

Effective lifecycle management of rural roads using AUS-SPEC

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Presentation outline

- Introduction
- Challenges faced by councils
- Improving road design
- Improving road construction
- Improving road maintenance management
- Pavement preservation
- Case studies

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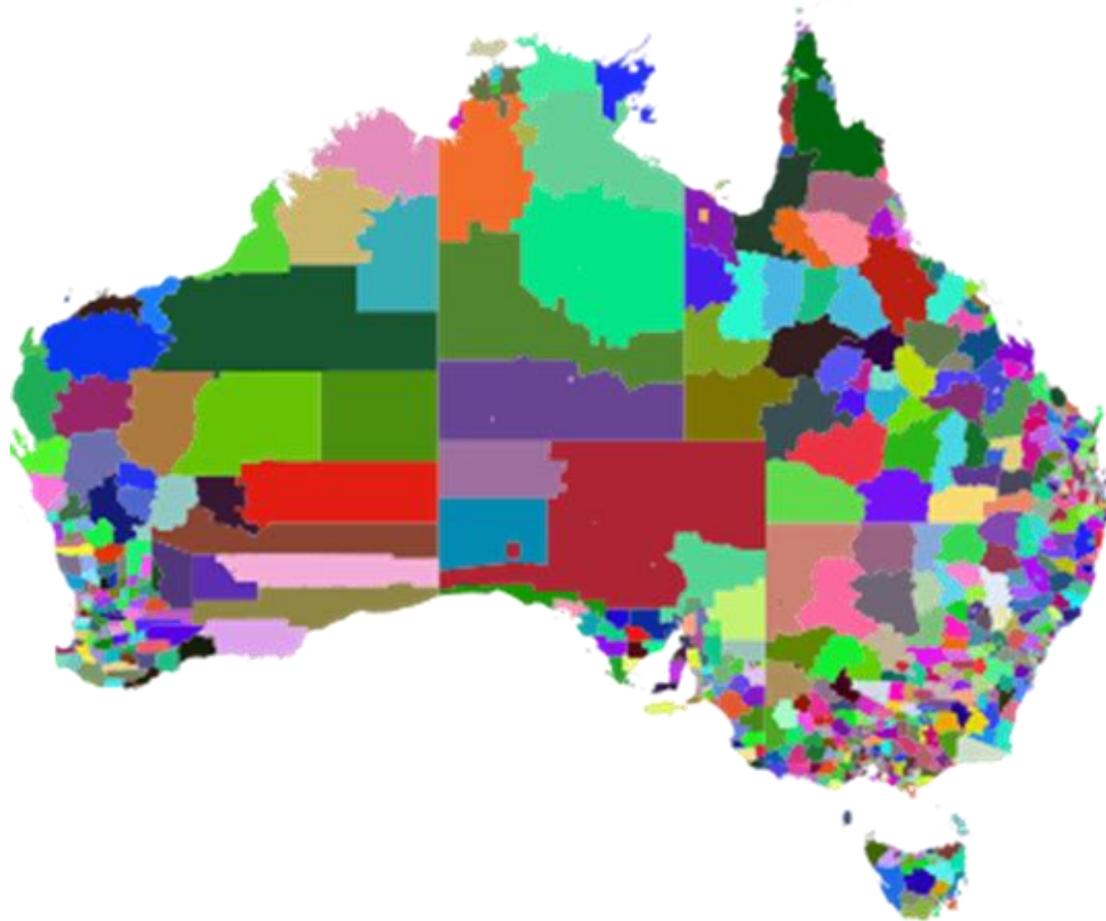


A searchable database of construction products with evidence of conformity to Australian and international standards.

AUS-SPEC for life cycle management of council assets



Local road network



No. of Councils – 537

No. of regional or rural councils – 60-70%

Council road related assets - \$202

Road accidents – 50% on local roads



Challenges faced by councils

- Unsealed roads are dynamic systems with traffic, environment, road profile and material characteristics influencing performance.
- Incomplete understanding of relationship between geometric road design, pavement design, maintenance and road safety.
- Inappropriate specifications
- Maintenance of road assets with constrained budgets.
- Use of traditional materials and practices



New AUS-SPEC Rural Roads package

NATSPEC//
Construction
Information



AUS
SPEC

The Local Government Specification

What is AUS-SPEC?

AUS-SPEC is the national specification system for the design, construction, maintenance and operation of local government assets. It is developed by industry, for industry, and is managed by NATSPEC, a national not-for-profit organisation in partnership with IPWEA. AUS-SPEC comprises various specification packages designed to promote uniformity and best practice in local government asset management. To learn how your local council can save money, improve quality and reduce risk, visit www.natspec.com.au today.

Why a national specification?

As a national system, AUS-SPEC promotes national uniformity and good practice in specifications for local governments, whilst allowing for inclusion of local requirements.

About NATSPEC

NATSPEC is a national not-for-profit organisation whose objective is to improve the construction quality and productivity of the built environment through leadership of information. It is impartial and not involved in advocacy and policy.

Rural Roads Specification Package

- // National, comprehensive and updated annually
- // Quick and easy with SPECbuilder Live
- // Uses the National classification system



AUS-SPEC, a joint venture between IPWEA and NATSPEC, recently released the new Rural Roads Specification Package, responding to challenges faced by regional, rural and remote councils. The national local government specification system, AUS-SPEC has been used by local councils since 1997. This new package is part of an ongoing investment by AUS-SPEC to support rural councils manage their large network of road assets.

The new AUS-SPEC Rural Roads Package will equip councils to implement improved practices across the asset lifecycle. The package covers documentation for planning, design, tendering, contract preliminaries, construction, maintenance and operation of regional and rural roads. Several new specifications and reference documents included in the package will assist rural Councils to effectively manage their sealed and unsealed road network.



"IPWEA is renowned for promoting best practice, producing industry leading publications and providing support training. It's our practical approach that is valued so highly by Councils, Government and the private sector. AUS-SPEC was developed by IPWEA Australasia to provide nationally consistent civil specifications for councils - instead of them reinventing the wheel."

"AUS-SPEC provides a library of civil design, construction and maintenance templates and allows the flexibility to edit and add Council specific and project specific information. It means that everyone involved in design, construction and maintenance of Council assets are using the same language."

"If you're not using AUS-SPEC - you're digging yourself into a bigger hole."

Murray Erbs, Chair NAMS, AU, IPWEA



TECHNICAL

BETTER LOCAL ROADS WITH THE NEW AUS-SPEC PACKAGE

Rural and remote councils manage a large local government area for a small rate payer base, for which they provide a greater range of services than urban councils. Compared to their urban counterparts, they are also more adversely affected by environmental factors and are financially more vulnerable. To improve service delivery and meet local community needs, rural councils need better ways to design, construct and proactively maintain their road assets.

Words by: Nandini Mehta

The challenge of local roads

Local councils manage nearly 80% of Australia's total road network, comprising a mix of both unsealed and sealed roads. Roads in regional and rural areas provide a vital link between local communities and the major road networks. The design, construction and maintenance of these roads are generally done using traditional materials and practices, without any real scientific methodology. This is partly due to incomplete understanding of the relationships between geometric road design, pavement design, maintenance and road safety.



Unsealed road



Sealed road

There is a need to have better technical skills in these councils to understand that unsealed roads are dynamic systems with traffic, environment, road profile and material characteristics influencing their performance. Material is the only element that can be controlled and improved. Therefore, the appropriate selection of wearing course material is a significant way councils can extend the life of their road surfaces and reduce the demand of frequent maintenance. Road safety is a primary concern for regional and local councils, more than half of Australian road accidents occur on their network. The dynamic and unpredictable nature of unsealed roads make them particularly

difficult to maintain, making it hard to forecast optimal expenditures or allocate resources. It follows that improving the performance and management of rural roads will deliver greater safety, ride quality and cost reductions.

Council engineers apply traditional practices inherited from past practitioners without much technical input, or refer to either Austroads or state road authority requirements as a guide to all roadworks. However, while these documents are

very comprehensive, they are aimed at major arterial roads and are unsuitable for rural roads.

New ways for rural councils to better manage local roads

Responding to challenges faced by regional, rural and remote councils, AUS-SPEC, a joint venture between IPWEA and NATSPEC, released the new AUS-SPEC Rural Roads Package in October 2018. As the national, local government specification system, AUS-SPEC has

now been used by local councils since 1997. This new package is part of an ongoing investment by AUS-SPEC to help rural councils better maintain their largest asset: roads.

The new package equips councils to enact better practices for the design, construction, maintenance and operation of local roads. Across this asset lifecycle, the package covers planning and design, tendering, contract preliminaries, construction, maintenance and operation of regional and rural roads.

The package is a simplified version of the existing AUS-SPEC Roadworks and Bridges Package. It also includes additional information for sealed and unsealed roads for rural councils. New TECHReport and TECHNotes also provide guidance on how to adopt a scientific approach to improve the material performance, as well as new ways of maintaining unsealed roads.

AUS-SPEC TECHNote

GEN 023 Using AUS-SPEC for management of unsealed roads.

This TECHNote provides guidance on using the AUS-SPEC specification system for the design, construction and maintenance of unsealed roads.

What's new in design?

The new AUS-SPEC design work sections help create uniform design processes for civil infrastructure works. These work sections can be used for either council capital works or developmental works.

As part of the new release, the AUS-SPEC design specifications now include geometric

road design and pavement design for sealed and unsealed roads in regional, rural and remote councils. The performance of unsealed road surfaces varies considerably with changes in traffic, climate and materials. Hence, the new cut-down versions of existing work sections assist councils to better design road reserves based on road purpose, expected traffic, available resources and the environment.

New design work sections include:

AUS-SPEC Design Specification

- 0051 Geometric rural road design - sealed ^{NEW}
 - 0052 Geometric rural road design - unsealed ^{NEW}
 - 0053 Rural pavement design - sealed ^{NEW}
 - 0054 Rural pavement design - unsealed ^{NEW}
- These generic specifications are for geometric road design and pavement design of sealed and unsealed roads and introduces a scoring system to assist councils to make an assessment to seal an unsealed road.

Design reference

Local government personnel and engineering consultants will find the design reference particularly useful, as it shows how the new AUS-SPEC work sections can be used by rural

councils for all types of roads and associated infrastructure. It also provides essential quality requirements for the design of sealed and unsealed roads, pathways and cycledways, subsurface drainage and stormwater drainage.

The document helps councils to bridge the gap where there is lack of in-house engineering

capability to deliver efficient design of rural roads.

AUS-SPEC Design Reference Specification and Checklists

The design reference specification is available in PDF format and the checklists in Excel format. The checklists can be used to ensure that all the design requirements have been addressed, provide a record of the design process and allow flexibility of add design criteria to be integrated into process as necessary.

TECHReport

AUS-SPEC TECHReport

TR08 Management of council gravel pit country areas - A case study ^{NEW}

Description: This TECHReport focuses on blending of gravels from marginal pits to produce defect-free unsealed in particular focusing on impermeable for waterproofing for longer pavement

For local roads in rural and remote areas traffic is less frequent and composed of long trucking hauls, the TECHReport has developed in support of the new AUS Rural Roads Package to help councils manage their gravel pits and improve performance of available material resour

TECHNICAL

This report focuses on how to attain greater impermeability and waterproofing in order to extend pavement life and deliver better usability. It explains how to blend gravels from marginal gravel pits to produce defect-free unsealed roads.

The report also details how to test and blend materials from neighbouring pits to get a gravel mix with improved performance characteristics for sealed and unsealed pavements. It explains how the marginal extra cost in actuality is offset by a significantly greater whole-of-life cost saving.

What's new in construction?

The new AUS-SPEC construction work sections provide specifications for both quality control and integrated management systems, contract elements associated with most councils' engineering activities. These work sections have been developed for councils to better control the quality of works performed by contractors and developers.

