Johannesburg +2711 922 3300
Pinetown +2731 717 2300
Cape Town +2721 531 8110
East London +2743 727 1055
Port Elizabeth +2741 453 0755
www.kaytech.co.za

Installation Guidelines

CONTENTS

1. INTRODUCTION

Without adequate maintenance paved roads rapidly deteriorate. The escalating cost of paved road rehabilitation highlights the need for cost effective solutions to this problem. In general, rehabilitation of paved roads can be divided into:

- Those requiring minor strengthening or surface improvements and,
- Those requiring substantial strengthening

To add a strength component to the paving fabric, a high strength glass fibre woven roving is stitched to **Sealmac®** to form a reinforced composite paving fabric, **Sealgrid®**. The reinforcing effect of the low strain glass filaments in combination with the waterproofing, stress relieving and bonding properties of **Sealmac®** leads to a dramatic reduction of reflective cracking under asphalt overlays.

These are guidelines for typical situations facing the engineer in road maintenance, but each project should be considered in isolation and the design adapted accordingly.

The success of the system lies in good communication amongst all the players involved:

<table>
<tr><td colspan="2">Client</td><td>The desired end result</td></tr>
<tr><td colspan="2">Consultant</td><td>• Most appropriate design
• Suppliers and contractor to inspect road with consultant visual assessment (TMH 9, Table A1) to include:
o Condition of surfacing
o Texture
o Crack type, severity and frequency
o Voids
o Elevation (cross or steep grades)</td></tr>
<tr><td rowspan="3">Suppliers</td><td>Bitumen</td><td>• Most suitable binder for the particular project
• Design input</td></tr>
<tr><td>Stone</td><td>Most suitable to the design taking into account existing surface, binder type, Sealmac® saturation and rolling, seal type and rolling, dust content, ALD, pre-coating, etc.</td></tr>
<tr><td>Paving Fabric</td><td>Sealmac® not to be considered in isolation but as an integral part of the design including spray rates, existing pavement assessment, binder type, installation procedure and seal design (TRH 3)</td></tr>
<tr><td colspan="2">Contractors</td><td>• Guidance on installation to ensure appropriate design is applied
• A trial section is recommended
• Adherence to installation guidelines and recommendations
• Flexibility to variations on site
• Co-ordination of effort
• Follow-up on completion and for a period thereafter</td></tr>
</table>

2. TYPES OF APPLICATIONS

Type of Distress	400/800mm Crack Sealing Strips	Patches (>1 m^2)	Full Width	Remarks
Surface cracking	✓	✓	✓	Cracks > 7 mm wide to be pre-filled
Block / Stabilisation cracks	✓		✓	Cracks > 7 mm wide to be pre-filled
Longitudinal or Transverse cracks	✓		✓	Cracks > 7 mm wide to be pre-filled
Crocodile cracks	✓ (800mm)		✓	Cracks > 7 mm wide to be pre-filled. Depends on the failure mechanism.
Rutting	✓	✓	✓	Only if cracking is evident, pre-treat to levelling layer
Potholes	✓	✓	✓	Potholes to be repaired or pre-filled with asphalt
Patches	✓	✓	✓	Distressed, broken, conventional patches to be pre-filled
Edge breaking	✓	✓	✓	Severe edge breaks to be pre-filled, repaired or built up
Road / lane widening	✓ (800mm)	✓	✓	Concrete to flexible pavements
Construction joints	✓ (800mm)	✓	✓	Concrete to flexible pavements

Table 1- Pavement Conditions where Sealgrid® is Used

(all applications must have at least 40 mm asphalt as cover layer to Sealgrid®)

3. BITUMEN BINDERS

3.1 SBR polymer modified cationic emulsion (SC-E1)

This is the ideal partner for **Sealgrid®** applications. It contains all the advantages of a bitumen emulsion as well as the improved polymer. The binder residue has modified rheological properties. A high level of consistency can be obtained due to the low temperature blending process and there is no risk of polymer degradation with storage or handling.

