PRIME OR PRIMERSEAL
Design Calculation Sheet

Form 395A

Job Details

Date: ..... **Job/Order Number:** ..... **Office:** .....

Road Number/Name: ..... **Segment Number:** .....

Roadloc: | | | | | | | | | | | | **TO** | | | | | | | | | | | |

Location: from town ..... towards town ..... **Chainage:** .....km to ..... km

Length: ..... m **Width:** ..... m **Area:** ..... m^2 **Number of Lanes:** .....

Type

Prime (**P**) ☐ Primerseal (**PS**) ☐

Prime Design	**Trial Primer Application Rate**	
	Pavement Surface Condition (Table 1)	
	Cutter oil percentage in mixture or equivalent AMC grade (Table 1)	
	Trial Primer Application Rate (L/m^2) (Table 1)	
	Design	
	Design Primer Application Rate (L/m^2)	
	Percentage of cutter oil in primer (%) or equivalent AMC grade	
Primerseal Design	Aggregate Nominal Size (mm)	
	Traffic Volume (v/l/d)	
	Design Aggregate Spread Rate (m^2/m^3) (Table 2)	
	Trial Primerbinder Application Rate	
	Pavement Surface Temperature (^oC)	
	Cutter oil percentage in mixture or equivalent AMC grade (Table 3)	
	Basic Primerbinder Application Rate (L/m^2), **A** (Table 2)	
	Surface Condition Allowance (L/m^2), $\mathbf{A_{SC}}$ (Table 4)	
	Aggregate Absorption Allowance (L/m^2), $\mathbf{A_{BA}}$ (Table 5)	
	Trial Primerbinder Application Rate (L/m^2), $\mathbf{B_D = A + A_{SC} + A_{BA}}$	
	Design	
	Design Primerbinder Application Rate (L/m^2)	
	Percentage of cutter oil in primerbinder (%) or equivalent AMC grade	

Remarks: .....
.....
.....

Design by: ..... **Signature:** .....

Organisation:..... **Date:** .....

Table 1: Trial primer application rate

Pavement Surface Condition[1]	Primer		Trial Primer Application Rates (L/m²) at 15°C of mixture[2]	
	Cutter oil (%)	Equivalent AMC Grade	Dried back (Preferred)	Not dried back
Tightly Bonded (TB) (hard and dense)	55%	AMC00	1.0	0.7
Fine (F) (hard and porous)	45%	AMC0	1.1	0.7
Coarse (C) (hard and very porous)	35%	AMC1	1.2	0.7

Notes:
1. From ball embedment test (RMS T271); if penetration is greater than 3 mm, the surface is not suitable for prime.
2. Cutter oil percentage to be adjusted based on desired penetration in the field of 5 to 10 mm into the base.

Table 2: Basic primerbinder application rate and aggregate spread rate

Aggregate Size (mm)	Basic Primerbinder Application Rate (L/m²) at 15°C of mixture[1] [2]			Aggregate Spread Rate (m²/m³)
	Vehicles/lane/day			
	< 300	300 - 2000	> 2000	
5	1.3	[3]	[3]	115 ± 10
7	1.3	1.0 - 1.2	1.0 - 1.1	115 ± 10
10	1.4	1.2 - 1.3	1.1 - 1.2	110 ± 10

Notes:
1. The application rates given are intended as a guide only.
2. Cutter oil percentage is to be adjusted based on desired penetration in the field of 2 to 5 mm into the base.
3. The use of 5 mm aggregate is not recommended for traffic greater than 300 vehicles/lane/day.

Table 3: Recommended cutter oil percentage for primerbinders at various road surface temperatures

Pavement Surface Temperature	Primerbinder
30°C to 60°C	10% (AMC5) - 15% cutter oil (AMC4)
10°C to 30°C	15% (AMC4) - 20% cutter oil (AMC3)
< 10°C	Seek specialist advice

Table 4: Surface Condition Allowance for Primerseal (A_{SC})

Pavement Surface Condition[1]	Allowance (L/m^2)
Tightly bonded (hard and dense)	0.0
Fine (hard and porous)	+ 0.1
Coarse (hard and very porous)	+ 0.2

Note:
1. If penetration is greater than 3 mm from the ball embedment test (RMS T271), the surface is not suitable for primersealing.

Table 5: Allowances for Binder Absorption by Aggregate (A_{BA})

Binder Absorption (%)	Allowance (L/m^2)
≤ 1	0.0 to + 0.1
> 1 to 3	+ 0.1 to 0.3
> 3	Not recommended unless performance in the field is proven

Guide notes for using RMS Form 395A

Form 395A has to be completed and submitted in accordance with Clause 6 of RMS Specification R106 (RMS, 2013a).

The design approach detailed on pages 1 to 3 is recommended for granular, cemented and bitumen stabilised materials.

The prime and primerseal design binder application rate determined on page 1 may be adjusted after a review of the field trial in accordance with RMS specification R106. Where no trial is conducted the trial rate becomes the 'Design Primer or Primerbinder Application Rate'.

