Tensar®
Road Technology

A14 CAMBRIDGE TO HUNTINGDON IMPROVEMENT SCHEME

DELIVERING ROBUST AND COST EFFECTIVE
REINFORCED SOIL STRUCTURES & FLEXIBLE PAVEMENTS

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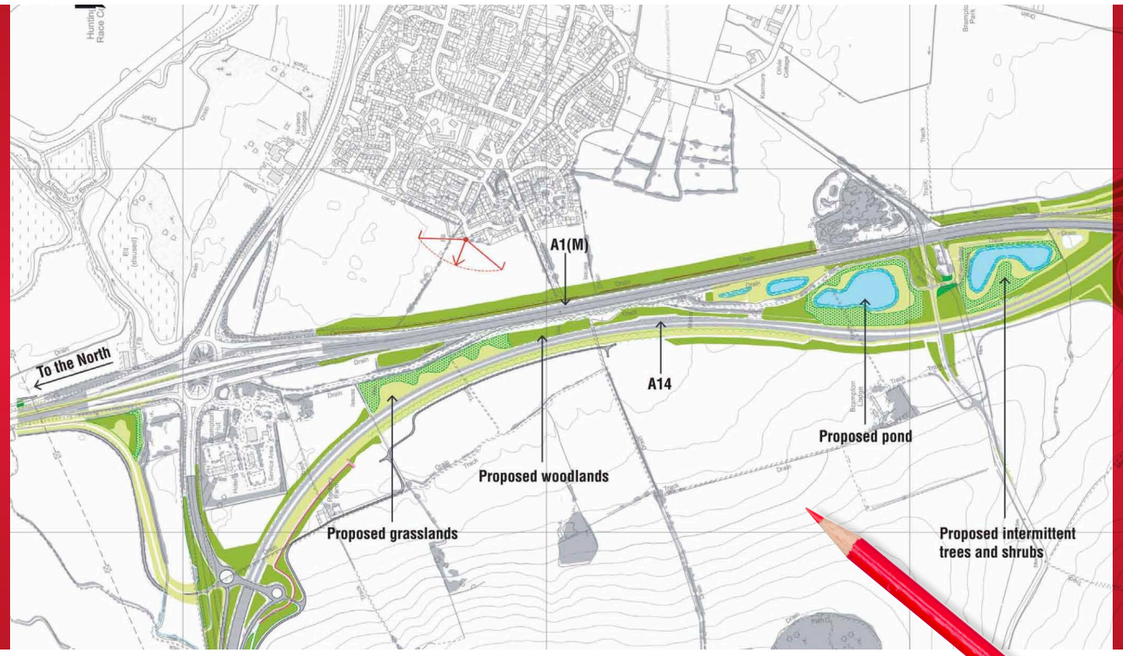
Tensar's involvement in the A14 Cambridge to Huntingdon Improvement Scheme

The A14 is a key national road link between the West Midlands and East Anglia. Part of the Trans-European Transport Network, the road stretches for more than 200km, connecting motorways such as the M1 and M6 with Felixstowe, UK's busiest container port.



The A14 Cambridge to Huntingdon improvement scheme

One of the A14's most heavily-used sections is between Huntingdon and Cambridge, a strategic link between the A1(M) motorway to the north of England, and the M11 motorway to London. The road carries about 85,000 vehicles a day – a quarter of which is HGV traffic travelling to and from Felixstowe, which is much higher than the national average of 10%. As a result it was often congested, with delays caused by roadworks, breakdowns and accidents.

Highways England's £1.5bn A14 Cambridge to Huntingdon improvement scheme set out to relieve congestion, to make journey times more reliable, increase capacity and support regional and national economic growth.

As well as widening and improvements to 34km of the A14, the project included the new 20km Huntingdon Southern Bypass, to take large volumes of traffic off the A14, plus improvements to the A1, Huntingdon town centre and local roads, with better connections for horse riders, cyclists and pedestrians.

The project was delivered for Highways England by the A14 Integrated Delivery Team, a joint venture of contractors Balfour Beatty, Skanska and Costain, plus consultants Atkins and Jacobs. Work began in November 2016 and the new road opened to traffic on 5 May 2020.

£1.5bn
scheme cost

34km
of upgraded road

34
new bridges and structures

80%
of construction materials sourced locally

An introduction to reinforced soil structures on highways

Reinforced soil is becoming a standard way of forming cost-effective walls and bridge abutments on highways, instead of the more traditional options that frequently involve piling and reinforced concrete.

The approach uses layers of geogrid to reinforce soil, increasing bearing capacity and increasing resistance to differential settlement. Reinforced soil structures often have lower bearing pressures than traditionally-built structures, which can eliminate the need for expensive foundations.

