2023 CAPRI FALL MEETING• OCTOBER 2023













OHIO DEPARTMENT OF TRANSPORTATION

OHIO LONGITUDINAL JOINT SOLUTIONS

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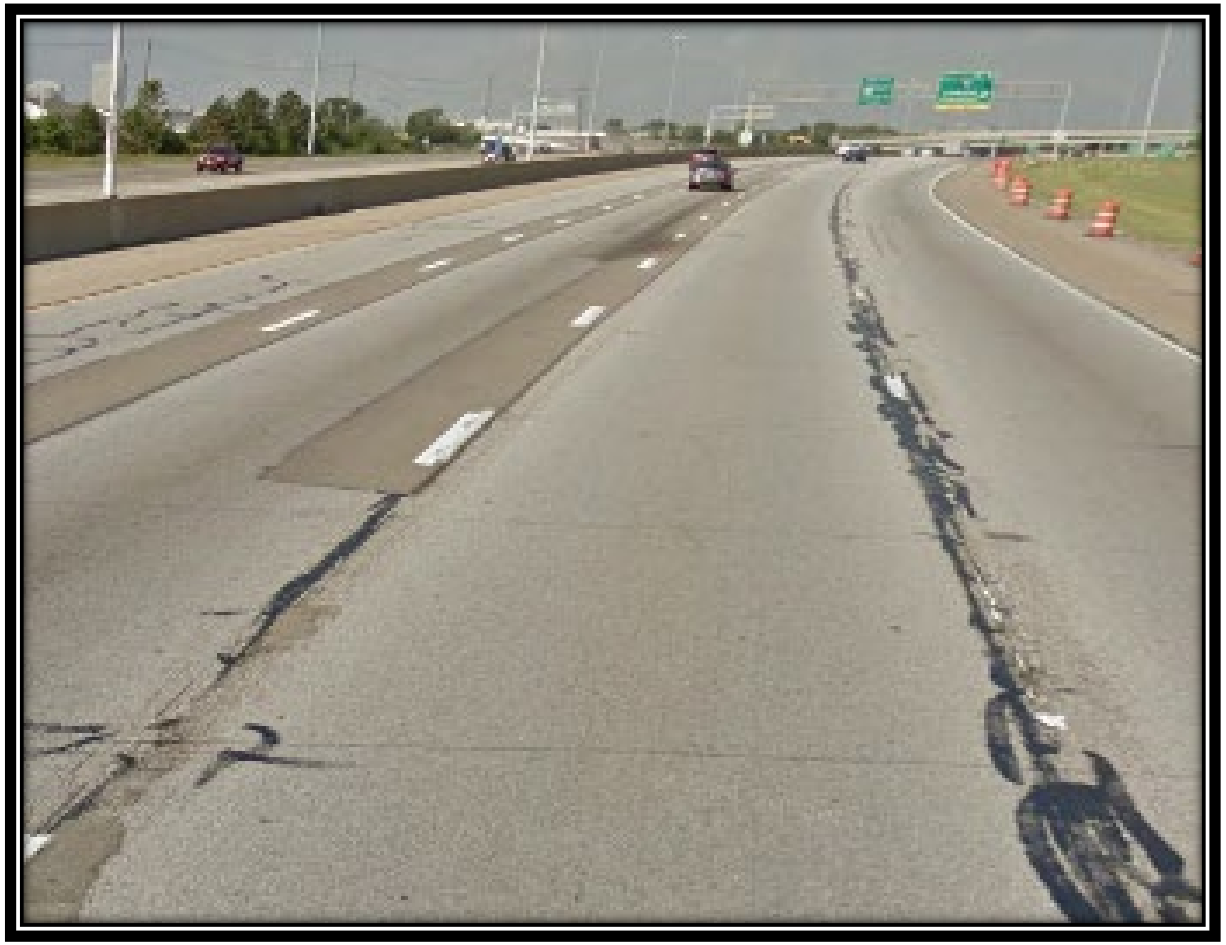
WHY CHANGES?

