PART R26

APPLICATION OF SPRAYED BITUMINOUS SURFACING

CONTENTS

1. GENERAL

.1 This Part specifies the requirements for the application of sprayed bituminous surfacing or resurfacing (sprayed seal coat treatment).

.2 Documents referenced in this Part are listed below:

AS 1141	Methods for Sampling and Testing Aggregates
AS 1289	Methods of Testing Soils for Engineering Purposes
AS 2008	Residual Bitumen for Pavements
AS 3706	Geotextiles – Methods of Test

2. QUALITY REQUIREMENTS

.1 The Contractor must prepare and implement a Quality Plan that includes detailed procedures and documentation for:

Primer, Primer Binder, Binder and Overspray

(a) Achievement of flux and/or cutter proportions.

(b) Ensuring compatibility of emulsion primers with the pavement material including any additives or modifiers and the achievement of stated curing times.

(c) Achievement of a homogeneous mixture (including the elimination of tank contamination).

(d) Control of temperature.

(e) Application.

(f) Details of spray bars proposed and methods to avoid blockage of nozzles and valves (refer Clause 7 "Operation of Sprayer").

(g) Ensuring adequate cure of the primer/overspray.

(h) Field sampling of binder.

In addition to the above, for Emulsions, Polymer Modified Binders and Crumb Rubber

(i) Management of curing process for emulsion, including traffic management for emulsions (refer Clause 4"Constraints to Work").

(j) The manufacturer's recommendations regarding: handling instructions including temperature range, maximum storage time for particular temperatures, maximum heating temperature, and any other relevant information.

(k) Transportation of Polymer Modified Binder in accordance with "Code of Practice: Manufacture, Storage and Handling of Polymer Modified Binders, First Edition", Australian Asphalt Pavement Association, June 2004, Clause 4.2.1 and Clause 4.2.6.

(l) For crumb rubber binder and high bitumen content emulsions the achievement of a homogeneous product that can be sprayed as a uniform application of binder across the pavement, free of streaking. Details that must be included as a minimum are recommended spray nozzle sizes, maximum width of spray runs, and management of storage times & temperatures.

(m) Materials Technical Data sheets for each product.

Aggregate

(n) Controlling loading to avoid contamination and wastage.

(o) Removal of dust and dirt.

(p) Application of precoat.

(q) Application of aggregate including the monitoring of aggregate spread rates.

(r) Rolling of aggregate.

.2 Provision of the procedures and documentation listed in this Clause shall constitute a **HOLD POINT**.

.3 If not provided previously the procedures must be submitted at least 28 days prior to the commencement of site work.

3. MATERIALS

Quality of Materials

.1 Binder (including Prime, Primer Binder, C170, C320, PMB, Crumb Rubber, Multigrade and Emulsion), Flux and Cutter must comply with Part R25 "Supply of Bituminous Materials".

.2 Paving Fabric must comply with Part R85 "Supply of Geotextiles".

.3 Aggregate must comply with Part R15 "Supply of Pavement Materials".

Where aggregate is supplied by the Contractor:

.4 Prior to the use of sealing aggregates, a **HOLD POINT** shall apply for the purpose of ensuring that test certificates have prepared and that the moisture content is in accordance with Clause 4.3 "Aggregate".

.5 Prior to the commencement of sprayed bituminous surfacing, the Contractor must demonstrate (by the submission of test results (of no greater than 12 months old) the pre-coating system required to ensure compliance with the aggregate stripping requirements as determined by TP 705 for the proposed aggregates.

.6 At least 7 days prior to the commencement of sprayed bituminous surfacing, the Contractor must supply a NATA endorsed test certificate for the Average Least Dimension of all sealing aggregates. Aggregates used in the determination of the Average Least Dimension must be sampled in accordance with TP 226 and the Average Least Dimension must be determined in accordance with Part R15 "Pavement Materials"

Where aggregate is supplied by the Principal:

.7 Prior to the use of sealing aggregates a **HOLD POINT** shall apply for the purpose of ensuring that the quantity of stockpiled material is agreed.

.8 At least 7 days prior to the commencement of sprayed bituminous surfacing, the Contractor may, upon request be supplied with test results for the Average Least Dimension of all sealing aggregates.

Measurement of Materials

.9 Unless otherwise stated all rates and quantities under this Specification relating to Prime, Primer Binder, C170, C320, PMB, Crumb Rubber, Multigrade, Emulsion and cutter must refer to measurement by volume at 15ºC.

