Transportation Information Center thanks its partners for their support and assistance.

Pavement Management for Local Governments - Wisconsin Style

Local Roads and Local Governments in Wisconsin

- 103,329 miles of local roads
- 1,923 local governments own roads

Units of local government & Mileage

- 72 Counties 19,865 miles 17.3%
- 190 Cities 13,752 miles 11.9%
- 402 Villages 5,980 miles 5.2%
- 1,259 Towns 61,979 miles 53.9%
- Other 1,753 miles 1.5%
- State 11,766 miles 10.2%
- 1,923 TOTAL 115,095 miles 100%
What is a Pavement Management System (PMS)?

“A set of tools that can help decision makers find cost-effective strategies for providing, evaluating, and maintaining pavements in a serviceable condition.”

FHWA definition

Five Features of a PMS

1) Inventory of physical features including most recent pavement condition ratings

2) Can project the future condition of the road network based on available funds and projects selected for maintenance and improvement.

3) Charts, graphs, and maps to help communicate current conditions and proposed plan to other officials and public
Five Features of a PMS

4) Able to Create Alternative Budgets for example
   - $$ to keep road network in current condition
   - $$ to improve network pavement condition
   - Effect on network condition of less $$

5) Way to select projects based on impact on the whole network. This requires
   - a pavement deterioration model
   - a project selection priority model

Rroads and Streets Council Initiated and Championed PMS Effort

- DOT funded expansion of PASER and creation of PASEWARE due to ISTEA (1993)
- DOT funded a new local roads database (WISLR) to take advantage of mapping and new computing and database power (1995)
- Roads and Streets Council championed the idea of requiring all local governments to submit condition ratings
- Adopted in 2000, first ratings due Dec 2001

Ratings Submitted by Local Governments
Why Rate Our Roads

• Lose Funding ---- WRONG !!!
• Required by the State every 2 years
• Know the overall condition of the whole road system, not just the bad roads or the ones I drive
• Use what we learn to help decide what needs to be done this year, next year, and the year after
• Take advantage of the inventory, mapping, and budget tools in WISLR
• Better able to answer questions and explain and justify our plans

PASER & WISLR = PMS

• PASER is a visual system to rate the condition of pavements based on nationally agreed to distresses and typical maintenance treatments.
• WISLR is a state supported data base of local roads that contain a inventory of physical characteristics that accessed via the web.
• WISLR has tools that support the update the pavement inventory, analyze the condition of the pavements in the local road system, test alternative maintenance strategies and budgets, and communicate analysis and budgets through maps, graphs, charts and lists.

What’s in WISLR

2.0 What Road Data is in WISLR
Road Data Displayed by Segment

<table>
<thead>
<tr>
<th>Segment Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>20</td>
<td>Well-maintained</td>
</tr>
<tr>
<td>25</td>
<td>Unimproved Road</td>
</tr>
<tr>
<td>30</td>
<td>Graded and Drained Earth Road</td>
</tr>
<tr>
<td>35</td>
<td>Gravel Road (not oiled or graveled)</td>
</tr>
<tr>
<td>40</td>
<td>1&quot; wearing surface</td>
</tr>
<tr>
<td>45</td>
<td>Cold Mix Asphalt Pavement on Concrete</td>
</tr>
<tr>
<td>50</td>
<td>Cold Mix Resurf on Asphalt Pavement Surface + Base &lt; 7&quot;</td>
</tr>
<tr>
<td>52</td>
<td>Cold Mix Resurf on Asphalt Pavement Surface + Base &gt; 7&quot;</td>
</tr>
<tr>
<td>55</td>
<td>Cold Mix Asphalt Pavement (CMAC) Surface + Base &lt; 7&quot;</td>
</tr>
<tr>
<td>57</td>
<td>Cold Mix Asphalt Pavement (CMAC) Surface + Base &gt; 7&quot;</td>
</tr>
<tr>
<td>60</td>
<td>Hot Mix Asphalt Pavement on Concrete (HMAC on PCC)</td>
</tr>
<tr>
<td>65</td>
<td>Hot Mix Resurfacing (overlay) on Asphalt Pavement</td>
</tr>
<tr>
<td>70</td>
<td>Hot Mix Asphalt Pavement (HMAC)</td>
</tr>
<tr>
<td>75</td>
<td>Concrete Pavement (PCC)</td>
</tr>
<tr>
<td>80</td>
<td>Brick or Block Pavement</td>
</tr>
</tbody>
</table>

