

SPECIFYING RECYCLED MATERIALS FOR ROAD WORKS USING AUS-SPEC

INTRODUCTION

The objective of this TECHnote is to assist local road authorities implement the use of recycled materials by including it in their policies, construction specifications and approval processes.

Why the use of recycled materials?

The 2018 National Waste Policy sets a roadmap for collective action by governments, businesses and communities to improve waste management, recycling and resource recovery in Australia. It also highlights sustainable procurement by all levels of government, as one of the important strategies to better manage waste in Australia.

Use of recycled materials in road/civil construction

With the shortage and rising cost associated with the sourcing of traditional natural aggregates and sand from quarries and increased haulage distances for the placement of these materials, the road authorities are seeking alternative solutions. The best ways to prevent valuable waste going to landfill is to consider the waste hierarchy, to reduce, recover, reuse and recycle materials for use in road construction for the following:

- Road base and subbase for flexible and rigid pavements.
- Select fill for use on road subgrades or raising site levels for road or building construction.
- Bedding material for paving blocks in pedestrian areas, car parks, etc.
- Drainage medium for drainage lines and drainage structures.

Recycled materials such as crushed concrete, bricks, reclaimed asphalt, crushed glass, plastics, printer toner cartridges, asphalt millings, slag and crumb rubber can be used for new construction or rehabilitation and reconstruction to improve the performance of existing pavements.

To jointly develop appropriate specification for the industry NATSPEC is currently working with SSROC, Sustainability Victoria, the Office of Projects Victoria, the Institute of Public Works Australasia, and the Civil Contractors Federation to determine opportunities for utilising recycled material for the construction of new roads, road maintenance and replacement to further reduce our landfill.

Use of recycled materials in AUS-SPEC

Currently AUS-SPEC includes the use of various recycled materials in design, construction and maintenance worksections for the benefit of the designers and specifiers.

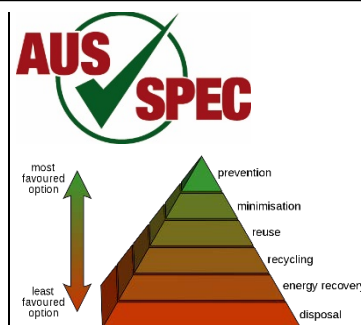
Design worksections

AUS-SPEC Design worksections include the use of recycled materials in *Template* to encourage the designers to recommend these materials at the design stage in *0042 Pavement design*, *0043 Subsurface drainage (Design)*, *0044 Pathways and cycleways (Design)*, *0053 Rural pavement design – sealed*, *0054 Rural pavement design – unsealed* and *0074 Stormwater drainage (Design)* and in *Guidance* text in *0012 Waterfront development* and *0022 Control of erosion and sedimentation (Design)*.

Construction worksections

AUS-SPEC Construction worksections permit and promote the use of recycled materials in road construction in *Template* and *Guidance* text in the following worksections:

- **General worksections:** *0173 Environmental management* includes the use of recycled materials in the Waste Management Plan and includes the methods of disposal of construction waste that can be reused and recycled.
- **Site urban and open spaces:** The use of mulch is specified in all landscaping worksections. The use of recycled materials is recommended in the base and subbase construction of *0282 Pathways and cycleways (Construction)*.
- **Structure:** Suggests specifying recycled concrete aggregate, reinforcement with recycled steel and recycled plastic in fibre reinforced concrete in *0319 Auxiliary concrete works*.
- **Construction – road reserve**
 - **Stabilisation:** Specifies materials including ground granulated blast furnace slag, fly ash, cementitious blend proportion in mix design, in situ stabilisation, pre-pulverisation of existing pavement and foamed bitumen stabilisation in *1113 Stabilisation*.



Waste hierarchy

Relevant publications

2018 National Waste Policy

Austrroads

AGPT Guide to pavement technology

AGPT04E Recycled materials

ARRB

Best Practice Guide 1 – Road materials

IPWEA NSW

Greenspec – Specification for supply of recycled material for pavements, earthworks and drainage

