NORTH CAROLINA
Department of Transportation

The Right Treatment for Resurfacing Projects

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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

S9.5B

S9.5C

S9.5D

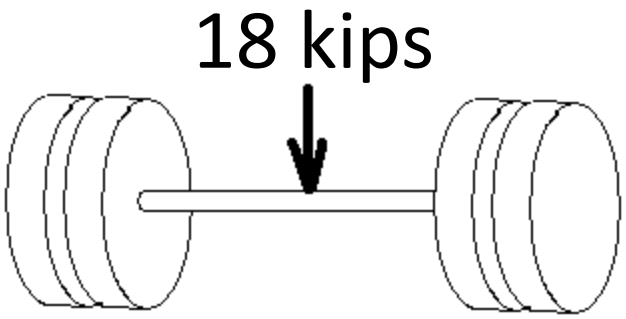
As you go from A and B to C to D:

- Liquid AC gets stiffer (for D-level)
- AC content generally decreases

As a result:

- Resistance to rutting increases
- Resistance to cracking decreases

Q:
How do we choose the right mix?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Mix Type	20 Year Loading (Million ESALS)	Liquid AC
S4.74A	Less than 1	PG 64-22
S9.5B	Less than 3	PG 64-22
S9.5C	3 to 30	PG 64-22
S9.5D	Over 30	PG 76-22

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” =

  (tractor trailers)+(single units)/3

Mix Level for Hourly ESALs

Hourly ESALs	Mix Level
Less than 13	S4.75A
Less than 40	S9.5B
More than 40	S9.5C

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

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:

- 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

Hourly ESALs	Mix Level
Less than 4	SF9.5A
Less than 13	S4.75A
Less than 40	B
More than 40	C

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!

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

- “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

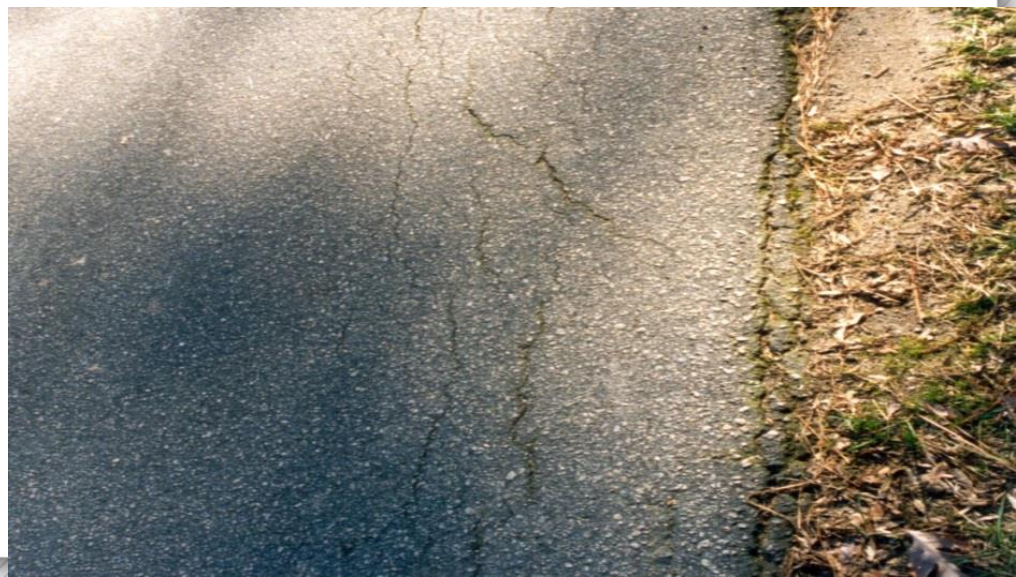
(pg. 16 - 23)

- 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

(pg. 16 - 23)

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.



Alligator Cracking

(pg. 16 - 23)

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.

Transverse Cracking

(pg. 24 - 31)

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

(pg. 24 - 31)

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
- Severe — Mill and Replace 2.5” to 4.0”

Block Pattern Cracking

- Moderate: — Mill and Replace 2.5” to 4.0”
- Severe: — Mill and Replace 2.5” to 4.0”
  Consider Full Depth Patch

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 ½ 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