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NHDOT WIDENS SEARCH FOR LONGER-LASTING PAVEMENTS

Thin-lift asphalt demonstration by Continental Paving in Rochester is state's latest effort to observe promising pavement preservation technologies

by Paul Fournier

he performance of thin-lift hot asphalt overlay recently placed on U.S. Route 202 in Rochester, as one of a series of field demonstrations, is being closely monitored by the New Hampshire Department of Transportation (NHDOT) as it looks for promising products designed to extend pavement service life.

Continental Paving Inc. of Londonderry, N.H., supplied the hot mix asphalt and installed the oneinch asphalt overlay on a 2.4-mile section of highway under a demonstration provision included in the contractor's \$1.72-million contract for paving various roads in NHDOT's Maintenance District 6. The thin-lift asphalt overlay incorporated highly polymer-modified liquid asphalt binder (HiMA) and was integral to a project initiated by the Northeast Pavement Preservation Partnership (NEPPP), a regional DOT group dedicated to advancing pavement preservation practices through education, research and outreach.

NEPPP's demonstration project was hosted by the National Center for Pavement Preservation housed at Michigan State University, which is under contract to develop and administer the Transportation System Preservation Technical Services Program (TSP 2). This is a national program funded by the American Association of State Highway and Transportation Officials (AASHTO) that provides current information on pavement and bridge preservation measures.

As a member agency of the regional partnership, NHDOT wanted to participate in the NEPPP/ AASHTO TSP 2 project to further the agency's continuing search for longer-life pavement treatments, according to Eric Thibodeau, Pavement Management chief of NHDOT's Bureau of Materials and Research.



Continental Paving's ROADTEC paver lays thin-lift HiMA overlay followed by HAMM HD120 breakdown roller during U.S. Route 202 test in Rochester.

New Regional Specifications

For the 2011 thin-lift overlay demonstration on U.S. Route 202 in Rochester, a highway that experiences an average daily vehicle count of 4,600, Continental Paving produced and placed about 1,500 tons of the Hi-MA-modified hot mix. This was installed adjacent to a section of highway they overlaid with 500 tons of conventional hot asphalt mix for comparison purposes.

The HiMA-modified mix adhered to regional specifications developed by NEPPP. Called "Superpave 9.5mm Highly Polymer-Modified Thin Overlay Specifications," (PMTOL) the mix is designed as a pavement preservation strategy to extend a pavement's service life without improving its structural capacity. It is intended to be placed on pavements in good condition that do not require structural rehabilitation.

Specifications allowed the use of up to 25 percent recycled asphalt pavement (RAP) in the mix.

NHDOT Widens Search For Longer-Lasting Pavements

A HAMM HD90 Finish Rolle, follows a HYPAC Intermediate Roller or demonstration for which results will b posted on AASHTO TSP•2 website

Owner: New Hampshire Department of Transportation *Contractor:* Continental Paving Inc.

Boosting Polymers but not Viscosity

The HiMA binder contained 7.5-percent SBS (styrene-butadienestyrene) polymer – more than twice as much used in conventional polymer-modified binders. While it's common industry knowledge that modification of liquid asphalt binders with polymers improves resistance to rutting and raveling of asphalt mixes, there is a practical limit to polymer concentration. Usually, as polymer concentration exceeds three percent, the viscosity of the binder increases such that the mix becomes more difficult to produce in the plant and less workable for the paving crew.

However, the polymer used in the demonstration was Kraton[™] D0243, a new SBS product manufactured by Houston-based Kraton Performance Polymers Inc., which meets the requirements of the new regional specifications without increasing viscosity.

NuStar Energy blended the D0243 polymer with a performance-graded asphalt binder at its New Jersey specialty asphalt product plant to produce the HiMA binder for the Rochester demonstration. Frank Fee has been the principal Nustar Energy manager for the AASHTO TSP•2 HiMA production in the northeast. NuStar will also produce the HiMA binder for a demonstration by the Vermont Agency of Transportation and for a demonstration tentatively planned by the Massachusetts DOT in 2012.

