Guide To Geotextile Reinforced Sprayed Seal Surfacing

Technical Bulletin No 38

Guide to Geotextile Reinforced Sprayed Seal Surfacing

GeoPave Technical Bulletin No 38

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Foreword

This Technical Bulletin provides information and guidance for geotextile reinforced in sprayed seal bituminous surfacing. It describes the required materials, processes and equipment used in the application of geotextile seals in sprayed bituminous surfacing.

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About VicRoads

VicRoads is the Victorian STATE ROAD AUTHORITY responsible for the management of the road network, which includes planning, designing, constructing and maintaining roads, managing road use through registration of vehicles, licensing drivers and traffic management, and providing information and road user services.

About GeoPave

GeoPave is an off-budget business unit within VicRoads responsible for developing technical expertise and training in road making materials, geotechnical work and pavement technology. In addition, GeoPave provides an investigation, testing, design and consulting service in these areas of expertise.

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Henk van Deuren – formerly VicRoads
John Esnouf – VicRoads
Ian Cossens – GeoPave

With editing and production assistance from Dom Meadley, Lance Midgley, John Rebbechi, Adrian Tofful and Janet Hider Smith.

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1

Introduction

Geotextile reinforced sprayed seals consist of paving grade geotextile, covered with either a single or double-coat, sprayed bituminous seal. This acts as a waterproofing membrane able to inhibit the reflection of cracking in a pavement.

Geotextile seal treatments are used extensively in Victoria as cost effective, rehabilitation and periodic maintenance treatments for weak or cracked pavements. They extend pavement life and reduce the need for more extensive rehabilitation treatments.

Geotextile seals have also been used as initial treatments on new pavements, which enables the use of marginal quality and water sensitive materials when better quality pavement materials are not available.

2

Types and Uses of Geotextile Seals

Geotextile seals can be used on cracked flexible pavements where the cracking may be due to:

- Surface ageing
- Environmental conditions such as thermal movement
- Swell or shrinkage
- Asphalt fatigue or material quality

They can also be used on new or old cement-treated base course pavements where the cracking is usually due to reflective cracking, shrinkage and fatigue of the underlying cemented material.

Other applications for geotextile seals include:

- Initial treatments on crushed rock pavements and cement treated bases
- Strain Alleviating Membrane Interlayer (SAMI)
- Water proofing layers on bridge decks
- Shoulders and bike tracks

Geotextile seals in Victoria are generally used as either:

- A Strain Alleviating Membrane (SAM) made of either a single application seal or a double application seal (two applications of binder and aggregate) or
- A single application seal (Strain Alleviating Membrane Interlayer or SAMI) followed by asphalt, most commonly as a combination treatment using Ultra Thin Asphalt (UTA).

2.1 Single and Double Application Seals (SAM)

Single application SAM treatments generally involve heavy binder application rates which are desirable for effective crack resistance and waterproofing.

Where crumb rubber or polymer modified binders are used in double application seals, they are often confined to the first layer of binder and aggregate. There has been a number of projects using emulsion binders for double application treatments.

A guide to selection of seal and binder type for single and double application seals is shown in Table 2.1 and Clause 3.3.

2.2 Combination Treatments (SAMI)

Geotextile seal treatments can be combined with regulation and/or UTA surfacing layers to improve pavement shape, ride quality and noise levels. This type of SAMI treatment is effective in covering minor surface defects, thereby reducing the extent of preliminary patching of the existing pavement.

SAMI geotextile treatments placed under UTA, traditionally only use Class 170, five parts rubber modified or unmodified bitumen emulsion binders.

The combination of geotextile seal and UTA provides:

- A flexible waterproof membrane that minimises reflection cracking and protects a cracked pavement from further deterioration due to entry of moisture
- A smooth riding surface with an open texture that minimises noise and water spray generation
- A surface that is more resistant to traffic stresses than a sprayed seal on its own

Regulation may be used to improve surface shape or to correct surface texture prior to placing the seal. Correction of surface shape prior to the geotextile seal can also ensure that the UTA is placed on a free draining surface in a layer of uniform thickness. Any suitable asphalt mixture may be used for regulation although a small nominal size, coarse-gap graded, mix has been found to be effective for thin regulation work.

