

## The Shortest Distance Between Two Points

The high school in Clavet is located directly across the busy Yellowhead Highway from the variety store. Over a side road and one hundred metres down the Highway is a pedestrian underpass, originally built to connect the residential and commercial areas. A dangerous 100 metre dash over the busy highway, instead of through the underpass, cuts off 400 metres as students sprint to the store between classes.

This dangerous situation has been resolved with a new Corrugated Steel Pipe (CSP) pedestrian underpass, built in a direct line to the variety store. As alternative designs were considered, a number of engineering challenges presented themselves.

This is an area of very flat terrain. Issues included limited available headroom, low cover, heavy highway loading and drainage. A 2400mm diameter CSP met all requirements. The pipe invert was partially filled with self-draining gravel and perforated sub-drains. Easily handled in long lengths, CSP can be installed quickly using open cut techniques.

There is however a standard in Saskatchewan requiring the construction of a paved detour, rated to 80 km per hour speeds, for major highway crossings. It was estimated that such a detour would add \$50,000 to the cost of the project.

To eliminate the need for a detour, it was proposed that the shoulder to shoulder portion of the crossing be installed by tunneling. A galvanized corrugated steel tunnel liner plate (TLP) of 2400mm diameter was used as a liner while the 17 metre long entrance and exit pipes were installed as single lengths of CSP by conventional open cut construction methods. Each CSP had a single 500mm long ring of TLP shop welded to it to facilitate connection to the tunnel portion. All welds were protected with zinc rich paint.



YELLOWHEAD HIGHWAY UNDERPASS, CLAVET

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The entrance pipe, on the high school end was installed and backfilled first. The backfilled road end became the tunneling face. Tunneling equipment and crew could enter the pipe at grade and work protected from the traffic and weather.

The tunnel was installed in the winter. Heavy frost in the ground helped to support the limited 800mm cover above the TLP during excavation. A small tracked tunnel-excavating machine augmented hand digging. As a precaution, to minimize impact loads, the highway speed limit was reduced to 60 km per hour during the tunneling operation. Pressure grouting, with nonshrink grout, pumped through factory installed grout ports, closely followed the installation of the TLP.

Once the 14 metres of TLP was installed the tunnel face was carefully day-lighted by open cut and the exit CSP was attached and backfilled.

Safety is the prime consideration for pedestrian underpasses. A 100mm diameter, solid wall polyethylene pipe was slit and bolted on the ends as a protective bumper. Vandal proof interior lighting completed the installation. The shortest distance between two points means the students are now safer in Clavet.



TUNNEL LINER PLATE WELDED TO CSP



END PROTECTION