GEOTEXTILE REINFORCED SEALS UNDER ASPHALT

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ABSTRACT

Paving fabrics are incorporated in asphalt paving act as a strain alleviating membrane, bridging existing environmental cracking and providing a waterproofing layer. Geofabrics has over the last 2 years been involved in the documentation of paving fabric surfacing performance, with assessment based on surfacing treatment selection criteria including pavement history and condition, regional location and consequent cost benefits, installation methods and overall performance for treatments up to 15 years old.

Performance assessment comprised visual inspection and interviews with paving fabric treatment selectors from various road authorities, with the assessment involving access to historical records, reviewing existing trials and specified installations.

Documentation of the benefits of paving fabrics in providing improved performance will assist designers and selectors in identifying where paving fabrics can return greater benefits in improved structural performance and longer life. Over twenty sites in Victoria, SA, WA, NSW and Qld are included in the project.

Key Words: paving fabrics, spray seals, asphalt, UTA, trials, treatment, selection, assessment, performance, life, investment

INTRODUCTION

Nonwoven needle punched geotextiles have been used in Australia for reinforcing and waterproofing chip seals and asphalt overlays since the early 1970s. Early trials have proved themselves over time, however the impetus was taken up by the industry later in the 1980's when road engineers looked for solutions to cost prohibitive treatments. Paving fabrics were selected to fill the gap between an inadequate resealed surface and a complete rehabilitation.

Pavement instability generally occurs due to heavy loading, water ingress, inadequate drainage and time. Pavement rehabilitation strategies with flexible overlays require drainage improvements such as sub soil drains, surface sealing, structural improvements with full depth asphalt, or sub-grade reinforcement and sufficient structural overlay thickness to adequately support the design load. Increased traffic volumes and loadings induce reflective cracking within overlays that are under designed, or in overlays placed on unsuitable base material.

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

• Those requiring substantial strengthening and waterproofing

These categories may overlap with a single procedure able to both water proof and strengthen the pavement, this being achieved by incorporating a reinforcing and waterproofing interlayer in the form of a paving fabric, to provide protection of the unbound granular road pavement beneath.

HISTORY OF PAVING FABRIC

Paving fabrics were first used in the 1930s when cotton sheets were installed as reinforcement to asphalt layers in roads in North Carolina, USA. Since the 1970s the concept of geotextile reinforcement of surfacing seals has been used successfully internationally with hundreds of millions of square metres installed worldwide.

For over 30 years nonwoven needle punched geotextiles have been used in Australia as paving fabrics, where they have been bonded to the road surface and saturated with bitumen to effectively seal the existing pavement and waterproof the overlay which can then be constructed on a base susceptible to rutting and shrinkage cracking.

The oldest recorded installation of paving fabrics in Australia was in the Mackay district in Queensland in 1976, where a trial section incorporating a paving fabric with a spray seal was placed over a cement treated base at Bakers Creek. Early trials in New South Wales at Brewarrina using the ALF apparatus proved the worth of heavier grade paving fabric in minimising reflective cracking and pumping under highway loading on saturated and unsaturated insitu black soil acting as the pavement base material.

Asphalt overlays on paving fabric were trialled in South Australia, NSW and Queensland in the early 1990's, with a significant amount laid under asphalt on major roads in the western Queensland area since the late 1990's. Some evaluation of performance was undertaken in the early 90's (Alexander & McKenna) where cyclic loading to determine the FEF (Fabric Effectiveness Factor) was performed on a trial section of pavement constructed by Geofabrics in Albury. Results showed a higher number of cycles were obtained with a paving fabric incorporated in a 40mm thick asphalt overlay, placed over existing 40mm cracked asphalt pavement.

FUNCTIONS OF PAVING FABRIC

Reflective Cracking

Many pavements that are considered to be structurally sound after the construction of a new overlay, prematurely exhibit a cracking pattern similar to that which existed in the underlying pavement. Reflective cracks destroy surface continuity, decrease structural strength, and allow water to enter the pavement layers. Thus, the problems that weakened the old pavement are extended upwards into the new overlay.

Cracking in new overlay surfaces is due to the inability of the overlay to withstand shear and tensile stresses created by movements of the underlying pavement due to either traffic loading (tyre pressure) or by moisture ingress and thermal effects(expansion and contraction).

Fatigue associated cracking occurs when shear and bending forces due to heavy traffic loading create stresses that exceed the fracture strength of the asphalt overlay. This is a structural stability problem.

Guidelines for typical situations facing the engineer in road maintenance are included in publications by Austroads (Austroads Technical Report T68/06) and various Australian state road authorities. However each project should be considered in isolation, with the design for paving fabric adapted accordingly.

Waterproofing

The function of bitumen impregnated paving fabric is to prevent the penetration of surface water and oxygen into the road pavement. Waterproofing prevents the ingress of water, exacerbation of environmental factors and consequent pumping of the structural pavement layers under traffic loads.

Despite surface cracking in wearing courses, paving fabric impregnated with bitumen maintains its waterproofing properties. The penetration of oxygen can result in further ageing of the existing base course, with subsequent cracking occurring due to brittleness. The infiltration of moisture weakens the shear strength of base layers, which with the combination of time and traffic and loss of fines due to pumping, leads to surface deformation and loss of bonding of the surface seal coat.

