

# Improving the Quality of Asphalt Pavement by Incentivizing Innovation

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3/4/25



# Unified Voice



**Mission Statement:**  
Champion,  
Support, and  
Promote Quality  
Asphalt  
Pavements

- Core Pillars:**
- Innovation
  - Collaboration
  - Education









Welcome to Hey NAPA

## What asphalt pavement questions can I answer for you?

I've been trained on hundreds of NAPA publications and have broad general knowledge of asphalt pavement topics. Ask me anything that you'd like and I'll do my best to provide a concise answer and point you to additional resources.

**What will the pavement of the future look like?**

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# www.HeyNAPA.com

- The pavement of the future is expected to incorporate a variety of **innovative technologies** and **sustainable practices**. Here are some key trends and features that are likely to define future pavements:
  - Perpetual pavements surface renewal only
  - Sustainable materials CR, RAP, RAS, GTR, etc.
  - Porous & permeable pavements water, heat
  - Warm mix asphalt (WMA) savings in \$, EPDs
  - Smart pavements health, traffic, environment
  - Reflective & photocatalytic materials
  - Energy-harvesting solar, mechanical
  - Enhancements in safety friction, noise
- Future pavements will prioritize **sustainability**, **durability**, and **functionality**, leveraging advances in materials science, design, and technology to meet evolving transportation demands and environmental challenges.



# Specifications

- Ensure performance for taxpayers (agencies)
- Streamline the testing/design process (workforce)
- Create opportunities for innovation (contractors).





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**How can we incentivize innovation to improve the quality of asphalt pavement?**



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# HeyNAPA on Incentivizing Innovation

- Incentivizing innovation can lead to significant improvements in **quality**, **performance**, and **sustainability** of asphalt pavement. Here are some effective strategies to encourage innovation:
  - Strategic project funding
  - Performance based contracts
  - Recognition and awards
  - Regulatory support for change
  - Collaboration and partnerships
  - Education and training
  - Pilot projects with shared risk(s).





# www.NCAT.us

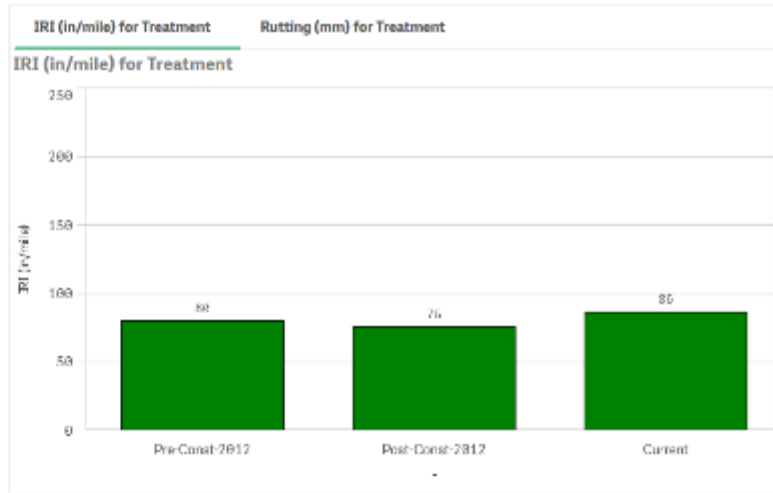
**Treatment** [Filter] [Close] [Check]

- Virgin thinlay with PG67-22
- Virgin thinlay with PG67-22 on 100% foamed recycle base
- Virgin thinlay with PG76-22
- Ultra thin bonded surface course
- 50% RAP thinlay