Fifty-four existing construction specifications related to road reserves were reviewed from the perspective of rural councils. Additional information was added where it was deemed to further assist rural councils in the construction of their road reserves. For example, the 1113 stabilisation work section has been re-issued with considerable updates, including information for unsealed roads. In addition, the following new work sections have been released:

AUS-SPEC Construction Specification

This work section includes the construction of plain reinforced concrete bases (by mechanical or hand placement), including slab anchors and terminal slabs. It includes the construction of reinforced concrete approach slabs at bridge abutments.

1140 Wearing course, base and subbase - unsealed ^{NEW}

This work section is applicable to the supply, spreading, compaction and trimming of flexible base, sub-base and wearing courses of pavements for local unsealed roads (with light to medium traffic levels).

Stabilisation



The new construction work sections supported by the following TECHNotes

AUS-SPEC TECHNotes

GEN026 Otto seal - A different approach to road sealing ^{NEW}

This TECHNote aims to assist road owners in understanding the feasibility of using C for low traffic volume unsealed gravel.

DES 034 Pavement stabilisation for unsealed roads

This TECHNote discusses factors affecting the quality of works performed by contractors and developers.

DES 035 Improvement and stabilisation of unsealed roads

This TECHNote describes how unsealed roads can be economically effectively preserved.

Construction references

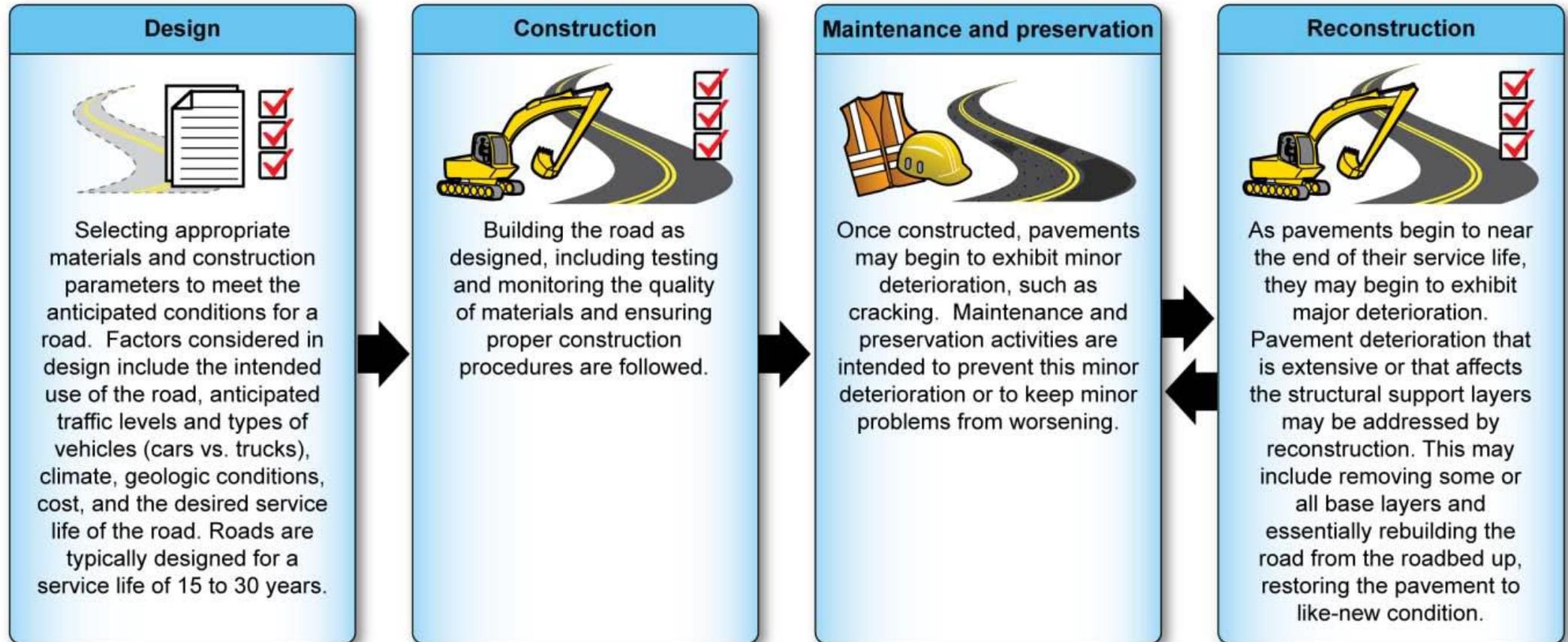
The construction reference shows AUS-SPEC road construction work sections to be used by rural councils for the construction of their road reserves. For example, the 1113 stabilisation work section has been re-issued with considerable updates, including information for unsealed roads. In addition, the following new work sections have been released:

AUS-SPEC Construction Reference Specification and Schedules

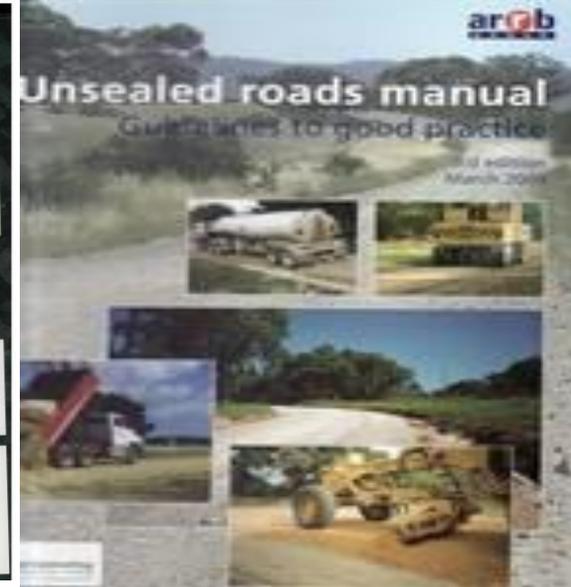
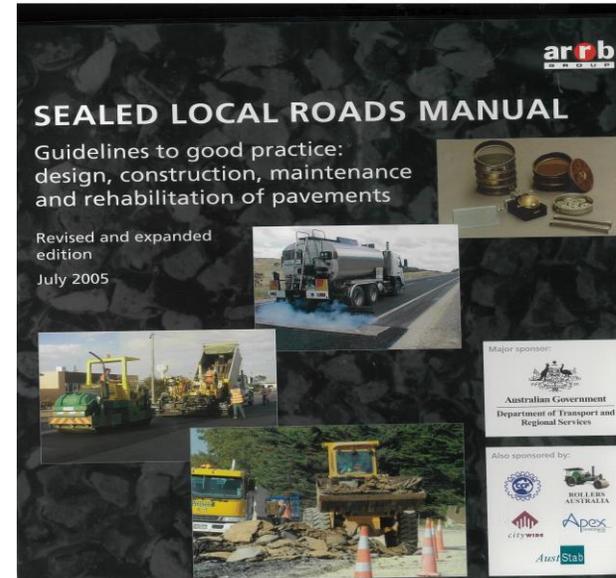
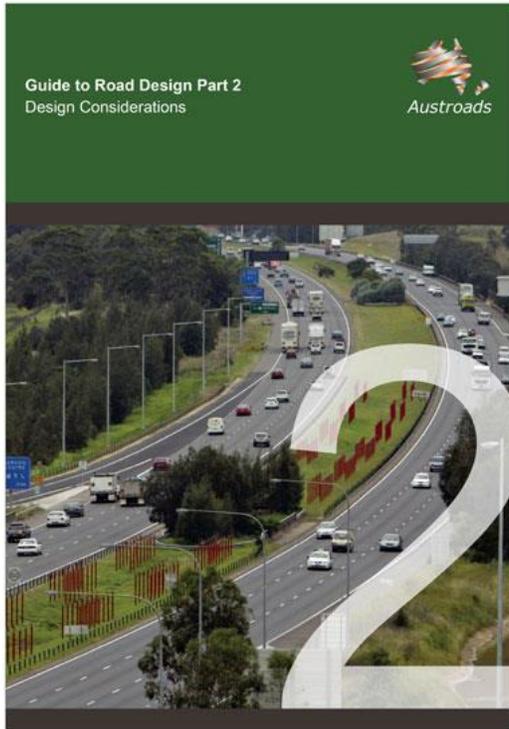
The construction reference specification is available in PDF format and can be used as a reference document for road construction schedules. Schedules are available in PDF format and need to be completed with specific requirements. Schedules include material selection schedules, summary points and sub-points, maximum 1 and test frequencies, and pay items for construction work section. This document is customised to specific activity requirements.



Stages of pavement life cycle



Road Design



ROADguide
Road Design and Performance

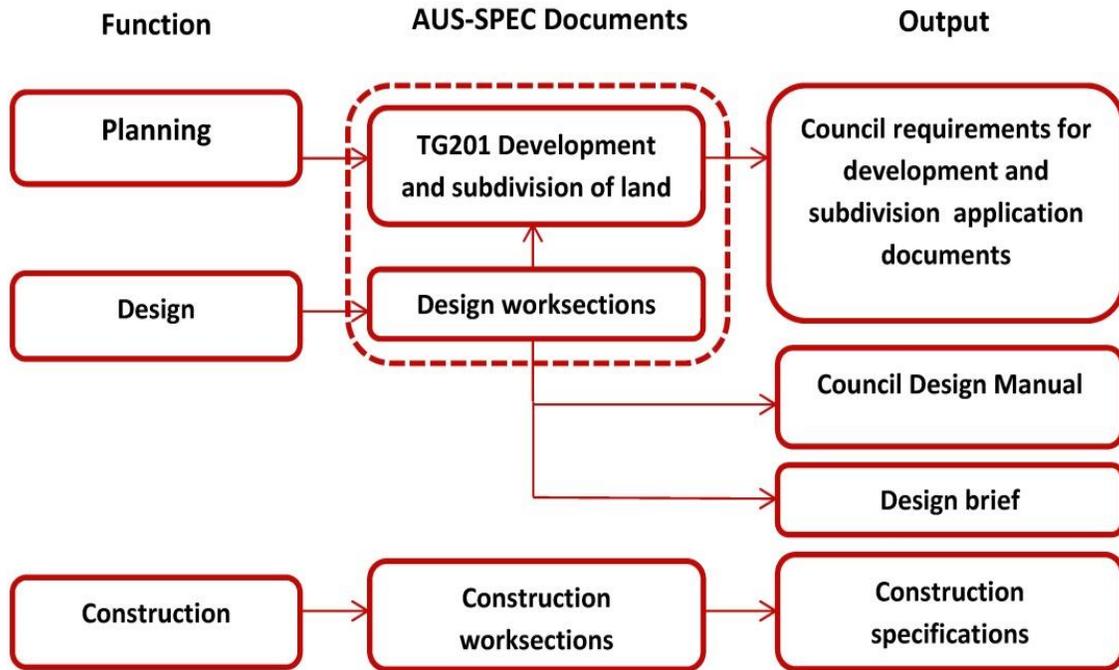


Additional sources

- Australian Asphalt and Pavement Association (AAPA)
- Australian Road Research Board (ARRB)
- Australian Rural Road Group (ARRG)
- Australian Society of Concrete Pavements (ASCP)
- Australasian Society for Trenchless Technology (ASTT)
- Austroads
- AustStab
- Civil Contractors Federation (CCF)
- Cement Concrete & Aggregates Australia (CCAA)
- International Erosion Control Association (IECA)
- IPWEA National, State Divisions, NAMS, Roads and Transport Directorate
- Infrastructure Sustainability Council of Australia (ISCA)
- Plastic Industry Pipe Association (PIPA)
- State Road Authorities
- Streets Opening Coordination Council (SOCC)
- Water Services Association of Australia (WSAA)



Using **AUS-SPEC** for asset delivery



SPECbuilder Live

The screenshot shows the NATSPEC website interface. At the top right, there is a search bar labeled "SPECbuilder & Domestic Online" with a search icon and the text "search". Below the search bar is a navigation menu with items: Home, Products, Product Partners, Training & Support, Technical Resources, About, and Contact. The main content area features the NATSPEC logo and a description: "NATSPEC is a national not-for-profit organisation, owned by Government and industry, whose objective is to improve the construction quality and productivity of the built environment through leadership of information. It is impartial and is not involved in advocacy or policy development. See a list of NATSPEC's stakeholders." Below this are three featured sections: NATSPEC (the national building specification), DOMESTIC ONLINE (accessible by subscribers and one-off users to streamline the specification creation process), and AUS-SPEC (the national specification system for the design, construction, maintenance and operation of local government assets).

