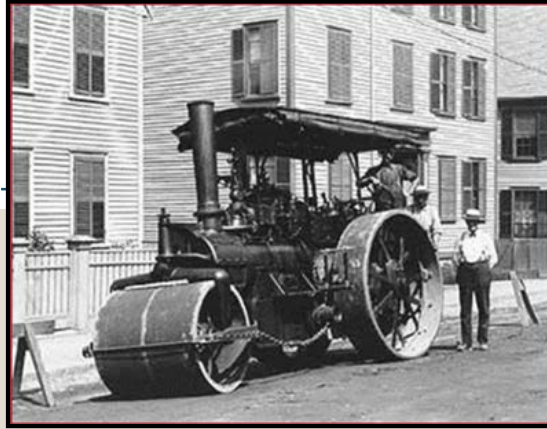


# FHWA's Demonstration Project for Enhanced Durability Through Increased Density



*Courtesy Asphalt Institute*

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**FHWA**

**Asphalt Mixture Expert Task Group**  
**Fall River, MA**  
**May 8, 2018**

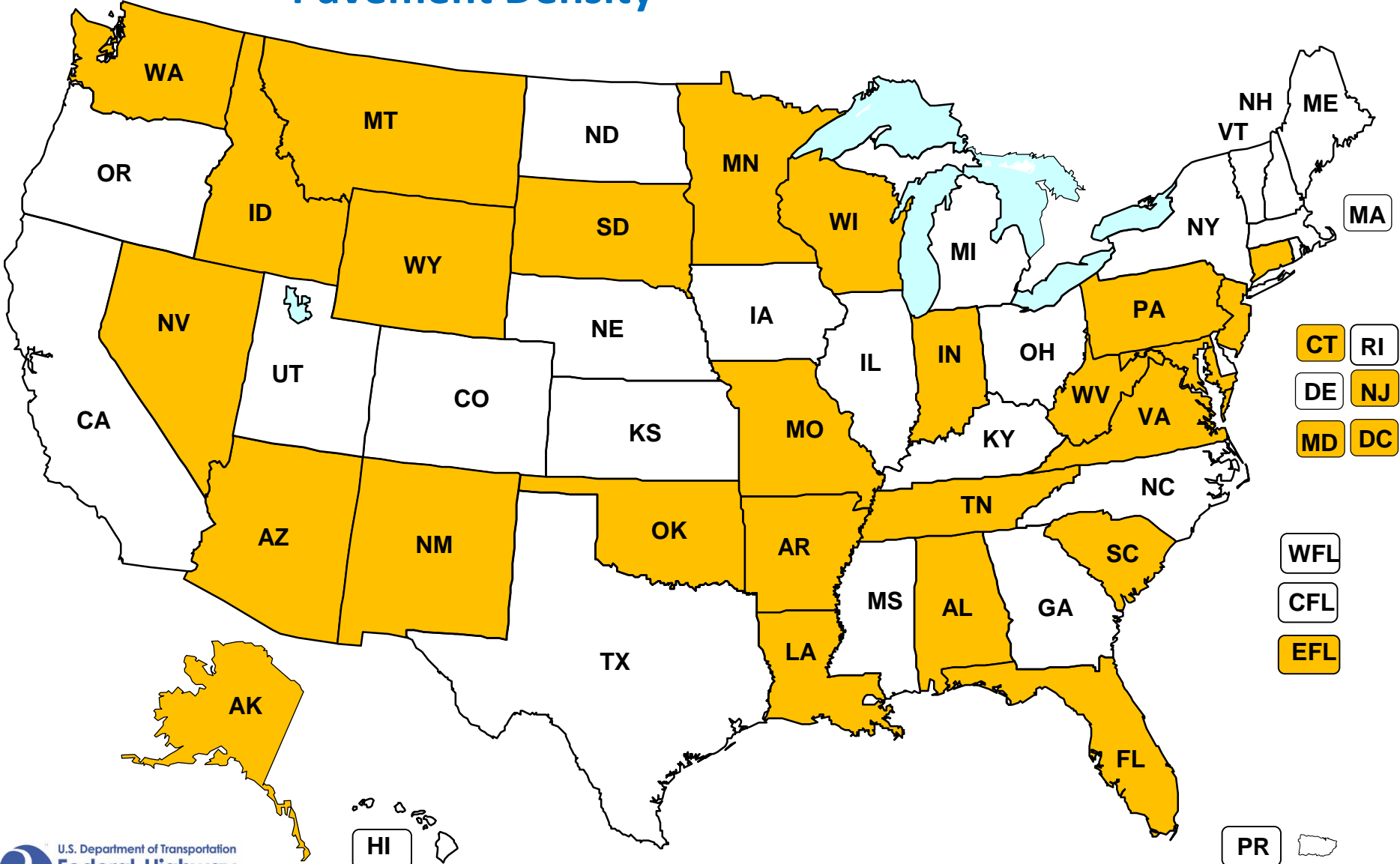


