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Daniel Crevier
Eastern Canada Manager, Weholite products
KWH Pipe Canada LTD
Québec, Canada

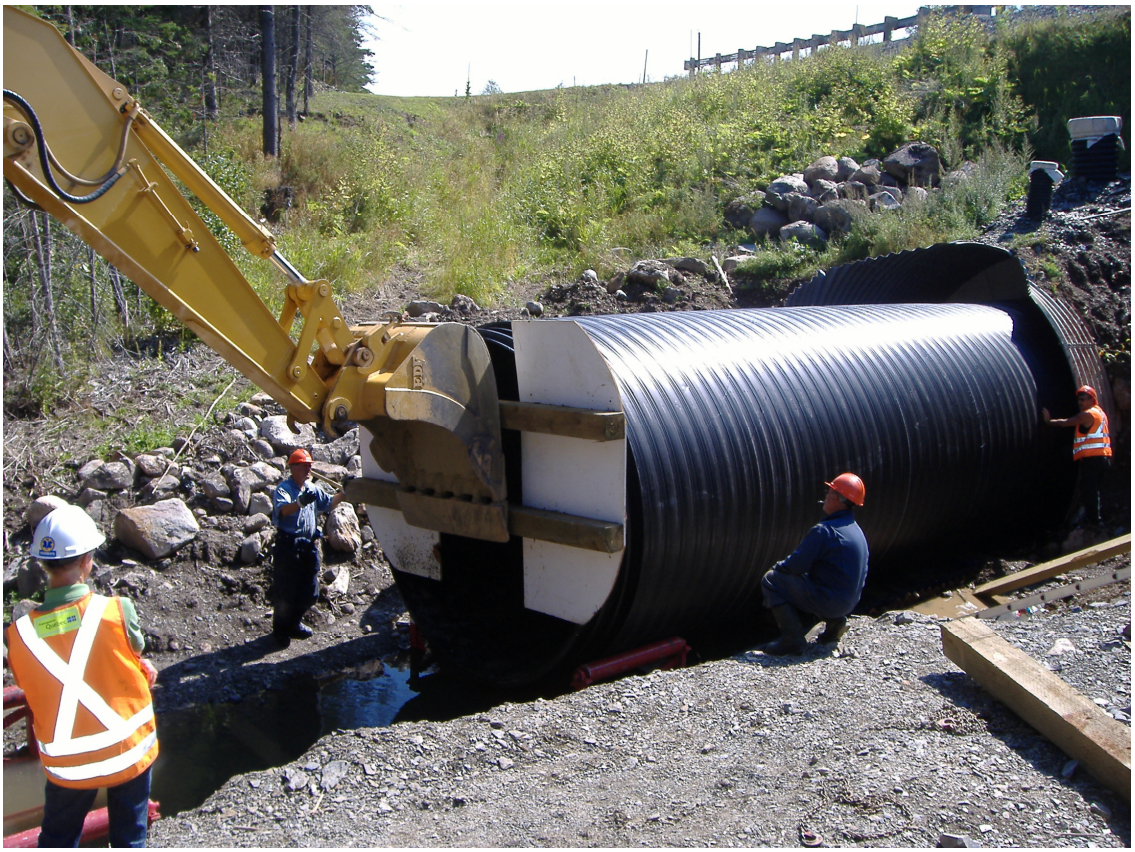
Corresponding author's E-mail: daniel.crevier@kwhpipe.ca

ABSTRACT

MTQ save millions $ by relining culverts with long life spend pipes

INTRODUCTION

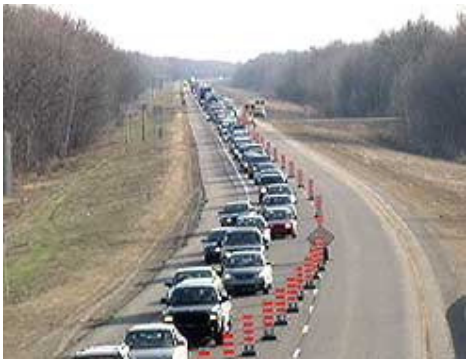
Too many culverts have surpass their design life spend. The irrigated bottom of those structures, change the fluidity of the original design system, to a point that they cannot face the storm designs anymore. The failing structures also permit wash-out of the soil support of the road, creating voids between the road and the culvert.



