

CBE

CALIFORNIA BUILDER & ENGINEER

Serving California and Hawaii

April 21, 2003



Reed Construction Data



U.C. Davis Soil Stabilization

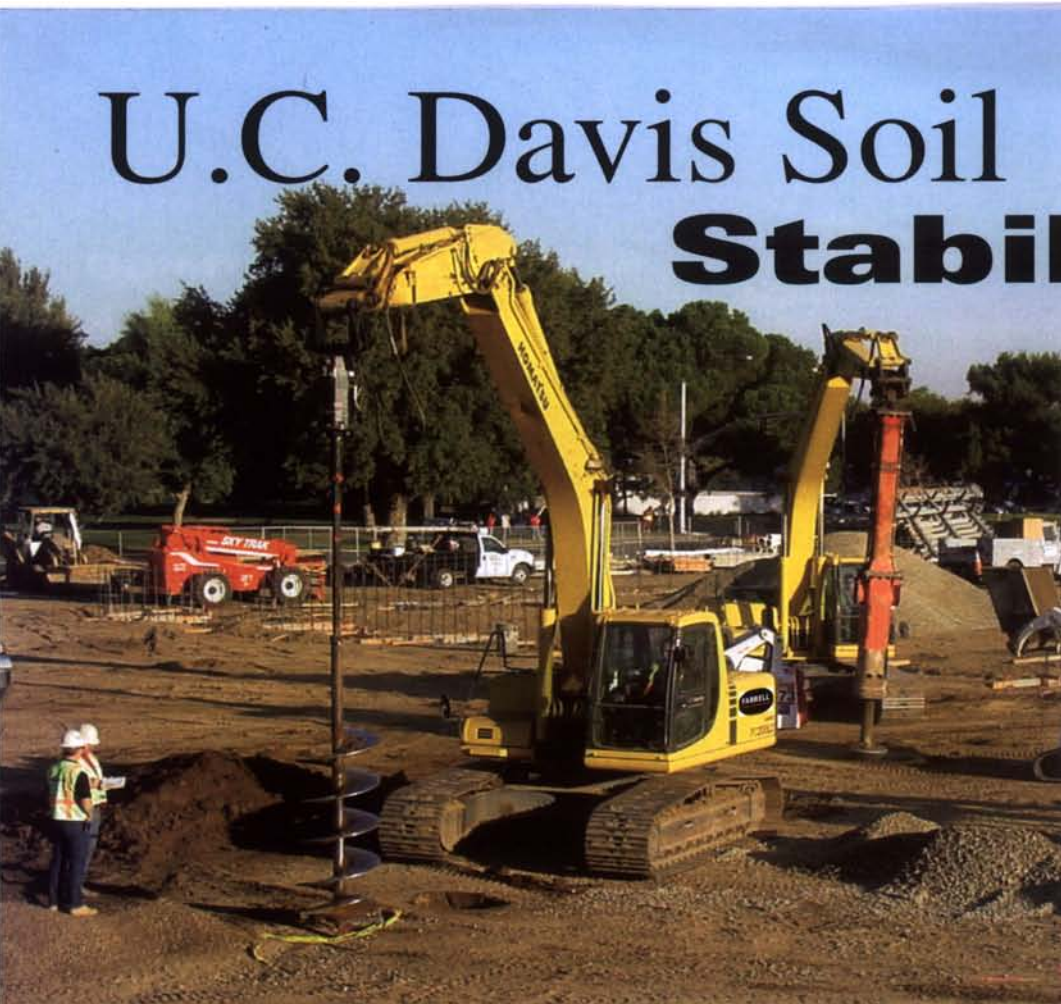
***AUTO**5-DIGIT 95667
CBE 438013 NORTH 09/18/01
MICHAEL FARRELL SEC/TREAS
FARRELL DESIGN BUILD COMPANIES INC
PMB 382
685 PLACERVILLE DR
PLACERVILLE CA 95667-4231

P3

**FOCUS:
Attachments**



U.C. Davis Soil Stabilization



Weak soil and other challenges require special approach for new building foundation construction.

■ *By Carol Carder*

Above: Weak upper soils consist of 12 feet to 15 feet of interstratified loose silty sand and soft silt and clay.

Below: To construct each pier, a 30-inch-diameter shaft is drilled to the design depth below spread footings. 577 Geopier elements were installed.

“Growth in both the student body and faculty research is fueling construction activity on our campus,” says Alex Achimore, University of California Davis project manager. McCarthy Building Companies Inc. of Sacramento recently finished the Mondavi Performing Arts Center and broke ground last June on the 155,000-square-foot \$46.5-million recreation center. According to Chancellor Larry Vanderhoef, the university’s Long Range Development Plan is addressing land and quality issues to accommodate an expected student body of 31,000 students by 2015. The new center sits adjacent to the recreation hall built 30 years ago when the student population numbered 18,000 and will link to it by a second floor bridge.

The site challenged both the contractor and engineer designers. McCarthy

faceted construction on a tight site traversed by active utilities and an active sanitary sewer that couldn’t be imme-



diately removed from service. Kleinfelder Inc. of Sacramento identified weak upper soils consisting of 12 feet to 15 feet

of interstratified loose silty sand and soft silt and clay. One solution for supporting the building loads considered by John A. Martin & Associates Inc. of LA was concrete drilled piers with a structural slab. Other approaches recommended by Kleinfelder to support spread footings were over excavation and recompaction of the weak soil or an innovative intermediate foundation, the design-build Geopier soil reinforcement system from Geopier Foundation Company Inc.’s design-build licensee, Farrell Design-Build Companies Inc. of Placerville, California.

