ST. JOHN'S

Structural Lining of Water Mains

City of St. John's, Water and Wastewater Division

Overview

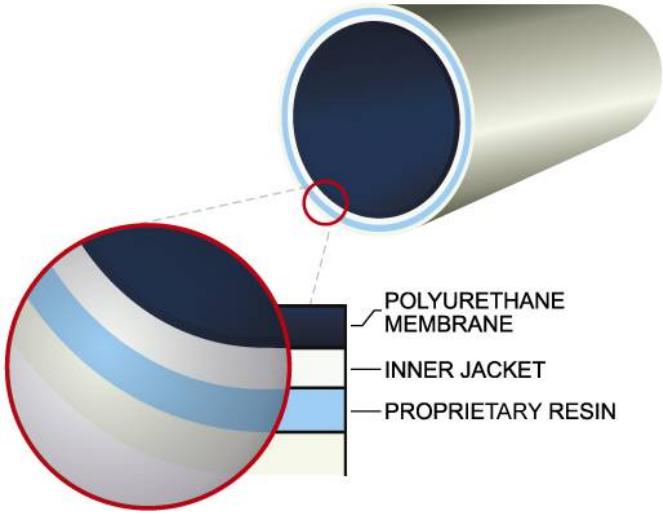
- Applications
- Pre-lining process
- Installation (Aqua-Pipe Product)
- Post-lining process
- Challenges

Applications

- Alternative to water main reconstruction.
- Limited above ground disturbance.
- Potentially a desirable option in:
  - High traffic areas
  - Locations with restricted access/space constraints
  - Environmentally sensitive areas.

Structural Capacity of Aqua-Pipe

- Class IV fully structural liner in accordance with AWWA M28 Structural Classification.
  - The liner can withstand internal pressures (including a vacuum) without relying on the residual strength of the existing pipe.
  - Maximum operating pressure of 150 psi.
- Certified by NSF/ANSI Standard 61.



Temporary Water Supply

- Temporary water supply provided to residents prior to starting work.
- Asphalt filings placed on temporary water line at driveway crossings.

Temporary Water Supply Cont’d

Access Pits Excavated

- Access pits are typically located at tees, 90° bends or valves.

Cleaning Main

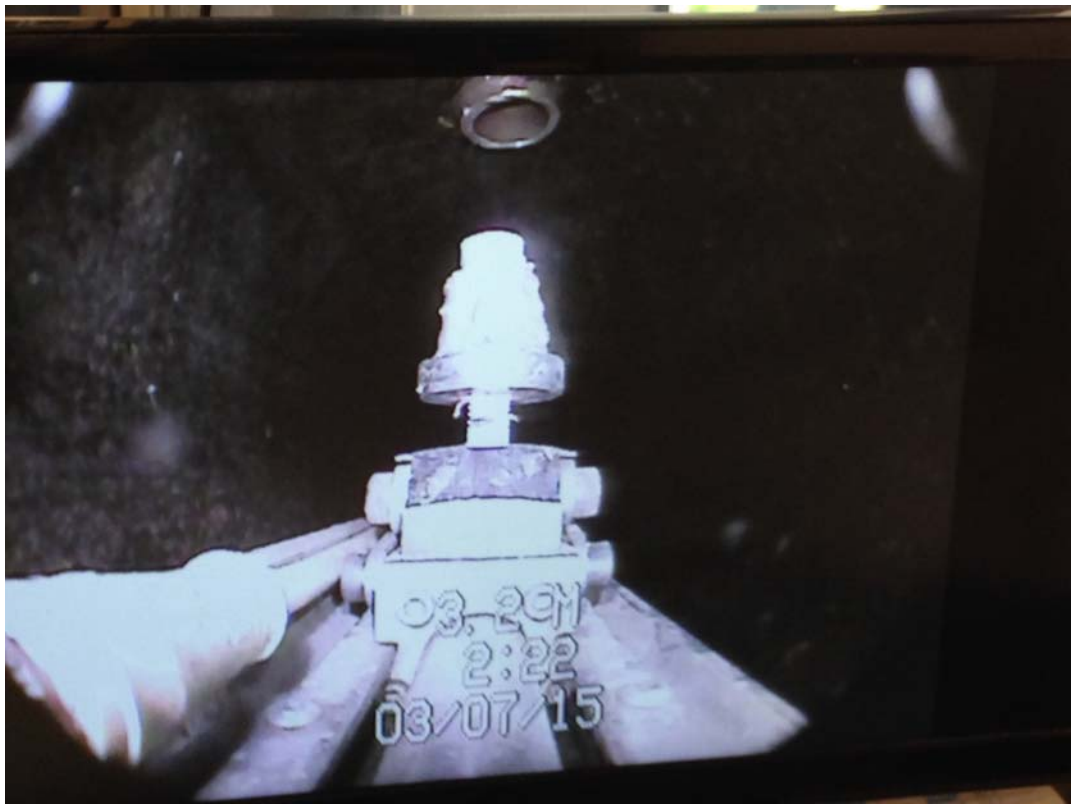
- Tuberculation removed and interior of pipe cleaned using a drag scrapper. The main is then flushed.
- Any water services which are protruding significantly into the pipe are cut back near the pipe wall.

