

Department of Transport and Main Roads

Introducing the new specification

Heavy duty dense graded asphalt


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Transport and Main Roads Specification
P2020 Heavy Duty Dense Graded Asphalt
July 2014

Great state. Great opportunity.



Government Priorities

Four pillars of the Queensland economy

Tourism | Agriculture | Resources | Construction

The Queensland Plan

A 30-year vision for Queensland

Our values

- Customers First
- Ideas into Actions
- Unleash Potential
- Be Courageous
- Empower People

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We connect Queenslanders ...

- We get people and industry moving
- We plan, we invest
- We deliver, we manage
- We regulate
- We help, we educate




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Overview

1. Asphalt basics – 10 minutes
2. Roles and responsibilities – 20 minutes
 - Asphalt suppliers
 - TMR Regions/Contract Administrators
 - Engineering and Technology.
3. Key changes – 30 minutes
 - Mix design
 - Compliance requirements
 - Construction procedures.

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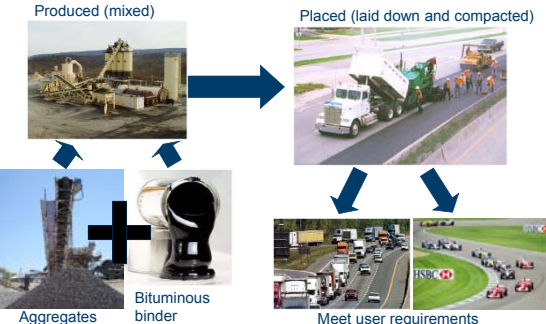
Asphalt fundamentals – customer perspective



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What is asphalt?

Produced (mixed) → Placed (laid down and compacted)



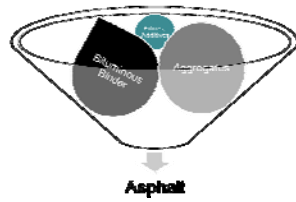
Aggregates + Bituminous binder

Meet user requirements

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Asphalt mix constituents

- Binder:
 - Unmodified
 - Modified.
- Aggregates
 - Coarse
 - Fine
 - Filler*.
- Can contain:
 - Recycled Asphalt Pavement (RAP)**
 - Fibres, additives.



* Filler: All dust (<0.075mm) from aggregate or combined with additive (for example, lime and cement)

** RAP contains both aggregate and binder

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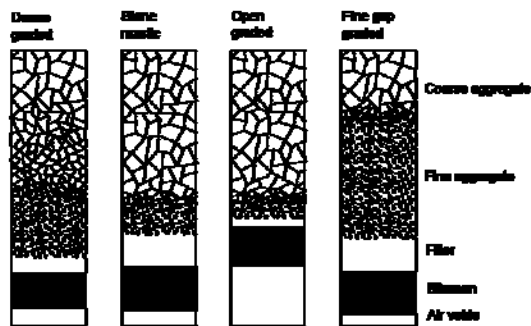
From being an 'asphalt mix' to ...

- Not all mixes are created equal
- Aggregates and bituminous binder are used and combined to produce different types of mixes, each with specific requirements.



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Different types of asphalt mixtures



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Different types of asphalt mixtures (cont.)



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Asphalt distresses

Fatigue cracking



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Rutting



Asphalt distresses (continued)

Ravelling



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Low skid resistance



(Due to polished aggregate)



(Due to bleeding)

At the end of the day...

- What we want is a good performing mix – **customer satisfaction**
- The performance of a mix depends on:
 - What it is made from (characteristics of its constituents)
 - How the constituents work together (characteristics of the mix).



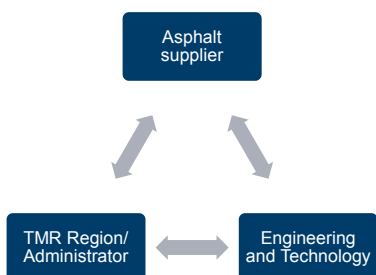
- What to check in the individual ingredients and in their combination (the mix) is described in the **relevant specification** for the 'mix' we are using.

