

# Specifying Concrete Pavement for local government

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## ABSTRACT

This presentation will provide an overview of the AUS-SPEC information, tools, technical specification templates, specifications framework and processes to document requirements for various asset life cycle activities. It will also demonstrate the use of the system to create contract documentation for the design, construction, and maintenance of local government infrastructure assets to meet the growing needs of the communities. Rigid pavement specifications and concrete specifications for other road related assets and specifying the use of recycled materials by embedding this information in the design, construction and maintenance specifications will also be discussed. AUS-SPEC documents are regularly reviewed and updated to permit for the use of recycled material for specific applications based on the current research.

AUS-SPEC is the national technical specification system for minor infrastructure. Developed by the Institute of Public Works Engineering Australasia (IPWEA) and updated by NATSPEC, the AUS-SPEC specification system provides specification Templates and supporting information for the life cycle management of community assets including buildings, roadworks, urban and open spaces, and public utilities. National master specification systems such as AUS-SPEC represents the collective experience of local government and other industry contributors. Further, there are huge efficiency gains in using the national master specification because the construction industry is national with common materials, construction techniques and procurement strategies.

AUS-SPEC documentation system further supports in improving and providing better infrastructure asset services to their communities. It is an essential technical resource which is relevant, responsive, and well researched. AUS-SPEC is aligned to the NATSPEC National Classification System, which has been widely adopted by the construction industry. This establishes a common language between governments, organizations, and consultants, which improves communication between the different parties involved in a project. A common language significantly reduces the risk of delays, rework, and extra costs by minimising misinterpretation.

## INTRODUCTION

AUS-SPEC is the Local Government specification system for the life cycle management of assets. Developed by IPWEA and updated by NATSPEC, a not-for-profit organisation owned by Government and industry bodies. NATSPEC's major service is providing a national master specification to the construction industry. The specification packages include design, construction, and maintenance worksections (specification templates) for buildings, roadworks, urban and open spaces, and public utilities.

AUS-SPEC's main aim is to provide a specification system for local government and improve the quality of construction and maintenance of their assets in Australia. The system supports technical and contractual consistency between Councils yet allows flexibility to edit and add project specific requirements where necessary.

Concrete is used for various local government applications including rigid pavements, pathways and cycleways, retaining walls, kerbs and channel gutters, storm water drainage, drainage structures, skate parks and rock pools etc. The concrete specifications vary based on its application. Relevant AUS-SPEC worksections as listed in Appendix A can be used to specify concrete for local government infrastructure.

## WHY SPECIFICATIONS ARE REQUIRED

The specification is an essential contract document, and its primary function is to define precisely and succinctly the quality required and the processes necessary for achieving it. Specifications is a multipurpose tool with many users' designers, estimators, tenderers, contractors, subcontractors, Project Managers, contract administrators, Superintendent, legal representatives, and other authorities. Specifiers must have the ability to make informed decisions and communicate those decisions effectively. Preparing a specification is a core process in tendering and contracting. Specifications may include functional requirements which define the function to be performed, performance requirements which define the physical performance expected which can be reliably measured and evaluated and technical requirements which define the technical and physical characteristics.

Specifications are key in determining the project cost, duration and ensure that project outcomes match objectives and is a core process in tendering and contracting. Where the specification is incomplete, unclear, or inconsistent, outdated, not updated to the current standards claims can potentially be made against:

- designers and consultants who prepared the specification.
- contractors and suppliers who warrant the Specifications are satisfactory.
- superintendents, project managers and certifiers who apply the specification.
- principals who provide the Specifications to contractors and suppliers.

To address all these issues, the national local government specification system assists the Councils in providing a framework of technical specifications for managing their various assets.

- Record of design decisions, materials used, and standards sets,
- To show statutory compliance,
- To be used in pre-tender estimates,
- For tendering, by the principal subcontractor and contractor.
- To be part of a contract – contract document.
- An onsite document for the contractor and contract administrator.
- Evidence to resolve disputes and Information for facility management.

# **SPECIFICATIONS FOR LOCAL GOVERNMENT**

## **HISTORY OF LOCAL GOVERNMENT SPECIFICATIONS**

National **Australian Specifications** AUS-SPEC were developed in 1997 as an answer to the Federal Government's call for microeconomic reform, the Institute of Municipal Engineering Australia (IMEA) now IPWEA (Institute of Public Works Engineering Australasia) sought to identify means of assisting Councils as they began integrating Competitive Provision of services procedures. Statewide Roads, through its Technical Management consultancy (SWRTM), part of the Sinclair Knight Merz Group, now Jacobs, had concurrently co-ordinated several Councils in successfully co-authoring the substantial Development Specification Set called DEVSPEC. A joint venture between IMEA now IPWEA and SWRTM, with support from the Local Government Association of Australia (ALGA), was formed to publish a series of documentation sets named AUS-SPEC that assist Councils in providing competitive services via internal and external contracts.

## **LOCAL GOVERNMENT SUITE OF SPECIFICATIONS**

Local Councils use AUS-SPEC suite of national specification system to provide quality and consistency for the life cycle management of various assets. AUS-SPEC provides a uniform approach to design decisions, construction, and maintenance practices across Australia.

AUS-SPEC standard contract documents have been prepared for local government works and reflect the terminology and particular requirements of local government in Australia. AUS-SPEC provides a range of specifications for buildings, roadworks, urban and open spaces, and public utilities.

