Long Life Asphalt Pavement – LLAP
Implementation of Special Provisions

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CMD

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Genesis of LLAP Specification

- **Transportation Quality Initiative (TQI) 2014**
  - Improve Leadership Culture
  - Workforce Development
  - Process Improvement
  - Technical Improvement
Genesis of LLAP Specification

2014-2015 Transportation Quality Initiative Framework

Leadership Culture
- Leadership
- Training
- Culture of Quality

Process
- Culture of Quality
- Contractual
- Pre-construction

Technical
- Culture of Quality
- QA/QC
- Materials
Genesis of **LLAP** Specification

- **Technical Improvement Workgroup**
  - Technical Goal #2 of 5 → "**Develop Long Life Concrete and Asphalt Pavement Specifications**"
### LLAP Schedule

<table>
<thead>
<tr>
<th>Task</th>
<th>Due Date</th>
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<tbody>
<tr>
<td>Add LLAP/Perpetual pavement to the Asphalt Pavement Improvement Committee as a work function. Identify ‘primary author’</td>
<td>September 2015 COMPLETE</td>
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<tr>
<td>Hold internal meeting with PAPA, Pavement Design, Innovation &amp; Support Services staff and FHWA to discuss development of a LLAP specification. Identify States with LLAP/Perpetual pavement specifications and those components that the Department should consider</td>
<td>October 2015 COMPLETE</td>
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<tr>
<td>Develop initial LLAP specifications for internal (APQIC) member review</td>
<td>December 2016 COMPLETE</td>
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<td>Reconcile comments from APQIC</td>
<td>February 2016 COMPLETE</td>
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<tr>
<td>Input from work group on Lab Performance Test Protocols</td>
<td>March 2016 COMPLETE</td>
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<tr>
<td>Complete clearance Transmittal of SSP</td>
<td>July 2016 COMPLETE</td>
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<tr>
<td>Request candidate pilot LLAP projects for implementation from Districts and PTC for construction in 2017.</td>
<td>November 2016 COMPLETE</td>
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<tr>
<td>Develop POA for monitoring pilot projects and their performance through an Asset management approach.</td>
<td>TBD - 2017</td>
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LLAP Pavement Design

- Use Guidelines for Demo Projects
- MEPDG (Comparison)
- Perpetual Pavement Best Design
LLAP Asphalt Mix Design

- **Minimum Effective AC Content** ($P_{be}$)
  
  * Interim Step to Performance Testing

- **SuperPave Design Volumetric Adjustments** (3%, 3.5% voids, gyrations)

- **Binder Modification** (i.e. polymers)
LLAP Asphalt Mix Design

- SMA on Interstates
- Full Deployment of WMA
- Required Use of Anti-Strip Additive
- Asphalt Rich Base
- Optimized – Balanced Mix Design (i.e. Performance Testing)
LLAP Current Features

• Written as a series of special provisions.
  – Overlay projects
  – Structural overlay projects
  – Full depth reconstruction

• Will only be used on interstate or interstate look- a-like projects initially.

• Performance testing is the most important and different part of this specification.
LLAP Construction Specifications

- MTV Required
- Longitudinal Joint Density Specification
- **RIDE SPECIFICATION OPTIONAL**
- Tack Coat Every Layer (New Section 460)
- % **WITHIN TOLERANCE (PWT) ACCEPTANCE**
- **INCENTIVIZE CRITICAL ELEMENTS (i.e. MAT DENSITY)**
Balanced Approach to Mix Design

- Looks good, tastes bad.
- Looks bad, tastes good.
Balanced Approach to Mix Design

• Looks good & tastes good?
Heavy Duty ID2 placed in 1991 – 25 years

Trying to make this the rule rather than the exception.
Performance Related Testing (Rutting)

- Hamburg Wheel Tacking Test. (AASHTO T 324)
  - Required for Mix Design
    - Measures rutting potential
    - Samples fabricated from gyratory samples or cores.
    - Test run at 122°F (50°C)
    - Required cycles and rut depth limits vary depending on mix type (SMA) and layer (wearing, binder)
Performance Related Testing (Cracking)

