

# *NCHRP Project 9-40 Update Optimization of Tack coat for HMA Placement*

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Emulsion: Design, Construction, and Performance  
Seminar

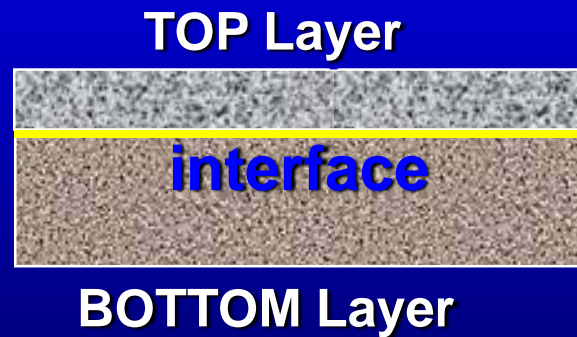
July 1, 2008

Baton Rouge, Louisiana

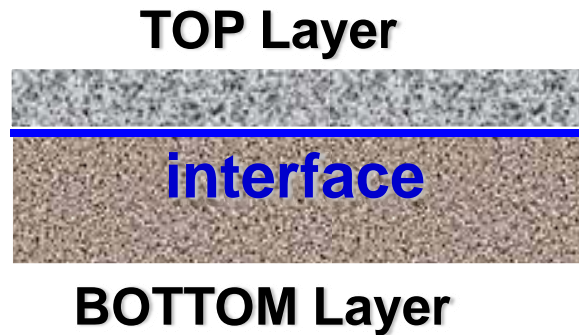


# What is a Tack Coat?

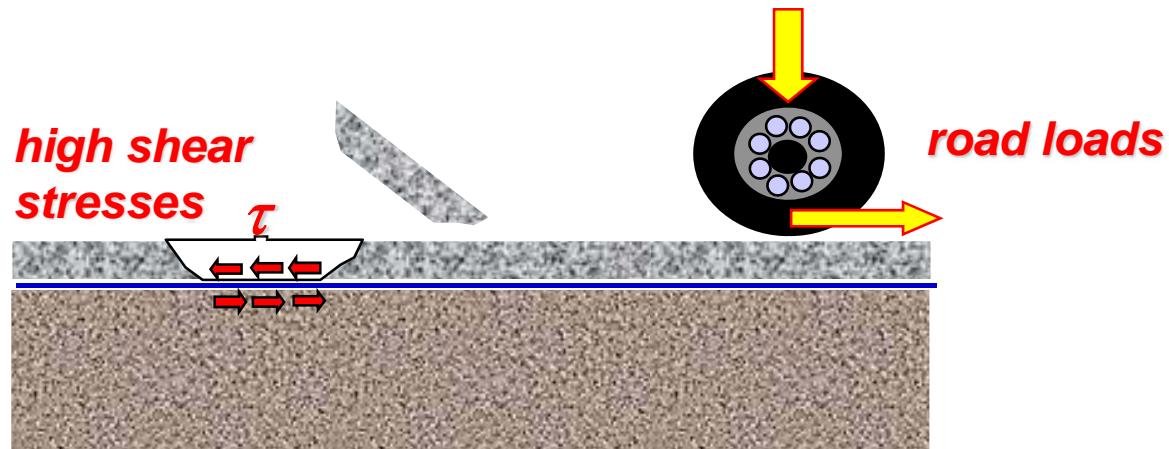
- Light application of asphalt,
  - usually asphalt diluted with water.
- Used to ensure a bond between the surface being paved and the overlying course



# What is NOT A BOND?



Loss of ADHESION and/or INTERLOCK at the interface:



Long term pavement performance and durability can be affected by Debonding as well as Rutting and Cracking.



