



Transportation Research Division



Technical Report 07-3

*Utilizing Snap-Tite Slip Line Pipe
as a Direct Burial Cross Pipe*

Construction and First Interim Report, October, 2007

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Introduction

The Maine Department of Transportation uses reinforced concrete, polymer coated corrugated metal, corrugated aluminum or corrugated polyethylene for highway cross pipes. Design life for cross pipe is 50 plus years. Repair of failed cross pipes involves excavation and replacement resulting in high costs and traffic congestion. A cost effective solution to repair failed cross pipes is to slip line the pipe. MaineDOT policy allows the use of solid wall and profile wall high density polyethylene pipe for slip line applications. Snap-Tite is one of the solid wall liners often used.

Snap-Tite Pipe is a smooth bore pipe that comes in a variety of lengths and diameters. The pipe is lightweight and has a unique joint that snaps together to form a tight bond and water tight seal.

The Department has been slip lining corroded corrugated metal cross pipes for a number of years using Snap-Tite Pipes. This repair can only be employed when the existing pipe is large enough for the slip line pipe, the replacement pipe is large enough to handle the water flow, the ends of the metal pipe have not been lifted by frost, and the position of the existing pipe is sufficient for drainage.

A cross pipe on the Smyrna Road in Oakfield and another on the Pond Road in Benedicta were not suitable for slip lining and had to be replaced. It was decided to use Snap-Tite Slip Line Pipe as a direct burial cross pipe at these locations because of the cost as compared to the conventional materials used.



Figure 1 Downstream view of Snap-Tite pipe at Oakfield one year after construction. Center elevation is 4 inches below inlet and outlet.

Construction

The cross pipe in Oakfield was replaced in 2005 by MaineDOT employees. Installation of the cross pipe was not witnessed however an inspection was completed one year after construction.

The corroded metal cross pipe was deformed by frost to the point where drainage was inhibited and the pipe had to be replaced. Two 54 foot by 32 inch ID Snap-Tite pipes were installed. Each pipe consists of three sections that are 18 feet in length. The top of the pipe is 54 inches below the roadway surface.

Condition of the pipe after one year reveals very little distortion. There is a 4 to 5 inch elevation drop at the center of

the pipe however the pipe joints appear to be well sealed and water tight. The roadway surface elevation has dropped 1.5 inches where the pipes cross the road.

MaineDOT personnel installed the Benedicta cross pipe the week of September 10, 2007.

This area has two corrugated metal cross pipes that are corroded from the water line to the bottom of the pipe. The existing pipes could have been slip lined however the pipe elevation was too high for proper drainage and fish migration.

Construction began with diverting water through the original overflow pipe then excavating and removing the outlet half of the main pipe.



Figure 2 Pre-construction view of cross pipe at Benedicta. New pipe will be installed one foot lower.



Figure 3 O Ring seal on male end of Snap-Tite Pipe. A small amount of pipe lubricant can be seen in the upper right corner.

The trench was excavated one foot below the original pipe and fine graded to a slope of between 0 and 1 percent to make it easier for fish to navigate.

The replacement pipe has a unique joint that snaps together to form a strong watertight seal. Two Snap-Tite pipes that have an ID of 44 inches and length of 20 feet were joined. The male end of the pipe has two grooves and the female end has two opposing grooves. An O-Ring is installed on the first groove of the male end to create a watertight seal when joined and the male and female ends are lubricated with Phoenix Pipe Joint Lubricant. The two pipes were aligned on the roadway and a piece of heavy equipment was positioned at one end of the pipes as a stationary anchor. A sign

board was placed over the far end of the two pipes for protection and a bulldozer was used to push the two pipes together. The joined pipe was then transported to the trench with the excavator and placed in position. Six feet of gravel was placed over the pipe in 2 foot lifts. Each lift was compacted to reduce settlement.

Gravel over the inlet half of the main pipe was excavated and the old pipe was removed. The intent was to join two Snap-Tite pipes together then place it into the trench then join that pipe to the previously installed outlet pipe. While transporting the joined pipe it came apart so each section had to be placed in the trench and joined to the outlet half separately. The crew had a difficult time joining the pipe because the outlet half of the pipe took on an oval shape when gravel backfill was placed. Eventually the two pipes were joined and the main pipe was backfilled and compacted.

The stream was diverted through the new main pipe while gravel was removed above the outlet end of the overflow pipe and the pipe was removed. Two sections of Snap-Tite pipe were joined on the roadway and transported to the excavation. The replacement pipe was installed at the same slope as the main pipe and the final position was 4 feet right and 1 foot higher than the main outlet.

The outlet pipe was backfilled and the inlet half of the corrugated metal pipe was excavated and removed. The trench was fine graded and two Snap-Tite pipes were joined on the roadway, transported to the trench, and placed in position. The excavator had chains around the pipe



Figure 4 Placing inlet half of overflow pipe in Benedicta.



Figure 5 Upstream view of Main Pipe in Benedicta. Pipe is deformed from weight of gravel backfill.

The crew mentioned that corrugated polyethylene pipe is much easier to work with than Snap-Tite pipe when replacing cross pipes.

which made it easier to maneuver and join the inlet half with the outlet half. After backfilling was complete the ends of the pipes were trimmed to length with a chain saw.

The completed pipe had tight joints however the pipe was deformed from the quantity of backfill used at this location. To monitor the condition of the pipe the Department will inspect the pipes on a yearly basis.

The Snap-Tite pipe that was used for this project was stored in an open field for a period of four years. While exposed to the elements the pipe settled and took on an oval shape. This shape change made it difficult to join the pipes unless the shape of the pipe is closely matched prior to joining.

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