- Approximately 25% Early Joint Failure Rate
- Slot Paving is $$$ Expensive $$$
  - $35-60k per linear mile of joint (as of 2016 numbers)
  - ~24%-40% of Surface Cost
  - On Avg. 2 yrs before Resurfacing
- Low joint density is the primary cause of failure
- Mainly US freeways, interstates, etc. (Ohio uses Superpave on heavy traffic routes; Marshall for everything else).



WHAT CAUSES JOINT PROBLEMS?

Pavement Properties:

- Low Density = High Permeability

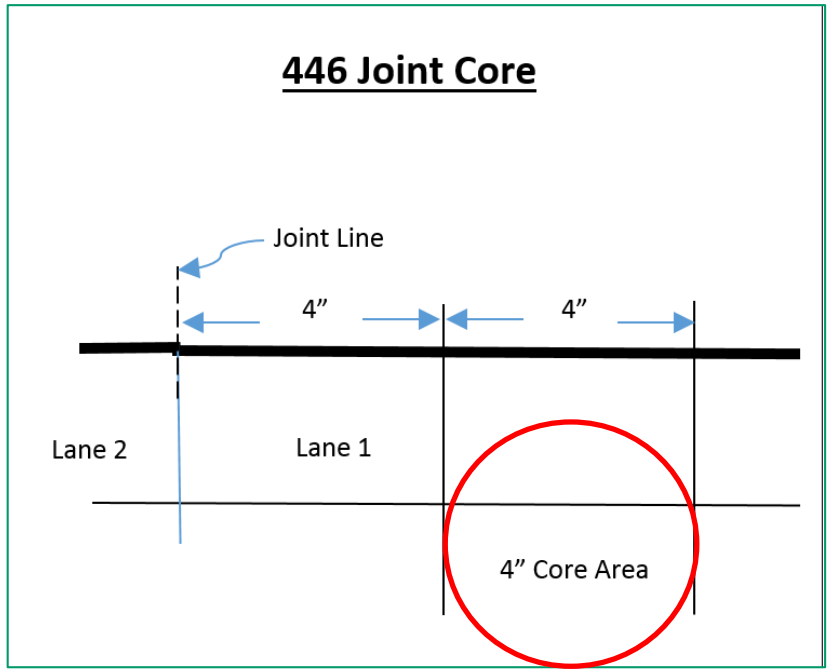
Causes of Low Density:

- Poor Mix Design
- Segregation
- Unconfined edge issues
  - Not straight
  - Edge unstable
  - Poor tack coat
- Improper rolling practice
- Improper height on confined edge

CURRENT SPECS?

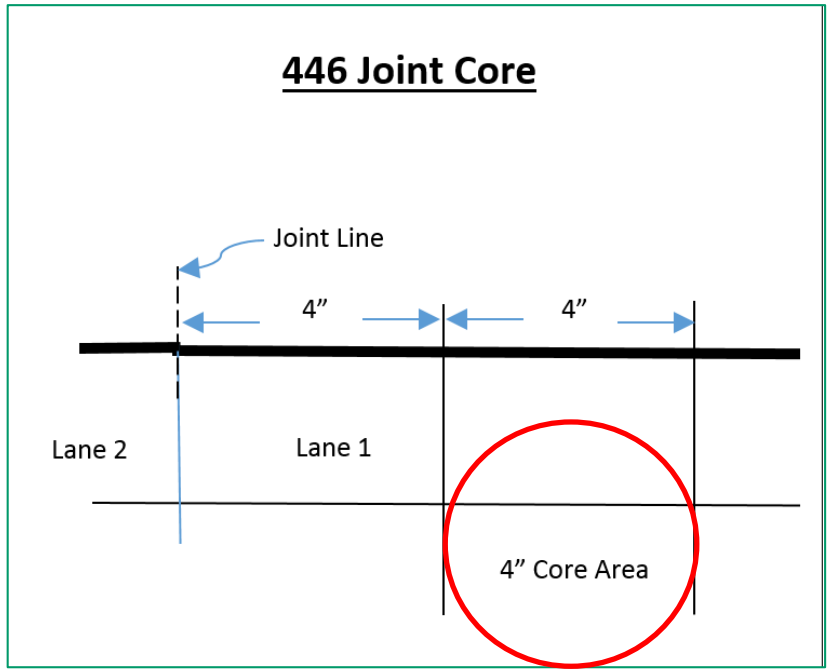
446 Density acceptance:

- 10 – 4-inch cores per production day with 3 being joint cores.
- Joint cores are 6 inches on center from joint
- 10 cores averaged for a pay factor

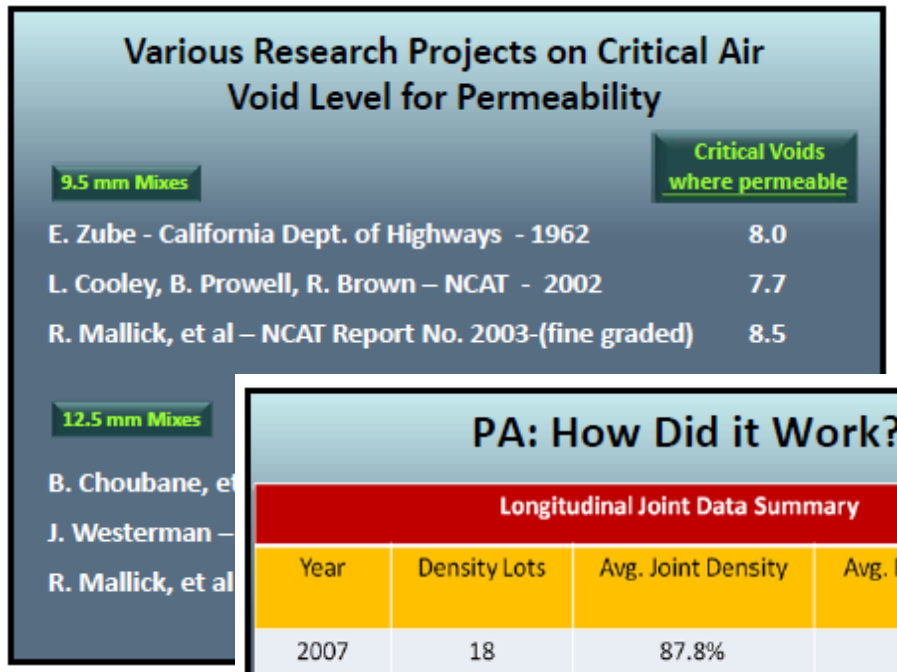


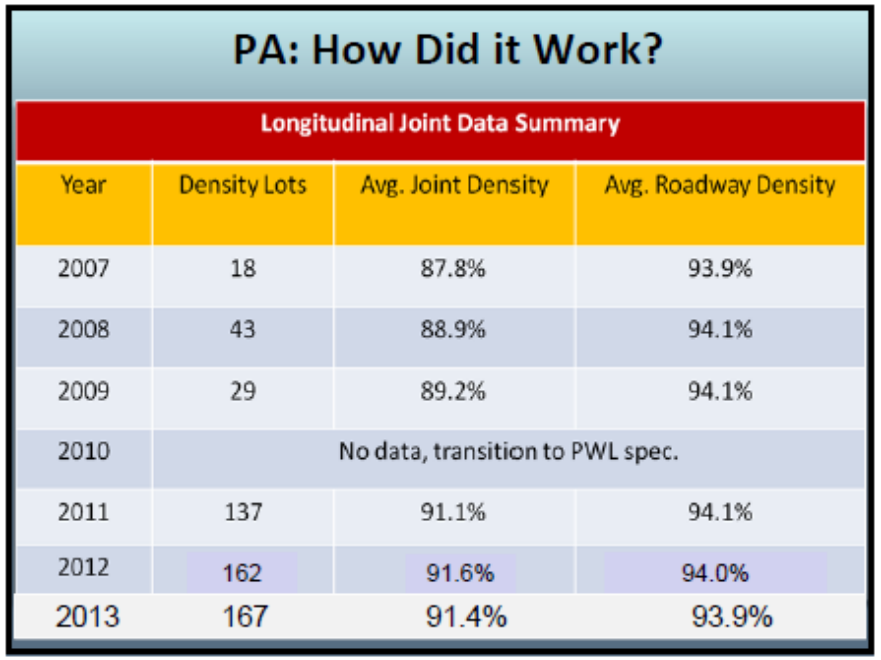
CURRENT SPECS?

