Concrete Pavement Preservation Essentials

(Giving New Life to Aging Concrete Pavements)

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Maintaining the Service and Investment of the Highway by Implementing Pavement Management Into Cost-Effective PAVEMENT PRESERVATION MEASURES
Determining Treatment Selection

• Preservation Policy- Stating what the goal is for pavement condition and/or service life.

• In order to select the right treatment, for the right pavement, at the right time, the following information must be compiled and analyzed:
  – Expected performance of the pavement.
  – The treatment and expected costs (initial and life-cycle), both direct (agency costs) and indirect (user costs).
  – Does it meet the goal?
What is Pavement Preservation?

1. Tools to preserve concrete
2. Concrete is a tool for preservation
Pavement Preservation
Tools to Preserve Concrete Pavement

Distressed Concrete Pavement
- Joint/Crack Resealing
- Grooving
- Diamond Grinding
- Tied PCC Shoulders
- Cross-Stitching
- Dowel Bar Retrofit
- Full-Depth Repair
- Partial-Depth Repair
- Retrofit Edge Drains
- Slab Stabilization

Not all projects will require every procedure, but the sequence should be maintained.

Restored Concrete Pavement
Pavement Preservation
Concrete is a Tool for Preservation

Bonded overlays (BCOC & BCOA) ≤ 4"
Milling surface distresses and establishing a new bonded surface

• Converts existing pavement from fair/poor to good condition via milling
• Returns pavement to original function
  - Ridability
  - Friction
  - Removes surface distresses
• Extends service life
Pavement Preservation

Bonded Overlays 4” or less

Unbonded Overlays
Pavement Management Concept

Pavement Age

- 40% of life: $X/mile
- 70% of life: $~4X/mile
- 90% of life: $~6-10X/mile
- >90% of life: $>10X/mile
5 Core Questions

1. What is the current state of our pavements?

- What do we own?
- Where is it?
- What condition is it in?
- What is the remaining service life and economic value?

Condition Analysis
2. What is the level of service to be provided?

- What do owners and public expect?
- How different is this from actual conditions?

Involve City Officials
3. What level of deterioration is acceptable?

- How do these assets deteriorate?
- What are the likelihood and consequences of deterioration?
4. What are the feasible options to consider?

- What repair options are most feasible for our agency?
- How do these strategies impact system performance?

Pavement Management Model
5 Core Questions

5. Which long-term funding option should be selected?

- Does the selected strategy align with policy goals?

Pavement Management Model
What Pavement Preservation is Not

- **Worst first**
- **Cover up problems**
Service Life

LONG-TERM PAVEMENT

PDR and/or DG

YES
Service Life

SHORT-TERM PAVEMENT

NO

Investment

Excellent

Good

Fair

Poor

Deteriorated

Years
PAVEMENT PRESERVATION

- BUDGET
- PERFORMANCE CHECK (TRIGGERS)
- PRESERVATION TECHNIQUES
- PRIORITY RANKINGS
- PERFORMANCE MODEL
## Trigger/Limit Values for Pavement Preservation (JPCP)

<table>
<thead>
<tr>
<th>Performance Indicator</th>
<th>Trigger Value</th>
<th>Limit Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transverse Cracking</td>
<td>1.5% - 2.5% of slabs cracked</td>
<td>5% - 15% of slabs cracked</td>
</tr>
<tr>
<td>Joint Spalling</td>
<td>1.5% - 2.5% of joints</td>
<td>15% - 20% of joints</td>
</tr>
<tr>
<td>Joint Faulting</td>
<td>0.10 inches</td>
<td>0.50-0.70 inches</td>
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<tr>
<td>Roughness</td>
<td>63-90 in/mi</td>
<td>160-220 in/mi</td>
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</table>
Table 2.3. Michigan DOT Criteria for Preservation Strategies (Scofield et al. 2011)

<table>
<thead>
<tr>
<th>Strategy</th>
<th>Minimum RSL</th>
<th>DI</th>
<th>RQI</th>
<th>IRI</th>
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<tbody>
<tr>
<td>FDR</td>
<td>7</td>
<td>&lt; 20</td>
<td>&lt; 54</td>
<td>&lt; 107</td>
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<tr>
<td>Joint Resealing</td>
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<td>&lt; 15</td>
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<tr>
<td>Crack Sealing</td>
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<td>&lt; 54</td>
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<tr>
<td>Diamond Grinding</td>
<td>12</td>
<td>&lt; 10</td>
<td>&lt; 54</td>
<td>&lt; 107</td>
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<tr>
<td>Dowel Bar Retrofit</td>
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<td>&lt; 15</td>
<td>&lt; 54</td>
<td>&lt; 107</td>
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<tr>
<td>Concrete Pavement Restoration*</td>
<td>3</td>
<td>&lt; 40</td>
<td>&lt; 80</td>
<td>&lt; 212</td>
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</tbody>
</table>

*Consists of full-depth concrete repairs, diamond grinding, and other.
RSL: Remaining service life
DI: Distress index
RQI: Ride quality index
IRI: International roughness index
Why Use Performance Models?

- Needs assessment $$
- Multi-year workplans
- Performance models
- Predict condition
- Predict M&R
- What-if analysis
Pavement Condition Index (PCI) Concept

- Distress Type
  - Distress Quantity
  - Distress Severity
  - PCI
    - Excellent
    - Very Good
    - Good
    - Fair
    - Poor
    - Very Poor
    - Failed
Concrete Pavement Preservation Techniques

- Contains 12 Chapters on Preservation Techniques
- Added Overlay Chapter
- Working on 11 Training Modules and Instructor Guide
- Plan on 20 future workshops in next two years.
- Technical Assistance to State DOTs
Slab Stabilization vs. Slab Jacking

- **Slab Stabilization:**
  - Pressure insertion of grout/polyurethane to fill void beneath slab

- **Slab Jacking:**
  - Pressure insertion of grout/polyurethane to raise slab
<table>
<thead>
<tr>
<th>“V” Shape Milling Head and Pattern</th>
<th>Rock Saw and Rounded Pattern</th>
<th>Vertical Edge Mill Head and Pattern</th>
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</thead>
<tbody>
<tr>
<td><img src="image1" alt="Concrete Removal - V Shape" /></td>
<td><img src="image2" alt="Concrete Removal - Rock Saw" /></td>
<td><img src="image3" alt="Concrete Removal - Vertical Edge" /></td>
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<tr>
<td>30 to 60 degrees</td>
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Investigation

City of West Des Moines

Design

• Plans
• Standard Specification
• Standard detail (MN)

Construction
Full Depth Repairs

New Additions to the Preservation Manual:

- Precast Repairs
- Utility Cuts
- CRCP Guidelines
Retrofitted Edge Drains

New Additions:

• Streamlining of Information
• Importance of Maintenance
Dowel Bar Retrofit

- Restores load transfer
- Reduces probability of pumping, faulting, and corner breaks
- Improves long-term rideability
- Increases service life
New Surface Textures

• Optimized Texture for City Streets (OTCS)
  – Similar to diamond grinding but reduced land heights/widths

• Next Generation Concrete Surface (NGCS)
  – Manufactured, low-noise surface consisting of flush grinding and grooving
Joint Resealing and Crack Sealing

New Additions:

- General Chapter Update
- Improve Troubleshooting
Concrete Overlays

New Additions:

• New Chapter
• Information from 2014 Overlay Guide Update
• Lessons Learned From Projects (2008 to 2014)
THANK YOU!

Representing the National Concrete Pavement Technology Center

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