ROAD SPECIFICATION

R51 SPRAYED BITUMINOUS SURFACINGS

Date June 2011

Department *of* Infrastructure, Energy *and* Resources

Tasmania
Explore the possibilities

Index **Page**

R51.1 GENERAL

R51.1.1 Scope

This specification sets out the requirements for Sprayed Bituminous Surfacings including prime and seals, primerseals and reseals, using bituminous materials and crushed stone aggregate. Bituminous materials include modified and multigrade bitumen.

The Specification covers:

- supply and quality of materials
- bituminous surfacing designs
- standards of workmanship including the Contract Management Plan
- records
- required evidence of compliance
- payment.

While this specification has been developed around the use of cutback bitumen, it is not intended to prevent the use of bituminous emulsions.

R51.1.2 Objective

The objectives of the specification are to:

- ensure that the surfacing is appropriately designed and constructed in order to produce a serviceable product compatible with the underlying surface and the expected future traffic
- avoid the unnecessary specification of work practices. The Contractor is required to define proposed work practices for the project in the Contract Management Plan consistent with recognised contemporary best practice, and to undertake the works accordingly
- ensure the safety of road users and construction personnel during the surfacing operations as well as to prevent damage to road infrastructure arising from the operations.

R51.1.3 Responsibilities

The Contractor referred to in the Specification is the principal Contractor with DIER under which the sealing works are to be undertaken.

In the event that a Subcontractor undertakes the surfacing works, the principal Contractor shall remain responsible for:

- the condition and suitability for sealing of the base course on new works
- the quality of materials used and the quality of the finished product
- furnishing all information required under this specification
- making good any defect in the finished surface or damage to roadside infrastructure

and any other obligation defined in this specification with respect to the safety of road users.

R51.2 STRUCTURE OF SPECIFICATION

R51.2.1 Common Requirements

The initial part of the specification defines the requirements, standards and procedures common to all categories of sprayed bituminous surfacing.

These common requirements include:

- references and definitions
- Contract Management Plan
- process to establish target application rates
- testing, records and evidence of compliance
- payment.

R51.2.2 Project Specific Requirements

The required features and properties are defined in the Project Specific Specification.

These include:

- type of surfacing in the following treatment categories
  - prime and seal
  - primerseal
  - reseal
  - geotextile reinforced seals

- required features of the surfacing including
  - aggregate size
  - binder grade including Polymer Modified Binder (PMB) class
  - number of applications of binder or aggregate
  - special properties of the aggregate or binder, such as polished aggregate friction value (PAFV), binder grade and PMB class.
  - geotextile reseal
  - nominal binder application rates for tender purposes.

R51.2.3 Client Supplied Information

R51.2.3.1 General

The works Specification includes client supplied information concerning:

- location of the works sites, traffic AADT and commercial vehicle content
- specific traffic management details G3.A – Traffic Management
- special events/considerations (G1.20), which may effect or disrupt the sealing operations.

R51.2.3.2 Site Classification for Traffic Management

As defined in Standard Specification G3 Traffic Management, roads with an AADT > 3500 vehicles shall be deemed to be high profile roads however other sites may be nominated as high profile in R51 Annexure C Sheet 2.

R51.2.3.3 Traffic Data

Every care is taken to ensure each reported traffic volume is as accurate as possible, and within the current Austroads guidelines. There is no guarantee that the data is free of errors and defects. Responsibility rests with the Contactor whenever applying a reported volume away from the actual location and date of the count on which it was based. The traffic counts are the total volume of traffic in both directions regardless of whether the road is divided carriageway, or multi-lane. The contractor is responsible for determining the traffic loadings for the seal design.
The location of where the traffic data was obtained for each site is shown in Annexure C.

Note:
Austroads Report AP-T68/06 Update of the Austroads Sprayed Seal Design Method Appendix A provides worked examples that show how traffic data may be assessed.

R51.2.4 Specific Treatments

Annexure A includes the particular requirements for:

- prime and seals (Annexure A1)
- primerseals (Annexure A2)
- reseals (Annexure A3)
- PMB's and multigrade (Annexure A4).

The separate annexures define the requirements for:

- substrate assessment
- selection of bituminous materials
- nominal and target application rates

R51.3 REFERENCES

R51.3.1 Sources

Sprayed Bituminous Surfacing shall be undertaken in accordance with all DIER Standards and Specifications, in particular:

- G1 – General Provision
- G2 – Contract Management Plan
- G3 – Traffic Management Plan
- G6 – Production of Aggregates and Rock Products
- R40 - Pavement Base and Sub base

and the *Austroads Guide to Pavement Technology* and Australian Standards:

Austroads Guides

- AP-C87/08 Glossary of Austroads Terms**;**
- Part 3 Pavement Surfacings;
- Part 4B Asphalt;
- Part 4E Recycled Materials;
- Part 4F Bituminous Binders;
- Part 4G Geotextiles and Geogrids;
- Part 4H: Test Methods**;**
- Part 4K Seals;
- Part 8 Pavement Construction;

There are a number of Austroads reports referenced in these guides that are also to be used particularly:

- AP-T68/06 Update of the Austroads sprayed seal design method;
- AG:PT/T190 Specification Framework for Polymer Modified Binders and Multigrade Bitumens;
- AP-T42/06 Guide to the selection and use of Polymer Modified Binders and Multigrade Bitumens;
- AP-G41/08 Bituminous Materials Safety Guide;
- AP-T39/05 Sprayed Seal Cutting Practice;
- AP-T38/05 Fibre-Reinforced Seals;
- AP-T37/05 Geotextile Reinforced Seals.

