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Best Practices for Asphalt Construction & Inspection

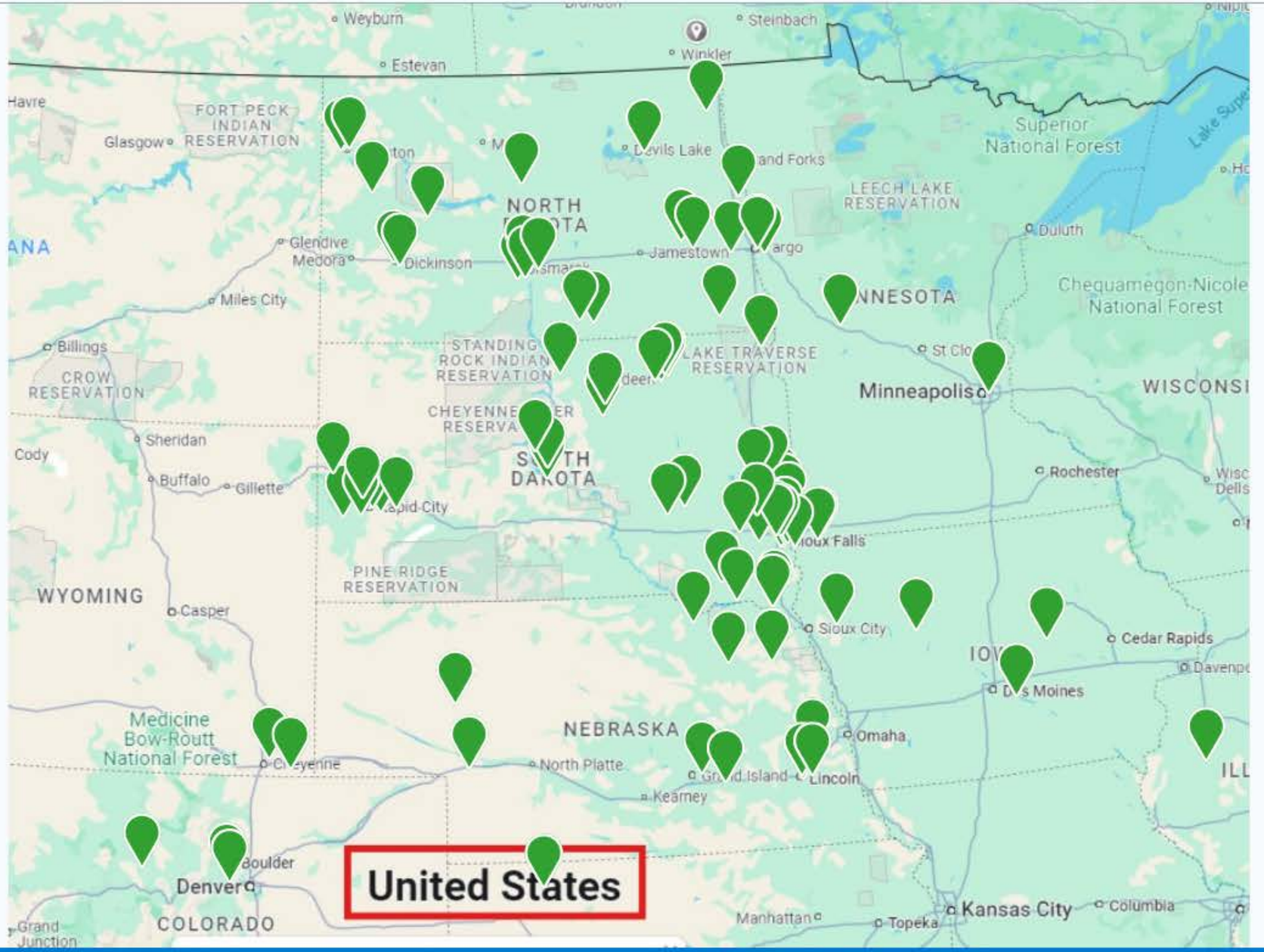
How to join

Web

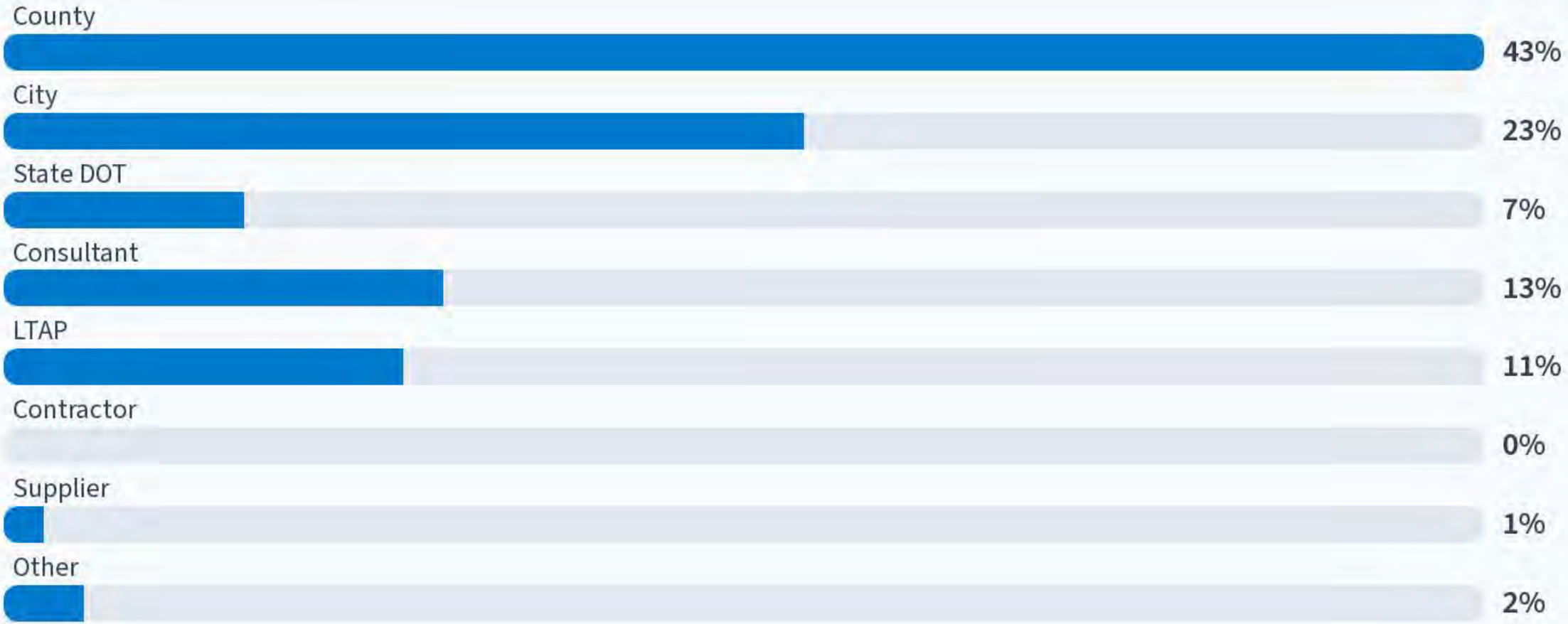
1. Go to **PollEv.com**
2. Enter **TRAVISW910**

Don’t register…!!
Just Skip…

Where are you from?



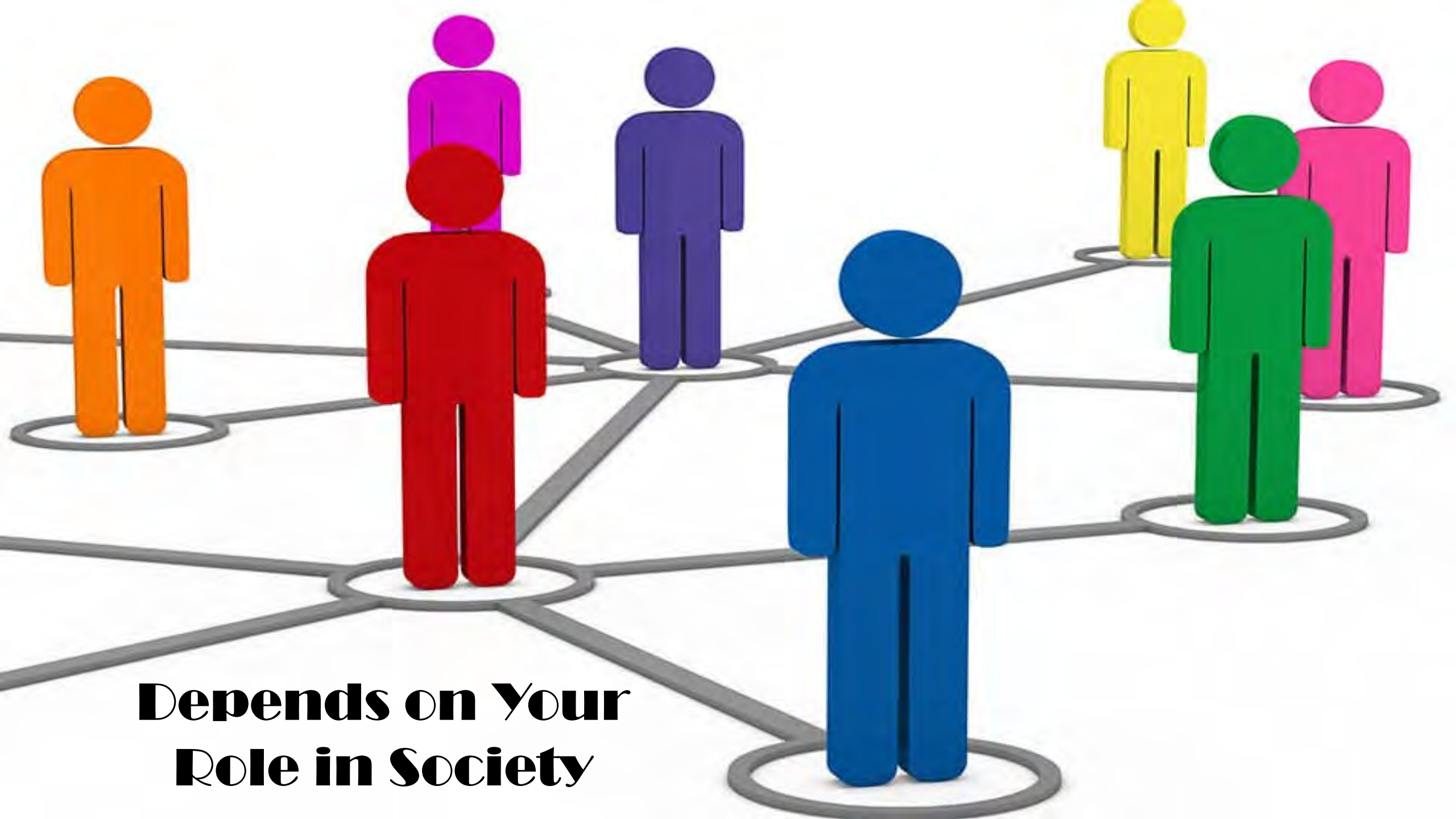
What is your affiliation?



