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Blowing It Open

Communities look to innovators to lead the market in advancements and improvements

By Kate Gawlik

Teams are working together to deploy innovative solutions in the underground sector, like the creative rescue of a tunnel boring machine during an I-75 renovation project in Detroit.

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Pushing for Advancements

Simply rebuilding infrastructure smarter may no longer be the norm.

A current engineering trend is pushing for new advancements that blow open how communities respond to natural disasters, climate change and the deterioration of the built environment. The projects and products mentioned in this section are successes because people pushed for new technology and new ideas while they dared to try something innovative.

Consider an I-75 modernization project in Detroit (page 32) that needed a vertical rescue shaft to access and remove a tunnel boring machine. To maintain the secant shaft overlap to depths exceeding 150 ft, tight installation tolerances were required. The innovative access shaft design relied on maintaining drilled secant shaft verticality tolerances of less than 0.5% at depths of more than 150 ft. Secant shafts must be drilled plum from the ground surface and cannot be steered down-hole during the advance. Despite this method having been widely used for excavations reaching 60-80 ft in depth, I-75's secant piling method is rarely used for elements with the depth required. To ensure the strict vertical tolerances, the team employed

temporary steel casings and a robust guide wall while surveying the piles with the SoniCaliper instrument.

This unique solution only happened because multiple disciplines came together throughout the planning,

design and implementation processes. As engineers and contractors face a backlog of projects, with labor and other challenges, keep watch for the professionals who are pushing the underground sector forward. ♦



Professional Perspective

Peter Faust, Vice President of Business Development, Malcom Drilling Co. Inc.

What are market expectations for 2022-23?

After last year's COVID impact, we have hope that the private sector will bounce back strong. The first signs of improvement for the second half of the year can already be seen. There still are plenty of ready-made projects in the pipeline and waiting for the final call. The announced Infrastructure Investment and Jobs Act will certainly provide a long-awaited boost to this sector. It remains to be seen how fast funds will be available to the local agencies.

What are current technology trends?

Apart from wind and solar, we have seen interesting concept studies with energy underground storage systems

or gravity storage, where radical new energy storage systems are tested. Sustainability considerations will play a major role for all geotechnical companies in the future.

How is the underground sector and your company pushing for advancements?

Design-build and value engineering will play an even greater role to not only reduce costs but to also provide more innovative ideas for more resilient structures. To enable this scope change, we are bracing ourselves with an increase of well-educated engineers who can provide the required out-of-the-box thinking. We hope that the educational sector will continue to advocate the geotechnical industry to young people. ♦

Airport Keeps on Running With Sanitary Lift Station

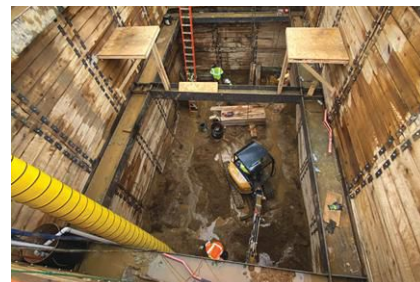
A project at Reagan National Airport was recently completed with minimal impact, thanks to the know-how of Midlantic Piling Co. in Glen Rock, Pa. The new sanitary lift station is located on a service road at the airport, outside of the taxiway and runway influences. This allowed Midlantic Piling to erect its Terex HC80 crane with 120 ft of boom, which was more than enough to drive the 40-45-ft Nucor Skyline-supplied HP14x73 and HP14x89 soldier piles.

The project was a soldier pile and lagging support of excavation system

and used the Nucor Skyline HP soldier piles, W24x68 and W24x131 walers for bracing, as well as HP14x73 cross struts. The soldier piles were driven with a Delmag D19 diesel hammer and swinging leads using the crane.

The general contractor wanted to install an on-line shoring system to utilize the lagging as the back form for their concrete. Maintaining proper alignment of the piles was critical during driving to prevent variations in the wall thickness that could cause costly structural redesign or significant overruns in concrete quantities.

To find out more about using Nucor Skyline steel in your next airport project, visit www.nucorskyline.com. ♦



Nucor Skyline soldier pile and lagging support of excavation added a new sanitary lift station at Reagan National Airport.