Geogrid layers are mechanically-connected to a range of facings, including modular blocks, concrete panels, gabions and crib walls, depending on the aesthetic requirements of the project. This creates strong, durable structures, requiring minimal maintenance, with design lives of up to 120 years, that are covered by BBA HAPAS certificates.

In many cases, all of a bridge's bank seat loading can be carried by a reinforced soil abutment. For example, Tensar has designed temporary and permanent structures using its TensarTech systems to support loads of more than 500kN/m². And, if piling is needed, then the piles can be incorporated easily into the abutment fill.

A big advantage of using Tensar's durable HDPE geogrids is that they work with a huge range of materials, including non-standard fills (such as selected site-won fill) and waste products such as pulverised fuel ash. This versatility can save time and money on projects, as well as reducing their carbon footprint.

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TENSARTECH® GREENSLOPE™

TENSARTECH® GREENSLOPE™

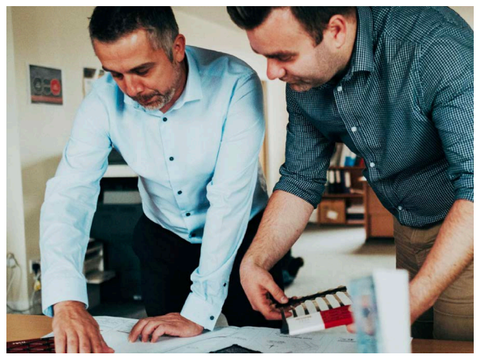
TENSARTECH™ TW3 WALL

TENSARTECH™ TW3 WALL

Tensar's reinforced soil structures were built using locally-sourced fill, playing a key role in the overall project drive to minimise material imports, saving one million lorry movements.

Tensar systems: delivering robust and cost-effective solutions for the A14 Improvements

Tensar was involved in the improvement scheme from the very start, working with the A14 Integrated Delivery Team to design a number of reinforced soil structures for junction improvements on the A14, as well as the design of flexible pavements for some of the site compounds. The team also provided technical and on-site support, visiting site regularly during works.



Tensar reinforced soil structures

Tensar reinforced soil systems were used on a number of aspects of the scheme, creating retaining walls for new bridges built over the A14 as part of junction improvements. Tensar systems also provided load bearing abutments for temporary bridges carrying construction traffic between sites along the route, to keep traffic flowing on the A14 throughout works.

Reinforced soil structures were also built using locally-available materials, as part of an overall project drive to reduce material imports, with 80% of primary construction materials sourced from local borrow pits, which saved money and cut 1 million lorry movements.

80%

of primary construction materials sourced from local borrow pits

TensarTech TW3

Providing permanent retaining structures

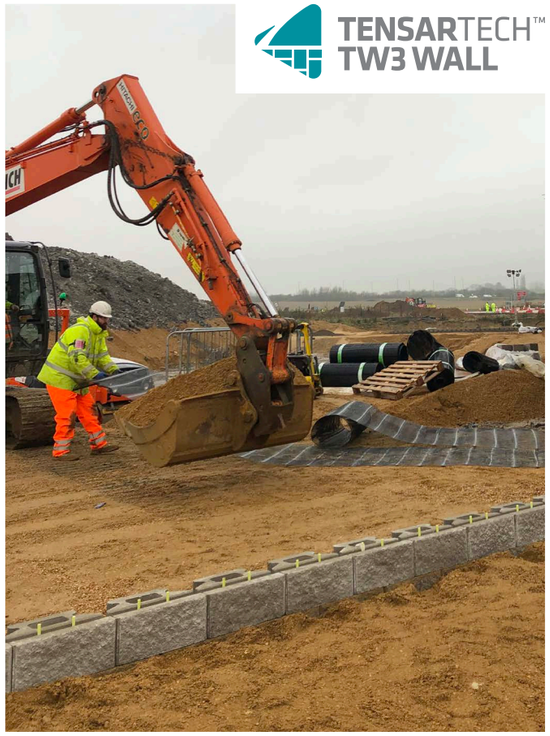
TensarTech TW3 reinforced soil retaining walls were built to create wing walls for new overbridges quickly and economically, instead of conventional reinforced concrete. These were up to 10m high, with a total face area of 11,000m^2.

Ground conditions were predominantly soft alluvial clay and medium dense river terrace gravels, underlain by Glacial Till, Oxford Clay and Kimmeridge Clay.

TensarTech TW3 was chosen because it was robust and flexible enough to accommodate the predicted settlements expected during construction and for several years after completion.

