

Best Practices for Asphalt Longitudinal Joints

A Cooperative Effort between AI & FHWA

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Two Goals for Project

*Best way
To Build it.*

*Best way
To Spec it.*





For Today

Don't We Already Know How To Build a Longitudinal Joint?





I-71 just North
of Cincinnati



I-71 between
Cincinnati
and
Columbus



I-71 in
Columbus

“ In recent years, it has become evident how critical longitudinal joint construction is to the life of the pavement structure...

Many pavements have been or are in the process of being resurfaced as a direct or indirect result of longitudinal joint deterioration.”

**Kentucky Transportation Center
College of Engineering, 2002**



An Agency and Industry Concern

Longevity matters, it impacts:

- LCC**
- Alternate Bid Competitiveness**
- DOT Program Costs**
- HMA Industry's Livelihood**
- the Travelling Public**

Experts Interviewed...

10 Consultants

- Jim Scherocman
- Chuck Deahl
- Jim Heddrich
- Ron Corun
- Larry Michael
- Steve Neal
- Brian Prowell
- Tom Skinner
- Frank Colella
- Wes McNett



9 NAPA Sheldon D. Hayes Winners

“Single best paving project of the year.”



Note: *Lindy Paving* has won 3 times in the last 10 years!

Interview Questions

LONGITUDINAL JOINT CONSTRUCTION INTERVIEW

This survey is part of the Asphalt Institute's cooperative agreement, "Marketing of Hot Mix Asphalt (HMA) Joint Construction Best Practices".

- 1) First pass must be as straight as possible. How do you accomplish that?
- 2) Do you prefer a
 - a) Notched wedge joint Do you compact the wedge? (yes) (no)
 - b) Butt Joint
- 3) Do you use paver automation (yes) or (no). Your preference is
 - a) Joint Matcher
 - b) Ski
- 4) Do you roll the unsupported edges by:
 - a) Staying back 6-inches from the edge
 - b) Overhang the edge of the mat by 6-inches
 - c) Other _____
- 5) When using a wedge joint do you tack the notch & wedge (yes) or (no) if yes, with
 - a) Emulsion
 - b) PG-grade Asphalt
 - c) Other _____ If yes, complete wedge or portion. Any problems?
- 6) When using a butt joint do you tack the vertical face (yes) or (no) if yes, with
 - a) Emulsion
 - b) PG-grade Asphalt
 - c) Other _____ If yes, complete wedge or portion. Any problems?
- 7) Have you ever used a proprietary joint adhesive, (yes) or (no), if yes
 - a) Was it practical? (yes) or (no)
 - b) Did it improve the performance of the joint? (yes) or (no)
- 8) Have you ever cut the cold joint back prior to placing the adjacent lane? (yes) or (no)
 - a) Was it practical? (yes) or (no)
 - b) Did it improve the performance of the joint? (yes) or (no)
- 9) Have you ever used an infra-red heater on a longitudinal joint? (yes) or (no)
 - a) Was it practical? (yes) or (no)
 - b) Did it improve the performance of the joint? (yes) or (no)
- 10) How much do you overlap the hot material onto the cold material?
 - a) _____
- 11) What do you do with the overlap material?

- a) Push it back to the joint
 - b) Do nothing
 - c) Other _____
- 12) Do you roll the second pass
 - a) From the hot side overlapping onto the cold
 - b) From the cold side overlapping onto the hot
 - c) Make the first pass staying back from the joint and overlapping onto the cold with the second pass
 - d) Start rolling on the outside edge and working in to the joint
 - e) Other _____
- 13) Do you monitor the longitudinal joint density (yes) or (no), if yes, how
 - a) Nuclear gage or similar device
 - b) Cores
 - c) Other _____
- 14) Which type of specification offers the best chance to long term joint performance?
 - a) Method
 - b) Minimum percent density. What is the practical minimum? _____%
 - c) No specification
- 15) Does a fine 9.5mm mix have a better chance for good performance than a 12.5mm
 - a) Yes
 - b) No
- 16) Does a 9.5mm mix with a design asphalt content of 6.2% asphalt have a better chance for good performance than that same mix at 5.7% asphalt?
 - a) Yes
 - b) No
- 17) Could I do anything additional in "late season" paving to improve joint performance?
 - a) _____
- 18) Have you ever been required to seal the surface of a longitudinal joint as part of the contract? (yes) or (no). If yes, what did you use to seal the joint?
 - a) The material was _____
 - b) The width of the seal was _____ -inches
- 19) What are the other "Tips that make the difference"? List as many as you like.
 -
 -

We sincerely appreciate your assistance in improving the performance of longitudinal joints. Thank You

Do the Experts Agree?