When poll is active respond at **PollEv.com/travisw910** Send **travisw910** and your message to **37607**

What makes an asphalt road good?

Instructions Responses Clear responses



Depends on Your Role in Society

The three most important factors for determining the long life of an asphalt pavement during construction:

Density Density Density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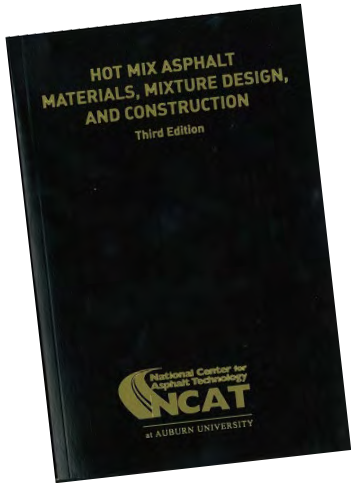
National Center for Asphalt Technology

- Created in 1986 through agreement with NAPA and Auburn University
- Largest research arm of Auburn University
- Annual budget about $13 million
- Approximately 45 personnel (including about 30+ college students and graduate students)



NCAT Web Site:

NCAT.us

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ARMLESS AND LEGLESS MEN
RIDING A TANDEM
© EX. SUP. CO., CHGO.

Learning Objectives

- Understand the importance of density in asphalt pavements
- Discuss tack coat application
- Identify major components of an asphalt paver

Compaction Greatly Affects Performance

In-place Density of Asphalt Pavements

- Studies have found that many new asphalt pavements do not have adequate in-place densities
  - NCHRP 9-9(1): 40 projects
    - 55% had average air voids greater than 8%
    - 20% had average air voids greater than 10%
  - NCHRP 9-27: 20 projects
    - 70% had average air voids greater than 8%
    - 35% had average air voids greater than 10%

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Time Available for Compaction

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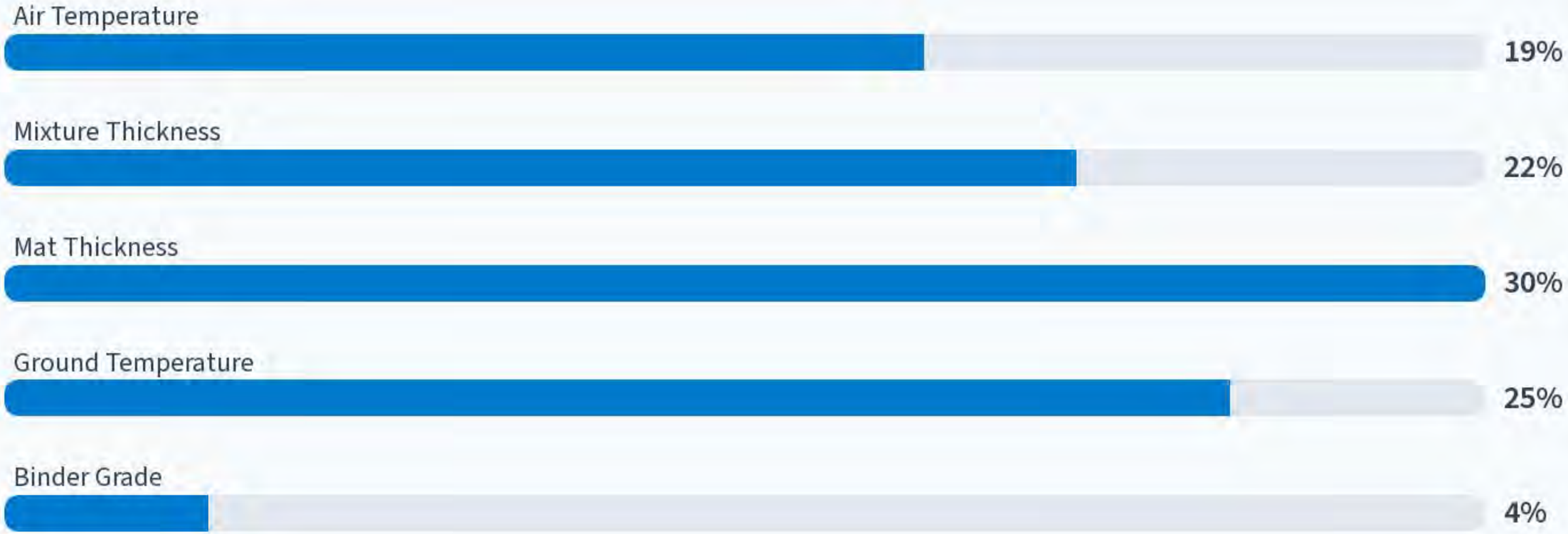
Environmental Variables

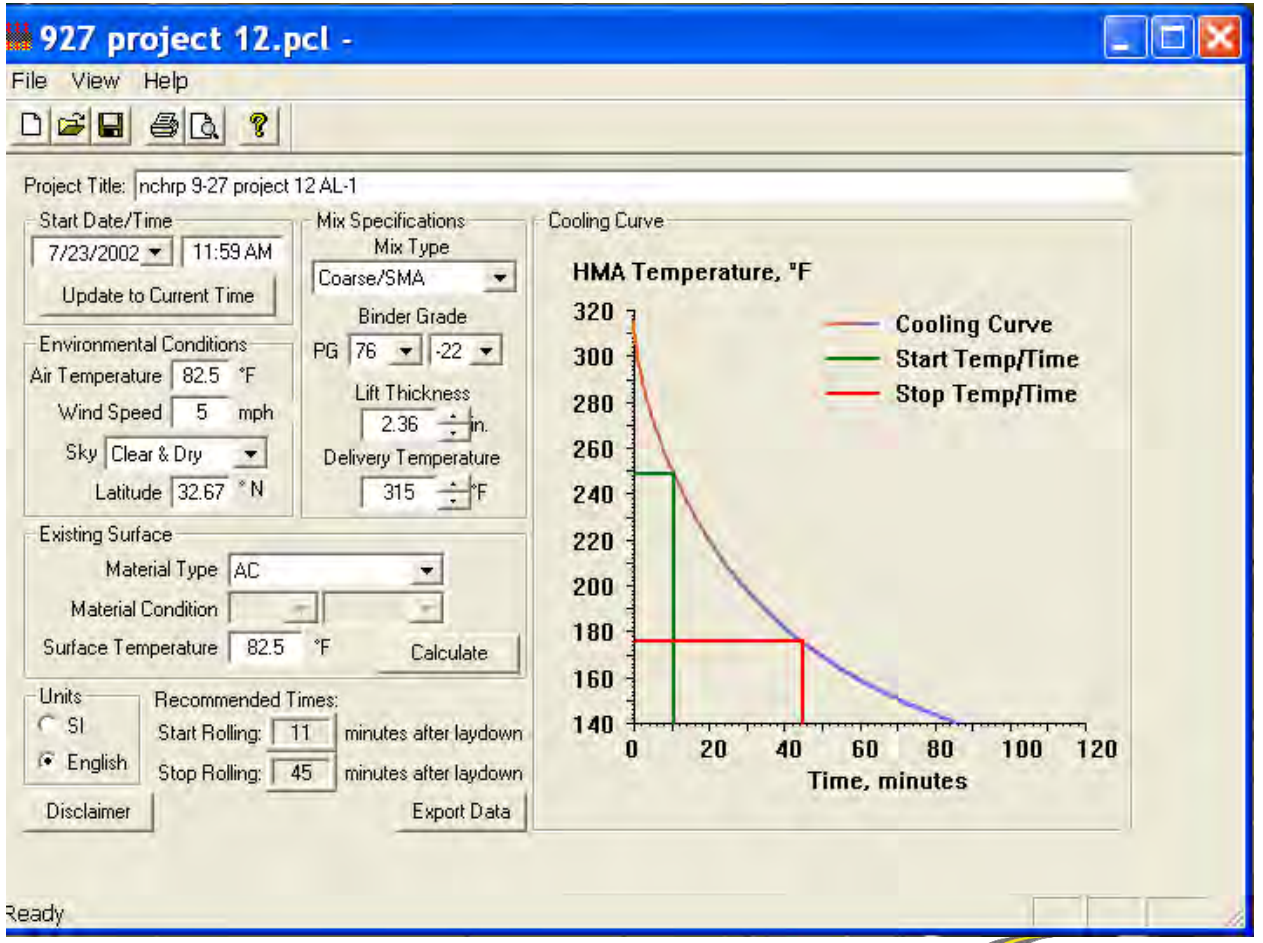
- Layer thickness
- Air and base temperature
- Mix laydown temperature
- Wind velocity
- Solar flux

Which item effects the Time Available for Compaction the most?



