Asphalt Paver Best Management Practices

FABICK CAT

WAPA
WISCONSIN ASPHALT PAVEMENT ASSOCIATION

Presented by
Dave King,
Caterpillar

CAT

Process Consistency = Quality

- **SIX SIGMA**
- **LEAN**
- **TPS/CPS**
- **BIQ**
- **Ect., Ect.**

All of this exists to drive consistency into process.

When we do something consistently, we can quickly and easily identify “Out of Process” and correct and eliminate.

Bi-Product: QUALITY

Process Consistency = Quality

Tony Gwynn

What

- **8 Batting Titles**
- **15 All-Star Games**
- **.338 Lifetime** (Highest since Ted Williams .344)
- **.300+ 19 of 20 Seasons**
  - .394 in 1994 (T.Willams .406, 1941)
- **Strikeouts:** 434 in 10,232 AB's
  - 1995 – 15K's (535 AB's)
  - Against HOF'rs Maddux, Glavine & Smoltz 3 SO's in 242 AB's (.331 B.A.) [Lifetime SO's Combined 9,061]
- **2024** – Bobby Witt .332/106K's, Aaron Judge .322/171

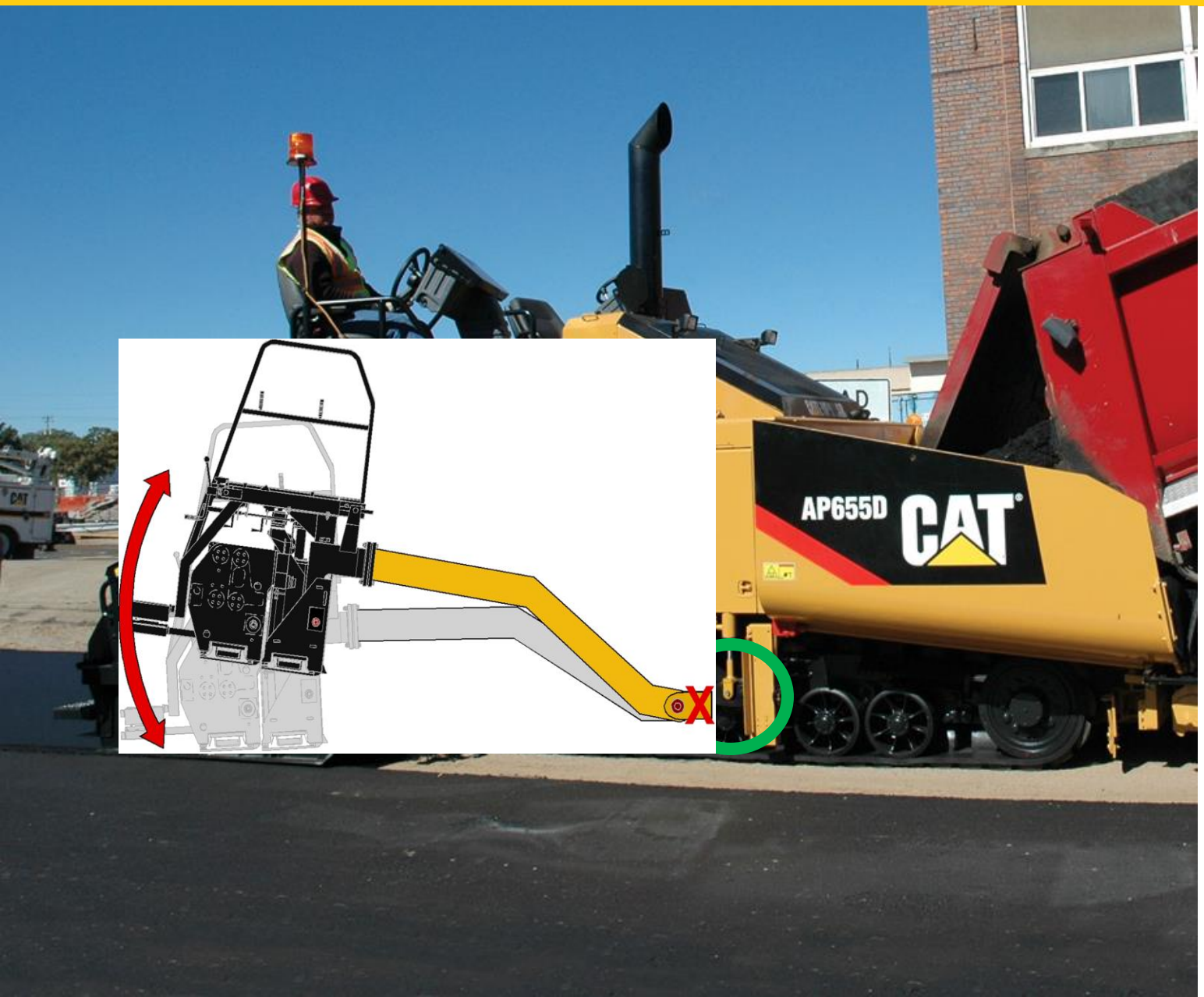
How

- **Video Analysis –** 1st in MLB
  - Pitcher Tendencies, Focus on Mechanics
- **Attention to Detail**
  - Strike Zone Mastery, Tailored approach
- **Batting Practice**
  - High-Quality Reps, Situation Drills
- **Mastery of Adjustments**
  - 2 Strike Approach, Using the whole field
- **Fitness:**
  - Hand-Eye, Agility conditioning
- **Love of the game**

Role of the Paver

- To meet specifications for grade, texture & smoothness

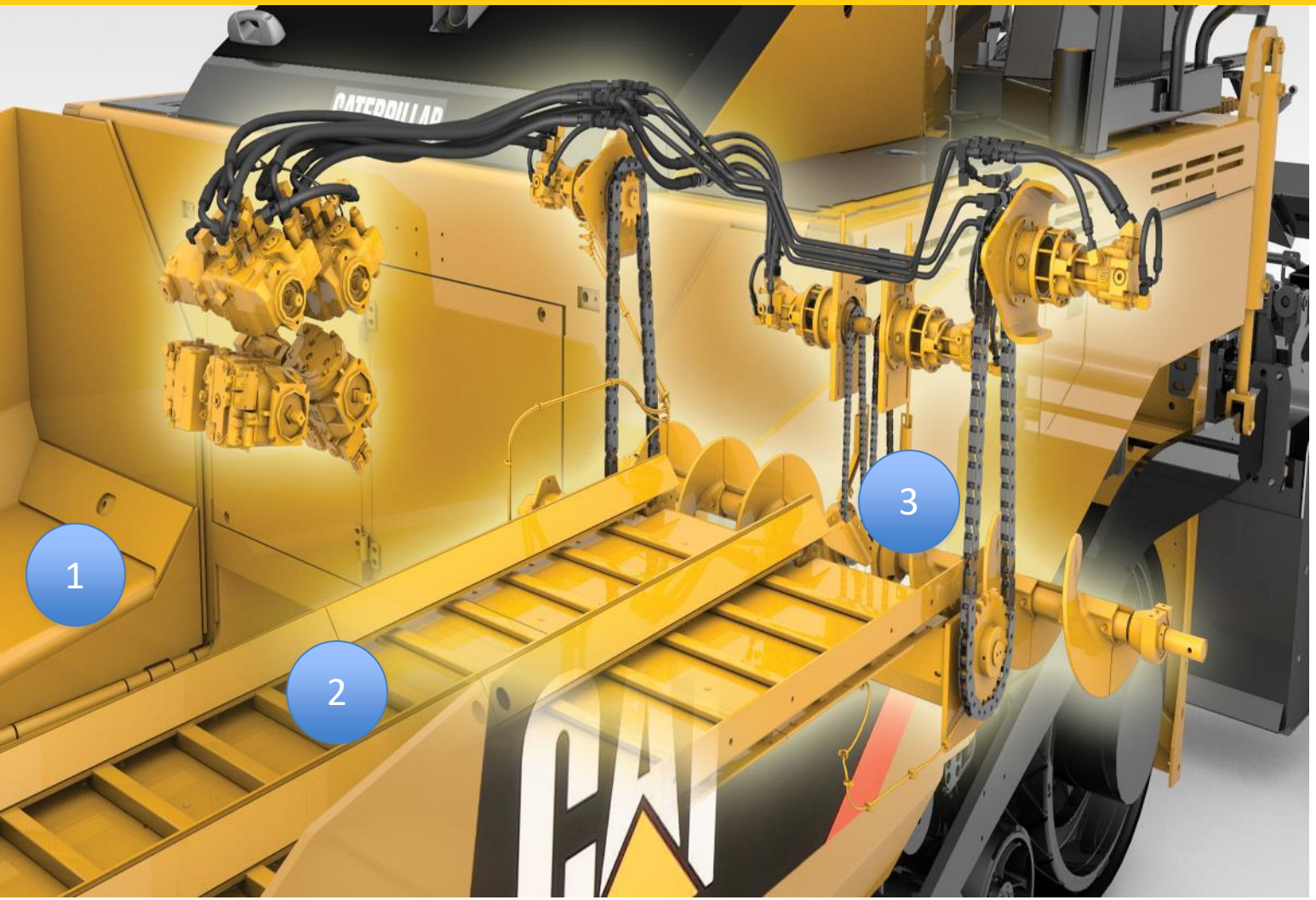
Understanding the Paver



- **TRACTOR**
  - Pushes Truck
  - Tows Screed
  - Receives and feeds mix to screed
- **SCREED**
  - Floats on Mix
  - Free to rise & fall
- **Constant line of pull when set up properly**

TRACTOR

Material Feed System



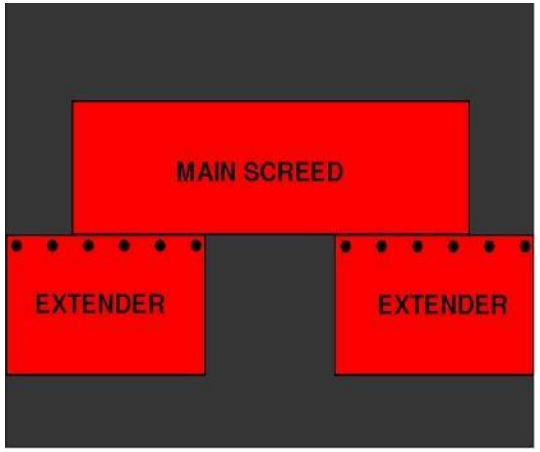
1. Hopper
2. Feeder bars
3. Adjustable height augers
4. Feeder sensors (Not Shown)

Free Floating Screed

- Principle has not changed since Barber-Greene commercialized the free-floating screed in 1934