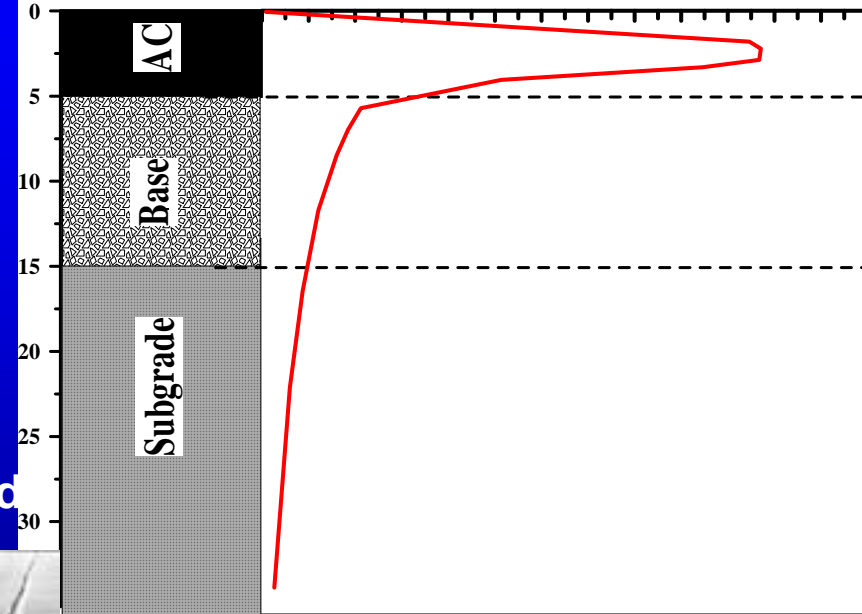
# ***Common Tack Coat Materials***

- Hot AC ( AC-20, AC-30, ...)
- Emulsified Asphalts ( SS-1, SS-1h, CRS-2, CSS-1h, ...)
- Cutback Asphalts ( RC-70, RC-250, ...)



# Why is Tack Coat Used?

- Bind two pavement layers
- Monolithic structure
  - withstand/transfer shear stresses from traffic loading
- Lack of bond between the wearing and binding layers
  - Cause slippage
  - activate distress mechanisms and rapidly lead to total failure





# **Objective**

- **Determine for the various uses of tack coats**
  - optimum application methods,
  - equipment type and calibration procedures,
  - application rates, and
  - asphalt binder materials
- **Recommend revisions to relevant AASHTO methods and practices related to tack coats**