Most of the walls experienced up to 50mm of vertical movement during construction – with no effect on performance or the wall facing – and they can accommodate up to 100mm of long-term settlement.

Dry-laid block facing enabled the walls to be built safely, without heavy lifting equipment, next to live traffic. Tensar worked with Atkins and Jacobs to design the walls, taking them through to technical approval (AIP) by Highways England.



TensarTech GreenSlope

Delivering softer landscapes with robust support

TensarTech GreenSlope formed steep vegetated slopes to approach embankments for overbridges and to slip roads at upgraded junctions.

TensarTech GreenSlope is designed for slopes between 45° and 70°, using a similar approach to other TensarTech systems: layers of uniaxial geogrid within the soil are connected to durable steel mesh facing units, which allow vegetation to establish.

A big advantage of GreenSlope was that slopes could be built using processed sand, a by-product from the on-site concrete batching plant (classed as a 1B material), instead of imported material. This saved both time and money, while supporting the project's sustainability approach.

TensarTech TR2

Supporting temporary construction access

TensarTech TR2 delivered low-cost retaining walls for the load bearing abutments of three temporary bridges, saving significant time, labour and cost. Two bridges were built over the A14 while the third carried construction traffic – including 50t dumper trucks – over the River Great Ouse during construction of the new viaduct.

The temporary abutments were designed to carry loads of up to 206kPa over the 3m wide bank seats (including the dead weight of the bridge and live traffic loads).

A major benefit of using TensarTech TR2 was that no formwork was needed, as the steel mesh panel facing (lined with a durable, heavy-duty geotextile) is braced internally and held in place by the geogrid and fill. This meant abutments could be built quickly and easily. The bridges were used for about 18 months before being dismantled.

"The reinforced soil wall abutments for the temporary bridges behaved exactly as expected, with uniform settlement during and after construction."

Fatemah Pegah Ara, Temporary Works Engineer, A14 Integrated Delivery Team

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A14 TEMPORARY AND PERMANENT STRUCTURES

Ellington Junction

Ellington Junction lies on the A14, to the west of the western end of Huntingdon Southern Bypass. It includes a new bridge over the A14 to provide local access and to ease traffic flow between Brampton and Ellington. The up to 8.5m high wing walls of the new bridge's reinforced concrete abutments were formed using TensarTech TW3, with a total face areas of 327m².

A1 (M) and A14 junction

The western end of the Huntingdon Southern Bypass joins with the A1(M) at Brampton Hut. Here, TensarTech TW3 was used to form the four, up to 10m high wing walls, covering a total of 80 linear metres, for the bridge forming the junction. The bridge deck is supported by reinforced concrete abutments on piles.

Constructing the junction was challenging, due to the need to keep both the A14 and A1(M) open throughout works. TW3 was ideal for the task; its modular nature meant the retaining walls could be built safely in the limited working area, without the need for heavy lifting equipment or propping, reducing temporary works risks and costs.

The blocks could be laid by hand next to the live road, with the reinforced soil layers built up behind, without need for lane closures.

Grafham Road Bridge and B1514 Junction

TW3 was also used to form the four, 10m high wing walls to the Grafham Road Bridge and at the junction with the B1514 Buckden Road, both of which were upgraded to improve local access to the A14.

River Great Ouse Viaduct

Tensar's TensarTech TR2 reinforced soil system was used to build the retaining walls for the load bearing abutments of temporary bridges carrying construction traffic over the River Great Ouse, during construction of the 745m long, 17 span viaduct carrying the new bypass over the river and the East Coast Mainline railway. The site was environmentally-sensitive, so a flexible, easy-to-build and remove solution was needed – TR2 was ideal, as it delivered stable, low-cost retaining walls, which could be easily dismantled at the end of construction.

Girton Interchange

Girton Interchange, where the A14 joins with the M11, is a key junction and was upgraded to allow for the widened road, new slip roads and a number of new connections with local roads. TR2 was used to form the load bearing abutments to a temporary bridge carrying construction traffic, to minimise disruption to local roads, while TW3 was used to form 12, up to to 10m high wing walls to the new elevated junction.

Swavesey Junction improvements

TensarTech TR2 was used to form the reinforced soil walls to the load bearing bridge abutments for a temporary bridge over the A14 at Swavesey Junction. TensarTech TW3 was also used to form the permanent wing walls for the junction overbridge, which connects the A14 with local roads, a business park and services. These were again up to 10m high and a total of 90m long.

Bar Hill Junction improvements

The improvements to Bar Hill Junction, just to west of the Girton Interchange, were one of the major aspects of the A14 improvements. Work involved demolishing a 1970s flyover near Bar Hill and replacing it with two flyovers to form a new roundabout linking the A14 with Bar Hill village and industrial estate, as well as with some major housing developments, including Northstowe new town.

