Promoting Quality through the FHWA / AI Cooperative Agreement

Mark Buncher
for
ETG, Sept 2014

ASPHALT INSTITUTE

Co-op Subtasks Led by the AI Regional Engineers

- **Best Practices for Constructing and Specifying HMA Longitudinal Joints**
- **Intelligent Compaction**
- **Tack Coat Best Practices**
- **MSCR Implementation at the State and Regional Level**

All promote quality to agencies

Too often longitudinal joints are the <u>weak link</u> in an otherwise long-lasting asphalt pavement.

- **Agency and industry concern!**
- **Offers greatest opportunity to improve overall life.**

Some States have more challenges than others!

4-Hour Longitudinal Joint Workshops

- Requested and hosted by DOTs
- Taught by AI Engineers
- AI Meets with DOT beforehand
- No cost to DOT or attendees
- Audience: mix of agencies, contractors, others

Workshop Goals

- Create greater awareness
- Improve specs by agencies
- Improve practices by contractors
- Increase use of innovative techniques, equipment, and materials
- Overall improved LJ performance

Longitudinal Joint Workshops (4-hrs)
Jan 2012 thru Jul 2014

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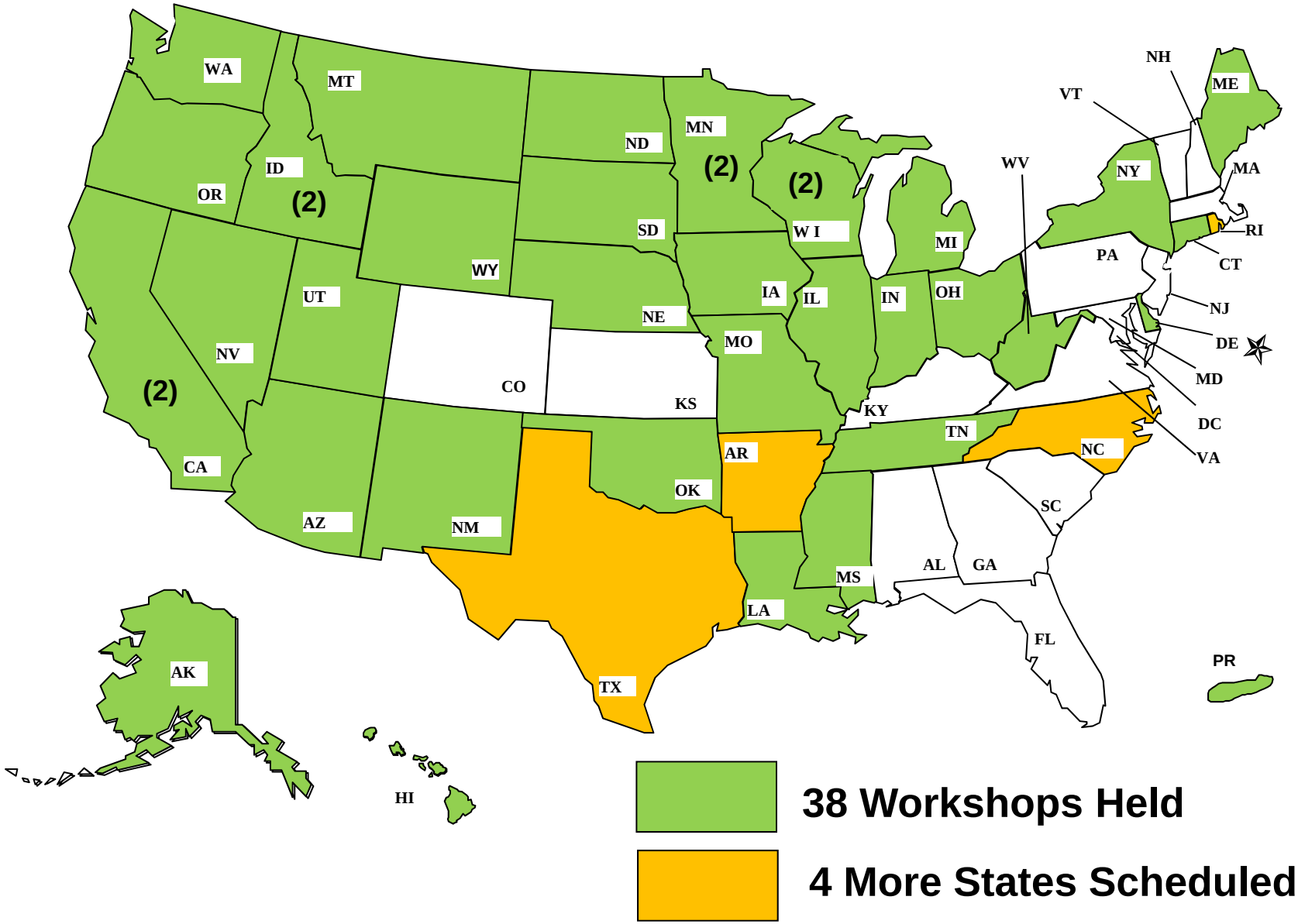

Reach of the LJ Project

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Attendance Totals for Workshops and Presentations Under Co-op

Jan 2012 thru Jul 2014

Year	LJ Workshops	LJ Presentations	Totals	
2012	640	1963	2603	13 Workshops 20 Presentations
2013	2081	1218	3299	19 Workshops 10 Presentations
2014 (thru Jul)	612	400	1012	7 Workshops 4 Presentations
Totals	*3333*	*3581*	*6914*	*39 Workshops* *34 Presentations*

Project Website

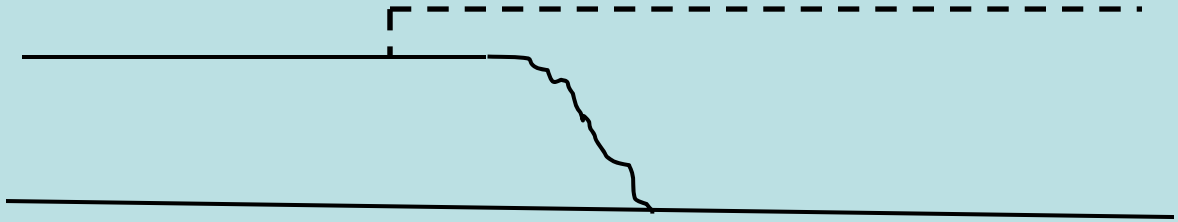
http://www.asphaltinstitute.org/public/engineering/longitudinal-joint-information

-Contains:

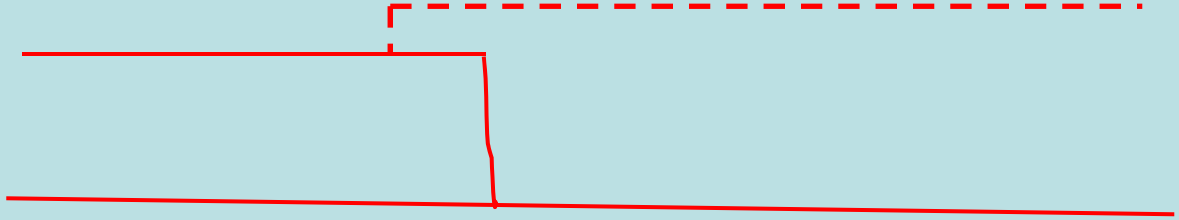
- Workshop infromation
- Handout of workshop slides (180+)
- Video of entire 4-hr Workshop in OH, Feb 2013
- 2-hr webinar, Oct 2012
- Project report
- 5-page “Summary of Recommendations”
- Magazine articles on project and findings

