Tack Coat Best Practices

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PAPA Regional Technical Meetings

Cranberry Township | State College | Allentown

Tack Coat

- Why

Tack Coat - Why

- Slippage Cracks
  - Cause: Poor bond or low strength mix

https://blacklidge.com/asphalt-slippage-causes-prevention/
FHWA Tech Brief, “Tack Coat Best Practices.” FHWA-HIF-16-017 (2016)

Tack Coat - Why

- Delamination
- Scabbing

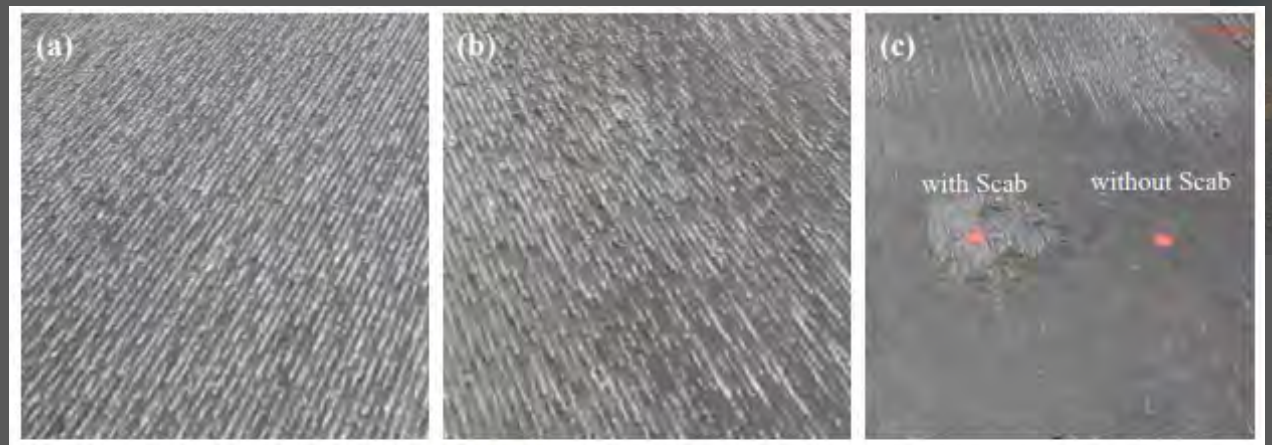


Figure 5. (a) No scabbing, (b) Moderate scabbing, and (c) Severe scabbing with and without scab layer