TensarTech TW3 was used to form the 12 wing walls for the three bridges at the new junction. These were a maximum of 9.5m high, with a total length of 798m.

The westbound off-slip and the south arm of the B1050 was to built on an embankment surrounding the Bar Hill Infiltration Pond but, due to a lack of space between the off-slip and the pond, a conventional 1 in 3 embankment slope could not be used.

Instead, TensarTech GreenSlope was chosen to form a 280m long, 70° reinforced soil slope to the embankment. This is a maximum of 8.6m high, with a vegetated face and a 120 year design life, ensuring the pond has sufficient volume to store water during times of heavy rainfall.

Additionally, connections were improved for pedestrians and cyclists, including a new bridge. TensarTech GreenSlope was used to form the sinuous approach embankments to the new cable-stayed crossing, chosen because it can form steep vegetated slopes with complex geometry.

A14 SITE COMPOUNDS AND CAR PARKS

Delivering robust flexible pavements for site compounds and car parks

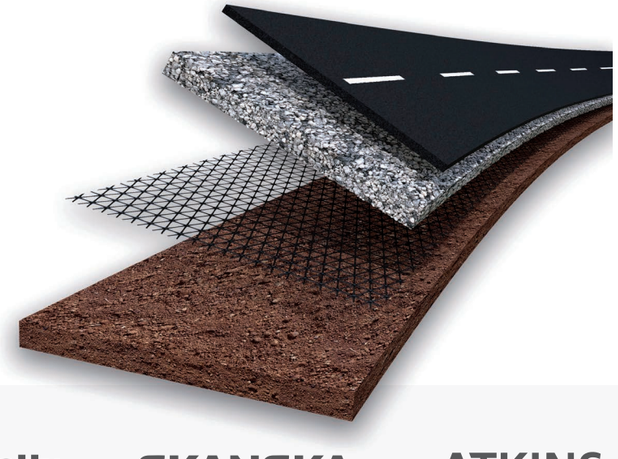
Tensar Pavement Optimisation, which uses Tensar geogrids to create mechanically stabilised aggregate layers, delivered high performing pavements over very weak ground (CBRs as low as 3%) for site compounds, quickly and economically, while minimising environmental impact.

86,400m²

of Tensar geogrid was used

A total of 86,400m² of Tensar geogrid was used to control lateral and vertical displacement of aggregates from traffic loads, reducing asphalt rutting and cracking, helping to prevent moisture and contaminants entering and weakening the pavement structures.

SPECTRA®
PAVEMENT OPTIMISATION SYSTEM



Supporting your project, from concept to completion

Tensar's professional engineering teams have extensive experience in the use of our products and systems on a wide range of infrastructure projects across the UK.

Our products are manufactured in the UK, placing us in a unique position to deliver exactly what is needed, when its needed, saving time and money. And, as our 'geogrid miles' are lower, we can help reduce the carbon footprint of projects.

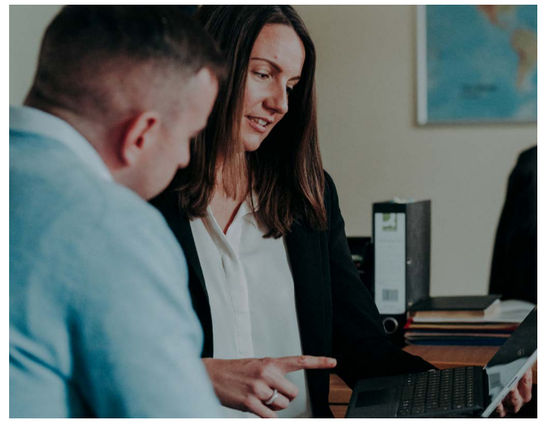
We provide a comprehensive range of design and advisory services, tailored to clients' needs, including project-specific support on concepts, design and installation advice, to help them develop the most cost-effective ground stabilisation and retaining structure solutions.

About Tensar International

Tensar International is a world-leading manufacturer and provider of subgrade stabilisation and soil reinforcement solutions to overcome common ground engineering problems in construction and civil engineering.

Our innovative and high-performance geogrid and geotextile products offer alternative approaches to traditional methods and have benefitted thousands of roads, railways and other infrastructure projects around the world.

www.tensar.co.uk



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BBA APPROVAL INSPECTION TESTING CERTIFICATION CERTIFICATE 13/H201
TENSAR RE AND RE500 GEOGRIDS FOR REINFORCED SOIL RETAINING WALL AND BRIDGE ABUTMENTS

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