


Idaho Asphalt Pavement Conference



Asphalt Pavement Durability The Role of Superpave5

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Why is it?



*That roads start off
looking like this?*



**And end up
looking like this**



First of All

*Let's Talk About
Asphalt*

How Does Asphalt Work?



Magnets



How does asphalt age?



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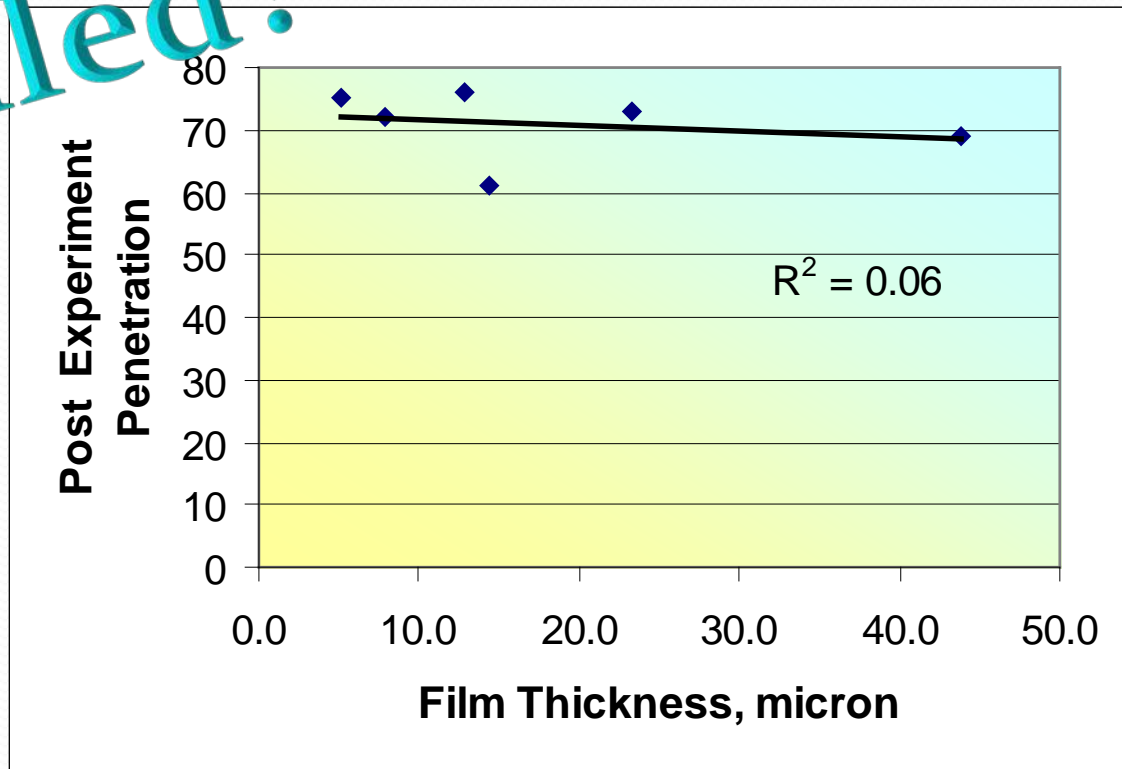


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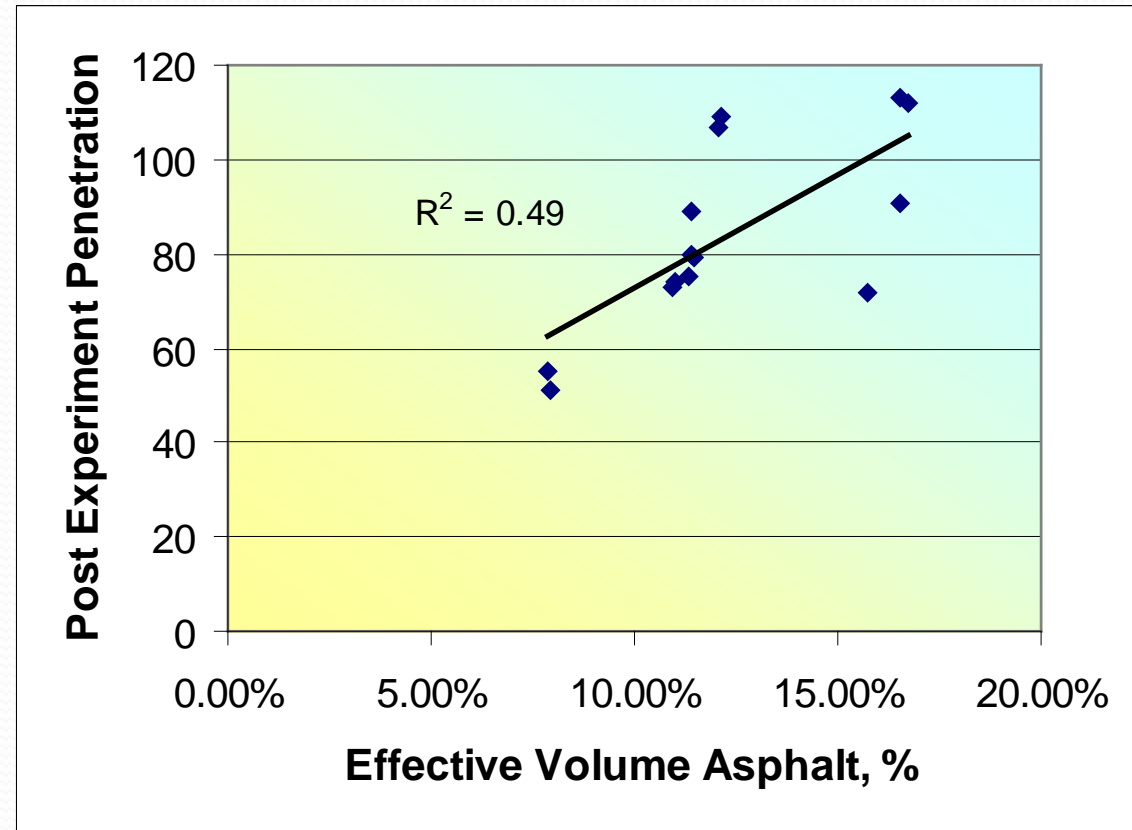
Film Thickness

