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WESTERN AUSTRALIA ROAD RESEARCH INNOVATION PROGRAM

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OPTIMISING THE USE OF RECYCLED MATERIALS IN GRANULAR SUPORT LAYERS IN WESTERN AUSTRALIA

With an increased focus to identify alternative sustainable materials for civil infrastructure applications, Main Roads WA have assessed the potential higher-value applications of two recyclable materials, **RECYCLED CRUSHED GLASS AND CRUSHER DUST**, for implementation in granular support layers of roads here in Western Australia.

The implementation of recycled materials is intended to:

- Reduce the reliance on quarried or natural resources while improving the performance of granular support layers
- Use materials with lower processing requirements
- Minimise cost and maximise environmental benefits.

RECYCLED CRUSHED GLASS (RCG)

In WA, around 1/3 (or 46,000 tonnes) of glass disposed of is recovered and recycled through commercial and municipal waste programs.

Collection of glass waste in a recycling facility (© belish / Adobe Stock)

Recycled glass is considered an under-develop sector by the Department of the Environment and Energy (2018) and is a suitable material for use in many road infrastructure applications as part or complete material replacement:

- Embankments (up to 20% by mass)
- Flexible pavement base materials (up to 20% by mass)
- Asphalt pavement layer materials (up to 5% by mass)
- Pipe bedding (up to 100% by mass)
- Backfill for structures/roadbeds/retaining walls (up to 20% for structural support and 100% for non-structural applications.

Main Roads WA Specification 302 Earthworks already permits the use of recycled crushed glass (up to 100% mass) in embankment construction.

Recycled crushed glass (© pjhpix / Adobe Stock)

Drainage pipe preparation (© edojob / Adobe Stock)

RCG passing the 4.75mm sieve has the potential to improve the engineering properties of drainage layers, embankments, structural fill and subgrade applications at quantities of 20-30% mass.

In recent years, RCG has been used in granular support layers in a few metropolitan projects across Perth. The economic viability of RCG greatly depends on the haulage distance to the construction site and a stable source of material.

CRUSHER DUST

Crusher dust (cracker dust/quarry fines) is a multi-purpose by-product of mining and quarrying that is designated as the fine fraction of crushed stone after primary and secondary crushing and separation on a 4.75mm sieve.

Road infrastructure applications include:

- Pavement working platforms
- Unbound aggregate for base and embankment
- Fine aggregate filler for low strength materials
- Cost-effective filler in hot mix asphalt, concrete mixes or to improve natural soil properties such as water demand through blending.

Drainage pipe preparation (© esalienko / Adobe Stock)

Produced at ~8 to 20% of the total mined aggregate, material properties may vary depending on the quarry source rock as well as the particle size and shape caused by the crushing equipment.

The Perth region is serviced by 5 active quarries licensed to produce between 1 to 2 million tonnes per annum of aggregate.

While some local quarries do have an existing surplus of crusher dust, a local completing market for this material already exists.

Internationally, crusher dust is viable for large scale implementation as an additive to improve the engineering properties of clayey/expansive soils at quantities of up to 35% by mass.

However usage in granular support layers is not widely accepted in Australia although it is specified for use in the USA.

Material derived from granite showed potential suitability for usage as a drainage layer.

Primary OHS risk associated with crusher dust is work exposure that is managed via workplace controls.

Main Roads WA does not limit the use of of crusher dust in road infrastructure projects.

For more information visit: warrip.com.au