Erosion Control Crossroads

Roadway relocation challenges call for time-honored and new solutions

By Andrew Gates

When the Missouri Department of Transportation (MoDOT) started designing a project to relocate 2.5 miles of Missouri Route 141, a major state roadway, the engineers faced an age-old problem: The best route for the new roadway went directly through a floodplain.

"We have two major creeks and three significant tributaries running through the new location for this project," said Jesse Jonas, MoDOT's resident engineer for the Route 141 relocation project. "Since it is in a floodplain, the existing roadway flooded at least once a year."

The relocation project was designed to lift six lanes of roadway out of the floodplain and to improve the flow of traffic and safety along the roadway.With the great potential for storm water and groundwater in the area, engineers had to take into account how to control the potential rush of water onto the project—and the associated risk of erosion from that water.

Their solution comprised a mixture of old and new procedures.

Traditional Solutions

An initial focus on erosion control was paramount through the design process and early stages of construction. The new roadway borders several miles of privately owned property; the engineers had to ensure they did not create erosion problems for those property owners during dewatering procedures or heavy rainstorms.

The Route 141 relocation project emphasized erosion control during the design and early construction stages.

"We knew that we were in a floodplain, and we had to think out precisely what devices we would put in the area to control erosion and how we would install those devices or structures," Jonas said. "Our first task in construction was to create storage for the excess water. If we could store it and control its movement, it would minimize the potential for erosion."

One of the first orders of business was to build massive culverts over the creeks and tributaries. This helped hold any water from torrential rains, such as those that doused Missouri in Spring 2011.

The installation workers also constructed flat-bottomed ditches on both sides of the project to control potential runoff from reaching private property. These ditches, along with rock-lined sediment control basins, bracketed more than 1.5 miles of roadway on each side of the project.

MoDOT used flocculant bags to remove extra sediment from water storage basins.

The project team used a litany of familiar erosion control devices. The department applied silt fences, ditch checks and linings, as well as scour control methods to control much of the erosion.

Natural Additions

During construction, site workers quickly reseeded any completed areas, or any areas where construction had halted for a few months due to staging. This provided a form of natural erosion protection, and was one element of MoDOT's efforts to keep the project environmentally friendly.

To remain more environmentally conscious, designers also decided to use resources already on—or, more technically, in—the ground.

On many construction projects, the property is completely cleared of all vegetation. On this project, engineers created zones where trees remained on state property during construction. To reduce the number of trees removed, the design team evaluated the entire area and established protection zones. The construction contractor would face penalties for removing or damaging trees in those zones.

"Since these trees, bushes and grasses are already established, they help prevent additional erosion during construction, especially on the edges of construction near property lines," Jonas said.

Those trees that had to be removed as part of construction were used to help control erosion on site. The contractor created mulch out of these trees and used it to create berms on the project site. The

mulch berms are being touted in the department as a best practice and have been incorporated into MoDOT's potential specifications for future construction projects.

Using flocculant bags was another new technique for Missouri engineers. These bags, used in the flat-bottomed ditches, removed extra sediment from the storage basins' outflow of effluent water that discharged back into the environment. Early visual tests have shown significant reduction of suspended materials in the ditches that use the flocculant bags when compared with a control ditch.

MoDOT engineers also are testing a photocatalytic additive to concrete on the Route 141 relocation project that is supposed to capture smog, break it down using sunlight and release harmless elements into the surrounding air. MoDOT believes this is the first time the process is being used for highways in the U.S.

As part of this testing process, the department is using the photocatalytic additive in 30 ft of porous shoulders as well as on a 1,500-ft stretch of roadway. The purpose of using porous shoulders with the special additive is to test the water quality improvements gained by having runoff filter through a pavement that not only is drainable, but also contains pollutant deterrent.

Finishing Touches

Once construction was complete, the engineers had to ensure that the waterways remained undisturbed and erosion free. Much of the work along the two creeks and three tributaries is being enhanced in two ways: by providing rock banks for normal flow, and providing scour control for times of increased flow and flooding.

The rock banks are fairly traditional. Stones about the size of two fists now layer the banks of the creeks and tributaries, especially where water passes under bridges or near the roadway. The ScourStop is a thick, plastic grid that is anchored into the ground, with seed underneath. The seed sprouts and grows up through it, providing a natural erosion prevention method. The plastic grid provides additional support for the root systems when the water levels are high or during flooding.

At the end of construction, more than 3,000 trees and bushes will be replanted around the project. The mix of traditional methods with new innovations and technologies allowed MoDOT to relocate a major roadway in a floodplain without the major impact of construction erosion. SWS

Andrew Gates is a customer relations professional with the MoDOT St. Louis District. Gates can be reached at andrew.gates@modot.mo.gov or 314.453.1808.

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