TITLE: Recycled aggregate use in the A2/A282 Dartford improvement

Construction Project: Road Building
Application: Bitumen bound base, binder and surface course
   Unbound sub-base
   Capping
Product: Aggregates for bitumen bound base, binder and surface course
   Type 1 unbound sub-base
   Class 6F4 capping
   Class 6F5 capping
Material: Recycled asphalt
   Spent railway ballast
Region: South East
Date: 2006 (construction due to commence June 2006)
Location: Dartford, Kent
Details of the supply chain: Highways Agency (Client), Costain Limited (Contractor), Foster Yeoman (Recycled Aggregate Supplier).
Conditions of contract: Highways Agency Early Contractor Involvement

Activity:

The A2/A282 Dartford Improvement will see the A2 widened from three to four lanes between Bean and its junction with the M25/A282, a total distance of 2.4km. The £125m scheme includes link roads from the M25/A282 in the north and A2 in the east.

Background:

The A2/A282 Dartford Improvement is being constructed in the period 2006 to 2008. The Client is the Highways Agency.

The choice of materials was driven by the requirements of the Specification for Highways Work and Client cost expectations. No specific requirements for the use of sustainable construction practices were included in the contract.

The materials are being supplied by Foster Yeoman from their virtual quarry at Isle of Grain and storage-production facilities at Northfleet and Purfleet. All three facilities have a sea terminal for delivery by ship, while Isle of Grain and Purfleet are connected to the Mendip limestone quarries by rail. Foster Yeoman were an integral part of the early contractor involvement team so their ability to provide materials with Recycled and Secondary Aggregate (RSA) and best value was fully included in the design produced and construction methodology.

Comparative performance

The RSA give equivalent performance to the primary aggregates it replaces.

Material details

Sub Base
The RSA used will be Type 1 sub base and Class 6F5 capping produced by Foster Yeoman from spent railway ballast at their Isle of Grain virtual quarry. It will be transported to site by tipper lorry and used in exactly the same way as primary aggregate with no special technique or
methods required. A total of 41,230 tonnes of recycled railway ballast will be used compared to a total of 64,790 tonnes of primary aggregate crushed limestone.

**Surfacing Materials**

Recycled asphalt will be partly used in the production of bituminous surfacing materials at Foster Yeoman’s Purfleet facility. The recycled asphalt will be obtained by processing a combination of production plant waste and asphalt arisings collected from highway maintenance operations.

**Specification, quality assurance and design**

The Specification for Highway Works, November 2005 amendments will be the specification for the project and includes the harmonised European Standards for aggregates.

The RSA used will be produced in accordance with the WRAP Quality Protocol for the production of aggregates from inert waste.

**Cost benefits**

The use of recycled railway ballast in sub base and capping will allow cost benefits of the order of £0.60/tonne for the total of 41,230 tonnes used.

The use of recycled asphalt in surfacing materials will not cause any increase in the cost of the surfacing materials used.

**CO$_2$ savings and other environmental benefits**

The CO$_2$ emissions calculation tool was employed to analyse 3 options as follows:

- **Option 1** – All primary aggregates option for Type 1 Sub base, Granular Capping and Bituminous Surfacing Materials.
- **Option 2** – As built option with RSA used for 25% of Type 1 Sub base and Granular Capping materials and recycled asphalt used for 5% of surface course and 25% of binder and base course materials.
- **Option 3** – Maximum recycled option with RSA used for 100% of Type 1 Sub base and Granular Capping materials and recycled asphalt used for 5% of surface course and 50% of binder and base course materials.

The outputs generated as show below:

<table>
<thead>
<tr>
<th>Option</th>
<th>CO$_2$ Emissions Tonnes</th>
<th>Comparison with As Built</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Unbound</td>
<td>Bituminous</td>
</tr>
<tr>
<td>All Primary Aggregates</td>
<td>1,832</td>
<td>2,413</td>
</tr>
<tr>
<td>As Built</td>
<td>1,518</td>
<td>2,353</td>
</tr>
<tr>
<td>Maximum Recycled</td>
<td>1,203</td>
<td>2,292</td>
</tr>
</tbody>
</table>

The CO$_2$ emissions calculated for the options in this case study demonstrate that the all primary aggregates option resulted in a 10% increase in CO$_2$ emissions compared to the as-built option. If the maximum recycled option was employed a further 14% saving could have been introduced however the local availability of RSA restricts the use of this option.
Contact details

Client:
Highways Agency

Contractor:
Costain Limited
Contact:
Paul Boulton
paul.boulton@costain.com

Designer:
Jacobs Babtie

Recycled Aggregate Supplier:
Foster Yeoman
Contact:
Roland Hall
ro.hall@foster-yeoman.co.uk