Pavement Rating 101 for Local Agencies Using MTC StreetSaver® PMP

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Retired
Outline

- Introduction to PCI
- Importance of PCI
- Distress ID
- Methods of Collection
- Quality Data
- Questions
StreetSaver® Pavement Management Program (PMP)

PCI is basic measure of condition

Method to uniformly characterize condition of paved surface
  – Along road/street
  – Over time
**PCI Process**

**Step 1.** Inspect sample units to determine type, quantity and severity level of pavement distresses.

**Step 2.** Determine Deduct Values.

- **L & T Cracking**
  - High Severity
  - Medium Severity
  - Low Severity

- **Alligator Cracking**
  - High Severity
  - Medium Severity
  - Low Severity

**Step 3.** Compute Total Deduct Value, TDV = a + b.

**Step 4.** Adjust Total Deduct Value.

**Step 5.** Compute Pavement Condition Index, PCI = 100 - CDV, for each sample unit inspected.

**Step 6.** Determine Pavement Condition Rating.
Pavement Management is a Decision Making Process

- To find cost-effective treatments
- At designated times
- To provide a desired level of service
StreetSaver® Pavement Management Program or Software

- Decision support tool
- Stores data and provides information
- To support in making cost-effective decisions
PCI Values Used

- To identify level of work needed
- Amount of funding needed
- Project future condition
Importance of PCI to StreetSaver®

PCI values are:
- Basis of most management recommendations

Incorrect PCI values will cause the PMP to
- Give incorrect recommendations
PCI Values

Based on distress surveys

To determine damage from distress, we must determine distress:
  - Type - What is wrong?
  - Severity - How bad is it?
  - Density - How much is present?
Step 1. Inspect sample units to determine type, quantity and severity level of pavement distresses.

Low Severity
Longitudinal Cracks

Medium Severity
Alligator Cracks
Distress ID Systems in StreetSaver®

- MTC StreetSaver® Distress ID
- PAVER/ASTM Distress ID
- CRAB recording method
Pavement Condition Index
Distress Identification Manual
for Jointed Portland Cement
Concrete Pavements

Figure 4. Illustration of Corner Breaks

5 Patching and Utility Cut Patching

Description: A patch is an area of pavement which has been replaced with new material to
repair the existing pavement.

A patch is considered a defect no matter how well it is performing (a patched area
or adjacent area usually does not perform as well as an original pavement section).
Generally, some roughness is associated with this distress.

Severity Levels:
1. Patch is in good condition and is satisfactory. Ride quality* is rated as low
severity or better.
2. Patch is moderately deteriorated and/or ride quality is rated as medium
severity.
3. Patch is badly deteriorated and/or ride quality is rated as high severity. Patch
needs replacement.

*Ride quality is defined in the severity levels of distress.
PCI Calculated automatically in StreetSaver® and used in the program based on:
– MTC 7 AC and 7 PCC Distress Types
  » (Soon to be 8 AC & 7 PCC)
MTC Distress Data Entry Screen
Can be Entered by Batch

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<th>Street ID</th>
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<th>Type</th>
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<td>1 - Alligator Cracking</td>
<td>M - Medium</td>
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<td>3 - Distortions</td>
<td>L - Low</td>
<td>24</td>
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<tr>
<td>4 - Long. &amp; Trans. Cracking</td>
<td>M - Medium</td>
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PAVER Distress ID Manuals

ASPHALT SURFACED ROADS & PARKING LOTS
PAVER™ DISTRESS IDENTIFICATION MANUAL
DEVELOPED BY:
US ARMY CORPS OF ENGINEERS
ERDC-CEML

SPONSORED BY:

CONCRETE SURFACED ROADS & PARKING LOTS
PAVER™ DISTRESS IDENTIFICATION MANUAL
DEVELOPED BY:
US ARMY CORPS OF ENGINEERS
ERDC-CEML

SPONSORED BY:

NAVY
NAVFAC
PAVER (ASTM 6433)- PCI

PAVER - PCI Calculated automatically in StreetSaver® and used in the program based on:
- 20 AC and 19 PCC Distress Types
PAVER Distress Entry Screen
Can be Entered by Batch
CRAB Distress Data Recording

- 1/10th mile inspections
- Lane location
- Lane direction
CRAB Distress Entry Screen
Can be Entered by Batch
CRAB Distress Entry Screen
Methods of Distress Collection

- Manual
  - Walking
  - Windshield
- Automated
- Semi-automated
- Hybrid
  - Combinations of the above
Manual Distress Data Collection Method

- Walking distress survey for calculating PCI

- Distress definition/description per:
  - MTC Pavement Condition Index Distress Identification Manuals (AC & PCC)
  - or
  - PAVER Pavement Condition Index Distress Identification Manuals (AC & PCC)
Field Procedure

- Inspect each inspection unit
- Determine:
  - Severity
  - Quantity
- Of each distress type present in inspection unit
- Record this information
Inspection Procedures

- Inspection Team
  - Generally two persons
    » One identifies distress types, severities, & quantities
    » One records and watches for traffic
  - More needed for high volume due to safety
  - One person can do it on low volume
    » Need three hands

- Safety is an issue
MTC recommends 10% of inspection units in each section be inspected for network-level inspections.

