OPTIMISING THE USE OF RECYCLED MATERIALS IN GRANULAR SUPPORT LAYERS IN WA

Review the current national and international practices as well as evaluate local feasibility for increasing recycled crushed glass and crusher dust usage in unbound pavements in WA.

In Western Australia (WA), the recycling of waste materials into civil infrastructure applications has typically been minimal. However, there is an increased focus on implementing recycled materials into higher value applications such as pavement construction with the intention of reducing the reliance on non-renewable resources while improving the performance of granular pavement support layers in WA.

Background

Every year in WA thousands of tonnes of glass is disposed of and processed through commercial and municipal waste collections. A portion of this glass collected for recycling is transported to WA's nearest reprocessing facility in South Australia that produces recycled glass, or cullet. However, a large amount of this glass continues to end up in WA landfills.

Main Roads WA (MRWA) currently permits the use of glass cullet in embankment construction via Specification 302 Earthworks[1] and crushed recycled concrete through Specification 501 Pavements[2]. However, the uptake of recycled materials in MRWA works appears to have been limited to date, possibly due to lack of awareness about the availability of these materials, and where and how these materials can be used appropriately.

This project aims to investigate the viability of increasing the proportion of recycled materials, specifically recycled crushed glass (RCG) and crusher dust, in Western Australian road building applications. To ensure these products are suitable for sustainable inclusion, a market survey was also conducted on the Western Australian waste stream and existing markets for RCG and crusher dust.

Approach

- Literature review of local and international usage of RCG and crusher dust in pavement applications, considering the benefits, potential issues and any associated risks or potential barriers to implementation.
- Review the existing practices for each of the Australian state road agencies with regard to the specifications and permissible uses of RCG and crusher dust in pavement applications.
- Review international specifications and permissible uses of RCG and crusher dust in pavement applications.
- Investigate alternative usage of RCG as a drainage layer material.
- Identifying the primary local suppliers in metropolitan and regional WA and the current industrial waste stream to determine feasibility of increasing the use of these recycled materials.

Literature Review

Crusher dust

- The use of crusher dust in granular support layers is not widely accepted in Australia, although it is specified for use in the USA.
- There is a crusher dust surplus in some WA quarries, however, a competing market for this product already exists.
- It is recommended that MRWA does not further investigate implementing the use of crusher dust in granular supports layers at this time.

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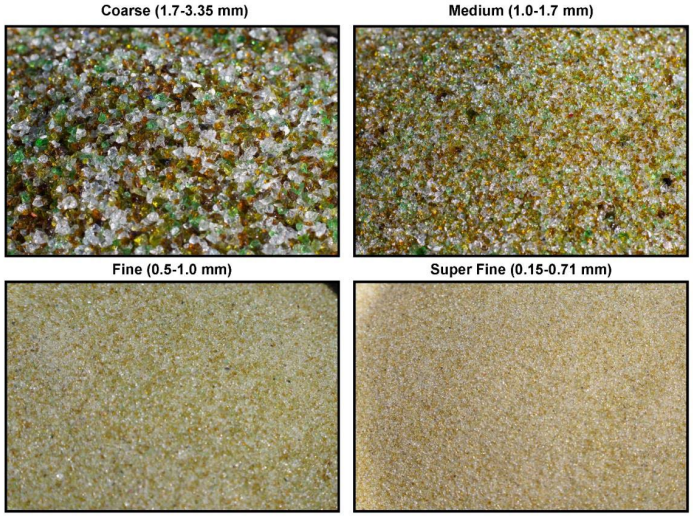
Recycled Crushed Glass

- Most national and international road agencies publications have shown that in terms of performance, RCG is suitable for use in granular support layers.
- The property requirements for RCG are generally consistent between each of the national and international road agencies.
- The physical properties of RCG permit the use of RCG as a free-draining material layer which may be used to limit the capillary rise in pavement applications.
- Perth's RCG supply is variable and thus, mandating a percentage of RCG be required for use in road construction would be a risk. The economic cost of RCG is non-prohibitive however the cost for cartage to site and blending RCG at the correct ratio with the other granular may be uneconomical.
- Recommended that laboratory testing is undertaken on WA-sourced RCG to produce a drainage blanket specification comprised of up to 100% RCG, aimed at reducing the required earthworks in locations where capillary rise is a problem.

RCG PRODUCTS



Source: Enviro Sand (2019).

Literature have noted performance benefits of using both RCG and crusher dust in unbound pavement support layers.

All have shown similar performance trends throughout their service life.

Indicated that the physical properties of RCG permit the use of RCG as a free-draining material layer which may be used to limit the capillary rise in pavement applications.

FUTURE CONSIDERATIONS

Conduct laboratory testing on WA-sourced RCG to produce a drainage blanket specification comprised of up to 100% RCG, aimed at reducing the required earthworks in locations where capillary rise is an issue.

References

(1) Main Roads Western Australia 2019, Earthworks, Specification 302, MRWA, Perth, WA.

(2) Main Roads Western Australia 2018, Pavements, Specification 501, MRWA, Perth, WA.