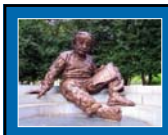

NCHRP UPDATE

Southeastern Asphalt User/Producer Group
November 17 – 20, 2008
Birmingham, Alabama

Thomas Harman
FHWA – Resource Center
Baltimore, MD

1

Our Visit

- HMA Quality Assurance
- HMA Mixture Design
- Warm Mix Asphalt (WMA)
- Mixture & Structural Design
- Other Tests & Procedures

2

Special Thanks

- Dr. Ed Harrigan
  - NCHRP Staff responsible for: Superpave/Asphalt Technology; Pavement Performance Evaluation; Metric Conversion; Geotechnical; Environment/Materials
  - Good friend to the Asphalt Industry

3

HMA QUALITY ASSURANCE

4

9-22: Performance Related Specification for HMA

- ***Quality Related Specification Software* (QRSS):** calculates pay factors from differences in predicted performance and IRI of as-designed and as-built pavement
- **Performance predictions derived from pre-solved solutions of the MEPDG**
- **QRSS written in C# as a stand-alone program; uses Monte Carlo simulations to develop probabilistic solutions that account for sources of variability**

Fugro Consultants, Inc. (March 2009)

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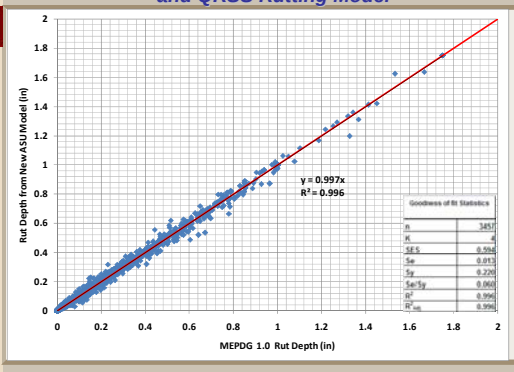
Accuracy of QRSS Models

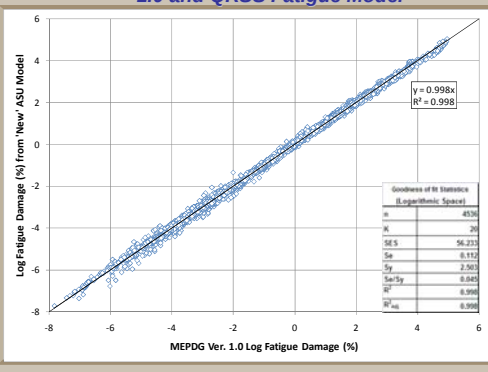
NCHRP 9-22 Beta Testing and Validation of HMA PRS

Comparison of Rut Depth between MEPDG 1.0 and QRSS Rutting Model



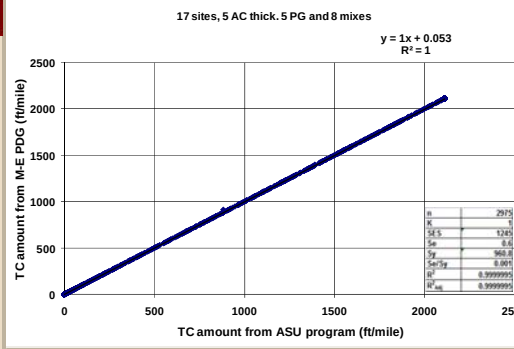
NCHRP 9-22 Beta Testing and Validation of HMA PRS

Comparison of Fatigue Damage between MEPDG 1.0 and QRSS Fatigue Model



NCHRP 9-22 Beta Testing and Validation of HMA PRS

Comparison of Thermal Cracking between MEPDG 1.0 and QRSS Thermal Model



NCHRP 9-22 Beta Testing and Validation of HMA PRS

9-22: Performance Related Specification for HMA

Facilitating Implementation of the QRSS -Next Steps:

- Shadow specification on several recently completed projects, including RAP and overlays.
- Proof of concept testing in 2009 and 2010 on new construction, both in parallel with agency specification and as sole specification
- Post QRSS for public evaluation on NCHRP website and provide support and error resolution
- National workshop in late 2009 or early 2010 to introduce QRSS to state DOT staff

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9-48: Field versus Laboratory Volumetrics & Mechanical Properties

- Determine **causes of variability** and the precision and bias for volumetric and mechanical properties of dense-graded asphalt mixtures measured within and among three specimen types:
  (1) laboratory mixed and compacted,
  (2) plant mixed and laboratory compacted,
  (3) plant mixed and field compacted.