Systematic random sampling
Windshield Survey

- Inspector sets in vehicle – conducts survey from vehicle as it travels along street
  - Generally takes less time & effort than walking survey
  - Covers entire street length visible to inspector
- Low severities of most distress types often not visible from a vehicle
- Direction of sun in relation to direction observer views pavement surface has dramatic affect on accurately identifying distress types, severities, and quantities
Difficult to keep track of all distress type-severity combinations and quantities of each when multiple distress types and severities present

Tend to pick only most obvious distress type-severity combinations

Some windshield survey inspectors only use distress quantity categories (less than 5%, 5 to 10%, etc.)
Will result in greater error in distress data and PCI values
Plan work to minimize time lost to travel
Lay out sections and inspection units
  – Allow changes in field
Have inspectors mark inspection units
Mix office/other field work with inspections
Plan for periodic retraining
Quality Control for Supervisors

☑ Check data coming in daily - look for problems
  – 1 sq ft block cracking
  – Only medium severity L&T, Alligator, & Patching
☑ Have teams mark inspection units
  – Reinspect same inspection units
☑ Supervisor reinspect small percent (2-5%)
Quality Control for Supervisors

With more than one team
- Change inspection team members regularly
  » Don’t let divergence develop
- Have teams reinspect sections inspected by other teams (5%)
Automated

- Machine produces sensors readings
- Readings interpreted by software to give distress types, severities, & quantities
- Few (if any) of current systems fully automated
- Some systems have relatively fully automated components:
  - Rut measurements of length and depth of rutting
  - Crack detection systems to determine length, width, location, and direction of cracks
  - Surface macro-texture
Semi-Automated

- Machine takes sensor readings
- Some readings may be machine interpreted
- Some readings may be partially interpreted by machines and verified manually
- Some readings may require manual interpretation - trained observers view images on computer screens & identify type, severity, and quantity of distress present
Hybrid Systems

- Use automated/semi-automated systems to collect some distress types
  - Cracking
  - Rutting
- Use other approach (typically windshield survey) to collect other distress types
  - Distortions
  - Patching
  - Weathering
Does distress data from semi-automated data collection methods match distress data from manual surveys?
– Generally - No
Comparison of Automated Width vs Normal Manual Width

Normal manual method
- Full width by 100’
  » Or
- Half width by 100’
- Typically includes parking area

Automated method
- 12’ by multiples of ~200’ (Driving lane)
Automated
~ 12’

Walking
Full Width

18’ 18’

18’

205’

18’ 18’

36’

100’
Common Semi-Automated Issues

- Weathering & patching difficult to determine manually – even with windshield or semi-automated
- Distortions (especially those along edge) may be missed
Is there an adjustment factor that can be applied?
– Generally - No

The distress differences (and PCI values) caused by location depend on the differences in the distress types, severities, and densities between the driving lanes and parking lanes/shoulders.
The Big Questions

☒ Can distress data and PCI values calculated from semi-automated distress surveys be used effectively in StreetSaver® and other PMP’s

☒ Yes, but some adjustments may be needed
Semi-Automated Collection of Distress Data

- Decreases safety issues
- Decreases traffic interruptions
- Uses contract funds instead of staff resources
- Will be somewhat different than manual data
Contracting for Distress Data Collection

- Define distress ID methodology to be used and precision and accuracy needed
- Require Data Quality Control Plan
- Establish Data Quality Assurance Plan

MTC has plans that agencies can end can use in developing their contract plans at: [http://www.mtcpms.org/support/consultants.html](http://www.mtcpms.org/support/consultants.html)
MTC Data Quality Management Plan

- Includes Pre-qualification & Rater Certification for distress identification using the MTC distress definitions

- Pre-qualification - Ensures that contracting agencies are capable of collecting distress data that is reasonably close to what would be collected by an "expert" rater

- Rater Certification Program - Under the P-TAP, even if a firm has pre-qualified, all of the firm’s raters must be certified. The exam is scheduled on November 19 & 20, 2014
Data Quality Control Plan

☑ Each firm required to provide Quality Control Plan that includes

– Qualifications of each rater

– Description of their data verification processes including what checks will be made and actions to be taken when issues arise
MTC Data Quality Acceptance Plan

1) Administer Rater Certification Program
   Pre-qualification of the contractor does not ensure that all raters are capable of rating with the desired level of accuracy.

2) Conduct Audits of Contractors’ Quality Control Plans
   - MTC reviews quality control plans and approves prior to commencement of work
   - CSUC conducts audits of the QCP results to ensure that the data collection contractors are meeting the requirements established in their plans.