Regulation asphalt should be allowed to remain in place well before the application of the geotextile seal to tighten the surface and minimise embedment of the overlaying seal during hot weather.

Overlaying geotextile sprayed seals with stone mastic asphalt is being trialed. If this type of treatment is considered appropriate, sufficient time should be allowed for evaporation of any cutter oils.

2.3 Selection and Use of Treatments

A guide for selection and use of geotextile seals is shown in Table 2.1.

Table 2.1 Selection of seal and binder type

Seal and Binder Type	Typical Application
Single application: Class 170 (including binders modified with 5 parts of Crumb rubber and low modified PMBs)	Normally used beneath UTA. Can also be used as a single application seal on its own but with increased risk of stripping in more heavily trafficked and highly stressed situations
Single Application: Binders with 18 or 20 parts of crumb rubber or high modified PMBs	Used for free flowing traffic. Use of 20 parts of crumb rubber is generally recommended as superior to 18 parts in this application
Double Applications: Class 170. Crumb rubber or PMBs usually used in the first layer only	More commonly used than single application seals in urban areas to reduce risk associated with higher traffic stresses. Generally unmodified or low levels of modifications are used.
Bitumen emulsion (double application only)	High binder content and PMB emulsions can give performance similar to comparable hot binders – specialist advice should be sought

2.4 Effectiveness

Geotextile seals and combination treatments have been found to be cost effective in:

- Minimising maintenance treatments such as crack sealing or patching
- Increasing the intervals between re-treatments compared to other treatment forms and reducing the risks associated with flushing and lack of skid resistance
- Reducing rate of progression of roughness and associated user costs by retarding the recurrence of cracking, moisture entry and the severity of pumping of fines. (This is in addition to the direct improvement in ride quality using asphalt regulation or UTA surfacing.)

The primary reason for using geotextile seals is to maintain an effective waterproof membrane over existing cracked pavements or where cracking is likely to occur.

Effectiveness will also be influenced by binder type or multiple applications of seals. A guide to the effectiveness of geotextile seals in resisting different levels of cracking is shown in Table 2.2.

Table 2.2 Effectiveness in resisting reflective cracking

Condition of Pavement	Comment
Minor Crazing	Treatment is generally successful
Major Crazing	The treatment will waterproof pavements and extend life. Improved performance is expected when pre-treatment such as patching or regulation is carried out well in advance of the seal application
Severe Crazing	Severely distressed areas should be patched well in advance of the seal application to ensure successful rehabilitation of the pavement
Transverse and Longitudinal Environmental and Shrinkage Cracking	Treatments are generally successful in minimising the return of and severity of cracking

2.5 Life of Geotextile sprayed seal treatments

Geotextile sprayed seal treatments are currently the highest quality form of sprayed seal used by VicRoads for treating pavement distress.

The life of the treatment is dependent upon many factors, particularly:

- Pre-existing pavement condition
- Drainage
- Stability and quality of pavement materials

- Size of aggregate and binder modification
- Traffic volumes

On sound pavements, the life expectancy of a geotextile seal is often 12 to 15 years. This life being limited chiefly by binder oxidation, rather than by condition of the pavement.

On severely distressed pavements where geotextiles are used as holding treatments, if correctly applied with appropriate preparation, the treatment will demonstrate significantly higher serviceability than other forms of sprayed seal or thin asphalt treatments.

3

Materials

Geotextile seals require the use of the same aggregates and binders as those used in normal sprayed bituminous seals as well as a special geotextile fabric.

3.1 Geotextile Fabrics

Type

There is a large range of geotextile fabrics available for use in sprayed seal applications. Non-woven, needle-punched fabrics are preferred over woven fabrics as they have more uniform elongation, better resistance to tearing and superior bitumen/fabric adhesion. The most common types of geotextiles used are:

Polyester

Polyester geotextiles are most commonly used because they typically have a melting point of 250°C and are not affected by very hot bituminous materials including polymer modified binders.

The polyester is porous so it retains sufficient bitumen to perform water-proofing functions and is not affected by hydrocarbons in the bitumen.

Polypropylene

Polypropylene geotextiles are suitable for binders where the temperature of binder used is below the melting point of the material (often less than 175°C).

