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► **GEOPIERS:** New soil reinforcement system gains momentum.



► **COST CONTROL:** Intermediate foundation system saves companies time and money on construction.

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GEOPIERS: Soil reinforcement technology reduces settlement, offers time and cost advantages.

Technology

SHORTER PILES HAVE DEEP IMPACT

CONTRACTORS EXPECT TO SHAVE CLOSE to 30% off the schedule to install foundations for two buildings at the Redstone Arsenal in Alabama with an innovative system to replace deep piles and large shallow footings. Using the intermediate length aggregate piers could also cost 50% less than caissons recommended by the Army Corps of Engineers.

Accelerating construction of the fast track, design-build project was a major consideration in choosing the relatively unknown method, says Carl Siddall, president of Universal Construction Co., Huntsville, Ala., a subsidiary of New York City-based Turner Corp. As the general contractor, Universal has 510 days to complete the \$28 million project, which includes a three-story steel-frame building and a four-story concrete frame building. "We had a soil problem," says

Siddall. "We weren't familiar with this system, but it offered a solution with time and cost advantages." The intermediate foundation system, called Geopiers, is the brainchild of Nathaniel Fox, president of Geopier Foundation Co. Inc., Stone Mountain, Ga. "It is simply a soil reinforcement system that reduces settlement," says Fox, although the actual construction process is patented.

Aggregate piles and caissons are replaced by drilling either vertical or linear cavities up to 9 ft deep. The soil in the cavity is densified and prestressed in a bulb-shaped area at the bottom by stressing the soil. The bottom is filled with aggregate and tamped with a modified hydraulic hammer. The tamper has a beveled edge, which provides a horizontal force and pushes the stone into the sides of the cavity. "The amount of stress

is higher than the load the foundation will actually carry," says Fox.

The size of the bulb depends on the soil conditions. Above the bulb area, 1 ft. layers of well-graded aggregate are added and tamped with the same tamper. Pushing the stone against the side of the hole creates a permanent lateral stress in the soil. "The soil actually pushes back. It's as if a hand were gripping the pier," says Fox.

The system cannot replace all deep foundations," says Fox. The piers are limited by the load they carry, and would be economically feasible in about 30 percent of foundations requiring deep piles. It can support up to four stories in poor soils and up to 20 stories in good soils.

The Geopier system was the 1993 winner of the NOVA award, and is beginning to be accepted around the country. Billings in 1996 will exceed \$3 million, up from around \$250,000 in 1993. □