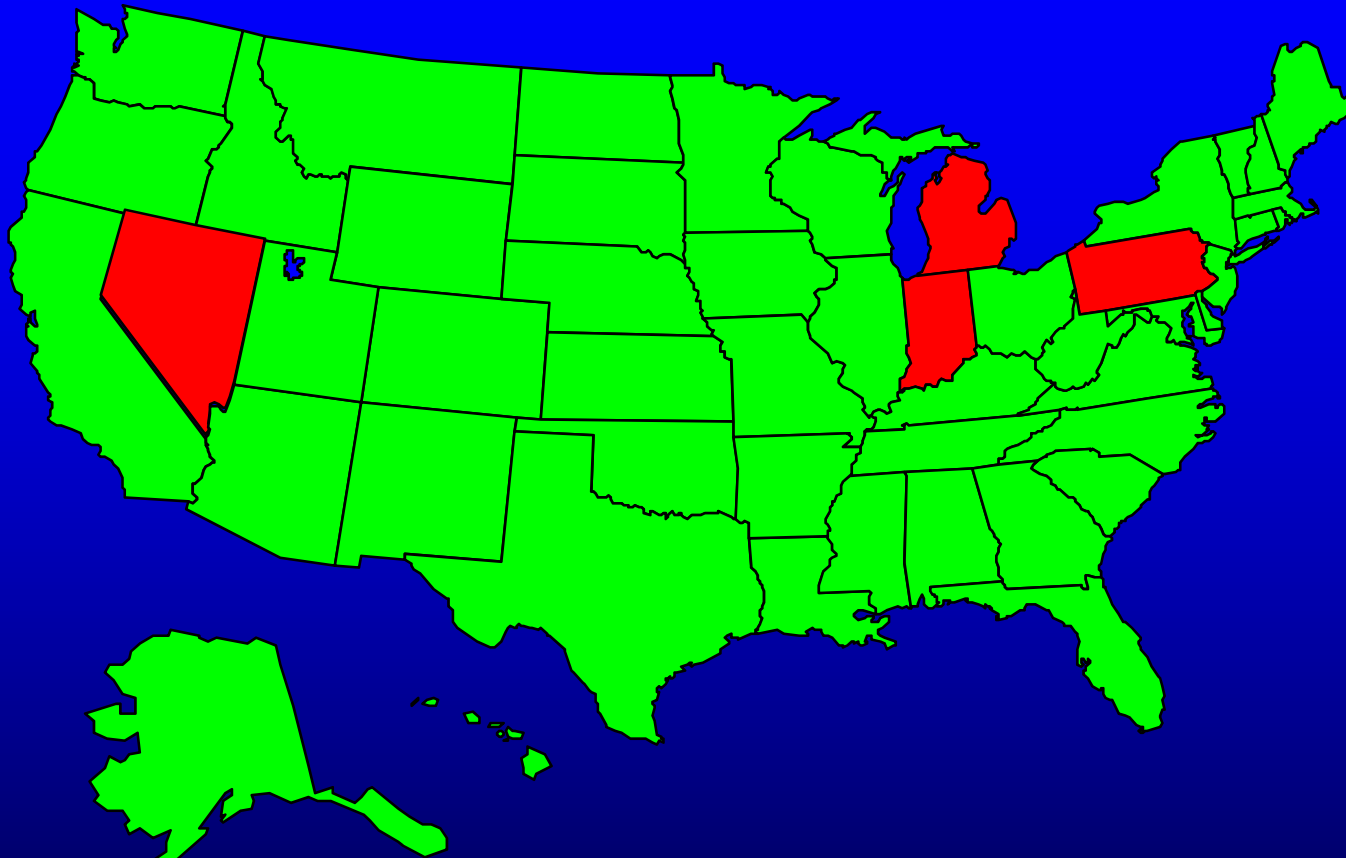


# **Survey**

- **Worldwide survey was conducted to determine various tack coat practices**
- **Sections:**
  - Tack Coat Materials
  - Tack Coat Application Methods
  - Characterization of Tack Coat Application
- **27 Questions**



# Literature Review - States Responded



- 46 state DOTs, Washington D.C.
- 5 Provinces in Canada.
- Other countries
  - Denmark
  - Finland
  - South Africa
  - Netherlands

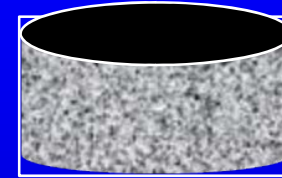
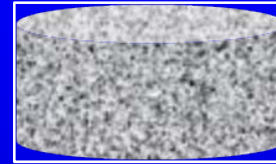
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# Development of Test Equipment