New Design documents

Existing Road Design Documents	New Documents
Reviewed existing 10 worksections	
0041 Geometric road design	0051 Geometric road design - sealed 0052 Geometric road design – unsealed
0042 Pavement design	0053 Pavement design - sealed
	0054 Pavement design - unsealed



AUS-SPEC Design Reference and checklists



AUS-SPEC DESIGN REFERENCE OCTOBER 2018



AUS-SPEC Rural Design checklist AUS-SPEC RURAL ROAD DESIGN CHECKLIST

AUS-SPEC RURAL ROAD DESIGN CHECKLIST

Checklist application
This checklist *Template* is applicable to the design worksections. The design worksections must include checklists based on this *Template* customised to suit the design requirements as mentioned in the *AUS-SPEC Rural Road Design reference*.
Rural Road Design Reference is available to AUS-SPEC subscribers as a pdf file downloadable from Subscription downloads/Reference specifications at SPECbuilder Live. Non-subscribers can purchase hard copies of *Reference* from AUS-SPEC.

Reference includes the full text of the design worksections, with the *Prompts* (complete/delete), and *Guidance* (green hidden text) and are excluded.

Guidance text
All text within these boxes is provided as guidance for developing the worksections and should not form part of the final specification. This *Guidance* text may be hidden or deleted from the document using the AUS-SPEC Toolbar or the hidden text *Hide* and *Delete* functions of your word processing system. For additional information visit FAQs at www.natspec.com.au.

Design Reference and Checklists

- The AUS-SPEC Rural Road Design document is a fixed document and the Checklists are customised to suit the project requirements. The two are complementary and the designer must coordinate the content.
- The specific design requirements override conflicting requirements of *Reference*.

Completing Checklists:

- Determine the worksections required for the project. Note redundant worksections and text and delete from Checklists.
- Review defaults and alternatives in *Reference*, checking their appropriateness to your project. If there are alternatives, nominate one, or if none are suitable, exclude them by adding a corresponding clause in Checklists.
- Modify the requirements of *Reference* if they are not appropriate for the project. Include a modifying clause in Checklists which effectively replaces the corresponding clause in *Reference* with your alternative text.
Provide additional text not covered by *Reference*. If an AUS-SPEC worksection does not cover matters you want included, add your new text in the respective or additional Checklists.
- Caution: If you delete a Checklist, or leave it uncompleted, one or more of the following may occur:
The corresponding *Reference* text may not apply and will not be contractually binding.
The default selection, if there is one, in *Reference* may apply.
Selection may be left to the designers discretion.

AUS-SPEC Rural Design checklist Worksections applicable to the project

WORKSECTIONS APPLICABLE TO THE PROJECT

Worksection title	Applicable to the project*	
	Yes	No
0010r Quality requirements for design – Sealed roads	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>
0013 Bushfire protection (Design)	Yes <input type="checkbox"/>	No <input type="checkbox"/>
0021r Site regrading	Yes <input type="checkbox"/>	No <input type="checkbox"/>
0022r Control of erosion and sedimentation (Design)	Yes <input type="checkbox"/>	No <input type="checkbox"/>
0043r Subsurface drainage (Design)	Yes <input type="checkbox"/>	No <input type="checkbox"/>
0044r Pathways and cycleways (Design)	Yes <input type="checkbox"/>	No <input type="checkbox"/>
0051 Geometric rural road design – sealed	Yes <input type="checkbox"/>	No <input type="checkbox"/>
0052 Geometric rural road design – unsealed	Yes <input type="checkbox"/>	No <input type="checkbox"/>
0053 Rural pavement design – sealed	Yes <input type="checkbox"/>	No <input type="checkbox"/>
0054 Rural pavement design - unsealed	Yes <input type="checkbox"/>	No <input type="checkbox"/>
0061r Bridges and related structures	Yes <input type="checkbox"/>	No <input type="checkbox"/>
0074r Stormwater drainage (Design)	Yes <input type="checkbox"/>	No <input type="checkbox"/>

*Check the box applicable for the project.

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Subscription Downloads

As well as the NATSPEC specification templates, your subscription also includes other supporting documents which are included here for download.

- AUS-SPEC additional resources
- AUS-SPEC Case studies
- AUS-SPEC Commentary
- AUS-SPEC Papers
- AUS-SPEC TECHguides
- Package zip files
- Reference specifications
- Simple specifications
- Worksection PDFs with changes highlighted

© AUS-SPEC (Oct 18) 2 [Insert date]

Pavement materials



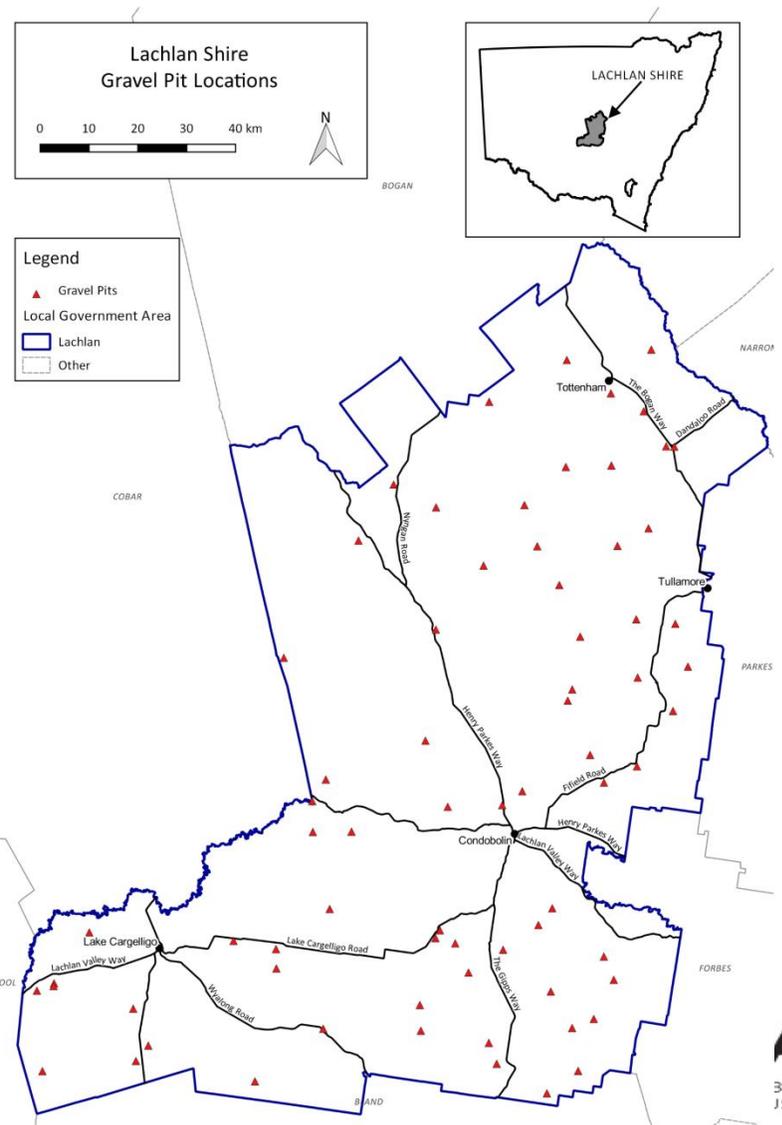
Management of gravel pits



October 2018

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

This TECHreport can be used by Councils who operate licensed gravel pits to comply with their duty of care and be compliant with the legal framework required by the State Governments. Councils can build and maintain better sealed and unsealed roads using a system of materials extraction and blending from different pits to meet the required performance standards. This report shows how Councils can achieve better whole of life costs and reduce budget expenditures for both sealed and unsealed roads.



Road Base Test Kit - Mix Design

File name Bolamspit 10545

Sample number

Material use

Material B source

Material B number

Material C source

Material C number

Material Grading

Sieve Size (mm)	Target grading upper limit %	Target grading lower limit %	Test Material A %	USER INPUT			Resultant mix design %
				Material B %	Material C %		
37.5	100	100	100	100		100	Out of range
19	100	100	88	92		88	
9.5	90	60	72	73		72	
4.75	75	40	61	57		61	
2.36	65	25	53	46		53	
0.425	45	10	43	32		43	
0.075	30	6	28	17		28	

Calculate mix design

Liquid Limit	30	1	35	27	29
Plasticity Index	18	8	14	9	11

% passing 25mm: 91.9
% passing 2mm: 51.8

Mix design proportions

A	B	C	Total
0.30	0.70	0.00	1.0

Note: Proportions are by weight

Material description

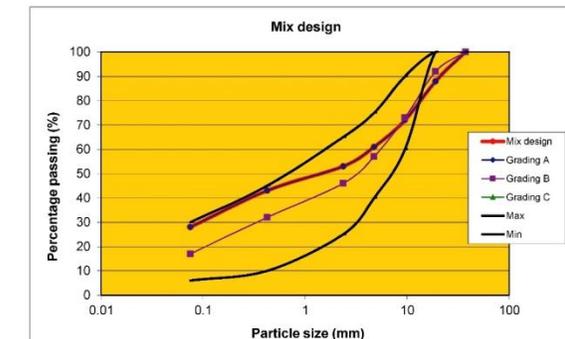
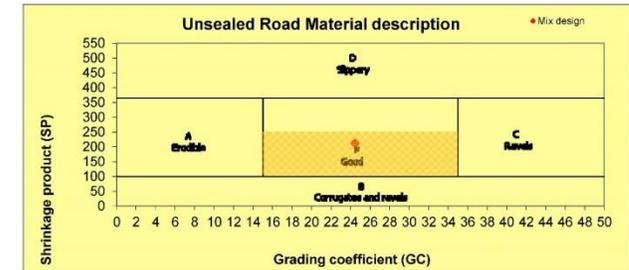
Possible density range (t/m^3)
Estimated MDD (t/m^3)
Estimated OMC (%)
Possible CBR range (%)

