Geosynthetics and steel meshes for longer life pavements

Cracking in asphalt pavements is now recognised as one of the biggest problems faced by highway maintenance engineers. Geosynthetics and steel meshes, also known as interlayers, are a proven approach for extending the life of pavements. Road Surface Treatments Association (RSTA) chief executive Howard Robinson explains why

When placed between bituminous bound layers these products retard the initiation and propagation of reflective cracking which leads to premature pavement failure.

These systems have a long track record of successful use with over five million m² used in the UK and more than 100 million m² installed throughout Europe since the 1980s. Over this period the industry has continuously improved its products, systems and installation techniques and captured evidence of performance. It is worth noting that the majority of UK local authorities have now used these systems as they have grown in acceptance.

The RSTA has produced a code of practice on these systems which has been peer reviewed and endorsed by ADEPT to provide highway authorities, designers and principal contractors with essential guidance on the use of geosynthetics and steel meshes, their use, laying techniques and applications. The document is freely available at www.rsta-uk.org/publications.htm and provides essential guidance on; material types, QA, site selection and material selection, training, traffic management and it also contains an extensive glossary of terms and references.

The maintenance of roads in the UK has always been a challenge due to heavy trafficking and variable weather conditions. Many types of treatments at, or below, the surface of an asphalt road have been used to extend the lifetime of the road with a view to minimising maintenance costs. Breakdown of the road surface is caused by weathering, movement and fatigue, accelerated by the asphalt’s susceptibility to reflective cracking leading to ingress of water, then to potholes and finally, a total breakdown of the surface.

One of the treatments which has been used extensively over the past 25 years in the UK and throughout Europe is the use of an interlayer which is installed within the pavement to intercept the path of a crack propagating through the...
Benefits
The main advantages include:

- Maintenance cost reduction
- Significant extension of road life over conventional surfacing
- Reduction in asphalt thickness, in some circumstances, saving on material costs
- Reduced environmental impact associated with longer maintenance intervals
- Reduced hidden costs to businesses and the general public through delays caused by road closure and traffic restrictions.

These benefits have steadily driven increased utilisation of these products over recent years.

Performance
Bituminous bound layers crack in-situ because of their inability to withstand strain, shear and tensile stresses created by a number of factors resulting in one or more of the following outcomes:

- Reflective cracking
- Fatigue cracking
- Differential settlement (often prevalent in road widening schemes)
- Thermal cracking.

The effectiveness and performance of the geosynthetic or steel mesh system is highly dependent on site specific circumstances. The majority of UK pavements have evolved over time and were not originally designed to withstand the weight and increased traffic volume of commercial vehicles. It has taken many years of careful monitoring to establish the performance of these systems after accounting for the many variables that can influence pavement deterioration, and this work continues.

To obtain the best performance it is necessary to consider a range of variables and based on these carefully select the correct geosynthetic or steel mesh system. Research over the years has addressed and isolated these variables, either through laboratory or site trials and this work has been supplemented via extensive practical experience gained from many thousands of successful installations.

One key lesson learned and, often overlooked in the past, is that correct installation of these materials is an absolute necessity. It is imperative that geosynthetics and steel meshes are installed correctly and efficiently to maximise long term performance against reflective cracking. Improvements have been made to the efficiency of the installation by using trained operatives and the correct laying equipment generally resulting in little or no delays to the road surfacing installation. The code of practice has an extensive section on installation techniques to ensure the optimum performance of the selected system.

The type of damage mechanism causing the cracks to appear at the pavement surface depends on the properties and
Product types

Key product types available are listed below:

**Steel meshes**
Steel meshes typically galvanised steel wire, double twisted to form a mesh with reinforcing bars at intervals.

**Polymer grids**
Polymer grids typically punched and stretched polypropylene or knitted/woven polyester. Other polymers are also available but less prevalent.

**Non-woven textiles**
Non-woven textiles are typically needle punched polypropylene but polyester and combination using glass fibres are also available.

**Glass grids**
Glass grids are typically knitted and may be coated with polymer or bitumen or a combination. Some of these materials have self adhesive backing.

**Composites**
Typically a combination of polymer or glass grids and non-woven textiles combined by lamination or stitching.

**Geosynthetics and steel meshes**
must be compatible with the asphalt to ensure the integrity of the system. They must be stable and durable both to withstand the rigors of the paving operation and provide functionality for the desired design life.

The code aims to guide and inform designers and end users on the range of products and applications that are available so they are able to make informed project related decisions. It identifies the important aspects for the use, design and correct installation of geosynthetics and steel meshes in bound pavement layers.

**Quality assurance**
All the product types listed in the panel above should be CE marked in accordance with BS EN 15381:2008 to ensure long term performance. The RSTA geosynthetics and steel meshes sector members are fully committed to the utilisation of quality manufactured products and operate quality management systems in accordance with the requirements of BS EN ISO 9001 (2008).

**Installation**
It is strongly advised that a competent specialist contractor is employed to undertake the installation. Installation by the asphalt surfacing contractor is not usually satisfactory because the operatives will be unfamiliar with the process, they are unlikely to have the necessary skills or qualifications or the correct equipment to ensure correct installation.

Installation of the geosynthetic or steel mesh will usually be scheduled to take place immediately prior to the asphalt surfacing. Provided an experienced specialist sub-contractor has been selected, installation of the product should not normally delay the surfacing works.

**Training**
All contractors site operatives must hold an appropriate CSCS card to demonstrate they have been properly trained and qualified to install the required product. 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.

**Surface dressings reinforced with geosynthetics**
Since the 1990s non-woven geosynthetics have been used in combination with surface dressings to treat roads that are suffering from reflective cracking. This provides an alternative economic solution to replacing the asphalt surfacing. New industry guidance on this topic is currently being developed by RSTA members for publication later this year.