BENEFITS OF PAVING FABRICS

Paving fabrics utilise the tensile strength of the geotextile and the elastic recovery properties of bitumen to bridge cracks and inhibit reflective cracking, this in turn ensures a waterproof surface is protecting the structural integrity of road pavement. As shown in the case studies outlined in this paper, paving fabrics can extend the life of surfacings by up to 10 years above a design life of 8-10 years. For the additional cost, the benefit to maintenance programs by either catching up on lost time, or delaying the application of a reseal to twice the time frame normally allocated, is a valuable contribution to effective asset management.

Paving fabrics has been proven to provide the following benefits:

• Prevent the ingress of water by providing a more flexible, homogeneous waterproof layer

• Stabilising pavement moisture content and curbing loss of fines due to pumping

• Bridging shrinkage cracks retarding their propagation to the surface.

• Acts as a stress absorbing interlayer allowing larger deflections in the order of 2–3 mm

• Reinforces and prolongs fatigue life when structural layers are weak/susceptible to rutting

• Cost effective alternative to expensive structural layer replacement

• Resistance to shrinkage from hot bitumen (polyester melting point; 260ºC)

• Nonwoven needle punched construction provides bitumen reservoir

• Robustness retards stone penetration and settlement

• Prolongs surfacing life span

• Provides surfacing foundation for future seals

EXISITING PAVEMENT CONDITIONS

Evaluation

Failure mechanisms of paving fabric seals relate to four areas, de-lamination of the seal, mechanical failure of the geotextile, shoving due to poor adhesion and bleeding due to incorrect spray rates. Class C170 bitumen is commonly used and provides adequate adhesion for paving fabric.

If the climate conditions require a cutter to be added to the bitumen, it is preferable that the tack coat placed for the paving fabric is not cut back. Cutback bitumen's should be avoided as their use results in bleeding, slippage of the wearing course on the paving fabric and loss of aggregate.

De- lamination

• Water in base course - sub soil drainage may be required

• Insufficient tack coat and/or saturation of paving fabric (allowing water ingress)

• Laying paving fabric in wet conditions

• Insufficient bond coat to overlap of fabric

Mechanical failures

• Vertical crack movement is excessive – fabric elongation excessive (cracks too large)

• Insufficient/lack of overlap in full width applications

• Laid in lanes and at intersections where braking load is excessive

• Holes and cracks larger than 7 mm not being repaired or pre-filled

• Existing rough surface (asphalt levelling course required prior to paving fabric placement)

Shoving / heaving

• High wheel loadings at intersections, sharp turns or on high speed bends

• Slippage on old bleeding surface

• Movement due to poor friction resistance of underlying surface

Crack sealing

Existing pavement cracks should can be sealed by conventional methods with cracks under 7mm wide ignored and cracks greater than 7 mm should be filled with a suitable crack filler prior to application of paving fabric. Refer to Table 1 for detailed guidelines.

Rectification

Condition of pavements where paving fabrics can be utilised, along with required pre-treatments, are outlined in Table 1. (G.M. James).

Table 1: Pavement conditions – remarks for paving fabric interlayer*s*

Type of Distress	Remarks
Surfacing Cracks	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 Cracking	Cracks > 7 mm wide to be pre-filled.
Pumping	Cracks > 7 mm wide to be pre-filled.
Rutting	Pre-treatment with levelling layer.
Potholes	Potholes to be repaired or pre-filled.
Patches	Distressed, broken patches to be pre-filled.
Edge Breaking	Severe edge breaks pre-filled or repaired

Pavement evaluation

Experience has shown that the existing pavement section must show no signs of vertical movement. To maximise the benefit of paving fabrics, pavements must be structurally sound, with no existing surface deformation or de-lamination. Application of paving fabrics on curved sections of less than 100m radius should be avoided.

Field evaluation, as required for any resurfacing assessment, should include a visual distress survey in accordance with accepted methodology and deflection testing; this data used to determine the effective modulus of the existing pavement section. As performance is based on empirical assessments, there are no defined limits on deflection or curvature, as the fabric interlayer with its retained bitumen, encourages movement with deflection.

Surface texture should be calculated for the design spray rate using a standard sand patch testing method. Shape correction and regulation patching can be adopted in accordance with standard practice to provide a level surface for paving fabric application. Typical applications include a slurry correction layer of asphalt “scrub coat.”

Choice of Reseal and Fabric

Paving fabric selection and application is effective if applied for the right reasons in a timely manner, much the same for all reseal applications. Selection for the specific use of paving fabric is based on the following criteria for the commonly specified minimum mass of 140 grams/sqm.

1. Age cracking
2. Settlement cracking
3. Fatigue cracking
4. Cracking due to expansive soils
5. Shrinkage cracking (CTB)
6. Availability of alternative treatments

Where additional benefit from stress alleviation and waterproofing is required, including installation with a SAMI system, 180g paving fabric is used to utilise the additional tensile strength and bitumen content.

Asphalt Design

Key to the reinforcement based design of paving fabrics in reflective crack prevention is the fabrics effectiveness, determined by laboratory testing and confirmed by experience. Koerner (2005) states that the Fabric Effectiveness Factor (FEF) is determined by the number of load cycles to cause failure in a non-reinforced asphalt overlay case, divided into the number of load cycles to cause failure in a geotextile reinforced asphalt overlay case.

Laboratory testing by Murray (1982) found that a non woven needle punched polyester paving fabric yielded a FEF of approx. 4.8. Koerner has in his design methodology adopted a figure of 3 and uses a control without geotextile, of 1.0.

