

# Steel Based Asphalt Reinforcement

A guide to the selection  
and specification of  
**Fortifix®** steel grid  
asphalt reinforcement  
system

ABG are pleased to  
partner Bekaert as  
exclusive UK distributors  
of the Fortifix® range  
of high strength steel  
reinforcement grids for  
cracked road pavements.

 **BEKAERT**

better together

 **abg** creative  
geosynthetic  
engineering









Asphalt is one of the most commonly used materials for the surfacing of roads and airport runways as well as other trafficked areas such as car parks and distribution centres.

The low tensile strength of asphalt means it can be easily damaged by a number of factors including settlement, fatigue, temperature fluctuations and vehicle loadings.

Damage arising from reflective cracking usually manifests as a cracked or broken surface which has implications for the comfort of the road user, vehicle damage and to the subsequent on-going maintenance costs to the operator of the paved area.

The ABG range of asphalt reinforcement grids offer systems designed specifically to mitigate these issues, offering increased pavement life cycles and a reduction in both new build and on-going maintenance costs.

The use of steel mesh offers many benefits over the traditional methods of construction which they replace, including reduced construction times and project costs. By allowing thinner pavements to be designed they help minimise the environmental impact of the project by reducing the volume of materials used, thereby reducing the transport loads both to and from the site.

ABG offer a complete service in the field of asphalt reinforcement from initial design, right through to a complete installation service.

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# Fortifix® asphalt reinforcement

## Why reinforce asphalt?

In civil engineering, the principle of adding a tensile element into a weaker material to make that material stronger is well established. Common examples being steel reinforced concrete, geogrid reinforced soil and glass reinforced plastic. Reinforcing asphalt, however, if used at all, is seen as a repair solution rather than as a logical part of new build road or airport construction. The great benefit of reinforcing asphalt is currently largely being ignored.

A pavement is subjected to repeated traffic loading plus cyclic thermal loading, both of which generate longitudinal strains in the asphalt. Asphalt is a visco-elastic material and can self heal, but eventually oxidation and fatigue lead to the formation of cracks. Cracks which not only weaken the asphalt but also allow water to penetrate to the lower layers, ultimately resulting in pot holes.

Reinforcement works by absorbing stresses to prevent strains reaching critical values and hence control cracking. A reinforced pavement will last significantly longer than a pavement without reinforcement. This is proven.

Alternatively, a reinforced pavement can be constructed thinner to achieve the same design life. This saves cost, materials and provides a significant reduction in carbon. In urban areas, a thinner pavement will also help to reduce threshold issues.

## Why steel reinforcement?

To work effectively, the reinforcement must have a modulus (low strain strength) that is significantly higher than the modulus of the material being reinforced. Fortifix steel cord has a Young's Modulus of 190 GPa (50 times higher than that of asphalt). By comparison, glass fibre has a Young's Modulus of 70 GPa, which makes glass fibre a less effective reinforcement of asphalt. Fortifix steel reinforcement is 8 times stronger than polymeric systems.

## Why Fortifix steel reinforcement?

The many studies in universities and technical institutions, as well as live sites over many years have shown that steel provides the optimum reinforcement of asphalt. The great difficulty, until now has been the complex and expensive installation process, that has confined the use of steel mesh to the most severe reinforcement situations (e.g. roads over peat).

Fortifix, with its unique light weight galvanised steel cord grid and polyester geotextile composite, changes everything.

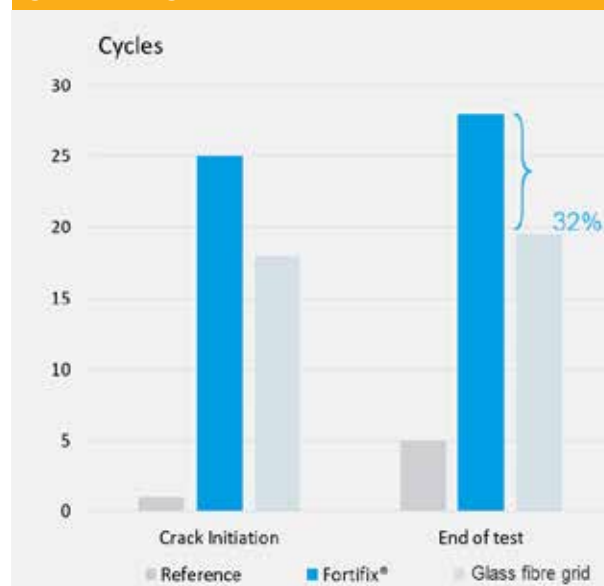


## Cost benefit of Fortifix

A new pavement will have a design life of 20 years before it requires maintenance, and an overlay onto an existing road will have a design life of 7 years. Adding Fortifix into the design will incur a small additional cost, typically less than 10% of a new road and 15% of an overlay. The design life of the pavement will be increased by up to a **factor of 4** however.

