PASER Training
Part 1: Distress Identification

TAMC Data Collection Training Program

PASER for Paved Roads
Part 1: Distress Identification
Part 2: Pavement Rating Intro & Council Update
Part 3: Rating and Data Collection Rules
Part 4: Rating Exercises

Inventory-Based Rating for Gravel Roads

See ctt.mtu.edu for upcoming trainings
PASER Training Part 1 Agenda

Distress Identification for Rating:
- Asphalt
- Concrete
- Sealcoat

Closing Thoughts

Preparing for Rating

Michigan Sealcoat Rating Guide
### 4 Major Pavement Types

<table>
<thead>
<tr>
<th>Hot Mix Asphalt (HMA)</th>
<th>Concrete</th>
<th>Composite</th>
<th>Sealcoat</th>
</tr>
</thead>
<tbody>
<tr>
<td>Asphalt</td>
<td>Concrete</td>
<td>Asphalt</td>
<td>Base (Gravel)</td>
</tr>
<tr>
<td>Base (Gravel)</td>
<td>Old Concrete</td>
<td>Old Concrete</td>
<td>Base (Gravel)</td>
</tr>
<tr>
<td>Sub-Base (Sand)</td>
<td>Base (Gravel)</td>
<td>Base (Gravel)</td>
<td>Sub-Base (Sand)</td>
</tr>
<tr>
<td>Sub-Grade (Native Soils)</td>
<td>Sub-Grade (Native Soils)</td>
<td>Sub-Grade (Native Soils)</td>
<td>Sub-Grade (Native Soils)</td>
</tr>
</tbody>
</table>

- **Brick**: Brick, Base (Gravel), Sub-Base (Sand), Sub-Grade (Native Soils)
- **Gravel**: Gravel, Base (Gravel), Sub-Base (Sand), Sub-Grade (Native Soils)

### Asphalt Distress Types

- **Age**
- **Structural**
- **Limited**
Environment

First Distress

Age Related Asphalt Distress
Primary Age-related Distresses: Cracking

Transverse
Longitudinal Joint
Block

Transverse Cracking

Spacing

> 40’
10’ to 40’
< 10’
Longitudinal Joint Cracking

Common Construction Joint
Longitudinal Construction Joint (Tapered)

[Diagram showing a section cut of a road with layers: Asphalt, Gravel Base, and Age Related Asphalt Distress]

Longitudinal Tapered Joint Cracking

[Image of a road showing longitudinal cracking with Age Related Asphalt Distress text]
Block Cracking – First Signs

First Signs (6’ to 10’ blocks)

Block Cracking – Moderate

Moderate (1’ to 5’ blocks)
Block Cracking – Severe

Crack Width - Tight
Crack Width – Open

Secondary Cracking
More Than Just a Crack.....

Some notes about cracks...

- A sealed crack is still a crack
- Crack opening width is the *only* thing changed by sealing
- Width varies due to thermal expansion and contraction
Asphalt Distress Types

Water Intrusion
Base Weakening & Loss of Support

Distress Propagation
Load Distribution

Rigidity

Cost

Asphalt
Gravel Base
Sand Sub-Base
Native Soil (sub grade)

Structural Related Asphalt Distress

Load Distribution – Small Vehicle

Structural Related Asphalt Distress
Load Distribution – Large Vehicle

Repeated Loading

Structural Related Asphalt Distress
Structural Distresses

- Rutting
- Shear Cracking
- Alligator Cracking

Structural Distress – Rutting

Structural Related Asphalt Distress
Structural Distress – Rutting

Deep Rutting

Surface Rutting

Rutting Progression

First Sign
Rutting Progression

Moderate

Structural Related Asphalt Distress

Rutting Progression

Severe

Structural Related Asphalt Distress
Measuring Rutting

Structural Distress – Shear Cracking
Shear Cracking

Load Related Distress Progression
Shear Crack Progression

First Sign

Moderate

Structural Related Asphalt Distress
Shear Crack Progression

Structural Distress – Edge Cracking
Edge Cracking

Moderate

Edge Cracking

Progressed

Structural Related Asphalt Distress
Structural Distress – Alligator Cracking

Alligator (Fatigue) Cracking

First Sign
Alligator (Fatigue) Cracking

Percent of Worst Lane
## Asphalt Distress Types

<table>
<thead>
<tr>
<th>Age</th>
<th>Structural</th>
<th>Limited</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Limited Extent – Surface Distress</th>
</tr>
</thead>
<tbody>
<tr>
<td>Raveling</td>
</tr>
</tbody>
</table>