Factors Affecting Compaction

- Mix properties
  - Aggregate
  - Asphalt
  - Mix temperature
- Environmental factors
- Site conditions



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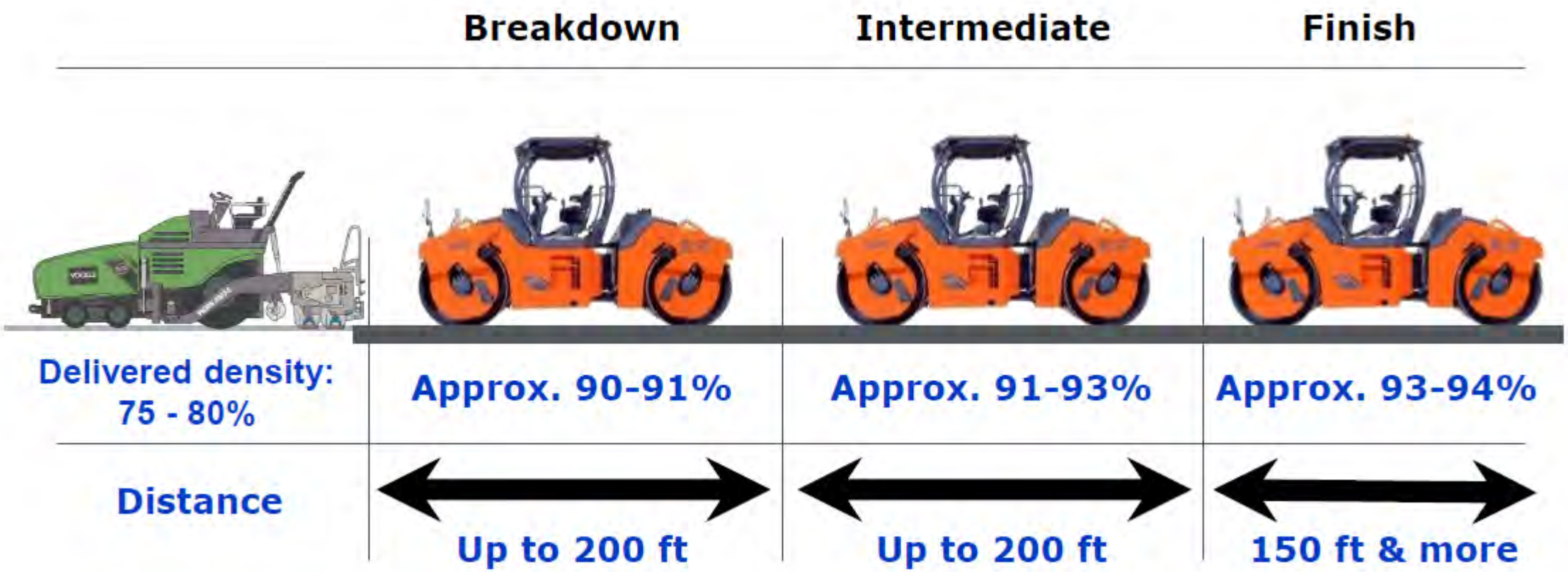
Compaction Train



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Common Ways to Check Density

- Cores
- Density Gauge
- Non-Nuclear Gauge

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Dielectric Profiling System (DPS)

- Uses ground penetrating radar technology to measure density
- Unlike coring, DPS provides continuous measurements, resulting in nearly 100% coverage of the constructed layers
  - Field cores are still required to calibrate the measured dielectric constant to the actual pavement density
- Potential for complete enumeration of the pavement density

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Compaction Checklist

- Satisfactory Rollers
- Rolling Techniques – Pattern, Speed, Operation
- Thickness to Aggregate Size
- Joints
- Mix Properties
- Mix Temperature
- Air Temperature
- Density Control

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Purpose of Tack Coats

- Bonds pavement layers together – allows them to behave as a single layer
- Decreases distress between the existing pavement surface and the new asphalt overlay
  - Prevents slippage between pavement layers.
  - Vital for structural performance of pavement.
  - Apply along all transverse and longitudinal vertical surfaces.
- Improved pavement performance

From a nation-wide survey, 17% of agencies indicated they do nothing to correct poor tack shots, and 56% did not vary application rate due to any factors.

This is what you should see

Effect of Poor Bonding on Service Life


TechBrief

The Asphalt Pavement Technology Program is an integrated, national effort to improve the long-term performance and cost-effectiveness of asphalt pavements. Managed by the Federal Highway Administration through partnerships with state highway agencies, industry and academia the program's primary goals are to reduce congestion, improve safety, and foster technology innovation. The program was established to develop and implement guidelines, methods, procedures and other tools for use in asphalt pavement materials selection, mixture design, testing, construction and quality control.

U.S. Department of Transportation
Federal Highway Administration

Office of Asset Management, Pavements, and Construction

FHWA-HIF-16-017

April 2016

Tack Coat Best Practices

This Technical Brief provides an overview of tack coats and their vital role bonding multiple asphalt layers into one monolithic system. Poor tack coat techniques result in compromised bonding of the asphalt layers. This leads to pavement distresses. Possible slippage cracking and delamination are associated with poor bonding. Additionally, poor bonding can lead to structural distresses, namely fatigue cracking and potholes. Often this lack of sufficient bonding is not recognized as the source of failures.

Introduction

A key, but sometimes overlooked, component of an asphalt pavement is the bond strength between asphalt pavement layers. Tack coat is a sprayed application of an asphalt binder upon an existing asphalt or Portland cement concrete pavement prior to an overlay, or between layers of new asphalt concrete. This thin membrane of asphalt binder provides the glue between the layers, creating a monolithic structure which performs as a unit as opposed to unbound, independent, layers. When properly built, a pavement will provide the desired characteristics for its users, while meeting the needs of an agency for an economical, environmentally friendly and sustainable material.

Poor bonding of a pavement surface layer is a direct result of inadequate tack coat practices resulting in slippage and shoving of the pavement, as seen in Figure 1. This type of failure is most frequently seen in locations where braking or acceleration is common, such as intersections. Other distresses can also be made related to poor tack coat bonding, most notably pavement fatigue cracking.

1

- May & King (2004):
  - 10% bond loss = 50% less fatigue life
- Roffe & Chaignon (2002)
  - No bond = 60% loss of life
- Brown & Brunton (1984)
  - No Bond = 75% loss of life
  - 30% bond loss = 70% loss of life

FHWA Tech Brief
Tack Coat Best Practices

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Tack Coat Fundamentals

- Correct tack material
- Distributor calibrated and properly setup
- Correct application rate
- Application quality
- Break and Cured
- Limit Construction Traffic

