

Standing the Test of Time

By Stephen C. Cooper

Inspecting large-scale HDPE pipe after 20 years

Advanced Drainage Systems (ADS) engineers recently examined hundreds of feet of ADS high-density polyethylene (HDPE) pipe, part of a storm water drainage project installed in 1987 in the popular resort town of Ocean City, Md. Remote video, hands-on inspection and a laboratory test were used. A 20th-anniversary look back at the project provided documentation of the pipe's long-term performance in terrain not known for being "pipe-friendly," according to Mike Freshwater, the original ADS representative for the project.

ARTICLE SUMMARY

Challenge: An inspection was required to confirm that 16,500 ft of HDPE pipe delivered on promises of maintaining joint integrity and standing up to corrosive environments over 20 years in Ocean City, Md.

Solution: Remote video, hands-on inspection and laboratory tests were performed on several street blocks worth of pipe that was installed in 1987.

Conclusion: Inspections concluded that the pipe is still performing as designed, with no defects or signs of ultraviolet damage.

"The inspection definitively concluded that after the initial 20 years of service life, the ADS N-12 HDPE pipe installed in Ocean City is still performing as originally designed with no visual signs of deflection or other defects," said Nathan Jovanelly, ADS regional engineer. "In addition, lab results from tests performed on samples taken showed that the exposed sections at the outlets have incurred no UV degradation as a result of constant exposure to the sun."

Looking Back

In the 1980s, the Maryland State Highway Administration began a series of projects to enhance pedestrian safety, create landscaping and improve drainage on Route 528, the major north-south highway running along the Atlantic Coast in Ocean City.

"The east-west flow of water during storms was a traffic hazard, and therefore drainage was a major component of the design," Freshwater said.

The popular resort town, located on a barrier island near the Maryland-Delaware border, sees road traffic skyrocket from 10,000 vehicles a day in the winter to 10 times that during the summer. Construction, therefore, began in the fall of 1987, after the rush of the tourist season ended. More than 16,500 ft of ADS N-12 HDPE pipe, ranging from 12 to 24 in. in diameter, was installed. HDPE was selected for its smooth interior and corrugated exterior, which provides excellent hydraulics and structural strength.

"It was imperative that the pipe have a superior joining method and would also be able to keep water flowing with a minor slope because some areas had less than a 3-degree down run," Freshwater said. "The outlet elevations of the storm sewer system were calculated to be equal to the low mean tide."

Ocean City is a beach with most areas just 3 to 4 ft above sea level. Once buried, the pipe would be in contact with seawater, subject to shifting that would affect the pipe's joint connections. Also factored in were the 100,000-plus vehicles that would travel this road each day in the summer.

The HDPE pipe was selected because it stands up to a wide range of corrosive environments and maintains its joint integrity. "This is what we set out to confirm during our inspection two decades after the installation," Freshwater said. "We found the pipe was in good condition with no evidence of infiltration."

According to Steve Drumm, assistant bureau chief of the Bureau of Highway Design for the Maryland State Highway Administration, concrete pipe was not selected because past experience demonstrated that concrete pipe laid in the area's sandy soil misaligned, eventually causing erosion of the overburden. Steel pipe also was set aside because it had a history of corrosion due to saltwater standing in the pipe for half of each day because of the tidal action. The corrugated HDPE pipe with a smooth interior was suited for the flat-grade issues presented in the design.

Fast-Forward

In June 2007, Jovanelly and Freshwater inspected the infrastructure from 41st Street at the Convention Center to 59th Street (the parameters of the original contract). Inspection criteria included visual observations, hand measurements and a high-tech zoom inspection camera. The camera unit required a



Ocean City, Md., sees traffic increase tenfold during the prime summer vacation season. HDPE pipe installed in 1987 has improved drainage for the past 24 years.

collapsible pole, 216:1 color-zoom video camera, high-intensity spotlights so inspection could be done primarily at night to take advantage of reduced traffic levels, and a battery-operated recording system. The Quickview camera has the technology to take both still photos and digital video footage. With underwater capability, the Quickview was also well suited for the often wet conditions of the inspection.

With the help of the Ocean City police, much of the inspection occurred from 3:30 to 6 a.m. The high ADT loadings logged prohibited lifting of storm sewer grates in the daytime. Even during the early hours, a police escort was required because buses run every five minutes, 24 hours a day between Memorial Day and Labor Day.

The inspection criteria included visual signs of deflection, pipe degradation and any other defect that might affect the performance of the pipe. Most of the inspection was done with the Quickview camera. Whenever possible, however, the pipe also was viewed without the camera to verify results obtained from the unit. Although it was not required as part of the inspection criteria, sediment amounts and other maintenance issues were recorded.

The initial inspection took place at 41st Street near the Convention Center, where inlet grates were lifted for video inspection of the dual 15-in.-diameter pipes. This initial installation was encased in concrete, and no deflection was found. The pipe liner was in good condition and little sediment was found. The inspection in this vicinity included one inlet and pipe run installed by the Ocean City Department of Public Works. Because the pipe was installed under the loading docks and is subject to almost daily tractor-trailer loading, it also was inspected and recorded. Further downstream, the 15-in. pipe continued to perform well through to the outlet at the Isle of Wight Bay.

The subsequent pipes were installed as cross pipes that drain storm water to the central box culvert collector in the center of Route 528, also known as Coastal Highway. These pipes were installed at minimal slope with 12 to 24 in. of cover. The cross pipes are at 48th and 49th streets, 52nd to 54th streets, and 56th, 57th and 59th streets. Local landmarks such as hotels or gas stations were used as reference points. According to the original design engineer, Doug Moyer, P.E., of Johnson, Mirmiran and Thompson Engineers, all pipes were to be installed with the design minimum of 95% compaction of the native sand backfill material.

Each of the cross pipes inspected is subject to the same HS-25 loads and has almost the same pavement section. Because the ADT loadings are excessively high in the summer months, these pipes were selected for the inspection. After the pipe evaluations were completed, all pipes inspected were found to have no defects that would affect their long-term performance.

Additionally, a sample for laboratory testing of HDPE pipe continuously exposed to sunlight was taken from the 53rd Street installation at the outlet bulkhead in the lagoon leading to the bay. Lab results showed that after 20 years of

exposure the pipe contained no signs of damage from ultraviolet rays and that the pipe meets the AASHTO M-294 resin requirements that were current at the time of installation. **WWD**

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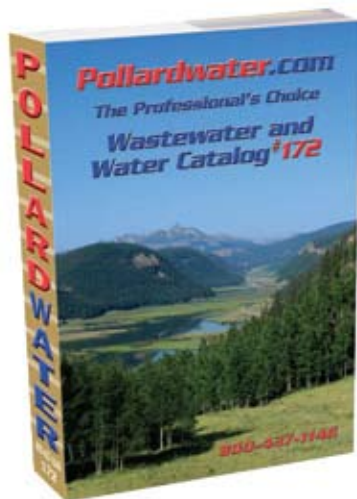
Left: Steel pipe is susceptible to corrosion from saltwater. Right: An inspection photo showed no signs of soil migration through the joints or visual deflection of the pipe.

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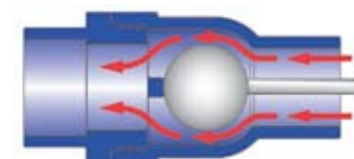
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