National Asphalt Technology Overview

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FHWA, Office of Pavement Technology
Major Asphalt Initiatives

- WMA Implementation – EDC
- High Reclaimed Asphalt Pavement Usage
- Asphalt Mixture Performance Tester
- Advance Multiple Stress Creep Recovery Test and Binder Specification
- Intelligent Compaction Efforts
- Materials Quality Assurance Reviews and National Assessment
Asphalt Technology Partnerships

• Expert Task Groups
  – Asphalt Mixture & Asphalt Binder
  – Asphalt Modeling
  – Warm Mix Asphalt TWG
  – Recycled Asphalt Pavement

• Cooperative Agreements
  – National Center for Asphalt Technology
  – Asphalt Institute
  – National Asphalt Pavement Association
Asphalt Mix ETG – Key Activities

- SGC Operational Issues
- Asphalt Mixture Performance Tester
- Mix Design Manual NCHRP 9-33
- Specific Gravity Recommendations
- Input to AASHTO SOM
Superpave Gyratory Compactor

Operational Issues

• Guidance document publications on internal angle evaluation and Ndesign
• T312 Annex for Evaluating Molds
• Proposed method to compare SGCs
Specific Gravity Task Group

- Identify issues with current AASHTO standards - Recommendations regarding changes and/or new methods
- T166 (Bulk Specific Gravity)
  - Changes sent to replace reference to paraffin method with vacuum sealing method
  - Change mix absorption limit to 1.0%
Asphalt Mixture Technical Briefs

- Superpave Mix Design and Gyratory Compaction Levels (Ndesign)
- Superpave Gyratory Compactor Guide for Assessing Variability
- Aggregate and Asphalt Mixture Specific Gravity Measurements and Their Impacts on Mix Design Properties and Acceptance
Binder ETG - Key Activities

- High Temperature Task Group
  - MSCR Test Method – MP 19
  - Implementation Efforts
- Evaluate existing tests and alternates
- Development of a CRM Binder performance specification
Multi-Stress Creep and Recovery

Test Method

• Inadequacy of Superpave high temp $G^*/\sin\delta$ to predict modifier behavior
• Testing is still done on existing equipment but at actual pavement temperatures
• New MSCR High Temperature Spec (MP-19 and TP-70) correlates to rutting for both neat and polymer modified binders
MSCR - Implementation Efforts

- Regional workshops Asphalt Institute and FHWA
- Asphalt Institute/FHWA/AMRL efforts on testing Precision and Bias
- Developing user literature – AI/FHWA
- User Producer Groups “round robin” repeatability testing (NE and SE)
Asphalt Binder Technical Briefs

- Understanding the MSCR Procedure
- Implementation of the MSCR Test & Specification
- Asphalt Modification with PPA
Recycled Asphalt Pavement

ETG – Key Activities

• High RAP Mix Design NCHRP 9-46
• Investigation of Low Temp RAP Properties
• Contribution of RAP binder % toward total binder % in the mix
• RAS Pooled Fund
• Technology Transfer – Workshops/Publications

Website: www.moreRAP.us
RAP Percentage

Based on Percentage Binder

- Historically, agency limit RAP based on RAP percentage by weight of total mix.
- With high RAP contents, the primary issue is impact on binder properties.
- Determine contribution of RAP binder toward total binder in the mix, by weight.
  - Example - “70% of binder content must be virgin” or “no more than 30% binder content can come from RAP or RAP & RAS”.
### Current Guidelines

**AASHTO M 323 Standard Specification for Superpave Volumetric Mix Design**

<table>
<thead>
<tr>
<th>Recommended Virgin Asphalt Binder Grade</th>
<th>Percent RAP</th>
</tr>
</thead>
<tbody>
<tr>
<td>No change in binder selection</td>
<td>&lt; 15</td>
</tr>
<tr>
<td>Select virgin binder grade one grade softer than normal</td>
<td>15 – 25</td>
</tr>
<tr>
<td>Follow recommendations from blending charts</td>
<td>&gt; 25</td>
</tr>
</tbody>
</table>
NCHRP 9-46 Mix Design and Evaluation

“Procedure for High Reclaimed Asphalt Pavement Content in Hot Mix Asphalt”

- Develop mix design method and specification for HMA containing up to 50% RAP
- Test method for measuring properties of composite binder – test mix back calculate binder properties
- Specification for RAP quality and processing
Low Temperature RAP Study

