

TECH NEWS

TECHNOLOGY NEWS

May–June 2005

Highway applications for aggregate columns

Aggregate columns can be a cost-effective option for improving soil's bearing capacity, reducing settlement, and/or stabilizing slopes without a lot of excavation. They have been successfully used in several transportation-related projects in Iowa.

An *in situ* ground improvement technique

Aggregate columns are generally constructed by creating a hole and filling it with crushed rock or other aggregate material. ("Stone columns" are generally created by vibrating a probe into the ground through which aggregate is fed into the soil.)

Iowa's homegrown system

In the 1980s, Dr. Nathaniel Fox, a civil engineering alumnus of Iowa State University, developed a system of soil reinforcement that eventually became Geopier® Rammed Aggregate Piers™.

In Fox's system, stiff aggregate piers consisting of thin, compacted layers of crushed rock are created by drilling 10- to 25-foot-deep holes, about 30 inches in diameter, in the ground. Crushed rock is placed in layers in the hole and rammed with a special beveled tamper, one foot at a time.

The Geopier® soil reinforcement system works especially well in cohesive soils like silt and clay, where it provides positive settlement control. Such systems can be installed in tight places because the equipment is small.

Geopier® systems are especially cost-effective when the project requires excavation of more than 8 or 10 feet. They may not be as cost-effective when excavating granular materials under the water table or when the piers need to be embedded more than 20 or



Placement of aggregate in drilled hole and special beveled tamper used for compaction (Geopier® system)



Drilling a Geopier® foundation

25 feet due to soft underlying materials.

Highway applications

In Iowa, aggregate columns have been used in transportation applications primarily to support the soil under mechanically stabilized earth (MSE) retaining walls and to support slope embankments. Specifically, Geopier® systems have been used in the following transportation-related projects:

- stabilizing and controlling soil settlement for highway approach ramps below an MSE wall on the 50th Street bridge in West Des Moines
- reducing the lateral stresses adjacent to a railroad tunnel culvert in Madrid
- stabilizing an active landslide adjacent to P48 in Dallas County
- reinforcing weak foundation soils and supporting a track for a railroad line in Cedar Rapids



Geopier® tamping equipment

For more information

Some Iowa DOT project lettings include special provisions related to bearing capacity, settlement, and/or slope stability problems that allow "intermediate foundation improvements"—the Geopier® system or other aggregate column system contractors—to bid on the project. To learn more, contact Bob Stanley, Iowa DOT soils design engineer, 515-239-1026, robert.stanley@dot.iowa.gov.

Geopier® Rammed Aggregate Piers™ are patented internationally. The only certified contractor in Iowa is Peterson Contractors, Inc. (PCI) of Reinbeck, Iowa. For information, contact Dick Gernant, 515-224-6130, dgernant@geopiers.com.

The Iowa Highway Research Board (TR-443) sponsored a project to evaluate highway applications of Geopier® Rammed Aggregate Piers™. The project was conducted by John Pitt and David White, associate and assistant professors, respectively, in ISU's Department of Civil, Construction and Environmental Engineering. The report is online, www.ctre.iastate.edu/research/detail.cfm?projectID=254.

For more information, contact White, 515-294-1463, djwhite@iastate.edu.