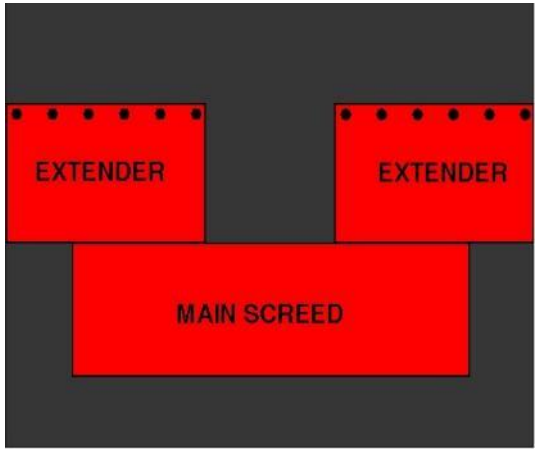
Front-mount and Rear-mount Screeds

Front-mount



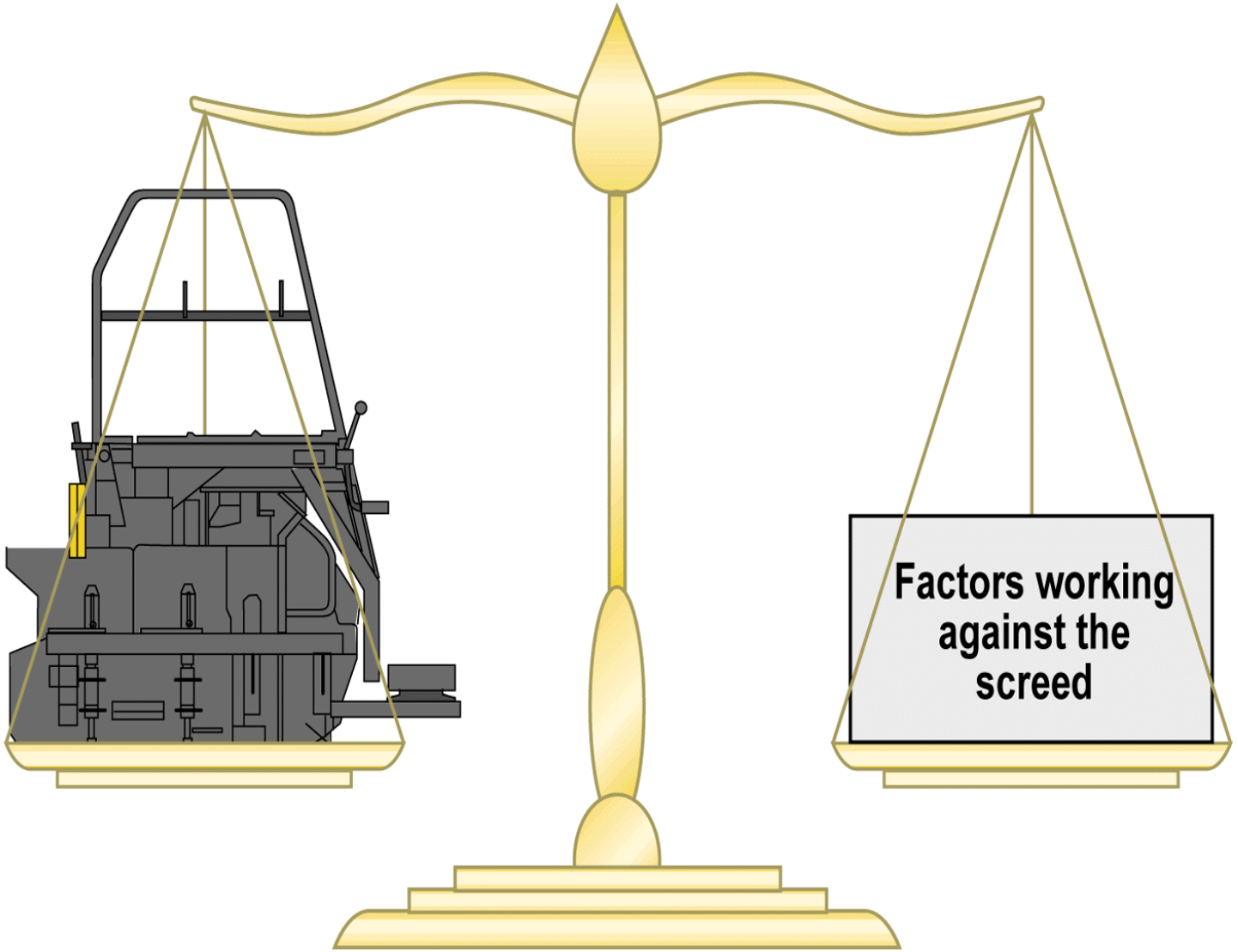
Direction of paving

Rear-mount



Understanding the Paver

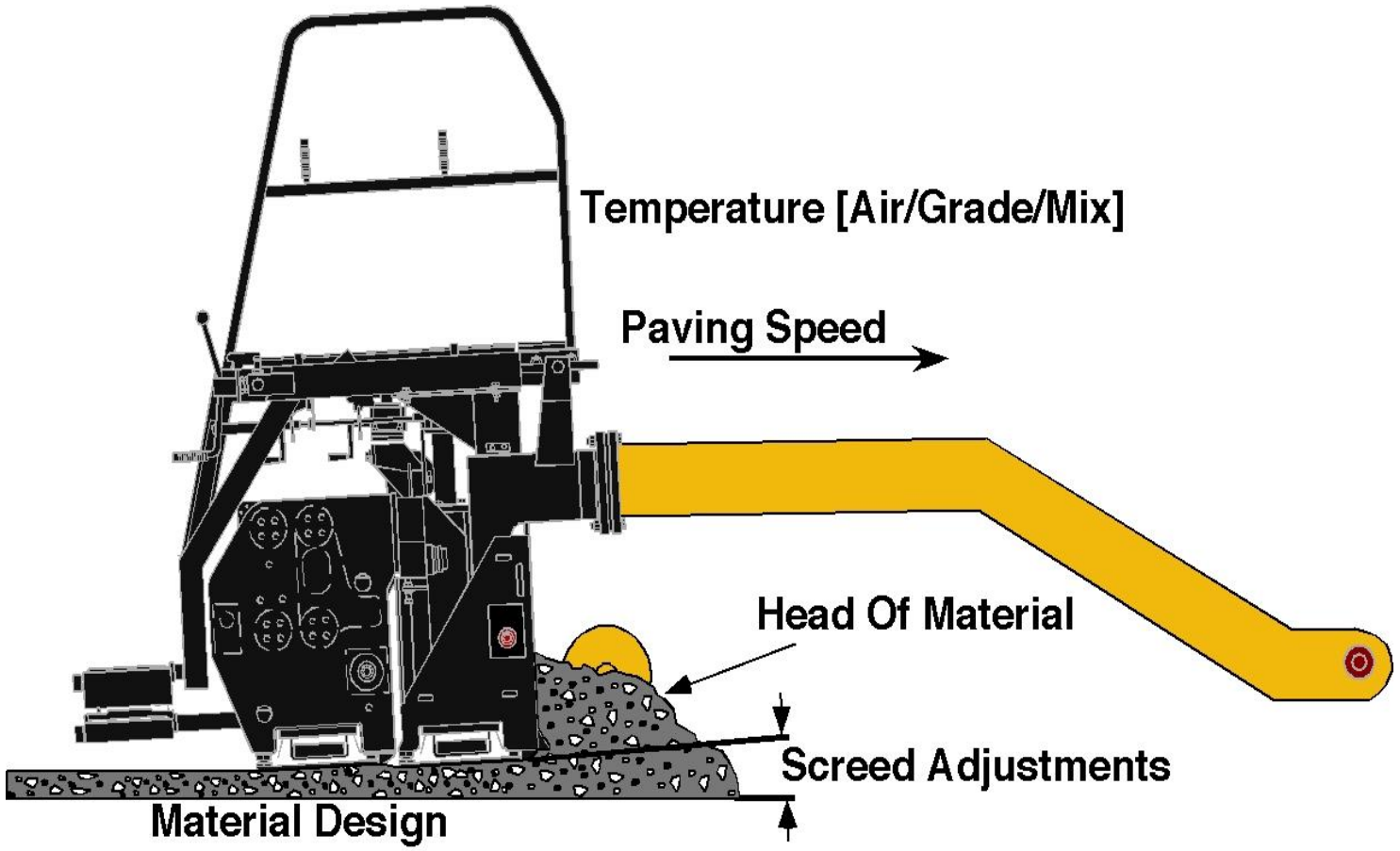
Free-Floating Screed



- Screed position determines mat thickness
- Screed position is constant <u>as long as all factors remain constant</u>

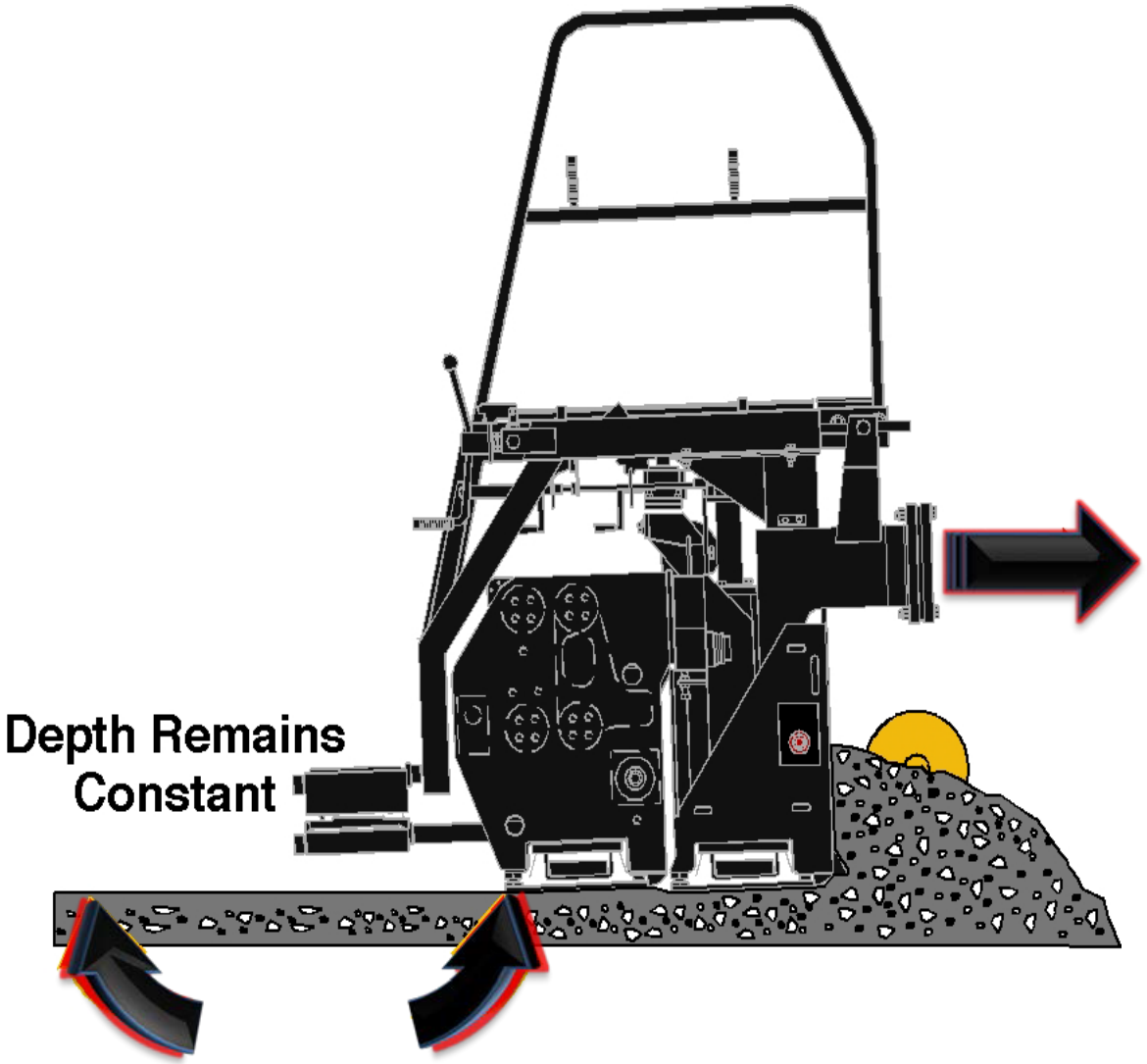
Understanding the Paver

Factors Affecting the Screed



- Paving speed
- Head of material
- Screed adjustments
- Mix design
- Mix temperature
- Air temperature
- Grade temperature

Factors Affecting Screed – Crew Controls



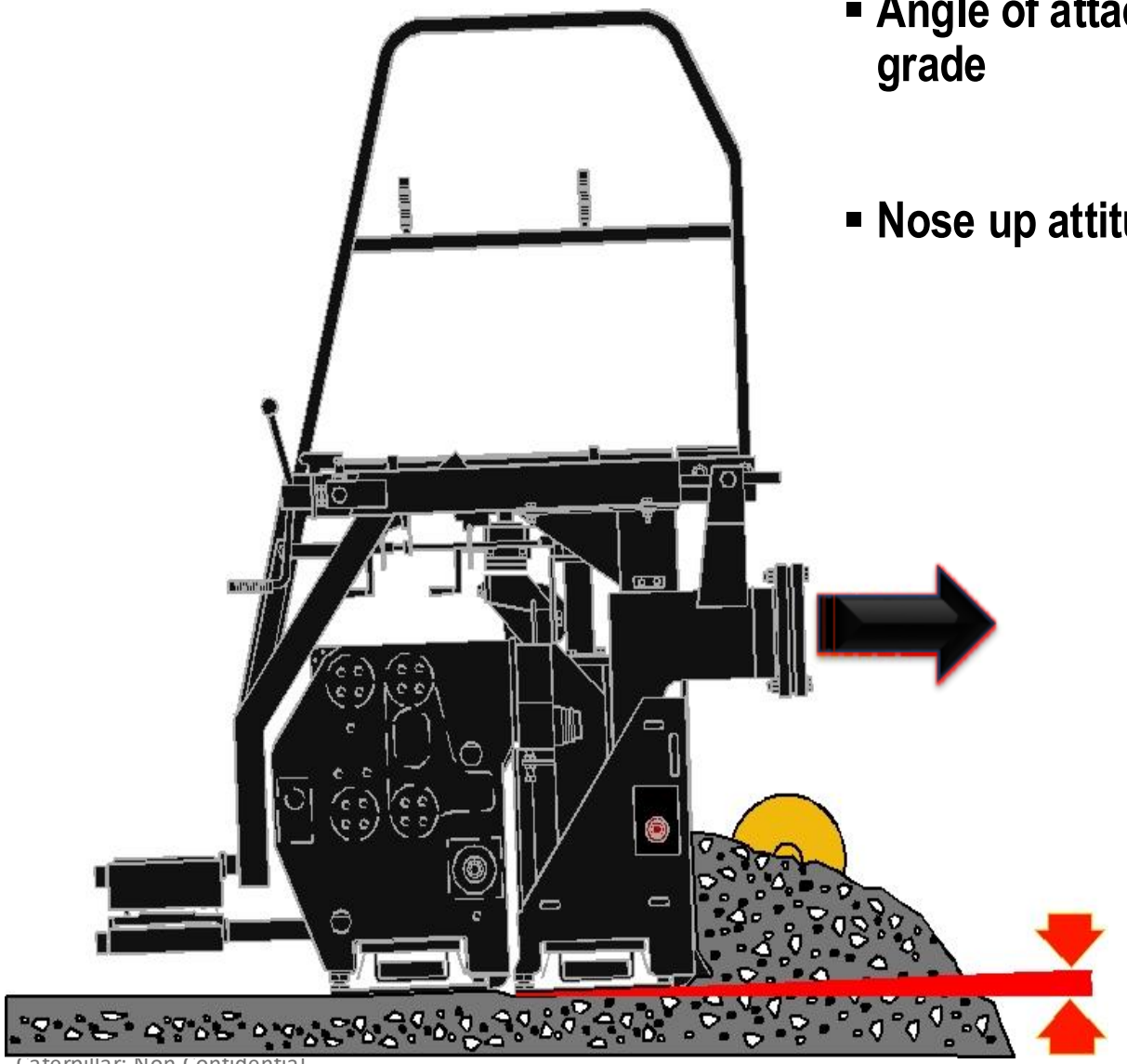
1. Speed

2. Head of Material

3. Screed Adjustments

- Shear factor is constant
- Depth remains constant

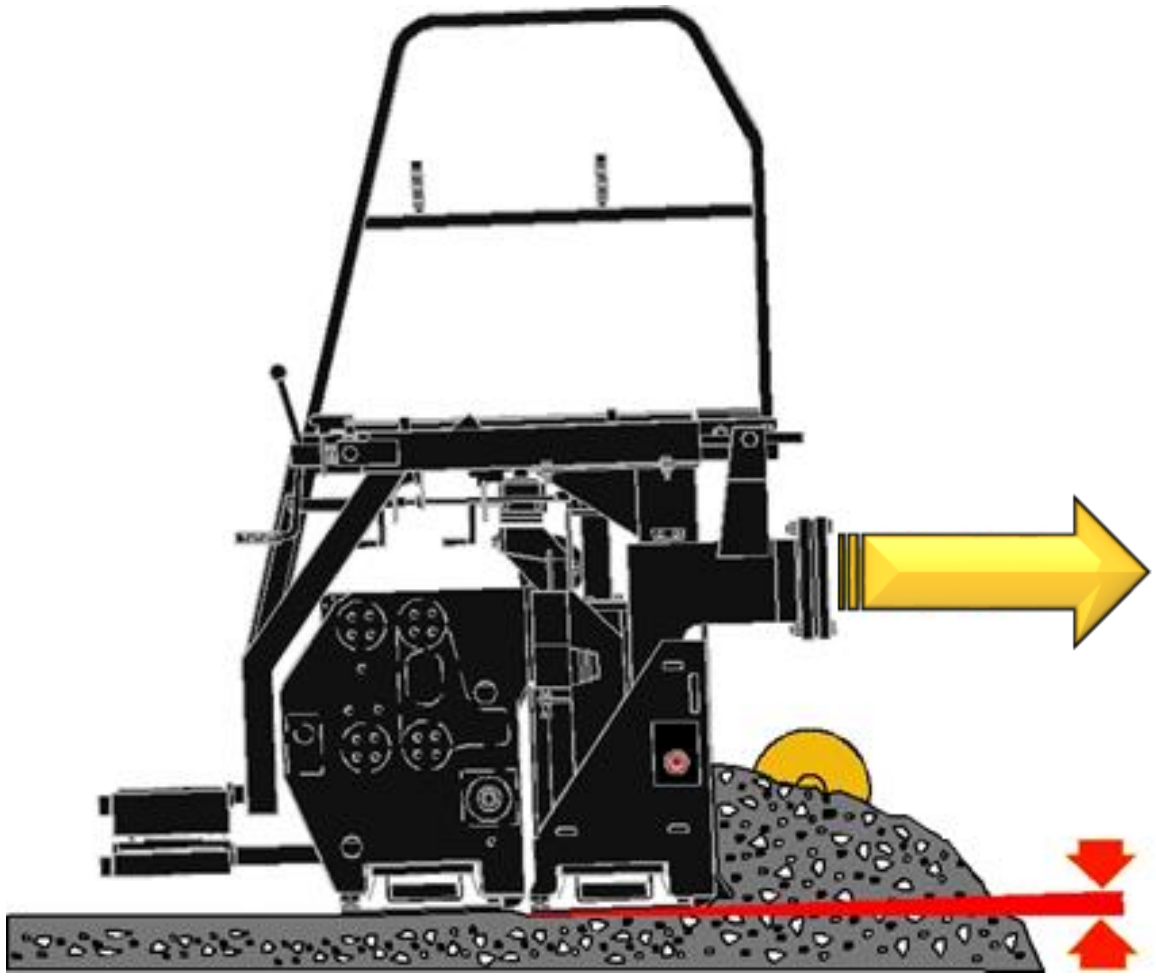
Angle of Attack



- Angle of attack is the relationship between the nose of the screed & the grade
- Nose up attitude