Not Always



The Best Longitudinal Joint Echelon Paving



Rolled Hot

Echelon Paving Longitudinal Joint



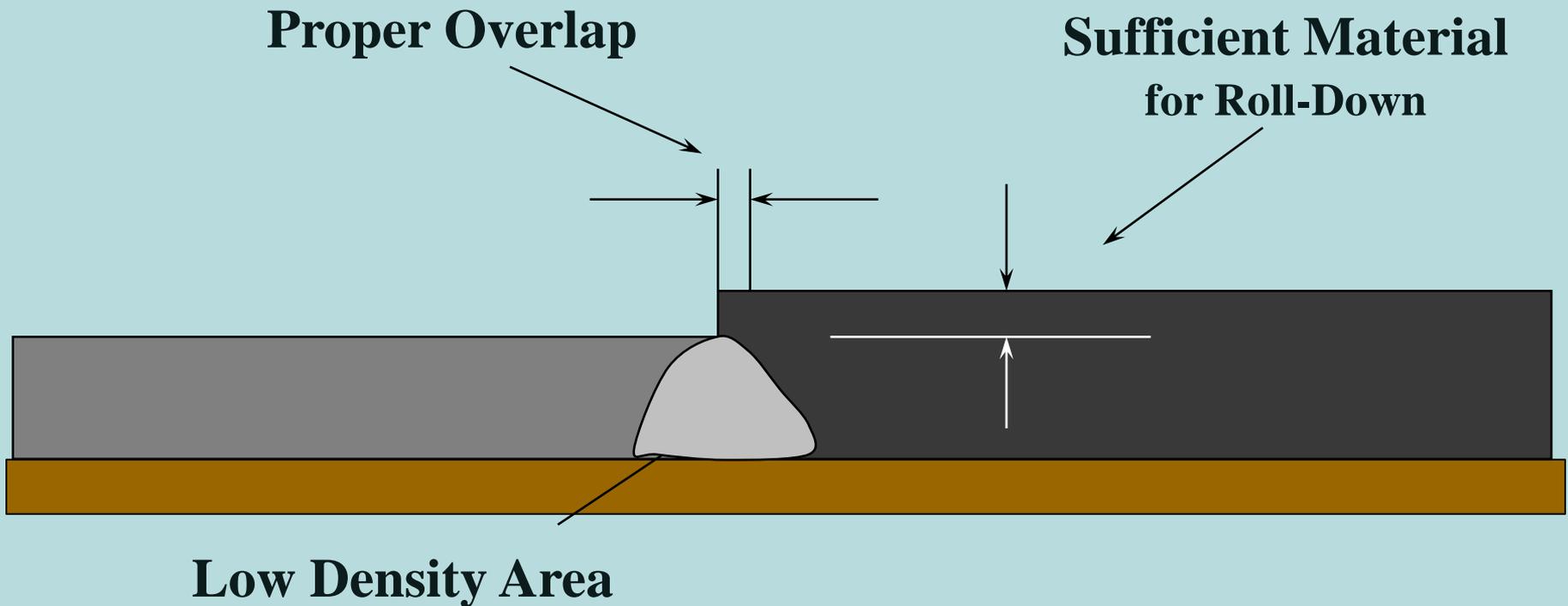
Joint passes between the quarters

But, the need to maintain traffic limits the opportunities to pave in echelon

Consequently, most longitudinal joints are built with a cold joint.

