

ROAD BUSINESS



The outlet end of the newly installed slip lining in Plymouth on Fair Grounds Road

On the Road in New Hampshire *Two Slip Lining Culvert Projects*

A recent study showed that slip lining is the most often used culvert maintenance practice in the US. However, few agencies in NH are slip lining. The NHDOT District 2 is actively slip lining culverts where there is deep cover and/or high traffic volumes.

District 2's first project was in Sutton, eight years ago. It was on the interstate at exit 17. The culvert was damaged and replacing it would mean closing the ramp. Slip lining was a quick repair and traffic was maintained.

In the two NHDOT projects featured in this article, T160 PVC 1120 was used as a liner. After each liner was installed, the space between the old culvert

and the liner was sealed with a cement grout.

The picture on this page shows the completed installation of a liner. The existing culvert was 25' deep and 100' long. The 48" cement culvert was lined with a 36" liner. A 36" liner was used because the cement culvert was no longer straight and could not accommodate a larger liner.

For these projects, the NHDOT installed the liners from the inlet end. The liners were pulled through the existing culvert. A 3/8" cable was fastened to a wooden disk which was fitted over the end of the liner to evenly distribute the pressure.

As each 20' section of liner was pulled through, a coupling (or collar) joined the next liner. The crew found it effective to screw the pipes together, especially if they needed to remove the liner. To keep the pipe from cracking, they made a pilot hole and then used a 1/4" wood screw.

As each liner was pulled through, two-inch electrical conduit clips were fastened to the top of the liner. The clips secured a two-inch PVC pipe to the top of the liner; this pipe delivered the grout to the

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installation. The grout hose was inserted into the PVC pipe.

Beneath the liner, they placed another two-inch PVC pipe as a weep hole (to allow water to exit between the culvert and liner). The weep hole was capped before grouted. It is vital to dewater the culvert and liner to allow the grout to set-up and cure.

Once the liner was fully installed, a mini-header was constructed between the pipe and liner (about one foot in). The header kept the grout between the culvert and liner. Before the grout was inserted, an excavator was placed at the outlet end to hold the liner. Without this support, the liner may pump out of the culvert as the grout was pumped in.

These projects used a 8-12 bag mix (eight bags of cement to one yard of concrete sand) cement grout. Once mixed, it was screened so it didn't clog the PVC pipe that delivered the material. If the PVC pipe became clogged then one of the two vent pipes can be used.

They maintained a pump pressure of less than five psi. They closely watched the pressure as it can increase rapidly. They begun pumping at the half-way point of the space (from the inlet end). It took about a half-day to grout and it cured within a few hours. The biggest challenge was in estimating the quantity of grout needed, as any cracks or holes in the old culvert, may allow the grout to leach into existing soil or cracks in the liner may occur.

Dennis Ford, the District 2 maintenance supervisor said, "You don't have to tear up the road. Even if the costs are the same, the indirect costs are substantially more. We aren't impeding traffic. In

fact, people don't even know that we're out there."

Next summer, District 2 plans to line 6-8 pipes. In all cases, the pipes are at least 100' long with 50' of cover. With traditional replacement techniques, they could expect to replace only one or two culverts.

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Benefits of Slip Lining:

- Does not disturb the road, compaction, or surface,
- Lessens environmental impact,
- Does not disturb underground utilities,
- Does not impeded traffic,
- Quicker than replacing culvert.

Right: PVC weep hole pipe. The pipe will be capped before grouting begins.



Below: An installation of Rt 25, after grouting at the inlet end, 2 PVC vent pipes on top of the PVC pipe used to deliver the grout.



Lessons Learned

- Dewatering the culvert before grouting is vital,
- Screw the liners to the culverts,
- Keep the grout smooth and the pump pressure below 5 psi,
- Each installation is unique,
- Properly seal joints.
- The liner pipe is brittle, use straps and a fork loader to move rather than chains.