

# HDPE Pipe Moves Missouri Highway Expansion Ahead

Pro-active citizenry serves as catalyst.

**T**he expansion of Highway 63 in the north-central part of Missouri was so important to local citizens that they initiated a bond issue to pay for the 22-mile project and set up a corporation to spearhead the undertaking. With a mandate from the citizenry to maintain the road and its infrastructure for 15 years, the contractors knew it was important to do the job right and use the most qualified materials and crews.

Providing a direct north-south line that travels across Missouri nearly in the center of the state, Highway 63 is an important route for commerce and vacation travelers. With the ability to handle added capacity, the highway will be an even more important lifeline for the area, and will encourage further economic development along the route.

For the drainage system, corrugated polyethylene pipe from Advanced Drainage Systems (ADS, [www.ads-pipe.com](http://www.ads-pipe.com)) was selected and used. The benefits are significant for this venture,

one of the first Missouri Department of Transportation projects to follow new specifications on how drainage systems are designed. Slated for completion in 2006, the widening of Highway 63 to four lanes by constructing two new north-bound lanes began in May 2003 with a high profile groundbreaking ceremony led by Missouri Governor Bob Holden, U.S. Senator Jim Talent, and other dignitaries. Koch Performance Roads, Inc. ([www.performanceroads.com](http://www.performanceroads.com)) is the project's manager working with Bross Construction Company (Hannibal, MO).

## The Perfect Storm

For years, residents along the Highway 63 corridor thought they would never see the highway become a four-lane thoroughfare. With the leadership of the Highway 63 Transportation Corporation, however, taxpayers in Kirksville voted to move this project forward in April 2002, passing the vote by 2,927 in favor to 831 against.

At the same time, another initiative was forming in the Missouri Department of Transportation that would positively impact how highway drainage systems would be designed and constructed. MoDOT was reviewing the use of corrugated high-density polyethylene (HDPE) pipe for highway drainage systems used for years by other state DOTs. Providing Koch Performance Roads with the

green light to use this alternative pipe would help to reduce costs and speed up the project. Subsequent to approval on the Highway 63 project, in July 2004 MoDOT approved HDPE pipe for storm sewer and culvert crossings beneath roads with traffic volumes up to 3,500 ADT (Average Daily Traffic) in their standard specifications.

There are some 14,000 ft of pipe ranging from 15 in. to 60 in. in diameter with 90 percent of it being used for cross road drainage. ADS N-12® pipe is made from specifically engineered polymers that meet and exceed standards issued by the American Association of State Highway and Transportation Officials (AASHTO). With a corrugated exterior and smooth interior, the pipe provides both strength and optimum hydraulic capacity. Named for its excellent Manning's "n" rating of 0.012, the N-12 pipe was designed in 1987 by ADS specifically for culverts, storm sewers, highways, airports, and other civil design construction and it has been used in these applications ever since.

Because the pipe meets the requirements for Type S pipe under AASHTO M 252 and M 294, it can be specified for culverts, cross drains, storm sewers, and other types of new and rehabilitation construction.

"The large diameter 60-inch pipe will provide excellent run off control for the frequent heavy rain storms we have in this area. Because we have a lot of clay in our soil, the rain runs rather than soaks in," explained Layne Colgrove, project manager for Bross Construction. "The



*Set for completion in 2006, the expansion of Highway 63 uses corrugated polyethylene pipe for its drainage system.*

ADS pipe with water tight seals between the sections will help keep the integrity of the roadway and also provide the path to direct the water where we want it to go,” he emphasized.

Because of the design and structure of the pipe, even 60-in. diameter sections could be deeply buried. “Even though the pipe is carrying a lot of weight on top, it maintains its shape and performance,” he continued.

At the intersection of Highway 63 and State Route 156, for example, the 60-in. pipe is installed with 20 ft of cover over the pipe. The backfill was compacted and tested to 95 percent of standard proctor following the MoDOT installation standards for storm sewer pipe.

As a flexible conduit, HDPE pipe withstands vertical pressure by transferring most of the load to the surrounding soil. N-12 pipe will support H-25 live loads with 12-in. minimum cover, and E-80 loads under 24-in. of cover. In controlled tests, according to ADS, the N-12 pipe has performed well at fill heights of more than 100 ft. The backfill specs are the same for concrete and ADS pipe.

