completely recovered on a case-by-case basis having regard to the aims of the Waste Framework Directive and the need to ensure the Directive's effectiveness is not undermined.

³Waste is exempt from REACH (Registration, Evaluation, Authorisation and Restriction of Chemicals) [Regulation (EC) No 1907/2006] as it is covered by separate waste management controls. However, once waste has been fully recovered and ceases to be waste, waste management controls cease to apply and the REACH exemption due to the material's status as waste will no longer apply. Further information on REACH is available from the REACH UK Competent Authority website www.hse.gov.uk/reach or Helpdesk on 0845 408 9575 or email ukreacha@hse.gov.uk

Bound applications

- 1.3.1 PFA and FBA will normally be regarded as having ceased to be waste and therefore no longer subject to waste management controls provided the material:
- requires no further processing before use, that is:
 - it meets all the requirements of an approved product standard for the specific end use (see Section 2.3); and
 - if required, it meets any additional customer specifications (see Section 2.4).
 - is destined for use in one of the designated bound applications described in Section 4.

Grout applications

- 1.3.2 PFA and FBA will normally be regarded as having ceased to be waste and therefore no longer subject to waste management controls provided the material:
- requires no further processing before use, that is:
 - it meets all the requirements of an approved product standard for the specific end use (see Section 2.3); and
 - if required, it meets any additional customer specifications (see Section 2.4).
 - is destined for use in grouting applications only.

For all applications

- 1.3.3 Producers and processors must demonstrate that these criteria have been met. Section 3 provides details on compliance procedures including documentation requirements.
- 1.3.4 This Quality Protocol will be adopted as a technical regulation under *Technical Standards and Regulations Directive 98/34/EC* as amended. We recognise that there may be codes of practice or standards which apply in *European Economic Area* (EEA) States other than the UK setting out requirements for the production and use of PFA and FBA. We accept that PFA/FBA may cease to be waste provided that it has been produced in compliance with:
- a relevant standard or code of practice of a national standards body or equivalent body of any EEA State; or
 - any relevant international standard recognised for use in any EEA State; or
 - any relevant technical regulation with mandatory or de facto mandatory application for marketing or use in any EEA State.

These must give levels of product performance, protection of human health and the environment which are equivalent to those required by this Quality Protocol.

- 1.3.5 An outline of the main stages and control mechanisms of the Quality Protocol is presented in Figure 1. These are described further in Sections 2 and 3.

1.4 When Quality Protocol compliant material may become waste

- 1.4.1 Processors and users of PFA and FBA should note that, even if the Quality Protocol is complied with, the material will become waste again and subject to waste management controls if it is at any stage:
- disposed of; or
 - stored indefinitely with little prospect of being used.
- 1.4.2 If Quality Protocol compliant material is mixed with waste materials, the resulting mix will be considered to be a waste and subject to waste management controls. If Quality Protocol compliant material is mixed with non-waste materials, the resulting mix will not, as a result of this, be waste.

1.5 Failure to comply with the Quality Protocol

1.5.1 Where this Quality Protocol is not complied with (e.g. the PFA or FBA does not meet a specified product standard, or the processor cannot demonstrate evidence of compliance), the PFA or FBA produced will be considered to be waste.⁴ In such circumstances, the processor or user must comply with the appropriate waste management controls for the transportation, storage and use of the PFA or FBA and may be committing an offence if they do not do so.

1.5.2 Detailed guidance on waste management controls can be obtained from the Environment Agency's National Customer Contact Centre on 08708 506 506 or from its website www.environment-agency.gov.uk/subjects/waste, or NetRegs www.netregs.gov.uk. In Northern Ireland guidance can be obtained from NIEA's website www.ni-environment.gov.uk/waste-home/authorisation.htm.

1.6 Updating the Quality Protocol

1.6.1 We plan to review and update this document every two years from the date of its final publication.

1.6.2 However, this document may be subject to change before the review dates. Triggers for change could include:

- pollution incidents;
- a change in the market;
- a change in legislation or case law;
- a shift in understanding of the chemical composition or physical properties of PFA and FBA; or
- a significant change to the combustion process.⁵

1.6.3 This Quality Protocol may be withdrawn by the Environment Agency if it becomes apparent that it is generally being misapplied and/or misused.

