

## THE GEOPIER X1<sup>®</sup> SYSTEM INTERMEDIATE FOUNDATION<sup>®</sup> SOLUTIONS



The Geopier X1<sup>®</sup> system creates Rammed Aggregate Pier<sup>®</sup> (RAP) elements using a vertical ramming process which is a combination of both replacement and displacement methods.

This unique system builds RAP elements to reinforce good to poor soils, including loose to dense sand, soft to stiff silt and clay, mixed soil layers, organic silt and peat, and variable, uncontrolled fill. The process allows for construction flexibility and the ability to construct through caving zones that are encountered during drilling operations. Like the original Geopier systems, the X1 system's drilling operation allows for visible inspection of the hole and the opportunity to address changing ground conditions as they happen. Its performance, flexibility, and cost-effective qualities make it the ideal solution for reinforcing a variety of different soil types.

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.



### ADVANTAGES OF THE X1<sup>®</sup> SYSTEM

- ▶ **STRONG AND STIFF** Vertical impact ramming results in high density and high strength RAP elements providing superior support capacity and excellent settlement control.
- ▶ **DEPTH** Drilled RAP treatment depths of 40 feet or more.
- ▶ **QUALITY** Superior on-site quality control is maintained through full-time quality control personnel to observe, inspect and test the system, including visual spoil observation and full-scale modulus load tests.
- ▶ **VERSATILE** Can be used for various soil and groundwater conditions.
- ▶ **FAST** Rapid installation process means shorter construction schedules.
- ▶ **ECONOMIC** Often results in 20% to 50% savings compared to traditional deep foundation alternatives.

## THE CONSTRUCTION PROCESS

RAP solutions are designed to provide superior total and differential settlement control and increased bearing support to meet project requirements.

1. The process first involves drilling a cavity. Drill depths normally range from about 5 to 40+ feet, depending on design requirements. Pre-drilling allows you to see the soil between the borings, ensuring that the piers are engineered to reinforce the right soils.
2. Layers of aggregate are then introduced into the drilled cavity in lifts. A patented chamber compaction head allows lifts of aggregate to flow to the bottom of the hole allowing for fast pier construction.
3. Compaction is achieved through static down force and dynamic vertical ramming from the hammer. The process densifies aggregate vertically and the patented compaction head forces aggregate laterally into cavity sidewalls. This results in excellent coupling with surrounding soils and reliable settlement control with superior strength and stiffness.
4. 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
- ▷ MSE Walls/Embankment Support
- ▷ Floor Slabs
- ▷ Slope Stabilization
- ▷ Industrial Facilities
- ▷ Transportation
- ▷ Storage Tanks
- ▷ Wind Turbines
- ▷ Liquefaction Mitigation
- ▷ Uplift & Lateral Load Resistance



*Fairfax County Public Safety Center and Parking Headquarters  
Fairfax, Virginia*



*Refrigerated Distribution Center for U.S. Cold Storage  
Covington, Tennessee*



*Carus Well Pad Slope Stabilization  
Near Killdeer, North Dakota*



*All-Care Animal Hospital Addition  
Fountain Valley, California*

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.

# GEOPIER®

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