

## MATERIALS & RESEARCH

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### RESEARCH UPDATE

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## INSTALLATION OF THE ULTRALINER PVC ALLOY PIPE LINER BARTON, VERMONT

**REFERENCES:** Work Plan No. 2001-R-8

### **PRODUCT LOCATION:**

The Ultraliner was installed in two pipes with an intermittent water flow within the project on US Route 5 in Barton, Vermont, beginning 1.61 km from Barton Village line and continuing towards Barton for 0.46 km. The first is a 450 mm diameter pipe located at station 1+063.000 and the second is a 600 mm pipe located at station 1+142.000 on the Barton STP 0113(58) S project.

### **PRODUCT DESCRIPTION:**

The Ultraliner PVC Alloy Pipe liner is a folded continuously extruded polyvinyl chloride pipe liner with a specified nominal wall thickness dimension ratio of 35. The pipe liner is designed to return to its pre-folded round "memory" shape upon the application of heat and to be formed tightly against the host pipe by "blow molding" with steam.

### **INSTALLATION:**

The existing pipes were in poor condition with deformations, tree root infiltrations, and extensive areas of corrosion.

The installation of the new pipe liners began on May 7, 2003, with the ambient air temperature at 46 degrees F. The process commenced with cleaning the existing pipes with a high powered jet hose. The 'steam truck' arrived and the crew began the set up for the installation of the 450 mm pipe liner.

The 'steam truck' houses a 50 HP Kewanee brand boiler which, by the manufacturer's requirement, supplies low pressure steam at 10 to 15 psi for up to two hours for processing. The folded pipe liner arrived on a large wooden spool as seen in the adjacent photograph.





To prepare the product for installation, steam was applied to the liner for approximately 4 hours by covering the entire spool with tarps and injecting the steam within the tarps. The time needed to soften the liner depends on the length and diameter of the liner as well as the ambient temperature. Once the liner was sufficiently malleable it was pulled through the existing pipe with a winch.

During this process the temperature of the liner is lowered, therefore stiffening the liner and making it necessary to reheat. Plugs are inserted in both ends of the liner which are attached to a hose supplying steam from the boiler.

At first, steam is applied through the entire liner and then the pressure is raised in order to mold it to the existing pipe. Two ways this is done is to inject compressed air into the liner, and to restrict the flow of air using the pressure regulator attached to the outlet.



According to the manufacturer's documentation the pressure within the liner is never to exceed 12 PSI. For this installation pressure was brought to 5 PSI. Once the liner has taken the shape of the existing pipe the injection of steam is stopped and only compressed air is applied to cool the liner. The temperature of the exhaust air was brought down to 100 degrees before the pressure was released.

Material at the inlet and outlet are trimmed at this time. The adjacent photograph is of the 600 mm corrugated metal lining. An inspection of the culvert is performed before and after installation using a video



camera which can be fed through the entire length of the culvert. The entire process of lining one culvert took one working day to complete.

**COST ANALYSIS:**

A significant motivation for utilizing this product is cost savings. The cost of replacing failed culverts can be significant depending on the depth and length of the culvert. It is estimated that replacing these two culverts would require approximately \$110,000 worth of installed materials along with a full or partial road closure of two to three weeks which would cause a significant amount of inconvenience to the traveling public.

The total cost of the 600 mm lining was \$27,300, and was bid as a lump sum. The total cost of the 450 mm lining was \$13,000. Some additional manpower and minimal materials were used in erosion control and preparation. Those costs would also have been incurred with a normal replacement.

**FOLLOW-UP:**

The liner will be monitored on a semiannual basis and observations, including the condition of the liner and the roadway, will be documented in a report completed after the second year of performance. A final report documenting these items as well as the product's life cycle cost will also be published.

**DISCLAIMER**

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