

John Crane, PE_{wv}

Pavements, Materials & Field Applications Engineer

Flexible Pavements of Ohio







Why is Tack so Important

Materials

Surface Prep

Mean of Measure

Insurance vs Performance

MHA DO ME LYCK ŚŚ

 To bond paving layers in order to create a monolithic pavement structure

- Failure to achieve a Monolithic Layer??
 - Flexural strength is reduced
 - Structural design is invalid
 - Premature failure



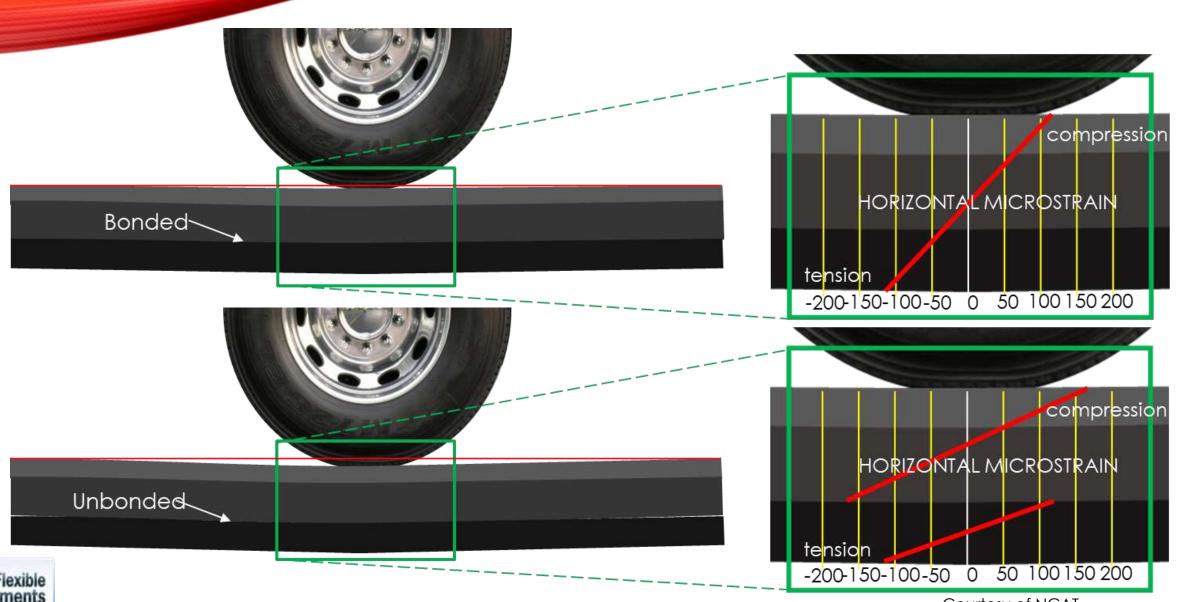
STRUCTURAL IMPORTANCE





Up to 5 sheets (layers) 48" x 4" x 11/32"

STRUCTURAL IMPORTANCE





Courtesy of NCAT

TELLTALE SIGNS OF A BOND FAILURE?

