Study to Develop Recommended Best Practices for Constructing and Specifying HMA Longitudinal Joints

A Co-operative Effort between AI and FHWA

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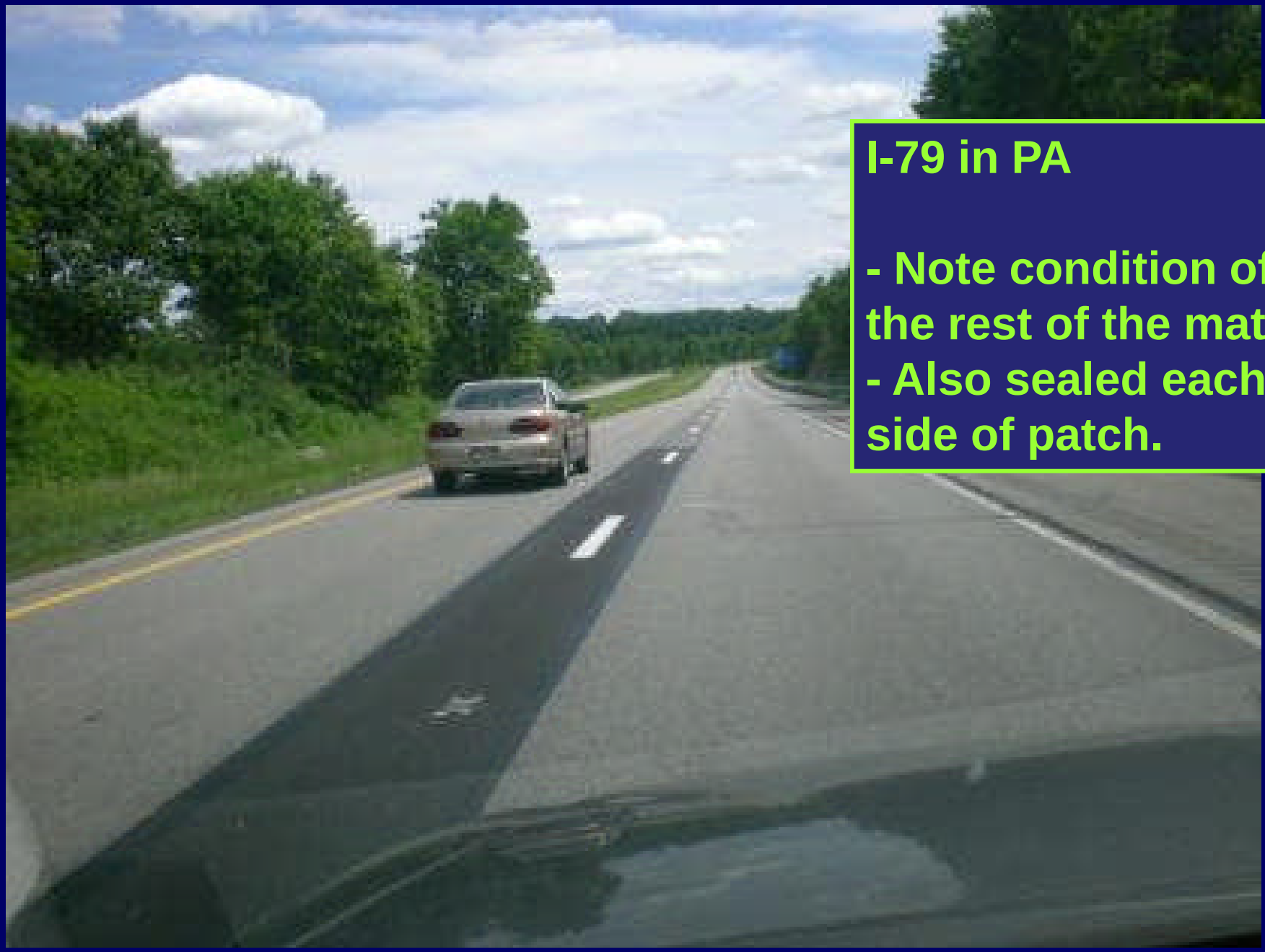
Asphalt Institute

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

I-81 in Pennsylvania

I-84 in New York


I-84 Connecticut



I-79 in PA

- Note condition of the rest of the mat.
- Also sealed each side of patch.