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Roles and responsibilities

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Roles and responsibilities



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Asphalt supplier

- Increased responsibility
- Develop and implement quality plans
 - Aggregate production
 - RAP management (where applicable)
 - Asphalt production and pavement construction.
- Asphalt mix design certification.

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TMR Regions/Administrator

- Minimal change to current processes
- Review and comment on quality plans
 - No approval.
- Construction processes:
 - Audit against contractor's quality plan(s).
- Compliance of mix design:
 - Verification testing no longer undertaken by Engineering and Technology
 - Need for production audits?

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Engineering and Technology

- Registration of designs (reduced role)
 - Certification by asphalt supplier
 - 'Paper' check only
 - Consistency of assessment.
- Assess suitability of high RAP content mix designs
 - History of 'proven performance'.

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Key technical changes



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Changes


- Less prescriptive
 - Outcome driven
 - Not method based
 - Increased flexibility for suppliers/contractors.
- Enables increased use of new technology
 - Higher RAP contents
 - Warm mix asphalt (WMA)
 - WMA + RAP.



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Changes (continued)


- Reduced field voids without compromising mix volumetrics
 - Reduced permeability
 - Reduced moisture sensitivity
 - Remove waterproofing seal from designs?
 - Strain Alleviating Membrane Interlayer (SAMMI) seal required when specified (e.g. for cracked pavements).
 - Increased deductions for non-conforming field voids.



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Changes (continued)

- Mix design
 - Contractor fully responsible for mix design
 - Reduced costs and time
 - Greater flexibility.
- Industry is confident with the performance of Roads and Maritime Services' (RMS) mixes
 - Performance standards and warranty
 - RMS experience.



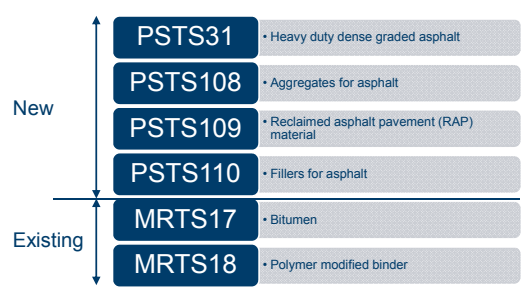
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Basis for specification development

- Harmonisation principals:
 - R116 unless good technical/operational reasons
 - Alignment with Austroads *Guide to Pavement Technology*.
- Retain existing TMR systems:
 - Quarry registration system
 - Asphalt supplier registration system
 - Asphalt mix design registration (requested by industry).

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Overview – Technical specifications



New	PSTS31	• Heavy duty dense graded asphalt
	PSTS108	• Aggregates for asphalt
	PSTS109	• Reclaimed asphalt pavement (RAP) material
	PSTS110	• Fillers for asphalt
Existing	MRTS17	• Bitumen
	MRTS18	• Polymer modified binder

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Slide 21

MLP16 This duplicates some of the previous slide. See comments on previous slide.
Mike L Pickering, 8/08/2014

Aggregate

- Property requirements are largely unchanged except:
 - Coarse aggregate:
 - Particle shape, by proportional caliper replaces flakiness index
 - Water absorption limits relaxed to $\leq 2.5\%$.
 - Fine aggregate
 - Water absorption limit $\leq 3.0\%$
 - Aggregate soundness (sodium sulphate solution) $\leq 12\%$.
- Grading limits:
 - Contractor to nominate.
- Test methods:
 - Australia Standard methods (where feasible).

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RAP material

- Surface course
 - Up to 20% RAP.
- Other than surface course
 - Up to 40% RAP.
- Polymer Modified Binder (PMB) mixes
 - Up to 15% RAP.
- History of 'proven performance'
 - > 15% RAP.



