

Longitudinal Joint Density State of Practice

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- Background Information
- Case Studies
- Best Practices
- Questions

Background

What we “know”

Asphalt Institute study (2012) showed that longitudinal joint construction is an area where consensus is nearly unachievable, but that with attention to detail, we can produce good joints with differing techniques.

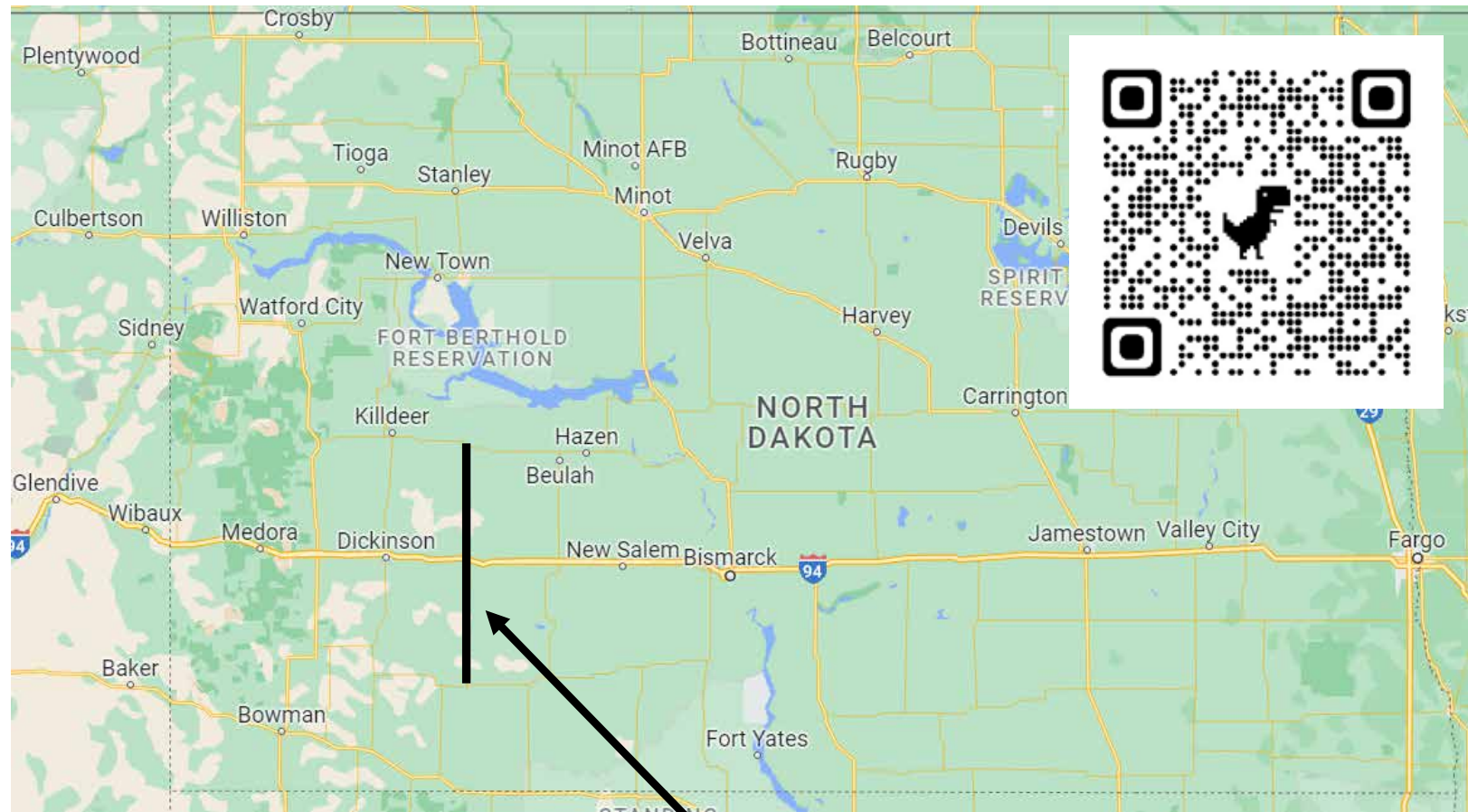
Areas of General Agreement

- Longitudinal Joints are most pavement's weakest point
- Typically, joint density is ~2% less than mat density
- Unsupported edge will usually have the lowest density
- Joint density specifications typically 89-92% of TMD
- For each 1% loss in density = about 10% loss of life

