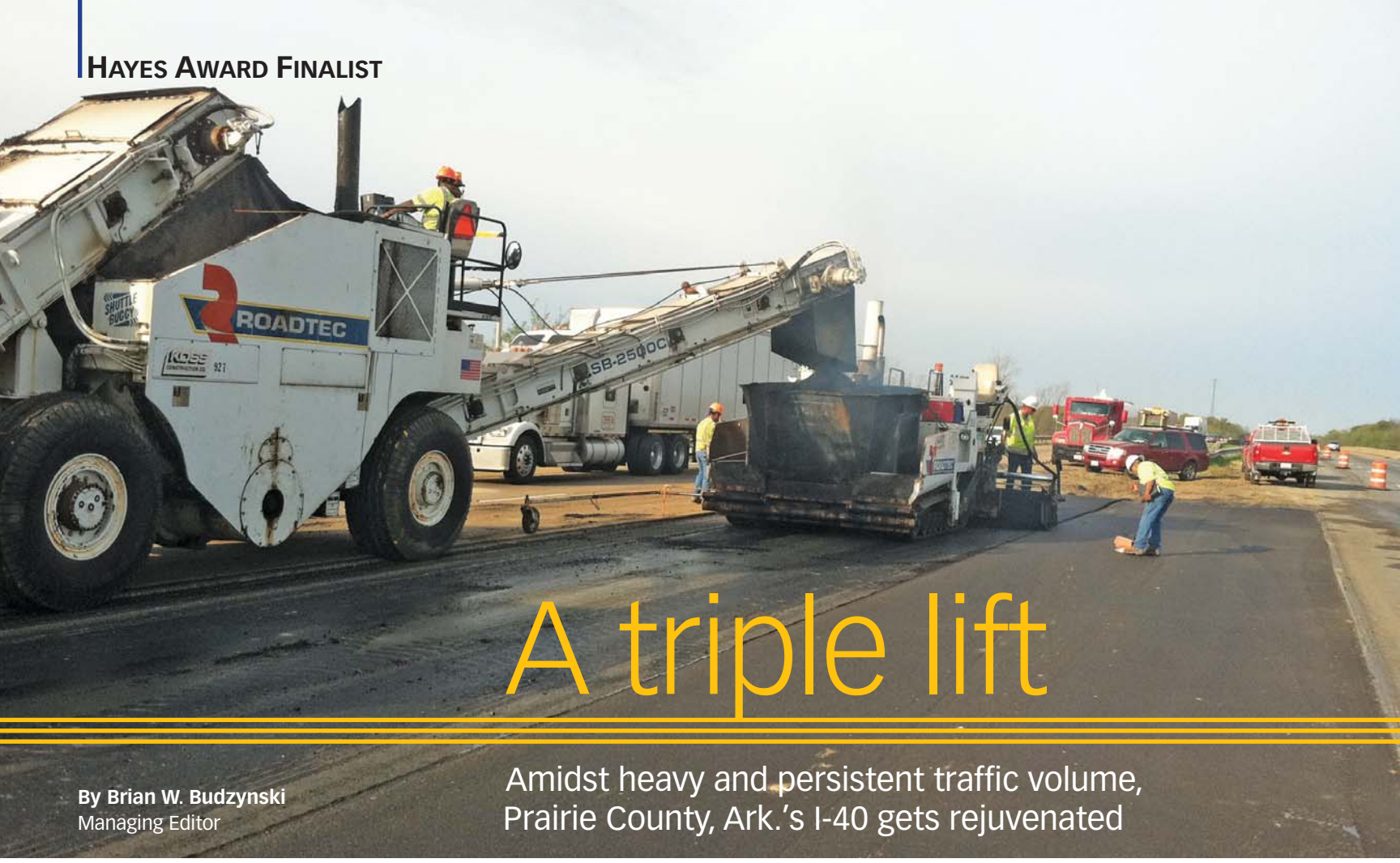


A triple lift

Amidst heavy and persistent traffic volume, Prairie County, Ark.'s I-40 gets rejuvenated

By Brian W. Budzynski
Managing Editor

Ask the common man to describe a cavern and you'd likely be regaled with the stuff of discovery tucked into a picturesque mountainous landscape.