Instructions - Maintenance Treatment Report

MATERIAL TYPE

- Concrete: The most commonly used material for pavements, offering durability and longevity.
- Asphalt: Widely used for its ability to absorb road vibrations and reduce noise.
- Gravel: A common choice for temporary roads due to its lower cost and ease of maintenance.
- Brick: Often used in urban areas for aesthetic reasons.

TREATMENT TYPE

- Crack Filling: Used to seal cracks and prevent further damage.
- Microsurfacing: A thin layer of asphalt applied to improve surface texture and extend pavement life.
- Slurry Seal: Used to seal joints and cracks, improving pavement stability.
- Surface Dressing: A mix of asphalt and aggregate applied to improve surface texture and extend pavement life.

NOTES

- Specific maintenance strategies may vary depending on local conditions and standards.
- Regular inspections are crucial for effective maintenance.
Goal: Maintain System Serviceability At Lowest Lifecycle Cost

- A “Dual-Priority” Approach to Project Selection
  - Emphasize treating pavements in region of opportunity
  - And also the most important roads in poor or worse condition
  - Not Worst-First
Pavement Rating

Overlays & Reconstruction

Surface Treatments

Routine Maintenance

Excellent

Good

Fair

Poor

Pavement Age

Pavement Condition

Unit Cost of Treatments for 5 year Plan

The initial Cost Worksheet screen is shown below.

NOTE: the unit cost (in $/yd$^3$) for both pavement and shoulder improvement is provided for each possible pavement rating associated with the given pavement type and functional class.
Project Priority Calculation

The example below shows how to calculate a priority score for paved roadways.

<table>
<thead>
<tr>
<th>Pavement Management Priority Classification (PMPC)</th>
<th>Pavement Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Importance Points</td>
<td>Rating</td>
</tr>
<tr>
<td>Major: 100</td>
<td>6</td>
</tr>
<tr>
<td>Minor: 75</td>
<td>4</td>
</tr>
<tr>
<td>Local: 50</td>
<td>6</td>
</tr>
<tr>
<td>Low Use: 25</td>
<td>4</td>
</tr>
</tbody>
</table>

Example: PMPC = Major; Pavement Rating = 7

Raw Priority Score = Importance Points / Rank = 100 / 4 = 25

Priority Score @100 scale = 25 x 4 = 100

Five Year Plan in Spreadsheet

The following figure is a Spreadsheet Download example.
Mapped Five Year Plan by Year

A Map by Year is shown below.

- Click the Legend to show the colors associated with the budget plan year.
- Click the Close Map button located in the upper right portion on the map to return to the Budget Plan.

Five Year Plan Outcomes Summary

More about PASER

- PASER (Pavement Surface Evaluation and Rating)
  – Created by TIC for use as a planning tool
  – A visual condition rating system
  – In use since 1988
  – PASER is a simple way to rate the condition of your pavements based on standard distress terminology.
TIC PASER activities 1993 to 2000

- TIC created the additional PASER Manuals
- TIC wrote and re-wrote PASERWARE
- Conducted training the trainer sessions on rating roads
- Conducted Pavement Rating and PASERWARE training on how to create 5 year plans and budgets in preparation for 2001 when the first ratings would be required.

PASER

- The rating system and distresses included in the rating are described and the treatments associated with those distresses are presented in the PASER Manuals. There is a manual for each type of pavement.

These manuals are used to rate all pavement types in the WISLR database

http://tic.engr.wisc.edu/publications.html

PASER Pavement Rating

Relies on the Knowledge and Attitude of the Rater.