Screed Adjustments

Angle of Attack



3mm (⅛ in) – 6mm (¼ in)

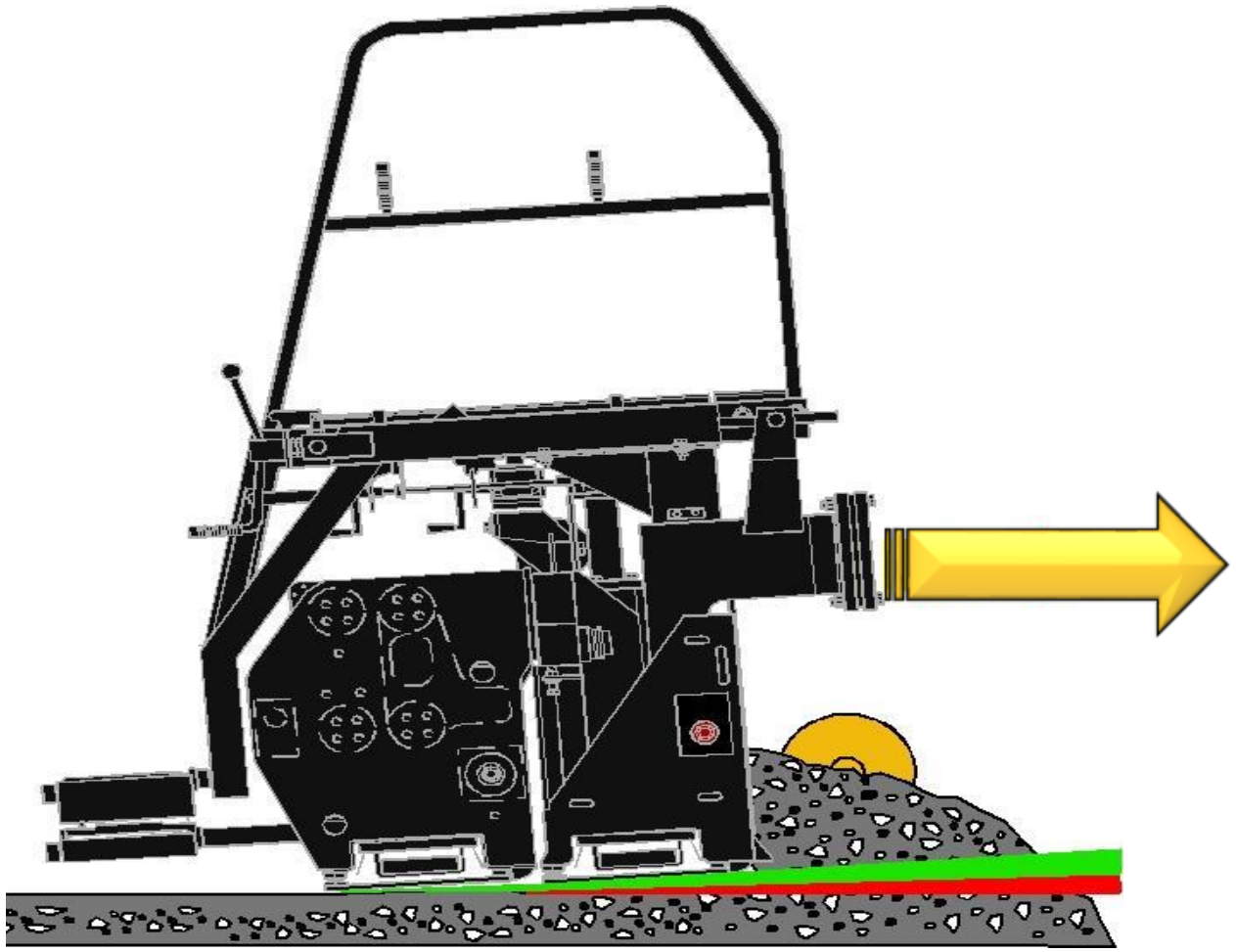
- Normally 3 mm (1/8 in) to 6 mm (1/4 in)
- Angle too high, screed compacting with trailing edge
- Angle too low increases shear factor and wear

How to Adjust Mat Thickness & Slope

- **Use depth control cranks or “screws”**
- **Use tow points**

Screed Adjustments

Increase Angle of Attack



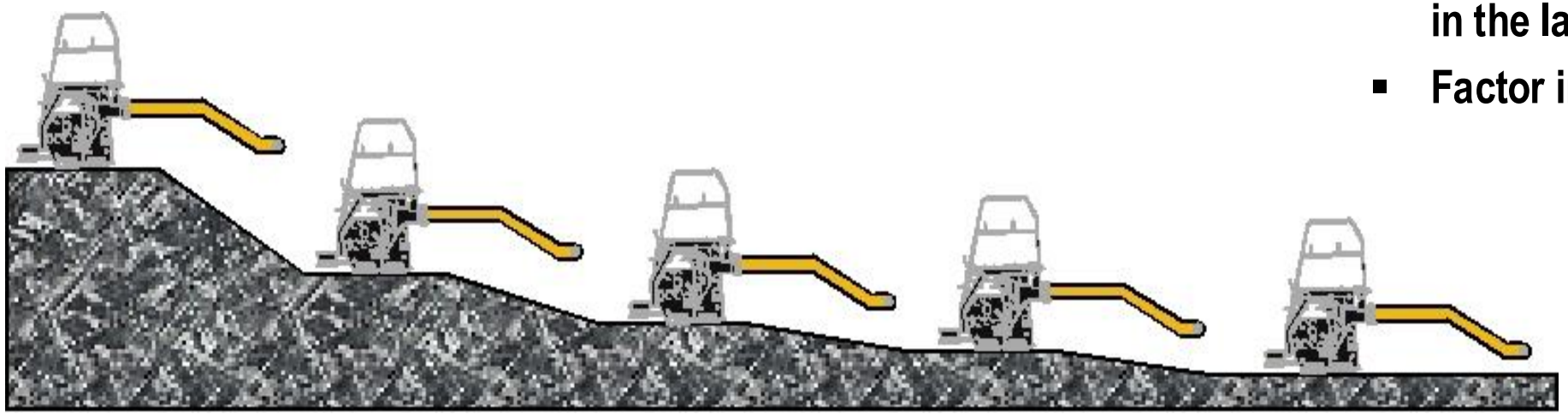
- More material passes under screed
- Screed rises to new level
- As screed climbs, angle of attack decreases

- Re-establish same angle, but at increased depth

- Remember, screed travels through arc and reaches equilibrium @ new thickness

Screed Adjustments

Screed Reaction Time



- Screed reacts to change in angle of attack over 5 tow arm lengths
- 65% of change occurs in the first tow arm length
- 35% of change occurs in the last 4 tow arm lengths
- Factor improves rideability

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5 most common mistakes….

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What are the 5 most common mistakes when it asphalt paver best management practices

Referenced Documents (47)
Answers are supported by relevant documents. Click on here to explore them.

Asphalt paving involves a series of precise actions and techniques to ensure a high-quality, durable pavement. Here are five common mistakes related to best management practices for asphalt pavers:

1. **Neglecting Equipment Maintenance:**

- **Mistake:** Failing to regularly check and maintain the paver and related equipment.
- **Impact:** Equipment that is not well-maintained can lead to operational issues, impacting the quality of the paving process. Regular checks and maintenance are necessary to ensure equipment operates smoothly and efficiently.

1. **Improper Joint Construction:**

- **Mistake:** Not constructing longitudinal and transverse joints correctly.
- **Impact:** Poorly constructed joints can lead to weak spots, cracks, and water infiltration. Proper techniques should be used to ensure joints are well-compacted and aligned with the correct overlap and density.

1. **Inconsistent Paver Speed:**

- **Mistake:** Allowing the paver to start and stop frequently or varying the paver speed too much.
- **Impact:** This can lead to uneven surfaces, bumps, and inconsistent mat density. The paver should be operated at a steady pace to ensure a smooth and uniform surface.

1. **Improper Material Flow:**

- **Mistake:** Failing to maintain a consistent head of material in front of the screed.
- **Impact:** Inconsistent material flow can cause segregation and uneven density, leading to rough surfaces. Ensuring a constant supply of material to the augers helps in maintaining a uniform mat.

1. **Inadequate Compaction:**

- **Mistake:** Failing to achieve the required level of compaction during the paving process.
- **Impact:** Insufficient compaction can lead to air voids, reduced pavement strength, and increased permeability, which can cause premature deterioration. It's essential to follow proper rolling patterns and use the right type of rollers to achieve optimal compaction.

By addressing these key areas, paving crews can enhance the quality and durability of asphalt pavements.

New chat

Ask any asphalt pavement question.

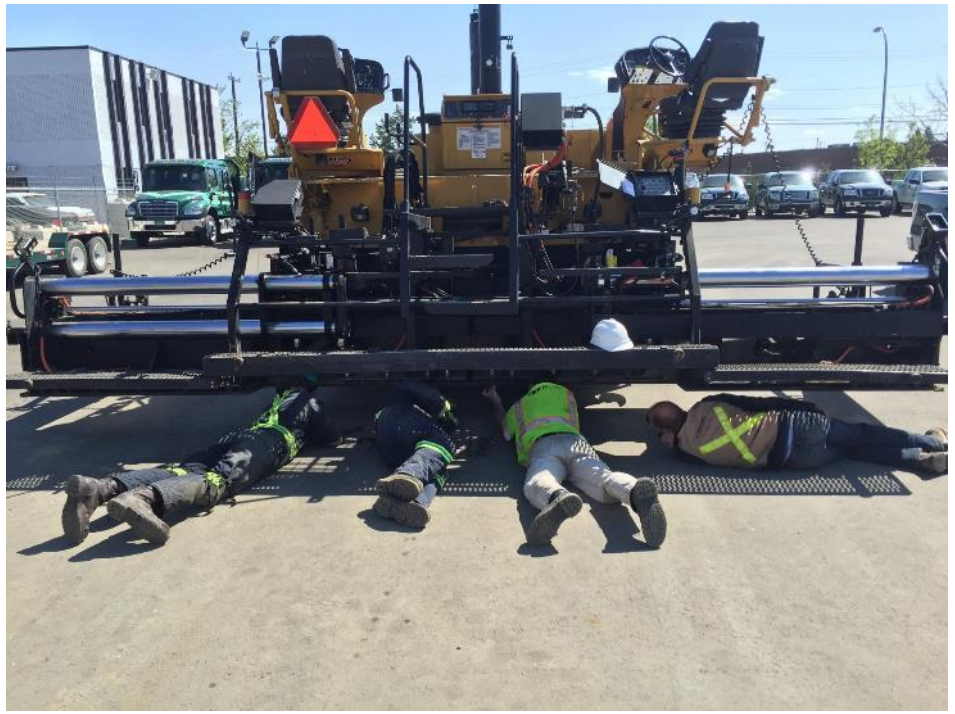
Use custom instructions ?

Project Planning – "How Are we Getting Paid $"

- Asphalt tonnage
- Paving width
- Specifications
- Grade Conditions

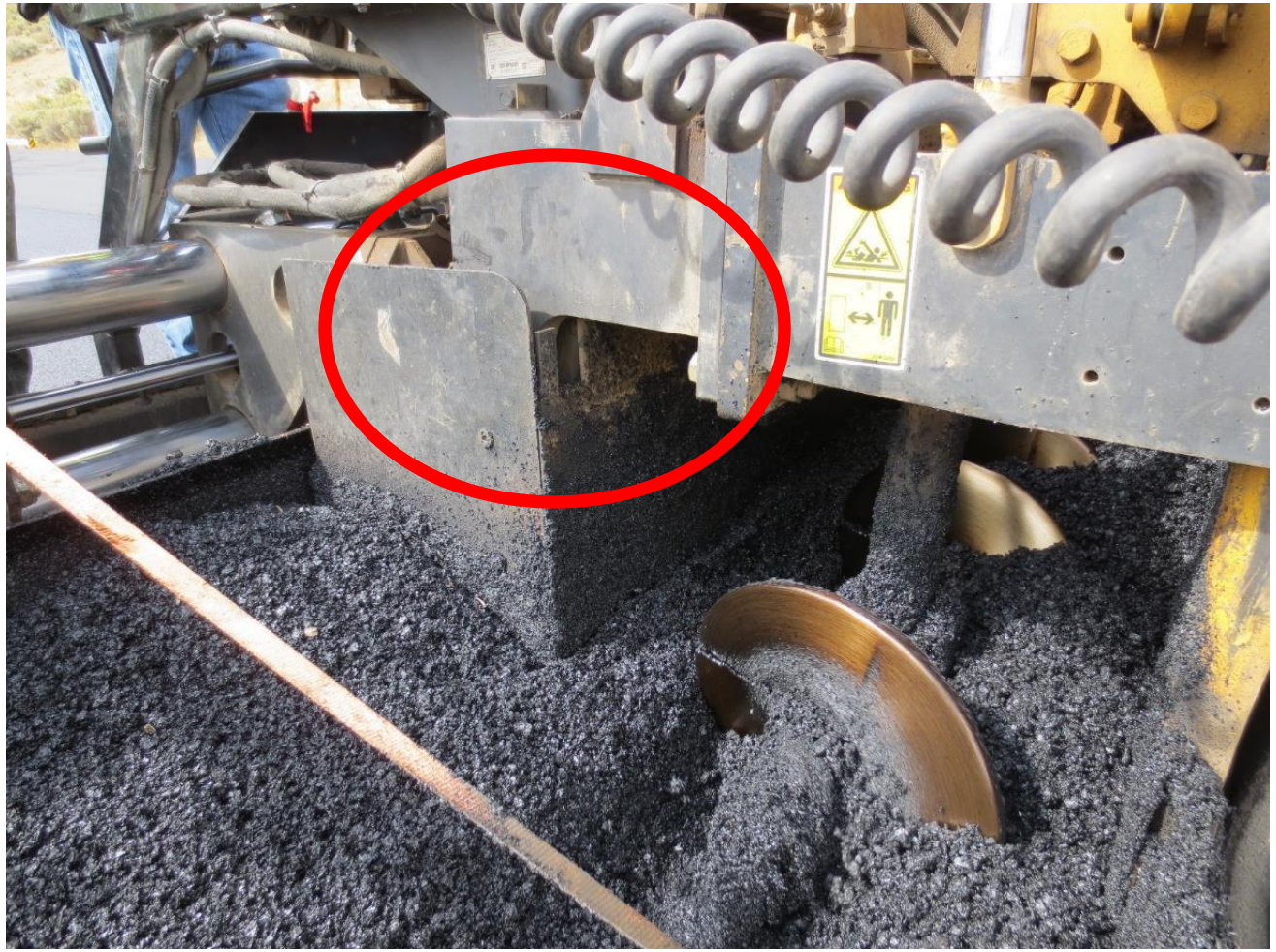
Equipment Maintenance

- Must be free to rotate about pivot points
- Strike off and nose bar must be clean
- End gate springs clean and free



