Black to Basics
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Columbia, MO

Balanced Mix Design for Municipalities

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NB West Contracting

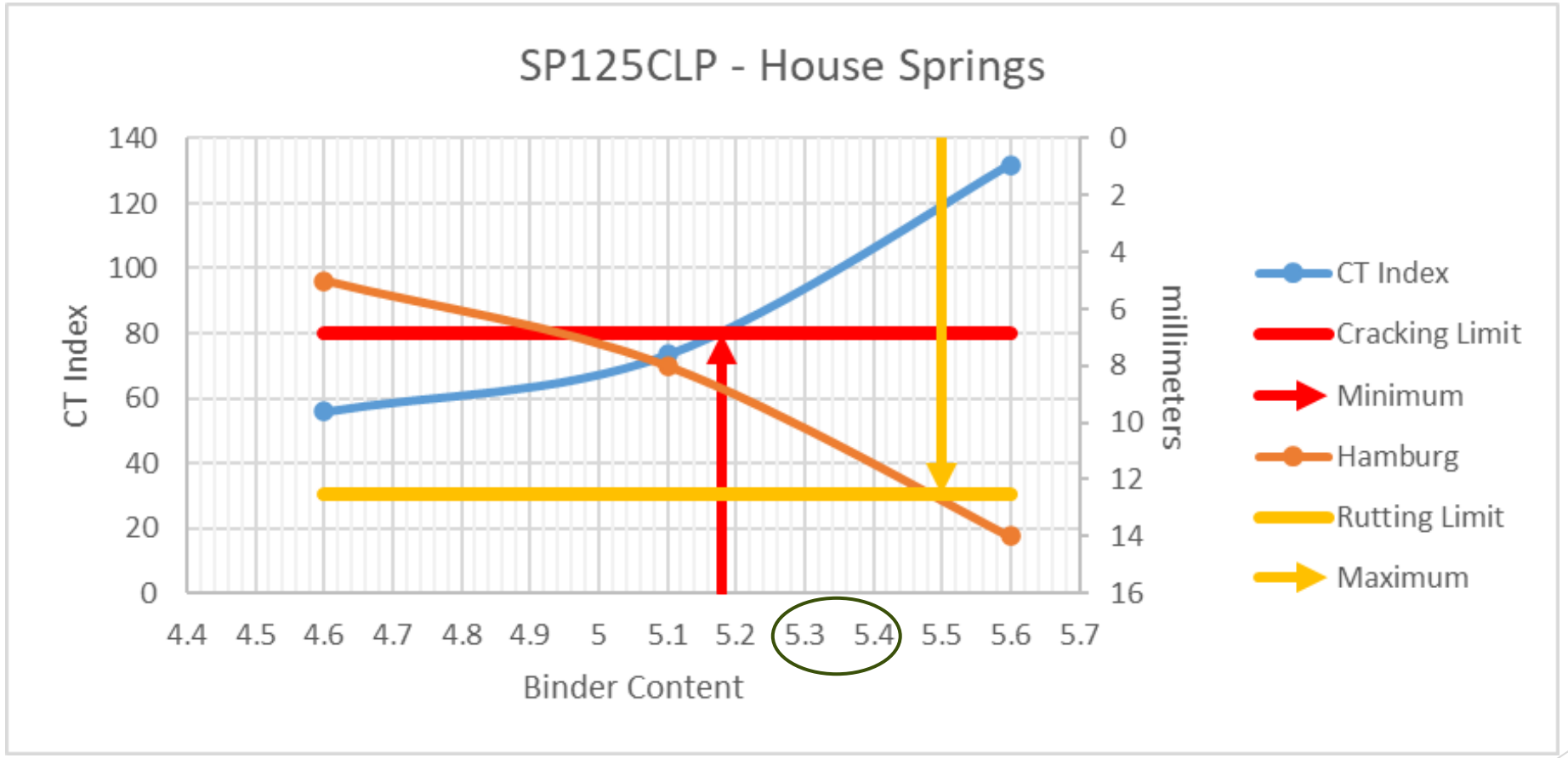
Introduction

- What is Balanced Mix Design (BMD)
- MoDOT Specification
- How Can BMD Be Applied for Lower Truck Loading
- Expectations

