BREAKING THE MOULD

A HOLISTIC REVOLUTION IN ASPHALT TESTING

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GEOTECHNICS

BALANCED MIX DESIGN

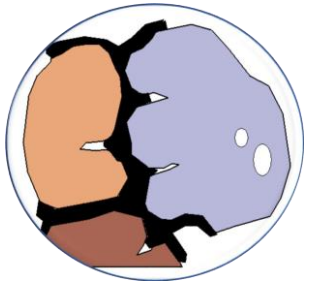
BMD DEFINITION

In September 2015, the former Federal Highway Administration (FHWA) Expert Task Group (ETG) on Mixtures and Construction formed a Balanced Mix Design Task Force, which consisted of asphalt researchers, practitioners, and pavement engineers from federal and state highway agencies, asphalt contractors, consultants, and academic and research institutions.

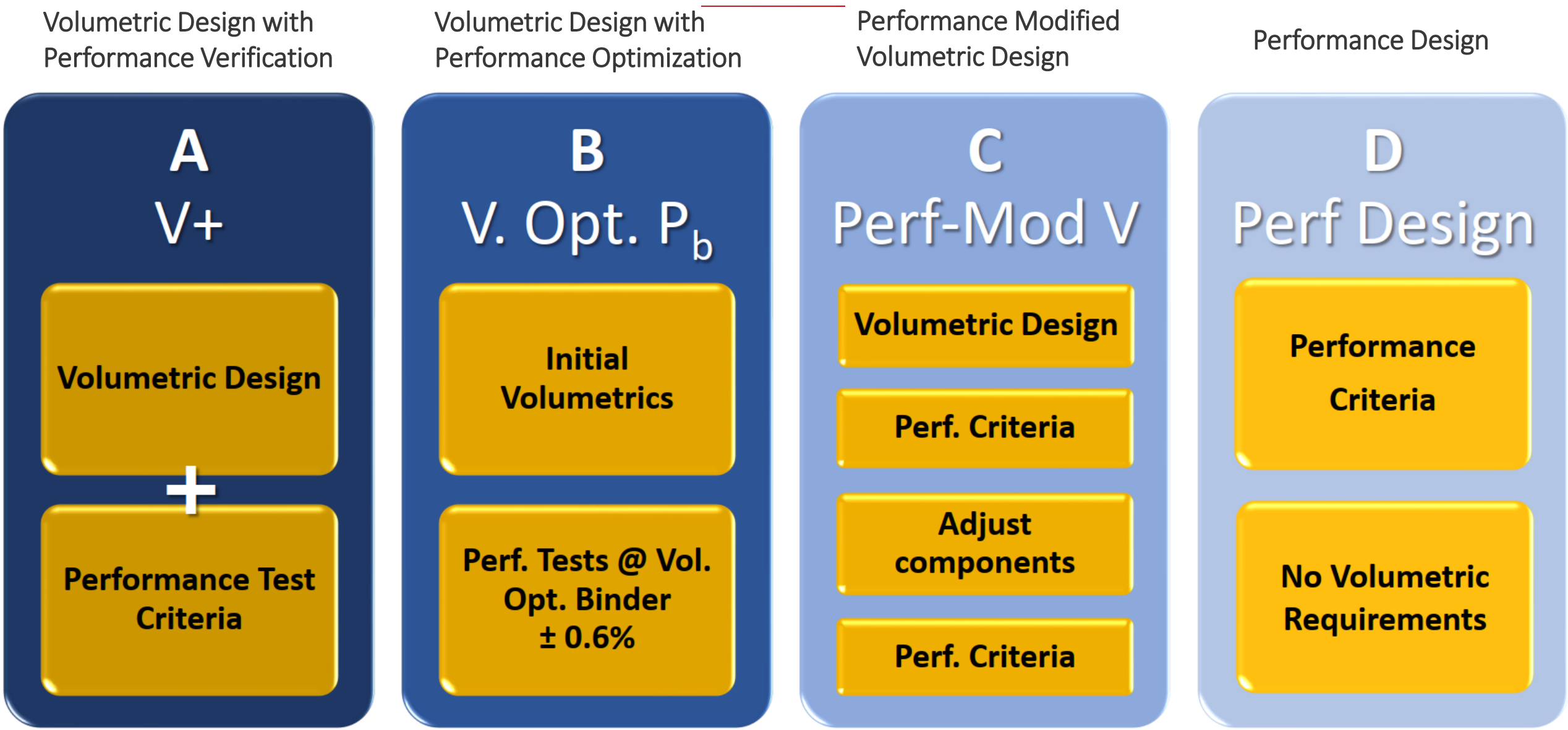
The task force defined balanced mix design (BMD) as **“asphalt mix design using performance tests on appropriately conditioned specimens that address multiple modes of distress taking into consideration mix aging, traffic, climate, and location within the pavement structure.”**