Fabric Grade

For sealing applications, a minimum geotextile fabric grade of 140 g/m^2 is used for aggregate sizes of 10 and 14 mm and 180 g/m^2 for aggregates larger than 14 mm.
For initial treatment applications on gravel shoulders, bicycle paths, clay pavements and untreated soft pavements, a minimum geotextile fabric grade of 180 g/m^2 should be used.

Width

The width of the geotextile fabric is usually 4 metres, although it can be cut by the manufacturer on request or with a chainsaw on site to the required width.

Storage

Prior to use, geotextile fabric should be stored in a dry and shaded area retained in its plastic cover as the materials are generally sensitive to UV rays.

3.2 Aggregate

The aggregate should comply with the requirements of VicRoads Specification Section 831 and should be clean and pre-coated at the quarry or on-site. For single application seals, a size 10 or 14 mm stone is normally used but size 14 mm aggregate is recommended as smaller sized aggregates may strip where the seal is subject to turning traffic.

Where the seal is to be covered with asphalt, size 10 mm aggregates are used, as the reduced texture associated with the high binder application rates is less of a concern when the seal is to be overlaid by asphalt.

For double application seals it is normal to use 14 and 7 mm stone sizes although a size 10 and 5 mm combination is sometimes used.

Further details on selecting aggregate size are detailed in APRG/AAPA Pavement Work Tip No 19 - Sprayed Sealing-Selecting Aggregate Size[1].

3.3 Binder

A suitable binder is Class 170 bitumen complying with the requirements of Australian Standard 2008 – Residual Bitumen for Pavements. Polymer Modified Binders including crumb rubber binders can be used to improve resistance to crack reflections, maximise stone retention and increase binder elasticity.

Some modified binders may occasionally present a problem with absorption as they tend to form a skin, therefore not penetrating the geotextile fabric. This is likely to occur with styrene-butadiene-styrene (SBS) polymers. If polymer modified binders are used, polypropylene geotextiles should be avoided as the higher spraying temperature of the binder will melt the geotextile.

For initial sealing treatments on gravel shoulders, bike paths and low trafficked roads, a primer-binder or equivalent is used for the bond coat with the binder used for the seal placed on top of the geotextile being a cut back Class 170 bitumen.

Use of bitumen emulsion binders in double application seals has also been successful.

Figures 3.1 Laying of polypropylene geotextile fabric in combination with an emulsion binder.

4

Design

Care must be taken in the design of the binder and aggregate application rates for geotextile reinforced sprayed seals.

4.1 Binder Application Rate

VicRoads research[2] suggests that geotextile reinforced sprayed seals can be designed using conventional spray seal design methods that include:

- A basic voids factor (Bvf) and standard adjustments to that factor
- Adjustments for double application seals or PMBs, if appropriate
- An allowance for the amount of binder absorbed by the fabric
- Standard surface texture allowances.

Single Application Seals

The total binder application rate for single application seals is given by the following expression:

$$BAR_T = ALD \times (Bvf - Adj) \times D_f \times PMB_f + Allowances + Fabric$$

where:

BAR_T	=	Total binder application rate
ALD	=	Average Least Dimension of the aggregate
Bvf	=	Basic voids factor for the traffic conditions. See Table 4.1
Adj	=	Aggregate, traffic and geometry adjustment factors
D_f	=	Adjustment factor for double application sprayed seals
PMB_f	=	PMB factor for use of polymer modified binders (if appropriate). See Table 4.2
Allowances	=	Allowances for surface texture, absorption into the pavement, aggregate and surface embedment
Fabric	=	Allowance for fabric absorption. See Table 4.3.

Double Application Seals

For double application seals the binder application rate for the first layer is as for single seals with the basic application rate adjusted by multiplying by a factor of 0.9. A portion of the total binder is sprayed as a bond coat, typically 0.4 to 0.6 l/m^2, prior to spreading the geotextile. The actual amount depends on temperature, presence of cutters, binder type and the texture of the existing surface. Field adjustments are made to achieve the highest practicable application rate without subsequent pick-up due to bond-coat binder bleeding through the fabric.

Typical binder application rates for the second layer, or 'pin-down' coat, are shown in Table 4.4. This binder application rate may be increased while reducing the first layer by an equivalent amount.

4.2 Aggregate Application Rate

For single application seals, the aggregate spread rate should be the same as that calculated for normal reseals and the particular stone size used.

