



TECHNICAL GUIDE

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Guidelines on how to use the surface texture depth results in seal design

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1 Introduction

Sprayed seal/reseal design primarily depends on the surface texture depth of the existing seal, the size of the proposed aggregate and the traffic loading.

This guide describes a method on how to use the surface texture depth results in seal design. The apportioning of traffic and the effect of the properties of the proposed aggregate are not covered in this document.

Three case studies are used in the guide and they are summarised as follows:

- Case Study 1 – Uniform texture in the traffic lane
- Case Study 2 – Variable texture between Outer Wheel Path (OWP) and Between Wheel Path (BWP)
- Case Study 3 – Uniform texture across the pavement, but the actual texture varies in a longitudinal direction along the length of the section to be resealed.

2 Purpose

The purpose of this document is to provide guidance in the use of Form 395K (Roads and Maritime, 2014) to determine binder application rates when the existing seal has either uniform or variable surface texture depths. This guide does not replace engineering judgement.

3 Surface texture depth testing

Surface texture depth testing must be carried out in accordance to Test Method T240 (Roads and Maritime, 2013) on all sealed surfaces except for primed surfaces or when the sealed surface is bleeding.

To enable an assessment of where pre-treatment or pre-spraying is required, surface texture depth testing must be carried out on the shoulder, outer wheel path, between wheel path, inner wheel path and centreline at a frequency of 250 m and at changes in aggregate size or heavy patches. Seal designs that do not take into account surface texture variations may result in the shorter life and poor performance of the seal in terms of bleeding and stripping of the reseal.

Note:

Project Managers must make a thorough assessment of where sand circles tests are being carried out to verify if tests are representative of the section to assess if variability is present. Any reduction in frequency as specified must be done only in agreement that the section represents significant uniformity.

4 Use of surface texture depth results in seal design

The sequence of activities carried out prior to using the surface texture depth results in seal design are:

Step 1 – Obtain surface texture depth results

Coordinate with the laboratory to carry out surface texture depth in accordance with RMS T240 at the nominated site/(s). Surface texture must be determined at the outer wheel path, inner wheel path, between wheel path, centre line and shoulder, for each lane.

Step 2 – Determine the surface texture allowance

Determine the surface texture allowance in accordance with Table 8 of Form 395K.

Step 3 – Select the surface texture allowance for the seal design

On sprayed seal surface, it is common to have texture variations within the traffic lane. If the seal surface is non-uniform, select the surface texture allowance for the wheel paths provided the difference in surface texture allowance between the wheel paths and in between wheel path is not

greater than 0.2 L/m². Otherwise a remedial treatment or pre-treatment should be carried out prior to sprayed sealing the entire section. This includes high pressure waterblasting, binder hardener, hot aggregate, precoated aggregate, packing coat, correction seals, pre spraying etc.

Step 4 – Seal design

Use Form 395K to complete the seal design.

5 Case Study 1

A section of a rural arterial road is to be resealed with a 7 mm single/single reseal using C240 bitumen. The existing seal is a 14 mm seal with surface texture results listed in Table 1. This section of road carries an AADT of 800 and 10% equivalent heavy vehicles (EHV). This section of road is a single carriageway with no overtaking lanes and with sealed shoulders.

Step 1 – Obtain surface texture depth results

The surface texture depth results obtained from this section of road are as listed in Table 1.

Table 1: Surface texture depth results across the pavement

| Location | Surface texture depth (mm) |
|----------|----------------------------|
| Shoulder | 3.4 |
| OWP | 2.8 |
| BWP | 3.0 |
| IWP | 2.9 |
| CL | 3.1 |

Step 2 – Determine the surface texture allowance

Using Table 8 in Form 395K, the surface texture allowance is listed in Table 3 at each transverse site.