- Purdue University
- Open-Graded mixes
- Air voids
 - 21.0 to 35.0%
- Film Thickness
 - 5.1 to 43.9 μm



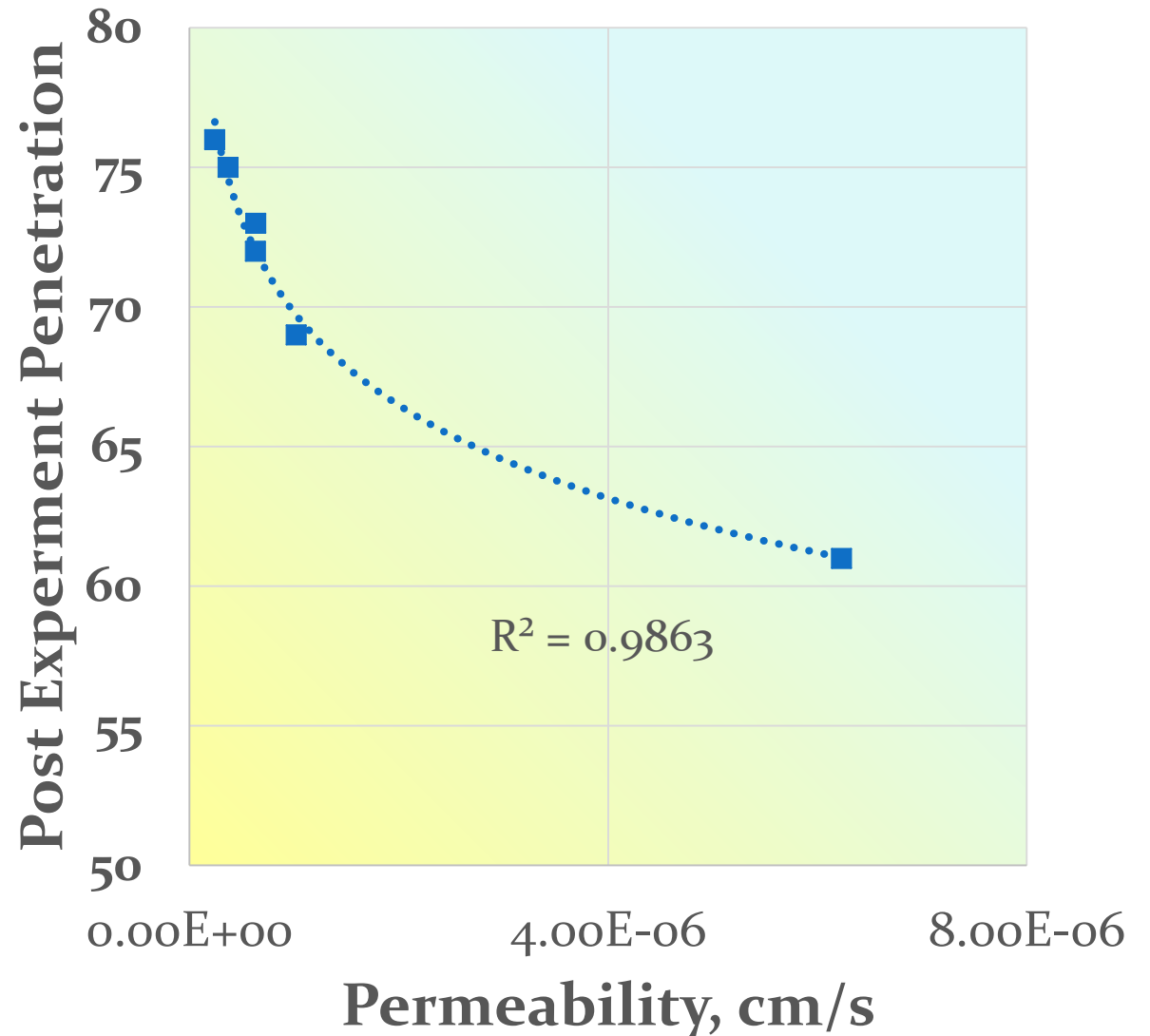
Effective Volume Asphalt?

- Shows medium strength relationship with penetration after aging.



