MATERIALS & CORROSION

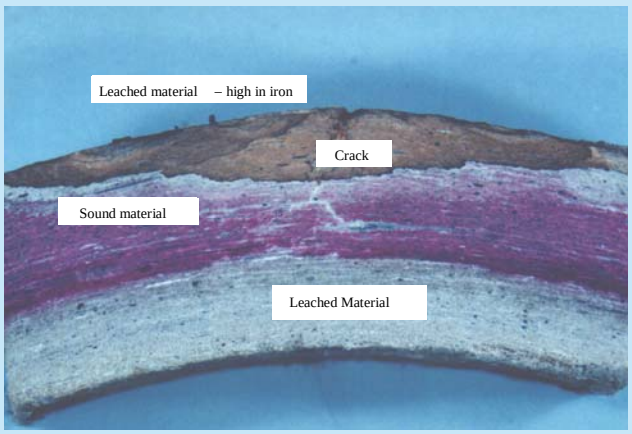
Condition Evaluation of Asbestos Cement Pipe

Asbestos cement pipe has been used extensively as a source of durable, inexpensive piping for water distribution and sewer collection systems. With time, aggressive waters, sewage and soil/groundwater can compromise the integrity of the distribution or collection systems. Levelton's studies have shown that the major problem with AC piping systems is cement mortar leaching, with the most severe attack, in most cases, from the outside diameter surface or soil/groundwater side.

Most municipalities have funded their water and sewer piping infrastructure repair/replacement at a rate that is less than what is required by the piping deterioration rate. This maintenance strategy has been geared more towards reacting to failure rather than preventing failure. Although catastrophic failures occur infrequently with AC piping, they increase with age and can absorb a very large percentage of available monies for repair and seriously erode public confidence in the management of the system. The premature replacement of infrastructure at the wrong point in its deterioration cycle causes large sums of money to be spent unnecessarily.

Investing the taxpayer's dollar in the most effective manner possible is clearly the order of the new millennium.

The cement mortar leaching attack of AC pipe appears to progress by a movement inwards of a very distinct front separating the leached material from sound pipe body. As the thickness of the barrier increases, the rate of leaching drops off to some extent. Studies by Levelton have shown that the depth of leaching of AC pipe is proportional to a function of time. Since the majority of asbestos cement water distribution and sewer collection systems in North America are at least 40 to 50 years old, there is concern over the continued serviceability of these urban infrastructures due to cement mortar leaching.



Polished Cross-Section – Phenolphthalein Stain

Many municipalities are now looking for an engineering solution that would result in the most effective use of their shrinking asset management dollars. The questions that need to be asked to identify the most cost-effective rehabilitation strategies include:

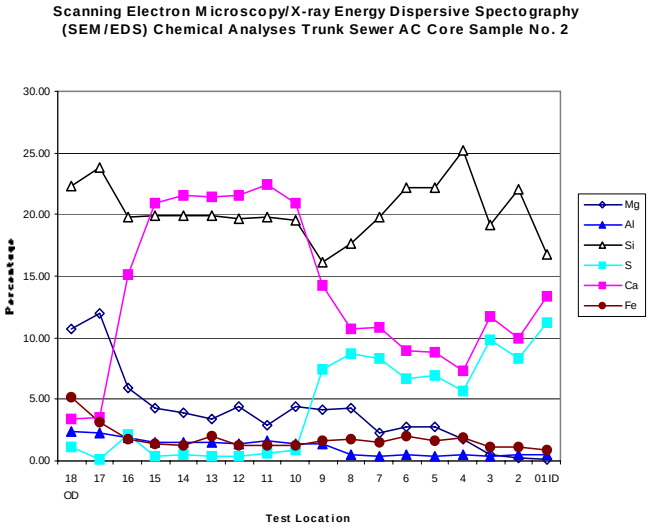
- What must be replaced?
- What is the optimum time for repair?
- What are the direct and indirect cost consequences of failure?
- What is the potential impact of the failure on the public?
- What level of funding will be required to establish a sustainable infrastructure?

To assist in answering these questions, Levelton Consultants Ltd. has developed a conservative empirical approach to estimate the remaining service life of asbestos cement pipes. This now allows municipalities to plan an orderly replacement program for AC piping systems.

LEVELTON

The following is Levelton's typical test procedures for evaluating the condition and expected additional service life for samples of AC piping. Some or all of these tests may be carried out depending on the sample size and client requirements.

- Visual examination aided by low power stereomacroscopy.
- Crush strength test.
- Hydrostatic strength test.
- Dimensional measurement.
- Sectioning and polishing pipe cross-sections.
- Measurement of surface hardnesses and scratch hardness tests of polished cross-sections.
- Phenolphthalein indicator "staining" of polished cross-sections to evaluate gross leaching of the cement mortar.
- Chemcial analysis of the AC pipe wall to evaluate the degree and extent of cement mortar leaching.



Estimate of Additional Service Life - Levelton Consultants Ltd. has developed a conservative empirical approach to estimate the remaining service life of asbestos cement pipes. The equation is based on: the unaffected wall thickness; a cement mortar leaching rate proportional to a function of the age of the pipe; and a numerical ranking system that relates to our test results and experience from past studies. This now allows municipalities to plan an orderly replacement program for AC piping systems.

Levelton Consultant's Physical & Mechanical testing laboratory has extensive experience in testing many piping materials including AC, concrete, ductile and cast iron, steel, copper, plastic and composites. The laboratory is CSA certified and has extensive facilities including two universal testing machines to 530 kN capacity, a compressive testing machine to 1800 kN and a variety of related apparatus for stress-strain and load-displacement measurements. Facilities also include a comprehensive inventory of equipment for electrochemistry and corrosion studies.

Levelton Consultants Ltd.

150 – 12791 Clarke Place Richmond, B.C. V6V 2H9
Tel: 604.278.1411 Fax: 604.278.1042
Email: info@levelton.com www.levelton.com

ABBOTSFORD 604.855.0206 CALGARY 403.269.4141 COURTENAY 250.334.9222 KELOWNA 250.491.9778 NANAIMO 250.753.1077 SURREY 604.533.2992 VICTORIA 250.475-1000