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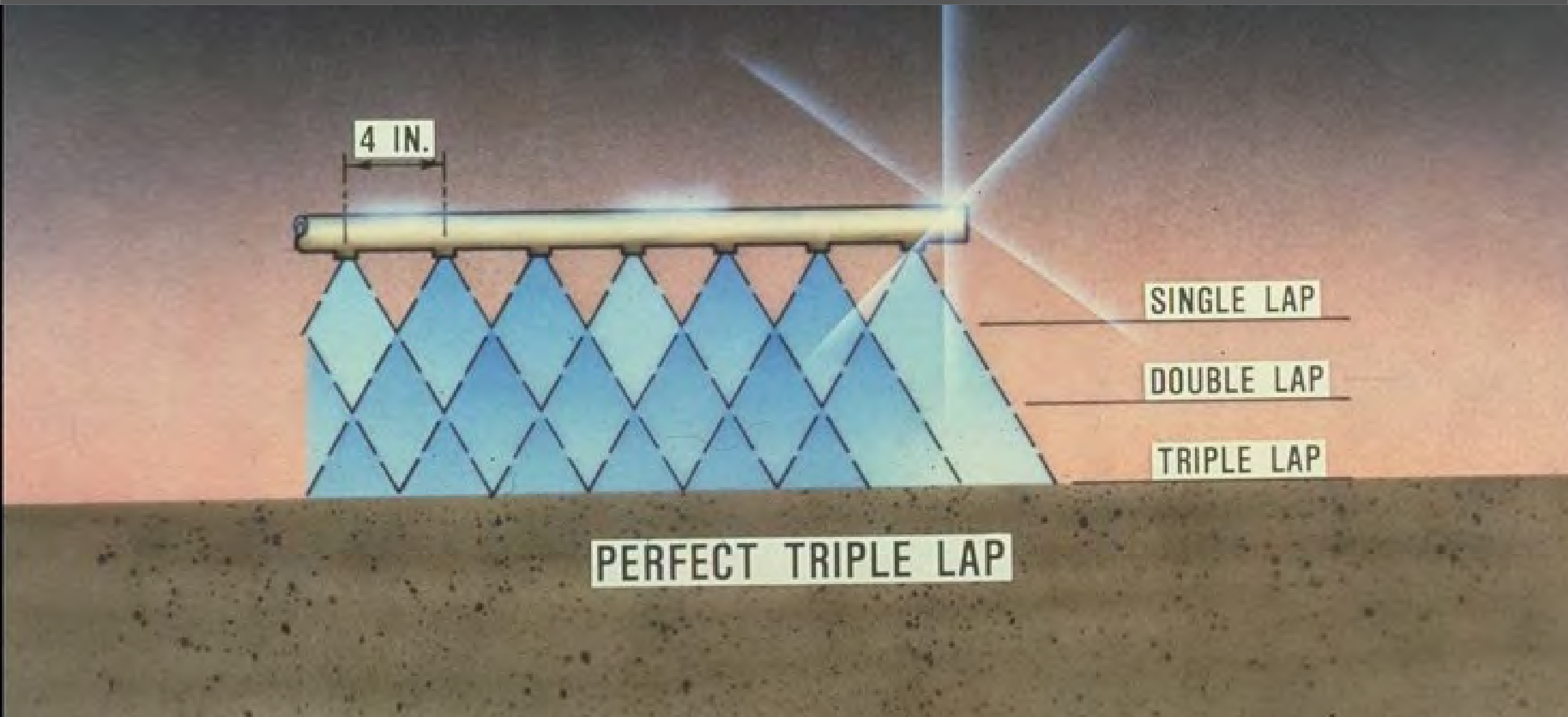
OLEX
UIPMENT

Tack picked up by trucks

Use Double or Triple Overlap



Application Rates

- The rate of application shall be adequate to bond the new bituminous layer to the existing surface.
- Refer to specification for application rate ranges.
- Bar rate vs Residual rate

- Should the tack rate vary?

Tack Surface Preparation

- Clean the surface of all materials that prevent the tack from bonding to the existing surface
- Tack all layers
- Cover all tacked surface areas the same day

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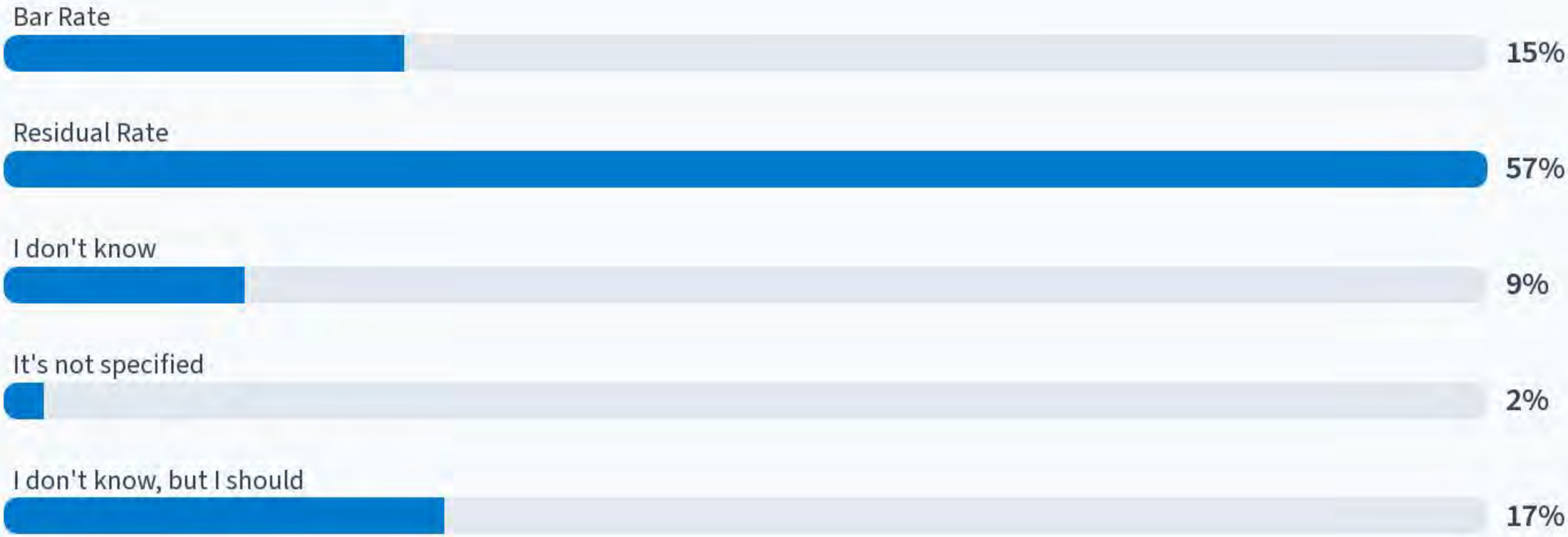
How can you visually tell that a tack coat has cured and is ready for construction traffic and paving?

Is the tack coat application rate bar rate or residual rate in the specification/agency you work with?



Asphalt Hauling Equipment

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Three Basic Types of Haul Trucks

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- End dump
- Belly (bottom) dump
- Horizontal discharge

Truck Beds Must Be Clean and Smooth

- Diesel Must Not Be Used as a Release Agent

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Loading of asphalt delivery trucks is a potential source of segregation

Trucks must be Properly Loaded to Minimize Segregation

- Multiple drops

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Diesel Fuel

Cannot be used as a release agent

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Release Agents

- Lubricate dump box when necessary with a thin film of material that does not dissolve the bitumen.
- Do not use petroleum distillates.
- Drain excess coating from dump box before use.

- In Nebraska DOT Specifications diesel fuel is allowed at night after paving operations have finished for the day.

Travis' face ➡

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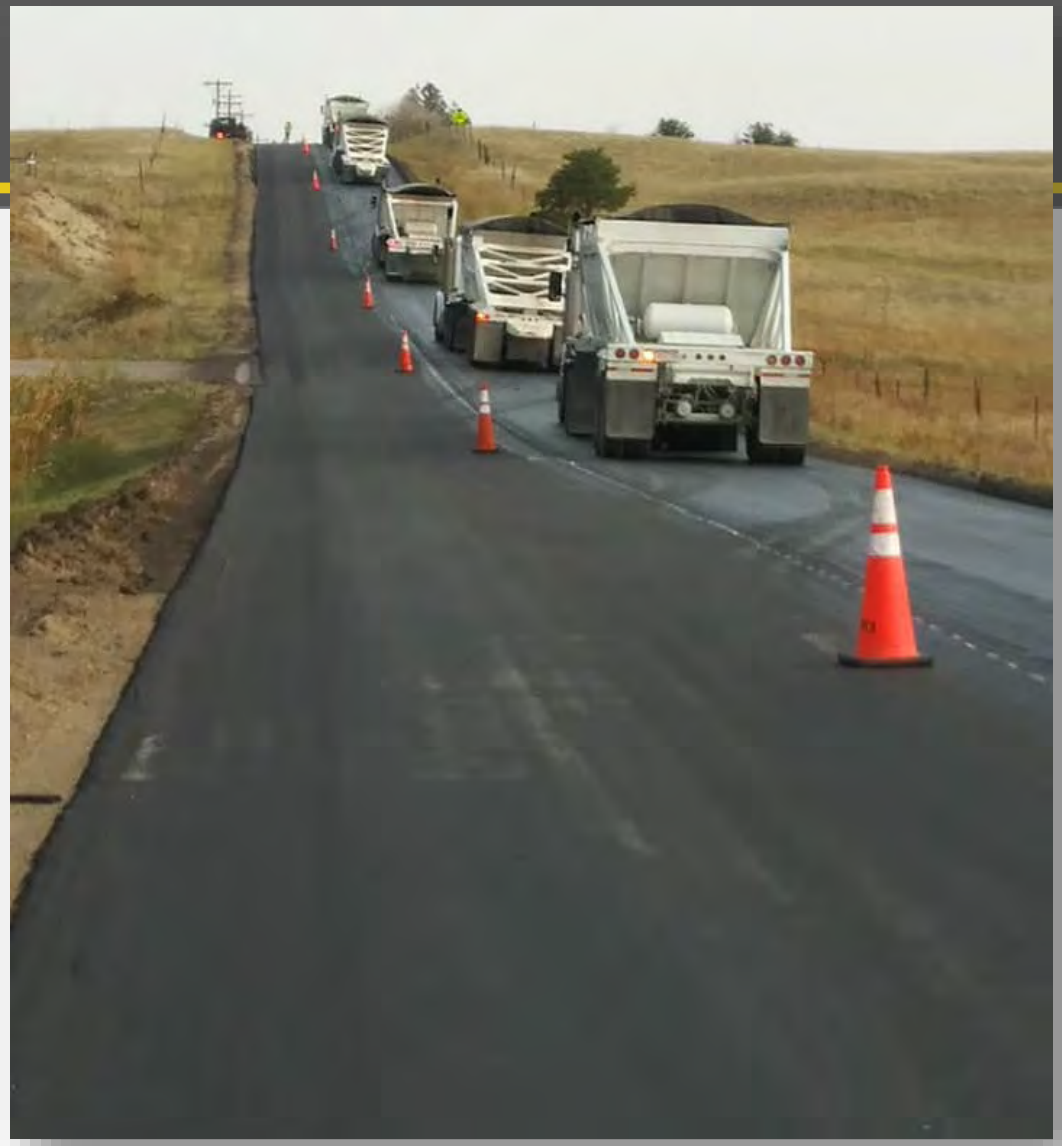
Truck Tarps