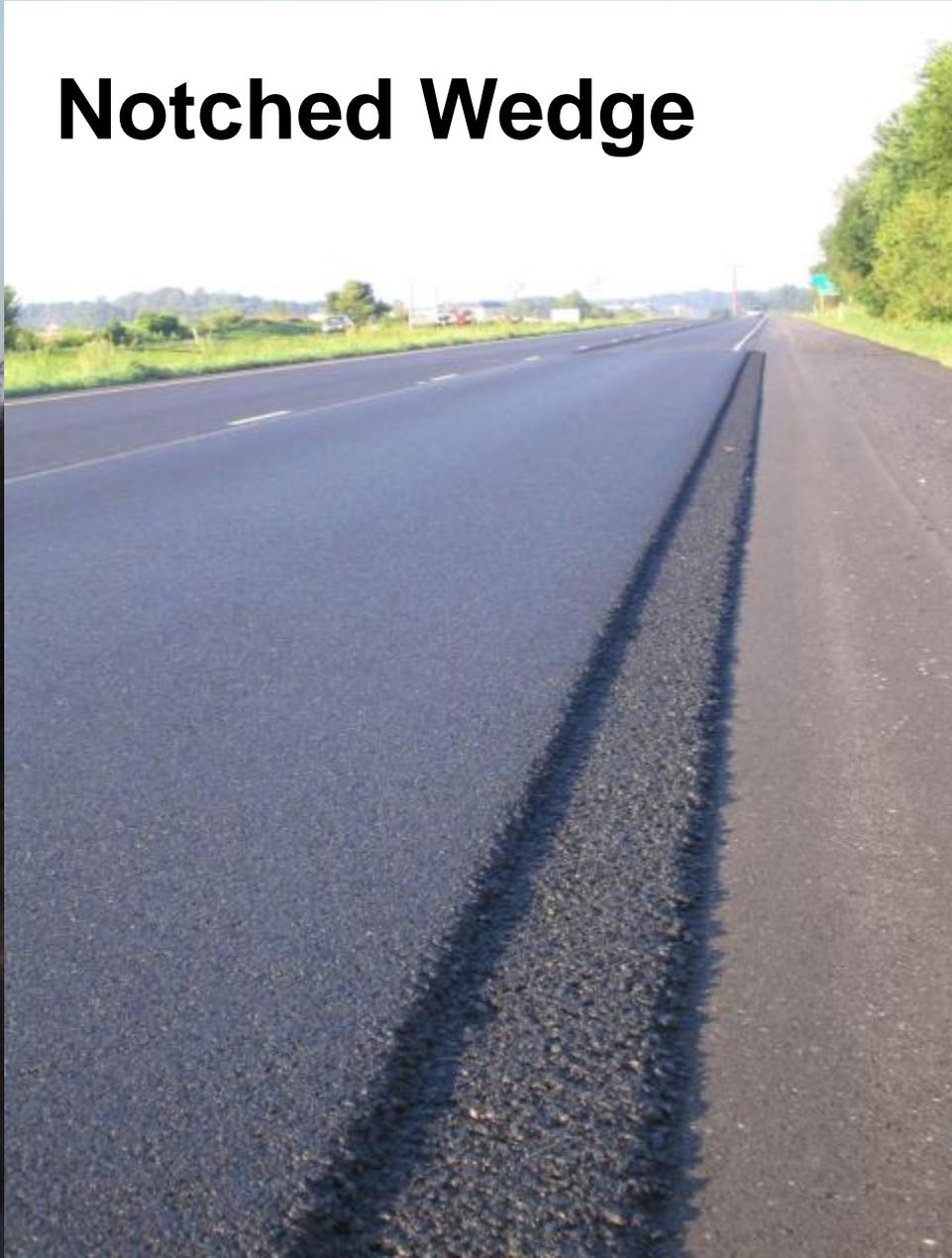


We Know Unsupported Edge Will Have Lower Density



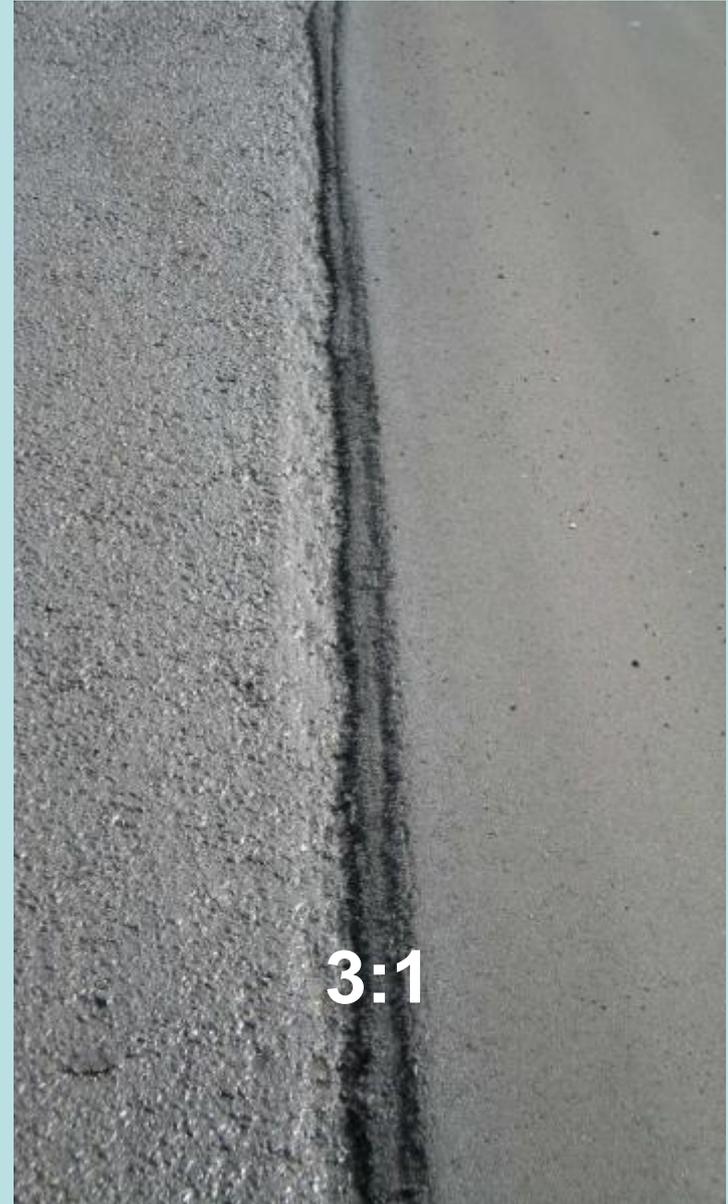
Experts Were Evenly Divided Regarding Preference

