



Utah Hi-Mod Asphalt MnDOT Research Perspective

Michael Vrtis, P.E., Ph.D. | Assistant MnROAD Operations Engineer

- Started in asphalt in 2010 in Utah; worked on HMA mix design using native oil sand with UDOT and Uintah County



- Began at MnROAD in 2017



MnROAD- Minnesota Road Research Facility



MnROAD's Mission Statement (Michael's Version)

- *Our goal is to provide safe, long-lasting pavements that cost less to the taxpayer and the environment.*



What is Utah Hi-Mod Asphalt?

- Hot Mix Asphalt with:
 - Binder with high polymer modification and elastic recovery
 - Mix design at 1% air voids
 - Placed around 96%+ Gmm
 - Overlay and thick-lift applications
 - Different than HiMA;
 - Highly modified asphalt placed at conventional mix

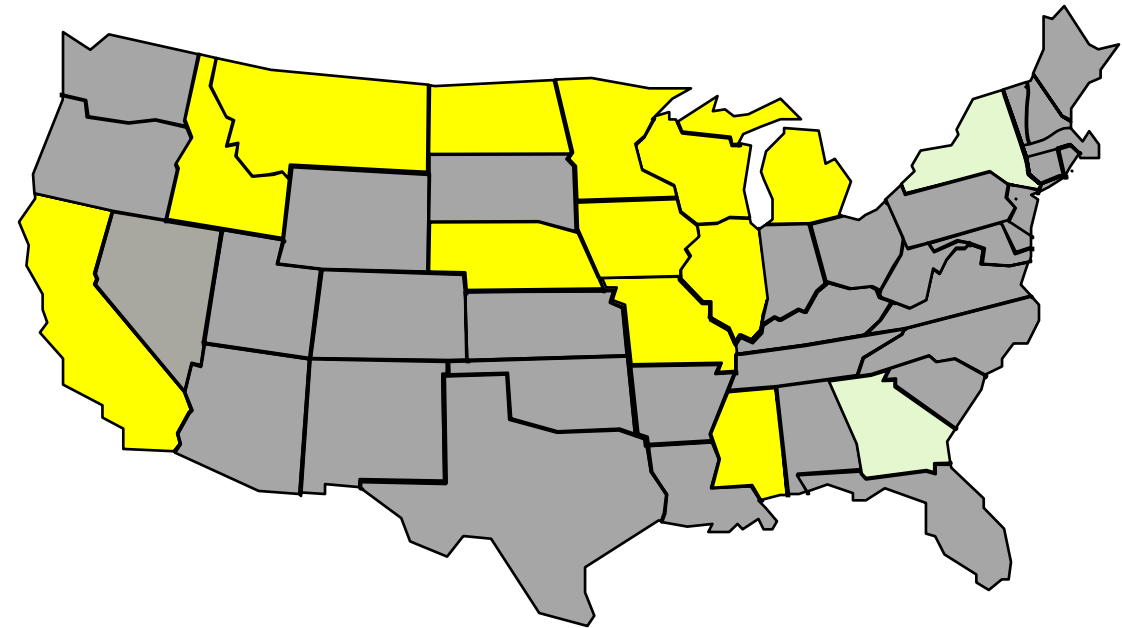


Image created using Google Gemini Imagen 3;

NRRA and MnDOT Interest

National Road Research Alliance

- **TPF-5(466) - Fee Structure / year (five years)**
 - Phase-1 complete (5 yr) – Now into Phase-2 (year 3/5)
 - 14 Full Agency Commitments (yellow)
 - \$75K /\$150K Annual Commitment
 - 12 States, Illinois Tollway, LRRB
 - FHWA is also a contributing partner
- **2 ICT Commitments (Green)**
 - \$25K (ICT Team only – Veta Efforts)
 - GA and NY
- **~85+ Associate membership**
 - 2K/year - Associations, Industry, Consultants, Universities
 - Upper Great Plains Transportation Institute





Questions or Comments?

NRRA and MnDOT Interest

- Montana Department of Transportation (MTD) trial project in 2025
- More MTD projects coming in 2026 based on 2025 lessons learned
- Idaho has 2026 project plan
- North Dakota and others have expressed interest