Defining Different Types of Longitudinal Joints

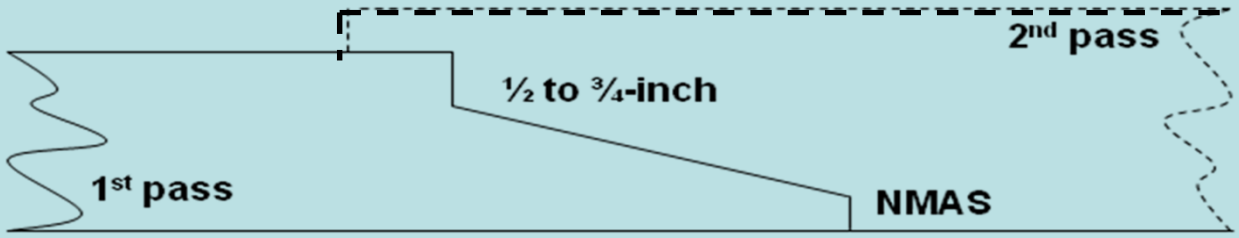
Butt (Vertical) Joint



Milled or Cutback Joint

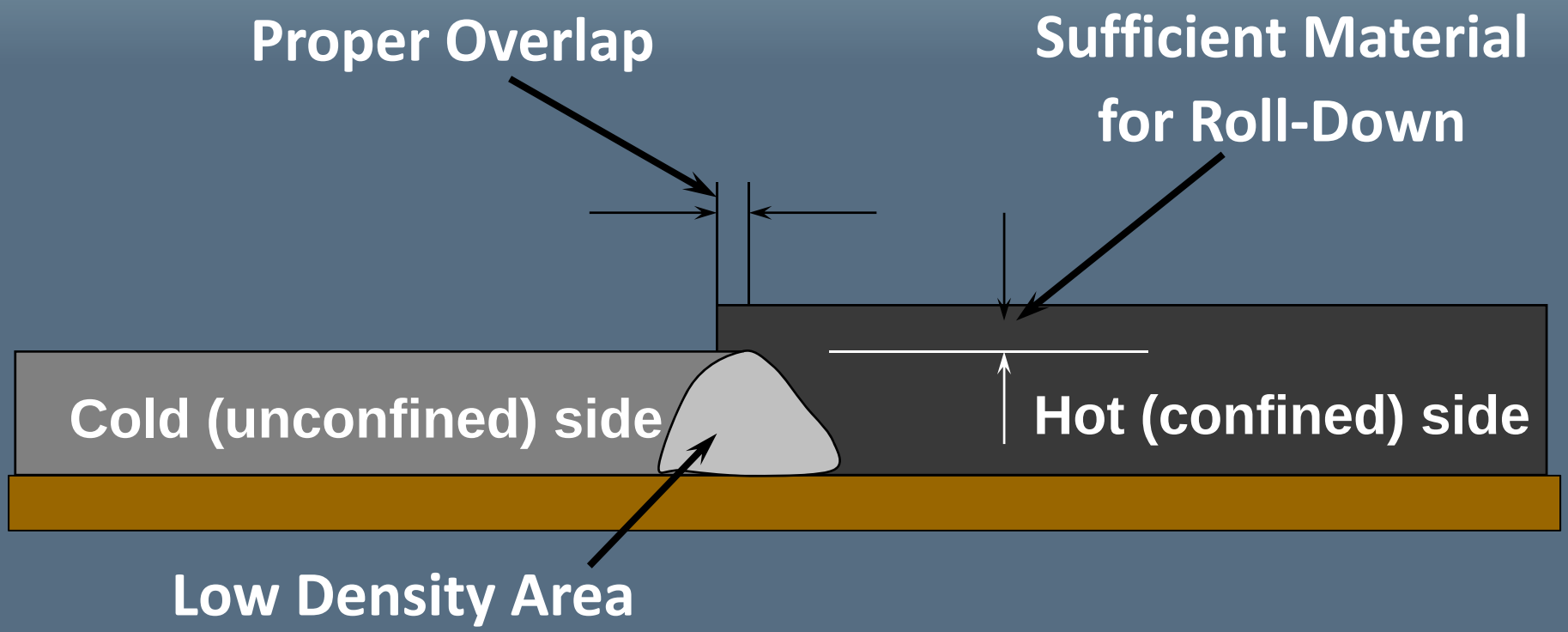


Notched Wedge Joint



Wedge 3:1 to 12:1

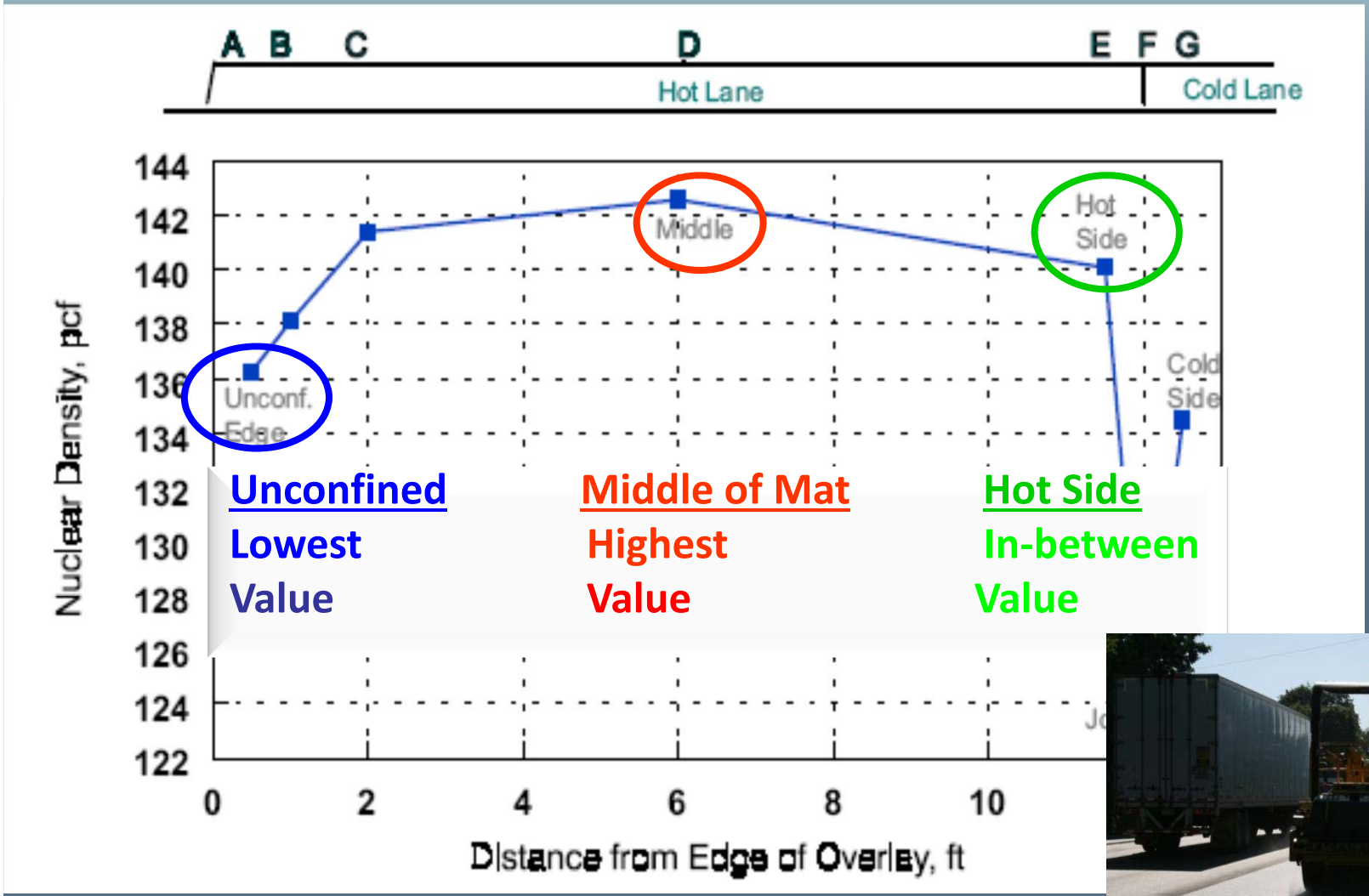
We Know Unsupported Edge Will Have Lower Density



