CRUSHED CONCRETE AND BRICK

WHAT ARE CRUSHED CONCRETE AND BRICK?

Crushed concrete and brick are recycled products that primarily derive from the demolition of buildings. Contaminants such as timber, steel and plastics are removed, and the materials are further crushed and screened before incorporation into road infrastructure

WHAT ARE THE BENEFITS OF USING CRUSHED CONCRETE AND BRICK?

The benefits of using crushed concrete and brick in road and rail infrastructure are as follows:

- **Environmental benefits**
  - Reduced use of quarry rock, reduced landfilling.
- **Performance benefits when used in granular road applications**
  - Crushed concrete has greater levels of stiffness and strength than conventional road construction materials for granular subbase applications.
- **Performance benefits for railways**
  - Crushed concrete and crushed brick have comparable properties to conventional materials used for capping layers in the railway structure.

WHERE ARE THEY USED?

Recycled concrete and brick aggregates have been used to produce concrete, mortar, and brick tiles, and are suitable for pipe backfilling. Additionally, they can be re-used as aggregates in concrete as a replacement for quarried crushed rock.

Crushed concrete may also be used in road base, as an aggregate replacement in asphalt, in gravel paths and driveways, in wall cage fill, in covers for drainage and in retaining walls.

Further, research is underway for using blends of crushed brick and crushed concrete as replacements for natural capping materials in railway layers.

HOW MUCH CAN BE USED?

Research suggests that recycled concrete aggregates perform similarly to natural aggregates. However, their functionality and durability must be assessed before adding them to pavements. Up to 100% replacement of natural aggregates can be considered for hydraulically bound or unbound lower pavement layers, capping materials in railways and other applications such as backfill, retaining walls and drainage.

VIC, SA, QLD, WA and NSW all have various specifications that allow up to 100% crushed concrete to be used in granular applications for intermediate course, base and subbase, depending on the specific application. Similarly, brick may be applied as a supplement for unbound or bound granular intermediate course, base or subbase, up to 15% in QLD, 20% in SA and NSW, and 50% in VIC, in certain applications.

Approximately 8,000 tonnes of construction and demolition waste (which includes crushed concrete and crushed brick) can be diverted from landfill for each kilometre of road constructed.

WHAT OPPORTUNITIES ARE THERE FOR IMPROVING ADOPTION?

Some key barriers to adoption include a lack of standards and specifications in some applications. There is also concern, about contamination, lack of awareness around the cost benefits of recycling over landfilling, and haulage distances between the material sources, their processing facilities and their site of use.

Several strategies to remove these barriers and create a sustainable market for recycled crushed concrete and brick have been proposed. For example, Sustainability Victoria is developing educational materials for designers and builders to improve the onsite separation of brick from other construction and demolition waste. It is also intensifying its promotion of recycling these materials into pavement construction.

Increased awareness, educating relevant bodies and further incentivising waste generators away from landfilling will create more opportunities. Development of specifications for more use options should also support further adoption.

CRUSHED CONCRETE AND CRUSHED GLASS: VIC

Recycled materials can often be used in tandem and the Dingley Bypass, completed in Victoria in 2016, is a great example of this. The project used a mix of recycled materials, including crushed concrete and recycled crushed glass as a sand replacement. This project saw savings of 23,000 tonnes of material, 770 fewer truck loads and 1,695 tonnes of carbon emission reduction. More than 269,000 tonnes of sustainable construction materials were used along the 6.4 km project.

Dingley Bypass - Project Profile

LOCATIONS

NATIONAL TRANSPORT RESEARCH
CENTRE AND HEAD OFFICE:
80A TURNER STREET
PORT MELBOURNE, VIC 3207

OFFICES IN:
BRISBANE, SYDNEY, ADELAIDE, PERTH, CANBERRA

This case study is part of the project Best Practice Expert Advice on the Use of Recycled Materials in Road and Rail Infrastructure. This project has been funded by the Australian Government.

CRUSHED CONCRETE AND CRUSHED GLASS: CANTERBURY BANKSTOWN, NSW

The increased use of recycled crushed glass (RCG) was investigated as part of City of Canterbury Bankstown's rehabilitation program. A recycled crushed concrete (CC) was identified as a source material for use in subbase and road base applications. This material was characterised by ARRB in their laboratory. This was then blended with RCG to optimise its resistance to permanent deformation. It was identified that the addition of RCG to CC could improve gradation, resulting in easier compaction and improved permanent deformation resistance. As a result of this, testing an optimised blend of 70% CC/30% RCG was chosen for production scale-up, with a view to implementing field trials.

ARRB engaged Fulton Hogan (FH) as a subcontractor to look at the feasibility of scaling-up the blend through plant production for the planned field trial. FH blended the RCG and CC materials using an asphalt batch plant, then laid and compacted some material in a test pad in their yard.

In February 2022, a trial section was constructed as part of rehabilitation works on Marion Street, Georges Hall, near Bankstown Aerodrome. This work involved laying an approximately 270-m section with approximately 460 tonnes of the 70% CC/30% RCG blend being incorporated into a 200 mm thick subbase. This work was undertaken for City of Canterbury Bankstown by ARRB in partnership with Fulton Hogan, who were responsible for scale-up and construction.

ARRB will be undertaking performance monitoring on this section to assess its long-term suitability.

A grant from EPA NSW, under the Civil Construction Market Program, enabled City of Canterbury Bankstown to undertake this work to gain more sustainable outcomes as part of its rehabilitation program.

One key takeaway from this trial is that it shows how a key barrier to the uptake of recycled materials – lack of awareness and education – was overcome by the enthusiasm of a local government authority to test innovative materials on their network. Another key benefit is the demonstrated readiness of industry to innovate and scale up to provide bespoke recycled materials solutions. This full-scale construction trial is a clear indicator that industry is ready to implement recycled materials, especially with the backing of the asset owner, in this instance City of Canterbury Bankstown.

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