OVERVIEW OF TREATMENT STRATEGIES

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Overview

- Where we are now
- Where we want to be in the future
- Pavement Preservation
- Pavement Design
- Pavement Rehabilitation
NJDOT Current Pavement Preservation Program

- Pavement Preservation
  - Routine Maintenance - $
  - Preventive Maintenance - $$
  - Minor Rehabilitation - $$$
  - Major Rehabilitation - $$$$$
Network has been neglected over years
Slipped into a very poor condition
Over the past several years we’ve made a major commitment to rehabilitate NJ roads
We’re not done with major rehabilitation yet
We’ve made a commitment to do more preventive maintenance
We need to do more preventive maintenance
Pavement Preservation

Pavement Preservation is “a program employing a network level, long-term strategy that enhances pavement performance by using an integrated, cost-effective set of practices that extend pavement life, improve safety and meet motorist expectations.”  

Source: FHWA Pavement Preservation Expert Task Group
The Pavement Preservation Concept

- Original Pavement

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<tr>
<th>Time (Years)</th>
<th>Very Good</th>
<th>Good</th>
<th>Fair</th>
<th>Poor</th>
<th>Very Poor</th>
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Rehabilitation Trigger
“Planned strategy of cost-effective treatments to an existing roadway system and its appurtenances that preserves the system, retards future deterioration, and maintains or improves the functional condition of the system (without increasing the structural capacity).”  

Source: AASHTO Standing Committee on Highways
Approximate Cost of Treatments (per lane mile)

- Preventive Maintenance - $30,000
- Minor Rehabilitation - $350,000
- Major Rehabilitation - $500,000
- Reconstruction - $1,500,000
NJ motorists demand and deserve easy mobility on safe, smooth, well maintained roads.
Pavement Preservation

- Focus shift from pavement rehabilitation to pavement preservation
- Perpetual Pavements (50+ year design)
  - Confine distresses to upper pavement layers
  - Periodic removal and replacement of surface layer
- Project Selection - timing is critical
  - Best for pavements with slow rates of deterioration
- More frequent, less expensive treatments
- Minimal increase to pavement structure
Pavement Preservation

- **Purpose of Pavement Preservation:**
  - Extending pavement life
  - Improving ride quality
  - Correcting surface defects
  - Improving safety characteristics

- **Treatments**
  - Patching - polymer modified material
  - Crack Filling - overband
  - Cold surface seals - microsurfacing
  - Thin HMA overlay < 1.5” thick
  - Concrete Pavement Rehab (CPR)
Benefits

- Safety
- Shorter Construction Disruptions
- Improved Roadway Quality
- Cost Savings for Vehicle Maintenance
- Long-Term Public Perception
- Long-Term Department Saving
Pavement Design
To provide a structure that protects the subgrade and supports both traffic and environmental loads for a given period at a specified level of serviceability

Design Considerations
- Structural
- Serviceability
- Frost Penetration
Empirical Design
Relates to ride
  - Serviceability
  - Subjective
Considers
  - Subgrade resilient modulus ($M_R$)
  - Traffic – ESAL’s (equivalent 18 kip single-axle loads)
  - Rule-of-Thumb materials properties (new HMA structural coefficient $= 0.44$)
DARWin 3.1 Pavement Design Software
Mechanistic-Empirical Pavement Design

- Considers
  - Mechanical properties of all layers
  - Traffic, climate & observed performance
    - More accurately model pavement structure
    - More accurately predict pavement life
Mechanistic-Empirical Pavement Design

- Can easily incorporate new materials, different traffic and changing conditions
- More accurately described as an analysis tool
- Design to avoid structural failure (i.e. HMA pavement – cracking and rutting)
- For more info. go to: http://www.trb.org/mepdg/
Perpetual Pavement Design

- Design the structure such that there are no deep structural distresses
  - Bottom up fatigue cracking
  - Structural rutting
- All distresses can be quickly remedied from surface
- Result in a structure with ‘Perpetual’ or ‘Long Life’
- Typically HMA thickness $\geq 8$ inches
- Structural design life $\geq 50$ years
Surface Distresses Only

Top Down Cracking

Non-Structural Rutting
Perpetual Pavement

40-75 mm SMA, OGFC or Superpave

Zone Of High Compression

High Modulus Rut Resistant Material (Varies As Needed)

Max Tensile Strain

Flexible Fatigue Resistant Material 75 - 100 mm

Pavement Foundation
Pavement Rehabilitation
Pavement Rehabilitation

“Structural enhancements that extend the service life of an existing pavement and/or improve its load carrying capacity. Rehabilitation techniques include restoration treatments and structural overlays.”  
Source: AASHTO Highway Subcommittee on Maintenance
Pavement Treatment Goals

- Improve Pavement Condition
- Improve Ride Quality
- Improve Safety
- Extend Life
- Increase Structural Capacity
- Reduce Life Cycle Costs
- Increase Customer Satisfaction
  - Noise Reducing Surface(s)
Rehabilitation Process

- Evaluate Existing Pavement and Conditions
- Evaluate Options
- Construct Project
- Monitor Performance
Major Aspects to Evaluate

- Structural adequacy
- Functional adequacy
- Full Depth Repair needs
- Subsurface drainage adequacy
- Material durability
- Shoulder and ramp condition
- Extent of maintenance activities performed in the past
Major Aspects to Evaluate

- Variation of pavement condition or performance within a project (segmenting)
- Miscellaneous constraints for example:
  - Bridge under-clearance
  - Traffic control restrictions
  - Barrier Curb
  - ROW
Pavement Rehab Types

- HMA and Composite Pavement
  - Functional overlay (mill and pave)
  - Structural Overlay (mill, pave and increase profile)
  - Premium mixes
  - Paving Fabrics for HMA pavements
  - CPR and Reflective Crack Relief Interlayers (RCRI) for Composite

- Concrete Pavement
  - CPR
  - CPR and Overlay (4” desired; researching thin overlays, premium mixes, RCRI)
  - Rubblize and Overlay
Our goal is to focus shift from pavement rehabilitation to pavement preservation

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More frequent, less expensive treatments

Minimal increase to pavement structure
Thank you. Questions?

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