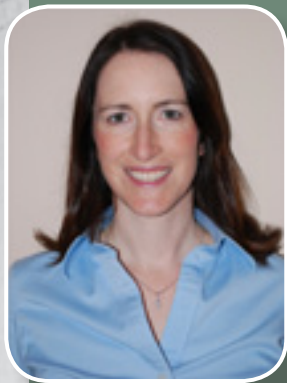


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MANHATTAN'S 1ST AVENUE UNDERGOES PAVEMENT TEST

NYCDOT tries new asphalt overlays in search of cost-effective pavement for city's planned upgraded bus lanes

By Paul Fournier

New York City's Department of Transportation (NYCDOT) recently applied two trial thin-lift asphalt overlays to two sections of Manhattan's 1st Avenue as the agency seeks cost-effective ways to resurface the entire roadway.

The City is currently upgrading bus lanes on busy 1st Avenue but the street's 25-year-old Portland cement concrete (PCC) pavement is in poor condition and there isn't enough money to completely replace the 18-inch-thick structure. Consequently, NYCDOT is looking for less costly alternatives to improve the street's riding surface and decided to look at thin asphalt overlays as a possible solution.

Another motivation for considering overlays was concern that heavy demolition and construction required to replace the PCC pavement could threaten the integrity of an important steam line beneath the street. Replacing a ruptured line in itself would be costly, and could seriously impact buildings that rely on steam for heating and cooling. The 24-inch line, which carries pressurized steam at 400-degrees Fahrenheit, is part of the New York City district heating system operated by Con Edison. The system includes 5 generating plants that provide nearly 10 million pounds of steam per hour during



A New York City crew employs a CAT AP1055D Paver and HAMM HD110 Roller during nighttime paving of Manhattan's 1st Avenue with thin HiMA overlay.

peak winter months through approximately 105 miles of mains and service pipes.

Choosing Alternatives

In their search for a solution, NYCDOT officials consulted representatives of NuStar Energy, one of the largest asphalt refiners and marketers in the U.S., to discuss possible alternatives to demolishing and replacing the PCC pavement. As a result of these discussions, NuStar proposed, and NYCDOT approved, the application and comparison of two high performance thin overlay (HPTO) mixes on two adjacent blocks of 1st Avenue. An added benefit of thin overlays would be retaining the curb reveal. One overlay would contain NuStar's proprietary FlexGard asphalt binder, the other would incorporate highly modified asphalt (HiMA) binder developed by Kraton Performance Polymers. NuStar would supply both binders.



Manhattan's 1st Avenue Undergoes Pavement Test

Owner/General Contractor: New York City Dept. of Transportation
Asphalt Materials Supplier: NuStar Energy

In nighttime trial, NYCDOT uses a CAT AP1055D Paver to apply thin overlay incorporating highly modified asphalt binder on Manhattan's 1st Avenue.



An asphalt distributor truck applies tack coat to the existing pavement before haul trucks begin delivering trial mix to the job site.

The HiMA binder contains 7 percent Kraton D0243 SBS (styrene-butadiene-styrene) copolymer, while the NuStar FlexGard binder is modified with 3 percent standard SBS polymer.

The HiMA binder contains more than twice the amount of polymer ordinarily used in binder to achieve the benefits of polymer modification – i.e., improved resistance to asphalt stripping and stone raveling and expanded effective performance temperature range – without substantially increasing binder viscosity.

NuStar worked with engineers at Rutgers University to produce a design that was satisfactory with NYCDOT and would meet New Jersey DOT's High-Performance Thin Overlay specifications, while employing aggregates available to Willets Point Asphalt, the company selected to produce the mix.

Manufacturing The Mixes

Both HiMA binder and FlexGard binder were manufactured at NuStar's refinery in Paulsboro, N.J., and shipped to Willets Point's asphalt plant in Flushing, N.Y. for mix production. NuStar has experience with HiMA, having produced it for previous Kraton-sponsored thin overlay projects in Vermont and New Hampshire.



The overlay was applied to a compacted depth of 1-½ inches at the crown, and gradually tapered to one inch at the curbs to maintain curb reveal.