Brown silty gravel
2.1
1.83
9.30

Minimum amount of material A to use: 30 %

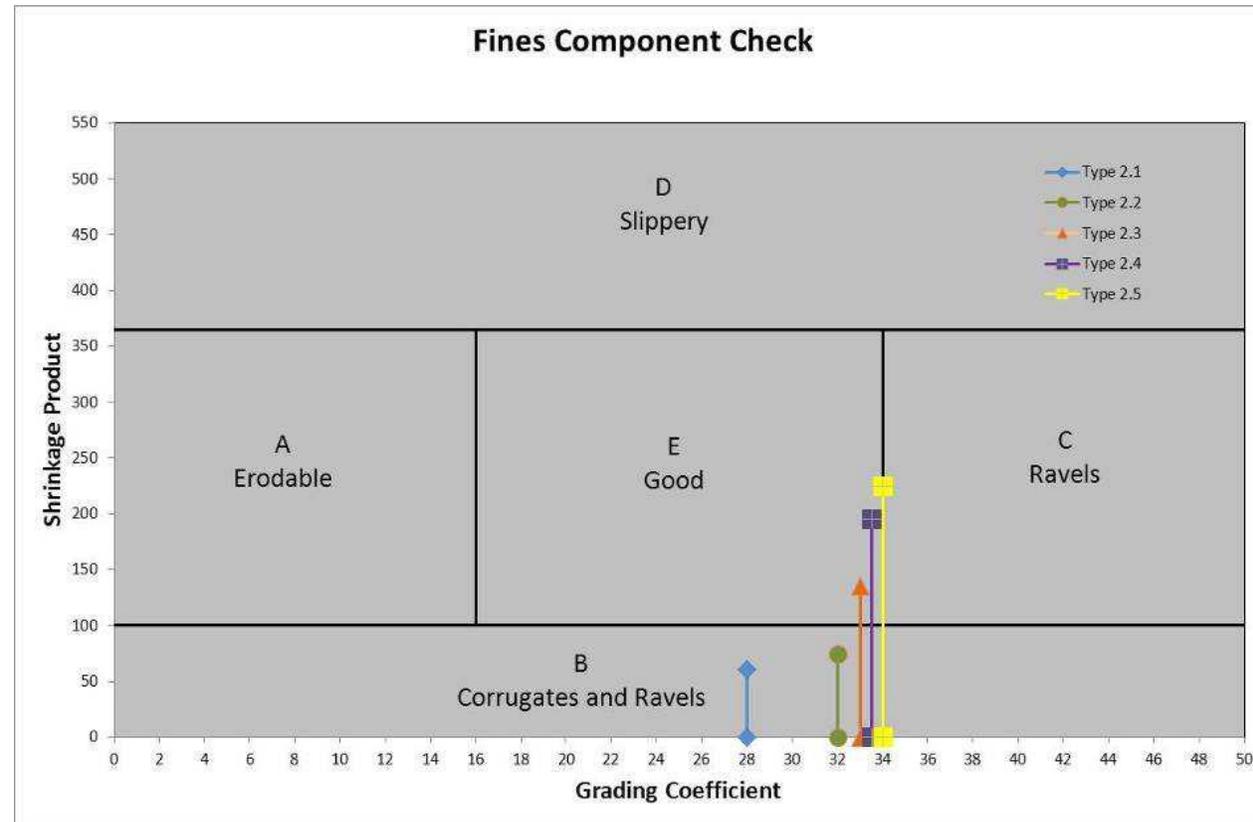
This should only be used if the mix design result does not use material A and it is required that the mix use some proportion of material A

OMC Not applicable - conduct test - refer



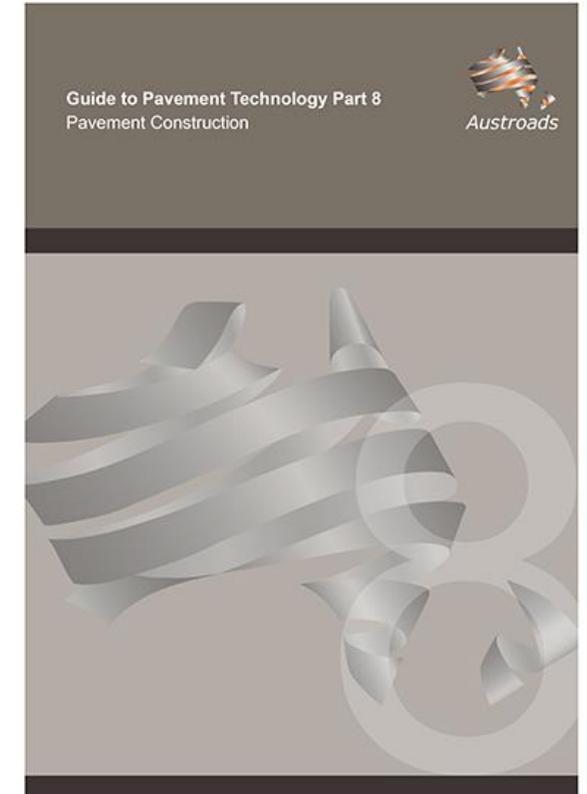
Proven examples from Councils

Cassowary Coast Regional council



New Construction documents

Existing Road Construction Documents	New and revised Documents
Reviewed 54 existing worksections	
Formation preparation	1113 Stabilisation
Rigid pavements	1130 Rural concrete base
Pavement base and subbase	1140 Wearing course, base and subbase - unsealed
	1141 Flexible pavement base and subbase



TECHnotes

NATSPEC TECHnote guidance for consideration

GEN 02

USING AUS-SPEC FOR MANAGEMENT OF UNSEALED ROADS

INTRODUCTION

This TECHnote provides guidance on using the AUS-SPEC specification system for the design, construction and maintenance of unsealed roads. Unsealed roads account for approximately 484 000 km from a total of 810,000 Km of Australia's road network and provide access to rural and remote areas for passenger and commercial vehicles, haulage vehicles routes and emergency services access. They comprise either natural material or gravel and do not have a permanent water-resistant surface like bitumen spray seal, asphalt or concrete.

TYPES OF UNSEALED ROADS

Unsealed roads can be classified in two ways:

- Stage of construction: e.g. unformed, formed and gravelled.
- Traffic volume: Austroads AGPT06 Table 2.1 classifies unsealed roads as Class U1 to U5, with U1 having the highest traffic volume. Similarly, Australian Road Research Board (ARRB) identifies unsealed road Classes 4A to 4D, with 4A having the highest traffic volume.

Pavement selection is based on consideration of the following:

- Traffic volume and type.
- Desired speed.
- Importance of the pavement for all weather access.
- Availability of local materials.
- Available funds.

MANAGEMENT OF UNSEALED ROADS

Unsealed roads can deteriorate rapidly due to weather conditions, traffic volume, construction quality, lack of availability of materials, poor drainage provisions and inadequate maintenance. Effective and efficient life cycle management of unsealed roads is a significant issue faced by most regional, rural and remote councils. The guiding principles of unsealed road management include:

- Maintenance of road safety through quality design
- Providing a high-density impervious gravel pavement to deflect rainfall away from the weaker subgrade.
- Reduction of road maintenance costs by using mechanical blending and chemical stabilisation to reduce defects such as potholes, slippery, dusty, ravelling, corrugating and rutting.
- Testing of materials crushed and screened in each quarry to ensure better service and extended resurfacing life.

The AUS-SPEC specification system of Templates and procedures can be used for the design, construction and maintenance of unsealed roads and the *new Rural Roads Package* will assist local government to effectively manage these diverse assets.

Design

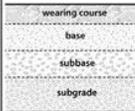
The *00 PLANNING AND DESIGN* workgroup covers quality requirements, bushfire protection, site grading, control of erosion and sedimentation, geometric road design, pavement design, pathways and cycleways, design of stormwater drainage. These Templates can be used to document design requirements such as stage of construction, design life, pavement materials, construction documentation requirements.

Construction, rehabilitation and renewal

The following AUS-SPEC workgroups can be used to document the construction, rehabilitation and renewal requirements for unsealed roads:

- 01 GENERAL:** For tendering requirements, quality assurance, schedule of rates, integrated management, environmental management and standard contract checklists.
- 02 SITE, URBAN AND OPEN SPACES:** For construction of bushfire perimeter tracks, pathways, masonry walls, crib retaining walls, gabions and rock mattresses.
- 03 STRUCTURE:** For auxiliary concrete works.

11 CONSTRUCTION – ROAD RESERVE: For construction requirements of various elements relating to unsealed roads including control of traffic, control of erosion and sedimentation, clearing and grubbing, earthworks, stabilisation, pavement base and subbase, road openings, drainage elements such as subsoil and formation drains, pavement drains and various ancillary items like signposting and boundary fences.



Layers associated with unsealed roads



Stages of construction in unsealed roads

© NATSPEC (Oct 14 – Amdt Apr 19)

Check www.natspec.com.au for latest version

NATSPEC TECHnotes guidance for consideration

DES 034

PAVEMENT STABILISATION FOR UNSEALED ROADS

WHAT IS STABILISATION?

Stabilisation is a process by which the intrinsic properties of a pavement material are altered by the addition of a stabilisation binder and/or granular material to meet performance expectations in its operating, geological and climatic environment.

TYPES OF STABILISATION

Category	Indicative strength after stabilisation	Common binders	Anticipated performance attributes
Subgrade	CBR > 5% (subgrades and formations)	- Lime. - Chemical binder.	- Improved subgrade stiffness. - Improved shear strength. - Reduced heave and shrinkage.
Granular	40% < CBR < +100 % (subbase and base course)	- Blending of other granular materials which are classified as binders. - Mechanical stabilisation.	- Improved pavement stiffness. - Improved shear strength. - Improved resistance to aggregate breakdown.
Modified	0.7 MPa < UCS < 1.0 MPa (base course)	- Small quantities of cementitious binder. - Lime. - Chemical binder.	- Improved pavement stiffness. - Improved shear strength. - Reduced moisture sensitivity and loss of strength due to increasing moisture content. - At low binder contents, stabilised material can be subject to erosion where cracking is present.
Lightly bound	1.0 – 2.0 MPa	- Small quantities of cementitious binder. - Lime.	- Similar to Modified.
Bound	UCS > 2.0 MPa (base course)	- Greater quantities of cementitious binder. - Combination of cementitious and bituminous binders.	- Increased pavement stiffness to provide tensile resistance. - Some binders introduce transverse shrinkage cracking. - At low binder contents, stabilised material can be subject to erosion where cracking is present.

Factors affecting type of stabilisation

Consider the following in selecting the most suitable type of stabilisation:

- Material to be stabilised: Most stabilisation treatments will have an effect on material properties such as strength, volume stability, abrasion resistance, permeability and durability. This property is influenced to differing degrees by the various stabilisation binders.
- Proposed use of the stabilised material.
- Climate and drainage.
- Relative costs of selected binder content.
- Transportation of binder to site.
- Availability of testing facilities for investigations, subsequent controls and construction equipment.
- Capabilities and experience of the construction personnel.
- Health and safety.

Factors affecting the performance of unsealed roads

Stabilisation design for unsealed roads is influenced by specific requirements for the following:



Abbreviations

PI: Plasticity Index
CBR: California Bearing Ratio
UCS: Unconfined Compressive Strength

Austrroads

AGPT01 Guide to pavement technology Part 1: Introduction to pavement technology.
AGPT04 Guide to pavement technology Part 4: Pavement Materials.
AGPT04D Guide to Pavement Technology Part 4D: Stabilised materials.
AGPT04L Guide to Pavement Technology Part 4L: Stabilised Binders.
AGPT06 Guide to pavement technology Part 6: Unsealed pavements.

ARRB

ARRB 2009, Unsealed roads manual – guidelines to good practice.
Andrews, Bob and Sharp, Keran, 2010, Evaluation of in situ stabilisation for best value management of unsealed roads

AustStab

Pavement recycling and stabilisation guide, 2015.

Relevant TECHreport

NTN TECHreport TR 08 Management of gravel pits in country areas – a case study

Relevant TECHnotes

NTN GEN 023 Using AUS-SPEC for management of unsealed roads.
NTN GEN 026 Otta seal – a different approach to road sealing

Relevant worksections

1113 Stabilisation
1140 Wearing course, base and subbase – unsealed
1141 Flexible pavement base and subbase

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Check www.natspec.com.au for latest version

NATSPEC TECHnotes guidance for consideration

DES 035

IMPROVEMENT AND STABILISATION OF UNSEALED ROADS

INTRODUCTION

Preservation of existing unsealed gravel roads can be an economical and effective alternative to:

- Frequent grading maintenance intervention.
- Frequent gravel reshuffling.
- Full construction of a sealed road.

The required intervention levels and timing of maintenance intervention resource may not be sufficient to protect Councils duty of care to provide safe roads. Local gravel pits are becoming increasingly a scarce resource.

Reshuffling only with single pit local gravel materials may not be a lasting solution.

PRESERVATION AND REDUCED INTERVENTION

Improving an unsealed road by blending a combination of road materials for reshuffling or using stabilisers to mix into the existing road material should be considered to reduce construction and maintenance costs. The objective is to increase the time between grading interventions and to increase accessibility after rain or to reduce bulldust hole hazards due to long dry spells.