Post Cleaning

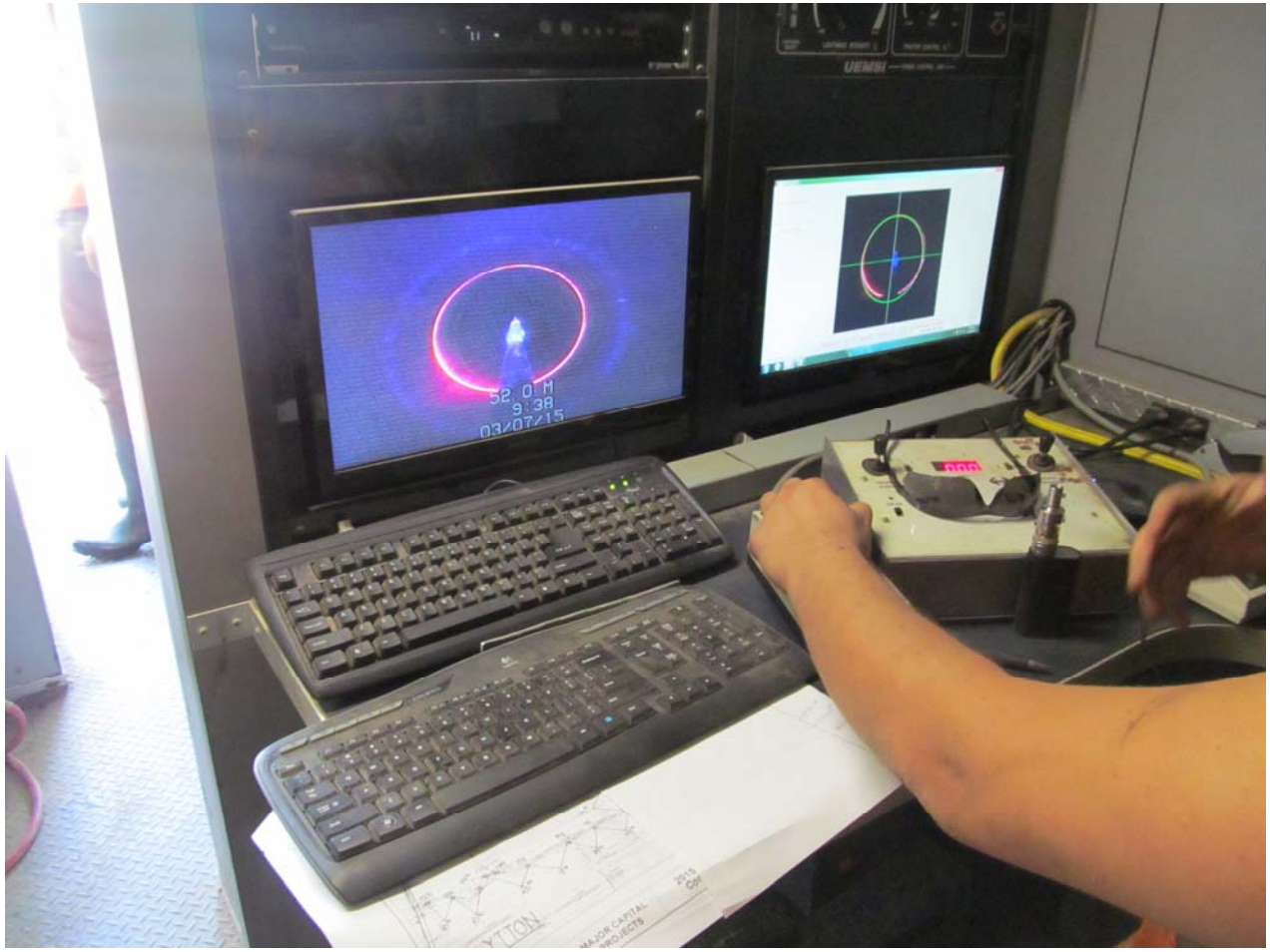
- A pre-lining camera inspection is carried out to map the service connections and confirm the pipe is cleaned to satisfaction.
- All standing water must be removed prior to lining.

