



GEOANZ #1

ADVANCES IN GEOSYNTHETICS

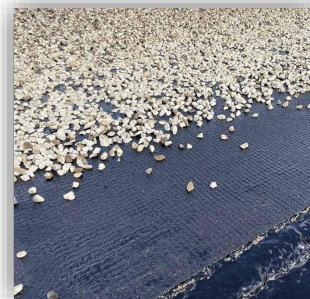
7-9 JUNE 2022 | BRISBANE CONVENTION & EXHIBITION CENTRE



***A modern approach to traditional geotextile seals:
An advanced chipseal grid for high-performance
reinforced sprayed seals & field verification in Australia***

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- # Traditional Geotextile Seals in Australia
- # Why advanced “Chipseal grid” system for Sprayed Seal reinforcement
- # Case Study
- # Installation/Construction

Materials & Construction

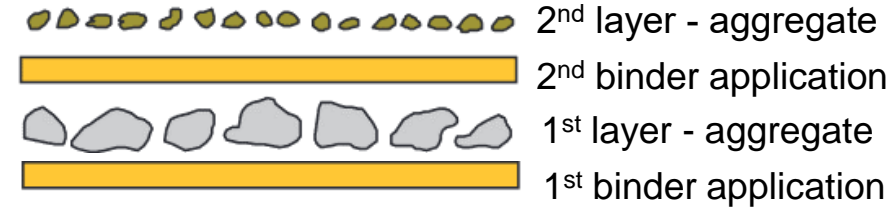
Single/single seal

One layer of binder covered with a single layer of aggregate



Double/double seal

Two applications of binder, each followed by an application of aggregate



Source: Nascimento 2004



Source: Getty images

Purpose:

- # Increase skid resistance
- # Pavement rehabilitation
- # Waterproof to protect underlying pavement

Geosynthetics & their Functions in general



Geogrids



Nonwoven geotextile



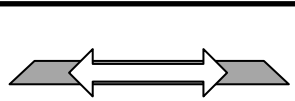
Wovens



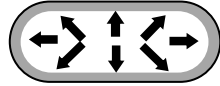
Composites



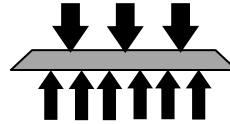
Container



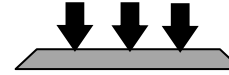
Reinforcement



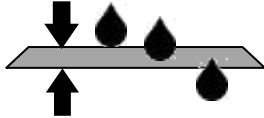
Containment



Separation



Protection



Filtration



Drainage



Sealing



GCL

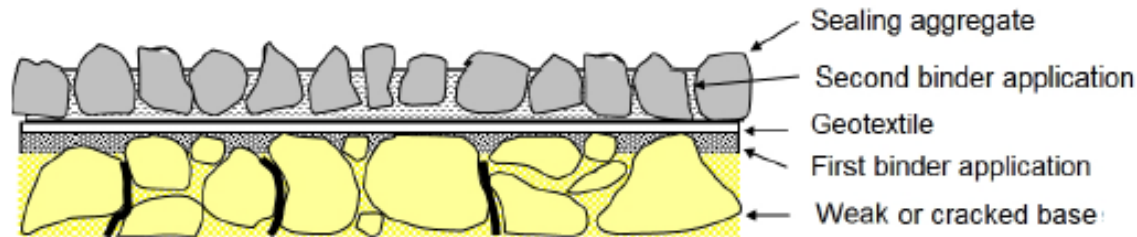
3.3.9 Geotextile Reinforced Seal (GRS)

Geotextile reinforced seals (GRSs) are produced by spraying a layer of bitumen onto a pavement (bond coat), then covering this bitumen with a layer of geotextile and lightly rolling.

GRS can be used to provide more robust waterproofing, and as a SAM or a SAMI treatment, and may be considered the most effective technique when treating badly cracked and distressed bound and unbound pavements. A double/double seal is typically applied over the geotextile (Figure 3.12) if it is intended to be a SAM wearing course, with single/single generally only used for SAMI applications.

Geotextile seals are more sensitive to weather conditions during and several weeks after construction, and as such they should be programmed to allow trafficking in warm weather.