.10 Where the volume of such materials is measured at a higher temperature, the Volume Conversion Formulae must be used for converting the volume to equivalent volume at 15ºC. The Volume Conversion Tables are included as Attachments R26 A and R26B. For the purpose of sprayed bituminous surfacing, rates and quantities relating to volume of aggregate must refer to loose volume.

4. CONSTRAINTS TO WORK

Binder and Traffic

.1 The Contractor must comply with the constraints regarding binder listed in Table 4.1 Refer to Part CH20 "Provision for Traffic" for other constraints relating to traffic control.

TABLE 4.1

Treatment	Constraint
Prime	Traffic must not be permitted on the surface within 24 hours of spraying or until the prime has dried sufficiently so as not to be damaged by vehicles. A binder must not be applied over a cutback prime within 72 hours or over an emulsion prime within 12 hours of spraying of the prime. These times may need to be increased in cold weather to allow the prime to cure and also in the case of cutback primes to permit the solvent cutters to have substantially evaporated.
Primerseal	A treatment must not be applied over a cutback Primerseal within 6 months or over an emulsion Primerseal within 1 month of spraying of the Primerseal. Where an emulsion primerseal is to be overlayed with asphalt this period may be reduced to 1 day.
Crumb Rubber	Crumb Rubber must not be stored longer than 12 hours unless sufficient evidence is provided that demonstrates the ability of the storage/blending vessel to maintain the properties of the binder. In that case, an additional 12 hours of storage will be allowed provided that the temperature of the binder is held between 140ºC and 150ºC. Plant blended crumb rubber may only be transported for 2 hours from the point of manufacture, and both plant blended and field blended crumb rubber must be sprayed within four hours from the transfer into the sprayer. Base binder must consist of C170 bitumen complying with AS 2008 Once rubber has been added to the base binder the contents must be circulated for the minimum period indicated in the quality plan to provide a homogenous product of consistent quality.
Emulsion	In addition to the protective measures specified in the Quality Plan, the Contractor may be required to provide pilot vehicles to control traffic speeds to 25 km/h for at least 2 hours or until the binder has cured sufficiently to retain the screenings.
All two-coat seals	Both courses of a double seal must be laid on the same day. The top seal must overlap each finished edge of the bottom seal by 50 mm.
Spraying of intersections and junctions	Details of the proposed spray plan for intersections and junctions must be submitted on a diagram to the Principal prior to works commencing

.2 Submission of the diagram showing the proposed spray plan for intersections and junctions shall constitute a **HOLD POINT**.

Aggregate

.3 Hot binders must not be sprayed if the moisture content of the screenings exceeds 0.8% for non-PMB's or 0.1% for PMB's as determined in accordance with AS 1289.2.1.1 and AS 1289.2.1.4.

Temperature, Wind and Weather

.4 The acceptable limits for temperature, wind and pavement condition prior to sealing are detailed in Table 4.3.

.5 Pavement temperatures must be measured in the shade.

.6 Unless specified otherwise, wind speed, pavement and air temperature as measured by the Principal will be the value used to determine whether spraying will proceed.

TABLE 4.3

Product	Minimum Air/Pavement Temperatures (ºC)	Maximum Air/Pavement Temperatures (ºC)	Maximum Wind Speed (KPH)	Pavement
Prime	10/10	None	20	Dry
Primer Binder[2]	10/10	None	30	No free water present
C170[2]	15/15	None	30	Dry
C320[2]	15/15	None	30	Dry
PMB (SBS based)[2]	20/20[1]	None	30	Dry
PMB (PBD based)[2]	15/15	None	30	Dry
Crumb Rubber[2]	15/20[1]	None	30	Dry
Multigrade[2]	15/15	None	30	Dry
Emulsion[2]	10/10	40/70	30	No free water present

Notes: 15/15 can be applied for SAMI in non-trafficked areas.

Max wind speed reduced by 5 km/hr where application rate less then 0.9 l/m^2

.7 Air temperatures must be measured using a thermocouple based temperature device taken 1 metre from the pavement surface. The temperature device must be positioned:

(a) away from any heat source;

(b) shaded from the sun; and

(c) not protected from the wind.

.8 Until notified otherwise, the only Polymer Modified Binders (PMB) that are PolyButaDiene (PBD) based are Mobil and BP formulations of S35E.