Case Studies

North Dakota

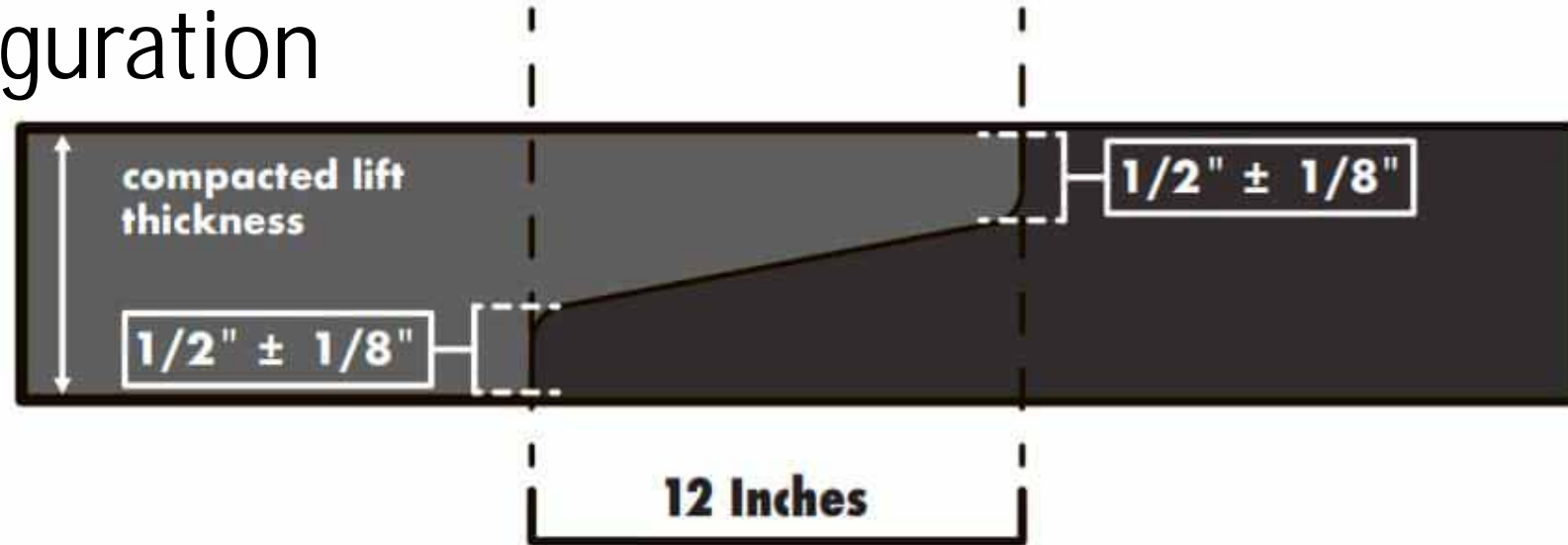
- August 2021
- 26-Mile Project
- State Highway #8
- 3" CIR
- Two 1.5" 12.5 mm Superpave Lifts
- 58S-28 (MSCR)
- Mix Temperatures 250-280°F at Paver
- 90.5 Joint Density Required



ND Highway 8

Unique Features

- Notched Wedge Configuration
- Willow Design Devise
- PaveScan RMD 2.0



Photos and graphics from
Asphalt Pro Magazine and
Willow Design

Unique Features

- Breakdown Roller
 - CAT Oscillatory
- Intermediate Roller(s)
 - CAT Vibratory (Primarily used)
 - Sakai Vibratory Pneumatic (Used on hot days when tenderness appeared)
- Finish Roller
 - CAT Vibratory in Static Mode