“ 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”

Current Project Team

- AI
  - Mark Buncher
  - Carlos Rosenberger
  - AI Regional Engineers
- FHWA
  - Tom Harman
  - Michael Arasteh
  - Stephen Cooper
- PA State Asphalt Paving Association
  - Gary Hoffman

PROJECT STEPS

- FHWA “Benchmark” Survey to Divisions
- Literature Review
- Identify What We Know/ Things We Don’t
- Interview 19 Experts
- Visit Five Select State DOTs
- Draft/ Final Report
- Develop Training Tools

Takeaways from FHWA Survey to 52 Division Offices

- 1/2 of states not satisfied with overall performance of L-Joints.
- 2/3rds of states have a L-Joint spec
  - Half of those (17) have a LJ density spec
    - Range from 89% - 92% min TMD
  - Other half were method specs
    - From Joint Adhesive to very prescriptive
- Great start to point us in the right direction, but no definitive answers

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

- **What We Know**
  - Certain Steps Everyone Agrees On

- **What We Don't Know**
  - Differing Opinions on Other Steps
  - Developed Questionnaire for Experts
    - Interview Consultants, Manufacturers and Contractors (Sheldon Hayes winners since 2000)
    - Compile and Analyze Findings

19 Experts Interviewed

Consultants

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

Sheldon Hayes Winners

- Lindy Paving (PA) [3]
- P. Flanigan & Sons (MD)
- Duininck Bros (TX)
- Thompson-McCully (MI)
- DesMoines Asphalt & Paving (IA)
- K Barnett & Sons (NM)
- Norris Asphalt Paving (IA)

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 into 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 you assistance in improving the performance of longitudinal joints. Thank You

Do the Experts Agree ?