But ask a construction contractor astride Prairie County, Ark.'s I-40 in early 2014 for the same, and you would get a very different story.

"Many of the concrete panels here were tilted, and there were actual caverns [void areas] underneath them. Some were rocking back and forth a few inches as traffic passed over them," Kelly Moore, asphalt division manager for Koss Construction, told ROADS & BRIDGES. Koss was the primary contractor for the Arkansas State Highway and Transportation Department (AHTD) on the I-40 project. "This is a very busy stretch of I-40, a heavily traveled coast-to-coast road, as well as being the main thoroughfare from Little Rock to Memphis. It was extremely faulted and rough."

Thus the importance of rejuvenating this paved prairie pocket—for which Koss and AHTD received recognition as finalists for the 2014 Sheldon G. Hayes Award for excellence in construction of an asphalt pavement—literally spoke for itself.

Topographic trouble

The area surrounding I-40 as it passes through Prairie County is wetlands, adjacent to which flows the White River, a 722-mile waterway that snakes through Missouri and Arkansas. Though the White is not nearly as long as the Arkansas River (1,469 miles), it carries about the same amount of water, some 20,000 cu ft per second in calm times and 100,000 cu ft per second when flooded. Consequently, water was an immediate concern for the AHTD.

"This area is prone to flooding on both sides of the White River," Mike Hays, resident engineer for AHTD, told ROADS & BRIDGES. "There were some serious flooding problems back in 2010-2011. When we made an evaluation, we had a lot of slab movement, a lot of longitudinal separation and a whole lot of potholes."

Moore concurred, "The entire project was under water by about a foot several months prior to us beginning the construction work."

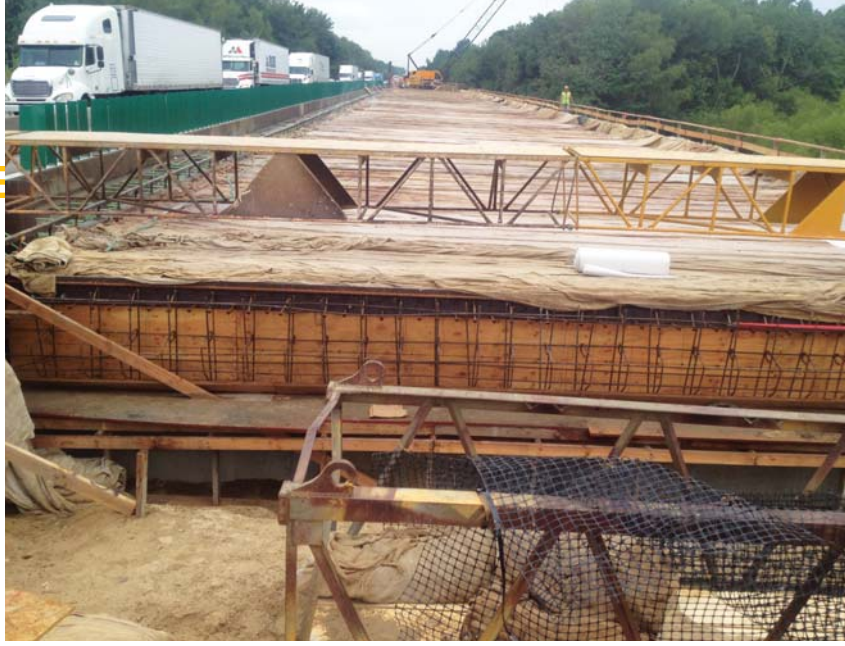
Since manipulation of the topography is never an option, and with I-40 being a crucial artery through the state, the determination was made to see what could be done to get the revived road surface raised above a level of persistent threat from water.

"Due to the fact that the entire roadway was being raised essentially a full foot," said Moore, "it required multiple lifts of pavement to be placed. This in itself would allow us the opportunity to gain smoothness with each course paved. I guess you could say this was a direct result of the volume of asphalt placed and the desire to raise the level of the driving surface."