Please note "Cold side" **and** "Hot side", **as they are terms used throughout this Workshop.**

Typical Nuclear Density Profile

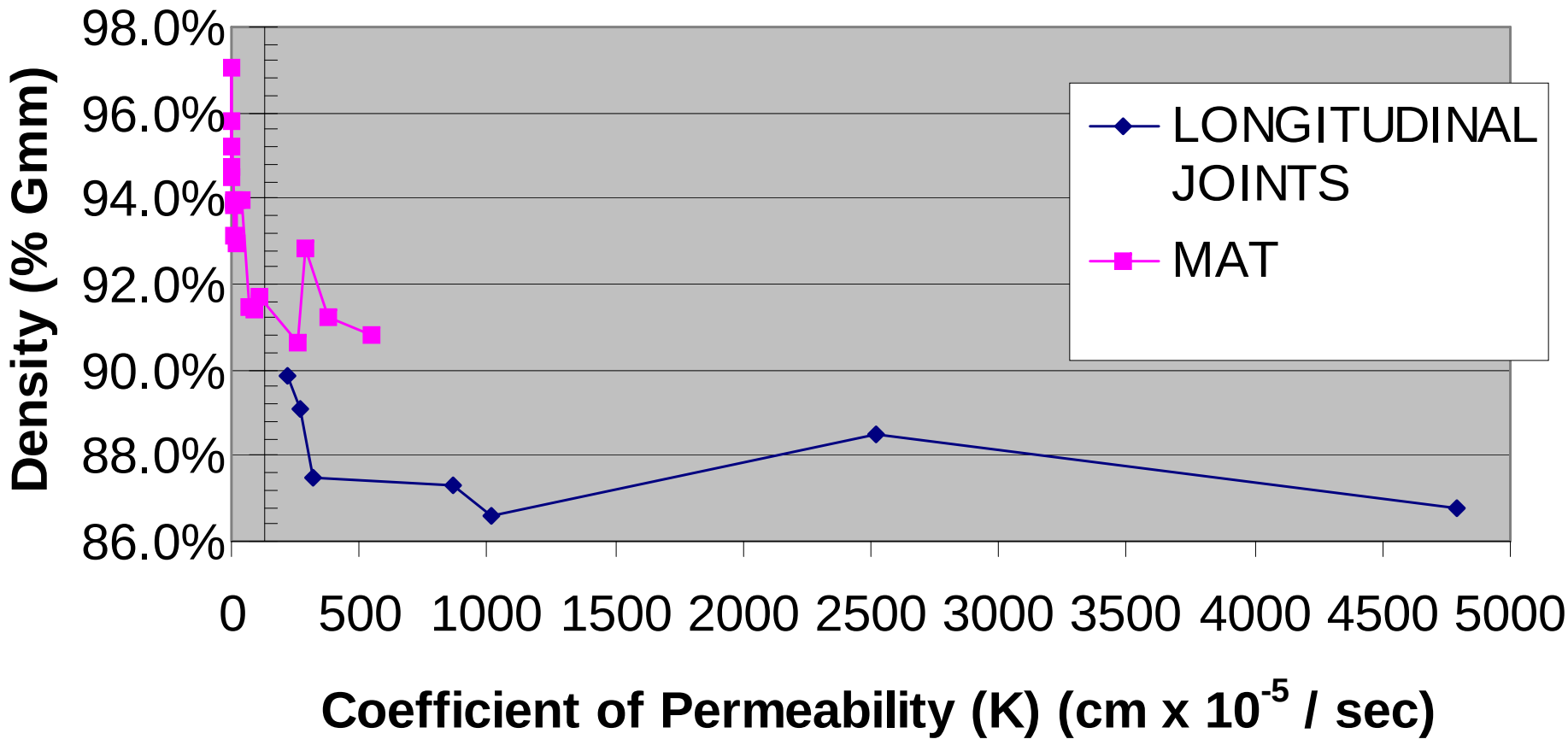
Texas Transportations Institute Study




…and then there's permeability
Permeability at the Longitudinal joint
Photo: Wes McNett

Permeability can be Catastrophic

Permeable Below 92% Density



Various Research Projects on Critical Air Void Level for Permeability

9.5 mm Mixes	Critical Voids where permeable
E. Zube - California Dept. of Highways - 1962	8.0
L. Cooley, B. Prowell, R. Brown – NCAT - 2002	7.7
R. Mallick, et al – NCAT Report No. 2003-(fine graded)	8.5

12.5 mm Mixes	
B. Choubane, et al – Florida DOT - 1998	7
J. Westerman – Arkansas HTD - 1998	6
R. Mallick, et al - NCAT Report No. 2003(coarse graded)	7

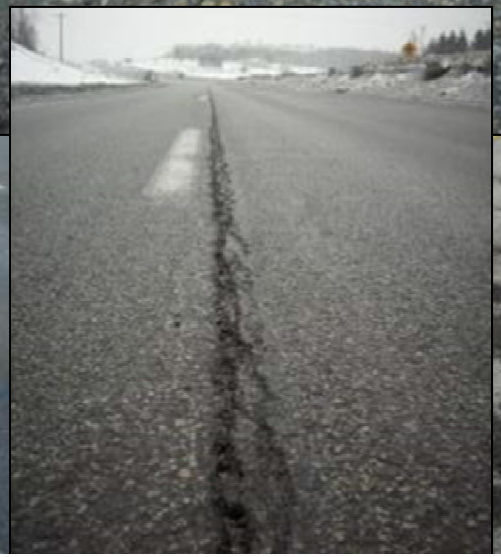
Proposed Acceptance Criteria for an LJ Density Spec

Six-inch Cores located either directly over visible joint for butt joint, or middle of wedge for wedge joint. This gives a 50/50 split, in order to average the G_{mm} of both lots.

