



# AUSTRALIAN-MADE WITH RECYCLED MATERIAL

## SEALMAC® GREEN PAVING FABRIC GEOTEXTILE

### INSTALLATION GUIDE

Sealmac® Green is a non-woven paving fabric made from continuous polyester fibre, widely used in the maintenance and rehabilitation of road surfacing. It provides a cost-effective method of waterproofing and stress alleviation, mitigating the effects of reflective cracking in pavements and extending service life. When incorporated into new spray seals and asphalt overlays, it prevents the infiltration of moisture through surface cracks into the structural road pavement layers.

### GEOTEXTILE REINFORCED SEALS AND ASPHALT OVERLAY

#### 1. INTRODUCTION

This guide provides the road practitioner with useful information on the use, design, application and maintenance of geotextile reinforced spray seals and asphalt surfacing. It should be used in conjunction with other AUSTRROADS and State Road Authority guides for Sprayed Sealing and Asphalt Surfacing.

A Geotextile Reinforced Seal (GRS) is a normal sprayed sealing application into which a paving fabric is incorporated to add strength to the membrane and offer a better performance where conventional binder or polymer seals are known to have a reduced life. Paving fabrics are installed beneath asphaltic overlays as a waterproofing membrane to pavements that have sufficient strength to support asphalt surfacing. A paving fabric can be incorporated into any seal design.

##### 1.1. Applications

Geotextile reinforced seals provide a strengthened waterproof membrane suitable for applications such as a Strain Alleviating Membrane (SAM) over cracked pavements, including asphalt and sprayed sealed surfaces and as a wearing surface for low volume roads and expansive clay pavements where conventional and polymer binders are known to have a reduced life. The paving fabric reinforces the seal and provides increased waterproofing capability with provision of an increased application of bitumen.

Paving fabrics are not recommended for high stress locations. High stress locations are any situation whereby the traffic increases its force on the pavement either by acceleration, braking or turning and occurs at intersections, junctions, roundabouts, curves below 500m radius and industrial entrances.

To minimise the risk of de-bonding of sprayed seal stone or asphalt, limited exposure to traffic and rolling of the paving fabric is recommended. This ensures a firm bond to the base structure prior to placement of the seal or asphalt. The length of time a paving fabric reinforced seal can be trafficked may be restricted by the location, ambient temperature and service conditions.

#### 2. MATERIALS

##### 2.1. Paving Fabric

Paving fabrics used for sprayed sealing are conventionally manufactured from polyester because of its' high melting point. The fabric should be non-woven, needle-punched and formed from mechanically bonded continuous filaments.

Paving fabrics should have the minimum properties as shown in Table 1.

Property (PFIGA)	Recommended Minimum
Mass	150 g/m <sup>2</sup>
Thickness	1.6 mm
Elongation at ultimate strength	48%
G Value (Robustness)	950
Bitumen saturation (max)	1.0 l/m <sup>2</sup>
Melting Point (min)	240°C

Table 1 – Geotextile Properties

A minimum fabric mass of 150 g/m<sup>2</sup> is recommended for all sealing applications. Where larger sealing aggregates are proposed (e.g. > 10 mm) for use on expansive clays or untreated soft pavements and in wetter climates heavier grades of fabric, with a fabric mass ≥175 g/m<sup>2</sup> should be used. This provides higher waterproofing capability and will minimise potential puncturing of the fabric.

##### 2.1.1. Storage and Handling of Geotextiles

Paving fabrics shall be stored in the short term in dry well drained areas, preferably on raised bearers with original packaging intact. Longer term, rolls shall be stored away from direct sunlight for protection from moisture infiltration and UV degradation & the plastic wrapping.

Sealmac paving fabric is supplied with a , crush resistant PVC core, to enable efficient handling and easy placement on dispenser frames.

## 2.2. Binders

Conventional sealing binders including C170 bitumen and polymer modified binders can be used for a geotextile reinforced seal.

It may also be feasible to use crumb rubber or polymer modified bitumen. Emulsions should only be used when ambient temperature is greater than 30 degrees. Care should be taken to allow sufficient time for the emulsion to "break" before installation of the fabric to the surface binder. When using polymer modified bitumen binder, care should be taken, given the shorten time frame of PMB will take to set, short spray runs are highly recommended.