SBR polymer modified cationic emulsion achieves greater binder cohesion as the aggregate is held fast to the road in cold and hot climates without the need for pre-coating the aggregate. It can be used with slightly damp / dusty stone. If aggregate is too dusty, pre-coating may be required. Maximum chip retention is achieved with optimised binder application rates due to the improved wetting action of the modified binder. Thus there is a reduced risk of flushing or bleeding.

This modified binder has elastic properties to complement **Sealgrid®** for sealing cracks in roads. It is user-friendly, can be returned to storage if surfacing operations are delayed, and can be applied at standard emulsion application temperatures.

Some useful values:

		PROPERTIES	TEST METHOD
Binder content % m/m		65 min	MB-22
Viscosity @ 50 °C sSF		51 - 200	
Residue on sieving g/100 ml max	710µm	0.1	MB-23
	150 µm	0.5	
Particle charge		Positive	MB-24
Sedimentation after 60 rotations		Nil	SANS 4001-BT3
pH		<6	
SBR content, % m/m on bitumen		3	
Softening point °C		≥ 48	MB-17
Elastic recovery at 15 °C		≥ 50	MB-4

Table 2 – SBR Polymer Modified Cationic Emulsion (SC-E1)

3.1.1. Handling and storage

The product may be stored at ambient temperature or at 65 °C spraying temperature. Slight agitation may be required at weekly intervals during the storage period. No degradation of the Polymer occurs during storage periods. It may be diluted with potable water up to ratios of 1:1 for fog spray and saturation coat applications. Diluted product should not be stored.

Type of binder	Advantages in conventional use	Saturation characteris-tics (Tack coat)	Adhesion of Sealgrid® to surface	Adhesion of aggregate surfacing to saturated Sealgrid® (Penetration coat)	User-friendly	Weather versatility (Road surface temp)	Sealgrid® friendly rating
65% SBR latex (3% net) modified bitumen emulsion 	Reseals over lightly cracked pavements. Tolerates higher deflections. Better for colder, wetter climates. Easier handling. Long storage.	★★★★	★★★★	★★★★	★★★★ (sprayed @ 65 °C)	10°C+ rising	★★★★
Spray grade 60 / 65% cationic bitumen emulsion	Reliable and easy to handle. Wide range of suitable stone. More tolerant of inclement weather	★★★	★★★	★★★	★★★ (sprayed @ 60 °C or higher)	10°C+ rising	★★★
Stable grade 60% anionic bitumen emulsion 	Reliable, easy to handle. Time till break problems.	★★ (need time to allow to break)	★★★ (especially the modified)	★★★ (slow curing)	★★★	10°C+ rising	★
Penetration grade hot bitumen	Readily available. Good base bitumen for emulsions. Can be applied to steep gradients	★★	★★★★	★★	★★ (sprayed @ 170°C)	25°C+ rising	★★
Bitumen rubber 	Better option to reseal rapidly deteriorating pavements. Good engineering qualities	★	★★★★	★★★★	★★ (sprayed @ 210°C)	20°C+ rising	★
SBR latex modified hot bitumen	Reseals over medium cracked pavements. Increased flexibility. Good storage stability. Early opening to traffic.	★★	★★★★	★★★★	★★ (sprayed @ 200°C)	Road: 25°C+ rising Air: 20°C+ rising	★★

Table 3 – Bitumen Binder Performance with Sealmac®

★★★★ = Excellent ★★★ = Good ★★ = Average ★ = Poor

 = Highly Recommended

 = Caution: consult Kaytech

Cautionary note: Stable grade 60% anionic bitumen emulsion can be used to tack down **Sealgrid®** if modified with 3% latex. It must not be used for the armouring aggregate seal.