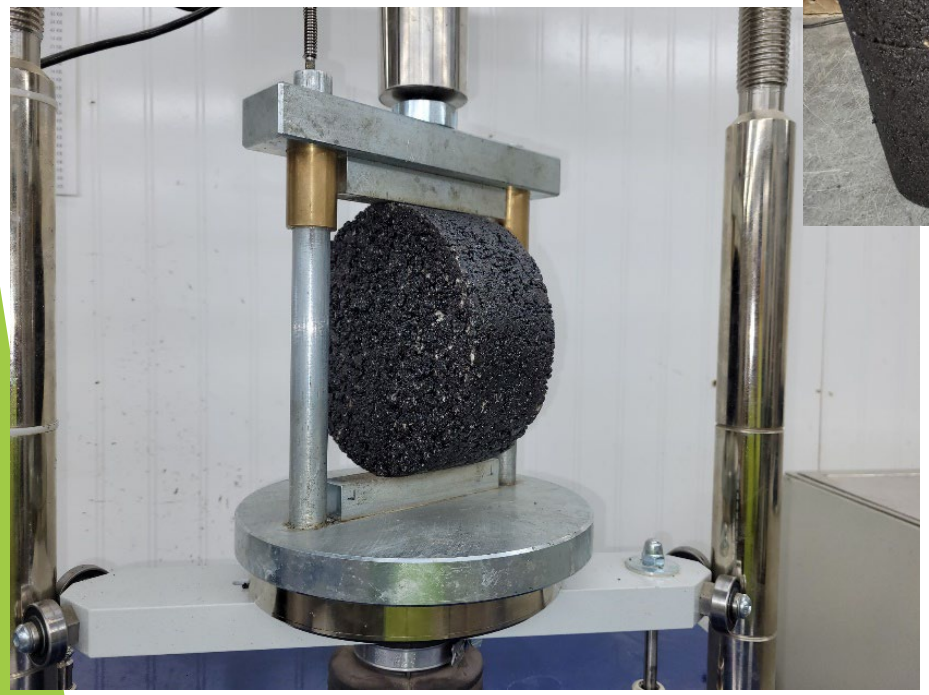
Finding the Balance

- Balanced Mix Design (BMD) is described as an “asphalt mix design using performance tests on appropriately conditioned specimens that address multiple modes of distress taking into consideration mix aging, traffic, climate, and location within the pavement structure.”
  - Rutting
    - Hamburg Wheel Tracking
    - IDEAL RT
  - Cracking
    - IDEAL CT

