Concrete Pavement Preservation
Why Preserve Concrete Pavement! Bellefontaine, Ohio

Main Street paved in 1891.

1st Concrete Street in America
Bellefontaine, O.
119 Years Old

Bellefontaine, Ohio 2012
Preservation Can Work (122 Years)

Proper Preservation!!!!!!!
Iowa --1910
Trends We May Want to Start: the JFK Example

- A Nation of Doers
- Compelling Vision
- Funding, Funding, Funding, Funding, Funding
A dual 7090 system at NASA in about 1962.

Could store 32,768 36-bit words.

That’s about 0.00015 gigabytes.

Cost:

about $3,000,000.

or $19,794,000 2005 dollars
Doers

- Kennedy Challenges the Nation to put a Man on the Moon—Sept 12, 1962
- Neil Armstrong Walks on the Moon—July 20, 1969 ........ Seven Years Later............
Those who came before us made certain that this country rode the first waves of industrial revolution, the first waves of modern invention, and the first wave of nuclear power, and this generation does not intend to founder in the backwash of the coming of the age of space. We mean to be part of it. We mean to lead it.”—John F. Kennedy
...”We choose to go to the moon. We choose to go to the moon in this decade and do the other things, not because they are easy, but because they are hard, because that goal will serve to organize and measure the best of our energies and skills, because that challenge is one that we are willing to accept, one we are unwilling to postpone, and one which we intend to win, and the others too.”. John F. Kennedy
“…To Be Sure, all this costs us all a good deal of money. This year’s space budget is three times what it was in January 1961, and it is a greater than the space budget of the previous 8 years combined. That budget now stands at $5,400 million a year—a staggering sum, thought somewhat less than we pay for cigarettes and cigars every year. Space Expenditures will soon rise some more from 40 cents per person per week to more than 50 cents a week for every man, woman, and child in the United States, for we have given this program a high national priority even though I realize that this is in some measure and act of faith and vision. …“ John F Kennedy
AASHTO New Design Guide: 1996: 19 years Later...

FHWA Performance Measures: 3 Years +

Concrete Pavement Strategy Life Extension (??????)
Returning to the Old Ways

- Let's Talk Implementation not Innovation
- Let's Talk Every Dollar Counts
- Let's Preserve the Greatest Transportation System in the History of Mankind
Roman Road – Network Approximately Equal to the US Interstate System—Cost $3.2 Million per Mile
<table>
<thead>
<tr>
<th>Measure</th>
<th>Surface</th>
<th>Assessment</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>IRI (in/mi)</strong></td>
<td><strong>All Pavements</strong></td>
<td><strong>Population Consideration</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Population &lt; 1 Million</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Population &gt; 1 Million</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Good</strong></td>
</tr>
<tr>
<td>&lt;95</td>
<td>95 - 170</td>
<td>&gt;170</td>
</tr>
<tr>
<td>&lt;95</td>
<td>95 - 220</td>
<td>&gt;220</td>
</tr>
<tr>
<td><strong>Cracking Percent</strong></td>
<td><strong>Asphalt</strong></td>
<td><strong>Good</strong></td>
</tr>
<tr>
<td></td>
<td><strong>Jointed PCCP</strong></td>
<td>&lt;5 5 - 10 &gt;10</td>
</tr>
<tr>
<td><strong>Rutting (in)</strong></td>
<td><strong>Asphalt</strong></td>
<td><strong>Good</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td>&lt;0.2 0.2-0.4 &gt;0.4</td>
</tr>
<tr>
<td><strong>Faulting (in)</strong></td>
<td><strong>Jointed PCCP</strong></td>
<td><strong>Good</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td>&lt;0.05 0.05-0.15 &gt;0.15</td>
</tr>
<tr>
<td><strong>Cracking Percent</strong></td>
<td><strong>CRCP</strong></td>
<td><strong>Good</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td>&lt;5 5 - 10 &gt;10</td>
</tr>
</tbody>
</table>
Filling In the Gaps

Guidelines for the Preservation of High-Traffic-Volume Roadways

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Treatment Life (yr)</th>
<th>Pavement Life Extension (yr)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concrete joint resealing</td>
<td>2–8</td>
<td>5–6</td>
</tr>
<tr>
<td>Concrete crack sealing</td>
<td>4–7</td>
<td>NA</td>
</tr>
<tr>
<td>Diamond grinding</td>
<td>8–15</td>
<td>NA</td>
</tr>
<tr>
<td>Diamond grooving</td>
<td>10–15</td>
<td>NA</td>
</tr>
<tr>
<td>Partial-depth concrete patching</td>
<td>5–15</td>
<td>NA</td>
</tr>
<tr>
<td>Full-depth concrete patching</td>
<td>5–15</td>
<td>NA</td>
</tr>
<tr>
<td>Dowel bar retrofiling</td>
<td>10–15</td>
<td>NA</td>
</tr>
<tr>
<td>Ultra-thin bonded wearing course</td>
<td>6–10</td>
<td>NA</td>
</tr>
<tr>
<td>Thin HMA overlay</td>
<td>6–10</td>
<td>NA</td>
</tr>
</tbody>
</table>
The LTPP SPS-2 Experiment
**The Nations Largest Concrete Research Effort**

