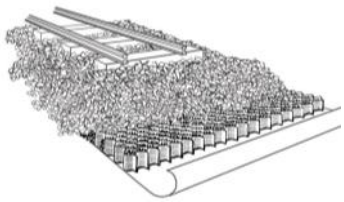
GEOWEB®

AAR/TTCI RESEARCH PROVES CONFINEMENT SYSTEM A SUPERIOR GEOSYNTHETIC FOR TRACK STABILIZATION

PUEBLO, COLORADO

GEOWEB 3D Confinement System stabilizes track subballast layer and reduces layer depth up to 50%.



GEOWEB® System Delivers 14 Times Reinforcement Benefit of Other Geosynthetics for Track Subballast Support

TEST FACILITY & SCOPE:

*The Association of American Railroads' (AAR) research facility near Pueblo, CO, the **Transportation Technology Center (TTCI),** contains the **Facility for Accelerated Service Testing (FAST)** track where years of extreme stress conditions can be applied in a few months.*

On FAST's High Tonnage Loop, a 2.7 mile 'loop track' dedicated to High Axle Loads (called HALs, denoting 39-tons or more), some remarkable testing has been performed on the GEOWEB System.

TESTING CRITERIA:

The goal of the testing at AAR/TTCI's FAST (Facility for Accelerated Service Testing) track was to evaluate the effects of repeated heavy loads on the GEOWEB System installed over a soft subgrade.

The soft subgrade was constructed from highly expansive Vicksburg Buckshot Clay, an ASTM "Reference Soil" imported from Mississippi for this purpose. The clay was placed at 30% moisture content in a five foot deep, 700 foot long trench along a section of the High Tonnage Loop, known as the Low Track Modulus (LTM) test zone. The test train operations are designed to accumulate approximately 1 million gross tons (MGT) per day, running on a continuous basis at no more than 40 mph speed.

Numerous geosynthetic materials had previously been tested under the track in the LTM zone, but ballast tamping was still required on an average every 15 MGT of loading.

For the test, the **GEOWEB** System was placed in the sub-ballast layer in readiness for the repeated application of 39 ton axle loads. To ensure that the testing would capture the **'worst case' condition for clay subgrades,** fire hoses were used to simulate two 500 year rainfall events, saturating the highly expansive clay subgrade during a dry mid-winter period between snow storms and snow melt conditions. Researchers found that the ballast support offered by the **GEOWEB** System was not affected by the added water.

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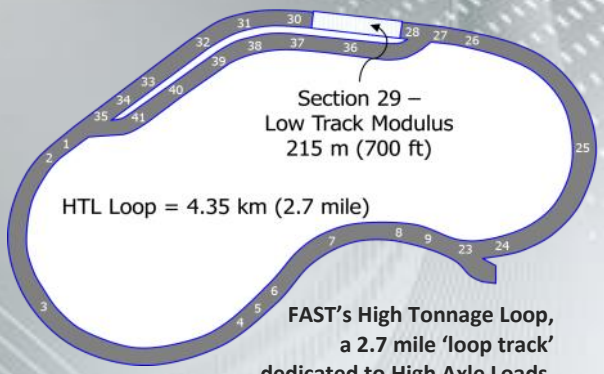
AAR/TTCI GEOWEB TESTING Track Layout



FAST's High Tonnage Loop, a 2.7 mile 'loop track' dedicated to High Axle Loads.
Transportation Technology Center, Pueblo CO

Installation of the GEOWEB sections for the FAST track testing.

GEOWEB® 3D CONFINEMENT SYSTEM

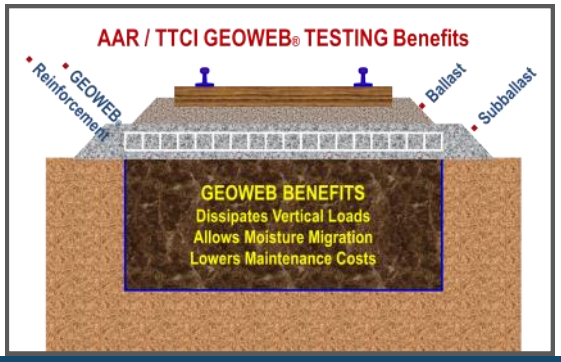
The **GEOWEB**® System is a versatile high density polyethylene (HDPE), 3-dimensional honeycomb-like structure that stabilizes ballast layer in it network of interconnected cells. Loads are spread across the system and the 3D network behaves like a stiff but flexible semi-rigid slab beneath the track surface.

The GEOWEB System prior to this testing had provided excellent load support across soft subgrade conditions for heavy load applications including track subballast , ports and intermodal/bulk handling yards with daily truck traffic and parking, as well as for heavy load and soft subgrade problems for highway and transportation structures.

Prior to installation of the **GEOWEB** System, the unreinforced track over this section of highly expansive clay had required ballast tamping every one million gross tons (MGT) of loading under 315,000-pound car operation. An early testing report of the **GEOWEB** installation prepared by Steve Chrismer at TTCI in *Railway Age* (9/97) noted that the track geometry error was still well within acceptable limits after (at that time) 64 MGT operation without ballast tamping **(already more than 4 times the average reinforcement benefit provided by other geosynthetic products such as geogrids and geotextiles).**

Crismer commented that the testing and track geometry measurements would continue, at least until the track required surfacing so that the actual improvement in tamping cycle can be determined. However, two years later, Steve's successor Joe Lopresti indicated that, after almost 180 MGT, still with only minimal loss of track geometry, TTCI had decided to stop waiting for the track to require resurfacing. They discontinued the testing and eventually removed the **GEOWEB** installation in order to free up this section of soft deformable clay subgrade for other planned projects.

After more than two years torture testing with a total load of 206.6 million gross tons (including the incidental train traffic involved in maintaining the less successful sections) the GEOWEB section continued to perform flawlessly. At the end of TTCI's monitoring, the GEOWEB installation had provided almost 14 times the average reinforcement benefit of other geosynthetic products tested with no indication of reduced system effectiveness or need for ballast tamping. Also, **the permanent track deformation after 180 MGT accumulated load was less than 30% of the allowable deformation margins permitted by the FRA.**



GEOWEB® SYSTEM PERFORMANCE RESULTS

The outstanding performance of the **GEOWEB** Cellular Confinement System in this 'worst case' field testing program conducted by TTCI correlates well with field installations and research programs conducted with the **GEOWEB** Cellular Confinement System for highway and rail applications.

The research at TTCI supports the evidence that the GEOWEB cellular confinement technology offers far greater performance benefits for ballast support applications than geogrids and geotextiles, and it offers a solution for situations where other geosynthetic products fail to deliver long term stabilization.

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