Equipment Maintenance

Clean pivot points allow smooth changes



- Pivot points must be free to rotate for thickness changes to occur smoothly and for the screed to “float” relaxed
- When pins are plugged, we compensate & wear the screed out
- Smoothness suffers

Equipment Maintenance

Clean pivot points allow smooth changes

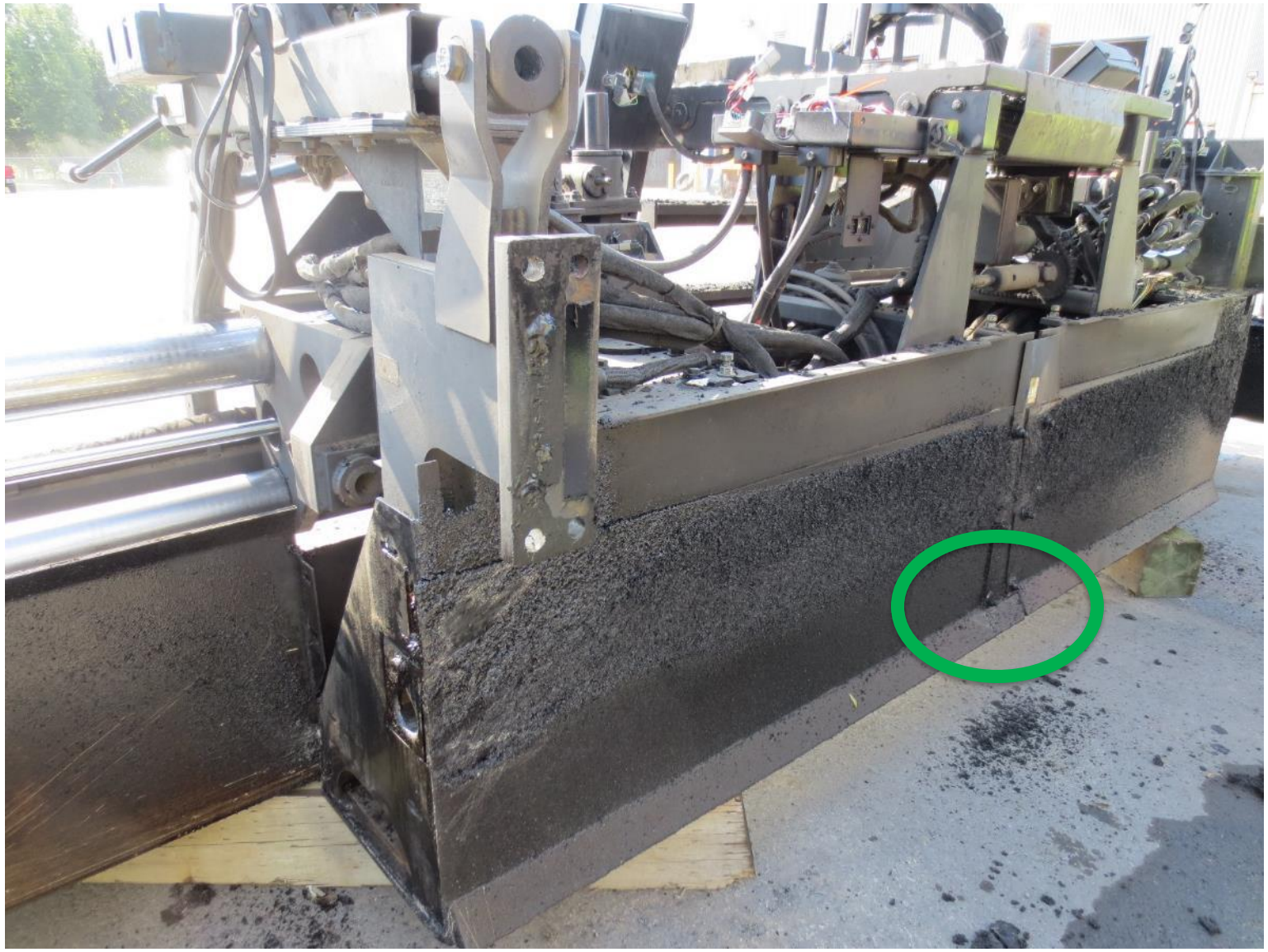
View looking down on top of pivot point

Remove side cover

Clean hardened mix out

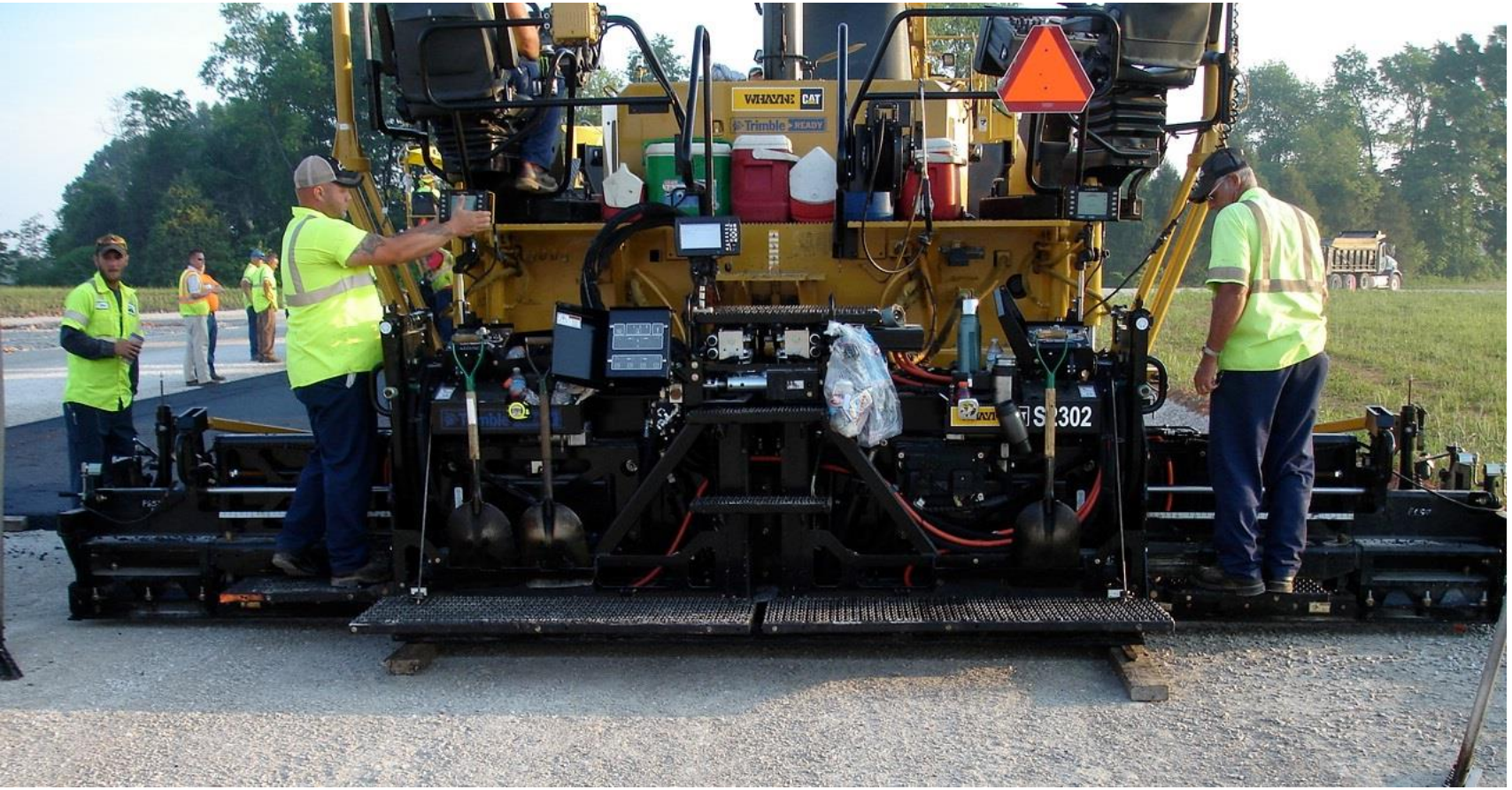
Equipment Maintenance

Strike Off Plate & Nose Bar



Joint Construction

Paver Set Down & Take Off



PAVING BY THE NUMBERS

1. Heat the screed
2. Set the tow points
3. Set paving width
4. Set crown
5. Set extender height
6. Set extender slope
7. Lower screed and remove slack
8. Null the screed
9. Position end gates
10. Set auger height
11. Position feeder sensors
12. Set feeder controls
13. Fill auger chamber/place in auto
14. Set accessory functions
15. Pull off starting reference

CAT

QEXQ1403-04
(Replaces QEXQ1403-03)

Joint Construction

Taking off

- **Is this a good place to start?**

Joint Construction

Good Starting Point

- Cut straight starting joint
- Butt joint flat

- Tack butt joint
- Clean area where screed will set down

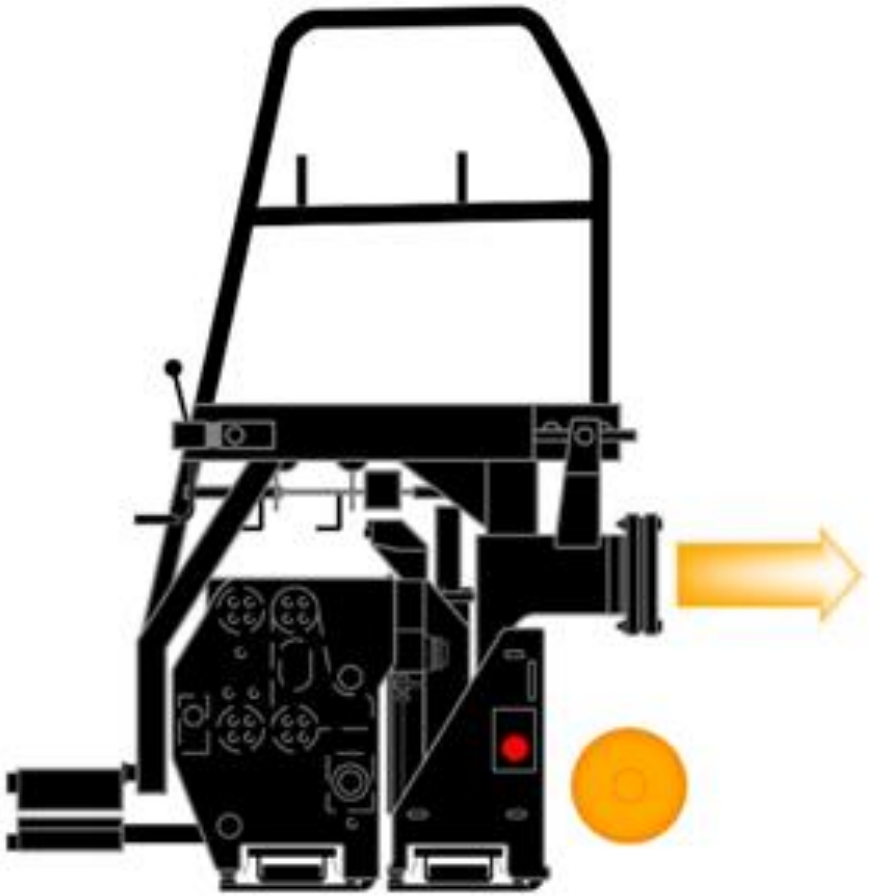
Joint Construction

Build a Pad or use Starter Boards

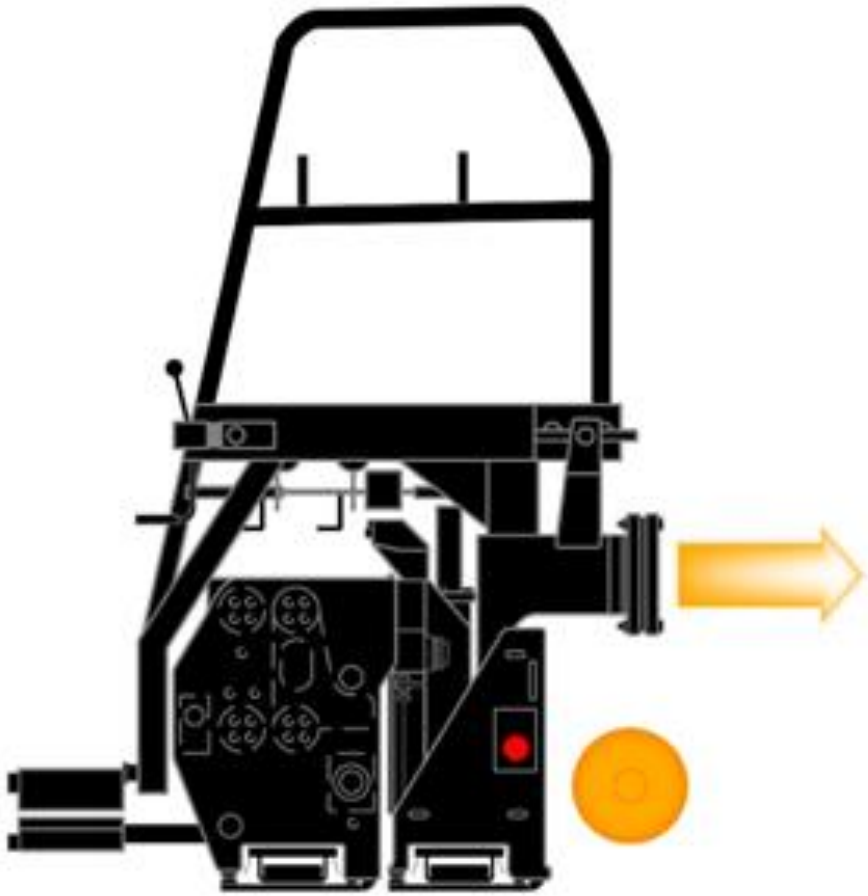
- **Support full length of screed & extensions**
  - **3 to 4 feet long boards**
- **Calculate thickness of starter boards**
  - **General rule vibratory screed: ¼” compaction per 1” loose depth**
  - **Example: Place 2-½” loose to end up with 2” after rolling**

Joint Construction

Boards must support Main & Extenders



Full Support Main & Extenders



Screed will drop or ‘nose over’

What's Wrong with this take-off?