PHOTO: MIDLANTIC PILING

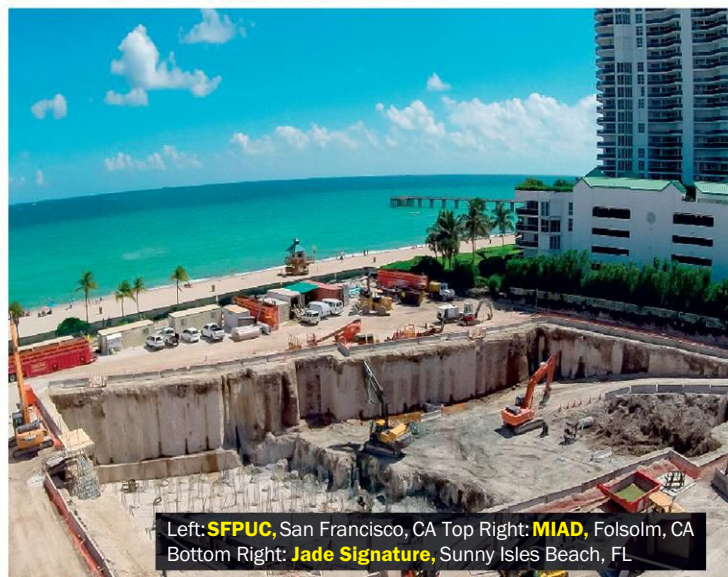


MALCOLM

Design Build /Assist

Malcolm's expertise in the development and implementation of innovative and cost-effective design build/design assist solutions is invaluable to clients. This method provides owners with time and money savings while also fostering innovation. Efficiencies are immediately realized as all members of a project team come together early in the process to identify and address issues of cost, constructability, and schedule. Due to our decades of engineering expertise, our superior management staff, and state-of-the-art equipment, we provide the full spectrum of design build/design assist benefits for most of our offered services. When you need a solution that requires Malcolm's expertise, contact us at Malcolmdrilling.com

Deep Foundations
Retention Systems
Design Build/Assist
Ground Improvement
Dewatering



Left: **SFPUC**, San Francisco, CA Top Right: **MIAD**, Folsom, CA
Bottom Right: **Jade Signature**, Sunny Isles Beach, FL

Rescuing Eliza 150 Feet Deep

Just north of Detroit is an 18-mile-long stretch of freeway where the I-75 modernization project lies. Flooding has been an issue, and the modernization project will help to prevent flooding by replacing an outdated drainage system.

The plans include the construction of a drainage/storage tunnel. About 22,370 ft long, the proposed tunnel lies 100 ft below the ground along the north-bound I-75 service drive. This required the use of a tunnel boring machine (TBM) known as Eliza. Eliza came to a complete halt in Madison Heights during its voyage. The engineering consultants decided a vertical rescue shaft would be necessary to remove Eliza and repair the damaged tunnel liner. Eliza would be encased in a vertical shaft that would support excavations up to 100 ft in depth. Malcolm Drilling (www.malcolmdrilling.com) was contracted to construct a large-diameter secant wall

ring comprised of 56 secant piles that are about 150 ft deep.

In front of and to the sides of the TBM Eliza, the secant shafts were extended to just above the bedrock, about 150 ft deep, creating a horseshoe of support extending 50 ft below the planned excavation invert. Two 6.67-ft diameter King Pile shafts were drilled to either side of the tunnel, overlapping into each end of the secant horseshoe. The King Pile shafts, together with a heavily reinforced ring beam above the crown elevation, functioned as a door frame to transfer hoop loads from the incomplete secant arc into reaction supports above and below the tunnel. These oversize King Pile shafts were socketed into rock more than 70 ft below the tunnel invert.

This unprecedented challenge could only have been effectively accomplished in six months with the involvement of the many teams. ♦



When a tunnel boring machine got stuck at the I-75 modernization project in Detroit, a vertical rescue shaft was created to get the machine named "Eliza" out.

PHOTO: COURTESY OF MALCOLM DRILLING

Trusted Rotary Wellpoint Pumps

Thompson Pump and Manufacturing Co.'s rotary wellpoint pumps are the original rotary wellpoint pumps designed by the company's cofounder, George Thompson, and trusted by contractors worldwide for decades.

Specifically designed and engineered for construction wellpoint and sock dewatering, the 12-in. Rotary Wellpoint Pump (Model: 12R) features high air handling, large water volume capabilities—up to 2,200 gpm and heads up

to 120 ft—high vacuum capabilities and operating speeds up to 2,200 rpm.

Capable of handling both air and water, and with a highly efficient design that provides low fuel consumption, the positive displacement with constant suction makes the 12R an optimal dewatering pump.

As with Thompson Pump's entire line of products, the performance and reliability of the 12R make it the ideal choice for all wellpoint applications to get the job done right, every time.

Thompson Pump and Manufacturing, a family-owned company celebrating more than 50 years in business, is a full-service manufacturer and provider of high-quality pumps, pumping equipment and engineering expertise for bypass pumping, dewatering, mining and flood control. Please visit www.thompsonpump.com to learn more about Thompson's wellpoint pumps and their entire line of products. ♦



The Rotary Wellpoint Pump 12R pumps both air and water with low fuel consumption and a positive displacement with constant suction.

PHOTO: THOMPSON PUMP AND MANUFACTURING