Permeability

- Correlation of asphalt aging to mixture permeability
 - Different film thickness
 - Different asphalt contents
 - Different air voids

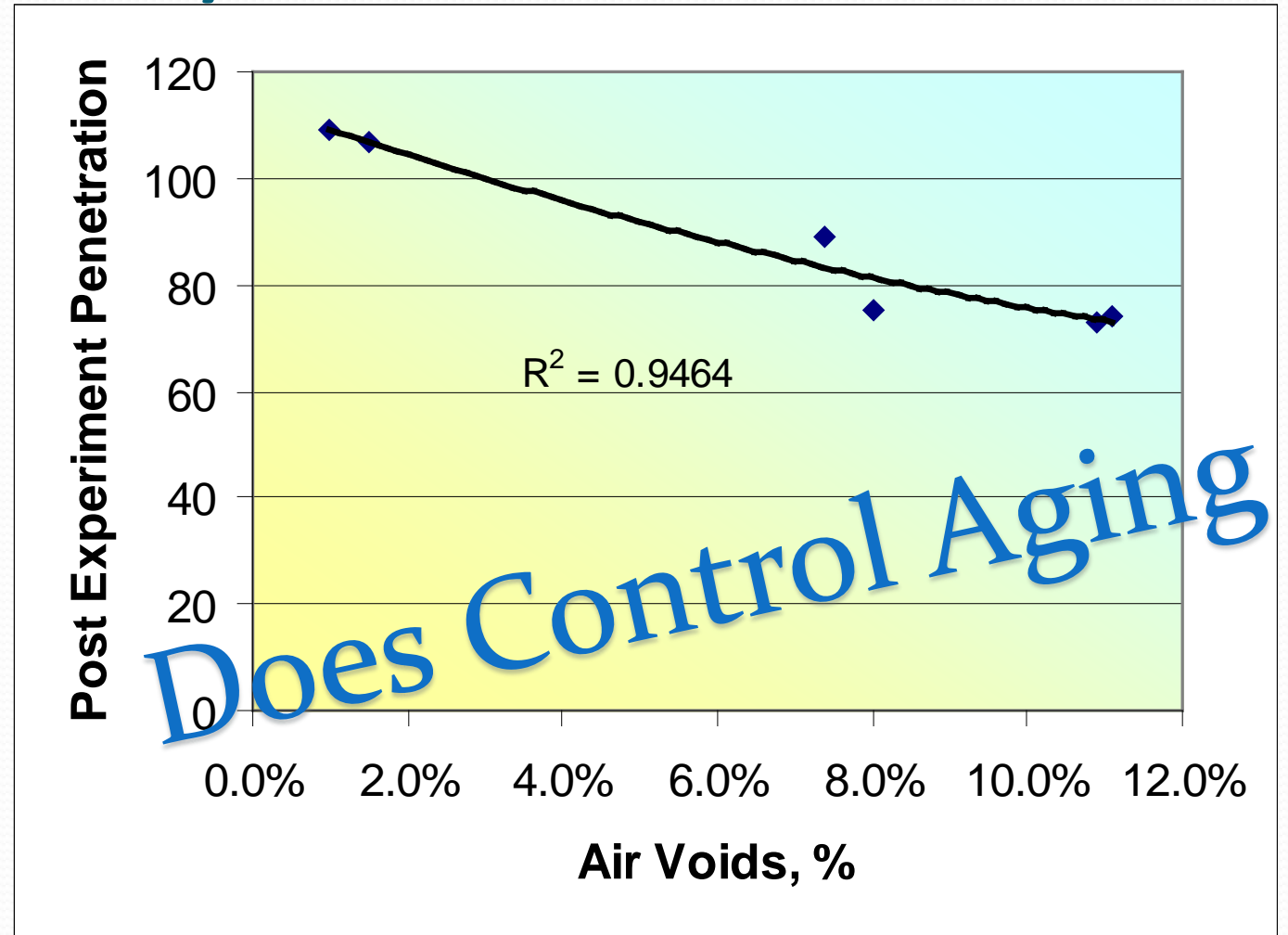


Purdue Research Paper 1976-19

Air Voids (in-place)

- Purdue University
 - Dense-graded mix
 - 5.5% asphalt
 - Vary compaction
 - Air voids
 - 1.0% to 11.1%