The US Asphalt Institutes' Asphalt Overlays and Pavement Rehabilitation manual MS-17 outlines the design procedure for calculation of pavement and asphalt overlay thickness. Multiplying the initial traffic number, (ITN) a combination of vehicle mass and traffic count and an assessment of the sub-grade CBR, by the adjustment factor for the desired design period and estimate for traffic growth, gives a DTN which can be used in the thickness design chart.

This chart can be used to determine full depth asphalt–to-pavement thickness needed for the design sub-grade strength value, the DTN and the design period. Determination of the effective thickness of the overall pavement is required, the figure then taken away from the total unreinforced design asphalt thickness to give a new asphalt overlay thickness.

This process is repeated for the geotextile reinforced overlay case to give a geotextile reinforced asphalt overlay thickness, with the two compared for saving on asphalt layer thickness, as the base and sub-base course thickness would remain the same in both cases.

Bitumen Application Rate Design

The determination of bitumen tack coat under the paving fabric seal requires the following consideration:

1. Obtain paving fabric absorption rate from manufacturer
2. Determine existing surface texture
3. Determine bond coat application rate (paving fabric to existing surface)

PAVING FABRIC PROPERTIES

The Australian installations of paving fabric under asphalt has typically used a 140 and 180gsm Polyester non-woven needle punched geotextile with a melting point in excess of 240°C. Typical properties and minimum average roll values (MARV) are shown in Table 2.

Table 2: Paving Fabric Properties

Mass	AS3706.1	g/m^2	Typical MARV	140 147	180 200
Thickness	AS3706.1	mm	Typical MaxARV	1.45 1.4	1.85 1.8
Wide Strip Tensile MD/XMD	AS3706.2	kN/m	Typical MARV	7.4 9.0	10.5 12.5
Wide Strip Elongation MD/XMD	AS3706.2	%	Typical MARV	42 55	47 57
Trapezoidal Tear MD/XMD	AS3706.3	kN	Typical MARV	200 245	280 330
Minimum Melt Temp.	-	Degrees C		240	240
Bitumen Retention @ 160 degºC	ASTM D6140 (modified)	litres/m^2	Typical	1.0	1.4

SPECIFYING PAVING FABRIC

Thermal stability

Stability of the paving fabric must be ensured when subjected to the excessive heat of a paving operation. The melting point of polyester is approximately 240°C and polypropylene is around the 150°C vicinity, with asphalt surfacing generally laid at temperatures of around 165°C.

Compatibility

Paving fabrics manufactured from Polyester [PET] with a melt point of 240 degrees C are resistant to shrinkage due to impact of hot asphalt temperatures in excess of 150 degrees. Polypropylene fabrics are sensitive to temperature above 145 degrees C. the non-woven texture provides interlock adhesion and in conforming to irregular surfaces. [e.g. milled surfaces]

Durability

The paving fabric should be protected from physical abrasion when installed. Traffic movement over the fabric should be minimised until seal coats are in place. Protection from inclement weather and prolonged UV exposure is also required.

Installation

Paving fabric should be rolled out mechanically to provide fast and wrinkle free application. Manual laying should only be attempted in exceptional circumstances. Correct bond coat application rate and timely installation will ensure good adhesion and adequate saturation of the fabric enabling its waterproofing function. Typical bitumen application rate for tack coat; 0.9 – 1.1 L/m^2

COST CONSIDERATIONS

Paving fabric used in asphalt rehabilitation and maintenance construction is regularly specified each year in South Australia, Victoria, New South Wales and Queensland. Asphalt overlays are generally a minimum of 40 mm thickness, with 140g/sqm paving fabric adding to the overall laid rate cost by approx. $2.00/ m^2.

Life span of treatments incorporating paving fabrics over cracked but stable pavements are detailed in case studies included in this paper. An overview of life span versus investment, for paving fabrics in various seal treatments, is shown in Figure 1. An overview of life span versus pavement condition is shown in Figure 2.