Notched Wedge



Butt

Wedge Joints



Unacceptable Notched Wedge Joint Construction

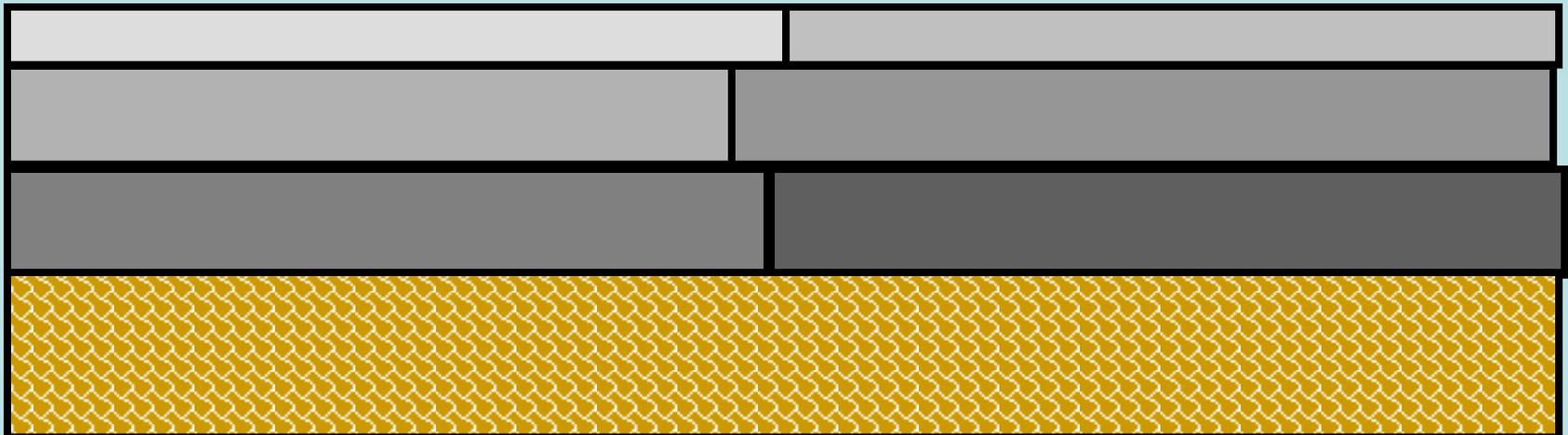


Mix Selection and Design Considerations

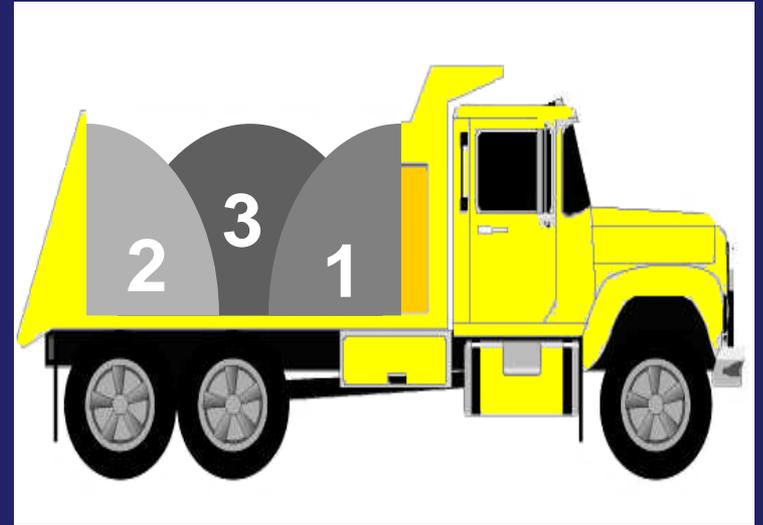
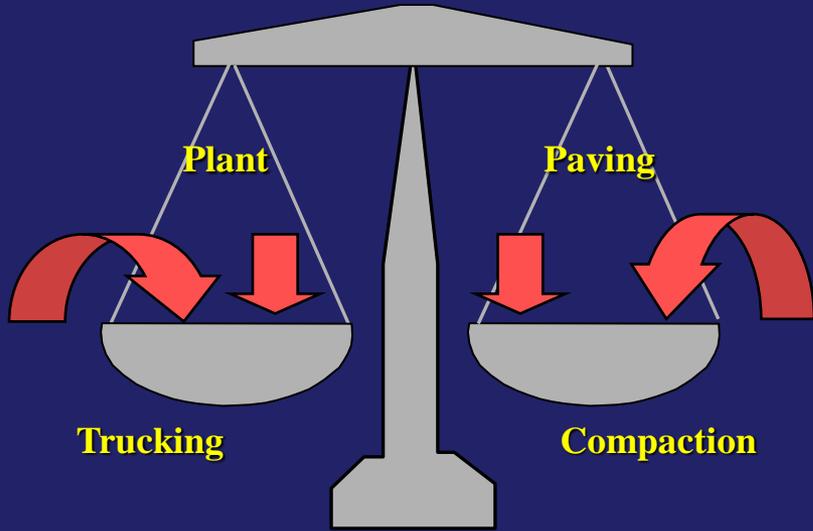
- ❑ **Less permeable mixes**
 - **Smallest NMMAS that will do the job**
 - **Consider using a “fine” gradation**
 - **Lower gyrations levels**

- ❑ **Min lift thickness is NMMAS x 4,
exception: for “fine” gradation NMMAS x 3**

Offset longitudinal joints between layers by at least 6-inches; joint should be at centerline, not in or near the wheelpath



GETTING STARTED OFF RIGHT



Dump Person



MTV

Tack Coat



Full width of mat to minimize movement of unsupported edge



First Pass Must Be Straight!