This gives a Cost Benefit of 1.8, meaning that for every £1 spent a saving of £0.80 is made.

## The life-time of Fortifix® is 32% longer than glass fibre grids



The anti-cracking properties clearly outperform glass fibre grids with a similar EA and a higher tensile strength

## Advantages vs glass fibre grids

- 3 times stiffer
- 100% recyclable
- Easy to lay flat with no rucking effect
- Extended maintenance intervals



## Sustainability

Fortifix is a cost effective and sustainable solution. Increasing the life of the pavement or overlay has an associated carbon saving compared to traditional unreinforced road construction. In addition, Fortifix creates a further carbon saving by eliminating pot holes and the energy consumed in repairs to damaged tyres and vehicles. Fortifix is **100% recyclable** and thanks to the innovative treatment of the cords, the structure can be easily planed and completely separated from the asphalt.

## Ease of Installation

Fortifix is installed by exactly the same process as used for glass fibre reinforcement grids. Historic installation difficulties encountered when installing older style steel mesh based systems (requiring pneumatic rollers and the use of heavy nailing) have been overcome with the development of Fortifix. Fortifix has a fine cord structure kept in position on a low-weight non-woven textile, affording a light weight roll that is easy to handle and cut, with just a pair of straight edge tin snips required.

Fortifix can be rapidly installed, with the road surface first swept before all potholes and large cracks are filled with bituminous material.

Bitumen emulsion or pure bitumen is sprayed onto the prepared receiving surface and the Fortifix is unrolled flat (by hand or machine) onto the bond coat. The bitumen does not bleed through the geotextile until hot asphalt is laid and this permits the paver and delivery trucks to run on the Fortifix.

The overlay is laid to normal specifications, temperatures, compaction and weather conditions (minimum overlay of only 40mm compared to traditional reinforcement systems up to 100mm).

## Why ABG?

ABG is one of the original pioneers of asphalt reinforcement and has continually developed the market since 1990 by introducing innovations in product and installation. Our engineers will take survey information and use their experience and our design techniques to develop proposals for a wide range of projects, backed by PI insurance. ABG is also qualified to provide a complete installation service.

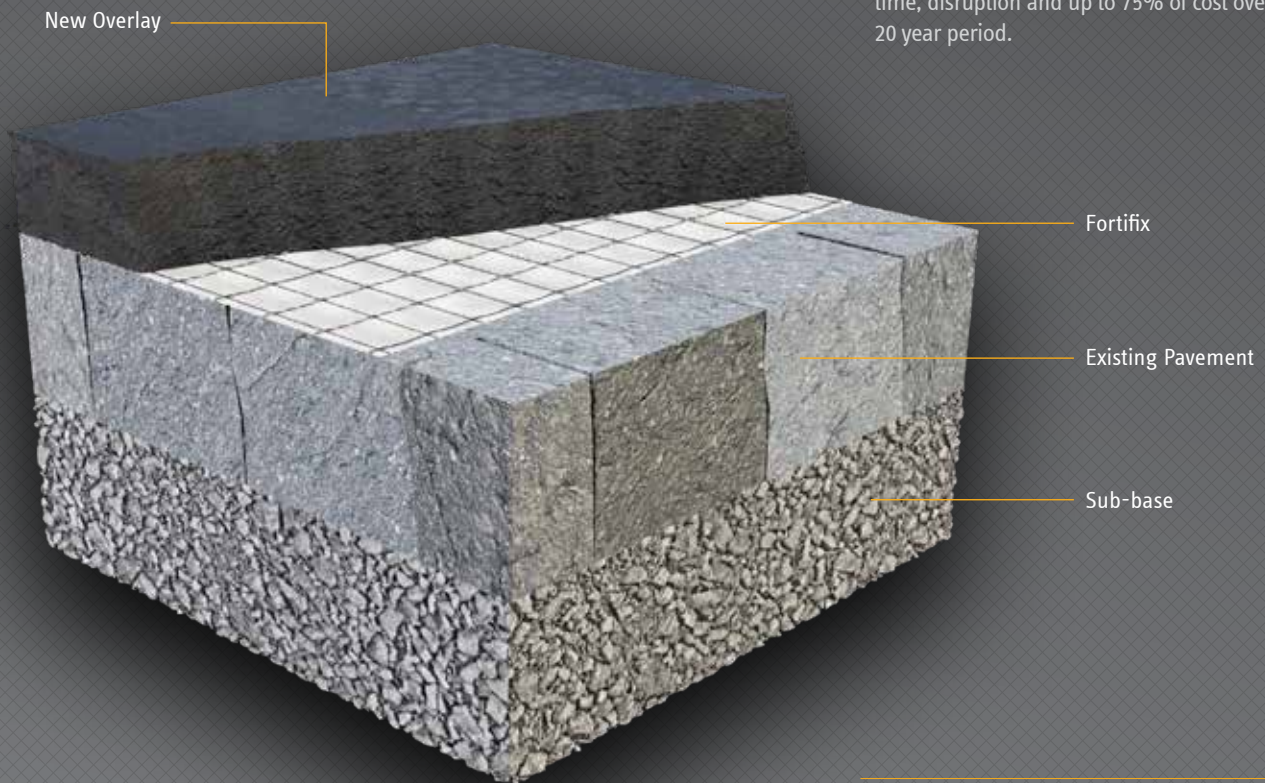
Examples of how Fortifix is used in a range of applications is detailed on the following pages.