Finding the Balance



BMD Tests



Testing for BMD

- Cracking Test - CT Index

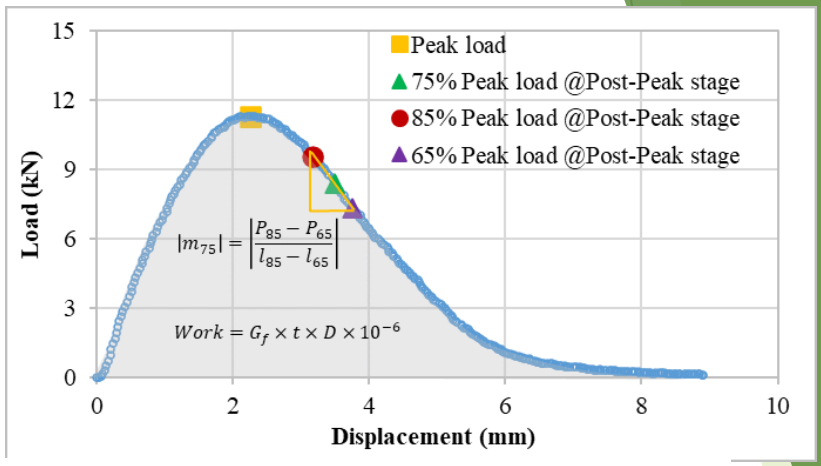
  ASTM D8225 @ 77°F

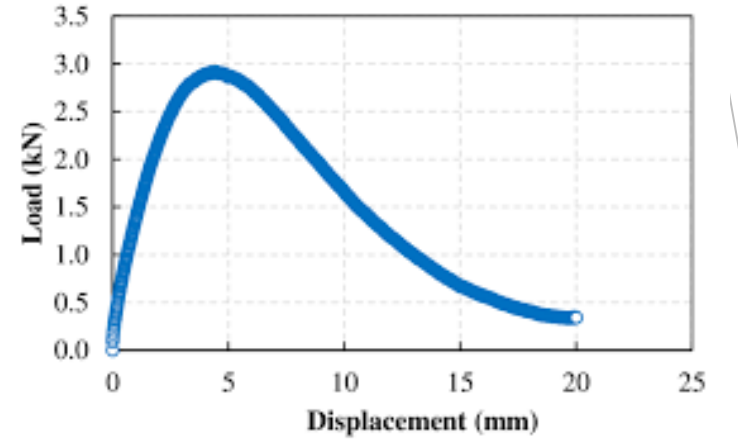
- Rutting Test - RT Index

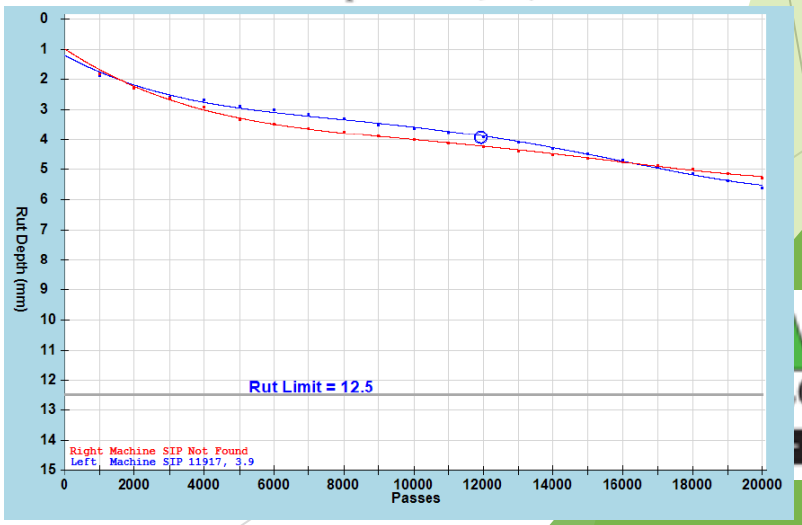
  ASTM D8860 @ 122°F

- Rutting Test - Hamburg Wheel Testing

  AASHTO T324 @ 122°F







Implementation Spotlight

Balanced Mix Design for Alabama Counties

higher CT_{Index} values. They iteratively adapted their Superpave mixes to meet the new cracking and rutting test requirements. The resulting blends resembled the Marshall mix designs that were used in Alabama until the time of Superpave implementation. These new BMD mixtures contained 35% RAP (compared to 20% RAP for the Superpave mix designs) and higher total binder

NCAT Spring 2021 Newsletter

MoDOT BMD Specification - Design

- Design Gyrations

Design	N_{design}[a]
F	35
E	50
C	60
B	65

- Air Void 3.0 to 5.0%
- VMA min. = V_{be} min. plus design air voids

Mixture	V_{be} Minimum (percent)
SP250	9.0
SP190	10.0
SP125 (except for SMA)	11.0
SP095 (except for SMA)	12.0
SP048	13.0

- Moisture Susceptibility using TSR (AASHTO T283) – 80%
  - Criteria raised to 85% unless using liquid antistrip.

MoDOT BMD Specification -Design

- Cracking Tolerance Index Test - CT_{index} @ 25 ± 0.5˚C

Mix Type	Minimum CT_{Index}	$CT_{Index,(Critically\ Aged)*}$
Non-SMA	50	Informational Only
SMA	135	Informational Only

*Critically Aged defined as loose mix aging for 20 hours at 115˚ C.

- Rutting Tolerance Index Test - RT_{index} @ 50 ± 1˚C

PG Grade High Temperature*	Minimum RT_{Index}
58-28H / 64-22	50
64-22H / 70-22	65
64-22V / 76-22	80

*Determined by the binder grade specified in the contract.

- Hamburg Wheel Tracking Test – HWT @ 50 ± 1˚C

PG Grade High Temperature *	Minimum Wheel Passes	Maximum Rut Depth (in.)
58-28H / 64-22	7,500	0.38
64-22H / 70-22	15,000	0.38
64-22V / 76-22	20,000	0.38

*Determined by the binder grade specified in the contract.

MoDOT BMD Specification - Production

- Density - 92.5 to 98.0% of G_{mm}
- Asphalt Content JMF ±0.3%
- Air Voids JMF ±1.0%
- CT_{index} minimum of 50
- Rutting Tolerance Index Test - RT_{index}

PG Grade High Temperature*	Minimum RT_{Index}[(a)]
58-28H / 64-22	50
64-22H / 70-22	65
64-22V / 76-22	80

*Determined by the binder grade specified in the contract.
[(a)]Mixtures not meeting the minimum RT_{Index} shall be tested by the Hamburg Wheel Track Test and meet a minimum of ½" rutting at the number of wheel passes required by the contract grade of the mixture.

