

Presented by David B. Marshall, P.E.

BMD FIELD OPERATIONS: SAMPLING, AGING, RETAINED SAMPLES, & TERMINOLOGY



NEW FRONTIER

MATERIALS

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BALANCE MIX DESIGN TERMINOLOGY:

Terminology

- JSP Job Special Provisions. The current Section 403 BMD specifications are currently not in the Standard Specifications but listed as JSP-24-01C and called for on a per contract basis
- N Number of gyrations of a specimen compacted in a Superpave Gyrotory Compactor
- N_{design} Number of gyrations for the Design level of a mixture
- V_a Percent Air Voids of a compacted mixture
- G_{mm} Theoretical Maximum Specific Gravity or “Rice” value of a mixture. It is the mass per volume of the mixture if it was to have no V_a as compared to the unit weight of Water. Determined with AASHTO T 209

Terminology continued

AASHTO R 97 Sampling of Asphalt Mixtures

AASHTO R 47 Reducing Samples of Asphalt Mixture to Testing Size

Quartering A technique to reduce mix sample to test size in the lab using a large pan, scoop, and template plates in order to reduce a larger sample into 4 smaller samples per AASHTO R 47

Performance Tests IDEAL-CT (CT_{index}), IRT (RT_{index}), HWT, and TSR

BMD Balanced Mix Design. A design methodology where mixtures are developed to balance the Cold Weather Cracking with Rutting potential using various Performance Tests such as IDEAL-CT, IRT, HWT, and TSR

Terminology continued

IDEAL-CT Indirect Tensile Asphalt Cracking Test. Used to determine CT_{index} which is used to determine asphalt mixture cracking resistance at the intermediate temperature range (5 °C to 35 °C) depending on local climate

CT_{index} calculated from the failure energy, the post-peak slope of the load-displacement curve, and deformation tolerance at 75 % of the peak load from the IDEAL-CT testing

IRT Ideal Rutting Test. Used to determine RT_{index} which is used to determine asphalt mixture rutting resistance at the high temperature range (50 ± 15 °C) depending on local climate

RT_{index} calculated from the peak load (or shear strength) from the IRT testing

Terminology continued

HWT Hamburg Wheel-Track Testing of compacted asphalt mixtures. Used to determine the rut depth at a specified number of passes and used to determine rut potential of an asphalt mixture

TSR Tensile Strength Ratio. A test to determine moisture susceptibility of an asphalt mixture. It is the ratio of the tensile strength of conditioned compacted specimens to the unconditioned control samples of the compacted specimens

BMD FIELD TESTING
PREPARE FOR RANDOM SAMPLE

PRE-SAMPLE CHECKLIST

Set Gyrotory to "Specified Height"

Ensure Gyrotory is in proper mode to compact to 62 mm

Set number of gyrations higher

Change to enough gyrations to compact to specified height. Example 150.

Set Oven to Compaction Temp

Ensure oven is set to the compaction temperature as noted on the Mix Design.

Obtain Performance Test Puck Weight

Obtain required weight to achieve $7.0\% \pm 0.5\%$ Air Voids ($6.0\% \pm 0.5\%$ for SMA). This is determined during the mix design process or from previous field testing

Verify puck weight

Before the BMD pucks are made produce a specimen at 62 mm and verify Air voids are within range using a representative Field Gmm



BMD FIELD SAMPLING

BMD Sampling

Obtain Sample

Obtain four 5-Gallon buckets (or equivalent) of mix according to AASHTO R 97 at the random number/tonnage provided by QA. These buckets should be at least $\frac{3}{4}$ full or approximately 50 pounds. Two buckets will be used for producing specimens and the other 2 labelled and saved appropriately for the retained sample

30 Minute Cure

Place the two buckets of mix into the oven at compaction temperature for 30 mins prior to molding specimens. This time starts when all loose mix has been obtained. Mixture is not to fall below compaction temperature during this period.

BMD Sampling_{continued}

Reduce Bucket 1

Reduce the sample to test size by Quartering (AASHTO R 47). Take one bucket from the oven and dump into quartering pan to reduce to test size. Weigh out 6 samples by placing in bowls at the compaction weight. Place these in the oven as soon as each is weighed to keep mixture at compaction temperature.

Discard Extra Mix

Discard the extra mix in the quartering pan after 6 specimens are weighed and placed back into the oven. The remaining mix is most likely too cold and segregated to yield good data.

Compact Pucks

Fill the mold in one steady charge. Level mix with spatula (do not shake mold to level) and compact to 62 mm

BMD Sampling_{continued}

Reduce Bucket 2

When the 4th or 5th specimen is being compacted, repeat the same process that was performed with the first bucket. Weigh out an additional 6 specimens and place back into oven at compaction temperature.

Discard Extra Mix

Discard the extra mix in the quartering pan after 6 additional specimens are weighed and placed back into the oven. There should be 12 total now. Discard The remaining mix in the quartering pan.