- Higher RAP contents not significantly stiffer than virgin mix
- May be possible to employ higher RAP contents (20%) without changing the performance grade of the virgin binder
- Dropping grade to PG58-28 may not be always needed
Performance of Recycled Asphalt Shingles in Hot Mix Asphalt

Pooled Fund Study - TP-5(213)

- Best practices for using RAS in HMA with focus on material properties and mixture performance.
- Participants FHWA, MO, CA, CO, IA, IL, IN, MN, and WI
- Also QC/QA concerns, demo projects, performance database

http://www.pooledfund.org/
Materials and Construction Technology

Example of Asphalt Technology Efforts:

- Provide Mobile Asphalt Lab
- Support National Asphalt R&D Programs
- Advance New Design Methods
  - Asphalt Mixture Performance Tester
    - Field validation & mix quality verification
  - Binder Testing Equipment
    - Effects of modified binders on mix
  - Aggregate Imaging System
    - Testing program & implementation
Field Equipment Demos, Training, and Data Acquisition

- Mobile Asphalt Pavement Materials Lab
  - Site visits - State agency/academia/industry
    145 site visits in 45 States (1988-2010)
  - On site shadow testing/QA training
  - Showcase equipment/technologies
  - WMA, AMPT, High RAP, MSCR, etc.
  - Support research (FHWA & NCHRP) with field data (9-29/33/43/46/48)
Mix Design Manual Project

- Performance Testing Evaluation Criteria
- 9-33 maintain existing $N_{\text{design}}$ criteria
- Proposed Specification: “to be used as a preliminary selection of mix parameters as a starting point for mix evaluation … prior to T 320..”
Asphalt Mix Performance Tester

- NCHRP 9-29
- Provides MEPDG input
- Dynamic Modulus (E*) and Flow (Fn)
- TP-79 procedure
- Pooled Fund and Training
**Flow Number (Fn) - Rutting**

- Too early to prepare standard criteria
- ETG Round Robin Testing
- Continue to monitor work in progress
- Encourage investigation of
  - Relationship to rutting performance
  - Sensitivity to mix design factors
  - Use of both confined and unconfined tests on the same materials
Intelligent Compaction Initiative

- Intelligent Compaction Equipment Loan/Demo (TPF5-128)
- Demo Projects (MN, NY, MS, MD, GA, IN, TX, KS)
- Best Practice Documents (1) Asphalt Materials (2) Soils
- Analysis Software and MN DOT Effort to standardize data
Const & Materials Quality Assurance

Produce quality materials with shared risk to both owner and contractor

Initiatives:

- Guidance on 23 CFR 637
- Use of Contractor Test Results & Sampling Plans
- State Process Reviews (to date in 30 States)
- Develop Training Materials & Sponsor Workshops
- Develop Analysis Tools (SPECRISK, NHI)
- Promote Advanced Quality Systems
  - Quality Assurance Specs
  - Performance Based Specs
Environmental Stewardship

**Improve sustainability of pavement materials**

Initiatives:

- Participate on Expert Task Groups
- Support AASHTO Recycling Initiatives
- Development of Applications to Reuse Materials
- Develop Publications and Workshops
- Develop Tools (Recycling Tool Kit)
- Support Development of Specs
- Support Green Highways Programs
Use of Recycled Materials

- Increased RAP Usage
  www.moreRAP.us
- Effective Utilization of RAS
  http://store.hotmix.org/index.php?productID=624
- Recycled Materials Resource Center
  http://www.rmrc.unh.edu/
- FHWA Policy on use of Recycled Materials
Asphalt Technology Pooled Funds

- Current Pooled Funds
  - AMPT Procurement/Training (TPF-5 178)
  - RAS Performance Information (TPF-5 213)
  - Intelligent Compaction Equipment Loan/Demo (TPF-5 128)
  - NCAT Test Track (TPF-5 508)
  - Recycling Materials Resource Center (TPF-5 199)
NHI Training Course

- Current Materials Course Revisions
  - 131118 - Asphalt Mixture Performance Tester
  - 131050 – Asphalt In-Place Recycling Technologies
  - 131023 – Highway Materials Engineering
  - 134059 – Quality Assurance Specification Development and Validation
http://www.fhwa.dot.gov/pavement

Download ETG Presentations at:
ftp://fhwaftp.fhwa.dot.gov
User ID: hiptguest
Password: hiptguest