

# The Environmental Status of Ferrous Slag in the UK

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- Early 90's EA had concerns regarding Sulphide leaching from air-cooled blast furnace slag
- Minor pollution incidences from old BFS many years ago
- Modern slags have lower S contents
- MPA (then QPA) joined forces with the Environment Agency (then National River Authority) to produce a joint guidance document for the use of BFS in unbound applications

# First Air-Cooled Blast Furnace Slag Guidance Document



## THE USE OF AIR COOLED BLASTFURNACE SLAG AS AN UNBOUND AGGREGATE IN THE CONSTRUCTION INDUSTRY

## BACMI / ENVIRONMENT AGENCY JOINT GUIDELINES

*These guidance notes have been jointly prepared by the British Aggregate Construction Materials Industry and the Environment Agency. The document sets out clear and simple guidance which if followed will minimise the risk of water pollution.*

### 1. INTRODUCTION

Air cooled blastfurnace slag is a by-product of the iron making process. It consists primarily of the silicates and aluminosilicates of calcium and magnesium together with compounds of sulphur, iron, manganese and other trace elements. The solidified slag is usually processed by crushing and screening, then placed in stockpiles prior to use.

In the UK many tens of millions of tonnes of unbound blastfurnace slag have been used in construction projects without any known environment impact and the use of slag as a construction material is regulated by BS 1047. The standard recognises potential for water pollution from sulphur species unless appropriate measures as described below are taken. Concerns about water pollution largely only apply when slag is used as a bulk fill in water logged or poorly drained areas. However, slag is used for a variety of other purposes and good engineering design, appropriate selection of materials and adherence to the specific guidance given below will minimise the risk of pollution.

### 2. THE ENVIRONMENT AGENCY APPROACH

The Agency recognises that blastfurnace slag can be used as a construction material in many situations without causing water pollution. The Agency is fully aware that blastfurnace slag is a by-product of an industrial process and if not used in the construction industry would have to be disposed of to landfill, with the associated potential to cause water pollution. The Agency approach to the use of blastfurnace slag is to fully accept its use in appropriate circumstances according to the guidelines so as to provide adequate protection to the aquatic environment.

### 3. SLAG AND THE WATER ENVIRONMENT

BS 1047 recognises that under specific ground conditions such as poorly drained soils, bacterial or chemical action on slag and leachate can give rise to sulphides and other compounds that can be harmful if they enter the water environment. The guidance provided below has been designed to prevent such problems arising.

### 4. SPECIFIC GUIDANCE

- (i) Materials stored in exposed stockpiles should be utilised in preference to freshly made slag.
- (ii) Unbound blastfurnace slag should not be used in water logged or poorly drained areas.
- (iii) Unbound blastfurnace slag should not be used below the water table.
- (iv) Where unbound slag is used in the construction of large exposed trafficked areas such as vehicle parks and major carriageways good practice, e.g. compaction and avoidance on ponding, should be followed to minimise ingress of water.
- (v) Situations where the use of large quantities of unbound blastfurnace slag could give rise to water pollution should be identified at the materials selection stage of the construction project and a method statement produced setting out details of how the slag will be stored and handled and the measures taken to protect the aquatic environment.

For further information and advice either of the listed below.

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Office on 0645 333 111.

The 24-hour emergency hotline number for reporting all environmental incidents relating to air, land and water.

**ENVIRONMENT AGENCY  
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- In view of changes within European standardisation, the document was updated
- The Environment Agency were satisfied with the revised document **but** the waste regulatory department within the EA refused to sign up to this document unless it clearly states that slag is a waste and needed to be regulated as such
- This was a result of the European definition of waste - Palin Granite case

- Stand off between the slag industry and the EA
- Several meetings over many years followed to try and find common ground
- The EA started to develop Quality Protocols for waste materials
- The Slag Industry agreed to work together with EA on a ‘**without prejudice**’ basis (The industry consider slag to be by-products)

- Since 2007 Blast Furnace Slag classified as By-Product - no need for a protocol
- However, Steel Slag (BOS and EAF) did not meet the Environment Agency's interpretation of the definition of a by-product and therefore they considered it to be a waste
- Technical Advisory Group (TAG) formed by the EA, Waste Recycling Action Programme (WRAP) and the slag industry to develop a quality protocol for **steel slag** which ultimately defines the recovery point
- To do this the following stages have to be achieved:

- Financial impact assessment (FIA) highlighting
  - Benefits to industry
  - Benefits to environment – landfill avoidance
  - Market certainty
  - Viable business case

- Risk Assessment
  - Type of applications (bound and unbound)
  - Sampling strategy
  - Chemical analysis and leaching data
  - Evaluation – modelling of various scenarios
  - Risk Assessment at different levels



- **Technical Report**
  - Steel Slag manufacturing information
  - Processing and weathering procedures
  - Material data sheets
  - Storage and haulage
  - Risk assessment – depending on end use

- The Quality Protocol document
  - Very brief summary of the technical report
  - Defines the recovery point when the Steel Slag ceases to be a waste and becomes a product
  - List of the European harmonised standards relevant to the applications of the steel slag
- Quality Protocol implementation
- Independent auditing using a third party

- Started in 2006
- A draft protocol completed in 2007
- This was rejected by the EA in 2007 based on insufficient data, relevance of test methodology and questionable representation of tested samples
- Since then sampling strategy was developed
- Leaching tests were performed in line with EU testing methods
- Different approach to the original risk assessment adopted
- But, the goalposts continue to change

- Interim - Steel slag accepted as **product** once bound.  
i.e. asphalt or concrete
- If a protocol is achievable - expected during 2012
- If not, unbound will have a regulatory position with the  
EA