Training, Experience, Diagnostic Skills, and “Getting out of the Car” is necessary to do a credible Job
Pavement Rating Do’s

- Know the Four Basic Causes of Deterioration
- Know the distresses and their cause(s)
- Know the treatments appropriate for each set of distresses
- Inspect and Decide the primary cause(s) using the PASER Manual Guidance to Help
- Select the Appropriate Treatment for the Cause and the Corresponding Rating

Distress caused by truck loads

- Wheel Load
- Hot-mix asphalt
- Base
- Subbase
- Natural soil

Distress caused by temperature changes

Cold Weather - Transverse Crack

- Asphalt surface
- Contraction
- Friction on underside of the asphalt surface
- Existing Crack or Cold Joint
- Tensile Stress in Asphalt Surface
- Existing Crack or Cold Joint
**Distresses caused by water**

In Subgrade Soil:

- Water Gets Into Soil
  - Lubricates Soil Particles
  - Weakens Soil Structure

In Subgrade, Aggregate Base and Asphalt Surface:

- Water Gets Into Voids
  - Freezing Water Expands
  - Breaks Material Apart

**How does water get into the pavement?**

1. From edge
2. Upward movement of water-table
3. Through permeable surface
4. From water-table
5. Vapor movements
6. Seepage from high ground

**Distresses caused by age**

Asphalt pavement oxidizes from exposure to sunlight (Ultra-Violet light exposure causes the pavement to be less flexible)
PASER Asphalt Pavement Distress Categories

- Surface Defects
- Surface Deformation
- Cracking
- Potholes and Patches

ASPHALT SURFACE DEFECTS

Raveling
Flushed
Polishing

ASPHALT SURFACE DEFORMATION

- Rutting
- Shoving
- Settling
- Frost Heave
Instability Rutting

SURFACE WEAR RUTTING

- Not a common problem in Wisconsin because studded tires are not allowed.
- Can be seen due to snowmobiles, steel buggy wheels and carbide horseshoe pins
Frost Heave

Water drawn up from water table by capillary action

Asphalt Pavement

Aggregate Base

Subgrade Soils

Ice lenses form

Expansion of frozen water pushes up on pavement

Cracking

- Transverse Cracking
- Longitudinal Cracking
- Block Cracking
- Alligator Cracking

Transverse Cracking

Note: Rate entire crack at highest level present for 10% or more of total crack length

Distress type 6, Low severity
Longitudinal Cracking

- Inner Wheel Path
- Outer Wheel Path
- Blade Shoulder

4a - Wheel Path
4b - Non-Wheel Path
Longitudinal cracking on pavement edge

Block Cracking
RATINGS ARE RELATED TO NEEDED MAINTENANCE OR REPAIR

<table>
<thead>
<tr>
<th>Rating</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>Excellent</td>
</tr>
<tr>
<td>9</td>
<td>Very Good</td>
</tr>
<tr>
<td>8</td>
<td>Good</td>
</tr>
<tr>
<td>7</td>
<td>Fair</td>
</tr>
<tr>
<td>6</td>
<td>Poor</td>
</tr>
</tbody>
</table>

**PASER RATING SYSTEM**

Page 15 in the Asphalt PASER Manual
PASER System built into WISLR

PASER RATING SYSTEM

<table>
<thead>
<tr>
<th>Surface rating</th>
<th>Visible distress*</th>
<th>General condition/ treatment measures</th>
</tr>
</thead>
<tbody>
<tr>
<td>7 Good</td>
<td>Very slight or no cracking, surface shows some traffic wear.</td>
<td>For signs of aging, maintain with routine crack filling.</td>
</tr>
<tr>
<td></td>
<td>Unpaved cracks (1&quot;) spaced 10 or more apart, little or slight crack widening. No potholes or very few patches in excellent condition.</td>
<td></td>
</tr>
</tbody>
</table>

* Individual pavements will have all of these types of distress listed for any particular rating, they may have only one or two types.
### PASER RATING SYSTEM

