

Relining with Corrugated Steel Pipe

Owner
**Ministry of Transportation,
Ontario**

Consultant
Morrison Hershfield

Contractor
**Underground Services
Limited**

Location
Mississauga, Ontario

INFRASTRUCTURE



With over 320,000 vehicles per day the intersection of Highways 401, 403 and 410 in Mississauga, Ontario, is one of the busiest in North America. At the same location can be found the confluence of several drainage paths, all of which are channelled into one major storm drain, which then passes beneath the intersection through a single storm sewer pipe.

Built in 1974, this 3050mm concrete storm sewer was showing severe signs of pre-mature deterioration. For several years, the concrete sewer had been cracking; joints had been separating and corrosion of the reinforcing steel and subsequent spalling of the concrete from the interior pipe walls was becoming a major concern.

The owner, the Ministry of Transportation of Ontario recognized that the storm sewer had to be rehabilitated. Replacement was impractical, if not impossible, due to its location under one of the busiest highways in Canada.

The decision was made to re-line the existing structure to extend its life. The consulting engineer, Morrison Hershfield was charged with finding a liner system that would accommodate the anticipated structural loading and up to 90mm of pipe deflection. In addition the solution demanded unusual physical constraints due to the condition of the existing culvert. Whatever solution was chosen would need to be installed with a minimum reduction in hydraulic capacity.

Numerous options were examined that were all variations of Corrugated Steel Pipe. Multi-Plate®, Tunnel Liner Plate® and various corrugations, gauges and coatings of Hel-Cor® Corrugated Steel Pipe were considered. The objective was to find a solution that would meet the load and deflection requirements, maximize the inside diameter and satisfy the hydraulic conditions.

Various solutions were eliminated on the basis of corrugation profile,



Case History



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physical properties, hydraulics, construction and cost. Meeting the required design life of the culvert added yet another dimension to the challenge.

The solution selected, which provided the required strength and durability, was a Corrugated Steel Pipe, 2850mm inside diameter employing a 125x25mm corrugation, manufactured from 4.2mm gauge galvanized steel. Due to the fact that the liner had to negotiate a curve in the sewer in order to reach its final location, the length of each pipe section was limited to 3150mm, with a total of 62 sections of pipe being supplied on the contract.

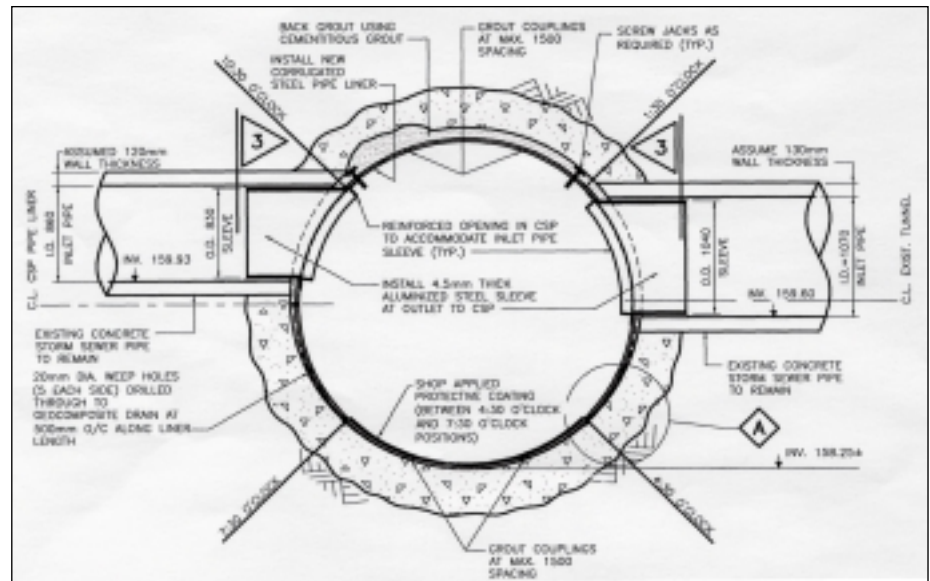
As added protection, a Coal Tar Epoxy coating was specified for the invert of the pipe and at the cut ends of each pipe section. To assist in drainage behind the pipe joints, Mirafi G100W high-performance drainage composite was installed.

A key component of the contract was the de-watering scheme, as the sewer could not be taken out of service. The contractor's innovative de-watering scheme was cost efficient and highly effective in accelerating the progress of the project.

The Corrugated Steel Pipe was installed piece by piece, each piece secured in

place using factory-installed screw jacks and additional wedges. The short lengths eased the rapid passage of the relining pipe into the existing concrete pipe. After installation, the annulus between the deteriorating concrete sewer and the Corrugated Steel Pipe liner was grouted.

Originally scheduled to take place over two winters, the entire project was easily completed in the first winter, within the Ministry's budget.



Insertion of the Re-line pipe into the host pipe.



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