- Raveling
- Flushing or Bleeding
- Polishing
Surface Distress - Raveling

- Slight

Surface Distress - Raveling

- Moderate
Surface Distress - Raveling

Severe

Limited Extent Asphalt Distress

Surface Distress – Flushing / Bleeding

Slight to Moderate

Limited Extent Asphalt Distress
Surface Distress – Flushing / Bleeding

Extensive to Severe

Surface Distress – Polishing

Slight to Moderate
Surface Distress – Polishing

Limited Extent Asphalt Distress

Limited Extent – Structural Distress

Slippage  Frost Heave  Differential Settlement
Limited Extent – Layer Slippage

First Signs
Limited Extent – Layer Slippage

Advanced

Limited Extent – Frost Heave

First Distress
Limited Extent – Frost Heave

Water Intrusion

Localized Heaving
Limited Extent – Frost Heave

Base Weakening

Loss of Support

Limited Extent Asphalt Distress

Limited Extent – Frost Heave

Distress Propagation
Limited Extent – Frost Heave

Limited Extent – Differential Settlement
Limited Extent – Differential Settlement

Concrete Pavement
Concrete Distress Types

Concrete Deformations
Concrete Cracking
Concrete Joint Distress
Concrete Surface Distress

Concrete Deformations

Buckles
Durability Cracking
Faulting
Deformations – Buckles

Non-compressible Material

Concrete Deformations

Deformations – Buckles

Concrete Deformations
Deformations – Buckling (Tenting)

Deformations – Buckles
Deformations – Durability Crack

Concrete Deformations

Deformations – Durability Crack

Concrete Deformations
Deformations – Faulting

Concrete Deformations

Deformations – Faulting

Concrete Deformations
Deformations – Faulting

Concrete Cracking

Transverse  Meander  Corner
Concrete Cracking – Transverse

Isolated

Concrete Cracking - Transverse

Multiple
<table>
<thead>
<tr>
<th>Concrete Cracking - Meander</th>
<th>Isolated</th>
</tr>
</thead>
</table>

Concrete Cracking - Meander

Concrete Cracking - Meander
Settlement – Utility Trench

Concrete Cracking

Settlement – Utility Trench

Concrete Cracking
Meander Crack – New Construction

Concrete Cracking

Concrete Cracking – Corner Break
Concrete Cracking – Corner Break

Multiple cracks with broken pieces

Concrete Cracking – Slab Curling / Corner Break
Concrete Cracking – Slab Curling / Corner Break

Concrete Joint Distress
Typical Concrete Joint

Cause of Joint Spall – Incompressible Materials
Partial Depth Joint Repair

Concrete Joint Distress

Partial Depth Joint Repair

Concrete Joint Distress
Full Depth Needed

Full Depth Joint Repair
Full Depth Joint Repairs

Joint Distress – Spalling

First Sign
Joint Distress - Spalling

Joint Distress – Spalling
Joint Distress – Spalling

Concrete Joint Distress

Concrete Surface Distresses

- Shallow Steel
- Scaling
- Pop-out
- Map Cracking
- Polishing
Surface Distress – Shallow Reinforcement