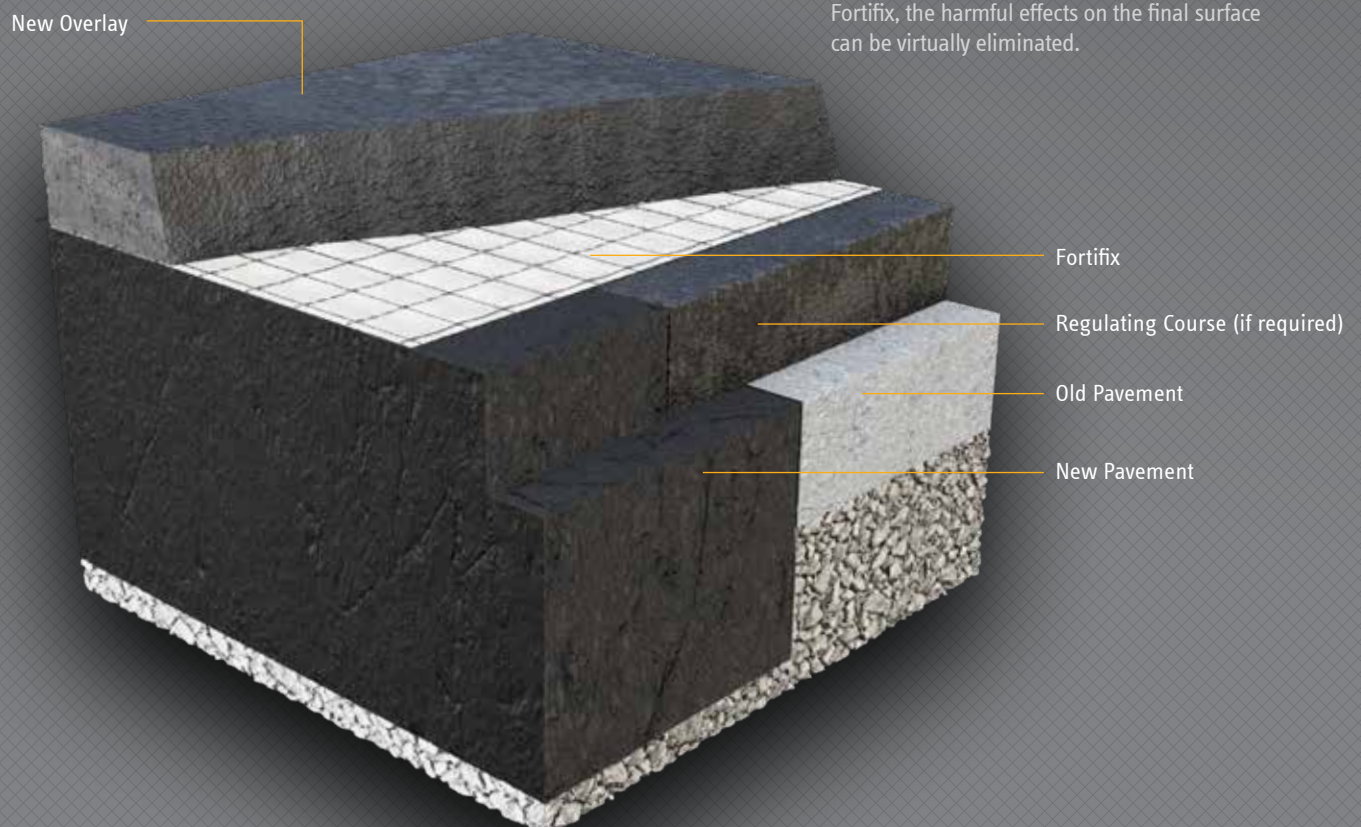
## Control of Reflective Cracking

Using Fortifix to prevent reflective cracking will extend the service life of pavements by up to a factor of 4. Fortifix provides reinforcement to help prevent crack propagation. This saves time, disruption and up to 75% of cost over a 20 year period.



