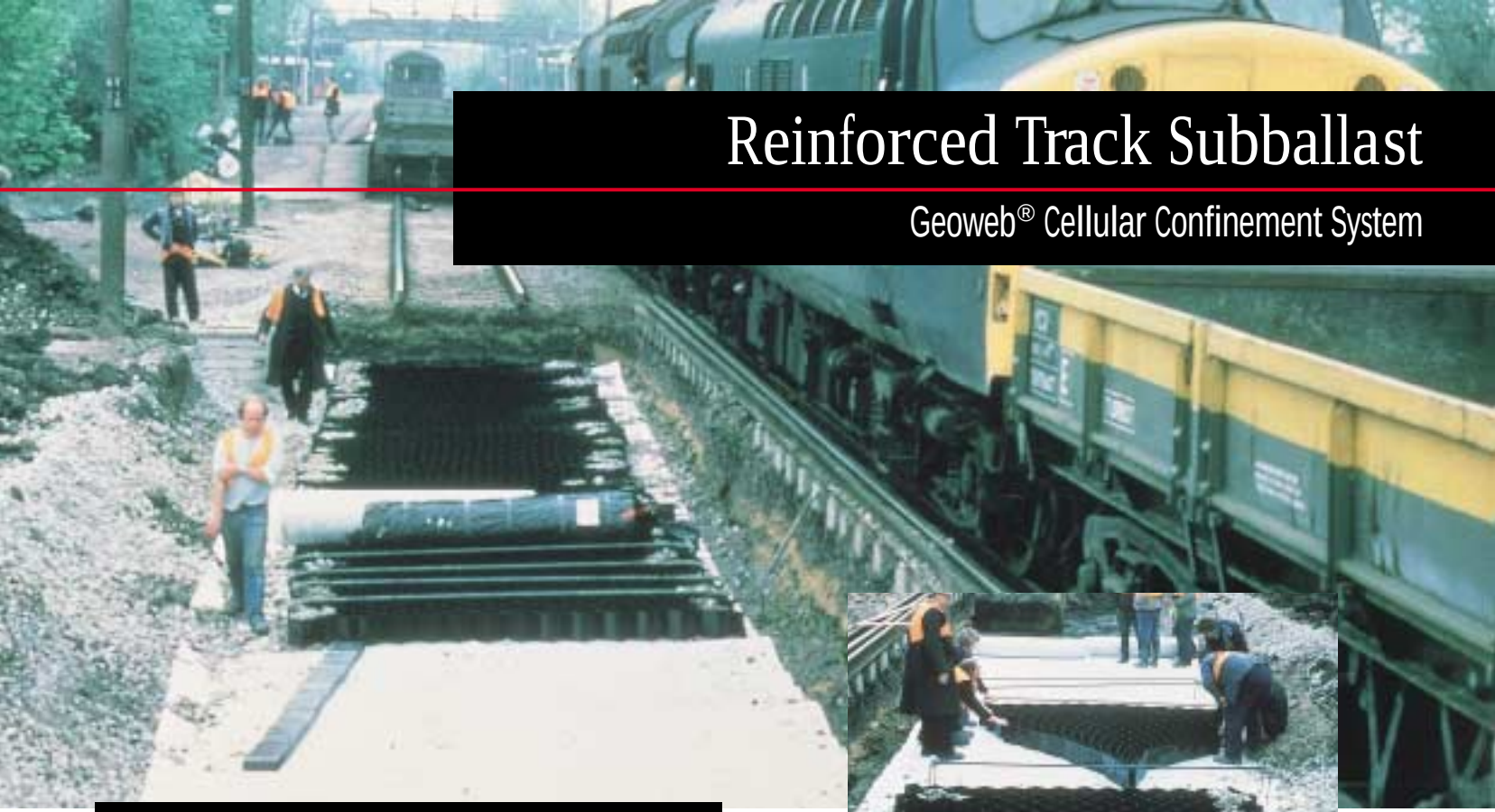
# Reinforced Track Subballast

## Geoweb® Cellular Confinement System





A major problem in the railroad industry - unstable soils. A major solution - the Geoweb® cellular confinement system. By significantly reducing vertical and lateral stresses, the Geoweb system reduces and can even eliminate the cost of dealing with unstable soils. Long-term test results and successful applications worldwide confirm the benefits of the Geoweb system.

