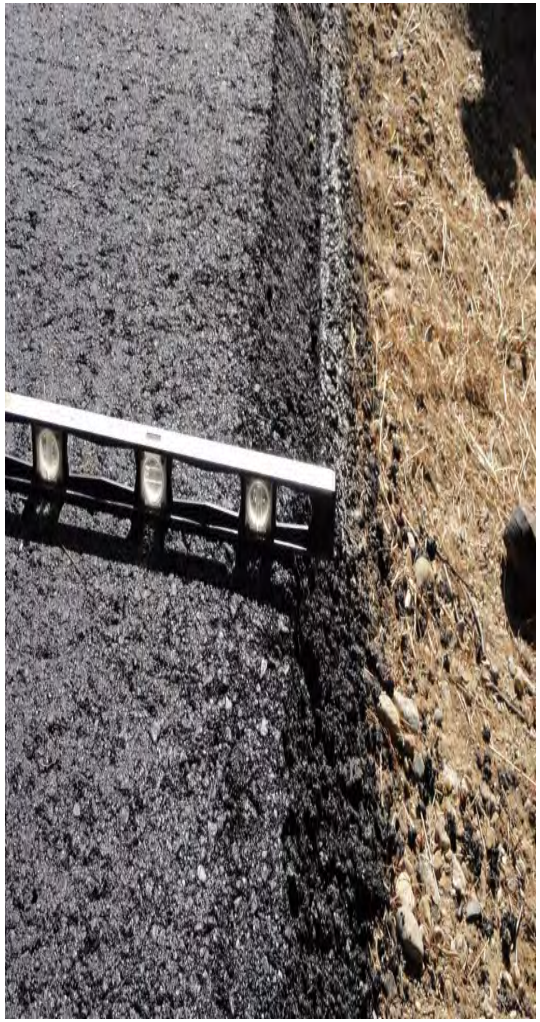
Maine Route 117

August 2010

(5.0-inch HMA overlay, 19-mm base and 12.5-mm wearing course, Advant-Edger and TransTech Shoulder Wedge Maker)

Maine Route 117



- Safety edge formed on both lifts.
- Safety edge increased pavement total width by about 8 inches.
- Safety edge and control (no safety edge) section densities were similar.
- Advant-Edger average slope was 54°.
- TransTech Shoulder Wedge Maker average slope was 45°.

Old Furnace Road, Delaware

August 2010

(2.0-inch WMA overlay, 9.5-mm mix,
Advant-Edger and TransTech Shoulder Wedge Maker)

Old Furnace Road, Delaware

- Shoulders were graded to prevent edge contamination.
- Safety edge density was 2.3% higher than the control (no safety edge) section.
- TransTech Shoulder Wedge Maker average slope was 37°
- Advant-Edger average slope was 48°.
- Mix tenderness likely increased the slope made by the Advant-Edger.

Wisconsin State Hwy 55

September 2010

(2.0-in overlay, 12.5-mm mix, TransTech Shoulder Wedge Maker and Carlson end gate devices)

Wisconsin State Hwy 55

- Carlson devices were simple to attach and operate.
- Carlson devices produced a smooth, sealed sloped surface.
- Control section (no safety edge) edge density was 1.6% higher than the safety edge sections.
- Average slope from both devices was 35°.

Jasper County Road F62, Iowa

August 2010

(5.0-inch HMA overlay, 19.0-mm mix, TransTech Shoulder Wedge Maker)

Jasper County Road F62, Iowa

- Safety edge was formed on all 3 lifts.
- Each lift was offset.
- To maintain slope - breakdown and intermediate rollers did not compact the safety edge.
- Control section (no safety edge) edge density was 5.3% higher than the safety edge sections. Control section edge was compacted by rollers.
- Average slope was 38°.

Linn/Jones County Hwy E34, Iowa

May 2010

(6.0-inch PCC overlay, widened PCC shoulder)

Linn/Jones County Hwy E34, Iowa

- Screed was modified to create the safety edge shape.
- Additional labor required at intersections.
- Transverse joint sawcuts stopped at the sloped face of the safety edge. Joints formed correctly through the safety edge.
- Average slope was 31.5°.
- Concrete modulus values and air voids at the edge and interior were reasonably uniform.

