

Georgia's Use of Polymer Modified Asphalt Cement

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Total Tons of HMA 2009

- 6.4 Million Total Tons of HMA
- 0.5 Million Tons of HMA requiring PMAC

Asphalt Cement Use in Georgia 2009

- **Approximately 104 Million Gallons of Total AC Used in Georgia**
- **Approximately 7.5 Million Gallons of Polymer Modified (SBS-SB) AC Used 2009**
- **Approximately 1 Million Gallons of AC Modified Using GTR/Vestenamer Modification**

PMA Use in HMA

- All Stone Matrix Asphalt (SMA)
- Porous European Mix (PEM)
- Open Graded Friction Course (OGFC)
- 12.5 mm Superpave placed on roads with $\geq 25,000$ ADT
- Surface Treatment with Sand Seal

Georgia's SMA Mixes

- Typically Used on Interstates
- Special Requirements for Aggregates
- Requires Approved Fiber Additive
- Requires Approved Mineral Filler
- Requires PMA
 - SBS
 - SB





Georgia's PEM and OGFC Mixes

- Typically Used on Interstates
- Requires Approved Fiber Additive
- Requires PMA
 - SBS
 - SB
 - Limited Use of GTR/Vestenamer







Reduced Visibility

Prior to PEM Overlay

With PEM Overlay



Dense-Graded Conventional Mixes with PMAC

- Used on State Routes
 - ADT $\geq 25,000$ but $< 50,000$ ADT
- Typically Used in 12.5 mm Superpave mixes





What happened to surface treatment in Georgia?

- 💀 Loose/Excess Stone
- 💀 Windshield Damage
- 💀 Negative Public Perception

The No. 1 deficiency in finished surface treatment is loose stone.

- Reduces skid resistance
- Leads to windshield damage
- Obscures striping
- Dislodges stone that would not otherwise be disturbed
- Contributes to negative public perception
- What did GDOT do?

First determine what factors contribute to the problem of loose stone?

Materials

- Improper grade of bituminous material (PG64-22 vs. PG58-22)

Construction Practices

- Paving outside Specified seasonal limits
- Improper or insufficient rolling
- Excessive application rate for No. 89 seal stone
- Failure to adequately sweep the finished surface

➤ What were our Neighboring States doing?

➤ South Carolina

- SCDOT maintains all or nearly all roads in the State
- April 2005 – Let more than 9 million Yd² of resurfacing contracts with conventional surface treatment
- Roads comparable to Georgia's Off-System routes
- Maximum 750 AADT – Majority <500 AADT
- Primarily single surface treatment w/ No. 89 stone
- After contracts were awarded, Specifications were changed to require latex-modified emulsion and other construction related requirements. This resulted in an increase in the bid price and a reduction in quantities.
- Some roads received additional “sand-seal” application

➤ **South Carolina**

➤ **Reasons for the Sand Seal –**

- Additional layer of bituminous material
- Sand helps to “lock-in” the larger aggregate
- Reduce windshield damage
- Quicker return to traffic
- Appearance similar to hot mix

➤ South Carolina

➤ Modifications to SCDOT's Standard Specification for Surface Treatment –

- CRS-2P
- March 15 – October 15
- Minimum 60 F
- Two pneumatic-tired rollers
- Vacuum sweepers
- Sand layer

➤ What did GDOT do?

Materials

- **CRS-2L**
- Cationic asphalt emulsion
- SBR in latex form
- Better initial stone retention
- Increased strength during high ambient temperature conditions
- Increased flexibility during cold ambient temperature conditions
- **Class A, Group II Aggregate**
- Best stone available in Georgia for surface treatment

➤ What did GDOT do?

Construction Practices

- **Seasonal Limits**
- April 15 – October 15
- **Rolling Requirements**
- 2 individual rollers
- 2 complete coverages
- **Application Rate for No. 89 Seal Stone**
- Training
- **Sweeping Requirements**
- Within the first 3 hours of the next available workday



SR 333 Wilson
5/4/2006



JK & W. H. Co.
5/4/2006



James Wilson
5/4/2008









Crumb Rubber Modified AC



Why Would GDOT Revisit Crumb Rubber Modified Asphalt?

- We received comments from driving public that the OGFC/PEM asphalt oxidized faster than expected, even though they like our smooth and quiet OGFC/PEM pavement
- Other states have used Crumb Rubber Modified Asphalt (CRMA) to help extend the service life of roadways.
- Consider alternate materials or construction methods that reduce project costs while maintaining quality

CRMA Test Section Hawkinsville, GA on SR 26



Superpave 9.5 mm Crumb Rubber Mix Design

- AC content 5.6%
- 10% rubber (of asphalt content) + 4.5 % Vestenamer (of rubber)
- LWT 0.19 mm (max allowed rutting in spec is 5 mm)
- RAP 45% (typically “dead-looking” without rubber)
- Tensile 80.4 %. However, the individual strengths very high
- Met all the volumetrics requirements