## Widening and Haunching

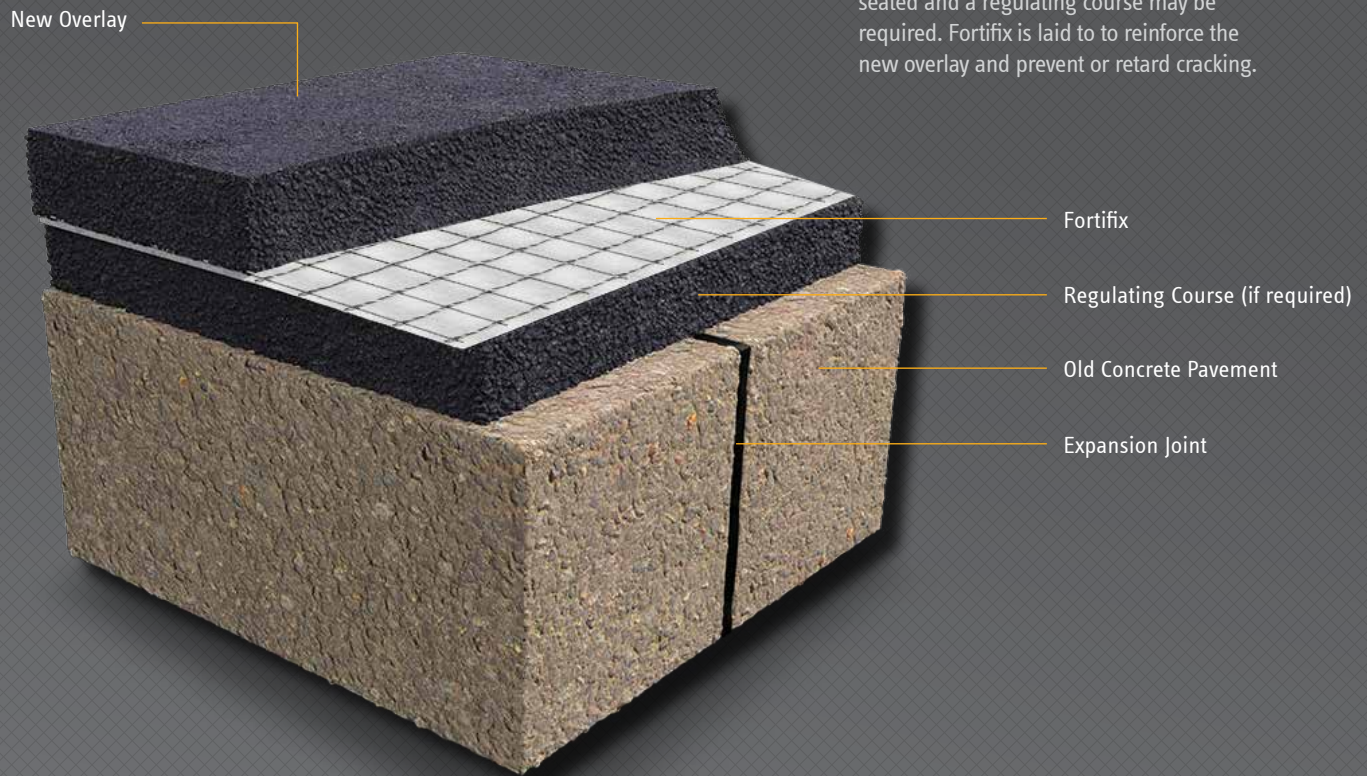
A major problem in road widening schemes is that the new and old pavement structures tend to move apart due to differential settlement and thermal movement. By reinforcing the joint with Fortifix, the harmful effects on the final surface can be virtually eliminated.