1.7 Importing and exporting Quality Protocol compliant material

1.7.1 Processors intending to export material that complies with this Quality Protocol should be aware that, although the material may cease to be waste in England, Wales and Northern Ireland, the country of destination may take a different view. If the competent authority in the country of destination considers the material to be waste, the shipment will be subject to the controls set out in the Waste Shipment Regulation (EC No. 1013/2006).

1.7.2 Those intending to import Quality Protocol compliant material into England, Wales and Northern Ireland should be aware that, if the country of despatch regards the material as waste, the controls set out in the Waste Shipment Regulation will apply to the shipment. This is the case even though the material may be regarded as having ceased to be waste in England, Wales and Northern Ireland.

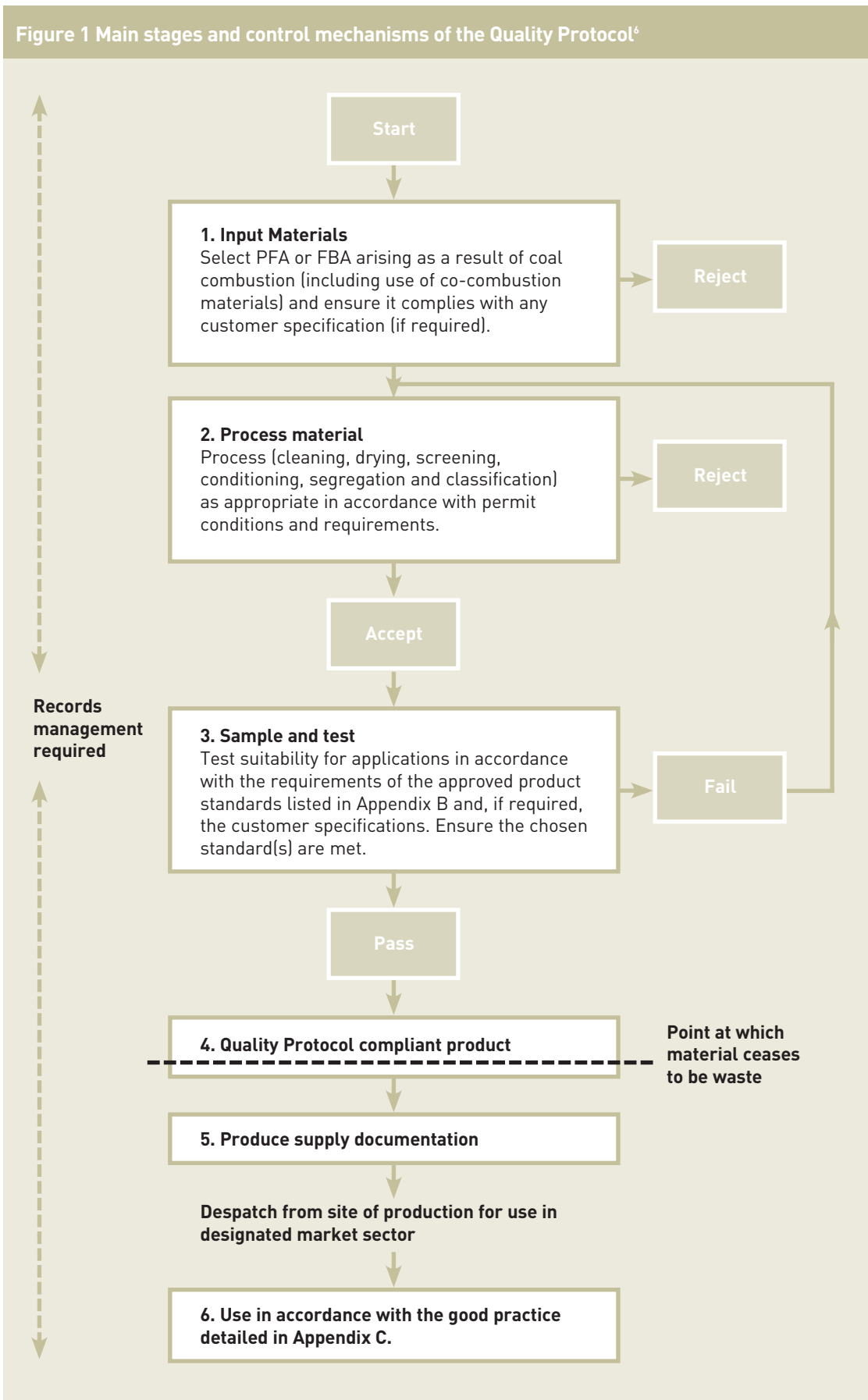
1.7.3 Before importing or exporting such material it is prudent to check with the competent authority for the country of despatch or destination. A list of the competent authorities can be found at:

http://ec.europa.eu/environment/waste/shipments/pdf/list_competent_authorities.pdf

⁴Unless it has been demonstrated to have been completely recovered on a case-by-case basis having regard to the aims of the Waste Framework Directive and the need to ensure the Directive's effectiveness is not undermined.