Austroads Test Methods

- AG:PT/T101 - Method of Sampling Polymer Modified Binders, Polymers and Crumb Rubber
- AG:PT/T102 - Protocol for Handling PMBs in the Laboratory
- AG:PT/T103 - Pre-treatment & Loss on Heating of Bit, M/grade Polymer Modified Binders (RTFO)
- AG:PT/T108 - Segregation of Polymer Modified Binders
- AG:PT/T109 - Ease of Remixing of Polymer Modified Binders Polymer Modified Binders
- AG:PT/T111 - Handling Viscosity of Polymer Modified Binders (Brookfield Thermosel)
- AG:PT/T112 - Flash Point of Polymer Modified Binders
- AG:PT/T121 - Consistency, Stiffness, Elastic Recovery and Tensile Modulus of PMBs (ARRB Elastometer

- AG:PT/T122 - Torsional Recovery of Polymer Modified Binders
- AG:PT/T131 - Softening Point of Polymer Modified Binders
- AG:PT/T141 - Compressive Limit of Polymer Modified Binders
- AG:PT/T142 - Rubber Content of Digested Crumb Rubber Binders – Trichlor Bath Method
- AG:PT/T144 - Morphology of Crumb Rubber – Bulk Density Test
- AG:PT/T530-536 – Calibration of Bitumen Sprayers, Part 0 – 6
- AG:PT/T537 – Field Calibration of Aggregate Spreaders
- AG:PT/T250 - Modified Surface Texture Depth - Pestle Method
- AG:PT/T251 – Ball Penetration Test

Australian Standards

- AS 1141, Methods for Sampling and Testing Aggregates
- AS 1160, Bituminous Emulsions for Construction and Maintenance of Pavements
- AS 1742.3, Traffic Control Devices for Works on Roads
- AS 2008, Residual Bitumen for Pavements
- AS 2157, Cutback Bitumen
- AS 2341, Methods of Testing Bitumen and Related Road Making Products
- AS 2758.2, Aggregates and Rocks for Engineering Purposes

R51.3.2 Definitions

Definitions shall be as given in the Australian Standards, Standard Specifications G6 - Production of Aggregates and Rock Products and R50 – Bituminous Surfacing and as follows:

Design Lot

Design lots are sections of the roadway that for the purposes of design have essentially uniform properties. Lots have:

- homogenous properties of surface type, texture, visual conditions etc.
- uniform traffic conditions.

A lot may have identifiable changes in properties between lanes across a roadway but shall generally have uniformity in properties along individual lanes.

For resurfacing contracts a lot shall generally consist of a minimum of 1000m^2 of road surface. Sub minimum lots may be scheduled. DIER reserves the right to nominate smaller lots as an agreed variation to the contract.

Design Application Rate

The application rate for binder and aggregate determined by the seal design.

Nominal Application Rate

The application rate for binder or aggregate on which the tender price is based.

Target Application Rate

The application rate for binder and aggregate after release of the seal design hold point that is to be adopted.

Assigned Value

The assigned value, is the value of a property, calculated from consecutive and the most recent measurements of that property. It is used to determine compliance of the product with the specified value for the particular property. The assigned value approach applies to;

- Wet strength

- Wet Dry Strength Variation, WDSV
- Polished Aggregate Friction Value, PAFV
- Flakiness Index, FI
- Average Least Dimension, ALD

and is calculated from the five most recent test results.

R51.4 CONTRACT MANAGEMENT PLAN

The Contractor shall adopt procedures consistent with the best practice procedures recommended by Austroads. The procedures shall be defined in the Contractor's Contract Management Plan and cover:

- the estimation of application rates. These will include reference sources, evaluation of substrate on which the surfacing is applied
- supply and control of materials including
  - handling and storage
  - pre-treatment and additives
  - polymer type and manufacturer, including trade name
  - inspection and testing regimes
  - presentation and analysis of data, including control charts
  - nomination of aggregates form **Annexure R51B,** (the form is available on request to Documents.RandT@dier.tas.gov.au)
- placement of surfacing including
  - necessary weather conditions to undertake field work
  - spraying of binders
  - spreading and rolling of aggregates
  - calibration of equipment and methods of verification of the application rates
  - protection of road furniture
  - cleaning and removal of excess aggregates
- care and protection of the surface and the travelling public during placement
- inspection, Reporting and Rectification process for the Defects Liability Period
- control of a non-conforming product

Details of all proprietary products such as those used for adhesion agents, aggregate precoat, bitumen emulsion, cutback bitumen, cutter and polymer modified binders including name, supplier, test conditions and criteria shall be provided in the plan.

R51.5 MATERIALS

R51.5.1 Bituminous Materials

All quantities relating to bitumen, cutter, flux oil and other additives shall be based on properties at 15^{o}C.

Unless otherwise defined in Annexure R51A (1 to 4), bitumen shall be Class 170 residual bitumen complying with AS 2008 and the following:

- density at 15^{o}C shall exceed 1.0t/m^{3} (AS2341.7)
- the minimum time to reach the specified apparent viscosity level shall be 9 days (AS2341.13).

Unless otherwise stated in Annexure R51A (1 to 4), cutback bitumen shall comply with AS2157. Field blended cutback shall be in accordance with AP-T39/05. Details of any modifications shall be provided with the seal design. No flux oil including diesel fuel shall be used as cutter oil in cutback bitumen.
Where Annexure R51A includes provision for other than cutbacks of Class 170 bitumen, the following shall apply:

- emulsion shall comply with AS1160
- multigrade bitumen shall comply with Austroads AG:PT/T190
- polymer modified binder shall comply with Austroads AG:PT/T190 with Class 170 in accordance with AS2008 as the base binder.

R51.5.2 Nomination of Bituminous Materials

The Contractor shall furnish details of:

- binder
- cutter
- flux oils
- all proprietary products e.g. adhesion agents

including the trade name of each component with the submission of designs.

R51.5.3 Aggregates

All aggregates shall be precoated and free from water and adhered dust. Aggregates shall be sourced from a quarry complying with *Standard Specification G6 Production of Aggregates and Rock Products*. The aggregates shall comply with AS2758.2 with the following clarification:

Table R51.1 Aggregate Properties

Aggregate Properties	Rock Type	
	Igneous	Non Igneous
Durability Assessment	Wet, Wet/Dry	LA & Unsound Stone (AS2758.2 Clause 9.4)
Durability Limit	100kN, 35%	AS2758.2 Class A, Tables 5 & 6
Flakiness Index	35% maximum	35% maximum
PAFV	Minimum 48	Minimum 48
Particle Size distribution	AS 2758.2 Tables 1, 2 & 3	AS 2758.2 Tables 1, 2 & 3
Resistance to Stripping	AS 2758.2 Clause 11	AS 2758.2 Clause 11

R51.5.4 Nomination of Aggregates

The Contractor shall, at least ten (10) working days prior to the intended used of an aggregate i.e. with the seal design, supply to the Superintendent the following:

- an updated Nomination of Aggregates Form, Annexure R51B
- test results for the specific material to be used,
- a representative sample (2kg) of each nominated aggregate in a clearly labelled bag
- identification of the particular sites where the aggregate is to be used.