## 2.3. Aggregates

Aggregate should be as specified for conventional sealing operations and conform to the relevant State Road Authority or other appropriate specification. Aggregate should be clean and dust free and can be "pre coated" prior to use. Wet cover aggregate containing free water must not be used.

## 3. SEAL DESIGN

### 3.1. Bitumen Retention

Geotextile Reinforced Seals or Reseals incorporating paving fabric are designed in accordance with conventional design procedures. Allowances are added for binder retention by fabric and binder absorption by base course (if not primed or primer sealed). The allowance for binder absorption on the base ranges between +0.1 and +0.4 L/m<sup>2</sup>. This may be assessed using Test Method SDT 05 or your local authorities' specification for embedment.

The Binder retention allowance in the geotextile is the volume of bitumen required to saturate the fabric and varies from 0.9 – 1.1 l/sqm for PF1 and 1.2 to 1.4 l/sqm for PF2 (cold) of binder, depending on the grade of the geotextile.

### 3.2. Aggregate Sizes

It is preferable to use only 10 and 14 mm aggregate for single/single geotextile reinforced seal treatments, as smaller 7 mm aggregates have a tendency to flush or bleed in GRS applications. Aggregate sizes 14 and 16 mm are acceptable for use in double coat applications with 10 mm aggregate respectively.

10mm aggregate is incorporated in Ultra Thin Asphalt applications as a strain alleviating membrane interlayer.

### 3.3. Fabric Selection

A minimum paving fabric mass of 135g/m<sup>2</sup> is used for general sealing applications. Where larger sealing aggregates are proposed, heavier grades of fabric (min. 175 g/m<sup>2</sup>) should be used to minimise the potential for damage to the geotextile. Polyester geotextiles are preferred when using hot bitumen as they have a melting point in excess of 240 degrees. Polypropylene paving fabrics can shrink at temperatures over 160 degrees, with strength reduced when in contact with hydrocarbons.

## 4. PRE SEALING CONSIDERATIONS

### 4.1. Stabilised Heavy Duty Pavements

For stabilised bases in heavy duty conditions (e.g. > 1\*10<sup>7</sup> ESAs), the surfacing must be primer sealed or primed and sealed prior to application of the geotextile reinforced seal. This will more effectively anchor the geotextile reinforced seal to the base and ensure that a rough interface (assumed in a Circlay design) is achieved for both retention of the seal under traffic and to avoid a slip layer under future asphalt overlays.

## Texture Correction

To ensure no damage occurs to paving fabric, preparation of the existing surface may be required. If the existing surface texture is rough and irregular, a correction course comprising a small aggregate seal, asphalt scrub correction coat or cold overlay should be applied well in advance of a geotextile reinforced seal application.

Where the existing surface is smooth, with little or no texture, or is recently applied asphalt or slurry surfacing, a small aggregate seal should be applied first to provide a friction key for the geotextile reinforced seal interlayer. Paving fabric should not be applied to profiled or milled surfaces without due consideration of adequate adherence to the substrate or whereby an additional application of binder should be considered to fill the "voids".

### 4.3. Pre spraying of Un-trafficked Areas

Un-trafficked areas (along the centreline, outer edges and between wheel tracks) and zones where the surface texture is hungry may be pre-sprayed with 0.2 to 0.3 l/m<sup>2</sup> C170 bitumen in advance of the tack coat. Paving fabric overlap areas such as road centre line joints require an additional amount of bitumen usually applied via a high volume spray bar jet.

## 5. OPERATIONS

### 5.1. Weather Conditions

Preferred conditions at the time of placement for a GRS are:

- Minimum air and pavement temperatures as required for binder specification
- Predicted fine weather for duration of job
- Little or no wind
- Pavement and surface clean & dry & free of any dust or very fine particles
- No long shadow areas on the surface.

The pavement and surface should be dry so as to avoid trapping moisture under or within the geotextile reinforced seal.

