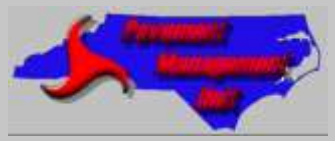
Choosing the Right Asphalt Mix For the Right Road

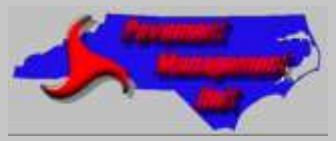
Clark Morrison

Pavement Management Unit



What is the Difference Between Asphalt Surface Mixes?

SF9.5A
S9.5B
S9.5C
S9.5D

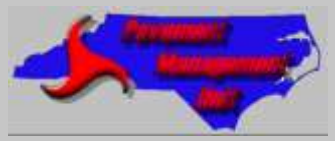


As you go from A to B to C to D:

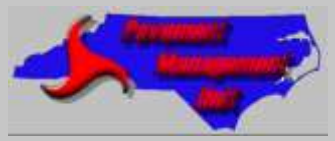
- Liquid AC gets stiffer
- AC content generally decreases

As a result:

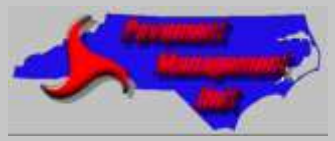
- Resistance to rutting increases
- Resistance to cracking decreases



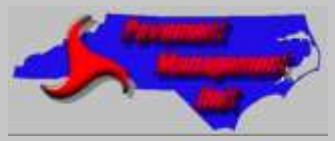
Q: How do we compensate for the decreased resistance to cracking in higher level mixes?



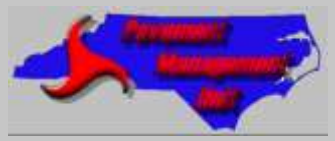
A: Make the pavement thicker.



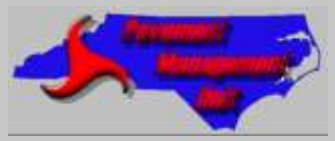
Q:
What happens if we put a high level mix on a thin pavement?

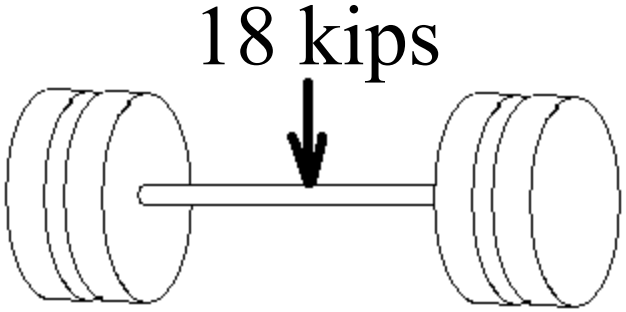


A:
Compaction difficulties
Increased likelihood of cracking

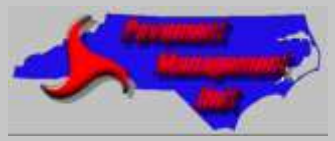


Q: How do we choose the right mix?

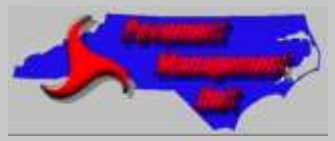



18 kips

Mix Type	20 Year Loading (Million ESALS)	Liquid AC
SF9.5A	Less than 0.3	PG 64-22
S9.5B	Less than 3	PG 64-22
S9.5C	3 to 30	PG 70-22
S9.5D	Over 30	PG 76-22



Checking the Mix Type



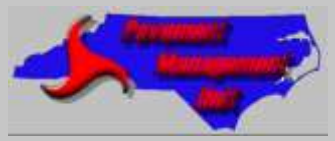
I’m supposed to overlay this road with 1.5” S9.5C, but the existing pavement is only 2 inches thick, and I haven’t seen a truck out here all day.

Can that be right?