The Nomination of Aggregate Form, Annexure R51B, shall be completed for each source of aggregate used within the Contract. Details shall be provided for:

- durability, including strength and soundness
- resistance to polishing PAFV
- flakiness index, ALD and grading for each nominal size of aggregate intended for use within the Contract.
- resistance to stripping.
- in the event that aggregate spread rates are based on mass of aggregate used, the Contractor shall provide evidence of aggregate bulk density. This can be based on field measurement (tray volumes and weigh bridge weights) or by laboratory tests (AS1141.4). The frequency shall not be less than one determination in 2 years for the particular product.

Aggregate shall not be delivered to site until the design Hold Point has been released.

R51.5.5 Sampling and Testing of Aggregate

The frequency of sampling and testing for durability, resistance to polishing, Flakiness Index and ALD shall comply with *Standard Specification G6 Production of Aggregates and Rock Products*. The following frequencies shall also apply:

- particle size distribution, one (1) per 250 tonnes of supply or part thereof.

  In the event that the Contractor can show evidence of compliance with AS2758.2, Tables 1, 2 and 3 for five (5) consecutive test results for a particular product, the frequency of testing may be reduced to one (1) test per 500 tonnes. This evidence may include tests conducted over the previous six months, provided it includes all tests over that period .In the event of any further non-compliance the sampling and testing frequency of one (1) per 250 tonnes shall apply until compliance is achieved for a further five (5) consecutive tests;
- Resistance to stripping, one per 2000 tonnes or part thereof.

R51.5.6 Evidence of Compliance of Materials

R51.5.6.1 Bituminous Products

When requested by the Superintendent, the Contractor shall provide evidence of compliance with:

- AS2008, AS2157 and this specification for Class 170 cutback bitumen
- AS1160 for emulsions
- AG:PT/T190 for multigrade and polymer modified binders.

The evidence shall include:

- test certificate showing compliance with the relevant standard batch, the batch number and the date of test
- batch number of the supplied product.

In the event that the batch number on the certificate differs from the batch number of the product, the Contractor may be required to provide evidence that the production of the product was under control at the time of delivery. This evidence might include test data and or control charts over the preceding 6 months.

In addition to the above, for PMB's the evidence for the particular batch supplied shall include:

- consistency at 60^0C and 15^0C (AG:PT/T121)
- viscosity at 165^0C (AG:PT/T111)
- torsional Recovery at 25^0C (AG:PT/T122)
- softening point (AG:PT/T131)
- date of manufacture and storage details both actual and manufacturer's recommendations.

R51.5.6.2 Quarried Materials

When requested by the Superintendent, the Contractor shall provide evidence of compliance with this specification including:

- a 25kg sample of aggregate from each site stockpile,
- evidence of traceability from supplier to placed seal.

R51.5.6.3 Proprietary Products and Processes

The Contractor shall provide evidence that all proprietary products and processes used for adhesion agents, aggregate precoat, bitumen emulsion, cutback bitumen, cutter, polymer

modified binders and geotextiles and geogrids has demonstrated satisfactory field performance for a period of at least three (3) years.

Such evidence shall include full details of the products properties.

Evidence of Compliance shall include Certificates of Compliance (CoC), details of the product including name, supplier, test conditions and criteria and evidence that the Contractor has been trained by the product supplier to install their proprietary products.

A CoC signed by the Contractor's Representative and/or the product supplier, shall be provided certifying that all products, prior to and after installation, meet the requirements of this specification.

R51.6 DESIGN

R51.6.1 Establishing Design Application Rates

Design application rates shall be determined in accordance with the Austroads Seal Design Method AP-T68/06 following an assessment of the substrate. Assessment shall include:

- visual examination and recording of the surface condition, including uniformity in both the longitudinal and transverse directions and the location and description of surface defects
- pre-treatments including proposed type
- measurement of substrate properties.

The visual examination and measurements shall provide the basis for the determination of design lots.

The application rates shall be adjusted to account for non-uniformity of the substrate and traffic loadings in the transverse direction.

R51.6.2 Substrate Measurements

Surface texture depth shall be determined by the Sand Patch Method (Austroads Test Method AG:PT/T250 Modified Surface Texture Depth - Pestle Method). The location and required number of tests will depend on uniformity within the existing seal. The surface texture allowance shall be based on the average of at least three (3) readings.

The embedment allowance shall be determined by Ball Penetration Test (Austroads Test Method AG:PT/T251 – Ball Penetration Test) measurements. Where the number of test sites is five (5) or less the embedment allowance shall be based on the maximum penetration recorded. For greater than five (5) sites, the allowance shall be based on the average plus one standard deviation of the measurements.

Primer penetration shall be determined with prepared solutions spanning a range of cutter contents.

Moisture content tests are required on new pavements in accordance with *Standard Specification R40 Pavement Base and Sub Base*.

R51.6.3 Design Calculations

The Contractor is required to provide the design calculations for the design application rates for the binder and aggregate for each design lot.

The design calculations must identify:

- the particular lot, including road name, link location and location within the carriageway
- a plan of each site showing the location of each lot
- any special function the seal is required to perform including aggregate retention, high stress, holding treatments
- the traffic loading, including the division between lanes, and climbing, turning and stopping manoeuvres that require special consideration
- substrate conditions, including location of measurements (texture depth, ball embedment) and test results
- the assigned ALD, when relevant to application rates
- all design factors, allowances and adjustments used in the estimation of binder rates
- basis of the aggregate application rates. This should include the bulk density of the aggregate, when spread rates are to be based on mass of aggregate used
- the PMB factor where the binder is modified.

The required information shall be included in a fit-for-purpose form. A replica of the form shall be included in the Contractor's Contract Management Plan.

The Superintendent shall be notified when the:

- estimated ball embedment allowance for binder equals or exceeds 0.3 l/ m2
- surface texture allowance for binder equals or exceeds 0.5 l/m2
- surface texture allowance invokes a AP-T68/06 - update of the Austroads Sprayed Seal Design Method Note 3 recommendation.