U.S. Department of Transportation  
Federal Highway Administration

# Enhanced Durability of Asphalt Pavements through Increased In-Place Pavement Density

## Workshops

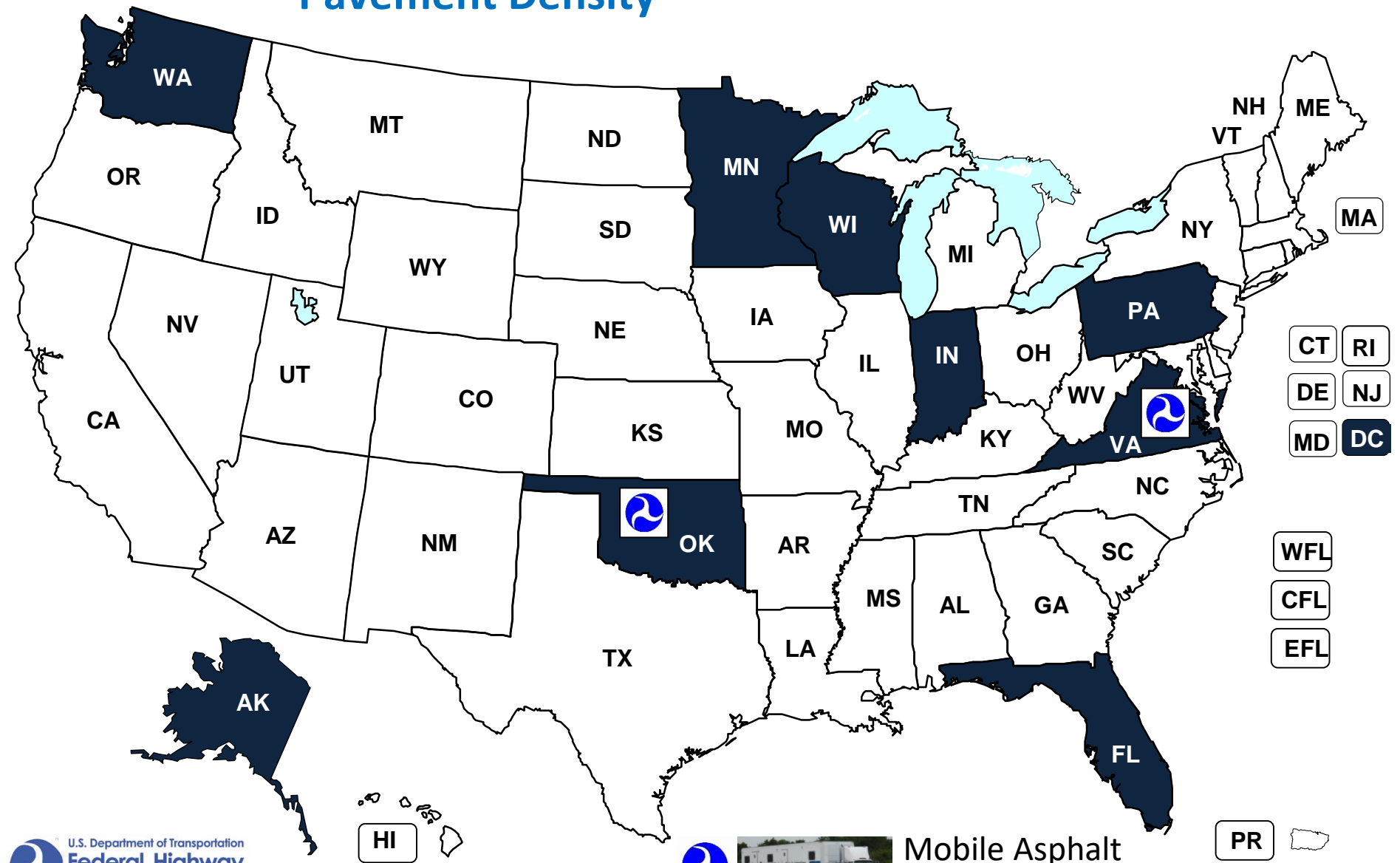
 28 States



# Enhanced Durability of Asphalt Pavements through Increased In-Place Pavement Density

## Demonstration Projects

Phase 1 (10 states)



