Concrete Pavement Preservation

Southeast Concrete Preservation Workshop
3-18-15

Larry Scofield
IGGA
Why Preserve Concrete Pavement! Bellefontaine, Ohio

Main Street paved in 1891.

1st Concrete Street in America
Bellefontaine, O.
Bellefontaine, Ohio 2012

120 Years Old
Purpose of Concrete Pavement Preservation

- Used early when pavement has little deterioration.
  - Repairs isolated areas of distress.
  - Repairs some construction defects.
  - Manages the rate of deterioration
## FHWA Performance Measures

<table>
<thead>
<tr>
<th>Measure</th>
<th>Surface</th>
<th>Assessment</th>
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<tbody>
<tr>
<td><strong>IRI (in/mi)</strong></td>
<td>All Pavements</td>
<td>Population Consideration</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Population &lt; 1 Million</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Good</td>
</tr>
<tr>
<td></td>
<td></td>
<td>&lt;95</td>
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<tr>
<td></td>
<td></td>
<td>No Population Considerations</td>
</tr>
<tr>
<td><strong>Cracking Percent</strong></td>
<td>Asphalt Jointed</td>
<td>Good</td>
</tr>
<tr>
<td></td>
<td>PCCP</td>
<td>&lt;5</td>
</tr>
<tr>
<td><strong>Rutting (in)</strong></td>
<td>Asphalt</td>
<td>No Population Considerations</td>
</tr>
<tr>
<td></td>
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<td>Good</td>
</tr>
<tr>
<td></td>
<td></td>
<td>&lt;0.2</td>
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<tr>
<td><strong>Faulting (in)</strong></td>
<td>Jointed PCCP</td>
<td>No Population Considerations</td>
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<tr>
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<td>Good</td>
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<tr>
<td></td>
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<td>&lt;0.05</td>
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<tr>
<td><strong>Cracking Percent</strong></td>
<td>CRCP</td>
<td>No Population Considerations</td>
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<td>&lt;5</td>
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</table>
First Level of Response for Deteriorating Concrete Pavements Should Always be Preservation

- Best Value
- Least Service Disruption
- Increases Safety
- Least Use of Non Renewable Resources
- Ensures Customer Satisfaction
Favorable Characteristics for Preservation

- Few or limited structural problems
- No materials-related distress
- Pavements in overall relatively good condition
Preservation Strategy Selection

Determining correct strategy is NOT complicated.

- Determine the **cause** of distress.
  - Structural, Functional, Material, Drainage
- Consider multiple perspectives
  - Ride Quality, Traffic, Noise, Maintenance Requirements, Lane-Condition Uniformity, Future Performance, Cost
Concrete Pavement Preservation

- **Common Treatments**
  - Full-depth repairs
  - Dowel bar retrofit
  - Diamond grinding
  - Partial-depth repair
  - Joint sealing

- **Growing Treatments**
  - Cross stitching
  - Thin Concrete Overlays

- **Less Common Treatments**
  - Slab stabilization
  - Retrofitted edge drains
Full Depth Repairs

If distress greater than 1/3 D

May also need to Stabilize Sub Base
Advantages

• Better quality concrete
• Controlled curing
• Minimal weather impacts
• Rapid opening

Experience in CA, CO, MI, DE, MN, MO, TX, NJ, NY, IL, UT, VA

Good performance to date
Partial Depth Repairs
Changes with New Guide

Figure 5. Types of partial-depth joint/crack/spall repairs
Partial Depth Repairs

If distress less than $\frac{1}{3}D$ $\frac{1}{2}D$
Partial Depth Repairs

- Removal and replacement of small, shallow areas of deteriorated concrete
- Expanded use as repair technique
- Greater use of milling for preparation
  - Productivity
  - Bonding
- New patching materials
Dowel Bar Retrofit
Installation of dowel bars in existing joints to improve load transfer

Increased use on cracks

Focus on patching materials
  • Durability
  • Shrinkage
Also need to:
Reseal Joints
Cross Stitching
Cross Stitching