Pennsylvania State Road 2009

July 2010

(1.5-inch HMA overlay, 9.5-mm mix, Advant-Edger)

Pennsylvania State Road 2009

- Narrow roadway/shoulder conditions.
- End gate occasionally plowed up grass and soil into the safety edge.
- The sloped surface had a coarse/open texture.
- Safety edge density was 3.9% higher than the control (no safety edge) sections.
- The average slope was 48°.

Nebraska State Route 10

July 2010

(2.0-inch HMA overlay, 12.5 mm mix, TransTech Shoulder Wedge Maker)

Nebraska State Route 10

- Rolling did not steepen the slope.
- Safety edge and control (no safety edge) section densities were similar.
- Average slope was 34°.

Mississippi State Road 182

July 2010

(1.5-inch HMA overlay, 9.5 mm mix, TransTech Shoulder Wedge Maker)

Mississippi State Road 182

- The slope before and after rolling was about the same.
- Safety edge density was 1.8% higher than the control (no safety edge) section.
- Average slope was 37°.
- The shaft of the edge device was bent and created a gap between the end gate. The gap may have increased slope.

Test Results Summary

State	Device / Section	Slope	StDEV	Density, pcf (Near The Edge)	StDEV	Density, pcf (3 ft From The Edge)	StDEV
DE	Advant-Edger	48°	5.7	145.1	4.53	147.5	2.83
DE	TransTech	37°	8.9	140.2	2.46	145.6	1.65
DE	Control	NA	NA	137.9	6.21	145.2	3.44
IA	TransTech	38°	6.8	133.2	4.93	145.8	3.65
IA	Control	NA	NA	140.2	4.66	147.2	3.26
ME	Advant-Edger	54°	3.8	83.8 (PQI)	0.37	93.0 (PQI)	0.24
ME	TransTech	45°	7.1	83.7 (PQI)	0.59	93.5 (PQI)	0.27
ME	Control	NA	NA	83.8 (PQI)	0.50	93.1 (PQI)	0.39
MS	TransTech	37°	3.19	131.4	1.53	137.3	1.44
MS	Control	NA	NA	129.0	1.69	137.5	2.38

Test Results Summary

State	Device / Section	Slope	StDEV	Density, pcf (Near The Edge)	StDEV	Density, pcf (3 ft From The Edge)	StDEV
NE	TransTech	34°	3.0	133.5	3.25	140.3	1.45
NE	Control	NA	NA	135.4	4.30	138.6	4.10
PA	Advant-Edger	48°	5.4	137.1	1.86	140.2	3.42
PA	Control	NA	NA	131.9	2.86	140.6	3.97
WI	TransTech	35°	2.1	136.7	2.32	145.4	1.39
WI	Carlson #2	33°	2.4	135.4	1.73	144.9	2.19
WI	Carlson #3	36°	2.4	132.9	1.96	143.6	1.38
WI	Control	NA	NA	137.1	1.84	145.2	2.91