Crumb Rubber Feed System



Blended Crumb Rubber Added To Plant at RAP Collar







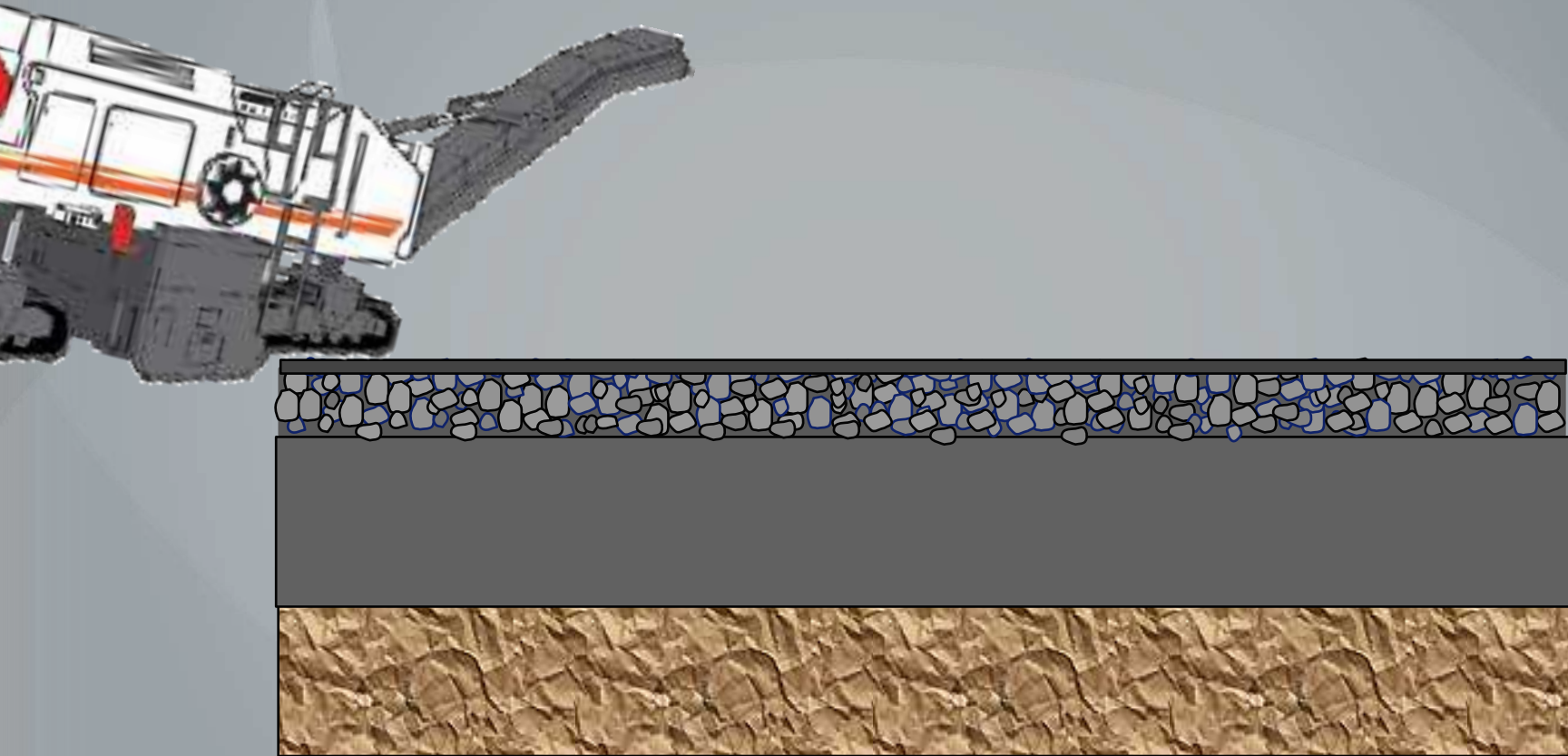
Pavement After 3 Years

A photograph of a paved road, likely asphalt, showing the condition after 3 years. The road has a white line on the left shoulder and a yellow line in the center. The pavement appears slightly worn and discolored. Large, dark shadows of trees are cast across the right side of the road, indicating it is daytime. The overall scene is a straight view down the road.