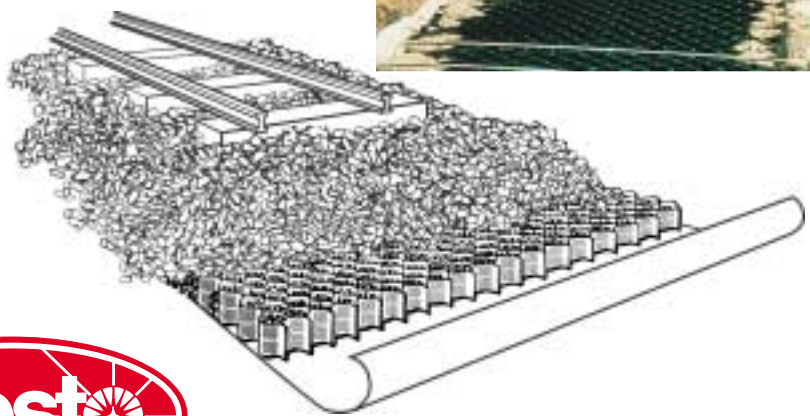
### The Stable Solution

Railway Engineers worldwide have successfully applied cellular confinement technology to 1) strengthen the track structure over weak soils and 2) stabilize soils on adjacent slope and channel embankments.

Presto Products Company and the US Army Corps of Engineers first investigated the concept of cellular confinement in the late 1970's. The engineered system uses a three-dimensional, honeycomb-like structure that confines soil in its cells so the soil functions and performs as you intend it to. Presto's Geoweb system has been successfully engineered to stabilize infill materials for load support, slope and channel protection and earth retention applications.

### Benefits in Load Support

In load support applications, the Geoweb system generates powerful confinement forces and soil-to-cell wall friction creating a load dispersion structure with high flexural strength. The results, significant improvements in the long-term performance of the load support system. The proof, a reduction in the rate of track geometry degradation and measurable lower maintenance costs.



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Leaders In Advanced Geotechnology™

## TESTING PROOF

A 2.5-year under track test at the ***Facility for Accelerated Service Testing at the Transportation Technology Center*** in Pueblo, Colorado yielded the following results, proving the system significantly reduces traffic-induced stresses that negatively effect the track subgrade.

## Direct Comparison

### Unreinforced Layer:

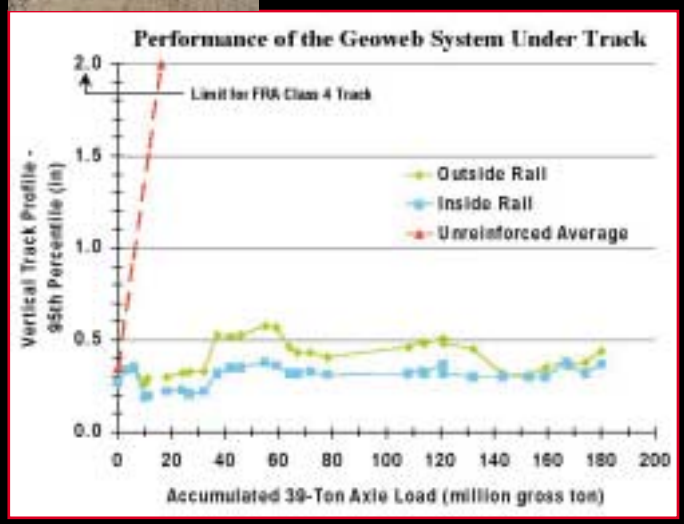
- The soft clay subgrade under an 18 inch thick unreinforced ballast / subballast layer deforms at a relatively rapid rate.
- The unreinforced track structure reaches the maximum vertical profile limit and requires tamping every 15 million gross tons (mgt) on average to maintain Federal Railroad Administration (FRA) class-4 track geometry.

### Reinforced Layer:

- The high stiffness of the subballast layer reinforced with the Geoweb system caused a stress reduction that directly effected the time between required tampings, allowing the tamping cycle to extend beyond 200 mgt of heavy, 39-ton, axle load.

- In the 2.5-year test period, the vertical track profile never exceeded 30% of the allowable FRA class-4 track geometry standard. Clear indications were that the vertical track profile limit would never be reached.

See Graph Results.




The Geoweb system offers significant stabilization of track structures regardless of the loading. Both research and actual installations provide substantiation.

## CASE STUDY 1
### HEAVY-DUTY LOAD SUPPORT
The Burlington Northern Santa Fe Railroad, Lewisville, Texas

### The Problem

A section of the Burlington Northern Santa Fe Railroad (formerly the Atchison, Topeka and Santa Fe) track had a history of track misalignment and weekly maintenance due to settlement caused by the weak clay subbase material. This region experienced many subgrade problems and slides because of the expandable clay. The track, a main artery into Dallas, handled up to three trains per day. Previous methods of stabilization, including pole slide pilings, lime-fly ash injections, and concrete caps had all failed to provide long-term track stabilization.