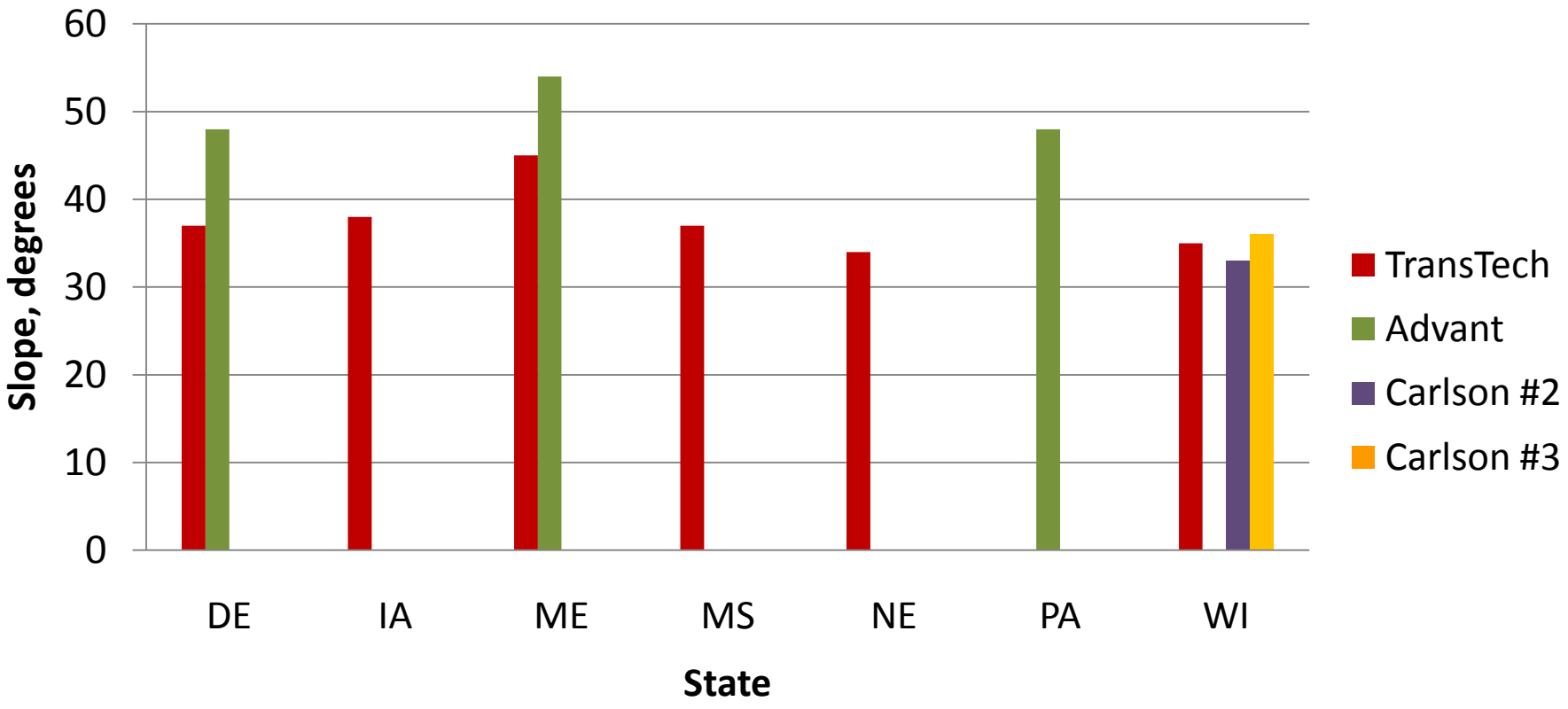
Test Results Summary

State	Device / Section	% Air Voids (Near The Edge)	StDEV	% Air Voids (3 ft From The Edge)	StDEV
DE	Advant-Edger	9.0	2.84	7.4	1.78
DE	TransTech	11.8	1.55	8.4	1.04
DE	Control Section	13.5	3.89	8.9	2.16
IA	TransTech	13.6	3.19	5.4	2.37
IA	Control Section	9.1	3.02	4.6	2.12
MS	TransTech	10.6	1.04	6.6	0.98
MS	Control	12.3	1.15	6.5	1.62