5. PROTECTION OF ROAD FIXTURES

.1 The Contractor must prevent primer, binder, aggregate or other material used on the work from entering or adhering to gratings, hydrants or valve boxes, inspection pit covers, kerbs and other road fixtures. Damage to roadside furniture to be recorded on the daily record sheets to enable costs to be recovered.

6. CLEANING OF PAVEMENT

.1 The pavement must be cleaned free of loose material so that primer will be absorbed into the base, or binder adhere to the existing seal, without prilling or being absorbed onto loose material.

.2 The method of cleaning must ensure that damage to the existing surface is prevented. Steel brooms must not be used on unsealed base.

.3 The Contractor must remove all raised pavement markers and pavement bars prior to sealing and undertake any necessary repair to the existing seal. Additional payment will not be made for this activity.

7. OPERATION OF SPRAYER

.1 Binder volumes must be determined by dip stick measurement.

.2 The application of primer, primer binder, overspray and binder must be by means of sprayer(s) currently certified as complying with Austroads Sprayer Calibration Procedures series AGPT/T530 to AGPT/T535.

.3 Hand spraying will only be permitted when the use of a mechanical sprayer is not practicable.

.4 All sections of road 8 m or less in width and with the same application rate must be sprayed in one pass.

.5 Where the width of the run is greater than the maximum width that the sprayer is calibrated to spray, the Contractor must include details of how a uniform application of binder across the joint will be achieved in the Quality Plan.

.6 Bitumen impregnated paper must be used at the start and end of each run to produce a straight line with no gaps or overlap between adjacent runs.

.7 Where binder application rates below 0.7 litres per square metre are specified, A3 nozzles or S2 (Austroads AN9) nozzles must be used.

8. APPLICATION OF PRIME AND PRIMERSEAL

.1 Prior to the application of the prime or primerseal, a **HOLD POINT** must apply. Release of the hold point will occur when it has been verified that:

(a) the surface to be primed or primersealed is suitable,

(b) marked guide lines have been set out correctly; and

(c) the Contractor is properly prepared to proceed.

.2 For unstabilised granular pavements, priming and/or primer sealing must not be commenced until the moisture content of the top 20 mm of the base is less than 60% of OMC.

.3 Where slow absorption of the prime causes interference with traffic or the application of binder, or at an intersection where traffic must cross the new prime, the Contractor must apply approved cover material evenly over the primed surface.

.4 The Contractor must maintain the surface in a satisfactory condition until the seal coat is applied.

9. APPLICATION OF BINDER

.1 Prior to the application of binder a **HOLD POINT** shall apply. Release of the hold point will occur once it has been verified that the pavement surface is suitable for the application of binder and that the Contractor is properly prepared to proceed.

.2 A list of approved bitumen adhesion additives is included in the DPTI Approved Products List. The Contractor may submit a request for the approval of additional adhesion additives.

.3 . The adhesion agent will only be considered to be active for a period of 10 hours after inclusion into the binder.

.4 Class 170 bitumen in a sprayer must be deemed to be 100:0:0 and a tolerance of + 0.5 parts of cutter must be allowed for the effect of minor quantities in previous loads, cleaning and the like.

.5 Where cutter and/or additives are required to be included in the binder, these must be added at the site of the works. Cutter must be added in accordance with Attachment R26D. Flux must not be used unless approved otherwise.

.6 Carry over of adhesion additive content, for spray load calculations, must not be permitted after overnight storage.

.7 The application temperatures for primes, primerbinder and binders must comply with Table 9.

TABLE 9

Product	Minimum Spraying Temp (ºC) Un-cut	Max Re-heating Temp (ºC) Un-cut	Minimum Spraying Temp (ºC) Cut	Max Re-heating Temp (ºC) Cut
AMC 00	10	30	na	na
AMC 0	35	55	na	na
AMC 4	120	135	na	na

TABLE 9				
Product	**Minimum Spraying Temp (ºC) Un-cut**	**Max Re-heating Temp (ºC) Un-cut**	**Minimum Spraying Temp (ºC) Cut**	**Max Re-heating Temp (ºC) Cut**
AMC 5	120	135	na	na
C170	175	200	Resultant	185
C320	175	200	Resultant	185
PMB	190	200	185	190
Crumb Rubber	190	200	185	200
Multigrade	175	185	Resultant	185
Emulsion	Manufacturers recommendation	90	na	na

.8 *For cut C170, C320 and Multigrade the binder must be heated to 185ºC, additive and/or cutter added and then sprayed at the resultant temperature.