Pooled Fund On SPS-2 Pavement Preservation
LTPP’s GOAL is...

to provide answers to HOW and WHY pavements perform as they do!
Designed to Evaluate Relative Influence of 5 Design Factors and 3 Site Factors on Long Term Performance

- Concrete Thickness (8” & 11”)
- Base Type (LCB, DGA, PATB/DGA)
- Flexural Strength (550 & 900)
- Lane Width (12’ & 14’)
- Drainage (with and without)

Site Factors
  - Temperature
  - Precipitation
  - Subgrade
What are Potential Opportunities

- Life Extension of Concrete Pavement Preservation Treatments
- Development of PMS Triggers for Concrete Preservation
- Improved Ride Quality
- PCCP Design Life Verification
- Sealant Research
Performance of Sealed and Unsealed Concrete Pavement Joints

This Tech Brief presents the results of a nationwide study of the effects of transverse joint sealing on the performance of jointed plain concrete pavements (JPCP). This study was conducted to assess whether JPCP designs with sealed transverse joints performed differently from JPCP designs with unsealed joints. Distress and deflection data were collected from 117 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 jointed concrete joints in JPCP has been standard practice throughout much of the United States for many years. Its widespread use is due to the commonly held belief that sealing 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 punting, spalling, and heaving; and by preventing the infiltration of incompressible materials, such as sand and silt, into the joints, thereby reducing the likelihood of pressure-related joint failures such as joint spalling and blowout.

Traditional jointed concrete pavements (JCP) are typically created by forming and sawing concrete to form transverse joints at predetermined intervals. These joints are typically sealed with flexible joint sealants at the time of construction. This traditional approach, however, can result in high maintenance costs over time, particularly when the joints are not properly maintained.

For example, the SHRP 2 Report notes that the effectiveness of sealants in JPCP can vary significantly depending on the specific type of sealant used and the conditions under which it is applied.

SHRP 2 Report: 5-6 years
20 Year Old Silicone Sealed Joint
National Average CDG Costs Over time

CDG Costs ($/sa yd)

Year

Road Building 1993 and 2014

- Funding
  - 1993 Lets Build 100 Miles of Road
  - 2014 Lets Build 67 Miles of Road

- Colorado Consumption Rate
  - 1995 Lets Drive 35.1 Billion VMT
  - 2012 Lets Drive 46.8 Billion VMT
The Value of Smooth Pavements

- **Passenger Cars:** Decrease in IRI of 63 in/mi results in approximately a 2% fuel savings (Chatti and Zaabar 2012)

- **Trucks:** Decrease in IRI of 63 in/mi results in a 1% fuel savings at highway speeds and 2% at low speeds (35 mph) (Chatti and Zaabar 2012)
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.
AASHTO Design Model Prediction vs. Actual Traffic

- AASHTO design model prediction (50% reliability)
- Cumulative traffic (construction to grinding)
- Total traffic since initial construction

Traffic, million ESALs

<table>
<thead>
<tr>
<th>State</th>
<th>Route</th>
<th>Traffic (million ESALs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>FL</td>
<td>I-10</td>
<td></td>
</tr>
<tr>
<td>AL</td>
<td>I-20</td>
<td></td>
</tr>
<tr>
<td>NC</td>
<td>I-26</td>
<td></td>
</tr>
<tr>
<td>SC</td>
<td>I-85</td>
<td></td>
</tr>
<tr>
<td>GA</td>
<td>I-75</td>
<td></td>
</tr>
<tr>
<td>GA</td>
<td>I-85</td>
<td></td>
</tr>
</tbody>
</table>
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
GUIDE FOR
PARTIAL-DEPTH REPAIR OF
CONCRETE PAVEMENTS

April 2012

IOWA STATE UNIVERSITY
Institute for Transportation
In Summary

- We Need to Create a Data Rich Environment
- Life is Simple: **Fund it and Build It**
- We Need to Focus on Value
- We Need to Focus on Big History Sustainability, Not Short Term
Any Question?

Thanks to all contractors for all your hard work!
Thank You

and

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www.igga.net