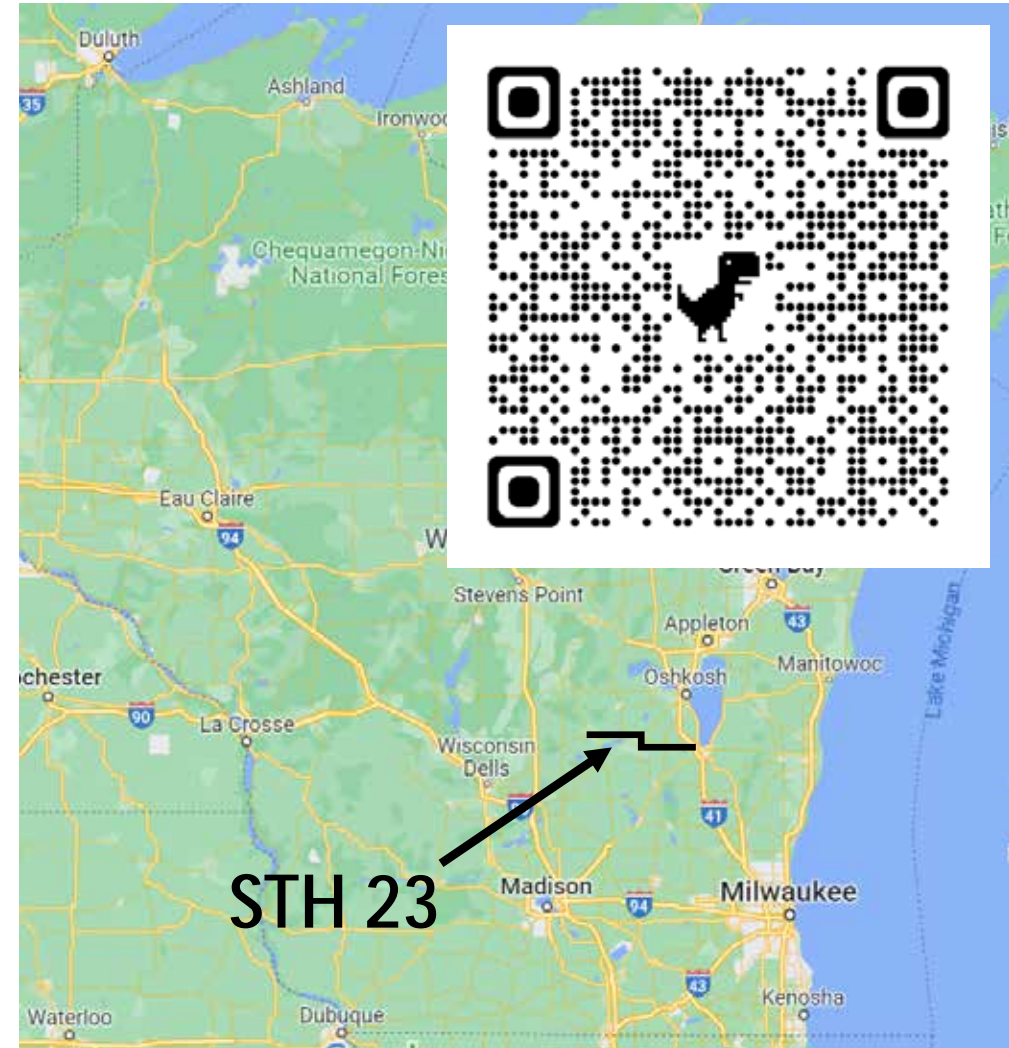
94.8 % Joint Density

(93.9% Matt Density)



Courtesy of Asphalt Pro Magazine

- State Trunk Highway 23
- 7.5-Mile Project
 - 22,230 T 19 mm
 - 2.25" 1st lift
 - 18,289 T 12.5 mm
 - 1.75" 2nd lift
 - 58-28S (MSCR)
- ~290°F at Breakdown Roller
- 90.5 Joint Density Required



Unique Features

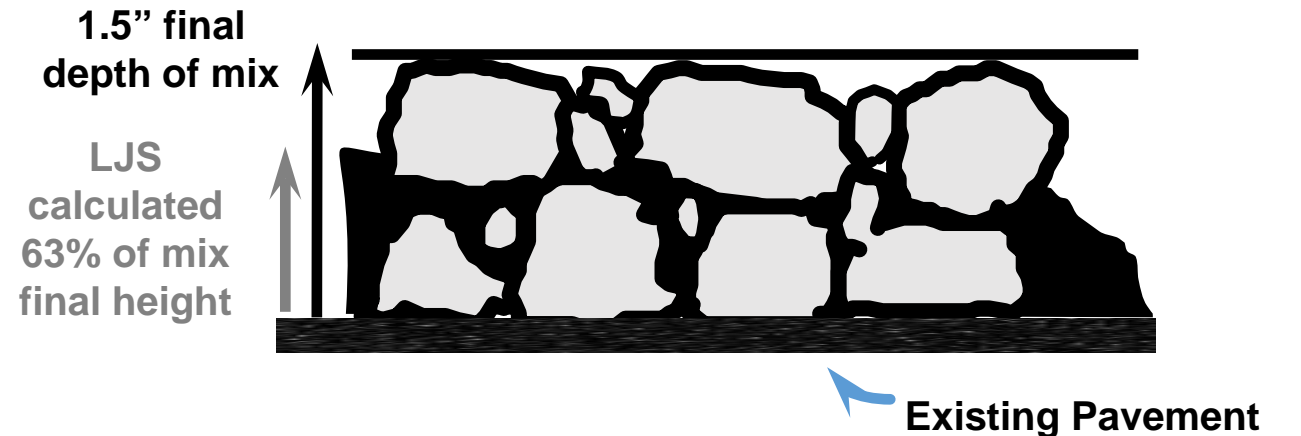
- Paving Speed Set as 22ft/min
- Breakdown Roller
 - Sakai High Frequency Vibratory
- Intermediate Roller(s)
 - BOMAG Pneumatic
- Finish Roller
 - BOMAG Steel



