MODIFYING SUPERPAVE GYRATORY COMPACTION SPECIFICATION TO INCREASE PAVEMENT DURABILITY

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Abstract

- Increasing pavement durability through volumetrics
- Exploring other state agencies changes in mix designs
- Developing new mix designs
- Testing performance of modified mix designs through 10 different tests
- Update specifications

Background

- State highway agencies have demonstrated growing concern on the durability of asphalt mixtures using the Superpave mix design
- Asphalt mixture durability can be improved by increasing asphalt binder content (AC)
- In order to increase binder content, several agencies have explored and adopted changes in their volumetric mix design
- Last major report on this concern (Tran et al., 2019) summarized the 27 states that lowered their design gyration levels (N_{des}), where:
  - 18 increased their minimum voids in mineral aggregate (*VMA*) requirements
  - 8 lowered their design air voids
  - 6 included minimum asphalt content (*AC*) requirements
  - 5 added factors to recycled asphalt binders
  - 13 made other changes

Methods

- Complete performance testing on both Plant-mixed lab-compacted (PMLC) and lab-mixed lab-compacted (LMLC) asphalt samples
- Performance tests will include:
  - Volumetric Properties (G_{mm}, G_{mb}, G_{sb}, *VMA*, *VFA*), *Figure 3*
  - Tensile Strength Ratio, *Figure 6*
  - IDEAL-CT, *Figure 5*
  - APA
  - I-FIT, *Figure 6*
  - Dynamic Modulus, *Figure 6*
  - Flow Number, *Figure 6*
  - Flow Time, *Figure 6*
  - S-VECD
  - Hamburg Wheel Tracking, *Figure 2*

Sampling

Figure 1. Gyratory Compactor
AASHTO T312

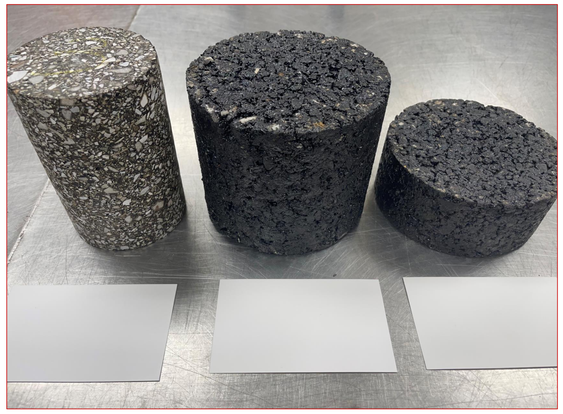

Figure 2. LMLC Asphalt Samples

Performance Tests

Figure 3. CoreLok. Machine
AASHTO T84, T85

Figure 4. Hamburg Wheel Tracking
AASHTO T324

Figure 5. Testing Load Frame
AASHTO T283

Figure 6. Asphalt Materials Performance T.
AASHTO T378

Results

- Ongoing research
- Collected data collected and analyzed following national and state standard specifications (i.e., AASHTO, ARDOT Standard Specification for Highway Construction)
- Projected to verify documented benefits of mix design modifications
- Findings will be reported to the state agency for evaluation
- Further research might be necessary

Discussion

- State highway agencies have different approaches to modifying mix designs
- Results may vary from agency-to-agency
- Vigorous state-based Life Cycle Cost Analysis (LCCA) should be completed
- Volumetrics properties of asphalt mixtures can be modified to improve mixtures' susceptibility to common distresses
- High potential for more efficient asphalt pavement construction by increasing workability
- High potential for more durable highway infrastructures, reducing costs and increasing life cycle of pavements.

References

1. Tran, N., Yin, F., Leiva, F., Rodezno, C., Huber, G., and Pine, B. Adjustments to the Superpave Volumetric Mixture Design Procedure for Selecting Optimum Binder Content. In *National Cooperative Highway Research Program*, NCHRP 20-07/Task 412, 2019.

Acknowledgements

- Arkansas Department of Transportation
- Asphalt Hogs Research Team
- Dr. Andrew F. Braham, *Advisor*
- Dr. Micah Hale, *CVEG Department Head*
- University of Arkansas' Department of Civil Engineering