

CUI

CANADIAN UNDERGROUND INFRASTRUCTURE

HITTING ALL THE SHOTS

GUIDED BORING MACHINE
DEPLOYED TO CONGESTED
CONSTRUCTION SITE IN
EDMONTON

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Tight boring in downtown Edmonton

GC challenged to install five deep 400 to 760-mm gravity sewer laterals under a pedestrian overpass connected to Rogers Place, in new arena district

BY LAURA ANDERSON

Downtown Edmonton, Alberta is in the midst of a major revitalization with the intent to transform the current urban region to a mixed-use destination offering entertainment and extensive business, retail and public space. The main attraction is now complete – Rogers Place, a new arena for the Edmonton Oilers, alongside several new office towers, a luxury hotel, residential complexes, a casino, restaurants, bars and nightclubs. The Edmonton Arena District (EAD) pro-

ject will be under construction through 2020. Although a small contributor to this huge endeavour, the latest guided boring technology provided the key solution for five change order sanitary lateral connections in the heart of the construction.

The EAD's lead contractor is Borger Group of Companies of Calgary and the construction manager is PCL Construction of Edmonton. Calgary Tunnelling & Horizontal Augering Ltd. was the qualified trenchless construction contractor.

Calgary Tunnelling is no stranger to complex guided boring machine (GBM) projects. They've been specializing in

trenchless services since 1984 and were an early convert to investing in the benefits of guided boring technology applied to auger boring for accuracy and longer drives.

The company initially had a contractual arrangement on the project to install 10 400 to 900-mm gravity sewer alignments, that were up to 93 m in length, at depths ranging from 6 to 15 m. Work started on these connections in late July 2015, and all took place within a four-block radius of downtown Edmonton by guided auger boring means.

Requiring some ingenuity, four of these bores were initiated from one shaft. To do

The jacking frame was outfitted with a new Augering Adapter Assembly to manage soil discharge with up to 35,251 Nm (26,000 foot-pounds) of torque from the jacking frame's gear box.

this, the contractor installed pilot tubes and casing from one direction. Then the equipment was turned 180 degrees to jack the second bore from the opposite direction. Next, they removed the equipment, backfilled the shaft to the correct elevation for the third and fourth alignments, and the process was repeated.

This kind of gumption makes guided boring contractors stand out. PCL Construction was impressed with the skill that Calgary Tunnelling demonstrated, so when another trenchless opportunity arose in the fall of 2015, they approached them to get their advice.

The tight spot

The general contractor had to find a solution to install five deep 400 to 760 mm gravity sewer laterals under a pedestrian overpass connected to Rogers Place, but the available real estate for constructing them was minimal. A total of 89 m had to be installed at depths ranging from 7 to 10 m to avoid the region's many buried utilities. Another restricting factor was that installation had to occur without disruption to other construction efforts, road traffic or businesses.

Alan Cluett, senior project and estimating manager at Calgary Tunnelling, was familiar with the newest Akkerman GBM 4800 Series system, and he consulted with the manufacturer to find the most cost-effective solution for the variables on the project.

Cluett explains: "Because it's in the heart of downtown Edmonton, the sheer number of underground obstructions, existing lines and infrastructure was brutal, and there were massive quantities of it. The equipment allowed us to jack 1.5-m casings out of a 4.5-m jacking pit using 1.5-m augers. In comparison, conventional auger boring equipment requires a minimum 7.6-m pit." Pipe jacking with this new system was a first for the contractor, but they had been using other Akkerman GBM jacking frames and tooling for many years. Cluett's confidence to proceed was much like the hockey adage: "All things


are hard before they are easy."

The solution


The combination of a 4800 Series Jacking Frame and the new Augering Adapter Assembly made it possible to have the torque and jacking force of an auger boring machine in a considerably smaller shaft. The GBM 4800 Series is small enough to fit within a confined shaft with sufficient power to handle densely compacted soil and a range of pipe diameters. GBM 4800 Series Jacking Frames can install up to 1,220 mm OD pipe with combinations of 2.4, 3 and 6 m skid extensions and 762 mm or 1,016 mm

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WATER & SEWER CONSTRUCTION

stroke cylinders for a multitude of pipe lengths and shaft configurations. For this reason, Akkerman refers to it as their erector set jacking frame. (See product profile, page 12). The jacking frame was outfitted with a new Augering Adapter Assembly to manage soil discharge with up to 35,251 Nm (26,000 foot-pounds) of torque from the jacking frame's gear box.

As with most pipe jacking operations, the final ingredient to the alignments' success was a soil appropriate lubricant. Calgary selected Alcomer 120L drilling fluid additive to reduce the friction during the pilot tube passes and provide clay stabilization.

Hustle, hit and never quit

The laterals were located along 104 Avenue near Rogers Place. Traffic flows through two northbound and two southbound lanes in this area. One of the lanes in each direction was diverted into the other lane to keep motorists moving during construction. Calgary's team maintained an around-the-clock schedule to get their work done on time.

Calgary embarked on the first alignment on November 14, 2015. The launch shaft was located alongside a sidewalk at 104 Avenue and 101 Street. The guided boring system was positioned on the standard 4.2-m skid to fit inside the 4.5-m length shaft at 8-m depths. The crew completed 20 m of 760 mm casing on November 30, 2015.

The second bore, 32 m of 400-mm casing, originated from the opposite corner of the intersection of the first bore. This shaft was 5 m long and 7 m deep. Crews started the run on November 23, 2015 and completed it on December 9, 2015.

A short 4-m, 10-m deep run of 500-mm pipe was next. Calgary Tunnelling completed it on January 23, 2016, in three days time.

The second to last bore, also short, was positioned along 104 Avenue at the entry to a condominium complex. A total of 6 m of 500-mm casing was installed 8-m deep.

The final crossing was located at 104 Avenue and 104 Street, at the southwest corner of Rogers Place. Crews were ready to launch pilot tubes on April 4, 2016. They installed 27 m of 400 mm pipe, at 7-m depths. The pipe reached the exit shaft on April 14, 2016.

The GBM operators experienced vary-



A range of 400 to 760-mm diameter gravity sewer laterals were installed under a pedestrian overpass at depths ranging from 7 to 10 m to avoid the area's many buried utilities.

ing ground conditions, from clay and clay till to hard and densely packed materials.

While these installs were going on, crews continued on the remaining two guided auger boring crossings with their GBM 240A system at 104 Avenue and 103 Street. All trenchless construction was wrapped up in July 2016. The connections were on line and grade, completed on schedule, and had no impact to the surrounding regions.

Making the most of small opportunities

At the end of the project, Cluett commented: "I knew our team was up to the challenges on these sewer connections.

We have plenty of experience with pilot tubes jobs – each one different from the next. Since the confined shaft size ruled out conventional guided auger boring, the 4800 jacking frame and the augering adapter made it possible to complete the gravity sewers within the confined spaces.

"In the end, the goal is to make it happen and make the stakeholders happy, and we managed to do both," he concluded.

Akkerman

Laura Anderson is marketing and communications director for Akkerman.