(HI)STORY ABOUT
WHY

...there is no way of knowing if these materials help or hurt



BMD APPROACHES



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APPROACH A

- Appears the easiest from an Agency perspective
- Just adds performance testing to Superpave
- No change in consensus properties or Superpave volumetrics
- Allows current AQCs to continue to be used for acceptance

- Increases cost and time
- Iterative mix design with only option to increase mix VMA
- Limits improvements to sustainability:
  - Limits local aggregate
  - Limits RAP and other recycled materials
  - Increases carbon footprint of mix design

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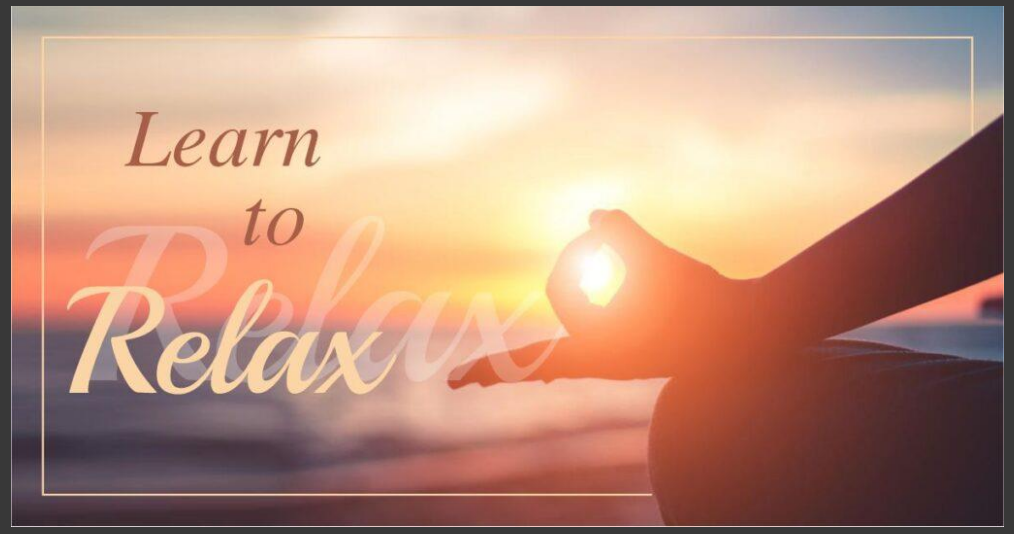
APPROACH B

- Easy from an Agency perspective
- Just adds performance testing to Superpave
- Only binder content can be adjusted
- No change in consensus properties
- Air void and VFA criteria must be relaxed
- Allows current AQCs to continue to be used for acceptance, with a shift in air voids target



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APPROACH C

- Volumetric criteria and consensus properties may be relaxed or eliminated as long as performance test criteria are satisfied
- Mix designers have the freedom to:
    - Utilize a binder grade of their choice
    - Alter the gradation
    - Increase utilization of recycled materials
    - Use other mix additives (recycling agents, fibers, innovative materials)