## **BASIS OF TECHNICAL SPECIFICATIONS**

Every project is different and may require a unique set of associated drawings, technical and contractual documentation that describe the requirements and outcomes, the contractor is expected to deliver for the projects. Most of the technical specifications are based on:

1. Legislative requirements including Acts, National Construction Code etc.
2. Standards generally provide the minimum standard of a material, quality requirements, design method, test method, construction procedures, and implementation. It is preferable to cite the Australian Standard, but if an AS Standard is not available the international standards e.g., ASTM, BSI etc are referenced in the specifications.
3. Other technical publications include guides from Austroads, Australian Road Research Board (ARRB), CCAA, IPWEA publications and State Road Authority specifications. These are best practice guides and inform the local government suite of specifications to support the specifier.
4. Specifications are a framework of worksections, that are customised to the project specific needs to develop a complete set of technical specifications which is then included in the contract documents.

## **CONCRETE APPLICATION FOR LOCAL GOVERNMENT WORKS**

Concrete is required for many local government infrastructure applications. It could be for commercial applications for streets with high volume traffic, airport aprons, residential streets and parking lots, regional local roads, bridge decks, for stormwater drainage including pipes and drainage structures, precast culverts,

kerb and channel gutters, pathways and cycleways, skate parks, boat ramps, rock pools etc. All these works are constructed by local government to provide quality infrastructure for the benefit of the community that will last for a long time.

## **DESIGN DOCUMENTATION**

AUS-SPEC design worksections form a basis for the creation of uniform design processes for civil infrastructure works. These worksections can be used for Council capital works as well as developmental works. The *0010 Quality requirements for design* worksection outlines the quality assurance requirements of design and a comprehensive checklist system to:

- Inform designers of the design criteria.
- Provide a record of the design processes.
- Allow flexibility of additional design criteria to be integrated into the process, as necessary.

Proper road design is the basis of the entire local road transport system. Roads connect communities. Roads are affected by environmental and demographic changes. During the planning and design phase of local roads proper assessment is undertaken such that the design of the pavement structure meets the following:

- Required design life and traffic loading.
- Maximum economic value, safety, and serviceability requirements over the pavement design life.
- Adequate for its load carrying capacity.
- Appropriate to subgrade strength, climatic conditions, and environmental factors.
- Materials for the subgrade, subbase, base and wearing surface.
- Have minimal deterioration over pavement design life.
- Have minimal disruption to the adjoining land use.
- Fit into the built environment visually.
- Develop design options to repair existing pavement distress and prevent future problems.
- Integrate control measures in the development design.

However, for light traffic roads or minor roads are more susceptible to the effects of the environment, have higher variation in subgrade and moisture conditions, have lower traffic speeds in urban locations and are more susceptible to significant pavement damage resulting from a small number of passages of heavily overloaded vehicles. Relevant documents applicable for concrete pavement works are listed as Design worksections in Appendix A. Refer to the flowchart in Figure 1 for the design considerations, design input and various factors affecting pavement design.

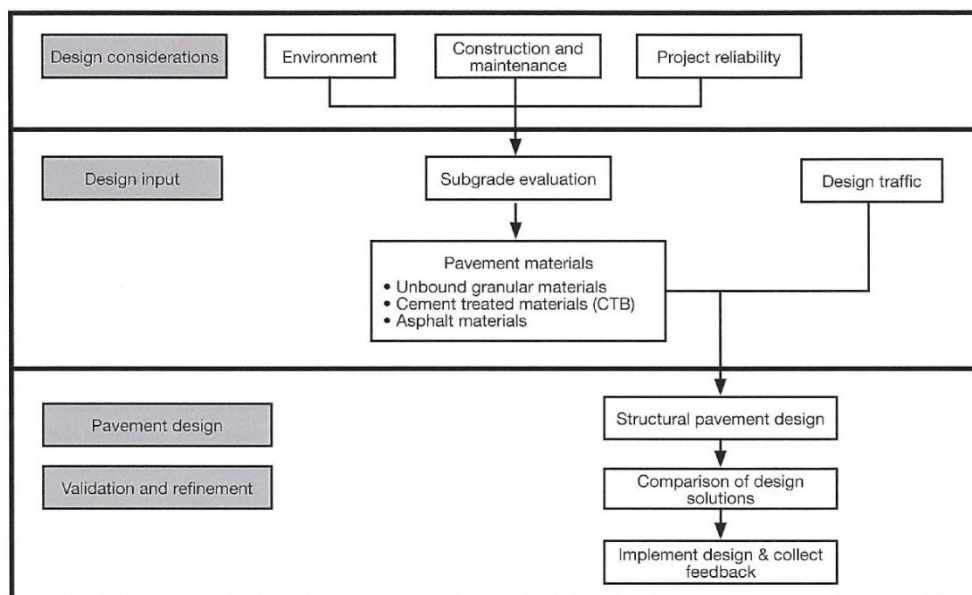


Figure 1: Factors affecting pavement design (Source IPWEA NSW RoadDesign Guide)

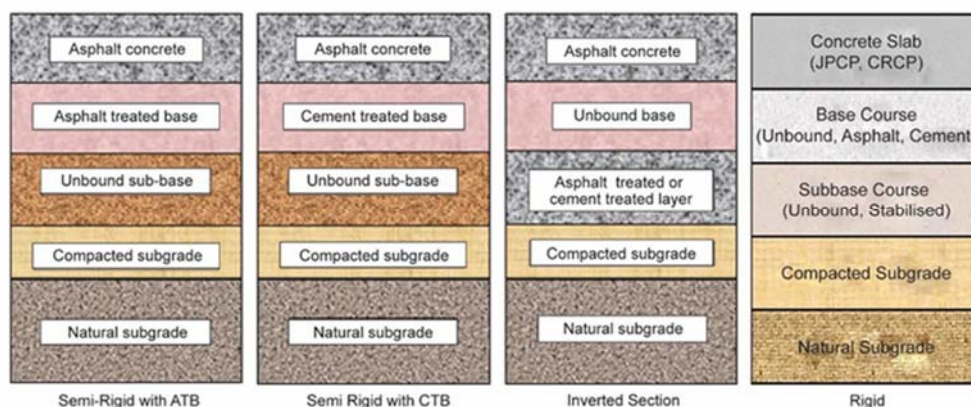


Figure 2: Common types of rigid pavements (Source ARRB Best Practice Guide – Materials)

## PAVEMENT MATERIALS

Rigid pavement consists of different layers, subgrade, subbase, and concrete base as shown in Figure 2. The concrete base can be of different types for example, PCP, CRCP, SFRC which affects the design of joints and the reinforcement details. There are various factors that affect the performance of the pavement; however, pavement material is the only element that can be controlled and improved. Therefore, appropriate selection of pavement material is a significant way Councils can extend the life of their road surfaces and reduce the demand of frequent maintenance.