Where a seal design identifies a variation of 0.3l/m^2 or more, separate binder application rates shall be implemented with the first spray run applied to the "heavy" areas (e.g. everywhere outside of the wheel paths) with the spray rate being the difference between the designs.

R51.6.4 Submission of Seal Design

Designs for all sealing applications, except primes and primerseals, shall be submitted to the Superintendent at least ten (10) working days prior to the commencement of sealing.

The submission of the design information represents a Hold Point.

The Superintendent may require further explanation supporting the seal design from the Contractor. Once the Hold Point is released, the Contractor's design rates will then become the target application rates.

The Superintendent shall release the Hold Point within five (5) working days of receipt of the required information.

The Contractor shall monitor the ALD throughout the Contract. In the event that the assigned ALD during the Contract is not within the range of the design ALD ± 5%, the Contractor shall modify the target application rate in accordance with the current assigned value of the ALD. The Superintendent shall be notified of any change to the target application rates. Such advice shall include a revised seal design.

R51.7 SURFACE PREPARATION

R51.7.1 Inspection of the Surface

Prior to the application of any sprayed bituminous surfacing on any surface the Contractor shall provide notice to the Superintendent at least two (2) days prior to the desired date for a joint inspection of the existing surface.

During the inspection, the Superintendent, in the company of the Contractor, shall:

- mark out the location of defects in the existing surface that require treatment.

- define the nature and extent of the required surface treatment.
- define the additional site specific information that the Contractor must provide as evidence of compliance at the Hold Point release.

R51.7.2 Joint Inspections

Joint inspections shall be undertaken:

- prior to any surface preparation works,
- after the completion of the specified prime, primerseal or seal and
- where specified in the Project Specification.

R51.7.3 Pavement Repairs

Pavement repairs to any surface, both existing bituminous or new pavement, shall include:

- repair of surface defects
- removal of adhered foreign matter, loose stones, existing thermoplastic markings and raised pavement markers

Surface preparation treatment shall extend at least 200mm beyond the outside (shoulder) edges of the proposed adjacent surfacing treatment.

R51.7.4 Substrate Produced Under the Current Contract

The substrate shall be prepared in accordance with *Standard Specification R40 Pavement Base and Sub base*. The composition of, and / or time of placing of primes, primerseals and seals within the substrate shall be such that volatiles within the substrate will not reduce the future performance of the seal.

All required repairs to the substrate shall be made at the Contractor's expense.

R51.7.5 Existing Bituminous Surfacing

Where the works involve the placing of a bituminous surfacing on an existing bituminous surfacing that was not produced under the current contract, any defect repair, as identified by the Superintendent for treatment during the joint inspection, shall be paid as a separate item.

If required by the Superintendent, the Contractor shall provide details of the depth and location of reconstruction patches and details of the nature and quality of the repair materials.

R51.7.6 Transverse Joints

In accordance with recommended practice, as a minimum, cut in and cut off paper, minimum 215g/m^2, shall be used at the start and end of each sprayer run.

Prior to laying the paper for a new run, the end of the previous run shall be trimmed back to a point where the full binder application exists.

R51.7.7 Protection Measures

Adjacent roadside furniture, bridge expansion joints, private property and the travelling public must be protected from spray and any other potential nuisance arising from the sealing operations

R51.7.8 Removal of Thermoplastic Pavement Markings

All existing Thermoplastic Pavement Markings shall be removed flush with the surrounding surface prior to sealing works unless otherwise approved by the Superintendent.

Details of the method for removing existing markings shall be included in the Contract Management Plan (CMP).

A small trial section of line marking removal shall be undertaken and inspected by the Superintendent in order to establish an acceptable standard of surface texture to be achieved on completion of line removal.

Any surface defects created by the removal of Pavement Markings shall be repaired by the Contractor at no additional cost to the Principal prior to sealing.

R51.7.9 Raised Road Pavement Markers (RRPMs)

All existing RRPMs shall be removed prior to sealing works unless approved by the Superintendent and any surface defects created by the removal of the RRPMs shall be corrected prior to sealing.

R51.7.10 Temporary Pavement Markers

Surface preparation shall include the installation of temporary pavement markers. Markers shall be in accordance with AS1742, and shall be placed on existing centreline and lane line markings, for the purpose of temporary delineation and pavement marking reinstatement set out.

Where existing thermoplastic markings have been removed, temporary pavement markers shall be installed on the same day.

Markers shall be located at maximum 20 metre intervals on straight sections of roads and 12m intervals on curves.

The Contractor may elect to place markers at closer spacings or on edgelines to aid setout and traffic control.

Pavement markers shall be maintained and replaced where necessary on sealed surfaces until permanent markings have been placed at which time markers that are not exposed to traffic shall be cut off.

R51.7.11 Surface Preparation Hold Points

Surface Preparation Hold Points shall be:

- joint inspections of the existing surface
- method of removal of existing markings after the trial
- completion of the surface preparation including removal of existing thermoplastic markings.

Evidence of compliance including all supporting information shall be provided to the Superintendent prior to the release of each Hold Point.

R51.8 STANDARDS OF WORK

R51.8.1 General

The Contractor shall select plant and construction practices appropriate to the particular site and surfacing and consistent with the Contract Management Plan.

The following requirements are mandatory:

- binders must be stored for periods and in conditions that will not lead to a deterioration in performance
- materials shall not be handled or moved in a manner which will cause their deterioration
- all measuring equipment must have a current and reliable calibration appropriate to its particular class and usage
- the location of existing line markings, including link node markers, must be preserved by temporary markers

- the site conditions, (temperature, rain, wind etc), both immediate and impending must be appropriate to the particular binder
- sprayed sealing operations shall not commence unless there is sufficient time in the day to complete the rolling of the aggregate. the amount of rolling shall be based on traffic volumes and shall not be less than that defined in this specification
- aggregate shall be rolled immediately following placement
- hand spraying shall be kept to a minimum and undertaken in areas least exposed to traffic particularly turning operations.

R51.8.2 Properties of Completed Surface

The completed surface shall be a uniform mat of one or two layers as defined in the Works Specification. The mat shall firmly adhere to the underlying surface and be free of flushing and stripping.