Montana 2025 Experience

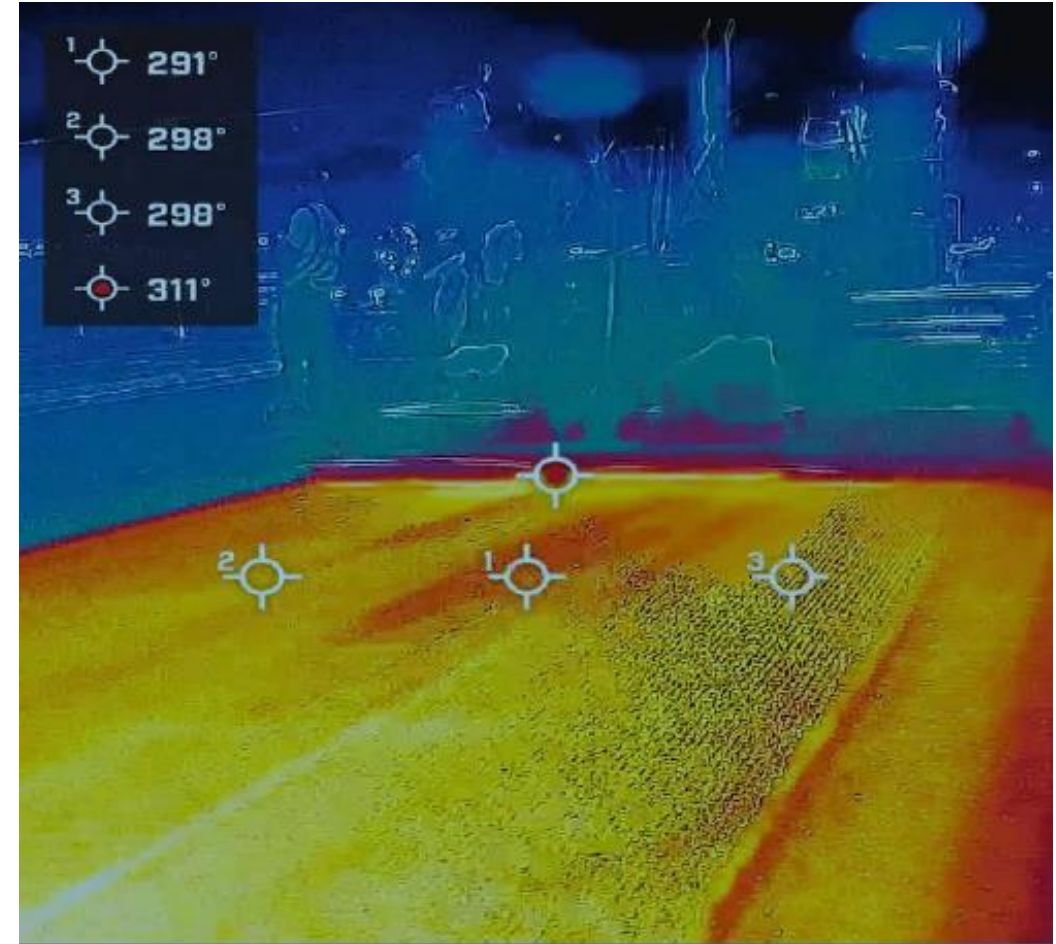
- Mill + overlay + improvement=
- \$8.5 million
- 19th Avenue in Bozeman, MT
- From I-90 to US 191
- 2.6 miles



Montana 2025 Experience

Montana HiMA Spec

- 100% manufactured aggregates
- Hydrated lime
- 15% RAP; no shingles
- Design 1.0%-1.5% air with min. 6.0% binder
- Field = 96% Gmm
- Hamburg Wheel at 50 C



Binder HiMA Specifications

Special Provision 27. Highly Modified Asphalt Mix

B.2) Furnish a highly modified asphalt binder in accordance with AASHTO M 320 Grade PG 76-34 with the following modifications|

| PG76-34 Highly Modified | | |
|--|-------------------------------|----------------------|
| <u>Original Binder</u> | | |
| Dynamic Shear Rheometer, AASHTO T 315 | @ 76° C, G*, kPa | 1.30 Min. |
| | @ 76° C, phase angle, degrees | 70.0 Max. |
| Rotational Viscometer, AASHTO T 316 | @ 135° C, Pa.s | 3 Max. |
| Flash Point, AASHTO T 48 | °C | 260 Min. |
| <u>RTFO Residue, AASHTO T 240</u> | | |
| Dynamic Shear Rheometer, AASHTO T 315 | @ 76° C, G*/sinδ, kPa | 2.20 Min. |
| Elastic Recovery, AASHTO T 301 mod (a) | % | 90 Min. |
| <u>PAV Residue, 20 hours, 2.10 MPa, 100 °C, AASHTO R 28</u> | | |
| Dynamic Shear Rheometer, AASHTO T 315 | @ 25° C, kPa | 5,000 Max. |
| Bending Beam Rheometer, AASHTO T 313 | @ -24° C, S, MPa | 300 Max. 150 Min. |
| | @ -24° C, m-value | 0.300 Min. |
| Delta Tc from additional BBR test, ASTM D 7643 | @ -30° C | -1.0 Min. |

Montana 2025 Experience

- WMA Additive as compaction aid
- Produced at 330-350 F
- Appearance = mat black,
- Lessons learned = Contractor achieved density and volumetric incentives but...
- Production rate at plant slowed from 400 ton/hr to 200 ton / hr due to high binder viscosity



Potential Issues for Hi-MOD in Minnesota

- Contractor and Supplier experience and dedication are essential
 - UAPA was behind the scenes connecting DOT, suppliers, and contractors in Utah
 - MnDOT and MAPA can do this
- MN winter and deep freeze
- “Blisters” in Chip-seals and STRATA
- Natural sand versus manufactured sand
- Lime in Utah mix
- Others???



