About this release

<table>
<thead>
<tr>
<th>Title:</th>
<th>Typical Pavement Profiles</th>
</tr>
</thead>
<tbody>
<tr>
<td>Author:</td>
<td>SuYin Tao</td>
</tr>
<tr>
<td>Authorised by:</td>
<td>George Vorobieff</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Issue</th>
<th>Date</th>
<th>Revision description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.0</td>
<td>23 Jan 2015</td>
<td>New Guide</td>
</tr>
</tbody>
</table>

Contents

1. Purpose ........................................................................................................................................ 3
2. Abbreviations .............................................................................................................................. 3
3. Definitions ................................................................................................................................... 4
4. How to use the drawing set ....................................................................................................... 4
   4.1 Units of measurement ............................................................................................................. 5
   4.2 Design detail requirements ..................................................................................................... 5
5. Design notes ............................................................................................................................... 7
   5.1 Asphalt over lean mix concrete or heavily bound materials .................................................... 7
   5.2 Bridge deck and approach slabs ............................................................................................. 7
   5.3 Low cutter seal design ............................................................................................................ 7
   5.4 Low cutter seal under stone mastic asphalt ............................................................................ 8
   5.5 Select subgrade materials .................................................................................................... 8
   5.6 Sprayed seal under unbound granular materials .................................................................... 9
   5.7 Subgrade treatments ............................................................................................................... 9
6. Specifications .............................................................................................................................. 9
7. References and further information ........................................................................................ 10
1. Purpose

This Technical Guide has been prepared to assist pavement designers with the use of Roads and Maritime Services Pavement Standard Drawings, Typical Pavement Profiles set (DS2013/000067).

The pavement types provided in the drawing set comprise of typical heavy duty pavements for carrying highway traffic. It also contains typical details of wearing surfaces for bridge decks and approach slabs as well as temporary pavements. These profiles are not intended for use in tunnels and may not be applicable for light trafficked roads.

The drawing set has been developed to:

- Assist designers in preparing project specific details
- Harmonise profiles, details and notes amongst consultants
- Minimise the variation in drawings between projects
- Minimise the work required in preparing and checking the project specific drawings.

As amendments occur to the Roads and Maritime drawing set this guide will be updated to provide explanations for the changes.

2. Abbreviations

The following abbreviations apply to this guide:

- AC14: Dense Graded Asphalt (nominal size 14 mm)
- CRCP: Continuously Reinforced Concrete Pavement
- DGA: Dense Graded Asphalt
- ESA: Equivalent Standard Axles
- F: Flexible pavement
- HBM: Heavily Bound Material
- HVAG: Heavy Vehicle Axle Group
- JRCP: Jointed Reinforced Concrete Pavement
- LCS: Lean-Mix Concrete Subbase
- OGA: Open Graded Asphalt
- PCP: Plain Concrete Pavement
- QDP: Quick Drying Prime
- R: Rigid pavement
- SAR: Standard Axle Repetition
- SFCP: Steel Fibre Reinforced Concrete Pavement
- SG: Subgrade
- SMA: Stone Mastic Asphalt
- SMZ: Selected Material Zone
- UZF: Upper Zone of Formation
3. Definitions

The following definitions are used in this Technical Guide:

**Course** – one or more layers of the same material forming part of a pavement structure.

**Designer** – For the purpose of this drawing set, a person who understands and applies the principles of the Austroads Guide to Pavement Technology, Part 2: Pavement Structural Design, and Roads and Maritime supplements and specifications to any decision relating to the variables stipulated in the drawing set.

**Heavy duty pavements** – Roads with design traffic loading of $1 \times 10^7$ ESA per lane or greater for the first 20 years of service (Roads and Maritime, 2013a).

**Layer** – The term used to describe the portion of a pavement course placed and compacted as an entity.

**Low cutter seal** – This type of sprayed seal is designed to be placed underneath an asphalt layer. Usually a 7 mm or 10 mm nominal size aggregate is used. Refer to the Design Notes section for more information.