Evotherm warm mix technology was added to both mixes at a dosage of 0.5 percent by weight to improve workability and achieve compaction density requirements in the anticipated reduced temperatures of the night paving operation. Manufactured by MWV Specialty Chemical, Evotherm is a water-free warm mix asphalt technology that enables production of asphalt mix at temperatures 50- to 100 degrees Fahrenheit lower than conventional hot mix asphalt and also extends the allowable time period for compaction operations.

Willets Point's 350-ton-per-hour Astec drum plant produced the trial mixes at between 280- and 300 degrees Fahrenheit, with a target of 7.2 percent asphalt binder for the HiMA and FlexGard binders. The plant ran normally during the production of the mixes, which met NYCDOT requirements and underwent NJDOT HPTO specifications testing.



Photo shows milled Portland cement concrete pavement near a manhole of Con Edison, which supplies pressurized steam in 24-inch line to heat buildings.



The overlay mixes, which contained 7.2 percent asphalt binder for both HiMA and FlexGard trials, were produced with the plant running normally.

NYCDOT Does Own Paving

NYCDOT had chosen two adjacent blocks of 1st Avenue from 100th Street to 102nd Street for the trial overlays. Each section of roadway is approximately 264 feet long and 72 feet wide. About 170 tons of mix was required for each section, according to Ron Corun, Senior Manager, NuStar Asphalt Technical Services, who closely monitored the applications.

In general, NYCDOT does its own paving – about one million tons worth each year. The agency also operates two asphalt plants, but they do not produce specialty mixes such as the two applied in this trial. Galileo Orlando, NYCDOT Deputy Commissioner, heads up the agency's extensive roadway maintenance activities, and reports to Commissioner Janette Sadik-Khan.

The agency has an overall annual budget of more than \$2 billion, employs 4,700 people, and is responsible for the operation and maintenance of 6,300 miles of streets and highways, nearly 800 bridges, and the Staten Island Ferry, the nation's busiest commuter ferry service, which carries more than 21 million passengers annually.

Pavement Preparation Is Critical

Pavement preparation was scheduled for Monday, September 24, 2012, and paving of both mixes was scheduled for Tuesday night, September 25. Two milling machines cut tie-ins at the ends of the project and at the side streets in the intersections. A vacuum sweeper truck was used to clean up the milled material, then patching of the existing pavement was undertaken.

According to Corun, 1st Avenue was in such poor condition that proper pavement repair and preparation were critical to good performance by the HPTO mixes. On his recommendation, NYCDOT crews used Crafcro Inc.'s

Manhole covers were paved over, then the HiMA modified mix was easily removed from the structures using a shovel.



PolyPatch material to patch and repair the numerous cracks, wide unsealed joints and holes prevalent throughout the pavement. A highly-modified asphalt mixed with fine aggregate, PolyPatch is heated in a kettle to 400 degrees Fahrenheit and is poured directly into large cracks and holes. NYCDOT purchased the PolyPatch material, while Crafcro agreed to do a free demonstration and apply the PolyPatch at no cost.

NYCDOT supplied an air compressor and a nozzle which was used to clean out the cracks and holes to be patched. Before installing PolyPatch, crews used a propane torch to dry up water from the sweeper.

Nighttime Operations

Paving commenced the following evening at 9:00 p.m., with the application of an asphalt tack coat to the existing pavement. Then tri-axle dump trucks began delivering mix to the jobsite, averaging 35 minutes for the haul from Willets Point's plant.

At the 1st Avenue jobsite, a CAT AP1055D Tracked Paver with extendible screed was used to place the mix.

The paving crew employed three rollers on the new mixes – a CAT CB-534C Double Drum Vibratory Breakdown Roller, a Hamm HD-110 Oscillatory Intermediate Roller and a Hyster 8-10 ton Static Finish Roller. Noting that initial over-rolling caused some cracking in the first 100 feet of pavement, Corun called for restricting compaction operations to just one vibratory pass and also limited static passes, which solved the problem. Nuclear gauge testing showed pavement densities ranged from 95- to 97 percent after 2 rollers, with 92 percent being an acceptable minimum value, Corun said.

In order to maintain curb reveal, the crew applied the mixes to a compacted depth of 1-½ inches at the crown, and gradually tapered pavement thickness to one inch at the curbs, producing an average thickness of 1-¼ inches.

NYCDOT will evaluate and compare the performance of the two thin asphalt overlays over the winter. This trial could determine if one, both or neither of the two mixes is a cost-efficient alternative to use for paving the entire 1st Avenue. 🛑