**Subgrade** consists of in situ soil or rock, previously placed landfill or spoil or other existing natural local material over which a road is to be placed. The support provided by the subgrade is the most important factor in determining pavement design thickness and is dependent upon soil type, material density and moisture content both during construction and seasonal changes whilst in service. Subgrade strength is defined in terms of CBR which essentially represents the ratio, expressed as a percentage, of the penetration resistance of a soil to the penetration resistance of a standard crushed rock.

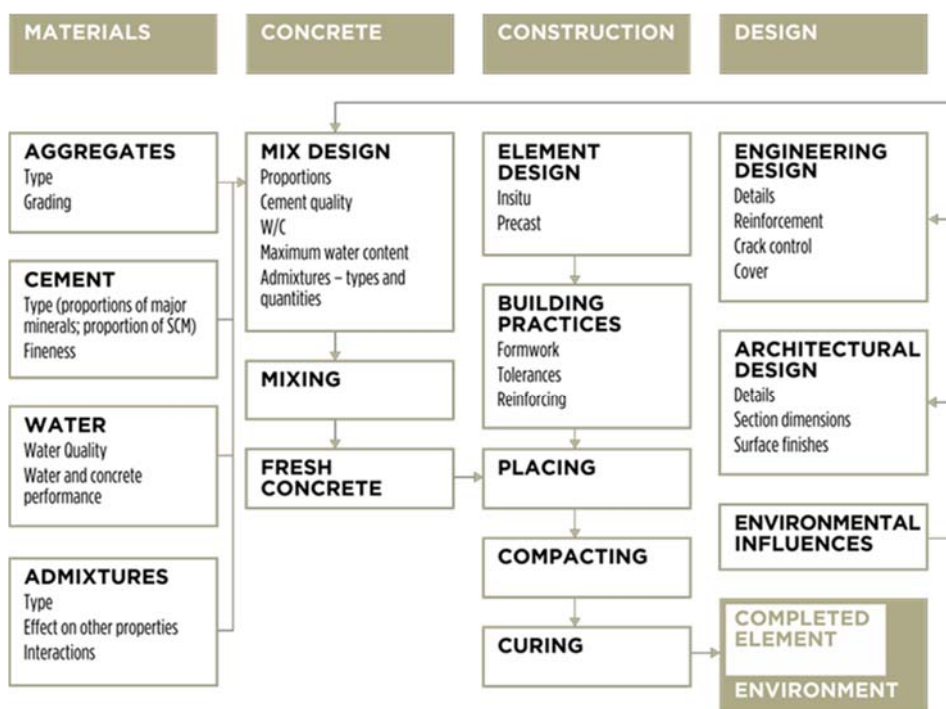
**Subbase** – is the layer under the basecourse of a road where extra strength is required. It usually consists of roller compacted concrete subbase or lean mix concrete subbase.

**Road base:** A road base or wearing course is made up of gravel and sand to provide the structural strength and fines to bind the mix together. In the case of local materials, it is likely that the proportions of the materials will be sub-optimal in their grading distribution and plastic properties. Adequate material must be mixed from separate sources preferably in the pit/s or, less desirably, on the road and blended to improve both grading and plasticity to meet the target specification. For rigid pavements material requirements for a pavement will occur mainly during the initial construction.

It is essential to build the road as designed and include the testing and monitoring of quality materials and follow quality management and proper construction procedures at different stages of the construction.

## SPECIFYING CONCRETE

Quality concrete is made from quality materials, yet poor concrete is also made from the same materials. Subtle changes in the concrete mix can have significant effects on the finished concrete. Specifying concrete defines the properties including permeability, strength, water-cement-ratio, workability, slump etc and its expected performance. Specific material properties, concrete mix design, construction procedures are covered in all concrete worksections based on its application as listed in Appendix A.



## FACTORS INFLUENCING THE PERFORMANCE OF CONCRETE STRUCTURES

Figure 3 - Source – CCAA document, Guide to concrete construction

## CONSTRUCTION DOCUMENTATION

AUS-SPEC Construction worksections provide specifications for both Quality control and Integrated management systems associated with most Councils' engineering activities. These worksections have been developed for Councils in controlling the quality of works performed by contractors and developers.



Overarching documents are required and should be included for every project. It covers Quality control, Quality assurance, quality system requirements. These are listed under General worksections in Appendix A.

All concrete worksections include main headings:

1. General: Includes clauses relating to the general responsibilities, cross references, main standards applicable to the entire worksection, definitions, tolerances, submissions, and inspections.
2. Materials: Includes clauses relating to nominated mix requirements, materials for making the mix (cement, fly ash, water, admixtures, aggregates, curing and debonding compounds, steel reinforcement) properties, concrete properties, concrete for subgrade beams.
3. Execution: Includes clauses relating to nominated mix production, transport and delivery of concrete, plant and equipment, site establishment, concrete base paving trial, subgrade beams, concrete placing and finishing, joints, curing and debonding, concrete cracking, testing, removal and replacement of subbase.
4. Annexures: Rate of evaporation, summary of hold points and witness points, maximum lot sizes and minimum test frequencies, pay items and reference documents.