4. TYPICAL SPRAY RATES

Pre-treatment Type (size)	Surfacing (min thickness)	Tack Coat	Saturation Coat**
Crack sealing strips* (400 + 800 mm)	Asphalt (40 mm)	1.20 ℓ/m²	0.50 ℓ/m²
Patches* (2.5 m)	Asphalt (40 mm)	1.20 ℓ/m²	1.00 ℓ/m² @ 50:50 dil
Full width (2.5 m)	Asphalt (40 mm)	1.40 ℓ/m² ***	0.50 / 0.50 ℓ/m²

Table 4

Notes:

Binder: Modified Cationic Spray Grade 65% Emulsion with 3% net SBR latex (Table 2). The actual spray rates of bitumen given in Table 4 are a guide only and must be considered after a visual inspection of the road has taken place and a trial section has been done. Application rates exclude the bitumen required for the surfacing. The condition of the pavement should be evaluated to establish what total bitumen must be applied in the saturation coat (in addition to the above) to ensure adhesion of the stone. (Refer to "Pavement Conditions where Sealgrid® is Used" - Table 1 and the "Existing Surface Texture - Tack Coat Variances" -Table 5).

** Used on cracked overlays to concrete bases, construction joints, and lane widening from concrete to flexible pavements.*

*** A saturation coat is optional where it is observed that the tack coat is not sufficient to saturate the **Sealgrid®** or where a holding action surfacing is applied.*

**** A smooth surface will require less application whereas a coarse surface will require more application (Table 5).*

Existing Surface Texture – Tack Coat Variances	
Existing Surface Condition	**Additional Application (ℓ/m²) for tack coat**
Tight – non-porous	As per Table 4
Cracked – weathered	0.1 - 0.3
Cracked – open texture	0.3 - 0.5

Table 5

5. SEALGRID® INSTALLATION PROCEDURE

5.1 Strips, Patches, Full width under asphalt

- **Sealgrid®** used under the right conditions and installed correctly, can retard reflective cracking and provides a moisture barrier.
- The surfaces on which **Sealgrid®** may be used are limited to old or new asphalt surfaces, levelling layers, concrete pavements, old chip seals or dense bitumen treated bases.
- Good preparation and planning produces best results. Refer to the "Tools and Equipment for the Installation of **Sealgrid®**" (Table 6). **Sealgrid®** is supplied in a standard width of 2.5 m.
- Remove water, grass, weeds, grease, or any other material which may prevent bonding of the composite paving fabric. Sweep the road surface to remove all loose material. Larger holes or depressions and cracks wider than 7 mm should be patched or filled with conventional materials, e.g. slurry seal or premix. Allow a week for crack sealing and pothole repair cold emulsion-based fillers to cure. This last step is not required for hot mix patching systems.
- **Sealgrid®** can be placed onto a milled surface as the paving fabric component provides protection to the glass fibre component grid. However, milled surfaces with deeper, vertical grooves are not recommended. Where required, deep milled surfaces may first be treated with a levelling layer of asphalt *(Note 1).*
- When installing over milled surfaces, increase the tack coat by 10-15% as per "cracked-weathered" condition in Table 5. It is preferable to tack milled surfaces with hot bitumen as emulsions will tend to pond in valleys.
- Spray on a uniform application of bituminous tack coat – either a quick-setting SBR modified cationic emulsion or a hot applied bitumen. The necessary amount of tack coat is 1.0 – 1.2 ℓ/m² of residual bitumen. A trial section is recommended to confirm ideal spray rates. When using latex modified cationic emulsion, a minimum of 65% residual bitumen content is recommended. (Total quantity of a 65% modified emulsion to be applied is 1.7 ℓ/m².) Avoid cutters or solvents. When using SBR modified cationic emulsion – allow it to break before installing **Sealgrid®** (Note 1).
- If using a hot bitumen – install the Sealgrid® immediately using a mechanical lay down machine (especially with a hot modified bitumen).
- Roll out the first width of **Sealgrid®**, preferably using a mechanical lay down device to reduce wrinkles and creases. It can be done by hand, but this is not advisable when using hot bitumens where speed of application is important (Note 2). Use a squeegee or the reverse of a hard broom to smooth out any wrinkles. Stubborn folds are to be cut and smoothed. This should be done before the bitumen has cooled or lost its tackiness. Large wrinkles should be cut, opened out, extra bitumen applied to the one side (±0.6 ℓ/m² residual bitumen) and overlapped. All **Sealgrid®** overlaps and joins should be at least 50 mm wide.
- Roll the laid **Sealgrid®** with a pneumatic tyre roller (2-3 passes) as soon after the tack coat has cured sufficiently, to ensure good adhesion to the road surface and to prevent bleeding and pick-up. If pick-up still occurs, delay rolling. The roller tyres must be clean and free of bitumen binder. While rolling the first width of **Sealgrid®**, the bitumen distributor can make a second pass, spraying bitumen 150 mm over the edge of the first width of **Sealgrid®**. When the second width of **Sealgrid®** is rolled out to overlap the first by 50 - 150 mm, ensure there is sufficient bitumen to saturate the double layer of **Sealgrid®** along the overlap. This process should be repeated until the full road width is covered in **Sealgrid®**. Where asphalting takes place under traffic, half width construction is possible. Under no circumstances must the **Sealgrid®** be left exposed to traffic.