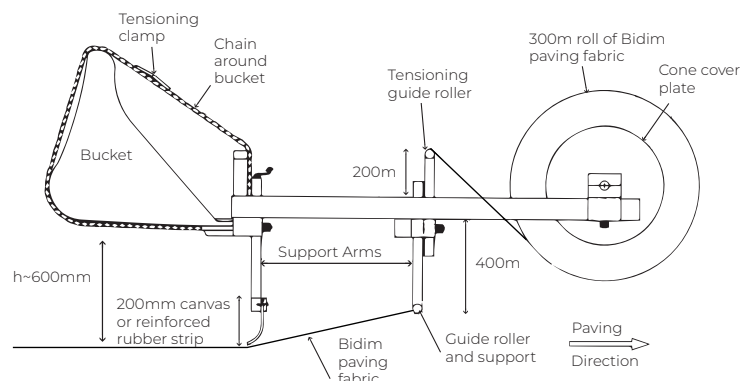
### 5.2. EQUIPMENT

The plant used for conventional sprayed sealing operations can be used for geotextile reinforced sealing. A pneumatic-tyred multi-wheel roller of less than 15 t mass is preferred for rolling paving fabric and seal treatments.

Sealmac paving fabric is applied using a dispenser such as that shown in figure 1 and can be easily fitted to a multi-tyred loader or broom sweeping plant. This is a lightweight frame attached to a loader and incorporates a spindle to hold the roll of paving fabric. It is highly recommended NOT to use any articulated vehicle i.e. loader. Front wheel steer vehicle are recommended only.

Two guide bars provide support and control of paving fabric on the dispenser frame. A rubber spreader bar attached at the base of the frame is designed to press the fabric firmly onto the pavement surface to prevent wrinkling. Arrangement of the paving fabric over guide bars provides a tension control mechanism to ensure a uniform application.

Frames can be manufactured locally or can usually be hired or purchased from paving fabric supplier Geofabrics A/Asia.



### 5.3. Surface Preparation

For seals to be placed over natural surface or clay formations, the relative compaction of the pavement should comply with the appropriate specifications.

Preferred practice for unsealed bases is to first apply a prime or primer seal. Priming is recommended where a geotextile reinforced seal is to be applied to a granular or pavement (particularly stabilised), timber or concrete surfaces.

Before sealing, the surface should be cleaned, swept and given a light spray with water (if not primed or primer sealed) to promote penetration.

For seals placed on constructed cement stabilised, concrete base or gravel pavements, cracks should be filled before sealing. Geotextile reinforced seals are used to waterproof pavements that have the potential to, or are already, extensively cracked due to reflection or fatigue. Cracks up to 3 mm in width should not require specific pre-treatment. Larger cracks should be pre treated with one or a combination of the following:

- Fill with emulsion and grit
- Hot or cold modified bitumen crack sealants. (When using this method cracks should be filled but not over banded)
- Fine asphalt or slurry mixes.

For geotextile reinforced seal placed on existing sealed or asphalt pavements, existing cracks and other defects should be repaired before resealing.

As a general rule, any correction seal, crack filling and pavement repairs should be completed at least six weeks in advance of the application of the GRS.

## 6. SPRAYED SEALS

### 6.1. Order of Operations

A typical order of operations is shown in Table 2. There may be slight variations to this order for particular circumstances e.g. if the tack coat bleeds through the paving fabric, a 7 mm aggregate may need to be spread prior to or during rolling of the paving fabric.

Order of Operations	Operation
1	Surface Preparation
2	Tack Coat
3	Apply geotextile
4	Roll Geotextile
5	Spray binder
6	Apply Aggregate
7	Roll Aggregate*

Table 2 – Typical Sequence of Operation for GRS

\*for a double/double seal - second application would be applied in the normal manner

### 6.2. Absorption/Tack Coat

The tack coat is the amount of binder needed to bond the fabric onto the road surface during sealing and ranges between 0.5 and 1.0 L/m<sup>2</sup> (cold). The amount is included in the Design Binder Application Rate and should be sufficient to secure the fabric during application and sealing operations, without causing the binder to bleed through the fabric during application or rolling.

The binder should be C170 bitumen, ideally without cutter oil. However, if the pavement material is relatively permeable, and where priming or primer sealing has not been carried out in advance, a small amount of cutter oil (up to 3%) may be used in the tack coat to promote penetration.

