Strategic Roadmap to Improve Construction of Asphalt Pavements
Critical Asphalt Mixture Compaction Factors

- FHWA Mix ETG
- Construction Task Group - Priority issues
  - Longitudinal Joints
  - Tack Coats
  - Compaction
    - Tasked by ETG to identify and recommend actions to improve the compaction of asphalt mixtures
Construction Task Group members

- Mark Buncher, Asphalt Institute
- Erv Dukatz, Mathy Construction
- Lee Gallivan, FHWA
- Kevin Hall, University of Arkansas
- Gerry Huber, Heritage
- Julie Kliwer, Arizona DOT
- Cindy LaFleur, Oldcastle Materials
- Todd Lynn, Thunderhead Testing
- Louay Mohammad, University of Louisiana
- Jim Musselman, Florida DOT
- Judy Ryan, Wisconsin DOT
Single best predictor of long-term pavement performance

- Increased pavement stiffness
- Resistance to permanent deformation
- Reduction in permeability
- Reduce premature oxidation/aging
“Part I of the Problem”
Density Specifications left to Agencies to determine

Compaction Spec minimums
Based on % Gmm

- 15%
- 35%
- 50%

Statistical Acceptance States
- 53%
- 47%

Compaction Specification Upper Limits

- 99%
- 97%
- > 97%

Range of Compaction Specification

- 51%
- 9%
- 9%
- 31%
- 10%

Measurement for Acceptance

- 30%
- 38%
- 2%

Basis of Payment

- Disincentive: 80.0%
- Incentive: 54.0%
- PWL: 42.0%
“Part II of the Problem”
Rely on Contractors to “Optimize” Density

- Contractor will build what is specified
Evolving Document
  - “Strategic Roadmap to Improving Compaction of Asphalt Mixtures”

- **Identify critical elements**
- **Develop action items/plan**
Critical Factors
Mix Design and Mixture Type

- Mixture Design – impact on construction
  - Volumetrics
    - Design Target Air Voids
    - VMA
    - Minimum binder content
  - Gradation and aggregate characteristics

- Mixture Type
  - HMA, WMA, SMA, OGFC, Thin Lift Overlay
    - Density vs. permeability
Impact of mix volumetrics on compaction

Distribution by Individual Core Result

- % of tests
- % Density (Maximum Theoretical)
- 2006-2009
- 2002-2005

change design air voids
Critical Factors

Pavement Layer and Pavement Lift Thickness

- Base, Intermediate and Surface course mixtures
  - Better understanding needed on the structural requirements by layer and the resultant compaction effort

- **Layer Thickness**
  - NCHRP Report 531
    - 4-5 times NMAS
  - Agencies need to follow minimum lift thickness recommendations to ensure density for coarse graded mix
Critical Factors
Construction Operations

- Cold Planing (Milling)
  - Improvement in density
- Tack Coats – Layer bond
  - Critical for performance
- Equipment
  - Intelligent Compaction
  - Paver Screed improvements
- Longitudinal Joint Construction and Specifications
Critical Factors
Construction & Plant Operations

- Production Variability
  - Temperature of Mixture
  - **Mat thermal segregation**
  - Moisture in Mixture
Critical Factors
Specs, Acceptance and Measurement Methods

Measurement for Acceptance

- Stratified: 2%
- Gauge: 30%
- Cores: 38%
- Method: 30%
Critical Factors
Training and Proficiency

- Contractors
- Agency
  - Partners at NAPA and Asphalt Institute, SAPA and AGC
  - Equipment Manufacturers
  - Consultants
Work in Progress

- TRB Synthesis- “Field Compaction- Methods of Measurement and Specifications and Relationship to Performance”

- Best Practices for Constructing and Specifying HMA Longitudinal Joints” (AI)

- Tack Coats - NCHRP 9-40