Concrete Surface Distress

Corrosion

Corrosion
Surface Distress – Shallow Reinforcement

Concrete Surface Distress

Surface Distress – Shallow Reinforcement

Concrete Surface Distress
Surface Distress – Shallow Reinforcement

Surface Distress – Scaling
Surface Distress - Scaling

Concrete Surface Distress

Surface Distress – Scaling

Concrete Surface Distress

- < 25%
- 25% to 50%
- > 50%
Surface Distress – Map Cracking

Surface Distress – Polishing

Concrete Surface Distress

Moderate
Surface Distress – Polishing

Sealcoat Pavements

Michigan Sealcoat Rating Guide
Sealcoat Pavement Close Up

Gravel Base

Asphalt vs. Sealcoat

Sealcoat

Hot Mix Asphalt
Sealcoat Distress Types

- Edge Distress
- Lane Distress
- Raveling

Edge Distress

Sealcoat

Gravel Base

Sand Sub-Base
Edge Distress Progression

Edge Distress Progression
Edge Distress

Lane Cracking
Upcoming Trainings & Final Thoughts

IBR Training – February 2nd, March 8th, June 21st

Master the Roadsoft Data Collection Cycle for MPO/RPO – TBD

Review PASER Manuals prior to next training

---

PASER Training

Part 2: Pavement Rating

Introduction and Council Update
TAMC Data Collection Training Program

PASER for Paved Roads
- Part 1: Distress Identification
- Part 2: Pavement Rating Intro & Council Update
- Part 3: Rating and Data Collection Rules
- Part 4: Rating Exercises

Inventory-Based Rating for Gravel Roads

See ctt.mtu.edu for upcoming trainings

PASER Training Part 2 Agenda

- Rating System Overview
- Rating Demonstration
- Reasons to Rate Roads

News from TAMC

Michigan Transportation Asset Management Council

Data Collection Business Rules
Overview of Rating Systems

that are used to rate pavements

Road Rating Systems

There are many systems available

- PASER
- International Roughness Index
- Pavement Condition Index
- Present Serviceability Index
- Distress Identification Manual
Some systems are end of life measures

Only collect “decision making” data!

Data should:

- Evaluate outcomes
- Direct decisions
- Convey information
- Tell your story
PASER is a visual inspection system

Determine Distress:

- **Type**: What is it?
- **Extent**: How much?
- **Severity**: How bad?

PASER Estimating

- Segments are not consistent
- Rate overall condition
- Ignore isolated distresses
- All distresses may not be there
- Split segments with caution
Rating Demonstration

of using PASER on an actual segment
What were the distresses?

- Edge Distress
- Transverse Cracks
- Block Cracking
- Alligator Cracking
- Rutting

Using PASER

PASER is a visual system

Rate the most consistent condition

All distresses may not be present
Reasons to Rate Roads

and what you can do with the data

Why is TAMC Rating Roads?
Foundations of Road Rating in Michigan

• PA 499 (2002)
  • All public roads in Michigan will be managed using the principles of asset management
  • Created Transportation Asset Management Council (TAMC)

• PA 199 (2007)
  • TAMC shall develop a pavement management system
  • MDOT and LA reporting to the council is mandatory
    • Road and Bridge condition
    • 3 year project plan
    • Expenditures

TAMC Annual Report To Legislature
Why Should You Rate Roads?

See how road condition is changing

**Surface Condition Trend**

![Surface Condition Trend Chart]

Why Should You Rate Roads?

Estimate future road conditions

![Future Road Conditions Chart]
Why Should You Rate Roads?

Measure effectiveness of past improvements
Cost Effectiveness of Treatments

Initial Construction Cost

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crack Seal</td>
<td>$4,000</td>
</tr>
<tr>
<td>Chip Seal</td>
<td>$25,000</td>
</tr>
<tr>
<td>Mill &amp; Fill</td>
<td>$100,000</td>
</tr>
<tr>
<td>Crush &amp; Shape</td>
<td>$225,000</td>
</tr>
<tr>
<td>Reconstruct</td>
<td>$375,000</td>
</tr>
</tbody>
</table>
Expected Treatment Life in Years

- Crack Seal: 1 year
- Chip Seal: 5 years
- Mill & Fill: 10 years
- Crush & Shape: 14 years
- Reconstruct: 15 years

Cost per Year of Treatment Life

- Crack Seal: $4,000
- Chip Seal: $5,000
- Mill & Fill: $10,000
- Crush & Shape: $16,000
- Reconstruct: $25,000
Rating Roads in Michigan

TAMC uses PASER for Asphalt and Concrete
MI Specific Sealcoat Guide for Sealcoat
Inventory-Based Rating System™ for Unpaved