.9 The use of alternative products to those nominated in the Quality Plan for binder and precoat must be subject to approval and the Contractor demonstrating the suitability and compatibility of the products.

10. APPLICATION OF STRAIN ALLEVIATING MEMBRANE INTERLAYER

.1 A SAMI seal must be left exposed for at least 1 day but no more than 7 days, prior to the application of the asphalt overlay. If the SAMI seal is subject to traffic, other than construction vehicles, then an alternative time for the application of the asphalt overlay may be directed.

.2 Where the temperature of the pavement surface on which the SAMI is to be placed is below 20ºC, the following additional requirements must apply:

(a) The use of an emulsion binder, or

(b) The use of hot application of binder with hot sealing aggregate.

.3 These measures do not apply where the SAMI is not subject to public traffic and measures are put in place to prevent aggregate loss.

11. APPLICATION OF AGGREGATE

Precoating

.1 Precoat may be applied at the quarry or at the stack site. Precoat must be applied such that at least 80% of each stone's surface is coated. A vibrating screen aggregate loader must be used where aggregate is precoated at the stack site.

.2 Precoat must consist of not less than 30 parts of bitumen to 100 parts of IDF and 1.5 parts approved adhesion agent.

.3 Precoated aggregate may be stockpiled, provided that the Contractor implements approved measures to ensure that contamination does not occur.

.4 Aggregate must be used within 1 month of precoating.

.5 The methods to eliminate contamination from deleterious material and deterioration of the pre-coated aggregate must be included in the Quality Plan.

.6 The Contractor's methods to monitor, manage, mitigate or eliminate pollution or environmental impacts of pre-coated aggregate sites will be included in the Contractor's Environment Management Plan outlined in Part G50 "Environmental Management Requirements".

Aggregate Spreading and Rolling

.7 Aggregate must be spread over the binder in a single uniform layer as soon as practicable after spraying has commenced but in no case must this exceed the times given in Table 11.

TABLE 11.					
Product	**Maximum Cover Time (min)**		**Traffic Volume (vehicles/lane/day)**		
			< 300	**301- 1200**	**> 1201**
	Pavement < 25°C	**Pavement > 25°C**	**Minimum Passes over Full Width**		
Primerseal	5	5	6	6	4
C170	3	5	10	8	6
C320	3	5	10	8	6
PMB (SBS based)	3	3	12	10	8
PMB (PDB based)	3	5	10	8	6
Crumb Rubber	3	5	10	8	6
Multigrade	3	5	10	8	6
Emulsion	Manufacturer's Recommendation		6	6	4

.8 Rolling must commence immediately after aggregate spreading has commenced and must continue without interruption until the aggregate is firmly embedded in the binder.

.9 Notwithstanding the requirements of this Clause, the minimum number of passes over the full width treated must be made as per Table 11.2 for all pavement temperatures.

.10 For all binders there must be sufficient rollers to cover the full width to be sealed with one pass. Roller speeds must not exceed 5 km/h for the first 2 passes and 15 km/h thereafter.

.11 The aggregate covered surface must be rolled with a minimum contact pressure of 690 kPa over the whole surface.

12. REMOVAL OF LOOSE AGGREGATE AFTER ROLLING

.1 When the binder has hardened to a stage at which no more aggregate can be pushed into it by rolling, or by traffic moving at slow speeds, all loose aggregate must be removed 900 mm clear of the edge of the seal. Loose aggregate only must be removed, and without disturbance of the embedded aggregate.

.2 The above must apply to all seals, including the first coat of a double seal.

.3 Where the pavement has kerb and gutter, the loose aggregate must be picked up and removed from the site. Removal of loose aggregate must commence within 12 hours of the completion of rolling.

.4 Prior to removal of loose aggregate after rolling, a **Hold Point** shall apply for the purpose of ensuring the binder has properly adhered to the aggregate and pavement.

.5 Release of the hold point will occur once it has been verified that the removal of loose aggregate will not damage or have the potential to damage the new seal through the loss of aggregate and loose aggregate does not present a traffic hazard.