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Filler

- Added fillers to comply with Australian Standards
- Methylene blue test
 - Lead indicator for moisture sensitivity.
 - Limits
 - Combined filler excl. hydrated lime ≤ 18 mg/g (clay index ≤ 4)
 - Combined filler incl. hydrated lime ≤ 10 mg/g (clay index ≤ 2.2).
- Voids in dry compacted filler
 - Increased to $\geq 40\%$.



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Asphalt mix properties

- Binder content
 - Minimum requirement increased by 0.2% by mass.
- Mix gradings (Table 7.2.1.1)
 - New grading envelopes (from R116)
 - Grading envelopes include production tolerances.

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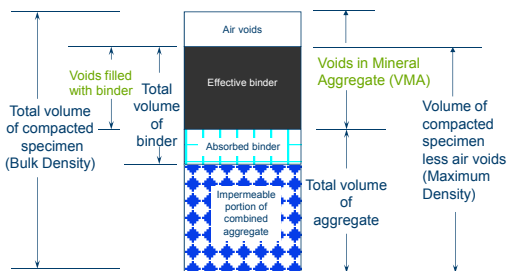
Asphalt mix properties

- Table 7.2.1.1 – Grading limits

AS Sieve Size (mm)	Grading Limits for Combined Aggregate and Filler			
	AC7	AC10	AC14	AC20
26.5				100
19.0			100	80 – 100
13.2		100	80 – 100	65 – 93
9.50	100	80 – 100	–	–
6.70	80 – 100	65 – 90	55 – 80	45 – 70
2.36	45 – 65	35 – 65	25 – 45	20 – 40
0.600	15 – 40	15 – 35	10 – 30	5 – 25
0.075	3 – 11	3 – 11	2 – 8	2 – 8

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Asphalt volumetrics



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Asphalt quality plan

- Documents all contractor's procedures:
 - Inspection and Test Plans (ITP)
 - Management for constituent materials
 - Calibration of plant
 - Procedures for asphalt manufacture, transport and pavement construction.



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Production asphalt

- Binder content and grading (Table 7.4.3.2)
 - Wider grading tolerances
- Air voids (new)
 - 3.0-6.0%
 - 50 blows Marshall, or
 - 120 cycles gyratory compaction.
 - ≥ 2.0%
 - 350 cycles gyratory compaction.
- Maximum density
- Moisture sensitivity
 - TSR ≥ 80%
 - Tensile strength ≥ 600 kPa.



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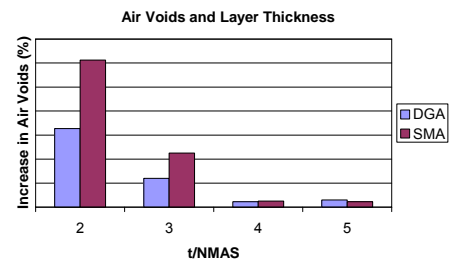
Pavement construction

- Contractor's responsibilities
 - Construction process
 - Maximum mix temperature
 - Homogeneous asphalt pavement
 - Provide a strong bond to the underlying pavement
 - Asphalt is allowed to cool sufficiently before trafficking.
 - Finished pavement properties
 - Air voids
 - Thickness (where specified)
 - Levels (where specified)
 - Surface shape
 - Ride quality.



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Layer thickness limits



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Layer thickness limits (continued)

- Table 8.6.1

Asphalt designation	Minimum (mm)	Maximum (mm)
AC7	25	35
AC10	35	50
AC14	50	70
AC20	60	100

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Temperature limits for paving

- Table 8.7

Asphalt designation	Minimum surface temperature for asphalt pavement (°C)	
	Binder complying with MRTS17	Binder complying with MRTS18
AC7	15	20
AC10	5	10
AC14	0	5
AC20	0	5

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In situ air voids

- Table 9.2.1

Location	Limits of Characteristic Value of In situ Air Voids (%)	
	Specified layer thickness > 30 mm and < 50 mm	Specified layer thickness 50 mm
Mat	3.0% – 8.0%	3.0 – 7.0%
Joints	3.0% – 11.0%	3.0 – 10.0%



