THE FOUNDATION

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Featured in this issue of *The Foundation*:

- **Geopier GeoConcrete™** columns, meeting time and settlement criteria.
- The **Geopier Densipact™** system, improving soil density.

Geopier GeoConcrete™ Columns: Meeting Time Constraints and Settlement Criteria

11TH STREET BRIDGES WASHINGTON, D.C.

Grade changes to facilitate replacement of the 11th Street SE bridges over the Anacostia River and interchange improvements in Washington, D.C. required construction of Mechanically Stabilized Earth (MSE) walls up to 40 feet in height. Maximum bearing pressures of the MSE walls were 7000 pounds per square foot (psf).

Soil conditions varied considerably across the project site. Generally, silty and clayey sand (SM/SC) fill extended to depths of 5 to 15 feet below grade followed by layers of alluvial silty and clayey sand, silt, and clay with varying amounts of organics. The alluvial soils ranged in thickness from 20 to 40 feet. Moisture content values of the cohesive soils ranged from 34 to 114 percent. The alluvial soils were underlain by Terrace deposits consisting of loose to very dense sand and gravel with varying amounts of fines and stiff to hard clay (CL). Groundwater level was influenced by the Anacostia River and was within 3 to 12 feet below grade.

GCC Installation process

The project team required a cost-effective foundation solution to support the tall MSE walls and meet the 3 inch settlement criteria. The solution also needed to perform within an accelerated construction schedule and be installed within an urban site with constrained access and varying subsurface conditions.

The original design for the project called for the use of wick drains and MSE wire wall surcharging which would result in 10 to 45 inches of settlement and take many months for settlement to be complete. This was time the team did not have, not to mention the additional detailing, labor, and costs associated with 2-stage MSE walls. Working closely with the project team and Geopier Foundation Company, GeoStructures, Inc. designed a solution consisting of GeoConcrete Columns (GCCs) to reinforce the compressible soils and transfer MSE wall loads to the stiffer underlying competent sand and clay layers. This allowed the construction to continue without a delay.

During installation, concrete was pumped through the mandrel using a pressurized system. The mandrel was raised and re-driven at the design depth in the competent soil to create an enlarged 24-inch diameter concrete base. The mandrel was then withdrawn while continuously pumping concrete to the ground surface. The tops of the GCC's were enlarged to a diameter of 3 feet at the surface to optimize the GCC spacing and load transfer platform (LTP) design. A No. 8 steel reinforcing bar was inserted 20 feet into each GCC to help resist bending stresses applied during construction activities. GCCs were constructed at triangular spacings ranging from 7.5 to 9 feet on-center. An LTP consisting of 3 feet of well-graded engineered base course material with 3 layers of Tensar geogrid was placed over the tops of the constructed GCCs.

Over 1,300 GeoConcrete Columns were constructed for the project at the north and south abutment locations to provide support of the MSE walls. Load tests using the Statnamic testing procedure were conducted to verify the load-deflection response of the GCCs. The test results from a 37 foot long GCC that terminated in dense sand showed a load of nearly 425 kips at 1 inch of deflection.

Geopier Densipact™ System: Improving Soil Density

Densipact Installation

PARK SUMMIT BUILDING
ST. LOUIS PARK, MINNESOTA

The Park Summit Apartment Building project in St. Louis Park, Minnesota, was designed with post-tensioned cast-in-place concrete with 1.5 levels of below grade parking supporting 10 floors of apartment units. This resulted in column loads generally ranging from 50 to 2010 kips. Loads were significantly higher in areas such as the elevator core, resulting in wall loads up to 100 kips per linear foot (klf). Soil explorations revealed loose to medium dense sand to depths of about 70 feet underlain by dense, sandy glacial till to depths of about 85 feet, where bedrock was encountered in the borings. Geotechnical engineers from Braun Intertec quickly identified that the upper loose sand would be a problem that would result in excessive settlement.

Working with project estimators, the design team quickly rejected a deep foundation option as being too costly. Geopier engineers suggested that its Densipact system be used to densify the native loose sand. The Densipact system consists of driving a multi-tined mandrel into the ground to the treatment depth, which displaces the sand and pushes the soil laterally away from the tine location, causing the sand to densify. The surficial dish-shaped divots are filled with on-site or imported sand and densified with subsequent passes of the tool. The post-improvement CPT soundings at the site showed that the soil was improved to achieve a penetration resistance of over 300 tons per square foot and about three to 5 times better than the original unimproved ground.