- **$\geq$ 92% of G_{mm}: maximum bonus**
- **Between 92% and 90% of G_{mm}:**
  100% pay, pro-rated bonus, need to "overband" or "surface seal" joint
- **< 90% of G_{mm}: reduced payment, overband or surface seal joint**

LJ Initiatives in PA, CT, MI

Joint Issues In PA



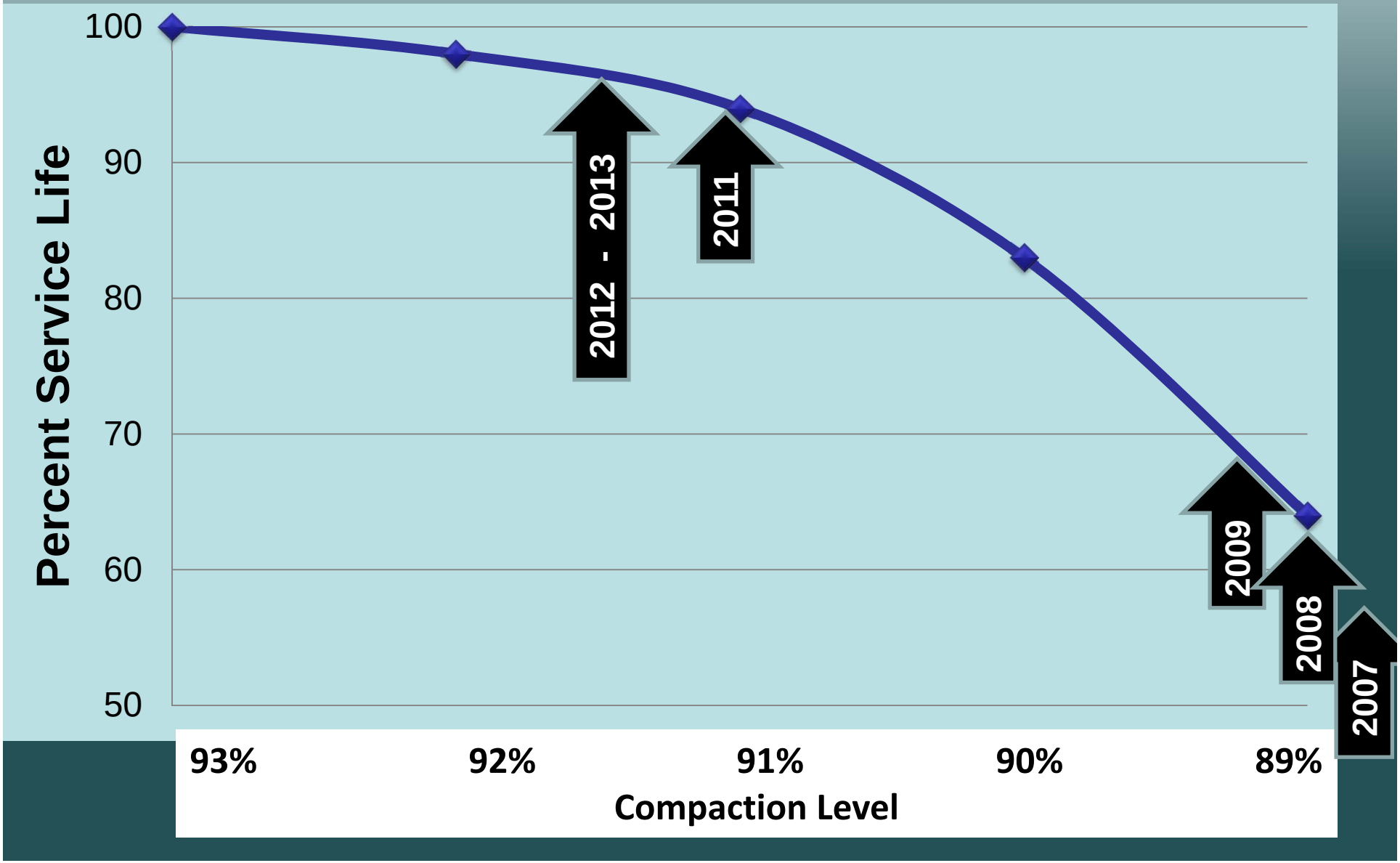
PA Story on Longitudinal Joints

Year	Activity to Address Joint	# Lots	Avg Joint Density, %	Avg Mat Density, %
2007	Began measuring joint density on random projects	18	87.8	93.9
2008	Implemented new method spec from MD	43	88.9	94.1
2009	Continued with same method spec	29	89.2	94.1
2010	Transitioned to new joint density spec using PWL, no official data	-	-	
2011	Fully implemented new jnt spec, PWL w/ bonuses and penalties	137	91.1	94,1
2012		162	91.6	94.0
2013		167	91.4	93.9

All joint densities by 6” cores over joint

3.8% increase over 5 years

Increased Projected Life of Joints Due to Improved Densities in PA, 2007 thru 2013



PA: Statewide Pay Impacts Since New Joint Density Spec (2011 - 2013)

2011

- $261,625 in bonuses
- $99,216 in penalties

2012

- $468,300 in bonuses
- $62,976 in penalties

2013

- $588,247 in bonuses
- $24,720 in penalties

Wedge Joints and Compactors

Vibratory Wedge Compactor

Plate Compactor

Average Joint Densities from PA DOT for Entire Paving Season

	2011	2012	2013
Notched Wedge	91.7%	91.7%	"mostly notched wedge joints"
Butt (vertical)	90.3%	90.7%	

Connecticut Joint Density Spec

- Prior to 2011, acceptance from gauges only
  - Tested joints only on hot side of joint
  - Require notch-wedge joints (12:1 to 8:1)
- In 2011, moved to cores
  - 92% min average required in mat
  - 91% min average required over joint
    - Requirement only for surface lifts
      - typically 2” lifts of 12.5 SP mix
    - Cores taken over middle of wedge

CT DOT Average In-Place Lot Density on Cores for Entire Year

Roadway (Non-Bridge)