Purdue Research Paper 1976-19



Field Example



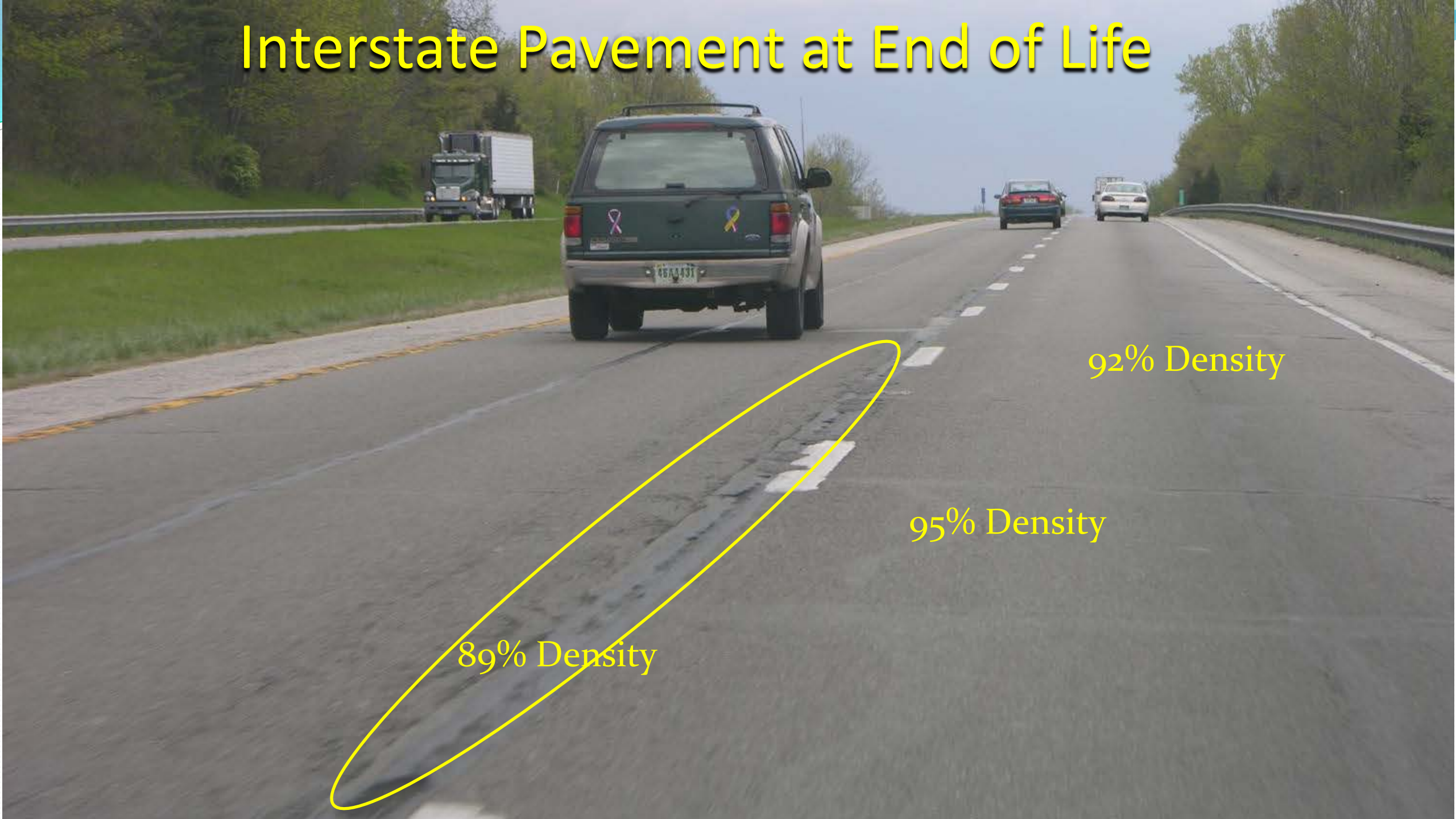




No Crack

Crack

Interstate Pavement at End of Life



92% Density

95% Density

89% Density

Superpave 5 Concept

- Mix Design
5% air voids

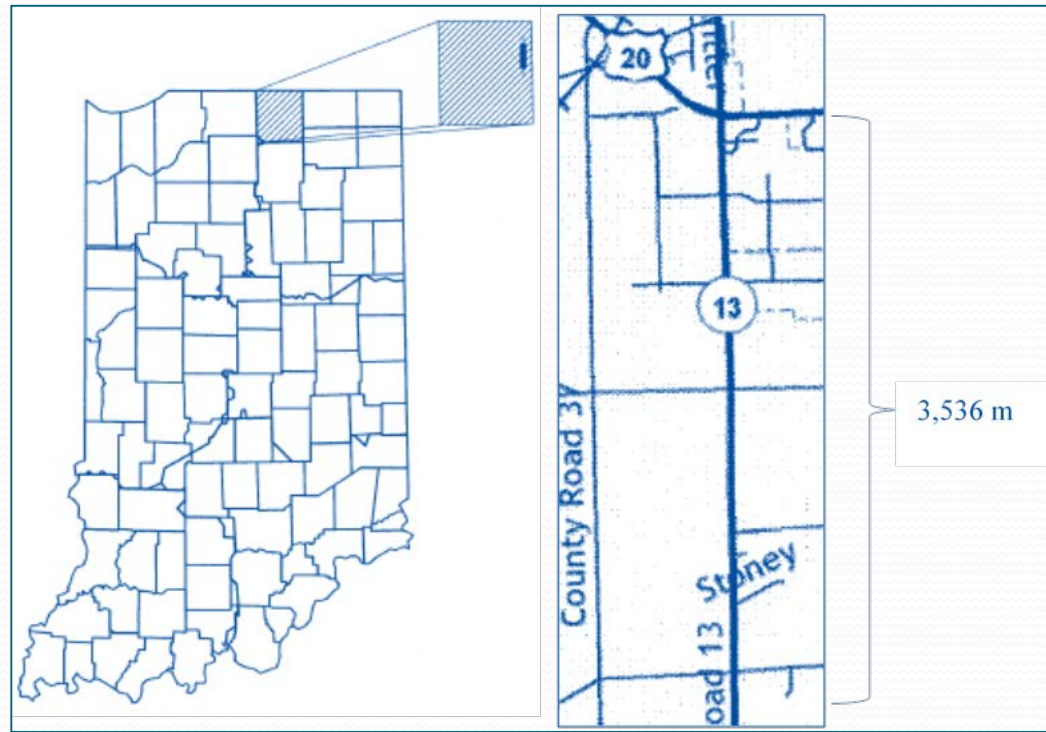


- Field
Compaction
95% Gmm



SR 13, Middlebury, Indiana

- 2013 Trial Project
 - 13,400 AADT
 - 19% heavy trucks