Table 2: Surface texture allowance (A_T) in accordance with Form 395K

| Existing Seal/Primerseal | | | Proposed Reseal - Aggregate Size | | | |
|---|-------------|---|----------------------------------|------|-------------------|-------------------|
| Agg. Size | Condition | Texture Depth (T240) | 5 mm | 7 mm | 10 mm | 14 mm |
| 5 mm | Bleeding | < 0.4 mm | A | -0.2 | -0.2 | -0.2 |
| | Flushed | 0.4 - 0.7 mm | A | -0.1 | 0 | 0 |
| | Smooth | 0.8 - 0.9 mm | 0 | 0 | 0 | 0 |
| | Matt | 1.0 - 1.2 mm | 0 | +0.1 | +0.1 | +0.1 |
| | Hungry | 1.3 - 1.8 mm | +0.2 | +0.2 | +0.2 | +0.2 |
| | Very Hungry | > 1.8 mm | +0.3 | +0.3 | +0.3 | +0.3 |
| 7 mm | Bleeding | < 0.4 mm | A | -0.2 | -0.2 | -0.2 |
| | Flushed | 0.4 - 0.7 mm | -0.1 | -0.1 | -0.1 | 0 |
| | Smooth | 0.8 - 1.1 mm | 0 | 0 | 0 | 0 |
| | Matt | 1.2 - 1.5 mm | 0 | +0.1 | +0.2 | +0.2 |
| | Hungry | 1.6 - 2.0 mm | +0.2 | +0.2 | +0.3 | +0.3 |
| | Very Hungry | > 2.0 mm | +0.3 | +0.4 | +0.4 | +0.4 |
| 10 mm | Bleeding | < 0.4 mm | A | -0.2 | -0.2 | -0.2 |
| | Flushed | 0.4 - 0.7 mm | -0.1 | -0.1 | -0.1 | 0 |
| | Smooth | 0.8 - 1.2 mm | 0 | 0 | +0.1 | +0.2 |
| | Matt | 1.3 - 1.7 mm | +0.1 | +0.2 | +0.3 | +0.4 ^A |
| | Hungry | 1.8 - 2.2 mm | +0.2 | +0.3 | +0.4 ^A | C |
| | Very Hungry | > 2.2 mm | +0.3 | +0.4 | C | C |
| 14 mm | Flushed | 0.4 - 0.7 mm | A | -0.1 | -0.1 | -0.1 |
| | Smooth | 0.8 - 1.3 mm | 0 | 0 | +0.1 | +0.2 |
| | Matt | 1.4 - 2.2 mm | +0.1 | +0.2 | +0.4 ^A | +0.4 ^A |
| | Hungry | 2.3 - 3.2 mm | +0.2 | +0.3 | C | C |
| | Very Hungry | > 3.2 mm | +0.3 | +0.4 | C | C |
| | 20 mm | Bleeding | > 0.4 mm | B | A | -0.3 |
| Flushed | | 0.4 - 0.7 mm | B | -0.1 | -0.1 | -0.1 |
| Smooth | | 0.8 - 1.4 mm | 0 | 0 | +0.1 | +0.2 |
| Matt | | 1.5 - 2.4 mm | +0.1 | +0.2 | +0.4 ^A | +0.4 ^A |
| Hungry | | 2.5 - 3.5 mm | +0.2 | +0.3 | C | C |
| Very Hungry | | > 3.5 mm | +0.3 | +0.4 | C | C |
| Notes: | | Surface Texture Allowances for Seals over ... | | | | |
| A: Not recommended | | primers: See Table 11A | | | | |
| B: Specialised treatments necessary | | asphalt: See Table 11B | | | | |
| C: Consider alternative treatments (eg enrichment, small size seal etc) | | primed concrete: See Table 11C | | | | |
| | | primed timber: See Table 11D | | | | |
| | | slurry surfacing: See Table 11E | | | | |

Proposed aggregate size

Existing aggregate size

Table 3: Surface texture allowance (A_T) across the pavement

| Location | Surface texture depth (mm) | Surface texture allowance (L/m^2) |
|----------|----------------------------|---------------------------------------|
| Shoulder | 3.4 | 0.4 |
| OWP | 2.8 | 0.3 |
| BWP | 3.0 | 0.3 |
| IWP | 2.9 | 0.3 |
| CL | 3.1 | 0.3 |

Step 3 – Select the surface texture allowance for the seal design

Since the surface texture depth across the traffic lane is relatively uniform, the surface texture allowance (refer to Table 8, Form 395K) adopted for the seal design should be as follows:

- +0.3 L/m² for the traffic lane
- +0.4 L/m² for the shoulder

Step 4 – Seal design

The seal design must be carried out in accordance with Form 395K. The seal design process should include the design binder application rate calculation as detailed in Table 4.

