

# Main Roads Specification

## **MRS30** **Dense Graded and** **Open Graded Asphalt**

**June 09**

## **IMPORTANT INFORMATION**

The requirements of this document represent Technical Policy of the department and contain Technical Standards. Compliance with the department's Technical Standards is mandatory for all applications for the design, construction, maintenance and operation of road transport infrastructure in Queensland by or on behalf of the State of Queensland.

This document will be reviewed from time to time as the need arises and in response to improvement suggestions by users. Please send your comments and suggestions to the feedback email given below.

## **FEEDBACK**

Your feedback is welcomed. Please send to [mr.techdocs@tmr.qld.gov.au](mailto:mr.techdocs@tmr.qld.gov.au).

## **COPYRIGHT**

© State of Queensland (Department of Transport and Main Roads) 2009

Copyright protects this publication. Except for the purposes permitted by and subject to the conditions prescribed under the Copyright Act, reproduction by any means (including electronic, mechanical, photocopying, microcopying or otherwise) is prohibited without the prior written permission of the department. Enquiries regarding such permission should be directed to the Road & Delivery Performance Division, Queensland Department of Transport and Main Roads.

## **DISCLAIMER**

This publication has been created for use in the design, construction, maintenance and operation of road transport infrastructure in Queensland by or on behalf of the State of Queensland.

Where the publication is used in other than the department's infrastructure projects, the State of Queensland and the department gives no warranties as to the completeness, accuracy or adequacy of the publication or any parts of it and accepts no responsibility or liability upon any basis whatever for anything contained in or omitted from the publication or for the consequences of the use or misuse of the publication or any parts of it.

If the publication or any part of it forms part of a written contract between the State of Queensland and a contractor, this disclaimer applies subject to the express terms of that contract.

**June 09**

## Table of Contents

1	INTRODUCTION.....	1
2	MEASUREMENT OF WORK.....	1
2.1	Standard Work Items.....	1
2.2	Work Operations.....	1
2.3	Calculation of Quantities .....	3
2.3.1	Preparation of the Existing Surface .....	3
2.3.2	Tack Coat.....	3
2.3.3	Dense Graded Asphalt and Open Graded Asphalt .....	3
3	UTILISATION OF A REJECTED LOT FOR A REDUCED LEVEL OF SERVICE .....	3
3.1	Production Asphalt .....	3
3.1.1	Assessment of a Production Lot.....	3
3.1.2	Recurring Nonconformance – Production .....	4
3.1.3	Calculation of Defects for a Production Lot .....	4
3.1.4	Determination of the Reduced Value.....	5
3.2	Placement.....	5
3.2.1	Assessment of a Pavement Lot.....	5
3.2.2	Recurring Nonconformance – Placement.....	5
3.2.3	Compaction Standards .....	5
3.2.4	Surface Evenness.....	6
3.2.5	Determination of the Reduced Value.....	6
3.3	Application of the Reduced Payments .....	7
4	ADDITIONAL PAYMENT FOR A HIGHER STANDARD OF SURFACE EVENNESS .....	7
4.1	General.....	7
4.2	Payment .....	7

SUPERSUDED

SUPERSEDED

# Dense Graded and Open Graded Asphalt

## 1 INTRODUCTION

This Specification applies to the construction of asphalt pavements and surfacings using dense graded and open graded asphalt.

This Specification shall be read in conjunction with Specification MRS01 *Introduction to Specifications* and other Specifications as appropriate.

This Specification forms part of the Main Roads Specifications and Technical Standards Manual.

## 2 MEASUREMENT OF WORK

### 2.1 Standard Work Items

In accordance with the provisions of Clause 2 of MRS01 *Introduction to Specifications*, the standard work items covered by this Specification are listed in Table 2.1.

