



Bonding and Sealing Treatments for Asphalt Overlays

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Cooperative Research Program

TEXAS A&M TRANSPORTATION INSTITUTE
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 - Amin Banihashemrad

Introduction

Importance of Bonding

- HMA overlay life largely dependent on bond quality
- Poor bonding can lead to:

Fatigue cracking



Slippage cracking



Delamination



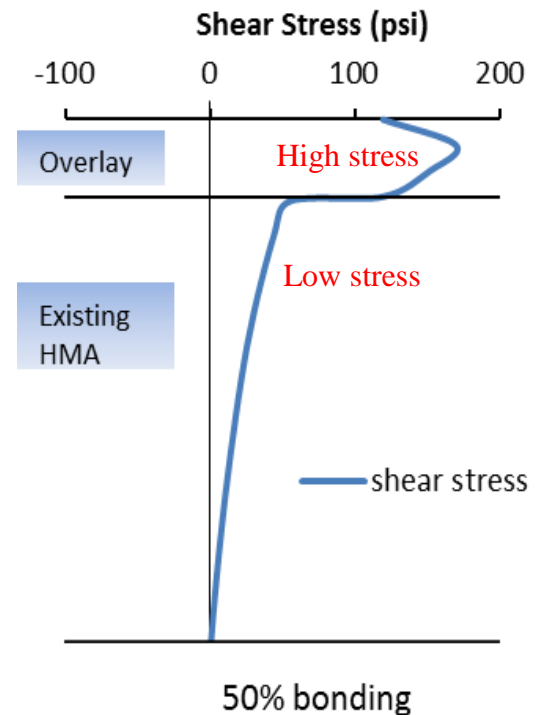
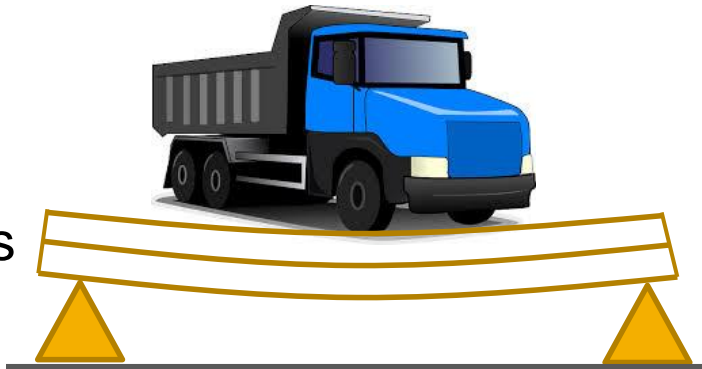
Importance of Bonding

- Improves load transfer
- Decreases pavement deflection
- Lowers stress concentrations

Non-bonded
layers



Bonded layers



Importance of Sealing

- Existing cracks must be sealed.
- Water migrating from surface to beneath the overlay will weaken support layers.
- Water trapped near the interface can strip asphalt in the mixture and at the interface bond.
- Can lead to fatigue and delamination.



