



COMPLEX CULVERT REPAIR

Pipe withstands weight of railroad & threat of contamination

By Steve Cooper

The town of Durham, N.H., home to the University of New Hampshire, found that sliplining with 5-ft-diameter polypropylene pipe was the solution to a three-pronged problem when it repaired a storm water culvert. The 99-year-old poured-in-place box culvert runs under an active railroad track through a brownfield site. The repair had to seal out any contamination from above, not inhibit the creek's water flow rate, and withstand the weight of 17 ft of earth and the multi-ton Amtrak passenger and freight railcars passing overhead. The project used 180 ft of 60-in.-diameter SaniTite HP triple wall profile pipe from Advanced Drainage Systems Inc. (ADS). The majority of the project was paid for with a U.S. Environmental Protection Agency (EPA) Brownfield Program grant, with the town providing a 25% match.

"There was concern on both the part of [EPA]

and state that contamination from the parking lot area above could potentially seep into the brook," said Dave Cedarholm, P.E., town engineer for the Durham Department of Public Works. "There were some pretty bad cracks in the side of the original culvert, which is 6 ft wide and 8 ft tall at the top of the arch, and during high groundwater table time you could see water just pour out of those cracks. The state and EPA really wanted to seal that up, and together we came up with a couple of options, and the most attractive was to slipline the culvert."

Pipe Selection

The town received a \$200,000 Brownfield Program cleanup grant for 2 acres at Depot Road, which includes the university campus and town land and abuts the high-speed rail corridor and the university's Whittimore Center Arena and memorial athletic field. The grant

was used for community involvement activities and remediation of tetrachloroethene contamination in the soil and groundwater at the former Craig Supply Co. site. The contamination is the result of spills and leaks from aboveground storage facilities and railroad tanker cars.

The pipe lining is intended to prevent contaminants from migrating into the brook through cracks in the existing concrete cast-in-place culvert and had a minimum joint pressure rating of 15 psi.

"Corrugated metal pipe was not an option because of the joint pressure rating requirement, and it does not last as long," Cedarholm said. "And you really cannot slipline with concrete pipe, and spraying a concrete coating would not have done the job. It became pretty obvious that the SaniTite HP pipe—because of its material, the way it is monolithically extruded and because a standard contractor could easily and



A contractor assembles the field joint with ratchet straps.

quickly install it—was our choice.”

A hydraulic analysis was conducted to calculate the effects of a 100-year flood. Sliplining also would reduce the capacity of the culvert.

Manufactured with a specially formulated polypropylene resin, SaniTite HP pipe in 30- to 60-in. diameters meets ASTM Standards F2764 and AASHTO MP21-11 for polypropylene pipe in

surface and subsurface drainage applications.

Its triple-wall profile provides a smooth interior and exterior wall design, supported by a corrugated structural core. This design provides a high pipe stiffness and greater beam strength to minimize deflection and enhance performance. The pipe has an extended inline bell and spigot joint design with pre-installed dual gaskets for

maximum joint integrity.

“When the calculations were done, the design assumption was that the existing culvert would not provide any strength,” Cedarholm said. “[The pressures] required at least a 46-psi pipe stiffness and joint pressure rating of 15 psi that other pipes could not meet and be economical. The SaniTite pipe carries a lab-tested 15-psi joint pressure rating.”

Installing the Pipe

While the project began in 2001, the culvert repair, along with construction of the new headwall, needed to happen in just six weeks. Contractor Ted Berry Co. Inc. won the public bid.

“We built a plywood mandrel prior to bidding the job that was the same [outside diameter (OD)] as the specified ADS pipe and actually walked it through the culvert,” said Matt Timberlake, vice president of Ted Berry Co. “This let us confirm the true OD of the entire culvert and avoid any complications later on. Our plan called for putting in 2-by-4 rails on the base of the culvert that we could use to slide the pipe in and would allow water to flow underneath the pipe as we were building our bulkhead.”

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After the pipe was installed, Ted Berry Co. began the grouting process to fill in any cracks in the walls of the old culvert and to fill in the annulus between the pipe and the surface of the old box culvert. The grout was a critical component of the installation, as it would fill in all around the pipe and more than 200 cu yd were used. The grout penetrates the old joints to fill voids in the soil around the pipe while increasing loading ability by filling in annular space between the pipe and the inside surface of the old culvert.

Performance & Aesthetics

The final step was the repair of the existing headwall.

“The old concrete headwall also had some real structural issues. It had a very large crack and a large portion was tipping forward. In addition, the slope above the headwall [was] steeper than 1:1,” Cedarholm said. “So the SaniTite HP pipe actually stuck out beyond the old pipe by about 10 ft, which allowed us to build the new headwall in front of the old one,”

Compacted fill between the two headwalls supports the slope as well as the failing



The final headwall and the 60-in.-diameter pipe blend in with the surrounding area.

headwall. Installation was completed without disturbing potentially contaminated soils or stable vegetation in the area above the old headwall. The headwall’s stonework blends in with the existing landscape.

“As contractors, one of the things we understand is that we go in and put pipes underground, under roads, under railroads, under all these things,” Timberlake said. “Nobody sees

that. But what they do see is what you leave behind, especially on storm drain projects ... in the end, it must be pitched the right way so there’s no puddle on the end, and our crew takes a lot pride in that.” **SWS**

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