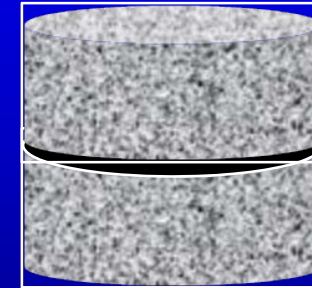
- **Tack Coat Quality**

- » Equipment Development

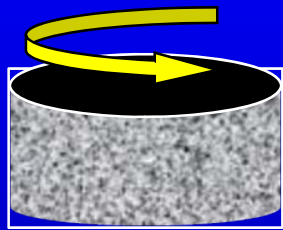


- **Interface Bond Strength**

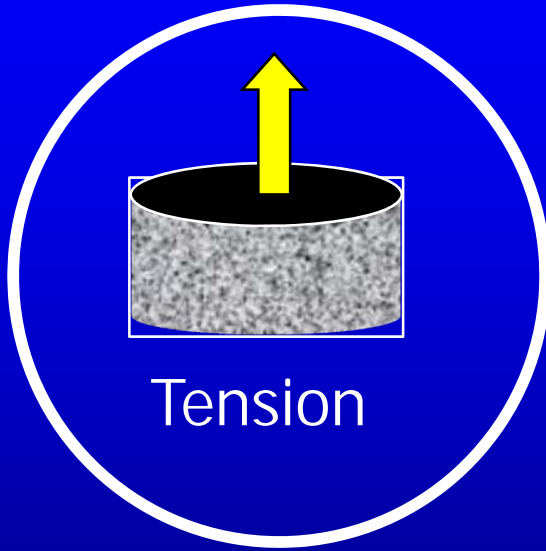
- » Equipment Development



# *Characterization of Tack Coat Quality*



Torsion



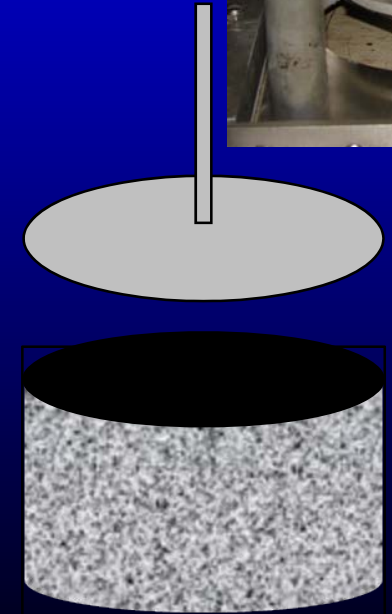
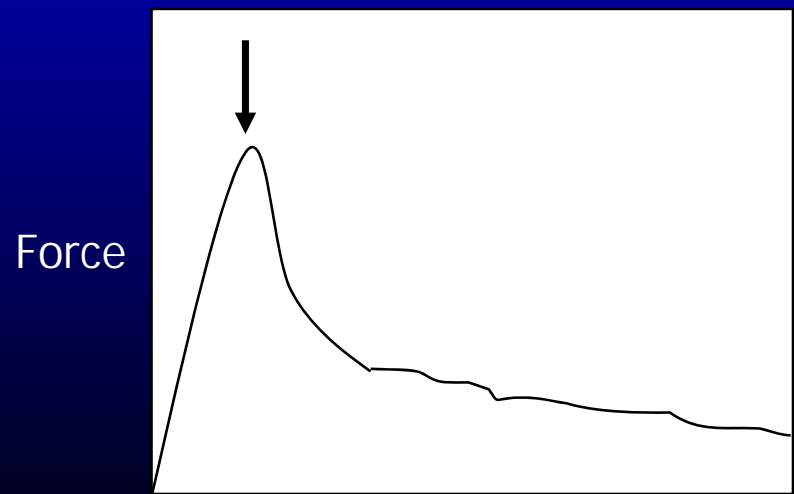
Tension



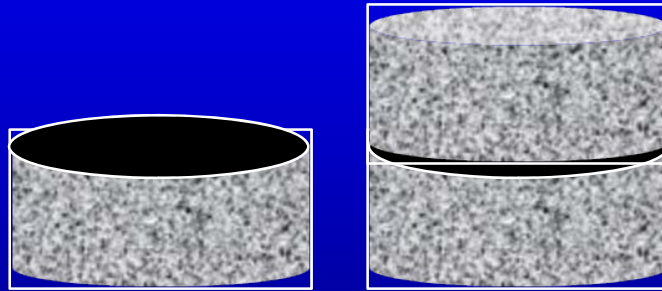
# Characterization of Tack Coat Quality

## Louisiana Tack Coat Quality Tester -- LTCQT

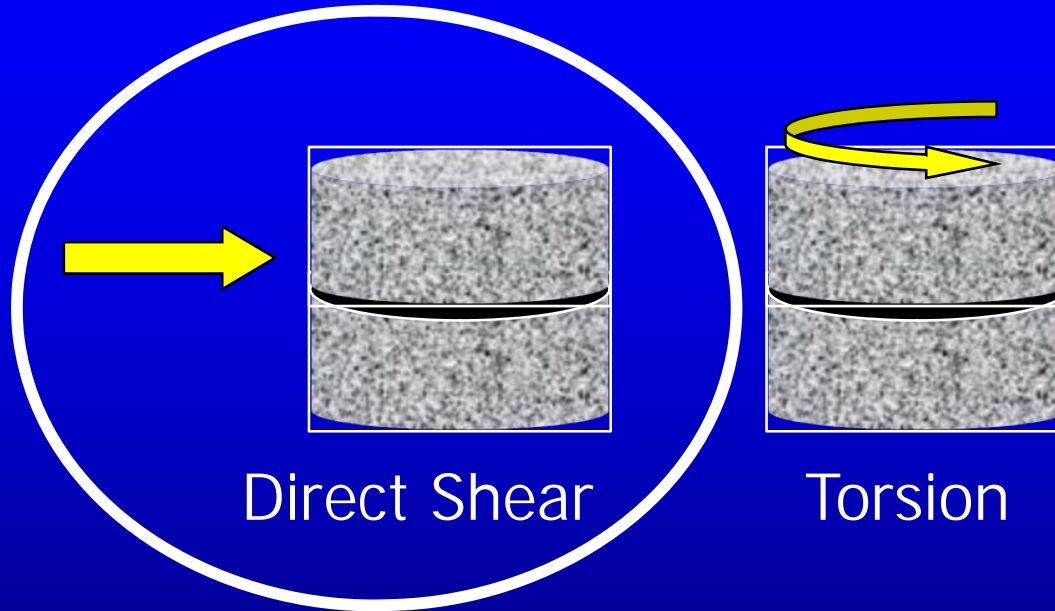
- Developed equipment
  - Tack coat quality -- residual
  - Tension
- User friendly, Easy to use
- Laboratory and field
- Draft test method in AASHTO format
- Tensile load
  - Displacement
  - Tensile Force
  - Time