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APPROACH D

- No criteria for volumetric or consensus properties
    - They can still be used as a guide
- Only the performance test criteria must be satisfied
- Mix designers have the freedom to:
    - Utilize a binder grade of their choice
    - Alter the gradation
    - Increase utilization of recycled materials
    - Use other mix additives (recycling agents, fibers, innovative materials)

BMD BENEFITS

- Perfomance-based tests correlate well to the field performance
- BMD tests can extend the lifespan and longevity of asphalt
- BMD tests can be run on production asphalt samples in a timely manner

- BMD tests enable and encourage asphalt contractors to think outside the box
- Allows for responsible use of locally available materials and asphalt recycled materials

COST-SAVING

- BMD offers a platform for asphalt contractors to pick and chose from variety of available mix designs
- Allows selection of most cost-effective solution in a low-bid environment

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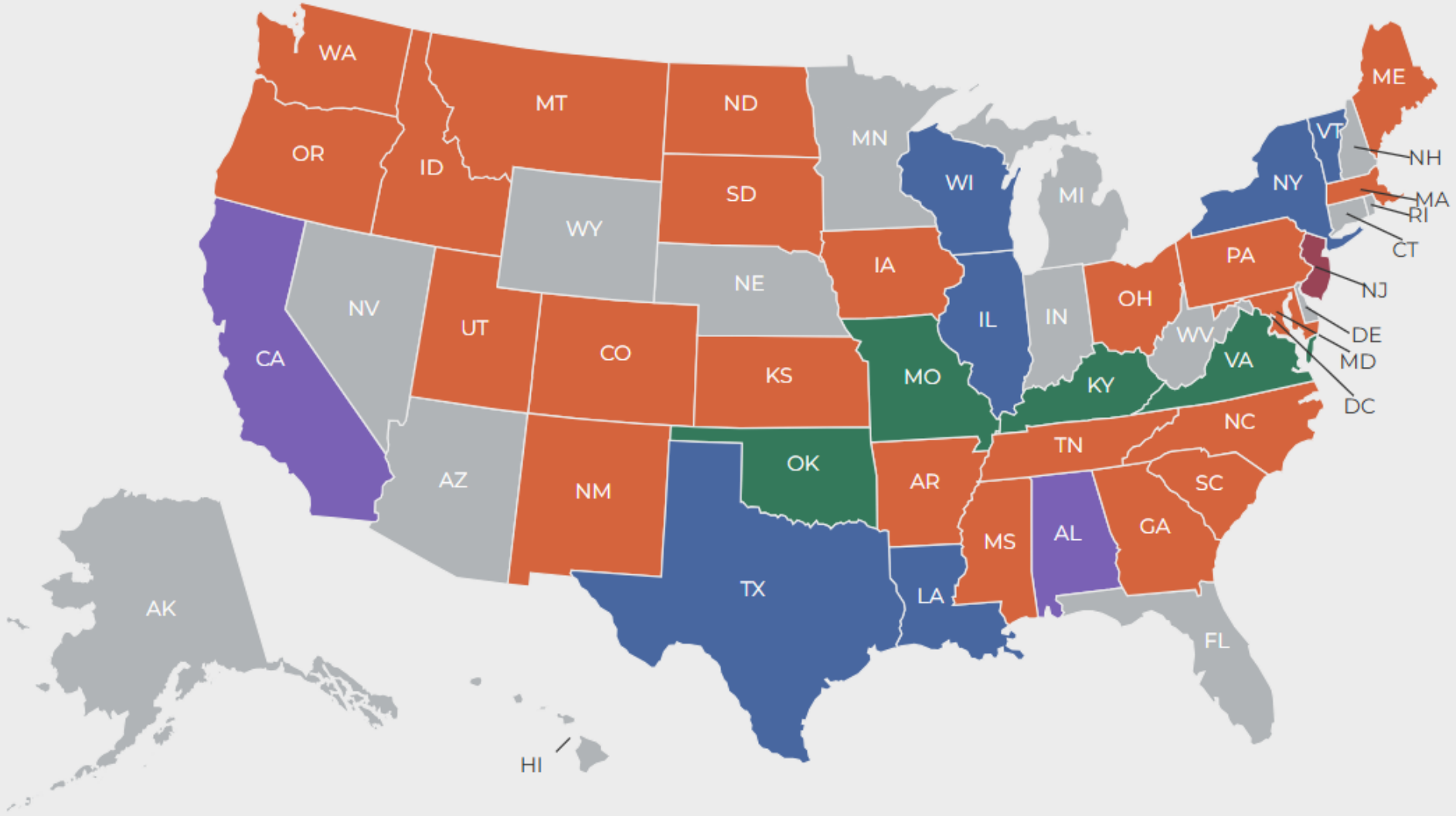
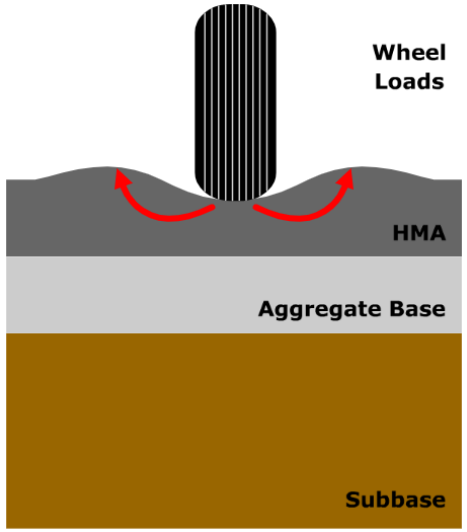
STATE HIGHWAY ADMINISTRATIONS (SHAS)