## RELEVANT CONCRETE CONSTRUCTION WORKSECTIONS RELATING TO LOCAL GOVERNMENT WORKS

Following is a list of the worksections directly applicable for specifying concrete:

**0319 Auxiliary concrete works** - This worksection *Template* is applicable to the supply and placement of concrete, including sprayed concrete for concrete works of an auxiliary/supplementary nature to the primary works taking place. It includes ancillary requirements such as ground preparation, formwork and reinforcement. Auxiliary concrete works include drainage pits and other ancillary drainage structures, headwalls, wingwalls, in-situ box culverts, box culvert base slabs, retaining walls, footings, concrete safety barriers and works of a similar nature.

**1121 Open drains** - This worksection *Template* is applicable to the construction, lining and protection of all types of open drains, including unlined and lined open drains.

**1122 Kerb and channel (gutters)** - This worksection *Template* is applicable to the construction of new kerbs and channels (gutters) and associated works including foundations for components, adjustment/replacement of gully pits and reinstatement of pavement and driveways, as documented. It also includes the removal and disposal of existing kerbs and channels (gutters).

**1130 Rural concrete base** - This worksection *Template* includes the construction, by mechanical or hand placement, of plain reinforced concrete base, including, slab anchors and terminal slabs. The work also includes the construction of reinforced concrete approach slabs at bridge abutments. The construction of steel fibre reinforced concrete (SFRC) base and minor SFRC works for pavements including mixing, transportation, placing, finishing and curing and slab anchors. It does not apply to large scale highway works.

**1131 Roller compacted concrete subbase** - This worksection *Template* is applicable to construction of roller compacted concrete subbase. It includes mixing, transportation, placement, compaction, jointing and curing.

**1132 Lean mix concrete subbase** - This worksection *Template* is applicable to the construction of lean mix concrete subbase including trial sections and subgrade beams.

**1133 Plain and reinforced concrete base** - This worksection *Template* is applicable to the construction, by mechanical or hand placement, of plain and reinforced concrete base, including trial sections, slab anchors and terminal slabs. The work also includes the construction of reinforced concrete approach slabs at bridge abutments.

**1134 Steel fibre reinforced concrete base** - This worksection *Template* is applicable to the construction of steel fibre reinforced concrete (SFRC) base and minor SFRC works for pavements including mixing, transportation, placing, finishing and curing. It does not apply to large scale highway works.

**1135 Continuously reinforced concrete base** - This worksection *Template* is applicable to the construction of continuously reinforced concrete base including mixing, transportation, placing, finishing, curing, trial sections and slab anchors.

## **MAINTENANCE DOCUMENTATION**

Maintenance and operations are an on-going process, once constructed pavements start deteriorating due to different factors affecting the pavements like traffic levels, environmental conditions etc. Maintenance aims to preserve an asset and includes regular checking, repairs, and minor improvements to remove the cause of any defects and avoid excessive repetition of maintenance effort. Each organisation is required to adopt a maintenance policy and strategy to effectively manage and maintain their assets at an appropriate level of service and structural integrity at the lowest possible cost to the asset owner and users. Delayed or neglected maintenance may incur additional direct and indirect costs.

The AUS-SPEC maintenance system is based on quality management, competitive principles, and programmed maintenance. It reflects the move from predominantly direct control, responsive maintenance and operations to the proactive approach outlined in the National Sustainability Frameworks for Asset Management for Local Government and developed in the International Infrastructure Management Manual (IIMM) and the Australian Infrastructure Financial Management Guidelines (AIFMG). The system allows asset owners to balance the level of service provided with the maintenance and operations budget available and prepare documentation for in-house and/or private maintenance contracts. It includes records of asset inspections, defects registers, programmed and prioritised works and periodic reports of completed works. These records and reports improve the maintenance history and asset inventory and provide a defence against possible litigation.

AUS-SPEC maintenance worksections cover routine, periodic and urgent maintenance for local government infrastructure assets. The related concrete maintenance worksections are listed in Appendix A.

Each asset is managed against an Asset maintenance plan that defines the activities required by that asset, includes maintenance, refurbishments, and ultimate replacement. When the pavement exhibits major deterioration that affects the structural support layers it may require reconstruction and the design and construction documents available assist the councils and can be incorporated into the documentation for projects requiring reconstruction and rehabilitation.

The benefits of road asset maintenance plans:

- Improved regulatory compliance.
- More meaningful financial reporting.



- Increased system reliability.
- Long-term system integrity.
- Potentially, eligibility for federal infrastructure funding.
- Significant cost savings.

## QUALITY REQUIREMENTS/MANAGEMENT

Quality considerations are embedded in the local government specifications throughout the entire process of design, procurement, construction, maintenance and operations for the road assets to provide best value of assets to the community. A well maintained purpose-built technical specification system is a key component in producing quality documentation. The benefits of quality documentation include reduced project ambiguities, variations, re-work and a reduced likelihood of legal action due to contractual disputes. It is only through quality documentation that clients can be assured of a quality result. Quality is reliant on good documentation and good documentation is incomplete without a good specification.

The main aim of local government is to deliver infrastructure that is fit for purpose and provides quality assets to their communities. The following documents assist local government to embed the level of quality required at each stage of the life cycle:

**Design** – 0010 *Quality requirements for design*.

**Construction** – 0161 *Quality management*, 0162 *Quality (Supply)*, 0163 *Quality (Delivery)*, 0167 *Integrated management*. In addition to these quality worksections, each AUS-SPEC construction worksection includes a Submission and an inspection clause, provides a summary of activities that require testing including lot sizes, minimum test frequencies and test methods. Provides a summary of Hold points and witness points for each construction activity and minimum test frequencies.

