



GUIDANCE ON THE USE OF NON-WOVEN FABRICS IN SURFACE DRESSING



Guidance on the Use of Non-Woven Fabrics in Surface Dressing

Forward

This guidance note on the Use of Non-Woven Fabrics as Stress Absorbing Membrane Interlayers (SAMI's) in Surface Dressing has been produced by the RSTA Geosynthetics & Steel Meshes Committee in conjunction with the RSTA Surface Dressing Technical Committee. It forms a part of the series of guidance documents relating to the use of Geosynthetics

For clarity this process is seen as a surface preparation technique prior to surface dressing so this document will focus mainly on the surface preparation aspect and include essential information on surface dressing where necessary.

It provides highway authorities, designers and principal contractors with essential guidance on where and how surface dressing over paving fabric can be undertaken successfully and provide a cost effective contribution to pavement maintenance.

For clarity this document is solely concerned with addressing pavement defects caused by reflective cracking on the surface. Failures and degradation resulting from the following circumstances are not addressed:

- Asphalt deterioration
- Sub-grade failure and associated rutting
- Asphalt rutting associated with permanent asphalt strain

This document has been peer reviewed by the ADEPT Soils, Materials, Design and Specifications Committee.

The information contained herein is intended to represent industry best practice. No liability is accepted by RSTA for any damages caused to property or personal injury resulting from using the guidance contained within this document.

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www.adeptnet.org.UK

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1. INTRODUCTION

Context

Surface dressing is a well known technique for restoring texture depth and sealing the road surface to inhibit water ingress however its application is limited to roads that are in reasonably good structural condition. Roads that exhibit reflective cracking are not normally treated with surface dressing because the road usually requires a reinforced asphalt overlay. Using a fabric under a surface dressing extends surface dressing onto parts of the network that would otherwise not usually be considered for surface dressing. So for example roads that have localised areas of cracking that have been marked out for patching can now be overlaid with a fabric prior to Surface Dressing. Engineers are encouraged to reconsider how they use their patching budget.

Previous Use of Interlayers in Surface Dressing

These systems were first used in the UK in the mid 1990's and there are case studies and technical reports available from the RSTA to demonstrate the extended service life of using fabrics in Surface Dressing.

Over this period the industry has continuously improved and optimised its products, systems and installation techniques and captured evidence of performance. A number of local authorities have used paving fabrics in surface dressing and they continue to gain acceptance. This technique has also been used extensively overseas over the past 25 years particularly in the USA and Australia.

System Description

The system consists of placing a fabric on a bitumen bond coat applied to a properly prepared and structurally sound substrate (save for the presence of reflective cracking) followed by a double surface dressing. Experience has shown that a single surface dressing on a fabric is liable to chipping loss.

Benefits of Using Paving Fabrics in Surface Dressing

The bitumen impregnated fabric becomes an integral part of the road structure by forming a SAMI absorbing stresses to reduce reflective and fatigue cracking of the asphalt or concrete surface. It also forms a barrier to surface water ingress helping to maintain the pavement's structural strength.

- Whole life maintenance cost reduction
- Significant extension of road service life
- Extension of area which can receive surface dressing avoiding the need for inlay construction
- Can avoid expensive pre-patching
- Reduced environmental impact associated with longer maintenance intervals
- Eliminate future crack filling or sealing

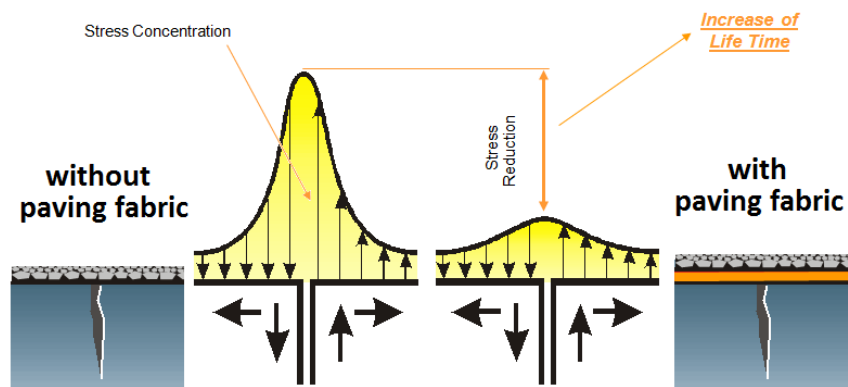
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- Prevent surface water ingress
- Allow wet subgrades to regain strength and load carrying capacity
- Protect the underlying pavement from ageing, oxidation and traffic wear

How does a Fabric work in Surface Dressing?

