

# THE GEOPIER IMPACT® SYSTEM

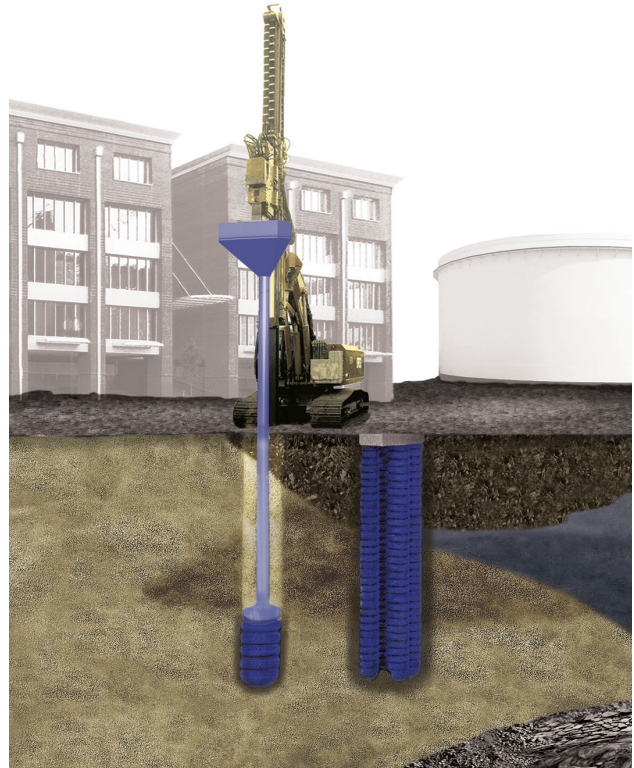
## INTERMEDIATE FOUNDATION® SOLUTIONS

### IMPACT®

The Geopier Impact® system creates Rammed Aggregate Pier® (RAP) elements using a patented vertical ramming process. The Geopier Impact system uses a patented displacement mandrel to reinforce good to poor soils, including loose sand, soft silt and clay, mixed soil layers, uncontrolled fill, contaminated soils and soils below the groundwater table. The displacement process allows for installation with no spoils and eliminates the need for casing. Its performance and cost-effective qualities make it the ideal solution for soils that are subject to caving.

The RAP elements are constructed by applying direct vertical ramming energy to densely compact successive lifts of high quality crushed rock to form high stiffness engineered elements. The vertical ramming action also increases the lateral stress and improves the soils surrounding the cavity, which results in foundation settlement control and greater bearing pressures for design.

In soft or organic soil, the addition of grout to the Impact process stiffens the pier and provides improved long term confinement. During installation, cement grout is introduced into the hollow mandrel and filled to a prescribed depth. Aggregate is then placed into the mandrel and the combination grout/aggregate is used in the RAP element construction. The ramming of the grouted aggregate causes pre-stressing and pre-straining of the matrix soils, improves the density of the granular materials, and increases the lateral stress in surrounding soil.



The grout binds the compacted aggregate together, and strengthens the pier through weak soil zones or organic layers.

#### ADVANTAGES OF THE IMPACT® SYSTEM

- ▶ **PRACTICAL** Vertically ramming thin lifts of aggregate provides high strength and stiffness. The Impact system eliminates casing and allows for construction in caving soils and high groundwater table sand.
- ▶ **DEPTH** The Geopier Impact system expands RAP treatment depths to more than 40 feet.
- ▶ **STRONG AND STIFF** Vertical impact ramming results in high density and high strength RAP elements providing superior support capacity and excellent settlement control. Additionally, cementitious mixtures may be added to improve stiffness and support as well as reduction of contamination migration.
- ▶ **VERSATILE** The Geopier Impact system can be used for various of soil and groundwater conditions, including deep treatment for liquefaction.
- ▶ **PROVEN** Thousands of structures are currently supported – proven experience that ensures high levels of performance and reliability.
- ▶ **ECONOMICAL** Often results in 20% to 50% savings compared to traditional deep foundation alternatives.
- ▶ **FAST** Rapid installation process means shorter schedules.
- ▶ **ENGINEERED** Projects are engineered in-house by Geopier Professional Engineers, allowing for rapid response when design or construction changes arise.

## THE CONSTRUCTION PROCESS

The unique installation process displaces soil during installation and utilizes vertical impact ramming energy to construct RAP elements, which exhibit unsurpassed strength and stiffness. RAP solutions are designed to provide total and differential settlement control and increase bearing support to meet project requirements. In liquefiable conditions, Geopier Impact elements are used to increase the resistance to liquefaction and limit dynamic settlement.

1. A specially designed, patented mandrel and tamper foot is driven into the ground using a strong static force augmented by dynamic vertical impact energy. Depths normally range from about 10 to 40 feet, depending on design requirements. A sacrificial cap or internal compaction mechanism prevents soil from entering the tamper foot and mandrel during driving. The process eliminates spoils and displaces soils laterally, densifying and reinforcing soils.
2. After driving to design depth, the hollow mandrel serves as a conduit for aggregate placement. Placed inside, the aggregate flows to the bottom of the mandrel. The tamper foot and mandrel are then raised approximately three feet and then driven back down two feet, forming a one-foot thick compacted lift. Required compaction strokes are developed on-site to provide site specific construction procedures. Compaction is achieved through static down force and dynamic vertical ramming from the hammer. The process densifies aggregate vertically and the patented beveled tamper foot forces aggregate laterally into cavity sidewalls. This results in excellent coupling with surrounding soils and reliable settlement control with superior strength and stiffness.
3. Following installation, RAP elements support shallow foundations and floor slabs, reduce liquefaction potential, and improve stability support of embankments, walls and tank pads. The footing stresses are attracted to the stiff RAP elements, resulting in engineered settlement control.

## 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
- ▷ 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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