Figure 3.12: Geotextile reinforced seal



Source: Guide to Pavement Technology Part 4K – Selection and Design of Sprayed Seals (Austroads, 2019)

Table 4.2: Effectiveness of sprayed seal, microsurfacing and combined resurfacing treatments on existing surfacing characteristics

Property requiring improvement	Sprayed seal treatments				Microsurfacing	Combined treatments	
	Surface enrichment	Single application sprayed seal (single/single)	Multiple application sprayed seal	Geotextile reinforced sprayed seal		Correction or regulation course plus SAM	Correction or regulation course plus SAM with asphalt surface
Bitumen ageing/oxidation	Delays further oxidation						
Roughness	No effect				Suitable for an uneven surface but has little impact on loss of longitudinal shape	Good	Very good
Waterproofing properties	Minimal	Good	Very good	Excellent	Minor improvement	Excellent	
Skid resistance	Possible short-term reduction	Excellent			Good at low speeds but may reduce at high speeds due to fine texture	Excellent	As for asphalt
Structural strength	No effect				Minimal but depends on thickness of asphalt layers		
Robustness (relating to sharp turning traffic)	No effect	Poor, but improved with modified binders	Some improvement over single coat seals due to interlocking of aggregate		Moderate	More robust if double application used	As for asphalt
Water spray reduction	No effect	May achieve some improvement depending on aggregate size			Minimal effect	Good	As for asphalt
Permeability of surface	Some reduction	Low			Moderate to high	Low	
Flexibility	Very good	Very good			Poor	Good	As for asphalt

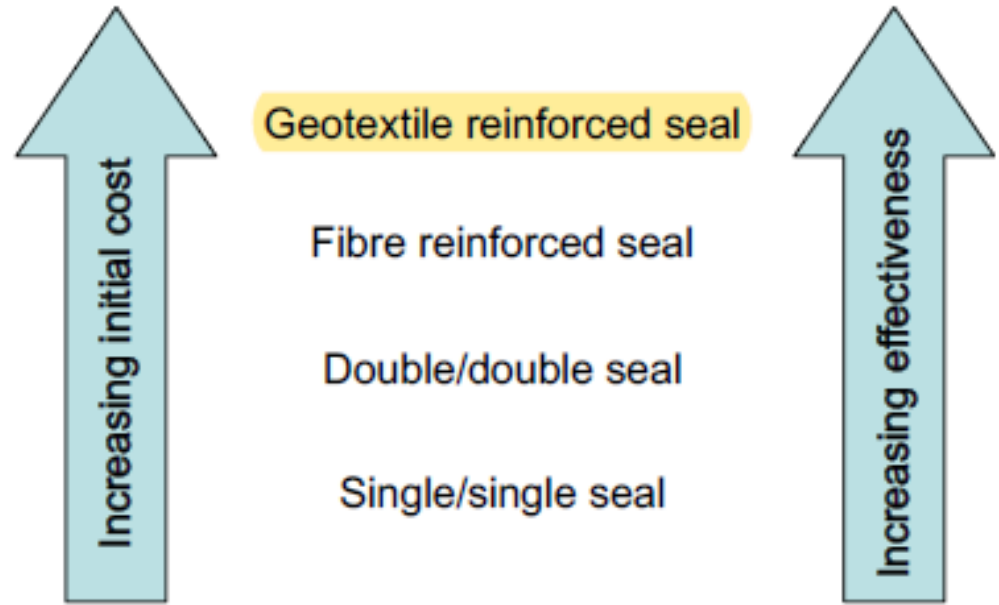
Source: Guide to Pavement Technology Part 4K – Selection and Design of Sprayed Seals (Austroads, 2019)

Property requiring improvement	Sprayed seal treatments				Microsurfacing	Combined treatments	
	Surface enrichment	Single application sprayed seal (single/single)	Multiple application sprayed seal	Geotextile reinforced sprayed seal		Correction or regulation course plus SAM	Correction or regulation course plus SAMI with asphalt surface
Shape correction ability	No effect				Suitable for correcting shallow wheelpath ruts with single or multiple layers	Good	Very good
Surface reflection cracking	Little effect	Good ⁽²⁾		Excellent	Poor	Excellent	
Likely life of treatment ⁽¹⁾	2 to 5 years	5 to 15 years	8 to 15 years	8 to 15 years	5 to 10 years	5 to 10 years	5 to 12 years

- 1 Depends on the condition of the existing surface and the structural condition of the pavement.
- 2 The performance of a single/single seal will depend upon the width of the cracks and their extent. Where wide cracks are in the surface then the performance of a single/single seal may be between good and poor.

Source: Austroads (2009a).