**Condition** [Filter] [Time]

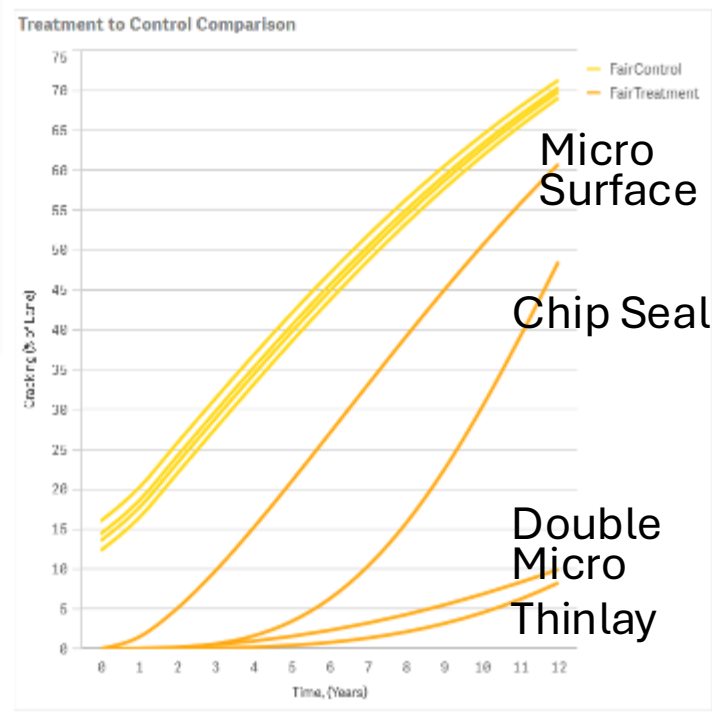
- Fair
- Good
- Poor

**Treatments Location (Google Maps)**



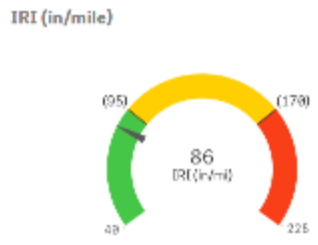
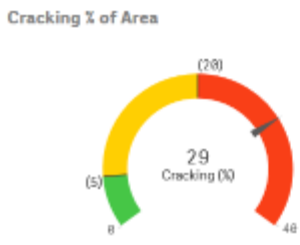
Time to Poor (Control)      Crack Reduction (Average)      Time to Poor (Treatment)

**1.1**      **32.7**      **6.5**



Overall Section Condition

**FAIR**



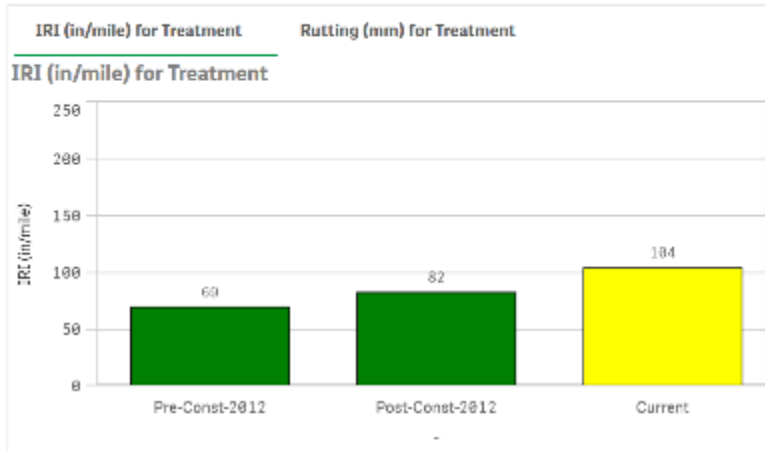
# www.NCAT.us

...

- Virgin thinlay with PG76-22
- Ultra thin bonded surface course
- 50% RAP thinlay** ✓

- Fair** ✓ 0.0
- Good 0.5
- Poor 1.0

Treatments Location (Google Maps)



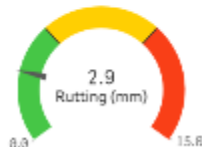
Overall Section Condition

FAIR

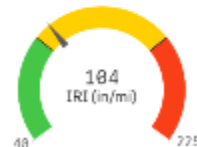
Cracking % of Area



Rutting (mm)