Courtesy of Asphalt Pro Magazine

- Unconfined Joints
 - 206 Nuclear Tests
 - Averaged **93.3%**
- Confined Joints
 - 224 Nuclear Tests
 - Averaged **94.5%**
- **+95%** of joints received maximum bonuses

- Void Reducing Asphalt Membrane
 - Heavy application of modified binder
 - 18 inches in total
 - Material wicks up to fill voids



Cross Sectional View at Longitudinal Joint

VRAM Application Methods



Placed by pressure distributor with mechanical agitation in tank

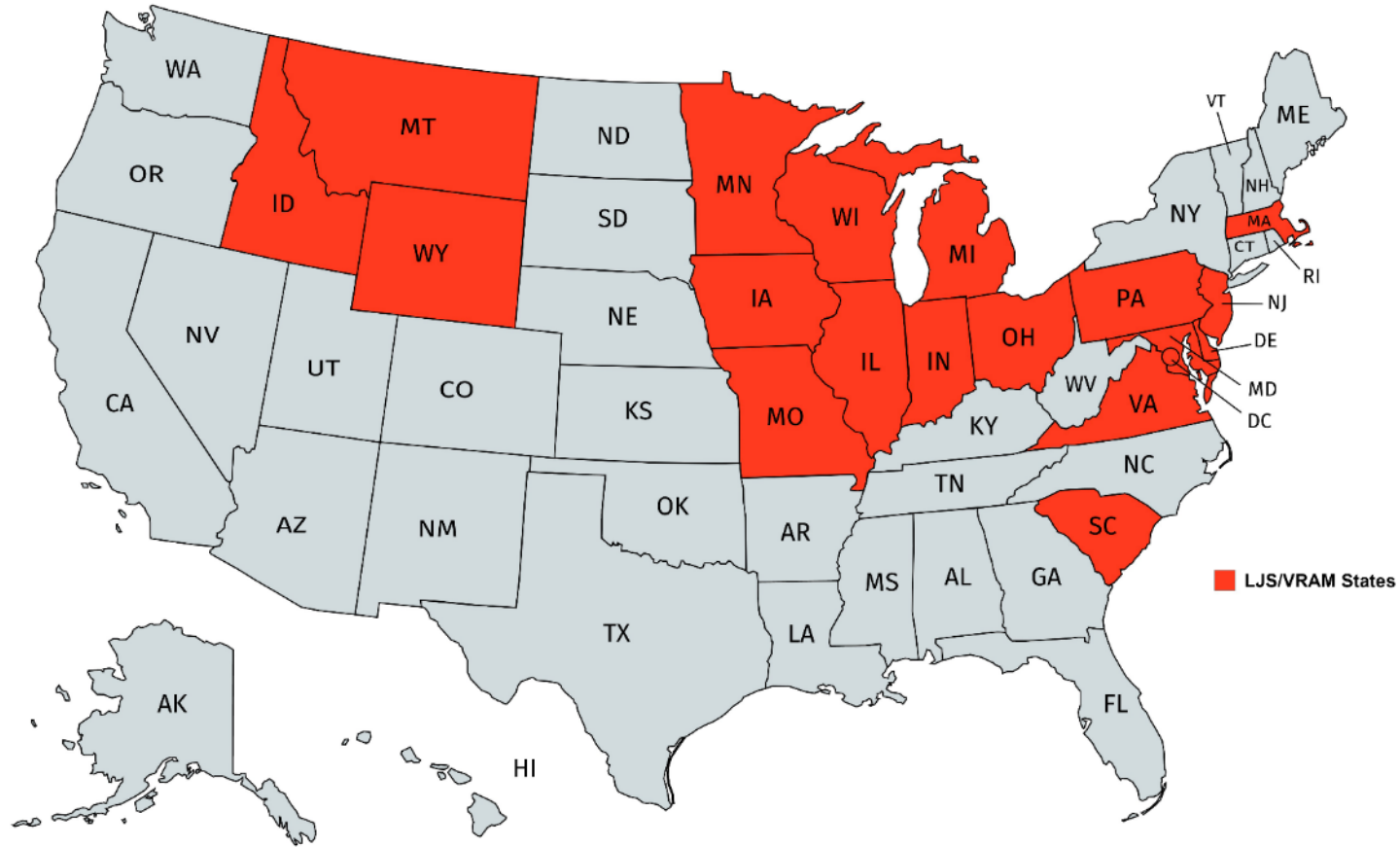


Manual strike off box fed from melting kettle



Tow behind melter applicator