INVESTIGATION AND DESIGN

OPTION 1 for reshuffling and stabilisation

The use of blended granular road materials or stabilisers compared to a single Council pit gravel has the objective of getting a better unsealed road at a lower whole of life cost. A binder is a combination of road gravels or a chemical stabiliser mixed with a single gravel. Testing using sieve analysis and Plasticity Index (PI) is required for preliminary binder selection by referring to the following table:

PARTICLE SIZE	MORE THAN 20% PASSING 0.425 mm			LESS THAN 20% PASSING 0.425 mm		
	Pl<10	10-Pl<30	Pl<30	Pl<6	Pl<10	Pl<10
BINDER TYPE						
Cement and cementitious binders*	Green	Green	Green	Green	Green	Green
Lime	Green	Green	Green	Green	Green	Green
Bitumen	Green	Green	Green	Green	Green	Green
Bitumen/cement blends	Green	Green	Green	Green	Green	Green
Granular	Green	Green	Green	Green	Green	Green
Dry Powdered Polymers	Green	Green	Green	Green	Green	Green
Macleanes Chemicals**	Green	Green	Green	Green	Green	Green

KEY: ■ Usually suitable ■ Doubtful or supplementary binder required ■ Usually not suitable ■ Requires time as a pre-treatment

* The use of some chemical binders in a supplementary addition can reduce the effectiveness of cementitious binders in fine soils and higher plasticities.

** Should be taken as a binder guideline only. Refer to trade literature for further information.

Source: AustStab Pavement recycling and stabilisation Guide, Table 3.2.

This requires the trial investigation to be a granular blend of two gravels and involves the following:

- The trial consists of first a low-cost commercial pit by-product with low plasticity and high CBR referred to as scalping's or similar
- Second select a local medium plasticity low CBR Council pit gravel previously tested with sieve gradings, plasticity index, UCS, CBR, and density. Set up an excel spreadsheet with sieve grading information for both materials. Trial four different blend percentage combinations on the spreadsheet and select one or two mixes for further laboratory testing.

The trial investigation is done to achieve the following objectives:

- To raise the plasticity of the blue metal by product, increase the combined density and increase the CBR by filling the voids with clay binder in the by-product blue metal.
- To get much cheaper base material supply costs, quicker road construction time, longer whole of road life and a reduction in subgrade potholing due to lower penetration of water in the low pavement.

If this blended gravel is used for a bitumen seal then the mix needs to be tested for Unconfined Compressive Strength (UCS) requiring a range 0.3 to 1 MPa.

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NATSPEC TECHnote guidance for consideration

GEN 026

OTTA SEAL - A DIFFERENT APPROACH FOR ROAD SEALING

INTRODUCTION

The objective of this TECHnote is to assist road owners understanding the feasibility of using Otta seal for low traffic volume unsealed gravel roads. The Otta seal is an alternative to gravel reshuffling or upgrading roads to a conventional chip seal.

PROVIDE BASE GRAVEL STRUCTURAL SUPPORT

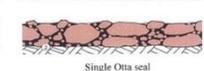
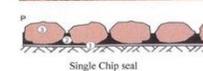
With all sealed pavements whether it be conventional chip seal or Otta seal it is necessary to ensure that the base gravel pavement is designed to provide structural support for the seal. Otta seal has greater deflection tolerance over weaker pavements.

WHAT IS AN OTTA SEAL?

The Otta seal is a bituminous road surface treatment which was originally developed by the Norwegian Road Research Laboratory (NRR) in the early 1960's. It derives its name from the location in Norway where it was developed – the Otta Valley.

In Australia and New Zealand the binder has been nicknamed Norwegian Road Oil or NRO. Otta seal NRO binder can be a single seal and has a higher application rate than a conventional single single seal. Compare this with the extra treatments for chip seals with prime seal, and 2 coat aggregate seal plus precoat emulsion on the aggregates.

In Victoria Otta seals are referred to as GATT seals.



Single Chip seal

Single Otta seal

1. Prime
2. Binder
3. Stone

CHARACTERISTICS OF OTTA SEAL'S

• A primer seal is not required. Spray cutback binder hot bitumen MC900 MC3000, and cutback (up to 10% cutter) 150/200 penetration grade bitumen readily supplied locally. Hot spray application rates range from 1.8 to 2.2 litres per square metre clay fines dependent.

• It is desirable for Otta sealing to dampen the prepared base gravel prior to spraying of the binder.

• Use a local screened natural pit road gravel (screened and separately stockpiled when the pavement gravel stockpile is created) range of 0.042 to 16 mm aggregate which includes up to 10% clay fines below 0.075 mm. This aggregate and clay material are spread on the road over the bitumen in a 16 mm layer or up to 19 mm if a double Otta seal is planned.

• The seal develops after initial rubber tyre rolling and is then left for a period of 2 months followed by sweeping of any residue gravel. Initially the Otta seal has the appearance of a gravel reshuff however the seal becomes more visible over the next few months as the bitumen/clay mastic rises and joins with the larger stones in the gravel.

• The Otta seal aggregates need adhesion testing using an appropriate adhesion test, for example Riedel and Weber Test. Use an adhesion agent if required.

• The gravel aggregate spreading rates for Otta seals vary between 0.013 to 0.020 cubic metre per square metre, and for sand spreading the rate is 0.010 to 0.012 cubic metre per square metre of road surface.

• After rolling and trafficking, the binder and fines work their way upwards through the aggregate interstices which results in a dense, durable matrix that relies on both mechanical interlock and bitumen binding for its strength – similar to a bitumen premix.

• Heavy trucking may require selection of a 32 mm double Otta seal for a 30-year life.



Abbreviations

NRC: Norwegian Road Oil
NRR: Norwegian Road Research Laboratory

Relevant publications

Austrroads
AGPT01 Guide to pavement technology
AGPT03 Pavement surfacings
AGPT05 Pavement evaluation and treatment design

Technical Paper 1

The Otta Seal Surfacing: An economic and practical alternative to traditional bituminous surface
By Charles Doney, Norwegian Public Roads Administration
And Michael Pinard, InfraAfrica Consultants, Botswana

Technical Paper 2

Innovation and Sustainable Road Services in Rural Setting
By Krishna Shrestha, Works Manager, Narrandera Shire Council, NSW

Relevant worksections

0054 Rural pavement design - unsealed
1140 Wearing course, base and subbase - unsealed
1141 Flexible pavement base and subbase

Method B11

Riedel and Weber Adhesion Test
Road Research Laboratory, England
Bituminous Materials in Road Construction

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Stabilisation

1113 Stabilisation

1113 STABILISATION

Worksection abstract

This worksection *Template* is applicable to materials and processes for stabilisation of subgrade and pavement courses. Stabilisation binders include cement, quicklime, hydrated lime, cementitious blends, bitumen emulsion, foamed bitumen, granular materials and dry powdered polymer.

This worksection should be reviewed by a professional engineer and amended if necessary to suit local conditions.

Background

Refer to *AustStab - Pavement recycling and stabilisation guide* for information on design and construction of stabilised pavements.

Guidance text

All text within these boxes is provided as guidance for developing this worksection and should not form part of the final specification. This *Guidance* text may be hidden or deleted from the document using the NATSPEC Toolbar or the hidden text *Hide* and *Delete* functions of your word processing system. For additional information visit FAQs at www.natspec.com.au.

Cross references

Worksections that cross reference this worksection are:

- 1112 Earthworks (Road reserve).
- 1141 Flexible pavement base and subbase.
- 1145 Segmental paving.
- 1351 Stormwater drainage (Construction).

Material not included in AUS-SPEC

Some projects may include items not covered by AUS-SPEC. For these you may need to create new text or modify this text or a suitable worksection.

- This worksection does not include preparation of granular pavements for priming or initial sealing, rectification or maintenance of surfacings before resealing or the reinstatement of linemarking, raised pavement markers, etc.

Documenting this and related work

Documented and similar terms are used in this worksection *Template* to indicate that information may be documented within the text of the specification, the schedules or on drawings. It is recommended to complete a search for this term and make sure that the required information is documented where appropriate.

You may document this and related work as follows:

Specifying ESD

The following may be specified in the worksection:

- Re-use of materials from the existing pavement which can be treated by stabilisation to achieve the required characteristics.
- Ground granulated blast furnace slag.
- In situ stabilisation techniques.

1 GENERAL

1.1 RESPONSIBILITIES

General

Requirement: Provide stabilisation of subgrade and pavement courses, as documented.

Documented is defined in 0136 *General requirements (Construction)* as meaning contained in the contract documents.

1.2 CROSS REFERENCES

General

Requirement: This worksection is not a self-contained specification. In addition to the requirements of this worksection, conform to the following:

- 0136 *General requirements (Construction)*.

0136 *General requirements (Construction)* sets out the quality system or quality control, set-out of the works, work-as-executed drawings, environmental planning, site facilities, meetings, items supplied by the principal, utilities and authorities requirements and project specific requirements. This worksection is applicable to all project specifications.

Guide to Pavement Technology Part 4D Stabilised Materials



IMPROVING PROPERTIES OF UNSEALED ROADS

A TONYE PAVEMENT AND AUSTRAL TASK GROUP RECENTLY EXPLORED THE BENEFIT OF STABILISATION TO IMPROVE THE DURABILITY AND LIFE OF UNSEALED ROADS IN RURAL AND REMOTE REGIONS. THE MOST BENEFIT WAS OBSERVED IN ROAD WITH SOME POSITIVE OUTCOMES.

NSW PROVED TO BE AN IDEAL REGION FOR TRIALS - ITS ROAD NETWORK COMPRISES ROUGHLY 90,000 KILOMETRES OF ROAD, OF WHICH 50 PER CENT IS UNSEALED.

NSW was to provide safe all-weather access on unsealed roads and improve the structural integrity of the pavements. Early trials resulted in successful cost reductions of up to \$100 per kilometre annually for some regions, based on whole of life costing and changes to regular minor maintenance activities.

INRA NSW - Road Directorate and Austroads, wanted to look at additional trial sites in black soil regions, particularly the unsealed roads that are affected by the wet season and are often inaccessible for long periods of time in a season.

NSW was ideal for trials. Its road network comprises roughly 90,000 kilometres of road, of which 50 per cent is unsealed. Four unsealed pavement trials had already been undertaken in the region road - road part of a previous Federal Government - funded study. These roads were stabilised with lime, cementitious blends or dry thermal polymer binders, depending on the existing pavement materials. The trial areas were brown field sites made up of existing worn granular pavements at the end of their pavement life.

The objective of each site varied slightly and typically consisted of a three-step process of testing materials stabilised using a smaller binder as deemed for the program. Before stabilisation, substantial testing was undertaken in accordance with Austroads standards. These tests for plasticity index (PI) identified the expense class and aid binder selection, leading to determine the suitability of the material for stabilising and successful compressive strength (SIC) to assist in determining the suitability of the selected binder application rate.

The current project is aiming to achieve a plethora of outcomes similar to the previous trials. These include an overall reduction of the whole of life cost for unsealed pavements in black soil regions of western NSW, and south-west Queensland.

Part of the goal is to also establish a field performance testing regime in this area to help guide councils on stabilising expensive black soil soils in the stabilisation of unsealed granular pavements, as well as reducing the whole of life maintenance costs for the local government bodies.

The trials also aim to reduce the amount of time that unsealed pavements need to be closed due to seasonal flooding or extended periods of wet weather.

Queensland's Goodland Regional Council was the first council to work with the task force on the project. The costs of the project were shared between councils, INRA, Austroads and Austroads members who would provide plant, labour, materials and supervision or grant-in-aid rates. Bundaberg Road, approximately 85 kilometres west of Queensland, was chosen for the testing site. The road had a gravel overlay, sourced from a local council pit on top of the natural black soil material.

However, the granular material had worn away for a new overlay. The project team decided on a trial of 200 mm granular material and the depth of stabilisation. More analysis of these results is required before reporting. The site will be monitored for up to five years with emphasis placed on performance, safety and maintenance requirements (if any).

All sections were sampled for grading PI and CBR. Results are variable due to variability in the course of granular material and the depth of stabilisation. More analysis of these results is required before reporting. The site will be monitored for up to five years with emphasis placed on performance, safety and maintenance requirements (if any).