The application of primer or primerbinder must not occur when the pavement surface temperature is below 10°C in accordance with RMS specification R106. In addition, when pavement surface temperatures exceed 60°C, consideration should be given to not commencing the application of the primer or primerbinder as high pavement surface temperature can soften the bitumen resulting in bitumen 'pick-up' by vehicle tyres and embedment of aggregate into the underlying pavement, resulting in a bleeding seal.

In Table 1 dry back refers to the moisture of the base material being ≤ 70% of the OMC of the material (RMS, 2013b).

The 'Pavement Surface Condition' in Tables 1 and 4 are described as:

- Tightly Bonded – Visually seen as hard and dense as shown in Figure G1.
- Fine – Visually seen as hard and porous as shown in Figure G2.
- Coarse – Visually seen as hard and very porous as shown in Figure G3.

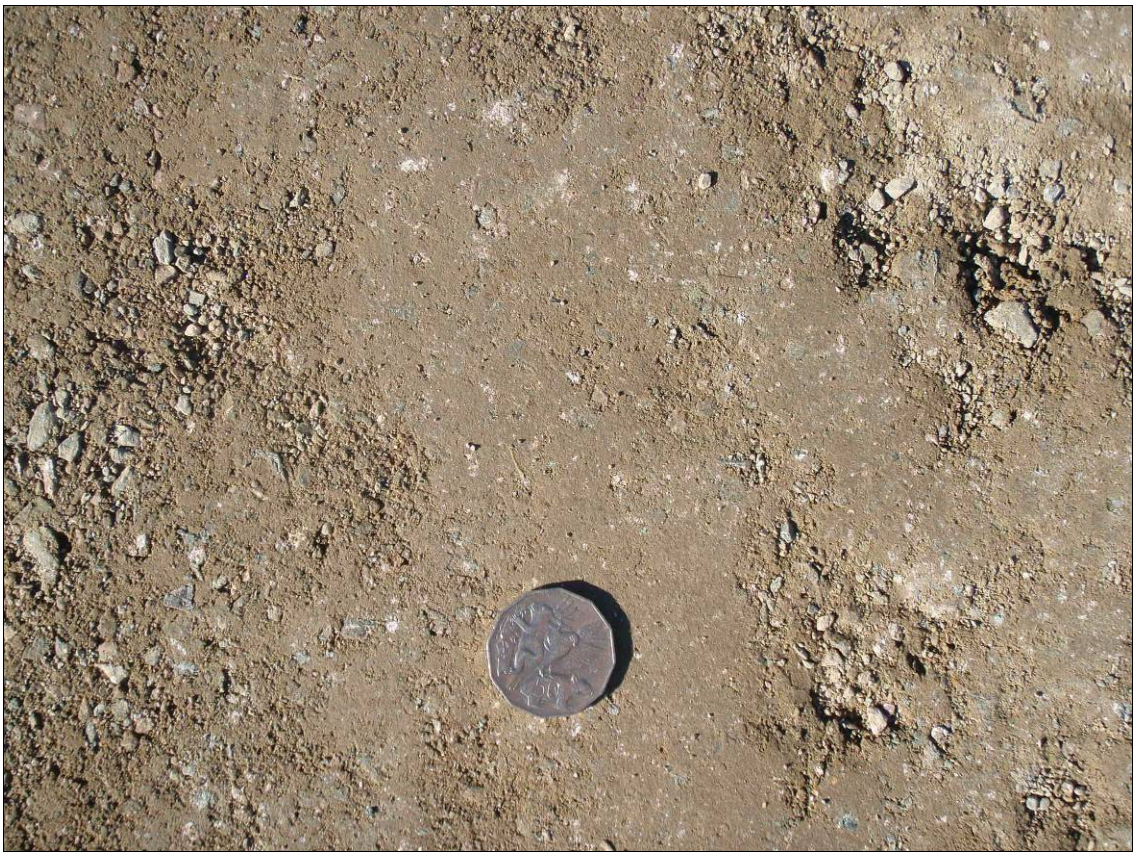

Figure G1: Example of a tightly bonded surface before sealing.