Table 4: Parameters for the design binder application rate calculation

| Design Parameters | Traffic Lane | Shoulder | Comments ¹ |
|---|--------------|----------|---|
| Basic voids factor (L/m ² /mm) V_f | 0.18 | - | Based on 400 v/l/d on traffic lane using Figure 1A |
| Traffic Effect Adjustment (L/m ² /mm) V_t | 0.0 | - | From Table 3B with no overtaking lane |
| Aggregate Shape Adjustment (L/m ² /mm) V_a | 0.0 | - | From Table 4 and assuming angular aggregate is used |
| Design Voids Factor (L/m ² /mm) $VF = V_f + V_t + V_a$ | 0.18 | 0.21 | From calculation or Note 1 from Figure 1A |
| Basic Binder Application Rate (L/m ²) $A = VF \times ALD$ | 0.63 | 0.74 | Based on an ALD of 3.5 mm |
| Surface Texture Allowance (L/m ²) A_T | 0.3 | 0.4 | From Table 8 |
| Binder Absorption by Aggregate Allowance (L/m ²) A_{BA} | 0.0 | 0.0 | From Table 9 |
| Embedment Allowance (L/m ²) A_E | 0.0 | 0.0 | From Figure 2 |
| Binder Absorption by Base (L/m ²) A_{BB} | 0.0 | 0.0 | From Table 12 |
| Design Binder Application Rate (L/m ²) $B_D = A + A_T + A_{BA} + A_E + A_{BB}$ | 0.93 | 1.14 | |
| Note: 1. The tables noted in the "Comments" column are from Form 395K. | | | |

From the binder design calculations as listed in Table 4, this section of road requires two separate design binder applications rates for the shoulder and the traffic lane, that is:

- shoulder = 1.14 L/m²
- traffic lane = 0.93 L/m²

6 Case Study 2

A section of a rural arterial road is to be resealed with a 7 mm single/single reseal using C240 bitumen. The existing seal is a 14 mm seal with surface texture results listed in Table 5. This section of road carries an AADT of 800 and 10% equivalent heavy vehicles (EHV). Also, this section of road is a single carriageway with no overtaking lanes and with sealed shoulders.

Step 1 – Obtain surface texture depth results

The surface texture depth results obtained from this section of road are listed in Table 5.

Table 5: Surface texture depth results across the pavement

| Location | Surface texture depth (mm) |
|----------|----------------------------|
| Shoulder | 3.7 |
| OWP | 1.0 |
| BWP | 3.4 |
| IWP | 1.2 |
| CL | 3.1 |

Step 2 – Determine the surface texture allowance

Using Table 8 in Form 395K, the surface texture allowance is listed in Table 6 at each transverse site.

Table 6: Surface texture allowance (A_T) across the pavement

| Location | Surface texture depth (mm) | Surface texture allowance (L/m^2) |
|----------|----------------------------|---------------------------------------|
| Shoulder | 3.7 | +0.4 |
| OWP | 1.0 | +0.0 |
| BWP | 3.4 | +0.4 |
| IWP | 1.2 | +0.0 |
| CL | 3.1 | +0.3 |

Step 3 – Select the surface texture allowance for the seal design

Since the surface texture allowance between OWP and BWP varies by more than 0.2 L/m^2 , a remedial treatment or pre-treatment is good practice, prior to sprayed sealing the entire section, to ensure longer life and better performance of the seal.

7 Case Study 3

A section of a rural arterial road is to be resealed with a 7 mm single/single reseal using C240 bitumen. The existing seal is a 14 mm seal with surface texture results listed in Tables 7 and 8. This section of road carries an AADT of 800 and 10% equivalent heavy vehicles (EHV). Also, this section of road is a single carriageway with no overtaking lanes and with sealed shoulders.

Step 1 – Determine the surface texture depth

The surface texture depth results obtained from this section of the road are listed in Tables 7 and 8.

Table 7: Surface texture depth results at chainage 100 m

| Location 1 | Surface texture depth (mm) |
|------------|----------------------------|
| Shoulder | 3.4 |
| OWP | 1.0 |
| BWP | 1.8 |
| IWP | 1.2 |
| CL | 1.4 |

Table 8: Surface texture depth results at chainage 350 m

| Location 2 | Surface texture depth (mm) |
|------------|----------------------------|
| Shoulder | 3.4 |
| OWP | 2.4 |
| BWP | 3.3 |
| IWP | 2.7 |
| CL | 3.0 |

Step 2 – Determine the surface texture allowance

Using Table 8 in Form 395K, the surface texture allowances are listed in Tables 9 and 10 at each transverse site.

