

Presto Geosystems

GEOWEB® Geocell Reinforcement Improves Structural Performance of Railway Track Beds

Every year, railroads dedicate a great deal of capital and resources towards creating and maintaining high-quality track profiles. Providing a well-designed track profile is the foundation on which a successful rail line operates.

With ballooning rail traffic carrying heavier loads than ever and increased occurrence of extreme weather events, a stable track profile is essential for successful operation.

GEOWEB® geocells have been used in the track bed for rail applications worldwide for more than 40 years. Through an interconnected honeycomb-like network, the HDPE-based GEOWEB® Soil Stabilisation

System provides apparent cohesion and strength to materials that would otherwise be unstable over soft subgrades. Geocells stabilise the ballast, reduce vertical and lateral stresses and limit ballast movement. Stabilisation within the geocell system provides a longer lasting track profile that extends rail service life, while also reducing maintenance cycles and recurring maintenance costs. Research has shown that geocells reduce settlement of the ballast foundation and can reduce required cross-section thicknesses by up to 50%. This is particularly advantageous where track beds must be constructed over soft soils. The reduction in thickness leads to cost savings, along with an accompanying reduction in carbon emissions due to decreases in aggregate processing, transportation, handling and installation. In general, geosynthetics offer

tremendous potential in reducing carbon emissions from civil construction projects, in many cases by 50% or more.

North West Electrification Programme Case Study

In the United Kingdom, Network Rail encountered extremely soft soils with low shear strengths during track modifications to the North West Electrification Programme. Due to soft subgrade conditions, conventional track design methods resulted in cross-sections as thick as 1 metre. Poor soil conditions along the track route required a soil stabilisation solution to improve undertrack stiffness and provide a more cost-effective solution. The Network Rail Track Bed Investigation (TBI) team elected to evaluate an alternative solution using

geocells to reduce the required cross-section thicknesses. The GEOWEB® Soil Stabilisation System has been used under track in the United Kingdom since the 1980s; however, very limited information was collected at that time to document the resulting improvement in performance. Therefore, the TBI team used in-house numerical modelling to validate the design approach, and results indicated that a geocell-stabilised track performed as well as the conventional full-thickness cross-section. Based on this information, combined with the demonstrated long-term stabilisation of the above-referenced early installations, the TBI team elected to use the alternate track bed design incorporating GEOWEB® geocells. The North West Electrification Programme subsequently approved the use of geocells on a number of sections with the goal of reducing construction depth, and in turn reducing costs associated with track enhancement and long-term maintenance.

After installing the GEOWEB® Soil Stabilisation System on the North West Electrification Programme in 2017, track quality improved significantly. The reduction in the required track bed construction materials (40% reduction in granular fill material), reduced the cost of track enhancement by approximately 22% (Wehbi, et al., 2018). Network Rail also realised the benefit in the ability to use granular fill and coarse sand as ideal infill materials. Network Rail's experience using geocells has shown substantial construction cost savings and benefits to the structural integrity of the track bed (Wehbi, et al., 2018). Network Rail has also monitored Willesden North



Installation: expanded GEOWEB® geocells

Network Rail has approved the GEOWEB® Soil Stabilisation System as the solution in areas with soft soils to improve and regulate track bed stiffness, while reducing maintenance, installation time and cost.

GEOWEB® geocells achieve all requirements of the Network Rail Track Bed Standard NR/L2/TRK/4239, Issue 2 and accompanying guide “Use of Geocells” for below track installations.

on the London North East and Newham Bog on the London North West in addition to the Northern West Electrification Programme, which show similar results and benefits.

Based on their success using the GEOWEB® system in track bed applications, Network Rail developed a guide providing a summary of the benefits from research and testing, design recommendations, and best practices. In August 2020, Network Rail issued “The Use of Geocells in the UK Railway Track Bed, Technical Guide”. The guide provides technical guidance based on extensive research conducted at the University of Kansas (UK)

and Oregon State University (OSU), which includes existing geocell design methods, case studies from successful installations and industry-proven installation methods utilising specialised geocell ATRA® connection keys. The guide served as a reference for development of the Network Rail Track Bed Standard NR/L2/TRK/4239, Issue 2, issued in September 2020, which contains detailed design information and guidelines for using geocells in track bed applications.

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Installations: infilling GEOWEB® geocells

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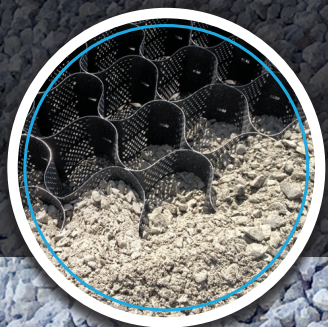
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