- TSR ≥75% - Minimum allowable conditioned tensile strength 60 psi

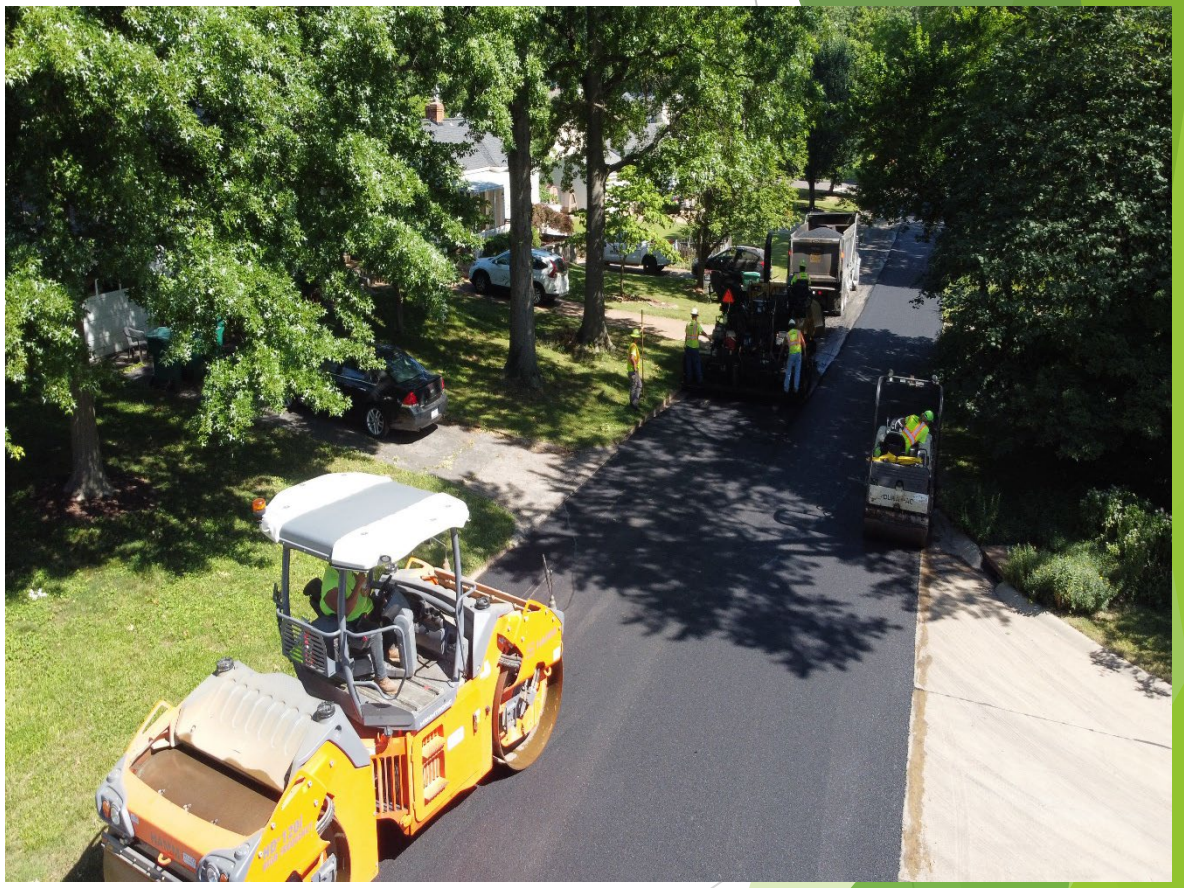
WEST Contracting

Low ESAL Roadways
Residential Streets

- Mix Design
  - Superpave Mixtures – Level F
  - Marshall Design
  - Whatever Meets the Performance Criteria
- Performance Only
  - CT-Index 50 minimum
  - RT-Index 35 minimum

Expectations

- Longer Lasting Pavements
- Higher Cost (?)
  - Contractor QC
  - Most Likely Higher Asphalt Contents
- Unknowns
  - Finding the Appropriate Minimum Test Criteria
  - Application to MoDOT Low Type Mixtures



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Questions

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