The cross road

Blessed route the beneficiary of FDR process

By Tom Kuennen
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A full-depth reclamation (FDR) project involving the removal of a failed portland cement concrete pavement and the construction of an 8-in. stabilized reclaimed asphalt pavement (RAP) and aggregate base with an engineered asphalt emulsion, is hardly an event of Biblical proportions.

But the long-awaited rebuilding of a massively faulted pavement in rural Monroe County, Mich., was enough to bring the Erie United Methodist Church congregation out to bless the new pavement. They prayed for the safety of travelers and for construction workers still reclaiming the road further to the west, and offered thanks for a fresh, new asphalt pavement that will make it easier for the congregation to get to church.

The church's pastor, Rev. Megan Walther, led the blessing following church services Aug. 10, 2014. But the reconstruction effort dated back to FY 2013, when money for the work was provided by a special Michigan program mostly serving shovel-ready local road projects.

It's all new

Among other options, the owning agency considered FDR for M-151/Samaria Road. "We were trying something new for Monroe County," said Randy Pierce, managing director of the Monroe County Road Commission. "We obtained supplementary financing from Lansing to rebuild 10.3 miles of Samaria Road. We took the old concrete out, and reclaimed the whole structure."

Monroe County lies in the southeast corner of the Wolverine State, just north of Toledo, Ohio, and M-151/Samaria Road dead-ends at Lake Erie to the east.

When constructed in the 1960s, no tie bars were used to provide load transfer from slab to slab. The result was that the entire stretch of M-151 had failed, with more than 10 miles of faulted 8-in.-thick concrete slabs connected by crumbling patches, as nearly every longitudinal and transverse joint had failed. Some stretches had been overlaid with hot-mix asphalt (HMA), with very rough continuous reflective cracks delineating the failed joints below.

"On a scale of 0 to 10, the condition of the road was 0," Pierce said. "The slabs were moving. We'd gotten a lot of complaints on this road, and there were serious issues with it. Even our insurance company wanted

Right (top to bottom): (top) Members of the Monroe County Road Commission pose before evidence of the failed road during the project's groundbreaking; (middle) Initial breakup of the failed concrete panels; (bottom) The existing concrete was pulverized and an Iron Wolf crushed it in place.

to get the work done, because there were blown tires and a lot of people driving on the shoulders and roadsides just to avoid the pavement."

Toward the end, trucks refused to drive to farms along M-151 to pick up produce, as they blew tires, bent rims and endured broken windshields. One company would not haul asphalt to a local paving site as the trucking firm declared the road undriveable. As a result, alternative roads not designed for heavy truck loads were taking a hit.

Road funding has been limited for all agencies, both state and local, Pierce said, and that compelled Monroe County to look for new solutions to replace Samaria Road. Overlays had been placed, but they constituted a bandage that no longer worked. While reconstruction was the only option, conventional removal and landfilling of concrete slabs and road base, followed by placement of virgin road base and base leveling and friction courses of HMA—with the endless truck traffic it entailed—was simply too costly.

Despite FDR being a new process for his county, Pierce had studied FDR best practice in other venues. "I looked at the recycling process in other states, and it was something that intrigued me. Heritage Research Group

Fact Finder

Recycled concrete aggregate sustained by this project, approximately 50,000 tons, will benefit county gravel roads in advance of future surface treatment work.

presented the technology and it made sense to me. It's a good, long-term fix that will let us be green and save money, as we will use all the recycled products either here or on another road project, and nothing will be thrown away.

"We agencies are having to look at alternative ways of doing things," Pierce continued. "The old ways of doing things—mill-and-fill for rehabilitation, for example—are totally out of the picture because governments can't afford them anymore. We are now looking at ways to stretch our dollars, and FDR is one of them."

Road agencies are loath to try new techniques, as they view themselves as custodians of taxpayers' money and see risk in deviating from the tried-and-true methods.

"Is use of this new process, FDR, taking a chance with our highway funds?" Pierce asked. "I have done research and the results have been very favorable. I think FDR is an opportunity to do more with less. Considering the data from other areas, and the limited resources available, we feel we have used the taxpayers' money wisely and got the best bang for their buck."

Road and risk reward

Despite the wretched condition of the road, mainstream funding for an M-151/Samaria Road rebuild simply was not available. Instead the project was made possible through a "3R" special program—the Road and Risk Reserve Fund—created by the Michigan assembly expressly for needs such as M-151.

"The road was pretty much in an undriveable condition," said Bob Stammer, chairman of the Monroe County Road Commission. "Replacement had been on the radar for several years. In earlier years the road commission applied for a federal grant to replace it and did not receive it. But the state had a program for this type of work. We entered this project as a candidate, and it was selected."

Through the 3R program, the state provided $5 million for M-151/Samaria Road, and the bid to use FDR and complete reuse of all material either in situ or in the case of the concrete, off-site, came to $4.5 million. Additional drainage work accounted for the rest.

In addition to its green aspects, lower costs drove the county to FDR, Stammer said. "Five million dollars to do 10 miles of road is not a lot of money," he said. "Everybody put their heads together, came up with the FDR solution and all thought it could be done within the $5 million budget."

"With 3R, the state made $230 million in additional road funds available throughout the state, $115 million for each of two years," said Dale Zorn, 56th District state representative. "It is funding shovel-ready projects, to start and finish, rather than just patching pavements. That means the engineering must be complete and a road commission be able to start the project immediately and finish the project. The nice part about this specific appropriation is that 80% of it is going on the roads that we live and work on, not on big expressways."

The two-year program came to an end in 2014.