For double application seals, the aggregate spread rate for the first seal coat should be lighter than that required for a normal reseal. This reduces loose stones and allows a second coat to be applied the same day, if required.

Table 4.1 Basic Void Factors for design of geotextile seals

Traffic Volume (v/l/d)	Bvf
0 to 50	0.23
50 to 100	0.21
100 to 150	0.19
150 to 300	0.17
300 to 600	0.15
600 to 1200	0.13
1200 to 2400	0.12
2400 +	0.11

Table 4.2 PMB Factors applied to binder application rates

Traffic Volume (Vehicle/lane/day)	Equivalent Parts of Crumb Rubber	PMB Factor	
		Crumb Rubber Polymer Modified Binder	Synthetic Polymer Modified Binder
All Traffic	5 parts/100 parts of bitumen	1.1	ND
All Traffic	10 parts/100 parts of bitumen	1.1	ND
<500 500 to 3000 3000 to 5000 5000 to 8000 >8000	18 to 20 parts/100 parts of bitumen	ND 1.7 1.5 1.5 1.4	ND ND 1.3 ND ND

ND No data is available from VicRoads research to provide guidance on these factors

Table 4.3 Suggested fabric absorption allowances

Fabric Weight	Absorption Allowance (l/m^2)	
	Single Application Seals	Double Application Seals
140g/m2	1.0	0.7
180g/m2	1.3	0.9

Table 4.4 Typical BAR for second application of double application seal

Traffic	Binder Application Rate (l/m^2)
>1200 vehicles/lane/day	0.45
150 to 1200 vehicles/lane/day	0.6
<150 vehicles/lane/day	0.7

5

Equipment

The only additional equipment required, other than that used for normal sprayed bituminous surfacing operations, is the dispensing frame and a chainsaw if the rolls have not been pre-cut to the required width.

5.1 Geotextile Dispensing Frame

The geotextile is best spread onto the roadway using a special dispensing frame.

The dispensing frame holds a roll of fabric and is usually attached to a multi-wheel roller although it can be attached to the bucket of a front-end loader or a truck. The frame allows the geotextile to unroll evenly with applied tension and has brushes or a rubber screed to smooth out minor creases.

The multi-wheeled roller provides a very stable mounting platform as its steering is not as sensitive as that of a front end loader and so produces less wrinkles and eliminates billowing in high winds. The use of a multi-wheeled roller has the further advantage that security of the fabric adhering to the pavement is guaranteed as it is rolled on placement and reduces the number of roller passes.

Figure 5.1 Geotextile dispensing frame attached to front of multi-wheel roller

Special construction practices are required for the application of geotextile reinforced sprayed seal surfacings.

6.1 Surface Preparation

The pavement should be basically sound and self-draining with any heavily visually distressed areas removed and replaced with sound material, in accordance with normal working practices. Special attention should be given to drainage because the principal cause of distress is the result of water penetrating the pavement due to poor drainage or cracking. In an urban environment it may be prudent to improve the existing drainage system by installing sub-surface and/or pavement drains as part of the remedial work prior to the surfacing treatment. In rural areas the existing longitudinal drain should be cleaned and lowered to a level below the bottom of the pavement boxing and any verge built-up at the edge of the shoulder removed.

Surface irregularities should be corrected and filled using a hot or cold mix (pre-mix) asphalt. Pavement rutting should be regulated either using a slurry seal, asphalt or cold mix. Existing cracks greater than 5 mm should be filled and sealed to support the geotextile and prevent it from being starved of bitumen, i.e., the first coat of bitumen flows down the cracks leaving none to penetrate into the geotextile.

Weak or visually distressed areas that are likely to cause problems at a later date should be removed and replaced with sound material. A geotextile seal is not a miracle treatment, but it will inhibit cracking and distress, provided the pavement is basically sound.

Raised Reflective Pavement Markers (RRPMS) should be removed prior to applying a geotextile seal.

The pavement should be swept as for normal reseals prior to applying the bond coat and geotextile.

Figure 6.1 Laying geotextile fabric over a well prepared clay pavement

For initial treatments placed on crushed-rock, natural-surface or clay formations, the surface should be cleaned, swept and lightly watered to promote penetration.