- **Disk-Shaped Compact Tension (DCT) testing. (ASTM D7313)**
- **Required for Mix Design**
  - Measures fracture energy (Divide the area under the curve by the specimen area.) \( G_F = \frac{W_f}{Area_{lig}} \times 10^6 \)
  - Samples fabricated from gyratory samples or cores.
  - Test run at 10\(^0\) C below the low PG mix designation.
  - Fracture energy requirements vary depending on mix type (SMA) and layer (wearing,
Performance Related Testing (Cracking)

- **Semi-Circular Bending (SCB)** testing. (AASHTO TP 105) For information only during pilots.
  - Measures fracture energy. (Divide the area under the curve by the specimen area.) $G_F = \frac{W_F}{Area_{lig}} \times 10^6$
  - Samples fabricated from gyratory samples or cores.
  - Test run at $10^0$ C below the low PG mix designation.
  - Fracture energy requirements vary depending on mix type (SMA) and layer (wearing,
Performance Related Testing (Cracking)

- **Illinois Flexibility Index Test** (IFIT). (AASHTO XX-XXX) For information only during pilots.
  - Measures fracture energy.
  - Uses fracture energy and load/displacement slope to compute Flexibility Index.
  - Samples fabricated from gyratory samples or cores.
  - Test run at 25°C (77°F)
  - Fracture energy requirements vary depending on mix type (SMA) and layer (wearing, binder)

\[ FI = \frac{G_f}{m \times A} \]
Performance Related Testing (Cracking)

- **Overlay Test (OT).** (TEX-248-F) For information only during pilots.
  - Measures fatigue or reflective cracking potential. (number of cycles to failure.)
  - Samples fabricated from gyratory samples or cores.
  - Test run at 25°C (77°F).
  - Applies load to induce 0.025 inches displacement.
  - Number of cycles to failure is reported along with percent decline in load.
LLAP Current Features

- **Asphalt Rich Base Course**
  - PWT acceptance includes incentive / disincentive.
  - Tack all layers
  - Design at 3% voids
  - Design 1 gyration level lower than other courses.

- **Need for low rut and high bottom-up crack resistance.**

- **High DCT fracture energy requirement (460 J/m²) for crack resistance.**

- **No Hamburg testing requirement.**
LLAP Current Features

• **Base Course**
  – Tack all layers.
  – PWT acceptance includes incentive/disincentive.
  – DCT required as performance testing.
  – Anti-Strip Required.
  – WMA Technology Required

• Need for low rut and moderate crack resistance.

• Moderate DCT fracture energy requirement (400 J/m^2) for crack resistance.

• No Hamburg testing requirement.
LLAP Current Features

• **Binder Course**
  - PWT acceptance includes incentive / disincentive.
  - Tack all layers
  - MTV required
  - DCT and Hamburg Wheel track test required as performance testing
    - Anti-strip required
    - WMA technology required

• **Need for moderate rut and high crack resistance.**

• **High DCT fracture energy requirement (460 J/m²) for crack resistance.**

• **High to moderate Hamburg requirement (12.5mm at 20,000 cycles) for rut resistance.**
LLAP Current Features

- **Wearing Course**
  - SMA only
  - Tack all layers
  - MTV required
  - 2% density incentive possible
  - DCT and Hamburg Wheel track test required as performance testing
  - Anti-Strip Required
  - WMA Technology Required

- Need for very high rut and crack resistance.

- Very high DCT fracture energy requirement (690 J/m²) for crack resistance.

- Very High Hamburg requirement (6.25mm at 20,000 cycles) for rut resistance
• Ride incentive is optional.

• Joint incentive / disincentive is required.
Many Incentives

- SMA wearing
  - Possible 2% incentive for Density.
  - Possible incentive for ride. (if included)
  - Possible incentive for joints.
- Binder
  - Possible 4 % for mix under PWT.
- Base
  - Possible 2 % for mix under PWT.
- Asphalt Rich Base
  - Possible 2 % for mix under PWT.
Current Demonstration Projects

- District 2-0 – SR 0080 Sect. B34 (ECMS 82105)
  - Mill and overlay
  - Projected let – 7/2017

- District 10-0 – SR 0079 Sect. 247 (ECMS 91919)
  - Structural overlay
  - Projected Letting 11/2017

- District 11-0 – SR 0279 Sect. A83 (ECMS 87772)
  - Binder & Wearing Performance Related Testing only.
  - Projected Letting 1/2017
Questions?