The majority of stones should lie so that their least dimension is vertical. The underneath surface of stones when removed from the mat, shall have binder adhered to the face.

When the binder rate is >1L/m^2 the achieved average binder and aggregate application rate of any run shall be within:

- $\pm$ 10% of the target binder application rate
- $\pm$ 10% of the target aggregate application rate.

When the binder rate is <1L/ m^2 the achieved average binder and aggregate application rate of any run shall be within:

- + 0.1L/m^2 of the target binder application rate
- $\pm$ 10% of the target aggregate application rate.

Failure to stay within the above limits shall be treated as a non-compliance in accordance with *Standard Specification G2 Contract Management Plan*.

The edges of all sprayed work shall:

- correspond with the specified dimensions or up to 100mm beyond
- form straight lines or smooth curves
- be flush with adjacent surfaces
- not impede drainage or cause distinct unevenness in the surface profile.

R51.8.3 Rolling

The effectiveness and performance of rolling operations shall be assessed against the Austroads Guide to Pavement Technology Part 8 Pavement Construction, clause 8.3.4 Sealing-Rolling, in particular:

- rolling speed
- position behinder aggregate spreader
- number of passes
- number of rollers
- timing of operations
- traffic management.

As a minimum rolling shall be in accordance with *Table R51.2 Area Effectively Rolled Per Hour by a Self Propelled Multi-Tyre Roller*.

Table R51.2: Area Effectively Rolled Per Hour by a Self-Propelled Multi-Tyre Roller

Aggregate size (mm)	**Traffic volume (vehicles per lane per day)**		
	< 300	**300 – 1,200**	**> 1,200**
	Area – m^2 per roller hour		

7 or smaller	4,000 – 4,500	5,000 – 5,500	6,000 – 6,500
10	3,000 – 3,500	3,500 – 4,000	4,500 – 5,000
14	2,500 – 3,000	3,000 – 3,500	3,500 – 4,000

Unless otherwise approved by the Superintendent a minimum of two (2) rollers will be in operation for each sprayer used.

R51.8.4 Care of Surface

The Contractor shall ensure that:

- loose aggregate does not accumulate on or adjacent to the surface whereby it becomes a nuisance or hazard to road users or adjacent property owners
- for works undertaken under traffic, loose aggregate is removed from the pavement, pits, kerb and channel and any adjacent infrastructure within the time frame required in this specification.
- until loose aggregate is removed from the pavement and shoulders, traffic speeds shall be controlled in accordance with *Standard Specification G3 Traffic Management*.
- any stones which become loose after the initial removal are also removed.

R51.8.5 Removal of Loose Aggregate

This clause supersedes the requirements in the DIER Traffic Code of practice clause 7.3(e).

R51.8.5.1 Works Under Traffic

The Contractor shall remove and dispose of all loose aggregate within the maximum time limits as specified in *Table R51.3 Maximum Time Limit for Removal of Loose Aggregate*. This shall include loose aggregate on all trafficked areas, areas where loose aggregate has been swept or moved by traffic onto sealed shoulders, non trafficked areas, concrete channels, traffic islands open drains, footpaths, nature strips or verges.

Table R51.3 Maximum Time Limit for Removal of Loose Aggregate

Traffic Volume (AADT)	Maximum Time Limit
>2000	Within 24 hours of sealing
500 to 2000	Within 48 hours of sealing
<500	Within 5 calendar days of sealing

R51.8.5.2 Works Not Under Traffic

The Contractor shall develop and implement procedures that will ensure the requirements of *Table R51.4 Loose Aggregate Remaining after Removal* are achieved prior to the site being opened to traffic.

R51.8.5.3 Performance Measures

After removal of loose aggregate and prior to the application of pavement markings (paint or thermoplastic), the number of loose aggregate particles remaining on the surface shall not exceed the limits set in *Table R51.4 Loose Aggregate Remaining after Removal*.

Table R51.4 Loose Aggregate Remaining after Removal

Aggregate Size	Traffic Volume (AADT)	Maximum Loose Aggregate (number/m^2)
10mm and above	>2000	20
10mm and above	500 to 2000	30

10mm and above	<500	40
7mm	All	60

At all times there shall be no windrow of aggregate on either the sealed surface or shoulder.

R51.8.6 Application pf Pavement Markings

This clause supersedes the requirements in the DIER Traffic Code of practice clause 7.3(e)(iii).

Where bituminous surfacings are placed under traffic the specified pavement markings shall be applied within the time limits specified in *Table R51.5 Maximum Time Limit for the Application of Pavement Markings*.

Table R51.5 Maximum Time Limit for the Application of Pavement Markings

Traffic Volume (AADT)	Maximum Time Limit
>2000	Within 48 hours of opening to traffic
500 to 2000	Within 3 calendar days of opening to traffic
<500	Within 5 calendar days of opening to traffic

R51.8.7 Raised Road Pavement Markers (RRPMS)

Further to *Standard Specification R64 Pavement Marking*, for sites where RRPMs are scheduled, RRPMs shall be spaced at 12 metre centres within 60 km/h zones and fog-prone areas. Elsewhere the spacing's shall be 24 metre centres. The spacing of RRPMs is indicated for each site in the description of the Schedule of Rates Item.

Dual Directional and Mono Directional RRPMs shall be placed in accordance with AS 1742.2. Mono Directional RRPMs shall be placed with the reflective side facing the oncoming traffic.

Where RRPMs are between separation lines they shall be placed:

- on the unpainted road surface, and
- on the same alignment as the pavement markings, and
- no closer than 1m to any other Pavement Marking

Where missing, RRPMs shall be replaced in conjunction with other Pavement Marking and RRPM placement as required on each site unless notified otherwise by the Superintendent.

R51.8.8 Reinstatement of Thermoplastic Link Node Markers

Existing thermoplastic link node markers shall be removed prior to resurfacing operations in accordance with Clause 3.6.3. Upon Completion of the resurfacing the markers shall be reinstated in the thermoplastic in accordance with DIER Specification R64.
Reinstated Markers shall be 400mm x 100mm.

Payment for reinstated link node markers is deemed to be included within all rates in the Schedule of Rates.

R51.9 RECORDS

R51.9.1 General

The Contractor is required to provide records at various stages of the works including:

- prior to sealing
- daily spraying reports
- completed works report.