Label Pucks

Label compacted specimens 1-12, carefully placing them on rack to cool. Take care to not damage specimens as this will adversely effect test results.

BEST PRACTICES

Avoid Mix Segregation

Sampling continued during sampling & quartering will produce inconsistent erratic test results. Develop proper lab practices to improve consistency and provide more accurate and repeatable results

Control Mix Aging

Strive to produce all specimens with the same amount of aging if possible. This is achieved by working quickly efficiently.

Sampling Location

Sample from truck or silo discharge and be consistent between samples so that the amount of truck aging is similar

Verify sample weight

Verify sample weight if mix has changed prior to random sample to obtain an accurate weight for 62 mm BMD specimens



RETAINED SAMPLE

Retained Sample

Obtain Sample

The extra two 5-Gallon buckets (or equivalent) of mix that was sampled with the mix used to make BMD Specimens is the retained sample. Place this mix into appropriate containers such as cardboard boxes or metal buckets with lids.

Label Sample

Label the containers with Date, Plant, Mix ID, Mix Type, AC Grade, Job Number, Contract Number, Route, County, and number of containers for this sample (Example Box 1 of 2, Box 2 of 2, etc.)

Sample Storage

Store retained samples in climate-controlled environment for long term storage or for Testing if RT_{index} requires HWT to be performed

RETAINED SAMPLE

Used for HWT if RT_{index} is Below Minimum

If the RT_{index} is low the retained sample will be used to perform HWT testing to verify susceptibility to rutting

Store covered in Safe Location

Minimize additional aging and contamination by storing covered samples in a cool clean location.

Sample Quantity

Ensure the retained sample is enough material and is at least two containers so that MoDOT can take one for HWT testing and additional material is available for Verification or Internal Testing if needed.



TENSILE STRENGTH RATIO
MINIMUM TENSILE STRENGTH

Tensile Strength Ratio

TSR

Moisture susceptibility is tested per AASHTO T 283 to ensure minimum acceptable TSR value for the mixture. Passing TSR required to obtain incentive pay for the CT_{index}

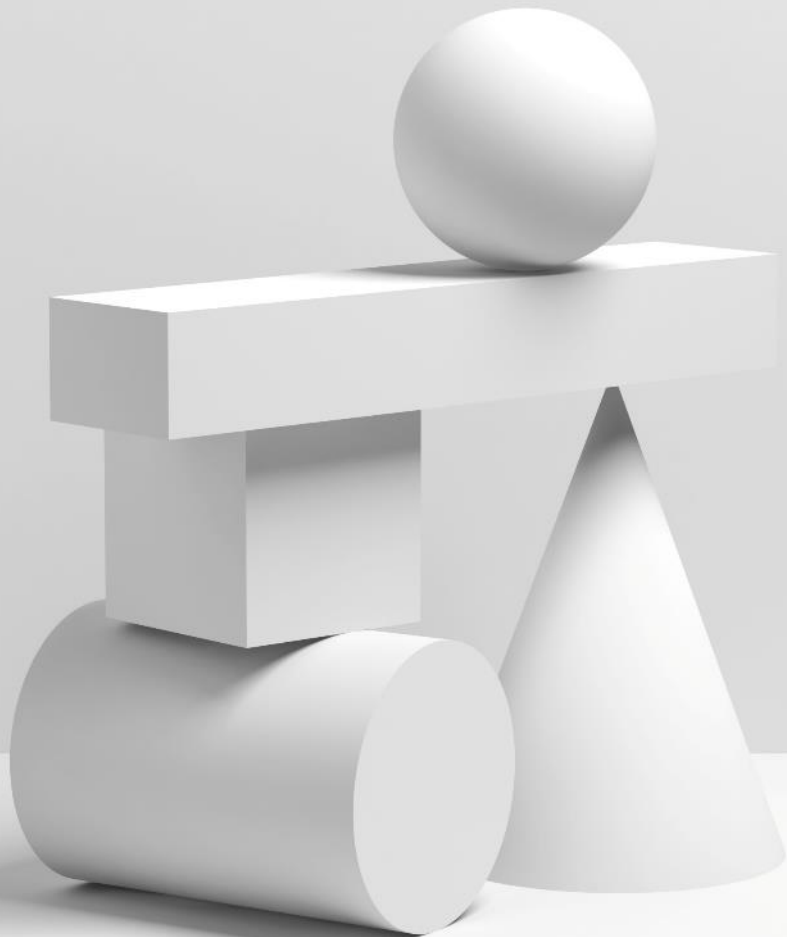
Tensile Strength

Minimum Tensile Strength is determined from conditioned specimens while performing AASHTO T 283 TSR testing.



PERFORMANCE TEST FREQUENCIES

TEST	QC FREQUENCY	QA FREQUENCY
CT _{index}	1 / 3000 tons	1 / 12000 tons
RT _{index}	1 / 3000 tons	1 / 12000 tons
TSR	1 / 12000 tons (maximum)	1 / project



QUESTIONS?



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THANK
YOU

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