

# MnROAD/NCAT Pooled Fund



- ▶ Development of a National Cracking Test
- ▶ National Pavement Preservation Treatment Study

Slides Courtesy of MnDOT as presented at MAPA Contractor's Workshop 2016

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# Cracking Performance Study & Pavement Preservation

- ▶ Cracking Group
  - IL, MI, MN, NY, WI,
  - 3 yrs at \$210,000
- ▶ Preservation Group
  - **CO**, IL, MI, MN, NY, WI,
  - 3 yrs at \$120,000

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# Cracking Performance Study- Objectives and Goals

- ▶ Validate laboratory cracking tests:
  - Establish correlations between test results and measured cracking in real pavements
- ▶ Evaluate various tests based on:
  - Criteria related to field performance
  - Practicality of the tests for mix design verification and QC testing
  - Ability to accommodate recycled materials, new and future additives, and mix combinations
  - Cost-effectiveness

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## Existing MnROAD Pavement Sections

Recycled Unbound Base, Warm Mix Asphalt				Low Temperature Cracking, Fractionated RAP			WMA, taconite
16	17	18	19	20	21	22	23
5" WM 58-34	5" WM 58-34	5" WM 58-34	5" WM 58-34	5" 58-28	5" 58-28	5" 58-34	5" WM 58-34
12" 100% recycle PCC	12" 50% RePCC 50% Class 5	12" 100% RAP	12" Class 5	12" Class 5	12" Class 5	12" Class 5	12" Mesabi Ballast
12" Class 3	12" Class 3	12" Class 3	12" Class 3	12" Class 3	12" Class 3	12" Class 3	12" Class 3
7" Select Gran	7" Select Gran	7" Select Gran	7" Select Gran	7" Select Gran	7" Select Gran	7" Select Gran	7" Select Gran
Clay	Clay	Clay Chip Seal July 2014	Clay Chip Seal July 2014	Clay 30% Non Fract RAP	Clay 30% Fract RAP	Clay 30% Fract RAP	Clay
Sept 08	Sept 08	Sept 08	Sept 08	Sept 08	Sept 08	Sept 08	Sept 08
500	500	500	500	500	500	500	500

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## Existing MnROAD Pavement Sections

Recycled Unbound Base, Warm Mix Asphalt				Low Temperature Cracking, Fractionated RAP			WMA, taconite
16	17	18	19	20	21	22	23
[Red Hatched Area]							
12" Class 3	12" Class 3	12" Class 3	12" Class 3	12" Class 3	12" Class 3	12" Class 3	12" Class 3
7" Select Gran	7" Select Gran	7" Select Gran	7" Select Gran	7" Select Gran	7" Select Gran	7" Select Gran	7" Select Gran
Clay	Clay	Clay Chip Seal July 2014	Clay Chip Seal July 2014	Clay 30% Non Fract RAP	Clay 30% Fract RAP	Clay 30% Fract RAP	Clay
Sept 08	Sept 08	Sept 08	Sept 08	Sept 08	Sept 08	Sept 08	Sept 08
500	500	500	500	500	500	500	500