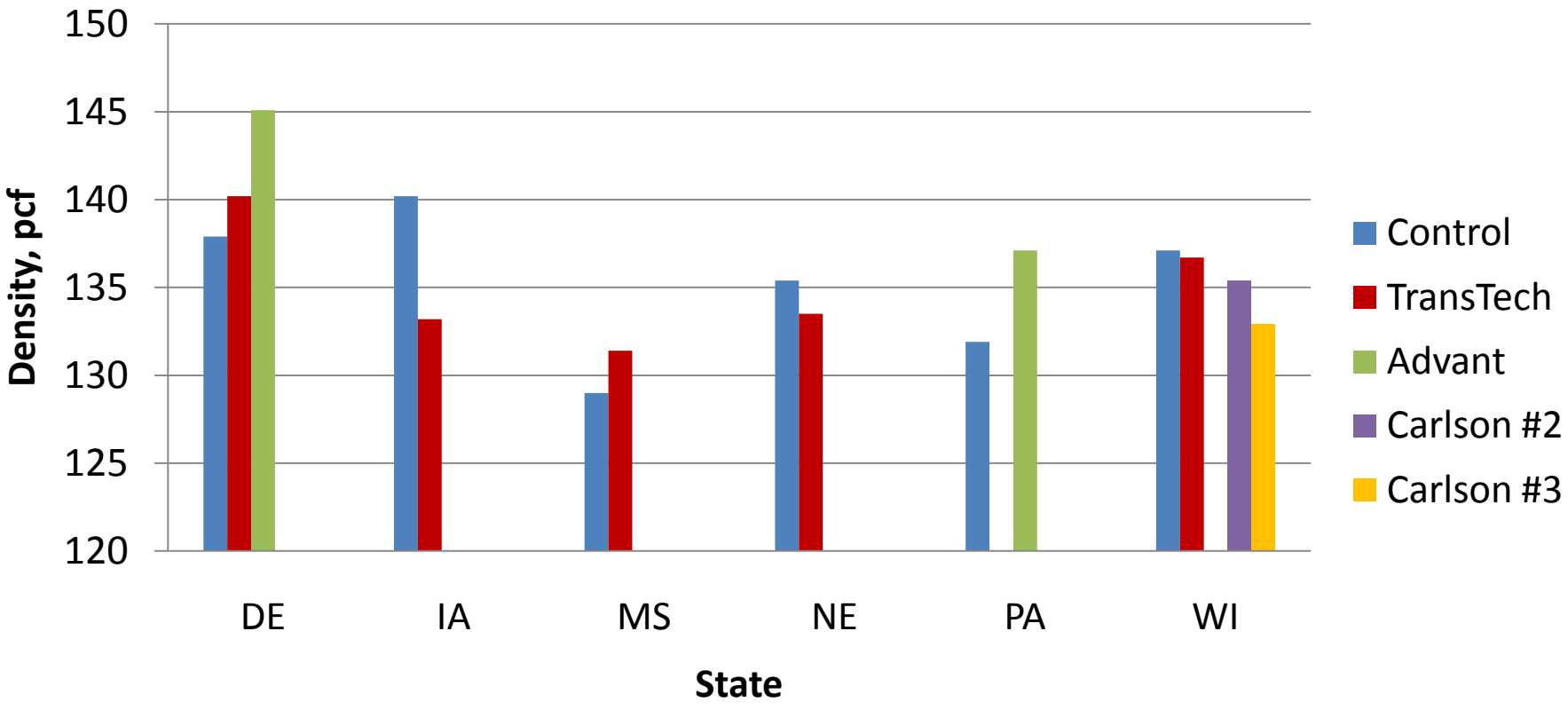
Test Results Summary

State	Device / Section	% Air Voids (Near The Edge)	StDEV	% Air Voids (3 ft From The Edge)	StDEV
NE	TransTech	11.8	2.13	7.3	0.93
NE	Control Section	10.5	2.84	8.5	2.71
PA	Advant-Edger	13.6	1.17	11.7	2.16
PA	Control Section	16.9	1.81	11.4	2.50
WI	TransTech	11.2	1.51	5.5	0.91
WI	Carlson #2	12.0	1.13	5.8	1.42
WI	Carlson #3	13.6	1.28	6.7	0.89
WI	Control Section	10.9	1.20	5.6	1.89

