

LAST RESORT

A creative contractor finds a way to repair a badly damaged culvert and prepare it for a permanent fix with CIPP lining

By **Scottie Dayton**

The Florida Department of Transportation's I-95/I-295 J.T. Butler Boulevard Interchange reconstruction in Jacksonville widened lanes, built bridges, and added on-off ramps with overpasses.

A subcontractor directional drilling to install a power conduit beneath I-95 struck a new 24-inch metal corrugated culvert running parallel under the freeway's outside southbound auxiliary lane. The impact, occurring where two butted ends of the pipe were banded together, deflected 28 inches of metal inward and downward from the 11 o'clock to 4 o'clock positions. One-third of the area's diameter was compromised.

Florida Pipe Tech in Green Cove Springs was subcontracted to clean and televise the installed pipe. When shown the film that owner Joey Loper shot of the damage, five contractors rejected the repair job. Loper, who is licensed to install sectional liners, felt the diameter involved was beyond his capabilities. He called Kris Barton, president of Avast Hydro-Lining International Corp. (AHI) in Naples, Fla. The company specializes in shooting large-diameter sectional liners.

Barton determined that he could repair the pipe. Using homemade tools, ingenuity, and brute strength, he reflected

the corrugated metal, lined the pipe, and saved the general contractor an estimated \$250,000.

Testing the temper

Water from the freeway flows through the 259-foot long, 8-foot-deep culvert and drains to a retention pond. Access to the damaged pipe was through two manholes 400 feet apart in the auxiliary lane of the highway. The general contractor, who managed traffic control, closed 1,500 feet of that lane after the off-ramp.

Although it was an active construction zone with signs and barricades, Barton's work site was still dangerous. Merging traffic came over a hill, and drivers had little warning of what lay ahead. Consequently, Barton asked that a Florida highway patrol car with rotating beacons be stationed behind the work site. It remained there throughout the four-day project.

The deflected pipe was 28 feet from the north manhole. To travel the distance, Barton bolted four rubber wheels to a length of plywood, threw a foam pool mattress on top, and tied the sled with ropes so that he or his spotter could pull it backward. He achieved forward motion by using his fingertips. (Where applicable, AHI followed OSHA confined-

space, ventilation, and lockout-tagout procedures, and DOT procedures for traffic maintenance.)

Lying on his back, Barton tried bending the distorted metal with a five-pound hand sledge. When it bounced off the thick pipe wall, he knew that pneumatic or hydraulic pressure would be required to reshape the metal. The team chose an Enerpac RC-Series, single-acting, 25-ton hydraulic cylinder.

To keep that cylinder from punching through the bottom of the culvert or turning it oblong, the team built a support frame. "We accomplished very little the first day," says Barton. "I took numerous measurements because the frame had to be long enough to achieve the necessary stability, yet short enough to enter the culvert at an angle." Built from regular 2-by-4s, the frame shattered on the first lift. When redesigned and built from pressure-treated 2-by-4s, it handled the stress well.

Greatest concern

Although the southbound traffic was heavy, the team's biggest concern was the new retention pond, which was still filling. "My prerequisite for doing this job was that the pipe be clean and dry," says Barton. "About a foot of water was in

TOUGH JOB

PROJECT:

Repair and line 28 inches of deflected, ruptured metal culvert without disrupting freeway traffic

CONTRACTOR:

Avast Hydro-Lining International Corp., Naples, Fla.

CUSTOMER:

Florida Department of Transportation

EQUIPMENT:

New Life Liner from Stephen's Technologies, Lake Hamilton, Fla.; Omni Eye III zoom camera, RS Technical Services Inc., Petaluma, Calif.

RESULT:

Damaged culvert restored to original shape and CIPP lined, saving about \$250,000 compared to open-trench repair

the invert when we arrived, and that was enough to hinder visibility."

Florida Pipe Tech inserted a double set of Test-Ball plugs through the south manhole, secured them with bracing, and pumped out the culvert. The plugs were removed each night.

The culvert was well bedded and structurally sound. The surrounding ground was so stable that none entered



The pipe was damaged from the 11 o'clock to 4 o'clock positions, affecting one-third of the diameter. Both pipe ends splay inward, exposing the black rubber gasket. Twelve inches of water stood in the invert.



The pipe is shown after after the hydraulic cylinder pushed the corrugated metal back into place.

the pipe when the drill bit breeched it. “Even while jacking, we didn’t have any debris falling down,” Barton says. “We were using pneumatic over hydraulic, so air pressure ran the hydraulic pump in rapid, brief spurts.”

Using electronics to position the cylinder wasn’t accurate enough to prevent flattening the ridges on the pipe. Unwilling to put his four men in harm’s way, Barton crawled down the manhole, pulled himself and the sled forward with his fingertips, and positioned the cylinder on its frame.

He then reversed his route, turned on the hydraulics, and watched what happened with an Omni Eye III zoom camera from RS Technical Services, launched from the downstream manhole.

“The camera monitored how far to go and when the cylinder started bogging down,” says Barton. “We also kept pressure gauges on the hydraulics to monitor the back pressure. At 25 tons of force, the cylinder bottomed out all the way.”

Barton averaged 10 entries an hour and came home with his stomach muscles and those under his arms aching. To avoid cramps, he drank ample lukewarm water to remain hydrated and ate light meals. Whenever Barton was in the culvert, a spotter in the north manhole maintained visual contact, as did the camera operator. A safety man stood guard at street level.

Double the protection

After three-and-a-half days of jacking, the damaged metal was reflected and ready for lining. “Load bearing was a concern, so we overlapped a 3-foot, 0.20-inch thick Stephen’s Technologies New Life liner with a 4-foot one,” says Barton.

The rectangular fiberglass liner has a

Velcro fastener down either side. Working under trees alongside the freeway, the men mixed two-part epoxy and squeegeed it into one side of the cloth. They repeated the process on the other side, then folded the liner and sealed the Velcro.

The liner, wrapped around a rubber bladder carriage, was pulled into position, inflated at 15 psi, and allowed to ambient-cure for four hours. After retracting the collapsed bladder, they video inspected the repair.

Florida DOT was concerned about exterior voids, so AHI injected flowable fill concrete. “We knew the conduit had been installed near the culvert, so we dug down real slowly,” says Barton. “The job required six 2-inch holes in the auxiliary lane.”

After drilling 18 inches through the asphalt and a layer of compaction with a hammer drill, they pushed down a 1.25-inch pipe with water, then injected 810 pounds of weak Portland cement and fly ash using a grout pump. Holes were filled to within one inch of the roadbed. Returning the next morning, they plugged the remaining depressions with asphalt.

“Had we failed, the general contractor would have had to close the lane and reroute traffic to dig up the culvert,” says Barton. “The soil is sugar sand, so for every foot down, he would have had to dig two feet wide — and the DOT was going to levy fines. AHI was definitely his last hope.” ■

MORE INFO:

Stephen’s Technologies

888/783-7436

www.stephenstech.com

RS Technical Services

800/767-1974

www.rstechserv.com

AFTER



The cured liner gives the pipe a smooth, leak-free interior.

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COLE Publishing
1720 Maple Lake Dam Rd.
P.O. Box 220
Three Lakes, WI 54562
800-257-7222
www.cleaner.com