**First
Project**



Counter-Flow Drum Mix
Plant



Superpave4



Tack Coat



Material Transfer



Same Rolling Train

Superpave5 Compaction

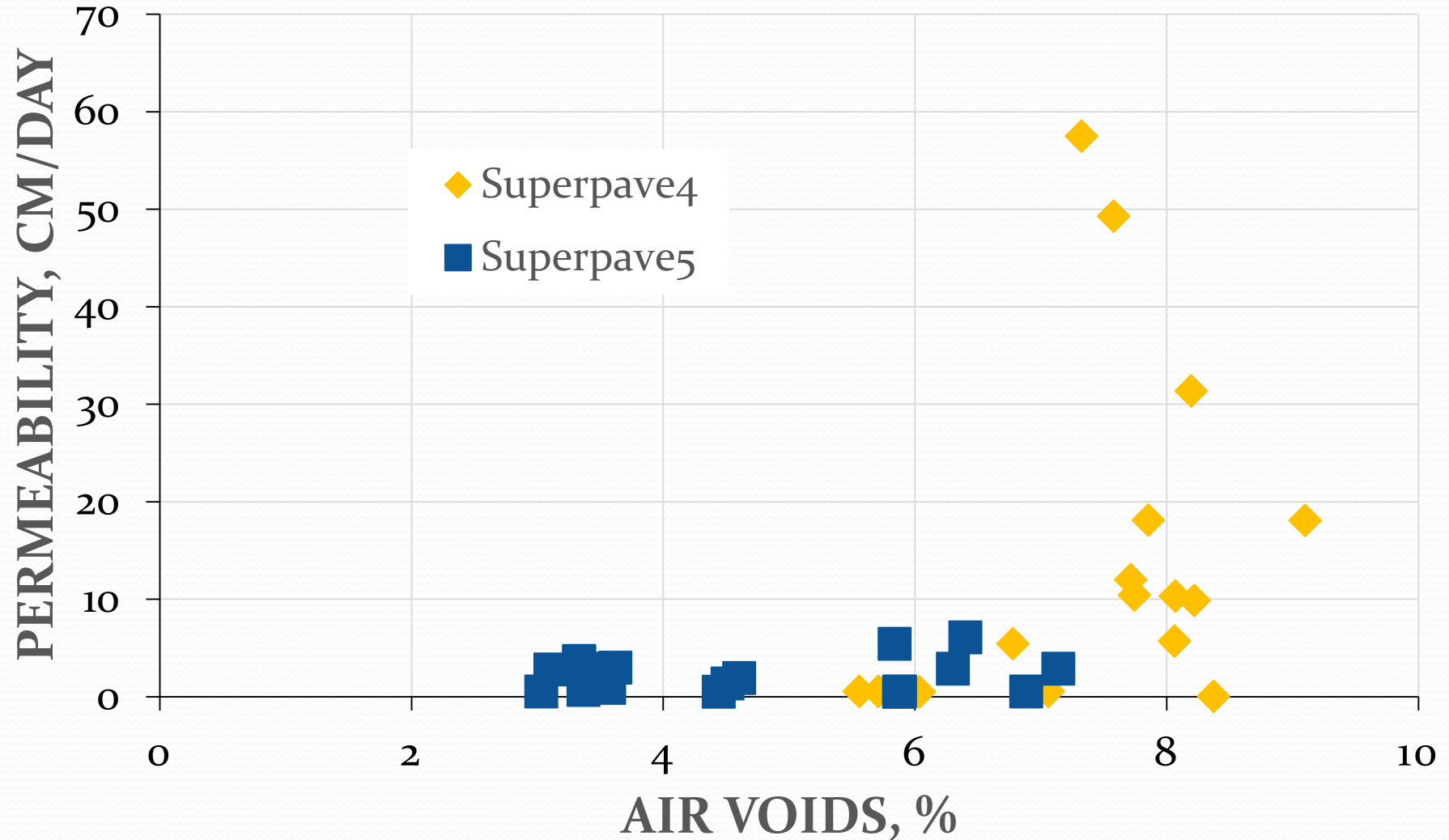
Mix Construction Properties

	Superpave4			Superpave5		
	Design	QC	QA	Design	QC	QA
Asphalt, %	5.1	5.1	5.0	5.4	5.5	5.2
Air Voids, %	4.0	3.5	4.1	5.0	4.5	4.0
Density, %Gmm	-	-	91.6	-	94.7	96.9