For bituminous surfacing specific contracts the Contractor shall supply the completed works reports (R51.9.4) for each site on completion of all work on that site.

Locations
Dimensions shall be recorded to the following accuracy:

- longitudinal 1.0m
- transverse 0.1m

for the purposes of calculation of payment and to 10m for locations within the road link system.

R51.9.2 Prior to Sealing

The required information shall include:

- description of the proposed binder, cutter, flux oil
- description and trade name of geotextile reinforcement
- Annexure B, Nomination of Aggregate Form
- substrate measurements
- design calculations
- the intended widths of spraying and hand spraying, including location plans
- where hand spraying is intended within a trafficked area
- location of surface defects requiring pre-treatment and the recommended treatment
- any special traffic management requirement.

R51.9.3 Daily Spraying Report

The report must be sufficient to:

- define the width of each spray run
- locate each spray run on the road link system
- identify all seal designs in each lot
- identify the design lots included in each spray run
- define weather conditions, air, road surface and binder temperatures during each run
- determine volumes used and applications rates for both binder, including cutter and flux oils and aggregate for each spray run
- compare actual and design application rates.

The recording form shall be part of the Contractor's Contract Management System. It shall be completed on site and be available to the Superintendent, if required, the following working day.

R51.9.4 Completed Works Report

In addition to completing the Wearing Surface Record GI - A5A and Pavement Marking Record G1 – A6, the Contractor is required to provide:

- the results of all tests on aggregate and binder
- the design calculations, including any modification arising from a change in the assigned ALD.
- the daily spraying reports,
- inspection reports before (R51.7.1 Inspection of Surface) and after sealing (R51.10 Evidence of Compliance).

The report shall be in a systematically compiled and indexed report in electronic PDF format except that the wearing surface and pavement marking records form shall be in excel format.

All Completed Works Reports are to be provided to the Superintendent and Documents.RandT@dier.tas.gov.au

(Asset Management) after acceptance by the Superintendent. The Superintendent is to ensure copies are also provided to the DIER Project Manager , the relevant DIER Regional Network Manager (Maintenance) and the DIER Project Manager for the Reseal Programme.

R51.9.5 Field Records

All actual field records of spray data and aggregate spread rates are to be made available to the Superintendent, or authorised auditor for copying and/or recording. These records may also be required by the Superintendent as supporting evidence.

R51.10 EVIDENCE of COMPLIANCE

The Contractor shall demonstrate compliance with all the requirements of this specification as a condition of payment. The methods by which the Contractor will monitor and demonstrate compliance shall be detailed in the Contract Management Plan.

The performance of the Contractor shall be measured according to the following criteria:

- the procedures detained in the Contract Management Plan in particular the points listed in this specification.
- provision of adequate resources both to manage and respond to actual events within the required response time;
- provision of all reports;
- no damage to the pavement.

R51.11 PAYMENT

Payment shall be based on achieved application rates for complying products.

For bituminous surfacing specific contracts, payment shall be withheld until the completed works report for the relevant sites has been provided.

The rate for each category of sprayed bituminous surfacing shall include the cost of sweeping and preparing of the surface to be sprayed; testing and recording; the supply, heating and spraying of primerbinder, primer and binder, including flux oils and adhesion agents; the supply and spreading of aggregate; rolling; disposal of surplus aggregate; clean-up and protection and maintenance of the surface throughout the Defects Liability Period.

The cost of traffic control shall be payed as a separate item in the Schedule of Rates in accordance with *Standard Specification G3 Traffic Management*. For resurfacing contracts this shall be as a separate item for each site.

The cost of removal of thermoplastic pavement markings and raised pavement markers and the repair of surface defects resulting from the removal shall be included in the scheduled rates for sealing.

Payment for reinstatement of link node markers shall be deemed to be included within rates tendered elsewhere for the Works.

Payment for Resistance to Polishing Testing (PAFV) shall be at the rate per unit quoted in the Schedule of Rates.

Payment for sealing outside the seal design edge and overlaps shall not be made.

Where the design primer or binder application rate varies from the nominal (tender) application rate, defined in Annexures R51A1, R51A2 and R51C, by more or less than 0.1 litres/m^2, payment shall be increased or decreased for the volume of primer, primerbinder and binder exceeding the nominal (tender) application rate at the rate shown in Schedule Item 5.14.

Where there is a non compliance no adjustment for additional binder shall be accepted.

Payment for pre-treatment that involves the application of additional binder to address variations in surface texture shall be at Schedule item 5.03(b)2.

For reseals, the Contractor shall base the tender rate for binder on the use of up to five (5) parts of cutter per 100 parts of bitumen. Where the amount of cutter exceeds this ratio the Contractor may recover the cost of extra cutter by providing documentation showing the quantities of bitumen and cutter used and the cost of supply.

R51.12 COST ADJUSTMENT FOR BITUMEN

If subsequent to the date of closing of tenders the Contractor makes claim for a variation in the price of bitumen binders to be supplied pursuant to the Contract, such variation shall be related to the increase or decrease in the bitumen supplier's Published List Selling Price (PLSP) at the relevant storage depot, existing at the time of tendering, and shall be accompanied by such evidence as the Superintendent shall reasonably require.

Notwithstanding anything to the contrary in the General Conditions of Contract, any payments made under Clause 42.1 of the General Conditions of Contract which are in respect of binder supplied subsequent to such increased or decrease bitumen prices coming into effect shall be adjusted by an amount determined by the following:

Price variation in terms of mass of binder sprayed on the basis of volume at 15°C.

$$\text{Price Variation Adjustment} = \frac{\text{Price variation per tonne of bituminous material}}{\text{Average density of bituminous material}^{*} \text{ (in litres per tonne at } 15^{\circ}\text{C)}} \times \text{Volume (at } 15^{\circ}\text{C) of bituminous material sprayed}^{**}$$

* *Nominally 970 litres/tonne unless otherwise notified*
** *Based on spray records*

R51.13 HOLD POINTS

Hold Points identified in Specification R51 *are listed in Table R51.6 Hold Points*