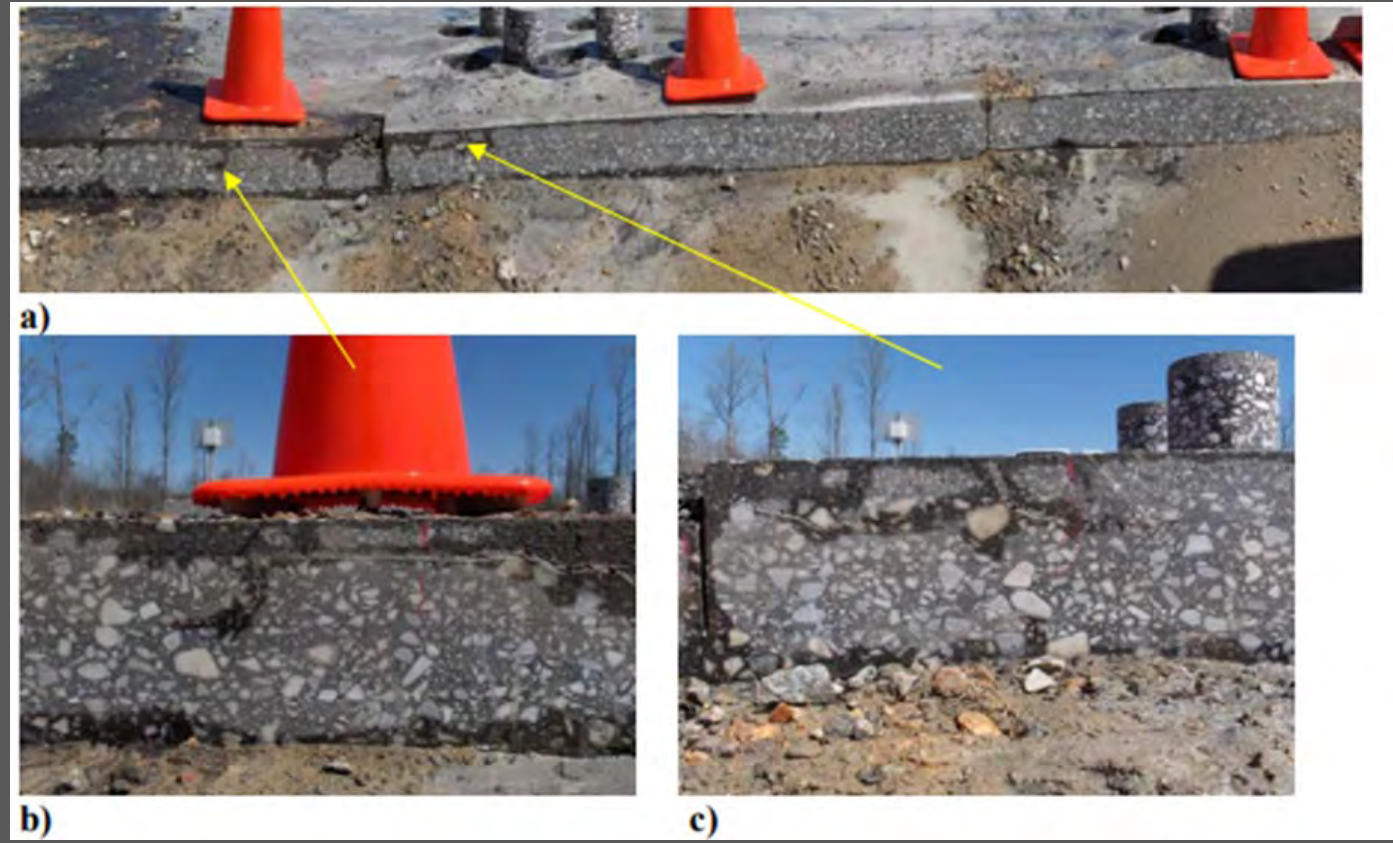
Tack Coat - Why

- Structural Distress
  - Fatigue Cracking

Willis & Timm, NCAT Report 06-04

Tack Coat - Why

- Structural Distress



Willis & Timm, NCAT Report 06-04

Tack Coat - Why

Question:

What scenario would result in more deflection?

a) 2 **bonded** layers

b) 5 **unbonded** layers

Tack Coat - Why

Question:

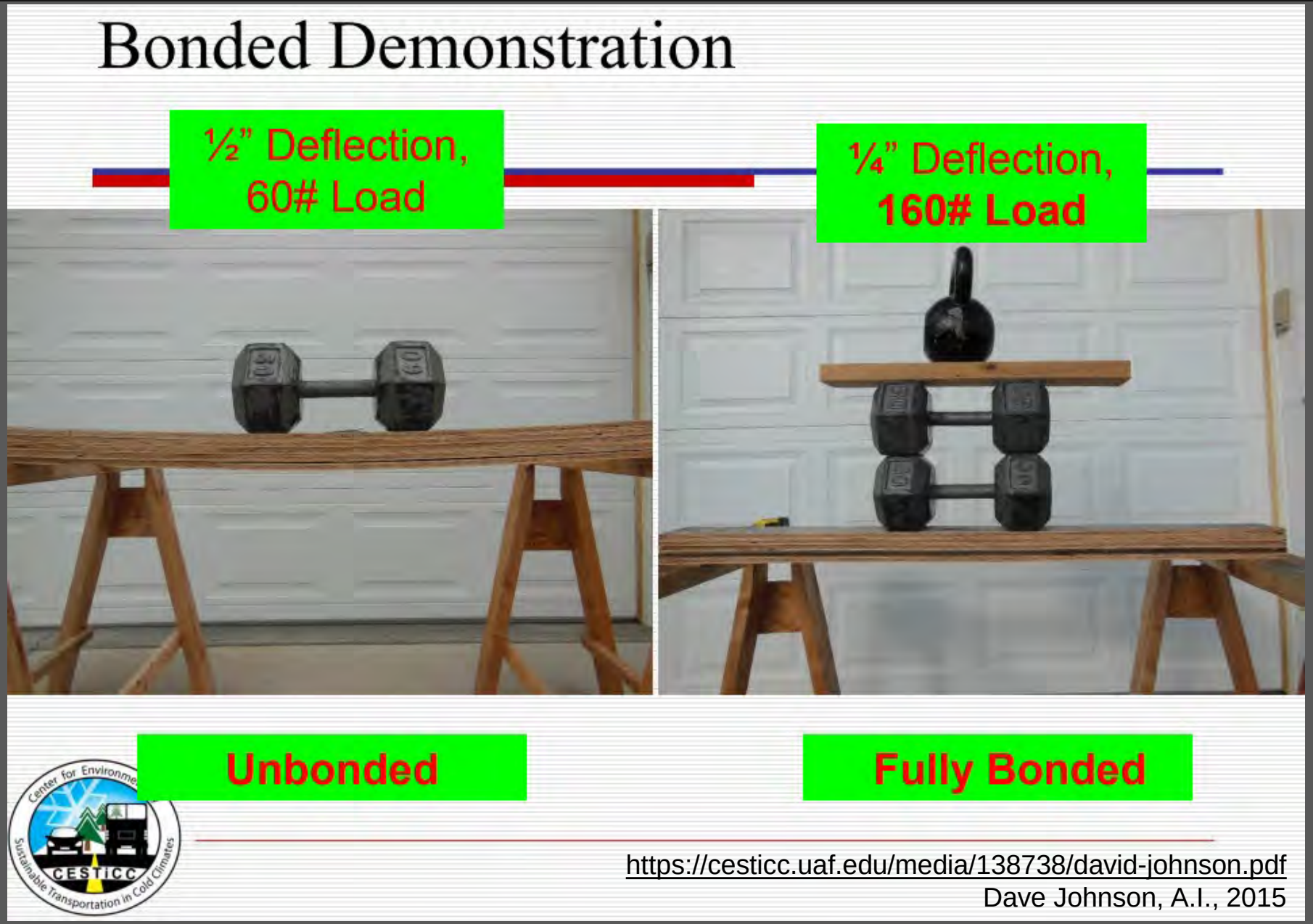
What scenario would result in more deflection?