13. PAVING FABRIC

.1 Where the use of paving fabric is specified, it must comply with Part R85 "Supply of Geotextiles" and must be placed in accordance with the manufacturer's instructions and the following:

(a) Public traffic must not be permitted to travel on the paving fabric until the first layer of the specified seal has been applied.

(b) Folds in the fabric must be removed.

(c) Overlap of the paving fabric on the longitudinal joint must be between 100 and 150 mm.

(d) At the transverse joint paving fabric may be butt joined.

(e) Longitudinal overlap of the fabric must be placed within 200 mm of the centreline or lane line.

(f) The fabric must be bonded to the pavement with a tack coat sprayed 100 mm wider than the fabric. Appropriate end jets must be used to ensure the specified tack coat rate is applied across the entire width of fabric.

(g) Equipment used to place fabric must not cause undue migration of the underlying tack coat into the fabric.

(h) Upon completion of placing of fabric and prior to application of binder, the fabric must be rolled with 4 passes of a pneumatic multi-wheel roller.

.2 A certificate of compliance for the paving fabric must be included with the respective AE Lot data.

.3 Seal dimensions specified do not allow for additional binder or fabric required for overlap.

14. SURPLUS AND WASTE MATERIALS

.1 Waste, including unused contractor supplied aggregate, bitumen, empty containers or other materials remaining after completion of the work must be removed from the site by the Contractor and the work site must be left in a neat and tidy condition. Disposal must be in accordance with the Environment Protection Act.

.2 All work must be conducted in accordance with the DPTI Environmental Code of Practice.

15. RECORDS OF WORK

.1 The Contractor must complete the form DPTI 397 "Seal Coat Treatment - Daily Record Sheet", included as Attachment R26C, or an approved equivalent, which must then be certified correct by the Contractor and forwarded by the start of the next working day. Details of all materials applied must be recorded immediately after each spraying "run".

.2 The Contractor may submit an alternative recording form for acceptance provided that all details required in form DPTI 397 are included.

.3 Note that the Contractor is required to submit documentation in accordance with Part R25 "Supply of Bituminous Materials" and Part R15 "Supply of Pavement Materials" to demonstrate compliance with the Specification.

16. APPLICATION TOLERANCES

.1 Materials must be applied, or added to, within the following tolerances of the specified rate:

(a) Cutter proportions - ± 1.0 parts per 100 parts of bitumen, except that for overspray when cutback is specified the tolerance must be - ± 1.5 parts per 100 parts of bitumen.

(b) Application of primer, primer binder, binder and overspray must be within ± 5% of the specified rate. For short bar runs and hand spray work the tolerance must be ± 20%.

(c) Spreading of aggregate must be within ± 5% of the specified rate.

(d) The proportion of adhesion additive used in precoat (specified per 100 parts IDF: 30 parts C170: 1.5 parts approved additive) must be within -0.5 to +1.0 parts.

.2 The longitudinal line followed must be within 50 mm of that specified for straight runs and 100 mm on curved alignments.

17. TEST PROCEDURES

.1 The Contractor must use the following test procedures (refer http://www.dpti.sa.gov.au/contractor_documents) to verify conformance with the Specification:

TEST		TEST PROCEDURE
Moisture Content:	Oven Drying Method Microwave Method	AS 1289.2.1.1 AS 1289.2.1.4
Sampling of Soil, Aggregates and Rocks		TP 226
Determination of Aggregate Stripping Value - One Day Plate Stripping Test		TP 705

18. HOLD POINTS

.1 The following is a summary of Hold Points referenced in this Part:

CLAUSE REF	HOLD POINT	RESPONSE TIME
2	Submission of Procedures and documentation(if not in Post Tender Submission)	7 days
3.	Prior to use of sealing aggregates	2 working days
4.2	Submission of a diagram detailing spray plan for intersections and junctions	2 working days
8	Prior to application of prime or primerseal	3 hours
9	Prior to application of binder	3 hours
12.4	Prior to removal of loose aggregate after rolling	3 hours

19. VERIFICATION REQUIREMENTS AND RECORDS

Test Records

.1 The Contractor must undertake the testing specified in this Clause and supply written evidence of compliance with the lot package.

