

# Lessons Learnt at London Bridge - Cement Replacement



## Introduction

As part of the commitment of the London Bridge Redevelopment to minimise the environmental impact of the scheme the team set an objective to achieve an average of 40% cement replacement with recycled material. It was envisaged at an early stage that this would be achieved using Ground Granulated Blast-furnace Slag (GGBS), which is a by-product of the steel production industry. The maximum rate of replacement for GGBS, whilst still exhibiting the same strength gain characteristics as Ordinary Portland Cement (OPC), is 50%.



**Figure 1 - Ground Granulated Blast-furnace Slag (GGBS)**

## Availability of GGBS

The delivery team identified at an early stage that GGBS was not a standard product from the preferred supplier within the London Area. GGBS is not readily available in the south east of England, with supplies being sourced via a broker in Purfleet from Port Talbot in South Wales, Gent in Belgium, and Teesside in England. This added a great deal of haulage to the delivery of the product, partially offsetting the environmental benefit of the product. The GGBS was considered a special order and as such attracted a higher premium for its supply.

## Alternative Replacement

An alternative replacement for the GGBS is Pulverised Fuel Ash (PFA), which is a by-product of the coal fired power station industry. This recycled product cannot be replaced at such a high rate within the concrete, with only 25% being possible whilst still exhibiting the same strength gain characteristics as Ordinary Portland Cement (OPC). This has adversely affected the overall percentage of the cement replacement possible within the scheme and means that an

average replacement of 40% may no longer be achievable. This product is readily available from our preferred supplier with the raw material being provided from Drax Power Station in Yorkshire.



**Figure 2 - Pulverised Fuel Ash (PFA)**

## Summary

The use of PFA within the London Bridge Redevelopment Scheme has now been incorporated across both the Main Station and Western Structures elements of the scheme. The lack of availability of the originally specified product has made the 40% replacement target very difficult to achieve. The delivery and design team are identifying structural elements that do not require high early strengths and can therefore utilise higher replacement rates than normal, enabling the team to deliver the most sustainable product possible to the end user. The team are also looking into

## Targets & Objectives

The incorporation of cement replacement affects the following targets and objectives:

- CEEQUAL – material use; transport; carbon and energy
- London Bridge Sustainable Delivery Statement – cost reduction; materials; carbon
- London Bridge objectives & targets – reduce the cost of delivery; reduce consumption of virgin materials; minimise carbon.