

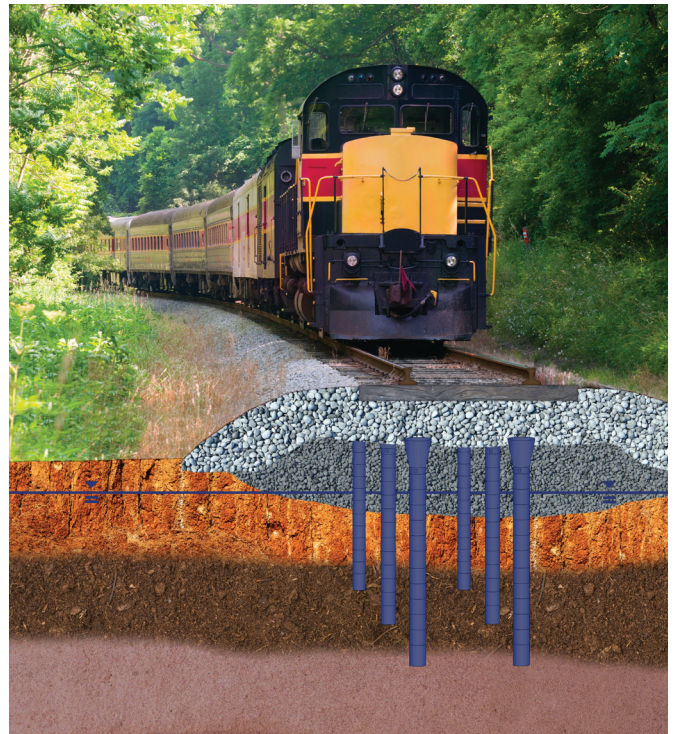
THE GEOPIER GEOSPIKESM SYSTEM

INTERMEDIATE FOUNDATION[®] SOLUTIONS



The Geopier GeoSpikeSM system is a patented, low-cost method for strengthening weak railroad track subgrades. This turnkey system creates strong elements in weak subgrade soils, and can be installed without removing railroad tracks, ties or ballast. Geopier licensed crews drive the pre-manufactured polymer shells in pairs between rail ties at regular intervals. The shell is driven in-place by inserting a driving mandrel within the shell and advancing the mandrel to design depths. The expanded top of the shell compresses between ties during insertion and expands back to its original shape after clearing the rail ties to allow for efficient load transfer from the ballast to the GeoSpike system. After driving to design depths, aggregate is placed within the confining GeoSpike shell. The dynamic loads from the passing rail cars arch through the ballast and are effectively transferred through the shell and densely compacted aggregate down to a suitable bearing layer.

Rail owners, contractors, and designers use the Geopier GeoSpike system to improve the railroad track subgrade modulus and decrease permanent track settlements.



ADVANTAGES OF THE GEOSPIKESM SYSTEM

- **STRONG AND STIFF** The stiff confining GeoSpike shell results in high stiffness and high strength elements that provide support capacity and stiffer subgrade response under cyclic rail car loading.
- **EFFICIENT** The patented installation process allows for in-place remediation and reinforcing of soft railroad track subgrades.
- **ENGINEERED** Projects are engineered in-house by Geopier professional engineers, allowing for rapid response when needs arise.
- **ADAPTABLE** GeoSpike systems can be lengthened or shortened in the field to accommodate variable subgrade conditions.
- **EXPEDIENT** Rapid installation process means shorter construction schedules and minimal downtime of working railroad lines.
- **ECONOMICAL** Life cycle cost savings are realized by reducing the need to re-build and repair track sections constructed over poor subgrade.

THE CONSTRUCTION PROCESS

The patented Geopier GeoSpikeSM installation process displaces soil during installation and utilizes vertical impact ramming energy to construct Rammed Aggregate Pier[®] elements that exhibit superior strength and stiffness in soft soils. Geopier GeoSpike solutions are designed to reinforce weak rail subgrade soils to increase the track subgrade modulus and reduce deflections that occur under dynamic loading conditions.

1. Geopier licensed crews place the GeoSpike on the specially designed tapered mandrel and drive the shell into the ground using a strong static force augmented by high frequency vertical ramming energy. The patented shape of the GeoSpike shell is designed to squeeze between closely spaced railroad ties and expand back out once driven to the design depth. To prevent damage to the shell during routine ballast maintenance, the top of the shell is embedded below ties to depths of 12 to 18 inches.
2. After driving to the design depth, the confining shell remains in place. The shell is then backfilled with small diameter aggregate placed in lifts and compacted with the driving mandrel. The process creates dense, high stiffness elements that offer superior strength and performance by transferring dynamic loads from passing rail cars through the poor subgrade down to a suitable bearing layer.
3. The installed elements significantly improve the subgrade modulus to effectively decrease the cyclic deflections of the track from passing wheel loads and reduce the permanent settlement of the track over its lifetime.



*St Clair Sub
Sarnia, Ontario*

GEOPIER[®] APPLICATIONS

Geopier systems have become preferred replacements for massive over-excavation and replacement or deep foundations, including driven piles, drilled shafts or augered cast-in-place piles. Local Geopier engineers and representatives work with you and your specific soil conditions and loads to engineer a project-specific practical solution to improve your ground. With multiple systems we are able to engineer support for virtually any soil type and groundwater condition across many applications, including:

- ▶ Foundations
- ▶ Floor Slabs
- ▶ Industrial Facilities
- ▶ Storage Tanks
- ▶ Liquefaction Mitigation
- ▶ MSE Walls/Embankment Support
- ▶ Slope Stabilization
- ▶ Railway Subgrade Stabilization
- ▶ Transportation
- ▶ Wind Turbines
- ▶ Uplift & Lateral Load Resistance

Geopier Foundation Company developed the Rammed Aggregate Pier[®] (RAP) system to provide an efficient and cost effective Intermediate Foundation[®] solution for the support of settlement sensitive structures. Through continual research and development, we've expanded our system capabilities to offer you more. Our design-build engineering support and site specific modulus testing combined with the experience of providing settlement control for thousands of projects provides an unmatched level of support and reliability to meet virtually all of your ground improvement challenges.

Work with regional engineers worldwide to solve your ground improvement challenges.

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GEOPIER[®]
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