CLAUSE REF.	SUBJECT	PROPERTY	TEST PROCEDURE	TEST FREQUENCY	ACCEPTANCE LIMITS
3 & Part R15	Precoat and Aggregate*	Stripping	TP 705	Annually / Source of Aggregate	Wet: Max 15% Dry: Max 5%
3 & Part R15	Aggregate Properties*	ALD	AS1141.20.1 or AS 1141.20.2	3 tests per lot	Report Value
3 & Part R15	Aggregate Properties*	Grading	AS 1141.11	One test per lot	Refer Part R15. Attachment R15A
3 & Part R15	Aggregate Properties*	Flakiness	AS 1141.15	One test per lot	Refer Part R15. Attachment R15A
3 & Part R15	Aggregate Properties*	Misshapen Particles	AS 1141.14	One test per lot	Refer Part R15. Attachment R15A
3 & 4.2	Aggregate Properties	Moisture Content	AS 1289.2.1.1 AS 1289.2.1.4	On request	Non-PMB: 0.8%PMB: 0.01%
13 & Part R75	Paving Fabric	Mass per unit area	AS 3706.1	One per lot	Refer Part R85
13 & Part R85	Paving Fabric	Wide Strip tensile strength	AS 3706.2	One per lot	Refer Part R85
13 & Part R85	Paving Fabric	Maximum elongation	AS 3706.2	One per lot	Refer Part R85
13 & Part R85	Paving Fabric	Binder retention rate	ASTM D6140-00	One per lot	Refer Part R85
15	Binder and Aggregate	Application Rate	As recorded on Daily Record Sheet	Per Run	Refer Clause 15 "Tolerances"
8, 9 & Part R25	Supply of Bitumen	Refer Part R25			

* Not applicable for aggregate supplied by the Principal.

Other Records

The Contractor must supply the following records:

CLAUSE REF.	SUBJECT	RECORD TO BE PROVIDED
15	Records of Work	DPTI 397 "Seal Coat Treatment - Daily Record Sheet",

20. MEASUREMENT

.1 Measurement of Quantities will be based on DPTI 397 "Seal Coat Treatment – Daily Record Sheet" or an approved equivalent.

.2 For two coat seals, measurement will be determined from the area of the first coat.

.3 Measurement of Cutter will be based on the amount used as recorded in the daily record sheets.

.4 Measurement of Paving Fabric will be based on the final surface area covered, with no allowance for the specified overlaps.

21. PAYMENT BY SCHEDULE OF RATES

.1 This clause applies if payment for sprayed bituminous surfacing will be made by Schedule of Rates.

.2 On an individual sprayer run basis, payment will be made at the rates in the Schedule of Rates for the actual quantities of primer, primer binder, overspray and binder prepared and sprayed on the road under this Specification at rates of application specified or ordered and within the tolerances specified.

.3 For individual jobs in this Contract, the unit rates must apply where the approved proportions and rates are within the ranges set out below for individual jobs. This does not invalidate the total Contract quantities or the limits of accuracy detailed in the Schedule of Rates.

Proportions of components of primer	± 25%
Proportions of flux, cutter in binder	± 100%
Proportion of additive in binder	± 100%
Application rate for primer	± 50%
Application rate for overspray	± 25%
Application rate for binder	± 15%
Application rate for precoating of aggregate	± 50%
Application rate for aggregate spreading	± 10%

22. PAYMENT BY LUMP SUM

.1 This sub-clause applies if payment for sprayed bituminous surfacing will be made by Lump Sum or part thereof.

.2 Where a direction has been issued to adjust the proportions or application rates, the amount paid will be adjusted by an amount determined from the applicable rate in the Schedule of Rates for Variations.