**Maintenance:** The AUS-SPEC roads maintenance system covered in *Workgroup 16 Maintenance and operations – Road reserve* conforms to a quality management model with the following characteristics:

- A systematic approach: Each project is broken into several defined activities.
- Inspection and test plans: Provided for each activity to allow systematic and progressive verification of conformance with requirements.
- Simple clear checklists: For in-the-field recording, as evidence of conformance with requirements. - Hold points: Assigned to critical aspects of the work.
- Conformance: Designed to encourage the service provider to identify and correct process faults and thereby assure the asset owner of good quality and productivity. If some aspect of the work does not conform and cannot be corrected, a non-conformance report is required.

## OTHER REFERENCE DOCUMENTS

There are many reference documents listed in the Annexures of each worksection, but in addition more guidance on specific topics is available in the following documents:

- TECHguides - provide roadmaps and examples for compiling the documentation required for local government projects. They include information on contracts, technical specifications and tender submission requirements and should be read before commencing a project.

- TECHnotes - are short guidance notes for consideration for your design and specification choices. They are divided into three groups – Design, General and Product. TECHnotes help you to keep up to date with industry changes. Relevant Technotes for AUS-SPEC are attached in Appendix.

## **CONTRACT MANAGEMENT**

The AUS-SPEC Contract management system includes activities that follow on from the establishment of the contract, including administration throughout the contract period, which helps to make sure that the terms of a contract are met and that the expected value is achieved.

In addition to the legislative and policy framework, there are a number of factors that are important at all stages of the contracting process. These are:

- Managing risks
- Managing relationships
- Managing resources
- Specifying responsibilities
- Behaving ethically
- Keeping records.

Contract administration is the last stage of the tendering and contract cycle, and includes all administrative duties associated with a contract after formation, including contract review, contract variation, and contract transition. The AUS-SPEC contract document system assists users to manage each stage of the contract cycle from project initiation, project delivery, compilation of contract documents, contract management and contract administration through to operation, maintenance and asset management.

## **SPECIFYING THE USE OF RECYCLED MATERIALS**

Road authorities are responsible for improving the sustainability of road asset management. Most of the Councils are improving their sustainability targets by applying the principles of waste hierarchy and by reducing the waste going to the landfill. Road authorities require a continuous supply of materials for road construction and maintenance of their large network. With depleting natural resources and virgin materials, the road authorities are looking for other alternatives and are utilising recycled materials which would otherwise end up in the landfill. Road authorities are also investigating to integrate circular economy principles and waste minimisation to their day-to-day operations in general. The need for recycling is becoming an increasing issue due to rapid growth of population and industry. Closed loop recycling is the best sustainable method to re-use waste streams back into new production, as it creates energy savings, reduces the demand on primary mineral resources and diverts materials away from landfill. Crushed concrete has been used for many decades as road base, subbase, aggregate, pipes bedding etc. as shown in Figure 3. There is a need for the use of recycled glass in a way which promotes sustainability with economic, environmental and construction benefits.

AUS-SPEC has been involved with other industry organisations to assist Local Government in an initiative to review engineering standards to increase the use of recycled materials in the construction and maintenance

of our local roads and reduce the amount of reusable materials being diverted to landfill. Relevant AUS-SPEC information is updated incrementally. More information is available at [www.natspec.com.au](http://www.natspec.com.au).

Transport for NSW (TfNSW) released the *Recycled crushed glass (RCG) in asphalt guide* and is available at [Recycled-crushed-glass-in-asphalt](#) this document also cites the relevant AUS-SPEC documents for local government works.

LGNSW and University of Sydney released the *Recycled materials in roads and pavements – A guide for local councils* and the *Recycled materials in roads and pavements – A Technical review*, this is a summary document of the guide. Relevant AUS-SPEC documents have been cited in these documents for the benefit of local government.

## EXPECTATION

The 2018 National Waste Policy reflects new ways of thinking about waste and the use of resources.

Australia's local roads can be key players in recycling. One of the best ways to prevent valuable waste going to landfill is to recycle materials for use in road construction. Regular asphalt roads use tonnes of raw materials, but recycled roads use crumb rubber, crushed concrete, recycled asphalt, plastic bags, waste toner from used printer cartridges, glass and more. Recycled materials are changing the way local governments approach road building.

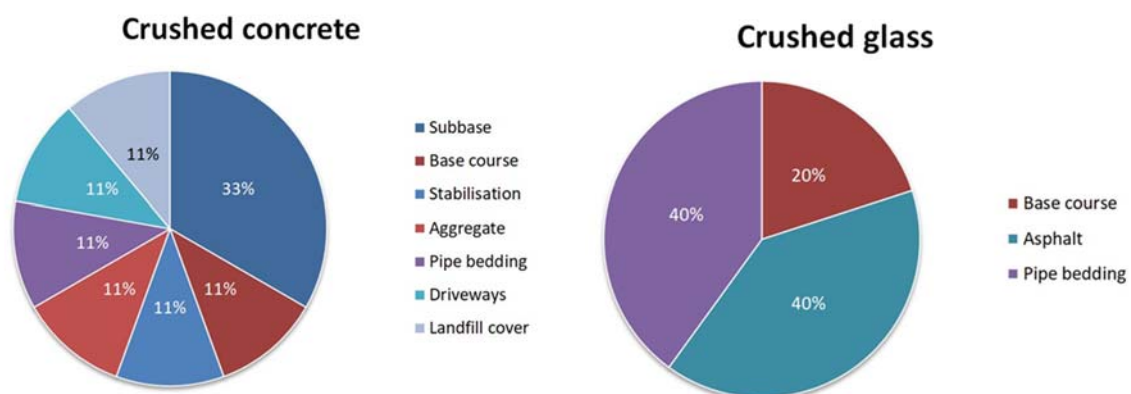


Figure 3: Different applications of crushed concrete and crushed glass

## REALITY

Currently AUS-SPEC includes the use of various recycled materials in design, construction and maintenance worksections for the benefit of the designers and specifiers. To make all recycled roads safe and durable, designers, engineers, building professionals and governments need specifications. To understand where the Councils as road authorities are in their journey of using recycled materials, to gather information regarding their current policies, specifications and documentation for utilizing recycled material for new roads, road maintenance and replacement, we conducted a few surveys and further information is available here [www.natspec.com.au/resources](http://www.natspec.com.au/resources). Some councils are leaders in using recycled materials for in-situ stabilisation, road base and subbase, crushed concrete and are more proactive than others while some do not have any policies of using recycled materials and depend only on the availability of natural resources.