**Project specific** – Any details unique to an individual project. These may vary from project to project and/or comprise of parameters specified by a project’s specification or contract.

**Temporary pavement** – Generally pavements with a design life of up to five years, where the main purpose is traffic management during construction. This pavement type may also be an interim solution to a future upgrade. Temporary pavements may eventually become a local or service road, or be abandoned after reclaiming materials.

**Thick asphalt** – Asphalt which has a typical thicknesses range of 175 to 225 mm (Roads and Maritime, 2013a).

4. How to use the drawing set

The latest version of the drawing set can be downloaded from the Roads and Maritime Internet/Intranet webpage. Do not use superseded versions. Designers should confirm that they are using the latest version of the drawing set.

The drawing set should not be used for construction without showing project specific details.

Tables and pavement thickness variables are to be completed and appropriately modified to suit a project.

Alternatively, individual profiles may be copied into a project specific drawing set.

Pavement tags, patterns, colours and names may be modified to suit project requirements.

A Microstation CAD package containing all patterns and colours used in the standard drawings is available upon request to the Pavements Unit.

In addition to these drawings, other Roads and Maritime standard drawing sets may apply. If inconsistencies are encountered, contact the Pavements Unit.

A project specific Schedule of Works and Technical Criteria (SWTC) or project brief takes precedence over the requirements of the drawing set.
4.1 Units of measurement

Table 1 details the units of measurement. Design traffic loading values are formatted to standard engineering numbers (ie x.xxExxx).

<table>
<thead>
<tr>
<th>Measurement Unit</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>mm</td>
<td>Course/layer thickness</td>
</tr>
<tr>
<td>L/m²</td>
<td>Bitumen and emulsion spray rates</td>
</tr>
<tr>
<td>m²/m³</td>
<td>Aggregate spread rates</td>
</tr>
<tr>
<td>ESA</td>
<td>Design traffic loading for flexible pavements</td>
</tr>
<tr>
<td>SAR5</td>
<td>Design traffic loading for fatigue of asphalt for flexible pavements</td>
</tr>
<tr>
<td>SAR7</td>
<td>Design traffic loading for surface rutting and shape loss derived from subgrade strain criterion for flexible pavements</td>
</tr>
<tr>
<td>SAR12</td>
<td>Design traffic loading for fatigue of cemented materials for flexible pavements</td>
</tr>
<tr>
<td>HVAG</td>
<td>Design traffic loading for rigid pavements</td>
</tr>
</tbody>
</table>

4.2 Design detail requirements

Critical components which must be preserved and updated with project specific details are discussed in the following subsections. Other aspects are considered optional and subject to a project’s requirements.

Table 2 lists the design parameters which need not be specified in the project specific drawings but may be nominated on site.

<table>
<thead>
<tr>
<th>Related Sheet Number</th>
<th>Description of unspecified detail</th>
<th>Specification Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>8</td>
<td>A tackcoat of application rate between 0.15 L/m²–0.30 L/m² may be used if the QDP has not been trafficked.</td>
<td>R116, R119 and R121</td>
</tr>
</tbody>
</table>

Profile depths for asphalt must meet the requirements of the Roads and Maritime asphalt specifications for layer thickness limits as detailed in Table 3.

Table 3 Allowable asphalt layer thickness range (mm)

<table>
<thead>
<tr>
<th>Asphalt type</th>
<th>Allowable asphalt layer thickness for different nominal asphalt size (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>5 mm</td>
</tr>
<tr>
<td>Dense Graded Asphalt (DGA)</td>
<td>15 - 25</td>
</tr>
<tr>
<td>Stone Mastic Asphalt (SMA)</td>
<td>-</td>
</tr>
<tr>
<td>Open Graded Asphalt (OGA)</td>
<td>-</td>
</tr>
</tbody>
</table>
Table 4 lists the details which must be included in project specific drawings. These details are considered as the minimum requirements and the pavement designer must also include site specific design, construction and maintenance notes for the pavement types.