(FY 2009 RFP)

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MIXTURE DESIGN

12

9-29: ~~Simple~~ Asphalt Mixture Performance Tester (AMPT) for Superpave Mix Design

- Commercial AMPT units based on 9-29 performance specification available and in use
- Ruggedness testing of E* and F_n test methods complete
- Interlaboratory study to determine precision and bias of E* and F_n test methods underway

Advanced Asphalt Technologies (September 2009)

9-33: A Mix Design Manual for Hot Mix Asphalt

Update method in AI Manual SP-02:

- Performance test(s)
- Criteria developed with M-E design guide performance models and software
- New volumetric criteria
- Framework for integrated mix and structural design

Advanced Asphalt Technologies, LLC (March 2009)

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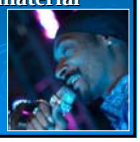
9-46: Improved Mix Design . . . For HMA with High RAP Content

- Adapt AASHTO R 35, *Superpave Volumetric Design for Hot-Mix Asphalt,* for high RAP content mix designs.
- Include performance-related tests and specification criteria as well as measures of durability.
- Develop practical guidelines for RAP material management and processing in a format similar to NAPA QIS 124.

NCAT (April 2010)



WARM MIX ASPHALT

16

9-43: Mix Design Practices for Warm Mix Asphalt

Develop a mix design method for warm mix asphalt (WMA):

- Based on Superpave mix design methodology.
- Including a suite of performance tests.
- Applicable to any WMA technology.

Advanced Asphalt Technologies (March 2010)

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9-47: Engineering Properties, Emissions, and Field Performance of WMA Technologies

Deliverables:

- Revisions to WMA mix design and analysis method.
- Protocol for lab evaluation of WMA performance.
- WMA production and construction guidelines.
- Updated emissions measurement protocol.

Asphalt Institute (September 2011)

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MIXTURE & STRUCTURAL DESIGN

19

9-30A: Rutting Performance Model for HMA Mix and Structural Design

- Sample and test materials from 30-40 field sections per MEPDG Level 1.
- Re-calibrate present MEPDG rutting prediction model with measured data and add other promising models.

ARA, Inc. (June 2009)

20

9-38: Endurance Limit of HMA Mixtures to Prevent Fatigue Cracking in Flexible Pavements

- Results indicate that there is a fatigue endurance limit, which is primarily an HMA mixture property.
- Lower bound is 70 micro-strain, but as high as 200 micro-strain, in six mixes tested.

NCAT (March 2009)

9-44: A Plan for Validating an Endurance Limit for HMA Pavements

- Follow-on to Project 9-38.
- Develop a plan to validate an endurance limit for a wide range of HMA mixes and pavements through an analysis of laboratory and field data.

AAT (December 2008)

9-44A: Validating an Endurance Limit for HMA Pavements

- Conduct the work plan developed in Project 9-44 to (1) validate the fatigue endurance limit through an analysis of laboratory and field data and (2) recommend changes to the MEPDG to fully incorporate the endurance limit.

(FY 2009 RFP)

OTHER TESTS AND PROCEDURES

24

9-34: Improved Conditioning Procedure for Predicting HMA Moisture Susceptibility

Improved conditioning procedure based on use of the environmental conditioning system (ECS) with a simple performance test.

Pennsylvania Transportation Institute (September 2006)

25

9-34: Improved Conditioning Procedure for Predicting HMA Moisture Susceptibility

- **The ECS/E* SPT combination provided better correlation with field performance (7 of 8 mixes) than either the Hamburg wheel tracking or ASTM D 4867 methods**
- **Further development of this procedure is recommended**

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9-39: Determining the Mixing and Compaction Temperatures of Superpave Asphalt Binders in HMA

- **Reliable, user-friendly method applicable to modified and unmodified binders:**
  - **Casola dynamic shear method (frequency, ω, where phase angle = 86°)?**
  - **Steady shear flow (SSF)?**
  - **High shear rate viscosity?**
- **Also evaluate methods for smoke and emissions, mix coating, and mix workability**

NCAT (March 2009)

27

9-45: *Development of Specification Criteria for Mineral Fines Used in HMA*

- **Develop test procedures and specification criteria to characterize the performance of mineral fillers or mixtures of binder and mineral filler.**

University of Wisconsin—Madison (June 2010)

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Summary

- HMA Quality Assurance
  - 9-22: Quality Related Specification Software
  - 9-48: Field versus Laboratory Volumetrics & Mechanical Properties
- HMA Mixture Design
  - 9-29: Asphalt Mixture Performance Tester (AMPT)
  - 9-33: A Mix Design Manual for Hot Mix Asphalt
  - 9-46: Improved Mix Design for HMA with High RAP Content
- Warm Mix Asphalt (WMA)
  - 9-43: Mix Design Practices for Warm Mix Asphalt
  - 9-47: Engineering Properties, Emissions, & Field Performance
- Mixture & Structural Design
  - 9-30A: Rutting Performance Model for HMA Mix and Structural Design
  - 9-38: Endurance Limit to Prevent Fatigue Cracking in Flexible Pavements
  - 9-44: A Plan for Validating an Endurance Limit for HMA Pavements
  - 9-44A: Validating an Endurance Limit for HMA Pavements
- Other Tests & Procedures
  - 9-34: Improved Conditioning Procedure for Predicting Moisture Susceptibility
  - 9-39: Determining the Mixing & Compaction Temperatures
  - 9-45: Development of Specification Criteria for Mineral Fines Used in HMA

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Resources

The Source of @ll WWWisdom…

http://www.trb.org/CRP/NCHRP/NCHRP.asp

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Thank You!
Any Questions?
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