Not Always

The Best Longitudinal Joint

Echelon Paving

Rolled Hot

I-295 in New Jersey

Echelon Paving Longitudinal Joint

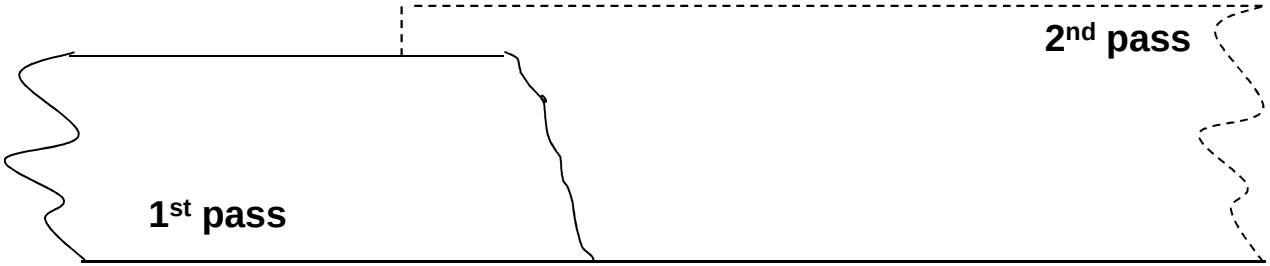
Joint passes between $ 0.25s

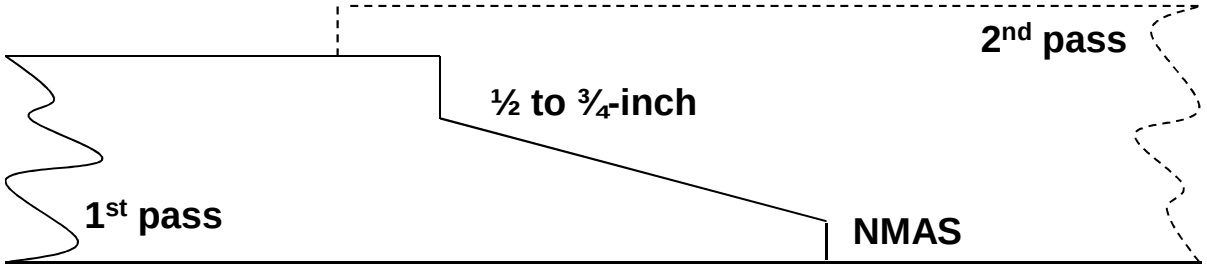
But, the need to maintain traffic limits the opportunities to pave in echelon

Consequently, most longitudinal joints are built with a cold joint

Prefer Notch-Wedge or Butt Joint?

Evenly Divided





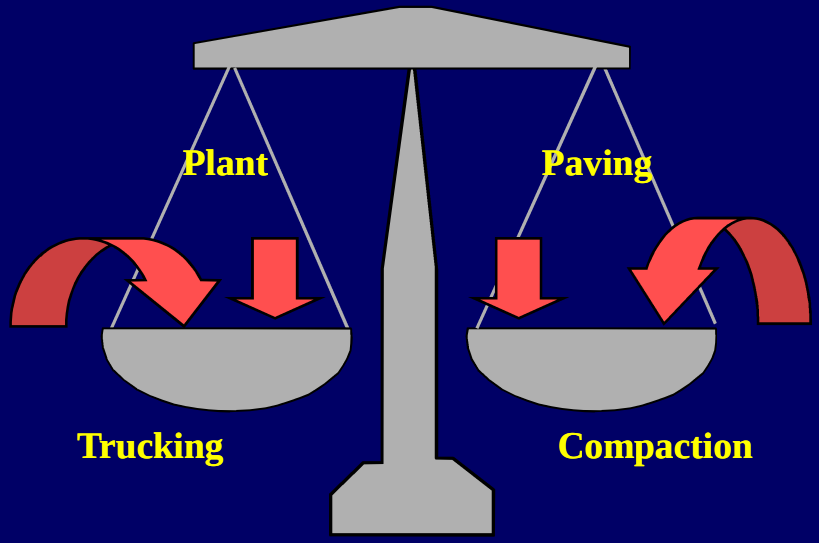
Wedge 3:1 to 12:1

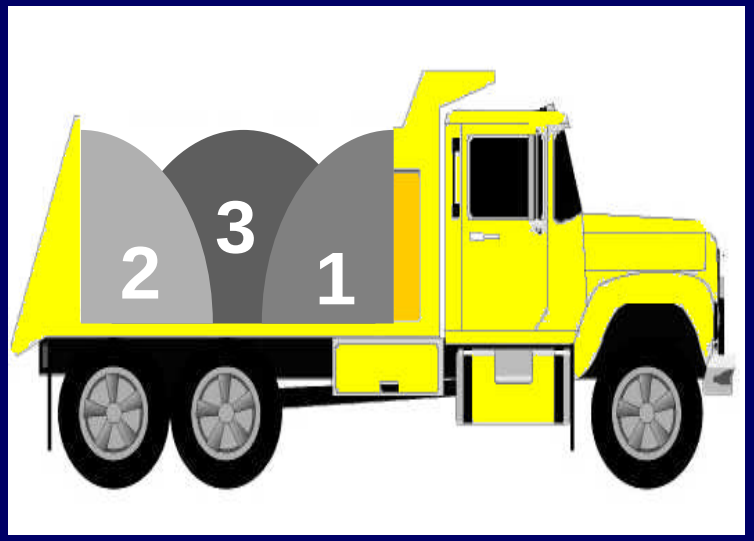
26. 5. 2000

Prior Planning

- Select joint (butt or wedge) best suited for that job
- Choose smallest NMAS that will do the job
- Consider using a “fine” gradation
- Lift thickness = NMAS x 4, exception “fine” gradation x 3
- Longitudinal joint should be included in construction plan & sequence