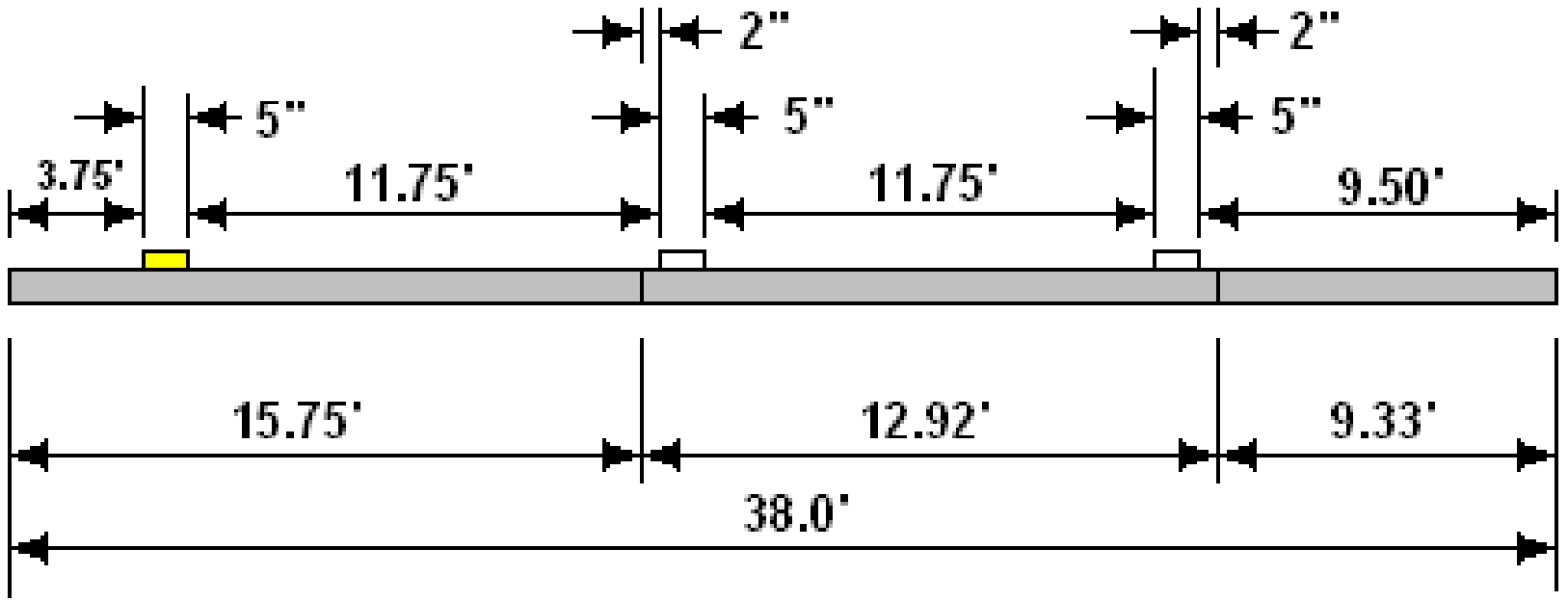
Year	Mat (Rqd. Min. of 92%)	Joint (Rqd. Min. of 91%)
Prior to 2010: Acceptance from gauges		
2011	**92.6%**	**91.6%**
2012	**93.0%**	**91.4%**
Std. Dev.	2.07 (on 2082 measurements)	2.40 (on 1863 measurements)
2013	**93.1%**	**91.8%**

MI DOT Joint Densities

6” cores directly over visible joint
1 core per 2,000 ft, 10,000 ft per section
Bonus/penalty based on averages, not PWL

- **2009**
  - **Avg: 89.77%**
- **2011**
  - **Avg: 90.71%**
- **2012**
  - **Avg: 91.59%**
    - **53% sections received bonus (Avg > 91.5%)**
    - **20% sections received penalty (Avg < 90.5%)**
    - **27% sections had no adjustment (90.5 < Avg < 91.5%)**

Final Lift Joint Layout Plan

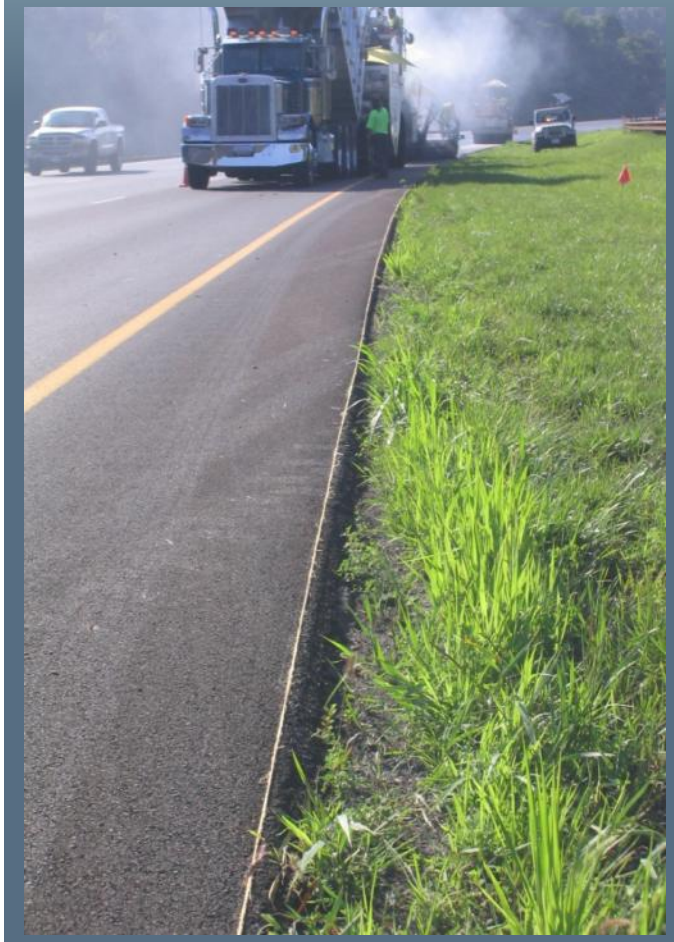


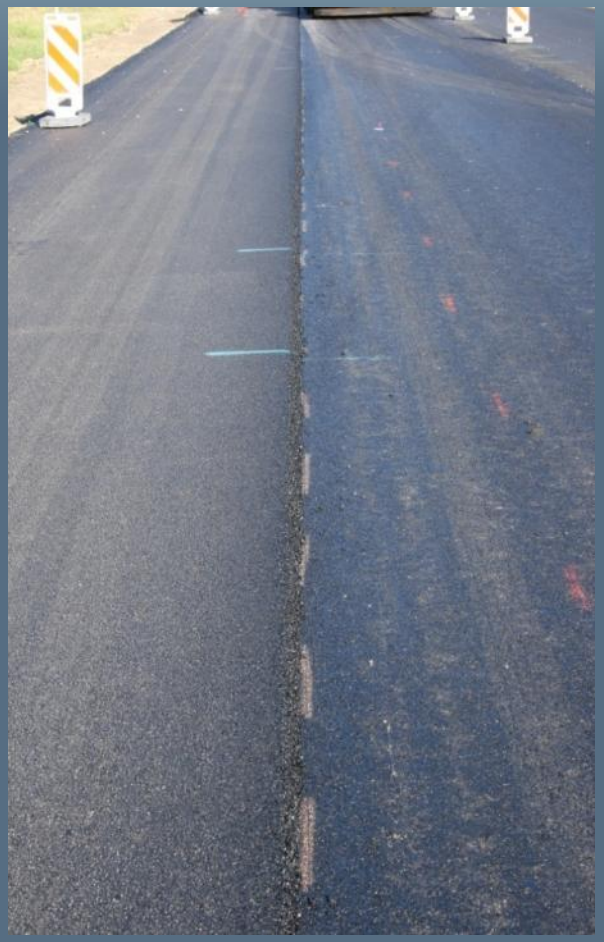
N.T.S.