The three best

In summer 2014, work on M-151 was executed in three phases, moving from east to west. In general, initial demolition of the 8-in.-thick concrete slabs was done with a self-propelled percussion (drop hammer) breaker, followed by reduction of the pieces with a self-propelled crusher. This reclaimed concrete aggregate was removed, followed by placement of processed RAP, in-place recycling of the RAP into the existing base course using emulsion injection during mixing, stabilization and compaction, and placement of a 3.5-in. asphalt overlay. A subsequent phase to the west would begin as work wound down to the east.

Work on M-151/Samaria Road began in late June 2014, with a groundbreaking ceremony July 1, and was scheduled to be completed in early November.

Subcontractor Tenmile Creek Excavating LLC was responsible for initial breaking of concrete via its subcontractor, Antigo Construction Inc., followed by reduction of those pieces in-place by Tenmile's Iron Wolf front-end loader-mounted attachment.

"We came in and pulverized the existing concrete pavement, and then used the Iron Wolf to crush the concrete in place," said Mike Anderzack, owner, Tenmile Creek Excavating LLC., and related firm, Anderzack-Pitzen Construction. "We then milled the crushed material out."

At first, Antigo broke the slabs into minus 12-in. chunks, but this posed problems for the crushing attachment. "It was a struggle to get through that size material," Anderzack said. "On the second phase we had them break it to 8- and 6-in. minus material." The resulting RCA rubble was loaded by Tenmile's Wirtgen W 220 cold mill into haul trucks.

"The job originally was scheduled for the concrete to be broken into slabs and hauled away to be crushed and screened at an off-site location to be used as a base course at a later date," said Dean Breese, vice president, Gerken Paving Inc., prime contractor on the M-151/Samaria Road project. "But that would have resulted in periods where residents would have been kept from their homes, or they would have to drive on subgrade that might not have been adequate depending on the weather. Tenmile came up with this method that allowed residents access to their homes almost all the time. It worked out quite well."

Normally, a contractor would break the concrete into sizes that could be dug out by an excavator and loaded into a truck.

"The way we did it was more efficient," Anderzack said, "as with the smaller RCA size we could get more material on the truck with fewer air voids, and were able to save a lot on the trucking costs."

"That recycled concrete aggregate—50,000 tons of it—will benefit our gravel roads throughout the county, providing a nice base for future surface treatments," said Stammer. "This green recycling technology is much cheaper than buying virgin stone out of a quarry."

Left (top to bottom): (top) A Wirtgen in-place recycler mixed the RAP on-site; (middle) Padfoot roller compaction in action; (bottom) Virgin asphalt was laid on top at 3.5 in.

Some serious base

A critical element of the project was the in-place recycling of existing base to a depth of 8 in., with a 6 in. depth of minus 2-in. RAP added, placed by an asphalt paver. The RAP and base were mixed in place by a Wirtgen WR 2500 recycler, which injected an engineered recycling emulsion into the mixing chamber of the recycler.

"The emulsion is engineered to provide mixing time for a project like this," said Bruce Wehr, technical representative for emulsion provider Asphalt Materials Inc. "It permits the contractor time to grade, shape and begin compaction. Depending on the weather, he will have 60 to 90 minutes before it becomes difficult to move. Then, when mixing is done, the emulsion is designed to release the water from the pavement."

Asphalt Materials—a company of The Heritage Group, Indianapolis—created the emulsion expressly for recycling work, which is a different function from conventional emulsions used for chip seals or other surface treatments. The firm created the emulsion for use with the materials in the road base, obtained by coring, rather than for a standard, homogenous stockpile in a contractor's yard.

Coring went right through the existing concrete down to the aggregate base.

"We needed to determine how thick that base was, its composition, and whether it was a good enough quality material to incorporate into the recycling process," Wehr said.

"The emulsion is designed to work with the composition and gradation of those existing materials, plus the RAP," he added. "As a result we quickly get the enhanced cohesion and stability we need to get traffic back on the road, as this road needs to stay open to local traffic. And that includes heavy Michigan 'truck trains'."

The minus 2-in. RAP added to the base was crushed, screened and stockpiled for this job at prime contractor Gerken Paving Inc.'s plant 3 miles from the jobsite.

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>
> *— Dean Breese, V.P., Gerken Paving Inc.*

"As soon as the concrete was removed, the RAP was placed and traffic allowed to run on it until the base was stabilized," Wehr said. "Using the RAP and the existing aggregate base, we are replacing 6 in. of virgin hot-mix asphalt intermediate course at tremendous savings to the owner."

"There is an excess of recycled asphalt pavement, and that material is relatively inexpensive," said Breese. "FDR base reclamation is a good way to use a lot of it. We decided to process it—removed from stockpile and crushed and screened it—just before putting it on the base. In doing that we placed it with an asphalt paver and compacted it. This provided a certain compacted depth and a good surface for residents to drive on. The result was almost as good as an asphalt road."

Tenmile continued by creating a crown in the stabilized base course by motor grader, and the graded base was compacted to refusal by a padfoot roller, using a front-mounted dozer blade to smooth the surface when moving in reverse. That dimpled surface was smoothed by use of a tandem asphalt roller to create a usable driving surface for local residents and businesses.

Finally, Gerken returned to place a 3.5-in. virgin asphalt overlay in two lifts.

"People need to take a good look at this project," said Breese. "It demonstrates a very viable way to replace a road. It's a great method to rebuild a road and is very cost-effective. We also showed how complete reconstruction of a road can have minimal impact on residents, which is big. Agencies should take note and keep watch on M-151/Samaria Road as I have a feeling it's going to perform very well."

"It was a good group effort with Gerken Paving, Monroe County and Asphalt Materials," Anderzack said. "Everybody cooperated, and working as a team is what makes a project possible. The results show that we accomplished that in a high-quality FDR project." **R&B**

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