⁵A 'significant change' would be when a change to a plant process requires variation to the power station's environmental permit (in Northern Ireland this would be a variation to the power station's PPC permit); or where a change, for example to input materials, is likely to result in PFA and FBA that exceeds the parameters in Appendix F of the Technical Report on the manufacture of products from pulverised fuel ash (PFA) and furnace bottom ash (FBA). In both instances, the PFA and FBA shall be tested to ensure it is within those parameters.

Figure 1 Main stages and control mechanisms of the Quality Protocol⁶



⁶When material is rejected through this process due to non compliance with the Quality Protocol, the Environment Agency’s regulatory position statement should be consulted for use in England and Wales. The NIEA regulatory position statement should be consulted for use in Northern Ireland.

2. Producing PFA and FBA

2.1 Regulating the production process

- 2.1.1 The combustion of coal with and without co-combustion materials is subject to control under an environmental permit. This Quality Protocol does not affect the obligation on producers to comply with all the conditions of the environmental permit (or PPC permit if in Northern Ireland) that applies to the combustion of coal for energy production.
- 2.1.2 The PFA and FBA may be subjected to processing (e.g. segregation, screening, classification and/or carbon reduction) in order to meet the requirements of the approved product standard and, if required, customer specification. This is classified as a waste recovery operation and is subject to the waste management controls in the Waste Framework Directive and domestic legislation.
- 2.1.3 This Quality Protocol does not affect the obligation on processors to:
- hold an environmental permit (a waste management licence or PPC permit if in Northern Ireland) that authorises the storage and processing of PFA and FBA; and
 - comply with its conditions.

2.2 Criteria for producing PFA and FBA that ceases to be waste

- 2.2.1 To comply with this Quality Protocol, PFA and FBA must meet the requirements as set out below.

Bound applications

- 2.2.2 In order for PFA and FBA to cease to be waste when used in bound applications (as described in Section 4), the material must:
- meet all the requirements of an approved product standard specified for the particular end use (see Section 2.3);
 - if required, meet any additional customer specifications (see Section 2.4);
 - be accompanied by evidence of compliance through records management as detailed in Section 3; and
 - be destined for use in one of the designated bound applications described in Section 4.

Grout applications

- 2.2.3 In order for PFA and FBA to cease to be waste when used in grout applications, the material must:
- meet an approved product standard specified for the particular end use (see Section 2.3);
 - if required, meet any additional customer specifications (see Section 2.4);
 - be accompanied by evidence of compliance through records management as detailed in Section 3; and
 - be destined for use only in the grouting applications described in Section 4.

2.3 Meets the requirements of approved product standards

- 2.3.1 The producer must comply with all the requirements of an approved product standard for the proposed application.
- 2.3.2 Appendix B lists the approved product standard for the proposed application identified in Section 4.⁷ Standards are subject to regular review and processors must ensure they comply with the latest version.
- 2.3.3 This appendix is up-to-date as of the date of publication of this Quality Protocol. Additional standards, that are not nationally recognised (e.g. a British Standard), will need to be approved by the Environment Agency and NIEA for inclusion in this Quality Protocol when it is reviewed.

2.4 If required, meets any additional customer specifications

- 2.4.1 Customers may set additional specifications for the material. Such specifications may relate to the composition of the material or additional standards. Appendix B contains some examples of additional standards that might be relevant; however, they are for illustration only and not an exhaustive list.

2.5 All designated applications

- 2.5.1 Users are expected to follow the good practice outlined in Appendix C.

⁷For certain bound uses, the approved engineering standard will be customer specified (see Appendix B). These uses are: (a) ceramic tiles and brick-making; and (b) paints, plastics and rubber (cenospheres).