MAPA Contractor's Works

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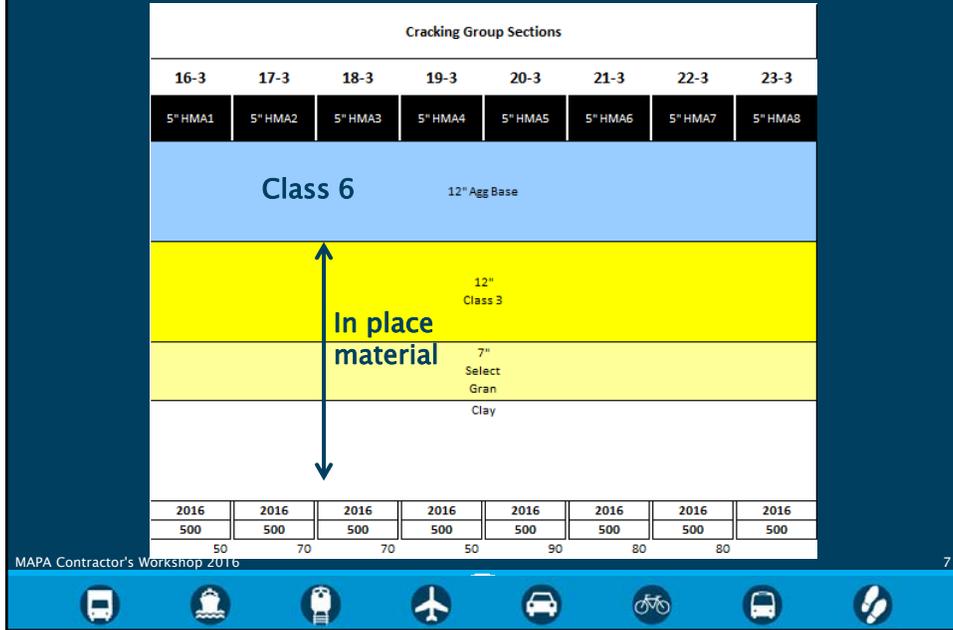
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# Proposed MnROAD Pavement Sections



MIX DESCRIPTION	MIX DESIGNATION	BINDER (SP Spec)	POLYMER	Crack Potential
Mix w/ highly mod. Asphalt (<15%)	PG 58V-34 @ 15/0 Control 2	PG 64-34	Yes	Low
Typical surface mix (20% max RAP)	PG 58H-34 @ 20/0 Control 1	PG 58-34	Yes	Low
Typical surface mix (20% max RAP)	PG 64S-22 @ 20/0	PG 64-22	No	Med/High
Mix w/ >30% RAP and softer AC	PG 52S-34 @ 30/0	PG 52-34	No	Med/High
Mix w/ 20% FRAP+3% RAS	PG 58H-28 @ 20/3	PG 64-28	Yes	Med/High
Typical surface mix (20% max RAP)	PG 64S-22 @ 20/0	PG 64-22	No	High
Mix w/ 30% FRAP+5% RAS	PG 64S-22 @ 30/5	PG 64-22	No	High
TBD				

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## Cracking Modes and Tests

- ▶ Types of cracking to be investigated
  - Low temperature a “given”
  - Top-down very likely
  - Fatigue also possible
- ▶ Production mixture testing
  - Low temp: SCB-IL, DCT-MN, SCB-MN
  - Top down, fatigue: Overlay Tester, BB Fatigue
  - ME Design: E\*
  - Additional: BBR mix beams (related study)
  - Loose mix, cores
  - Fracture energy test data analysis: both FE and FI

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## Project Details

- ▶ Letting date: late May or early June
- ▶ Asphalt mixture materials procured by Contractor
- ▶ Mix designs performed by NCAT
  - JMF provided to Contractor for production and placement

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**TPF-5(267), MnROAD/NCAT Pavement Test Tracks-  
Pavement Preservation Group Study (PG15)**



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**TPF-5(267), MnROAD/NCAT Pavement Test Tracks-  
Pavement Preservation Group Study (PG15)**

**MnROAD Test Track**



MnROAD has 50 different test sections. Research is sponsored by state DOTs, Minnesota Local Road Research Board, FHWA and industry.

**NCAT Test Track**



NCAT has 46 different test sections and is sponsored for three-year test cycles by state DOT's, FHWA and industry.