Figure 4.2: General relationship between initial costs and effectiveness for alternative sprayed seal treatments



Source: Guide to Pavement Technology Part 4K – Selection and Design of Sprayed Seals (Austroads, 2019)

Materials & Construction

With single/single seal

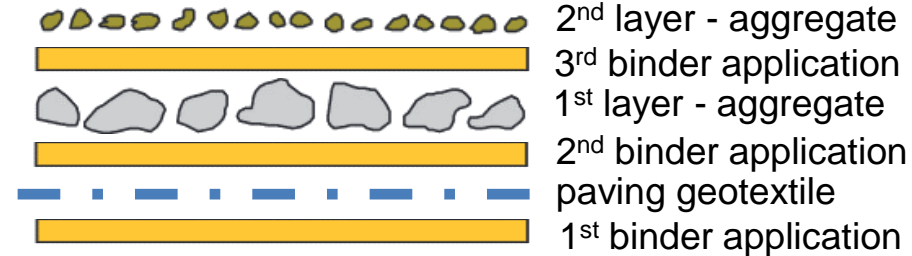
Bond coat application covered with a paving geotextile followed by a single seal construction



Source: Nascimento 2004 (adapted)

With double/double seal

Bond coat application covered with a paving geotextile followed by a double seal construction





Benefits:

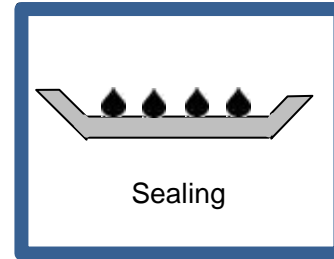
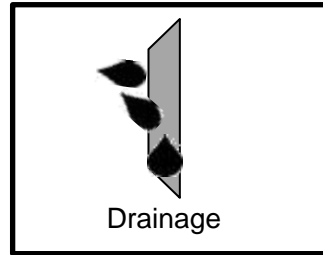
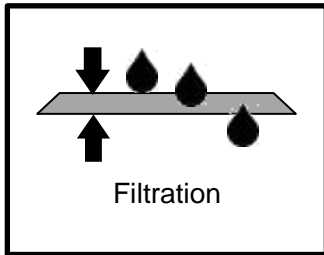
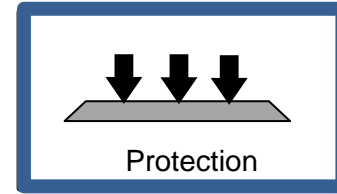
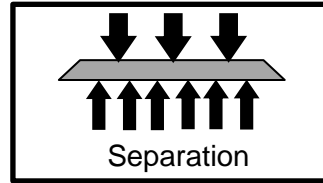
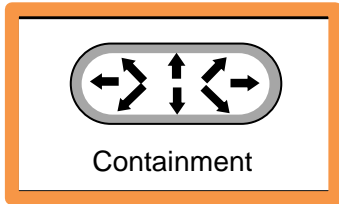
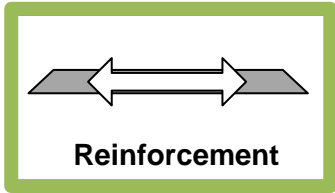
- # Provide improved waterproofing
- # Rehabilitate cracked and distressed pavement
- # Extend the service life of the seal treatment

- # Asset owners demanded a more robust solution to
 - # improve performance of traditional geotextile seals under heavy loads / in more demanding conditions,
 - # reduce the risk of mechanical failure of the geotextile
- # A paving geotextile only performs the containment function for the bitumen used, providing resistance to moisture ingress when impregnated with bitumen and if it remains intact
- # Traditional paving geotextiles cannot counteract the tensile stresses that geogrids do



Property	Test Method	Standard paving geotextile (150gsm)	Chipseal Grid, incorporating a standard paving geotextile (150gsm)
Tensile strength at 3% strain MD/CMD	EN ISO 10319 or ASTM D4595	$\cong 0$ kN/m	≥ 8 and ≤ 12 kN/m

Geosynthetics & their Functions in general



Sprayed Seal Reinforcement:

Waterproofing function combined with Reinforcement Function from the added Geogrid for seals



Case Study: Gore Highway, QLD, Australia

**Trial site: Condition prior to Double Double seal (14/7)
(over the existing pavement surface)**



Source: TMR Southern Queensland Region, Delivery and Operations Branch, 27/03/2020

Condition one year after Double Double seal (14/7):

