

Balanced Mix Design (BMD) Benchmarking

Bituminous Concrete Engineer

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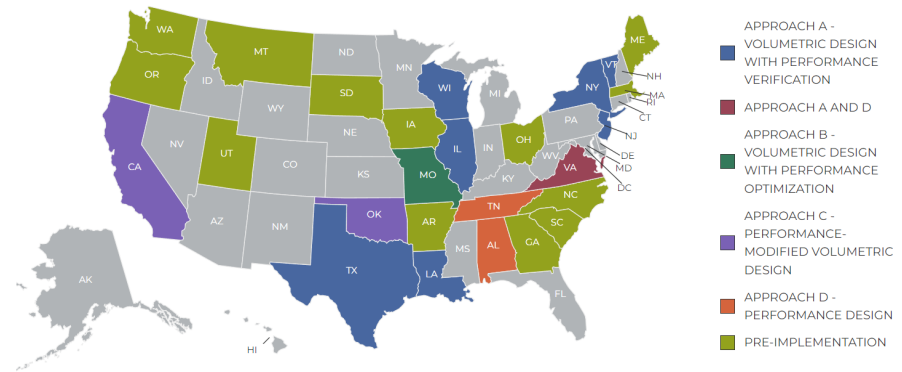
Bituminous Concrete Materials Manager

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What is BMD?

Bituminous Pavement undergoes numerous stresses, the two most prevalent distresses, Rutting and Cracking, act in opposition to each other. BMD seeks to “balance” these in the design process for optimization.

- AASHTO PP 105-20
- Encourages innovation using recycled materials and various binder/mixture modifiers
- Agency has been actively exploring BMD since 2015



Source: National Asphalt Pavement Association (NAPA).
<https://www.asphaltpavement.org/expertise/engineering/resources/bmd-resource-guide/implementation-efforts>

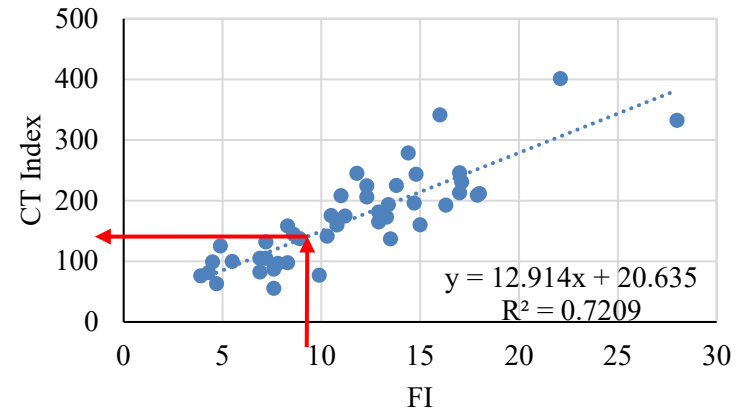
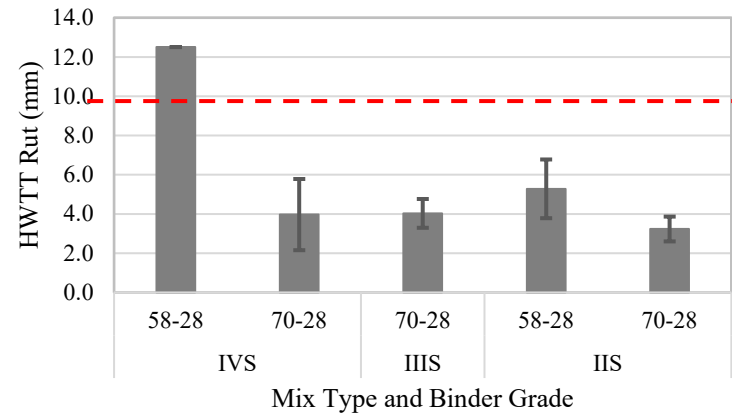
Purpose

- Benchmarking:
 - A step in establishing baseline data for performance testing
 - Determining the range of test results and which of the evaluated tests are most implementable
 - Conducted in partnership with FHWA and NCAT on samples representing mix produced from 2017 through 2021 construction seasons.



Analysis of Results

- 306 test results analyzed as part of analysis
- Most mix designs with polymer-modified PG 70-28 binders would meet a maximum HWTT rut depth criterion of 10.0 mm
- ~55% of Type IIS mixes would fail a minimum I-FIT Flexibility Index (FI) criterion of 10
- ~90% of Type IIS mixes would fail a minimum IDEAL-CT CT-Index criterion of 150
- Good correlation between I-FIT and IDEAL-CT (as noted in national research)



Conclusions & Next Steps

- Mix type plays a statistically significant role on rutting and cracking resistance due to its role in dictating the nominal maximum aggregate size (NMAS) and minimum voids in mineral aggregate (VMA).
- The benchmarking results indicated that the test results appear to reflect the benefits of polymer modified binders (i.e., PG 70-28) on rutting resistance and finer mixtures (i.e., Type IIIS and Type IVS) on cracking resistance.
- The modified Type IVS mixtures with PG 70-28 binder being produced for VTrans projects are primarily designed for rutting resistance.
- Next steps:
 - HWTT criteria in 2023 specifications book (max rut depth criterion of 12.5 mm, stripping inflection point (SIP) minimum of 15,000 passes to evaluate moisture resistance)
 - Continued benchmarking due to implementation of MSCR PG binder grading system
 - Discontinuation of I-FIT in 2023 specification book in favor of IDEAL-CT
 - FHWA suggestion: investigate differences in the three specified gyration levels (50, 65, and 80) to determine if consolidating gyration levels is worthwhile

Acknowledgments

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Questions?