Inserting Plugs into Water Services

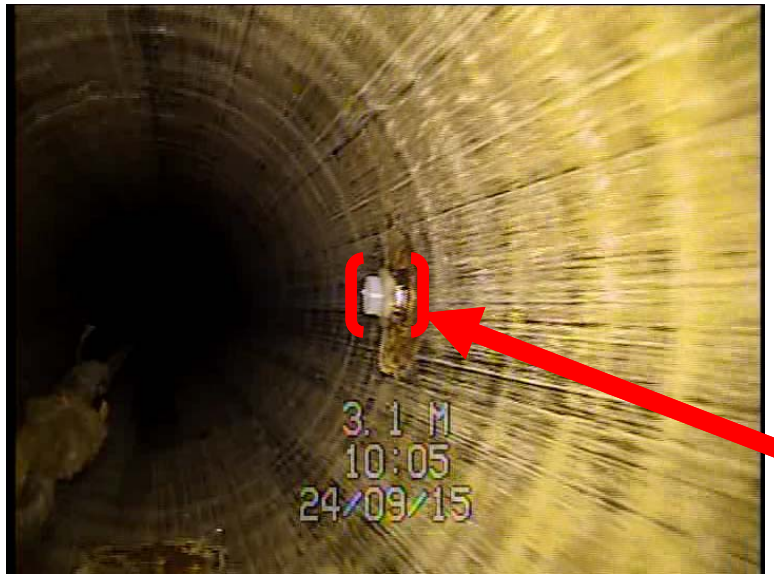
- Each water service must be plugged inside the pipe using robotic equipment. This prevents epoxy from blocking the service (in most cases).

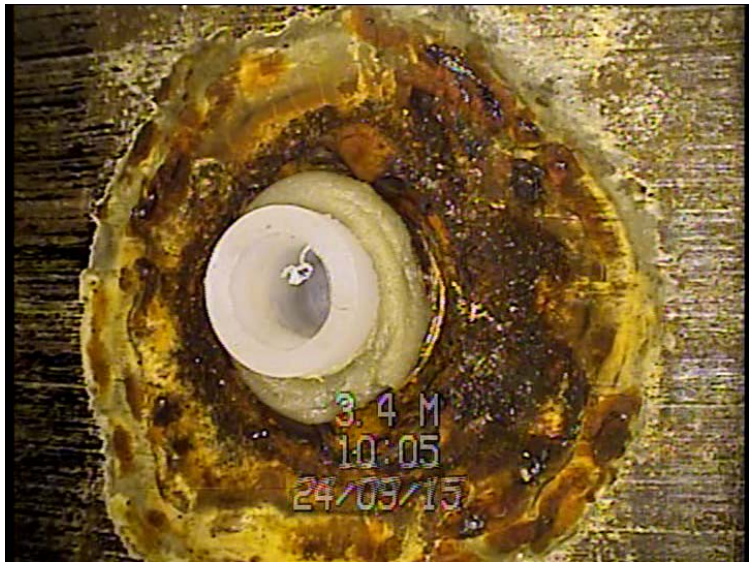


Control of Robotic Equipment



Plug Installed in Service





Lining Process (Aqua-Pipe)

- Cured in Place Pipe (CIPP) consists of a woven polyester tube injected with epoxy resin.
- A polymeric membrane is bonded to the interior of the tube to provide water tightness.
- Liner is formed by swabbing the pipe.

Lining Process Continued

Lining Process Continued

- Required amount of hardener and epoxy resin are mixed on site.
- Epoxy is injected into the liner as it is being pulled into the pipe.

Lining Process Continued

- The lined pipe is pressurized for 30 minutes using cold water to promote a tight fit between the liner and the host pipe.
- Hot water is circulated for 2 hours at 60 degrees Celsius and 50 psi to allow the liner to cure.

Lining Process Continued

- The lined pipe is kept under pressure during the over night cool down period.
- Perform hydrostatic pressure test as per specifications.