Huesker Chipseal Grid reinforced section (Left)

Control section: Double Double only (Right)



Source: TMR Southern Queensland Region, 29/03/2021

Condition one year after Double Double seal (14/7):

Huesker Chipseal Grid reinforced section (Left)



Control section: Double Double only (Right)



Source: TMR Southern Queensland Region, 29/03/2021

Chipseal Grid for Longer-lasting Sprayed Seals

Installed Chipseal Grid prior to seal coat application

Gore highway, QLD



Chipseal Grid for Longer-lasting Sprayed Seals

Gore highway, QLD
Installed Chipseal Grid prior to seal coat application

Constructed Chipseal Grid reinforced Double Double seal



Construction Video: Chipseal Grid for Longer-lasting Sprayed Seals



Benefits of the advanced Chipseal Grid system



Durability

Integrated reinforcing grid provides superior performance



Waterproof

Nonwoven with optimum bitumen retention capacity



Reliable

Effectively delays reflective cracking



Surface stability

In conjunction with bitumen bond coat, provides a consistent and uniform layer



Break-resistant

More resistant to rupture under traffic loading



Protective

Protects the underlying pavement asset

- # Use of an effective/specialized geogrid reinforcement system in pavement design/construction is demonstrated to deliver
 - # **Greater asset performance**
 - # Maximized asset life cycle / sustainability
 - # **Reduced maintenance costs** / Structural rehabilitation
 - # Better ride quality / safety / community satisfaction
 - # **Reduced use of non-renewable materials & CO2 emissions**
 - # Higher operational efficiency

Up to 89% reduction
in CO2 emissions

 **HUESKER**
Ideas. Engineers. Innovations.



Ecological
Sustainability with
Geosynthetics

Save
Non-renewables
Replace
Virgin materials
Increase
Asset durability

Questions ?

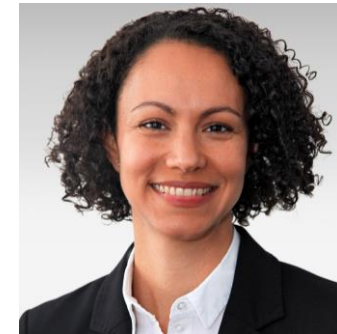


For further technical information, please contact:

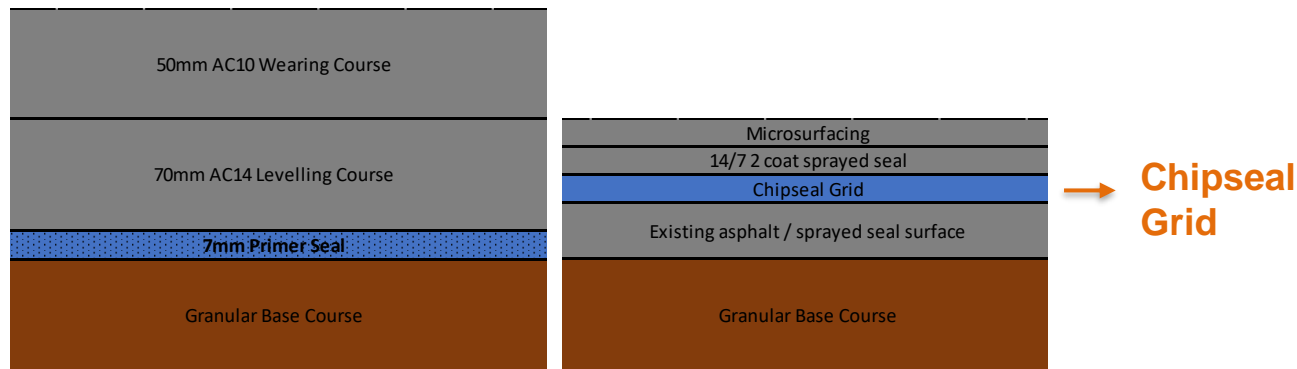
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Louisa Road, Paralowie, SA - Treatment Comparison