- 2013 coring research – 4% avg. density drop in 4”
- 446 Joint cores are not adequate.
  - 90% density @ 4 inches is too low
  - Averaging joint/mat cores masks the problem
  - Deviations are too high



HOW TO GAIN MOMENTUM





PA: How Did it Work?

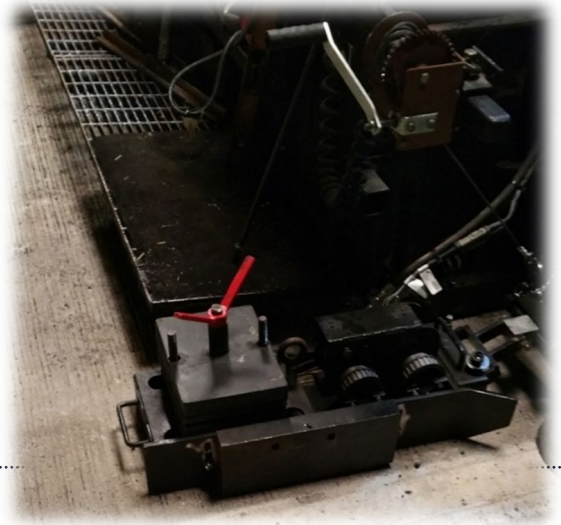
Longitudinal Joint Data Summary

Year	Density Lots	Avg. Joint Density	Avg. Roadway Density
2007	18	87.8%	93.9%
2008	43	88.9%	94.1%
2009	29	89.2%	94.1%
2010	No data, transition to PWL spec.		
2011	137	91.1%	94.1%
2012	162	91.6%	94.0%
2013	167	91.4%	93.9%

- Hosted FHWA/AI Joint Density Workshop – Feb 2012
- Formed joint task force with Industry
  - Presented Research
  - Evaluated Other State's Specs
  - Collected Data on Existing Projects
  - Developed Trial Specs
  - Allowed Low Risk Trials

