National Performance-based Asphalt Specification Framework
27 February 2018
Today’s moderator

Eliz Esteban
Communications Officer
Austroads

P: +61 2 8265 3302
E: eesteban@austroads.com.au
About Austroads

The peak organisation of Australasian road transport and traffic agencies

- Roads and Maritime Services New South Wales
- Roads Corporation Victoria
- Department of Transport and Main Roads Queensland
- Main Roads Western Australia
- Department of Planning, Transport and Infrastructure South Australia
- Department of State Growth Tasmania
- Department of Transport Northern Territory
- Transport Canberra and City Services Directorate, Australian Capital Territory
- Commonwealth Department of Infrastructure, Regional Development and Cities
- Australian Local Government Association
- New Zealand Transport Agency
Our structure

Austroads Board

Austroads National Office

- Assets Program
  - Assets Task Force
  - Bridge Task Force
  - Pavements Task Force
  - Road Tunnels Task Force
  - Project Delivery Task Force

- Network Program
  - Network Task Force
  - Freight Task Force

- Safety Program
  - Road Safety Task Force
  - Road Design Task Force
  - Registration and Licensing Task Force
  - Austroads Safety Barrier Assessment Panel

- Connected and Automated Vehicles
  - CAV Steering Committee
  - Industry Reference Group

- NEVDIS
  - Vehicle governance
  - Licensing governance
Housekeeping

Presentation = 35 mins
Question time = 15 mins

GoToWebinar

Please type your questions here

Let us know the slide number your question relates to
Austroads report

Download from Austroads Website:

Today’s presenter

**Joe Grobler**
Principal Research Engineer, Pavements and Surfacing
Australian Road Research Board (ARRB)
P: +61 7 3260 3540
E: joe.grobler@arrb.com.au

**Dr Richard Yeo (joining Q&A)**
Program Manager, Assets
Austroads
P: +61 404 806 549
E: ryeo@austroads.com.au
<table>
<thead>
<tr>
<th>Topic</th>
<th>Presenter</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project Background and Introduction</td>
<td>Joe Grobler</td>
</tr>
<tr>
<td>Current Austroads Mix Design Procedure</td>
<td>Joe Grobler</td>
</tr>
<tr>
<td>Performance-based Specifications</td>
<td></td>
</tr>
<tr>
<td>Proposed Concept Specification Framework</td>
<td>Joe Grobler</td>
</tr>
<tr>
<td>Future Research Needs</td>
<td></td>
</tr>
<tr>
<td>Summary</td>
<td>Joe Grobler</td>
</tr>
<tr>
<td>Q&amp;A</td>
<td>Joe Grobler, Dr Richard Yeo</td>
</tr>
</tbody>
</table>
Project Background and Introduction
Introduction to team

Project Team

Austroads Project Manager
Paul Morassut

Project Leader, ARRB
Joe Grobler

Team Members
Dr Michael Moffatt
Dr Erik Denneman
John Rebbechi

Review Team

Austroads Pavements Task Force

Austroads Asphalt Research Working Group

Stakeholders - Road and Traffic Authorities

Stakeholders - Industry

Austroads Board
The Project Team
The Project Team

Australroads Pavements Task Force
Industry

- Graham Hennessy
  AusStab

- Michael Moffatt
  ARRB

- John Nichols
  CCAA

- Erik Denneman
  AAPA

- Robert Urquhart
  ARRB

- Bryan Pidwerbesky
  Civil Contractors

- Kym Neaylon
  Opus
Project overview

Aims

• Develop a national performance-based asphalt specification framework
• Set an agreed direction for future research required to develop a performance-based specification framework

Objectives

1. Review and summarise existing knowledge base
2. Review previous barriers to implementing a national asphalt mix design procedure
3. Achieve national consensus on a performance-based mix design approach
4. Lay the foundation for further research

See Section 1
Project background

• Multi-year project
• First year focussed on:
  - stakeholder consultation
  - identifying gaps in the current knowledge base
  - propose a concept performance-based asphalt specification framework
  - identifying future research needs to further develop a national performance-based asphalt specification framework
Current Austroads Mix Design Procedure
Austroads mix design procedure