**Table 2.1 – Standard Work Items**

Standard Item No.	Description	Unit of Measurement
<b>Preparation of the Existing Surface</b>		
5401	Preparation of the existing surface	m <sup>2</sup>
5402P	Crack filling (Provisional Quantity)	m
5403P	Strain alleviating fabric strips (Provisional Quantity)	m
5404	Tack coat [ <i>application rate</i> ] litres/m <sup>2</sup> , residual bitumen (Provisional Quantity)	litre
5405	Dense graded asphalt corrector layer, DG [ <i>nominal size</i> ] mix	tonne
<b>Dense Graded Asphalt</b>		
5501	Dense graded asphalt, DG7 mix	tonne
5502	Dense graded asphalt, DG10 mix	tonne
5503	Dense graded asphalt, DG14 mix	tonne
5504	Dense graded asphalt, DG20 mix	tonne
5505	Dense graded asphalt, DG28 mix	tonne
<b>Open Graded Asphalt</b>		
5542	Open graded asphalt, OG10 mix	tonne
5543	Open graded asphalt, OG14 mix	tonne

### 2.2 Work Operations

#### Item 5401 Preparation of the existing surface

Work Operations incorporated in the above item include –

- a) Work Operations listed in Clause 2.1.5 of MRS01 *Introduction to Specifications*;
- b) Cutting back existing adjoining pavement to a vertical face;
- c) Cleaning/sweeping the existing surface; and
- d) Treatment of surface imperfections.

#### Item 5402P Crack filling (Provisional Quantity)

Work Operations incorporated in the above item include –

- a) Work Operations listed in Clause 2.1.5 of MRS01 *Introduction to Specifications*;
- b) Supply of crack sealant; and
- c) Filling of cracks with crack sealant.

**Item 5403P Strain alleviating fabric strips (Provisional Quantity)**

Work Operations incorporated in the above item include –

- a) Work Operations listed in Clause 2.1.5 of MRS01 *Introduction to Specifications*;
- b) Supply of all materials;
- c) Preparing existing surfaces;
- d) Applying bituminous emulsion or proprietary primer; and
- e) Laying and rolling strain alleviating fabric strips over cracks.

**Item 5404 Tack coat, [application rate] litres/m<sup>2</sup>, residual bitumen (Provisional Quantity)**

Work Operations incorporated in the above item include –

- a) Work Operations listed in Clause 2.1.5 of MRS01 *Introduction to Specifications*; and
- b) Supply and application of tack coat.

**Item 5405 Dense graded asphalt corrector layer, DG [nominal size] mix**

**Item 5501 Dense graded asphalt, DG7 mix**

**Item 5502 Dense graded asphalt, DG10 mix**

**Item 5503 Dense graded asphalt, DG14 mix**

**Item 5504 Dense graded asphalt, DG20 mix**

**Item 5505 Dense graded asphalt, DG28 mix**

Work Operations incorporated in the above items include –

- a) Work Operations listed in Clause 2.1.5 of MRS01 *Introduction to Specifications*;
- b) Being a registered asphalt manufacturer or engaging a subcontractor who is a registered asphalt manufacturer;
- c) Having a registered mix design or obtaining a registered mix design under the asphalt supplier registration system;
- d) Manufacture of the dense graded asphalt in accordance with the registered mix design(s);
- e) Delivery of the dense graded asphalt to the Works;
- f) Being a registered asphalt paving organisation or engaging a registered asphalt paving organisation;
- g) Laying, compacting and finishing the production asphalt;
- h) Providing an allowance for production asphalt used in temporary ramps and asphalt lost from cut-offs from joints;
- i) Provision of a laboratory and compliance testing facilities;
- j) Sampling, testing and quality assurance requirements;
- k) Delivery of the results for all tests and inspections to the Administrator within the nominated time; and
- l) Removal and disposal of any nonconforming material or product, or any material or product not utilised for a reduced level of service, and replacement with conforming material or product.

**Item 5542 Open graded asphalt, OG10 mix**

**Item 5543 Open graded asphalt, OG14 mix**

Work Operations incorporated in the above items include –

- a) Work Operations listed in Clause 2.1.5 of MRS01 *Introduction to Specifications*;
- b) Being a registered asphalt manufacturer or engaging a subcontractor who is a registered asphalt manufacturer;
- c) Having a registered mix design or obtaining a registered mix design under the asphalt supplier registration system;
- d) Manufacture of the open graded asphalt in accordance with the registered mix design(s);
- e) Delivery of the open graded asphalt to the Works;
- f) Being a registered asphalt paving organisation or engaging a registered asphalt paving organisation;
- g) Laying, compacting and finishing the production asphalt;
- h) Providing an allowance for production asphalt used in temporary ramps and asphalt lost from cut-offs from joints;
- i) Provision of a laboratory and compliance testing facilities;
- j) Sampling, testing and quality assurance requirements;
- k) Delivery of the results for all tests and inspections to the Administrator within the nominated time; and
- l) Removal and disposal of any nonconforming material or product, or any material or product not utilised for a reduced level of service, and replacement with conforming material or product.

