MATERIALS ENGINEERING BRANCH

USE AND DESIGN OF GEOTEXTILE REINFORCED SEALS

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1. SCOPE

This document provides information on the application and design of geotextile reinforced seals. A geotextile reinforced seal (GRS) is a treatment essentially used as a strain alleviating membrane (SAM) seal or a strain alleviating membrane interlayer (SAMI) seal. Further guidance on GRS can be found in the Austroads Report AP-T37/05.

2. REFERENCES

Austroads


Main Roads Western Australia

Specification 503 – Bituminous Surfacing

3. DEFINITIONS

Bond Coat is the binder applied below the fabric in a GRS to fill surface voids of an existing seal, bond the fabric to the substrate and to absorb binder into the lower portion of the fabric.

4. USE

Typical applications of a GRS include:

- To reduce the risk of reflective cracking from a heavily cracked surfacing
- As a wearing course for new pavements constructed with materials prone to shrinkage cracking, fatigue cracking or on expansive clay subgrades.

GRS should only be used as a SAM or SAMI seal to treat severely cracked pavements, or those likely to crack during their lifetime, where the application of a traditional modified binder would not be effective. Applications not suited to a GRS include any areas subject to braking, turning or acceleration forces such as intersections and their approaches, roundabouts, smaller radius curves and adjacent to driveways used by heavy vehicles. In these areas the geotextile fabric may debond from the substrate.

GRS are designed in the same manner as a normal seal except that an allowance for absorption of binder into the fabric is added. When the absorption of the binder is greater than anticipated in the design for the seal coat this may leave insufficient binder on top of the fabric to retain the cover aggregate. Thus when a GRS is applied as a single coat seal there is a significant risk of loss of aggregate when opened to traffic and during the early life of the seal.

It is strongly recommended that when a GRS will be subject to traffic for any length of time that it be applied with a double/double (2 coat) seal. Single coat seals may be appropriate when used as a SAMI seal and the asphalt is applied at the same time. When applied as a single coat SAMI seal it is recommended that 10mm cover aggregate be used. The application of a GRS is addressed within Specification 503.
The GRS fabric must be applied using a purpose designed applicator as shown in AP-T37/05. The applicator is usually mounted on non articulated vehicles such as multi tyred rollers, skid steer loaders or tractors. Articulated plant should not be used as this increases the risk of the fabric being creased as the vehicle corrects its direction of travel.

Careful consideration should be given to the application of a GRS over a substrate that contains moisture, eg. damp asphalt or concrete. Moisture vapour coming out of the substrate after application of the GRS will not be able to pass through the fabric and may result in blisters below the fabric with the outcome that the fabric debonds from the substrate.

Geotextile fabric can be supplied in various widths and typically comes in roll lengths of 150m and 300m. Stock may be kept by suppliers with a width of 4m but for most applications the fabric will have to be manufactured to size which may take 6-8 weeks from the date of order. When designing a GRS take into account whether the GRS needs to go beyond the width of the traffic lane. It is not practical to cut GRS fabric along its longitudinal axis and thought needs to be given to the width of the fabric for the GRS and the interface between the GRS and seals or a GRS in adjacent lanes or shoulders.

5. MATERIALS

The alleviation of cracks from a pavement is provided by the fabric whilst the binder only needs to retain the cover aggregate. Unless a greater level of binder/stone adhesion is required Class 170 bitumen need only be used. Bitumen emulsions have been used elsewhere in Australia however caution should be exercised in adopting new materials and work practices. Sufficient time should be allowed for the emulsion to break and cure without any water being left below the fabric.

The fabric is typically made of polyester or polypropylene. AP-T37/05 has two grades of fabric. Light Fabric is specified in TDP 503 and is used for 10mm or less sized GRS as a SAMI seal. Heavy Fabric is specified in TDP 503 and is used for 14mm aggregate in a GRS when applied as a SAM or SAMI seal or when used as a seal over a basecourse. The melting point of fabric made from polypropylene is typically 175°C which is lower than the spraying temperature of C170 bitumen and PMB. Therefore the use of polypropylene fabric with hot binders may result in the fabric melting. It is recommended that polypropylene fabric only be used with emulsified binders whilst polyester fabric is used with hot binders.

Rolls of geotextile fabric shall show the manufacturers name, type of geotextile, batch number and date of manufacture. Geotextile fabric shall be used within 2 years of the date of manufacture. When stored geotextile fabric shall be:

- wrapped with a waterproof opaque material including the ends of rolls
- stored under cover and away from direct sunlight
- kept off the ground and away from any source of moisture.

Specification 503 requires that a Contractor provide test reports showing that the geotextile fabric complies with all of the properties in Table 503.01. All test reports must be NATA endorsed for all tests.
6. DESIGN

The BAR and aggregate spread rate (ASR) for a GRS is designed in accordance with AP-T09 (copy available on the Main Roads website under Standards/Materials Engineering/Surfacing Technology). Allowances for absorption of binder into the geotextile fabric are added and any allowance for surface texture may have to be reapportioned within the seal design as explained below.

The amount of bitumen retained by the fabric will be shown on a test report for the fabric being used. A typical amount of bitumen to saturate the fabric is 0.9 L/m² for light fabric and 1.2 L/m² for heavy fabric. Experience in 2009 has shown that the allowance for absorption of binder into a light fabric should not be less than 0.9 L/m². The BAR of the Bond Coat should include a proportion (nominally half) of the fabric absorption allowance and the surface texture allowance for the seal design. Typical BARs for a Bond Coat using light fabric have been:

- No less than 0.8 L/m² on fresh new 10mm dense graded asphalt
- No less than 0.9 L/m² on cold planed dense graded asphalt
- No less than 1.0 L/m² on an existing seal.

The BAR for the seal coat on top of the fabric should:

- Include the balance of the fabric absorption allowance not included in the bond coat BAR. For a double coat (2 coat) seal the fabric absorption allowance must be included in the BAR of the first seal coat.
- Exclude any surface texture allowance for the existing pavement surface. The surface texture allowance should be added to the BAR for the Bond Coat.

Where a seal design requires varying rates across the width of a lane or on a shoulder this should be applied to the GRS as per usual practice. The Aggregate Spread Rate should be as per usual practice.