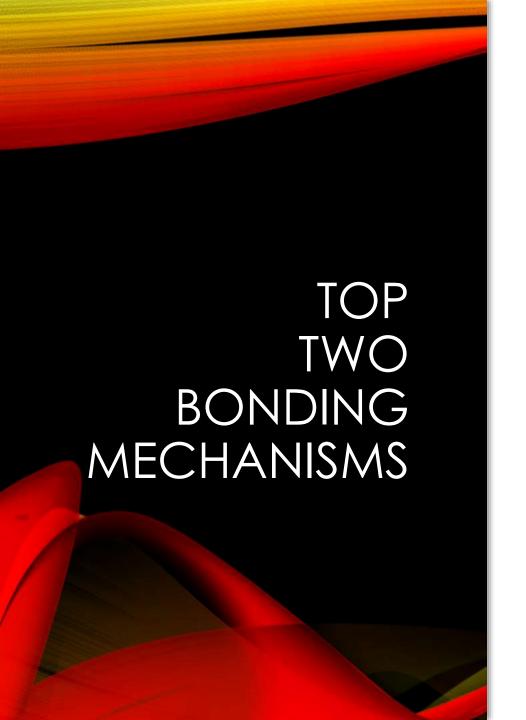
 Layers slipping under traffic load





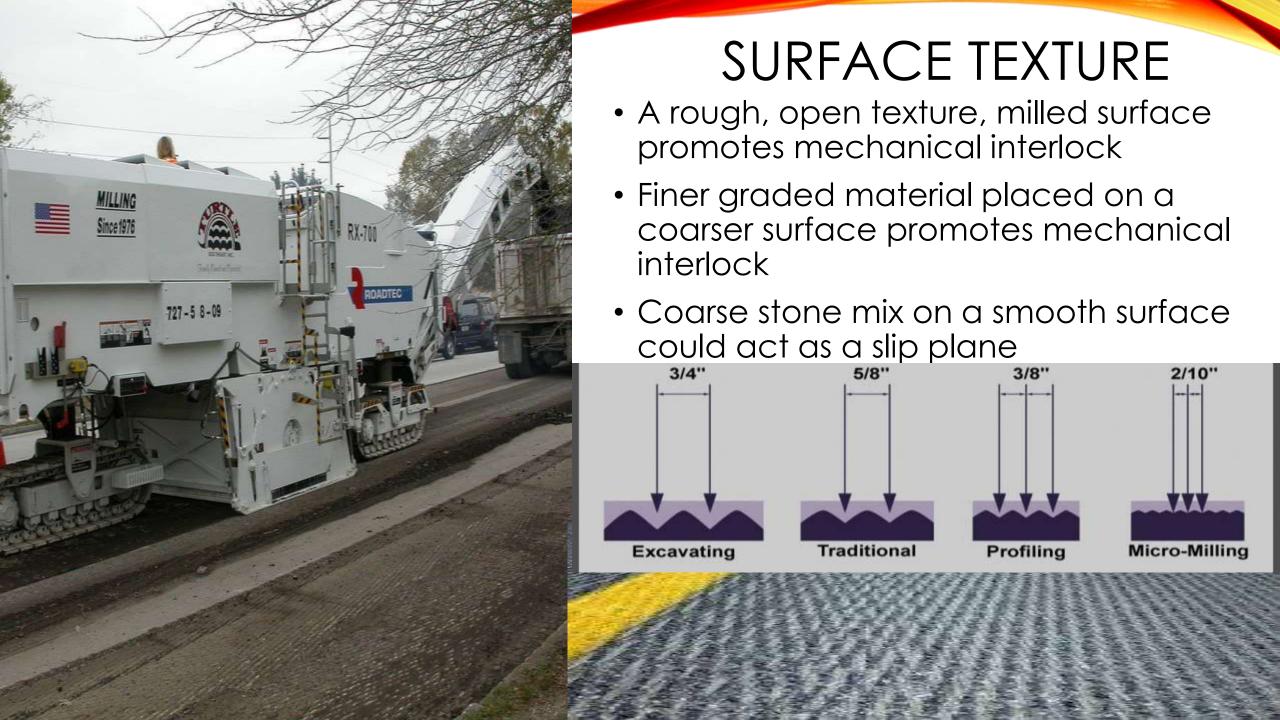
TELLTALE SIGNS?