a) 2 **bonded** layers

b) 5 **unbonded** layers

Tack Coat - Why

- Five bonded layers deflected half as much as five unbonded with 267% greater loading.



Tack Coat

- Tack Coat 101

Tack Coat 101

- Terminology
  - **Tack coat**: sprayed application of asphalt binder upon an existing asphalt or Portland cement concrete pavement surface prior to an overlay, or between layers of new asphalt concrete
  - **Undiluted Emulsion**: an emulsion which consists primarily of a paving grade binder, water, and an emulsifying agent
  - **Diluted emulsion**: an emulsion with additional water added to it. The most common dilution rate is 1:1 (one part undiluted emulsion and one part additional water).

FHWA Tech Brief, "Tack Coat Best Practices." FHWA-HIF-16-017 (2016)

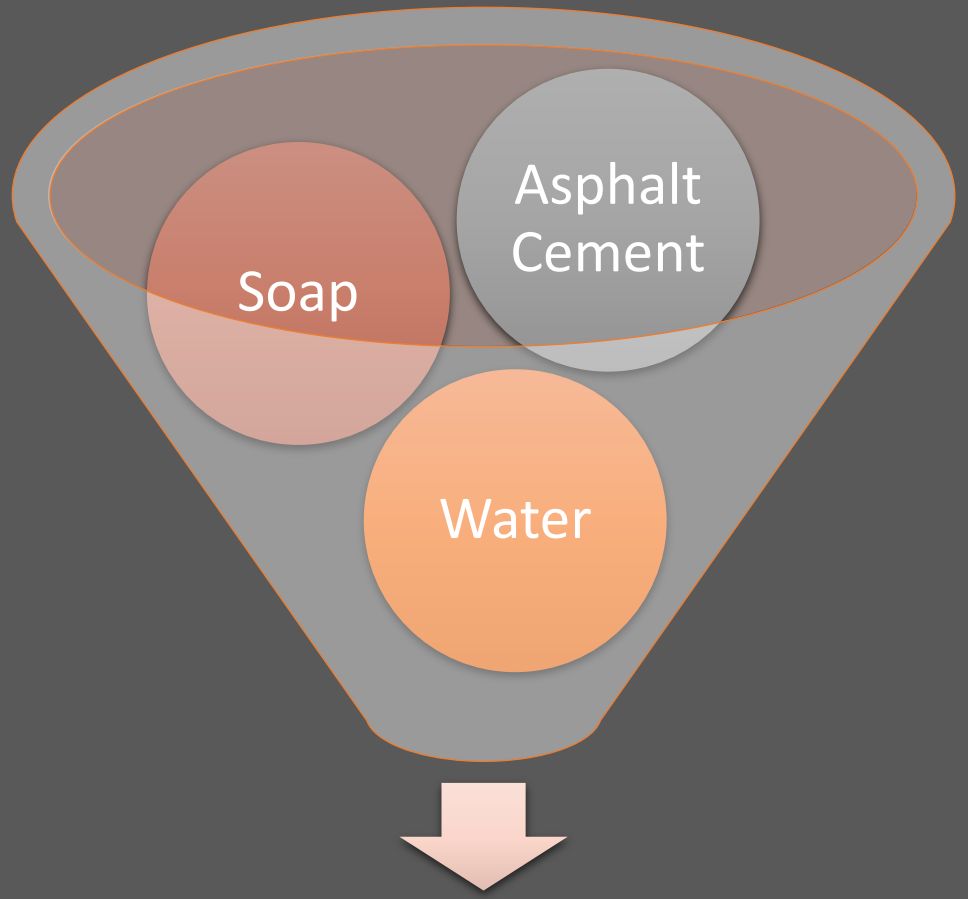
Tack Coat 101

- Terminology
  - **Residual Asphalt**: the remaining asphalt after an emulsion has set, typically 57-70 percent of the undiluted emulsion.
  - **Tack Coat Break**: the moment when water separates enough from the asphalt to show a color change from brown to black.
  - **Tack Coat Set**: when all the water has evaporated, leaving only the residual asphalt. Some refer to this as completely broken.