To the layperson the Geopier system resembles underground shafts of compacted gravel. However, this patented design-build system of multiple Rammed Aggregate Piers is a precise engineered product custom designed by local

Geopier licensees to the site conditions, structural requirements and desired load-bearing capacity. To construct each pier, the licensed installer drills a 30-inch-diameter shaft to the design depth below spread footings. Then, a modified hydraulic hammer rams 12-inch lifts of 3/4-inch class 2 aggregate baserock into the ground at 1 million to 1.5 million foot-pounds of energy per minute. The hammer's beveled tamper compacts the gravel vertically and horizontally into the ground increasing lateral stresses and reinforcing the surrounding soil.

Ken Sorensen, GE, senior geotechnical engineer at Kleinfelder, recommended Geopiers to UC Davis as a value engineering alternative to concrete drilled piers since the system can save both time and cost under the right conditions. "Good progress on 25-foot to 30-foot deep, 3-foot to 6-foot diameter, belled concrete piers is generally about four to seven per day while the Geopier elements are much faster to install," he explains. "On a typical Geopier project, an average of about 40 Geopier elements can be installed in a single day." However, because the Geopier system is proprietary, McCarthy solicited bids for UC Davis on both the Geopier Rammed Aggregate Piers and the alternative over excavation and recompaction of the 12-feet of weak soil.

In construction time is money, both in saved construction costs and in giving the owner earlier occupancy of the building. According to Dana Metoyer, project manager at McCarthy, the Geopier alternative saved \$300,000 compared to the over excavation method. Sorensen explains, "The Geopier system shaved two months off the construction schedule, and if you think about costs of two months of equipment and overhead on a job site, you save a ton of money." Sorensen adds that he has worked with Geopier systems on a dozen projects and on every one the method increased the speed on the schedule. "That's one reason this method is catching on in California," he adds.

Sorensen was involved in a design-build capacity with McCarthy and Farrell on the six-story 13th and P Street

Parking Garage in Sacramento, a 1999 Geopier-supported project. While working for another geotechnical firm, Sorenson participated in quality control (QC) observation and testing of the piers at the Historic Sacramento Hall of Justice four-story addition built by John F. Otto Inc. of Sacramento in 1997. He also participated in QC work in the 2000 construction of the twin six-story Sybase towers in Dublin, California, where DPR Construction Inc. of Redwood City and Farrell value engineered the Geopier system. Mike Majchrzak, Ph.D., GE, of Kleinfelder's Pleasanton, California, office was the project manager on this project.

At UC Davis, the Geopier system enabled McCarthy to straddle the existing sanitary sewer that serves the north end of the campus. "We have a long lead before we can cut in an alter-

nate sewer lift station to replace this line," Achimore explains. "By moving some of the piers we were able to proceed with the foundations in a timely manner."



Above: A modified hydraulic hammer rams 12-inch lifts of 3/4-inch class 2 aggregate baserock into the ground at 1 million to 1.5 million foot-pounds of energy per minute

Below: Pressure is measured. Interior column loads were on the order of 15 to 900 kips.



Soil **Stabilization**

According to Metoyer the speedy installation of the 577 11-foot deep Geopier elements helped McCarthy beat the weather. "The Geopier installation finished in October; we did our slab on grade in November, and were ready to rock and roll with the structural steel December 16," Metoyer says. The contractor is on schedule and on budget to finish for a spring 2004 opening.

From the architectural viewpoint, this building is challenging. Marion LaRue, associate vice president of Cannon Design, Los Angeles, observes, "This 'Fusion' building is a new type of building on the architectural horizon as it combines a free zone for student union activity and a controlled access zone for recreation." Cannon Design met the challenge of visually unifying the diverse components with two wings enclosing a central courtyard that can serve as leisure or small class space. The design blends with the adjacent painted block

recreation hall, also designed by Cannon Design, by the texture and natural color of the exterior cladding of split face and ground face block.

The public access zone will house a ballroom with meeting rooms, mini-conference center and a lobby lounge with food service. The controlled access zone will house four basketball courts, lockers, weight room, eight racquetball courts, three multi-purpose dance or aerobic studios, student club offices, and a music library, storage and office space for the CAL AGGI band.

"Although we have been designing and building Geopier systems since 1995 in Northern California, owners



Rendering of new U.C. Davis building.

and engineers are just now realizing the savings, benefits and other advantages such as seismic design that the Geopier system brings to the table," says Tom Farrell, MS, GE and president of Farrell Design-Build. Farrell has designed and built Geopier Rammed Aggregate Pier support for buildings ranging from one-story concrete tilt-ups to multi-story parking garages to 10-story hotels in San Francisco. □

*Design-Building Stability for the Future ...
Retrofitting Old Foundations into New ...*

FARRELL *DESIGN-BUILD*
Companies, Inc.
47251 A+B

*Optimizing Investments
Below the Ground!*

Farrell Design-Build Companies, Inc. (530) 621-4867 phone
685 Placerville Drive (530) 621-4837 fax
Placerville, CA 95667

Visit us at www.farrellinc.com

RECENT *geopier*® PROJECTS

- UC Davis Activities & Recreation Center
2 and 3-story in Davis, CA
- Sybase Inc. Corporate Headquarters
6-story in Dublin, CA
- Orchard Hotel
10-story in San Francisco, CA
- PMI Headquarters and Offices
8-story in Walnut Creek, CA
- Century Theaters 12-plex Cinema
1-story in San Mateo, CA
- Roseville Civic Center
2 and 3-story in Roseville, CA
- Ledgewood Creek Winery
1-story tank and slab support in Fairfield, CA
- Bolsa Storage Facility
3-story in Westminster, CA

RECENT *CHANGE* RETROFIT PROJECTS

- East End Lofts (seismic retrofit)
5-story in Sacramento, CA
- Pepsi Warehouse Expansion
1-story in Sacramento, CA