New York Implementation of Performance-Engineered Mixtures

https://www.kimley-horn.com/recycled-pavement/
New York Implementation of Performance-Engineered Mixtures

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(518)-485-5276

https://www.kimley-horn.com/recycled-asphalt-pavement/
Why Performance Engineered Mixes?
SuperPave System

- Our SuperPave system provides us with a solid product with limitations.
- We can improve on that system to account for those and continue to improve our pavements.
SuperPave System

Why Switch?
- Encourage Innovation
- Improve Mixture Performance
- Become More Flexible

https://www.amycoleconnect.com/blog/flexibility-in-the-workplace-is-not-an-f-word
Encouraging Innovation
Encouraging Innovation
Encouraging Innovation

Recycling Material/High RAP Mixtures
Encouraging Innovation

- Recycling Material/High RAP Mixtures
- Chemical Additives/WMA
Encouraging Innovation

- Recycling Material/High RAP Mixtures
- Chemical Additives/WMA
- Fibers/Physical Adds.
Encouraging Innovation

- Recycling Material/High RAP Mixtures
- Chemical Additives/WMA
- Fibers/Physical Adds.
- Rejuvenator
Encouraging Innovation

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Encouraging Innovation

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- Chemical Additives/WMA
- Fibers/Physical Adds.
- Rejuvenator
- ?
Improving Mixture Performance
Improving Mixture Performance

Evaluation of Asphalt Mixtures in New York State
Improving Mixture Performance

Evaluation of Asphalt Mixtures in New York State

Establishing Proper Balance for Mixtures
Improving Mixture Performance

Evaluation of Asphalt Mixtures in New York State

Establishing Proper Balance for Mixtures

Specialty Mixtures and Creating Usable Criteria for Production Mixes
Improving Mixture Performance

- Evaluation of Asphalt Mixtures in New York State
- Establishing Proper Balance for Mixtures
- Specialty Mixes and Creating Usable Criteria for Production Mixes
Developing a Flexible and Robust System
Developing a Flexible and Robust System

Source: https://civiconcepts.com/blog/what-is-pavement-types-of-pavement-road-construction-layers
Developing a Flexible and Robust System

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Developing a Flexible and Robust System

Experienced and Competent Staff

Paving Program

Source: https://civiconcepts.com/blog/what-is-pavement-types-of-pavement-road-construction-layers
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Developing a Flexible and Robust System

Effective Evaluation Procedures
Effective Equipment
Reliable Quality Control Process
Widespread Investment
Experienced and Competent Staff
Paving Program

Source: https://civiconcepts.com/blog/what-is-pavement-types-of-pavement-road-construction-layers
Developing a Flexible and Robust System

Effective Evaluation Procedures
Effective Equipment
Reliable Quality Control Process
Widespread Investment
Experienced and Competent Staff
Paving Program

Meetings

PowerPoint Diagrams to keep attention*

Research

Source: https://civiconcepts.com/blog/what-is-pavement-types-of-pavement-road-construction-layers
Developing a Flexible and Robust System

- Effective Evaluation Procedures
- Effective Equipment
- Reliable Quality Control Process
- Paving Program
- Meetings
- PowerPoint Diagrams to keep attention*

Source: https://civiconcepts.com/blog/what-is-pavement-types-of-pavement-road-construction-layers
U.S. Infrastructure Investment Gaps by 2040

Projected public and private infrastructure spending by sector, 2016–2040 (trillions of 2015 dollars)

- **Roads**: $3.42 trillion
  - Investment gap: $3.36 trillion
- **Electricity**: $3.15 trillion
- **Airports**:
- **Telecommunication**: $0.6 trillion
- **Rail**:
- **Water**:
- **Ports**:

Notes: Investment gap is the difference between projected investment and the investment required to match the best-performing peer countries, accounting for differences in country characteristics. Projected investment assumes the United States continues to invest at current levels and accounts for economic and population growth.
Performance Testing

Simple

Cheap

Feasible

Semi-Circular Bending Test

https://www.globalgilson.com/semi-circular-bend-test-fixture

High-Temperature IDT Test

https://www.globalgilson.com/in-direct-tensile-loading-fixtures

IDEAL Rutting Test

https://www.hmalabsupply.com/products/ideal-rt-jig

IDEAL Cracking Test

https://www.researchgate.net/figure/IDEAL-cracking-test-IDEAL-CT_JIG_343735079

Simple

Cheap

Feasible
Implementation
Ended on this section. I think this should detail all of our efforts to this point. This should incorporate all of our specialty mixture testing. Still need to take pictures to replace the rounds of pucks. I detail a bit of how many different things we have going right now. Figuring we do a zoom into each year and touch briefly on each effort that we worked on. Quick takeaways from each effort. Regrets and positives.

