TRADE CONTRACTOR — CHAIRMAN'S AWARD • GOLD
Matcon Excavation & Shoring Ltd. – The Pier, Parcel's 1, 2 & 5

Excellent Tunnel Vision

A $3.1 million challenging excavation, shoring and grouting contract required the use of a new technology and equipment from Europe known as Jet Grouting, ensuring a successful project.

BY JEAN SORENSEN

TUNNEL VISION isn't always a bad thing, especially, when it's focused upon solving a problem. The challenge Matcon Excavation & Shoring Ltd. faced and overcame to win the Vancouver Regional Construction Association's Chairman Award for 2006 was how to stabilize a Canadian National Railway tunnel next to a site it was excavating and shoring.

The site was one of the B.C. Lower Mainland's diminishing supply of good building sites. The prime sites are those where million-old glaciers left trails of rock debris, or those of sandstone formations, both which provide solid foundations. The remainder? Well, those are the problem sites scattered through the Lower Mainland. They consist of loose materials, such as sands, gravels, clays and peat, which when combined with groundwater run like gruel. Or, there are pockets of artesian water held under on-site pressure. Such sites make excavation and shoring work tricky as any tampering with the supporting material surrounding these unstable areas causes collapse or sink holes to appear. Not only is there a concern that the shoring support-walls will collapse but when sand and water oozes away, any structure (albeit tunnel, building or infrastructure) above is subject to compromise.

Traditionally, the shotcrete and anchor method has been successful in stabilizing shoring walls on sites but while this method is used during the shoring process, it is of little help when dealing with an unstable area. It's a little like shutting the gate after the horse has departed. In most cases, crews have simply dealt with the problems as best as possible when problems were encountered.

"In the past, we just fought it," says Stephen Jungaro, principal of Matcon, which received the VRCA award in recognition of the work performed on North Vancouver's Pier 1 site where the new technology jet-grouting was introduced.

Jungaro says the real difficulty for companies performing excavation and shoring work in these conditions is the uncertainty. These unstable sites can impact on production scheduling causing work delays and budget over-runs. Safety is always a concern and then there exists the threats of downstream litigation from neighbours impacted by problems at the site. When Matcon bid on the North Shore Pier Project, Parcel 1, 2 & 5, all those considerations came home to roost. The more critical consideration was in Parcel 5 of the foreshore redevelopment area, which was formerly an old shipyard.

This particular parcel was sited by a CN Rail tunnel, which was actively used by the railway bringing commodity goods to port terminals. Even the slightest shifting of the ground could compromise the tunnel's integrity and impact trains. "If that happened, you might just as well pack up your company and go home," says Jungaro.

Matcon's team needed a better solution or one that hadn't been seen in Canada as yet. Jungaro had heard of jet-grouting, a process in which cement was forced into the ground in pillars that could stabilize an area. Fortunately, he had met Paolo Gazzarrini of Sea to Sky Geotech Inc., a business associate who was able to provide more information. "I had worked with this process 20 years ago in Europe and around the world," says Gazzarrini. But, it had not been tried in Canada with success

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any earlier as Gazzarrini says "the mountain was probably not ready." Otherwise, it was all a matter of timing.

Jungaro began researching the technology, which was readily available in Europe, but decided the only real way to determine its viability was to fly to Germany and evaluate it. "I spent two weeks in Germany and then went back and forth a few times," he says.

After careful consideration, he opted to buy a machine and ancillary equipment to bring to B.C. The reality looming was that more difficult sites would become the norm as development increased. "Most of the good building sites have been built upon," he says. There could only be an increased need for the machine and its technology if he could make it work, he figured. Since purchasing the equipment in 2004, it has been used 10 months out of the year on average. The equipment has worked not only in North Vancouver, but was in Surrey on-site for five months then New Westminster and is now working in Richmond.

But importing new technology is not cheap — both in time and money. "It's an expensive undertaking," says Jungaro, who estimates that equipment, training and travel has cost the company into the seven-digit dollar range. "It really takes a good operator two years to become proficient on the machine," he says, but the initial training period was a few months.

Jet-grouting essentially consists of boring holes (either vertically or sloped) into an area of loose soils. Cement is introduced into the hole which is three to five inches in diameter at a pressure rate of 7,000 – 10,000 PSI at flow rate of 150 – 200 litres per minute. It forms a pillar, which can range from three to five feet in diameter.

The pressure of the machine's injection into the hole of cement displaces the material in the hole leading to a column up to five feet. An onboard computer monitors the pressure and flow to determine post size. The consistency of site materials determines the width and also the depth to which the machine can work, but Jungaro says so far the crews have been able to drill down to 60 feet to inject cement.

The pillar of cement serves as a cut-off wall, underpinning for a structure and general support. These pillars can be spaced or they can be sited side by side to create a solid jet-grout wall. Once the cement has hardened, the crews can move in and begin excavating the site beside the wall without fear of collapse. One of the features of the system is the computer-aided monitoring that can be carried out to ensure that no shifting or movement is occurring in the surrounding area. "Quality control is a big part of the system," says Jungaro.

Matcon started the work on under-pinning the CN tunnel by running a series of test sites. Crews started approximately 50 feet away running test areas that were essentially building a wall using different amounts of cement and configurations. "By doing the testing, we could determine which system worked best," he says, adding the company received geo-technical support from Matt Kokan at Geopacific Consultants Ltd. "He stepped up and helped us think outside the box."

The jet-grouting eventually saw the tunnel area stabilized through the construction of a cement wall consisting of columns that were placed at a slight angle. A total of 231 jet columns were placed, he says, and 1.3 million litres of grout cement was pumped to create a wall that ran 10,000 square feet in length. The angle of the wall placed the bottom end of

the pillars approximately two feet beneath the tunnel which provided the underpinning that was required while the top portion of the pillars were four feet behind (on the excavation side) of the tunnel to provide shoring support. This wall protected the tunnel from any movement caused by the excavation.

Jungaro says it was the team effort of the on-site crew, geotechnical support consultants and also the property owner, Mondiale Developments, which allowed the project to move forward successfully for this first B.C. application. Other members: Adam Heath business partner and Glen Bransford general superintendent, Con-Tech Systems Ltd.

"This is our second VRCA award," he says, proving tunnel vision isn't a bad thing when it leads to excellence. **CB**