Table R51.6 Hold Points

Ref	Description of Hold Point	Nominated Work not to proceed	Evidence of Compliance	Time for Release of Hold Point
R51.4	Submission of Contract Management Plan	All work	Contract Management Plan	As nominated in the Conditions of Contract Annexure Part A or 10 days prior to surfacing operations where the surfacing is a sub element of a contract.
R51.5.3	Evidence of Compliance of Bituminous Materials	All works	Test results	5 days
R51.5.5	Nomination of Aggregates	Delivery of aggregate to site	Test results for the specific material to be used and updated form **Annexure B**	5 days
R51.6	Seal Design	Delivery of aggregate to site and Placement of surfacing	Fully documented seal design	10 days
R51.7	Joint Inspection of Surface	Surface preparation	Documentation of defects and proposed repairs	2 days
R51.7.8	Removal of Thermoplastic Pavement Markings Trial	Removal of Thermoplastic Pavement Markings	Acceptance of removal method	2 days
R51.7	Surface Preparation including Removal of Thermoplastic Pavement Markings	Placement of surfacing	Acceptance of Surface Preparation Works including removal of Thermoplastic Pavement Markings	2 days
R51.8	Standards of Work	Progress Payment	Demonstrated compliance, Wearing	28 days

			Surface Record	
R51.9 & R51.11	Bituminous Surfacing Specific Contracts - Completed Works Report	Progress Payment	Report	5 days

ANNEXURE R51A1 – PRIME AND SEALS

Substrate Evaluation

The Contractor is required to inspect and test the substrate for:

- moisture content prior to sealing in accordance with *Standard Specification R40 Pavement Base and Sub Base*
- ball embedment penetration in accordance with Austroads AG:PT/T251 – Ball Penetration Test
- primer penetration to ensure that the selected primer is compatible with the prepared surface, will penetrate at least 5mm into the substrate and that the nominal application rate is appropriate.

Prime and Binder Properties

Unless otherwise defined in the Project Specification the primer shall be a cutback bitumen complying with AS2157 of priming grade class (AMC00 to AMC1).

No flux oil including diesel fuel shall be used as cutter oil in cutback bitumen.

The class of binder and the other required features of the seal are defined in the Works Specification.

Embedment Allowance For Seal

The design binder application rate shall include an appropriate allowance for embedment.

In the event that the required embedment allowance determined by measurement equals or exceeds 0.3 l/m^2, the placement of the seal shall not proceed without the approval of the Superintendent.

Nominal (Tender) and Target Application Rate

The nominal (tender) primer application, which includes both the cutter and bitumen content, is 0.9 l/m^2. This rate will also apply as the target rate unless the Contractor demonstrates by field tests that another target application rate is more appropriate.

The binder application rate for the seal coat is inclusive of flux oil but not cutter. In two coat seals, the nominal application rate is the sum of both binder applications.

ANNEXURE R51A2 – PRIMERSEALS

Substrate Evaluation

The Contractor is required to inspect and test the substrate for:

- moisture content prior to sealing in accordance with *Standard Specification R40 Pavement Base and Sub Base*
- embedment of the aggregate. the superintendent is to be notified if the ball penetration value equals or exceeds 3mm.
- primer binder penetration to ensure that the proposed primer binder is compatible with the substrate and that it will penetrate at least three (3) mm into the substrate.

Primeseal Properties

Unless otherwise defined in the Project Specification, the primer binder shall be a cutback bitumen complying with AS2157 of primer sealing grade AMC2 to AMC4 appropriate to the substrate and weather conditions. The primer binder should penetrate at least 3mm into the substrate.

No flux oil including diesel fuel shall be used as cutter oil in cutback bitumen.

Nominal (Tender) Application Rates

The nominal (tender) primer binder application rate, which includes both cutter and bitumen content, is:

- 1.2 l/m^2 for 5 and 7mm aggregate
- 1.4l/m^2 for 10mm aggregate.

This rate will also apply as the target rate unless the Contractor demonstrates by field tests that another rate is more appropriate.

The target rate for aggregate shall be:

- 130m^2/ m^3 for 5 and 7mm aggregate
- 110m^2/ m^3 for 10mm aggregate.

ANNEXURE R51A3 – RESEALS

Assessment of Substrate

The Contractor is required to evaluate the substrate and base the design on the observed and recorded properties of the substrate, traffic and the properties of the intended aggregate and binder. In the event that the substrate is flushed, the Contractor is required to undertake ball embedment tests in accordance with this specification.

Design Application Rates

In furnishing the design basis of the design application rates, the Contractor shall identify lots where:

- there is flushing and where the embedment allowance equals or exceeds 0.3 l/m^2
- the difference between design binder application rates for wheel paths and other areas exceeds 0.5 l/m^2
- the surface texture allowance equals or exceeds 0.5 l/m^2.

In each of the above cases the Contractor may offer an alternative treatment to the specified treatment.

The Contractor shall bring to the attention of the Superintendent any further adjustment or allowance made to the design application rates based on judgement.

Binder Properties

Unless otherwise defined in the Project Specification the binder shall be a Class 170 bitumen, either cutback complying with sealing classes of AS2157, or not cut.

Nominal (Tender) Binder Application Rates

The nominal (tender) application rates for tendering are listed in Annexure R51C.

The nominal and target binder application rates are inclusive of flux oil but not cutter.

For two coat seals the nominal application rates referred to in Annexure R51C are the sum of the binder applications for both coats.

Geotextile Seals

The design of geotextile reseals shall be based on Austroads Part 4G Geotextiles and Geogrids. Account shall be made for:

- absorption of bitumen by the geotextile
- tacking the geotextile to the underlying substrate
- design traffic, stone size etc.

ANNEXURE R51A4 – POLYMER MODIFIED BINDERS

General

This Annexure is to be read in conjunction with Annexure R51A3 for the type of seal as identified in Annexure R51C.

Polymer Modified Binder (PMB) Properties

- PMB properities shall be in accordance with *Table R51.7 Properties of Polymer Modified Binders for Sprayed Sealing Applications* taken from AG:T/T190 Specification Framework for Polymer Modified Binders and Multigrade Bitumens.