Unanimous that a string-line should be used to assure first pass is straight



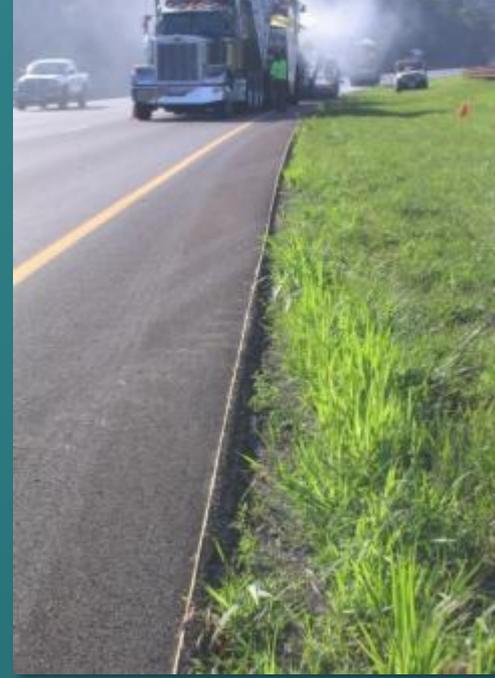
String-line



Skip Paint



Reference



Great Results

Tough to get proper overlap (1") with next pass



Use Automatic Control Systems



Vibratory Screed Should Always Be On





END GATE

Seated on the Existing Surface

Auger

Uniform Head of Material
Across the Entire Screed

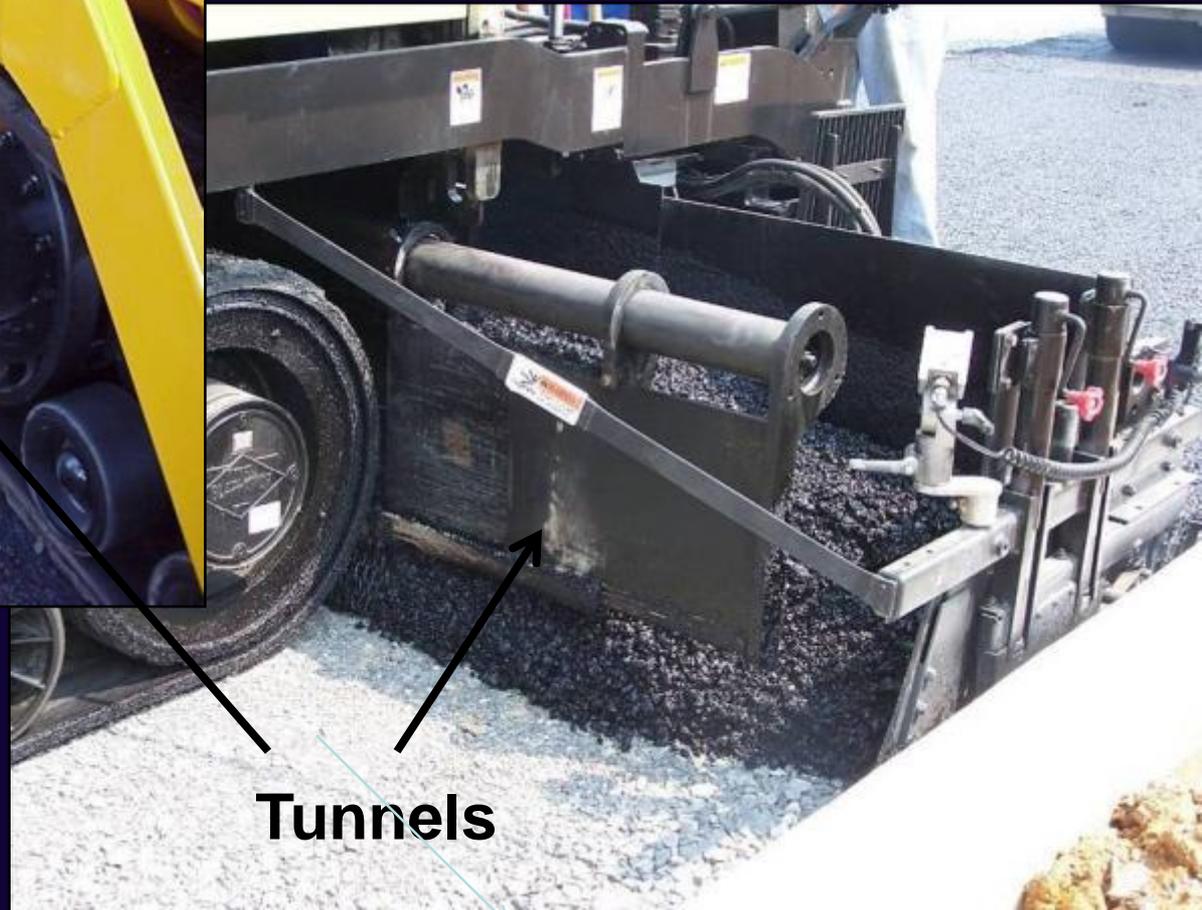


Carry Material Within
12 – 18-inches of
the End Gate



Hydraulic Extending Tunnels

Controlling material flow at
outer edges of screed and
delivering homogenous HMA



Tunnels



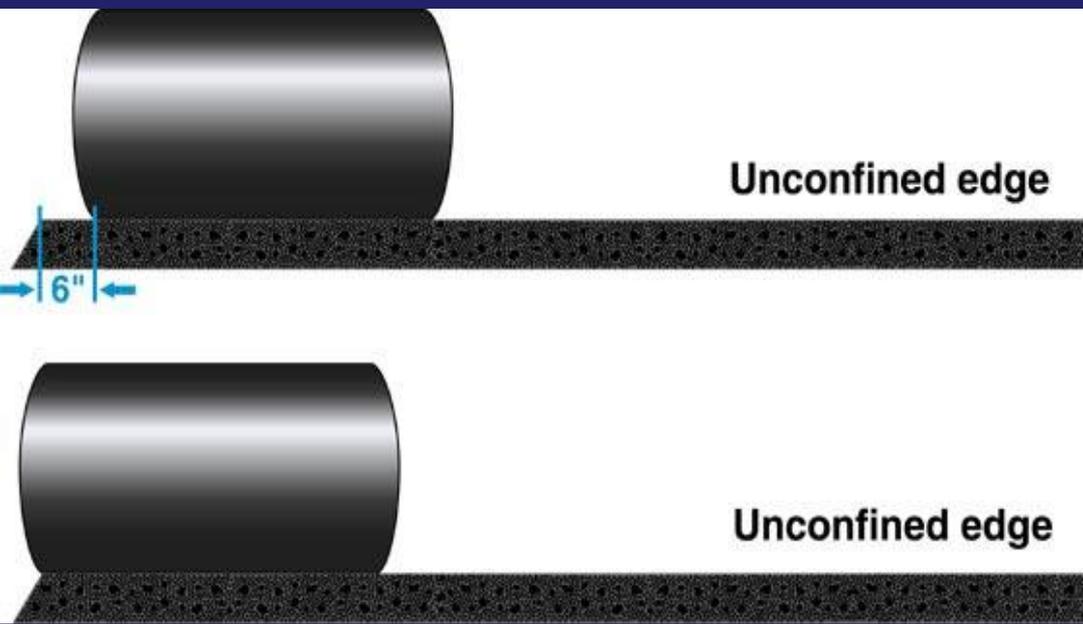
Auger not extended to
within 12 to 18-inches
of the end gate.

The result -
SEGREGATION at joint

Our Recommendation: 1st Roller Pass Hangs Over 4-6 inches



Alternative: Stay Back 4-6 inches on 1st pass, then roll 2nd pass w/ slight overhang