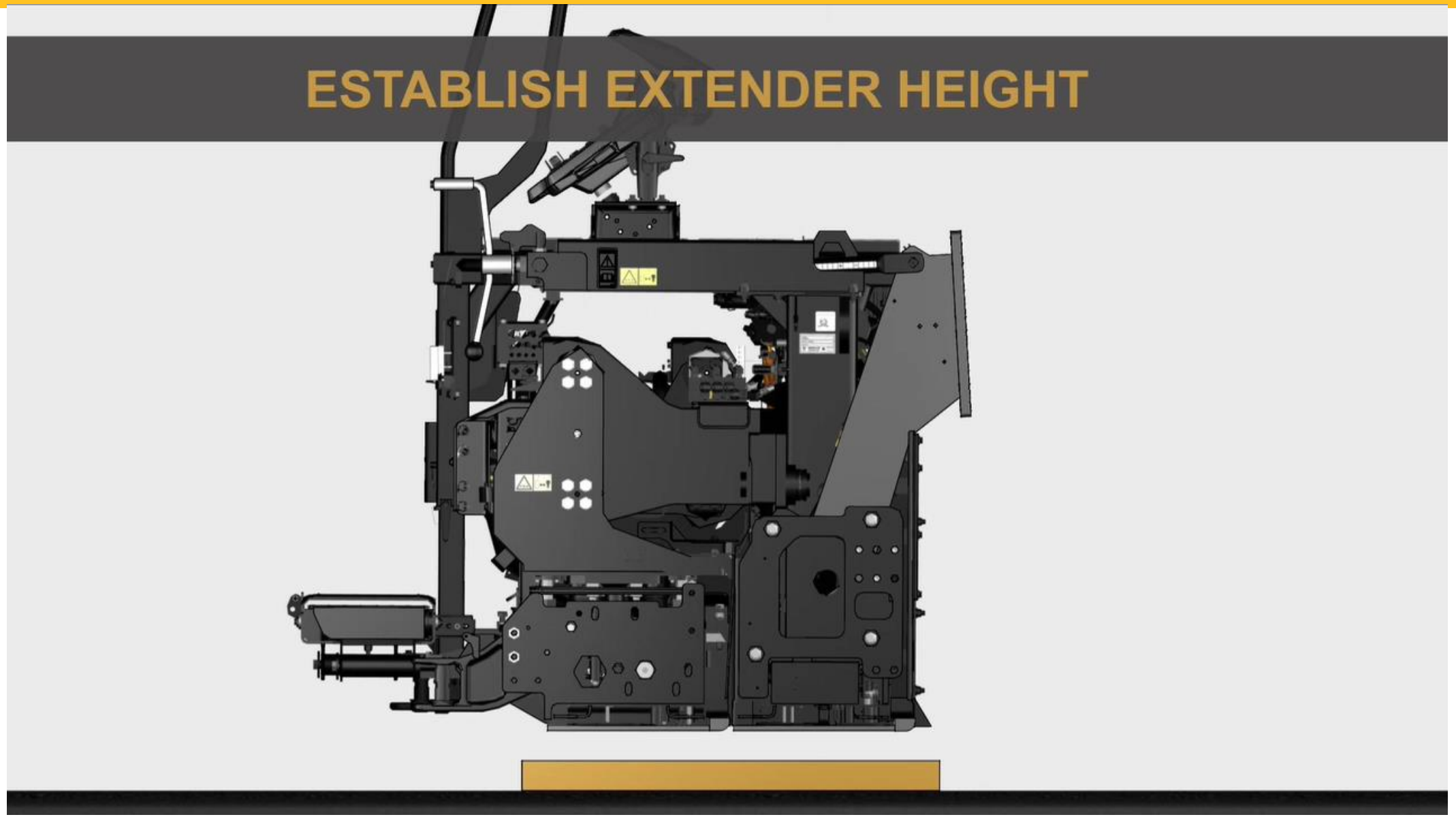
- No starter boards!

- What's going to happen?

Null the Screed

- Nulling the screed removes all the tension in the screed
- Use depth screws on each side until no tension is felt
- Go to tension both sides
- The screed must be “free-floating” on the mix

Null the Screed & Angle of Attack



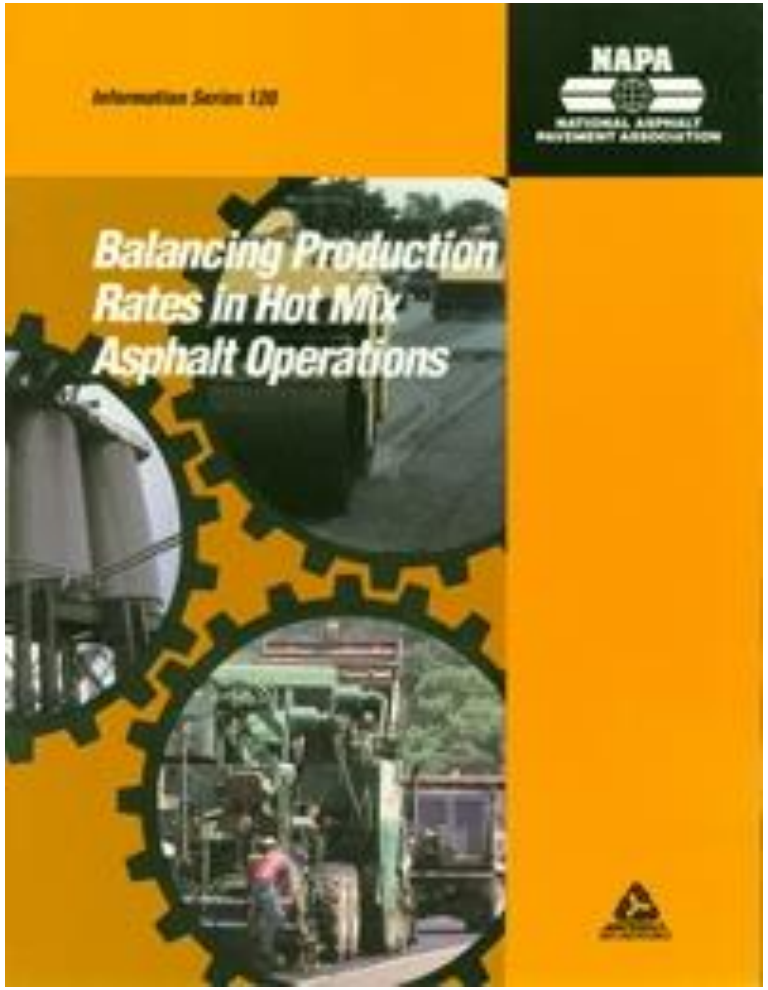
Paver Speed

Planning a Balanced Paving Operation

- Goal is non-stop paving
- Set to match mix delivery
- Balance with rollers
- Quick starts/stops
- 60 fpm maximum

Paver Speed

Planning ≈ 20 minutes



Pre- paving planning

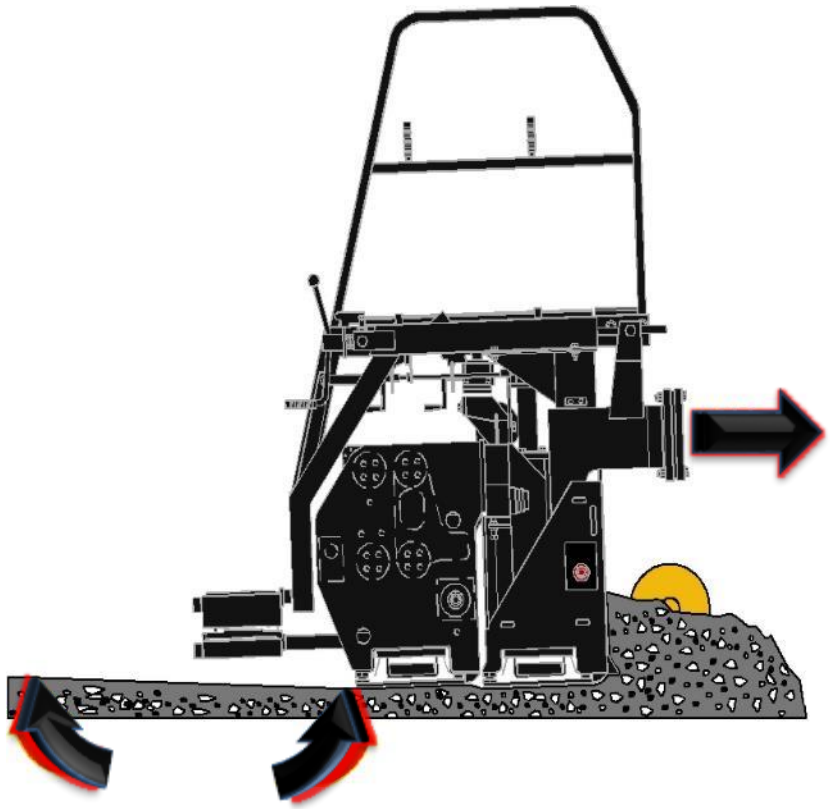
- Tons per day
- Number of trucks needed
- Paver speed
- Roller speed
- Rolling Pattern
  - Density
  - Smoothness

Tools available

- NAPA IS-120
- Paving Production Calculator App
- PaveCool App

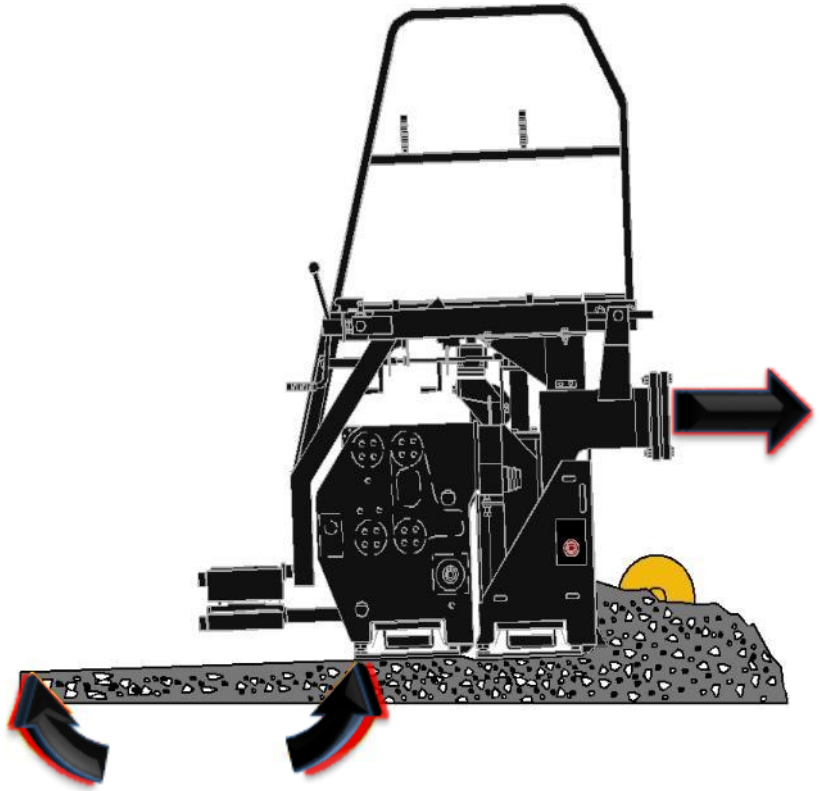
Paver Speed

Changes in Paver Speed



Increased Speed

- Shear factor decreases
- Depth decreases



Decreased Speed

- Shear factor increases
- Depth increases

Paver Speed

Real World Paving

- Do not panic
- Stay with the plan
- Get rid of trucks in an orderly fashion
- Establish a uniform trucking pattern
- Will help density & smoothness

Paver Speed

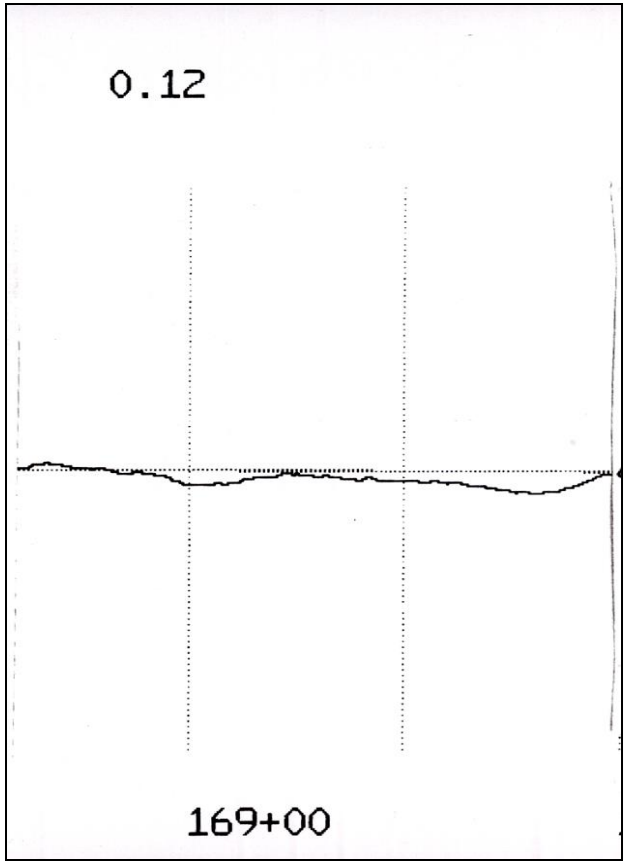
Setting Paver Speed

Pull Off Starting Boards

- ✓ **Pave mode (1), Screed in Float (2), throttle (3)**
- ✓ **Turn speed dial (4) to desired target speed (5) brake released (6)**
- ✓ **Move propel lever full forward (7)**

Paver Speed

Quick Starts & Stops – Head of Material



Changes in Paver Speed

- **Changes in paving speed may require feeder system adjustments**

- **Too often, paver speed changes, but feeder system ratio dials or flow gates are not adjusted to match new paver speed to maintain 20 - 40 rpm auger speed**

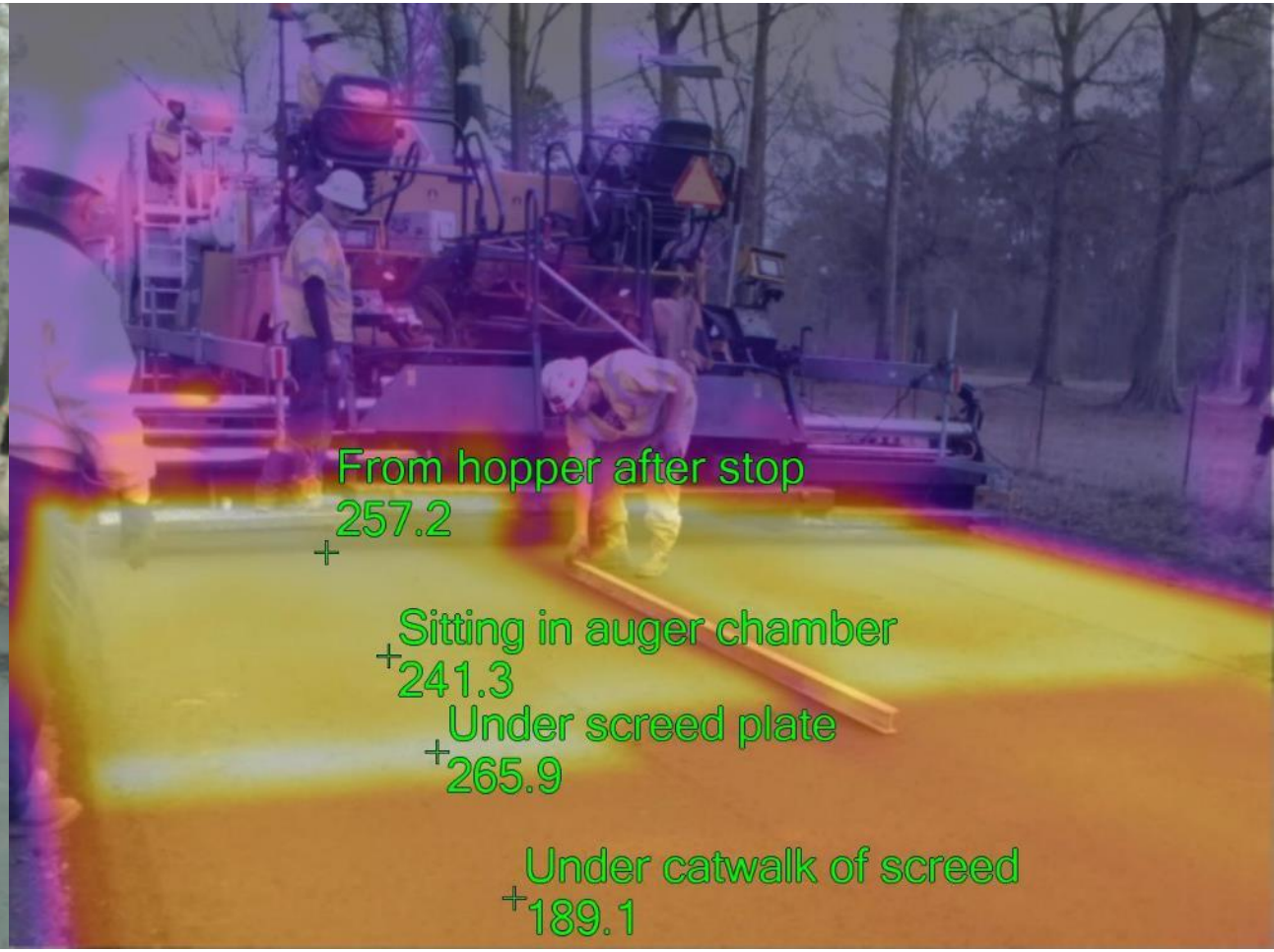
Paver Speed

Paver Stops & Starts...