- Accepted treatment for
  - Early longitudinal cracks in new construction
  - Longitudinal cracks in older pavements
  - Misaligned tie bars

- Advantages:
  - Quick and easy to install
  - Less intrusive

- Good performance
Note A: Distance between holes is 24 in. for heavy traffic; 36 in. for light traffic

Note B: Determine distance from longitudinal crack to hole based on slab thickness T and drill angle. Slabs less than 12 inches thick require a 35° insertion angle.
Slab Stabilization / Jacking
Slab Stabilization

Fill Void or Level Slab

Grout
Grinding & Texturing Concrete
Removal of thin layer of concrete to restore smoothness

Important to concrete pavement preservation

Diamond grinding types

- Conventional
- City street
- NGCS
• Removes Faulting
• Improves Ride
• Improves Friction
• Reduces Noise
Diamond Grinding Equipment
CALTRANS has determined that the average life of a diamond ground pavement surface is 17 years and that a pavement can be ground at least three times without affecting pavement structurally. See ACPA-SW for full report.
Joint and Crack Resealing
Performance of Sealed and Unsealed Concrete Pavement Joints

This TechBrief presents the results of a nationwide study of the effects of transverse joint sealing on performance of plain concrete pavement (PCP). This study was conducted to assess whether JCP designs with unsealed transverse joints perform differently from JCP designs with sealed transverse joints. Distress and deflection data were collected from 177 test sections at 26 experimental joint sealing projects located in 11 states.

- Performance of the pavement test sections with unsealed joints was compared with the performance of pavement test sections with one or more types of sealed joints.

**BACKGROUND**

The sealing of transverse concrete joints in JCP has been standard practice throughout much of the United States for many years. Its widespread use is due to the common belief that sealing joints improves concrete pavement performance in two ways: by reducing water infiltration into the pavement structure, thereby reducing the occurrence of moisture-related distresses such as pavement surface cracking, and by preventing the infiltration of incompressible materials, for example, sand, and mud, into the joints, thereby reducing the likelihood of pressure-related joint failures such as joint spalling and blowouts.

A disadvantage of jointed concrete pavements (JCP) are typically created by using an oscillating or oscillating to force controlled cracking, followed by a second, wider saw cut to produce a reservoir for the joint sealant material. This traditional approach of sawing and sealing transverse contraction joints is estimated to account for between 2 and 7 percent of the initial construction cost of a JCP. Moreover, these sealed transverse joints require resealing one or more times over the service life of the pavement, leading to additional costs in terms of labor, materials, operations, and lane closures.

Recently, several state departments of transportation (DOTs) have been questioning conventional transverse joint sawing and sealing practices. These agencies contend that the benefits derived from sealing do not offset the costs associated with the placement and continued upkeep of the sealant over the life of the pavement. As a result, they have been experimenting with different sawing and sealing alternatives, for example:

- Narrow unsealed joints, consisting of single saw cuts that are left unsealed.
- Narrow filled joints, consisting of single saw cuts that are filled with sealant that adheres to the sides and bottom of the saw cut.
- Narrow sealed joints, consisting of single saw cuts that contain a narrow backer rod and sealant material.

**SHRP 2 Report: 5-6 years**

- Without preformed
- With preformed

*Fargo, ND*

*El Paso, TX*
20 Year Old Silicone Sealed Joint
Utility Cut Repairs

- Opening street to gain access to utilities
- On-going issue of returning pavement to good condition
- Guidance on:
  - Sizing cuts
  - Creating/removing
  - Jointing
  - Backfilling
  - Embedded steel
  - Opening to traffic
Concrete Pavement Preservation Manual

• 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
Preservation Checklists

Pavement Preservation Checklist Series

7 Diamond Grinding of Portland Cement Concrete Pavements

10 Full-Depth Repair of Portland Cement Concrete Pavements
Finding Buried Treasure?
A Pavement Preservation Technique that Uncovers and Renews Aged PCCP that has Been Overlaid with Asphalt due to Functional Requirements and Not Structural Issues

- Functional Issues Consist of Noise, Friction, and Smoothness
Thank You

and

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