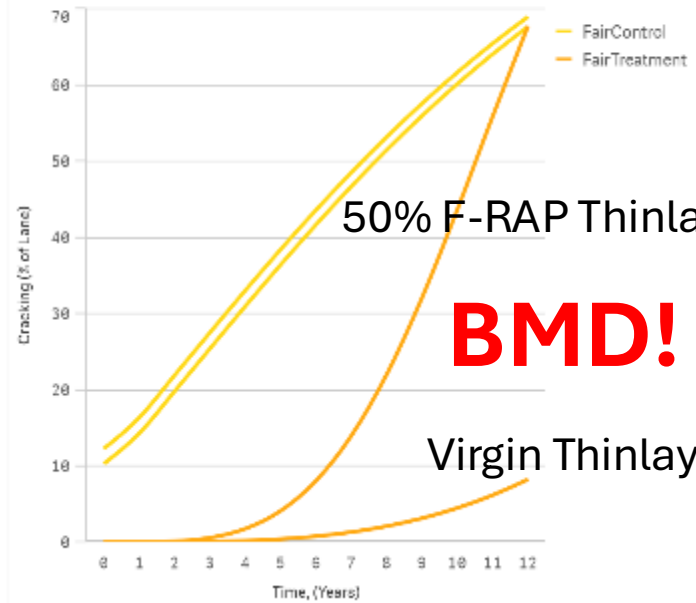


IRI (in/mile)



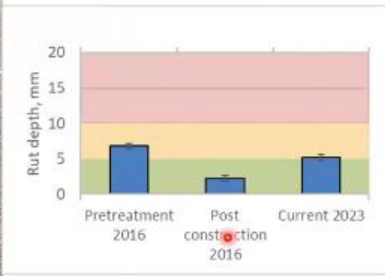
Time to Poor (Control) **1.6**      Crack Reduction (Average) **31.5**      Time to Poor (Treatment) **7.5**

Treatment to Control Comparison



# Healthy ThinLays on 70<sup>th</sup> Street at MnROAD

Control (Thinlay)  
 Pretreatment: Poor  
 @ Year 4: 24%



Parameter	Value	Rating	Overall Condition
Cracking, %	24	POOR	FAIR
Rutting, mm	5	FAIR	
IRI, in/mi	122	FAIR	



# #BuzzOnAsphalt

- Legacy Marshall/Hveem volumetric designs tested for stability
- Practical tests for quality control useful for rapid mix designs
- Dirty stockpiles and mix “fixes” with low-cost liquid asphalt
- Superpave designs with enhanced aggregate quality/blends
- Implementation with virgin aggregates, mostly neat asphalt binders
- Increasing understanding of specification compliance and cost
- Quadrupling cost of liquid asphalt, increasing use of RAP, RAS, etc.
- Need to account for both quantity and quality of effective binder.



# Research Perspective

- Divergence of thought as product of academic process
- Funnel is upside down, doesn't iterate to most practical answer(s)
- Theoretically elegant solutions difficult/impossible to implement
- Superpave Shear Tester <sub>SST</sub> → Asphalt Mixture Performance Tester <sub>AMPT</sub>
- Must start in the field and work backward to specifications
- Quality control tools also used to rapidly develop mix designs
- Binder contribution from RAP is not 100 percent, also not constant.

# Agency Perspective

- Desire to be good stewards of taxpayers' resources
- Resistance to scrapping old specifications when change occurs
- Tendency to increase specification complexity over time
- Push as much uncertainty as possible onto the contractor
- Thought experiment to bid and build profitable (legacy) jobs...
- Bidding against others who may exploit specification weaknesses
- BMD takes twice as long as volumetrics (plant settings)
- Compliance with federal quality assurance requirements (PWL).

# Industry Perspective

- Rapid development of alternative mix designs is essential
- Need to know production specification compliance very quickly
- Risk uncertainty always results in higher bid prices
- RAP, RAS, GTR, plastic, rejuvenators, fibers, dryers, curing silos,...
- Growing number of levers to pull and dials to turn
- Recipe specifications do not leave room for innovation
- Excessive component testing may be useful, but impractical
- Specify mix quality and provide volumetric space for change.