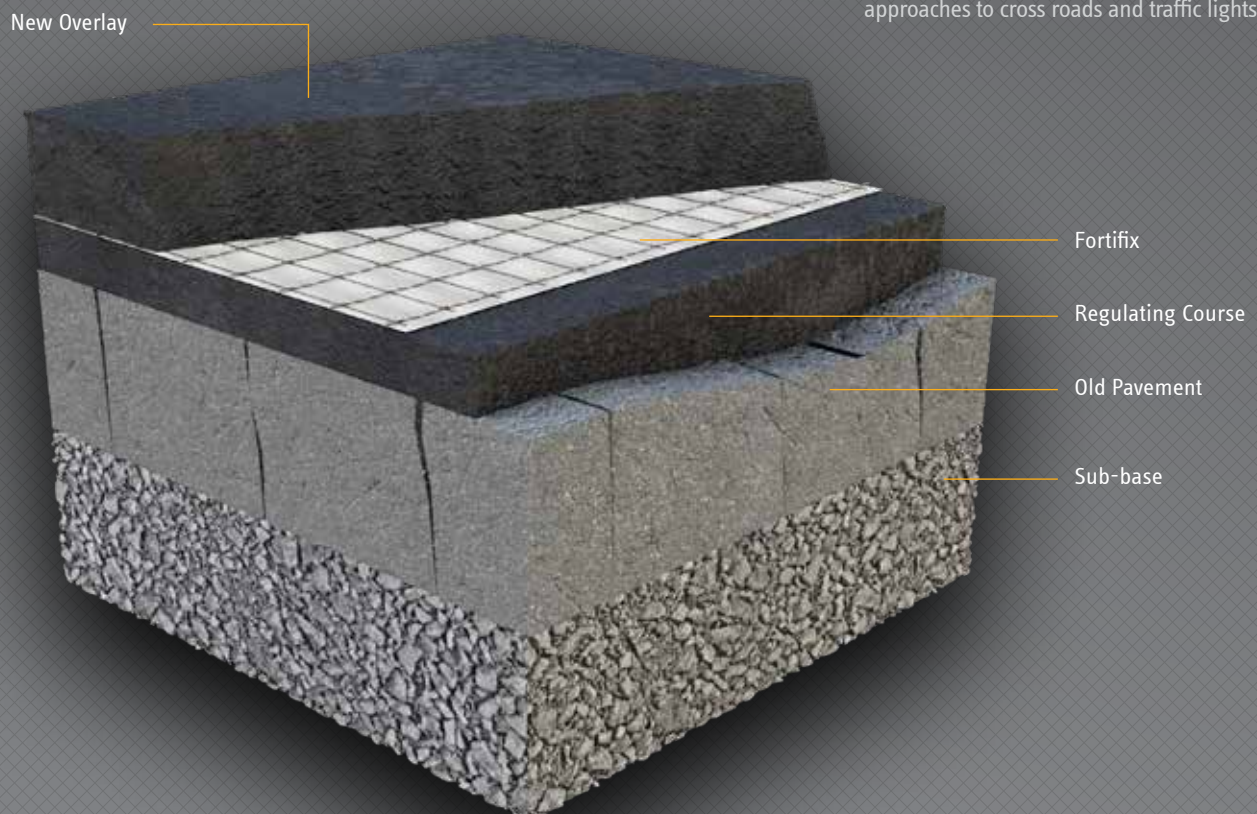
## Overlay of Concrete

Thermal movement within concrete pavements results in contraction and expansion at the construction joints. It is essential that the concrete pavement is well seated and a regulating course may be required. Fortifix is laid to reinforce the new overlay and prevent or retard cracking.



## Rutting

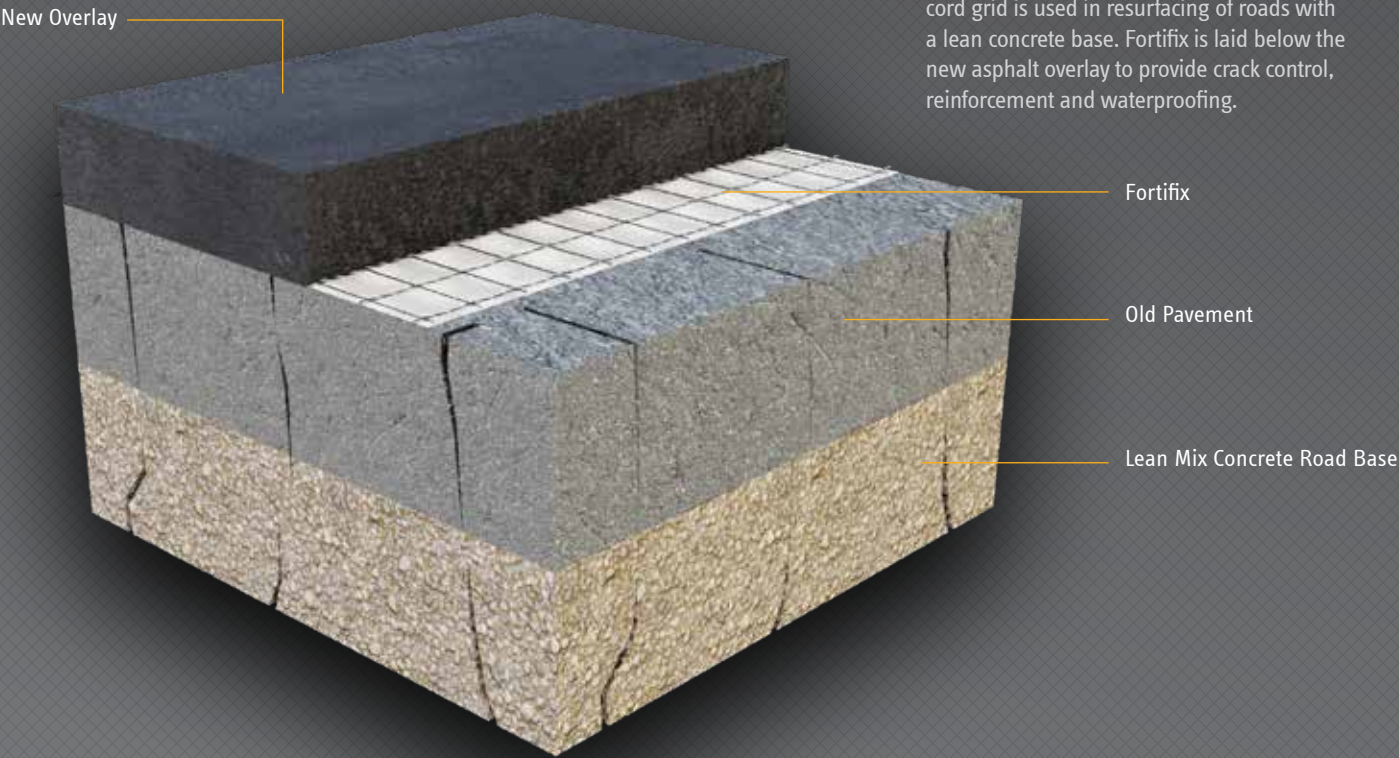
Fortifix is used in conjunction with stiffer bituminous layers to reduce rutting in pavements subject to intense wheel loadings and high ambient temperatures (e.g. bus lanes, approaches to cross roads and traffic lights).