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

Stringline

Skip Paint

Reference

Great Results

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

Paver on Automatic w/ Joint Matcher

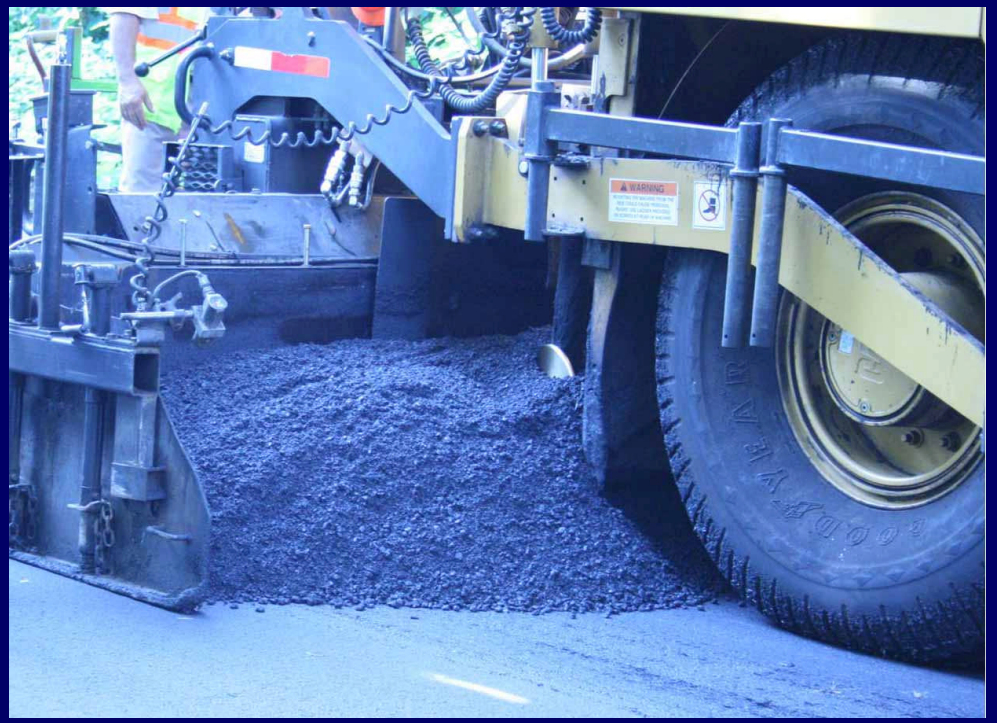
Vibratory Screed Should Always Be On

Auger

Uniform Head of Material Across the Entire Screed

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

This is unacceptable



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

The result - SEGREGATION at joint

END GATE

Seated on the Existing Surface

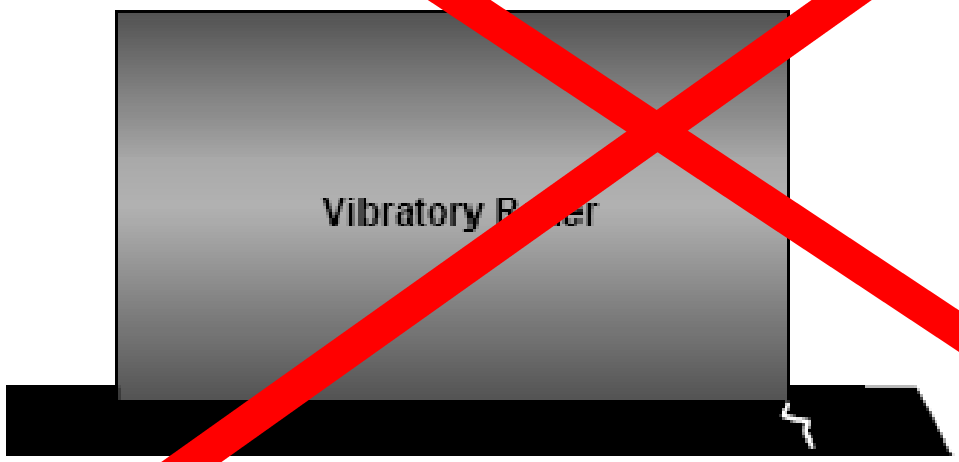
1st Roller Pass on Unsupported Edge
50/50: Overhang vs. Stay Back 4-6”