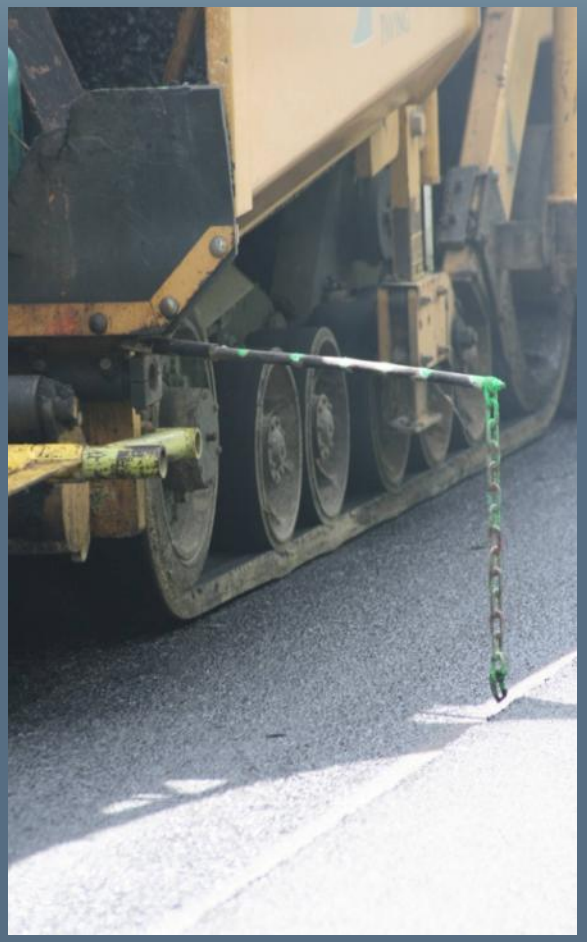
DELDOT

First Pass Must Be Straight!

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





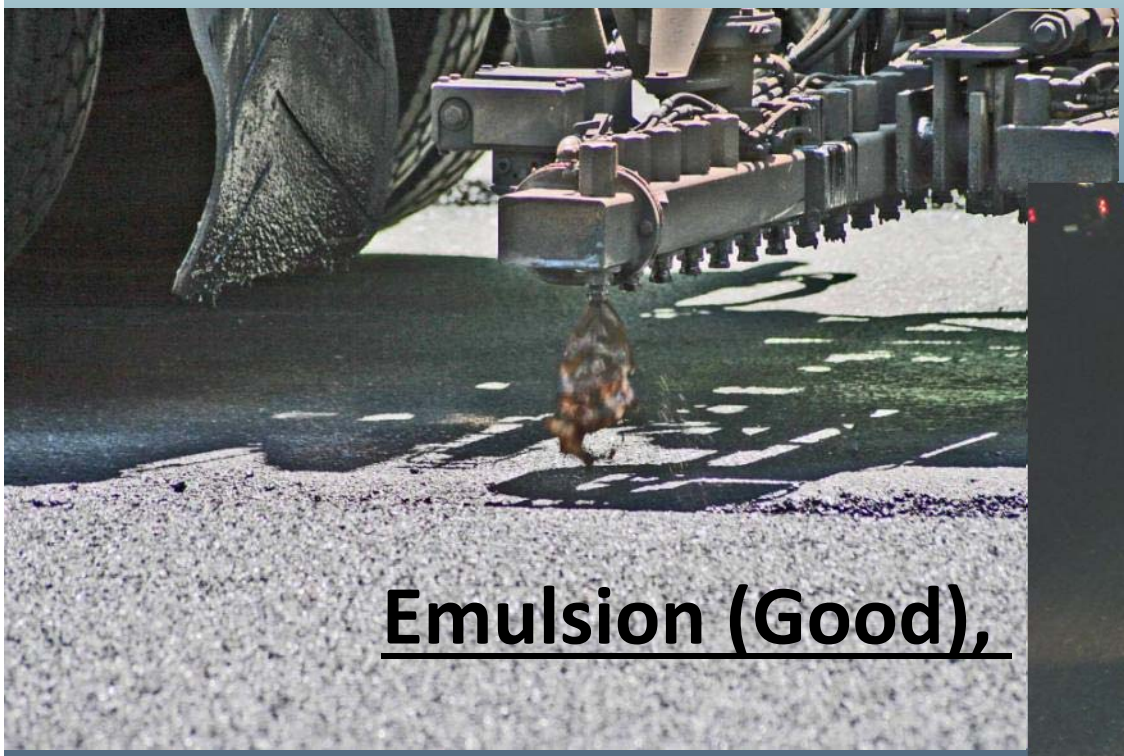


Stringline for reference, and/or Skip Paint, Guide for following

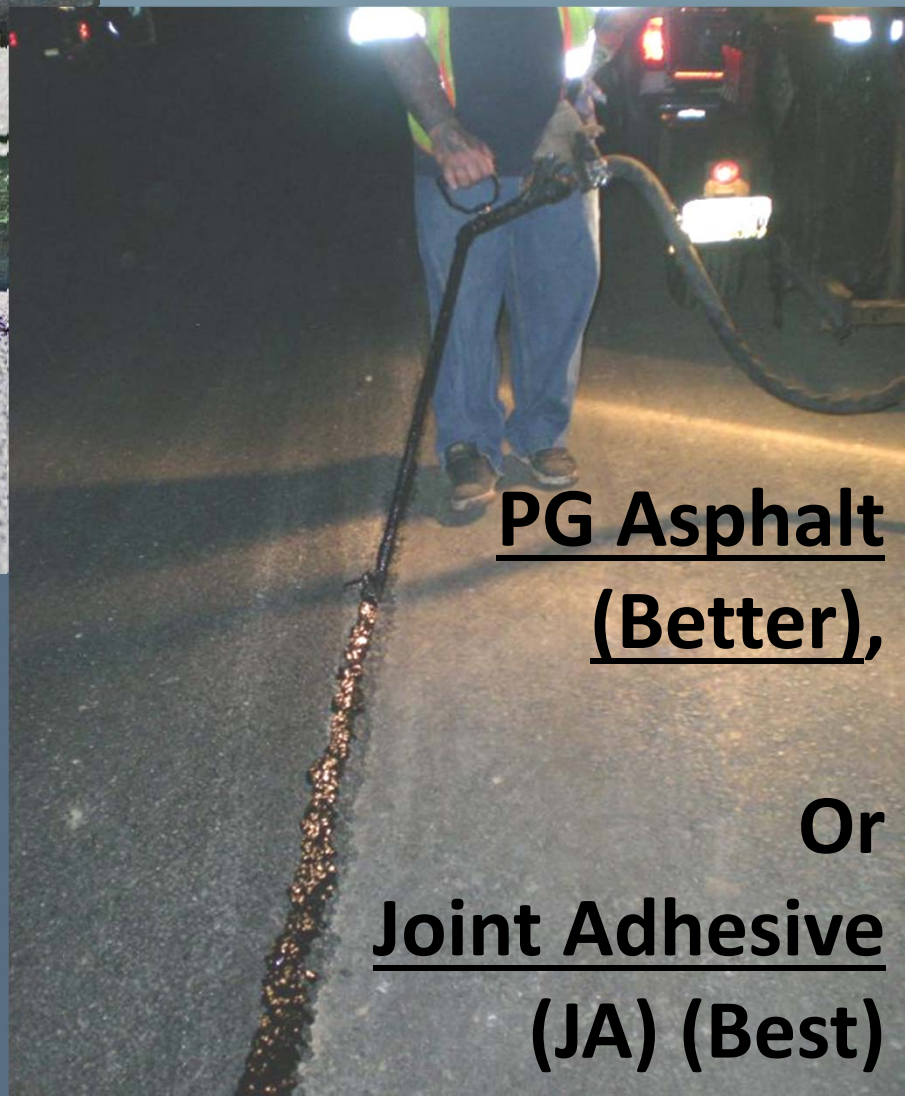
Tough to get proper overlap (1”) with next pass