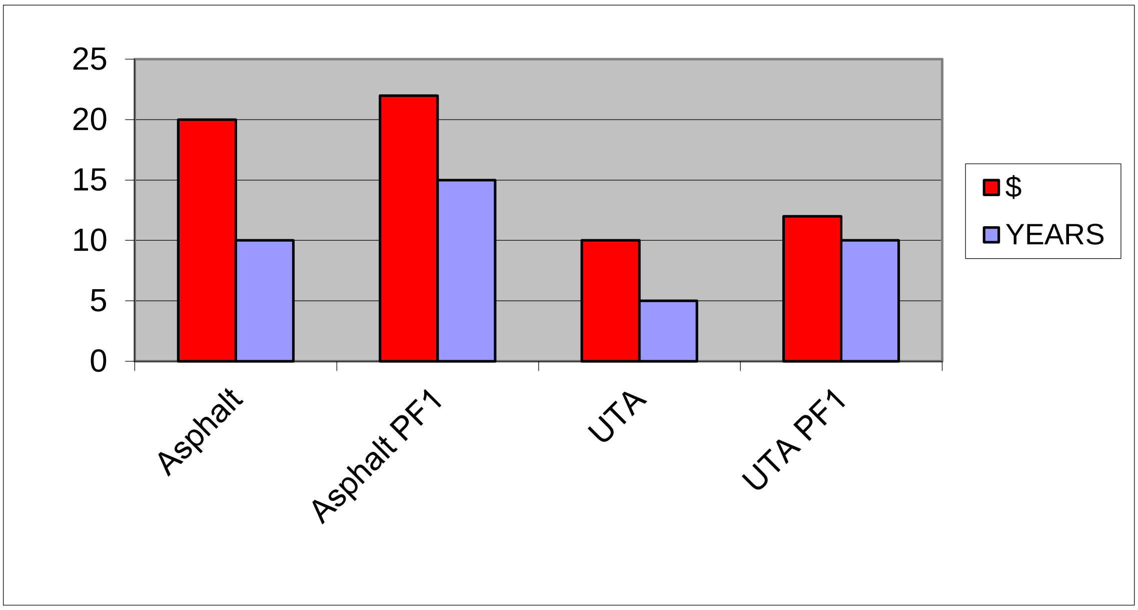


Figure 1 Paving Fabric Seal Life v Cost Benefits

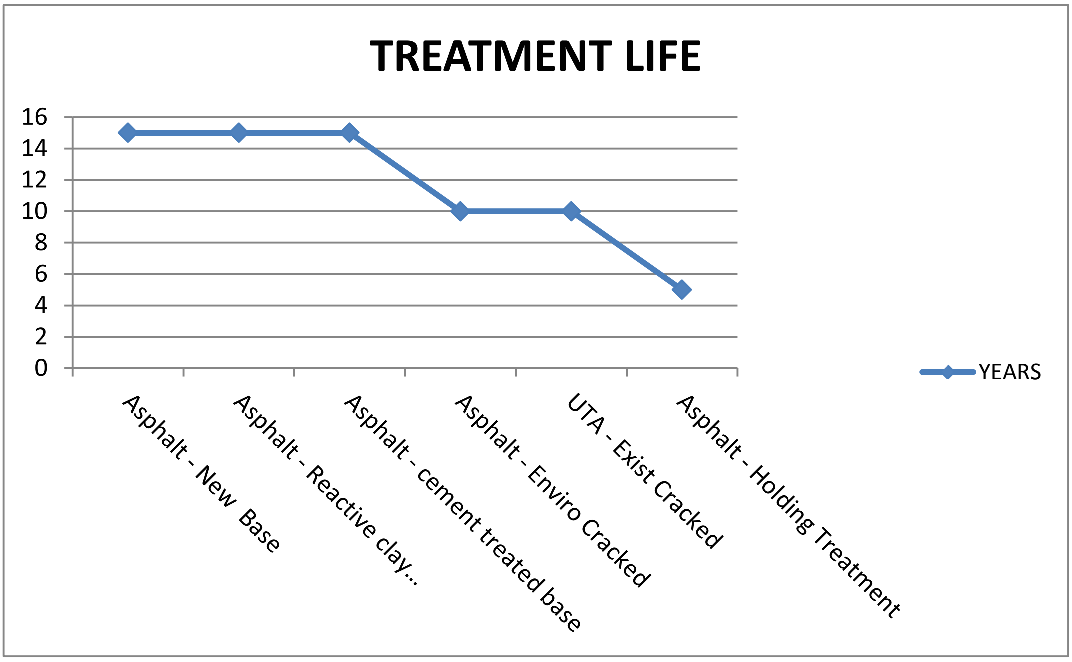


Figure 2. Paving Fabric Seal Life v Application

Life Cycle Considerations

Life cycle costing benefits can provide choices for alternative investment when the real consideration for incorporating a 140gsm paving fabric into an asphalt seal design is the benefit of additional surface life. Based on an average seal life of between 8 to 10 years, the case studies outlined in this paper show the incorporation of paving fabrics can provide additional surfacing life, to extend asphalt seals by at least 5 years, where choices of extended life, or a holding treatment for poor pavement are the options.

Paving fabric incorporated into an asphalt overlay will cost an additional 10% over the cost of a 50mm thick asphalt overlay, designed for an average 10 year life. Additional investment incorporating a paving fabric can provide a 50% increase in life span extending a seal life to over 15 years, as shown in one case study included in this paper.

New applications predict that with the use of a 180g/sqm paving fabrics over cracked cement treated base course, life can be increased by at least 5 years.

UTA incorporating paving fabric as a SAMI has been selected where matching adjacent road line and levels is necessary, with cost savings in no requirements for milling and planning. This application has been in place for at least 10 years in SA and Vic where performance is proving that this treatment is at least equivalent to deeper asphalt layers to date.

Cost Benefits

The extension of pavement life provides;

1. Choice of a cost effective alternative treatment
2. Longer maintenance time frames
3. Revision of maintenance planning
4. Savings through less frequent maintenance and traffic disruption
5. Allowance for priorities to other roads in a network
6. Safety through the provision of more stable and skid resistant surfaces
7. Provision of asset investment choice

INSTALLATION

Paving Fabric

The geotextile should be rolled out slowly (using a 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 to ensure wrinkle free application. All wrinkles smaller than 5mm can be dispersed and smoothed by brooming. The dispensing rate of fabric can be increased with the use of experienced personnel.

Adjoining or adjacent rolls should be overlapped by a minimum of 100 mm, with the overlapped join receiving additional binder. Placement of fabrics along straight alignments is straight forward; however caution should be exercised on curves of less than 100m radius due to creasing of the fabric. Where 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 (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 treated in the same manner.