### **2.3 Calculation of Quantities**

#### **2.3.1 Preparation of the Existing Surface**

The preparation of the existing surface shall be measured as the area over which the asphalt is laid.

#### **2.3.2 Tack Coat**

The quantity of the tack coat, as residual bitumen at 15°C, shall be determined from the area on which the tack coat is placed and the application rate stated in Clause 6 of Annexure MRTS30.1 *Dense Graded and Open Graded Asphalt*.

#### **2.3.3 Dense Graded Asphalt and Open Graded Asphalt**

The quantity of asphalt shall be determined from the tally of the weighbridge dockets of the delivered asphalt, less –

- a) The quantity of asphalt which does not remain in the Works (such as asphalt in temporary ramps, cut off joints and spillages or that remaining on or in the Construction Plant); and
- b) Any amount of asphalt which exceeds the upper vertical and horizontal geometric tolerances but is accepted to remain in the Works by the Administrator.

## **3 UTILISATION OF A REJECTED LOT FOR A REDUCED LEVEL OF SERVICE**

### **3.1 Production Asphalt**

#### **3.1.1 Assessment of a Production Lot**

The assessment of a rejected production lot for utilisation for a reduced level of service shall be based on the number of defects associated with nonconformance with the requirements for grading and binder content only, as determined from Clause 3.1.3.

A production lot which has a number of defects greater than 6 shall not be utilised for a reduced level of service, and shall be removed and replaced with material that conforms to the requirements of MRTS30 *Dense Graded and Open Graded Asphalt*.

A production lot which has a number of defects up to and including 2 may be utilised for a reduced level of service, provided that the Contractor takes the necessary action within 2 working days to prevent recurrence of the nonconformance and states, on the nonconformance report, what action is to be taken.

Where approved by the Administrator, a production lot which has a number of defects greater than 2 but not greater than 6 may be utilised for a reduced level of service provided that –

- a) The Contractor takes the necessary action to prevent recurrence of the nonconformance and states, on the nonconformance report, what action is to be taken; and
- b) The Contractor accepts payment for the lot at the reduced value stated in Clause 3.1.4.

### 3.1.2 Recurring Nonconformance – Production

A nonconformance is considered recurring when more than 5 out of the most recent 20 tests have the same nonconformance.

The Contractor shall submit a nonconformance report for each of the following recurring nonconformances **Witness Point** –

- a) Binder content repeatedly above the upper job limit or repeatedly below the lower job limit stated on the mix design certificate;
- b) Grading repeatedly above the job limit or repeatedly below the job limit stated on the mix design certificate for a particular sieve;
- c) Maximum density repeatedly above the job limit or repeatedly below the job limit nominated on the mix design certificate; and
- d) For dense graded asphalt air voids lower than the specified minimum in Table 10.4.3.3.3 of MRTS30.

The nonconformance report shall detail the actions previously undertaken to prevent a recurrence of the nonconformance and reasons for these actions being ineffective. The Contractor shall also detail what further actions will be taken to rectify the recurring nonconformance. The Contractor shall also submit a copy of the nonconformance report and a summary of the conformance reports for all preceding lots to the Administrator and Principal Chemist. If the recurring nonconformance persists at a frequency greater than 1 in 4 lots, the registration status of the mix design may be reviewed under the requirements of the *Asphalt Supplier Registration System*.

### 3.1.3 Calculation of Defects for a Production Lot

Calculation of defects for a production lot shall be based on variations from the job limits on the mix design certificate as shown in Table 3.1.3.

The number of defects in a production lot shall be calculated as the total number of defects in the 2 samples representing that production lot.

In the case of a terminated or small production lot, where only one sample has been obtained, the number of defects in the production lot shall be calculated by doubling the number of defects in the sample.