Prepping the road

The 10.3-mile section of I-40 to be reconstructed would require no less than 413,000 tons of asphalt, distributed over three project phases substantiating four bridge replacements and three asphalt lifts.

"Phase 1 was approximately 3.9 miles," said Moore. "Phase 2 was the center portion of the project. It ran from just west of the rest area to just west of the Biscoe interchange. The length was approximately



Both eastbound and westbound relief bridges to the White River were completely replaced from the footings on up.

3.58 miles. Phase 3 was the eastern segment of the project. It ran from just west of the Biscoe interchange to the west end of the Cache River Bridge. The length was approximately 3.34 miles. The sections were all end-to-end, but you could only work in Phase 1 and 2, or 2 and 3 simultaneously. You could not work in 1, skip 2 and then have work going on in 3. The bridges were all located in 2, so this allowed continuous work on them while either 1 or 3 were being reconstructed."

Hydraulic breakers, including the Cat 336D, removed the faulted panels, after which RMI Inc. was subcontracted to rubbilize all the existing mainline pavement and acceleration lanes in place—a 10-in. faulted portland cement concrete pavement—prior to asphalt lay-down.

A Cat 140G motor grader, a Cat D6 dozer and a Volvo SD116F padfoot roller completed grade preparation for temporary asphalt ramps and crossovers, after which a W2000 Wirtgen milling machine was employed to excavate existing pavement and shoulder rock for installation of the required asphalt shoulder strengthening needed to push traffic over onto the existing shoulders during the three construction phases.

Rising mix by mix

The project advantaged three different mixes for its three respective lift levels, all of which were produced on the Astec 400 Six Pack Plant, after stockpile by the Cat 980G loader. The base course was a 1.5-in. mix with PG 76-22 binder at 5.8 in. The binder course (2nd lift) was a 1-in. mix with PG 76-22 binder at 3 in., and the surface course was a ½-in. mix with PG 76-22 binder at 4 in.

Roadtec SB2500-C Shuttle Buggies transferred asphalt into the pavers, and a Roadtec RP195 was used for most of the mainline paving, while a Cat AP155B was employed for a fraction of the surface paving and the lion's share of the 10-ft shoulder paving. The narrow shoulder paving was handled by the Roadtec RP155, and a Gomaco Commander III slipform paver reinstalled the permanent median barrier wall. Compaction was achieved by a tag team of a Volvo DD118 dual steel-drum roller and a Ingersall-Rand PT125 pneumatic roller. All told, the 413,000 tons of asphalt used brought I-40 up the foot desired in the planning.

"Upon completion of the project," Moore said, "if all densities fell into a range of 93% and 96%, an additional bonus was paid out. We received that bonus for achieving all densities in this range for the project."

Building bridges

Along this area of the White River are four relief bridges, which would need to be replaced in order for the project to proceed. As part of Phase 2, bridge replacement would occur while traffic was in play.

According to Moore, this portion of the project asked for the bridges to be replaced in the same manner as their predecessors, so as to maintain their simple functionality.

"After traffic was detoured to the head-to-head configuration, the bridges were taken down in sections. A work road was constructed underneath the bridges and pipes were installed to carry the flow of water under the work roads. This allowed a spot for the cranes, trackhoes and other necessary equipment to traverse in the channel and have access to the footings and piers for removal and installation. The decks were cut into pieces and lifted off the steel structures. The steel structures were then cut into pieces and removed from the topside using cranes to handle the sections. Then the pier and footings were removed. The new bridges were rebuilt in the same manner, utilizing the work roads for the lower part of the structures and cranes from the topside to build the superstructure. Pump trucks were used to pour the decks on the new bridges."

Adjacent traffic was a persistent concern for workers and planners alike. "Traffic was not scheduled to be re-routed for construction of this project. It was only to be placed in the specified head-to-head configuration using temporary concrete barrier walls," Moore said. "However, frequent accidents forced traffic to be re-routed to Highway 70 numerous times."

