

Balanced Mix Design Symposium

Introduction to BMD Concept

Why Change?

- The key properties in Superpave mix design are air voids (V_a) and voids in mineral aggregate (VMA)
 - $VMA - V_a =$ volume of effective binder (V_{be})
- Volumetric properties do not tell us anything about the **quality** of the binder, or the interactions of different binder components and additives
- V_{be} is dependent on the aggregate bulk specific gravity (G_{sb}), which is not a reliable property
 - G_{sb} are subject to change over time, but not often verified
 - G_{sb} has a low level of precision
 - G_{sb} of RAP aggregate is questionable



Recycled Shingles



Fractionated RAP



Recycled Tire Rubber

With the current
volumetric mix
design system...



WMA additives



Recycling agents



*we have no way of knowing if
these materials help or hurt*



SBS Polymer

Performance Testing (20+ years ago)

- Performance tests were supposed to be included in Superpave Level II & III
 - Superpave Shear Tester (SST)
 - Superpave IDT
- Equipment was purchased for Regional Superpave Centers
- Tests were too complicated and cost too much to implement for routine use



Rutting

- In the early years of Superpave implementation, most attention was focused on rutting
 - State highway agencies evaluated different mix design strategies to mitigate rutting and obtained great success
 - No longer a concern



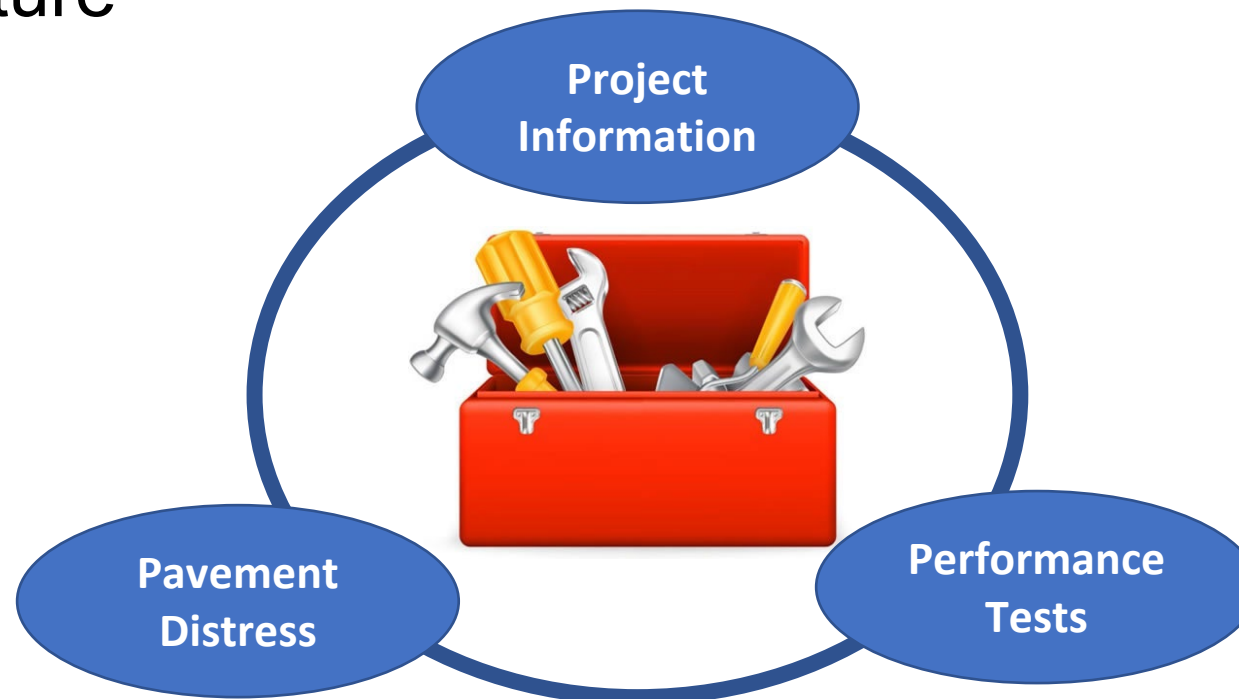
Cracking

- A decade after Superpave implementation, we realized we needed to evaluate cracking susceptibility
 - No national research and guidance on cracking tests
 - Many highway agencies attempted to tweak volumetric criteria to mitigate cracking, but did not always achieve promising results



What is BMD?

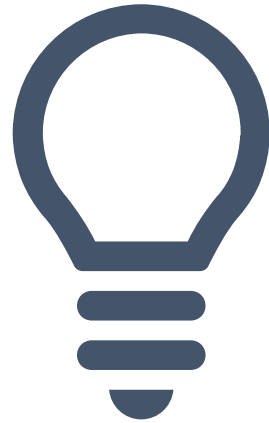
Asphalt mix design using performance tests on appropriately conditioned specimens that address multiple modes of distress taking into consideration mix aging, traffic, climate and location within the pavement structure



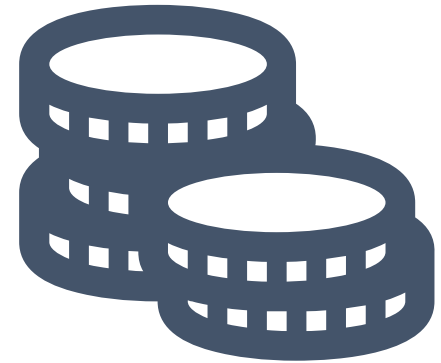
Anticipated Benefits of BMD



Ensure Performance



Enable Innovation



Optimize Cost

BMD Approaches

1. Volumetric Design with Performance Verification
2. Volumetric Design with Performance Optimization
3. Performance-Modified Volumetric Design
4. Performance Design

From Approach 1 to 4

- Less requirements on volumetric analysis
- Higher innovation potential



Thank You

Questions?