6.2 Bond Coat

A primer/binder or equivalent product is used for the bond coat on initial treatments where bleeding is less likely to be a problem, such as on shoulders, low trafficked roads and bike paths.

For reseals the recommended bond coat binder is Class 170 bitumen or emulsion, preferably without cutter. If climatic conditions warrant, cutter may be used in the bond coat but should be kept to a minimum or avoided wherever possible. The bond coat should be sprayed at a rate of 0.4 to 0.6 l/m^2 depending on climatic, traffic and existing surface conditions.

For initial treatment seals, the bond coat should be a primerbinder or equivalent. The bond coat should be sprayed at least 100 mm wider on each side than the width of the geotextile, to allow the seal to protect the edges of the geotextile and for some movement of the geotextile when it is being placed.

If the geotextile is to be placed in two or more adjacent runs, then the bond coat should also be sprayed one run at a time and in the same sequence, prior to placing each run of the geotextile. The overlap width is usually about 100 mm and it must be fully saturated with bitumen to minimise the potential for aggregate stripping. This is achieved by spraying the overlap area twice, with the second spray run overlapping the first run of geotextile. Figure 6.2 shows details of the typical laying sequence for geotextile seals.

6.3 Cutters

For reseal treatments it is desirable to apply the geotextile seals in good weather to minimise or avoid use of cutters (usually kerosene). If weather conditions require cutters to be added to the bitumen for the successful seal, it is preferred that the bond coat is not cut back. Use of cutters should be minimised as the cutter becomes locked in the fabric and the volatiles soften the bitumen causing the seal to bleed during hot weather. Alternatively, emulsion binders can be used because they contain minimal or no cutting oils.

6.4 Laying a Geotextile Fabric

Immediately after the bond coat is sprayed, the geotextile is spread using the special dispensing frame. The geotextile should be held close to the ground to prevent billowing and with sufficient tension to avoid wrinkling. Adjoining or adjacent runs should be overlapped by at least 100 mm, with the overlapped joint receiving additional bond coat. Overlapping joints are preferred to butted types because they are more effective in providing a continuous membrane which inhibits reflective cracking. Experience has shown that for two-coat geotextile seals it does not matter where the overlapping joints are located as there has not been any adverse affect when these joints were situated in the wheel tracks.

For single coat seals, place the overlapping joints on the centre or lane line. Butted joints, if used, should always be placed on the centre or lane line.

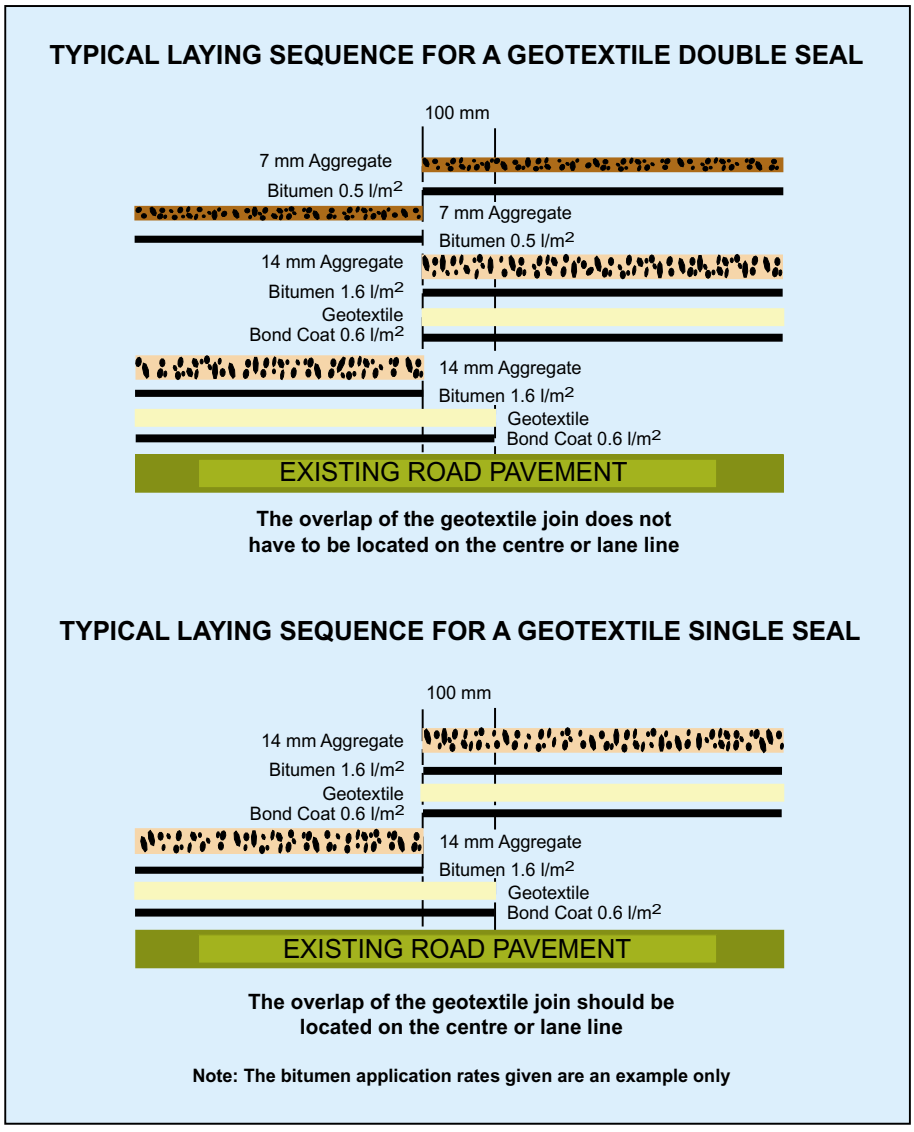
To avoid wrinkles when placing geotextile on large curves, tension the fabric and dispenser on the outside of the curve. Where geotextile is placed on small radius curves, the fabric should be folded at regular intervals along the inside of the curve and then cut and butted together or overlapped before spraying the seal coat. The underside of any overlaps should be hand sprayed with additional binder to fully saturate the geotextile.