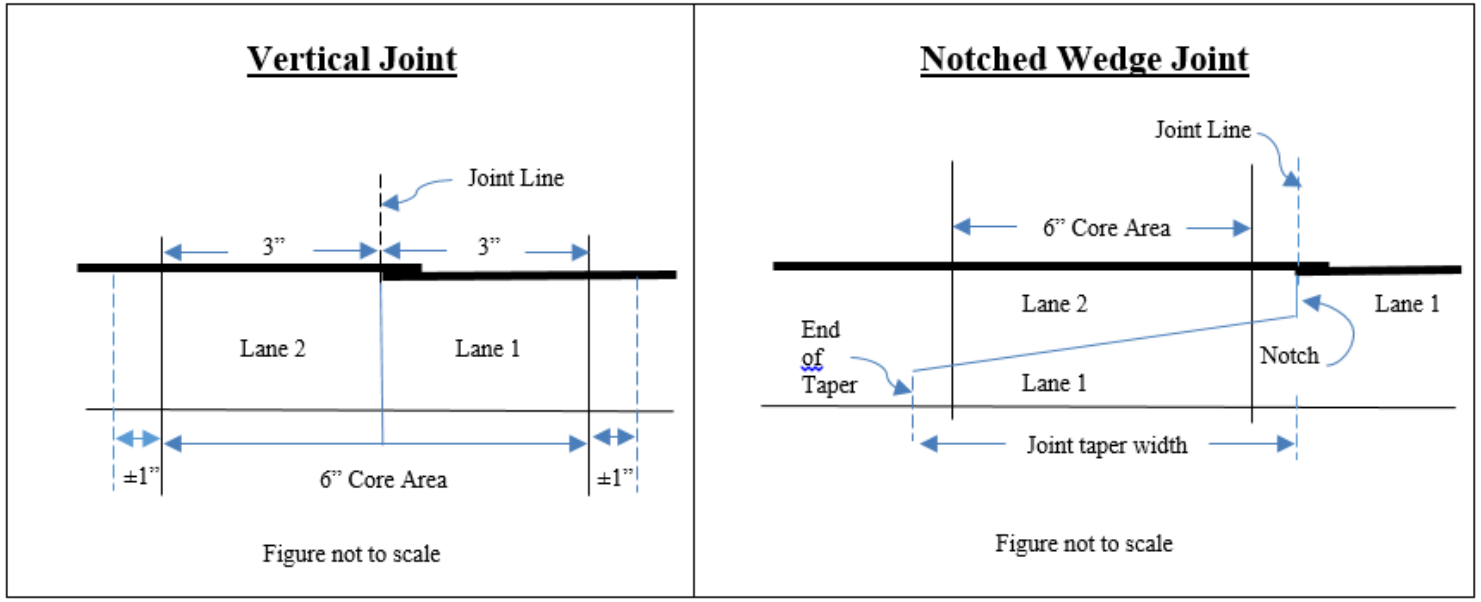
2014 TRIAL PROJECTS?

- Allowed 6-inch cores on joint on 446 projects.
- Void in bottom of core is problem:
- Starving the joint is a problem.
- Current Joint Construction Methods are not adequate.
- There will be a learning curve.
- Pay Factors are Achievable / Challenging



NEW JOINT DENSITY SPECS – REFERRED TO AS SS-806

- Mocked PA DOT's specs
- 90% Minimum Density Target
- PWT > 90 – Bonus up to 2%
- PWT = 61 to 89 – Full Pay
- PWT< 60 – Deduct up to 5%
- 6 in. cores directly over joint
- Lot = Entire Project Cold Joint
- Sublot = 1 core per 2500LF
- Require hot applied Joint Adhesive on joint face rather than PG binder
- Mat Density remained the same as 446 (10 – 4-inch mat cores)



Goal: Get an additional 2 years performance to match pavement distress on mat

2015 NEW SPEC RESULTS

Proj.	Mat Avg.	Joint Avg.	% Drop	Mat PF Avg.	Joint PF	Joint PWL	Joint Type
1	94.3%	88.2%	-6.47%	101.8%	95.0%	6.6	3in. Cutback with confined joint
2	94.9%	90.1%	-5.06%	101.8%	96.9%	53.8	Multiple Joint treatments
3	94.8%	88.9%	-6.22%	101.8%	95.0%	25.3	Unconfined no additional effort
4	92.6%	87.7%	-5.29%	98.8%	95.0%	0.0	Unconfined no additional effort
5	93.5%	92.4%	-1.18%	100.0%	101.9%	99.7	6in. Cutback on unconfined edge

