PHOTO: COURTESY OF HERRENKNECHT AG

A 3,075-ton tunnel-boring machine (TBM) nicknamed "Chessie" will be used to excavate a new 5,700-ft subaqueous transportation tunnel on the Parallel Thimble Shoal Project in Virginia. At 308 ft long, this mammoth machine is roughly the size of a professional football field.

Underground Today II

Tunneling Transformed

Industry digs deep to optimize tunnel-boring machine performance

By Erica Bender

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- Tunnel-Boring Method Chosen for Los Angeles Purple Line Extension
- Virginia's Parallel Thimble Shoal Tunnel Project Currently Underway

New Secant Pile Wall Protection for Flagler Beach Community

In October 2016, a category 4 hurricane dubbed Matthew made its appearance with torrential rain, massive storm surges and winds up to 145 mph. Matthew hit Haiti, moved past Cuba and the Bahamas, and then destroyed the coastal areas of Florida, Georgia, South Carolina and North Carolina. Among the cities impacted by Hurricane Matthew was Flagler Beach, Fla.

The extensive damage needed to be fixed, and the Florida Dept. of Transportation hired Malcolm Drilling as a subcontractor to Superior Construction Co. Southeast out of Jacksonville, Fla., for the job. With a goal to protect the Treasures Roadway from future hurricanes as well as the harsh saltwater environment, it was decided to install a 1-mile-long secant pile wall.

To form this wall, Malcolm installed a total of 1,847 overlapping drilled piles, each with a diameter of 36 in. Due to the very aggressive nature of the saltwater on conventional reinforcement cages, the design called for glass fiber reinforced polymer (GFRP).

The cased auger cast method was used for the piles installation to accommodate the very loose nature of the beach sand. Cased continuous flight auger (CCFA) piles are installed with a large drilling machine using a double rotary system. These two rotary drilling units are mounted on top of each other and operated counterclockwise. Using this method, one unit advances the casing while the other turns the auger into the ground simultaneously. The machinery was both engineered and assembled by Malcolm's team of engineers in its Los Angeles facility. ◆

Malcolm Drilling is developing a 1-mile-long secant pile wall to protect the coastal community of Flagler Beach from any future hurricane events.

PHOTO: PETER REINOLD

Deep Excavation Will Bring Subway Service to More of Downtown Los Angeles

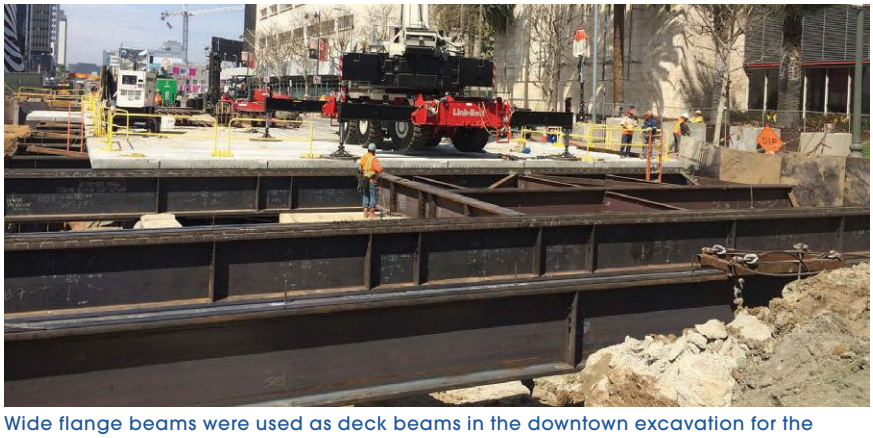
Los Angeles Metro's new Purple Line Extension will provide high-capacity, high-speed and dependable service between downtown Los Angeles, the Miracle Mile, Beverly Hills and Westwood. The 9-mile extension is divided into three sections, with Section 1 currently under construction.

This priority project is completely underground and therefore requires complicated excavation design and shoring systems. The joint venture of Skanska USA Civil West, Traylor Brothers and J.F. Shea Construction reached out to Nucor Skyline for its expertise in steel beam solutions.

Section 1 is 3.92 miles and stretches from Wilshire/Western to Wilshire/La Cienega. The largest and most complex of the three major excavation sites is the Wilshire/La Brea Station, where a tunnel-boring machine will be launched. The project site is 1,000 ft long, 65 ft wide and nearly 80 ft deep.

Nucor Skyline provided approximately 10,000 tons of 24-in., 36-in. and 40-in. wide flange beams for the project, which were all produced in its Blytheville, Ark., mill. These versatile beams will be used throughout the construction of the new line as bracing, soldier pile beams, cap beams, deck beams, walers and struts.

For more information about Nucor Skyline's wide flange projects, visit www.nucorskyline.com/wf. ◆



Wide flange beams were used as deck beams in the downtown excavation for the Purple Line Extension.