Cutter oil should not be used in tack coats over impermeable pavements such as clay pavements or heavily bound base materials, as the cutter oil will be trapped in the geotextile, leading to softening of the seal and possible aggregate stripping. The tack coat should be sprayed wider (by 100-200 mm) than the width of the geotextile to be laid, to allow the final seal to protect the edges of the geotextile.

If the geotextile is to be placed in two or more adjacent runs, the tack coat should be sprayed one run at a time, prior to placing each run of geotextile. The overlap width for the geotextile should be minimum 100 mm and must be fully saturated with bitumen to minimise the potential for aggregate stripping. To achieve this, the overlap area is sprayed twice – the second spray run overlapping the first run of geotextile by 200 mm. Alternatively a higher output spray jet can be installed to cover the overlap zone.

### 6.3. Placement of Geotextile

The geotextile should be rolled out slowly (using the fabric applicator) immediately after spraying the tack coat and as close behind the sprayer as practicable.

The dispensing of fabric should be controlled by adjusting the rubber spreader bar to match road profile and set at a height where excess drag is prevented. All small wrinkles should be broomed out, with any larger than 5mm cut out and butt jointed.

Adjoining or adjacent rolls should be overlapped by a minimum of 100 mm, with the overlapped joint receiving additional binder as described above. Placing of fabrics along straight alignments is straight forward and should be used with extreme caution on curves of less than 400m radius. Where the geotextile is to be placed around a curve, it should be 'cut and butted' at regular intervals along the inner side of the curve (to minimise overlap thickness). Resulting overlaps should be hand sprayed with additional bitumen so that the geotextile is fully saturated. Wrinkles larger than 25 mm should be cut out and butt jointed..

For all reseal applications, the fabric should be applied over the full width of the pavement. On natural formations, where Sealmac PF2 is used, fabric should be laid as wide as possible over the shoulder area of the pavement, to shed water, prevent shoulder erosion and ingress of moisture.

The paving fabric should be rolled prior to the seal coat. Where rolling and/or construction traffic causes the tack coat to bleed up through the fabric, a blinding coat of 7 mm aggregate may be applied in advance of the seal coat to prevent pick-up. Rollers or vehicles should not stand on the laid fabric as this may lead to a build-up of binder on the surface of the fabric. Trafficking of the geotextile should be limited to a minimum, i.e construction plant, with binder and aggregate seal placed as soon as possible after geotextile has been laid.

### 6.4. Seal

The binder for seal coat should be sprayed onto the geotextile at the design rates following placement of the geotextile. Lightly roll Geotextile until light brown in colour.

Bitumen should not be sprayed onto the geotextile if the geotextile has become wet, as the presence of moisture will lead to subsequent seal loss. For this reason sealing should not commence unless the seal over the geotextile can be applied well before any rain or inclement weather occurs.

It is essential to delay the final seal if cutter oil has been incorporated in the tack coat. Sufficient time must be given for the volatiles to escape from the geotextile otherwise softening of the seal will occur. If too much cutter oil is used in the tack coat (e.g. >3%) the evaporation of volatiles will be slow and in hot weather, this can cause bubbling in the sealed surface.

### 6.5. Aggregate Spreading and Rolling

Aggregate should be spread onto the binder as soon as possible after spraying. Rolling should be carried out with a rubber tyred roller with the rolling sequence being from the middle outwards to the edges. Rolling duration should be in accordance with specifications.

### 6.6. Trafficking

For untreated pavements, slow moving traffic can be allowed onto the seal after the first layer of aggregate has been placed. Speed restrictions may be required until the aggregate and binder are firmly adhered to the geotextile.

For treated pavements, trafficking of the fabric may be permitted in extreme circumstances such as plant breakdowns and emergencies, provided traffic speeds are kept low and the time of trafficking is minimised.

## 7. ASPHALT

### 7.1. Order of Operations

A typical order of operations is shown in Table 3. There may be slight variations to this order for particular circumstances e.g. if the tack coat bleeds through the paving fabric, a 7 mm aggregate may need to be spread prior to or during rolling of the paving fabric.