On natural formations and sealed pavements, the geotextile should be applied over the full width of the pavement and as wide as possible over the shoulder area to prevent entry of moisture and shoulder erosion.

Minor creases or wrinkles can be removed by brooming, but experience has shown that they have little effect on the performance of geotextile seals. The fabric can be cut using a good sharp knife with a strong blade and one of these should be available on-site together with a small container of kerosene to clean the blade.

The key person in the laying operation of the geotextile is the operator of the multi-wheeled roller or tractor who needs to focus on a far-sighted target to produce a straight line. It is advisable to keep the number of personnel around the tractor or roller to an absolute minimum to focus the driver's

Figure 6.2 Typical laying sequences for geotextile seals



attention. If a tractor is used, it should have a light rigid frame with front axle steering in preference to a heavy articulated one, because a larger unit may shove or rip the fabric when changing directions.

Bitumen should not be sprayed if the geotextile is wet, because moisture will lead to emulsification of the binder with subsequent stone loss.

6.5 Rolling

Rolling of the geotextile should consist of 2 to 4 passes with a light, self-propelled, multi-tyred roller and a rolling sequence from the middle outwards to the edges. Further trafficking of the geotextile should not occur until a seal is applied to the surface to prevent vehicles picking up the cooling bitumen and geotextile.

Plant and vehicles should not be allowed to stand on the laid geotextile as this causes compression of the fabric and build-up of binder on the surface of the geotextile. If this occurs, spread a light cover of grit by hand over the affected areas to prevent the geotextile being picked up by vehicles.

If pick-up occurs, a light cover of aggregate should be spread, but not too heavily because it may prevent the binder for the seal penetrating the geotextile.

Rolling of the reseal(s) is carried out in accordance with standard practice, and additional rolling is recommended, particularly using controlled traffic.

Figure 6.3 Rolling geotextile fabric prior to application of further binder

6.6 Spreading Aggregate

For single-seal coat seals, the aggregate spread rate should be the same as that calculated for normal reseals and the particular stone size used.

For two-coat seals, the aggregate spread rate for the first seal coat should be lighter than that required for a normal reseal. This reduces the number of loose stones and allows a second coat to be applied the same day, if required. If the job takes longer than one day, it is usual to spray the second seal after completion of the initial seal.