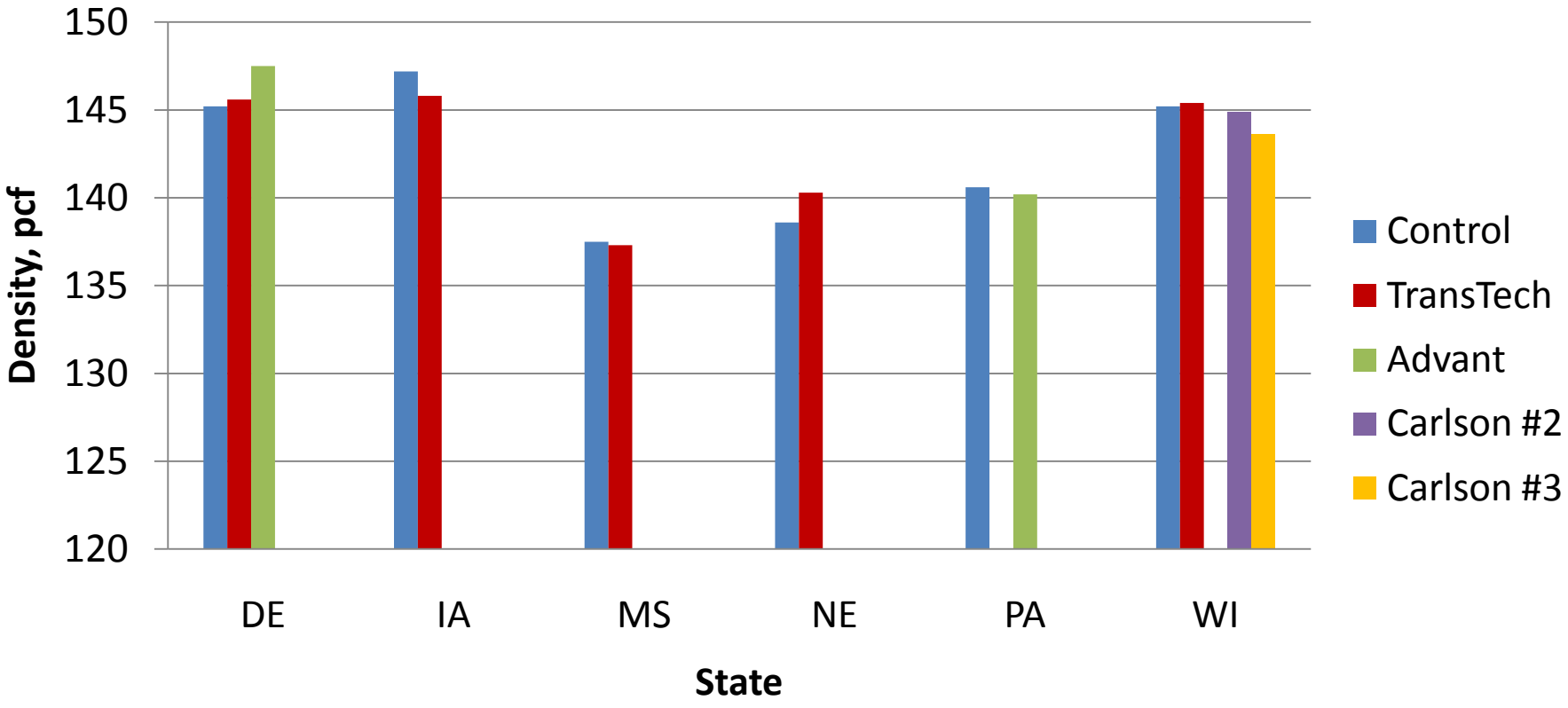
Safety Edge Slope



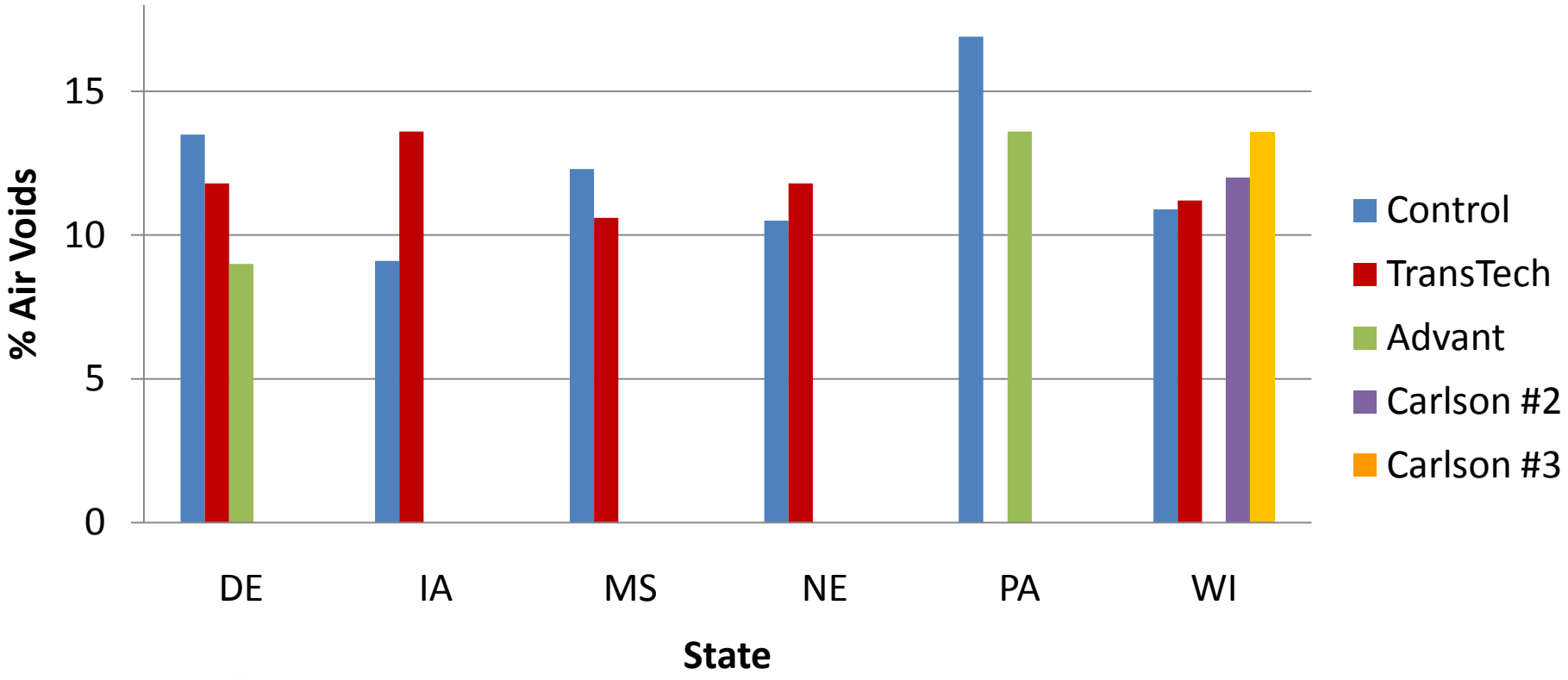
Density Near The Edge



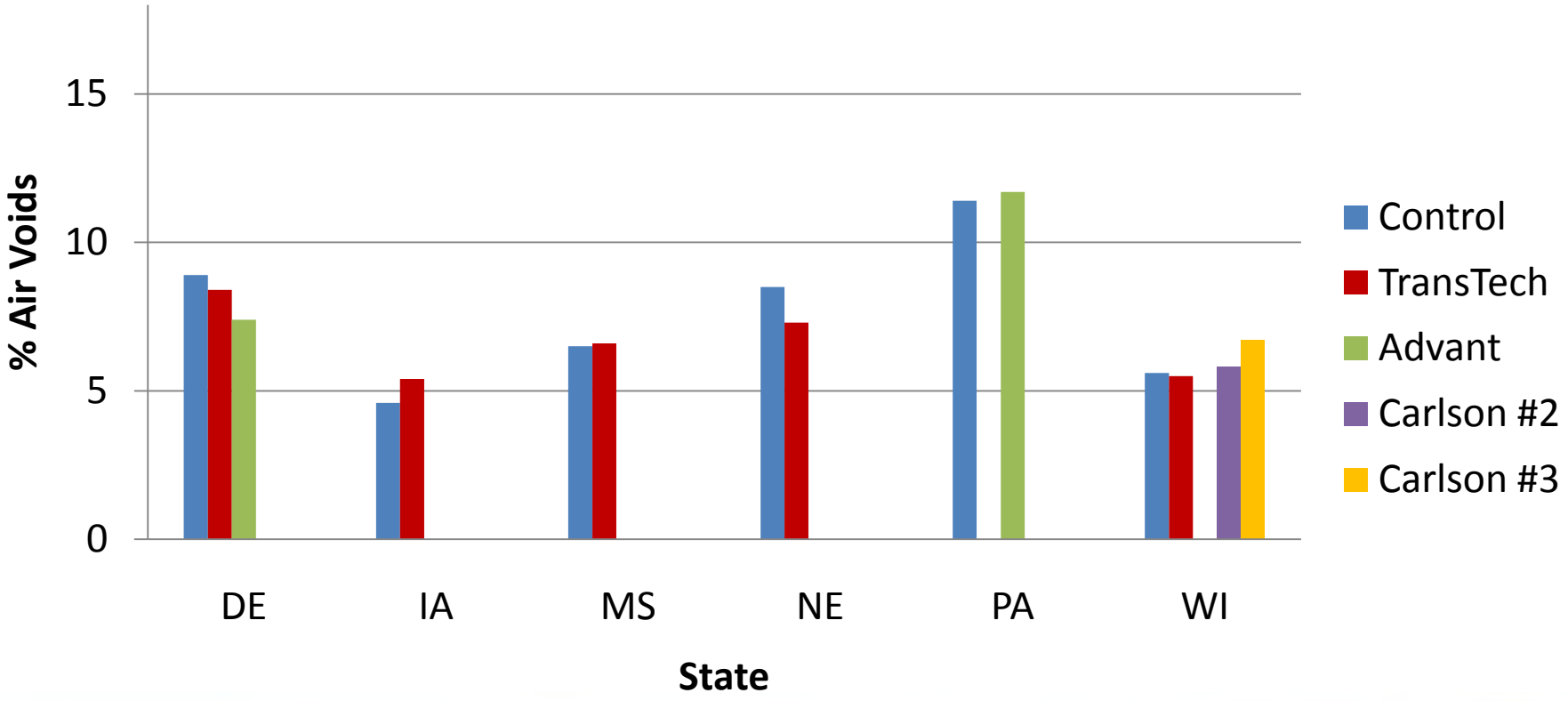
Density Away From The Edge



% Air Voids Near The Edge



% Air Voids Away From The Edge



Test Result Summary

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DE	Control Section	NA	137.9	141.2	13.5	8.9
IA	TransTech	38°	133.2	145.8	13.6	5.4
IA	Control Section	NA	140.2	147.2	9.1	4.6
MS	TransTech	37°	131.4	137.3	10.6	6.6
MS	Control	NA	129.0	137.5	12.3	6.5