Surface Texture

Bonding Agent (Tack coat)



DELAMINATION POTENTIAL



TACK COAT

• ODOT Item 407 - Tack Coat

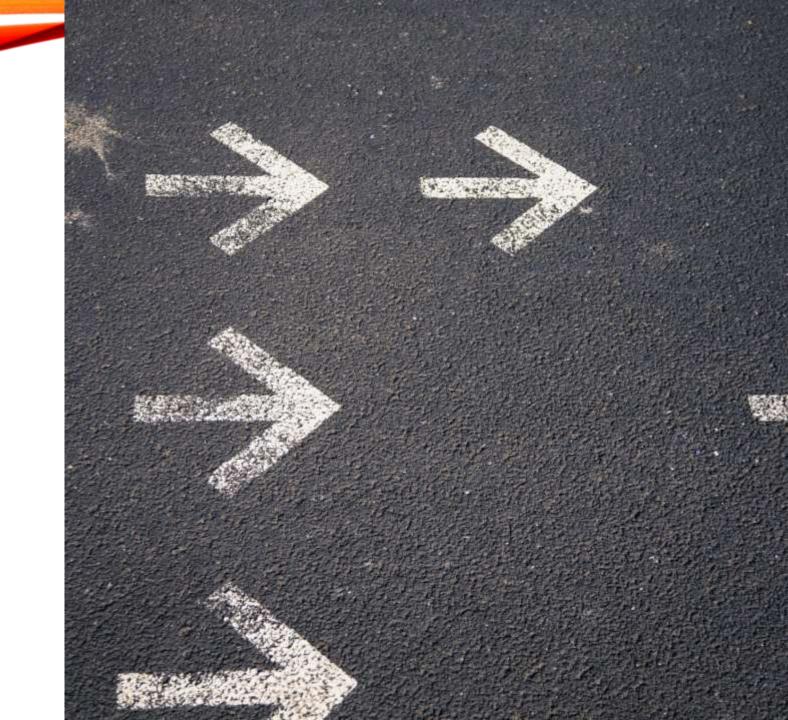
Provides requirements for preparing the surface and treating the surface with an application of asphaltic material





ENSURING THE BEST TACK COAT

- Surface Preparation
- The Right Material
- The Right Way
- The Right Time





SURFACE PREPARATION

407.05 PREPARATION OF SURFACE

• Ensure that the surface is thoroughly clean and dry when the asphalt material is applied. Remove material cleaned from the surface and dispose of it as the Engineer directs.











SURFACE PREPARATION

What is "CLEAN AND DRY"?

Clean...

 Remove anything that would interfere with adhesion or with placement operations, e.g. dust, loose aggregate, soil, leaves, pieces or lumps of foreign material, etc.

Dry...

- Emulsions may be placed on "damp" surfaces
- Pavement should not be wet
- No visible, flowing water on the pavement surface



THE RIGHT MATERIAL

407.02

702.04

RS-1, SS-1, SS-1h, CRS-1, CSS-1, CSS-1h

702.12; Non-Tracking Asphalt Emulsion - May be used anytime, required when specified

702.13; SBR Asphalt Emulsion Required when paving over concrete or brick (407.06)







PROTECTING THE TACK MATERIAL

- Avoid overheating typically <180°F
- Protect from freezing
- Do Not Heat And Cool Repeatedly
- Do NOT mix anionic and cationic emulsions
- Be sure to use the Reclamation Tank on the Distributor and remove all fuel prior to pumping into distributor
- Consult with the Supplier for any unique handling needs for their product(s)!





NON-TRACKING TACK COAT

- Shorter break and set time vs standard tack
 - 10-15 minutes vs 20-30 minutes
- Typically harder base binder
 - Does harder mean Stronger??
- Quick curing keeps tack on roadway where it is needed
 - accelerates paving operations
 - Improves aesthetics by avoiding tracking onto local roadways
- Night paving
- Any project where conditions do not allow for adequate cure time for standard tack coat
 - Urban & suburban areas with numerous driveways, intersections and high traffic volume
 - Any project where tracking onto local roads is unacceptable



APPLICATION OF ASPHALT MATERIAL

407.06

- Determining your Application Rate Table 407.06-1
 - Existing surface (asphalt vs concrete)
 - Aged of the existing surface? (oxidized, fresh,...)
 - Pavement texture (milled, fine-milled, rough, smooth,...)
 - On concrete (or brick) use SBR asphalt emulsion, 702.13
- For ODOT projects... obtain the Engineer's approval and apply tack coat within ranges specified in Table 407.06-1