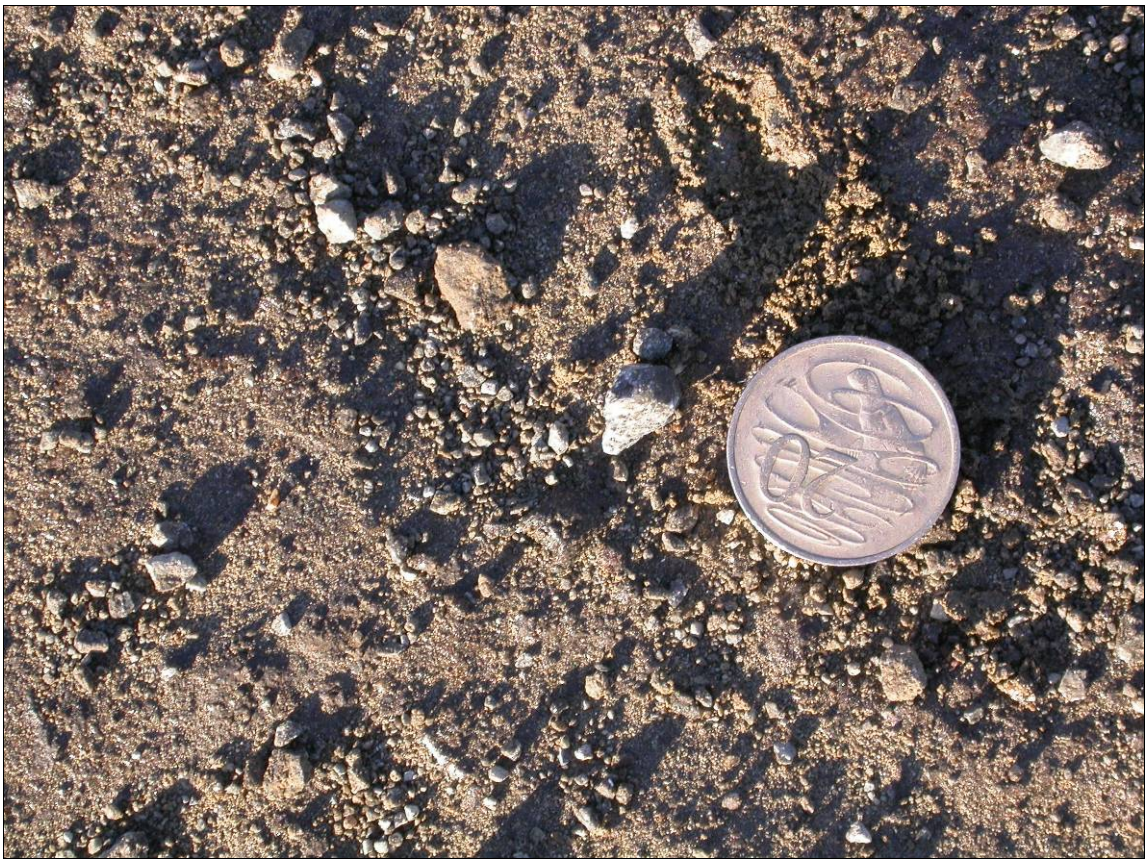

Figure G2: Example of a fine surface before sealing.

Figure G3: Example of a course surface.

If the penetration on the surface is greater than 3 mm based on the ball embedment test method T271 (RMS, 2012), the surface is not suitable for the application of a primer or primerbinder. The contractor must not commence sealing operations until the surface dries out and 'hardens', otherwise this will lead to early distress of the sprayed seal.

In Table 2, the application rates given are intended as a guide only and the actual rates should be determined by on site trials. The trial section must be at least 50 m in length. For prime, it must achieve the desired penetration of 5 to 10 mm and a hard black surface without excess binder on the surface. For primerseal, it must achieve the desired penetration of 2 to 5 mm with a small amount of binder available to hold the aggregate on the surface.

The aggregate spread rate in Table 2 has a tolerance of ±10 m^2/m^3 and the designer uses the lower limit of the application rate (ie more aggregate is required) if the aggregate used is larger than normal (ie ALD ≥ 0.6 times the nominal size of the aggregate).

The binder absorption in Table 5 is determined using Austroads test method AGPT/T052 (Austroads, 2005). The range in the 'allowance' column is directly proportional to the absorption. It is recommended that aggregates with absorption greater than 3% are not used unless proven field performance has been documented. For further information, contact the RMS Pavement Surfacings Section.

In Tables 1 and 2, the application rates are for design purposes and are expressed at 15°C. Since bituminous materials expand when heated, the actual application rate will increase depending on the temperature at spraying by a volume correction as shown in Austroads Pavement Work Tip No.40 – binder volume correction (Austroads, 2004) or RTA Form 500A (RTA, 1995).

References

Austroads (2004) *Sprayed sealing – binder volume correction,* Pavement Work Tip No.40*,* Austroads and AAPA, Kew, Victoria.

Austroads (2005) *Absorption of bituminous binder into aggregate,* Test Method AGPT/T052, Austroads, Sydney, NSW.

RTA (1995) *Cutback bitumen prime and primerseal daily record*, RTA Form 500A, Roads and Traffic Authority, Sydney, NSW.

RMS (2012) *Ball penetration test,* Test Method T271, Roads and Maritime Services, North Sydney, NSW.

RMS (2013a) *Sprayed bituminous surfacings (with cutback bitumen)*, Specification R106, Roads and Maritime Services, North Sydney, NSW.

RMS (2013b) Construction of unbound and modified pavement course, Specification R71, Roads and Maritime Services, North Sydney, NSW.