**Table 4 Details required in project specific drawing sheets**

<table>
<thead>
<tr>
<th>Related Sheet Number</th>
<th>Detail Required</th>
<th>Specification Reference (If applicable)</th>
</tr>
</thead>
<tbody>
<tr>
<td>All</td>
<td>Update the title block with project specific details.</td>
<td>N/A</td>
</tr>
<tr>
<td>4 - 10</td>
<td>Update the Design Parameter table provided on each sheet with design traffic loadings, subgrade design CBR, pavement layer thicknesses, binder type and asphalt type for each required pavement type. See referenced specifications and Figure 2 for an example of a completed profile and table.</td>
<td>R82, R83, R106, R116, R119 and R121</td>
</tr>
<tr>
<td>6 &amp; 7</td>
<td>Where a profile contains any granular layer labelled “if required” see referenced specification for more details.</td>
<td>3051</td>
</tr>
<tr>
<td>6 &amp; 7</td>
<td>Where a profile contains any 7 mm sprayed seal labelled “if required” see the ‘Sprayed seals under unbound granular materials’ section.</td>
<td>N/A</td>
</tr>
<tr>
<td>4 - 9</td>
<td>Where a profile contains any upper zone of formation (UZF) layer labelled “if required” see referenced specifications for guidance.</td>
<td>Supplement to Austroads Part 2, Pavement Design and R44</td>
</tr>
<tr>
<td>6</td>
<td>Where a profile contains a DGA layer labelled “if required” a second DGA layer is required if the proposed thickness of the DGA wearing course is greater than 70 mm. Due to the likely location of these pavement types, an intermediate asphalt layer may not be required.</td>
<td>R116.</td>
</tr>
<tr>
<td>4 &amp; 6</td>
<td>Dense graded asphalt 20 mm is not to be used as a wearing course as it has a higher probability of deformation and permeability. Consideration should be given to an SMA, OGA or a smaller stone sized dense graded asphalt as the wearing course.</td>
<td>R116, R119 and R121.</td>
</tr>
</tbody>
</table>
5. Design notes

5.1 Asphalt over lean mix concrete or heavily bound materials

This section applies to profiles F2, F3, F5, F6, F8 and F9.

As noted in section 8 of the supplement to Austroads Guide to Pavement Technology, Part 2: Pavement Structural Design, for heavy duty pavements the minimum thickness of asphalt is 175 mm. The minimum thickness does not include sprayed seals or an OGA wearing course.

5.2 Bridge deck and approach slabs

This section applies to profiles B1 to B3.

The details provided in the drawing set apply only to wearing courses on bridge decks or approach slabs. Refer to Roads and Maritime Standard Bridge Drawings for pre-treatment of the bridge deck or approach slab.

The function of the AC7 layer is to:

- Provide protection for the waterproofing membrane during future removal and replacement of the wearing course.
- Provide shape correction if required to the bridge deck in order to achieve final ride quality requirements on the wearing course.

5.3 Low cutter seal design

This section applies to profiles F1 to F12.

The purpose of a low cutter seal is to provide a traffickable surface for construction traffic using a sprayed seal with minimal cutter. Standard cutter proportions used in primerseals and cutback
sprayed seals may soften the binder of an overlaying asphalt layer which will compromise asphalt performance.

The design and application of a low cutter seal is as follows:

- The aggregate spread rate for 10 mm aggregate as per Form 395K, aggregate design. Aggregate spread rate for 7 mm aggregate is to be between 200 - 230 m²/m².
- A maximum of 2 % cutter oil may be used
- Use 1 % adhesion agent
- Double the amount of rolling for a sprayed seal
- To be placed in accordance with R106.

No tackcoat is required prior to the application of the asphalt layer provided the low cutter seal is fresh and free of dust.

5.4 Low cutter seal under stone mastic asphalt

This section applies to profiles F7 to F9.

The low cutter seal below the SMA may be omitted if the SMA is designed and laid in accordance with R121 Edition 3/Revision 0 or later. Earlier editions of R121 specify characteristic insitu void requirements of 3 to 9%. At the high end of this range SMA that is highly textured and highly permeable may be designed and produced. R121 Edition 3/Revision 0 and later editions have a lower requirement for the upper characteristic insitu void requirement thus reducing the permeability of the SMA and the need for the low cutter seal.