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### MnROAD/NCAT Pavement Preservation Group Study (PG15)

<u>NCAT Completed Projects</u>	<u>MnROAD Completed Projects</u>
SuperPave mix design methodology refinement	Low temperature cracking model development
Warm Mix Asphalt Implementation	Warm Mix Asphalt Implementation
SMA and OGFC mix refinement and implementation	Mixture fracture energy (DCT Testing) methods
Thin asphalt overlay development (“thinlays”)	Innovative diamond grinding for better ride
Structural pavement design calibration	Stabilized Full Depth reclamation development
Reclaimed and recycled materials performance	Whitetopping validation and training
Life-extending benefit of pavement preservation	Timing of preventive maintenance



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### MnROAD/NCAT Pavement Preservation Group Study (PG15)

**Overview:**

- Pavement preservation techniques are very cost-effective when applied to the right road at the right time, with benefit-cost ratios as high as 10:1.
- Accelerated testing at MnROAD and NCAT provides unique opportunities to determine the field performance of breakthrough materials and pavement preservation concepts without the risk of failure that local and state agencies are unwilling to accept.
- Each facility has a history of evaluating the performance of pavement preservation treatments, including chip sealing, micro-surfacing, crack sealing and thin overlays.
- To address needs in both northern and southern climates, similar test sections are being developed at each facility to address national issues.
- The goal of this effort is to quantify the life extending benefits of different treatments for roadways in different stages of life/decay.



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2015 Test Track  
Conference

March 3-5, 2015



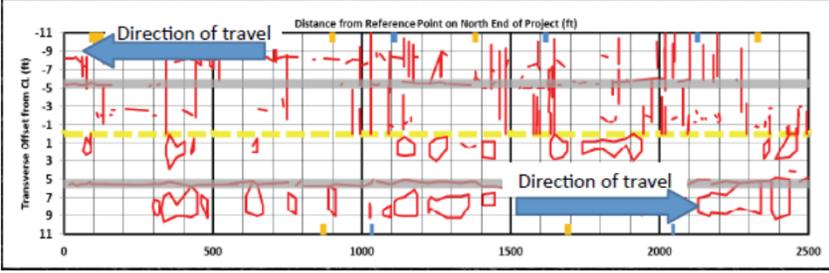


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**MnROAD/NCAT Pavement Preservation  
Group Study (PG15)**

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Distance from Reference Point on North End of Project (ft)



At NCAT Location - **23 Preservation Treatments** were built

**Varied pre-treatment pavement conditions** and performance tracked over time

Treatments now to be **tested at MnROAD site** – winter climate, plowing, deicers

<ol style="list-style-type: none"> <li>1. Rejuvenating Fog Seal</li> <li>2. Fibermat Chip Seal</li> <li>3. Control</li> <li>4. Control</li> <li>5. Crack Seal (CS)</li> <li>6. Single Layer Chip Seal</li> <li>7. CS + Single Layer Chip Seal</li> <li>8. Triple Layer Chip Seal</li> <li>9. Double Layer Chip Seal</li> <li>10. Single Chip + Microsurfacing (Cape)</li> <li>11. Microsurfacing</li> <li>12. CS + Microsurfacing</li> <li>13. Double Layer Microsurfacing</li> </ol>	<ol style="list-style-type: none"> <li>14. Fibermat Chip + Microsurfacing (Cape)</li> <li>15. Scrub Seal + Microsurfacing (Cape)</li> <li>16. Scrub Seal</li> <li>17. Distress Demo Section</li> <li>18. Fibermat Chip + HMA thinlay (HMA Cape)</li> <li>19. HMA Thinlay (PG 67-22)</li> <li>20. HMA + 100% Foamed Recycle Inlay</li> <li>21. HMA Thinlay (PG 76-22)</li> <li>22. Ultra Thin Bonded Wearing Course</li> <li>23. HMA Thinlay (50% RAP)</li> <li>24. HMA Thinlay (5% PCRAS)</li> <li>25. HMA Thinlay (High Polymer)</li> </ol>
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### MnROAD/NCAT Pavement Preservation Group Study (PG15)

**Implementation Products:** Research products in the form of reports, guidelines, specifications and practices that provide cost-effective solutions applicable to pavement preservation of Colorado highways.