FHWA Tech Brief, "Tack Coat Best Practices." FHWA-HIF-16-017 (2016)

Tack Coat 101

- Materials:
  - Emulsion
  - Non-tracking tack
  - Hot applied: Neat binder
    - PG 64S-22
    - PG 58S-28

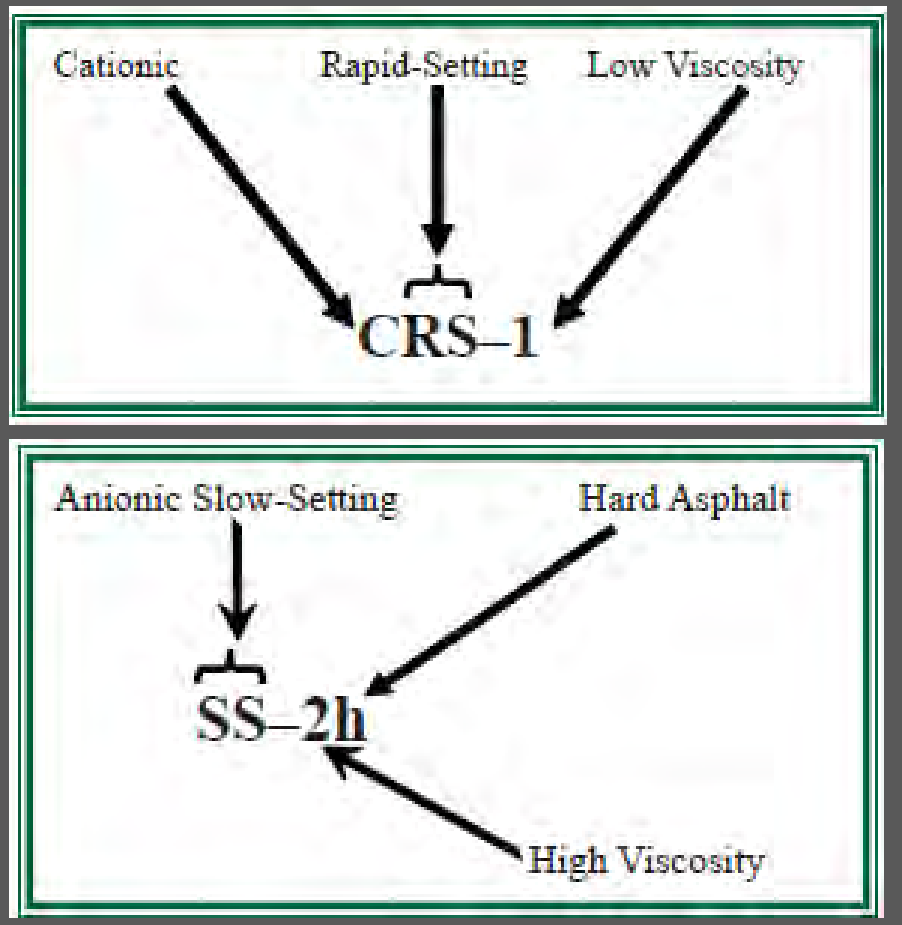


Anionic or cationic emulsion

Tack Coat 101

- Materials:
  - **Emulsion**
  - Non-tracking tack
  - Hot applied

CRS-1
CRS-2
CRS-1h
CSS-1
CSS-1h
CMS-2
SS-1
SS-1h
SS-1hp



Caltrans (2009) Tack Coat Guidelines

Tack Coat 101

- Materials:
  - Non-tracking tack: similar to emulsions, but need extra care/handling
    - Keep circulated (store in a tank that can be circulated/agitated 1x/week)
    - Keep hot (store at 50 – 110F); apply at 160 – 180F
    - **Short shelf life**
    - Larger strainer
    - Do NOT dilute
    - Inspect tank before each new load

Tack Coat 101
Dos and Don’ts for Non-Tracking Tack

Do

- Clear paving surfaces of dust and dirt immediately before application
- Ensure full coverage
- Follow Spec on rate
- Allow to break, dry, and set before allowing traffic on surface (15 – 30 mins under normal conditions)
- Always follow safety procedures and wear PPE

Don’t

- Dilute for tack application
- Allow to freeze or drop below 45F
- Allow to boil or rise above 180F
- Apply when raining or to wet surface
- Apply to dusty or dirty surfaces
- Apply to surfaces that are extremely hot (> 150F)
- Apply at a rate > 0.10 gal/SY