Bonding and Sealing Treatments

Tack Coat



Shot Rate: 0.04 – 0.10 gal/sy
Emulsion or binder

Trackless Tack Coat



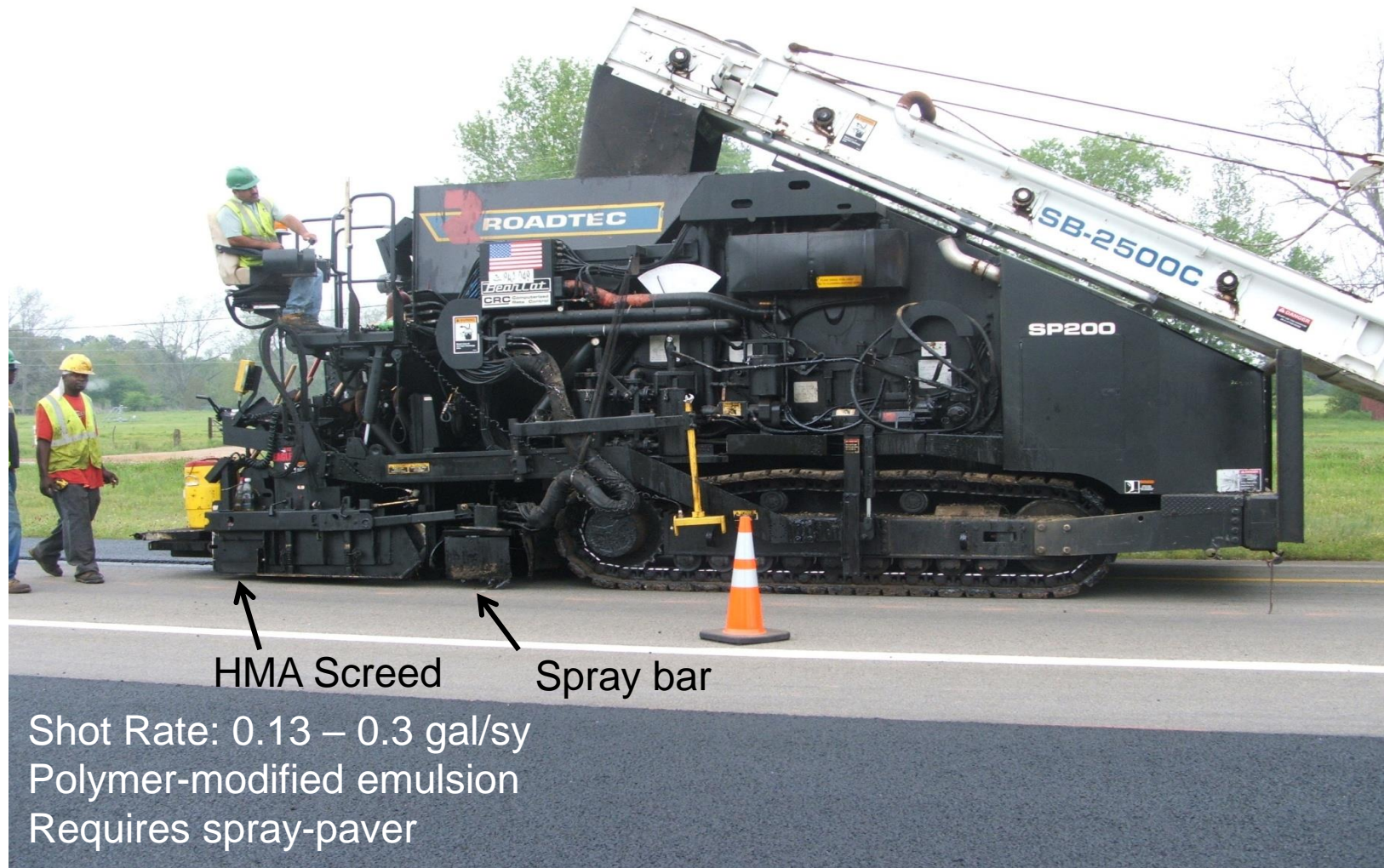
Shot Rate: 0.04 – 0.10 gal/sy
Emulsion with hard-pen residual or polymer-modified