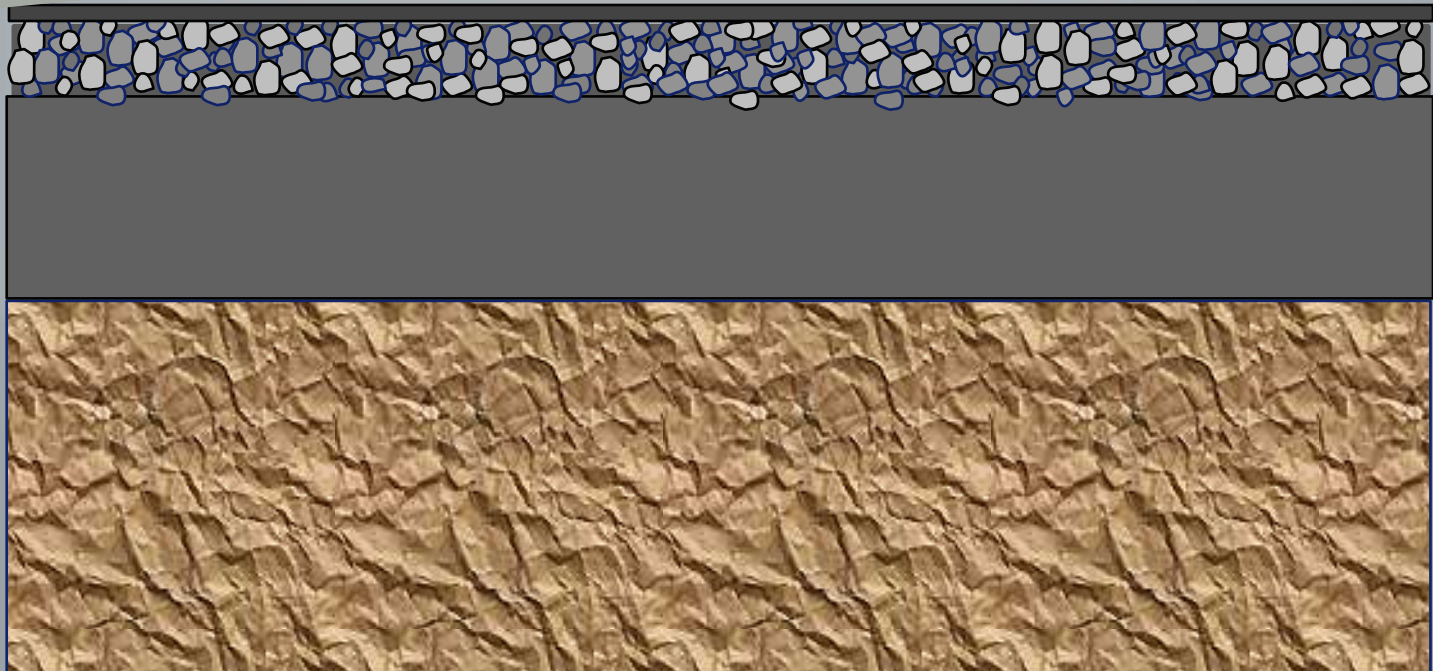
New Test Section



Micro-milling as the Rehabilitative Method



Savings of More than \$ 5 Million For This One Project















During Initial Test Sections We Experimented with Crumb Rubber Feed Systems







Specified Crumb Rubber Feed System

- Separate feed system to store and proportion by weight of the total asphaltic cement, the required percentage of crumb rubber into the mixture.
- Feed system is accurate to within ± 6 percent of the amount required. Automatically adjusts the feed rate to maintain the material within this tolerance at all times.
- Provide in-process monitoring, consisting of either a digital display of output or a printout of feed rate, in pounds per minute, to verify feed rate. The supply system shall report the feed in 1 lb (454 gr.) increments using load cells that will enable the user to monitor the depletion of the modifier.
- Provide flow indicators or sensing devices and interlock them with the plant controls to interrupt the mixture production if the crumb rubber introduction output rate is not within the ± 6 percent tolerance given above. This interlock will immediately notify the operator if the targeted rate exceeds introduction tolerances. All plant production will cease if the incorporation rate is not brought back within tolerance after 30 seconds. When the interlock system interrupts production and the plant has to be restarted, upon restarting operations; the modifier system shall run until a uniform feed can be observed on the output display.
- Add the rubber to the aggregate and uniformly disperse prior to the injection of asphalt cement.
- Ensure the crumb rubber modifier will not become entrained in the exhaust system of the drier or plant and will not be exposed to the drier flame at any point after induction.
- No separate measurement and payment will be made if Contractor elects to utilize crumb rubber

Revised AC Requirements Using Crumb Rubber

- For non Stone Matrix Asphalt Mixtures (SMA), SBR or crumb rubber modified PG 76-22 is an acceptable alternative to SBS or SB modified asphalt cement at contractor's discretion, provided the SBR and crumb rubber modified asphalt cement meets the tests' requirements of PG 76-22.
- Use only SBR currently approved on QPL-65 "Georgia's List of Approved Latex Suppliers".
- Use 30 mesh size ambient or cryogenic ground tire rubber at 10% of weight of total asphalt cement content. Trans-Polyoctenamer shall be added at 4.5% of the weight of the crumb rubber to achieve better particle distribution. The maximum Phase Angle requirement is not applicable to the crumb rubber modified PG 76-22 (see note f).
- MSCR requirement is applicable to the SBR, Crumb Rubber & TOR combination modified PG PG76-22 asphalt cement.

Crumb Rubber Feed System – New Specifications





One of four 1 lb increment load cells

Holding Bin on Load cells

Shredder box with three shred bars

Vane Feeder

Blower Transfer Line





Questions?