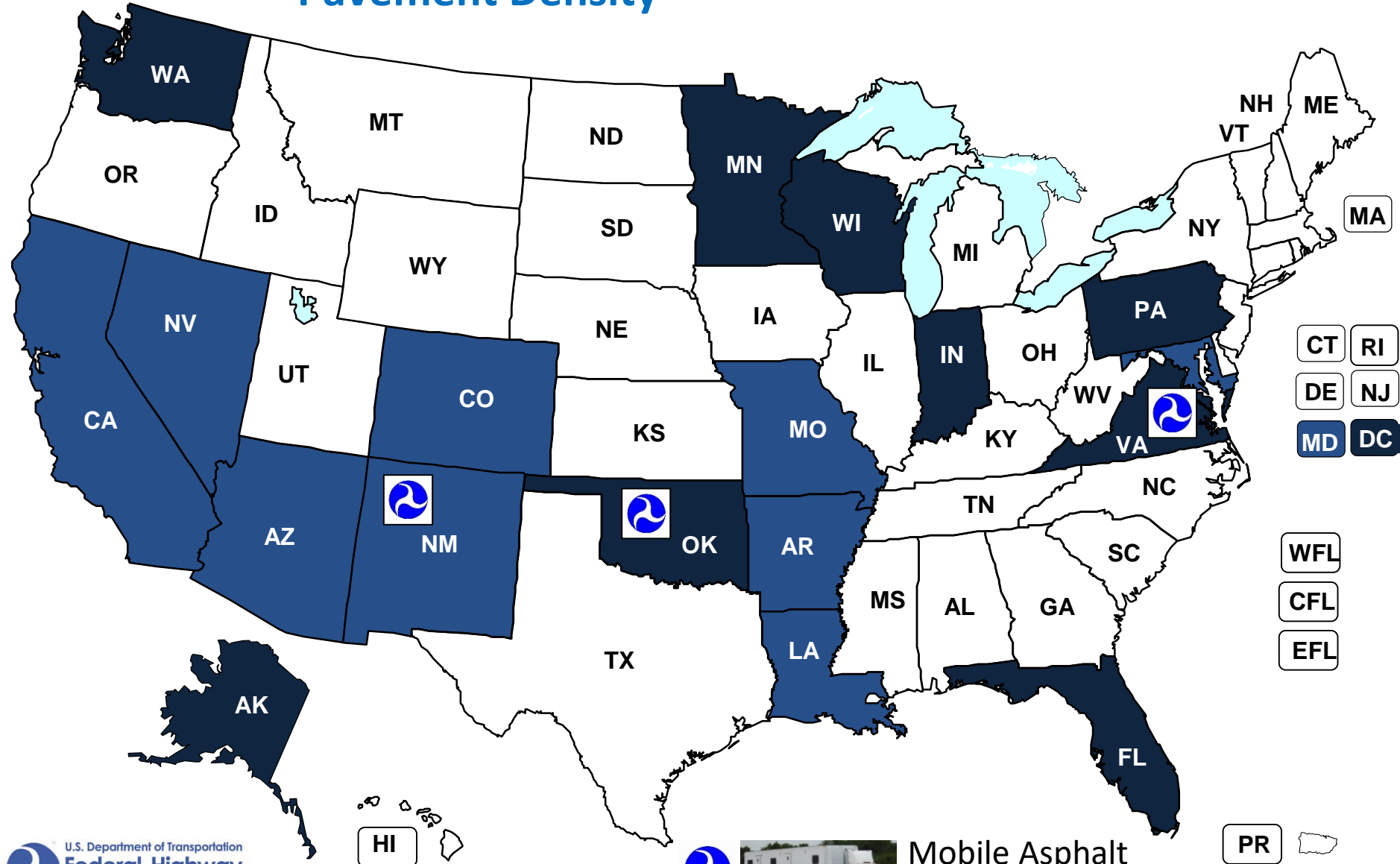
Mobile Asphalt Testing Trailer (2)