ATTACHMENT R26A

VOLUME CONVERSION TABLE - BITUMEN EMULSION

HOT LITRES x A = COLD LITRES (15°C) COLD LITRES x B = HOT LITRES (T°C)								
60% BITUMEN EMULSION			70% BITUMEN EMULSION			80% BITUMEN EMULSION		
A	TEMP (T°C)	B	A	TEMP (T°C)	B	A	TEMP (T°C)	B
1.0000	15	1.0000	1.0000	15	1.0000	1.0000	15	1.0000
.9998	16	1.0002	.9977	20	1.0023	.9974	20	1.0026
.9989	18	1.0011	.9951	25	1.0049	.9948	25	1.0052
.9980	20	1.0020	.9924	30	1.0076	.9921	30	1.0079
.9971	22	1.0029	.9899	35	1.0102	.9895	35	1.0106
.9962	24	1.0038	.9872	40	1.0129	.9868	40	1.0134
.9953	26	1.0047	.9840	46	1.0162	.9837	46	1.0166
.9944	28	1.0056	.9830	48	1.0172	.9826	48	1.0177
.9935	30	1.0065	.9819	50	1.0184	.9816	50	1.0187
.9926	32	1.0074	.9809	52	1.0194	.9805	52	1.0199
.9917	34	1.0083	.9798	54	1.0206	.9794	54	1.0210
.9908	36	1.0092	.9788	56	1.0216	.9783	56	1.0222
.9899	38	1.0102	.9777	58	1.0228	.9773	58	1.0232
.9890	40	1.0111	.9767	60	1.0238	.9762	60	1.0244
.9881	42	1.0120	.9752	62	1.0254	.9751	62	1.0255
.9872	44	1.0129	.9746	64	1.0260	.9740	64	1.0267
.9863	46	1.0138	.9736	66	1.0271	.9730	66	1.0277
.9854	18	1.0148	.9725	68	1.0282	.9719	68	1.0289
.9845	50	1.0157	.9715	70	1.0293	.9709	70	1.0300
.9836	52	1.0166	.9704	72	1.0305	.9698	72	1.0311
.9827	54	1.0176	.9693	74	1.0316	.9687	74	1.0323
.9818	56	1.0185	.9683	76	1.0327	.9677	76	1.0334
.9809	58	1.0194	.9672	78	1.0339	.9667	78	1.0344
.9800	60	1.0204	.9662	80	1.0349	.9656	80	1.0356
.9791	62	1.0213	.9651	82	1.0361	.9643	82	1.0370
.9782	64	1.0222	.9640	84	1.0373	.9630	84	1.0384
.9773	66	1.0232	.9630	86	1.0384	.9616	86	1.0399
.9764	68	1.0241	.9619	88	1.0396	.9603	88	1.0413
.9755	70	1.0251	.9608	90	1.0407	.9590	90	1.0427

ATTACHMENT R26B

VOLUME CONVERSION TABLE – HOT BITUMEN-BASED BINDERS

MULTIPLY BY "A" TO REDUCE VOLUME AT T° TO VOLUME AT 15° MULTIPLY BY "B" TO INCREASE VOLUME AT 15°C TO VOLUME AT T°					
Multiplier A	Temp. °C T	Multiplier B	Multiplier A	Temp. °C T	Multiplier B
.9856	38	1.0146	.9356	120	1.0688
.9844	40	1.0158	.9344	122	1.0702
.9831	42	1.0172	.9332	124	1.0716
.9819	44	1.0184	.9320	126	1.0730
.9806	46	1.0198	.9308	128	1.0743
.9794	48	1.0210	.9296	130	1.0757
.9782	50	1.0223	.9284	132	1.0771
.9769	52	1.0236	.9272	134	1.0785
.9757	54	1.0249	.9260	136	1.0799
.9745	56	1.0262	.9249	138	1.0812
.9732	58	1.0275	.9237	140	1.0826
.9720	60	1.0288	.9225	142	1.0840
.9708	62	1.0301	.9213	144	1.0854
.9695	64	1.0315	.9201	146	1.0868
.9683	66	1.0327	.9189	148	1.0883
.9671	68	1.0340	.9178	150	1.0896
.9659	70	1.0353	.9166	152	1.0910
.9646	72	1.0367	.9154	154	1.0924
.9634	74	1.0380	.9142	156	1.0939
.9622	76	1.0393	.9130	158	1.0953
.9610	78	1.0406	.9119	160	1.0966
.9597	80	1.0420	.9107	162	1.0981
.9585	82	1.0433	.9095	164	1.0995
.9573	84	1.0446	.9084	166	1.1009
.9561	86	1.0459	.9072	168	1.1023
.9549	88	1.0472	.9060	170	1.1038
.9537	90	1.0486	.9049	172	1.1051
.9524	92	1.0500	.9037	174	1.1066
.9512	94	1.0513	.9025	176	1.1080
.9500	96	1.0526	.9014	178	1.1094
.9488	98	1.0540	.9002	180	1.1109
.9476	100	1.0553	.8990	182	1.1123
.9464	102	1.0566	.8979	184	1.1137
.9452	104	1.0580	.8967	186	1.1152
.9440	106	1.0593	.8956	188	1.1166
.9428	108	1.0607	.8944	190	1.1181
.9416	110	1.0620	.8933	192	1.1195
.9404	112	1.0634	.8921	194	1.1209
.9392	114	1.0647	.8909	196	1.1224
.9380	116	1.0661	.8898	198	1.1239
.9368	118	1.0675	.8886	200	1.1253