All told, Continental Paving installed about 20,000 tons of hot mix for the District 6 contract, with most of this produced by the company's Litchfield CMI plant. The Londonderry Astec drum mix plant produced the 1,500 tons of HiMA mix for the demonstration section on U.S. Route 202. "Each year DOT tries to look at new products and processes that will produce longer service life pavements,"

Thibodeau said.

Performing the Demonstration

The contractor dedicated its 400-ton-per-hour Astec plant in Londonderry to the demonstration project for the day. Erected in 1985, the plant has undergone major environmental and production upgrades over the years. Three 180-ton heated silos store the mix and feed haul trucks. Since the demonstration site in Rochester is 55 miles, or about an hour's drive, from the plant, the mix was produced at approximately 340-degrees Fahrenheit to compensate for cooling in transit.

By the time the mix reached the contractor's ROADTEC RP190 Paver at the job site, the temperature had dropped to between 290- and 300-degrees. A tack coat of RS-1 asphalt emulsion was applied ahead of the paver by Continental's Etnyre distributor.

Immediately behind the paver, a HAMM HD120 Compactor in non-vibratory mode did the breakdown rolling. This was followed by a pneumatic HYPAC C350AH Intermediate Roller. A HAMM HD90, also running in non-vibratory mode, performed finish rolling.

On site to observe the demonstration was Denis Boisvert, NHDOT Chief of Materials Technology. In commenting on the process he said: "You couldn't tell the difference in appearance and handling between the conventional mix and the highly polymer-modified mix as they were installed," Boisvert said. "Simply stated, both were hot, black and smooth. Our biggest problem with pavements up here in New Hampshire is cracking due to our cold temperatures. Regular asphalt binder gets brittle and cracks and then water gets in and we have frost heaves. We'll watch the test section and see if any cracks develop over time," he concluded.



ROADTEC paver lays one-inch HiMA overlay that was produced using mix specifications developed by Northeast Pavement Preservation Partnership.



A Mack haul truck gets a load of 340-degree HiMA mix produced by Continental Paving's Astec drum mix plant in Londonderry.

Testing Protocols by UMass Lab

The NEPPP regional specifications governing the Rochester demonstration were developed by eleven participating transportation agencies of the regional partnership and Dr. Walaa Mogawer, P.E., professor and director of the Highway Sustainability Research Center housed by the University of Massachusetts/Dartmouth. Professor Mogawer also developed testing protocols for the specifications.

As part of his contractual functions, professor Mogawer tested samples of raw materials that were to be used in producing the demonstration, then gathered samples of plant-produced mix after the demonstration for testing against performance specifications.

In addition to NHDOT, Vermont's Agency of Transportation, also a NEPPP member, has scheduled a thin-lift asphalt overlay demonstration in the near future. Professor Mogawer is to provide his lab's services for this demonstration as well.

Other Trials, Other Processes

Outside the Northeast, several AASHTO TSP•2 member transportation agencies have indicated interest in participating in thin-lift overlay demonstrations. One of them, the Minnesota DOT, recently conducted such a demonstration under the auspices of a sister regional group, the Midwestern Pavement Preservation Partnership. While Minnesota did not adhere to the NEPPP regional specifications for the asphalt mix design, they did use testing protocols devised by the northeast participants.

NHDOT's Thibodeau pointed out the New Hampshire agency has tried other paving products recently: "For example, in 2010, NHDOT had 2,500 tons of conventional SBS polymer-modified asphalt overlay placed on New Hampshire Route 106 in Concord and Pembroke," he said. "In addition, 3,100 tons of conventional asphalt overlay was placed on an adjacent section. Both sections received a ¾-inch overlay," he said.

And early in 2011, NHDOT tried another pavement technology.

"We had a 1-1/2-inch-thick overlay containing rubberized asphalt binder installed on Route 38 in Pelham earlier this year," he said. "The binder contains very fine particles of recycled rubber from scrap tires. About 5,600 tons of the asphalt rubber gap-graded mix was applied to a three-mile section of the highway."

