



HWY 12 SOIL NAIL WALL

TBH and Associates, a geotechnical construction firm located in Vancouver, WA, is often called upon to construct retaining walls and deep foundations on difficult projects where access is limited and soil conditions prohibit the installation of standard systems. TBH recently completed one such project, the Westbound Passing Lane for Highway 12 near Lewiston, Idaho. This particular project required construction of a 14,000 square foot soil nail wall on a slope that had been previously cut, requiring installation of soil nails up to 28' above the bench elevation. The work was made more difficult by variable drilling conditions including silts, boulders, and fractured rock. Of the 5 drilling contractors from which bids were requested, TBH was the only company that provided a full proposal to construct this wall. They were able to complete the project successfully by adapting standard drilling methods to custom made high-reach drilling equipment.



Idaho Transportation Department (ITD) had an existing contract for construction of a passing lane through this portion of Hwy 12. As the roadway is bound on one side by the Clearwater River and on the other side by steeply sloped mountains, the widening required excavation of the existing slope at roughly 1/2:1. This was thought to be reasonable based on the presence of basalt throughout this portion of the highway. Unfortunately, after excavating the first 35 feet of the slope, it was apparent that the majority of the slope was not in rock, and what rock was present was of very poor quality. ITD quickly realized that the slope was not stable and that a soil nail was the most feasible type of retaining wall to allow the project to continue.

Though a change order, TBH was contracted to determine the true location of bedrock throughout the wall area. TBH utilized a TEI HD-500 drill rig to drill into the overlying soil using hollow bar with button bits. This system was able to drill easily through the soil, and could accurately determine depth to bedrock. Within days, TBH had completed roughly 30 borings ranging from horizontal to vertical, at heights of up to 30 feet above the existing bench elevation.



Once the rock elevation was determined, ITD designed a soil nail wall with carved shotcrete to match the surrounding rock features. TBH was selected to construct the wall and underwent a several month negotiation, where TBH proposed various VE options to reduce costs. VE options proposed by TBH included the use of hollow core anchors (potential savings of approximately \$325,000) and the use of standard cement grout in lieu of non-shrink grout (\$125,000 savings), as well as various minor details that had large a affect on the cost to construct the wall. Ultimately, ITD

provided a Change Order for this work which included installing solid bar soil nails to depths of 7.5m 9.5m depending on the depth at which rock was encountered.



The use of solid bar anchors had a large impact on cost and schedule for this project, as the soil conditions at the site required the ability to case the holes through boulders and decomposed basalt at heights of 25 feet above the existing bench elevation. TBH's existing TEI drill rig was capable of installing nails at this height, but was not designed to drill with casing. To overcome this, TBH constructed a custom drill rig for this project with a 35' long mast, Eurodrill top drive, jaws capable of handling 6" casing, and a 3-way knuckle. This system was mounted on an excavator to allow drilling to the required heights.

Once the drill rig was fabricated, TBH then planned for several drilling systems to allow nail installation regardless of the soils encountered. These included standard 2-3/8" API inner rod with casing, 6" down the hole hammer, 6" casing system with lost bits, and R51 drill steel with 6" button bit. TBH installed verification anchors with each system to ensure adequate bond capacity, which all systems demonstrated with ease.

TBH was able to install a total of 574 nails and 14,000 SF of 6" thick shotcrete construction facing in approximately 60 working days. This was accomplished despite numerous changes to the wall layout and subfreezing temperatures. Ultimately, the final shotcrete facing, consisting of 8" structural shotcrete and 2-4" of carved and stained shotcrete was completed in May of 2005. While it was not an easy project and was hamstrung with a number schedule and weather constraints, it was completed on time through the ingenuity of TBH and their ability to look beyond standard drilling systems.