For all reseal applications, the fabric should be applied over the full width of the pavement. Paving fabric should be rolled prior to the asphalt application. 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 aggregate seal coatings or asphalt surfacing placed as soon as possible.

Asphalt Application

Asphalt surfacing should be laid directly over paving fabric, residual heat transferred to the tack coat reactivates and draws bitumen into the fabric interlayer. Rolling of asphalt can proceed as normal and in accordance with specifications. Asphalt should be applied to a minimum thickness of 40mm doe dense and open grades, with 20mm the accepted thickness in ultra-thin applications.

BOUNDARY CONDITIONS

Milling and Recycling

Cold asphalt recycling incorporating milling is currently done without problems 140 – 180g/sqm paving fabrics pose no problem in this process. Chisel teeth are preferred with paving fabric residue in sections of 20mm x 40mm being generated at milling speeds of 3-6 metres per minute.

De-lamination

De-lamination of paving fabric can occur if water is present in the base layers. Insufficient bond/tack coat, wet paving fabric or contaminated base course surface can contribute to de-lamination.

Mechanical Failure

Mechanical failure of paving fabric can occur if any vertical movement from cracking occurs. Insufficient overlap between paving fabric runs and installation on high speed curves in extremely hot climates can also lead to mechanical failure. Potholes, if not filled and prepared adequately, can cause excess elongation and tensile failure.

Bleeding

Bleeding through the Asphalt could occur if cutbacks are used in the bond/tack coat. Paving fabric will prevent cutback from evaporating in sufficient time, locking the bitumen into a softer, active state, creating potential for longer term bleeding.

CASE STUDIES

A cross section of asphalt paved projects is reviewed in the following pages. Older projects have been recently evaluated in 2009 with assistance and comments provided from asset owners. Project ages range from 1 year old up to 15 years in age.

University Drive – Sturt, South Australia

Asset Owner;	University of South Australia
Design consultant;	KBR
Sealed;	1999 - 2001
Asphalt;	40mm (up to 100mm for correction)
Paving Fabric;	Sealmac PF1
Bond coat;	C170
Area;	20,000 sqm
Existing condition;	Reflective cracking resulting from environmental factors influencing reactive clay sub-grade and varying rock substrates. Sections of severe crocodile cracking planed and reinstated. Waterproofing critical to preventing wet road sub-grade encouraging tree root ingress.

Figure 21: Laying fabric – 1999

Figure 22: Pavement 2009; Old untreated pavement adjacent University Drive

Figure 23: University Drive 2009

Figure 24: Pavement 2009

Vasey Street - Greenacres, South Australia

Asset Owner;	City Port Adelaide Enfield
Sealed;	1996
Asphalt;	30mm
Paving Fabric;	Sealmac PF1
Bond coat;	C170
Area;	4,000 sqm
Existing condition;	Reflective cracking resulting from environmental factors influencing reactive clay sub-grade and substrate. 30mm asphalt resurfacing laid over reconstructed 40mm FCR base course, typical construction by the council for this era, for achieving extra strength over reactive clay sub-grade.