3. Providing evidence of compliance with the Quality Protocol

3.1 Evidence of compliance with the approved standard

- 3.1.1 Processors who choose to use the Quality Protocol must be able to demonstrate compliance with its requirements. If they are unable to do so the material they produce will be considered a waste.⁸
- 3.1.2 Some of the records specified below may already be required as part of the processor's environmental permit conditions (a waste management licence or PPC permit conditions if in Northern Ireland).
This Quality Protocol does not affect the obligations on processors to comply with environmental permit conditions (a waste management licence or PPC permit conditions if in Northern Ireland).
- 3.1.3 The record keeping requirements are additional to any statutory record-keeping obligations. However, some records may be used to fulfil both a regulatory obligation and evidence of compliance with the Quality Protocol.

3.2 Records management

- 3.2.1 In order to be able to demonstrate compliance with the Quality Protocol, processors must maintain records of each sale or supply of PFA and FBA.⁹
- 3.2.2 This documentation must include:
- date of supply;
 - customer's name, contact details and nature of business;
 - processor's name and contact details (including the address of the processing site);
 - details of the designated application for which the PFA or FBA is destined (see Section 4);
 - quantity supplied by weight;
 - a copy of a *material safety data sheet* (MSDS) if required by other legislation,¹⁰ and
 - the title of the product standard(s) with which the PFA or FBA supplied complies.

The documentation should also include:

- a statement that the product was produced in compliance with this Quality Protocol; and
 - confirmation that information on good practice (as set out in Appendix C) has been supplied to the customer
- 3.2.3 Processors shall retain records of all inspection and testing carried out.
- 3.2.4 The processor is expected to:
- keep and retain all the above specified records for a minimum of two years; and
 - make them available for inspection by the regulator (if requested).

⁸Unless it has been demonstrated to have been completely recovered on a case-by-case basis having regard to the aims of the Waste Framework Directive and the need to ensure the Directive's effectiveness is not undermined

⁹Supply documentation is not required for each delivery – only for each application / project.

¹⁰For additional guidance, refer to the Health and Safety Executive (HSE) *Approved Code of Practice: The compilation of safety data sheets* (3rd edition), L130, ISBN 0717623718, HSE Books, 2002. For further information, contact the HSE InfoLine on 0845 345 0055 or visit the HSE website www.hse.gov.uk

4. Application and use of PFA and FBA

- 4.1 As with all construction materials, users of PFA and FBA should:
- take full account of any environmental impact resulting from its use; and
 - ensure that its use does not compromise the future sustainable use of water resources or the integrity of designated conservation areas.

- 4.2 To comply with this Quality Protocol and to ensure protection of human health and the environment, the PFA and FBA products should be used in accordance with the good practice detailed in Appendix C.

4.3 Designated applications

4.3.1 PFA – bound applications

Used as an ingredient/component within a product and is fully bound within that product.

- Type I addition in concrete, e.g. as filler or lightweight filler aggregate.
- Type II addition in concrete, e.g. cementitious component in concrete.
- Cement manufacture, e.g. added as a raw material into kiln feed or added to Portland cement.
- Ceramic tiles and brick-making.
- Paints, plastics, rubber and similar.
- Lightweight filler in bitumen-bound materials, e.g. foamed bitumen or asphalt.
- Hydraulically bound mixtures in pavement construction, e.g. capping, sub-base and road base, and ground stabilisation.

4.3.2 PFA – grout

Uses where the material is hydraulically pumped or injected into the ground to fill void space.

- Lightweight filler for use in grouts.

4.3.3 FBA – bound applications

- Lightweight aggregate in concrete, e.g. block manufacture.

Appendix A Definitions

In this Quality Protocol, the words and phrases below have the following meanings.