## CASE STUDY 2
### LIGHT DUTY LOAD SUPPORT
Polish Railway / Region of Zabrzeg, Poland

### The Problem

In the region of Zabrzeg, Poland on the E-65 trunk line, a challenge existed to reinforce a 5-meter high track embankment built over a weak soil base with upper layers of poor quality clay and silt. Considering 1) the need to maintain continual traffic on parallel tracks, 2) short permissible track downtimes, 3) soil excavation up to 2 meter in depth, and 4) environment protection issues, the Geoweb system was chosen as a prototype solution for this track stabilization problem.

## The Installation

The Geoweb material was placed under 300 feet of single-track on a 25-foot high, elevated bridge approach embankment comprised of clay and shale fill. Extensive tamping was required to establish and maintain the track cross elevation.

Rail and ties along with a two-foot deep layer of ballast and sub-ballast were removed over a 300-foot length of track. After grading and leveling, a 20-ounce nonwoven geotextile was installed as a separation layer. Next, a four-inch layer of sand was placed over the geotextile. Geoweb sections were then positioned providing a 20-foot wide bed under the ties. After infilling the sections with limestone screenings, the 6,000 square foot area was compacted. A three-inch surcharge was added, leveled and new track and ties panels were placed. Finally, ballast was dumped and tamped, and the track was leveled and returned to service.

## The Results

This section of track was repaired with the Geoweb system in less than one day, allowing the track to be fully operational the same day. Consistency of the track modulus was maintained after installation, allowing the work order to be lifted and speed returned to its normal 40 mph just 24 hours later. After six weeks, no maintenance was required on this track section that normally required weekly maintenance.

## The Installation

Work on the parallel-track was completed in two stages. Stabilization began under Track 2. After site preparation, the Geoweb sections were placed. In this situation, one long Geoweb section was placed under both tracks. However, only the necessary portion of the Geoweb sections is expanded and infilled under Track 2. The unexpanded portion was buried at the edge of Track 1. After Track 2 was back in service, stabilization began on Track 1. After the subballast under Track 1 had been removed, the buried portion of the Geoweb sections was expanded and infilled with the same clear-stone, creating a uniform stabilizing layer beneath both tracks.

Geoweb sections, covering more than 2,100 square meters were used to stabilize the two tracks. A geocomposite drainage system consisting of sand and sub-drain pipes was placed beneath the Geoweb layer. The improved sub-ballast layer had a total thickness of 0.65 meters.

## The Results

Traffic on both tracks had been limited to a maximum speed of 30 km/h. A few months following installation of the Geoweb system, the results from testing and evaluation gave railroad officials confidence to return the train speed to its normal 120 km/h.

Ease-of-installation of the Geoweb system allowed Polish Rail to complete the project well within their time schedule, and without disruption to traffic on the parallel track. This was the first use of the cellular confinement system in Poland.

CASE STUDY 3

# LOAD SUPPORT AND EMBANKMENT STABILIZATION

Polish Railway / Region of Katowice-Warczawa, Chruszczobrod, Poland



## The Problem

Heavy rains in the region of the Katowice-Warszawa railroad caused a 50-year-old track embankment, consisting of poor quality blast-furnace slag, limestone, clay and mudstone, to deform. Placement and compaction of a clear-stone fill initially eliminated track deflection. Nevertheless, additional slope landslides and clear rifts and gaps caused a reduction of railway speed, ultimately causing the track section to close to traffic.

To remedy this problem, Polish Rail needed to rebuild a safe, stable embankment in the shortest possible time. The Geoweb system was chosen and used to strengthen and stabilize the track sub-ballast as well as the embankment slope.

## The Installation

The project was completed in two stages; 1) rebuilding the track ballast so the track could be put back in operation and 2) rebuilding the embankment slope by stabilizing the upper slope and installing a retaining wall along the toe of the slope, both with the Geoweb system. A total of 4,000 square meters of the Geoweb system was used for the slope protection and earth retention systems.

## The Results

This project was also completed within Polish Rail's time schedule because of ease-of-installation. Three weeks after traffic restoration, train speed was increased from 15 km/h to 30 km/h. A few months later, railway traffic was restored to its normal speed of 120 km/h. In contrast to conventional engineering requiring deep-soil excavation, this problem was solved at a lower cost and in a shorter timeframe.

## Presto's Commitment

Presto offers solutions to plaguing soil stabilization problems through the engineered Geoweb cellular confinement system. Our commitment to help solve your site problems begins with understanding your needs, providing design assistance and continuing through installation support. Contact the leaders in the industry when you need a long-term solution that will stand the test of time. Contact Presto.



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