Figure 25: Sealing 1994

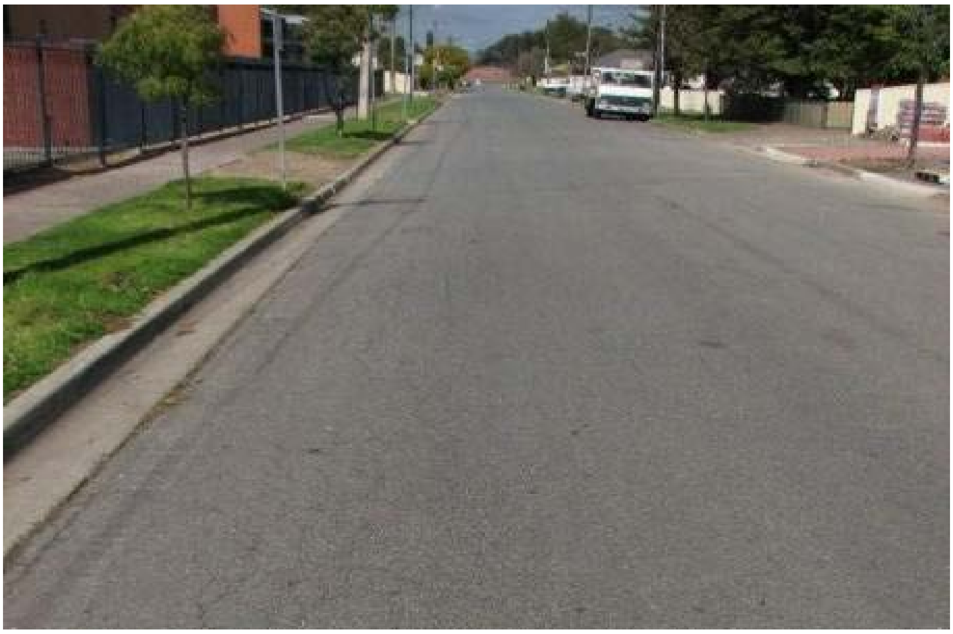


Figure 26: Pavement 2009

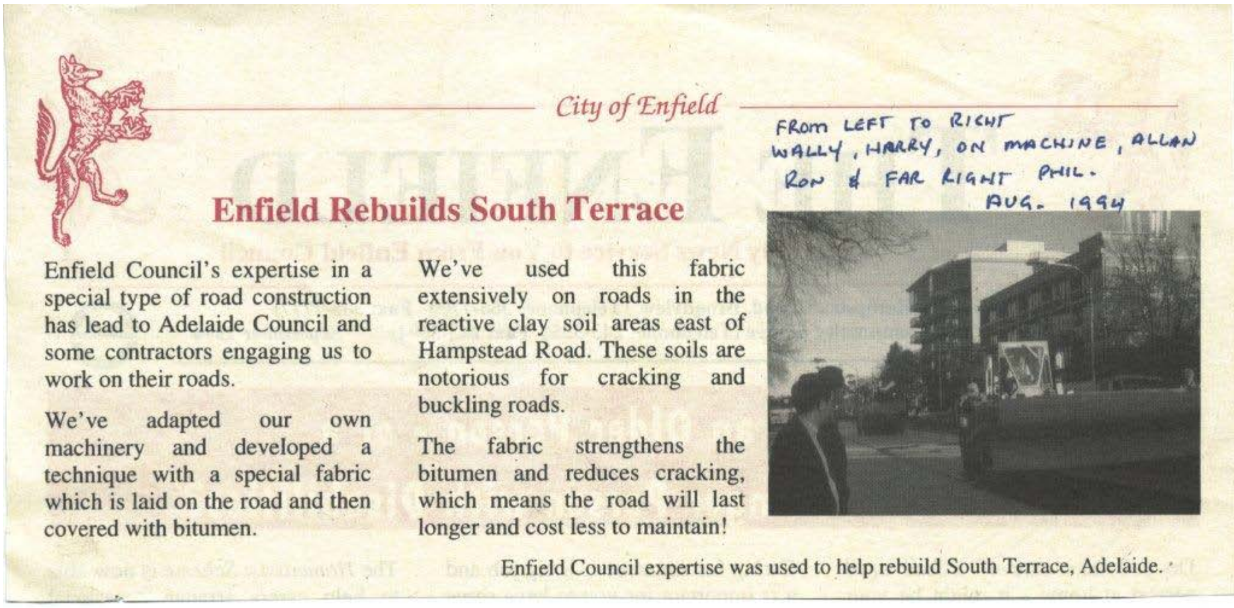
Figure 27: Pavement 2009

Figure 28: Adjacent area - Untreated pavement 2009

South Terrace - Adelaide

Asset Owner;	Adelaide City Council
Sealed;	1996
Asphalt;	40mm
Paving Fabric;	Sealmac PF1
Bond coat;	C170
Area;	~30,000 sqm
Existing condition;	Poor surface with … Underlying reactive clay sub-grade.

Figure 2… Paving 1996



City of Enfield

FROM LEFT TO RIGHT
WALLY, HARRY, ON MACHINE, ALLAN
RON & FAR RIGHT PHIL.
AUG. 1994

Enfield Rebuilds South Terrace

Enfield Council's expertise in a special type of road construction has lead to Adelaide Council and some contractors engaging us to work on their roads.

We've adapted our own machinery and developed a technique with a special fabric which is laid on the road and then covered with bitumen.

We've used this fabric extensively on roads in the reactive clay soil areas east of Hampstead Road. These soils are notorious for cracking and buckling roads.

The fabric strengthens the bitumen and reduces cracking, which means the road will last longer and cost less to maintain!

Enfield Council expertise was used to help rebuild South Terrace, Adelaide.

Figure 2… Extract – Local paper 1994

Figure 2… Pavement 2009

Figure 2… Pavement 2009

Midland Hwy - Bendigo, Victoria

Asset Owner;	Vic Roads
Sealed;	2007
Asphalt;	15mm UTA
Paving Fabric;	Sealmac PF1
Bond coat;	C170
Area;	~5,000 sqm
Existing condition;	Poor surface with varied pavement and pavement construction due to lane widenings. Regulation and patching of weaker areas undertaken before resurfacing.

With a life expectancy of 10 years, UTA surface incorporating a paving fabric SAMI was chosen to provide a quieter surface than sprayed sealing, however, based on economical feasibility, UTA was an alternative to deeper asphalt, without the problems of matching fixed water table levels. A paving fabric SAMI was used as insurance to assist in control of reflective cracking from varied pavement construction over a period of years and protect from environmental influence.

Figure 29: Midland Hwy. Adjacent untreated pavement - 2009

Figure 30: Midland Hwy pavement 2009

Graham Farmer Freeway Perth WA

Asset Owner; Main Roads WA
Asphalt; 30mm OGA
SAMI (D/D) 14/7mm
Paving Fabric; Sealmac PF2
Bond coat; C170
Area; 50,000 sqm
Existing condition; Cement treated base in a cracked condition. Firm substrate with no loss of shape and no vertical movement.