The dramatically improved sand was then judged by the foundation engineers to be sufficient to support shallow spread footings loaded to 14,000 pounds per square foot. These very high bearing pressures were needed to help keep shallow foundation dimensions reasonable and economical for the project. The Geopier installer performed their critical path soil improvement work in less than three weeks, ensuring that the 16-month construction schedule would be completed on time. With savings in the hundreds of thousands of dollars over deep foundation alternatives, the Densipact system allowed the project to be built economically, which is a tribute to the innovative and collaborative thinking of the project team.

(Photo credit: https://plus.google.com/+36parkapartmentsmn/photos)

A Word from Kord

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THE COMMODITIZATION CONUNDRUM

▸ **Everybody is up in arms** about commoditization. *We have to stop it*, say our leaders. *It's not us, it's those scoundrels down the road*, is the response. *We have to educate our clients*, say others. *We are losing this battle,* say many.

▸ **Commoditization** is described as a market condition that occurs when services can no longer be differentiated by anything other than price[1]. *But we are different than they are*, we say! The sad truth is that this difference does not matter unless it is perceived to be of value by the folks paying the bills. We need to be innovative to differentiate ourselves, say forward-thinkers – but innovation is tough in a business model that rewards safety, not risk. This is our commoditization conundrum.

▸ **Maybe we can get some insight** by taking a look at an innovative industry. Let's see how our sisters and brothers in Information Technology do it. Folks in the IT world aren't so different from you and I. The IT world consists of people and companies who make things (contractors) and people and companies who facilitate things (consultants). Contractors are companies like Hon Hai (Taiwanese-based manufacturers of cell phones who bid on manufacturing SKUs based on a set of specifications) and companies like Apple (innovative developers of new products and services of value to consumers like us). Contractors who add value through innovation are rewarded when their innovations are well received (think iPhone and Tensar) and are punished when they are obsolete (think Blackberry and Stepped Taper piles – when's the last time you saw either one of those?). Consultants are needed to pick up the pieces to facilitate best practice uses of the innovative technology. There are website consultants, database consultants, supply chain consultants… there are more IT consultants than there are crickets in July. IT consultants don't invent anything, but good ones differentiate their practices by knowing more about what's out there and how to bridge the offerings with their clients' needs. The best ones, the ones that earn the most money because they create the most value, are the folks that can bridge this gap between offerings and needs more effectively than their peers (who largely have the same opportunity to do bridging of their own). This means that unlocking the commoditization conundrum isn't so hard after all; it simply takes: (1) in depth technical knowledge of innovative offerings, (2) client focus, and (3) the ability to bridge the gap.

> *Unlocking the commoditization conundrum isn't so hard after all . . .*

[1]Source: **Wikipedia.com**

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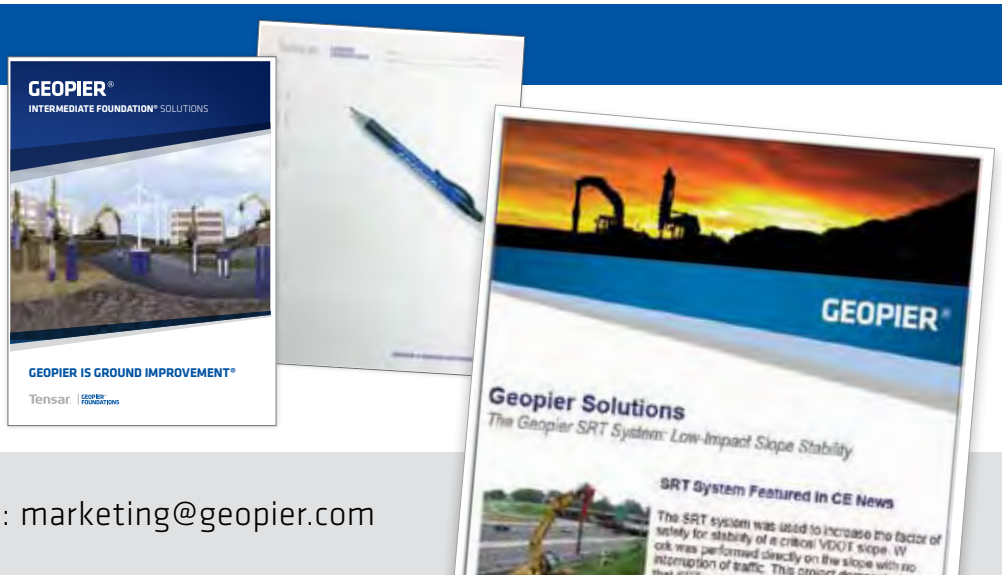

