Setting the Standard with Soil Nail Technologies

by Dino Kartofilis and Gary Corwin

Figure 1

Nicholson Construction Company was awarded the contract to build a reinforced shotcrete soil nail retaining wall along State Route 9900 in Blair County, Pennsylvania (U.S.). The 330-ft-(100-m)-long, 35-foot-(10.7-m)-high permanent retaining wall was cut into the hillside to provide an access route to the new Blair County Convention Center (see Figure 1). The general contractor for this project was HRI, Inc. and the owner was PennDOT.

The wall was installed using top-down construction in seven lifts. The scope of work involved 9,300 ft^2 (864 m^2) of 8-in.-(203-mm)-thick reinforced shotcrete, 275 soil nails, two verification pullout tests and 13 proof tests on production nails. The final design-build wall included an 8 in. (203 mm)-thick shotcrete facing with a center reinforcement of #4 bars positioned horizontally and vertically on 1 ft (.3 m) centers, and soil nails on an approximate 6 x 6 ft (1.82 x 1.82 m) grid.

The shotcrete team was comprised of a six-person Nicholson crew, three local laborers as needed for wall preparation work, and an experienced operator who placed the shotcrete via a nozzle attached to a small mini excavator. The number of passes needed to apply the required shotcrete thickness depended on how neat the excavation was controlled at the wall face. As little as 4 in. (100 mm) and sometimes over 18 in. (457 mm) of shotcrete was placed behind the reinforcement, followed by 4 to 6 in. (100 to 150 mm) in front of the reinforcement, which was screed-finished to the required wall face alignment using hand tools. Vertical wall face alignment was maintained by a total station laser beam mounted on the center of the top of the wall.

This fast-track design-build wall was completed in 12 weeks of fieldwork utilizing one drilling operation and one shotcreting operation. The project was challenging for several reasons, including an aggressive schedule, rainy weather, and tight tolerances. New Enterprise Stone & Lime Co., Inc. furnished the shotcrete and mix design.

Soil nailing technologies have been proven to be a safe and cost-effective alternative to traditional sheeting and shoring methods. For this reason, the use of soil nails is becoming increasingly popular in many regions.

Dino Kartofilis is a senior project manager and Gary Corwin is a project superintendent at Nicholson Construction Company. Both authors were instrumental in the success of SR9900 and have solved numerous earth retention, slope stabilization, and structural support problems across the country. A full-service geotechnical construction company, Nicholson is the North American affiliate of Italian-based Rodio, S.p.A., the world's oldest specialty geotechnical contractor. Nicholson specializes in soil nails, anchors, INSERT WALLS^{SM}, PIN PILE^{SM}, diaphragm walls, and vibro techniques. Visit Nicholson on the web at **www.nicholson-rodio.com**.

Figure 2