States implementing specs or have had demos (2021)



Best Practices

Echelon Paving

- Common on Airports
- No cold joint
- Creates the best possible joint
- Not practical for all projects
 - Traffic
 - Production
 - Equipment



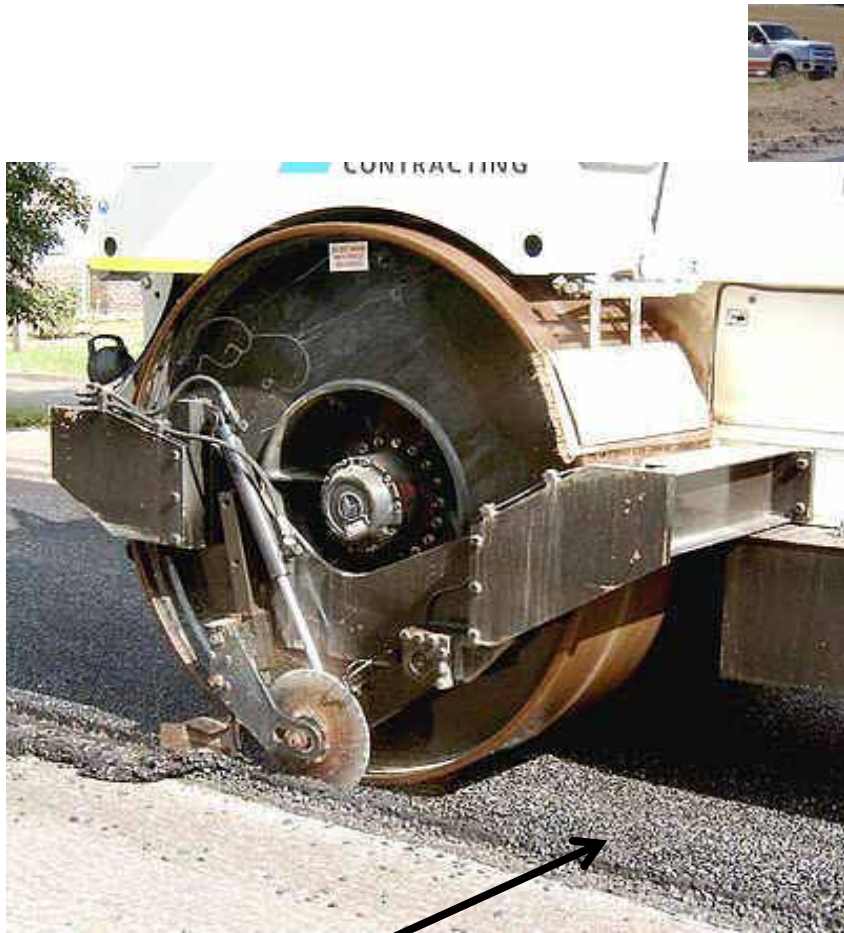
Courtesy of Gohkan Alay

Cutting Back the Joint

- Required on most airports
- Eliminates low density material
- “Waists” material
- Avoid tearing
 - Must do when mix still warm (temperature sweet spot)
- Critical to cut straight (stringline)
 - Easier with long wheelbase vehicle



Unacceptable Cutting



No guideline!



Cutting wheel,
but no guideline.
Not straight.