Term	Description
Approved product standard	<p>These include:</p> <ul style="list-style-type: none"> ■ the standards listed in Appendix B against each particular specified use in the column headed 'approved product standards'; ■ any other standard approved by the Environment Agency for inclusion in this Quality Protocol; ■ a relevant standard or code of practice of a national standards body or equivalent body of any EEA State; ■ any relevant international standard recognised for use in any EEA State; and ■ any relevant technical regulation with mandatory or de facto mandatory application for marketing or use in any EEA State <p>These must give levels of product performance, protection of human health and the environment equivalent to those standards listed in Appendix B.</p>
Co-combustion materials	<p>Materials combusted with coal (e.g. biomass and petcoke). There are four main types of biomass which are co-fired with coal. These are olive, palm kernel, wood based and cereal based biomass. The maximum co-firing blend tends to be 10 per cent by weight, biomass to coal, but is specified on a case by case basis on each site's Environmental Permit (or PPC permit in Northern Ireland). Petcoke (Petroleum coke) is a carbonaceous solid derived from oil refinery coker units or other cracking processes.</p>
Cenospheres	Hollow PFA particles
Designated Applications	Applications that have been reviewed and approved by the PFA Technical Advisory Group for use under this Quality Protocol.
Environment Agency	The Environment Agency is the leading public body for protecting and improving the environment in England and Wales. Its job is to make sure that air, land and water are looked after by everyone in today's society, so that tomorrow's generations inherit a cleaner, healthier world.
Environmental Permit	<p>Environmental permits or exemptions issued under the Environmental Permitting (England and Wales) Regulations 2007, which came into force on 6 April 2008, or a position adopted at any particular time¹¹ by the Environment Agency in accordance with its guidance on the regulation of low-risk activities.</p> <p>From 6 April 2008, the following automatically became environmental permits:</p> <ul style="list-style-type: none"> ■ PPC permits issued under the Pollution Prevention and Control (England and Wales) Regulations 2000 (as amended); and ■ Waste Management Licences (WMLs) issued under the Environmental Protection Act 1990 (as amended). <p>Exemptions from the need for a Waste Management Licence, registered under Regulation 18 and Schedule 3 of the Waste Management Licensing Regulations 1994 (as amended) now come under Schedule 3 of the Environmental Permitting (England and Wales) Regulations 2007.</p>

¹¹This excludes any position that has been withdrawn.

European Economic Area (EEA)	The EEA States consist of the members of the EU (Austria, Belgium, Bulgaria, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, The Netherlands, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden and the UK) together with Iceland, Liechtenstein, Norway and Switzerland. Although the Channel Islands and the Isle of Man are part of the UK, they are not part of the EU and businesses registered there are subject to different licensing legislation.
Furnace bottom ash (FBA)	The residual solid material from the combustion of coal (at high temperatures, in excess of ~1000°C) in coal-fired power stations. FBA is the coarse ash that, in a molten state, adheres to the boiler tubes within the furnace and falls to the bottom of the furnace where it is cooled using high-pressure water jets and flushed from the bottom of the furnace.
Grout	PFA is mixed with cement and water to form a grout and then hydraulically pumped or injected into the ground. The material sets gradually. The setting time depends on the mixture design, water content and ground conditions.
Hydraulically bound mixtures (HBM)	Mixtures that set and harden by hydraulic reaction.
Input materials	Materials such as coal and co-combustion materials that are used in the coal combustion process to produce energy.
Material safety data sheet (MSDS)	A document containing data regarding the properties of a particular substance, including health and safety information. It includes the chemical and common names of all ingredients that have been determined to be health hazards if they constitute 1 per cent or greater of the product's composition (0.1 per cent for carcinogens). Also includes precautionary guidelines and emergency procedures for handling the product.
Northern Ireland Environment Agency (NIEA)	Northern Ireland Environment Agency (NIEA) is the leading public body in Northern Ireland responsible for protecting, conserving and promoting the natural environment and built heritage in Northern Ireland.
PPC permit (Northern Ireland)	A permit issued under the Pollution Prevention and Control Regulations (Northern Ireland) 2003 SR46. Establishes a pollution control regime for certain installations or mobile plants and includes combustion activities.
Processing	Any activity undertaken including cleaning, drying, classifying, screening, conditioning, sorting or selection that is required to ensure the PFA (including cenospheres) and FBA complies with necessary product standards or customer specifications.
Processors	Operators who process PFA (including cenospheres) and FBA, or ensure product quality control in order to meet necessary standards and specifications for sale in other applications. This may also be done on site of production;