# Characterization of Interface Bond Strength

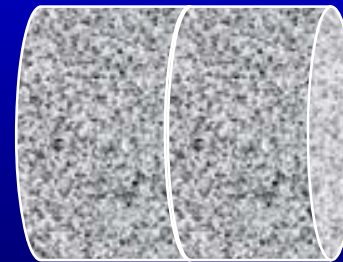
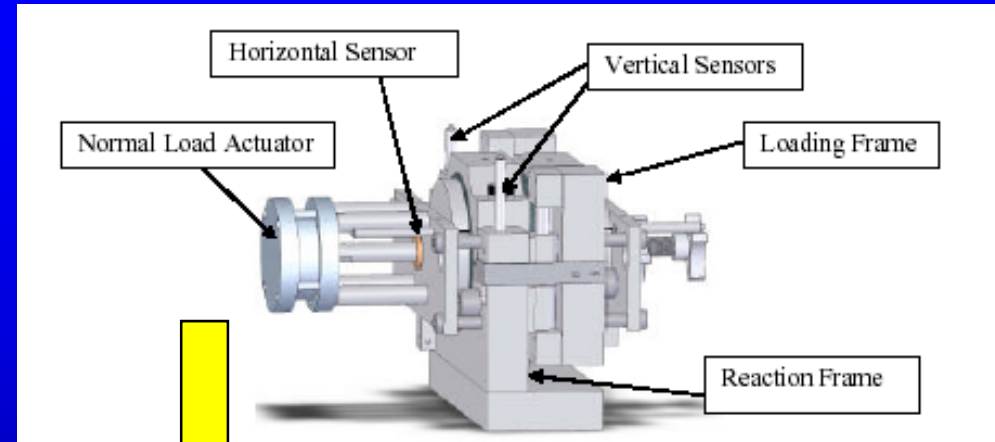


# Characterization of Interface Bond Strength




# Interface Bond Strength Test – Louisiana Interlayer Shear Strength Tester (LISST)

- Developed equipment
  - Interface Bond Strength Shear
- Easy to use
- Portable
- Adoptable to existing load frames
- Reasonable cost
- accommodate both 100 and 150-mm sample diameter
- Draft test method in AASHTO format





# **Factors Considered Experiment To Study Tack Coat**

- **Pavement surface types:**
    - existing HMA, milled HMA, and PCC
  - **Surface Condition:**
    - clean and dirty/dusty
    - Wet and Dry
  - **Tack coat material types**
    - Hot AC
      - » PG 64-22
    - Emulsion
      - » CRS-1, Trackless, SS-1h, SS-1
  - **Application rates (residual):**
    - high, medium, and low
  - **Surface coverages by tack coat:**
    - 100% and 50%
- 

# Factors Considered Experiment To Study Tack Coat

Surface Type:	HMA					PCC			Milled	
Tack Coat Type	1	1	1	1	1	1	1	1	1	1
	PG 64-22	SS-1h	CRS-1	Trackless	No Tack	PG 64-22	SS-1h	SS-1	SS-1h	SS-1
Coverage Rate	2	2	1	1	1	1	1	1	1	1
	50 & 100%	50 & 100%	100%	100%		100%	100%	100%	100%	100%
Residual Rate (gal/yd <sup>2</sup> )	3	3	3	3	1	3	3	3	3	3
	0.031	0.031	0.031	0.031		0.031	0.031	0.031	0.031	0.031
	0.062	0.062	0.062	0.062		0.062	0.062	0.062	0.062	0.062
	0.155	0.155	0.155	0.155		0.155	0.155	0.155	0.155	0.155
Surface Condition	2	2	1	1	1	2	2	1	2	1
	Wet & Dry	Wet & Dry	Dry	Dry	Dry	Wet & Dry	Wet & Dry	Dry	Wet & Dry	Dry
Cleanliness	2	2	1	1	1	1	1	1	1	1
	High & Low	High & Low	High	High	High	High	High	High	High	High
Temperature	1	1	1	1	1	1	1	1	1	1
	77 °F	77 °F	77 °F	77 °F	77 °F	77 °F	77 °F	77 °F	77 °F	77 °F
Normal Load	2	2	2	2	2	2	2	2	2	2
	0 & 20 psi	0 & 20 psi	0 & 20 psi	0 & 20 psi	0 & 20 psi	0 & 20 psi	0 & 20 psi	0 & 20 psi	0 & 20 psi	0 & 20 psi
Replicates	3	3	3	3	3	3	3	3	3	3
Subtotal	144	144	18	18	6	36	36	18	36	18
Total	330					90			54	
Grand Total	<div style="border: 2px solid yellow; padding: 10px; display: inline-block; font-size: 2em; font-weight: bold;">474</div>									