No cutting
wheel or
guideline!

Joint Construction Methods



Infrared Joint Heater

Pros:

- Can achieve good density and aggregate interlock
- No additional labor required
- No waste asphalt or edge cleanup
- “pretty” joint – no bridging/stacking

Cons:

- Limits paving production
- Additional aging of asphalt
- Will not work well with any moisture in the pavement
- Does not heat full depth

First Pass Must Be Straight!

String-line should be used to assure first pass is straight



Stringline for reference, and/or Skip Paint, Guide for following

If not straight, impossible
to get consistent overlap
with next pass

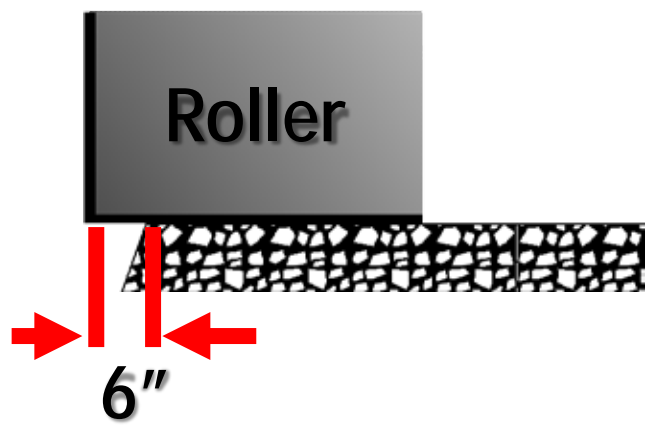


Best Way to Roll an Asphalt Joint

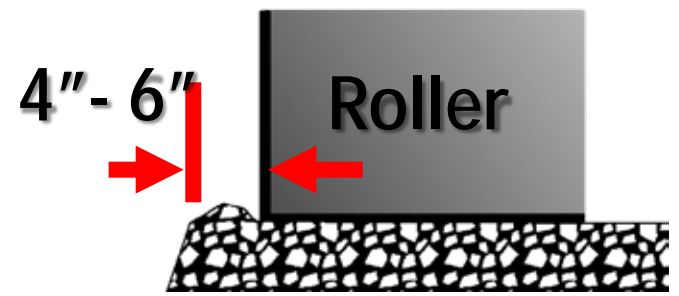
Rolling Unconfined Side?

50-50 on Where to Put 1st Pass

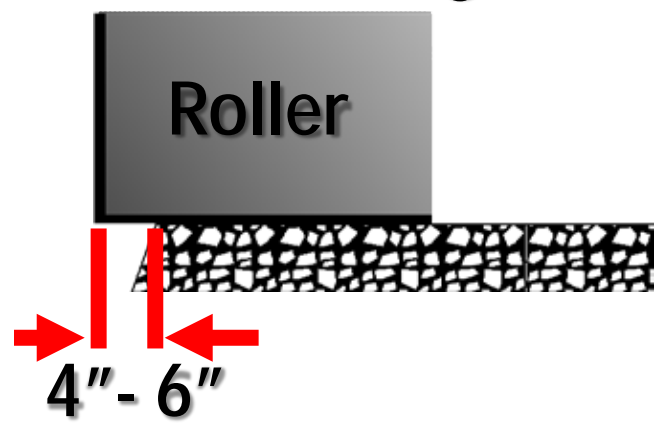
Option 1
Hang over 4-6"



Option 2
1st Pass 4"-6" inside



2nd Pass hang over 4"-6"



When Closing Joint, Set Paver Automation to Never Starve the Joint of Material

- Target final height difference of +0.1" on hot-side versus cold side
 - NH spec requires 1/8" higher
- If hot-side is starved, roller drum will "bridge" onto cold mat and no further densification occurs at joint



Proper Overlap:

- Cutback or milled:
 $.5'' \pm 0.5''$
- If not cutback:
then $1.0'' \pm 0.5''$

Bumping the Joint?



Rolling Confined Side



1st pass entire drum on hot mat with roller edge off joint approx. 6-12"



2nd pass overlaps on cold mat 3-6"

Consider Pneumatic Rubber Tired Rollers

- Kneading action helps provide tighter surface that is more dense and less permeable compared to drum rollers.
- Keep these away from unsupported edge to avoid excessive lateral movement of mat
- Use during intermediate rolling of supported edge
 - Not finish rolling





AI Longitudinal
Joint Webpage



Questions?