MTQ now have an exhaustive inspection program for their over 62,000 culverts. They have an inspection guide and a method of evaluation. A complete relining specification document that covers all the relining specification including the cement grout mixtures, that is one of the key of the success of this method.

Why did they invest so mush funds in research and development in the last 10 years for these infrastructures?

"Where and how do they save cost? " The typical replacement of a culvert involves: securing the job site with safety signs, often build a detour road, cut the asphalt, dig-out the material and the failing culvert, install new culvert, bring and compact new material, back field, compact backfield material, install new asphalt, redo paint lines and finally take out safety signs.



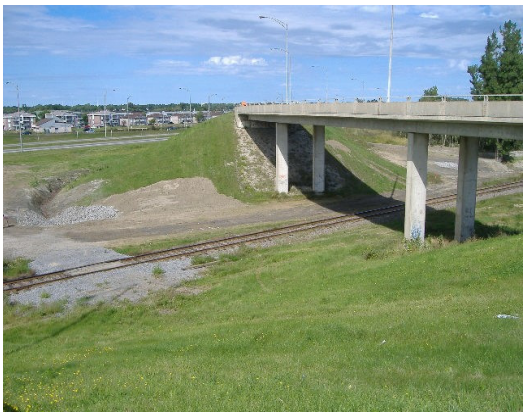
Lets not forget the users, how much is it worth $ to THEM?

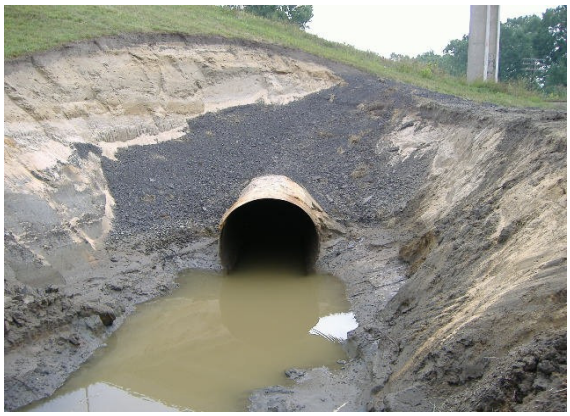
On the other hand the relining method involve: very little safety signs, simply pull or push the new culvert in place and grout the annular spacing to prevent point loads in the future.

Smooth and a very good "N" factor for the OD are required allowing the grout to flow.
No de-routing, no asphalt cutting, no digging, no taking out and disposing of the failing culvert, no back field to put back and compact, no asphalting and no need to redo the painted lines.

All dough these costs vary from one job to the other, in average, the savings of relining comes to 70%. In other words, the cost of replacing is 3 times higher then relining.

Let's look at one case study.

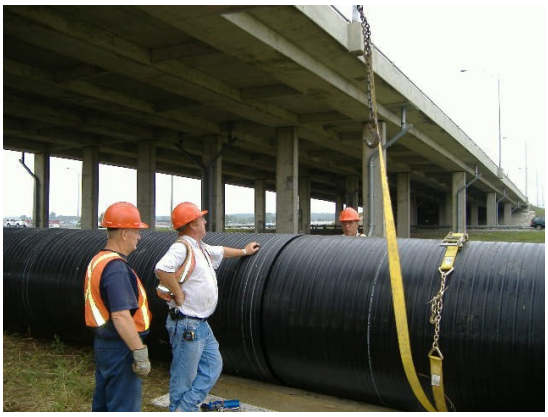




The pictures above shows a culvert under an asses road to an autoroute next to a rail way. The wrinkle metal culvert was rusted, in fact, bottom less and letting in the soil support at an alarming rate. It was determined that the cost of dig and replace would have been well over $1,500,000.00 and would have taken months to do the extensive work. The economic cost, of stopping the traffics of the road and the railway, was also in the Millions $. An assessment of relining with Weholite was then taken in consideration. The first step is to determine the largess size of pipe that can be pulled in the existing culvert. The second step is to verify and evaluate if the reline pipe can and will handle the new 100 year storm data.