6.7 Sweeping

Excess aggregate should be removed on the same day. A suction sweeper should be used to remove excess aggregate but it may be lightly broomed with a rotary broom. It is recommended that a lighter spread rate for the aggregate be used in order to reduce the amount of sweeping required.

Figure 6.4 Spreading aggregate over geotextile

6.8 Traffic Control

Traffic should be controlled so that speed is kept low for the first few hours after sealing to prevent stripping of the seal. Traffic should also be moved over the full width of the new seal to aid rolling and embedment of the stone and to avoid forming wheel tracks.

6.9 Wet Weather

Uncovered geotextiles should not be trafficked. In emergencies, like the sudden onset of wet weather after the geotextile has been placed on the bond coat, it can be trafficked overnight with suitable traffic control warnings, without any detrimental effect to the material provided the geotextile is dry, and that the application rate for the bond coat has been kept to a minimum to avoid pick-up. If the geotextile is wet or likely to be rained on again, it should be barricaded off, because the surface will be very slippery. The geotextile should be allowed to dry prior to the application of the sprayed seal.

7

Factors Influencing Performance of Geotextile Seals

Particular factors that can affect the performance of geotextile reinforced sprayed seals include:

- Condition of the existing pavement
- Weather and climate
- Initial adhesion and aggregate embedment
- Aggregate spread rate
- Edge effects, slippage and construction of joints
- Flooding.

7.1 Condition of Existing Pavement

Prior to the application of a geotextile seal the condition of the pavement should be basically sound, with adequate strength and good drainage. Very poor areas should be removed and repaired and any required regulation should be completed. Sealing of wide cracks is desirable but not necessary for narrow cracks.

Factors that may need to be considered include the need for shape correction and possibly the variation of surface texture across the pavement.

Pavements selected for the application of geotextile seals are often exhibiting major distress, including rutting (which may cause the binder to flow into ruts), poor ride quality, inadequate crossfall, or variable surface texture both across and along the pavement (which makes it difficult to design). In some cases, the preparation process should be undertaken in a number of steps.

When undertaking major repairs prior to geotextile seals, consideration should be given to the potential impact of patching on variations in surface texture, or the effect of materials such as cold mix and crack filling materials on subsequent embedment or flushing of the sprayed seal.

7.2 Weather and Climate

Sprayed seal treatments are susceptible to damage if rainfall occurs soon after application. Single coat geotextile sprayed seals appear to be more at risk of stripping than other types of geotextile reinforced sprayed seal treatments.

Emulsion binders should be considered for work done in cool conditions as the alternative use of high cutter contents—to ensure adhesion of the aggregate to the cutback binder—may result in lively binders which lead to flushing in subsequent hot weather.

Accordingly, geotextile sprayed seal works should be avoided late in the spray sealing season or at times of the year when cool or wet conditions are likely. In some situations, two-coat bitumen emulsions provide an alternative to the use of high cutter proportions in cool conditions.

With very high pavement temperatures during construction (>50°C) there may be a need to reduce the total binder application rate by 0.1 to 0.2 l/m^2 to reduce flushing.

7.3 Initial Adhesion and Aggregate Embedment

Initial adhesion and embedment of the aggregate into the binder of a geotextile reinforced sprayed seal can take some time and is often not achieved by conventional rolling alone. Controlled trafficking of the surfacing is desirable to achieve adequate initial adhesion and embedment of the aggregate.

7.4 Aggregate Spread Rate

The aggregate spread rate is believed to influence the amount of binder required to ensure the optimum performance of the seal. The effect of aggregate spread rate has not been investigated in detail at this stage.

7.5 Edge Effects, Slippage and Construction of Joints

Slippage of the geotextile seal can occur at locations where there are:

- High longitudinal forces, such as those due to vehicles braking and accelerating at intersections
- High transverse forces due to tight radius curves or vehicle turning movements
- Smooth surfaces at high stress sites. Consideration may need to be given to the application of a 7 mm correction seal to increase the surface texture of smooth surfaces.

Care should also be taken where vehicles can travel across overlaps or the outside edges of the geotextile, as the fabric may tend to lift or move/slip sideways. To minimise these effects it is desirable to ensure:

- That joints are adequately bonded and of sufficient width (approximately 100 mm is normal).