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Thickness control tolerances

- Table 9.3.2



Nominal size of asphalt	Layer thickness tolerance (mm)	
	Average	Individual value
AC7	± 3	± 5
AC10	± 3	± 5
AC14	± 4	± 7
AC20	± 5	± 10

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Level control tolerances

- Clause 9.4
 - Levels ± 10 mm – all layers
 - Surfacing course:
 - Average thickness ± 10% of the nominated thickness.
 - Surfacing and intermediate course:
 - Thickness at any point ± 20% of the nominated thickness.

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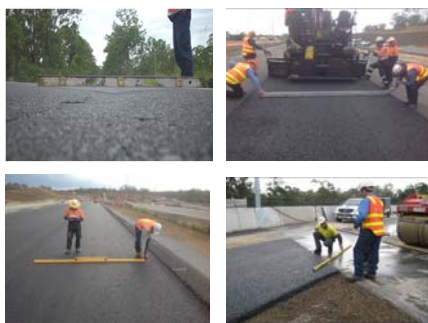
Surface shape

- Table 9.5.2

Course	Maximum deviation from a 3m straight-edge (mm)	
	Through carriageway < 70 km/h	Through carriageway ≥ 70 km/h
At actual completion date		
Surfacing	5	3
Course below surfacing	10	5
Other courses	15	10
12 months after date of practical completion		
Asphalt surface	8	6

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Surface shape (continued)



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24 month performance requirement

- Clause 1.2:
 - The asphalt must not ravel, rut, shove, strip or bleed for the first 24 months after the date of practical completion.



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Key measurement/payment changes

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- ## Overview – Specification (measurement)
- PSS31
 - R116 reformatted similar to MRS30.
 - Work items similar to MRS30
 - New items:
 - Asphalt overlay – thickness control
 - Asphalt overlay – level control
 - Deformation resistance testing.
 - Reduced level of service:
 - Binder content and grading
 - In situ air voids
 - Ride quality.
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- ## Reduced level of service
- Binder content and grading (Clause 3.2.1):
 - Wider production tolerances:
 - ≈ 20% few non-conformances.
 - Smaller deductions
 - ≈ 2.5% less on the average case
 - Payment deductions apply for all non-conformances
 - Deductions apply to the quantity of material represented by each test result.
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- ## Reduced level of service (continued)
- In situ air voids (Clause 3.2.2)
- | In situ air voids in excess of specified limit by (%) | Deduction (in percentage of lot value) | Example AC14 |
|---|--|--------------|
| < 0.5% | 5 (2.5) | 7.1% – 7.4% |
| 0.5 – 1.0% | 15 (7.5) | 7.5% – 8.0% |
| 1.1 – 1.5% | 30 (15) | 8.1% – 8.5% |
- ¹ Values in brackets apply prior to 30 June 2015
- Existing MRTS30:
 - Maximum 15% deduction at 12.0% air voids.
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Reduced level of service (continued)

Ride quality NAASRA counts / km	% Bonus (+) or deduction (-) from scheduled rate	
	New PSS31	Existing MRS30
25	+ 3	+ 4
30	+ 2	+ 4
35	+ 1	+ 4
40	0	+ 2
45	0	0
50	0	0
55	- 2	- 2.5
60	- 4	- 5
65	- 8	- 7.5
70	- 16	- 10

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- ## Risks management
- Training
 - Specification intent (AAPA course)
 - Mix design.
 - Auditing and surveillance
 - TMR no longer 'checking' the mix design
 - Auditing versus reliance on performance standards.
 - Deletion of waterproofing seals
 - Performance will be heavily influenced by field voids.
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Summary

- Mix design
 - Asphalt supplier fully responsible
 - Reduced time and cost
 - Greater flexibility
- Less prescriptive
 - Outcome focused
- Reduced field voids without compromising mix volumetrics
- Enables increased use of new technology.



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Thank you

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