# Survey of Test Lanes

- Surface texture measurement



Sand Patch Method,



Road Surface Profiler

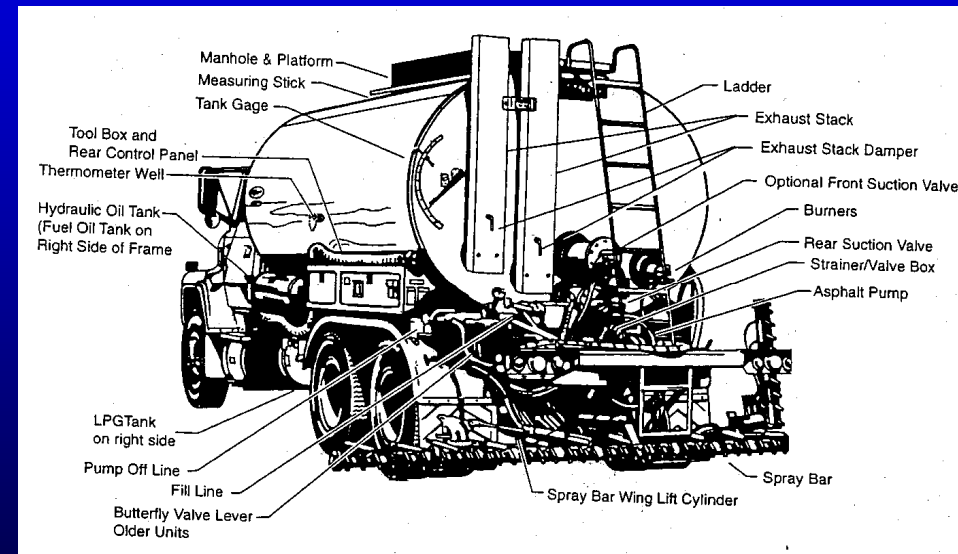


Circular Texture (CT) Meter

# Distributor Truck Calibration

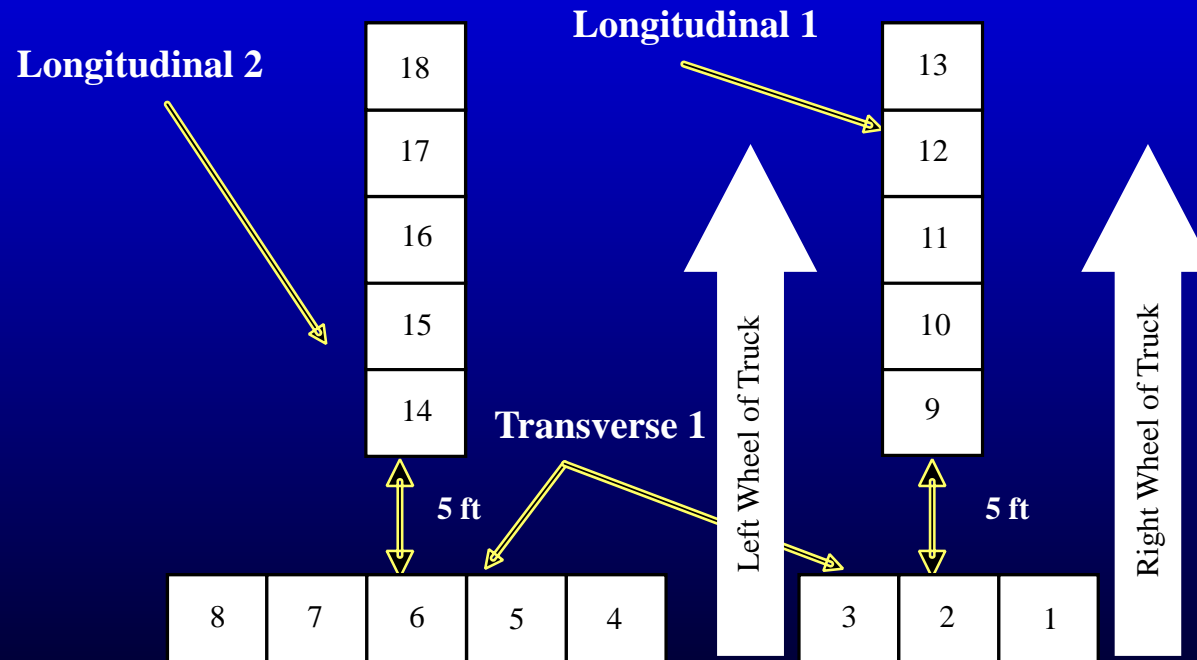
- **Equipments**

- Asphalt Products Unlimited, Inc
- Computerized tack coat distributor truck
- Etnyre, Model 2000