Michigan Transportation Asset Management Council

Update
TAMC Data Collection Training Program

PASER for Paved Roads
Part 1: Distress Identification
Part 2: Pavement Rating Intro & Council Update
Part 3: Rating and Data Collection Rules
Part 4: Rating Exercises

Inventory-Based Rating for Gravel Roads

See ctt.mtu.edu for upcoming trainings
PASER Training Part 3 Agenda

- Business Rules
- Rules for Rating
- Rating Tips
- Collection Reminders

Business Rules

when collecting data for TAMC’s data collection effort
Reporting Data: TAMC Data Collection


Reporting Data: Tale of Two Data Collections

- TAMC federal-aid data collection

- Non-federal-aid data collection
  - Agency decides what to collect
  - Agency must get approval first to be eligible for reimbursement
  - Agency rater does agency’s own roads
Reporting Data: What to Rate

Federal-aid network

- Rate 50% of federal-aid-eligible roads for 2022 (paved and unpaved)

Reporting Data: How to Rate

Tools

- Roadsoft and the Laptop Data Collector
  - Roadsoft 2021.X*
  - Roadsoft LDC 2021.X*
  - GPS
  - Framework version 21

*where X = latest version
Reporting Data: How to Rate

Reporting Data: How to Rate

<table>
<thead>
<tr>
<th>Group</th>
<th>Field</th>
<th>Operator</th>
<th>Value(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Federal-aid</td>
<td>=</td>
<td>Yes</td>
</tr>
</tbody>
</table>
Reporting Data: When to Collect & Submit

First Monday in APRIL
  Begin collection

Last Friday in NOVEMBER
  Complete collection

First Friday in DECEMBER
  Submit data to CSS

Reporting Data: Funding

• Agencies report time and expenses through planning organization (PO)

• PO reports to the TAMC
  • Use TAMC Expense Log
Reporting Data: Required Information

- Crew first and last names
- Surface type
- Number of lanes
- PASER number/IBR score

Reporting Data: Rating Team

Federal-aid Data Collection (need two team members)

- Local Agency
- PO (RPO/MPO)

- All team members must be trained
- Team members may designate others as their representative
- Two person team must represent different agencies
- Collection Policy is on the Council Policies webpage (under About Us)

Non-federal-aid Data Collection*

- Local Agency

* NFA agencies approved for T AMC reimbursement shall consist of a minimum of two.
Reporting Data: Training Requirements

PASER

• Trained or Certified in 2019, 2020, 2021
• Trained in 2022

IBR

• Need to have been trained within 3 years of data collection


Reporting Data: Non-federal-aid data

• The TAMC needs properly tagged data
• The TAMC may reimburse collection
• Follow the manual!

LDC: Surface Type

Checking Number of Lanes
Rules for Rating
effectively and consistently

Pavement Types
Brick and Gravel

Rate Distress Not Ride
Rate Distress Not Importance

Which Lane To Rate?
Which Pavement Type to Rate?

Asphalt
Seal Coat
What if the Road is Under Construction?

How Many Lanes?
Report as two lanes

Agree or Disagree

Report as 3 lanes

Agree or Disagree
Report as 2 lanes

Agree or Disagree

How do you rate after a new seal coat?
Ghost cracks influence ratings.

Agree or Disagree

Photo Credits: Larry Brown, Allegan CRC

Rating Tips
for using visual distress rating systems
Driving

Drive the segment again if needed

Slow down
Into The Sun
Same Location – Different Perspective

Sun Behind

Sun in Front

What About These?
**Tree Shade**

**Wet Pavement**
Light Colored Pavement

These cracks influence the rating.

Agree or Disagree
Paved Shoulders

Asphalt
Gravel Base
Sand Sub-Base
Native Soil

Collection Reminders

when collecting data for TAMC’s data collection effort
Data Collection Policy

**PASER**
Trained or Certified in 2019, 2020, 2021
Trained in 2022

**IBR**
Need to have been trained within 3 years of data collection


Training & Data Collection Effort Is Funded

Rating Team: PO & County/City/Village

TAMC Coordinator

MPO or RPO (rating team)
Rating Team Reminders

**Federal Aid**
2 Member Team:
Local Agency
PO (RPO/MPO)

- All team members must be trained
- Team members may designate others as their representative
- Two person team must represent different agencies
- Collection Policy is on the Council Policies webpage (under About Us)

* NFA agencies approved for TMC reimbursement shall consist of a minimum of two.