- Install conventional asphalt surfacing according to normal design procedures. A minimum thickness of 40 mm is recommended.
- **Sealgrid®** treatment to existing concrete roads:
  Sealgrid® can be used to minimise cracking of asphalt overlays to joints in existing concrete pavements. Lightly trafficked concrete pavements can be overlaid directly after filling of joints, while pavements carrying heavy traffic should first receive a minimum 25 mm premix levelling layer prior to placement of **Sealgrid®**. It is recommended that the crack and seat method be applied to an existing concrete surfacing with a heavy roller of it is unstable and shows excessive movement.

Notes:

1) *Emulsions that have not properly broken may lead to pick-up during rolling or during the paving operation. Should pick-up occur during the paving operation, avoid pushing the delivery truck with the paver or wait until the emulsion has cured. Also, a light sprinkling of loose asphalt in front of the paver's wheels can be applied by hand.*
2) ***Sealgrid®*** *may only be placed with the glass fibre grid component facing down where a levelling layer has been placed over the existing surface or the existing surface has a relatively smooth finish.* ***Sealgrid®*** *should always be installed with the glass grid facing up especially when placed onto a shallow milled surface.*

6. TYPICAL PROBLEMS

De-lamination

- water in base – inadequate sub-soil drainage
- insufficient tack coat and saturation of **Sealgrid®** allowing water ingress
- laying in rain / wet conditions

Mechanical failures

- vertical crack movement is excessive – shears composite paving fabric
- insufficient / lack of overlap in full width applications (at least 50 mm is required)
- laid at intersections where braking is excessive
- potholes and cracks larger than 7 mm not being repaired, pre-filled, or textured prior to **Sealgrid®** placement
- shoving / heaving (too thin layer, wet tack, water trapped between tack coat and **Sealgrid®**)
- at intersections or sharp bends
- slippage on old rich surface
- bleeding (too much binder)
- use of cutback bitumens and winter grade bitumen emulsion (addition of cutters or solvents)
- use of stable grade emulsions

General

It at all possible, avoid winter grade bitumen emulsions and cutback bitumen. If the climate conditions require a cutter or solvent to be added to the bitumen for the seal, it is recommended that the tack coat placed prior to placement of the ***Sealgrid®****, is not cut back. The reason for minimizing the use of the cutter is that it gets trapped in the paving fabric. This results in bleeding, slippage of the seal on the* ***Sealgrid®*** *and loss of aggregate. Avoid slow-curing stable grade emulsions under asphalt overlay operations.*

Latex modified emulsions give superior performance with all ***Sealgrid®*** *paving fabric installations.*

7. INSTALLATION EQUIPMENT

Tools and Equipment for the Installation of Sealgrid®

	Full width Sealgrid®
Brooms (hard bristle)	✓
Spades	✓
Squeegees	✓
20 ℓ empty containers	✓
Large scissors or sharp knife	✓
Pneumatic roller (6-8 ton)	✓
Kaytech lay down machine	✓
Bitumen distributor	✓
Tipper truck (5m³)	✓
Paving machine	✓
Cleaning material: paraffin, diesel, rags, water	✓

Table 6