Generally metro councils are more proactive and are leaders in recycling than regional or shire councils. These councils have included the use of recycled materials and sustainable construction methods in their policies, procurement strategies and tender processes.

## **ADAPTATION**

AUS-SPEC 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 profiling. 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.

Australia's local roads can be key players in recycling. One of the best ways to prevent valuable waste going to landfill is to recycle materials for use in road construction. Regular asphalt roads use tonnes of raw materials, but recycled roads use crumb rubber, crushed concrete, recycled asphalt, plastic bags, waste toner from used printer cartridges, glass and more. Recycled materials are changing the way local governments approach road building.

### **Typical Case study from City of Sydney**



In the City of Sydney's first of its kind green road trial, they have taken industrial waste from coal-fired power stations and steel manufacturing to create a new roadway.

Working with researchers from the University of NSW, they have replaced a section of roadway on Wyndham Street in Alexandria to test the green concrete's durability. Made from fly ash and blast furnace slag, geopolymer concrete is a sustainable blend of concrete and recycled materials. Geopolymer generates just 300kgs of CO<sub>2</sub> per tonne of cement, compared to 900kgs from traditional cement production. The carbon emissions savings is equivalent to the electricity used by an average household every 2 weeks.

With 70% of the concrete produced today going into pavements and footpaths, using products like geopolymer concrete for our roads and footpaths has great potential to further lower emissions from our operations. As a major road leading to Sydney Airport, Wyndham Street's high traffic volume provides the perfect conditions for the trial. Nine sensors have been positioned under the concrete to monitor and compare how the geopolymer concrete performs. The low CO<sub>2</sub> concrete has the potential to put the 400 million cubic tonnes of globally documented waste from the coal and steel industries to good use. While a

small amount is currently used in construction, much of it is currently stored on site. UNSW researchers will monitor the road performance for up to 5 years. This example clearly shows the opportunities of using recycled materials for local roads which will be of benefit to other Councils.

## CONCLUSION

AUS-SPEC systems support technical and contractual consistency between Councils nationally. AUS-SPEC is accepted by the industry and provides fit-for purpose specifications for different concrete applications and allows flexibility to edit and add project specific requirements. It provides a professional and best practice approach to responsibly design, construct and maintain community assets within budgetary constraints.

AUS-SPEC provides tools, templates, and other reference documents to provide better service to the communities and better manage their capital, maintenance, and operation of concrete works. The specifications are easy to use and compile through an online specifications' compiler SPECbuilder.

### **Benefits of the local government specifications system**

The AUS-SPEC local government specification system provides the following benefits:

**Local government focus:** Planning, design, construction, and maintenance contract documentation requirements for local government assets. Simple and easy to use.

**For minor civil works:** Address minimum best practice requirements.

**A national document:** Apply across all Australian jurisdictions. Accommodate variations for metro/regional location, climate zone or locally available materials.

**A reference type specification:** Minimise the customisation required. Addresses the shortage of in-house technical expertise and reduces need for outsourcing. Performance and technical requirements separated from contract management requirements. Consistency for contractors specialising in local government work.

**An industry standard:** Improve productivity and quality and good quality outcomes at project level.

**Sustainability requirements:** AUS-SPEC maintenance system and the sustainability aspects embedded in the design, construction and asset maintenance *Templates* assist the councils in extending the life of their current as well as future infrastructure assets.

These benefits will assist Councils in specifying concrete works for their construction and maintenance works and provide quality infrastructure assets to their communities.

## ACKNOWLEDGEMENTS

I would like to acknowledge the following people for their help in producing this paper:

**Justin Moss** – *Arcadis*

**Jamie Egan** – *Acciona*

**Richard Choy** – *NATSPEC*

**Marc Morelli** - *NATSPEC*

## APPENDIX A - LOCAL GOVERNMENT SPECIFICATIONS FOR CONCRETE WORKS

AUS-SPEC SPECIFICATION FOR LOCAL GOVERNMENT CONCRETE WORKS	
<b>Design worksections</b>	<p><i>0042 Pavement design</i></p> <p><i>0043 Subsurface drainage (Design)</i></p> <p><i>0044 Pathways and cycleways (Design)</i></p> <p><i>0053 Rural pavement design – sealed</i></p> <p><i>0061 Bridges and related structures</i></p>
<b>General worksections</b>	<p><i>0122 Information for tenderers</i></p> <p><i>0123 Conditions of tendering</i></p> <p><i>0124 Tender submission documents</i></p> <p><i>0125 Standard contract checklists</i></p> <p><i>0126 Period supply and service checklists</i></p> <p><i>0134 General requirements (Supply)</i></p> <p><i>0135 General requirements (Services)</i></p> <p><i>0136 General requirements (Construction)</i></p> <p><i>0147 Conditions of contract</i></p> <p><i>0152 Schedule of rates (Construction)</i></p> <p><i>0153 Schedules - period supply and service</i></p> <p><i>0161 Quality management (Construction)</i></p> <p><i>0162 Quality (Supply)</i></p> <p><i>0163 Quality (Delivery)</i></p> <p><i>0167 Integrated management</i></p> <p><i>0173 Environmental management</i></p>
<b>Construction worksections</b>	<p><i>0282 Pathways and cycleways (Construction)</i></p> <p><i>0292 Masonry walls</i></p> <p><i>0293 Crib retaining walls</i></p>