THE TACK COAT DISTRIBUTOR

- End goal...Apply Tack Coat material to obtain a uniform, complete coverage**
- Spray bar set-up level with the paving surface
- ~12" off the surface
- Double or <u>Triple</u> Coverage
- Correct nozzles

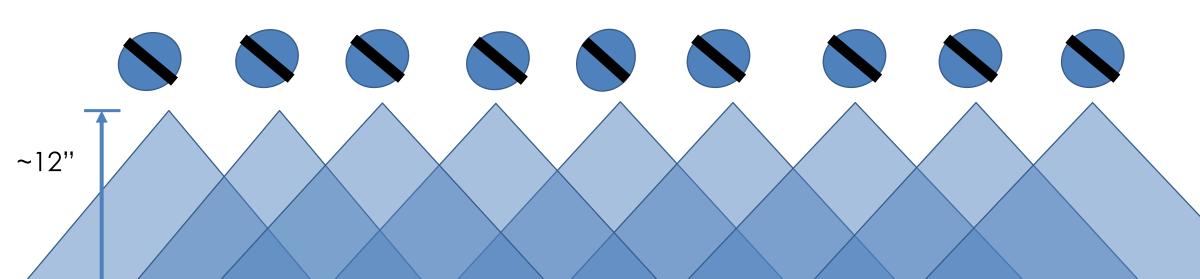




EFFECT OF NOZZLE ORIENTATION

NOZZLE ANGLE SETTING: 15 TO 30 DEGREES

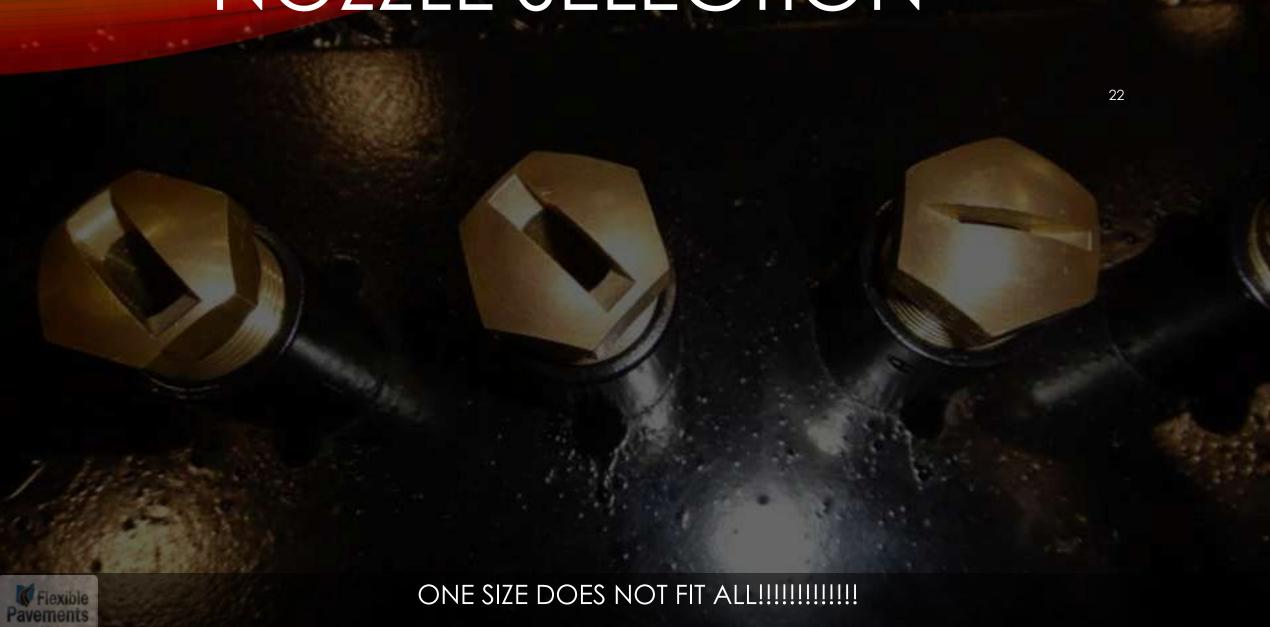
SPRAY BAR AXIS



Triple Lap Coverage



NOZZLE SELECTION





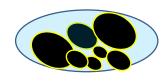




EMULSION BREAKING VS SETTING

- Emulsions are asphalt droplets suspended in water
- Breaking
 - Contact with surface changes pH; reducing charge
 - Color change... brown to black
- Setting
 - Evaporation leads to coalescence
 - Original asphalt characteristics return











NON-TRACKING TACKS FIX THE PROBLEM, RIGHT?

 If you don't let it break material choice doesn't matter















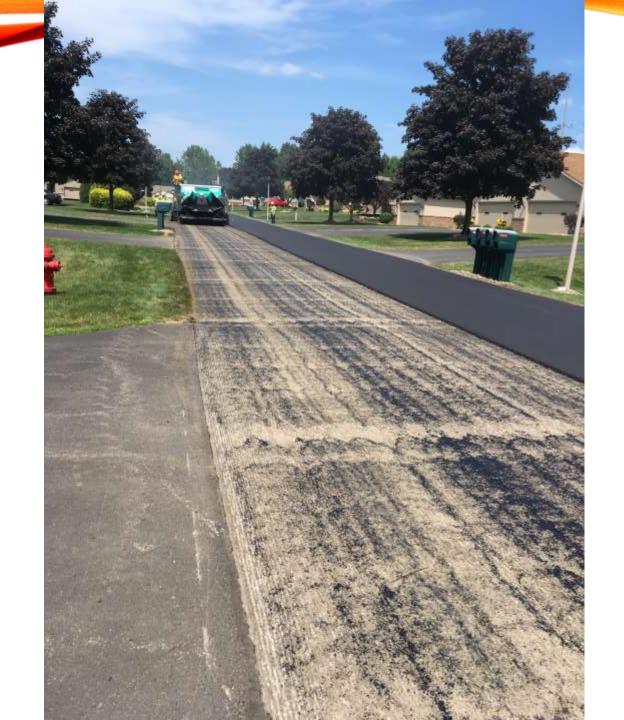
Is this application acceptable?

Is it uniform?

Is this complete coverage?

No, No and No.





Acceptable?

Uniform?

Complete Coverage?

No





Acceptable?

Uniform?

Complete Coverage?

Yes





MEASURE AND PAYMENT

407.07&407.08

- Determine gallons to be paid from weight tickets and weighed partial loads using \$1060 and CA-FP-6 (Excel File)