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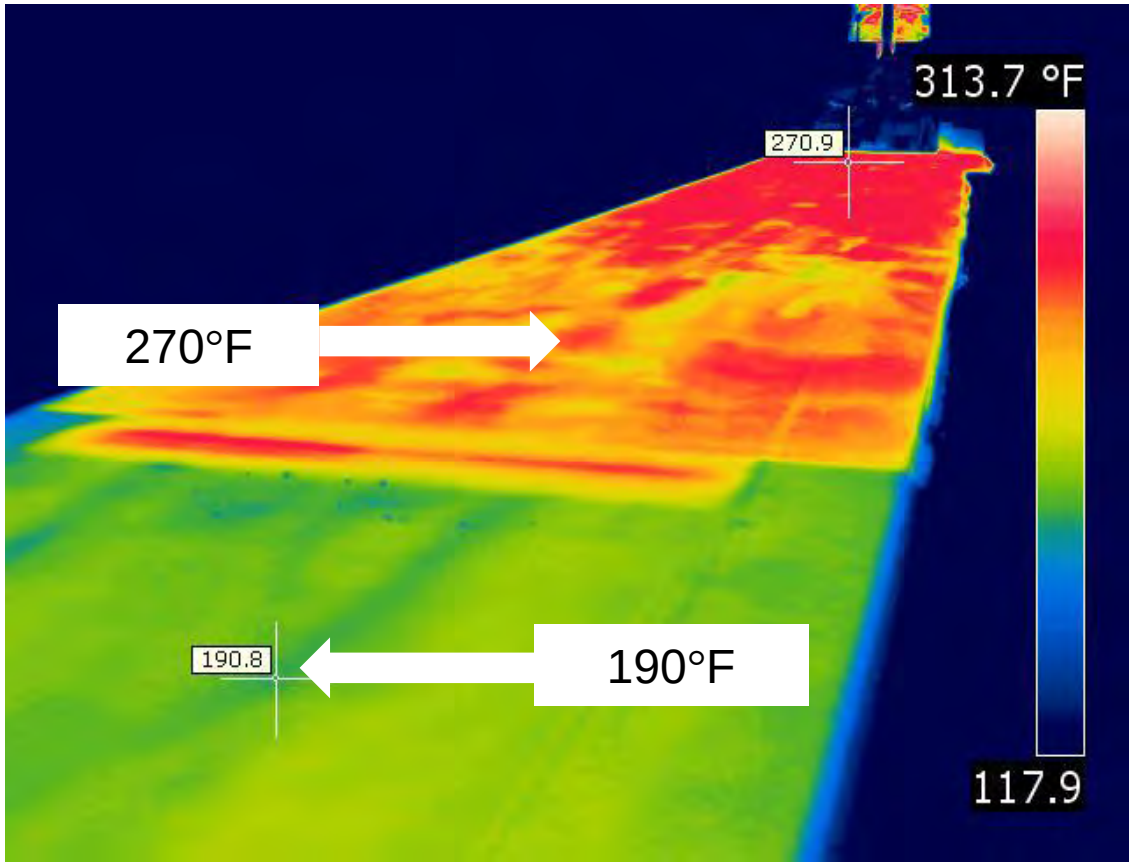
Unseen effect of repetitive paver stops



Some States require removal if temp drops below 190°F prior to compaction

80°F difference after 30 minute paver stop

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Effect of Cold Mix?

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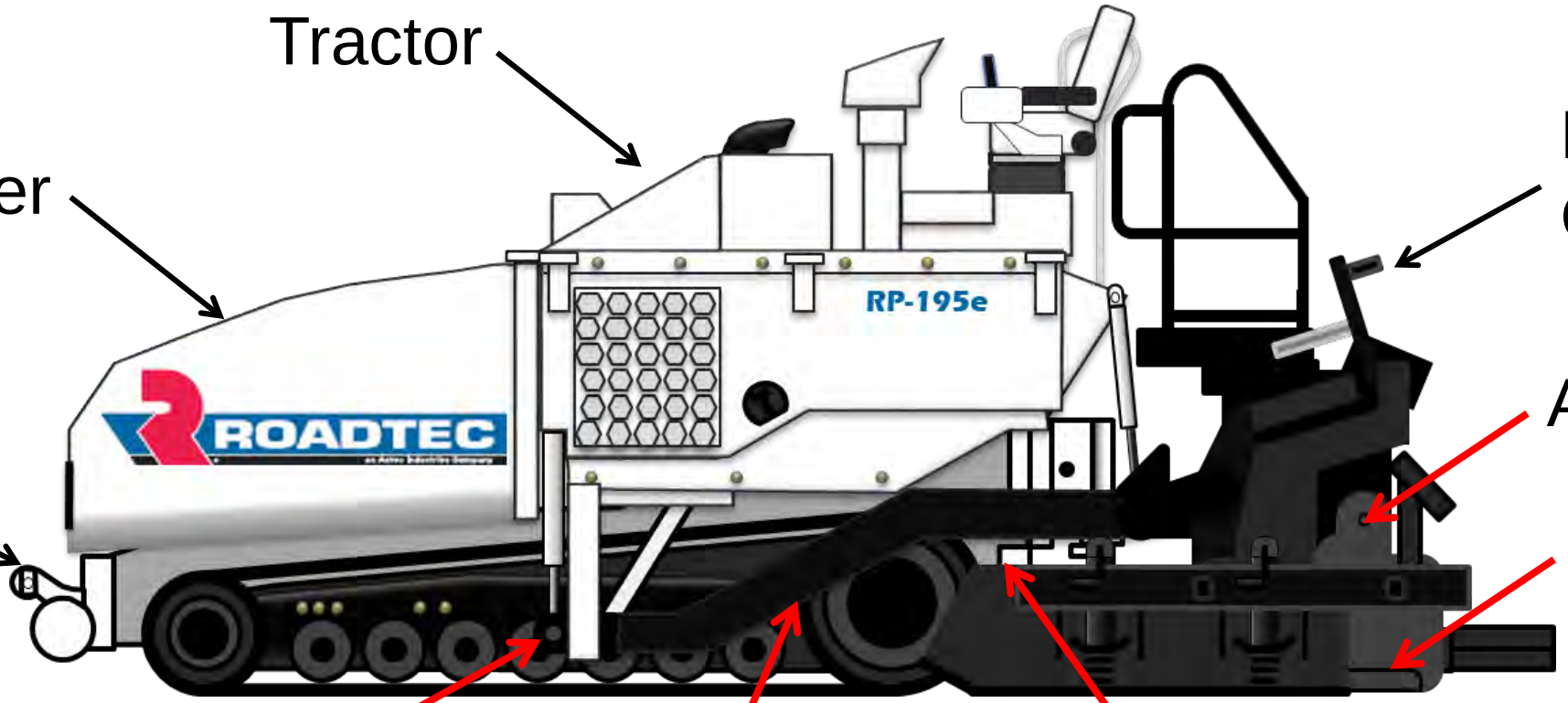
BLAW-KNOX
PF 5200
INGERSOLL RAND

Asphalt Paver



Courtesy of:

ROADTEC

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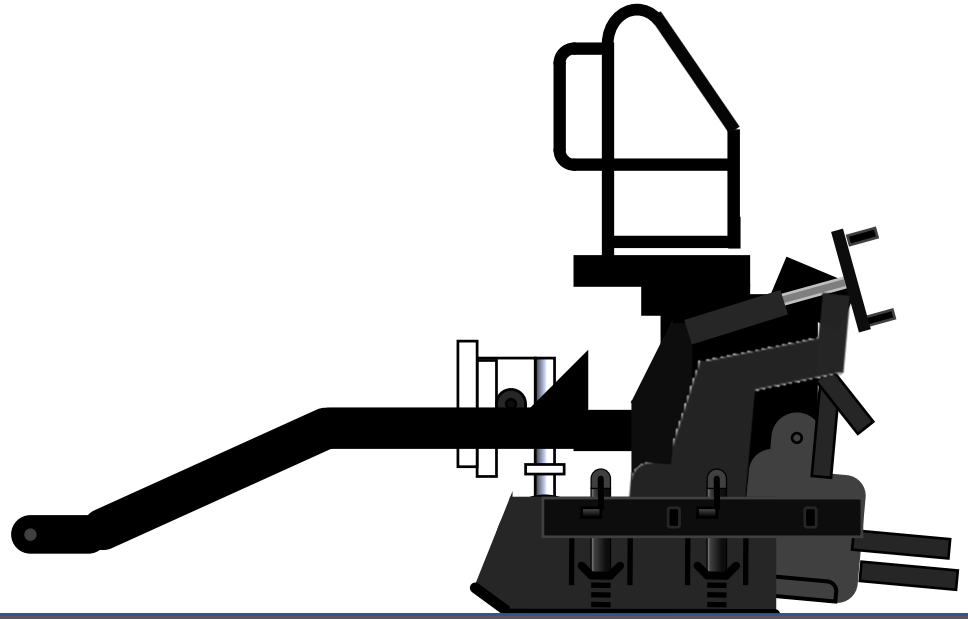
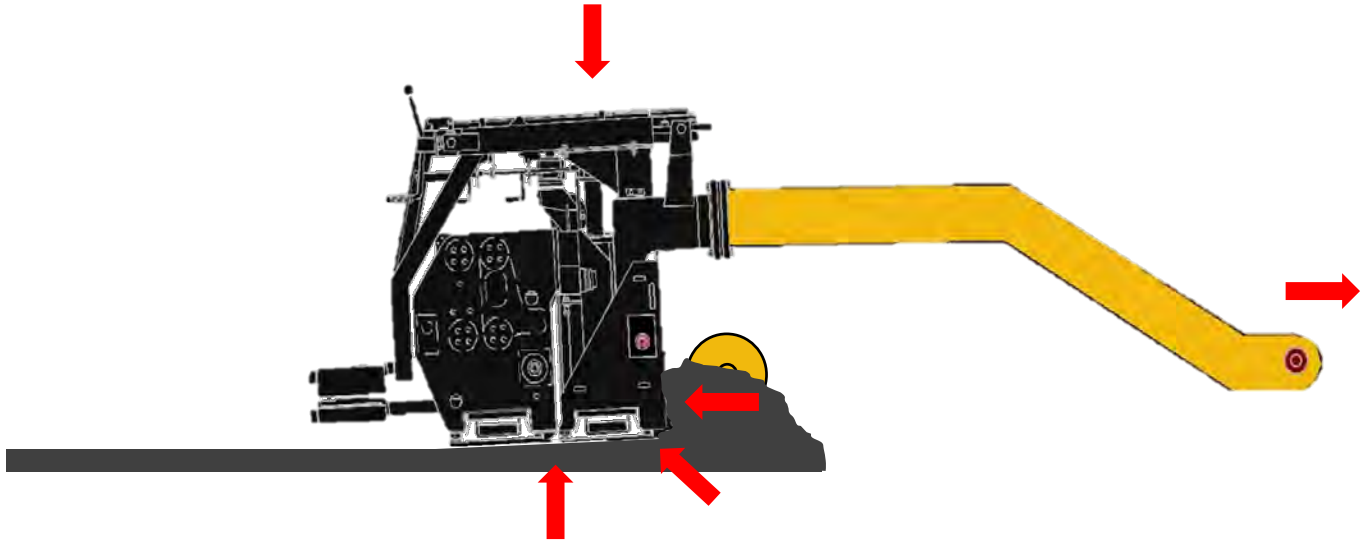
Asphalt Pavers Utilizes a Floating Screed Principle

What does that mean?



Forces Acting on Screed

- Speed of paver (Tow Force)
- Head of Material
- Shear Force (Angle of Attack)
- Screed Weight
- Reaction of the Material



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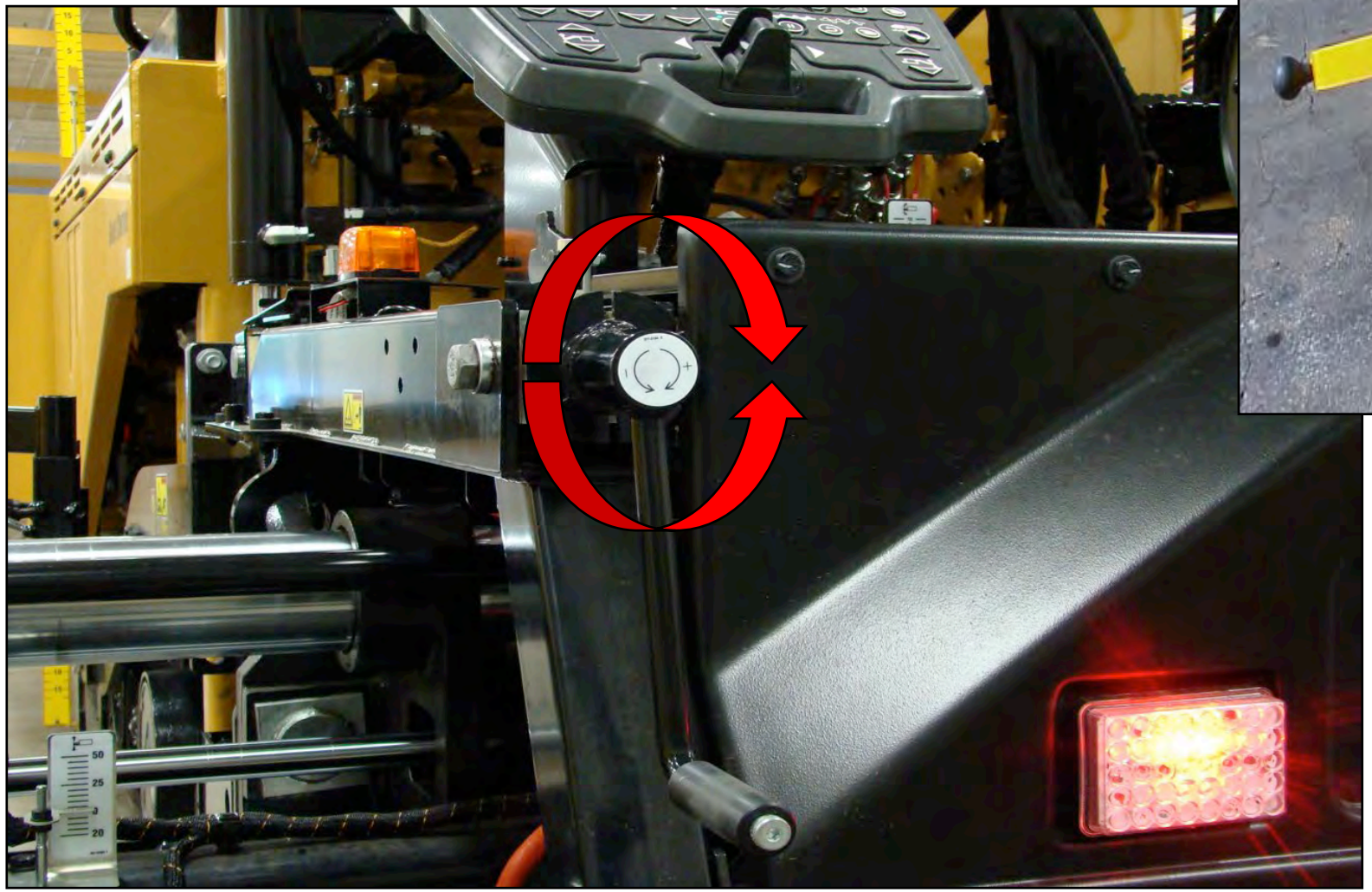
Tow Point

