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TURNPIKE RECONSTRUCTION RELIES ON HDPE PIPE FOR STORM WATER DRAINAGE

New Roadway Part of Twin Bridge PennDOT Project

HARMAR TOWNSHIP, Pa – Two and half miles of the Pennsylvania Turnpike being built here for the new Allegheny River Bridge is relying on a type of high-density polyethylene (HDPE) pipe that will not only carry storm water runoff but will also, because the pipe has perforations in the top, allow water to seep down into the system. The $190 million project underway will widen I-76 to three lanes in each direction from the present two lanes and replace the Allegheny River Bridge. The project 14 miles northeast of Pittsburgh is located between Harmar Township and Plum Borough and is scheduled for completion in 2010.

Twin bridges that are each 2,350 feet long, 61 feet wide and up to 120 feet high will be constructed as cast-in-place concrete segmental box girders. The new bridges will be downstream from the present span. The existing bridge was built in 1951 and carries some 40,000 vehicles a day.

"Although road construction remains essentially unchanged since 1951, it is of interest to examine another aspect of the project that has undergone dramatic changes during the past 57 years, and that is storm water management," said Tony Radoszewski, executive director of the Plastics Pipe Institute, Inc. (PPI).

With a 44 percent increase in impervious area, contiguous wetlands and alternative drainage materials, coupled with EPA initiatives now several decades in the making, Allegheny River Bridge project designers had to manage drainage issues unimagined for the 1949-51 original construction. One of the most prominent considerations was the choice of construction materials available in the drainage industry today, namely plastic pipe.

In order to receive competitive pipe bids on its projects, the Turnpike Commission allowed contractors to choose from alternative pipe materials. HDPE was allowed for pipe up to 36 inches in diameter on the project. Walsh Construction Company chose to utilize nearly three miles of corrugated HDPE pipe in diameters up to the 36 inch diameter specification limit. More than one half of the storm sewer is specified as combination storm sewer and underdrain, a PennDOT specification in which partially perforated plastic pipe is installed in its inverted position – the perforated half of the pipe facing up, to facilitate sub-grad drainage into the pipe.

"We are very encouraged to see that the Commission, whose chief considerations are service life, durability and economy, allowed its contractors the choice to utilize corrugated plastic pipe for the storm sewer system, and to

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take advantage of its unique properties," said Radoszewski. "This is certainly a strong trend by DOT's throughout the nation as they look to improve drainage systems while controlling costs by using HDPE pipe." In 2006 the Federal Highway Administration (FHWA) changed the national construction and maintenance regulation to expand the use of alternative types of pipe on federal-aid highway projects.

Walsh Construction contracted with Joseph B. Fay Company (Russellton, Pa) to do the job. Fay's portion of the project is the demolition of the existing bridge, all the earth work, remove and replace the roadway and install the drainage which will see some 200 drainage structures replaced and more than 28,000 feet of drainage pipe installed along with erosion sedimentation controls.

Nearly two miles of existing roads and drainage structures will be removed. As the old road is removed, the new alignment will be established and the wider roadway constructed.

The corrugated HDPE pipe produced by Lane Enterprises, Inc. (Camp Hill, Pa) has two rows of holes at the four o'clock and eight o'clock positions. PennDOT calls it Group 6P. Generally installed with the holes at the bottom to allow water to drain into the soil, this PennDOT project called for the pipe to be installed upside down so the holes are on the top allowing the pipe to become a combination storm sewer drainage line that also picks up water. Water infiltrates through the soil and down to the pipe through the perforations. A standard bell and spigot is used to connect the pipe sections for a soil-tight seal.

Lane Enterprises is a PPI member company. Lane's quality program meets all ASTM and AASHTO requirements.

"Because HDPE pipe will maintain its structural integrity and its surface will not be damaged when the perforation holes are drilled, it is the ideal product," stated PPI's Radoszewski.

During construction, non-perforated HDPE pipe was also used for a temporary diversion of storm water and to temporarily replace drains and lines that are being removed in the process. This is important, according to Nate Dwyer, project engineer for the Joseph B. Fay Company, because it helps to control the water flow.

"The major part of the temporary diversion is on the north side of the project. We constructed a mountain of fill that's about 120 feet high. This eliminated a lot of existing drainage, and disturbed the water flow in that area. Water has to be diverted because we don't want water getting into the fill."

The non-perforated HDPE pipe which was also manufactured by Lane, ranges from 8 inch to 36 inches.

The deepest burial of the HDPE pipe was some 40 feet. "We filled in a valley and ran a line of 18-inch diameter pipe where there's a stream in that area so we had to go pretty deep," explained Dwyer.

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The choice of pipe was based on cost and effectiveness. Fay uses a crew of five to install the HDPE pipe drainage system. "We can put in about 200 feet a day of HDPE pipe because it's easy to handle and fast to install," said Dwyer. "There are other options for pipe, of course. Concrete pipe was a considered alternative. But it would have to be open-jointed. This would require the open joints to be filled with grout on the lower half of the diameter. One easy question to answer is 'How fast can you put together HDPE perforated pipe as opposed to open-jointed concrete pipe that you have to half-way fill in the joints?' It's phenomenal the amount of difference in the production. The HDPE pipe probably doubles our efficiency."

"Because each corrugated HDPE pipe section is around 20 feet long, there are fewer joints," Radoszewski explained. "This reduces labor and easily provides a secure system. Reinforced concrete pipe (RCP) comes in smaller 8-foot sections that weigh considerably more and so it would cost more to use and install than corrugated HDPE pipe."

There are environmental advantages to using the HDPE pipe according to Radoszewski. "The HDPE saves fuel to transport because of its low weight and the ability to nest the long stick lengths when diameters vary. Plus it takes less energy to produce HDPE pipe and using it protects the groundwater from contamination with a system that will last for generations."

When the project is finished, water will drain off the road through the system that is equipped with sediment traps and weir plates that stop and contain debris into tributaries that lead to the Alleghany River.

Additional information can be found at the PPI website: www.plasticpipe.org

About the PPI

The Plastics Pipe Institute Inc. (PPI) is the major trade association representing all segments of the plastic pipe industry and is dedicated to promoting plastics as the material of choice for pipe applications. PPI is the premier technical, engineering and industry knowledge resource publishing data for use in development and design of plastic pipe systems. Additionally, PPI collaborates with industry organizations that set standards for manufacturing practices and installation methods.