HOT

Caution: Watch for lateral movement and stress crack

Rolling Unsupported Edge

(First Paver Pass)



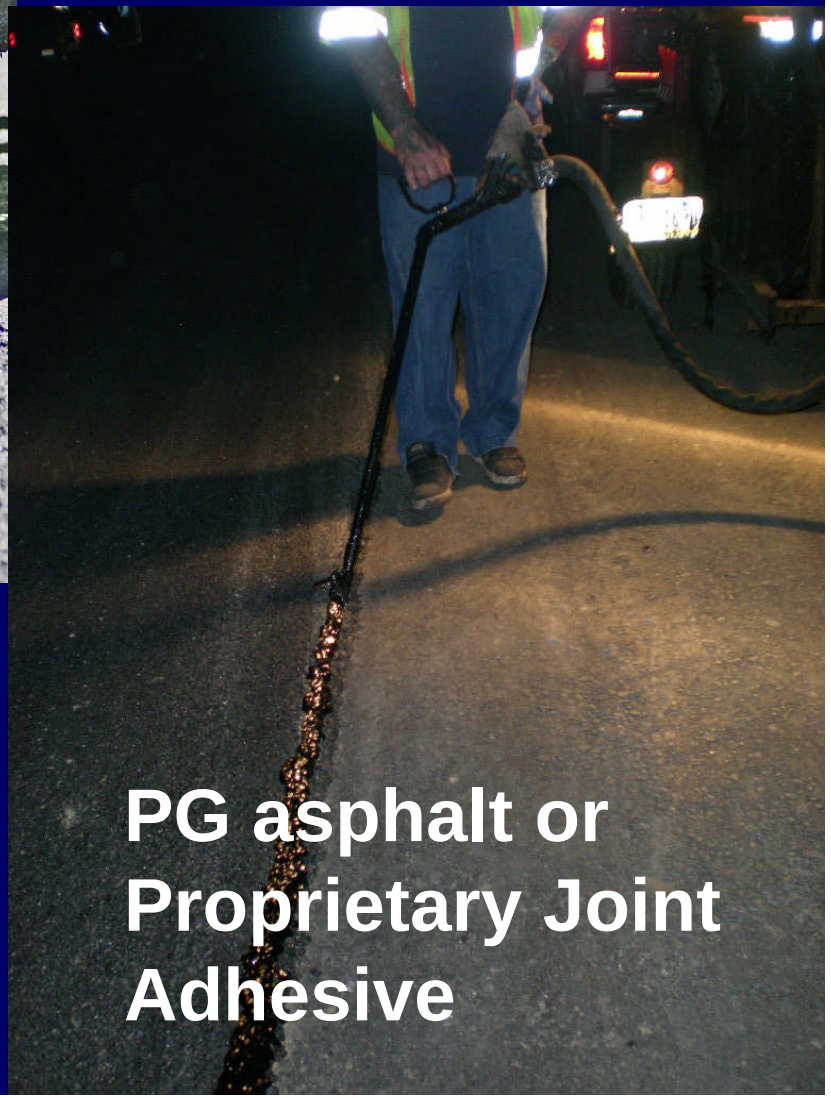
Edge of drum inside unsupported edge

Can cause cracking near the edge and lateral mix movement at the unsupported edge