The hope is that the black soil, with the addition of lime, will perform as well as the materials stabilised in the initial DOTARS study and result in reduced annual maintenance costs for regional councils.

TYPICAL PROPERTIES OF BLACK SOIL

Property	Typical range of values (%)
Plasticity index (PI)	21 - 49
Swell (CM)	13.5 - 14
CBR unsealed	10 - 40
CBR 4 day sealed	1 - 7
Optimised/Proctor core (CMC)	20 - 30 (Approximately)
Linear shrinkage	0 - 10

Treatment for sealed roads



Treatments

AUS-SPEC documents

Sprayed seal



1143 Sprayed bituminous surfacing



Asphalt overlay



1144 Asphalt (Roadways)



Surfacing treatments

Treatments

Slurry surfacing
 Slurry seal
 Microsurfacing



AUS-SPEC documents

1146 Microsurfacing

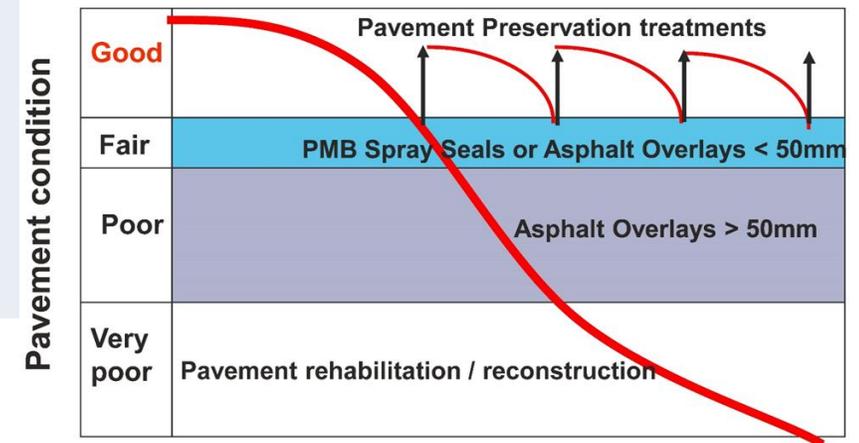


Sprayed preservation surfacing treatments

Rejuvenation
 Enrichment
 Polymer modified Emastic

1147 Sprayed preservation surfacing and TECHnote Sprayed preservation surfacing treatments

Pavement Life Cycle with treatment strategies



Pavement Life

AUS-SPEC Construction References



AUS-SPEC CONSTRUCTION REFERENCE OCTOBER 2018



Schedules – AUS-SPEC Rural Construction

Schedules application

This Schedules Template is applicable to a two-part specification. A two-part specification must include Schedules based on this Template customised to suit the project and the Reference – AUS-SPEC Rural Construction.

Reference is available to AUS-SPEC subscribers as a pdf file downloadable from Resource material downloads/Reference specifications at SPECbuilder Live. Non-subscribers can purchase hard copies of Reference from AUS-SPEC.

Reference includes the full text of worksections, with the SELECTIONS, Prompts [complete/delete], Guidance (green hidden text), and Optional text excluded. These are included in Schedules.

Guidance text

All text within these boxes is provided as guidance for developing the worksections and should not form part of the final specification. This Guidance text may be hidden or deleted from the document using the AUS-SPEC Toolbar or the hidden text Hide and Delete functions of your word processing system. For additional information visit FAQs at www.natspec.com.au.

Contract documentation and two-part specifications

Contract documentation using a two-part project specification includes the following:

- General and special conditions of contract.
- The project specific Schedules based on this document.
- Reference.
- The drawings.
- Other cited documents.

Contractual issues:

- A two-part project specification includes both the fixed Reference document and the Schedules customised to suit the project requirements. The two are complementary and the specifier must coordinate the content.
- List Reference and Schedules in the general conditions of contract as contract documents, including its date. Make sure the tenderer/contractor uses the latest version of Reference by including the current Reference pdf file as part of the tender document set.
- The requirements of other contract documents override conflicting requirements of Reference.

Completing Schedules:

- Determine the worksections required for the project. Note redundant worksections and text and delete from Schedules.
- Complete or delete Prompts.
- Convert Optional text to Open text to suit the project.
- Review defaults and alternatives in Reference, checking their appropriateness to your project. If there are alternatives, nominate one, or if none are suitable, exclude them by adding a corresponding clause in Schedules.
- Modify the requirements of Reference if they are not appropriate for the project. Include a modifying clause in Schedules which effectively replaces the corresponding clause in Reference with your alternative text.
- Provide additional text not covered by Reference. If a AUS-SPEC worksection does not cover matters you want included, add your new text in the respective Schedules worksection.
- Caution: If you delete a Prompt or part of the SELECTIONS schedules, or leave it uncompleted, one or more of the following may occur:
 - The corresponding Reference text may not apply and will not be contractually binding.
 - The default selection, if there is one, in Reference may apply.
 - Selection may be left to the contractor's discretion.

Schedules – AUS-SPEC Rural Construction

Worksections applicable to the project

WORKSECTIONS APPLICABLE TO THE PROJECT

Worksection title	Applicable to the project*	
	Yes	No
01 General	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>
0136 General requirements (Construction)	Yes <input type="checkbox"/>	No <input type="checkbox"/>
0147 Conditions of contract	Yes <input type="checkbox"/>	No <input type="checkbox"/>
0152r Schedule of rates (Construction)	Yes <input type="checkbox"/>	No <input type="checkbox"/>
0161 Quality management (Construction)	Yes <input type="checkbox"/>	No <input type="checkbox"/>
0167 Integrated management	Yes <input type="checkbox"/>	No <input type="checkbox"/>
0173 Environmental management	Yes <input type="checkbox"/>	No <input type="checkbox"/>
02 Site, urban and open spaces		
0257 Landscape – road reserve and street trees	Yes <input type="checkbox"/>	No <input type="checkbox"/>
0281 Bushfire perimeter tracks (Construction)	Yes <input type="checkbox"/>	No <input type="checkbox"/>
0282 Pathways and cycleways (Construction)	Yes <input type="checkbox"/>	No <input type="checkbox"/>
0292 Masonry walls	Yes <input type="checkbox"/>	No <input type="checkbox"/>
0293 Crib retaining walls	Yes <input type="checkbox"/>	No <input type="checkbox"/>
0294 Gabion walls and rock filled mattresses	Yes <input type="checkbox"/>	No <input type="checkbox"/>
03 Structure		
0319 Auxiliary concrete works	Yes <input type="checkbox"/>	No <input type="checkbox"/>
11 Construction – road reserve		
1101 Traffic management	Yes <input type="checkbox"/>	No <input type="checkbox"/>
1102 Control of erosion and sedimentation (Construction)	Yes <input type="checkbox"/>	No <input type="checkbox"/>
1111 Clearing and grubbing	Yes <input type="checkbox"/>	No <input type="checkbox"/>
1112 Earthworks (Road reserve)	Yes <input type="checkbox"/>	No <input type="checkbox"/>
1113 Stabilisation	Yes <input type="checkbox"/>	No <input type="checkbox"/>
1121 Open drains	Yes <input type="checkbox"/>	No <input type="checkbox"/>
1122 Kerbs and channels (gutters)	Yes <input type="checkbox"/>	No <input type="checkbox"/>
1130 Rural concrete base	Yes <input type="checkbox"/>	No <input type="checkbox"/>
1132r Lean mix concrete subbase	Yes <input type="checkbox"/>	No <input type="checkbox"/>
1136 Cold milling of asphalt and base course	Yes <input type="checkbox"/>	No <input type="checkbox"/>
1140 Wearing course, base and subbase – unsealed	Yes <input type="checkbox"/>	No <input type="checkbox"/>
1141r Flexible pavement base and subbase	Yes <input type="checkbox"/>	No <input type="checkbox"/>
1142 Cold mix asphalt	Yes <input type="checkbox"/>	No <input type="checkbox"/>
1143 Sprayed bituminous surfacing	Yes <input type="checkbox"/>	No <input type="checkbox"/>
1144 Asphalt (Roadways)	Yes <input type="checkbox"/>	No <input type="checkbox"/>
1145 Segmental paving	Yes <input type="checkbox"/>	No <input type="checkbox"/>
1146 Microsurfacing	Yes <input type="checkbox"/>	No <input type="checkbox"/>
1147 Sprayed preservation surfacing	Yes <input type="checkbox"/>	No <input type="checkbox"/>
1151 Road openings and restoration	Yes <input type="checkbox"/>	No <input type="checkbox"/>
1152 Road openings and restoration (Utilities)	Yes <input type="checkbox"/>	No <input type="checkbox"/>
13 Construction – Public utilities		
1351 Stormwater drainage (Construction)	Yes <input type="checkbox"/>	No <input type="checkbox"/>
1352 Pipe drainage	Yes <input type="checkbox"/>	No <input type="checkbox"/>
1353 Precast box culverts	Yes <input type="checkbox"/>	No <input type="checkbox"/>

Road reserve maintenance system

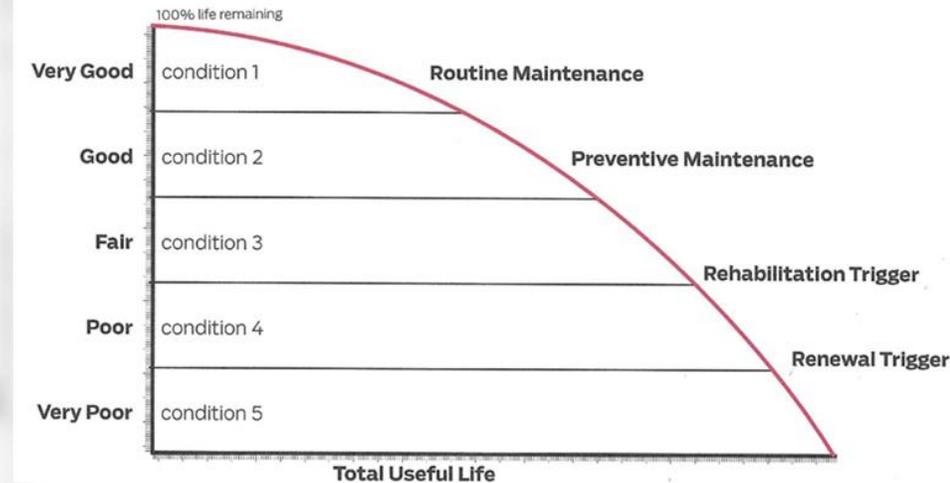
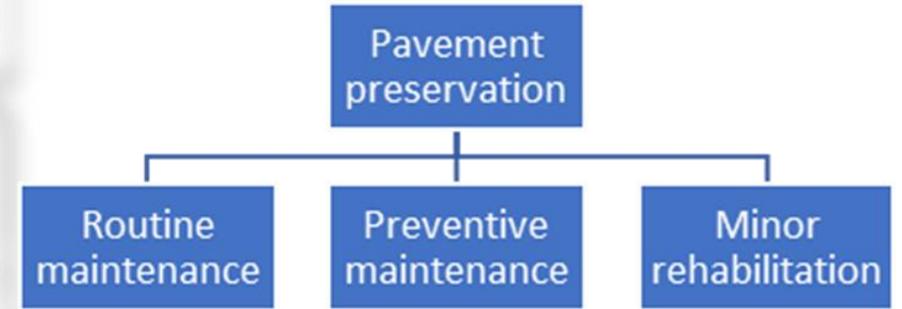
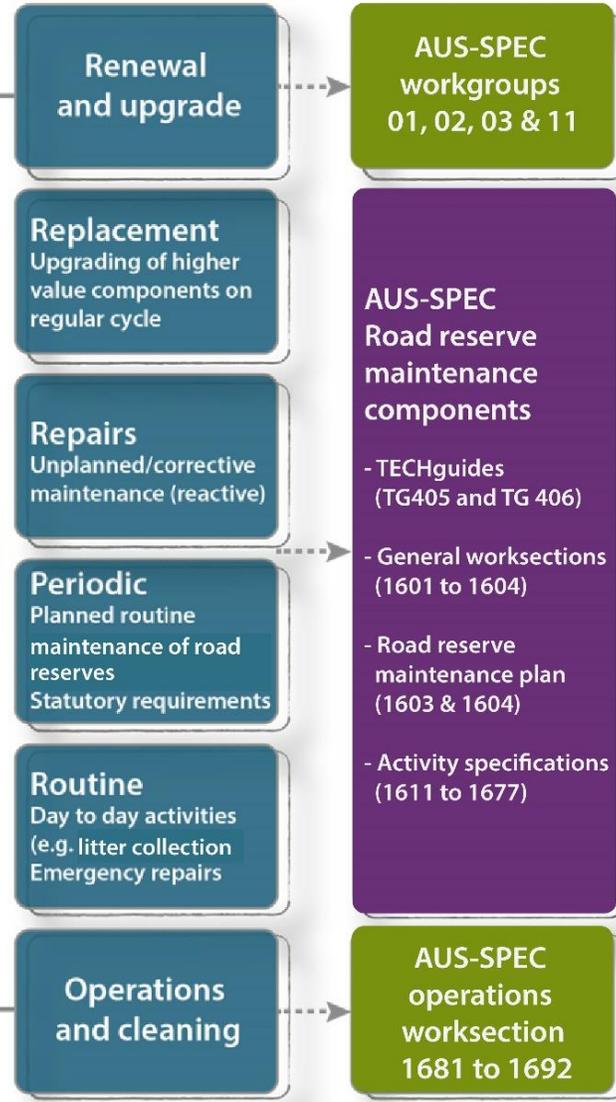
Asset management policy
Asset management strategy