- Smoothness issue
  - Will it roll out?
- Non-uniform compaction
  - Temperature differentials
- Inefficient trucking?
- Stops > 6 min = bump

Paver Speed

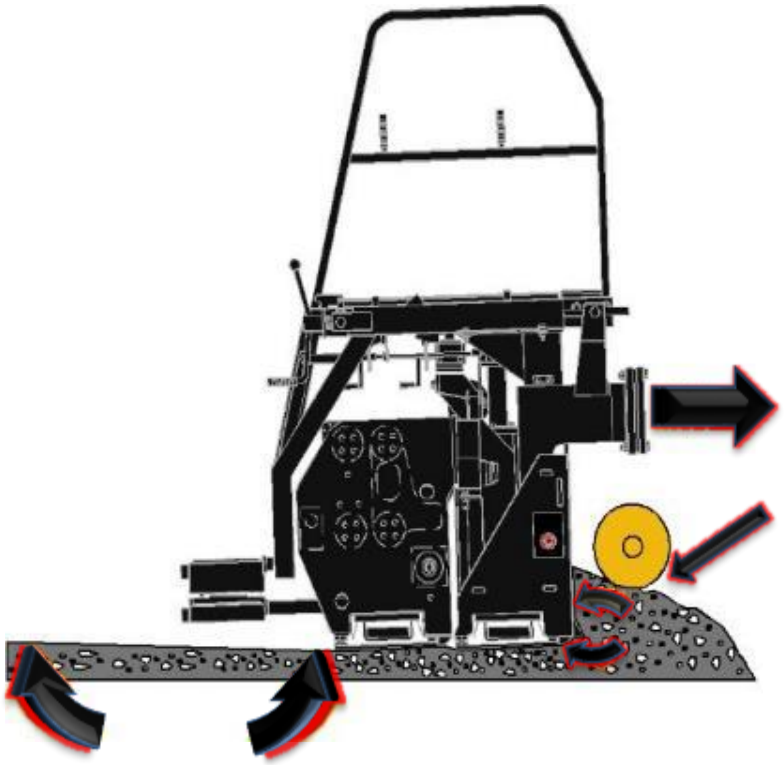
Paver Stops - density & smoothness



Paver Speed

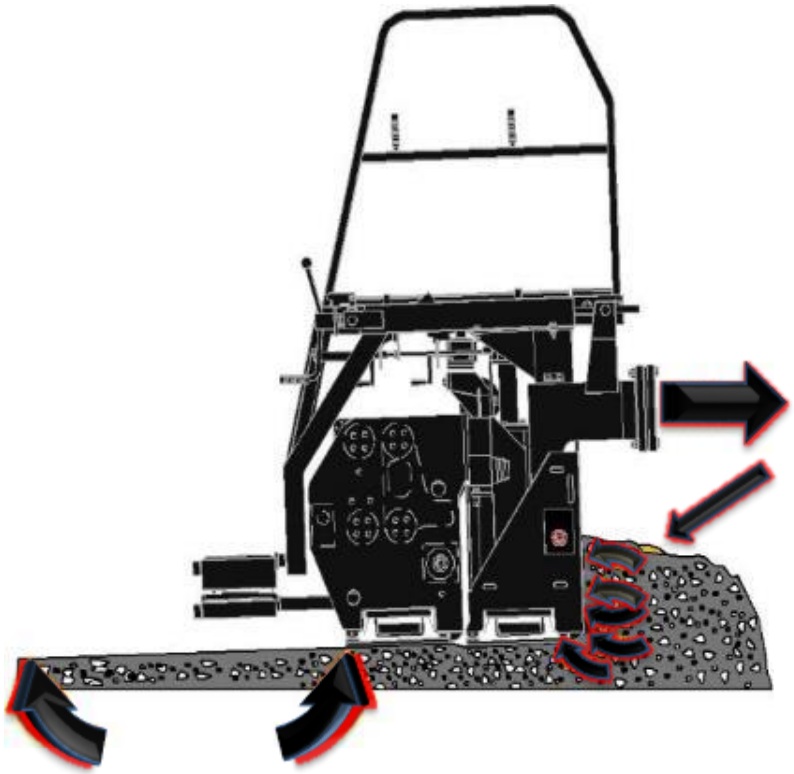
- MTVs can help
  - Non-stop between trucks
- Approximately 15% improved smoothness

Changes in Head of Material



Head of Material Decreases

- Resistance decreased
- Depth decreases



Head of Material Increases

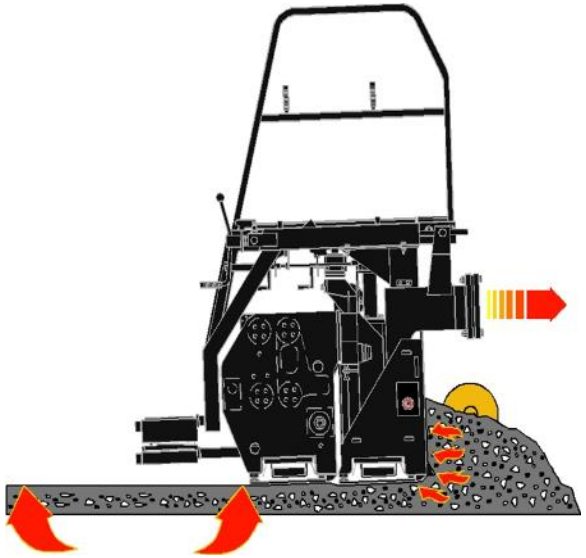
- Resistance increased
- Depth increases

Material Management

Head of Material @ ½ Auger

85-95% of all mat defects are related to head of material!!

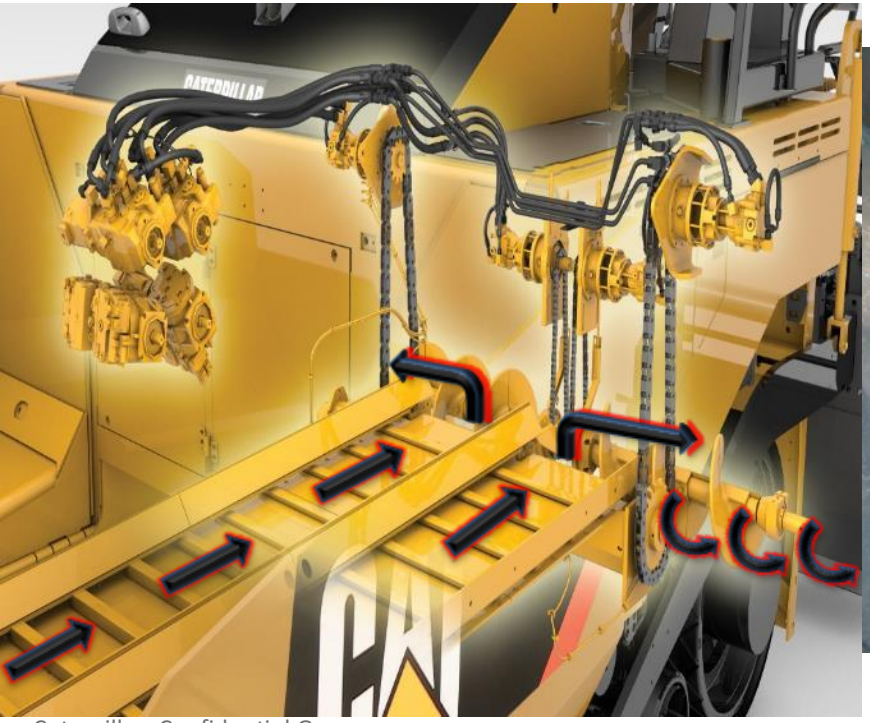
1. Ratio dials (or flow gates)
2. Auger height
3. Feed sensor position
4. Auger speed



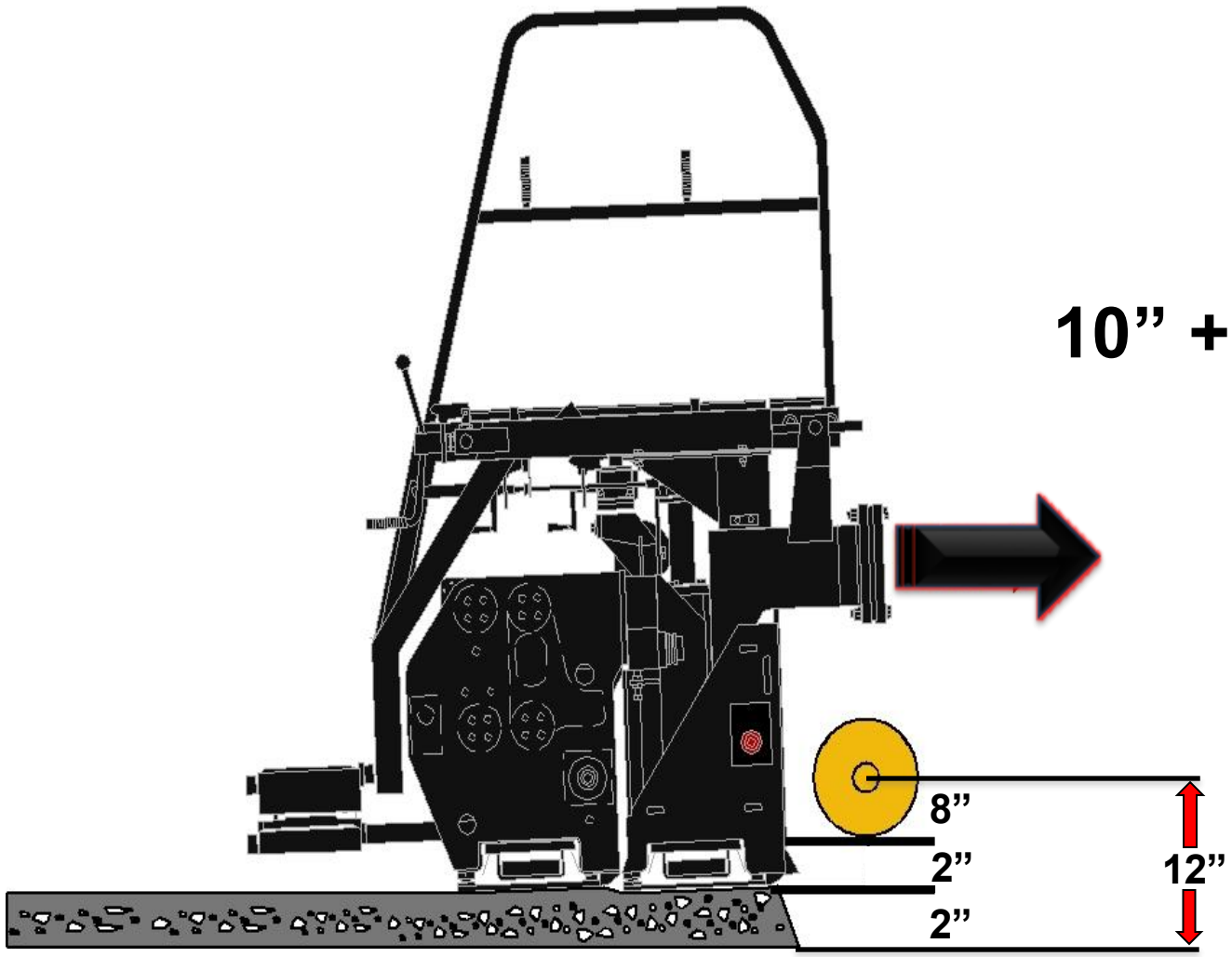
Material Management

Mix Feed

- Material level at center of auger chamber
- Material level in center area controls auger speed
- Flow gates on some pavers

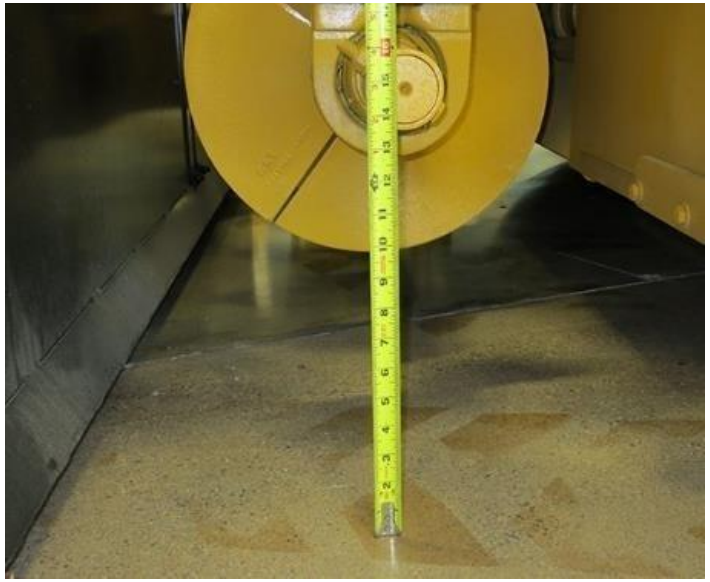


Auger Height



- Start at 2" above level of mat
- Adjust up or down depending on mix type and appearance of mat