PR

# Enhanced Durability of Asphalt Pavements through Increased In-Place Pavement Density



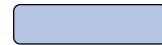
## Demonstration Projects

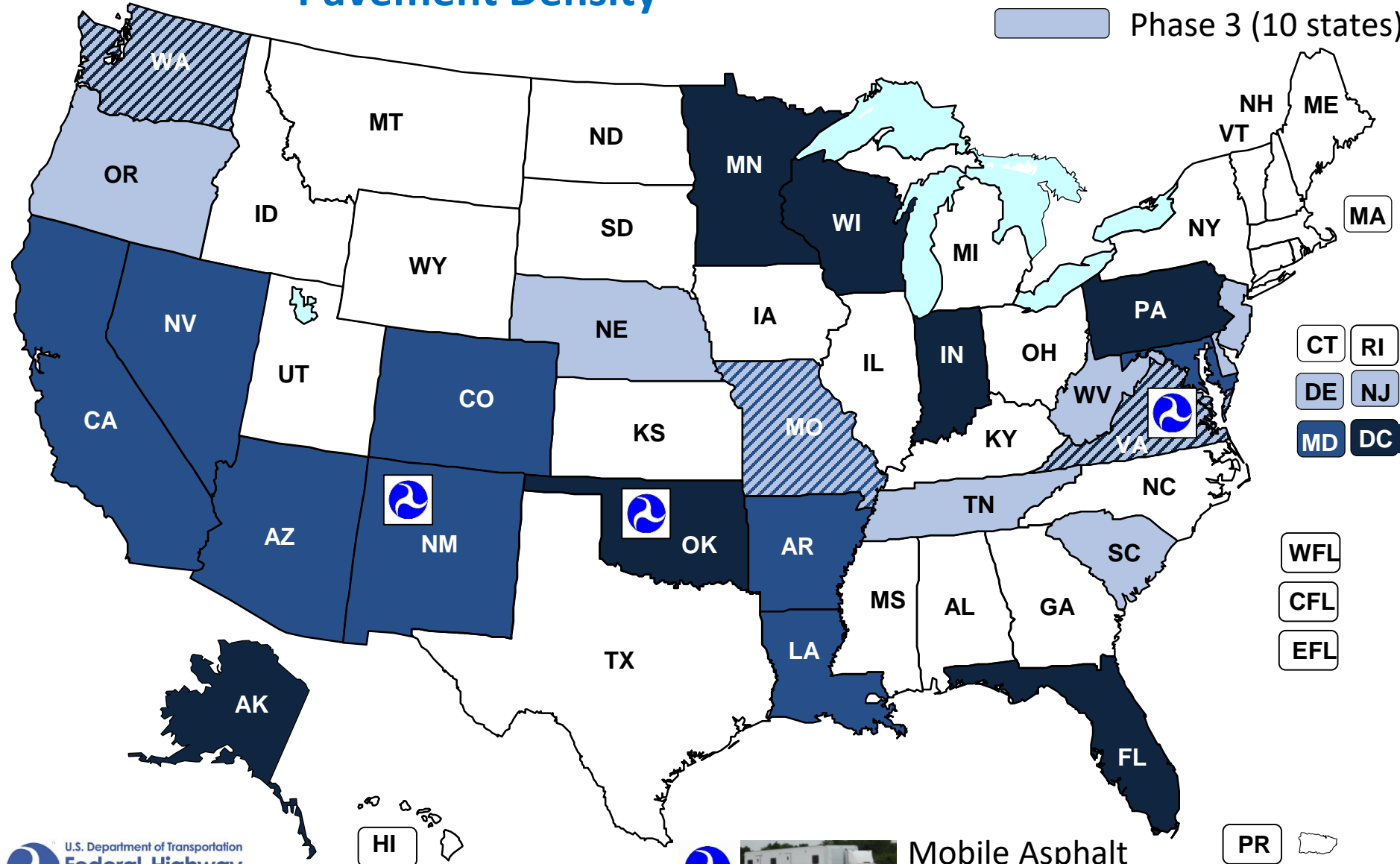
- Phase 1 (10 states)
- Phase 2 (9 states)



# Enhanced Durability of Asphalt Pavements through Increased In-Place Pavement Density

## Demonstration Projects

-  Phase 1 (10 states)
-  Phase 2 (9 states)
-  Phase 3 (10 states)



# Demonstration Project Status

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<b>Phase</b>	<b>Year</b>	<b>States</b>	<b>Constructed</b>	<b>State Reports</b>	<b>Summary Report</b>
1	2016	10	10	10	July 2017
2	2017-2018	9	5 (2 re-do's)	2	
3	2018	10	0	0	

# Some “Gold Medal” Density ( $\% G_{mm}$ ) Specifications

## Purpose

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- Identify density ( $\% G_{mm}$ ) specifications that are success stories.
- Since this is an Olympic year, these success stories are considered “gold medal” examples.