Surface dressings can be improved when a nonwoven interlayer has been included in the construction. Installation involves laying a fabric onto a sprayed bond coat followed by a double surface dressing. The receiving surface must be clean and cracks 5mm or more wide must be filled.

Non-woven polypropylene or polyester or glass fibre fabrics should be used because these allow the bond coat to migrate into the fabric thus providing a good bond to the substrate and a water proofing layer. In addition the nonwoven fabric provides stress absorption in combination with the bitumen layer to increase the life of the surface dressing.



The type of damage mechanism causing the cracks to appear at the pavement surface depends on the properties and nature of the pavement structure (e.g. thickness, stiffness etc), the properties of the underlying soil, the traffic characteristics and climatic conditions. Surface dressing by its nature (containing as it does a high proportion of bitumen) acts on its own as a fairly efficient crack preventative. The addition of a bitumen impregnated fabric combined with a double surface dressing provides a potent enemy of cracking.

2. SITE SELECTION

Surface dressing on a fabric is not suitable for all sites. For example this process is not successful if the road is subject to exposure from subsurface water penetration or if the road is exposed to ponding surface water because fabric delamination usually occurs in these situations.

Sites with the following characteristics are, however, generally suitable:

- Straight sections and no tight bends
- Few driveways or junctions
- Gradients of below 10%

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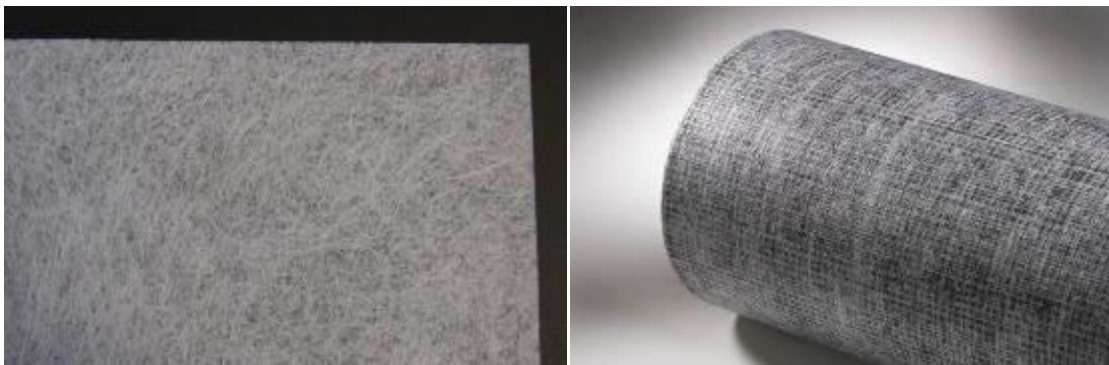
The highway design engineer must be satisfied that the site is suitable and it is highly recommended experienced installers are consulted at an early stage in the decision making process.

3. NON-WOVEN PAVING FABRICS

There are three main types of fabrics used – see below;



Polypropylene Paving Fabric



Fibre glass

Polyester Paving Mat

4. INSTALLATION

Correct installation of these materials is absolutely essential to maximise long term performance against reflective cracking. Investment in well trained and qualified operatives and purpose built laying equipment means the installation is now fast and effective resulting in little or no delays to the surface dressing operation. The installation of the paving fabric and the primary surface dressing is carried out on the same day.

The installation of the fabric is exactly the same as installation under an asphalt overlay except the bond coat application rate is usually less and also a butt joint should be used for joining adjacent rolls of fabric. The bond coat is sprayed at a reduced rate of spread because a completely saturated fabric is liable to be picked up by the surface dressing plant. To compensate for this the rate of spread of the first surface dressing emulsion binder is increased by the equivalent amount.