10” + mat thickness = auger height

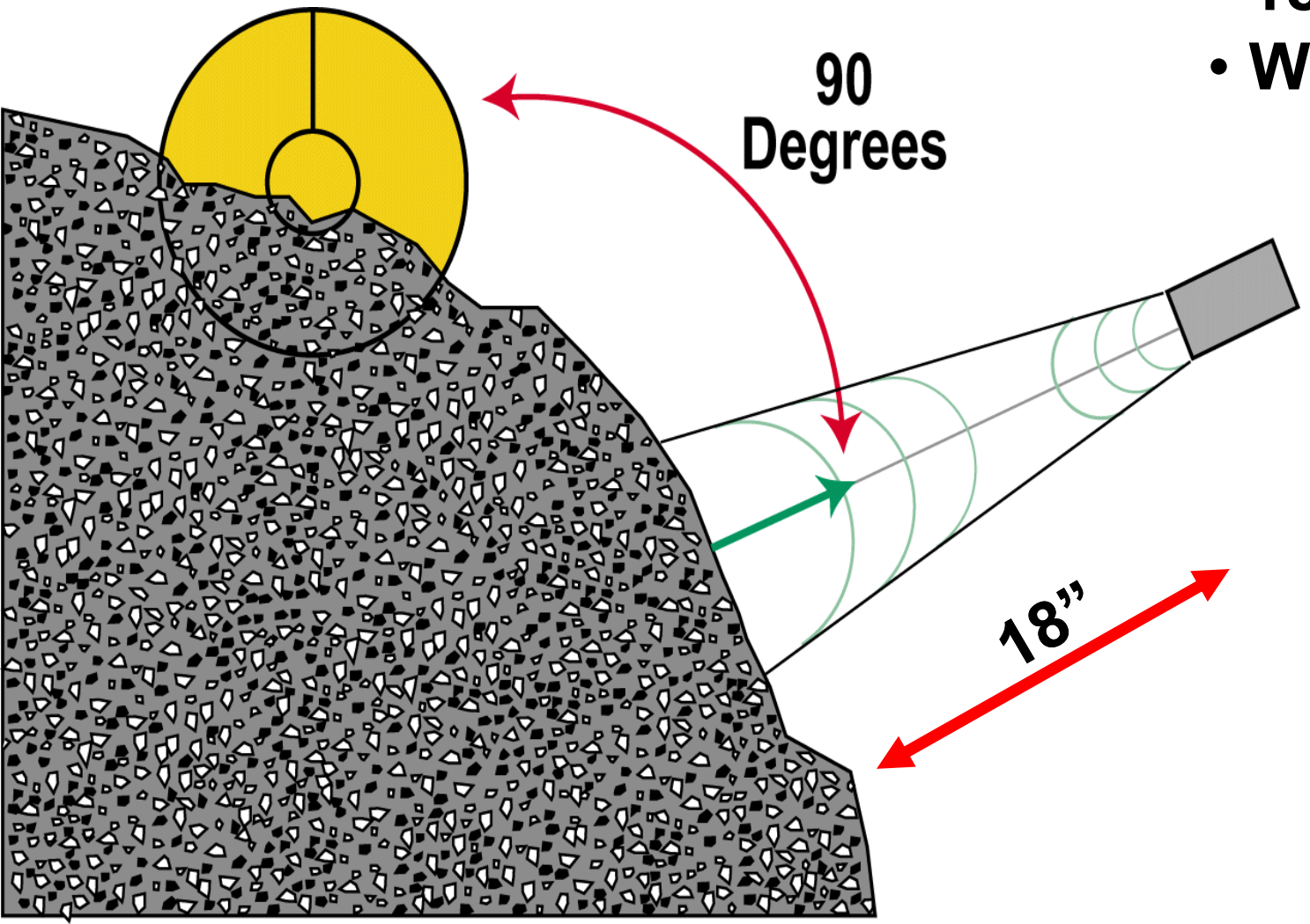


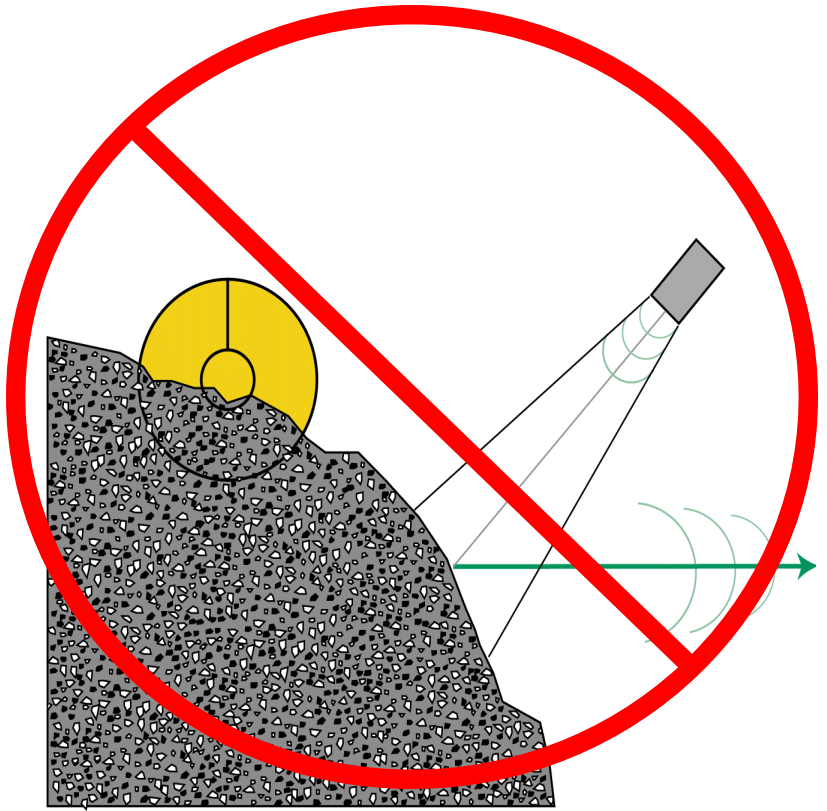
Aiming Sonic Feed Sensors

- Mechanical or sonic
- Control level of material
- Position Sensor 18" from end of augers

Sonic Sensor Mounting Distance

- 18” from mix
- 18” from last auger segment
- Working range is 12” – 32”





Feed System Segregation

- Conveyor speed too fast
- WHY?
- Do we get density here? Smoothness?

Auger Speed

- Auger speed uniform
- 20-40 rpm
- 2s per revolution
- Auger speed too high or too low can cause stripes in the mat

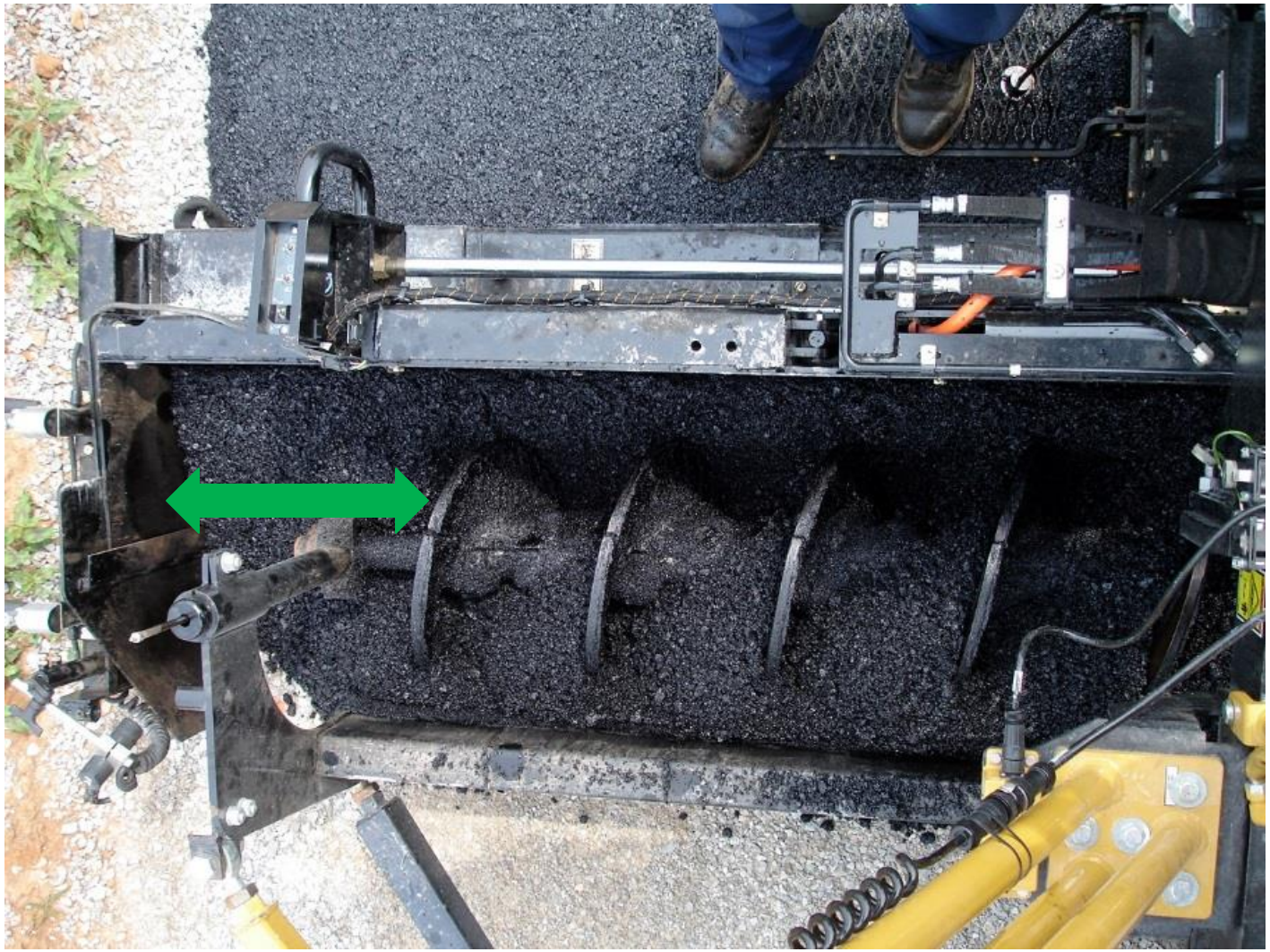
Material Management

Truck Exchange – HoM – Bumps & Dips

Auger Extensions & Tunnels

- Fixed width paving
- Variable width paving
- Front-mount screeds
- Rear-mount screeds

Front-mount Screeds



18” with front-mount

Rear-mount Screeds

36” with rear-mount

Material Management

Always Extend Tunnel in front of Augers

Variable Width Paving

- Auger extensions & tunnels to minimum width
- Be prepared to shovel as needed at wider widths

Managing Segregation – Truck Exchange

Four step procedure

1. **Release truck**
2. **Continue paving**
3. **Pave & fold wings**
4. **Stop quickly**

Managing Segregation – Truck Exchange

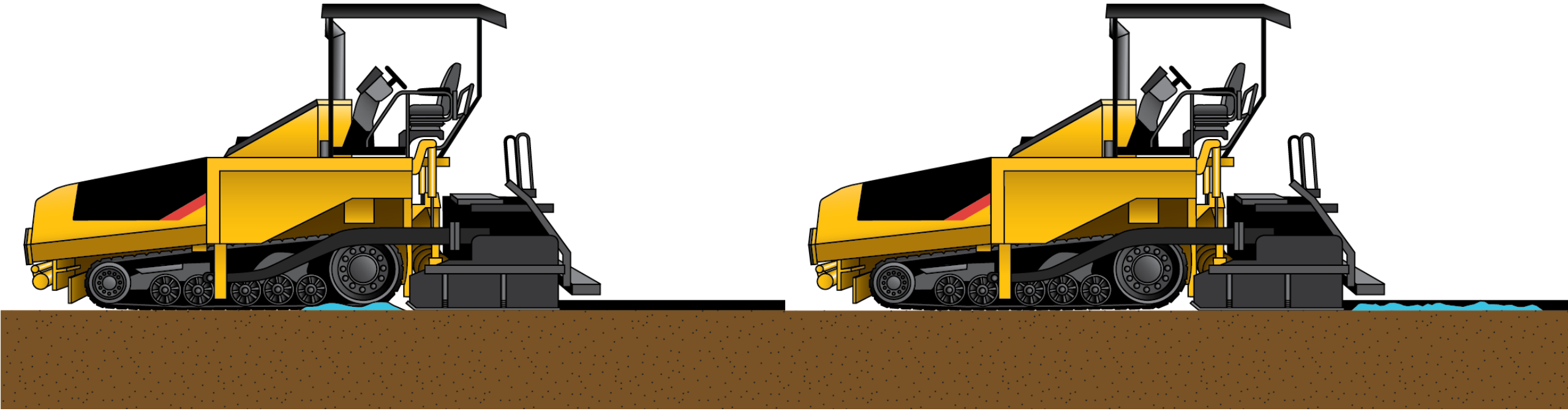
Material Management

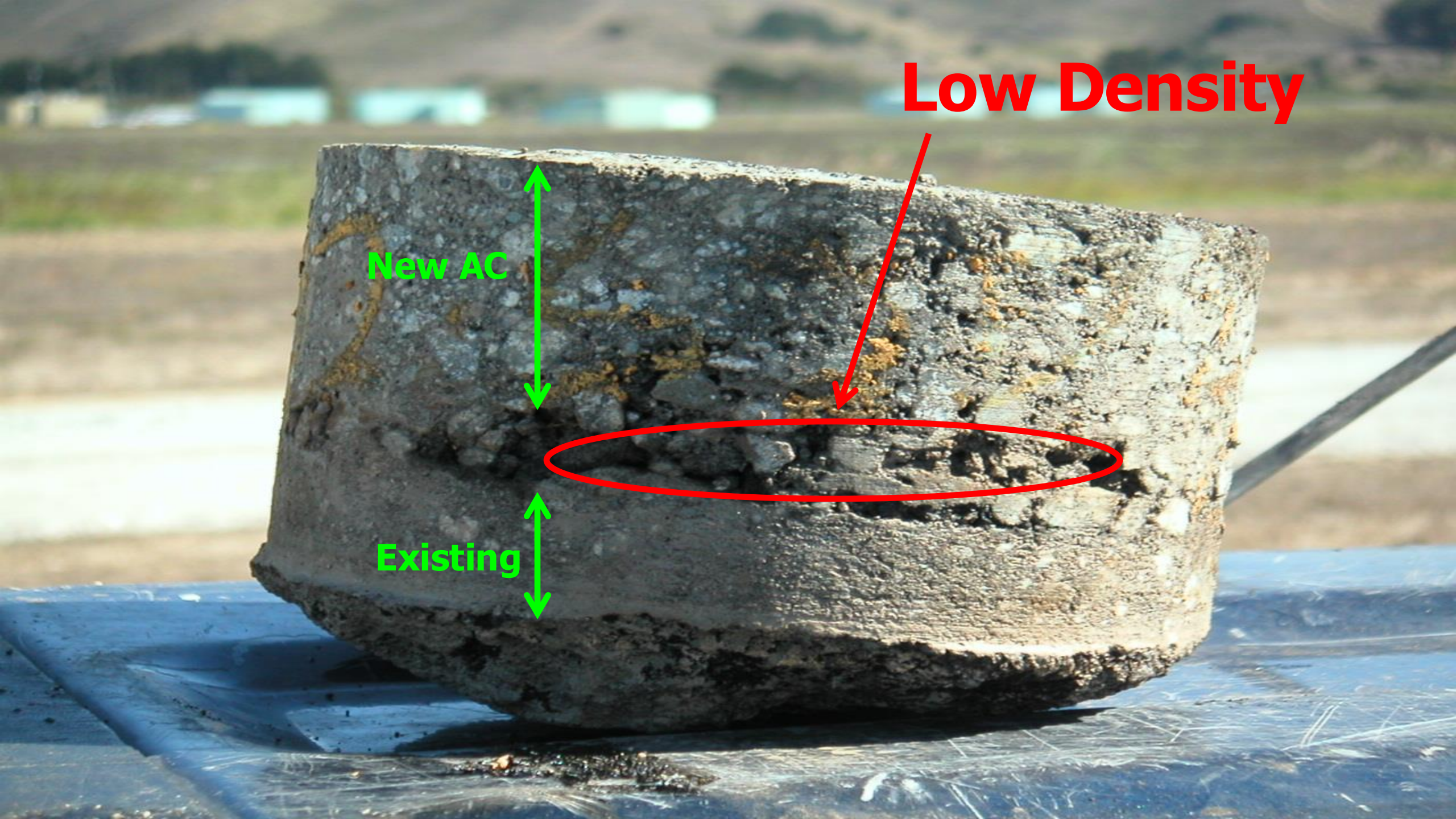
Spills on grade

- Potholes
- Density problem
- Smoothness problem

Material Management

Spills on grade are BIG mistakes!




