Chip Seal

Best Practices

by:
Larry Galehouse, P.E. (NCPP)
&
Tom Wood (MnDOT)
Pavement Preservation is needed because:

- it keeps good pavements lasting longer
- it costs less than traditional approaches
- it is cost effective
  - anecdotal evidence
  - pavement management data
Seal Coated
SR = -0.0008x^2 - 0.0307x + 4.0111
R^2 = 0.7934

No Maint.
SR = -0.0041x^2 - 0.0103x + 3.9607
R^2 = 0.8967
Web Resources

**Australia**

✓ Roads and Traffic Authority (RTA, NSW)

✓ Road Corporation (VicRoads, Victoria)

**New Zealand**

✓ Transit New Zealand (TNZ)
  [www.transit.govt.nz](http://www.transit.govt.nz)
United States

- National Center for Pavement Preservation
  [www.pavementpreservation.org](http://www.pavementpreservation.org)
- Minnesota DOT
  [www.dot.state.mn.us](http://www.dot.state.mn.us)
- Texas DOT
  [www.dot.state.tx.us](http://www.dot.state.tx.us)
Introduction
Chapter 1
Chip Seal - 5 months old
Chip Seal – 2 years old
Chip Seal – 2 years old
Preventive Maintenance Concept

- 40% Drop in Quality
- 75% of Life

Spending $1 on preventive maintenance here...

...eliminates or delays spending $6 to $10 on rehabilitation or reconstruction here...

12% of Life
Chip Seals - Development

- Date from the 1920's
- Originally designed as wearing courses for low volume gravel roads
- Evolved into maintenance treatments for low and high volume roads
- Protect asphalt layer from damage
- Skid resistant surface
Chip Seal Service Life

- United States: 5.76 years
- Canada: 5.33 years
- AU, NZ, UK, SA: 9.6 years
Definition:

“A program employing a network level, long-term strategy that enhances pavement performance by using an integrated, cost-effective set of practices that extend pavement life, improve safety and meet motorist expectations.”

Source: FHWA Pavement Preservation Expert Task Group
Chip Seal Advantages

- Cost Effective Treatments
- Good Durability
- Ease of Construction
- Improved Skid Resistance
Chip Seal Disadvantages

- Cure Time
- Flying Chips
- Noise Considerations
- Weather Consideration
- Performance
- Ride Quality (will not improve)
Chip Seal Limitations

- Adding Structural Capacity
- Unsuitable for Bad Roads
NCHRP User Survey

✓ Conducted 2003-2004
✓ Review of Best Practices
✓ State, Federal, and Local Agencies [54]
✓ Internationally: Canada, Europe, Africa, Pacific Nations [22]
NCHRP Findings

- Overseas experience much different than North America experience
- Rely on emulsion binders in the U.S.
- Climate most critical
- Emulsions better in hot weather and asphalt cement better in cool weather
- Aggregate choice and transportation costs
- Electrostatic compatibility of aggregates and binders
Where are Chip Seals Used?

Lane Miles

- US: 139,713
- Australia: 136,416
- UK: 106,575
- Canada: 39,482
- NZ: 35,950
### Art or Science?

<table>
<thead>
<tr>
<th>Art</th>
<th>Science</th>
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</thead>
<tbody>
<tr>
<td>Variable Conditions</td>
<td>Uniform Conditions</td>
</tr>
<tr>
<td>Judgmental Adjustments</td>
<td>Few Adjustments</td>
</tr>
<tr>
<td>Experienced Personnel</td>
<td>Flexible Personnel</td>
</tr>
<tr>
<td>Variable Results</td>
<td>Predictable Results</td>
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</table>
## Differing Philosophies

<table>
<thead>
<tr>
<th>North America</th>
<th>Overseas</th>
</tr>
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<tbody>
<tr>
<td>✓ Distress</td>
<td>✓ Low skid numbers</td>
</tr>
<tr>
<td>✓ Prevention of water infiltration</td>
<td>✓ Need for wearing surface</td>
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## Evolution of Chip Seals

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>North America</th>
<th>Overseas</th>
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<tbody>
<tr>
<td>Philosophy</td>
<td>Art</td>
<td>Science</td>
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<tr>
<td>Agency Realm</td>
<td>Maintenance</td>
<td>Construction</td>
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<tr>
<td>Forces</td>
<td>In-House</td>
<td>Contractor</td>
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<tr>
<td>Design</td>
<td>Recipe</td>
<td>Engineering Principles</td>
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<tr>
<td>Risk</td>
<td>Agency</td>
<td>Contractor</td>
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<tr>
<td>Pavement Selection</td>
<td>Variable</td>
<td>Textured (Sand Circle)</td>
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<tr>
<td>Surface Hardness</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Outcome</td>
<td>Uncertain</td>
<td>Predictable</td>
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</tbody>
</table>
✓ Flushing, bleeding, raveling, shelling?
✓ Variations between regions, within agencies, and from practitioner to practitioner.
✓ Terminology variations impact decision making, evaluation, and corrective actions.
Flushing!
Shelling/Raveling!
Proper Embedment!
Questions?