Route 70: Putting Pavement Innovation to Work

65th Annual New Jersey Asphalt Paving Conference

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Rt. 70, E. of N. Branch Rd. to CR 539

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Typical Section & Distresses

Rt. 70, E. of N. Branch Rd. to CR 539

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Innovation at Work

- ***Sustainable Design***
  - ✓ ***Rubblization***
  - ✓ ***Full Depth Reclamation***
  - ✓ ***Perpetual Pavement***

- ***Intelligent Construction***
  - ✓ ***Intelligent Compaction***
  - ✓ ***Thermal Profiling***

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Presentation Outline

I. ***Pavement Design***

II. ***Intelligent Construction Technologies***

III. ***Full Depth Reclamation***

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Pavement Restoration Alternatives

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Composite (Inner 10')	Flexible (Outer 2' + Shoulders)	Life of Composite (yrs.)	Life of Flexible (yrs.)	Other
Mill + Overlay	Mill + Overlay	10	10	No utility or env. impacts
Mill + Overlay	Reconstruct	10	50+	
Rubblize + Overlay	Mill + Overlay	50+	10	
Rubblize + Overlay	Reconstruct	50+	50+	
Rubblize + Overlay	FDR	50+	20	Minimizes disturbance; Essentially eliminates env. impacts

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Key Features of Preferred Alternative

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- ***Rubblization of Composite Pavement***
- ***Full Depth Reclamation (FDR) of Flexible Pavement***
- ***"Perpetual" Pavement Overlay***

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Rubblization

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Benefits:

- ***Eliminates reflection cracking***
- ***Lower costs vs. Reconstruction***
- ***Re-uses existing pavement***
- ***Little to no environmental impact***

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Full Depth Reclamation (FDR)

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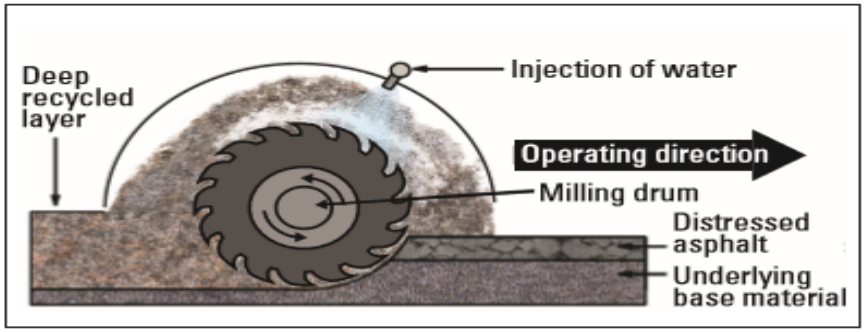

Benefits:

- ***Increased structural capacity (life) vs. mill & overlay***
- ***Lower costs vs. Reconstruction***
- ***Re-uses existing pavement***

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"Perpetual" Pavement Overlay

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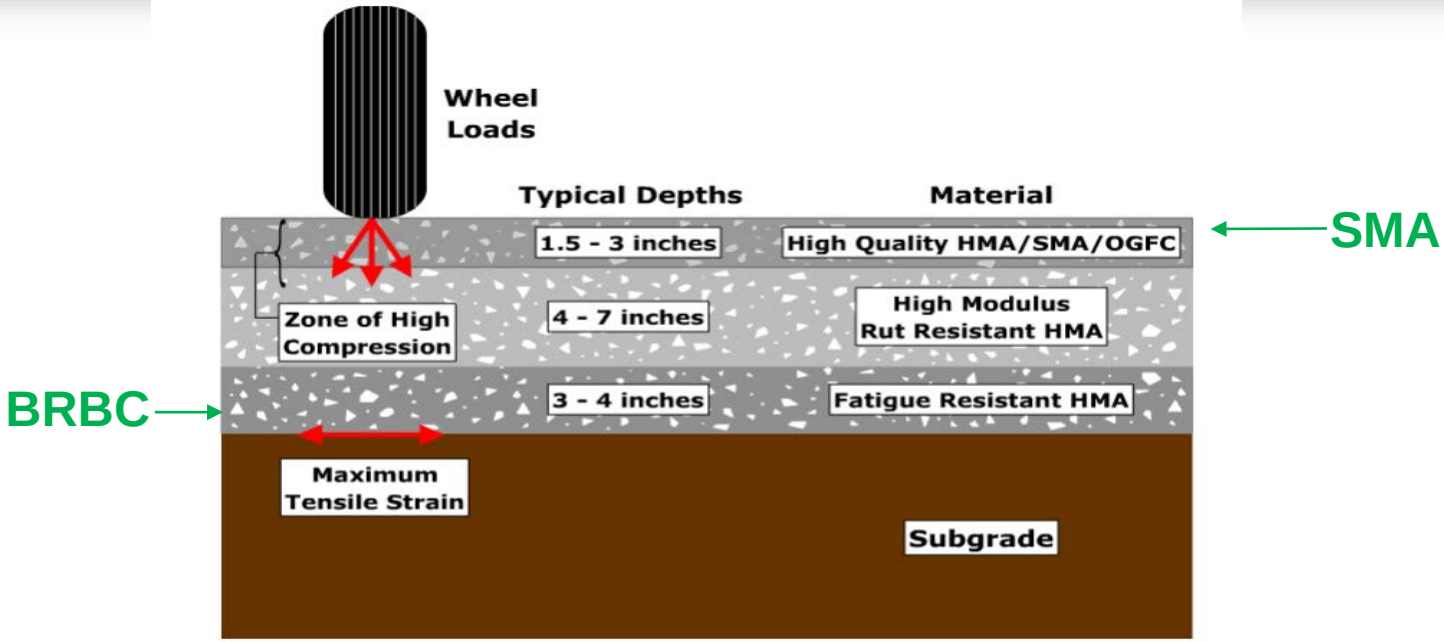