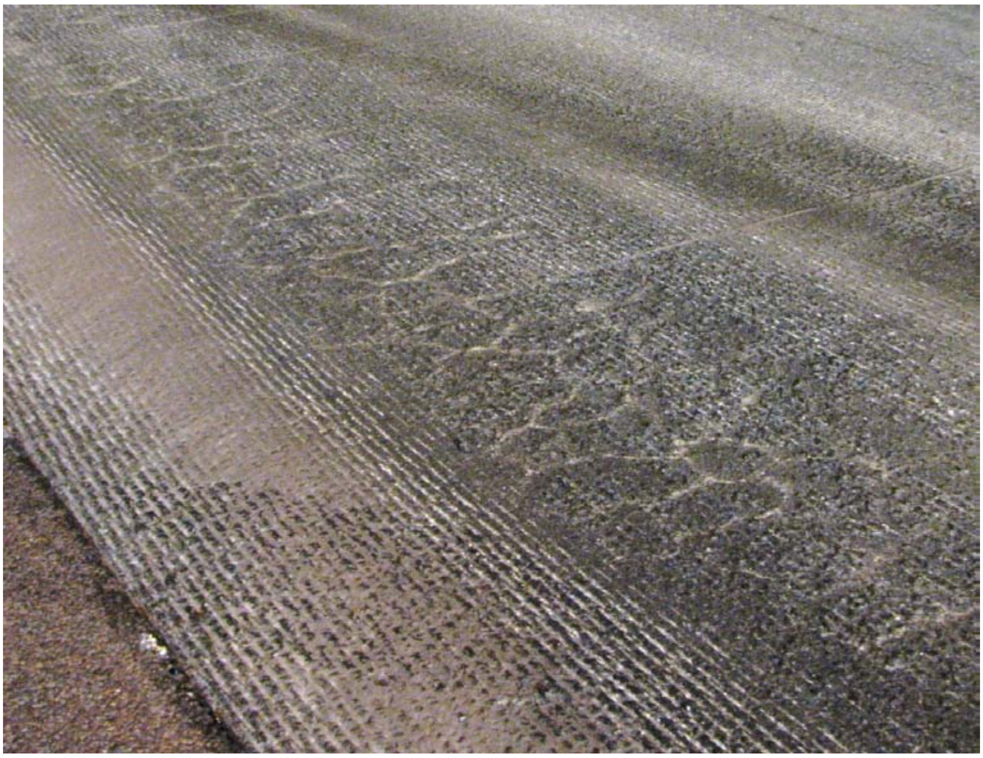


Figure 31: Existing Stabilised Pavement Base after milling

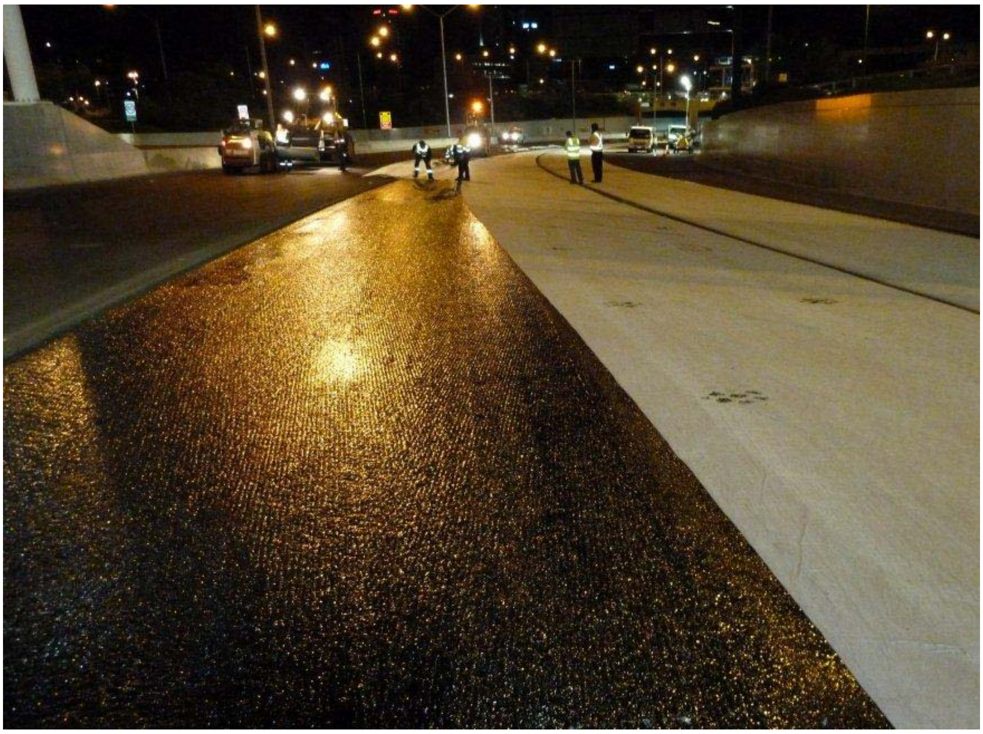


Figure 32: Paving fabric laid 2011

Figure 33: Paving fabric laid 2011

Figure 34: Paving Fabric with SAM 2011

Figure 35: Laying Asphalt Pavement 2011

Performance;
WA Main roads philosophy is to incorporate as much binder into the SAM as possible to enhance the waterproofing function using a 180g/sqm paving fabric.

WA Press Release; What are the benefits of these works (Mid to long term)?

The new asphalt surface uses new technology and materials that will significantly extend the life span of road surfaces. The new road surface will last 15 years (compared to the previous 10 years), which means the tunnel will not need to close again for similar works until approx. 2026.