Best Way to Roll a Joint

Paint the Side of Joint (Butt or Wedge)



Emulsion (Good),



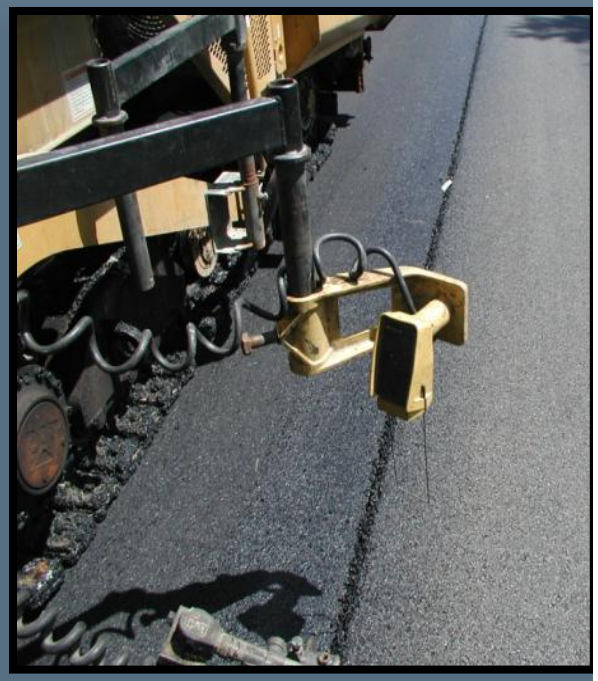
PG Asphalt (Better),

Or

Joint Adhesive (JA) (Best)

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

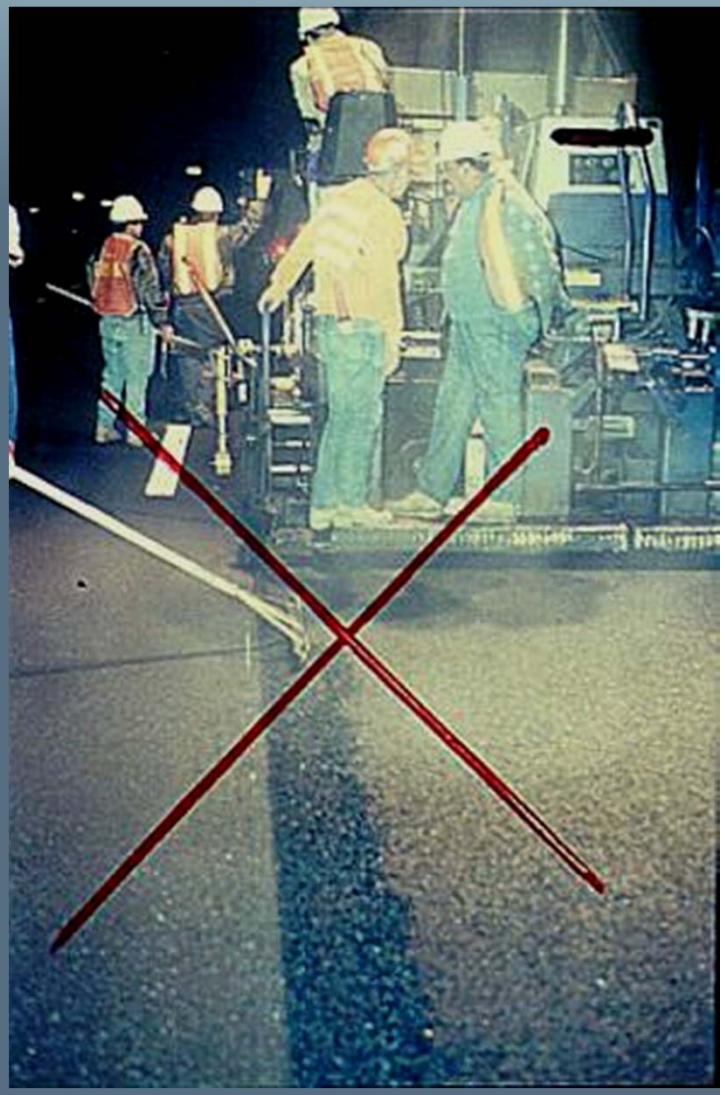
- Target final height difference of +0.1” on hot-side versus cold side
  - NH spec requires 1/8” higher
- Joint Matcher (versus Ski) is best option to ensure placing exact amount of material needed
- If hot-side is starved, roller drum will “bridge” onto cold mat and no further densification occurs at joint



Proper Overlap:

- 1.0 ± 0.5 inches
- Exception: Milled or sawed joint should be 0.5 inches

Bumping the Joint?



SECTION 5

Other Options / New Products

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

GOAL
14 year old surface

- I-65 in IN: SR252 to US31
  - 12 inches HMA over Rubblized JCP
  - Warranty Project