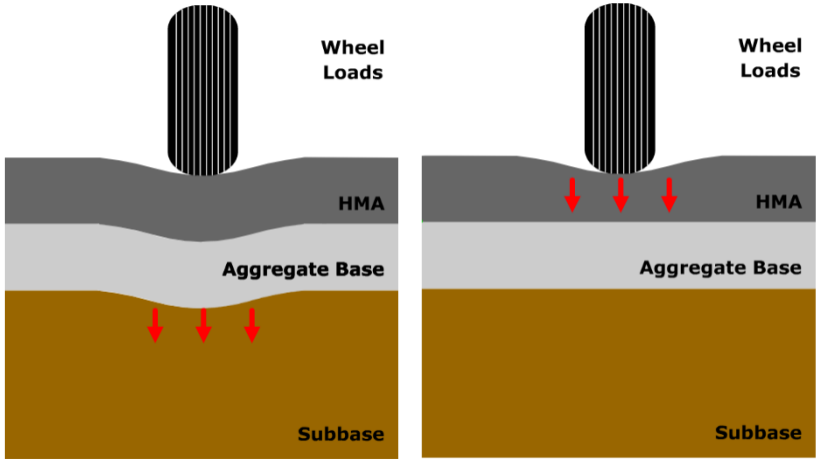


- APPROACH A - VOLUMETRIC DESIGN WITH PERFORMANCE VERIFICATION
- APPROACH A AND B
- APPROACH B - VOLUMETRIC DESIGN WITH PERFORMANCE OPTIMIZATION
- APPROACH C - PERFORMANCE-MODIFIED VOLUMETRIC DESIGN
- PRE-IMPLEMENTATION