Hot-Applied Trackless Tack Coat

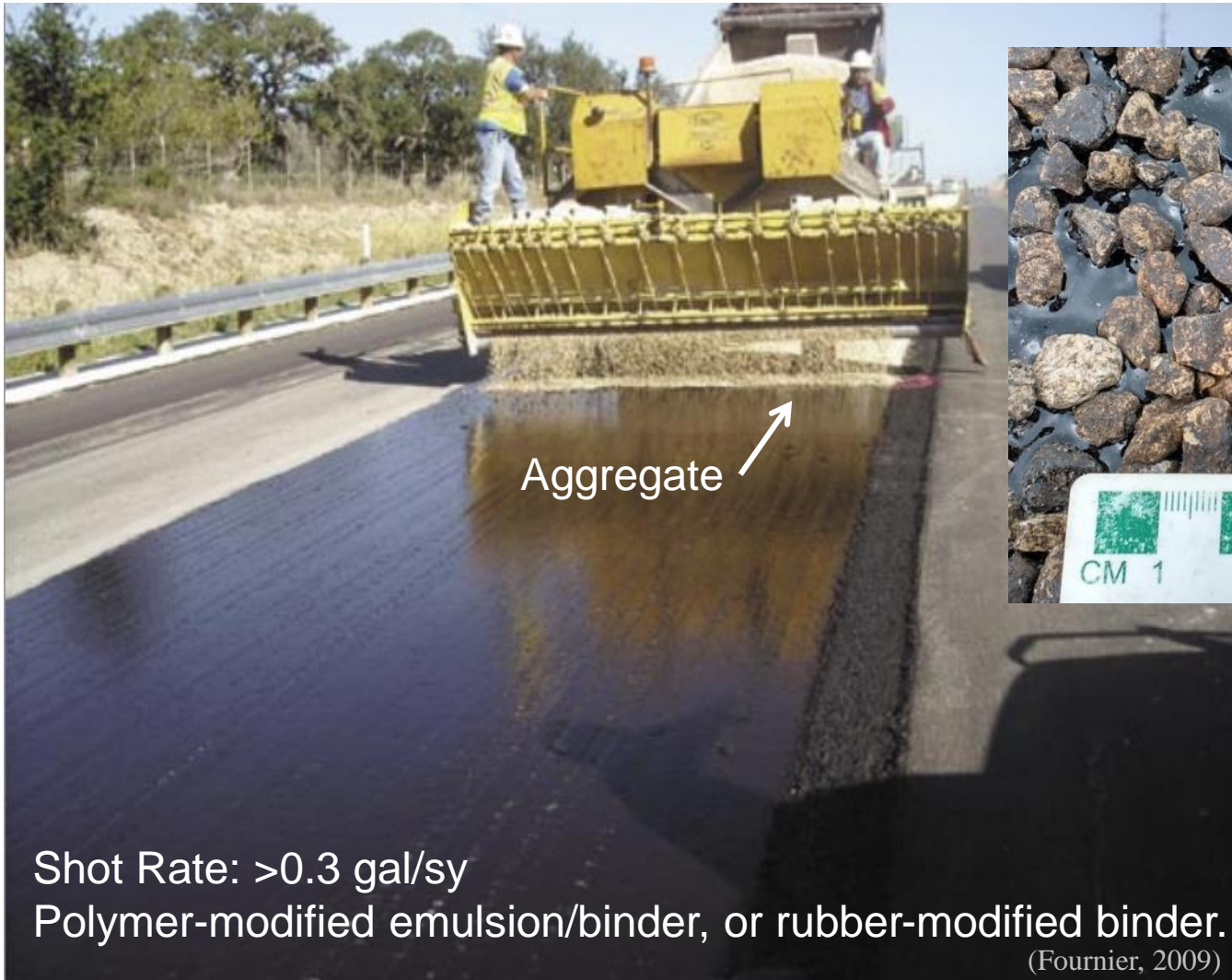


Shot Rate: 0.10 – 0.20 gal/sy
Binder, hard-pen or polymer-modified

Spray Paver Underseal Membrane



Underseal



Shot Rate: >0.3 gal/sy
Polymer-modified emulsion/binder, or rubber-modified binder.

(Fournier, 2009)

Application Scenarios

Application Scenarios

Construction Scenario		Recommended Bond and Seal Treatments and Residual Asphalt Rates, gal/sy				
		Traditional Tack Coat	Trackless Tack Coat		Spray Paver Membrane	Traditional Underseal
			Emulsion	Hot-Applied		
Surface Type	New HMA	0.02 - 0.03	0.02 – 0.03	-	-	-
	Aged HMA, Good Condition	0.03 - 0.05	0.03 - 0.07	0.10 - 0.20	0.10 – 0.15	-
	Aged HMA, Mod-Severe Cracking	-	-	-	0.12 - 0.18	0.25 - 0.40
	Bleeding HMA	0.02 – 0.05	0.02 – 0.07	-	-	-
	Polished HMA	-	0.03 – 0.07	0.10 – 0.20	-	-
	Milled HMA	-	0.04 – 0.07	0.10 – 0.20	0.10 – 0.15	-
	Aged Concrete	-	-	0.10 – 0.20	0.12 – 0.15	0.25 – 0.40
Overlay Type	Thin Overlay	-	0.02 – 0.07	0.10 – 0.20	0.10 – 0.15	0.25 - 0.40
	PFC	-	0.04 – 0.07	0.10 – 0.20	0.10 – 0.15	
	Seal Coat	None				
	Slurry Seal/ Microsurfacing	None				

New HMA

- Best case scenario.
- New construction and multiple-lift paving
- Binder still on surface
- Tack may not be necessary, but tack is cheap so light application still recommended for insurance.



Aged Surface, Good Condition

- Minimal low severity cracking, no bleeding, typical aggregate wear.
- Any treatment could work, but heavy spray paver application and underseal is probably excessive.
- Higher rate for course texture and thirsty aggregate.