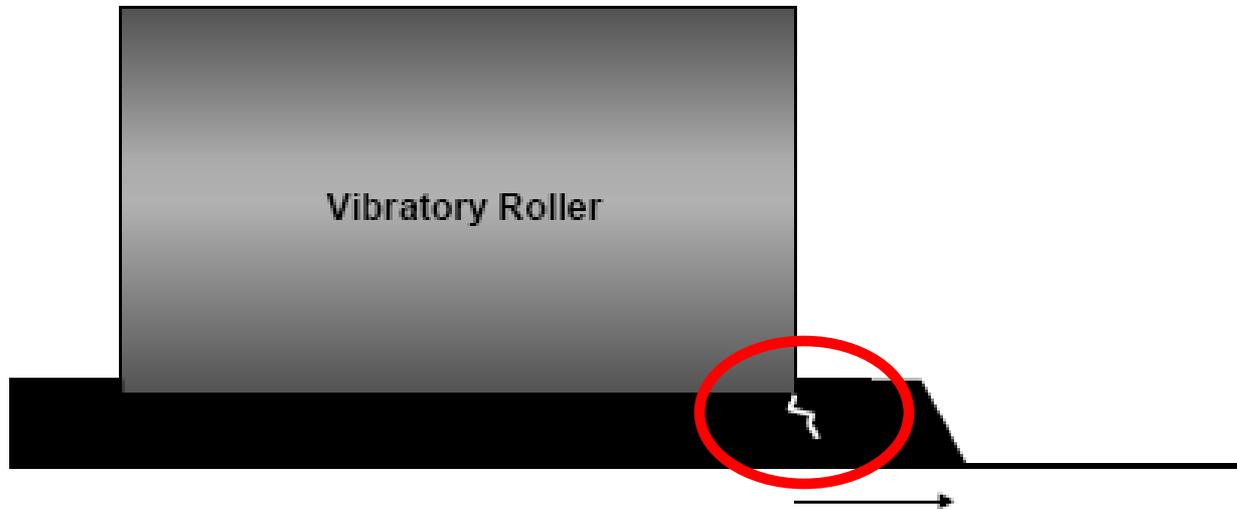


- Concern:
 - developing stress crack?
- Merit:
 - minimize lateral movement?

What We Don't Want

Rolling Unsupported Edge

(First Paver Pass)



**Edge of drum inside unsupported edge
can cause cracking near the edge**

Quality Control, Monitor Joint Density

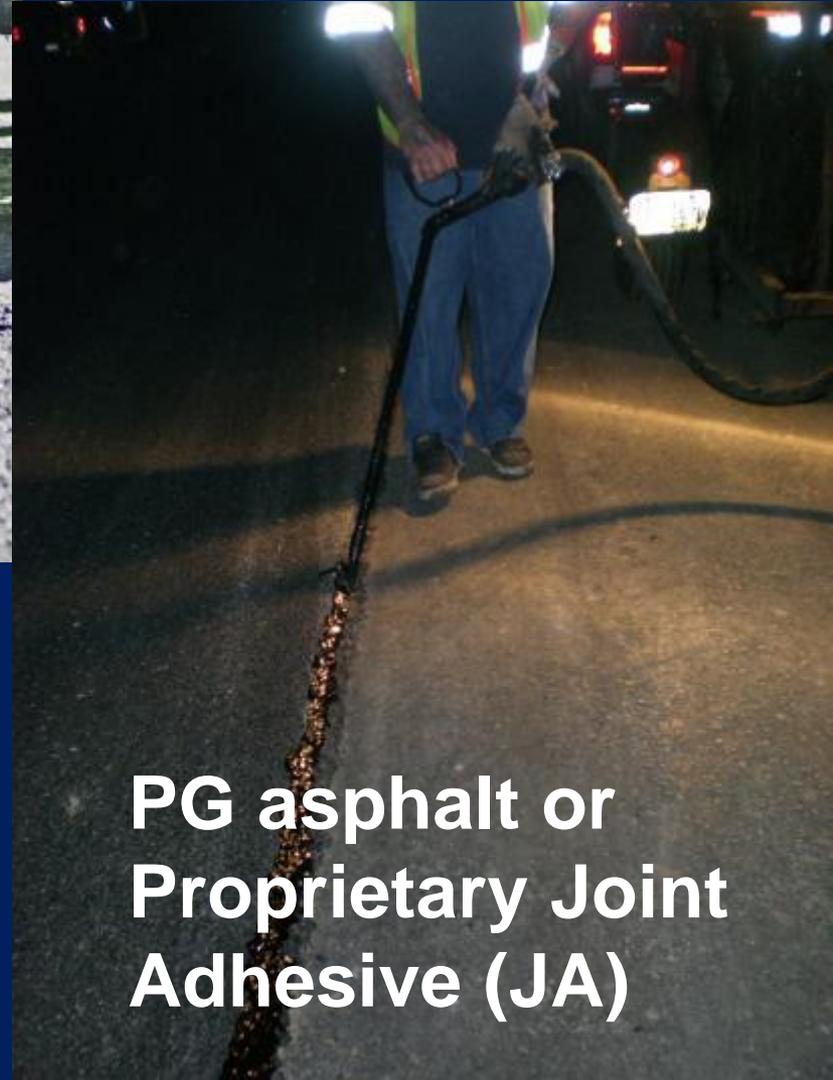


Tack the Joint! (Butt or Wedge)



Emulsion, or

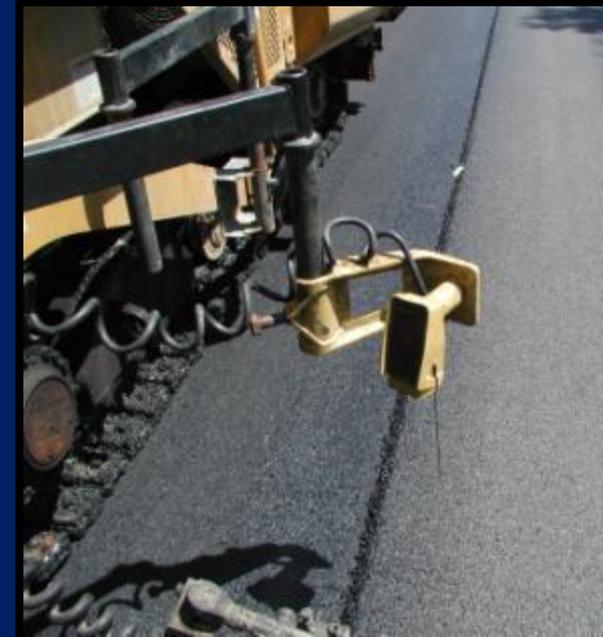
Good, Better, Best



**PG asphalt or
Proprietary Joint
Adhesive (JA)**

Paver Automation Using Joint Matcher (versus Ski) to Always Achieve Exact Thickness of Mat Needed