Table R51.7 Properties of Polymer Modified Binders for Sprayed Sealing Applications

Test method	Minimum testing frequency [1]	Class / Binder Property	S10E	S15E [11]	S20E	S25E	S35E	S45R [8]
AGPT/T121	3 Monthly [2]	Consistency at 60°C (Pa.s) min. [3]	250	700	700	5000	300	1000
AGPT/T121	3 monthly	Underlying viscosity at 60°C (Pa.s) [4]	TBR [6]	TBR	TBR	TBR	TBR	TBR
AGPT/T121	3 monthly	Stiffness at 15°C (kPa) max.	140	140	140	95	180	180
AGPT/T142[12]	Weekly	Rubber content by analysis (%) min.	NA [7]	NA	NA	NA	NA	10
AGPT/T132	3 monthly	Compression limit at 70°C, 2kg (mm) min.	NA	NA	NA	NA	NA	0.2
AGPT/T121	3 monthly	Elastic recovery at 60°C, 100s (%) min. [3]	NA	NA	NA	85	NA	25
AGPT/T111	Each batch	Viscosity at 165°C (Pa.s) max. [5]	0.55	0.55	0.55	0.8	0.55	4.5 [5]
AGPT/T112	Annually	Flash point (°C) min.	250	250	250	250	250	250
AGPT/T103	Annually	Loss on heating (% mass) max.	0.6	0.6	0.6	0.6	0.6	0.6
AGPT/T122	Each batch	Torsional recovery at 25°C, 30 s (%).	22-50	32-62	45-74	54-85	16-32	25-55
AGPT/131	Each batch	Softening point (°C).	48-64	55-75	62-88	82-100	48-56	55-65
AGPT/T108	3 monthly	Segregation value (%) max.	8 [9]	8 [9]	8 [9]	8 [9]	8 [9]	8 [9]
AGPT/T109	3 monthly	Ease of remixing (%) max. [10]	2	2	2	2	2	2

Table R51.8 Properties of Multigrade Bitumens

Property	Method	M1000/320	M500/170
Viscosity at 60°C (Pa.s) (1)	AS2341.2	report	400-600
Penetration at 25°C 100 g, 5 s, (pu) min	AS2341.12	report	65
Viscosity at 135°C (Pa.s) max	AS2341.2	1.5	1.0
Viscosity at 60°C after RTFOT (Pa.s)	AGPT/T103 AS2341.2	3,500 – 6,500	report
Penetration at 25°C after RTFOT 100 g, 5 s, (pu) min	AGPT/T103 AS2341.12	26	report
Matter insoluble in toluene (% by mass), max	AS2341.8, or AS/NZS 2341.20	1.0	1.0
Flashpoint (°C) min	AS2341.14	250	250
Density at 15°C (kg/m^3)	AS2341.7	report	report
Ductility at 15°C after RTFOT (mm)	AGPT/T103 AS2341.11	report	report
Loss on heating (%) max	AGPT/T103	0.6	0.6

Nominal (Tender) Application Rates

The nominal (tender) application rates for tendering are listed in Annexure R51C.

The nominal and target binder application rates are inclusive of flux oil but not cutter.

ANNEXURE R51B – NOMINATION OF AGGREGATE FORM

Nomination of Aggregate Form

Contract No :	Contractor:	Sealing Contractor
Aggregate Source:		
Quarry Name:	Location:	Rock Type:

PROPERTIES OF STONE –Assigned Values

Property	**LAST FIVE TEST RESULTS**	**ASSIGNED VALUE**	**Test report Dates**	
			1st Test report	Last test report
Wet strength KN				
WDSV %				
PAFV				
Flakiness Index; 14mm				
10mm				
7mm				
ALD mm; 14mm				
10mm				
7mm				

GRADING- Latest Test Result

a) Nominal Size 14mm

Tested by:	Report Date:	Report No:	Grading % passing sieve (mm)								
			19	13.2	9.5	6.7	4.75	3.35	2.36	1.7	0.600

b) Nominal Size (mm) – (10mm)

c) Nominal Size (mm) – (7mm)

RESISTANCE TO STRIPPING

Tested by:	Report Date:	Report No:	Name of Additive	% of additive required

BULK DENSITY of Aggregate t/m^3:

Signed:	Date:

ANNEXURE R51C – PROJECT SPECIFIC DETAILS

Sheet 1, SEAL INFORMATION

Sheet 2, TRAFFIC DATA & SEAL MATERIAL INFORMATION

R51- ANNEXURE C - PROJECT SPECIFIC DETAILS - Sheet 1 SEAL INFORMATION

CONTRACT No	TRIPS REFERENCE									SURFACE TREATMENT					
Date of Placement	Road No	Traffic Category	Link No	Start Ch	End Ch	Cway Code	Lane Code	Surface Code	If AC, Thickness (mm)	Size coat 1 (mm)	Size coat 2 (mm)	Aggregate Type	Source Code	PAFV Result	Binder Modifier Class

Carriageway Code
A Undivided carriageway
B Divided carriageway in prescribed direction
C Divided carriageway in counter direction
R01, etc Ramps (refer Link Maps or TRIPS manual)

Lane Code
Default all lanes in carriageway
1 - 4 Lane Number (count left to right while viewing road in prescribed direction)
SH Shoulder

Binder Modifier Class
As per the AUSTROADS Specification for Polymer Modified Binders (eg. S35E, A40R, etc)

Source Rock Code
Bas Basalt
Dol Dolerite
Con Conglomerate
Other Specify

Surface Code
AC Dense Graded Asphalt
ACO Open Graded Asphalt
EM Emulsion Seal
EN Surface Enrichment
FS Flush (spray)

R51- ANNEXURE C - PROJECT SPECIFIC DETAILS - Sheet 2 TRAFFIC DATA & NOMINATED BINDER INFORMATION	
CONTRACT No	

ROAD				**Count Site No.**	**Count Site Description**	**Count Site Link Reference**	**AADT**	**AADT year**	**%HV**	**%LHV**	**Cwy**	**Traffic Category***	NOMINATED BINDER	
SITE No	Category	No.	Name										APPLICATION RATE FOR TENDER (L/m^2 @ 15 ^{o}C)	Critical Site[#]

[#]Critical Site - Nominated Critical Sites require a site specific **Traffic Management Plan** including management of works outside nominated **PEAK TIMES**

TRAFFIC & INFRASTRUCTURE

Roads & Traffic Division

Department of Infrastructure, Energy & Resources

GPO Box 936, Hobart 7001

Ph: 1300 135513

Visit: www.dier.tas.gov.au