# Challenges for Specifications (Solutions)

- BMD takes twice as long as volumetrics (plant settings)
- Sample quality, temperature/time in oven affect BMD (experience)
- Quality assurance must recognize reheating effect (all pills together)
- Mix rejuvenators must prove long-term benefit (startup critical aging)
- Where to set production BMD requirements (risk avoidance)
- Short-term aging should match the plant (all plants are unique)
- Turning a triangle into a square (relax volumetric requirements)
- Voids cannot collapse else uncertain meaning of BMD (“ $N_{ini}$ ”).



# Utah HiMod as Practical Example

- Utah DOT trial project with Staker Parson at port of entry
- 5-7 percent SBS, low gyration level, 1 percent air voids design
- Extensive vetting in the laboratory by Utah DOT for confidence
- No rutting, cracking, flushing, or bleeding after millions of ESALs
- Converted district(s) from concrete to asphalt, replaced SMA
- \$200 million savings on \$2 billion I-15 work with rubblization
- Mixes would be unacceptable with legacy volumetrics.

# Missouri Wor

- Background and o
- Perpetual asphalt
- HiMod as ThickLay
- Lane additions wit
- Strategically incre
- Stabilization for im
- Panel discussion v

**MAPA** Missouri Asphalt Pavement Association

673 followers

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It's a great day to host an innovative asphalt pavement strategies workshop! Lots of conversation on tools and innovations available for design-build teams and completing projects. A special thanks to our expert speakers from [Asphalt Pavement Alliance](#), [Asphalt Institute](#), and [National Center for Asphalt Technology at Auburn University](#).

**#BuzzOnAsphalt**

Learn more at [www.moasphalt.org](http://www.moasphalt.org).



ASPHALT INNOVATION  
& IMPLEMENTATION  
WORKSHOP



1 to 3:00 PM

rson (UDOT)

enderfer (VDOT)

Buzz Powell

issippi Buzz for Griffin Sullivan

# Industry... Incentivized Innovation ...Agency

- $V_{beff}$  quantity & quality
- Volumetrics still matter!
- Bailey Method for quantity
- RAP stockpile practices
- Rheology for quality, but...
- Simple RAP impact option
- Simulate YOUR plant aging
- Critically aged rejuvenators
- “QC” BMD proof testing

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- BMD quality assurance program
- Allow quality to drive RAP content
- Make all samples at the same time
- Careful sample storage/handling
- Rapid quality control testing<sub>4 hours</sub>
- Plant settings between BMD tests
- Startup critical aging, not after
- Limits from PMS, IDEAL<sub>CT</sub> always high
- PWL option with legacy tests