- \$ 1060 contains procedures for converting weights to volume at a standard temperature using factors given in Table A.

Item	Material	Specific Gravity (77F)	T (F)	С	K
702.04	Asphalt Emulsions	0.9622	100.0	0.00035	8.368



CA-FP-6_20170120 Calculation of Liquid Asphalt Materials

Date		ContiD	0,		AltID	W.		
PLN Project No.(Part Code) em No Item Desc			ji .					
			8		-			
cation	Co/Rt/Sec							
	50							
olication Description:		0	Trackless Tack					
id Asphalt Material Used:		D	Anionic, Rap Grade RS-1			Cationic, Grade CRS-1		
		Anionic, Slov SS-1	E8136-1828		Cationic, Grade CSS-1			
			Anionic, Slow Set Grade SS-1H			Cationic, Grade CSS-1F		
Producer/Supplier: Specific Gravity:	0.0022		Analis	ntine Date		07	Californ	
			0.00000	ation Rate:			Gal/SY lbs.	
Weigh In:	450 lb	15.	Site Condition	Veigh back:		0	105.	
Plan Appli Station Begin	cation Rate: Station		☐ Yes	□ No	Pudding?		□ No	
0+00			Width	Length	Area (SY)	Gallons Required		
0400	5+00		12	500	666.7	47		
				Total Requ			47	
		Liquid As	phalt Used Ca	lculation				
Form	nula 1			VARIAN AS		mula 2		
cific Gravity ≥ 0.9622:				0.8458 ≤ Sp	Specific Gravity ≤ 0.9621			
lons= Net Weight				Gallons =	Net Weight			
	x Specific Gra	And the same of			8.23	6 x Specific	Gravity	
Gallons =	450					57 Gallons		
	8.245	X	0.9622					
	Pay =		47					
D-15 +050								
es: Per S 1060								
						104011777		

