Short-Run Pipe, Long-Term Results

High-density polyethylene (HDPE) pipe installation serves a coal mining flood zone more than 25 years later

By Stephen C. Cooper

In the coal-rich areas of the southeast corner of Ohio, acid mine storm water presents a severe challenge for drainage pipe. A 40-ft run of HDPE pipe, however, continues to substantiate the confidence Ohio Department of Transportation (ODOT) engineers had in their original selection. A recent inspection found that after 27 years of flowing storm water containing acid from coal mines and being hit with periodic floods, the pipe and roadway are still intact and performing as predicted.

Installed under Rte. 145 near

Recent inspections have found no changes in pipe deflection.

The HDPE pipe runs under Rte. 145 and collects acidic runoff from abandoned strip mines.

Marietta, Ohio, in 1981, the 24-in.-diameter corrugated HDPE pipe from Advanced Drainage Systems Inc. (ADS) was the first use of HDPE by ODOT as a highway crossdrain. It replaced Nexon-coated corrugated steel pipe, which had deteriorated over five years.

"The failure of the steel pipe was caused by the abrasive flow perforating the coating and then the acidic water attacking the metal and undercutting the coating," said James Goddard of ADS. "Actually, steel pipe had to be replaced several times at this site during the years, which prompted ODOT to use HDPE pipe, a material unaffected by low pH flows and known for its excellent resistance to abrasion and a wide range of chemicals."

Installation

The pipe was installed under the

two-lane highway; cover ranged from 15 to 18 in., and the trench was backfilled with a bank-run gravel. Runoff in this area comes streaming off the hillside from abandoned strip mines and carries crushed sandstone. The pH of the water varies from 2.5 to 4.9—the result of acid mine drainage occurring naturally during the mining process as pyrite reacts with air and water to form sulfuric acid.

The HDPE pipe not only had to maintain its integrity despite the corrosive water, it also had to stand up to frequent floods and carry rapidly flowing water. In 1997, a 500-year storm dropped nearly 15 in. of rain in 36 hours, resulting in the worst flooding in the area's history.

One year after installation, the site was inspected by ODOT. The visual inspection showed no signs of pavement cracking or settling, and the pipe showed no signs of attack from acidity. The inlet invert had surface roughness due to abrasion but no significant erosion of material.

Using a simple deflectometer, vertical deflection measurements were taken every foot and analyzed. The highest deflection, located at the joint, was most likely due to keeping one lane of the road open while the pipe was installed. The average deflection was 1.9 percent, well within accepted values for flexible pipe in this application.

Follow-Up

Since it was installed, the pipe has been inspected regularly with little change detected. Data gathered over the past 26 years has confirmed that pipe deflection has not increased over time despite regular traffic with 18 in. of cover, and the pipe has been resistant to abrasives at a low pH.

"In the early 1980s, the plastic pipe industry was in its infancy," Goddard said. "I guess you could say this was the first toddler, and we are pleased to see how it has performed under some pretty challenging circumstances." SWS

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