Contact-less Beam with Ultra-Sonic Sensors

Photo courtesy of Caterpillar Paving Products

Manual Adjustment



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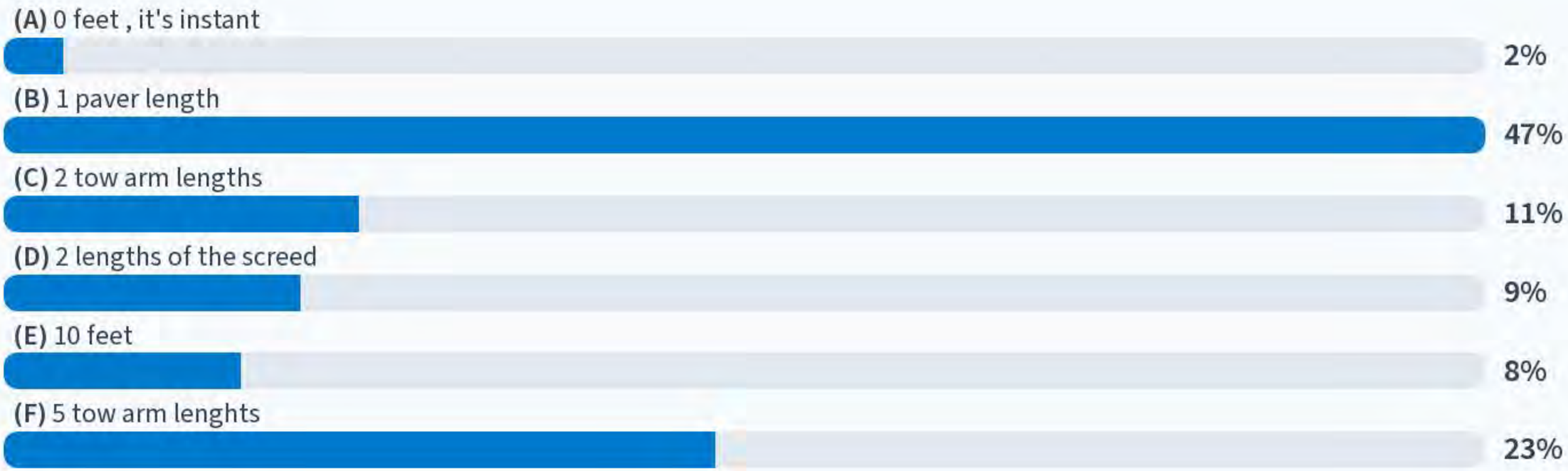
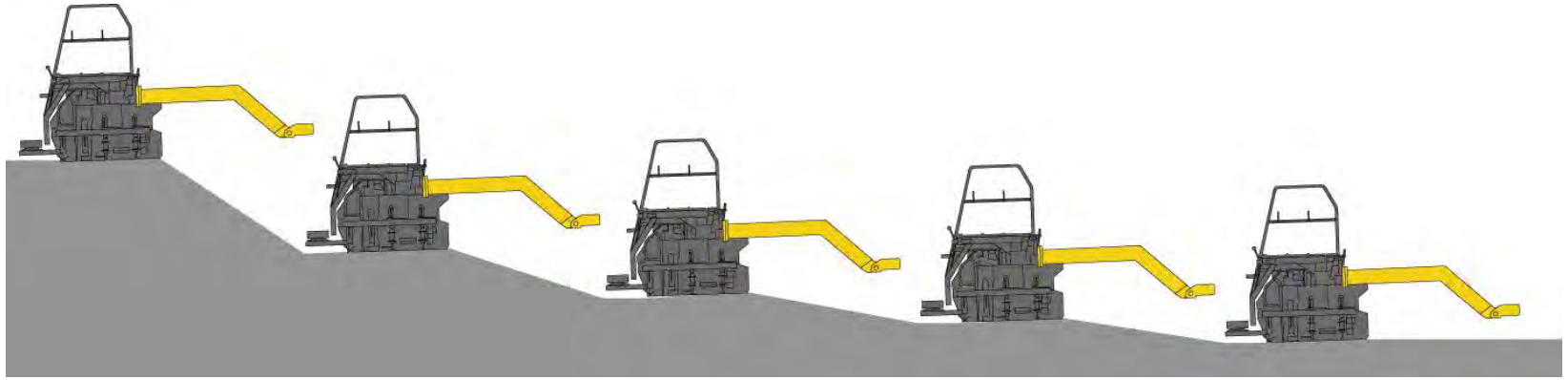
How far must the paver travel to see 100% of the adjustment made to the screed by changing the angel of attach?



Screed Reaction Time



Courtesy of Caterpillar Paving Products

- Screed reacts to change in angle of attack over **five** tow arm lengths
- 65% of change occurs in the first tow arm length
- 35% of change occurs in the last four tow arm lengths

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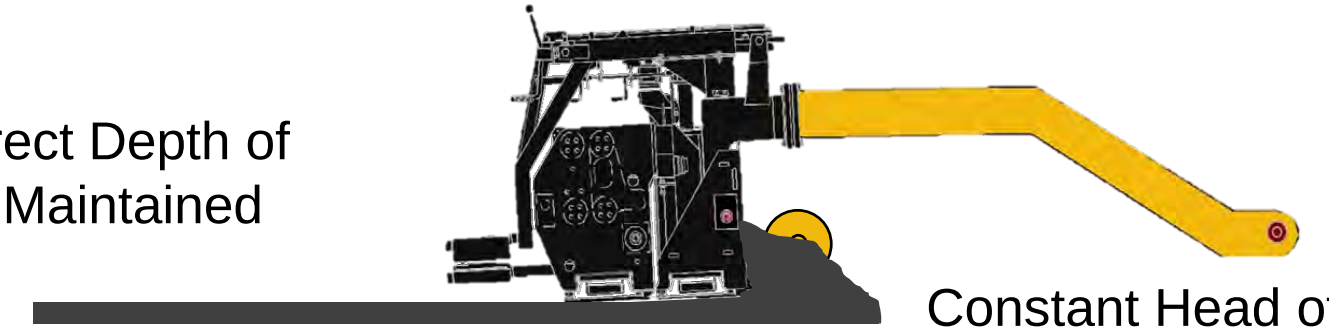
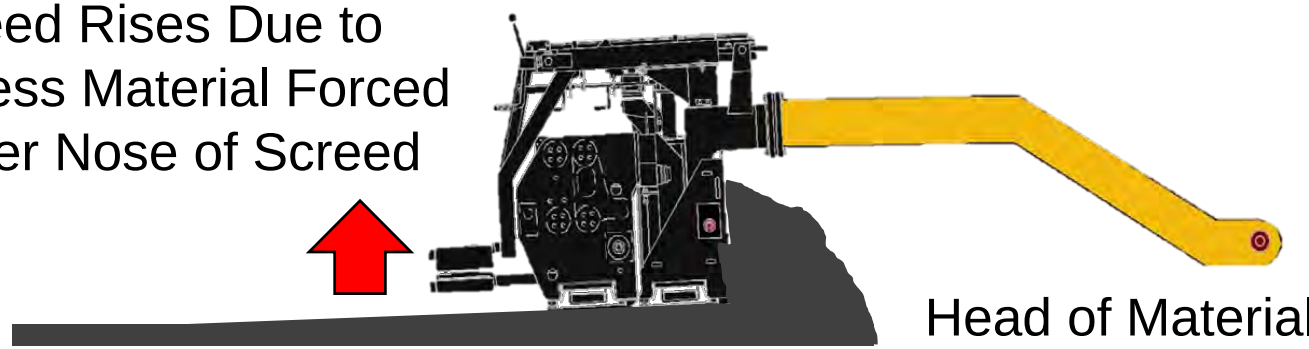
Correct Depth of
Mat Maintained



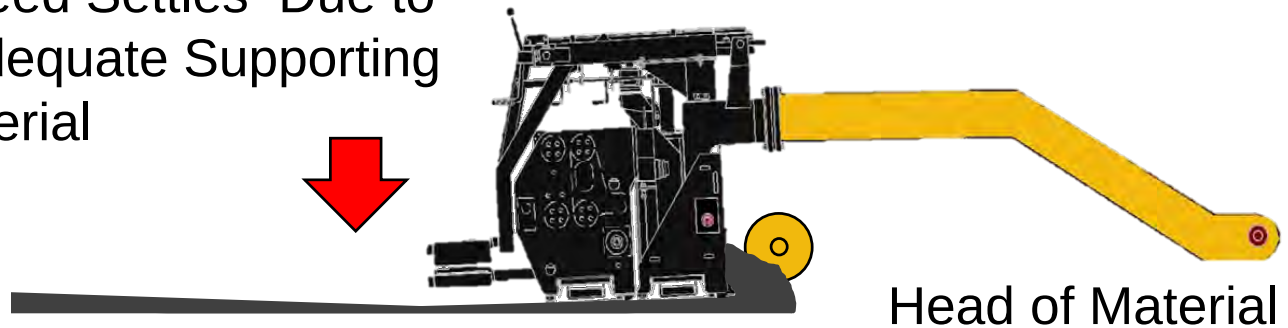
Constant Head of Material Volume

Screed Rises Due to
Excess Material Forced
Under Nose of Screed



Head of Material Volume Too High

Screed Settles Due to
Inadequate Supporting
Material



Head of Material Volume Too Low

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What’s wrong with this?

Photo courtesy of Caterpillar Paving Products

Misaligned Screed Extension

Photo courtesy of Blaw-Knox Ingersoll Rand Paving Products

Balancing the Paving Operation

Production

Trucking

Paving

Compaction

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Good Surface and Density

Learning Objectives

- Understand the importance of density in asphalt pavements
- Discuss tack coat application
- Identify major components of an asphalt paver

Other Nuggets

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Asphalt AI Tool

HeyNAPA.com

- Built with the ChatGPA software
- Only draws from vetted asphalt research and publications
  - NAPA
  - FHWA
  - NCAT
- Gives citations with responses