INSURANCE VS PERFORMANCE

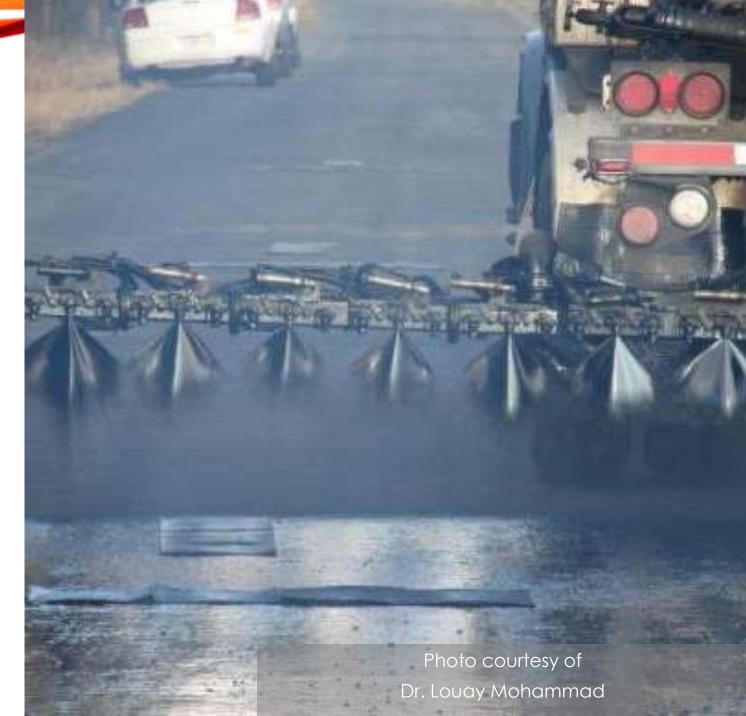
- Insurance
 - Calibration of the Distributor
 - Application Rate verification
- Performance
 - Destructive testing (Shear/Torsion/Tension/etc)





DIRECT MEASUREMENT ASTM D2995

- Field Measurement of Application Rate
 - Longitudinally
 - Transversely
 - Units of Gallons/Yard² (Liters/Meter²)









DIRECT MEASUREMENT ASTM D2995

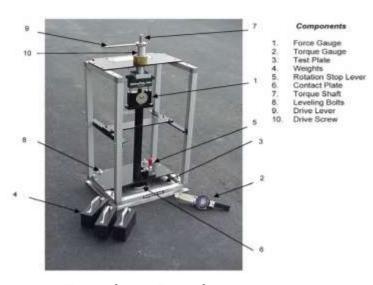
- Method B—Volume-Based Calculations
 - Spray tack coat into containers for a set time period
 - Determine volume collected for each nozzle
 - Calculate transverse uniformity
 - Calculate longitudinal rate incorporating truck's velocity





PERFORMANCE TESTING

 Three main types of bond strength testing devices



Tension Device



Direct Shear Device



Torsion Device



CONCLUSIONS

- Lack of a tack leads to Problems and Premature failure
 - 10% bond loss = 50% less fatigue life(May & King)
 - 10% bond loss = 70% loss of life (Brown & Brunton)
- Surface Prep
 - CLEAN AND DRY
- Application
 - Uniform, complete coverage
 - Triple Overlap
 - WAIT FOR THE TACK TO BREAK before putting construction Equipment on the road!!!!!!
- Verify the application
 - Application rate or Performance Testing