**Table 3.1.3 – Schedule for Calculating Defects in a Production Lot**

Measurement	Variations	No. of Defects
% passing 6.70 mm and larger sieves	Tolerances exceeded on 1 or more sieves	1
% passing – 4.75 mm sieve	Tolerances exceeded on 1 or 2 sieves	1
2.36 mm sieve	Tolerances exceeded on all 3 sieves	2
1.18 mm sieve		
% passing – 0.600 mm sieve	<i>Dense Graded Asphalt</i> Tolerances exceeded on 1 or 2 sieves	1
0.300 mm sieve	Tolerances exceeded on all 3 sieves	2
0.150 mm sieve	<i>Open Graded Asphalt</i> Tolerance exceeded on 0.300 mm sieve	1



Measurement	Variations	No. of Defects
% passing – 0.075 mm sieve	Up to 0.5% outside the limits	0
	Each additional 0.5% (or part thereof) beyond 0.5% outside the limits	1
Binder Content (%)	DG7, DG10, DG14, DG20, OG10, OG14 mixes – Each 0.1% (or part thereof) outside the limits	1
	DG28 mix – Each 0.15% (or part thereof) outside the limits	1

### 3.1.4 Determination of the Reduced Value

The reduced value for defects in a production lot shall be determined from Table 3.1.4.

**Table 3.1.4 – Reduction in Value for Defects in a Production Lot**

Number of Defects in a Lot	% Reduction in Value
3	5
4	10
5	15
6	20

## 3.2 Placement

### 3.2.1 Assessment of a Pavement Lot

The assessment of a rejected pavement lot for utilisation for a reduced level of service shall be based on the compaction standard and surface evenness.

### 3.2.2 Recurring Nonconformance – Placement

A nonconformance is considered recurring when more than 5 out of the most recent 20 lots have the same nonconformance.

The Contractor shall submit a nonconformance report for each of the following recurring nonconformances –

- Average joint relative compaction less than that stated in Clause 12.3.1 of MRTS30; and
- Average texture depth less than that stated in Clause 12.3.2 of MRTS30.

The nonconformance report shall detail the actions previously undertaken to prevent a recurrence of the nonconformance and reasons for these actions being ineffective. The Contractor shall also detail what further actions shall be taken to rectify the recurring nonconformance. The Contractor shall also submit a copy of the nonconformance report and a summary of the conformance reports for all preceding lots to the Administrator and Principal Chemist. If the recurring nonconformance persists at a frequency greater than 1 in 4 lots, the registration status of the mix design may be reviewed under the requirements of the *Asphalt Supplier Registration System*.

### 3.2.3 Compaction Standards

#### 3.2.3.1 Open Graded Asphalt

A pavement lot which has not received the minimum number of roller passes as required by Clause 12.2.7.3.1 of MRTS30 shall not be utilised for a reduced level of service.

#### 3.2.3.2 Dense Graded Asphalt

A pavement lot which has a characteristic value (CV) of relative compaction less than 88% shall not be utilised for a reduced level of service.

Where approved by the Administrator, a pavement lot which has a characteristic value of relative compaction not less than 88%, but less than the stated required value, may be utilised for a reduced level of service at a reduced value, provided that –

- a) The Contractor takes the necessary action to prevent recurrence of the nonconformance; and
- b) The Contractor accepts payment for the lot the reduced value given in Clause 3.2.5.

### 3.2.3.3 Corrector Layers

A pavement lot which has an average value (AV) of relative compaction less than 88% shall not be utilised for a reduced level of service.

Where approved by the Administrator, a pavement lot which has an average value of relative compaction not less than 88%, but less than the stated required value, may be utilised for a reduced level of service at a reduced value, provided that –

- a) The Contractor takes the necessary action to prevent recurrence of the nonconformance; and
- b) The Contractor accepts payment for the lot the reduced value given in Clause 3.2.5.

### 3.2.4 Surface Evenness

#### 3.2.4.1 New Works and Overlays with Correction or Profiling

In the case of works other than for single layer asphalt overlays, a lot which has a road roughness count rate greater than 70 shall not be utilised for a reduced level of service.

Where approved by the Administrator, a lot which has a road roughness count rate greater than  $R_s$  but not greater than 70 may be utilised for a reduced level of service at a reduced rate provided that –

- a) The Contractor takes the necessary action to prevent recurrence of the nonconformance; and
- b) The Contractor accepts payment for the lot the reduced value given in Clause 3.2.5.