*Image Pixabay*

# Some “Gold Medal” Density (% $G_{mm}$ ) Specifications

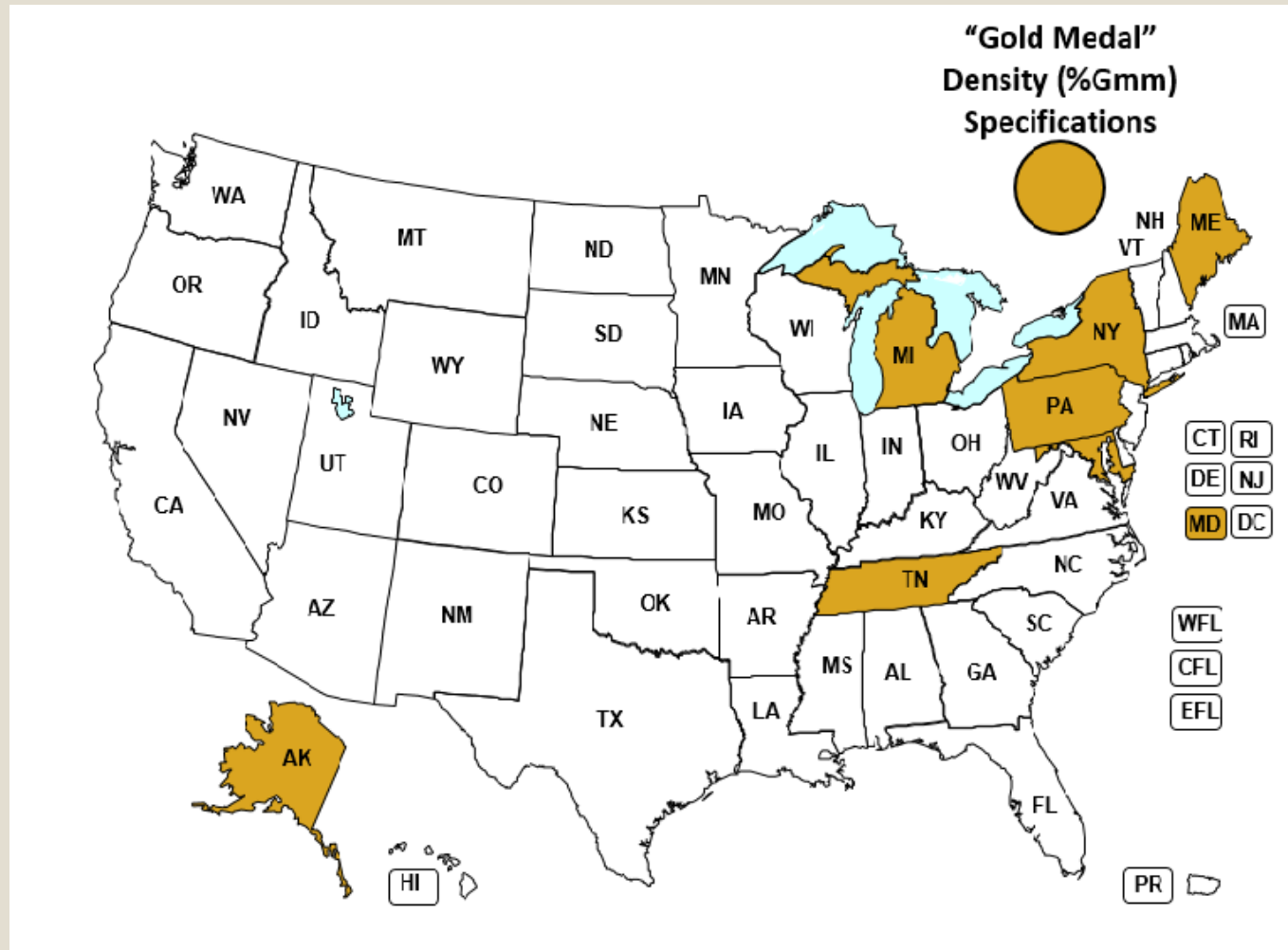
8

- Alaska Department of Transportation & Public Facilities
- Maine DOT
- Maryland DOT State Highway Administration
- Michigan DOT
- New York State DOT
- Pennsylvania DOT
- Tennessee DOT

Note: There are likely more. Contact me if you think you have one.