Heim, Michael P (DOT), 10/4/2021
Up Until 2017

• Widespread Production Mixture Evaluation
  – Production Mixes
  – Many Regions
  – Non-Standardization of methods

Major Takeaways:
1. Ruggedness Testing
2. Designed and Targeted Testing
3. Closely Adhering to Specifications
Widespread Production
Including Many Regions
Non-Standard Methods
• Widespread Production Mixture Evaluation
  – Production Mixes
  – Many Regions
  – Non-Standardization of methods
• Ruggedness Testing – Testing Matrix
• New Equipment
### Ruggedness Testing Matrix

<table>
<thead>
<tr>
<th></th>
<th>0% RAP</th>
<th>10% RAP</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.5%</td>
<td>IDT 1</td>
<td>IDT 1</td>
</tr>
<tr>
<td></td>
<td>SCB1</td>
<td>SCB1</td>
</tr>
<tr>
<td>6.0%</td>
<td>IDT 1</td>
<td>IDT 1</td>
</tr>
<tr>
<td></td>
<td>SCB1</td>
<td>SCB1</td>
</tr>
<tr>
<td>6.5%</td>
<td>IDT 1</td>
<td>IDT 1</td>
</tr>
<tr>
<td></td>
<td>SCB1</td>
<td>SCB1</td>
</tr>
<tr>
<td>7.0%</td>
<td>IDT 1</td>
<td>IDT 1</td>
</tr>
<tr>
<td></td>
<td>SCB1</td>
<td>SCB1</td>
</tr>
</tbody>
</table>

**Major Takeaways:**
1. Targeted Production Testing
2. Difference between Lab and Production
3. Correlate to Accepted Performance Testing
Implementation

Widespread Production
Including Many Regions
Non-Standard Methods

- 2017
- 2018
- 2019
- 2020
- 2021

Testing Matrix
Standardized
New Equipment Investment
• Production Special Note
• Rutgers Research Project
• Production Special Note
  – Two Mixes (Different Regions and Producers)
  – IDEAL Cracking Test, Semi-Circular Bending
  – High-Temp IDT, APA or Hamburg Test
  – Comparison Testing

• Rutgers Research Project
• Production Special Note

• Rutgers Research Project
  – 11 Mixes (Covering eight Regions)
  – APA, Hamburg, High-Temp IDT
  – Overlay Tester, SCB, IDEAL-CT
  – NY Balanced Mix
  
  – More Mixture Diversity
  – Statewide Criteria
Implementation

Widespread Production
Including Many Regions
Non-Standard Methods

Rutgers BMD
Production Note

2017  2018  2019  2020  2021

Testing Matrix
Standardized
New Equipment Investment
• **Performance Note 1.1**
  – Major Components:
    • Enhanced Mixture Approval
    • Modified Quality Control Process

[Images of test equipment and links to specifications and standards]
Enhanced Mixture Approval

Mixture Verification

- **Producer Made Samples**
  - Producer-Tested Samples
  - Regional Lab – Tested Samples
- **Regional Lab Made Samples**
  - Regional Lab Tested Samples

<table>
<thead>
<tr>
<th>Test Methods</th>
<th>Criteria</th>
<th>Design Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>AASHTO TP124-18 Flexibility Index Test</td>
<td>Flexibility Index</td>
<td>6</td>
</tr>
<tr>
<td>ASTM D6931-17 Indirect Tensile Strength Test</td>
<td>IDT Strength</td>
<td>30 psi</td>
</tr>
<tr>
<td>ASTM D8225-19 Determination of CT Index</td>
<td>CT Index</td>
<td>100</td>
</tr>
</tbody>
</table>
# Modified Quality Control Process

<table>
<thead>
<tr>
<th>Plant Test Property</th>
<th>Test Method</th>
<th>Contractor Testing Frequency(^1)</th>
<th>Department Testing Frequency(^2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aggregate Gradation</td>
<td>AASHTO T27</td>
<td>One per Sublot</td>
<td>One per Day (enough material for two tests)</td>
</tr>
<tr>
<td>Aggregate Moisture</td>
<td>AASHTO T255</td>
<td>One per Lot</td>
<td>Monitor and Verify</td>
</tr>
<tr>
<td>Mix Temperature</td>
<td>-</td>
<td>Two per Sublot</td>
<td>-</td>
</tr>
<tr>
<td>Air Voids</td>
<td>MM 5.16, AASHTO T269</td>
<td>One per 3 Lots</td>
<td>One per 3 Days</td>
</tr>
<tr>
<td>Indirect Tensile Strength</td>
<td>ASTM D6931-17</td>
<td>One per 3 Lots</td>
<td>One per 3 Days</td>
</tr>
<tr>
<td>Semi-Circular Bending</td>
<td>AASHTO TP124-18</td>
<td>One per 3 Lots</td>
<td>One per 3 Days</td>
</tr>
<tr>
<td>Determination of CT Index</td>
<td>ASTM D8225-19</td>
<td>One per 3 Lots</td>
<td>One per 3 Days</td>
</tr>
</tbody>
</table>