Term	Description
Producer	<p>if so, for the purposes of this Quality Protocol, these producers should be classified as processors.</p> <p>The operator of a coal-fired power station that produces and may segregate PFA (including cenospheres) and FBA.</p>
Pulverised fuel ash (PFA)	<p>The residual solid material from the combustion of coal (at high temperatures, in excess of ~1000°C) in coal-fired power stations. PFA is the fine ash recovered from the gas stream, while FBA is the coarse ash recovered from the bottom of the furnace. For the purposes of this document, PFA is defined as including coal-combustion PFA, co-combustion PFA and cenospheres. PFA can also be known as 'fly ash' or 'coal fly ash' within standards, scientific literature and in countries outside the UK.</p>
Technical Standards and Regulations Directive 98/34/EC (TSD)	<p>The Technical Standards and Regulations Directive 98/34/EC seeks to ensure the transparency of technical regulations and is intended to help avoid the creation of new technical barriers to trade within the European Community.</p>
Users	<p>Individuals or organisations that obtain PFA (including cenospheres) or FBA from a processor or third party with the intention of using the material for a specific application.</p>
Waste management controls	<p>Controls under legislation that govern the treatment, handling, containment and storage, transportation and use of waste.</p>
Waste management Licence or exemption (Northern Ireland)	<p>An authorisation issued in Northern Ireland under the Waste Management Licensing Regulations (Northern Ireland) 2003 for the deposit, disposal and treatment of waste.</p>
Waste Management Licensing Regulations (Northern Ireland) 2003	<p>Provides for applications in Northern Ireland for waste management licenses, which authorise the deposit, disposal and treatment of controlled waste. Includes exemptions from waste management licensing.</p>
WRAP (Waste & Resources Action Programme)	<p>WRAP's vision is a world without waste, where resources are used sustainably. We work with businesses and individuals to help them reap the benefits of reducing waste, develop sustainable products and use resources in an efficient way.</p>

Appendix B Approved standards and specifications for determining the quality of PFA and FBA in Bound and Grout applications

Bound Applications

In this Quality Protocol, the words and phrases below have the following meanings.

	Approved product standard	Additional standards to be complied with if required by the customer*
<p>Hydraulic bound mixtures in pavement construction (PFA) Includes capping, sub-base and road base in road construction.</p>	<p>BS EN 13242: 2002+A1: 2007 <i>Aggregates for unbound and hydraulically bound materials for use in civil engineering work and road construction.</i></p>	<p>BS EN 14227-4: 2004 <i>Hydraulically bound mixtures. Specifications. Fly ash for hydraulically bound mixtures.</i></p> <p>BS EN 14227-3: 2004 <i>Hydraulically bound mixtures. Specifications. Fly ash bound mixtures.</i></p> <p>BS EN14227-14: 2006 <i>Hydraulically bound mixtures. Specifications. Soil treated by fly ash.</i></p> <p>Specification for Highway Works Series 800</p>
<p>Lightweight filler in bitumen-bound materials (PFA) Uses include foamed bitumen, asphalt.</p>	<p>BS EN 13055-2: 2004 <i>Lightweight aggregates. Lightweight aggregates for bituminous mixtures and surface treatments and for unbound and bound applications.</i></p> <p>BS EN 13043: 2002 <i>Aggregates for bituminous mixtures and surface treatments for roads, airfields and other trafficked areas.</i></p>	
<p>Additions in concrete (PFA) Includes use as a cementitious component in concrete (Type II addition), filler aggregate (Type I addition) and lightweight filler aggregate (Type I addition)</p>	<p>BS EN 450-1: 2005+A1:2007 <i>Fly ash for concrete. Definition, specifications and conformity criteria.</i></p> <p>BS EN 12620: 2002+A1:2008 <i>Aggregates for concrete.</i></p> <p>BS EN 13055-1: 2002 <i>Lightweight aggregates. Lightweight aggregates for concrete, mortar and grout.</i></p>	<p>BS EN 450-2: 2005 <i>Fly ash for concrete. Conformity evaluation.</i></p> <p>BS EN 206-1: 2000 <i>Concrete. Specification, performance, production and conformity.</i></p> <p>BS 8500-1: 2006 <i>Concrete. Complementary British Standard to BS EN 206-1. Method of specifying and guidance for the specifier.</i></p>

Bound Applications

In this Quality Protocol, the words and phrases below have the following meanings.

