U.S. Department of Transportation
Federal Highway Administration

TOPS
Targeted Overlay Pavement Solutions

CASE STUDY

November 2021

HIGH-PERFORMANCE THIN OVERLAYS
NEW JERSEY DEPARTMENT OF TRANSPORTATION

This is one of five case studies highlighting FHWA's Every Day Counts initiative known as Targeted Overlay Pavement Solutions (TOPS). TOPS integrates innovative overlay procedures into practices to improve performance, lessen traffic impacts, and reduce the cost of pavement ownership.

The New Jersey Department of Transportation (NJDOT) specifies high-performance thin overlay (HPTO) as a fine-graded polymer-modified asphalt mixture that uses 100 percent high-quality crushed stone with a nominal maximum aggregate size of 3/8 inch. HPTO is designed using a modified Superpave design methodology with restrictions on reclaimed asphalt pavement and natural sands. The typical lift thickness for HPTO is 1 inch.

NJDOT treated more than 900 miles of roadway with HPTO between 2008 and 2018. Source: NJDOT

NJDOT uses HPTO as a multi-solution tool but primarily as a preservation application on pavements in good to fair condition in need of minimal repairs (less than 10 percent). HPTO can be combined with other preservation strategies such as microsurfacing, slurry seals, or micro-milling as warranted by unique project conditions. NJDOT research shows the timing of HPTO application is critical to get the maximum pavement life extension. According to NJDOT, HPTO applied to existing pavement in "good" condition, more than doubles the service life compared to HPTO applied to fair condition pavements.

Specification

The use of HPTO is not required by Federal law, nor are these specifications meant to bind the public in any way. NJDOT's HPTO specification includes the following provisions that give HPTO its characteristic qualities.

- Lab mixture performance testing occurs during mix design, test strip, and production.
- The resident engineer approves the test strip before production and placement.
- Performance tests include the asphalt pavement analyzer to measure rutting resistance, and the overlay tester to measure cracking resistance correlated with fatigue and reflective cracking.
- A material transfer vehicle is used to reduce thermal segregation and maintain consistent paving speed.
- Placement does not occur when the chance of rain is 50 percent or greater, or pavement temperature is below 50 degrees Fahrenheit.
- An engineer approves the underlying surface before placement.

Construction Considerations

NJDOT has identified two key construction considerations.

- Understand the significantly reduced compaction window for thin 1-inch lifts.
- Use a compaction aid and observe rolling operations during test strips.

HPTO is NJDOT's most widely used pavement preservation treatment.

NJDOT Preventive Maintenance 2008-2018

TREATMENT	MILES
High-performance thin overlay	944
Micro surfacing	405
Slurry seal	265
Ultra-thin friction course	193
Chip seal	59
Cape seal	55
Stone mastic asphalt thin overlay	30

> *"NJDOT's use of HPTO has increased service life and delayed resurfacing needs on several interstate projects with high-traffic volumes for flexible, rigid, and composite pavement types."*
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> ***—NJDOT Supervising Engineer Robert Blight***

Potential Benefits

According to NJDOT, HPTO provides the following benefits:

- Applies to state highway systems with high-traffic volumes.
- Improves ride quality depending on existing pavement conditions.
- Reduces noise and increases long-term skid resistance.
- Creates a renewed, sealed road surface to protect and extend pavement life.
- Minimally impacts traffic with short road closures.
- Extends pavement service life without raising profile grade by more than 1 inch.

NJDOT has not computed the overall HPTO benefit-to-cost ratio to date but anticipates it to be high despite HPTO being a more costly application. According to NJDOT, benefits such as life extension of pavement by approximately 10 years, minimal impact on traffic with short road closures, and reduced user costs and carbon emissions, outweigh the added cost of the treatment.

According to NJDOT, State performance mixture testing requirements, successful construction practices, and the resident engineer's prior approval in the specifications appear to have played a role in the success of HPTO as a pavement preservation tool.

Contact information:

To learn more about TOPS asphalt products contact Tim Aschenbrener, 720-963-3247.
For concrete TOPS products, contact Sam Tyson, 202-366-1326.

November 2021 **FHWA-HIF-22-010**