# Enhanced Durability of Asphalt Pavements Through Increased In-Place Pavement Density



# Gold Medal Density (% G<sub>mm</sub>) Specifications

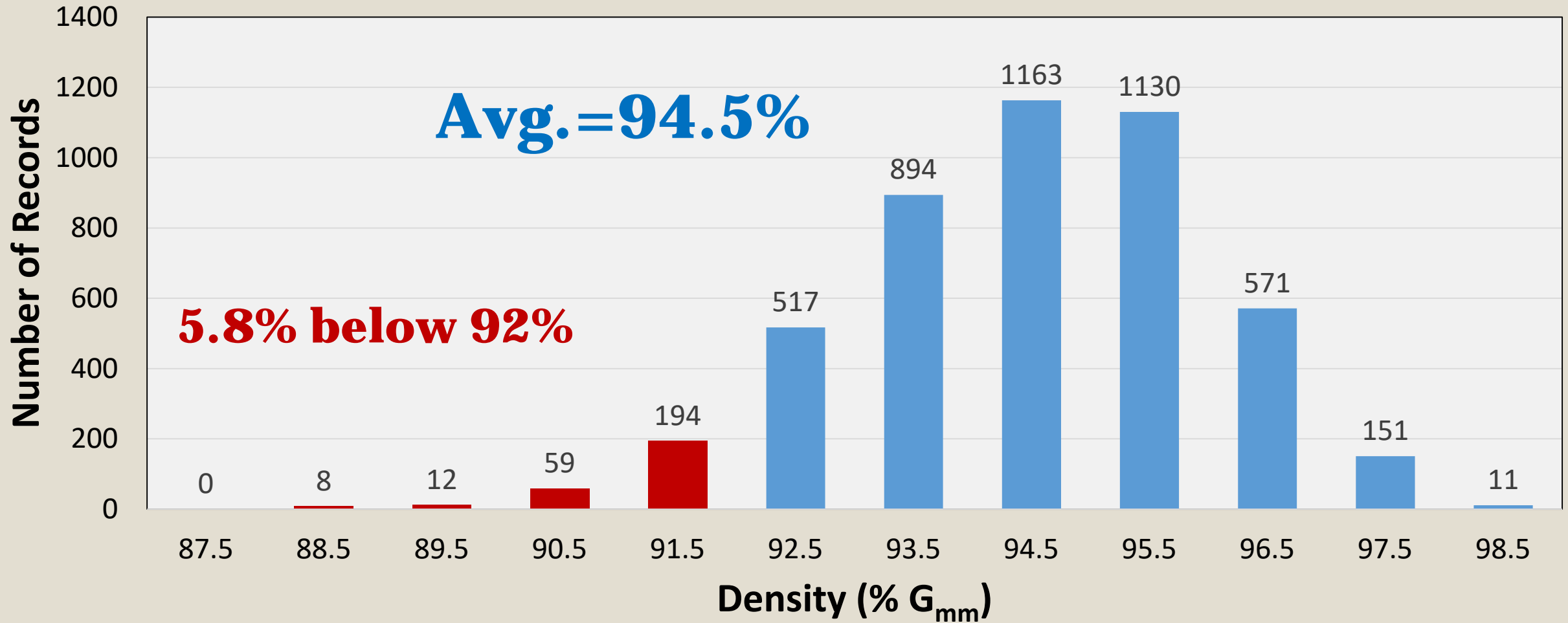
## Project Information

10

	<b>State D</b>	<b>AK</b>	<b>ME</b>	<b>MD</b>	<b>MI</b>	<b>NY</b>	<b>PA</b>	<b>TN</b>
<b>Year(s) of Data Analyzed</b>	2016	2015	2013 to 2017	2017	2015	2017	2017	2015 to 2017
<b>Mix Type</b>	Type C	Type II 19mm & Superpave 12.5 mm	9.5, 12.5 and 19 mm	Dense Graded	9.5, 12.5 and 19 mm	Series 50 9.5, 12.5 and 19 mm	High level wearing surface 9.5, 12.5 & 19mm	D-mix (3/8” NMAAS)
<b>Type of Projects</b>	N/A	Interstate and principal arterial	All mainline projects		All projects > 5,000 tons	Full or partially controlled roadways		Interstate and SR Freeways
<b>Acceptance Testing</b>	Agency only	Agency only	Agency only	Contractor validated by agency	Agency only	Agency only	Agency only	Agency only