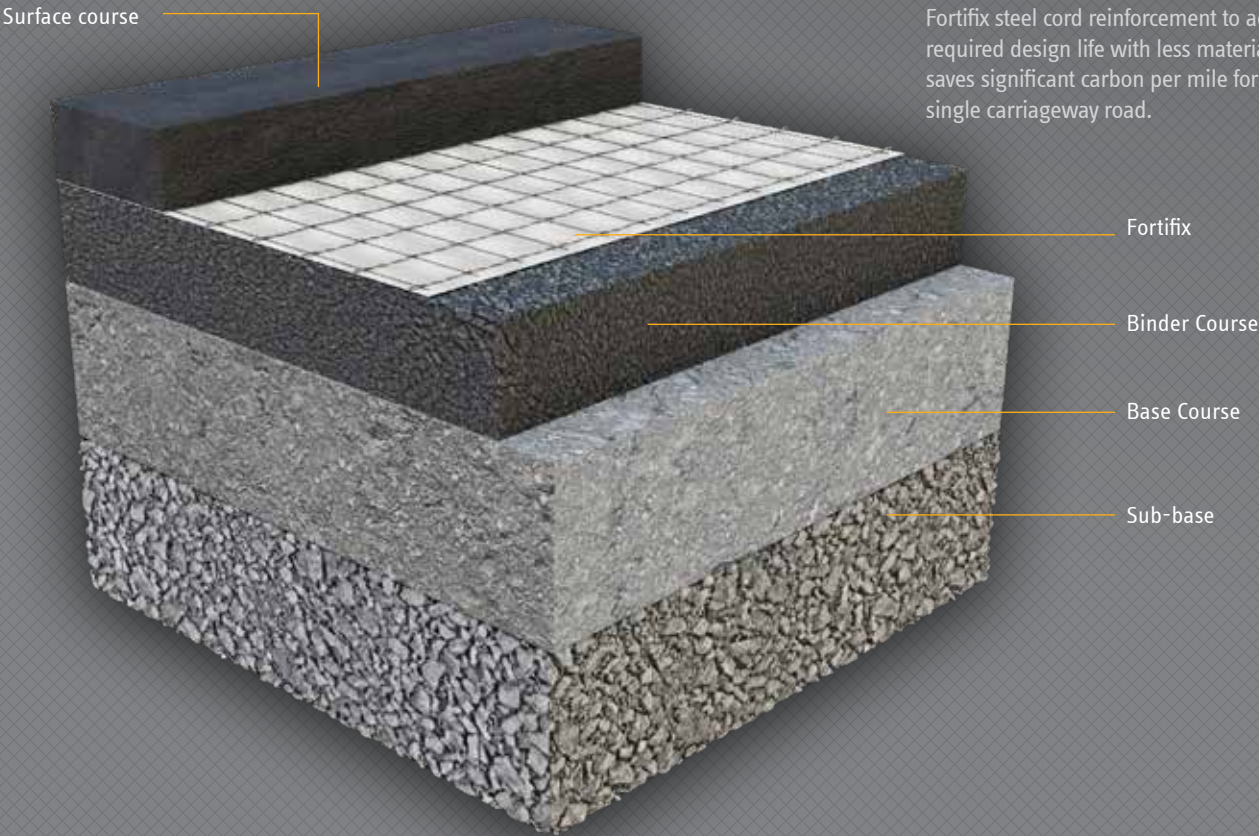
### Lean Concrete Roadbase

This is perhaps the most common problem faced by highway engineers. Fortifix steel cord grid is used in resurfacing of roads with a lean concrete base. Fortifix is laid below the new asphalt overlay to provide crack control, reinforcement and waterproofing.