C. Hurtgam, 2024 Annual PAPA Conference

Tack Coat 101

Tack Coat

- Best Practices

Tack Coat Best Practices

- Surface Prep
  - Fill or seal cracks > 1/8” wide
  - Repair structural distresses
  - Thoroughly clean the surface:
    - CLEAN and DRY
  - Uniform application to all exposed surfaces
  - **Tack every layer**
  - Minimize tracking of tack

Image source: https://www.designworldonline.com/coupling-cleans-up-challenges-for-construction-sweepers/

Courtesy Tim Harrawood

Tack Coat Best Practices

https://www.fhwa.dot.gov/pavement/recycling/98042/05.cfm

- Sweeping
  - Surface MUST be clean
    - Clean surface after patching, sealing, and/or milling
    - Power broom or sweeper
    - Remove dried mud, spilled asphalt, etc.
  - Running traffic on milled surface helps clean it
  - Re-sweep immediately prior to tack coat placement

Michael Huner
https://www.apa-mi.org/docs/Huner_Tack_Coats_-_A_Fundamental_Topic_with_a_Big_Impact.pdf

Tack Coat Best Practices

- Test Strip/Verification of Application Rate

TABLE B
Uniform Asphalt Residual Rates by Surface Type

Surface Type	Uniform Asphalt Residual Rates (RR) (gallons per square yard)
New Asphalt Paving	0.03 to 0.05
Existing Asphalt Paving	0.04 to 0.07
Milled Surface (Asphalt & Portland Cement Concrete)	0.04 to 0.08
Portland Cement Concrete	0.04 to 0.07

460 – 1
Initial Edition

PennDOT Pub 408 – Section 460.1

Tack Coat Best Practices

Test Strip/Verification of Application Rate

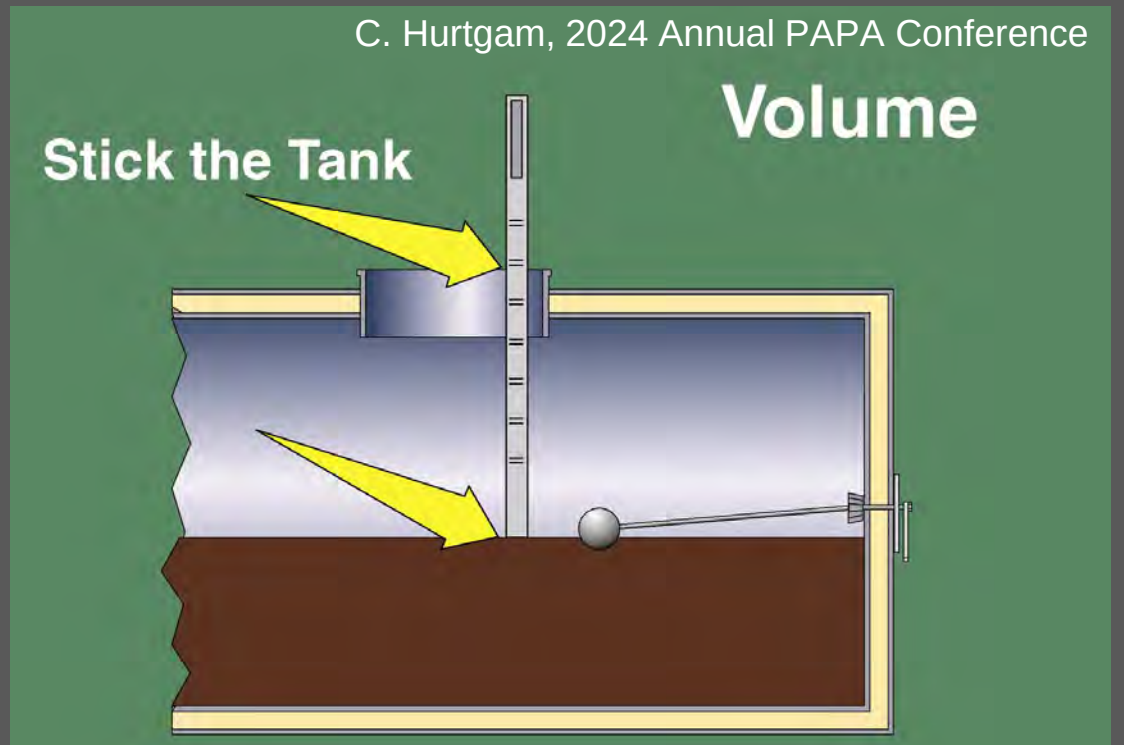
- PTM 747: Determination of Distributor Application Rate in the Field:
  - Using Dipstick measure level of bituminous material in tank