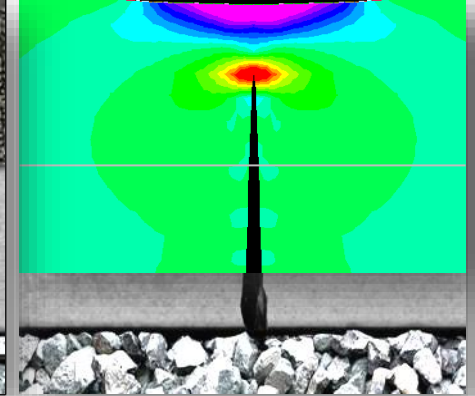
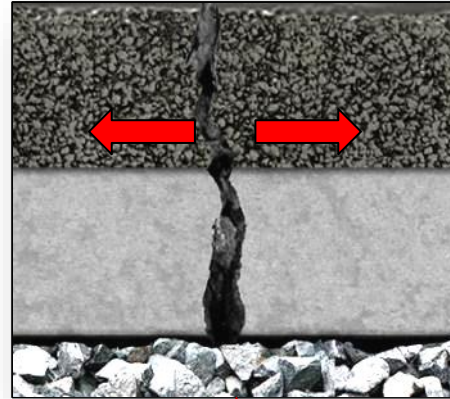
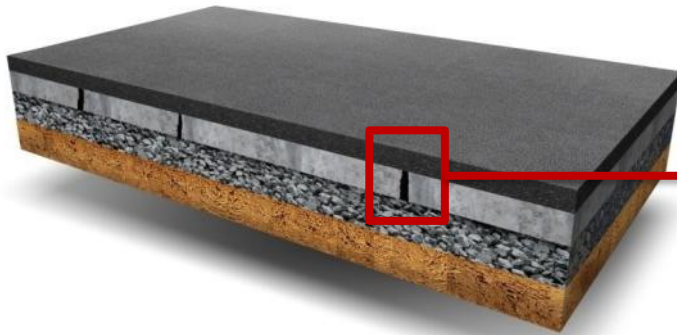
Source: City of Salisbury
Using IS Materials Calculator V 1.2

Treatment (4,800 sqm area)	120mm Asphalt rehabilitation and concrete kerb replacement (incl lighting and foot path replacement)	Chipseal Grid reinforced seal and micro surfacing treatment	Benefits Achieved
Total costs	\$ 726,000	\$ 300,000	\$ 426,000 saved
Total project costs	\$ 1,250,000	\$ 300,000	\$ 950,000 saved
Construction vehicles required	105	11	94 saved
CO2 Emissions	149.10 (tCO2-e)	20.05 (tCO2-e)	87% CO2 reduction
Construction / community disruption period	10 months	5 days	Approx. 10 months saved

Reflective cracking

Crack growth into the new asphalt layer

Due to high tensile stresses at crack tip



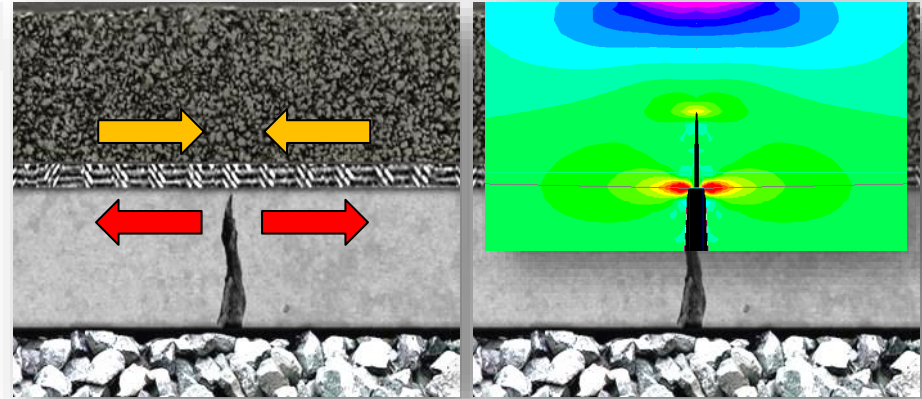
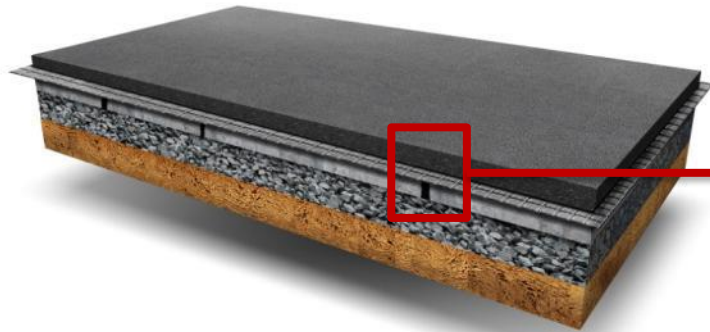
Source: Montestruque G. E., 2002, *Contribuição para a Elaboração de Método de Projeto de Restauração de Pavimentos Asfálticos Utilizando Geossintéticos em Sistemas Anti-Reflexão de Trincas* (Contribution to the preparation of a method of a project for rehabilitation of asphaltic pavements using geosynthetics on anti-reflective crack systems). Doctor's Thesis, Technological Institute of Aeronautics, São José dos Campos, Brazil.

