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

Best way
To Build it.
Don’t We Already Know How To Build a Longitudinal Joint?
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.”
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!
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
   b) Butt Joint

3) Do you use paver automation (yes) or (no), Your preference is
   a) JointMate
   b) Sks

4) Do you roll the unsupported edges by:
   a) Staying back 6-inches from the edge
   b) Overlap 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?

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 gauge 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

New Jersey

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

Proper Overlap

Sufficient Material for Roll-Down

Low Density Area
Experts Were Evenly Divided Regarding Preference

Notched Wedge

Butt
Wedge Joints

8:1

3:1
Unacceptable
Notched Wedge
Joint Construction
Mix Selection and Design Considerations

- Less permeable mixes
  - Smallest NMAS that will do the job
  - Consider using a “fine” gradation
  - Lower gyration levels

- Min lift thickness is NMAS x 4, exception: for “fine” gradation NMAS 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

Trucking

Plant

Paving

Compaction

Dump Person

MTV
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.
Tough to get proper overlap (1") with next pass
Use Automatic Control Systems
Vibratory Screed Should Always Be On
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
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 1\textsuperscript{st} pass, then roll 2\textsuperscript{nd} 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
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”
Destined for Failure
Joint Matchers

Non-contact sensor

G. Bridenbaugh photo

Contact sensor

Frank Colella photo
Averages optimum HMA thickness over entire length of ski.

Ski best for smoothness
Proper Overlap: $1.0 \pm 0.5$ inches.

Exception: Milled or sawed joint should be 0.5 inches.
Bumping the joint?
Don’t broadcast material across the mat
This lute person is doing a great job
Rolling the Supported Edge

Our Recommendation:

1\textsuperscript{st} pass off the joint approx 6-8 inches

2\textsuperscript{nd} pass overlap onto the cold mat
versus an Alternate Method of 1\textsuperscript{st} 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)
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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