

WORLD TUNNELLING

AND SUBSURFACE EXCAVATION

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MISSION IMPOSSIBLE

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Cutterhead viewed from the relief drive.

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Spino Construction is a family business founded in Montreal, Canada, in the 1920s to undertake excavation work on municipal projects. For the last 30 years, the company has been heavily involved in tunnelling, and in the last five years alone has completed over 18.5 km of tunnels of all sizes.

Many of these were located in heavily-populated urban areas and in some particu-

larly demanding situations, earning Spino a reputation for successfully tackling the most arduous of projects.

THE CONTRACT

So it was that Spino gained a contract from the Montreal Urban Community (MUC) for the retrieval of a TBM and the completion of drive in a situation where the TBM was

Ground support over the TBM was insufficient.



wedged in under a roof fall 1,200 m up a very wet Montreal sewer interceptor tunnel.

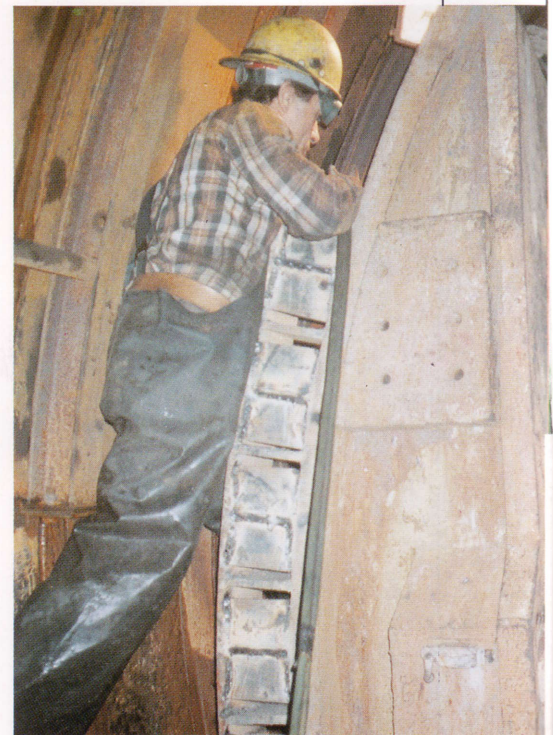
Included in this contract were to excavate 1.3 km of 5.8 m dia. tunnel, concrete 1.6 km of 5.25 m dia. sewer and complete related shafts and structures. In its tender documents, the MUC made no stipulation as to how the tunnel should be completed, leaving the successful bidder to decide whether to use the TBM or revert to other methods, such as conventional drilling and blasting techniques.

The principal concerns of the authority were two-fold: firstly, to complete the tunnel in order that the sewage systems could be commissioned; and, secondly, to remove the TBM from its position blocking the way to this achievement.

Spino was awarded the contract and, after careful analysis, decided that it would be advantageous if the machine were recommissioned to complete the excavation of the tunnel rather than simply dismantled and sent to its final destination, the MUC yard.

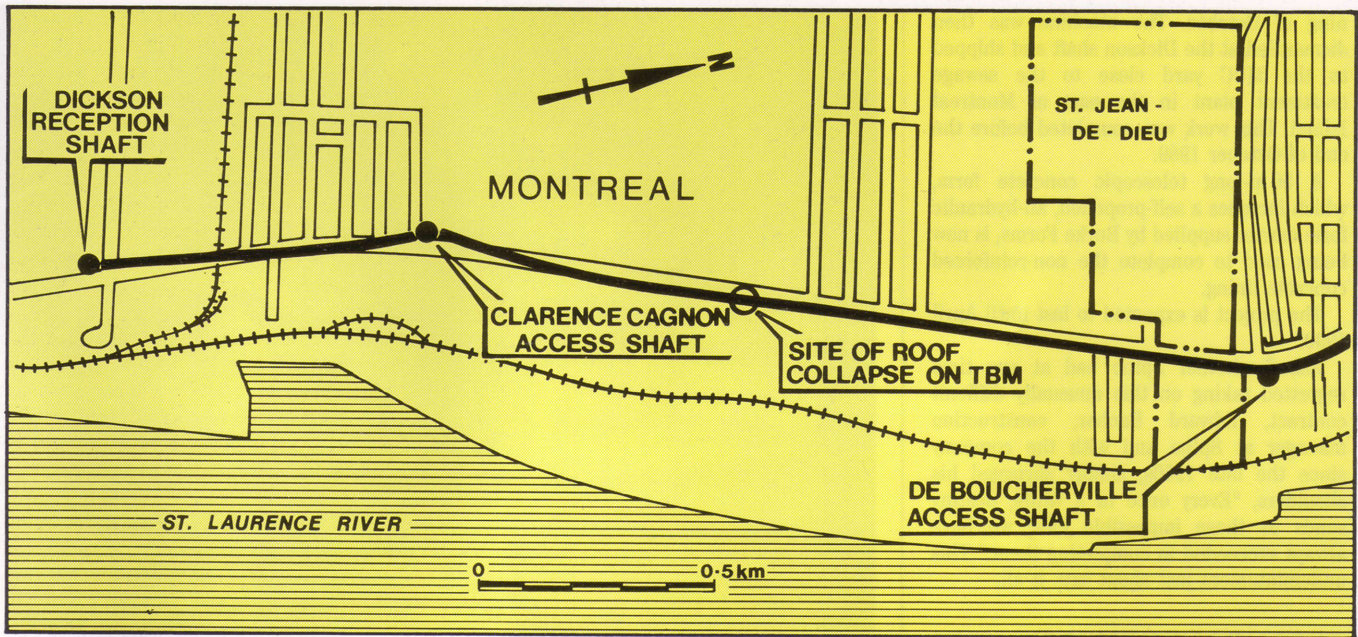
To succeed at this venture, the first thing to be done was to place adequate support in the tunnel in the immediate area behind the machine. This support consisted of ribs from approximately 100 m to the rear of the machine to directly behind the head.