LGNSW

Recycled materials in roads and pavements - A guide for local councils

Transport for NSW

Recycled Crushed Glass (RCG) in asphalt

Relevant worksections

Design worksections

0042 Pavement design

0043 Subsurface drainage (Design)

0044 Pathways and cycleways (Design)

0053 Rural pavement design – sealed

0054 Rural pavement design – unsealed

Construction worksections

0173 Environmental management

0257 Landscape – road reserve and street trees

0319 Auxiliary concrete works

1113 Stabilisation

113 Rigid pavements

114 Flexible pavements

Maintenance worksections

1601 General requirements – road reserve (Maintenance)

1602 Maintenance schedules – road reserve

1603 Road reserve maintenance plan (RMP)

1616 Grading unsealed roads

1617 Resheeting unsealed roads

1632 Grading unsealed shoulders

1633 Resheeting unsealed shoulders

TECHreport

TR 08 Management of Council gravel pits in country areas – A case study

TECHnote

GEN 023 Using AUS-SPEC for management of unsealed roads

GEN 026 Otta seal – A different approach to road sealing

DES 034 Pavement stabilisation for unsealed roads

DES 035 Improvement and stabilisation of unsealed roads

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- *Rigid pavement base and subbase:* Specifies recycled concrete aggregate, geopolymer cement, percentage of crushed glass content for fine aggregates and refers to the IPWEA Greenspec and Austroads AGPT04E in 1131 *Roller compacted subbase*, 1132 *Lean mix concrete subbase*, 1133 *Plain and reinforced concrete base*, 1134 *Steel fibre reinforced concrete* and 1135 *Continuously reinforced concrete base*.
- *Flexible pavements:* Specifies different classes of crushed rock, crushed concrete and recycled materials for base and subbase construction manufactured from crushed concrete, bricks, terracotta tiles, glass or reclaimed asphalt profilings. Includes properties of recycled materials and specifies limits for iron and steel slag, crushed concrete, bricks, recycled asphalt, fly ash and crushed glass fines. Includes percentage of undesirable material e.g. metal, glass, stone and slag, plaster, clay lumps, rubber, plastic, paper, cloth, paint, wood and other vegetable matter. Recommends blending of locally available materials to enhance material properties as discussed in the *TECHreport TR 08*.
- *Asphalt pavements:* Specifies the use of Reclaimed Asphalt Pavement (RAP) in RAP Management plan and asphalt mixes in 1144 *Asphalt (Roadways)*. The use of crumb rubber, granulated glass aggregate and clauses on the use of RAP for wearing course and base course have been updated.
- *Road openings and restorations:* Recommends waste disposal and recycling and specifies the use of recycled concrete and crushed rock for backfill material for pathways and carriageways.
- *Pavement marking:* Specifies the use of crushed quartz and crushed glass for increased retro reflectivity.
- *Guide posts:* Specifies the use of plastic, rubber or similar for flexible guide posts and semi flexible guide posts and metal for rigid guide posts. Recommends to recycle existing guide posts.
- *Boundary fencing for road reserves:* Recommends to recycle and re-use any surplus material after completion.
- *Construction – Public utilities:* Specifies the use of approved recycled material for bedding embedment and backfill material in water supply, stormwater drainage and sewerage reticulation.

Maintenance worksections

AUS-SPEC Maintenance worksections recommends sorting and sending waste materials for recycling from litter collection, cleaning and sweeping operations to the recycling centre for recycling back into roads. 1601 *General requirements - road reserve (Maintenance)* recommends including waste minimisation management techniques in the Environmental Management Plan. 1633 *Resheeting unsealed shoulders* recommends improving unsealed shoulders by stabilisation, by blending of gravel to enhance the properties of natural materials and the use of Recycled Asphalt Profilings. 1674 *Carriageway delineators* recommends resleeving and using recycled rubber posts. Most of the maintenance worksections for pavement repairs, maintenance, rehabilitation and reconstruction refer to the construction worksections for the use of recycled materials for road works.

Additional resources: *TECHNotes DES 034* and *DES 035* provide more information on pavement stabilisation and *TECHreport TR 08* provides information for councils to build and maintain better sealed and unsealed roads by blending materials from different gravel pits to meet higher required performance standards.

Benefits of using recycled materials

Long term benefits of using recycled products in civil construction:

- Reduced impact on the environment through efficient use of available resources.
- Reduced waste to landfill.
- Reduced energy required to produce pavement construction materials. Recycled materials are less energy intensive to produce than quarry materials.

CONCLUSION

AUS-SPEC embeds the use of recycled materials in its road design, construction and maintenance worksections. However, it is up to councils to source appropriate recycled materials based on availability, transportation costs and approved sources for the optimum performance of the pavements. Use of recycled materials should be included in Councils' policies, procurement strategies and tender processes to utilise materials that would otherwise go to the landfill.

Examples of the use of recycled materials for pavement construction and rehabilitation



In situ Stabilisation



Use of crushed glass for pavements by Waverley Council



Crushed glass sand produced by Lismore City Council



Use of Crumb rubber



Crumb rubber asphalt



Use of Toner pave by City of Sydney



Recycled local road in Sydney