Asset management plan

- Acquisition plan
- Operation plan
- Maintenance plan
- Disposal plan

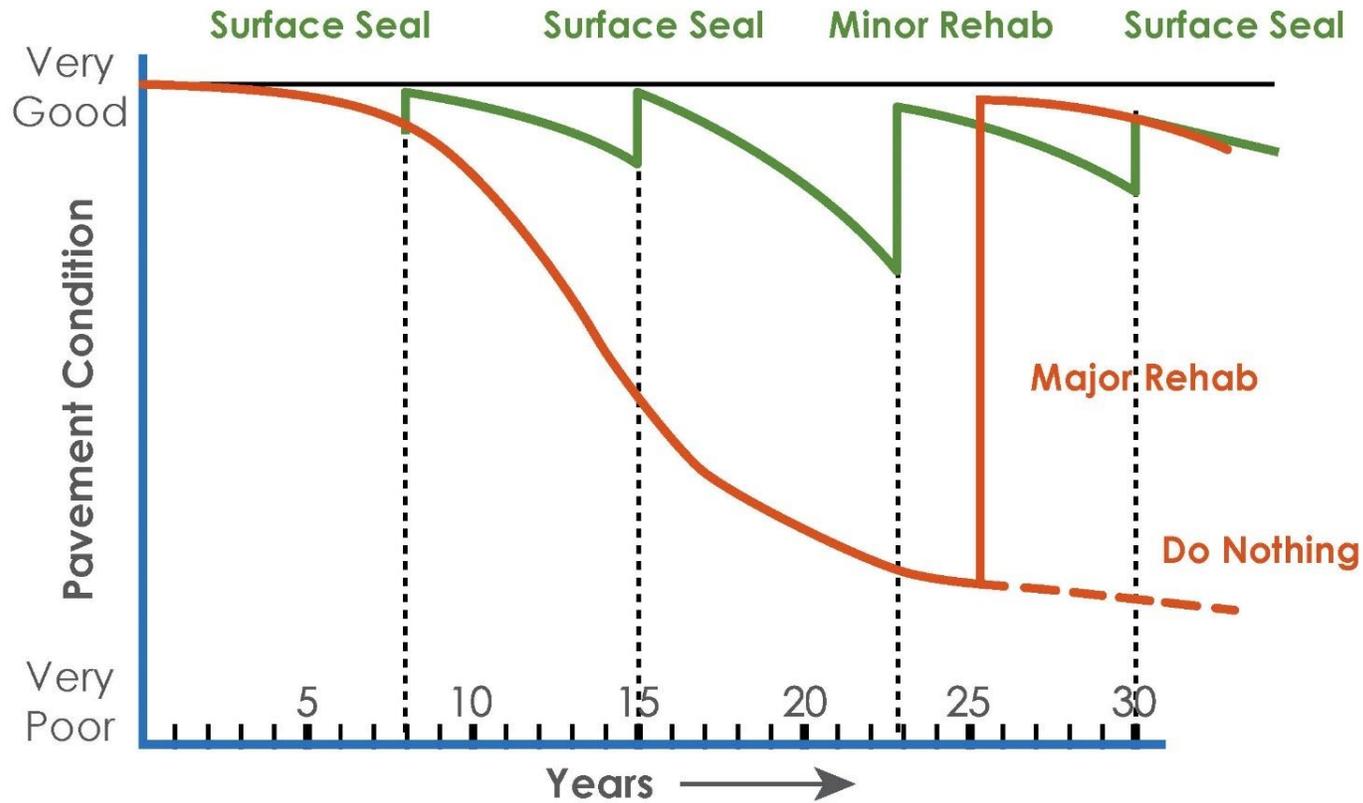
AUS-SPEC Maintenance system

**NAMS PLUS & PN9
PN9.1 and PN9.2**

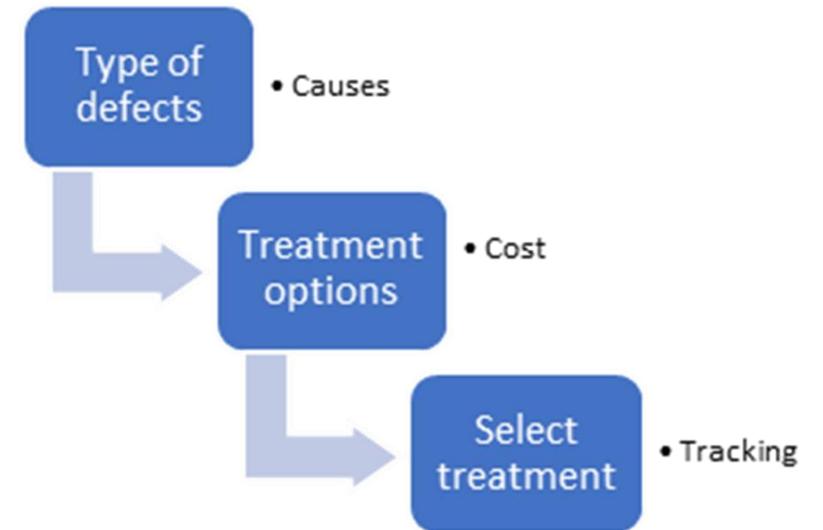


Pavement management strategies

Pavement Management with "Good Roads Cost Less" Preservation Strategies



Selection of treatments

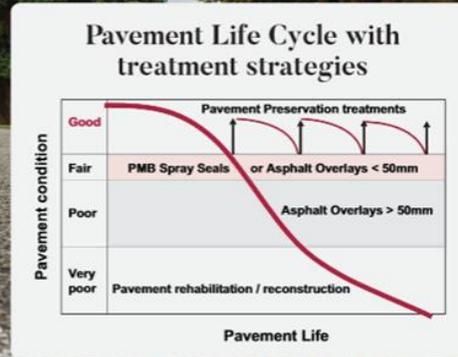
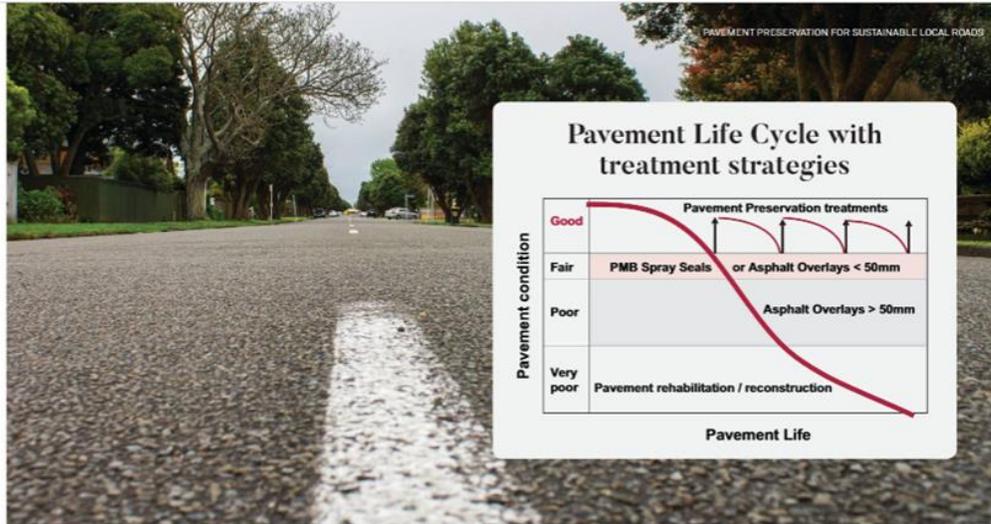


Preservation treatments

TECHNICAL

PAVEMENT PRESERVATION FOR SUSTAINABLE LOCAL ROADS

Maintaining local roads is a perennial challenge for councils. Here, AUS-SPEC Manager Nandini Mehta outlines four treatment options to prolong the lifespan of pavement.



Sprayed preservation surfacing treatments are generally applied to low-volume sealed roads where primary distress is caused by environmental factors from binder oxidation. If road surfaces are left untreated, microcracking and potholes can develop. This could result in localised pavement failure.



AUS-SPEC Technote
GE2025 Sprayed Preservation Surfacing Treatments
 Description: A technical note to determine when and where to apply sprayed preservation surfacing treatments to extend the life of sealed road networks.

Why does pavement decay?
 Pavements deteriorate for many reasons, but predominantly from lifetime vehicle loading and environmental elements. Council roads are generally lightly trafficked and surfaced with

either sprayed seals or asphalt, or unsealed wearing courses. Any deterioration of bitumen roads is usually due to the breakdown of the surfacing, primarily caused by oxidation and seal cracking. This permits water ingress to the base gravel, causing material decay.

Prevention practices
 Early failures can be due to a breakdown in the construction process of materials, site preparation or placement practices. These issues can be avoided if construction methods, placement techniques and base gravel materials conform to proper specifications, like those available from AUS-SPEC.

Quality construction and material practices apply to all types of pavements. For flexible sealed pavements, quality construction and material practices include sprayed seals, slurry seals, microsurfacing, enrichments, asphalt

overlay and pavement preservation treatments. Improved construction methods, appropriate treatment methods and proper specifications can all contribute towards improved pavement performance, safer roads and delayed (usually costly) rehabilitation.

Planned pavement preservation will reduce aging, increase waterproofing and restore serviceability without decreasing pavement capacity or strength. The net result is lower whole-of-life costs.

Types of treatment
 In local roads the standard preservation treatment is an aggregate resal. Local roads generally see low volume traffic and usually suffer from oxidation of the bitumen binder rather than polishing of the aggregate, which tends to manifest on high volume roads as the limiting wear factor.

The standard resal intervention for wetter and cooler climates is a maximum of 12 years and 15 years for dry climates. In wet climates the bitumen seal is more exposed to cracking, defects and polishing.

To protect and prolong pavement life, the following four sprayed preservation treatments should be considered by councils for low volume roads:

Treatment type: Enrichment
 This is a sprayed treatment that incorporates bitumen and proprietary additives being applied to bituminous surfacing in order to provide a protective barrier against oxidation. Enrichment treatments are typically non-sand filled. The nominal residual application rate range is 0.30 to 0.600/m². Slow and medium setting grades of emulsion may be diluted with water to improve coverage and flow between aggregate particles. Enrichment should be used on a structurally sound 14mm or 20mm single seal because the process adds a little bitumen on each cycle. →

“The net result is lower whole-of-life costs.”