	<p><i>0294 Gabion walls and rock filled mattresses</i></p> <p><i>0319 Auxiliary concrete works</i></p> <p><i>1121 Open drains</i></p> <p><i>1122 Kerbs and channels (gutters)</i></p> <p><i>1130 Rural concrete base</i></p> <p><i>1131 Roller compacted concrete subbase</i></p> <p><i>1132 Lean mix concrete subbase</i></p> <p><i>1133 Plain and reinforced concrete base</i></p> <p><i>1134 Steel fibre reinforced concrete base</i></p> <p><i>1135 Continuously reinforced concrete base</i></p> <p><i>1151 Road openings and restoration</i></p> <p><i>1152 Road openings and restoration (Utilities)</i></p> <p><i>1171 Subsurface drainage</i></p> <p><i>1351 Stormwater drainage (Construction)</i></p> <p><i>1352 Pipe drainage</i></p> <p><i>1353 Precast box culverts</i></p> <p><i>1354 Drainage structures</i></p>
<b>Maintenance worksections</b>	<p><i>1431 Footpath paving repairs</i></p> <p><i>1432 Gravel footpath repairs</i></p> <p><i>1433 Footpath and kerb ramp repairs</i></p> <p><i>1442 Boat ramps</i></p> <p><i>1620 Pothole repair</i></p> <p><i>1621 Concrete pavement repairs</i></p> <p><i>1622 Concrete slab stabilisation</i></p> <p><i>1623 Emergency pavement repairs</i></p> <p><i>1641 Kerb and channel (gutter) repairs</i></p>
<b>Full list of worksections</b>	<p><i>The full list of worksections are available in the National Worksection Matrix available from <a href="https://www.natspec.com.au/images/PDF/National_Worksection_Matrix.pdf">https://www.natspec.com.au/images/PDF/National_Worksection_Matrix.pdf</a></i></p>

OTHER REFERENCE DOCUMENTS	
TECHGUIDES	All TECHguides can be accessed from <a href="https://www.natspec.com.au/resources/aus-spec-techguides">https://www.natspec.com.au/resources/aus-spec-techguides</a>
TECHNOTES	<i>Using AUS-SPEC for asset delivery</i> <i>Using AUS-SPEC for contract documentation</i> <i>Using AUS-SPEC for asset maintenance</i> <i>Specifying recycled materials using AUS-SPEC.</i> All TECHnotes can be accessed from <a href="https://www.natspec.com.au/resources/technotes">https://www.natspec.com.au/resources/technotes</a>

## USING AUS-SPEC FOR CONTRACT DOCUMENTATION

### INTRODUCTION

This TECHnote provides an overview on using AUS-SPEC for standard and period supply and service contract documentation for the life cycle management of assets. The AUS-SPEC system assists users to manage each stage of the contract cycle: project initiation; project delivery; compilation of contract documents; contract management and administration; operation; maintenance and asset management.

### PROJECT DELIVERY AND PROCUREMENT

Local government typically procures the following:

- **Building and construction services** involving major works (e.g. construction of an aquatic centre or construction of a road) or minor works (e.g. repairs to a footpath or resurfacing a car park).
- **Supply of services** including supply of equipment or material.
- **Period supply and services** including construction or non-construction services over a fixed period of time (e.g. linemarking of roads, security surveillance, bituminous surfacing or weed treatment).
- **Consultancy services** including design and documentation.

The Local Government Acts of the various states underpin the detailed tendering process and procurement procedures used by Councils. AUS-SPEC provides for the incorporation of state-based requirements into contract documentation and also references AS 4120 *Code of Tendering* which sets out the ethics and obligations of the Principal and Tenderers in the tendering process in the construction industry.

### THE IMPORTANCE OF SPECIFICATIONS

Preparing the specification is a core process in tendering and contracting. It is an essential contract management document which sets out the Council's requirements to prospective suppliers and/or contractors. A clear, concise and unambiguous specification results in more accurate tender bids and fewer variation claims.

The AUS-SPEC specification *Templates* and associated guidance documents provide a framework for developing quality documentation for different procurement methods and types of contracts. They can be used to define:

- Outputs.
- Quality standards and standards of compliance.
- Method of payment.
- Risk identification and management.
- Procedures, roles and responsibilities.
- Dispute resolution processes.
- Requirements for Council's economic, social and environmental objectives.

### COMPILATION OF CONTRACT DOCUMENTS

The AUS-SPEC contract document system is suitable for all Council services related to asset management including design, construction, maintenance and operations of urban and open spaces, buildings and facilities, road reserves, and public utilities.

#### Reference documents

Before compiling the documentation, refer to the following AUS-SPEC TECHguides for detailed guidance on contracts, technical specifications, tender submission requirements and sample documents.

- *TG 102 Guidelines for Principals – standard contracts.*
- *TG 103 Guidelines for Principals – period supply and service contracts.*
- *TG 104 Guidelines for Principals – sample documents.*

#### Standard contracts

Identify the following contract requirements for the project:

- Conditions of tendering: Required for tender documentation only.
- Conditions of Contract: General conditions, Annexures and Special conditions of contract. SAI Global licence is required to use the Annexures of AS 2124 and AS 4000.
- Quality management system: Quality assurance or Integrated management.
- Method of payment: Schedule of rates or Lump Sum or a combination of both.



*The Australian economy spends approximately \$7 billion per annum to resolve disputes in the construction industry. Concerns exist including the cost of tendering, lack of clarity of documentation and unequal allocation of risk.*

*- CRC Construction Innovation, Guide to leading practice for dispute avoidance and resolution: An overview*

#### Relevant publications

##### Austrroads

*AGPD01 Guide to project delivery Part 1: Overview.*

*AGPD02 Guide to project delivery Part 2: Planning and control.*

*AGPD03 Guide to project delivery Part 3: Contract management.*

*AGPD04 Guide to project delivery Part 4: Direct management of project works.*

*AGPD05 Guide to project delivery Part 5: Road construction quality assurance.*

*AP-G92 Building and construction procurement guide – Principles and options*

The compilation of the AUS-SPEC contract documentation for standard and period and supply contracts is in alignment with the Austrroads project delivery guides AGPD01 to 05.