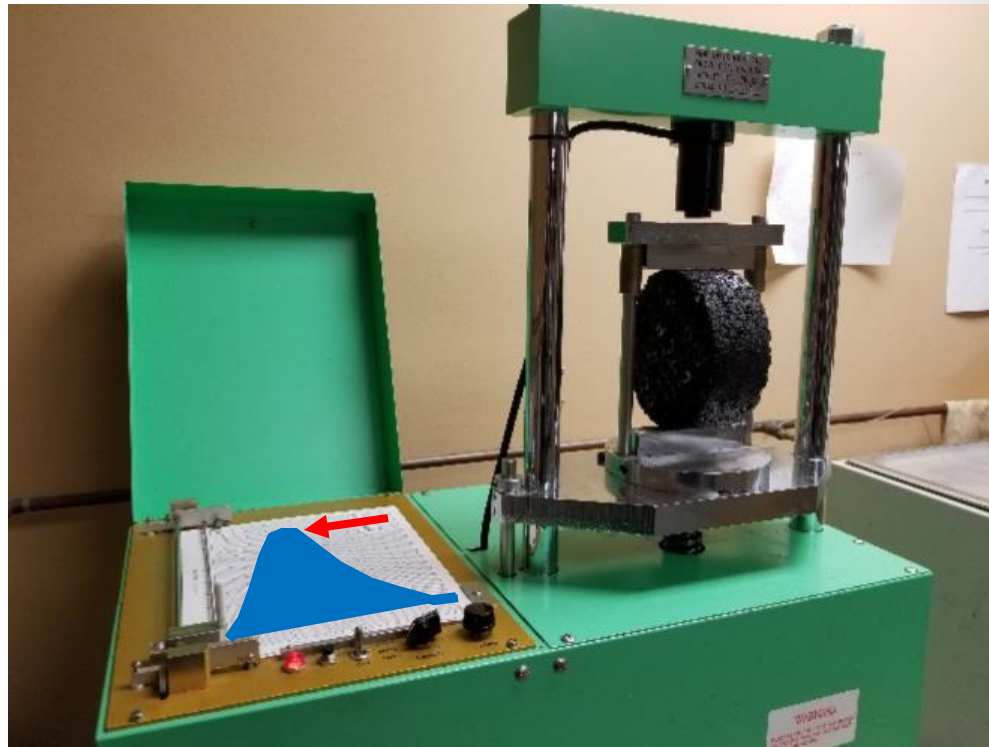
# “Simple BMD” in Alabama

- <https://www.ncat.us>
- Publications
- NCAT Newsletter
- Spring 2021
- Volume 33
- Number 1
- Page 6.





# Practical and Rapid Test for Rutting and Cracking



# Simple BMD Specification for Alabama Counties

- Mix design
- ALDOT-249
- 35 percent
- From truck
- Mass to p
- IDEAL-CT
- CT-Index a
- Repeat te

Hot asphalt plant mix {3/8"(9.5MM), 1/2"(12.5MM), and 3/4"(19MM) maximum aggregate sizes} in quantities as requested through August 31, 2020. Materials to be in compliance with Section 424 of the State of Alabama Highway Department Standard specifications for Highways and Bridges, 2018 Edition, with the exception that production mix volumetric testing/frequencies using Ndes samples are to be replaced with mix performance testing/frequencies using height compacted samples. ASTM D8225 (replacing the word "deformation" with "displacement" in Section 6.1.1) will be run at 77F to ensure average CT<sub>Index</sub> values equal or exceed 50 at intermediate temperature to prevent cracking. Testing will be repeated at 122F on identically prepared samples to ensure average indirect tensile strength at high temperature equals or exceeds 17 psi to prevent rutting. Mix proportions necessary to satisfy performance results will be established via test strip. Mix performance testing will be run within the first 100 tons of shipped mix each day, and testing will be repeated if mix is still being shipped after 5 hours and the total shipped tonnage for the day exceeds 500. Failing results will necessitate retesting. A second set of failing results will necessitate a new test strip to reestablish mix proportions. All mixes (regardless of maximum aggregate size and placement layer) can contain up to 35 percent reclaimed and recycled material and specified virgin aggregate properties (with the exception of minimum bulk specific gravity, absorption, deleterious materials, LA abrasion, and carbonate stone limitations for coarse aggregates and minimum bulk specific gravity and sand equivalency for fine aggregates) may be waived provided all stockpiles meet the requirements of ALDOT-249 and mix performance testing results exceed minimum values. **In no case can recycled asphalt shingles be used in the mix.** Price per ton (less than 75 tons, from 75 to 249 tons, from 250 to 499 tons, from 500 to 999 tons, and 1000 tons or more) in place, including tack coat, on an existing roadway surface and leveling. Price to include all materials, labor, and equipment required to haul, spread, clean roadway and compact the asphalt material in place in compliance with applicable sections of the specifications.

# Takeaways

- Utilize HeyNAPA as personal research assistant, caution with ChatGPT
- Mix performance from both quality and quantity of effective binder
- Legacy volumetrics only characterize quantity of effective binder
- Volumetric principles are great for developing mix designs, but...
- Volumetrics are inadequate for specifications/enforcement
- Think outside the box(!), specify quality with BMD, relax volumetrics
- BMD is practical/ready<sub>C-D</sub> for both rapid mix design & quality assurance
- **Safe, sustainable asphalt pavement at lowest possible life cycle cost!**

# #BuzzOnAsphalt

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