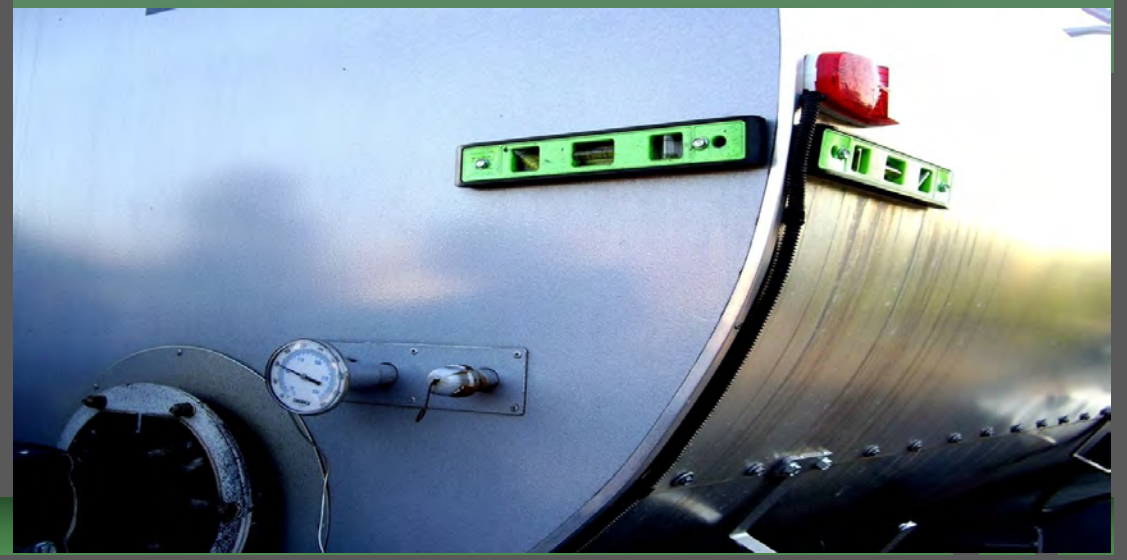
TABLE 1. LENGTH OF THE TEST STRIP

Application Rate L/m^2(gal/sq yd)	Length of the Test Strip. m(ft.)
Less than or equal to 0.45 (0.1)	300 (1000)
More than 0.45 (0.1)	150 (500)

PennDOT Pub 19 – Chapter 19

C. Hurtgam, 2024 Annual PAPA Conference





Tack Coat Best Practices

- Uniform Application
  - Checking application rates

Example:

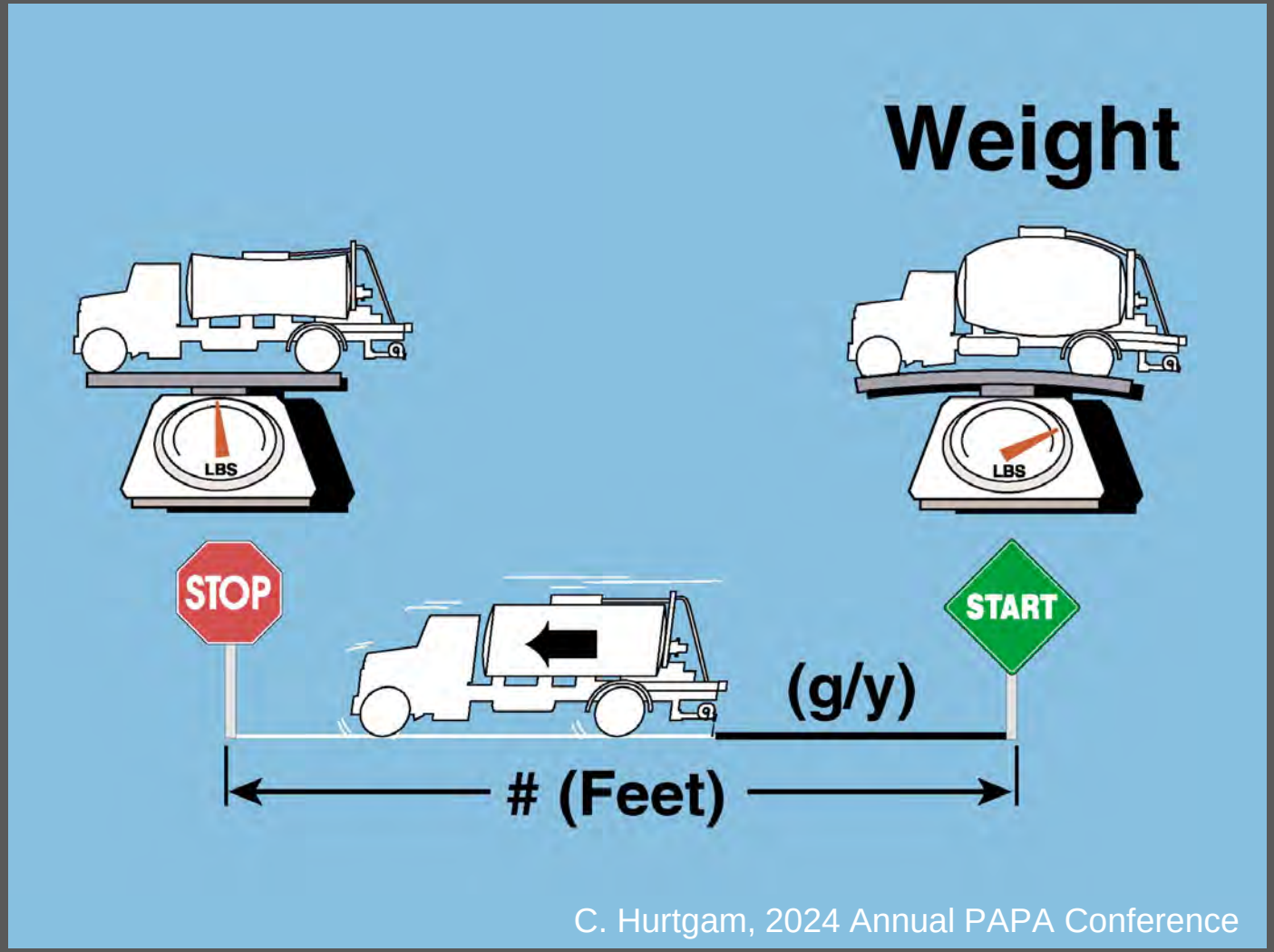
Initial reading = 450 gal

Final reading = 200 gal

Distance = 2500 ft

Emulsion = 61% residual

What was the application rate?



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Tack Coat Best Practices

Application rate = $\frac{9 \times Gallons\ Applied}{Width \times Length} = \frac{9\ x\ (450-200)}{(2500' \times 12')}$ = 0.075 gal/SY

Residual Rate (gal/SY) = Application rate x %Residual

= 0.075 gal/SY x 0.61 = <u>0.046 gal/SY</u>

Tack Coat Best Practices

- Uniform Application

How would you rate this application…Good or bad???

Tack Coat Best Practices

- Uniform Application

Tack Coat Best Practices

- Uniform Application

Tack Coat Best Practices

- Uniform Application – checking application rate

Tack Coat Best Practices

- Uniform Application
  - Checking application rates
  - Out-of-the-bar Rate vs. Residual Rate

Tack Coat Best Practices

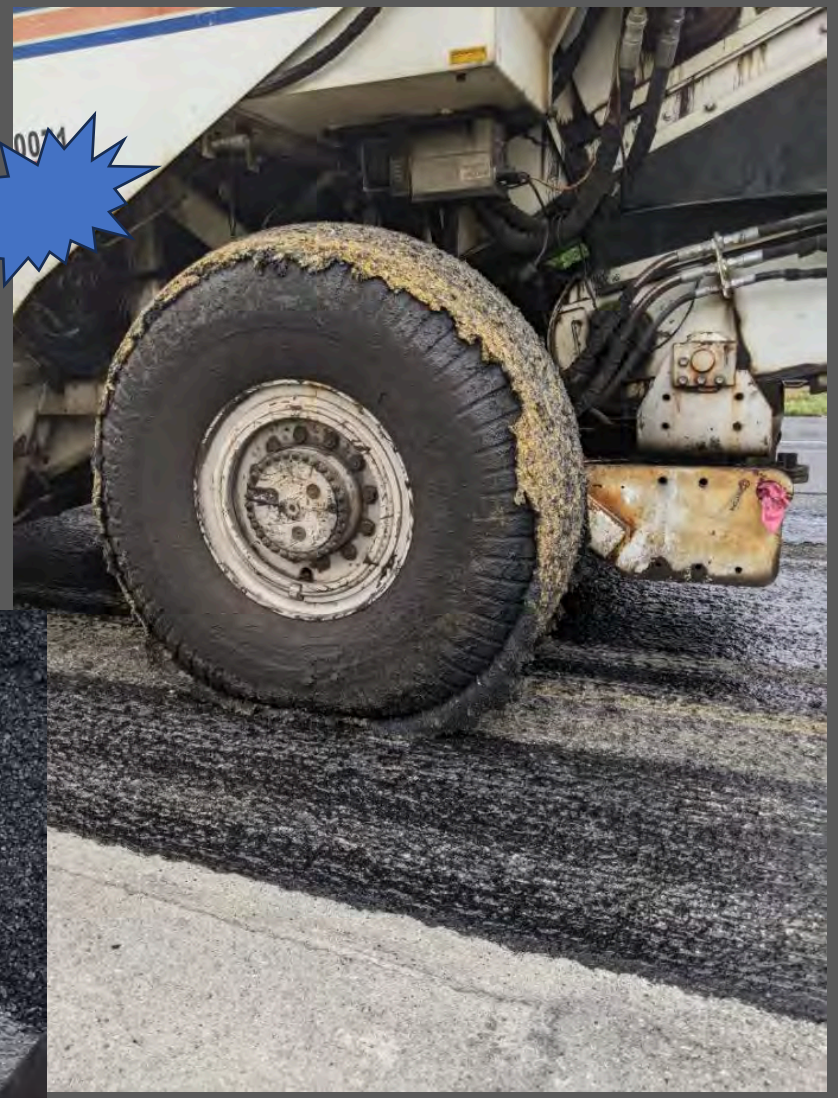
- Uniform Application
  - May have the correct amount, but application is not even
    - Will NOT have the same bond strength
  - No Corn Rows or Streaks

