

Ultrathin WMA Gives Missouri Smooth Fix

BY SANDY LENDER





LEFT: NB West Contracting Company's Pacific plant produced the ultrathin WMA for the Route 100 job in the summer of 2011 at temperatures of 240 and 250°F. **ABOVE:** The paving train for the Route 100 project consisted of a Shuttle Buggy delivering the WMA to the gravity-fed hopper of the SP200 behind the spraypaver's 2,100-gallon heated tack tank. Haul trucks like the one you see here had a designated area for cleaning out to make sure nothing messed up the thin and gorgeous mat you see on page 32.

As the team at NB West Contracting Company has been known to do, they proposed and carried out a method of pavement repair and resurfacing for the Missouri Department of Transportation (MoDOT) last summer that saved the agency money and left the traveling public with a smooth asphalt finish in a fast-growing county. NB West Manager Steve Jackson explained that MoDOT wanted an overlay it could "put down and walk away from for 10 years." Jackson's team delivered that while solving the nagging issues of delamination and reflective cracking that Missouri roads can experience.

To begin, NB West won Job J6P2206, which was the repair and resurfacing of Route 100 in Franklin County from DuBois Creek to Pine Tree Loop Road in Gray Summit. The

total length of the improvement was 8.682 miles and called for Superpave BP-1 and BP-2 mixes.

"They specified a 1 ¼-inch, 9 ½-mm Superpave overlay, but we suggested something different for them," Jackson said. "Road Science came up with the thinner crack resistant bonded mix for the mainline and we submitted it as a value-engineering option. Missouri uses a BP-1 mix, which is a bituminous plant mix for lower-volume roads and shoulders. So we had to re-do the shoulder mix because of the reduced thickness on the mainline. Overall, it saved them money and met their goals for the project."

As Jackson explained, the BP-1 and BP-2 are low-traffic-volume mixes with a ½-inch nominal maximum aggregate size (NMAS). The BP-2 is a finer mix than the BP-1. The team replaced the Superpave 095CLP* mix


originally specified for the project with the thin lift bonded mix.

"Our thin lift mix met the LP durable aggregate specification and allowed us to use a ¾-inch thick lift. As a result, we also used a BP-3 mix design on the shoulders instead of a BP-2 due to the maximum aggregate size. BP-3 is a 3/8-inch NMAS."

Changing thickness wasn't the only benefit of changing designs.

"The savings realized by the reduction in thickness allowed us to use a heavy polymer asphalt binder, a polymer-modified tack coat (Novabond) and a higher VMA-higher asphalt content mix on the shoulders. The emulsion was the Novabond product from Road Science, which we shot at a rate of 0.131 gallons per square yard."

To get the Novabond down and the WMA placed right on top, the NB West crew used the SP200 (a spray-



The Novabond polymer-modified emulsion went down at a rate of 0.131 gallons per square yard directly in front of the WMA, which measured $\frac{3}{4}$ of an inch in depth.

paver) from Roadtec, Chattanooga. This wasn't a requirement, but a best practices move.

"There isn't a specification for not driving on the tack coat," Jackson explained. He pointed out that roads in Missouri have had issues with pavements delaminating due to insufficient or contaminated tack coats. "MoDOT has voiced their delamination concerns to the industry for several years and are proactively working to develop a bond strength performance specification to add to their specbook. NB West has been working with Road Science since 2008 on Bonded Dense Graded pavements where we put traditional dense graded mixes down through the spray-paver. MoDOT, with the help of industry, is working on bonding a single lift of dense graded mixes to concrete.

"Traditionally, we would have put down two lifts of HMA over concrete to reduce the joint bumps and achieve a better smoothness. If we can use warm mix, the spray-paver and a polymer-modified asphalt emulsion with a single lift of dense graded mix and achieve the smoothness that we need to ensure that the traveling public is happy, then we could also provide a more economical pavement maintenance solution for the taxpayers of Missouri."

As you can see, saving money for the taxpayers was only one benefit of NB West's ingenuity.

"The goal of this project was to get a mix that would stand up to reflective cracking," Jackson said. "The binder itself was the secret ingredient. The binder was produced by taking a soft base asphalt and fortifying it to meet the mix design performance parameters with a high dosage of polymer. And we used high quality aggregates. Also, the warm mix wasn't aging the [asphalt cement] as we were making it."