## USING AUS-SPEC FOR CONTRACT DOCUMENTATION

### Period supply and service contracts

In addition, for period supply and service contracts, define the following contract requirements:

- Extent of service: Supply only, supply and deliver or supply, deliver and install/lay/place.
- Type of quality control: Quality control or Quality management system.
- Period of contract: e.g. 12 months with optional extension for 3 to 5 years or a longer term.
- Method of payment: Monthly payment, proportional payment, payment upon delivery.

### SPECbuilder

Using SPECbuilder, the online specification compilation software, select the appropriate AUS-SPEC worksections and Office edited worksections to create a project specification. Edit standard clauses where necessary and customise the worksections to include project specific information. Complete any checklists and annexures to suit the needs of a particular project.

### Project documentation

Assemble the project specific documentation in two sections:

- Section A – Tender documents: Assemble separately. For electronic tendering, a PDF file with all the information can be issued to the tenderers.
- Section B – Contract documents: Assemble contract documentation in 4 volumes as noted in the **Contract compilation table**.

### Contract compilation table

Contract volumes	Standard contracts	Period supply and service contracts
Section A	TENDER INFORMATION	
	0122 Information for tenderers 0123 Conditions of tendering	
Section B	CONTRACT DOCUMENTS	
Volume 1 CONDITIONS OF CONTRACT		
	0147 Conditions of contract (e.g. AS 2124)	
	Annexure to General conditions of contract	
	Special conditions of contract	
Volume 2 TECHNICAL SPECIFICATIONS		
General	0136 General requirements (Construction)	0134 General requirements (Supply) and/or 0135 General requirements (Services)
Quality assurance	0161 Quality Management (Construction)	0162 Quality (Supply) or 0163 Quality (Delivery)
Integrated management	0161 Quality Management (Construction) and 0167 Integrated management	
Checklists (for development of documents only)	0125 Standard contract checklists	0126 Period supply and service checklists
Specific requirements	Select other worksections as required. Refer to the <a href="#">National worksection matrix</a> . Construction services: <i>Workgroups 2, 3-11 and 13</i> . Maintenance services: <i>Workgroups 14-18</i> .	
Volume 3 (Separate compilation not covered by AUS-SPEC)		
DRAWINGS and SCHEDULES	Project drawings	
	Standard drawings	
	Schedules	
Volume 4		
TENDER SUBMISSION DOCUMENTS	0124 Tender submission documents including Tender forms, Schedule of rates or Bill of quantities Tenderer's particulars, Declarations	
ADDITIONAL INFORMATION	For example, geotechnical information, environmental protection agency information and Council's WHS policy	

### Relevant publications

#### TECHguides

##### General

TG 101 Guidelines for compiling documentation for contracts.

TG 102 Guidelines for Principals – standard contracts.

TG 103 Guidelines for Principals – period supply and service contracts.

TG 104 Guidelines for Principals – sample documents.

##### Maintenance

TG 401 Guide to parks and open space maintenance system and documentation.

TG 402 Guide to adapting asset delivery documentation to parks and open space maintenance.

TG 403 Guide to building and facility maintenance management system and documentation.

TG 404 Guide to adapting asset delivery documentation to building and facility maintenance.

TG 405 Guide to road reserve maintenance system and documentation.

TG 406 Guide to adapting asset delivery documentation to road reserve maintenance.

#### TECHreport

NATSPEC TR 06 Procurement: Past and present provides guidance on using NATSPEC for building construction and AUS-SPEC for infrastructure to suit different procurement and delivery systems. Integrating sustainable procurement with the general stages of the procurement process reduces adverse environmental, social and economic impacts of purchased products and services throughout the asset life cycle.

#### TECHnote

NATSPEC TECHnote

GEN 009 Hold points and witness points

GEN 018 Using AUS-SPEC for asset maintenance sets out the philosophy and components of the AUS-SPEC maintenance system.

GEN 022 Using AUS-SPEC for asset delivery

GEN 023 Using AUS-SPEC for management of unsealed roads

#### Worksections

Refer to the [National worksection matrix](#) for selection of worksections.

## 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.

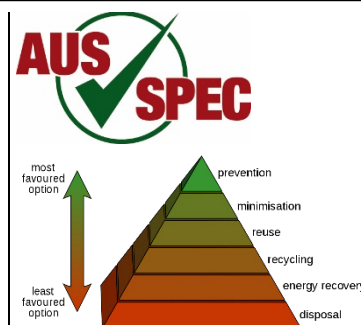
#### Design worksections

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



## SPECIFYING RECYCLED MATERIALS FOR ROAD WORKS USING AUS-SPEC

- **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.

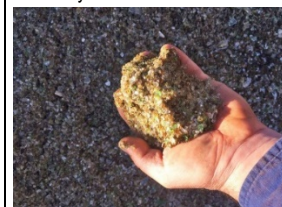
### Examples of the use of recycled materials for pavement construction and rehabilitation



In situ Stabilisation



Use of crushed glass for pavements by Waverley Council



Crushed glass sand produced by Lismore City Council



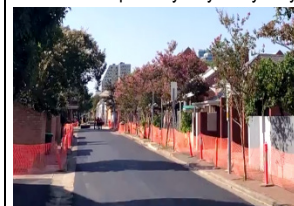
Use of Crumb rubber



Crumb rubber asphalt



Use of Toner pave by City of Sydney



Recycled local road in Sydney