Order of Operations	Operation
1	Surface Preparation
2	Tack Coat
3	Apply geotextile
4	Roll Geotextile
5	Apply Asphalt
6	Roll Asphalt

Table 3 – Typical Sequence of Operation for Asphalt

### 7.2. Absorption/Tack Coat

The bitumen absorption/tack coat must be uniformly applied to an amount of binder required to bond the fabric onto the road surface. The process should allow for ultimate saturation of the paving fabric without causing the binder to bleed through the fabric during application or rolling or subsequent asphalt laying operations. The residual binder is drawn up into the fabric after asphalt is laid with an allowance sufficient to secure the fabric during application in the range between 0.8 and 1.2 L/m<sup>2</sup> (cold).

The binder should be C170 bitumen, ideally without cutter oil. However, if the pavement material is relatively permeable, and where priming or primer sealing has not been carried out in advance, a small amount of cutter oil (up to 3%) may be used in the absorption/tack coat to promote penetration.

The absorption/tack coat should be sprayed wider (by 100-200 mm) than the width of the paving fabric to be laid, to allow the asphalt overlay to protect the edges of the paving fabric.

If the paving fabric is to be placed in two or more adjacent runs, the absorption/tack coat should be sprayed one run at a time, prior to placing each run of paving fabric. The road centre overlap should be butt jointed.

### 7.3. Placement of Paving Fabric

The paving fabric should be rolled out slowly (using the fabric applicator) immediately after spraying the tack coat and as close behind the sprayer as practicable.

The dispensing of fabric should be controlled by adjusting the rubber spreader bar to match road profile and set at a height where excess drag is prevented. All small wrinkles should be broomed out, with any creases larger than 5mm cut and butt jointed.

Adjoining or adjacent rolls should be butt jointed. Placing of fabrics along straight alignments is relatively straight forward and should be used with extreme caution on curves of less than 100m radius. If the paving fabric is to be placed around a curve, it should be 'cut and butted' at regular intervals along the inner side of the curve.

The paving fabric should be rolled prior to placement of AC overlay. Where rolling and/or construction traffic causes the tack coat to bleed up through the fabric, a blinding coat of 7 mm aggregate may be applied in advance of the seal coat to prevent pick-up. Rollers or vehicles should not stand on the laid fabric as this may lead to a build-up of binder on the surface of the fabric. Trafficking of the paving fabric should be limited to a minimum, with AC overlay placed as soon as possible after geotextile has been laid.

### 7.4. Placement of Asphalt

#### 7.4.1. Asphaltic Concrete

The use of geotextile paving fabric reinforced seal is not recommended where the thickness of asphalt to be placed over the seal is less than 40 mm.

AC overlay should be placed on the paving fabric as soon as possible. It is generally not necessary to place a tack coat on top of the paving fabric. Paving machines traverse laid paving fabric directly to apply the AC overlay. Should excess saturation of skidding of traction wheels occur, a small amount of asphalt can be placed in the wheel path ahead of the paver. Laying of lane widths in excess of 3 metres should be avoided due to drag and loss of traction on the paving fabric.

To avoid damage or creasing of the paving fabric, turning should be gradual and kept to a minimum.

#### 7.4.2. Ultra Thin Asphalt

Ultra Thin Asphalt surfacing incorporates a stress alleviating membrane interlayer comprising paving fabric and a 7mm stone seal under a the Ultra Thin Asphalt.

Following placement of paving fabric, it should be rolled prior to the application of a tack coat for placement of a 10mm stone seal coat. A tack coat combined with Ultra Thin Asphalt is then laid with a purpose built paver. The overlay should be placed on the paving fabric as soon as possible.

To avoid damage or creasing of the paving fabric, turning should be gradual and kept to a minimum.

### 7.5. Rolling

Proper installation of AC overlay placed on paving fabric is affected by two variables;

1. Temperature of the AC overlay mix at time of rolling
2. Degree of compacted effort applied to the overlay.

Rolling should begin as soon as possible as AC overlay cools fast. Optimising the higher residual AC temperature will assist in the binder draw up and saturation of the paving fabric.

Rolling of AC should be in accordance with specifications.

### 7.6. Trafficking

For treated pavements, trafficking of the fabric may be permitted in extreme circumstances such as plant breakdowns and emergencies, provided traffic speeds are kept low and the time of trafficking is minimised.

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