---

**TAMC Coordinator Assists With:**

Reimbursement Certification Data collection policy Reporting requirements

Roger A. Belknap, TAMC Coordinator Ph: (517) 230-8192 BelknapR@michigan.gov

Dave Jennett, TAMC Transportation Planner Ph: (517) 335-4583 JennettD@michigan.gov
Collection Important Dates

First Monday of April
Start collecting (weather permitting)

Last Friday of November
Last day to collect

First Friday of December
Last day RPO/MPO to submit to CSS

Rater Certification Test

• Not required
• Relief from webinar & on-site training next 3 years if 3 or 6 years (prior to 2019) rating experience and training
• Pre-registration required

Suspended for 2022
Final Exam

Implementation survey
Evaluation
Self-certification
Material request

Upcoming Trainings & Final Thoughts

IBR Training – February 2\textsuperscript{nd}, March 8\textsuperscript{th}, June 21\textsuperscript{st}
Master the Roadsoft Data Collection Cycle for MPO/RPO – TBD

Review TAMC Data Collection Manual prior to next training
Print out PASER Cheat Sheet & MI Sealcoat Rating Guide
PASER Training
Part 4: Rating Exercises

TAMC Data Collection Training Program

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Inventory-Based Rating for Gravel Roads

See ctt.mtu.edu for upcoming trainings
PASER Training Part 4 Agenda

Rating Segment Example
Asphalt Scale and Exercises
Concrete Scale and Exercises
Seal Coat Scale and Exercises
Final Reminders

Rating Demonstration
What were the distresses?

Edge Distress  Transverse Cracks
Block Cracking  Alligator Cracking
Rutting

Asphalt Cheat Sheet
No defects

Like New

*Crush & Shape* - A treatment is considered a reconstruct only if the base material is replaced or rehabilitated.
T-Cracks > 40’

Cracks hairline or sealed
Longitudinal cracks on joints
Recent Sealcoat*

Proactive Sealcoat Treatments

Asphalt 8

- Occasional transverse crack >40’ apart
- Crack width tight (hairline) or sealed
  Few if any longitudinal cracks on joints

Recent seal coat or slurry seal (*see below)

Little or no maintenance required
1. T-Cracks 10’-40’
   - First signs of wear
   - Little/no erosion
   - Little/no raveling
   - Cracks: <¼"

2. T-Cracks < 10’
   - Initial Block 6’-10’
   - Flushing/Polishing: Slight to Moderate
   - Raveling: Slight
   - Cracks: ¼”-½”
Secondary Cracks:
- Blocks: 1’ - 5’
- 1st signs of edge cracking

Flushing/Polishing:
- Extensive to Severe

Cracks > ¼''

Wheel Path Cracking:
- Blocks: < 1’

Rutting:
- ½” - 1”
Alligator cracking 1st signs, <25%

Alligator Cracking > 25%
Asphalt Repair Techniques

New construction
Reconstruction
Crush and shape

Micro Surface / Slurry seal
Seal coat
Wedging
Crack seal
New Construction

Reconstruction
Crush and Shape

Micro Surface / Slurry Seal
Seal Coat

Wedging
Crack Seal
Wheel/Edge Ruts: No
Alligator: No
Transverse: No
Long: Yes
Block: Yes
Show: No
Hide: All
Concrete Cheat Sheet

Concrete PASER

**Good**
- No leaks
- No control joints
- No surface delamination

**Fair**
- Minor surface cracks
- Minor control joint movement
- No significant surface delamination

**Poor**
- Major surface cracks
- Major control joint movement
- Significant surface delamination

Contact Information

10 No defects
Less than one year old
Joint rehab completed and no other defects
Like New

Joints are good
Partial loss of sealant
No transverse
Isolated meander
Isolated transverse
Full depth repairs are excellent
Minor scaling