#### 3.2.4.2 Single Layer Overlays

In the case of lots for single layer asphalt pavement overlays without a nominal full length corrector layer, a lot which has a road roughness count rate greater than  $R_s + 20$  counts per kilometre (where  $R_s$  is as stated in Clause 12.3.3.5 of MRTS30) shall not be utilised for a reduced level of service.

A lot which has a road roughness count rate up to  $R_s + 20$  counts per kilometre may be utilised for a reduced level of service at a reduced value provided that –

- a) The Contractor takes the necessary action to prevent recurrence of the nonconformance; and
- b) The Contractor accepts payment for the lot the reduced value given in Clause 3.2.5.

### 3.2.5 Determination of the Reduced Value

The reduced value for reduced compaction of a pavement lot shall be determined from Table 3.2.5-A.

**Table 3.2.5-A – Reduction in Value for Reduced Compaction**

Asphalt Mix Nominal Size (mm)	Surfacing, Binder and Base Layers	Corrector Layers
	Percentage Reduction in Value	Percentage Reduction in Value
DG7	$7.5 \times (90\% - CV)$	–
DG10	$7.5 \times (90\% - CV)$	$7.5 \times (90.0\% - AV)$
DG14 < 50 mm layer thickness	$5 \times (91\% - CV)$	$5 \times (91.0\% - AV)$
DG14 ≥ 50 mm layer thickness	$3.75 \times (92\% - CV)$	$3.75 \times (92.0\% - AV)$
DG20	$3 \times (93\% - CV)†$	$3 \times (93.0\% - AV)†$
DG28	$3 \times (93\% - CV)†$	–

† DG20 and DG28 lots with a CV < 93.0% but ≥ 92.0% shall be accepted for utilisation at a reduced level of service in accordance with Clause 12.3.1.2 of MRTS30. The reduced value of lots with a CV < 92.0% that have been accepted by the Administrator for utilisation at a reduced level of service shall be determined in accordance with this table.

CV = characteristic value of relative compaction (%)

AV = average value of relative compaction (%)

The reduced value for an increased road roughness count rate for a pavement lot shall be determined from Table 3.2.5-B for single layer asphalt pavement overlays and from the following formula for other than single layer asphalt overlays –

$$\text{Percentage reduction} = 0.5 \times (R_a - R_s)$$

where –

$R_a$  = the actual road roughness count rate; and

$R_s$  = the stated road roughness count rate defined in Clause 12.3.3.4 of MRTS30.

**Table 3.2.5-B – Reduction in Value, Surface Evenness – Overlays**

Road Roughness Count Rate (counts/km)	% Reduction in Value
> $R_s$ to ( $R_s + 5$ )	1
> ( $R_s + 5$ ) to ( $R_s + 10$ )	2
> ( $R_s + 10$ ) to ( $R_s + 15$ )	4
> ( $R_s + 15$ ) to ( $R_s + 20$ )	8

Note:  $R_s$  is as defined in Clause 12.3.3.5 of MRTS30.

### 3.3 Application of the Reduced Payments

The percentage reductions in value calculated in accordance with Clauses 3.1.4 and 3.2.5 shall be summed for each lot and shall be applied to the value of the lot as determined by the Administrator.

## 4 ADDITIONAL PAYMENT FOR A HIGHER STANDARD OF SURFACE EVENNESS

### 4.1 General

Unless indicated otherwise in Clause 1 of Annexure MRS30.1, an additional payment shall be made for the additional benefit of an improved standard of surface evenness as represented by the road roughness count rate.

### 4.2 Payment

Any such additional payment shall be made for each lot of asphalt which has been determined to have an improved standard of road roughness compared with the stated count rate calculated in accordance with the following –

- a) A percentage increase in the scheduled rate shall be determined from the formula –

$$\text{Percentage increase} = 0.4 \times (R_s - R_a - 5)$$

where –

$R_s$  = the stated road roughness count rate as defined in Clause 12.3.3.4 or Clause 12.3.3.5 of MRTS30 as relevant; and

$R_a$  = the road roughness count rate measured after placement and compaction of the asphalt.

- b) The additional payment shall apply only to the top layer of asphalt placed over the relevant pavement lots or sections thereof, and shall be determined from the value of the placed asphalt in the lot, based on the dimensions shown on the Drawings, as determined by the Administrator, and the percentage increase determined from (a) above; and
- c) The maximum percentage increase shall be 4%.