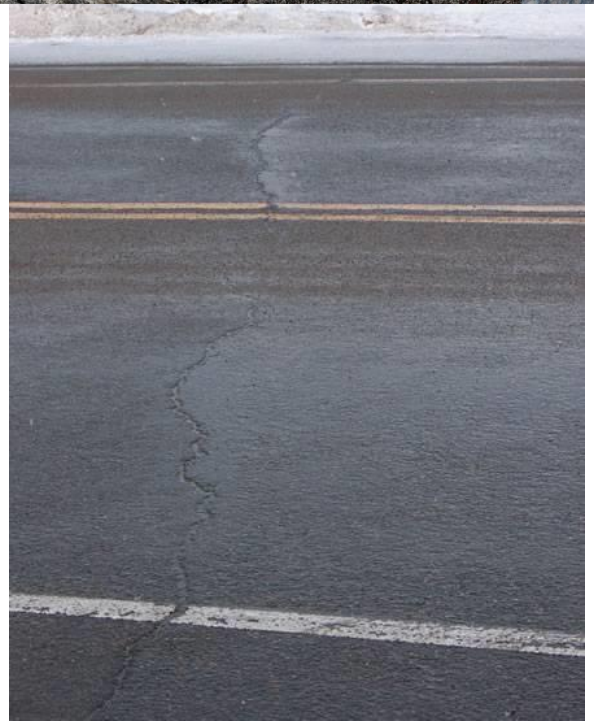
COMMON ASPHALT FAILURE TYPES

RUTTING





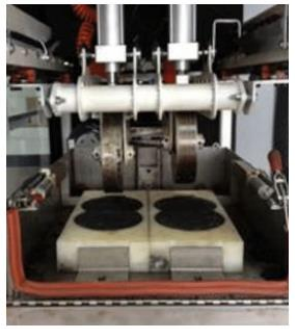
CRACKING



MOISTURE DMG

BMD PERFORMANCE TESTS

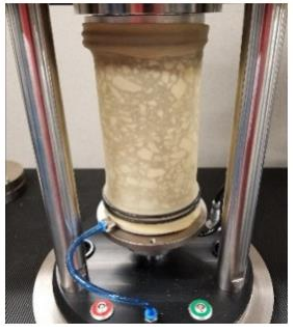
RUTTING



ASPHALT PAVEMENT ANALYZER

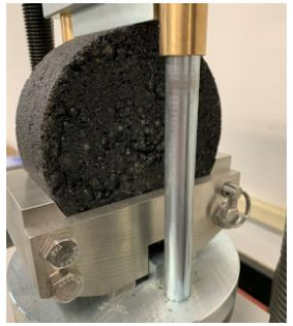
FLOW NUMBER TEST

HAMBURG WHEEL-TRACKING TEST



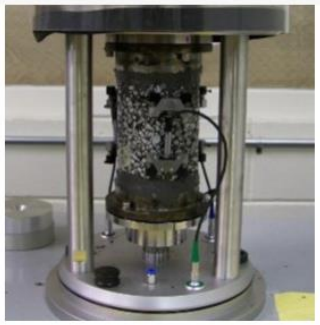
STRESS SWEEP RUTTING (SSR)

HIGH TEMPERATURE INDIRECT TENSION (HT-IDT)

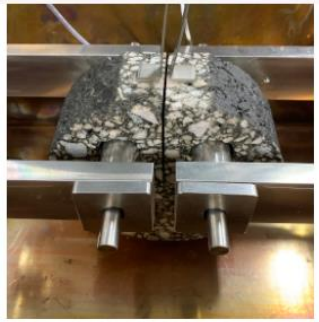


RAPID SHEAR RUTTING TEST (IDEAL-RT)

CRACKING



DIRECT TENSION CYCLIC FATIGUE TEST



DISC-SHAPED COMPACT TENSION TEST

IDT CREEP COMPLIANCE AND STRENGTH TEST

FLEXURAL BENDING BEAM FATIGUE

ILLINOIS FLEXIBILITY INDEX TEST (I-FIT)

OVERLAY TEST

INDIRECT TENSILE ASPHALT CRACKING TEST (IDEAL-CT)

SEMI-CIRCULAR BEND TEST (LOUISIANA METHOD)

NFLEX FACTOR

MOISTURE DMG

HAMBURG WHEEL-TRACKING TEST

TENSILE STRENGTH RATIO

WE’RE ALREADY THERE

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PAVETEST

MATEST
INNOVATIVE. GLOBAL. MANUFACTURER.

