Choosing the Right Asphalt Mix For the Right Road

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Pavement Management Unit
What is the Difference Between Asphalt Surface Mixes?

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 compensate for the decreased resistance to cracking in higher level mixes?
A: Make the pavement thicker.
Q: What happens if we put a high level mix on a thin pavement?
A:
Compaction difficulties
Increased likelihood of cracking
Q: How do we choose the right mix?
<table>
<thead>
<tr>
<th>Mix Type</th>
<th>20 Year Loading (Million ESALS)</th>
<th>Liquid AC</th>
</tr>
</thead>
<tbody>
<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>
</tr>
</tbody>
</table>
Checking the Mix Type
I’m supposed to overlay this road with 1.5” S9.5C, but the existing pavement is only 2 inches thick, and I haven’t seen a truck out here all day.

Can that be right?
Short-term traffic counts

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

<table>
<thead>
<tr>
<th>Hourly ESALs</th>
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<tbody>
<tr>
<td>Less than 4</td>
<td>A</td>
</tr>
<tr>
<td>4 to 40</td>
<td>B</td>
</tr>
<tr>
<td>More than 40</td>
<td>C</td>
</tr>
</tbody>
</table>
Example 1:

- Resurfacing project will place 1.5” S9.5C.
- In one “representative” hour you count 2 tractor trailers and 4 single unit trucks.
- Is the mix type appropriate?
Example 1

- “hourly ESALs” = (2 tractor trailers) + (4 single units)/3 = 3.3
- Check the Chart
# Mix Level for Hourly ESALs

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Example 1

• “hourly ESALs” = (2 tractor trailers) + (4 single units)/3 = 3.3
• From Chart, mix type should be A.
• Mix type “C” is probably not appropriate.
Remember!

- This is a very rough guideline.
- It should not be used to make changes to the plans immediately.
- It should be used to know when to raise the question.
But there’s still more to it. The thickness of the existing pavement matters too.
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>
<thead>
<tr>
<th>Existing Pavement Thickness*</th>
<th>Surface Mix Level</th>
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<tbody>
<tr>
<td>Any</td>
<td>A</td>
</tr>
<tr>
<td>More than 4”</td>
<td>B</td>
</tr>
<tr>
<td>More than 7”</td>
<td>C</td>
</tr>
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</table>

* Each inch of ABC counts as ½ inch of asphalt.
Example 2:

- 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 2

- “hourly ESALs” = (30 tractor trailers) + (45 single units)/3 = 45
- Check the Hourly ESAL-Mix Level Chart.
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Example 2

- “hourly ESALs” = (30 tractor trailers) + (45 single units)/3 = 45
- From Chart, mix type should be C.
Example 2

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

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* Each inch of ABC counts as ½ inch of asphalt.
Example 2

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

• From Chart, mix type should be C.
• Thickness is less than 7, so it may be better to use a B-level mix.
One More Example

• An engineer knows he has B-level traffic on a pavement that is only 3 inches thick.
• He only has money to place one lift of surface course.
• To compensate for the pavement being too thin, he decides to go with a higher level mix, placing 1.5” S9.5C.
One More Example

• Is this a good idea?
• Why or why not?
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.
The End