Table 9: Surface texture allowance (A_T) at chainage 100 m

| Location 1 | Surface texture depth (mm) | Surface texture allowance (L/m^2) |
|------------|----------------------------|---------------------------------------|
| Shoulder | 3.4 | +0.4 |
| OWP | 1.0 | +0.0 |
| BWP | 1.8 | +0.2 |
| IWP | 1.2 | +0.0 |
| CL | 1.4 | +0.2 |

Table 10: Surface texture allowance (A_T) at chainage 350 m

| Location 2 | Surface texture depth (mm) | Surface texture allowance (L/m^2) |
|------------|----------------------------|---------------------------------------|
| Shoulder | 3.4 | +0.4 |
| OWP | 2.4 | +0.3 |
| BWP | 3.3 | +0.4 |
| IWP | 2.7 | +0.3 |
| CL | 3.0 | +0.3 |

Step 3 – Select the surface texture allowance for the seal design across the pavement

At chainage 100 m

Since the surface texture allowance between OWP and BWP is not greater than 0.2 L/m², the surface texture allowances adopted for the seal design should be as follows:

- +0.0 L/m² for the traffic lane
- +0.4 L/m² for the shoulder

At chainage 350 m

Since the surface texture allowance between OWP and BWP is not greater than 0.2 L/m², the surface texture allowances adopted for the seal design should be as follows:

- +0.3 L/m² for the traffic lane
- +0.4 L/m² for the shoulder

Since the surface texture allowance between OWP_{100 m} and OWP_{350 m} is greater than 0.1 L/m², each section should be sprayed as per design.

Step 4 – Seal design

Seal design must be carried out in accordance with Form 395K. The seal design process should include the design binder application rate calculation as detailed in Table 11.

Table 11: Parameters for the design binder application rate calculation

| Design Parameters | @ chainage 100 m | | @ chainage 350 m | |
|--|------------------|----------|------------------|----------|
| | Traffic Lane | Shoulder | Traffic Lane | Shoulder |
| Basic voids factor (L/m ² /mm) V _f | 0.18 | - | 0.18 | - |
| Traffic Effect Adjustment (L/m ² /mm) V _t | 0.0 | - | 0.0 | - |
| Aggregate Shape Adjustment (L/m ² /mm) V _a | 0.0 | - | 0.0 | - |
| Design Voids Factor (L/m ² /mm) VF = V _f + V _t + V _a | 0.18 | 0.21 | 0.18 | 0.21 |
| Basic Binder Application Rate (L/m ²) A = VF x ALD | 0.63 | 0.74 | 0.63 | 0.74 |
| Surface Texture Allowance (L/m ²) A _T | 0.0 | 0.4 | 0.3 | 0.4 |
| Binder Absorption by Aggregate Allowance (L/m ²) A _{BA} | 0.0 | 0.0 | 0.0 | 0.0 |
| Embedment Allowance (L/m ²) A _E | 0.0 | 0.0 | 0.0 | 0.0 |
| Binder Absorption by Base (L/m ²) A _{BB} | 0.0 | 0.0 | 0.0 | 0.0 |
| Design Binder Application Rate (L/m ²) B _D = A + A _T + A _{BA} + A _E + A _{BB} | 0.63 | 1.14 | 0.93 | 1.14 |

From the binder design calculations listed in Table 11, this section of road requires three separate design binder applications rates for the traffic lane and the shoulder, that is:

- shoulder (from chainage 0 to 500 m) = 1.14 L/m²
- traffic lane (from chainage 0 to 250 m) = 0.63 L/m²
- traffic lane (from chainage 250 to 500 m) = 0.93 L/m²

8 References

Roads and Maritime (2013) Test Method T240 - Road Surface Texture Depth (Sand Patch), Roads and Maritime Services, North Sydney, NSW.

Roads and Maritime (2014) RMS Form 395K – Seal or Reseal Design Calculation Sheet, Roads and Maritime Services, North Sydney, NSW.