**Benefits of Joining the Pooled Fund Effort:**

- CDOT will be able to leverage more effectively its research funding resources and will be treated as an equal agency partner to plan and direct the work to be done at MnROAD.
- CDOT will have immediate access to not only the results of the preservation group study but also to all other research and technical support that is available from MnROAD and NCAT.
- CDOT will save time and money through the application of cost-effective solutions resulting from the completion of pavement preservation research projects that are applicable to Colorado roads.



**Minnesota Department of Transportation**

# Pavement Preservation Study

**Objective: Quantify life-extending benefits of various treatments.**

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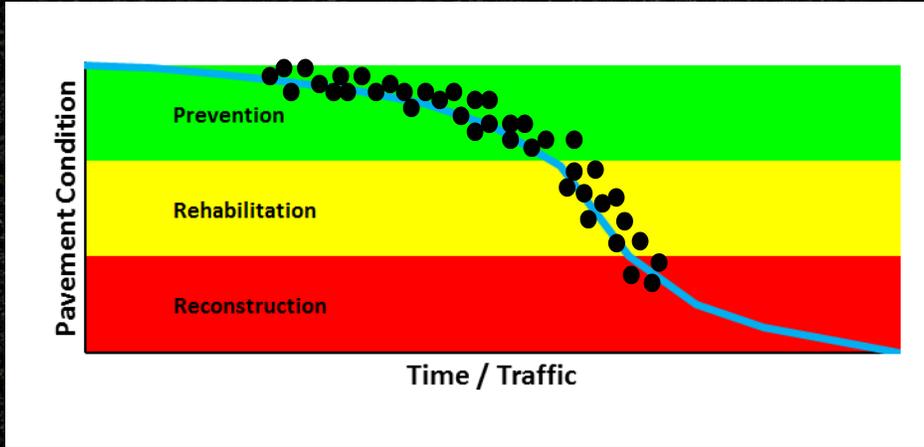
## Sample Treated Section on Lee Road 159 October 7, 2014

**Minnesota Department of Transportation**

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**National Center for Asphalt Technology**  
**NCAT**  
at AUBURN UNIVERSITY

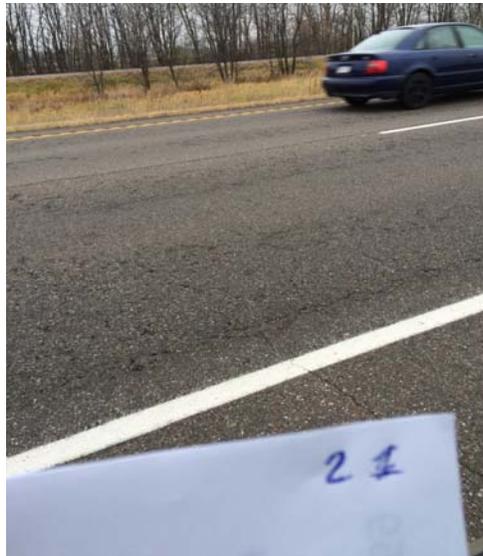
# Pavement Preservation on Lee Road 159



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## US 169



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## US 169



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## Replicate NCAT Sections

- Surface treatments
  - Fog and rejuvenating seals
  - Scrub, chip, and cape seals
  - Micro-surfacing, fibers, HiMA
  - Various combinations of the above
- Crack sealing
- **4.75 mm HMA overlays**
  - Virgin, ABR, HiMA, UTBWC
- Control sections

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# Schedule

- July 2016
- Surface treatments - Vance Bros
  - under contract with NCAT
- HMA – Determined through MnDOT bid process

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## Western and International In-Place Recycling Workshop Denver – October 19-20, 2016



Distress	Estimated Life (years)
Smoothness (IRI)	22
Permanent Deformation (Rut)	38
Fatigue Cracking	16
Transverse Cracking	> 40
Longitudinal Cracking	5
Average	24



**Thank You, WASHTO.**