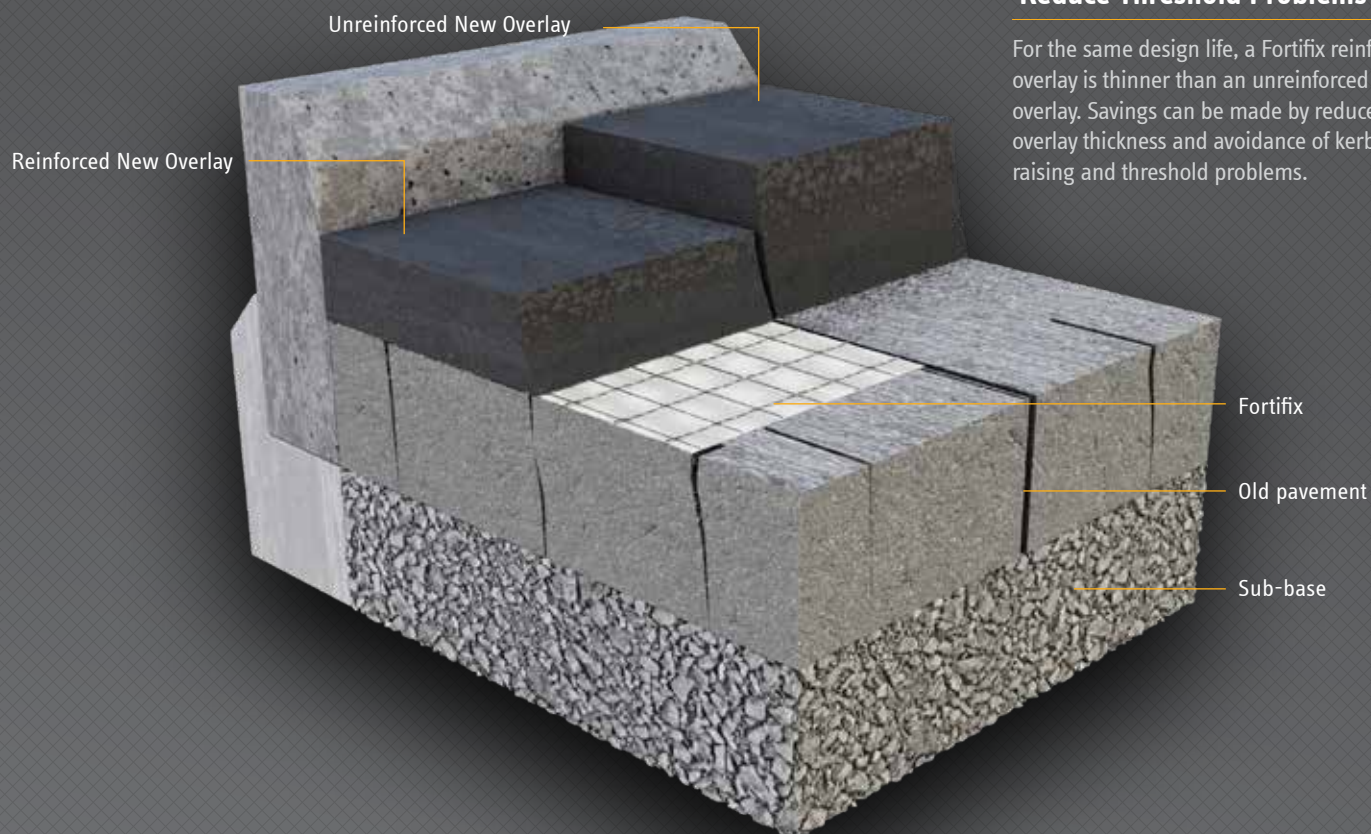


### New Construction

A more sustainable road construction includes Fortifix steel cord reinforcement to achieve the required design life with less materials. This saves significant carbon per mile for a typical single carriageway road.







## Reduce Threshold Problems

For the same design life, a Fortifix reinforced overlay is thinner than an unreinforced overlay. Savings can be made by reduced overlay thickness and avoidance of kerb raising and threshold problems.