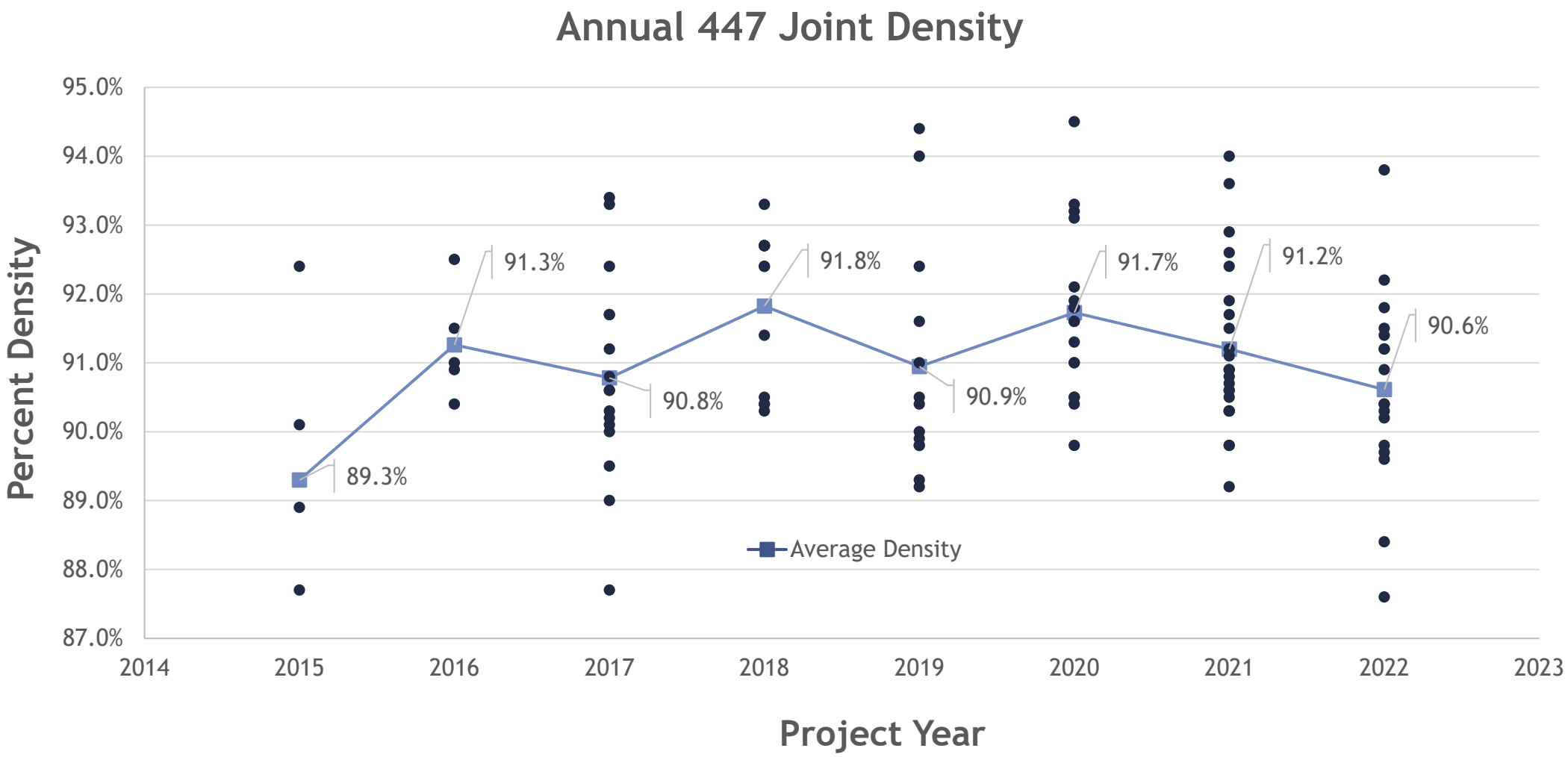
* Project 1 mat density data is missing final lot.

