The Right Treatment for Resurfacing Projects
Clark Morrison, PE
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The Right Treatment for Resurfacing Projects

• Selecting Mix Type

• Pre-Overlay Treatment
  – Alligator Cracking
  – Transverse Cracking
  – Rutting
What is the Difference Between Asphalt Surface Mixes?

S4.75A
SF9.5A
S9.5B
S9.5C
S9.5D
As you go from A to B to C to D:

- Liquid AC gets stiffer
- AC content generally decreases

As a result:

- Resistance to rutting increases
- Resistance to cracking decreases
Q: How do we choose the right mix?
18 kips
<table>
<thead>
<tr>
<th>Mix Type</th>
<th>20 Year Loading (Million ESALS)</th>
<th>Liquid AC</th>
</tr>
</thead>
<tbody>
<tr>
<td>S4.74A</td>
<td>Less than 1</td>
<td>PG 64-22</td>
</tr>
<tr>
<td>SF9.5A</td>
<td>Less than 0.3</td>
<td>PG 64-22</td>
</tr>
<tr>
<td>S9.5B</td>
<td>Less than 3</td>
<td>PG 64-22</td>
</tr>
<tr>
<td>S9.5C</td>
<td>3 to 30</td>
<td>PG 70-22</td>
</tr>
<tr>
<td>S9.5D</td>
<td>Over 30</td>
<td>PG 76-22</td>
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</table>
First Step in Mix Type Check: Short-term traffic count

• Count tractor-trailers and single unit trucks on the road for one hour.
• Try to pick a “representative” hour
• “Hourly ESALs” = \( \frac{(\text{tractor trailers}) + (\text{single units})}{3} \)
## Mix Level for Hourly ESALs

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<tr>
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<td>S4.75A</td>
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<tr>
<td>Less than 40</td>
<td>S9.5B</td>
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<tr>
<td>More than 40</td>
<td>S9.5C</td>
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Second Step in Mix Type Check: Existing Pavement Thickness

- Higher level mixes are stiffer, and require more effort to compact.
- The stiffness increases rut resistance, but makes it more likely to crack.
- Higher level mixes need a thicker “base” to get adequate compaction.
- Stiffer mixes need a thicker “base” to prevent cracking under traffic.
### A very rough guideline

<table>
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<th>Existing Pavement Thickness*</th>
<th>Surface Mix Level</th>
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<tr>
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<td>B</td>
</tr>
<tr>
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<td>C</td>
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* Each inch of ABC counts as ½ inch of asphalt.
Example:

• Resurfacing project will place 1.5” S9.5C.
• In one “representative” hour you count 30 tractor trailers and 45 single unit trucks.
• The existing pavement is 5 inches thick and has moderate alligator cracking.
• Is the mix type appropriate?
Example

• “hourly ESALs” = (30 tractor trailers) + (45 single units)/3 = 45

• Check the Hourly ESAL-Mix Level Chart.
# Mix Level for Hourly ESALs

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Example

- “hourly ESALs” = (30 tractor trailers) + (45 single units)/3 = 45
- From Chart, mix type should be C.
Example

• “hourly ESALs” = (30 tractor trailers) + (45 single units)/3 = 45
• From Chart, mix type should be C.
• Look at the thickness chart!
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Example

- “hourly ESALs” = (30 tractor trailers) + (45 single units)/3 = 45
- From ESAL Chart, mix type should be C.
- Thickness is less than 7, so it may be better to use a B-level mix.
Remember!

• These are very rough guidelines.
• They should not be used to make changes to the plans immediately.
• They should be used to know when to raise the question.
Why are the Guidelines Rough?

• We are projecting traffic over the life of the pavement from a one hour count using assumed ESAL coefficients.

• The existing structure depends on more than the thickness of the pavement. The condition of the pavement and the quality of the subgrade matter too.
Summary
Checking the Mix Type

- Count trucks for a “representative” hour and calculate hourly ESALs.
- Check the hourly ESALs chart.
- Determine the thickness of the existing pavement.
- Check the pavement thickness chart.
- Raise the question if needed.
What to Do About Distresses

- Alligator Cracking
- Transverse Cracking
- Rutting
• Alligator cracking is a load associated structural failure.

• Cracking first begins in the wheel path, usually as longitudinal cracking. Further stress creates an alligator pattern.
Alligator Cracking

Light: Longitudinal disconnected hairline cracks about 1/8 inch wide running parallel to each other; initially may be only a single crack in the wheel path or edge of pavement but could also look like an alligator pattern.
Moderate: Longitudinal cracks in wheel path(s) or edge of pavement forming an alligator pattern; cracks may be slightly spalled and are 1/4 inch wide.
Alligator Cracking
(pg. 16 - 23)

Severe: Cracking has progressed so that pieces appear loose with severely spalled edges; cracks are about 3/8 to 1/2 inch wide or greater; potholes may be present.
Alligator Cracking: Pre-Overlay Treatment

- Light: No Treatment
- Moderate: Mill and Replace 2.5” to 4.0”
  ¼” cracks
- Severe: Full Depth Patch
  3/8” cracks
  loose chunks
  severe spalling
Transverse Cracking
(pg. 24 - 23)

- Transverse/block cracking is NOT a load associated structural failure.
- Cracks are generally caused by shrinkage of the asphalt concrete and daily temperature cycling. Wheel path loads can increase the severity of block cracking.
- Transverse cracking also includes reflective cracking of plant mix resurfacing over concrete.
Light: Cracks are less than 1/4 inch wide and are not spalled; block pattern may not be visible yet; transverse cracks usually 10 to 20 feet apart. Cracks have little or no spalling and joints are usually not bumped up.
Transverse Cracking
(pg. 24 - 31)

Moderate: Block pattern may be visible with blocks 10 square feet or greater present; cracks are 1/4 inch to less than 1/2 inch wide; cracks may or may not be spalled; transverse cracks usually 5 to 20 feet apart. Joints may be bumped up 1/2 to 1 inch high.
Transverse Cracking

Severe: Cracks may be severely spalled with smaller blocks 2 - 10 square feet present; cracks usually about 1/2 inch wide or greater; transverse cracks may be 1 to 2 feet apart throughout portions of the surface. Joints may be bumped up greater than 1 inch high.
Transverse Cracking: Pre-Overlay Treatment

- Light: No Treatment
  Isolated Transverse Crack
- Moderate: No Treatment
  Block Pattern Cracking
- Severe: Mill and Replace 2.5” to 4.0”
  Consider Full Depth Patch

- Moderate: Mill and Replace 2.5” to 4.0”
- Severe: Mill and Replace 2.5” to 4.0”
Rutting  
(pg. 32 - 35)

• A surface depression in the wheel path or at the edge of pavement.

• Causes of rutting:
  • Pavement deformation caused by traffic loads
  • Unstable mix design
  • Movement of mix in hot weather
  • Subgrade failures
Rutting
(pg. 32 - 35)

Light: Rutting ¼ inch to less than ½ inch deep.
Rutting
(pg. 32 - 35)

Moderate: Rutting $\frac{1}{2}$ inch to less than 1 inch deep.
Rutting

( pg. 32 - 35 )

Severe: Rutting 1 inch or greater.
Rutting: Pre-Overlay Treatment

- Light (< ½” deep)  No Treatment
- Moderate or Severe  Mill to level, Mill and Replace, or Leveling Course
General Guidance on Treatments

• Don’t mill more than half the thickness of the existing asphalt
• If half or more of a segment of the project requires treatment, treat it all
• Lack of treatment may lead to compaction difficulties, and/or poor long-term performance
The End