## Overlay over Setts

Sett paved roads pose engineers serious problems as it is unwise to remove solid well seated setts, but overlays will crack and delaminate. Fortifix prevents cracking and holds surfacing materials together.





### Structural Drainage

ABG have vast experience in drainage solutions and the systems have been used globally on major highway projects.

Deckdrain is a geocomposite drainage system used to relieve external water pressure from behind retaining walls, bridge abutments culverts and beneath block paved areas.



### Verge Reinforcement

Vehicle over-run onto soft verges presents a serious safety hazard. Deep rutting can form and during heavy periods of rain significant wash out can occur.

ABG ConcertinaWeb is a geocellular containment system which confines and strengthens infill materials, providing a cost effective solution for the reinforcement of roadside verges and prevention of stone scatter.



### Erosion Control

ABG has a complete range of products suitable for erosion control and top soil retention on steep slopes. These products cover a broad section of erosion control requirements including biodegradable, non-biodegradable and pre-seeded varieties. ABG erosion control products can help with both the surface protection and structural stability of soil slopes.



### Retaining Walls

Webwall is a retaining wall system based on geocell technology, comprising layers of three dimensional cellular matrix usually infilled with site won materials. Using Webwall, ABG are in a position to offer full PI covered design, material specification of the drainage works and then installation of the Webwall system through to final planting of the face with the right plants selected for the project.



### Filtration and Separation

ABG have a complete range of geotextiles suitable for a wide range of filtration, separation and protection applications in civil engineering projects. The range comprises both woven (Abtex) and non-woven (Terrex) geotextiles each with a wide range of grades and performance.



### Sub-base Reinforcement

The use of geogrids is common practice on highways projects to both strengthen weak sub-bases or reduce the depth of imported fill required within the pavement construction. ABG has a range of sub-base reinforcement products including high-performance Trigrid, Abgrid and Abweb (a three dimensional mattress advocated for use in no-dig applications, such as in areas where protection of tree roots is an issue).



### Permeable Paving Surfaces

Permeable paving surfaces provide a stabilised pavement where water run-off can be reduced, treated and attenuated to reduce the risk of floods. Permeable paving systems are suitable for access roads, car parks, coach and bus parks, industrial yards, HGV surfaces and driveways. Options include interlocking plastic pavers and heavy-duty recycled paving grids that are an alternative to concrete blocks and suitable as part of a source control surface within a SuDS system.



### Indicator Layer

Dekotex indicator layer is a self-adhesive grid, coloured bright orange for high visibility to quickly show in any arisings during works on bridge decks. Traditionally bridge deck waterproofing has been protected by a red asphalt sand carpet which is expensive, difficult to obtain and not always obvious in arisings. Dekotex indicator layer will quickly show in the arisings and warn of the proximity of the bridge deck waterproofing to be protected.



### Fildrain

A high performance, economic alternative to traditional stone groundwater drainage solutions used extensively in a wide range of applications from highway edge drainage through to landscape drainage. Fildrain also has applications in the drainage of embankments, reinforced earth structures, cut off trenches on contaminated land and landscape applications. Fildrain offers a viable cost effective alternative to traditional drainage systems formed using a geotextile filter and drainage stone medium.





## About ABG

ABG is a market leader in the design, development, manufacture and technical support of high performance geosynthetic systems for use in a wide range of civil engineering, environmental and building projects.

Formed in 1988, based in Meltham, in the heart of the Pennines, ABG have developed an excellent reputation for developing quality products and delivering outstanding service. The ability for rapid product development ensures that the most innovative, up to date and cost effective solution can be found for many engineering problems.

ABG's involvement in highway construction and maintenance goes back over twenty five years and we now have a complete range of products developed specifically for use in this technically demanding application.

Technical support is provided by our trained and experienced staff, many of whom are Chartered Civil Engineers. This extensive support extends to full design, design validation, feasibility studies, cost advice and advice on meeting regulatory requirements.

Part of this technical support includes developing and driving knowledge within our active markets including working with both international and local regulatory bodies on developing guidance and best practice in the use of innovative geosynthetics to solve complex engineering issues.



This literature together with technical data, specifications, design guidance, technical advice, installation instructions or product samples can be obtained by contacting ABG Ltd. All information supplied in this brochure is supplied in good faith and without charge to enable a reasonable assessment of the practical performance of our products. Final determination of the suitability of information or material for the use contemplated and the manner of the use is the sole responsibility of the user. As design and installation is beyond our control (unless specifically requested) no warranty is given or implied and the information does not form part of any contract. The right is reserved to update the information at any time without prior notice. © 2020 ABG Ltd

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**Official UK distributors of Fortifix®**  
**Steel-based solution to road-cracking**

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