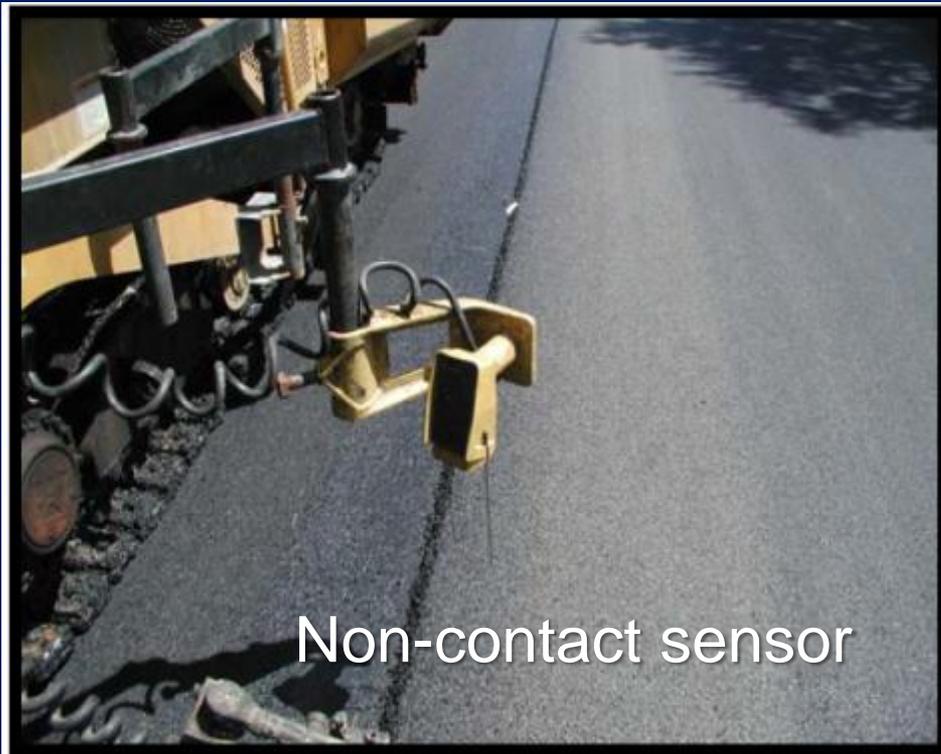
If the joint (hot-side) is starved of material, the roller drum will “bridge” onto the cold mat and no further density will occur at joint. To ensure this never occurs, target height difference after compaction is 0.1”



A high-angle, perspective shot of a two-lane asphalt road. A large, white, arrow-shaped road marking points directly forward from the bottom center of the frame. The road curves slightly to the right in the distance. A metal guardrail is visible on the left side, and a grassy area is on the right. The text "Destined for Failure" is overlaid in the center of the road.

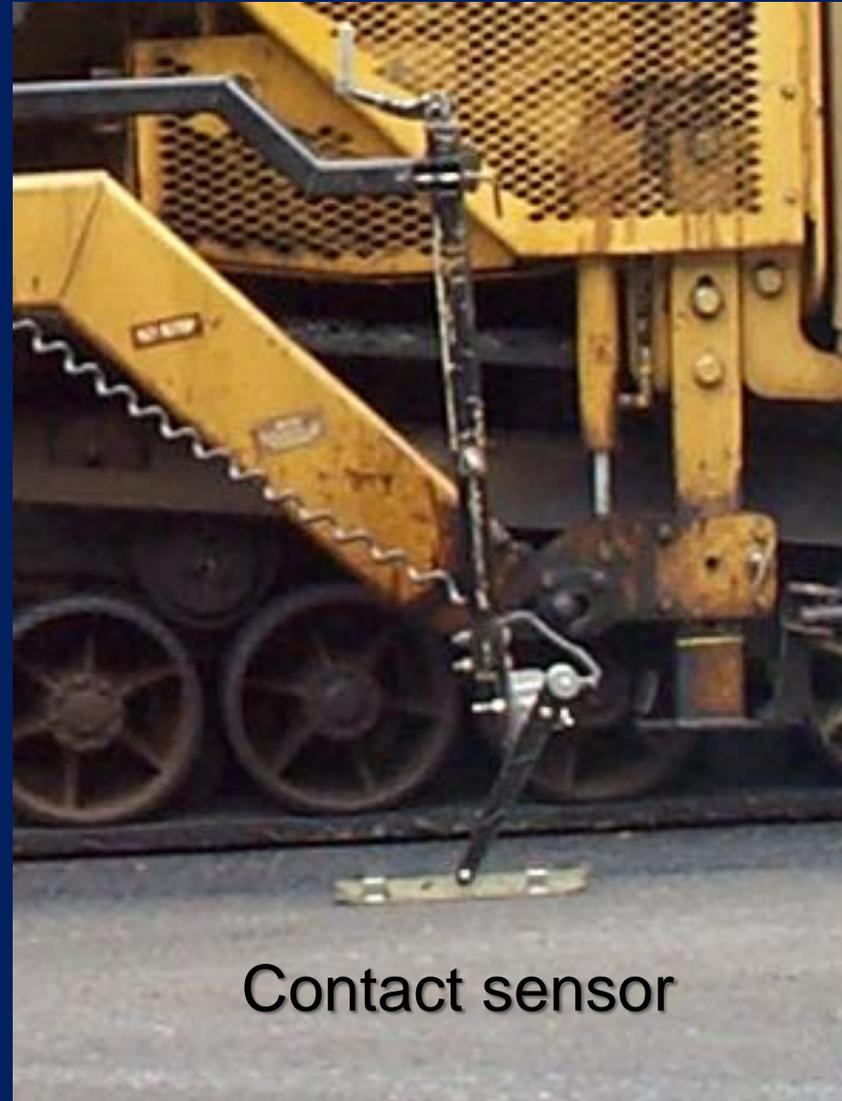
Destined for Failure

Joint Matchers



Non-contact sensor

G. Bridenbaugh photo



Contact sensor

Frank Colella photo



Arm

Ski best for smoothness

**Averages optimum HMA thickness
over entire length of ski.**



Proper Overlap:
 1.0 ± 0.5 inches.