7.6 Flooding

Geotextile surfacing treatments may be susceptible to damage during major floods particularly when laid across a floodway. When subjected to high forces such as flooding, separation of the inter-layer treatment from the pavement surface may occur. A number of preventive measures could be taken to reduce the risk of this happening:

- Sealing the upstream batter in one-way cross-fall situations to prevent entry of moisture
- Overlapping longitudinal joins in the fabric in the direction of likely water flow
- Ensuring the underlying seal has been cleaned and adhesion agent added to the bond coat.

8

Maintenance

Geotextile reinforced sprayed bituminous seals require normal maintenance and in certain circumstances special processes need to be considered.

8.1 Stripping

The most common problem with any geotextile seal is stripping of aggregate.

There is a number of solutions to prevent this:

- Spray bitumen at base rate and use an aggregate half or less of the nominal size in the first application e.g., sizes 14 and 7, to provide a lock or pin down seal
- Alternatively, small size aggregate or grit could be spread/racked-in to fill the voids between bigger stones

Both of the above treatments provide a mechanical interlock between the stones to prevent stripping of the aggregate from the first seal. Isolated stripping may be repaired by application of an emulsion with a tar brush or small sprayer and covering it with small-sized aggregate or grit.

8.2 Flushing

If flushing of the binder occurs the following remedial treatments may be used:

- On a hot day spray a light application of solvent (usually 0.2 l/m^2), spread 7 mm aggregate and roll it in with either a steel or multi-wheeled roller and controlled traffic.
- On a hot day spread 5 mm grit and roll in with steel or multi-wheeled roller and controlled traffic
- In extreme cases apply water initially to cool down the seal and apply either of the above treatments.

8.3 Repairs to Damage

Damage to geotextile materials can be repaired by cutting out the damaged sections and covering the patch/es with small pieces of the cloth applied with a bitumen bond coat.

8.4 Shoving

Single-coat geotextile seals should not be placed where there is heavy turning or stop/start traffic e.g., on approaches to signalised intersections, climbing lanes, etc. Double-coat seals could be used at these locations to absorb the additional stresses introduced by turning traffic from cars and small commercial vehicles, but some shoving may occur if there is a high number of large commercial vehicles making turns.

Any geotextile seal that has shoved or is bunched up could be removed by either:

- Cold planing or
- Cutting up and removal by grader and front-end loader

Alternatively, if located at an intersection with a high volume of turning traffic, a thin layer of asphalt could be applied.

8.5 Removing Geotextile

The geotextile can be removed to enable future rehabilitation or reconstruction by either cold planing or cutting up and removal by grader or front-end loader. Paving fabrics are recyclable in both hot and cold stabilisation processes with the geotextile providing some tensile reinforcement.

8.6 Future Pavement Maintenance

It is expected that once a geotextile seal has been used normal periodic resurfacing maintenance will be all that is required.

The following periodic treatments could be applied in the future:

- Application of a sprayed bituminous seal
- Application of an asphalt overlay if the pavement is suitable
- Resurfacing with Ultra Thin Asphalt or Open Graded Asphalt
- Application of another geotextile seal with or without one of the alternative surfacing treatments mentioned here

9

References and Additional Reading

9.1 References

1. APRG/AAPA Pavement Work Tip No 19 - *Sprayed Sealing - Selecting Aggregate Size*, February 2000.

2. VicRoads*:* Technical Report TR106, *Design of Geotextile Reinforced Spray Seals*, June 1998

9.2 Additional Reading

APRG/AAPA Pavement Work Tip - Geotextile Reinforced Sprayed Seals (draft in preparation, September 2000).

Design of Sprayed Seals, July 1990, Austroads

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Geotextile Reinforced Bituminous Surfacing, Technical Note Number 14, GeoPave

Guide to the Design, Construction, Maintenance and Management of Clay Pavements with Geotextile Reinforced Seals, RTA NSW

Geotextile Reinforced Sprayed Sealing, VicRoads, GR95/11, Van Deuren, H and Esnouf, J

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Technical Report TR 155, *Performance of Geotextile Treatments*, June 2000, VicRoads

GeoPave

12 Lakeside Drive,
Burwood East, 3151
Phone: 9881-8907
Facsimile: 9881-8900

VicRoads Bookshop

60 Denmark Street,
Kew, 3101
Phone: 9854-2782
Facsimile: 9854-2468

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