Benefits:

- ***Long Life (50+ yrs.) with need for only surface maintenance***
- ***Reduces overlay thickness & profile impacts***

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A Sustainable Solution

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- ***Reduced energy consumption via less hauling of material off-site***
- ***Reduced use of new raw materials***
- ***In addition, reduced <u>future</u> consumption & use noted above due to reduced need for future maintenance & rehabilitation***

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Intelligent Construction Technologies

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Objective:

To evaluate ICT technologies and recommend ways to utilize them in the future

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IC on Rubblized Pavement

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Utilized IC instrumented rollers:

- Accelerometers
- GPS Device

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IC on Rubblized Pavement

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- *Measured stiffness (IC-MV)*
  - *HMV (Hamm's IC-MV)*
  - *Correlate w/spot testing (FWD & LWD)*
- *Tracked sequence and number of seating passes*
- *Tracked operation parameters*
  - *Amplitude*
  - *Frequency*
  - *Speed*

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ICT on Asphalt Layers

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ICT on Asphalt Layers

Rt. 70, E. of N. Branch Rd. to CR 539

- *Utilized Paver Mounted Thermal Profiling (PMTP) system*
  - *Temperature sensor (Infrared, IR) mounted on paver*

- *Utilized IC-IR instrumented rollers*
  - *Accelerometers*
  - *GPS Device*
  - *Temperature (IR) Sensors*

- *Applied to multiple asphalt layers:*
  - *Bottom Rich Base Course*
  - *Hot Mix Asphalt*
  - *Stone Matrix Asphalt*

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ICT on Asphalt Layers

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- ***Measured mat temperature during paving and compaction***
- ***Tracked sequence and number of compaction passes***
- ***Tracked the roller speed***

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Why Should We Use ICT?

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- ***Use roller IC-MV values on unbound layers to monitor stiffness and ensure design values are reached.***

- ***Establish targets using a test strip, then monitor production in real-time for QC.***
  - ***Number of roller passes***
  - ***Paver and roller settings***

- ***Monitor mat temperature variation in real-time during paving and compaction to identify and resolve any issues in timing and sequencing.***

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Full Depth Reclamation (FDR)

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What It Is:

In-place recycling of entire asphalt layer and portion of unbound material to produce a stable, bound base layer, saving money and natural resources.

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FDR on Route 70 (Outer 2’ of Lanes & Shoulders)

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- *Pulverized and reclaimed existing pavement to construct 14” stabilized base*
- *Placed intermediate and surface asphalt concrete courses*
- *Portland cement used as stabilizing agent at 3 or 4% (different sections)*

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QA of FDR – Cement Content

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- ***Building upon past lessons learned, used following method for measuring and controlling cement content:***
  - ***Maintain reclaimer at controlled travel speed***
  - ***Calibrate and verify cement application rate each day***
  - ***Record cement quantity at beginning and end of each run and compare to target quantity***

- ***<u>Specification</u>: ± 0.5% tolerance***

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QA of FDR – Field Moisture Content

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- ***Obtained and stored moisture samples in airtight containers***
- ***Measured moisture content in lab per ASTM D2216/AASHTO T265***
- ***<u>Specification</u>:***
  - ***Lower Limit: 1% below OMC***
  - ***Upper Limit: 2% above OMC***

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QA of FDR – Compressive Strength

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- ***Prepared compressive strength samples per AASHTO T134***
- ***Tested for strength at 7 days per ASTM D1633***
- ***Specification: 250-450 psi***

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QA of FDR – Reclaimed Layer Thickness

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- ***Measured thickness of un-compacted reclaimed layer***

- ***Estimated final thickness based on adjacent surface elevation and adjusted for cross-slope***

- ***<u>Specification</u>: ± 0.5 in. tolerance***

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QA of FDR – In-Place Density

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- ***Measured density using Nuclear Density Gauge per ASTM D6938***

- ***Determined % of Max. Dry Density (per mix design and ASTM D558)***
- ***<u>Specification</u>:***
  - ***Moving avg. of 5 consecutive tests > 98% of MDD***
  - ***No single test < 96% of MDD***

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QA of FDR – Gradation

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- *Conducted gradation analysis of FDR reclaimed material*

- ***Specification:***
  - *100% passing 3” sieve*
  - *95% passing 2” sieve*
  - *55% passing #4 sieve*

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