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<th>Visible distress*</th>
<th>General condition/ treatment measures</th>
</tr>
</thead>
<tbody>
<tr>
<td>6 Good</td>
<td>Slight wearing (loss of fines and traffic wear), longitudinal cracks (open 0.1&quot; - 0.2&quot;), transverse cracks (open 0.1&quot; - 0.2&quot;), some spaced less than 1/16&quot;. First signs of back cracking. Sight to moderate flushing or polishing. Occasional patching in good condition.</td>
<td>Shows signs of aging. Sound structural condition. Could extend life with sealcoat.</td>
</tr>
</tbody>
</table>

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---

### PASER RATING SYSTEM

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</thead>
<tbody>
<tr>
<td>5 Fair</td>
<td>Moderate to severe wearing (loss of fine and coarse aggregate), longitudinal and transverse cracks (open 0.1&quot; or more) show first signs of slight wearing and secondary cracks. First signs of longitudinal cracks near pavement edge. Back cracking up to 50% of surface, dewatering or severe flushing or polishing. Some patching or edge wedging in good condition.</td>
<td>Surface aging. Sound structural condition. Needs asphalt or thin macadam overlay (less than 2&quot;)</td>
</tr>
</tbody>
</table>

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# PASER RATING SYSTEM

<table>
<thead>
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<th>Surface rating</th>
<th>Visible distress*</th>
<th>General condition/ treatment measures</th>
</tr>
</thead>
<tbody>
<tr>
<td>4 Fair</td>
<td>Severe surface raveling. Multiple longitudinal and transverse cracking with sight raveling. Pavement cracking in wheel paths. Block cracking over 50% of surface. Pavement in fair condition. Slight rutting or deterioration (0&quot; to 0.5&quot; deep or less).</td>
<td>Significant aging and first signs of need for strengthening. Would benefit from a structural overlay. (2&quot; or more).</td>
</tr>
</tbody>
</table>

* An individual assessment will not have all of the types of distress cited for one particular rating. They may have only one or two types.
**PASER RATING SYSTEM**

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<tr>
<th>Surface Rating</th>
<th>Visible Distress*</th>
<th>General Condition/ Treatment Measures</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 Poor</td>
<td>Clear spalled/longitudinal and transverse cracks; often showing wearing and crack erosion. Severe block cracking. Some alligator cracking (less than 35% of surface). Patches in fair to poor condition. Moderate rutting or distortion (greater than 1/2&quot; but less than 2&quot; deep); occasional potholes.</td>
<td>Needs patching and repair prior to major overlay. Milling and removal of deterioration extends the life of overlay.</td>
</tr>
</tbody>
</table>

*Individual pavements will not have all of the types of distress listed for any particular rating. They may have one or two types.*

**PASER RATING SYSTEM**

<table>
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<th>Surface Rating</th>
<th>Visible Distress*</th>
<th>General Condition/ Treatment Measures</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 Very Poor</td>
<td>Alligator cracking (over 25% of surface), severe rutting or distortion (1/2&quot; or more deep), extensive potholes in poor condition. Pavement in poor condition.</td>
<td>Severe deterioration. Needs rehabilitation with extensive base repair. Pavement is ineffective.</td>
</tr>
</tbody>
</table>

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<table>
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<th>Surface rating</th>
<th>Visible distress*</th>
<th>General condition/treatment measures</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Failed</td>
<td>Severe distress with extensive loss of surface integrity.</td>
<td>Failed, needs rep/ reconstruction.</td>
</tr>
</tbody>
</table>

* Individual pavements will not have all of the type of distress stated for any particular rating. They may have one or two types.
PASER and WISLR

- A cooperative effort
  - UW-Madison TIC (PASER)
  - Wisconsin DOT (WISLR)
  - Local Governments (Owners)
  - MPOs, Consultants, Contractors, UW-Extension
- TIC and DOT conducted five PASER / WISLR one day trainings in Wisconsin, 287 attended
- Two webinars to follow in September
- Next training steps are to conduct hands-on sessions focused on 5 year budget and plan