MnROAD Hi-MOD Test Section 2027

Michael's Wish List

- **1" overlay in reflective cracking scenario**
- **2" overlay in reflective cracking scenario**
- **4" Thick lift test section**
- **6" Thick lift test section**
- **1" overlay on bad PCC**

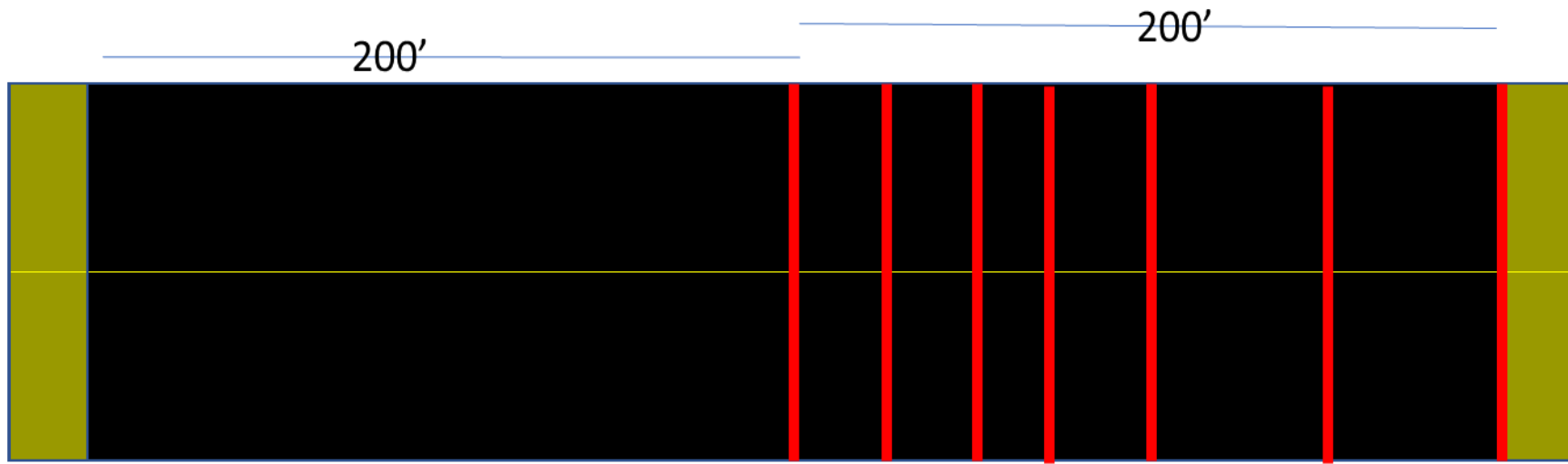
*Image created using Google Gemini;
Prompt: "Asphalt Engineer asking Santa"*



Hi-MOD Research Needs

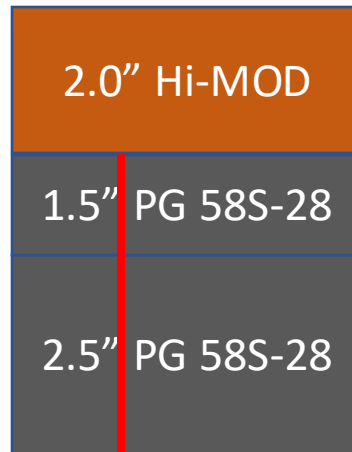
- Field Performance in MN – Does it work here?
- Construction - Can it be supplied, produced, and place here?
- Laboratory Testing – How does it compare to other MN mixes?
- Structural Testing – MnPAVE design inputs, stress/ strain reduction = thickness optimization

MnROAD Reflective Cracking Challenge

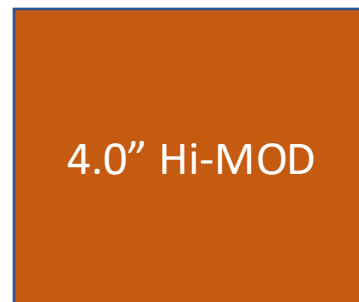
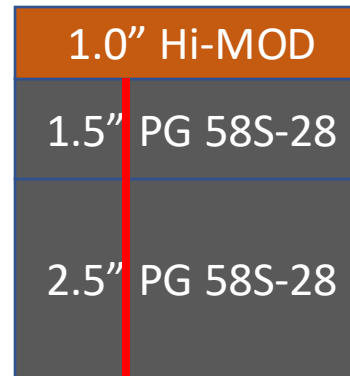


- Paved 450' per section
- 200' reflective cracking
- 200' conventional

25' 25' 25' 25'



50' 50'



Utah Hi-MOD for MnDOT - Summary

- MnDOT Research and MnROAD are interested in Utah Hi-MOD Asphalt
- “Peaked interest” of MnDOT Bituminous Office and District Material Engineers
- Will be deliberate with bringing to MN for evaluation
- Need MAPA Support (supplier, producer, contractor, equipment suppliers)
- Benefits from Utah experience can not be ignored;
- Utah Hi-MOD could be great to for MN asphalt
 - Or it could fail, and we will know why it does not work here.

Questions???

Feedback



Thank You!

Michael Vrtis, P.E., Ph.D

firstname.lastname@state.mn.us

555-555-5555