

Flying High

A Florida contractor uses a thermoforming PVC alloy pipe to reline culverts without disrupting heavy traffic on a naval air base

By Scottie Dayton

Water coursing into corroded culverts at Jacksonville (Fla.) Naval Air Station was eroding the surrounding soil, causing roads to sink and creating potholes. Infiltration of sand and mud restricted flows, causing back-ups that flooded parking lots and sometimes buildings. Unwilling to close the heavily traveled roads, the Navy filled and paved over the sink holes to keep traffic moving.

Televising of the 6- to 30-inch lines enabled the Navy to assess the problem and budget for repairs. Open trenching would create traffic confusion on the two- to four-lane roads, and compact the soil. The base, along the St. Johns River, has a high water table, and the culverts would require dewatering.

While cured-in-place-pipe (CIPP) lining would solve those problems, it raised the risk of a resin spill contaminating the river. In addition, in pipes larger than 12 inches, the wall thickness of CIPP could stretch too thin to provide the necessary structural support.

Steve Bagby of S. Bagby and Co. in Atlantic Beach won the repair contract but subcontracted culvert repairs to Engineered Lining Systems Inc. (ELS) in Jacksonville. ELS overcame all obstacles by using a custom PVC alloy thermoforming fold-and-form piping system that saved the Navy \$492,000 versus open cutting.

Preparation work

"Our original contract was to line seven culverts totaling 1,140 feet," says vice president Gary Pender of ELS. "However, the Navy added five more for a total of 2,042 feet. The sides of those roads were caving in."

The 3- to 12-foot-deep concrete-reinforced culverts were inspected using an OZ II pan-and-tilt camera on a Pipe Ranger transporter from

CUES Inc. The inspections revealed heavily deteriorated or collapsed lines, and grout often missing in the joints.

Pender supervised five employees who installed the PVC alloy pipe manufactured by UltraLiner in Oxford, Ala. They cleaned the culverts using a V311LHA/1300 combination truck from Vac-Con Inc. and various jetting heads. During the process, they exposed laterals on some 24-inch lines that were unknown to the Navy.

"After cleaning, groundwater was



This culvert beneath a road had deteriorated badly.

still infiltrating, but it didn't affect the pull," says Pender. "That's one reason why we like this lining system. Another is that the liners can be fabricated to any thickness. We ordered 1/2-inch thick lining for pipes smaller than 15 inches, and 3/4-inch thick lining for anything larger."

Liners arrived on massive wooden spools that required an 8,000-pound, 42-foot shooting boom lift. "These liners are factory produced, providing quality control and avoiding possible resin spills, which are of major importance due to the air station's proximity to the St. Johns River," says Pender. The 6- to 12-

inch liners were coiled flat, and anything larger was folded like an "H" lying on its side.

"Moving the spools to and from the hotbox and into position for the pull complicated traffic control the most," says Pender. "We sometimes had a flagman on either end letting



A culvert interior after liner installation. The liner fits so tightly against the host pipe that corrugation ripples are visible.



The PVC alloy fold-and-form liner is flexible after heating.

TOUGH JOB

PROJECT:

Reline 2,042 feet of storm culverts without disrupting traffic

CUSTOMER:

Jacksonville (Fla.) Naval Air Station

CONTRACTOR:

Bagby and Co., Atlantic Beach, Fla.

SUBCONTRACTOR:

Engineered Lining Systems Inc., Jacksonville, Fla.

EQUIPMENT:

PVC alloy fold-and-form piping system, UltraLiner, Oxford, Ala.; Kangaroo reinstatement cutter, CUES Inc., Orlando, Fla.

RESULTS:

Culverts repaired with minimal disruption to traffic



Above, the liner is heated with steam to prepare it for installation. Below left, the liner is pulled into a storm drain.

vehicles through one direction at a time, but we never closed a road.”

Hot head

Pender notes that the liners could not simply be pulled off the spools because the alloy has a memory, and it coils up again. The material must be heated and softened first. The spool was loaded into a hotbox, where steam from a boiler truck was introduced through a pipe into the center of the spool. The hole, acting like a chimney, dispersed steam at 280 degrees F upward and over the liner.

While the liner heated, the men pulled a 3/8-inch winching cable through the pipe. “We worked man-hole to manhole or catch basin to catch basin,” says Pender. When pliable, the head of the liner was tapered so it would not snag in the culvert. Then two opposing holes were drilled 12 inches in from the edge. A chain fed through the holes hooked to a 30-ton hydraulic winch.

“We can pull liners through the host pipe at 40 to 50 feet per minute, so the work went rapidly,” says Pender. “That attracted a lot of naval brass, including two admirals. They had never seen anything like this before. They flooded us with questions, then took what they learned back to their engineers.” The longest pull was 405 feet, and the shortest was 44 feet.

Once a liner was inserted, the men sealed the upstream end tightly against the host pipe with a flow-through sewer plug from Plug-It Products, then connected the steam hose. The heat relaxes the alloy and prevents post-installation longitudinal shrinkage. The crew then plugged the downstream end and

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increased the boiler pressure to 18 psi to inflate the liner.

After the liner formed to the pipe, the pressure was reduced to 12 psi to hold it in place as an after-cooler blew in 80-degree air. “We monitor the temperature at the exhaust end,” says Pender. “Once it drops below 100 degrees, we turn off the pressure because the liner is hard enough not to collapse. The brass couldn’t believe how fast the process went.”

Depending on the diameter and length of the culverts, liners cured in one to two-and-a-half hours. Had a mistake occurred in the process or placement, Pender could have reheated the liner, extracted it, corrected the error, and reinserted the liner.

Nontoxic shavings

When the pressure was relieved and the sewer plugs removed, the flared ends of the liner were trimmed four inches from the end of the host pipe. The crew then cut the alloy flush with a reciprocating saw and smoothed the edge with a grinder.

Laterals were robotically located and reinstated using an Evolution Series CCTV inspection/lateral reinstatement system from CUES Inc. mounted on a Chevrolet CC5500 diesel chassis. Openings were cut

with a Kangaroo reinstatement cutter from CUES.

“Reinstating laterals in PVC alloy leaves no slug of material to extract,” says Pender. “Grinding reduces the material to shavings that we jet out.” The nontoxic, ductile alloy relieves stresses created by reinstatement, eliminating cracking or shattering.

Because of torrential rain and possible hurricanes, the contract specified 90 days to complete the job, but ELS did it in 11 days, in part by working weekends. “We accomplished so much on those days because traffic was minimal, and the weather was great,” says Pender.

After witnessing the UltraLiner process, Jacksonville Naval Air Station awarded ELS a contract to line 8,817 feet of 8-, 10-, and 12-inch sewer lines. ■

MORE INFO :

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