The crew ran the mix through the NB West Pacific plant, which Jackson said was about 15 miles away from the job. With a late summer project and close proximity, they had no troubles with long hauls or temperatures.

"We typically produce it at about 290°F, but we were getting temperatures around 240 or 250. We wanted to drop the temperature down so we could get the best smoothness on the road."

Marvin Exline of Road Science talked about the Route 100 project goals as well. "The overlay was an experimental high performance thin overlay. The goal was to meet all the criteria requested by the agency and the contractor for this particular project—reasonable cost compared to conventional application, rut resistance and

crack resistance, and low permeability for winter safety concerns."

Exline said they used the following methods to get those performance characteristics.

- Thin application of less than 1 inch bonded to prevent delamination by spray-paver technology using polymer-modified emulsion
- Rock on rock contact similar to SMA or UBAWS (Novachip)
- Polymer modified binder at higher asphalt content, similar to SMA but without any fiber addition

"The mix and binder and concepts take several features of previous mixes and creates a hybrid system," Exline said. "It's not UBAWS, it's not SMA and it's not an SP9.5 mix, yet it has characteristics from all of them... It's clearly an attempt at making a performance based asphalt project. Allow the agency to voice their needs for the project and let the contractor

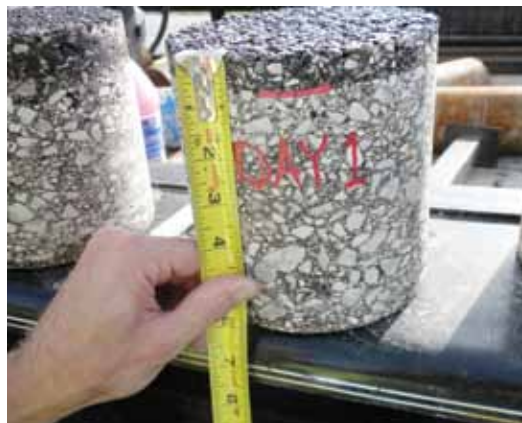
* SP 095CLP = Superpave 9.5 mm NMAS mix; C is the design level due to traffic of 3-30 million equivalent single axle loads (ESALS); LP is the requirement for a limestone porphyry aggregate or trap rock



and industry provide a performance based solution. I thought everyone did a great job considering the time frame for completing the design and performance testing."

The asphalt mix performed exceptionally in terms of crack resistance, a value of 1300 J/m² was measured using the D(c)T device. Typical asphalt ranges from 300-450 J/m². Permeability was reduced compared to some thin lift, gap graded projects that have caused safety concerns due to icing in winter storm events. The mix was produced with virgin material but very environmentally friendly because of reduced demand of material needed to meet MoDOT's goals and needs.

"The only way that it is possible to come up with innovative solutions is because we have a partner, MoDOT, that is willing to try new ideas," Jackson said. "They are always meeting with the industry and asking for new methodologies and improved materials. We have quarterly meetings to find solutions to issues that we are having



ABOVE TOP: NB West Manager Steve Jackson said the emulsion was difficult for hand-work, but the spraypaver got the WMA lift down on top of it right away. The ultrathin WMA mat performed as smoothly as a HMA but at temperatures of 240 and 250°F. **ABOVE LEFT:** NB West Manager Steve Jackson explained that MoDOT officials and inspectors have gotten used to the company's innovative ideas—not too many gawkers show up for an NB West special project anymore. Jackson said the Route 100 project managed to bring out more interested parties than usual. Here a QC/QA tech shows off a core sample that proved the crew's good work. **ABOVE RIGHT:** NB West Contracting Company won the bid for Job J6P2206 to repair and resurface Route 100 between DuBois Creek and Pine Tree Loop Road.

on projects, and MoDOT even sponsors a Partnering for Innovation and Efficiencies meeting where they ask all of their partners for ways to streamline and improve project delivery."

The time frame had NB West crews done by Nov. 11 or facing

damages of \$6,100 per day. Jackson said the team was done with time to spare for helping neighboring contractors finish off their 2011 seasons, all while giving Missouri drivers a smooth ride through Franklin County. **41**