Test Result Summary

State	Device / Section	Slope	Density, pcf (Near Edge)	Density, pcf (3 ft from Edge)	% Air Voids (Near Edge)	% Air Voids (3 ft from Edge)
NE	TransTech	34°	133.5	140.3	11.8	7.3
NE	Control Section	NA	135.4	138.6	10.5	8.5
PA	Advant-Edger	48°	137.1	140.2	13.6	11.7
PA	Control Section	NA	131.9	140.6	16.9	11.4
WI	TransTech	35°	136.7	145.4	11.2	5.5
WI	Carlson #2	33°	135.4	144.9	12.0	5.8
WI	Carlson #3	36°	132.9	143.6	13.6	6.7
WI	Control Section	NA	137.1	145.2	10.9	5.6

Test Result Summary

State	Device / Section	Slope	PQI Value (Near Edge)	PQI Value (3 ft from Edge)
ME	Advant-Edger	54°	83.8	93.0
ME	TransTech	45°	83.7	93.5
ME	Control Section	NA	83.8	93.1

Summary

- ☑ The HMA densities measured adjacent to the unconfined edge were similar with our without using the safety edge.
- ☑ The average slope of the safety edge can be constructed between values of 30 to 40 degrees using standard rolling patterns and dense graded mixtures.

Summary

- Safety Edge equipment/processes improvements – FHWA evaluation in 2011
- Picture vs data