Can cause cracking near the edge and lateral mix movement at the unsupported edge

Quality Control, Monitor Joint Density

Tack the Joint! (Butt or Wedge)



Matching Joint

Proper Overlap: 1.0 ± 0.5 inches

Sufficient Depth of HMA to avoid “starving” joint and “bridging” with roller

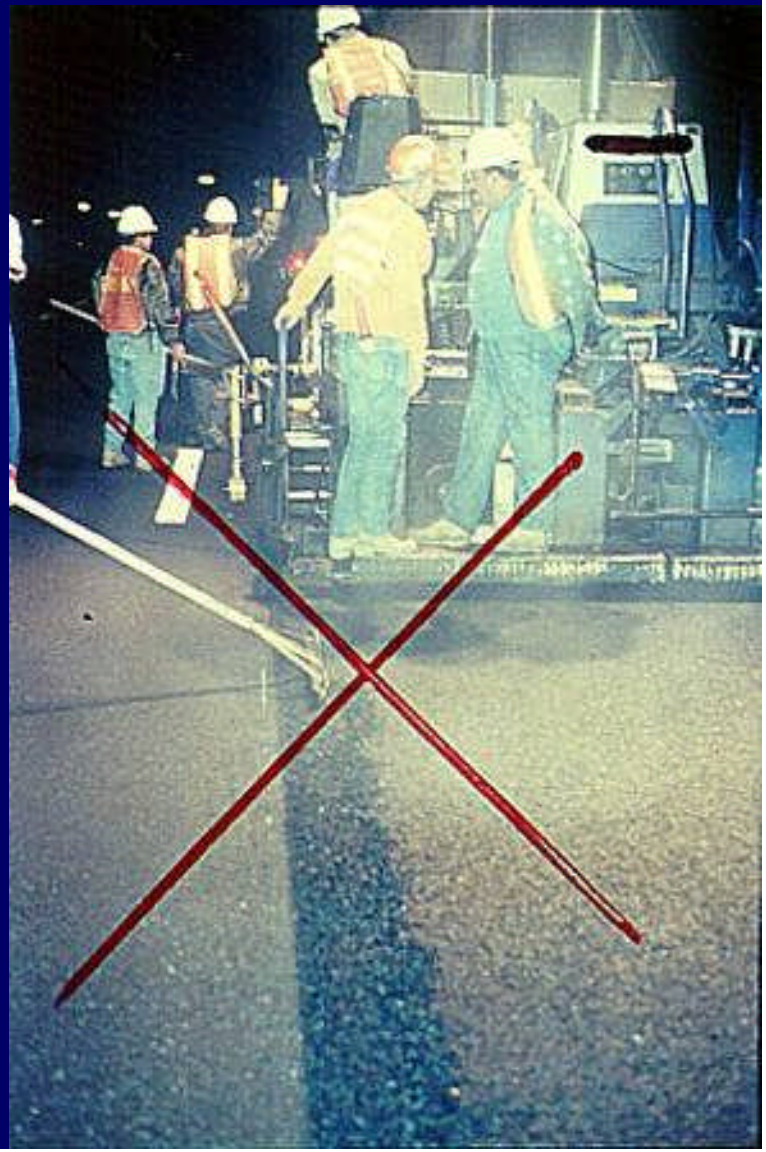
After all rolling, desired height diff. about 0.1”

Lute the Longitudinal Joint

This lute person is doing a great job

Bumping Joint Properly

Don’t push across!



Rolling the Supported Edge
(many different opinions and approaches)

Stay off the Joint by 6” with 1st Pass to Avoid Bridging

but, watch for stress cracks along the edge of the drum. May be more of a concern with rolling unsupported edge

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

Mill & Fill

Cutting Back the Joint

B. Prowell photos

Joint Heaters

Application of proprietary joint adhesive

Surface Sealers

Thank You