3) Verify Data Collected by Contractors
   - CSUC conducts full audits of the data collected from selected projects when issues are encountered
   - CSUC spot checks data collected by contractors from selected projects
# MTC Maintains List of Consultants that have experience with StreetSaver®

<table>
<thead>
<tr>
<th>Name</th>
<th>Address</th>
<th>Phone Numbers</th>
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</thead>
<tbody>
<tr>
<td><strong>AMS Consulting LLC</strong></td>
<td>5627 Stoneridge Dr, Suite 320, Pleasanton, CA 94588</td>
<td>925.225.9922</td>
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<tr>
<td></td>
<td>Aslab Pty Ltd</td>
<td>+61-08-9434-2540</td>
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<td></td>
<td>P.O. Box 1061</td>
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<td></td>
<td>Bibra Lake DC, Western Australia 6965</td>
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<tr>
<td></td>
<td>California Engineering Company, Inc</td>
<td>1110 Civic Center Blvd, Ste 404, Yuba City, CA 95993</td>
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<tr>
<td></td>
<td>Farallon Geographics Inc.</td>
<td>609 Mission St, 2nd Floor, San Francisco, CA 94105</td>
</tr>
<tr>
<td></td>
<td>GeoData Analytics, LLC</td>
<td>2510 Tassajara Avenue, El Cerrito, CA 94530</td>
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<tr>
<td></td>
<td>Kleinfelder Inc.</td>
<td>8 Pasteur, Suite 190, Irvine, CA 92618</td>
</tr>
<tr>
<td><strong>ASCG Inc.</strong></td>
<td>6501 Americas Parkway, Suite 400, Albuquerque, NM 87110</td>
<td>505.247.0294</td>
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<tr>
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<td>Bureau Veritas</td>
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<tr>
<td></td>
<td>6150 Stoneridge Mall Road, Suite 370, Pleasanton, CA 94588</td>
<td>925.468.7413</td>
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<tr>
<td><strong>Adhara Systems</strong></td>
<td>1735 N, First St. Suite 200, San Jose, CA 95112</td>
<td>408.441.0340</td>
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<tr>
<td></td>
<td>CSG Consultants, Inc.</td>
<td>1660 South Amphlett Blvd., Suite 330, San Mateo, CA 94402</td>
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<tr>
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<td>Fugro Consultants</td>
<td>8613 Cross Park Drive, Austin, TX 78754</td>
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<td>IMS</td>
<td>116 N. Roosevelt, Suite 131, Chandler, AZ 85226</td>
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<tr>
<td><strong>Capitol Asset &amp; Pavement Services</strong></td>
<td>P.O.Box 7840, Salem, OR 97303</td>
<td>503.689.1330</td>
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<td>Fugro Consultants</td>
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<tr>
<td><strong>Harris &amp; Associates</strong></td>
<td>120 Mason Circle, Concord, CA 94520-1272</td>
<td>925.827.4900</td>
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<td>MACTEC Engr. and Consultants, Inc.</td>
<td>916 Matley Lane, Suite 110, Reno, NV 89502</td>
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<td>Nichols Consulting Engineers*</td>
<td>501 Canal Blvd, Suite 1, Point Richmond, CA 94804</td>
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Consultant List

http://www.mtcpms.org/support/consultants.html

These consultants are licensed to use StreetSaver®. Consultants with an * passed pre-qualification tests in 2012.

Highlighted consultants are currently under contract with MTC as qualified PTAP consultants
QA/QC Is Worth the Effort

- You wouldn’t let contractors construct pavements without conducting QA/QC

- You shouldn’t purchase distress or other condition data without a QA/QC program

- Avoid “garbage in > garbage out”
Concluding Remarks

- Distress data from semi-Automated distress data collection will be somewhat different from that based on manual surveys.
- However, PCI values from semi-automated pavement distress data can be used for network-level analysis when collected properly.
- Adjustments in decision trees, etc. may be needed to use it effectively.
Concluding Remarks

- Manual inspections are still more common than semi-automated
- Recommend not to switch back and forth between manual and semi-automated distress data collection
- Can use semi-automated distress data collection on high volume streets (Arterials?) but manual on others, etc. as long as consistent
On-line Distress Training

Self-Paced Online Courses:

- Pavement Condition Assessment:
  - MTC’s 7- Distress protocol (will be modified)
  - ASTM D6433 (full Paver distresses)

More info:

www.mtcpms.org/products
Rater Certification Program

Part of MTC Data Quality Management Plan:
- Must attend a distress survey class or
- Online pavement condition assessment class
- Pass a 8-hour field test
- Pass an online knowledge test
- Certification good for 2 years

www.mtcpms.org/support/QualityMgtProgram.html

Next Field Test: November 19 & 20, 2014
Mobile Rater – Android Tablet
Mobile Rater – Android Smart Phone
MobileRater Features

- Instant PCI calculation
- Record multiple distresses at once
- Inspection error checking
- Choice of inspection areas – entire network or zones
- Secure and easy one-click transfer of data to online server
- Fully compatible with StreetSaver® Online version
Questions?