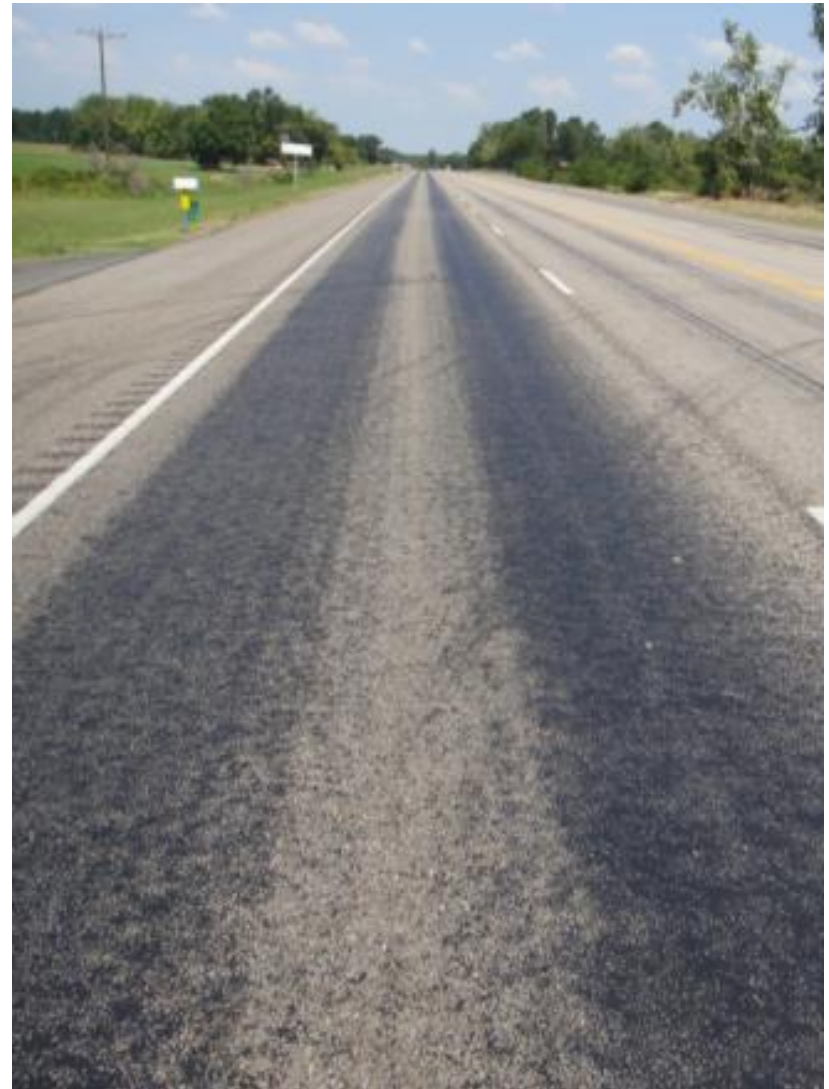
Aged Surface, Moderate Cracking

- Seal to limit moisture infiltration and reduce reflection cracking.
- Spray paver membranes and underseals recommended.
- Stiff treatments will increase reflection cracking.
- If too severe/aged, mill and inlay.
- No tack over underseal.



