PCC Rehabilitation
US 30 in Denison

Shane Tymkowicz
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Municipal Streets Seminar
Keep Good Roads in Good Shape

![Graph showing the relationship between investment, pavement condition, and years. The graph indicates that with proper treatment, roads can maintain their condition.]
OPENING UP THE TOOL BOX

RIGHT TREATMENT AT RIGHT TIME

- FULL DEPTH PATCHING
- PARTIAL DEPTH PATCHING
- DOWEL BAR RETROFIT
- DIAMOND GRINDING
- COMBINE COMPLIMENTARY TREATMENTS
- WINDOW OF OPPORTUNITY

Second Edition
CONCRETE PAVEMENT PRESERVATION GUIDE

September 2014

National Concrete Pavement Technology Center

U.S. Department of Transportation
Federal Highway Administration

FHWA Publication No. FHWA-HIF-14-014
Full Depth Patching
Partial Depth Patching

- Damage less than 1/3 Pavement Depth
Partial Depth Repair
Dowel Bar Retrofit

- Load Transfer
- Faulting

\[ \Delta_L = x \]
\[ \Delta_U = 0 \]

Load Transfer = 0% (Poor)

\[ \Delta_L = x \]
\[ \Delta_U = x \]

Load Transfer = 100% (Good)
Dowel Bar Retrofit Spacing

1 group of 3 epoxy coated dowel bars installed 1' on centers

TRAFFIC

18"
Diamond Grinding

Width of diamond blades (.125 inches - 3.2 mm)

Land area - .080 inches (2.3 mm) for hard aggregate
- .110 inches (2.8 mm) for soft aggregate
US 30 Denison

9500 ADT 12% Trucks
4 Lane Undivided
1.1 Miles in Length
Business Corridor for Denison
A Project Concept

Traffic & Pavement
- Traffic/Capacity
- Pavement Condition & Treatment
- Safety
- Drainage
- Costs
- Asset Management

Life Cycle Analysis
- Right Treatment
- Right Time
- Pavement Spoke
- No Complex Cost Analysis
US 30 - Considerations

- Aging 1958 10” PCC Pavement
- Had considered doing something due to roughness for over a decade
- Rough Ride since 1980s
- Low Friction (Safety)
- Drainage
- Access and Staging (Business Corridor)
- Costs ($$$)
Pavement History

• 1958 & 1962
  – No Load Transfer
  – 9.5 & 10 Inch
• Durable Aggregate
Pavement Condition

- Joint Spalling
- Corner Cracks
- Low Friction

- Lots of Good Slab
- Durable Aggregate
- Past Patching
Low Friction/ Polished Aggregate
Pavement Condition
Pavement Condition
## IRI Over Time

<table>
<thead>
<tr>
<th>Year</th>
<th>IRI</th>
<th>Year</th>
<th>IRI</th>
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</thead>
<tbody>
<tr>
<td>2005</td>
<td>265</td>
<td>2012</td>
<td>277</td>
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<tr>
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<td>2008</td>
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<tr>
<td>2010</td>
<td>277</td>
<td>2017</td>
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</tr>
<tr>
<td>2011</td>
<td>277</td>
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</table>

Over 170 IRI is Poor by FHWA Definition
## PCI Movement

<table>
<thead>
<tr>
<th>Year</th>
<th>PCI</th>
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<tbody>
<tr>
<td>2012</td>
<td>33</td>
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<tr>
<td>2013</td>
<td>27</td>
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<td>2014</td>
<td>39</td>
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<td>2015</td>
<td>39</td>
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<td>2016</td>
<td>19</td>
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<tr>
<td>2017</td>
<td>18</td>
</tr>
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</table>

PCI – 40% IRI, 40% Cracking & 20% Faulting
# Rehabilitation vs Reconstruction

<table>
<thead>
<tr>
<th>Rehabilitation</th>
<th>Reconstruction</th>
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</thead>
<tbody>
<tr>
<td>Concept Cost $1 Million</td>
<td>Estimated at $5 Million</td>
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<tr>
<td>Maintain Traffic</td>
<td>Complex Staging</td>
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<tr>
<td>Maintain Access</td>
<td>Business Access a Challenge</td>
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<tr>
<td>Shorter Construction</td>
<td>Full Construction Year</td>
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<tr>
<td>Minimal City Costs</td>
<td>City Costs Higher</td>
</tr>
<tr>
<td>Minimal Utility Impacts</td>
<td>High Utility Impact</td>
</tr>
<tr>
<td>District Design</td>
<td>Central or Consultant Design</td>
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<tr>
<td>Lots of Pavement Life</td>
<td></td>
</tr>
</tbody>
</table>
# Rehabilitation vs Reconstruction

## Rehabilitation PCC
- Concept Cost $1 Million
- Maintain Traffic
- Maintain Access
- Shorter Construction
- Minimal City Costs
- Minimal Utility Impacts
- District Design
- Lots of Pavement Life
- Drainage
- Load Transfer
- Knowledge/Fear

## Rehabilitation HMA
- Concept Cost $0.9 Million
- Maintain Traffic
- Maintain Access
- Shorter Construction
- Minimal City Costs
- Minimal Utility Impacts
- District Design
- Lots of Pavement Life
Concept to Reality

• Concept Estimate - $1.0 Million
  – Added Contingency for Small Project
  – Over Estimated Cost of Grinding Gravel
    • Estimated $10/sy actual was $5/sy
  – Over Estimated Cost of Dowel Bar Retrofit
    • Estimated $50 actual was $33

• Letting Cost - $581 Thousand
  – Added Extra Patching
    • $200 Thousand
  – Grinding & Small Quantity Concerns not Realized

• Final Project Costs - $800 Thousand ($2.80/sf)
Patching and Dowel Bar Retrofit
Diamond Grinding Equipment
Pavement After Grinding
Results of Diamond Grinding

• IRI Before – 294.8 inches/mile
  – Note 2017 Data was 277 inches/mile
• IRI After – 116.7 (115 < 45mph)
  – Intersections & Drainage
• PCI Before – 18 (Very Poor)
• PCI After* - 87 (Good)

*Estimated – Next collection cycle 2020
Other Thoughts and Advice

• Invest in Patching
  – Full Depth vs Partial
  – Over Estimate Quantities

• DBR & Partial vs Full Depth

• Once and Done

Partial Depth 3 times the cost of Full Depth
Know Your Pavements – DBR

Pavement Investigation

Need Solid Pavement at Joints
– Patching (Previous Maintenance)
– Coring
– Construction History
– Aggregate Durability
The Future for District 3

Denison – Measure new IRI & PCI
  - Significant Improvement in PCI & IRI
  - Monitor Changes over Time
  - Include Information in Asset Management

Looking at Additional Locations
  - Primghar
  - Manning
  - Other Urban Area(s)

Asset Management - LCCA
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