The 1% rule

"So much happens out there," Hays insisted. "It really comes down to percentages. If you've got 35,000-45,000 vehicles a day coming through your work zone, and 99% of those drivers are paying attention and know how to behave in a work zone, that means 1% doesn't. That's 400 every single day. Apply that to a regular day, or even an 18-hour day, that's one every few minutes, presenting a danger. It's not surprising that we had so many incidents. It's surprising we didn't have more."

Speed reductions were posted in the work zone to mitigate incidents, yet Hays said they occurred "in the hundreds," despite comprehensive safety measures employed through the scope of the project.

In addition to the concrete barriers, Moore said, "there were also numerous portable changeable message boards prior to entering the work zone. There were even static (stationary) message boards used as far away as Little Rock and Memphis that displayed messages warning of the construction zone and the potential delays. The PCMS boards near the project could be accessed and programmed via smartphone, iPad or PC, so the messages could be quickly updated to warn the traveling public of problems or delays. In addition to the PCMS boards we also had highway advisory radios (HARs) set to a private frequency that could be tuned in to by motorists to receive information about the work zone or possible detour info due to accidents. There were also numerous cameras leading up to and throughout the work zone to monitor the flow of traffic and help identify where traffic stoppages were occurring."

Nonetheless, safety was a persistent issue, one that the Arkansas State Highway Police were there to monitor. "We had a lot of instances both within the work zone and in the queues approaching the work zone," Hays said. "That's where we had the highway police there to help alleviate the queuing problems. Drivers ignore signs, but they'll pay attention to those flashing blue lights."

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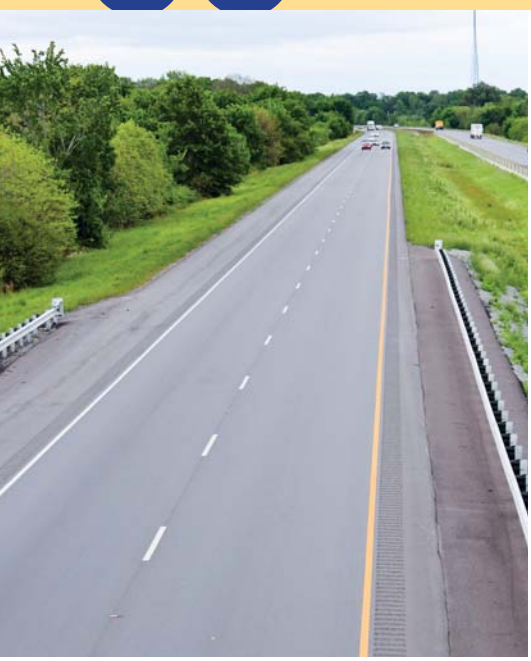

413,000 tons of asphalt were used to bring the 10.3-mile section of I-40 up a full foot.

Testing, testing, testing

"There was a large amount of testing done each day the asphalt was produced," Moore said. The partnership with AHTD carried with it rigid stipulations for quality control—stipulations Koss was prepared to satisfy.

"There was a mobile lab at our plant site where technicians employed by Koss did the required volumetric testing each day," Moore continued. "This consisted of testing for air voids, VMA, lab-molded densities, AC binder content and material gradations. There was also another mobile lab Koss provided at the plant site where the AHTD kept a full-time plant inspector to monitor our testing and verify it with a specified number of QA tests of their own."

As with many contracts, Koss stood to realize a sizeable bonus for maintaining compliance and generating consistent QC results throughout the life of the project. Koss earned each dime of it, Moore said.

One smooth ride

When all was said and done, the project was completed successfully—and early.

"We let the contractors bid the amount of time it would take to complete the job," Hays said, "rather than assigning a timeframe. This project was bid at 215 days, but came in around 211"—a fact Moore is particularly proud of.

"Koss received 99% of the available ride bonus and approximately 75% of all the other available QC incentives," he said. "And it was noted by the inspectors, the resident and assistant resident engineers that this was one of the smoothest pieces of pavement they had seen paved in the state of Arkansas." R&B

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