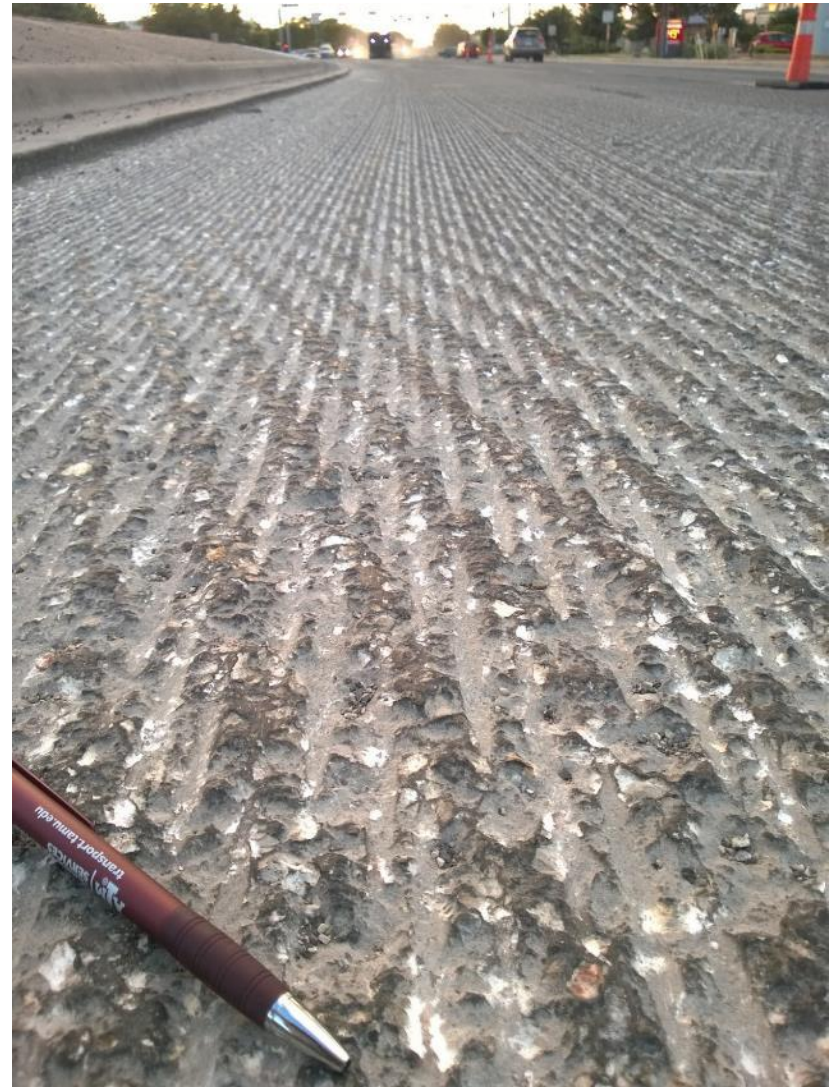
Aged Surface, Bleeding

- More tack liable to cause more bleeding.
- Reduce spray rate in wheel paths by changing the nozzle size.



Milled Surface

- Strong bond, but only if surface is properly cleaned.
- Recommended to use moderate to high application rate with trackless tack or spray paver.
- Scabbing will result in a poor bond and will not be corrected with any bonding or sealing treatment.



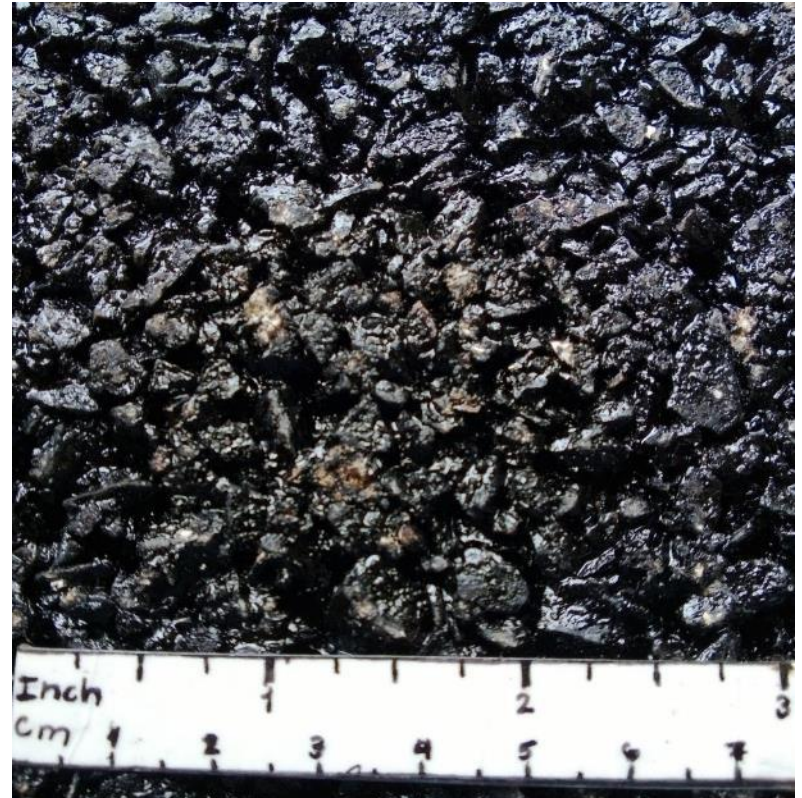
Thin Overlay

- <1.25 inches.
- Require better bonding because shear stress is more concentrated
- Trackless tack recommended.
- Spray paver membrane or underseal also recommended, though they are likely to have low initial shear strength, so limit use in heavy stop-go traffic areas.



Permeable Friction Course

- Existing layer must be sealed.
- Also, for decent bond, thicker application is needed.
- Recommend spray paver membrane.



Additional Considerations

Milling

- Remove deteriorated surface
- Correct roughnes.
- MUST clear properly
- Scabbing problem
 - Mill deeper.



Uniformity

- Poor uniformity
 - Achieving correct tack rate is defeated.
 - Too high and too low residual asphalt throughout the project.
- Factors
 - Blocked nozzles
 - Nozzle angle
 - Nozzle size
 - Spray bar height
 - Truck speed
 - Pump pressure
 - Tack temperature



Uniformity



Bonding Testing and Performance

- Test for informational purposes for TRAIL: recommended minimum 40-50 psi.
- Influenced by:
 - Tack material type.
 - Existing surface condition.
 - Overlay type.
 - Compaction temperature.
 - Age after construction.
- Bond increases drastically in 1st month.



Thank you

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