- Austroads Guide to Pavement Technology 4B *Asphalt*

- Level 1 testing:
  - Volumetric testing
  - Gyratory (AS 2891.2.2) or Marshall (AS 2891.5) compaction

- Level 2 testing (optional):
  - Performance testing

See Section 2.1.3
Performance testing

1. Resilient modulus
   - indirect tensile test (AS 2891.13.1)

2. Deformation resistance
   - wheel tracking (AG:PT/T231)

3. Stripping potential
   - tensile strength ratio (AG:PT/T232)

4. Fatigue life
   - four-point bending test (AG:PT/T233)
Performance-based Specifications
“A specification describing the desired levels of fundamental engineering properties (e.g. resilient modulus, strength, creep or fatigue), which have been shown to be reasonable predictors of performance over time and are used in primary performance prediction relationships”

- Austroads 2003
Benefits

- Optimise asphalt mixes based on available materials, local environment and in-service requirements
- Facilitate the introduction of innovative technologies
- Optimal use of available materials
- Risk management
- Link mix design with structural pavement design

See Section 4
Guiding principles

- Harmonised specification
- Directly related to field performance
- Each agency will specify own criteria
- Only one criterion per performance parameter
- Only one test method for a specific performance parameter
- Maximise use of available equipment, where possible
## Mix design practices

<table>
<thead>
<tr>
<th>International practices</th>
<th>Australian and New Zealand practices</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Move towards performance-based specifications</td>
<td>• Reached consensus on modulus, fatigue, permanent deformation and moisture sensitivity</td>
</tr>
<tr>
<td>• Mostly still based on volumetric requirements, but supplemented by performance testing</td>
<td>• Well placed to implement a national harmonised performance-based asphalt specification framework</td>
</tr>
<tr>
<td>• Main performance criteria considered are modulus, fatigue, permanent deformation and moisture sensitivity</td>
<td></td>
</tr>
</tbody>
</table>
Performance criteria

- Workability
- Moisture sensitivity
- Deformation resistance
- Fatigue resistance
- Modulus
- Permeability
- Resistance to ravelling
- Binder drain-off

See Section 4.1
Proposed Concept Specification Framework
## Concept specification framework

### Table

<table>
<thead>
<tr>
<th>Property</th>
<th>Performance Measure</th>
<th>Test Method</th>
<th>Performance Criteria</th>
<th>Performance Limit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Air voids by gyratory compaction</td>
<td>Workability</td>
<td>AS/NZS 2891.2.2</td>
<td>Minimum and maximum air void content</td>
<td>Specified by road agency</td>
</tr>
<tr>
<td>Tensile strength ratio</td>
<td>Moisture sensitivity</td>
<td>AG:PT/T232</td>
<td>Minimum TSR value</td>
<td>Specified by road agency</td>
</tr>
<tr>
<td>Rut depth after 10 000 passes</td>
<td>Permanent deformation</td>
<td>AG:PT/T231</td>
<td>Maximum rut depth</td>
<td>Specified by road agency</td>
</tr>
<tr>
<td>Modulus at 50 ± 3 μɛ</td>
<td>Modulus</td>
<td>AGPT/T274</td>
<td>Minimum modulus value</td>
<td>Specified by road agency</td>
</tr>
</tbody>
</table>
## Concept specification framework

<table>
<thead>
<tr>
<th>Property</th>
<th>Performance Measure</th>
<th>Test Method</th>
<th>Performance Criteria</th>
<th>Performance Limit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Micro strain level at $10^6$ cycles to 50% of initial modulus</td>
<td>Fatigue</td>
<td>AGPT/T274</td>
<td>Minimum strain value</td>
<td>Specified by road agency</td>
</tr>
<tr>
<td>Permeability of laboratory prepared asphalt Specimens</td>
<td>Permeability</td>
<td>To be developed</td>
<td>Maximum permeability value</td>
<td>Specified by road agency</td>
</tr>
<tr>
<td>Asphalt particle loss (open-graded asphalt only)</td>
<td>Durability</td>
<td>AG:PT/T236</td>
<td>Maximum value</td>
<td>Specified by road agency</td>
</tr>
<tr>
<td>Asphalt binder drain-off (open-graded asphalt and SMA only)</td>
<td>Handling and durability</td>
<td>AG:PT/T235</td>
<td>Maximum value</td>
<td>Specified by road agency</td>
</tr>
</tbody>
</table>
Austroads Test Methods

