

## RIGID INCLUSIONS

Rigid inclusions are ground improvement elements used to transfer loads through weak, compressible soils to deeper underlying competent soils. Geopier® rigid inclusions are comprised of plain concrete, aggregate/grout mixture, or cement-treated aggregate. Geopier offers several rigid inclusion technologies, including cement-treated aggregate GP3® Piers, Grouted Impact® Piers, and GeoConcrete® Columns (GCC).



Geopier Grouted Impact® Rigid Inclusion System



Geopier GeoConcrete® Column (GCC) Rigid Inclusion System

*Geopier's geotechnical engineers can combine rigid inclusions with any of our proprietary systems to deliver the most cost-efficient design-build ground improvement solution for your project.*

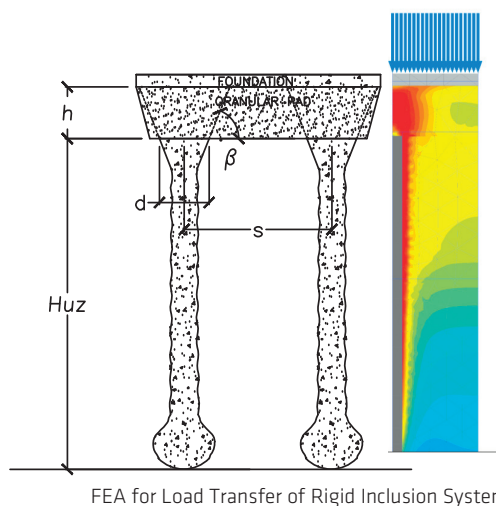
### WHY SHOULD YOU SELECT GEOPIER® RIGID INCLUSIONS?

- **ALTERNATIVE TO DEEP FOUNDATIONS** Rigid inclusions are an economical alternative to deep foundations (such as driven or drilled piles) and can be used to support conventional shallow footings, slab-on-grade foundations, and embankments. Rigid inclusions are not structurally connected to the foundation, so they eliminate the need for heavily reinforced pile caps, grade beams, and structural slabs.
- **SUBSURFACE CONDITIONS** Rigid inclusions can be used to increase bearing capacity and minimize total and differential settlements in most soil conditions. Rigid inclusions are especially suitable in soft soil profiles, such as peat or organics, and soft silt or clay.
- **ADVANTAGES OF INSTALLATION** Geopier's rigid inclusion systems are installed using patented displacement methods that generate little to no spoils. The fast production rates can reduce the foundation construction schedule by up to half the time as compared to deep foundations and structural slabs. The construction methods do not require dewatering.

# GEOPIER® RIGID INCLUSIONS

## GEOPIER'S DESIGN APPROACH

Rigid inclusions have the capacity to support heavily loaded foundations, slabs, and embankments. Geopier engineers perform advanced numerical modeling to evaluate the load transfer mechanisms and column stresses. The spacing and length of the rigid inclusions are controlled by both the structural and geotechnical capacity of the elements. Most of the applied loads are transferred to the rigid inclusions and some of the load is transferred to the surrounding matrix soils. The rigid inclusions and matrix soil share the load based on their relative stiffness and load-carrying capacity. An engineered granular pad may be used above the rigid inclusions to facilitate load transfer to the stiffer elements, as well as to serve as a shear break between the foundation and rigid inclusion elements.



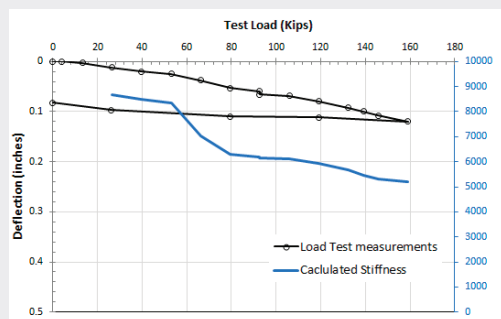
FEA for Load Transfer of Rigid Inclusion System

## QUALITY CONTROL

Geopier's rigid inclusion systems allow for robust quality control monitoring during the construction process, ensuring the installation of a high-quality ground improvement product. A full-scale load test is performed to 150 to 200% of design capacity on a test pier, depending on the project needs.

## LOAD TEST RESULTS

The results of a full-scale load test on an 18-in. diameter GeoConcrete® Column (GCC) are provided here. The GCCs penetrate 9 feet of granular fill over 36 feet of soft, saturated organic silt and peat to tag medium dense to dense sand. The load test results demonstrate the high capacity of the rigid inclusion, and provide a site-specific field measurement of the element stiffness.



Results of a Geopier GeoConcrete® Column Load Test

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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