All new products are closely monitored and compared to traditional paving methods.

"Within three to five years we will be able to draw conclusions about the performance of these alternate products," he said.

Not Business as Usual

Thibodeau explained that NHDOT's goal in trying these new technologies is to find more cost-effective ways to extend the service life of pavements and reduce life-cycle costs. "DOT has suffered a major reduction in its paving budget recently," he said. "Usually we get about \$18 million each year in State funds for the District resurfacing program. This year the program was funded at \$12 million. This means each of our six districts went from three million dollar-per-year budgets to two million dollars." "We have to find and evaluate newer technologies. We might have to pay 20-percent more initially, but then realize 50-percent longer pavement service life. This means longer intervals between having to get out on the road to make repairs and disrupt business and the motoring public, and ultimately, saving significant amounts of tax-payers' dollars by reducing life-cycle costs.," "It can't be 'business as usual' anymore," he concluded.



Observing Rochester field demonstration, (left to right): Dennis Boisvert, NHDOT chief of Materials Technology; Gregory Harder, Asphalt Institute regional engineer; Edward Welch Jr., NCPP Bridge preservation engineer; and Kevin Prince, NHDOT.

Continental Paving: Three Decades Of Growth

The company that installed the thin-lift asphalt overlay for the Rochester HiMA demonstration is one of the most experienced privately-held paving companies and hot mix asphalt producers in the northeast. Headquartered in Londonderry, N.H., Continental Paving Inc., manufactures about 600,000 tons of hot asphalt mix each year, installs most of it on its own paving jobs, and also performs extensive excavating and general site work.

Headed by brothers Mark Charbonneau, 53, president, and Richard Charbonneau, 55, vice president, the family-owned company has approximately 300 seasonal employees and about 650 trucks and pieces of heavy equipment.



Closeup of paver shows that HiMA mix does not stick to augers, despite having a polymer content of 7.5-percent.



UMass graduate students Siavash Vahidi and Abbas Booshehrian, assistants to professor Mogawer of The Highway Sustainability Research Center, gather demo materials samples.

The brothers took over the company from their father, Claude, in 1980. At that time, the company was essentially a trucking and site work company but the brothers significantly expanded operations, producing aggregate and hot mix asphalt.

The company bought its first aggregate crusher in 1983, and its first asphalt plant in 1986.

Now the company has four asphalt plants and four aggregate crushing plants, all located in New Hampshire:

- Hudson 5-ton CMI batch plant.
- Londonderry 8-ft. Astec drum plant.
- Litchfield 9-ft. CMI drum plant.
- Concord 3 ½-ton Barber-Greene batch plant.
- Londonderry stationary crushing plant 610 tons/hr. each.
- Litchfield stationary crushing plant 610 tons/hr. each.
- Concord portable crusher 300 ton/hr.
- Statewide portable roaming crusher 300 ton/hr.

Public Projects Dominate Work Load

According to Mark Charbonneau, in the past their work was divided equally between private projects and publicly bid work, but this has changed in the new economy.

"Now most of our projects are large road and bridge projects," he said. "But we do some private work – parking lot construction and paving, water, sewer and drainage for a large grocery store chain, for example, and subdivision projects involving water, sewer, grading and paving."

These days additional family members are working for the company: Mark's wife, Donna, his son, Ryan, his daughter, Amy and his son-in-law, Frank Forrest; and Richard's son, Chad.

In spite of tough economic times, the company has had steady work, noted Mark. "We've managed to stay busy and haven't had to lay off any fulltime employees during the last three years.

"We have a lot of long term, committed employees that help make Continental Paving successful," he added.

A Need To Look At New Products

In commenting on the company's participation in the thin-lift field demonstration in Rochester, Mark Charbonneau said:

"America doesn't have enough money anymore to pave all the roads needing paving with thick layers of hot mix asphalt, so we have to take a look at new products that could save taxpayers' money.

"Even if they initially cost more than conventional hot mixes, if they extend the life cycle longer, they may be more cost effective," Charbonneau concluded.