

# Putting HiMA to the Test-1<sup>st</sup> Avenue in NYC

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## HiMA Binder in in HPTO Mix on 1<sup>st</sup> Avenue in NYC (2013)



- 1<sup>st</sup> Avenue from 72<sup>nd</sup> Street to 125<sup>th</sup> Street in Manhattan was a 29 year old 18" thick PCC pavement
- Cost of total replacement far beyond NYC DOT budget
- NYC DOT contacted Associated Asphalt and asked for suggestions
- CITGO Asphalt proposed putting Highly Modified Asphalt (HiMA) binder into High Performance Thin Overlay Mix (HPTO)













## HPTO Mix

- CITGO Asphalt and Rutgers University developed High Performance Thin Overlay (HPTO) mix system using polymer-modified asphalt
  - Finer gradation than 9.5 mm Superpave mix
    - Allows thinner overlays
    - Better workability
  - Slightly gap-graded mix gradation
    - More room in mix for asphalt
    - Minimum 7% asphalt content
    - Higher asphalt content gives better crack resistance and longer pavement life
  - Polymer-modified asphalt formulated for specific application
  - Combination provides better rut and crack resistance and excellent workability

## HPTO Mix

- CITGO Asphalt named the mix FlexGard<sup>®</sup>
- NJDOT adopted the mix as HPTO
- NYS DOT adopted the mix as 6.3mm mix
- PennDOT adopted the mix as 6.3 mm mix

#### HPTO vs. 9.5 mm Mix Gradation



# Performance Testing of the HPTO Mix



- Laboratory Testing
  - Rutting
    - Asphalt Pavement Analyzer (APA)
  - Fatigue Cracking
    - Flexural Beam Fatigue Device
  - Reflective Cracking
    - Texas Overlay Tester
  - Permeability
    - Flexible Wall Permeability Tester
  - Skid Friction
    - Skid Trailer

## Asphalt Pavement Analyzer Results

#### **Rutting Comparison**



#### **Flexural Beam Fatigue Results**

**Fatigue Life Comparison** 



#### **Texas Overlay Tester**



#### **Texas Overlay Tester**



**Fixed plate** 

and glue onto both plates

#### **Texas Overlay Tester**



- Test developed at Texas A&M University for Texas DOT
- Very severe test brittle samples do very poorly
- Measures number of cycles to failure
- Texas DOT specification requires > 300 cycles for mixes that have been Short Term Oven Aged (STOA)

#### **Texas Overlay Tester Results**



7 Times More Cycles Than 9.5 mm Mix

25 Times More Cycles Than 9.5 mm mix

## **Permeability Testing**

 For Pavement Preservation, important to "seal" pavement to limit moisture damage under the surface layer

Testing in "Flexible Wall" Permeability Set-up to measure mix permeability

> Samples cored from 6-inch – diameter gyratory sample





#### **Permeability Results**



1600 times less permeable than 9.5 mm mix @ 95% field density

## Surface (Skid) Friction, SN<sub>40</sub>

Material Type	Skid Number, SN <sub>40</sub> (NJDOT Data)
FlexGard <sup>®</sup> S (new)	53
9.5 mm Mix (new)	51.6
9.5 mm Mix (4 years)	54.3
19 mm Mix (4 years)	55.7
19 mm Mix (5 years)	47.7



**NJDOT Skid Trailer** 



- Rehabilitation Design
  - Micro-mill existing PCC pavement
  - Patch areas as required with asphalt mix
  - Crack seal as required
  - Place PG 76-22 tack coat and Mirafi PGMG4 fabric
  - Overlay with 1 ½" HPTO mix with HiMA asphalt binder
    - Added Evotherm warm mix additive to lower mix temperatures and improve workability
    - Produced mix at 300°F
- Project completed by September 2013

#### 1<sup>st</sup> Avenue – New York City 2013 Micro-mill Existing Pavement



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### 1<sup>st</sup> Avenue – New York City 2013 Micro-mill Existing Pavement



#### 1<sup>st</sup> Avenue – New York City 2013 Crack Seal and Patch Existing Pavement



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## 1<sup>st</sup> Avenue – New York City 2013 Apply PG 76-22 Tack Coat and Paving Fabric



1<sup>st</sup> Avenue – New York City 2013 Apply PG 76-22 Tack Coat and Paving Fabric



#### 1<sup>st</sup> Avenue – New York City 2013 Pave with 1.5" HPTO Mix



#### 1<sup>st</sup> Avenue – New York City 2013 Pave with 1.5" HPTO Mix



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#### 1st Avenue Finished HPTO Pavement – September 2013



#### NYC DOT Press Release

NYC DOT Commissioner Sadik-Khan Announces Innovative Resurfacing of 53-block Stretch of First Avenue, the Latest in \$6 Billion of State of Good Repair Projects in Just Six Years

New York City Department of Transportation (DOT) Commissioner Janette Sadik-Khan today announced the completion of a \$7 million project to resurface First Avenue from 72nd to 125th streets using an innovative, thin-asphalt overlay atop the notoriously uneven concrete road at a fraction of the cost of a complete rebuilding.

"The high-tech asphalt overlay resurfacing of First Avenue will bring relief to residents and businesses who suffered 24/7 from the earth shattering pounding of vehicles barreling up First Avenue on what was previously a concrete roadway," said Council Member Jessica Lappin.

### HPTO Pavement 1<sup>st</sup> Avenue – August 2018



#### HPTO Pavement 1<sup>st</sup> Avenue – August 2018



#### HPTO Pavement 1<sup>st</sup> Avenue – August 2018























### 1st Avenue in NYC - Summary



- NYC DOT stated they would be satisfied if the pavement on 1<sup>st</sup> Avenue lasted five years
- After nine years, including two polar vortex winters, it is still in very good condition
- The combination of HPTO mix and HiMA binder provides a solution to urban pavement problems

### Questions?

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