**Exception: Milled
or sawed joint
should be 0.5
inches**

Bumping the joint?



Don't broadcast material across the mat





Lute the Longitudinal Joint



This lute person is doing a great job

Overlap



Rolling the Supported Edge

Our Recommendation:



**1st pass off the joint
approx 6-8 inches**



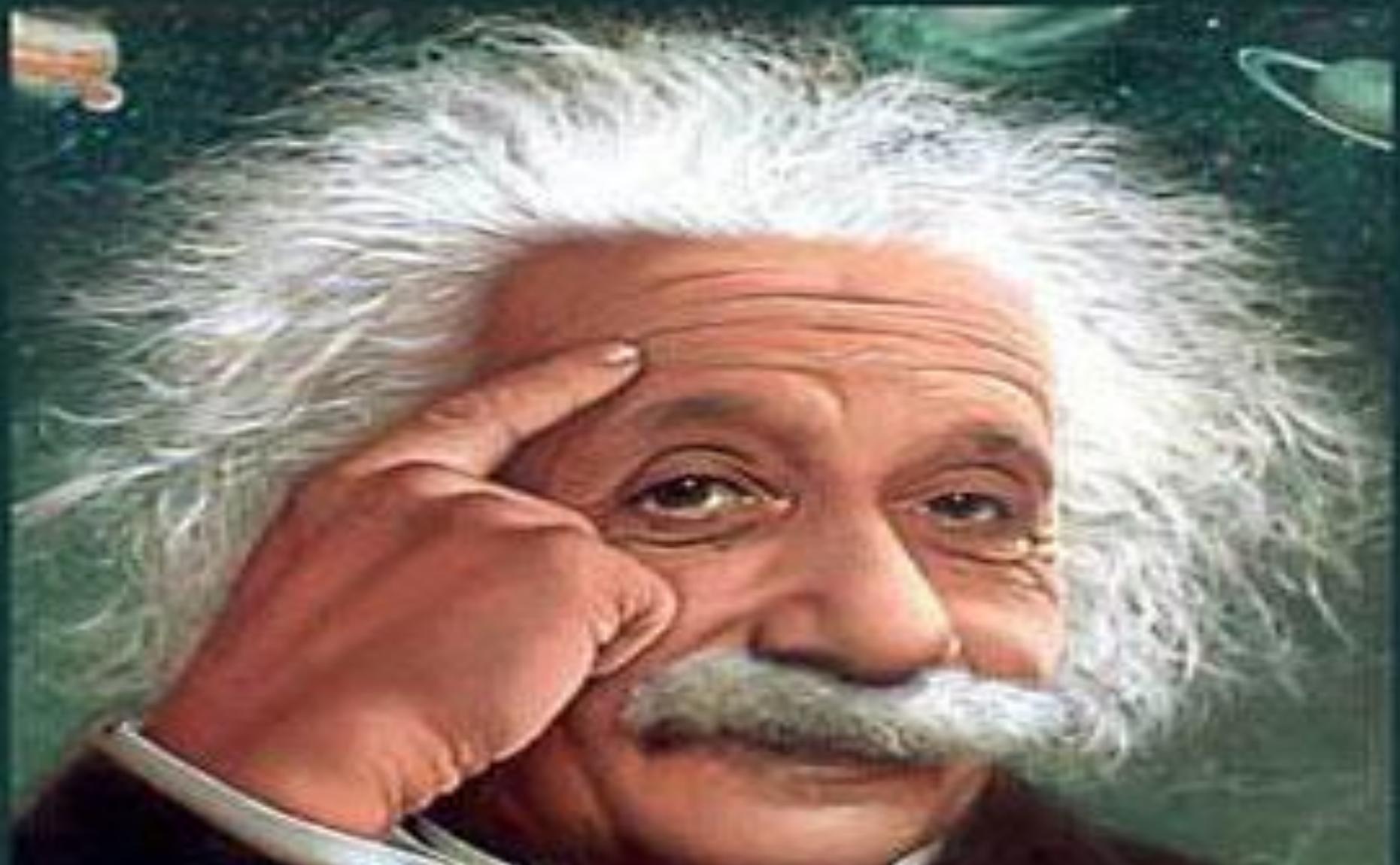
**2nd pass overlap
onto the cold mat**

versus an Alternate Method of 1st Pass over the Supported Edge



**Make a roller pass in the vibratory mode
overhanging 2 to 4-inches on the cold side.**

**Concern is bridging (roller being
supported by cold mat)**



“We can't solve problems by using the same kind of thinking we used when we created them ”

Other Options / New Products

- Mill & Pave One Lane at a Time
- Cut Back joint
- Wedge Compactors
- Joint Heaters
- Joint Adhesives (hot rubberized asphalt)
- Surface Sealers Over Joint
- Rubber Tire Rollers
- Warm Mix Asphalt

Mill & Pave One Lane At A Time



Cutting Wheel Fixed to Roller in Europe

- Best practice in Europe on Dense Graded mixes on large projects when traffic is managed.
- Cut when mix is warm and plastic.
- Watering of blade prevents tearing.
- Joint then painted with 50pen binder.
- Cutting and painting not done on open mixes.



<http://www.highwaysmaintenance.com/kraktext.htm>



**CEM
Vibratory
Wedge
compactor**

Infrared Joint Heaters



Application of proprietary joint adhesive (JA)



Surface Sealers



09.23.2008 12:22

Pneumatic Rubber Tired Rollers

Many believe these help in providing a tight surface that is more dense and less permeable.

However, when compacting the unsupported edge, it is key to avoid lateral movement of the mix. For this reason, pneumatic tired rollers should never be operated close to this edge.

Intermediate rolling of the supported edge with rubber tire rollers should be fine.

WMA as Compaction Aid



Questions?

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