*All Data Recorded on Control Charts*
• Performance Note 1.1
  – Major Components:
    • Enhanced Mixture Approval
      – Performance Component
    • Modified Quality Control Process
      – Simplified/Flexible
      – Reduced Plant Presence
      – Control Charts
Performance Note 1.1

IDT Strength Histogram

- Frequency
- Frequency (High Temp)
• Performance Note 1.1

Ideal CT Index Histogram

Frequency

Bin


Frequency
• Performance Note 1.1

SCB Histogram

Frequency

Bin

0-1 1-3 3-5 5-7 7-9 9-11 11-13 13-15 15-17 17-19 19-21 21-23 23-25 25-27 27-29 29-31 More

Frequency
• **Performance Note 1.1**
  
  – **Major Components:**
  
   • Enhanced Mixture Approval
     – Performance Component
   
   • Modified Quality Control Process
     – Simplified/Flexible
     – Reduced Plant Presence
     – Control Charts

**Major Takeaways:**

1. Improving and Evolving Criteria
2. Consistency in sample fabrication
3. Solidifying Aging Protocols
NYS Mixture Performance – Production Note

- Gradation is the controlling Test Property for this project
- Gradation Limits
  - Production
  - Action
  - Evaluation

<table>
<thead>
<tr>
<th>Limits (Test Value – JMF Value)</th>
<th>Sieve Sizes</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>#50 and Larger (300 μm and Larger)</td>
</tr>
<tr>
<td>Production</td>
<td>0.0 – 5.0</td>
</tr>
<tr>
<td>Action</td>
<td>5.0 – 8.0</td>
</tr>
<tr>
<td>Evaluation</td>
<td>&gt;8.0</td>
</tr>
</tbody>
</table>
NYSDOT Regions

7 Projects

2020

DOT Regional Office

1

2

3

4

5

6

7

8

9

10

11
Implementation

2017
Widespread Production
Including Many Regions
Non-Standard Methods

2018
Testing Matrix
Standardized
New Equipment Investment

2019
Rutgers BMD
Production Note

2020
Increased Usage
Mixture Design Component

2021
• **Performance Note 1.2**
  
  – **Major Components:**
    
    • No major changes
    
    • Expanded roll-out
    
    • Tweaks with process

**Major Takeaways:**

1. Need Experience, both years and projects
2. Good collaboration with involved parties
13 Projects
• **Performance Note 1.2**
  – Major Components:
    • No major changes
    • Expanded roll-out
    • Tweaks with process

**Major Takeaways:**
1. Need Experience, both years and projects
2. Good collaboration with involved parties
VERSION 1.0
FIRST REAL PROJECTS
EQUIPMENT/PROCEDURE
OPERATIONAL
RUTGERS
FIRST CONTRACTOR DATA

VERSION 1.1
EXPANSION & CLARITY
MORE COMPLETE
SHOWN COMMITMENT TO INDUSTRY
Enhanced Mixture Approval

Mixture Verification

- Producer Made Samples
  - Producer-Tested Samples
  - Regional Lab – Tested Samples
- Regional Lab Made Samples
  - Regional Lab Tested Samples
  - **Producer Lab-Tested Samples**

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<th>COV</th>
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<tbody>
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<td>AASHTO TP124-18 Flexibility Index Test</td>
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<td>8</td>
<td>≤40</td>
</tr>
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<td>30 psi</td>
<td>≤40</td>
</tr>
<tr>
<td>ASTM D8225-19 Determination of CT Index</td>
<td>CT Index</td>
<td>135</td>
<td>≤40</td>
</tr>
</tbody>
</table>

Major Changes:
1. Consistent Aging Producer to Region
2. More rigorous criteria
18 Projects
Implementation

VERSION 1.0
FIRST REAL PROJECTS
EQUIPMENT/PROCEDURE
OPERATIONAL
RUTGERS
FIRST CONTRACTOR DATA

VERSION 2.0
HAVE THE FULL YEAR TO EVALUATE 2 SEASONS
SIGNIFICANT CHANGE (IF ANY) HAPPENS NOW
EXPANSION STATEWIDE

REVISIONS TO ASPHALT QC/QA PROGRAM
REVISIONS TO ASPHALT MIXTURE APPROVAL

Pre-2020 2021 2022 2023 2024

VERSION 1.1
EXPANSION & CLARITY
MORE COMPLETE
SHOWN COMMITMENT TO INDUSTRY

REFINEMENT BASED ON 2.0 REVISION
PREPARATION OF DOCUMENTS TO STANDARDIZE
DECIDE SCOPE OF USAGE
Comments or Questions?

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