The fabric should be applied by a purpose made applicator capable of laying the fabric under tension without wrinkles or creases and

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brushing it firmly into the bond coat. Rolling out the fabric by hand should be avoided. Care should be exercised to avoid creases in the laid fabric but in the event of a crease occurring this should be removed by cutting and overlapping the fabric, with additional bond coat applied by hand to thoroughly stick down the fabric.

At the end of a run the geotextile is cut and removed as it is around iron work.

For full details on installation and site QC test procedures refer to the RSTA ADEPT Code of Practice for Geosynthetics & Steel Meshes. www.rsta-uk.org/publications.htm

SAMI Bond Coat

The bond coat impregnates and holds the fabric in position during the surface dressing process. The bond coat forms a seal between the underlying surface and the surface dressing. It is essential that the correct type of bond coat and the correct rate of spread are used.

The use of hot straight run bitumen as a bond coat has the advantage of immediate and effective fixing and therefore applying surface dressing over the fabric may take place immediately. For this to be effective the existing road surface should be dry or no more than slightly damp.

Bitumen emulsions can also be used as bond coats. Breaking agents can be used to facilitate the rapid breaking (curing) of bitumen emulsions if this is deemed necessary.

If an emulsion is used the rate of spread must be calculated so that the quantity of residual bitumen (after evaporation of the water) meets the requirements.

The bond coat shall be sprayed onto the substrate, 50mm to 100mm beyond all edges of the fabric where fabric will not be lapped (e.g. outside edge).

Once the fabric is installed the surface dressing can be applied immediately where the bond coat is a straight-run bitumen or after breaking where an emulsion is used. If the fabric is not saturated determined by (i) the fabric's capacity for bitumen absorption and (ii) the rate of spread of the bond coat then the surface dressing binder application rate may be increased to completely saturate the paving fabric and ensure bonding of the surface dressing aggregate.

The paving fabric must not be oversaturated.

It is strongly recommended that a Double or an Inverted Double Surface Dressing is applied onto the fabric. The dressing will be designed in accordance with the guidance in Road Note 39 with the exception that an increased rate of spread of the first binder application will be specified to compensate for any reduction in the rate of spread of the fabric bond coat. The surface dressing will be carried out in accordance with the RSTA ADEPT Code of Practice for Surface Dressing.

5. QUALITY ASSURANCE

The paving fabric manufacturer must be certificated to BS EN ISO 9001 and the fabric must be CE marked in accordance with the requirements in BS EN 15381.

Because of the extensive use of fabrics in Surface Dressings in the USA, paving fabrics specified in accordance with The American Association of Highway and Transportation State Officials (AASHTO) Standard Specification for Geotextile Specification for Highway Applications - Designation M288-06 (2011) – Section 10 can also be used.

Before spraying the bond coat the Contractor shall provide the Overseeing Organisation with a test certificate showing test results for rate of spread and accuracy of spread of binder carried out in accordance with the test methods in BS EN 12272-1 and issued by an appropriate Test House accredited by UKAS for those tests using the binder to be used in the Contract not more than 52 weeks before the commencement of the work.

The manufacturer and the installer must demonstrate their personnel are technically competent and provide certificates of training. All site operatives and visitors to site must hold an appropriate CSCS card to demonstrate an understanding of Health and Safety. Machine operators must hold CPCS or equivalent certificates to demonstrate a level of competence. Training requirements are embodied within the National Highway Sector Scheme 13 which stipulates the minimum training and qualification requirements for operatives and supervisors on site. Operatives and supervisors will be required to hold NVQ for the installation of geosynthetics and steel meshes used in bound pavement layers.

- Operatives must hold NVQ level 2 and RSTA endorsed CSCS cards.
- Supervisors must hold NVQ level 3 and RSTA endorsed CSCS cards.

Supervisors will attend the RSTA Training course on geosynthetics and steel meshes every 5 years and obtain an RSTA Silver certificate as evidence of maintaining competence. It is also recommended that operatives also attend the RSTA training course every 5 years to remain up to date with industry best practice.