## Pipe Economies

“Labor wise, the requirement is the same, but there is a significant difference due to the lighter weight of the ADS pipe. The plastic pipe is economical to load, unload, and put into place. We needed a lot less manpower. This meant



*Specially engineered polymers enable the HDPE pipe to meet standards issued by the American Association of State Highway and Transportation Officials.*

the pipe was cheaper per foot to install,” said Colgrove. Because the pipe comes in 20-ft lengths, the number of joints is reduced. For watertight applications, this can be quite significant.

The project did require a different backfill technique to satisfy Koch’s stringent compacting requirements, but it was a simple change. The Koch specifications required any pipe that was installed with less than 32 in. of cover to use flowable backfill, a thin water mix of sand and cement. Poured to one ft above the pipe, it assures a consistent backfill and protects the culvert from the lime-stabilization equipment. It was also a quick way to backfill the trench and was used for six crossings out of the more than 200 on the 22-mile job.

A few spots, such as 24-in. pipe under a crossing, have only 12-in. of cover. Some thought this minimal amount of cover would allow compression of the pipe, causing it to over deflect and make gaps in the seal between sections.

“Our tests showed that the pipe was performing just as specified,” Bennett confirmed. The Bross teams are using mandrels under MoDOT supervision to verify the deflection of each pipe before final pavement.

“Our N-12 pipe can be installed with a minimum of 12-inches of cover for pipe with diameters of 48-inches and below,” said ADS Regional Engineer, Dan Currence. “For larger diameters we recommend 24-inches of cover.”

As with any new procedure or product, the first use of

## A Pair of Projects

There are two separate projects along Highway 63 in Missouri. The Koch

Performance Roads project near Kirksville in the northern part of the state and another large project in the south in West Plains. In West Plains, Bross installed more than 15,000 ft of ADS corrugated pipe in diameters ranging from

12 to 60 in. for storm sewer applications. “This was the first storm sewer line project by MoDOT using the new standards for HDPE pipe,” related ADS

Regional Engineer, Dan Currence. Because of Bross’ confidence in HDPE, they submitted a value-engineering proposal to MoDOT offering a 20 percent savings if they could use HDPE pipe.

MoDOT accepted the Bross proposal making this the first HDPE storm sewer project approved by MoDOT. “Usually, pipelines are mandrel tested for about 10 to 25 percent of the project, usually focusing on spots that have

unusual terrain or other concerns,” he continued. “The original specification on this job was to mandrel test 10 percent.

MoDOT chose to mandrel 100 percent of this project because it was the first job and to satisfy the critics. We started doing that, but it soon became apparent that the pipe was lining up and performing just right over the three-mile run.”

The project in West Plains was completed with MoDOT officials signing-off on all HDPE pipe after post-installation inspection. Some pipe was even tested before base-course, after base-course, and following final pavement. All HDPE pipe met the MoDOT criteria.



*The combination of a corrugated exterior and a smooth interior enable the pipe to provide both strength and optimum hydraulic capacity.*



*Flowable backfill was used for any pipe installed with less than 32 in. of cover. Backfill consisted of a thin water mix of sand cement poured to one ft above the pipe.*

ADS pipe for a MoDOT project of this type fell under some exacting eyes. “MoDOT was a bit apprehensive about the pipe because it was new to them.

the drainage system were problem free. “We have one run that is 240 feet long and it’s perfect.”

And they watched very carefully. So we moved at a pace that would make MoDOT comfortable with the installation. We also did some step-by-step testing to ensure the integrity of the pipeline and the connections between the pipe lengths,” explained Bennett.

Bennett said that even long sections of

While the Highway 63 expansion is a project of ‘firsts,’ its innovations may not be the last of their kind. The project has become an example for other groups in Missouri to follow. At least two other groups in Missouri have formed transportation groups similar to the Highway 63 Corporation.

“Without Koch’s beneficial blend of financing, design, building, operation, and maintenance, the job just wouldn’t have gotten done,” Bennett said.

As for Colgrove and his crew, he expects to be installing more and more polyethylene pipe due to its installation and reliability. “The guys appreciate the easy way we can move and position the pipe. It’s saved a lot of backs!”