5.5 Select subgrade materials

This section applies to profiles F1 to F13 and R1 to R6.

Together the UZF (selected subgrade material) and general earthworks material provide vital support to a pavement’s structure.

This support is dependent upon the quantity and quality of selected subgrade materials available to a project. These materials will generally be sourced onsite. However a higher standard SMZ material may have to be supplied from off-site sources in accordance with specification 3071.

Heavy duty pavements require an SMZ layer with a minimum thickness of 300 mm.

For a project, specification R44 will detail the thickness and quality of materials to be used in the UZF which incorporates the SMZ. R44 may specify two material layers in the SMZ depending upon the quantity and quality of materials available. R44 (section 6.1.2) specifies that material placed in the upper 150 mm of the SMZ must be from the same source, produced using the same process and exhibit similar properties prior to any lime or cement stabilisation which may be required, as that placed in the lower layer at the same location.

For heavy duty pavements, the upper 150 mm of the SMZ will need to be modified if its CBR is less than 30%.

Pavement profiles for a specific project need to show the thickness and quality of materials in the SMZ layers and if necessary, the remaining portion of the upper zone of formation layer.
5.6 Sprayed seal under unbound granular materials

This section applies to profiles F12 and F13.

The advantages of a sprayed seal under unbound granular materials are:

- Prevention of moisture ingress into and erosion of SMZ if poor weather occurs during construction
- In the event that the SMZ needs to be trafficked, a sprayed seal protects the finished SMZ surface and provides a more appropriate surface for trafficking
- Provides a suitable interim holding surface for the SMZ layer for purposely staged construction or interrupted construction.

Conversely, the disadvantages are:

- Traps moisture and creates a permeability reversal
- Offers no structural purpose
- Imposes additional cost.

A sprayed seal has been included in the drawings, however if the designer deems the sprayed seal to be unnecessary, it may be omitted provided there has been adequate consideration and documentation supporting the omission.

5.7 Subgrade treatments

This section applies to profiles F1 to F13 and R1 to R6.

Specification R44 details a number of earthworks treatments associated with cuttings and embankment foundations. Following a subgrade treatment, the structural support provided to the pavement by the UZF (including the SMZ) should not be less than where the treatment is not required.

6. Specifications

The following specifications are typically referenced on the drawings:

3051 Granular Base and Subbase Materials for Surfaced Road Pavements
3071 Selected Material for Formation
B344 Sprayed Bituminous Waterproofing Membrane for Concrete Bridge Decks
R44 Earthworks
R71 Construction of Unbound and Modified Pavement Course
R73 Construction of Plant Mixed Heavily Bound Pavement Course
R82 Lean-mix Concrete Subbase
R83 Concrete Pavement Base
R106 Sprayed Bituminous Surfacing (with cutback bitumen)
R116 Heavy Duty Dense Graded Asphalt
R119 Open Graded Asphalt
R121 Stone Mastic Asphalt

7. References and further information

The following documents may be used by designers to assist them with the use of the pavement profiles drawings:


RTA (2010b)  *Rigid Pavements Standard Details PCP - Construction Series CP*, Roads & Traffic Authority, Sydney, NSW

RTA (2011)  *Standard Bridge Drawings*, B049E-B049H, Roads & Traffic Authority, Sydney, NSW

Roads and Maritime (2012a)  *Standard Pavement Subsurface Drainage Details Volume 1 - 6*, Roads and Maritime Services, North Sydney, NSW

Roads and Maritime (2012b)  *Technical Direction: Asphalt Overlay of Concrete Pavements*, PTD2012/001, Roads and Maritime Services, North Sydney, NSW


Roads and Maritime (2013b)  *Standard Bridge Drawings*, B621-B622, Roads and Maritime Services, North Sydney, NSW

Roads and Maritime (2013c)  *Standard Pavement Drawings, Asphalt Volume 1*, Roads and Maritime Services, North Sydney, NSW