# Distributor Truck Calibration

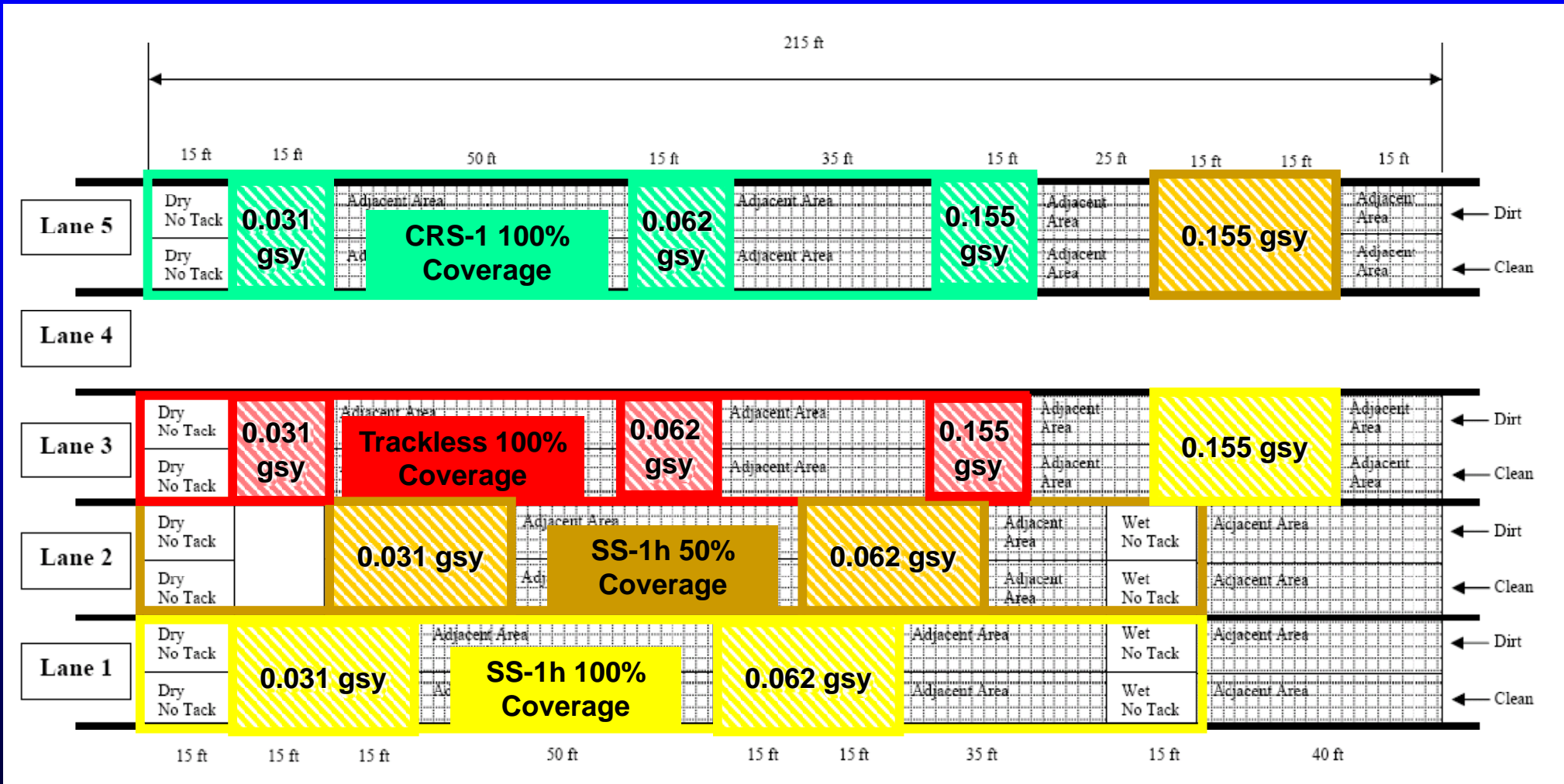
- Geotextile Pad layout
  - ASTM 2995
  - One transverse direction and two longitudinal directions