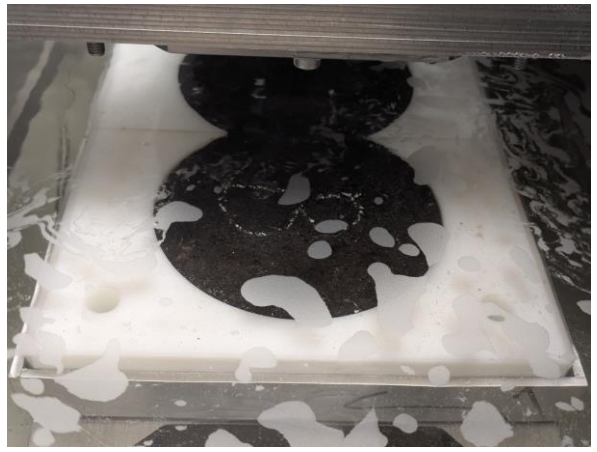
SIMPLE TEST METHODS

Rapid Shear Rutting Test (IDEAL-RT)

(surrogate for Hamburg)

Indirect Tensile Asphalt Cracking Test (IDEAL-CT)

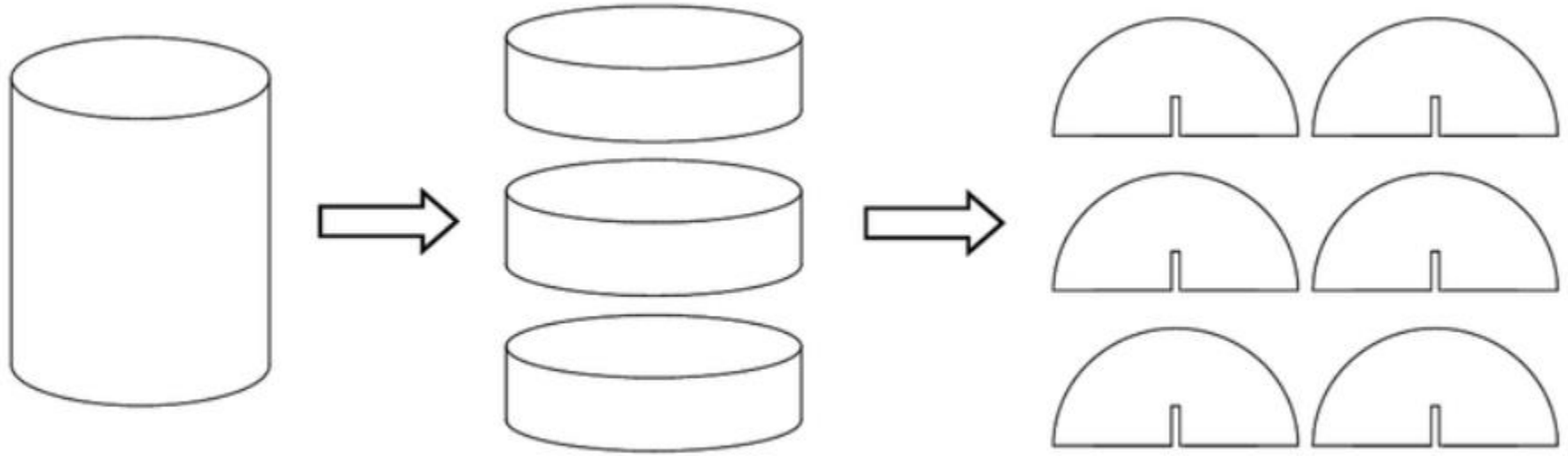
(surrogate for I-FIT)

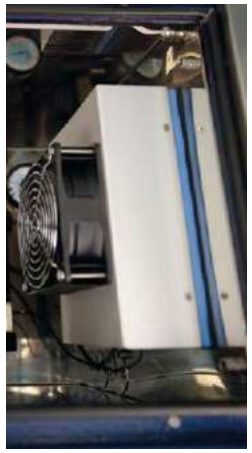


Hamburg Wheel-Track Test in Air or Water

COMPLEX TEST METHODS

Illinois Flexibility (I-FIT)



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