Validation Techniques for Setting BMD Test Criteria

CAPRI
CONSORTIUM FOR ASPHALT PAVEMENT RESEARCH AND IMPLEMENTATION

Case Study: *ALDOT* Open-Road Test Sections

Initial Validation

Objective

Evaluate and validate preliminary Balanced Mix Design (BMD) performance thresholds for cracking resistance and rutting resistance under Alabama traffic and climatic conditions using open-road test sections.

Benefit

This evaluation demonstrates how open-road test sections can be used to validate laboratory performance thresholds established through benchmarking. The results support the refinement of BMD criteria for Alabama conditions and provide a pathway for transitioning from laboratory screening to specification implementation.

Background

Since 2022, the Alabama Department of Transportation (ALDOT) has begun incorporating BMD concepts into its practices. Efforts include using the Hamburg Wheel Tracking Test (HWTT, AASHTO T 324) for Superpave mixtures with high traffic (≥10 million equivalent single-axle loads, ESALs). ALDOT also utilized the Indirect Tensile Asphalt Cracking Test (IDEAL-CT, CT_{Index}, ASTM D8225) and the High Temperature Indirect Tension (HT-IDT) strength (HT-ITS) to benchmark cracking and rutting resistance.

The target BMD thresholds for CT_{Index} and *HT-ITS* were established through consensus based on findings from a previous ALDOT-sponsored benchmarking study (Tran et al., 2023). The benchmarking study used a dataset of 212 asphalt mix designs approved in Alabama between 2020 and 2022 with PG 67-22 or PG 76-22 binders. Asphalt contents ranged from 4.4% to 6.8%. The distribution of the CT_{Index} ranged from 6.3 to 342.9 (Figure 1), with an average of 60.8. The HT-ITS distribution ranged from 4.4 to 130.0 psi, with an average of 45.3 psi. Threshold values were categorized as low, medium, or high (Table 1). ALDOT's BMD specifications for local roads require a minimum CT_{Index} of 50 and a minimum *HT-ITS* of 17 psi.

Methodology

The evaluation utilizes Open-Road Test Sections as its BMD validation strategy. It involved selecting target BMD performance thresholds for six asphalt mixtures to be constructed on State Route 55 in Covington County. The six mixtures were designed by varying their components to meet the chosen BMD performance targets. The mixtures were then produced and placed in six test sections of approximately 1000 ft long for field evaluation. Mixes were sampled and tested using IDEAL-CT and HT-IDT in both hot-compacted and reheated conditions to provide a comprehensive understanding of their performance. A comparison of laboratory test results with field performance data was then conducted to validate the BMD performance thresholds and refine ALDOT's BMD special provisions.

Results *(to-date)*

- After one year of service, no cracking was observed in any section. However, rutting trends did show differences in performance. Sections with higher HT-ITS thresholds showed lower rut depths in the field, confirming that laboratory results aligned with early field performance in terms of rutting.
- Specimen types significantly affected measured performance. Laboratory-mixed, laboratory-compacted (LMLC) specimens consistently produced higher CT_{Index} values than plant-produced specimens, while

reheated plant-mixed, lab-compacted (RH-PMLC) specimens showed further reductions, confirming the adverse effects of reheating on cracking resistance. In contrast, HT-ITS values increased with reheating, indicating enhanced resistance to rutting. Although there were differences among specimen types, the overall ranking of the mixtures remained consistent across them. This suggests that laboratory thresholds may need to be adjusted by specimen type, but the comparative performance of the mixtures remains reliable.

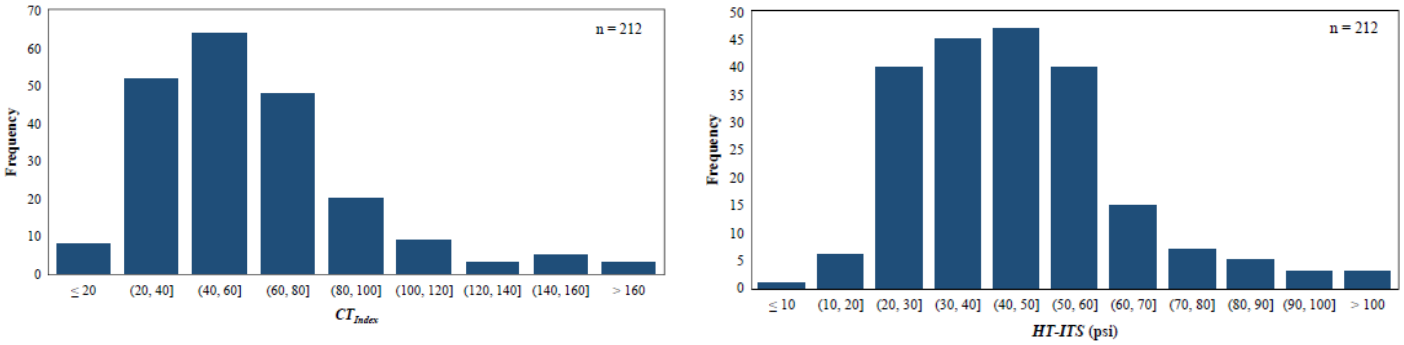

Figure 1. Frequency Distribution of: CT_{Index} and HT-ITS

Table 1. Target BMD Performance Thresholds for Six Test Sections

Test Section	Target CT_{Index} at 25°C	Target *HT-IDT* Strength at 50°C
1	55 to 77 Med	14 to 18 psi Low
2	83 to 117 High	14 to 18 psi Low
3	27 to 39 Low	19 to 27 psi Med
4	83 to 117 High	19 to 27 psi Med
5	27 to 39 Low	28 to 38 psi High
6	55 to 77 Med	28 to 38 psi High

Recommendations

- Continue monitoring of the test section to correlate lab results and field performance.

Level of Effort / Cost

The study required significant effort, including experimental design, development of mix designs to meet the narrow targets, construction of six open-road test sections, and continued monitoring for long-term performance assessment. The approach is replicable for DOTs with access to test facilities and industry partnerships.

References

- Balanced Mix Design Field Trial Projects in Alabama
- Tran, N., Chen, C., Bairgi, B. K., & Yin, F. (2023). *Incorporating Cracking Parameters Determined from ALDOT-361 Test Procedure into Specifications for Asphalt Mix Design and Production*, ALDOT Research Report 930-979. Alabama Department of Transportation, Montgomery, AL.

Agencies and Research Entity

ALDOT Alabama Department of Transportation

U.S. Department of Transportation Federal Highway Administration

National Center for Asphalt Technology NCAT AT AUBURN UNIVERSITY

CAPRI-B-01-2026.005