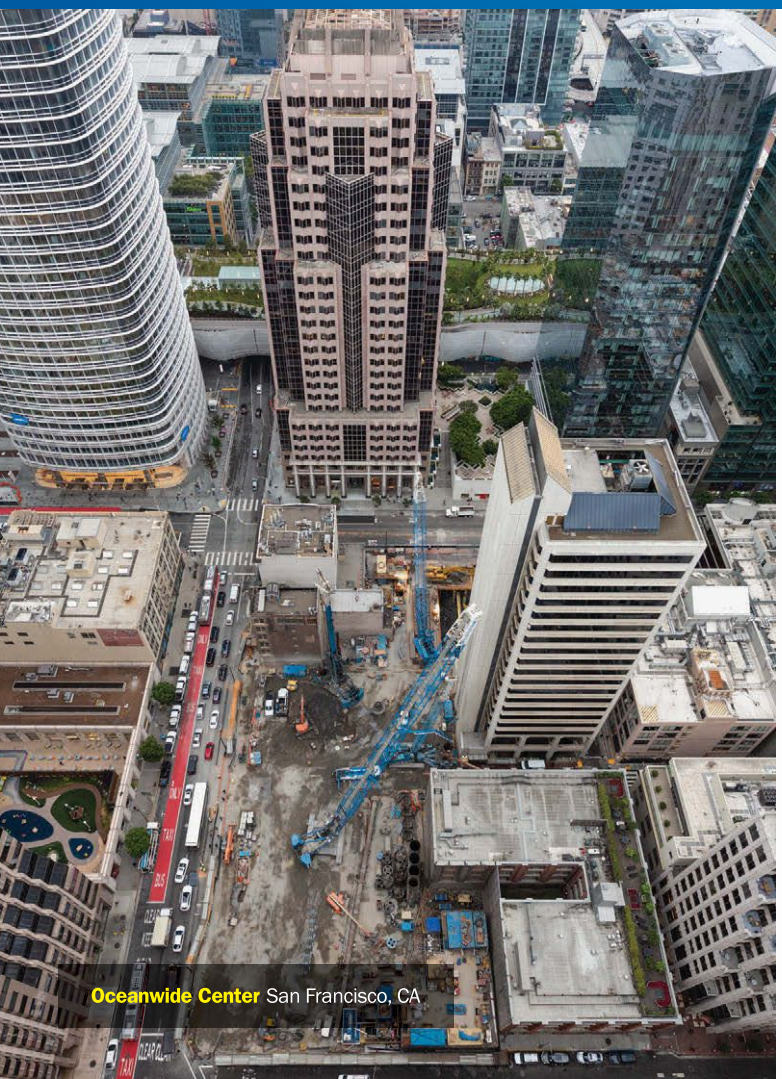
PHOTO: COURTESY OF SKANSKA, TRAYLOR, SHEA JOINT VENTURE

MALCOLM

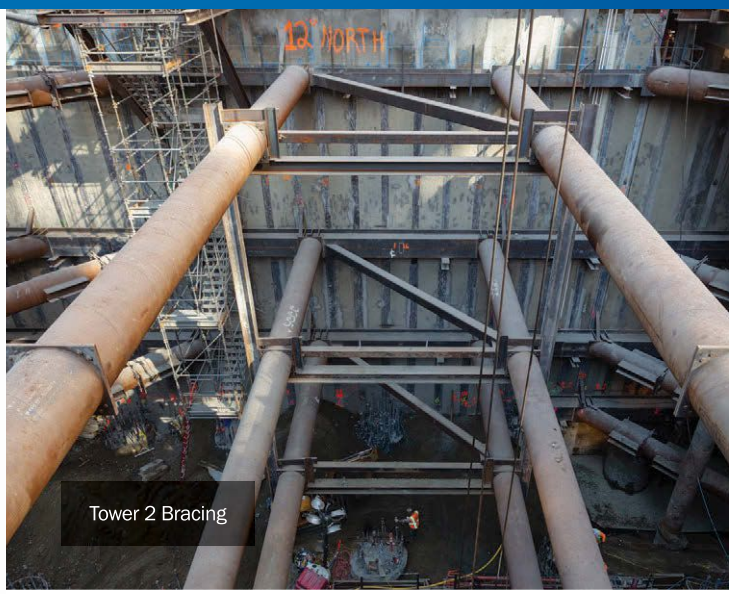
Look to the Blue

Malcolm's unmatched experience and specialized resources drive the construction state-of-practice, evolving new solutions to meet the demands of our clients. Our deep foundation services offer the most cost-effective solutions for virtually every project need in some of the most difficult ground conditions. We combine the most modern equipment fleet with construction and engineering experience for all types of deep foundations. When you have projects that require a higher level of expertise, contact us at **malcolmdrilling.com**

Deep Foundations
Design Build/Assist
Retention Systems
Ground Improvement
Dewatering



Oceanwide Center San Francisco, CA



Tower 2 Bracing

Top of 332-foot-deep shafts