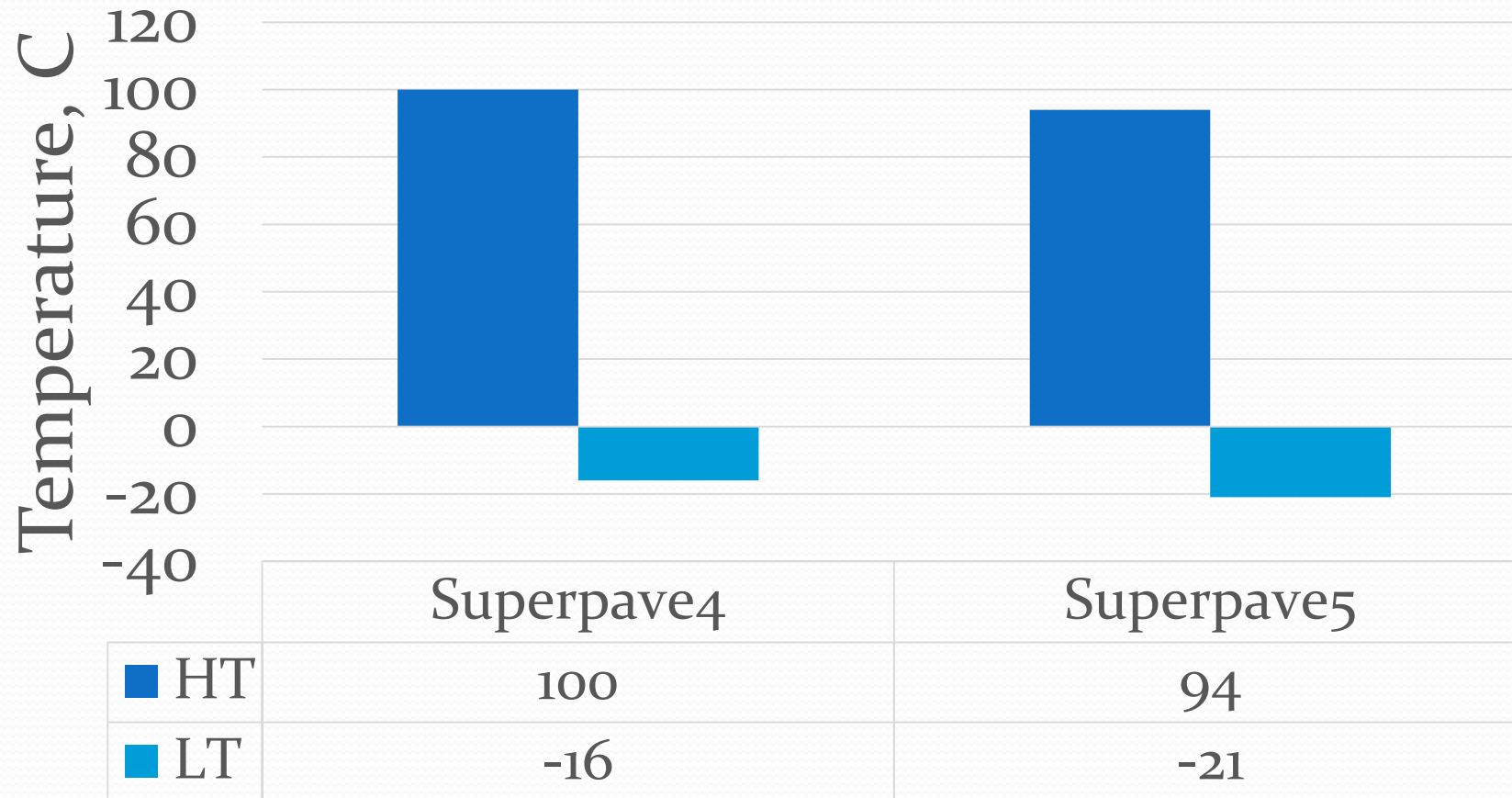


Cores Taken 2018

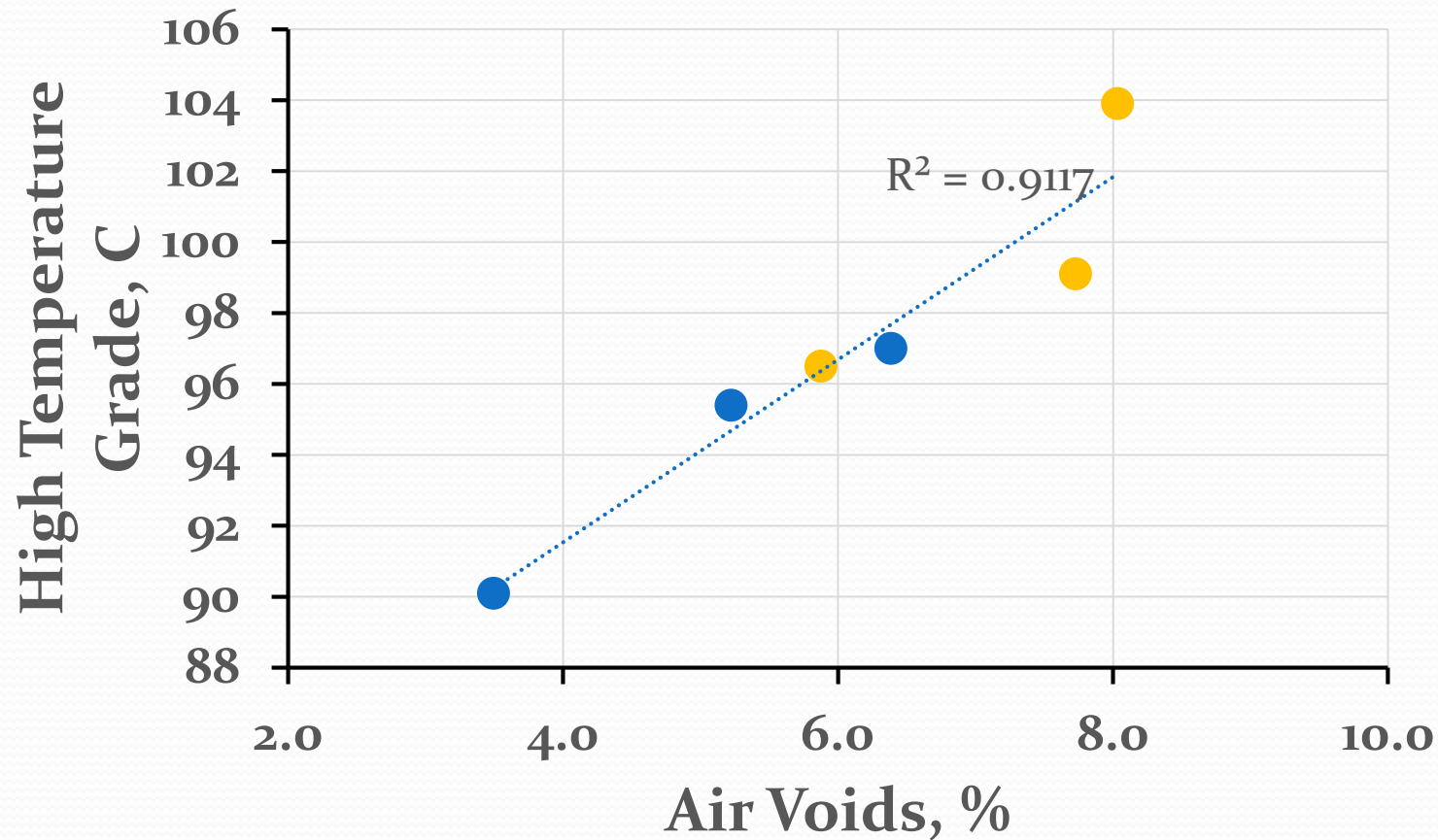
Permeability



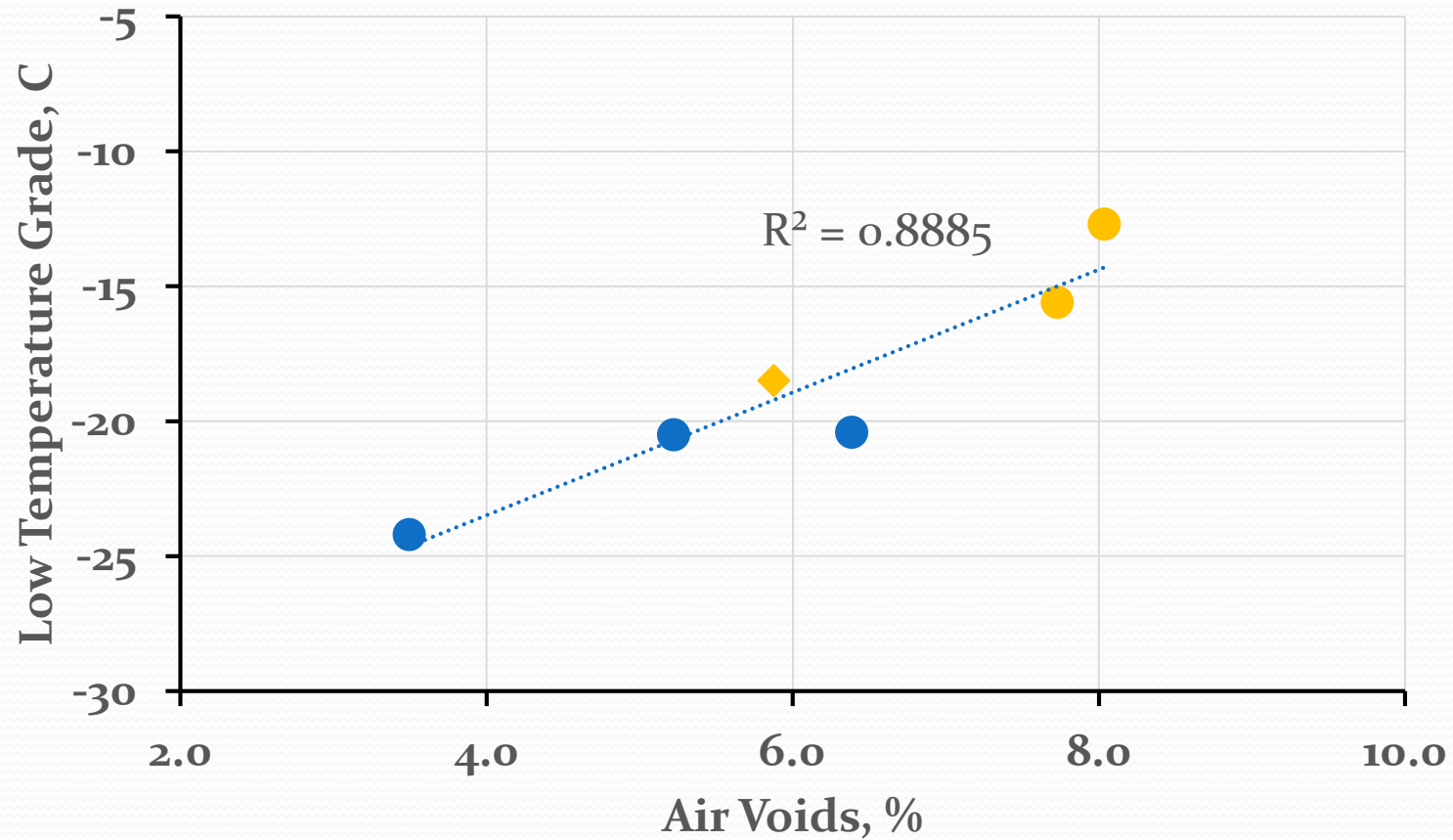
Asphalt Binder Grade



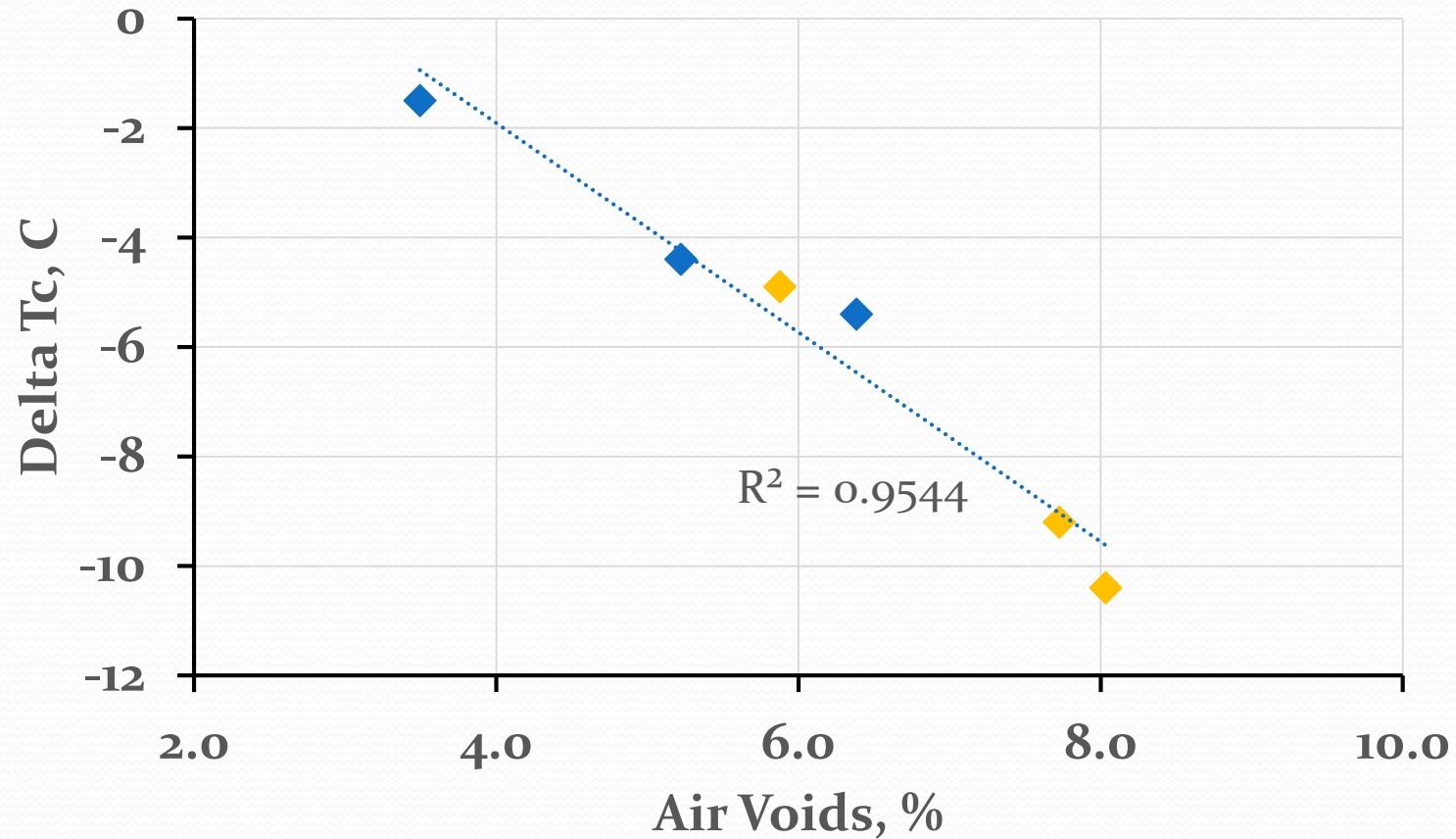
Correlation PG High Temp to In-Place Air Voids



Correlation PG Low Temp to In-Place Air Voids



Correlation Delta Tc to In-Place Air Voids



Specification Revisions

- Air Voids at $N_{\text{des}} = 5.0\%$
- Design Gyration
 - 100 \rightarrow 50
 - 75 \rightarrow 30
- Density LSL = 93.0%

INDOT Implementation

- 10 pilot projects in 2018
- Allowed by “opt-in” basis for 2019
- Effective for all mixes in 2020

Superpave5 Density (2019)

- Superpave4
 - Average = 93.19%
 - 899 sublots
- Superpave5
 - Average = 94.53%
 - 1000 sublots

Superpave5 Air Voids (2019)

- Superpave4
 - 3.91%
 - 899 sublots
- Superpave5
 - 4.71%
 - 1000 sublots

What does it all mean?

- Asphalt Binder Aging
 - Most strongly related to permeability
- Superpave5
 - Increase in-place density
 - Reduce in-place permeability
 - No increase in cost

Thank You!