Download from Austroads Website:
GoToWebinar

Please type your questions here

Let us know the slide number your question relates to
Future Research Needs
Key areas

1. Sample preparation
2. Develop performance criteria
3. Improve link between mix design and field performance
4. Improve link between mix design and pavement design
5. Guidance on quality assurance during manufacturing and placement

See Section 5
Sample preparation

Sample conditioning

- Current approach simulates binder condition after approximately 2 years in service
- Originally developed for conventional binders
- Short term ageing vs long term ageing

Source: IPC Global (2017)
Sample preparation

Compaction method

• Adopt gyratory compaction
• Slab compactor for some performance tests
• Consider load compliance requirement in test method (Gyropac vs Servopac)
• Need to link laboratory compaction to field conditions

Source: IPC Global (2017)
Performance criteria

Workability (AS/NZS 2891.2.2)

• Not included in current approach
• Gyratory compaction can be used (similar to EME2 specification)
• Maximum voids – adequate workability
• Minimum voids – prevent over compaction in the field
• Need to link with field conditions
• Need to develop/harmonise test method and typical performance limits
Performance criteria

Moisture sensitivity (AGPT/T232)

• Need to link with field conditions
• Need to harmonise test method and performance criteria (i.e. requirement for freeze/thaw etc.)

Source: Australian Asphalt Pavement Association (2005)
Performance criteria

Deformation (AGPT/T231)

• Questionable link with field performance and repeatability at high temperatures
• Review test method and current performance limits first (Cooper Wheel Tracking)
• May need to investigate other devices, i.e. Hamburg Wheel Tracker or AMPT
• Need to link with field performance
Performance criteria

Permeability

• Not included in current SRA specifications
• Local test methods available (Q304A/B & RMS T655)
• Need to develop national test method and indicative performance criteria
Performance criteria

Modulus – AGPT/T274

• Latest version of AGPT2 nominates flexural modulus test (AGPT/T274) for pavement design
• Need to develop performance limits for typical mixes

Fatigue – AGPT/T274

• Latest version of AGPT2 nominates flexural fatigue test (AGPT/T274) for pavement design
• Need to develop performance limits for typical mixes

Source: Wolf Paving
Performance criteria

Particle loss – AGPT/T236
- Open-graded asphalt only
- Already a national test method
- No further work recommended

Asphalt binder drain-off – AG:PT/T235
- Open-graded asphalt and SMA only
- Already a national test method
- No further work recommended
Proposed research framework

Year 1: Review sample preparation and test methods
Year 2: Establish performance limits
Year 3: Finalise performance limits and specification framework
Year 4: Implementation and validation

See Section 6
Summary

- Framework will have benefits to road agencies and industry
- Australia is well placed to develop a performance-based specification framework
- Proposed specification to include requirements
Questions?

**Joe Grobler**
Principal Research Engineer, Pavements and Surfacings
Australian Road Research Board (ARRB)
P: +61 7 3260 3540
E: joe.grobler@arrb.com.au

**Dr Richard Yeo**
Program Manager, Assets
Austroads
P: +61 404 806 549
E: ryeo@austroads.com.au
Upcoming Austroads webinars

<table>
<thead>
<tr>
<th>Topic</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pavement Design: Guide to Pavement Technology Parts 2 and 4C</td>
<td>9 March</td>
</tr>
<tr>
<td>Local Road Access for High Productivity Freight Vehicles</td>
<td>27 March</td>
</tr>
</tbody>
</table>

Thank you for participating