

## Out of Sight, Not Out of Mind – Heart Lake Storm Sewer Reline

Canada's infrastructure is in a state of deterioration. Many of the structures built in the post war building boom are reaching the end of their design life. Underground pipes that are out of sight are easy to ignore. It is comforting to know that highway departments are constantly reviewing and quietly upgrading their systems.

At the intersection of HWY 401, HWY 410 and HWY 403 some 321,000 vehicles pass every day. Under layers of intertwined bridge structures is the Heart Lake Storm Sewer. Built in 1980 this 3050 mm diameter reinforced concrete sewer was showing signs of serious deterioration. Large cracks were evident, the result of the rigid sewers inability to accommodate extreme pressures but relatively minor movement of the expanding shale bedrock. Corroded reinforcing steel was exposed at the top of the pipe. It was apparent that road salt was making its way into the concrete walls.

Replacing the sewer was not an option, nor was it an option to close your eyes and hope that all would be fine. Through an innovative relining technology, using Corrugated Steel Pipe, the MTO without fanfare, quietly fixed the problem.

The decision was made to reline the existing sewer and extend its life. The Consultant, Morrison Hershfield was charged with finding a system that would accommodate the expected loads and up to 90 mm of future shale bedrock expansion. The liner would also have to meet all of the physical and hydraulic constraints of the project.

A variety of liners were considered. In the end Corrugated Steel Pipe with a 2850mm inside diameter was selected. A 125 x 25 mm corrugation in 4.2mm thickness met both the structural and hydraulic requirements. As a flexible pipe CSP evenly distributes load to the surrounding backfill allowing it to safely support enormous loads.



CRACKED AND CORRODED RIGID SEWER PIPE

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Although the CSP was protected with a Galvanized Coating an additional shop applied coating of coal tar epoxy was specified for the invert area to enhance long term durability. A composite drainage fabric was installed outside the CSP liner at the joints, to drain water that was infiltrating the concrete sewer.

The real challenge was installing the liner. As the damaged section of sewer was several hundred metres from the outlet, under the main traveled portion of HWY 401, it was obvious that the liner would have to be slipped into place through the host pipe. The approach had a long radius curve so the 195 metres of liner had to be fabricated in short (3.15 metre) lengths to negotiate the bend. The storm sewer had to remain active and available throughout the project.

Each section of pipe had screw jacks fitted at the manufacturer's plant. These were required for accurate adjustment of line and grade prior to blocking and installation of internal coupling bands. Grout fittings in the liner walls allowed for controlled pumping of grout into the cavity between the liner and host pipe.

The contractor, Underground Services, developed a special frame to carry the CSP liner sections into the sewer using a small fork lift truck. An innovative de-watering scheme proved to be cost efficient and highly effective, accelerating the progress of the project.

The project was originally scheduled to take place over two mid winter seasons, when freezing temperatures reduced the risk of flooding. It was easily completed within budget, in a single winter.

Only a few of the 321,000 drivers who passed the site every day may have noticed the nearby site trailer and storage yard. Even fewer would know that MTO was quietly looking after their safety, out of sight but not out of mind.



FORK LIFT WITH CARRYING FRAME



CSP WITH SCREW JACKS AND GROUT PLUGS