Recycled and secondary aggregates have been used on a variety of projects within the Heathrow Terminal 5 development, including the use of recycled concrete as a working platform beneath new airfield pavements. This case study focuses on an innovative use of crushed glass and incinerator bottom ash in the binder course for temporary site roads. Their use has resulted in both financial and environmental benefits and no problems have been encountered with technical performance. Subject to additional monitoring of performance, these materials will be incorporated into the design for permanent works at T5.

Background

Project/site: Terminal 5 Development
Specification: RSA for pavement construction

The nature of the project:
- Type: Airport terminal construction
- Cost: £4.2 billion
- Location: Heathrow Airport
- Date: September 2002 – March 2008
- Client: BAA
- Designer and Contractor: the use of RSA in this instance has been a partnership between the client, Laing O’Rourke and Aggregate Industries
- Source of material: glass from municipal bottle banks and incinerator bottom ash (IBA) from domestic waste incinerators
- Material: Crushed glass mix and IBA
- RSA application: binder course for road construction
- Amount of materials: 14,200 tonnes.
How recycled or secondary aggregates were used on the project

- the aggregates produced from crushed glass and incinerator bottom ash were used for temporary carriageway works on the T5 construction project at Heathrow, and the process was championed by Aggregate Industries following tests at the company’s West Drayton depot
- the first supply of 28 mm HMB (high modular base) binder course contained 10 per cent glass mix and a total of 10,447 tonnes were laid on the site. This mix also contained 30 per cent recycled asphalt plannings (RAP)
- the second mix contained 10 per cent glass, 10 per cent IBA and 30 per cent RAP, giving a material with a 50 per cent recycled content. 3753 tonnes have been laid in 2004
- no logistical problems have been encountered, either with security of supply or storage/transport of materials
- substantial savings have been made through a reduction in the cost of supply and production.

The following indicators were used by the project:

- cost savings
- quantity of virgin aggregate saved by using RSA
- transport miles avoided and consequent CO2 savings.

These indicators helped to quantify the benefits of using RSA and have helped to make the case for further uses on the T5 Project. Due to the success of this and other uses of RSA, the T5 Project and BAA are firmly committed to using RSA wherever possible.

Why recycled or secondary aggregates were used on this project

BAA’s sustainable development policy sets the context for improving on its environmental performance. Using recycled and secondary aggregates enables the company to meet its commitment to sustainable construction and to converge its materials policy requirement of minimising the use of virgin aggregates and reducing the impact of both transport and quarrying operations on neighbouring communities. BAA also works closely with its supply chain companies to improve sustainability performance. In this instance, the supplier was able to suggest an innovative use for recycled materials on the T5 project.

Sustainable development is part of running a responsible business. Whatever the business does, the challenge is to make sure that opportunities are taken to maximise the economic and social benefits, and to improve environmental quality. Minimising waste and reducing transport impacts through using RSA is a good example of integrating environmental, social and economic objectives.

Technical information including specification

Recycled and crushed glass from bottle banks and IBA are available in significant quantities in the West London area, ensuring a sustainable supply. Both the glass and IBA were procured in a form suitable for immediate use. The products met the client’s specification for all physical characteristics. Research has suggested (CIRIA, R167, 1997) that un-bound IBA should be checked for potential leachate pollution, but in this application the IBA has bound in a bituminous mix.

Technical performance/benefits of using RSA

The use of crushed glass and IBA has not impacted on the technical performance of the binder layer. The benefits are financial and environmental.
Problems encountered and how these were overcome

Suppliers responded positively to the commitment to sustainability outlined in BAA's various policy statements. Suppliers were able to source the materials from readily-available local sources and there were no problems with regard to security of supply. Financial savings were immediately apparent and this meant that the use of RSA on the project was a "win win" option.

Direct benefits:

- the previous mix used a 28 mm HMB binder course
- the glass mix alone offers a £0.42/tonne saving and the glass/IBA mix offers a £1.06/tonne saving against the standard materials
- based on these savings and the quantities used, £8366 has been saved on the use of temporary roads, during the period October 2003 to June 2004.

Indirect benefits:

A number of indirect benefits were also achieved, these included:

- reduction in use of virgin aggregates
- reduction in volume of materials that might otherwise go to landfill
- reduction in carbon dioxide emissions due to reduction in vehicle miles and in extraction/processing activities.

These financial benefits were direct and immediate.
What has been learned from the project and how could this be put into practice on future projects?

- BAA's proactive approach as a construction client encouraged innovation by forward-thinking suppliers
- clients should be open to innovation from suppliers
- management of risk for new products through successful trials
- win-win environmental/economic situations do not have to be excessively complicated or risky
- environmental benefit through reductions of up to 50 per cent of virgin aggregates
- environmental benefit through reuse of materials which would otherwise go to waste
- suppliers can assist BAA achieving its environmental and sustainability targets
- clients should be open to suggestions from suppliers and contractors regarding change in traditional specification
- options need to be explored early enough in the programme to maintain flexibility of supply of material
- specification of options needs to be early enough in order for effective trials to be carried out
- even on very large construction projects, relatively small-scale initiatives make a significant contribution to environmental performance and cost-savings.

Glossary of terms

- HMB – high modular base
- IBA – incinerator bottom ash

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