Low Density
New AC
Existing

Material Management

Trucks Bumping the Paver

Defects Related to Truck Exchange

Compaction

Cat® SDX Screed Plate System

INNOVATIVE MATERIAL FLOW

- Angular surface provides a kneading action as mix passes through the diamond channels
- Tapering flat surface at the back of the plates provides a smooth finished surface
- Confined mixing manipulates the aggregates to reduce air voids and increase density
- Manipulation of aggregates helps create a more uniform surface texture
- Optimized aggregate structure promotes surface temperature uniformity for more consistent compaction
- Minimizes roller shoving for better smoothness
- Increased stiffness strengthens unconfined edges, promotes better joint matching

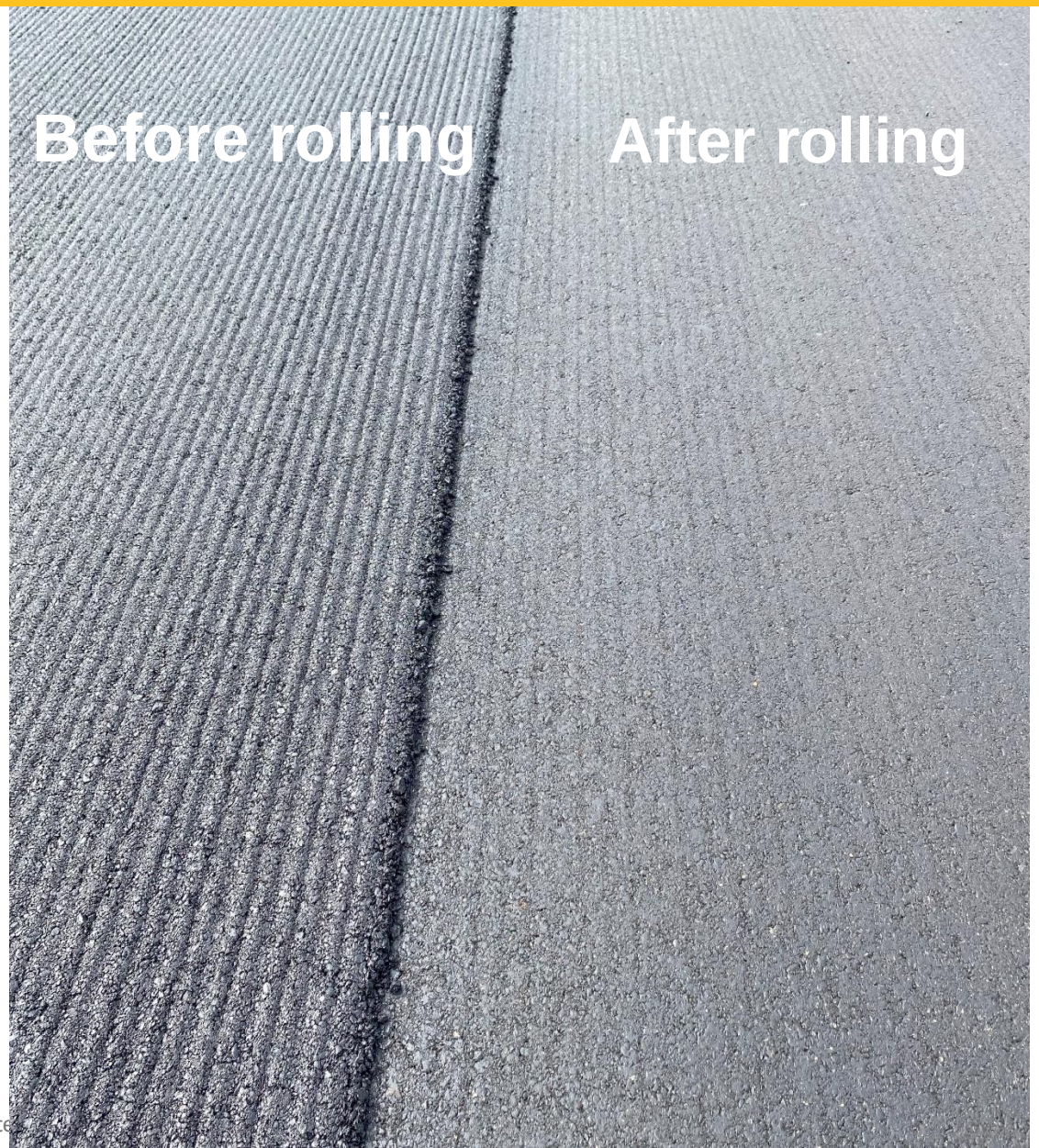
INCREASED DENSITY AND SMOOTHNESS

- IRI reductions up to 10 inches per lane mile have been realized
- Densities reaching up to 91% and higher behind the screed has led to fewer compaction passes, and in some cases, the elimination of an asphalt roller
- Lower standard deviation in density has led to increased bonus opportunities
- Increased stiffness leads to better longitudinal edge profiles and higher joint densities due to less lateral movement of the mix under the drums

Compaction

SDX Paver and screed setup

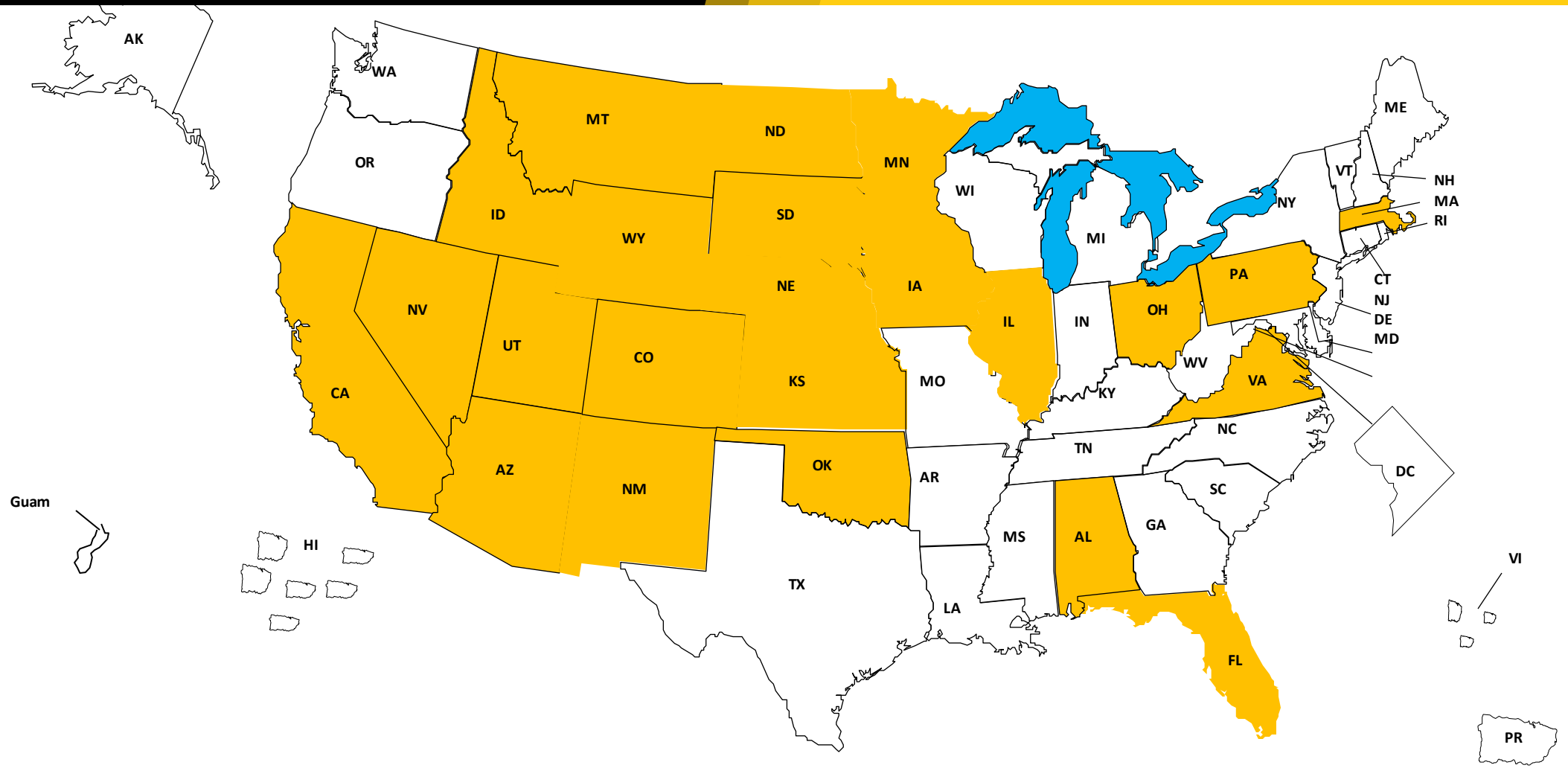
Compaction



SDX pavement surface

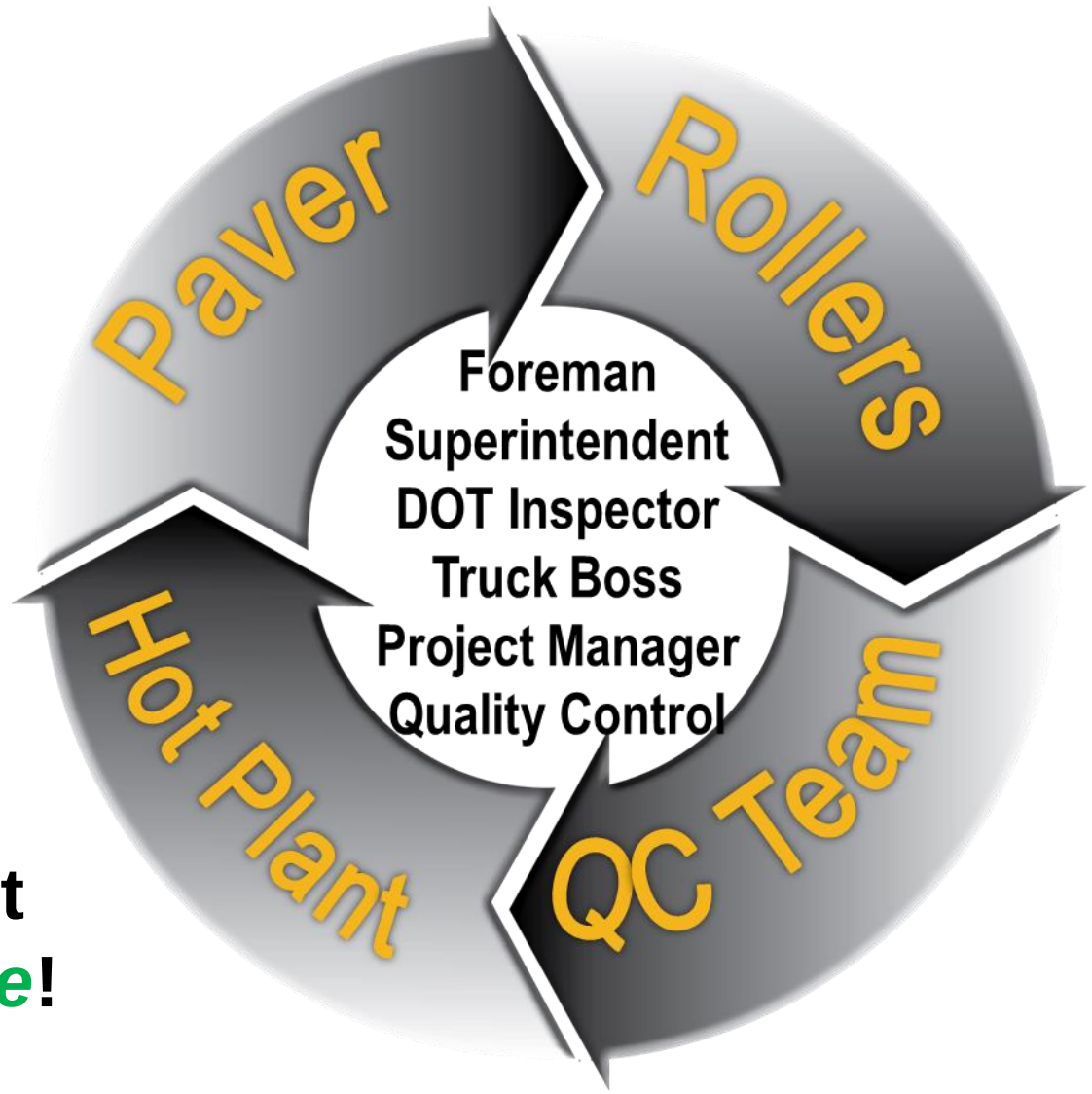
- Hwy 92 near Independence, MN
- Lines are still visible, but generally less prevalent after some traffic

States where SDX has been used shown in yellow



Consistency & Communication are the Keys to Success!

- **Quality is the Bi-Product of Consistency**
- **Do the fundamentals right**
- **Avoid BIG mistakes**



We use the same equipment - we just need to *plan ahead* and *communicate*!

Thank you!

For more information:

- **Dave King, Caterpillar**
- **King_david_a@cat.com**
- **763-412-5553 (mobile)**

- For more information on SDX Screed Plate System, please click here or visit:

Scan me for SDX information

Thank-you for your attention!
Questions?

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