NAPA
NATIONAL ASPHALT PAVEMENT ASSOCIATION

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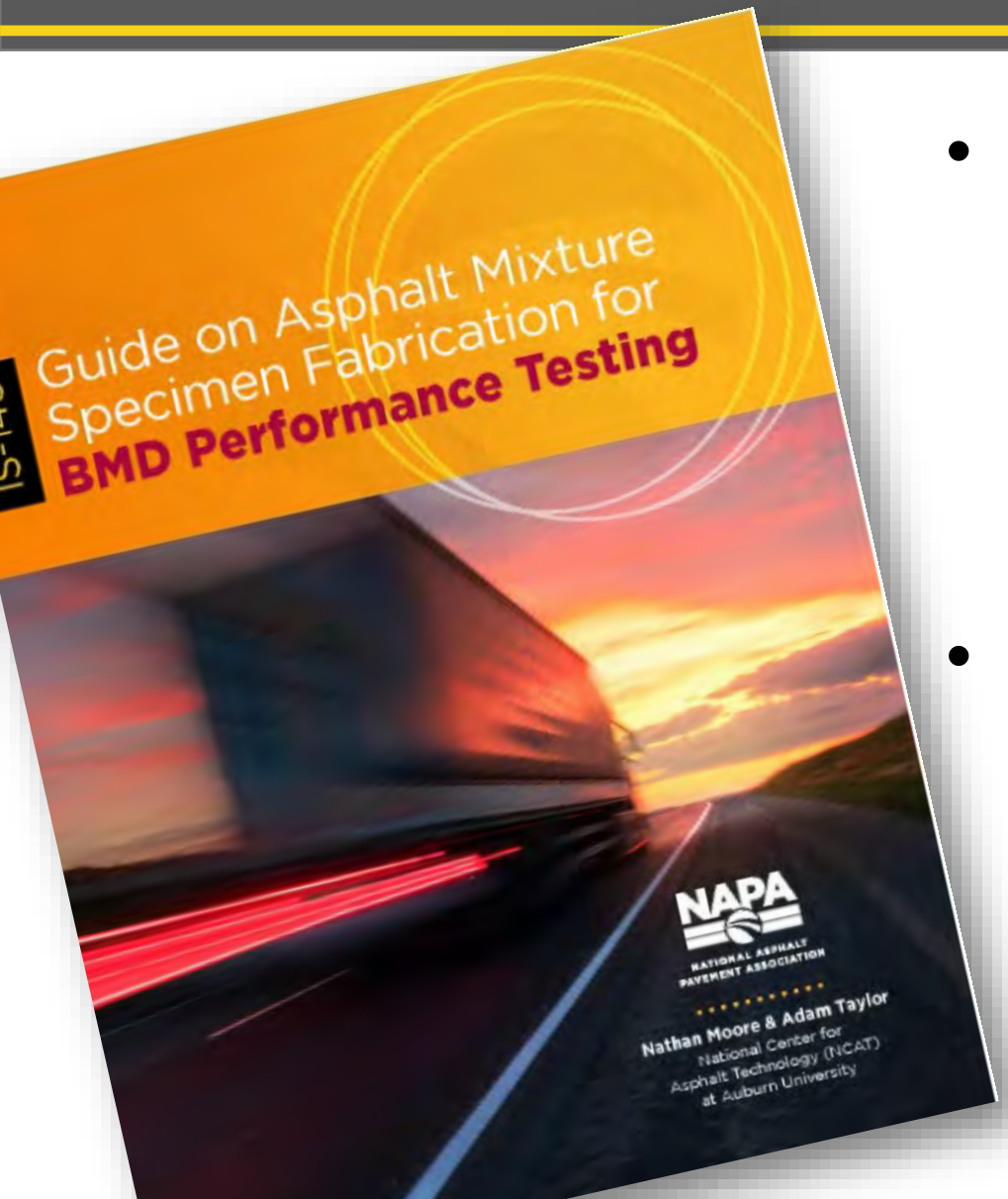
Sample Preparation Guide



- As the asphalt industry moves toward BMD and performance testing it is important to remember that the preparation of the samples being tested can effect the results of the testing.
- The ‘Guide on Asphalt Mixture Specimen Fabrication for BMD Performance Testing’ is helpful to obtain consistent results

YouTube

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Online Opportunities

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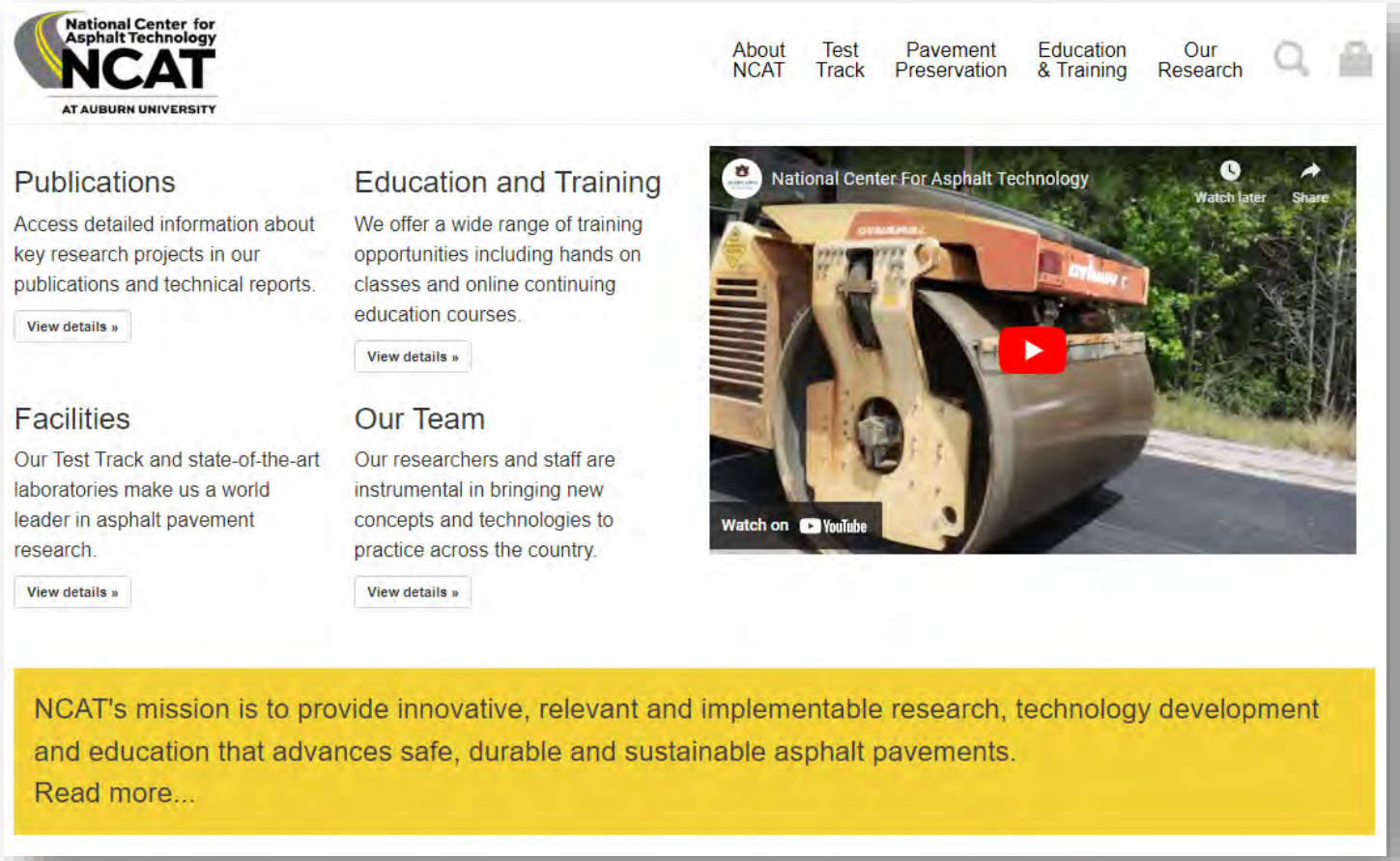
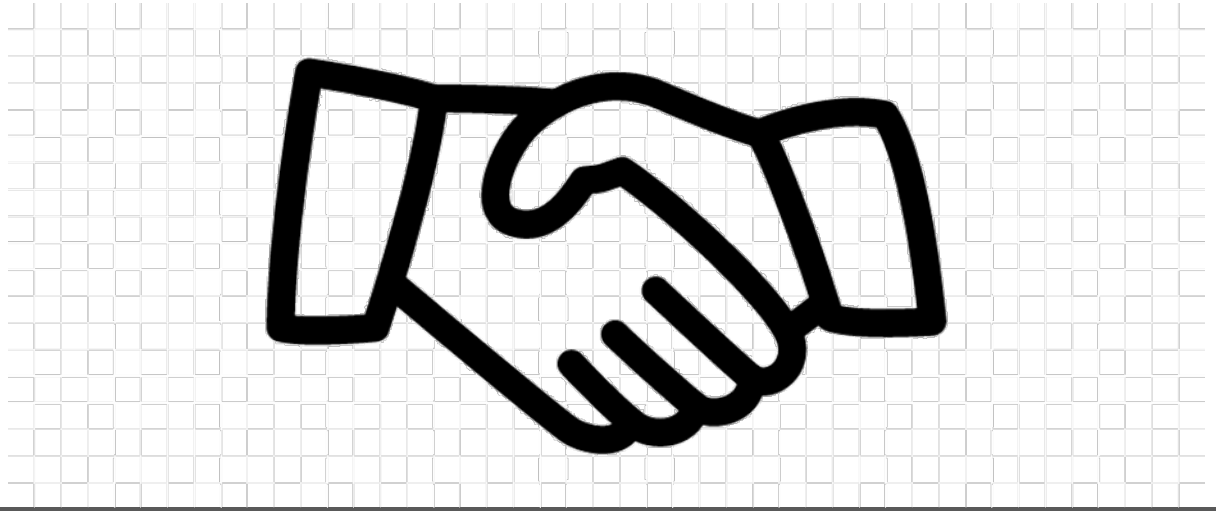
How do I communicate with NCAT?

- Contact Travis
  travis.walbeck@auburn.edu
  (334) 740-9176 cell / text

NCAT Webpage
http://NCAT.us



Thank You



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