Enrichment



Right side shows condition of 20 yr asphalt surfacing due to binder oxidation

Same age asphalt surface following 3 applications of Enrichment treatment



PME

PME applied to stripping seal

Maintenance worksections

Workgroup 14 & 16 for maintenance of Road reserves

16 MAINTENANCE AND OPERATION - ROAD RESERVE

160 General

161 Pavement

162 Pavement (cont)

- [1620 Pothole repair](#)
- [1621 Concrete pavement repairs](#)
- [1622 Concrete slab stabilisation](#)
- [1623 Emergency pavement repairs](#)

163 Shoulder

- [1631 Edge break repairs](#)
- [1632 Grading unsealed shoulders](#)
- [1633 Resheeting unsealed shoulders](#)
- [1634 Local scour repair](#)

164 Roadside

165 Pavement moisture control

167 Traffic facilities

168 Operation - road reserve

169 Operation - cleaning and waste management

17 MAINTENANCE - BRIDGES



NATSPEC TECHNOTE guidance for consideration

GEN 027

MAINTENANCE OF UNSEALED ROADS

Unsealed road shoulders with pervious gravel exposes the road owner to edge break repairs.

Dust suppression techniques for short sections of unsealed roads

The following dust suppression options can be considered for treating short lengths of unsealed road say 150 m in length for temporary or medium-term relief from dust for persons with houses next to unsealed roads:

- Addition of water is very short term.
- Addition of Calcium, magnesium or sodium chloride.
- Lignosulphonates (by-products of the wood pulping process).
- EVA emulsion glue (integrating by ripping into existing gravel).
- Emulsion combination of bitumen, water and additives.
- Asphaltic concrete millings mixed into tyned gravel where close to convenient source areas.
- Otta seal surfacing with "Norwegian Road Oil" mixed/blended with screened pit gravel creating macadam of aggregates, clay and bitumen. It can tolerate high deflections over weak gravel base. For more details on Otta seal refer to NATSPEC Technote GEN 027. This Otta Seal dust suppression option is cheapest over the long term and approximates the cost of gravel resheeting.
- Normal aggregate hot bitumen spray seal. This option depends on strength of the unsealed pavement, whether additional base gravel overlay is required.

Stabilisers

Where the blended gravel still has high plasticity (PI) specifically PI over 15 and for low CBR% consider adding of lime or dry powdered polymer. In areas such as floodways or flood prone roads then stabilising with hot foam bitumen or warm bitumen emulsion could be considered. These stabilisers can be reused in any future reconstruction works.

Commercial hard rock crushed and screened gravels (blending small %)

Where structural rutting or slipperiness is a problem then blending of a small percentage of commercial hard rock DGB20 or DGS20 say 20% of the total mix should be tested and considered. Feasibility of this hard rock addition will depend on ex pit costs and transport costs. Whole of life costs should be used in any decision making. Finally check compliance with construction worksection 1141ru Wearing course, base and subbase (unsealed).

TR 08 Management of Council Gravel Pits in Country Areas – A case study

This study provides more information for councils to build and maintain better sealed and unsealed roads. It uses a system of materials extraction and blending from different gravel pits to meet higher required performance standards. This report shows how Councils can achieve better whole of life costs and reduce budget expenditures for both sealed and unsealed roads.

Maintenance treatments

- Patrol grading: Light grading is performed on a routine basis to keep the road well drained to maintain a satisfactory running surface. Heavy grading is performed where road requires reshaping after periods of heavy traffic or has suffered severe surface damage due to wet weather. Heavy grading requires reshaping and restoring the surface to a correct cross-fall profile.
- Reshaping: Involves winning swept gravel from the table drains plus scarifying the road surface and remixing the aggregate base to yield a better blending of fines and aggregates and restoration of surface cross falls.
- Resheeting: This is a periodic maintenance activity and involves replacing the eroded wearing course when it has worn away. A suitable thickness of 100-150 mm gravel is applied to prevent structural deformations in the base or subgrade.

CONCLUSION

The performance of unsealed roads is based on the material properties, road geometry, drainage, weather and traffic conditions. Due to the seasonal and weather sensitivity of unsealed roads it is difficult to predict the expenditure for the maintenance of these roads. It is important to undertake material testing for each gravel pit source and use the ARRB spreadsheet prediction modelling to determine reasons for defects on the road and to determine blending mix solutions to eliminate or reduce the defects.

Dynamic nature of unsealed roads



Pavement defects



Corrugations



Pot holes

Maintenance Treatments



Resheeting



Stabilisation



Maintenance schedules

1602 Maintenance schedules - road reserve.xlsx - Excel

Nandini Mehta

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Note 3: Reference Worksection 1140 Wearing Course, base and subbase - unsealed roads and 1141r Flexible pavement base and subbase for sealed roads: The blue column is the plasticity index. For sealed roads require between 2 and 6 or for dry climates up to 8. For unsealed roads wearing course require PI greater than 9 and up to 13 in wet areas and maximum 15 in dry areas.

Sample Only Incomplete Example - Council's Gravel Pits and Geotechnical Test Results for Evaluation of Qualities of each pit and mechanical stabilisation for use as a sealed or unsealed pavement																					
Gravel Pits - Geotechnical testing				Particle size distribution % passing																	
Pit No.	Pit Name	Material Description	Base or Unsealed wearing course usage target?	Test sample number	37.5mm	19 mm	9.5 mm	4.75 mm	2.36 mm	0.425mm	0.075 mm	CBR% soaked	CBR% unsoaked	Liquid Limit	Plasticity Index (PI)	Linear shrinkage %	Maximum Dry Density (MDD)	Permeability Coefficient	L ₆₀ Angeles value to AS 1141.23	Unconfined Compressive Strength Note: 5	ATRB spreadsheet mode Defect Analysis: Good slippery, dusty, corrugated, ravel is pervious rd good results in potholes?
1	Hansons/ Class 4/ DGB20	DGB20	Base or Unsealed wearing course usage target?	ABC	100	99	81	55	36	18	7	380	24	12	5	1.99					High structural strength , however Maximum Dry Density (MDD) is too low and too porous for use in unsealed roads. Porous gravels = subgrade failure and potholes.
2	Mawsons	DGB20	Base or Unsealed wearing course usage target?	123	100	95	75	63	51	40	20	70	18	2	0	2.21				Needs blending with clay material to get higher plasticity. Try 30% of this Mawsons with 70% Western Red Ridge Gravel. Need higher MDD to qualify for unsealed wearing course.	
Mix 1	35% Hansons Class 4 with 65% Mawsons DGB 20	DGB20	Base or Unsealed wearing course usage target?	def	100	96	72	60	47	29	16		NP	NP	0.5					Will pothole , ravel and corrugate.	
Mix 2	25% Hansons Class 4 with 75% Mawsons DGB 20	DGB20	Base or Unsealed wearing course usage target?	456	100	97	74	63	51	32	16	200	NP	NP	0	2.38				High MDD qualifies as impervious gravel and high CBR gives good structural strength. Needs addition of clay western red ridge gravel to increase PI to over 9 for use as an unsealed wearing course. Ditto Mix2.	
Mix 3	35% Hansons Class 3 with 65% Mawsons	DGB20	Base or Unsealed wearing course usage	ghi	80	72	59	50	44	48	14	240				2.4					

Seal Preservation | Proposed Construction | Road Reserve Assets | Gravel Pit Testing | Gravel resheeting | Schedul ...

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ATSPEC

Case study – Mid North Coast Regional Organisation of Councils MIDROC



MidCoast
Council



KEMPSEY
Shire Council



NAMBUCCA
VALLEY
NAMBUCCA SHIRE COUNCIL

Bellingen Shire
COUNCIL



PORT MACQUARIE
HASTINGS

COFFS HARBOUR
CITY COUNCIL



“The AUS-SPEC documents help the Council achieve consistency in documentation and with our levels of service”.

*Mathew Naylor, Section Leader
Asset Project Delivery
Coffs Harbour City Council*



Case study – Keswick residential subdivision



“using the specifications has assisted the flow of the project and encouraged the consistently high standard we expect across the board”.

Director Technical Services, Dubbo Regional Council



Case study – Bernera road extension

LIVERPOOL
CITY
COUNCIL



Camden Valley Way to Soldiers Parade, Edmondson Park

“it was vital that the documentation for the project was well defined. In that regard, the AUS-SPEC contract and specification documentation was an obvious choice, providing a modular and partitioned, ‘user friendly’ structure”

- Suresh Kumar, Project Manager, Liverpool City Council



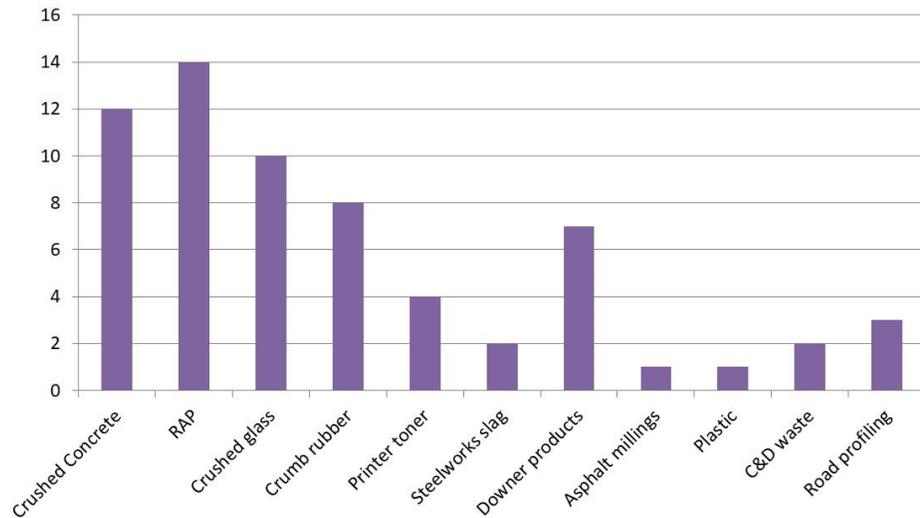
Recycled materials for roadworks



Local Council Responses by State



Recycled Materials used in Council Roads



Use of recycled materials for roadworks in local government

This Project report is a summary of the current use of recycled materials for roadworks in local government based on the Council responses received to date.

Check www.natspec.com.au for the latest version

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 2016 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 ground rubber can be used for new construction or rehabilitation and reconstruction to improve the performance of existing pavements.

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

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 specifier.

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

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.
- Structure: Suggests specifying recycled concrete aggregate, reinforcement with recycled steel and recycled plastic in fibre reinforced concrete in 0310 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-penetration of existing pavement and formed column stabilisation in 1113 Stabilisation.

Maintenance worksections
0001 General requirements – road reserve (Maintenance)
0003 Road pavement design – road reserve
0004 Road reserve maintenance plan (RMP)
0010 Sealing unsealed roads
0011 Sealing unsealed shoulders
0012 Sealing unsealed shoulders
0013 Sealing unsealed shoulders
1103 Road pavements
1104 Road pavements

TECHnote
1103 Management of council green jobs in country areas – A case study
1104 Case study

TECHnote
0201 Using AUS-SPEC for management of unsealed roads
0202 On-site – A different approach to road sealing
0203 Pavement stabilisation for unsealed roads
0204 Pavement and stabilisation of unsealed roads

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Case study – Tuncurry waste transfer station



“Using AUS-SPEC assisted in clear communication with the subcontractors during the tender and the execution phase, minimised risk and achieved the high expectation of the Council”

Stuart Small, Senior Project Manager, Midcoast Council



Benefits of using the Local government specification system

- Local government focus and ensure technical consistency
- Improves productivity and quality outcomes
- Flexibility to add specific design, construction and maintenance requirements
- Construct and maintain to a standard that satisfies the level of service at optimal maintenance investment
- Assists rural councils in making informed decisions to maintain their seal and unseal roads