# Distributor Truck Calibration



# Lane Layout – Existing HMA Surface



# **Spray of Emulsion**



**100% Coverage**



**50% Coverage**

# Overlay Construction

Material Transfer Vehicle





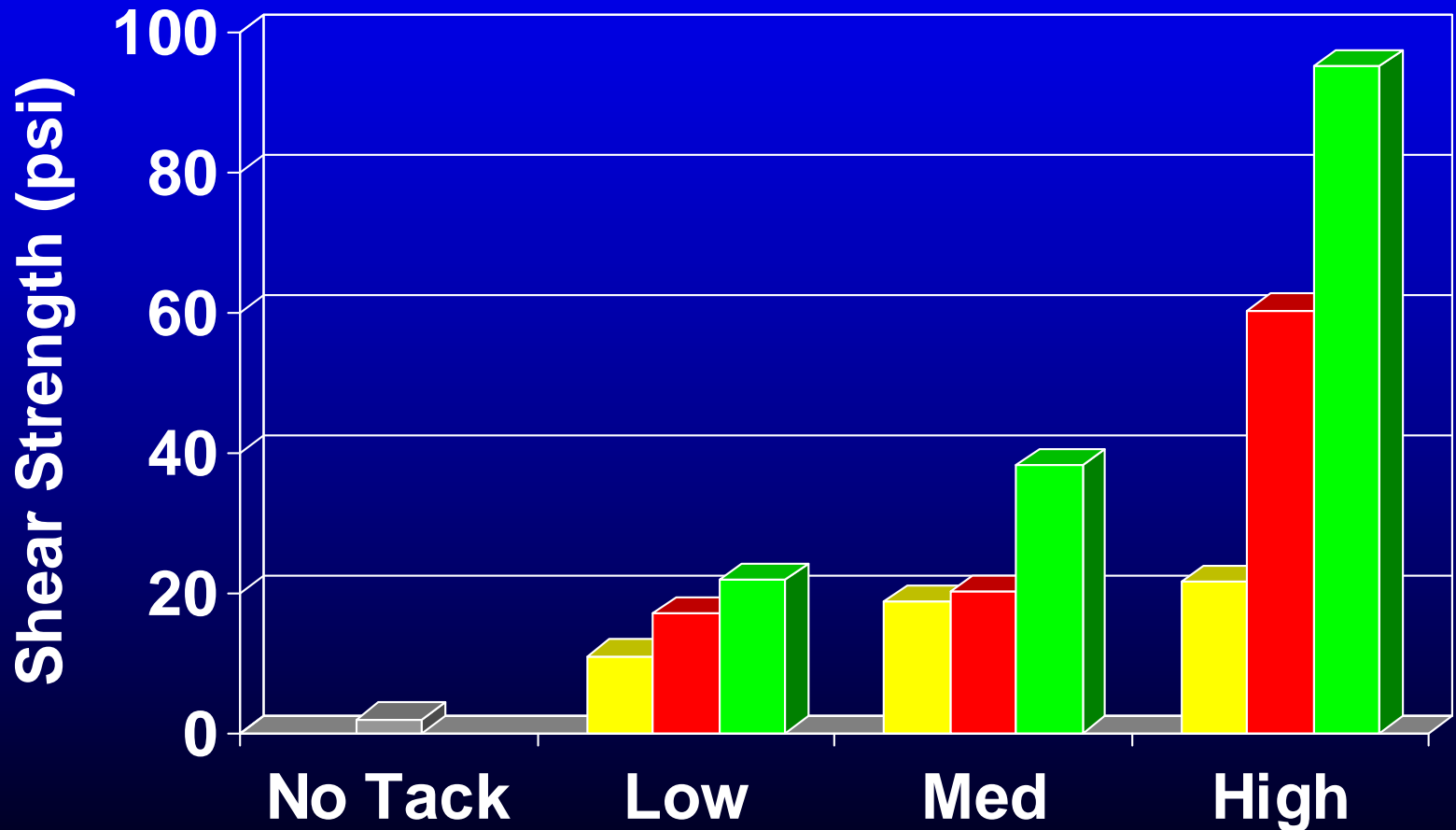
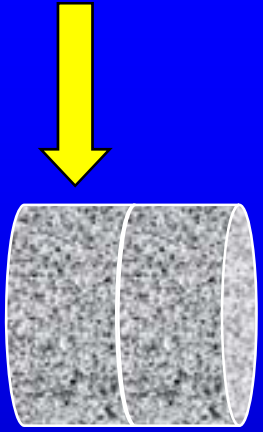


# *Video Presentation*

- **Emulsion Spray**
- **Tack Coat Quality Testing**
- **Overlay Construction**
- **Coring**
  - **Interface Bond Strength testing**



# Interface Shear Strength – 25C Existing HMA Surface, 100% Coverage



# Acknowledgement



- **APU**
  - Distributor Truck
  - SS-1h, CRS-1
- **Costal**
  - HMA Overlay
- **Blacklidge**
  - Trackless



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