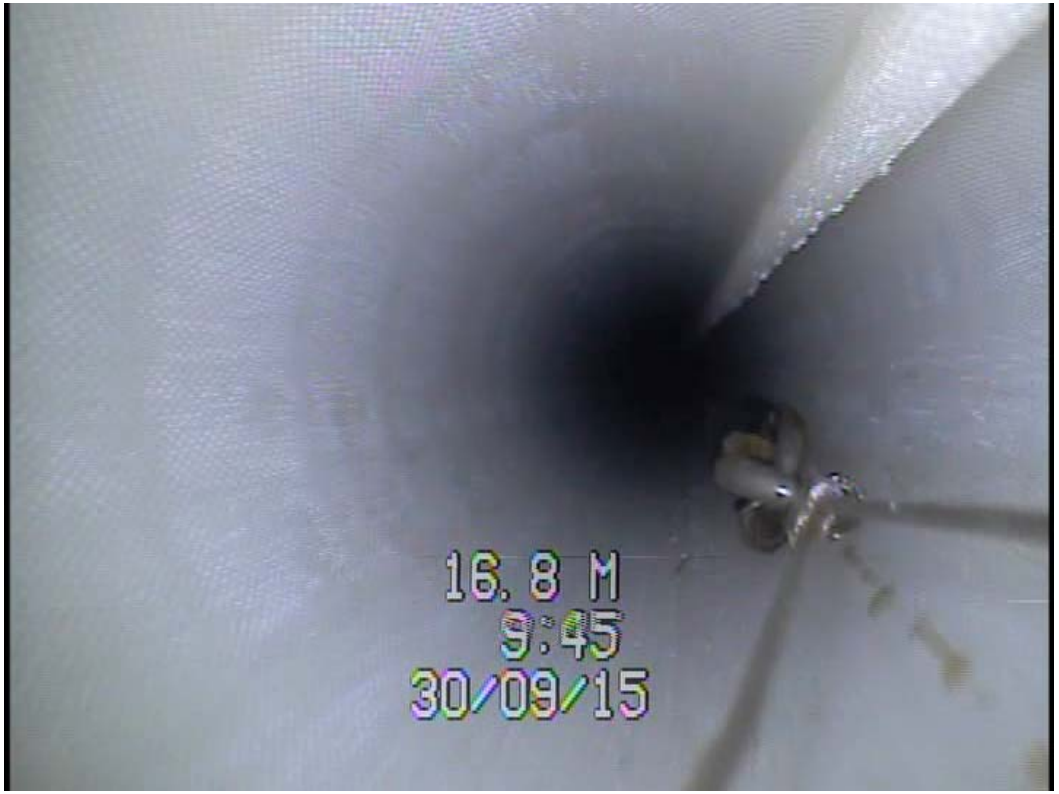
Service Plugs Removed

- Service connections are reinstated by drilling out the previously installed plugs using robotic equipment.

Typical Clear Water Service

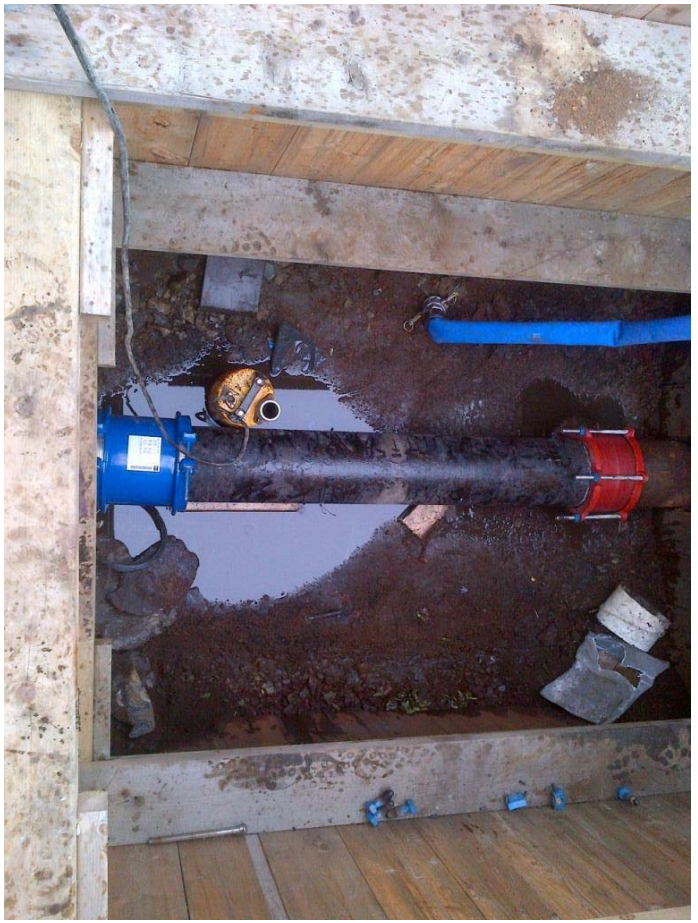
Finished Rehabilitated Product

- A post-lining camera inspection is carried out to confirm service connections have been re-established and to verify that the liner was installed correctly.
- Services located at the liner fold or blocked with resin must be excavated.



Commissioning of Main

- The rehabilitated pipe is chlorinated as per specifications.
- Typical connections are then made to the distribution system.



Testing of Liner

- At each access pit, a liner sample is collected and tested for strength and thickness.
- The sample from Rosevelt Avenue is shown on the right.

Challenges

- Mapping services can sometimes prove to be difficult.
- Robotic equipment can only carry one service plug per trip which is time consuming.
- Services must be excavated when plugged with epoxy resin or on the liner fold.

Questions

Thank you

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