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APPENDIX 1

CASE STUDIES

Long term monitored UK Case Study
Maintenance free since 2003

Participants:

Client: Norfolk County Council

Main Contractor: May Gurney

Paving Fabric Supplier: TenCate Geosynthetics UK Ltd

Project Description: Road resurfacing (surface dressing)

Materials utilised: Non-woven Fabric.



Quantity Installed: 10,800 m²

In July 2003, upon the instruction of Norfolk County Council, a stretch of the A143 highway, west of Bungay was surface dressed utilising a system which incorporated PGM14 paving fabric. The fabric was placed by TenCate specialist installation contractor, Foster Contracting under a main surface dressing contract undertaken by May Gurney. The road was constructed in the early 1980's in order to bypass Bungay. The original HRA surface was overlaid in 1995 with 25mm of 10mm SMA. Although the road has retained its shape, several severe cracks were present and the road surface appeared 'tired' and 'brittle'.

Norfolk County Council selected 15 sections of the highway, totalling 10,800m², where the cracking was most evident, for treatment with non-woven fabric and surface dressing. The construction details are summarised below.

Construction: (From top down)

10mm single size granite chippings (rolled & trafficked)

Polymer modified cut-back bitumen @ 1.4 l/ m²

6mm single size granite chippings (rolled & trafficked)

Polymer Modified Emulsion Binder @ 1.6 l/ m²

TenCate non-woven fabric

160/220 bitumen spray @ 0.6 l/ m²

Existing road (swept & cleaned)

Old road surface ~25mm thick Stone Mastic Asphalt (SMA) c.1995 over Hot Rolled Asphalt (~20 years old)



The installer will determine the SAMI bond coat application rate after taking into account site circumstances e.g. texture depth or fatty surface. It is usually the case the SAMI bond coat application rate under Surface Dressing is lower than when bonding a geosynthetic under an asphalt overlay where typically 1.1 l/m² bond coat would be used.



The bond coat was applied at approximately 180°C with the installation of 1.9m wide non-woven fabric rolls immediately afterwards. Adjacent panels were butt-jointed, as overlaps potentially form a ridge in the final surfacing.

The first layer of chippings was specified as 6mm applied onto 1.6 l/ m² polymer modified emulsion sprayed at 85°C. Following the installation of the non-woven fabric and 6mm

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chippings, the whole site, measuring approximately 30,000 m² was surface dressed with polymer modified cut-back bitumen, sprayed at 1.4 l/ m² with 10mm chippings.

Paving fabrics are installed with the following objectives:

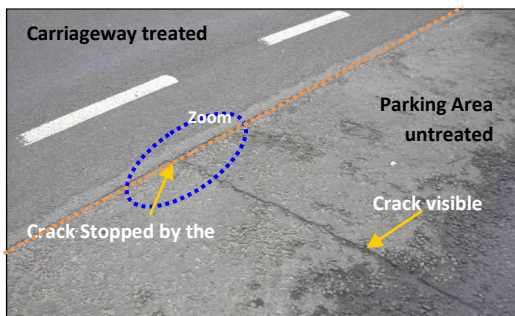
- To retard the formation of reflection cracks in the overlay by allowing a controlled horizontal flexibility
- To seal underlying layers against penetration by water
- To prolong the life of the overall road construction



Bob Noakes, Group Manager of the Norfolk County Council Laboratory, specified a non-woven fabric on a project almost ten years ago as a stress relieving and bitumen retention layer under surface dressing for one of their busiest roads. The particular section of road was in a cracked and crazed condition and would normally have been repaired prior to surface dressing with hot mix asphalt inlay patching. GeoPrep was specified in order to save on the costs of patching repairs.

Bob reports that *“my experience over many years of this type of surface and traffic loading tells me that pre-patching is essential to ensure surface dressing is effective. Without patching I would expect the surface dressing to last two to three years and even then this section would be at a high risk of developing potholes. Patch repairs run the risk of potholes around the edges of the repair, even under a surface dressing. However the road to date still shows no sign of distress and the saving to the council has been considerable and we recommend this treatment method throughout the county as part of our investigation and design for repairs”*.

10 years on...



APPENDIX 2

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