# Maine DOT Statewide Results 2013 to 2017

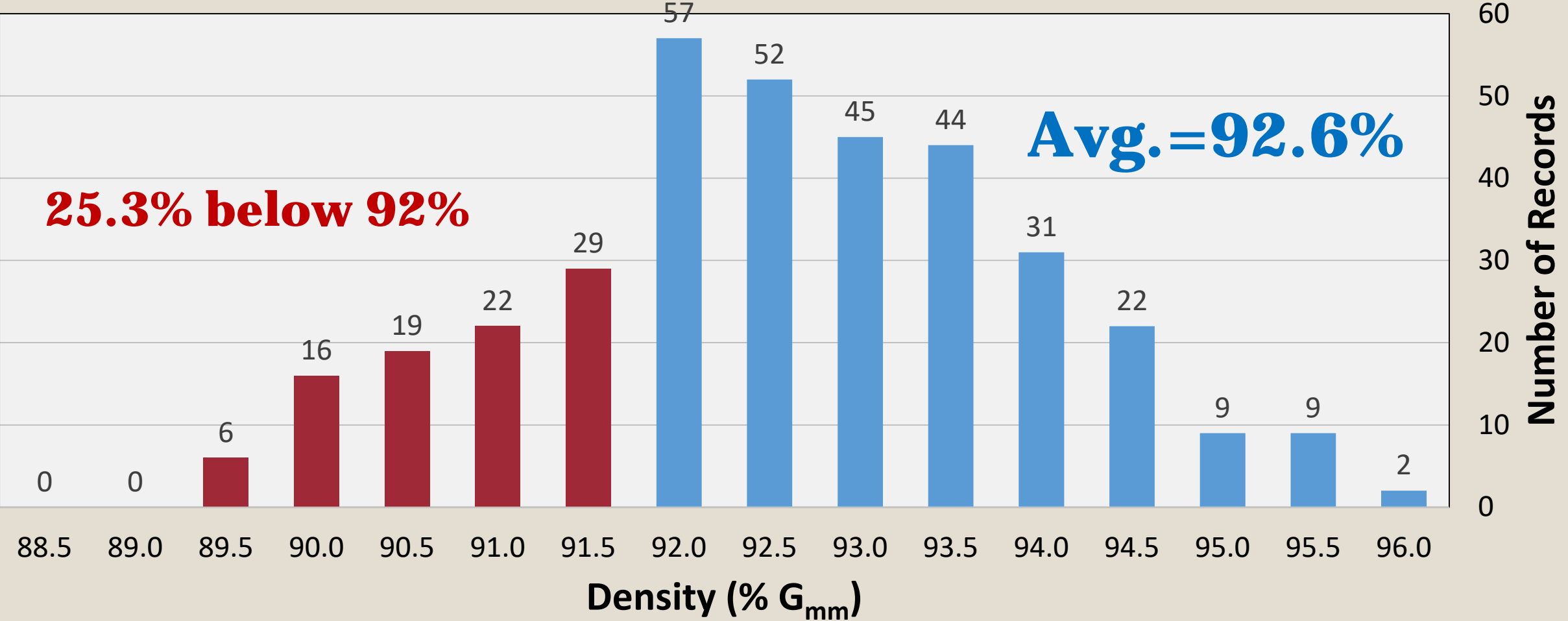
11



# State D

## Statewide Results from 2016

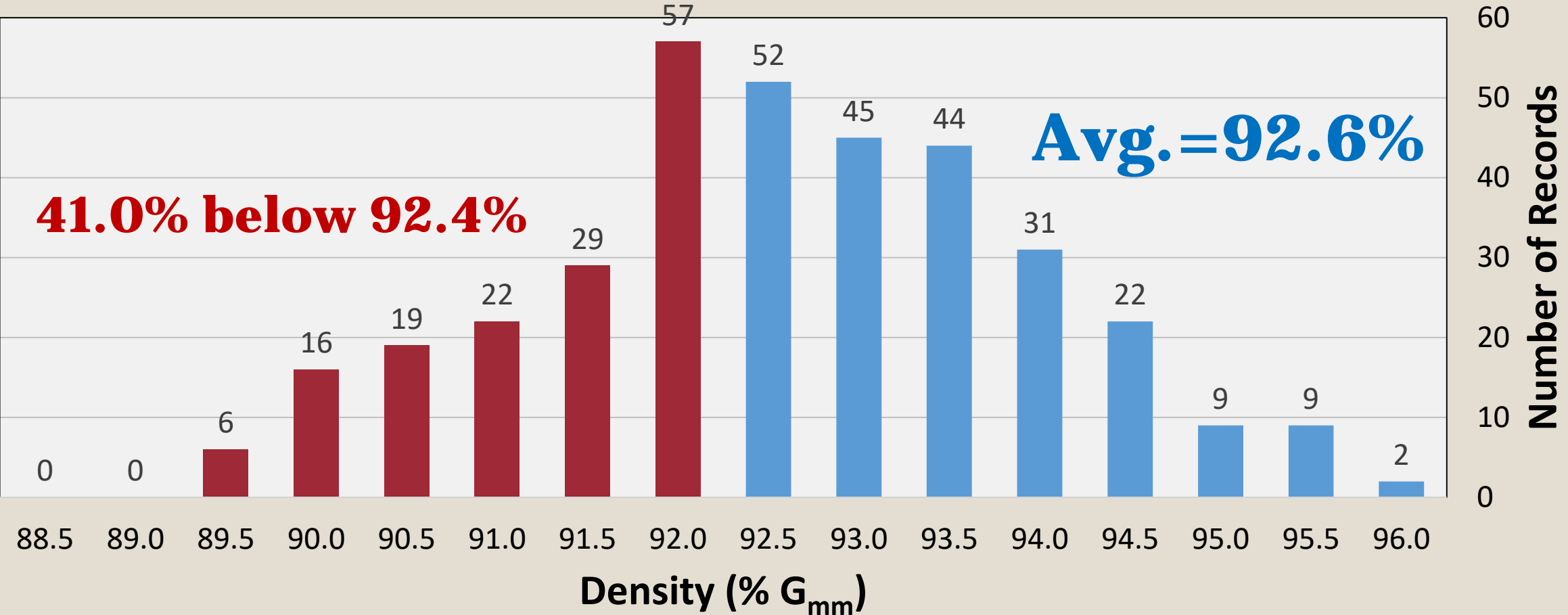
12



# State D

## Statewide Results from 2016

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# Gold Medal Density (% $G_{mm}$ ) Specifications

## Specification/Criteria/Results



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	State D	AK	ME	MD	MI	NY	PA	TN
Type of Specification		PWL	PWL		PWL	PWL	PWL	
Limits (% $G_{mm}$ )		93.0 to 100.0	92.5 to 97.5		92.5 to 100.0	92.0 to 97.0	92.0 to 98.0	
Incentive for Only Density		5.0%	2.5%		2.0%	5.0%	2.0%	
Max. Incent. (% $G_{mm}$ )		≈96.0	≈93.5		≈94.5	≈94.0	≈94.0	
Avg. (% $G_{mm}$ )		94.9	94.5		94.4	94.2	94.4	
Std. Dev. of Lots		1.76	1.20		1.03	1.01	1.46	
< 92% $G_{mm}$		5.6%	5.8%		5.5%	5.0%	3.1%	