Solution: An Engineered Asphalt Reinforcement Geogrid # HUESKER

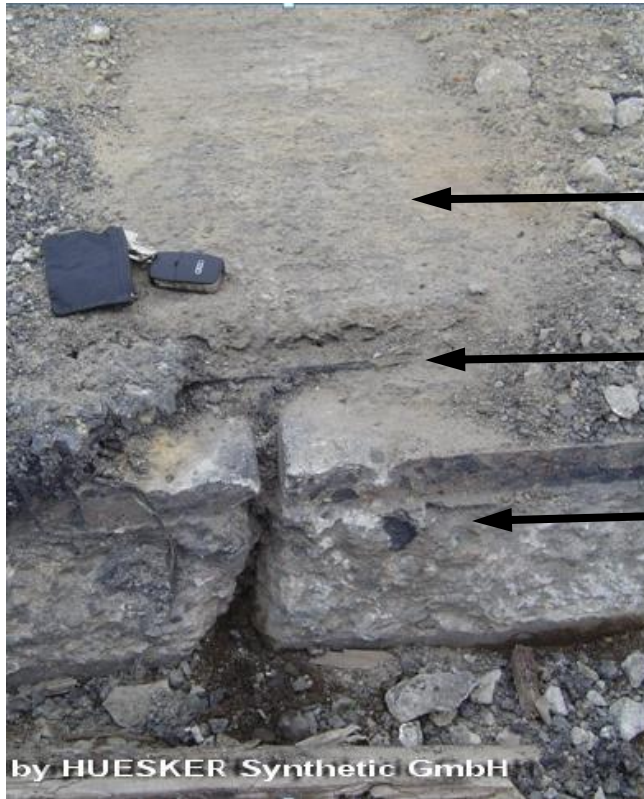
Ideen. Ingenieure. Innovationen.

Absorption and distribution of high tensile stresses

Significantly reduced growth of reflective cracks



Source: Montestruque G. E., 2002, *Contribuição para a Elaboração de Método de Projeto de Restauração de Pavimentos Asfálticos Utilizando Geossintéticos em Sistemas Anti-Reflexão de Trincas* (Contribution to the preparation of a method of a project for rehabilitation of asphaltic pavements using geosynthetics on anti-reflective crack systems). Doctor's Thesis, Technological Institute of Aeronautics, São José dos Campos, Brazil.

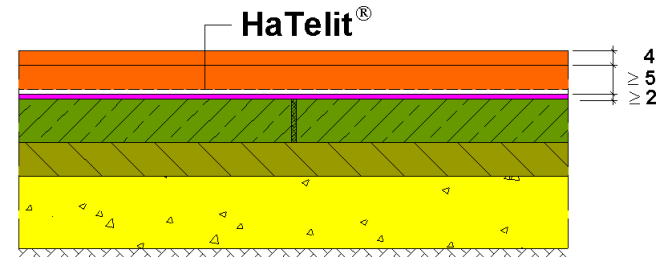


15 years after rehabilitation, in service with heavy traffic no further maintenance

No reflective cracking in the AC from the underlying slab joints & cracks

HaTelit® Asphalt reinforcement geogrid

Old concrete slabs



Source: Landesbetrieb für Straßenbau, Brandenburg, NL Autobahnen, 2005

With HaTelit[®] C 40/17



Without



Toombul Rd, Virginia, BCC, QLD

Source: IPWEQ20 State Conference, Enhancing Sustainability and Durability in Pavement Construction/Maintenance Using Asphalt Reinforcement Geogrid made from 100% Recycled PET. Practical Experience in Roads&Airfields



Toombul Rd, Virginia, BCC, QLD



Without



With HaTelit[®] C 40/17
reinforcement

Source: IPWEQ20 State Conference, Enhancing Sustainability and Durability in Pavement Construction/Maintenance Using Asphalt Reinforcement Geogrid made from 100% Recycled PET. Practical Experience in Roads&Airfields