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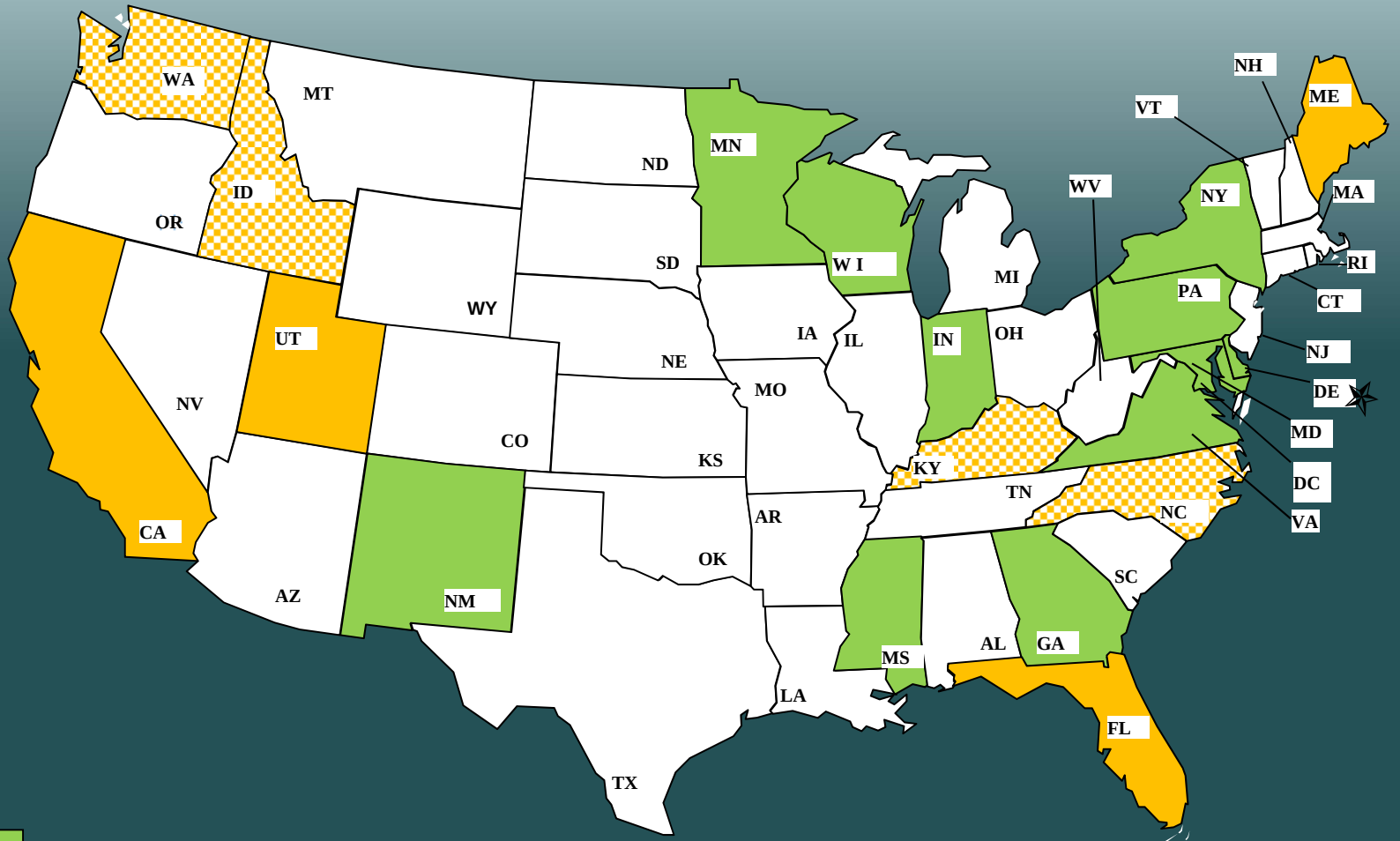
Improving Quality Control with Intelligent Compaction

AI Participation in IC Research Projects Under FHWA/AI Co-op

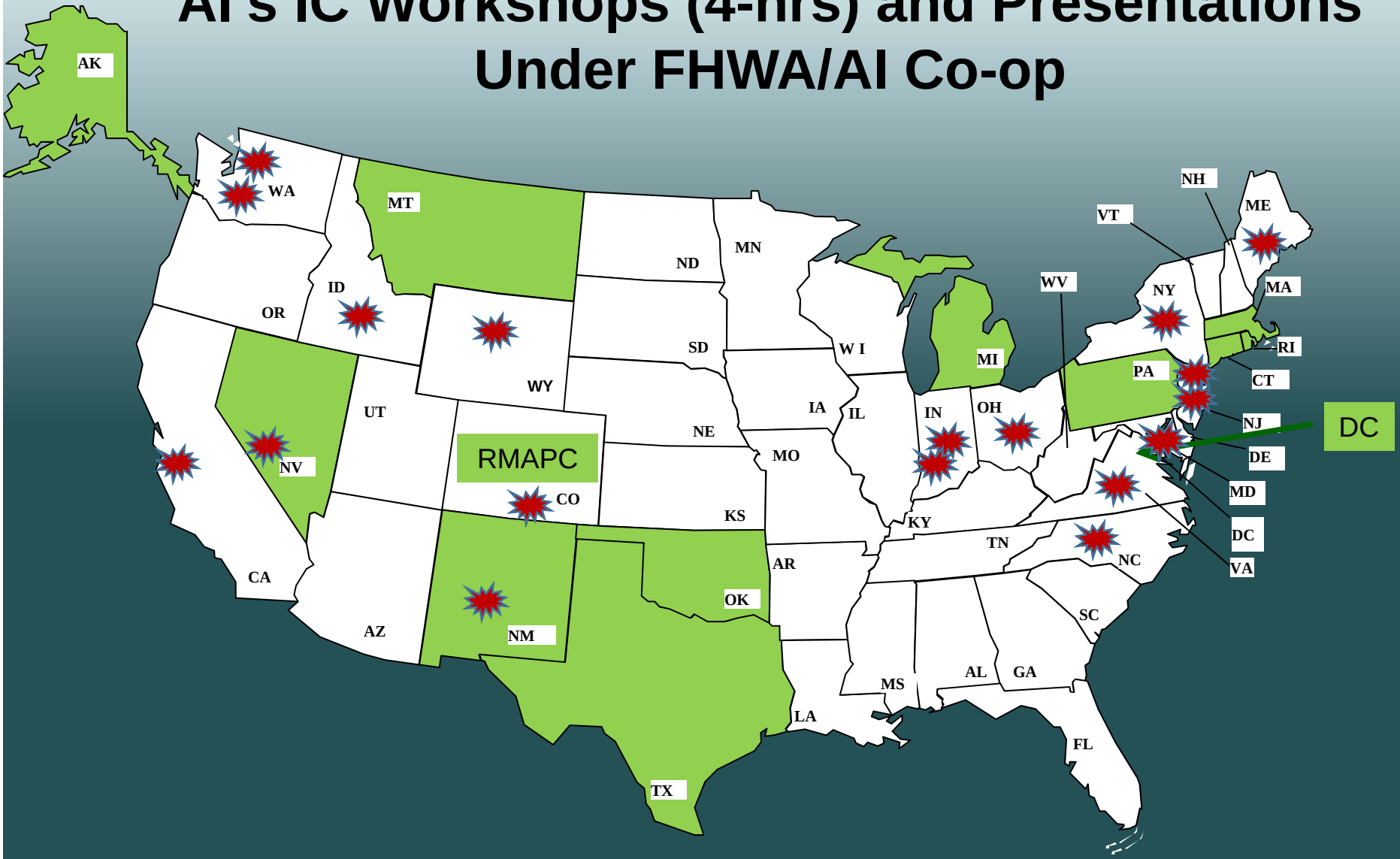


10 FHWA IC Pooled Fund Projects (2008-2010)

4 FHWA IC / In-Place Density Projects (2012-2013)

4 FHWA IC / In-Place Density Projects (Summer 2014)

AI's IC Workshops (4-hrs) and Presentations Under FHWA/AI Co-op



13 Workshops Held (2013 – Jun 2014)

18 Presentations Across U.S. (2013 – Jun 2014)

Tack Coat Workshop Coming Soon!

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Subject Areas

- terminology related to tack
- purpose of tack coats
- materials commonly used
- properties of newer materials
  relative to those commonly used
- proper handling, storage, and testing
- past and current research findings
- bond testing options
- best practices for construction & inspection

Pilot TC workshop planned for MD DOT this Fall