The next operation consisted of excavating a 2.1 m-wide by 2.7 m-high tunnel starting behind the first rib and, on a line offset but parallel to the main tunnel, leading to the front of the TBM.



Modifications were made to the grippers to facilitate relaunch of the TBM.

Besides serving as an access to the front of the TBM, this tunnel allowed Spino to grout above and ahead of it, thereby



Plan of the works.



Biggest task was to support the ground over the cutterhead.

consolidating the fractured rock and reducing the water inflow, which was estimated at 5,000 l/min. Also, it allowed the crew to probe ahead of the machine, giving much required information about the ground conditions in the immediate area. This was absolutely necessary in order to establish the proper working procedures for tunnel driving once the machine had been repaired.

REFURBISHMENT

For assistance with its repair and refurbishment, Spino approached the Robbins Co. of Kent, Washington, the original manufacturer

of TBM 191-161. Cutters, clutches and transmissions were supplied ex-stock by Boretac Inc. of Solon, Ohio, specialists in TBM remanufacture.

Modifications were put in hand to convert the back-up systems to handle the steel sets covered by mild steel plate that would be required as support in the expected difficult ground ahead.

The TBM electrics and hydraulics were stripped and rebuilt, and modifications were made to the side grippers in order to facilitate launching off the new ribs placed directly behind the cutterhead.

By the end of May 1989, the TBM was ready to restart its drive. The by-pass drivage was closed off using stacked cement in bags. These were set in position forming a solid sidewall against which the TBM could advance into fresh ground.

The retrieval operation had taken more than six months' working at double shifts, an indication of the difficult position in which the TBM was found.

THE DRIVE

The first 800 m of tunnel, which took more than three months to excavate, were in very poor rock conditions. Muck was hauled back to the de Boucherville shaft in 9 m³ skips by 8 t Clayton locomotives and hoisted to surface using a P&H 1055 B-LC 100 t crane.

At the time of the *WT* visit, intersection with the 8.2 m dia. shaft at Clarence Gagnon Street had been made, providing a fresh access for the final drive to the reception shaft at Dickson Avenue.

Excavation was completed at the begin-



Around 5,000 l/min of water was encountered at the site of the roof fall.

ning of October. The machine was then dismantled at the Dickson shaft and shipped to the MUC yard close to the sewage treatment plant in the east of Montreal Island. This work was completed before the end of October 1989.

A 50 m-long telescopic concrete form, which includes a self-propelled, all-hydraulic form carrier supplied by Burke Forms, is now being used to complete the non-reinforced concrete lining.

The project is expected to last until April 1990.

Asked whether Spino had at any time regretted taking on this unusually difficult contract, Edward Bachar, construction manager at Spino and with the company since the late 1950s, simply shrugged his shoulders, "Every once in a while, destiny sends us these impossible jobs; we have always succeeded in completing them." This understatement just about says it all.

ACKNOWLEDGEMENT

WT is grateful to Spino Construction Co Ltd for permission to publish this article, and to Nunzio Spino and Edward Bachar for the provision of pictures and the reading of draft.

by Mike Smith

Editor — World Tunnelling



The relief drive was closed off using bagged cement which set in place.

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