Joints and cracks open ¼”
Scaling < 25% of surface
<table>
<thead>
<tr>
<th>Faulting</th>
<th>Sealing</th>
<th>Surface Repair</th>
<th>Controlling</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; ¼&quot;</td>
<td>Full</td>
<td>No</td>
<td>Not Cont.</td>
</tr>
<tr>
<td>First signs of spalling</td>
<td>Partial Depth</td>
<td>Yes</td>
<td>Yes</td>
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<tr>
<td>Scaling 25% to 50% of surface</td>
<td>Smoothing</td>
<td>Yes</td>
<td>Yes</td>
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<tr>
<td>Severe joint/crack spalling</td>
<td>Partial Depth</td>
<td>Not Cont.</td>
<td>Yes</td>
</tr>
<tr>
<td>Multiple cracks</td>
<td>Full Depth</td>
<td>Yes</td>
<td>Not Cont.</td>
</tr>
</tbody>
</table>
### Faulting < 1”

- **D-Cracking**
- **Many open joints/cracks**

### Rebuild pavement

- **Not Cont.**
- **No**
- **Yes**
- **Not Controlling**
### Partial Depth Repair

1. Restricted speeds

<table>
<thead>
<tr>
<th>Not Cont.</th>
<th>No</th>
<th>Yes</th>
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</thead>
<tbody>
<tr>
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</tbody>
</table>

![Partial Depth Repair Image]
Full Depth Repair

[Image of a road with construction cones and a section of road with a hole]

[Table with options: Yes, No, One, No]
Partial Depth Seal

Full Depth Surface Repair

No

No

Yes

No
Minimal: No, No, No, No

Looking East
<table>
<thead>
<tr>
<th>Partial Depth Seal</th>
<th>Full Depth Surface Repair</th>
</tr>
</thead>
<tbody>
<tr>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>No</td>
<td>No</td>
</tr>
</tbody>
</table>
Typical Patch

Typical Crack

Yes  No  No  No

Surface Repair

Full Depth

Partial Depth Seal

No

No

No
Partial Depth Seal
Full Depth Surface Repair

No No No No

Looking West
Looking East

Partial Depth Seal
Full Depth Surface Repair
No
No
No
Partial Depth Seal Yes No No No

Looking East
<table>
<thead>
<tr>
<th>Partial Depth Seal</th>
<th>Full Depth Surface Repair</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>No</strong></td>
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</tr>
</tbody>
</table>
Sealcoat Cheat Sheet

Seal Coat - Good

New construction
Less than one year old

Like new
More than one year old

First signs of distress
Limited edge distress

Michigan Sealcoat Rating Guide

Rating | Condition/Defect | Remedy/Action | Total of Points
-------|------------------|---------------|-----------------}
10 | Good | None observed | 10
9 | Fair | None observed | 9
8 | Poor | None observed | 8
7 | Very Poor | None observed | 7
6 | Poor | None observed | 6
5 | Fair | None observed | 5
4 | Good | None observed | 4
3 | Excellent | None observed | 3
2 | Very Good | None observed | 2
1 | Excellent | None observed | 1
0 | New | None observed | 0
**Seal Coat - Fair**
Edge distress, or Lane Distress, or Raveling

- 7: Less than 5%
- 6: Up to 10%
- 5: Up to 20%

**Seal Coat - Poor**
Edge distress, or Lane Distress, or Rutting

- 4: Up to 30%
- 3: Up to 50%
- 2: Over 50%
- 1: Same as 2 with visible base

Ruts ½” to 1”
Ruts 1” to 2”
Ruts over 2”
**Upcoming Trainings & Final Thoughts**

IBR Training – February 2\(^{nd}\), March 8\(^{th}\), June 21\(^{st}\)

Master the Roadsoft Data Collection Cycle for MPO/RPO – TBD

Safety when Rating

Complete Evaluation
Contact Information

Michigan Transportation Asset Management Council
www.michigan.gov/tamc

Michigan's Local Technical Assistance Program
906-487-2102
LTAP@mtu.edu
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Roadsoft
roadsoft@mtu.edu
www.roadsoft.org