



Geopier®

Replacement Rammed Aggregate Pier®

RAP



Geologic Hazard Application

-  Soft/Loose Soil
-  Slope Stability

Depth Limit
25 ft (8 m)

Compatible Soils

- Silt (ML, MH)
- Clay (CL, CH)
- Clayey Sand (SC)
- Silty Sand (SM)
- Undocumented Fill

Bearing Capacity Range
5,000 psf (239 kpa)
to
9,000 psf (431 kpa)

Key Advantages

- Cost effective support
- Readily available material
- LEED opportunity
- High bearing capacity
- Uplift-tension hold-down

Key Considerations

- Vibration system & Low noise
- High spoil haul-off
- Casing at high ground water sand
- Moderate depth limit

Comparable To

- Overex/replace
- Concrete piers
- Driven piles
- Stone columns
- Soil-cement columns

Overview

Geopier®, a Rammed Aggregate Pier® system, (RAP) is a replacement, aggregate pier, ground improvement method used to improve shallow to intermediate soft clay, soft loose silt, and loose sand soil for support of shallow foundations. RAP improves soft soil and fill by vibration, compaction, and ramming of thin lifts of select crushed rock into a drilled hole. Soft soil is drilled out and removed from the ground and then high quality crushed rock is compacted into very dense lifts in the drilled hole which expands the hole into the adjacent soil. The compaction and ramming of thin lifts of crushed rock creates a cavity expansion effect that increases the adjacent soil strength and stiffness, increases soil bearing capacity, and reduces soil compressibility. RAP construction is low to moderate vibration with moderate noise. RAP are installed relatively fast compared to deep piles. RAP improved soil can support heavier loads on conventional shallow spread and strip footings with reduced settlement.

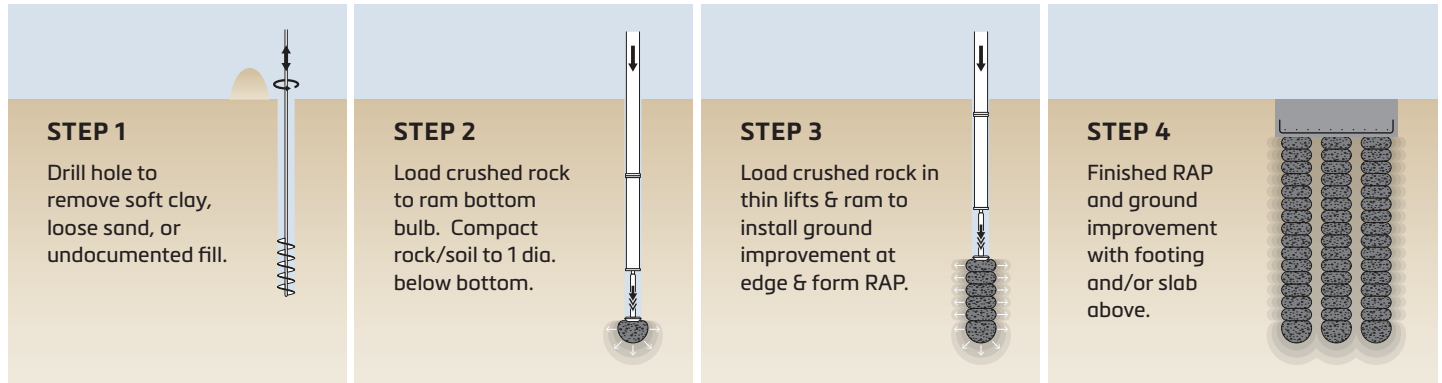
RAP Applications

Support footings, slab-on-grade, structural mats, embankments, MSE walls, and industrial foundations. The ideal applications for RAP occur at:

- 1) Soft clay, silty clay, silty and sandy clay, and loose soil sites.
- 2) Undocumented fill sites.
- 3) Sites where LEED® points are desired using recycled concrete.
- 4) Sites where drilled holes will stand open during construction.
- 5) Sites near occupied offices and in dense urban areas.



RAP 4-Step Construction Process



Technical Details

The **Geopier®, Rammed Aggregate Pier® system (RAP)** provides excellent ground improvement support of shallow foundations. The patented RAP ramming tool is beveled to deliver horizontal and vertical forces onto thin lifts of select crushed rock and into the soil at the edges of the drilled hole. The ramming effect results in coarse sided finished RAP that have finish diameters greater than 100% of the neat drill diameter. This compaction and ramming produces cavity expansion effects that 1) increase the shear strength, 2) increase over consolidation, 3) reduce void ratio, and 4) increase stiffness & modulus of the composite soil. RAP behavior exhibits high side friction along the edges because of the bonding of the crushed rock with the soil. As RAP is loaded, high friction forces at the edges resist load and push the footing stresses out and lower into the soil/RAP profile. A RAP is akin to a stiff spring that is confined in a soft spring matrix, where the stiff spring attracts load, bulges and sheds load, and resists compression by virtue of the very compact and very dense RAP.

Most RAPs are 7 to 25 feet (2.1 to 7.6m) deep and occupy between 15% to 30% of the footing bottom. RAPs can be installed with recycled concrete to qualify for sustainability and LEED® points. RAPs can be equipped with steel rebar to resist net tension forces. Full-scale load tests are performed on RAP projects to confirm RAP design bearing capacity and tension resistance.

Farrell uses excavators with hydraulic rammer attachments to install RAP. The ramming attachment and tool are designed to compact a loose 18" to 24" (457 to 610mm) lift of crushed rock to 12" (305mm) thick. Farrell installs RAP diameters of 18" (457mm), 24" (610mm), and 30" (762mm).

Geopier® RAP is a cost effective, settlement control, ground improvement that supports your project to ***Go Vertical with Confidence.®***

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Geopier systems by Farrell in Northern California.
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Testimonial



UC Davis Brewery/Winery
and Food Pilot Facility
Davis, CA

"The recycled concrete content in the Geopiers really made this a double win as we saved money for the project instead of using concrete drilled piers and we enhanced sustainability for the project."

John Westphal, SE
KPW Structural