	Approved product standard	Additional standards to be complied with if required by the customer*
<p>Additions in concrete (PFA) Continued.</p>		<p>BS 8500-2: 2006 <i>Concrete. Complementary British Standard to BS EN 206-1. Specification for constituent materials and concrete.</i></p> <p>BS 3892-2:1996 <i>Pulverized fuel ash. Specification for pulverized-fuel ash to be used as a Type I addition.</i></p>
<p>Cementitious component in cement manufacture (PFA)</p>	<p>BS EN 197-1: 2000 <i>Cement. Composition, specifications and conformity criteria for common cements.</i></p>	<p>BS EN 413-1: 2004 <i>Masonry cement. Composition, specifications and conformity criteria.</i></p> <p>BS EN 14216: 2004 <i>Cement. Composition, specifications and conformity criteria for very low heat special cements.</i></p> <p>BS EN 15368: 2008 <i>Hydraulic binder for non-structural applications: Definitions, specifications and conformity criteria.</i></p> <p>BS EN 206-1: 2000 <i>Concrete. Specification, performance, production and conformity.</i></p> <p>BS 8500-1: 2006 <i>Concrete. Complementary British Standard to BS EN 206-1. Method of specifying and guidance for the specifier.</i></p> <p>BS EN 14227-1: 2004 <i>Unbound and hydraulically bound mixtures. Specifications. Cement bound granular mixtures.</i></p> <p>Cement manufacturers may specify requests additional to these standards in order to balance the chemistry (e.g. silica and alkalis) in raw feed materials for cement clinker manufacture.</p>

Bound Applications

In this Quality Protocol, the words and phrases below have the following meanings.

	Approved product standard	Additional standards to be complied with if required by the customer*
Lightweight aggregate in concrete (FBA)	BS EN 13055-1: 2002 <i>Lightweight aggregates. Lightweight aggregates for concrete, mortar and grout.</i>	<p>BS EN 206-1: 2000 <i>Concrete. Specification, performance, production and conformity.</i></p> <p>BS 8500-1: 2006 <i>Concrete. Complementary British Standard to BS EN 206-1. Method of specifying and guidance for the specifier.</i></p> <p>BS EN 771-3: 2003 <i>Specification for masonry units. Aggregate concrete masonry units (dense and lightweight aggregates).</i></p> <p>BS EN 771-4: 2003 <i>Specification for masonry units. Autoclaved aerated concrete masonry units.</i></p> <p>BS EN 998-1: 2003 <i>Specification for mortar for masonry. Rendering and plastering mortar.</i></p> <p>BS EN 998-2: 2003 <i>Specification for mortar for masonry. Masonry mortar.</i></p>
Aggregate in road construction (FBA)	BS EN 13242: 2002+A1:2007 <i>Aggregates for unbound and hydraulically bound materials for use in civil engineering work and road construction.</i>	<p>Specification for Highway Works Series 600</p> <p>Specification for Highway Works Series 800</p>
Ceramic tiles and brick- making	PFA material enters a separate manufacturing process where it is controlled. Therefore this Quality Protocol accepts the use of a 'customer specification' agreed between the processor and the customer.	
Paints, plastics, rubber and similar (cenospheres)	PFA material enters a separate manufacturing process where it is controlled. Therefore this Quality Protocol accepts the use of a 'customer specification' agreed between the processor and the customer.	

Grout Applications

In this Quality Protocol, the words and phrases below have the following meanings.

	Approved product standard	Additional standards to be complied with if required by the customer*
<p>Grout applications Used as a cementitious component and a lightweight filler aggregate in grouts</p>	<p>BS EN 12715: 2000 <i>Execution of special geotechnical work. Grouting.</i></p>	<p>BS 3892-3: 1997 <i>Pulverized fuel-ash. Specification for pulverized-fuel ash for use in cementitious grouts.</i></p> <p>BS EN 13055-1: 2002 <i>Lightweight aggregates. Lightweight aggregates for concrete, mortar and grout.</i></p>

*The customer specifications listed are not exhaustive and are provided as examples only

Appendix C Good practice for the use of PFA and FBA

All applications

- All applications of PFA and FBA permitted under this Quality Protocol must comply with all recommendations from the Health and Safety Executive (HSE)¹² such as using appropriate personal protective equipment (PPE) and dust suppression measures.
- To help characterise a site and locate aquifers, refer 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* www.environment-agency.gov.uk/research/library/publications/40741.aspx

Bound applications

- When using products in contact with water intended for human consumption, follow the guidance given in Drinking Water Inspectorate (DWI) Advice Sheet 7 Construction products for water retaining structures in water collection, treatment and distribution systems. This document can be found on the DWI's website www.dwi.gov.uk/31/pdf/Advicesheet7.pdf

Grout applications

- 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 number¹³

¹²More information can be found on the HSE website www.hse.gov.uk

¹³If the BRE code of practice is changed so that it no longer meets Environment Agency and NIEA requirements, grout applications within the Quality Protocol may be withdrawn.

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**Waste & Resources
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