Michael Huner

https://www.apa-mi.org/docs/Huner_Tack_Coats_-_A_Fundamental_Topic_with_a_Big_Impact.pdf

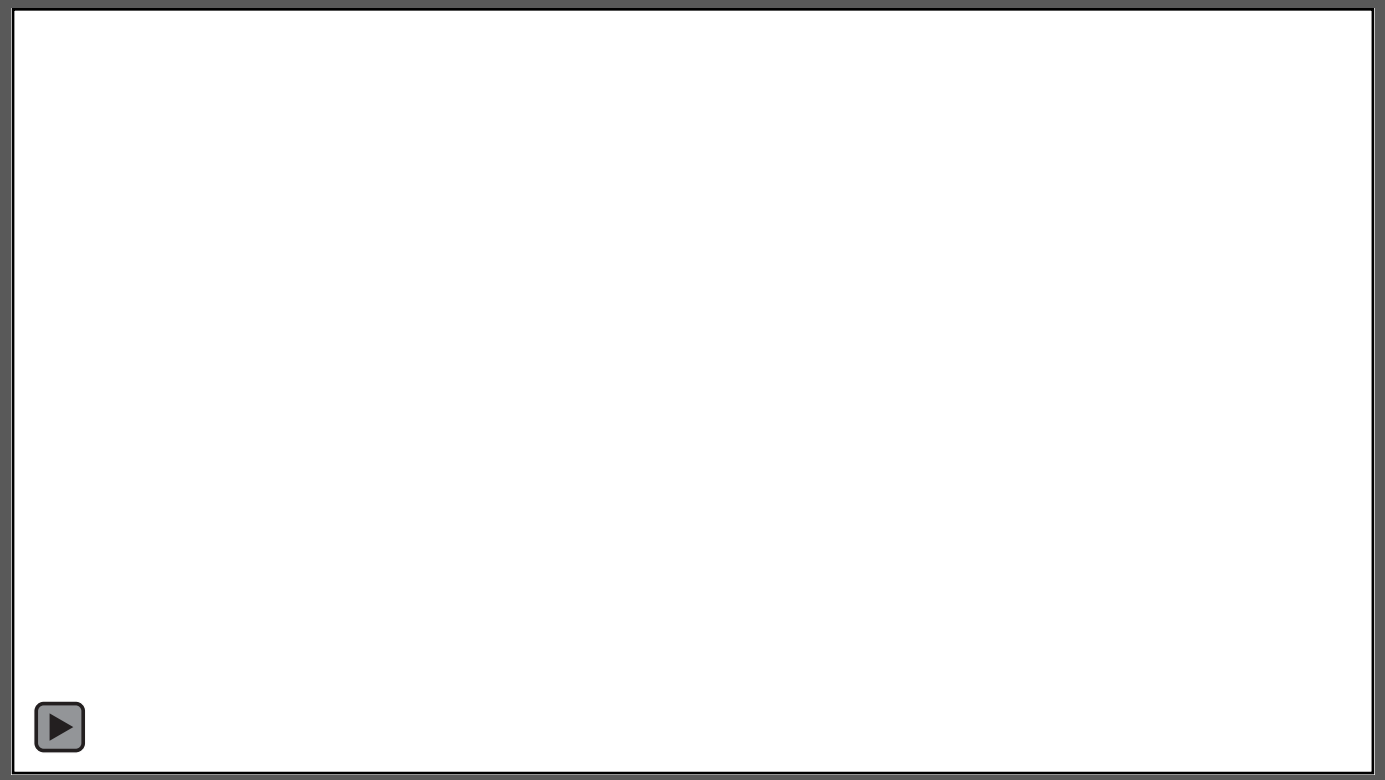
Tack Coat Best Practices

- Uniform Application



Tack Coat Best Practices

- Time to set depends on
  - Formulation (e.g., RS, SS)
  - Climate
    - Sun coverage
    - Daytime vs. nighttime
    - Humidity
    - Temperature:
      - Air
      - Surface
      - Emulsion
    - Dilution



Thank you....

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