# Gold Medal Density (% $G_{mm}$ ) Specifications

## Specification/Criteria/Results



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	<b>State D</b>	<b>AK</b>	<b>ME</b>	<b>MD</b>	<b>MI</b>	<b>NY</b>	<b>PA</b>	<b>TN</b>
Type of Specification		PWL	PWL		PWL	PWL	PWL	Lot Avg.
Limits (% $G_{mm}$ )		93.0 to 100.0	92.5 to 97.5		92.5 to 100.0	92.0 to 97.0	92.0 to 98.0	92.0 to 97.0
Incentive for Only Density		5.0%	2.5%		2.0%	5.0%	2.0%	2.0%
Max. Incent. (% $G_{mm}$ )		≈96.0	≈93.5		≈94.5	≈94.0	≈94.0	94.0
Avg. (% $G_{mm}$ )		94.9	94.5		94.4	94.2	94.4	93.9
Std. Dev. of Lots		1.76	1.20		1.03	1.01	1.46	N/A
< 92% $G_{mm}$		5.6%	5.8%		5.5%	5.0%	3.1%	11.0%

# Gold Medal Density (% $G_{mm}$ ) Specifications

## Specification/Criteria/Results



16

	<b>State D</b>	<b>AK</b>	<b>ME</b>	<b>MD</b>	<b>MI</b>	<b>NY</b>	<b>PA</b>	<b>TN</b>
Type of Specification		PWL	PWL	Lot Avg. & Ind. Sublot	PWL	PWL	PWL	Lot Avg.
Limits (% $G_{mm}$ )		93.0 to 100.0	92.5 to 97.5	92.0 to 97.0	92.5 to 100.0	92.0 to 97.0	92.0 to 98.0	92.0 to 97.0
Incentive for Only Density		5.0%	2.5%	5.0%	2.0%	5.0%	2.0%	2.0%
Max. Incent. (% $G_{mm}$ )		≈96.0	≈93.5	94.0	≈94.5	≈94.0	≈94.0	94.0
Avg. (% $G_{mm}$ )		94.9	94.5	94.0	94.4	94.2	94.4	93.9
Std. Dev. of Lots		1.76	1.20	1.03	1.03	1.01	1.46	N/A
< 92% $G_{mm}$		5.6%	5.8%	5.3%	5.5%	5.0%	3.1%	11.0%



# Gold Medal Density (% $G_{mm}$ ) Specifications

## Specification/Criteria/Results



17

	<b>State D</b>	<b>AK</b>	<b>ME</b>	<b>MD</b>	<b>MI</b>	<b>NY</b>	<b>PA</b>	<b>TN</b>
Type of Specification	Lot Avg.	PWL	PWL	Lot Avg. & Ind. Sublot	PWL	PWL	PWL	Lot Avg.
Limits (% $G_{mm}$ )	91.5 to 95.0	93.0 to 100.0	92.5 to 97.5	92.0 to 97.0	92.5 to 100.0	92.0 to 97.0	92.0 to 98.0	92.0 to 97.0
Incentive for Only Density	1.5%	5.0%	2.5%	5.0%	2.0%	5.0%	2.0%	2.0%
Max. Incent. (% $G_{mm}$ )	92.75	≈96.0	≈93.5	94.0	≈94.5	≈94.0	≈94.0	94.0
Avg. (% $G_{mm}$ )	92.6	94.9	94.5	94.0	94.4	94.2	94.4	93.9
Std. Dev. of Lots	N/A	1.76	1.20	1.03	1.03	1.01	1.46	N/A
< 92% $G_{mm}$	25.3%	5.6%	5.8%	5.3%	5.5%	5.0%	3.1%	11.0%

# Gold Medal Density (% $G_{mm}$ ) Specifications Testing and Frequency



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	State D	AK	ME	MD	MI	NY	PA	TN
Lot Size (tons)	2,000	5,000	4,500	Day's production	5,000	1,000	2,500	1,000
Sublots per Lot	8	10	6	5 min.	5	4	5	5
Frequency (tons)	250	500	750	500 max.	1000	250	500	200
Measuring $G_{mb}$	6-in. cores 1 per subplot	6-in. cores 1 per subplot	6-in. cores 1 per subplot	4 or 6-in. cores 2 per subplot	6-in. cores 1 per subplot	6-in cores 1 per subplot	6-in cores 1 per subplot	4 or 6-in. cores 1 per subplot
Measuring $G_{mm}$	Avg. of 5 tests: every 500 tons	Individual test: 1 per lot	Individual test: 1 per subplot	Individual test: Daily value	Individual test: 1 per subplot	Ind. test: 1 per lot	Individual test: Daily value	Daily Avg.: 2 tests per day

# Thank you



**QUESTIONS / COMMENTS:**



*Image Pixabay*

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