ATTACHMENT R26C

DAILY RECORD SHEET – SEAL COAT TREATMENT

	A.E. No. /
Road Name	Date / /
	Contractor
Type of Work (e.g. prime, seal, reseal, etc)	Sprayed No.
Location of Work (on this sheet) From	-Wards (*insert directions*)
To	
Reference to km Post, Junctions, chainages, etc	

Run No.		1	2	3	4	5	6	7	8	9	0	Totals
Time												
Air Temp °C												
Surface Temp °C												
Binder Mix 100/		/	/	/	/	/	/	/	/	/	/	
Added Load (Litres)	Bitumen hot											
	Flux cold											
	Cutter cold											
	Additive											
	Total											
Dipstick Reading	Start											
	Finish											
Litres Sprayed	Hot*											
	Temp °C											
	Cold*											
	Cutter*											
	Resid Binder*											
Distance From Starting point	Start of run											
	End of run											
Length of spray …….m												
Width of spray ……m												
Side of road												
Area sprayed m^2												
Specified appl. rate *												l/m^2
Specified litres *												
Tolerance ……..*												
Difference ……..*												
Actual appl. Rate …….*												
Aggregate	Source and Size											
	Spec. coverage											m^2/m^3
	Quantity used											
	Act. Coverage											
	Precoat (*l*)											
Sample Number												

Remarks (alterations to specifications – weather, etc.) No. of Rollers used .....Swept after rolling? Yes/No

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DPTI Representative ..... Contractor's Representative .....

ATTACHMENT R26D

GUIDELINES FOR ADDITION OF CUTTER

Cutter is used to reduce the viscosity of the binder, and enhance the initial wetting of the aggregate.

Following the addition of cutter to the binder, the load should be circulated for at least 15 minutes to ensure a uniform mixture

The amount of cutter required will vary with the pavement temperature and the temperature and traffic conditions in the next few days after application. The Tables show typical cutter addition rates in parts per hundred parts of bitumen

Product	**PAVEMENT TEMPERATURES (ºC)**							
100:0:y Parts Cutter	15 – 20	20 – 25	25 - 30	30 - 35	35 – 40	40 -50	50-60	Over 60
C170	6	5	4	3	2	0	0	0
C320	7	6	5	4	3	0	0	0
Multigrade	6	5	4	3	2	1	0	0
S10E	na	6	5	4	3	2	0	0
S15E	na	7	6	5	4	3	2	0
S20E	na	8	7	6	5	4	3	0
S35E (SBS based)	na	6	5	4	3	2	0	0
S35E (PBD based)	4	3	2	1	0	0	0	0
S15RF	na	9	8	7	6	4	4	4
S18RF	na	10	8	9	7	5	5	4
S45R	na	9	8	7	6	4	4	4

The only S35E's that are PolyButaDiene (PBD) based are Mobil and BP formulations, until notified otherwise.

Further changes to the cutter rates may be made on-site to account for:

1. Weather changes prior to completion of rolling: Treat as for likely conditions.
2. Time lapse between temperature measurement and actual spray run: Try to anticipate the actual temperature, and cut accordingly.
3. Age of prime or primer binder (if applicable): If these still contain significant amounts of cutter, the cutting rate may be reduced by 1 part.
4. Two-coat crumb rubber seals require a minimum of 4 parts of cutter in the bottom coat. For all other binders no more than two parts of cutter in the bottom coat is generally required.
5. Traffic conditions: High traffic volumes and masses require less cutter to achieve wetting. Cutter can be reduced by up to 2 parts for roads carrying high volumes and percentages of commercial vehicles (e.g. National Highways), particularly in spray runs completed in the morning, and which will be under traffic control for most of the day. Larger aggregates may require 1 part more cutter to assist wetting where traffic volume is low.
6. Pre-blended crumb rubber grades may contain process oil. This oil will most likely reduce the viscosity of the binder compared to field blended grades; this may allow a reduction of 1-2 parts in the cutting rate.

Wind speed at the time of spraying can affect the rate at which the binder cools. This should be considered when determining the amount of cutter required.