[1]While supplies last

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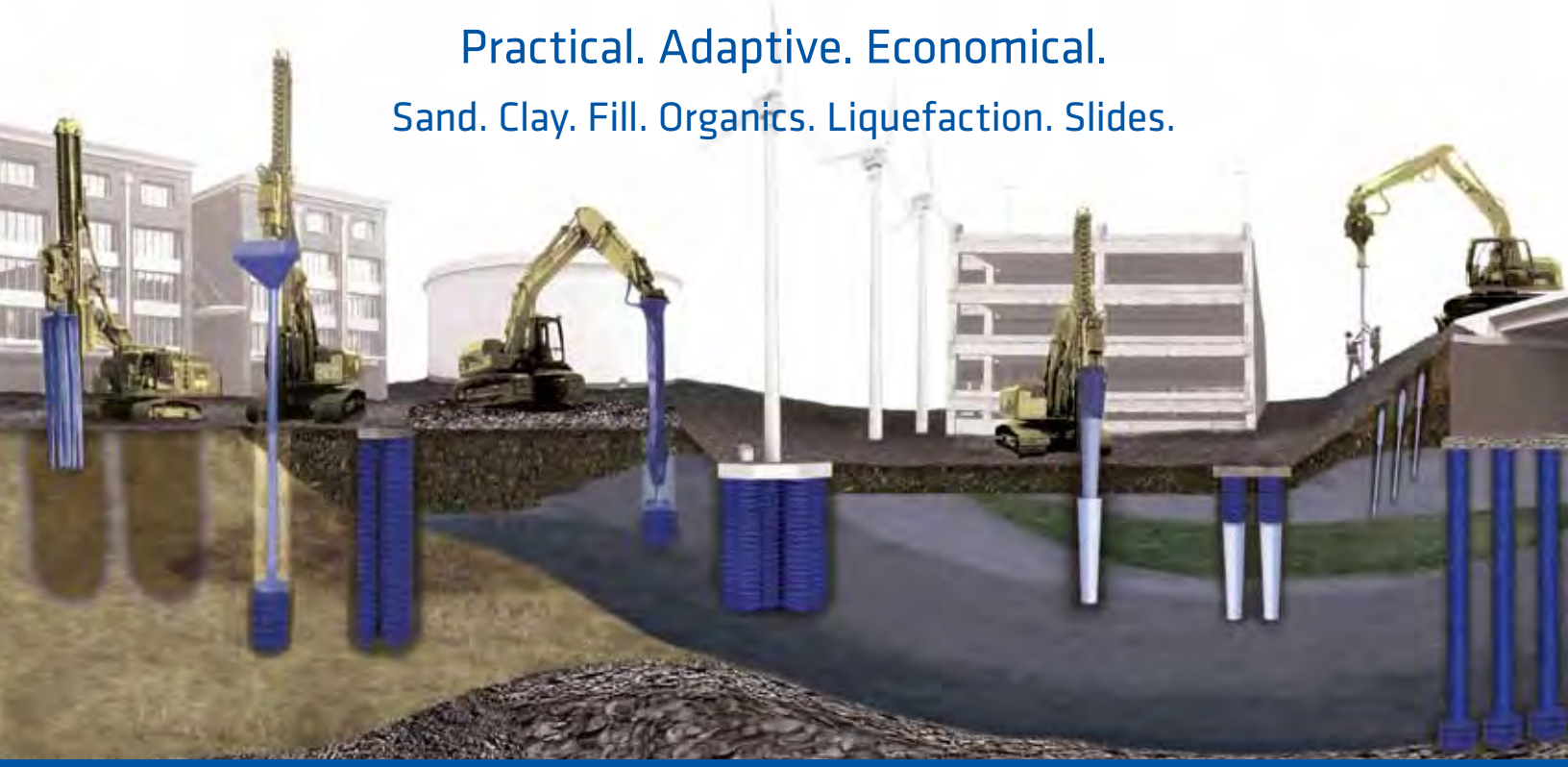

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