Vic Roads - Monash Freeway Widening

Asset Owner;	Vic Roads
Sealed;	2007 - 09
Paving Fabric;	Sealmac PF1
Bond coat;	C170
SAMI;	10mm
Asphalt;	20mm UTA
Area;	>500,000 sqm
VPD;	200,000 VPD

Existing condition; 2007 – 09 upgrade, existing cracking of unbound granular pavement, existing pavement 100mm Asphalt. A mixed patchwork of pavements over the length of the widening project with new lane widening constructed to provide increased traffic capacity.

Figure 36: Laying PF1 Paving Fabric 2009

Figure 37: Laying Asphalt Pavement 2009

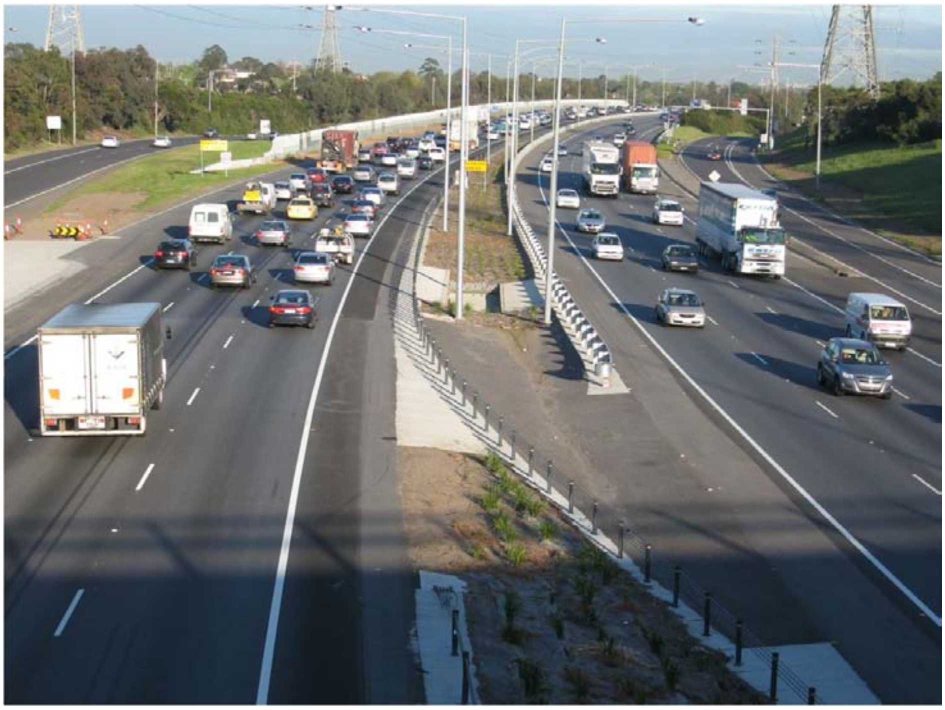


Figure 38: Monash Freeway 2009

Performance;

Widening of lanes resulted in pavement joints where paving provided coverage and thorough waterproofing, utilizing a high level SAMI and Paving fabric PF1.

CONCLUSION

The results of test sections and installations as detailed in the above case studies in South Australia New South Wales, Queensland and Victoria over the last 19 years has shown that geotextile seals can enhance the principal functions of conventional surfacings to extend the field of application of commonly specified seals.

Considering the case studies detailed and taking account of the vast area of application of paving fabric over the last 15 years, evidence of paving fabrics extending the life of surfacings by up to 10 years above the design life of 8-10 years has been shown to provide real benefits to life cycle costings of seals. For the additional cost, the benefit to maintenance programs by either catching up on lost time, or delaying the application of a reseal to twice the time frame normally allocated, is very real in terms of not only time, but economics.

The evidence of performance presented in the case studies can allow road engineers to embrace a broader scope of existing conditions where seals have been shown to out perform traditional methods of surfacing where placed over similar existing failed surfaces. There is also increasing awareness that the cost benefits are evident as the paving fabric treated surfaces show their strength and longevity in outlasting conventional seals.

Paving fabrics have the ability to provide a water proof interlayer in a spray seal to enhance the strength and life span of a pavement. Reflective cracking is retarded and contained by paving fabric providing an effective stress alleviating and waterproofing membrane over a bound pavement. Non woven needle punched geotextiles provide, because of their construction, a three dimensional bitumen reservoir for optimum bitumen absorption and tensile strength to act in a stress alleviating function. Ensuring the correct performance of paving fabrics is achieved, installation with proper procedures and application with correctly determined spray rates is essential.

Comments over this evaluation period in 2009 include remarks of ‘we are expecting more and more of paving fabrics’, ‘we are selecting paving fabric where there are no other options would work’ and we are selecting paving fabrics where cost prohibits mandatory pavement rehabilitation’. Opinions offered also, included the selection of paving fabric to provide a foundation for future seals, to help restore roads to a normal maintenance cycle and using paving fabrics in asphalt applications to extend pavement life.

Conclusions were also drawn that paving fabrics were selected where road surface condition had passed the point of conventional reseal considerations and where asphalt overlays would normally not be cost effective due to existing modes of surface failure. Paving fabrics were also selected to extend the surfacing life where the road would otherwise require total rehabilitation.

The projects reviewed in this paper are preliminary to an independent evaluation by the Australian Road Research board, commissioned by Geofabrics, to assess the applications of paving fabric and report on their current performance.

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Some of the results presented in this paper have been published in AAPA, (2009) ARRB (2010) and Roads magazine (2010). This paper builds on the previous work and also includes a number of new case studies.

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