Short-term traffic counts

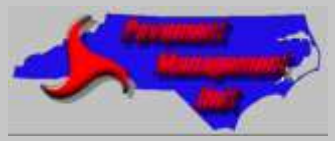
- Count tractor-trailers and single unit trucks on the road for one hour.
- Try to pick a “representative” hour
- “Hourly ESALs” =

  (tractor trailers)+(single units)/3



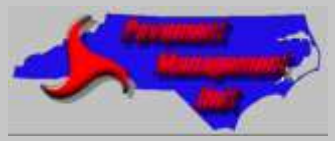
Mix Level for Hourly ESALs

Hourly ESALs	Mix Level
Less than 4	A
4 to 40	B
More than 40	C



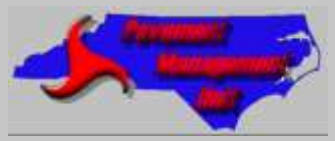
Example 1:

- 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



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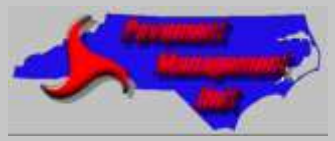
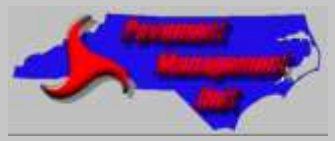


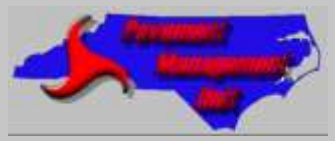
Example 1

- “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.

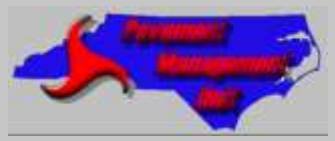


Remember!

- 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.

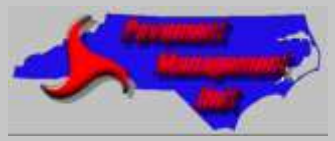


But there's still more to it. The thickness of the existing pavement matters too.



Existing Pavement Thickness

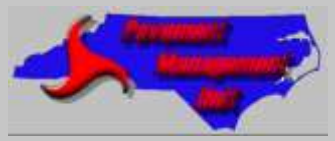
- Higher level mixes are stiffer, and require more effort to compact.
- The stiffness increases rut resistance, but makes it more likely to crack.
- Higher level mixes need a thicker “base” to get adequate compaction.
- Stiffer mixes need a thicker “base” to prevent cracking under traffic.



A **very rough** guideline

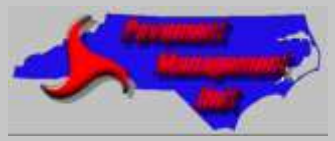
Existing Pavement Thickness*	Surface Mix Level
Any	A
More than 4”	B
More than 7"	C

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



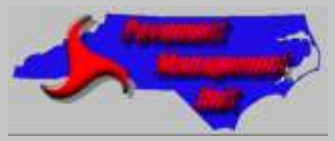
Example 2:

- 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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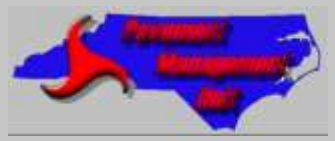
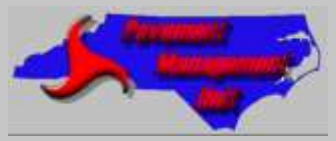


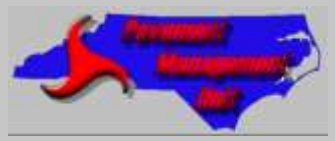
Example 2

- “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!



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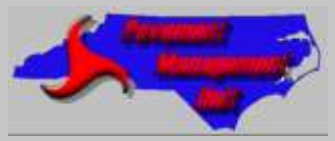
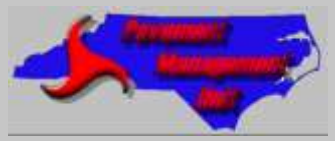


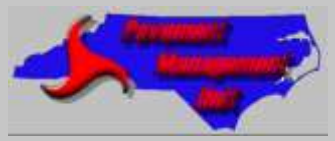
Example 2

- “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.



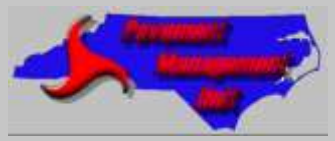
One More Example

- 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?



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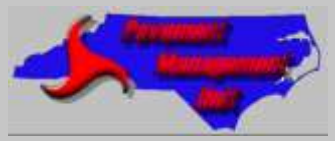
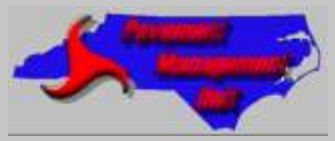


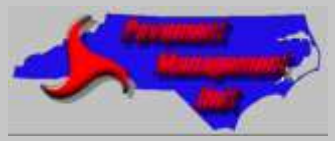
Why are the Guidelines Rough?

- 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