** Project 2 is not complete, second half of project will be finished in 2016.

CURRENT 447 PROJECT DATA

	Number of Projects	Average Joint Density	Average Joint PWT	Average Joint Pay Factor	Average Mat Density	Average Mat Pay Factor
2015	4	89.3%	33	0.97	93.8%	100.8%
2016	5	91.3%	80	1.02	93.9%	101.3%
2017	16	90.8%	63	0.99	93.8%	101.0%
2018	12	91.8%	87	1.02	93.7%	100.1%
2019	13	90.9%	64	0.98	93.4%	99.3%
2020	17	91.7%	81	1.00	-	-
2021	23	91.2%	68	0.99	-	-
2022	17	90.6%	75	0.99	-	-

CURRENT DATA



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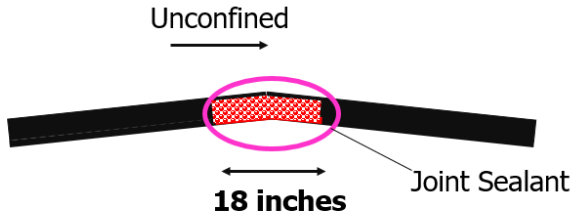
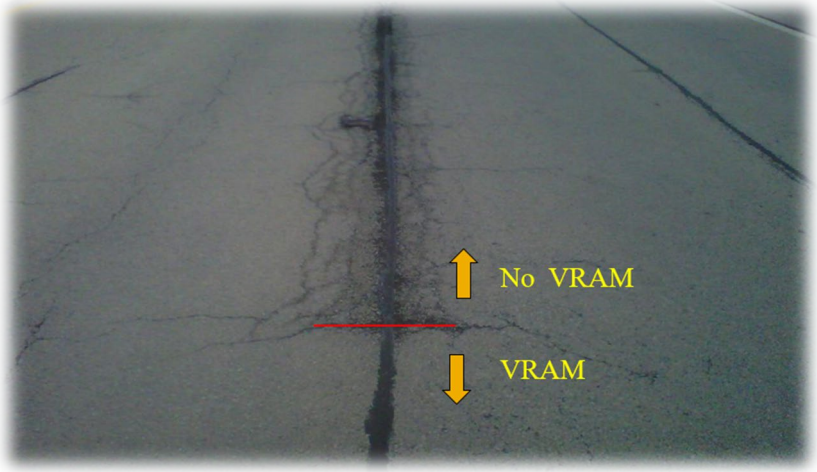
VRAM – VOID REDUCING ASPHALT MEMBRANE

What is VRAM?

- Highly modified asphalt binder
- Applied under new surface course at joint location
- Non-tracking in ~15 min.
- Illinois DOT data (See picture)
- Average Cost ~ $2.70/ LF **





VRAM – VOID REDUCING ASPHALT MEMBRANE

Pilot Projects:

- 12 test sections – 1st in 2016
- Targeting 12.5mm surface mixes on the priority system
- Test / Control Monitored Annually
  - Compared against 446 and not the new joint density spec.
- Central Office will monitor sections for full implementation

VRAM – VOID REDUCING ASPHALT MEMBRANE

Rate the following 3 categories:

- Cat #1: Length (ft.) of single cracking < ½”
- Cat #2: Length (ft.) of multiple cracking where all individual cracks are < ½”, do not sum crack widths
- Cat #3: Total length (ft.) of the following 3 situations (= a + b + c)
  - a. Length where any crack is ≥ ½”
  - b. Length currently spalled
  - c. Length currently patched

VRAM

2022
Cat1 – 5280
Cat2 – 0

Control

2022
Cat1 – 4656
Cat2 – 18

I-71 VRAM (PROJECT 17-0036)

VRAM

2021

Cat1 – 5241 feet (down); 5237 feet (up)

Cat2 – 39 feet (down); 43 feet (up)