The scope of the work is really not complicated;

1- Clean the inside of the culvert of any material.
2- Thread together the Weholite pipes.



3- Pull in the sections from the first threaded section.

4- Grout the spacing between the host pipe and the Weholite pipe to prevent point loading.

The total cost was $ 203,000.00. The cost of the pipe was only $ 38,000.
MTQ save well over $ 1 Million on this job alone.

MTQ have realized well over 6,500 relining since 1996. They are relining over 600 culverts every year since 2003. In average, relining cost is below 30% of the cost of dig and replace.
With the big advantage, of not stopping traffic. Keep in mind that we still have lots to do, since 40% of the 62,000 culverts have surpassed their design life spend.

The product used has a Manning "N" of 0.010, it's not affected by low or high PH level, often present in water streams, does not rust or corrode, is not affected by UV, resist joints separations due to freezing water, provides 100% silt tight joints that will not wash away the road support and has the best abrasion resistance of all culvert material.

"How long will this installation last once the relining is done? "

Weholite PE pipe has a service life that can conservatively be estimated to **exceed100 years** for most service conditions that can be anticipated, almost without exception, for service in municipal and DOT'S infrastructures environments and applications.

The 'Plastic Pipe Association' provides a number of technical reports that are useful in assessing the suitability of a PE pipe for a specific application, and in determining if there are any environmental factors that might limit the service life to a period less than 100 years. The two (2) most useful documents are TR 19 and TR 43. An extensive listing of the corrosion resistance of HDPE to many industrial chemicals as a function of temperature may be found on the 'Plastic Pipe Association' website in their Technical Report (TR) 19. In general, PE is highly resistant to most of the corrosive products that will be experienced in a municipal infrastructure environment (all storm sewers, sanitary sewers and raw and potable water pipelines).
Their Technical Report (TR) 43 is an assessment of the service life of circular corrugated PE pipes. It is common practice to undertake a design by using the tensile and compressive strength properties and flexural modulus properties of the pipe at 50 years when subject to constant load for this 50 year design period. Analysis and observation have shown however, that the thermo-viscous property of PE produces a relaxation of the internal stresses that far exceeds any deterioration that may occur in the material properties of the pipe. In general the initial deformation that takes place when the pipe is first installed causes the surrounding soil to form a compression arch. The loads are transferred to the surrounding soil and the load values used in the design analysis generally are not experienced by the pipe after the short period of predicted pipe and soil deformation that is characteristic of a flexible pipe design. The grade of PE resin used in the production of Weholite pipe exceeds the requirements of the ASTM standard to which the pipe is made (ASTM F894). The resin requirements of this standard exceed those of the AASHTO standards to which the circular corrugated pipes are manufactured (and which is the basis for the 100 year service life recommended by TR 43).

Deterioration of the properties of PE as a result of oxidation has been shown not to occur for a period of 570 years at normal temperatures (temperatures below 35C / 95F).
The resistance of PE to abrasion has been well documented. In fact this property is the primary reason that PE is used extensively in the highly abrasive application of slurry transport in mine tailings lines. And the pipe composition is uniform throughout. There are no abrasions or chemical resistant coatings that can be corroded or abraded.

IMPORTANT

This statement is not a substitute for professional engineering advice and is made without guarantee or representation as to results. Although every effort has been made to assure its accuracy KWH Pipe does not warrant or assume liability or responsibility for its use or suitability for any given application.

Conclusions

The average cost saving per culvert rehabilitated is $ 50,000.00. Since they do in average 600 rehabilitation yearly, we can conservatively come to the conclusion that MTQ save well over 30 millions $ yearly, by relining with Weholite every year. With a product that has a potential life spend of 100 years.

Acknowledgements

I wish to acknowledge the efforts and investments made by MTQ (Ministry of Transports of Quebec) in particular the departments of Structure, Laboratory and off course all MTQ hard working installer.