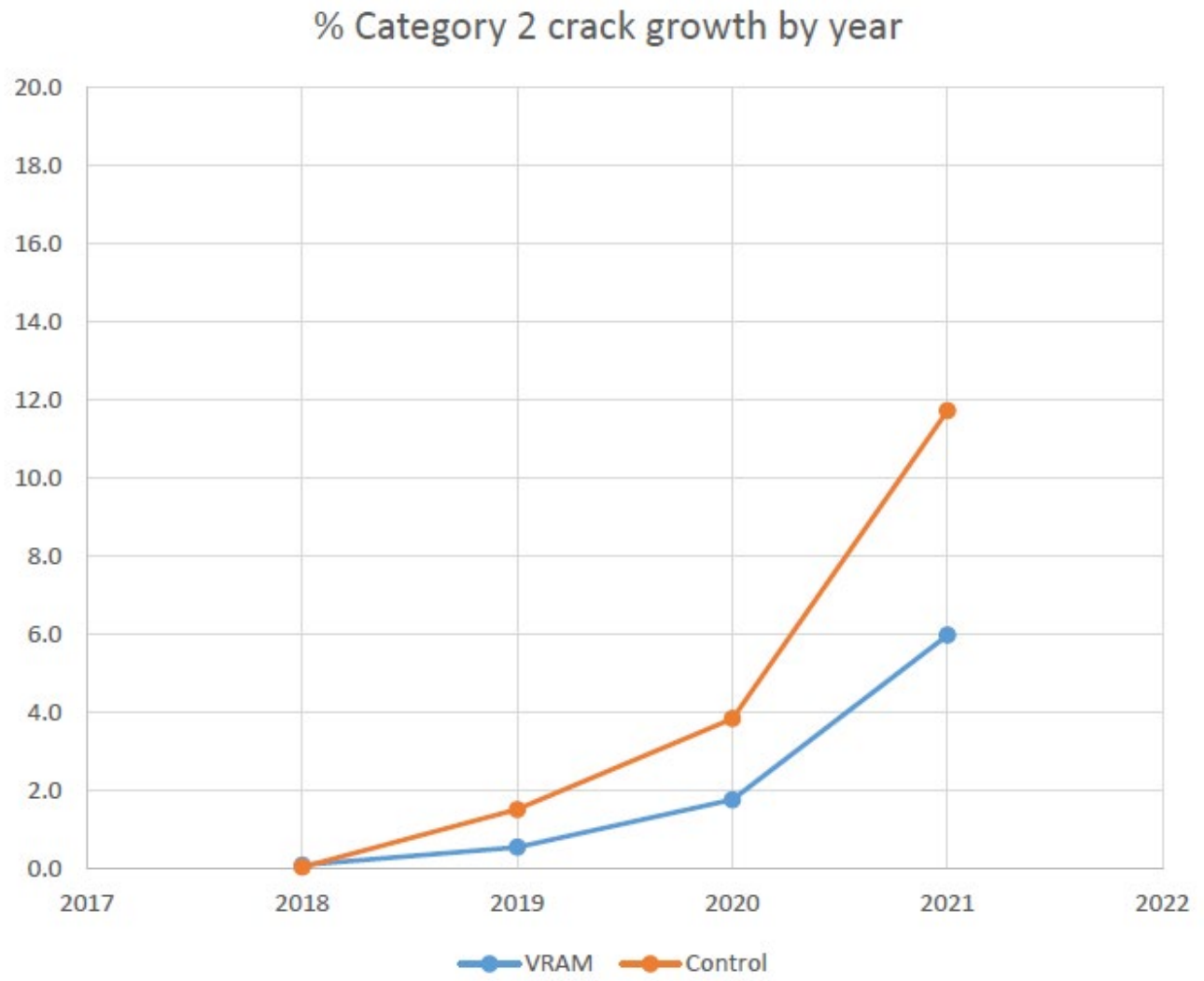
Control

2021

Cat1 – 4959 feet (down); 1800 feet (up)

Cat2 – 321 feet (down); 3480 feet (up)

VRAM – VOID REDUCING ASPHALT MEMBRANE



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COST COMPARISON

- 447 Longitudinal Joint Spec:
  - Incentive of $880 + milling/asphalt $1,500 = ~$2,380/lane mile ($0.50/ft)
- VRAM
  - $1.50 to $2.00/ft
- 447 LJ Spec < VRAM

CONCLUSIONS

- Long Joint Spec has improved overall joint density.
- Working with industry was key to successful implementation
- Continuing to monitor 447 spec performance
- VRAM appears to be viable alternate

QUESTIONS

Last updated 10/14/2023