Superpave5

Gerry Huber
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Heritage Research Group

Why is it?


That roads start off
looking like this?

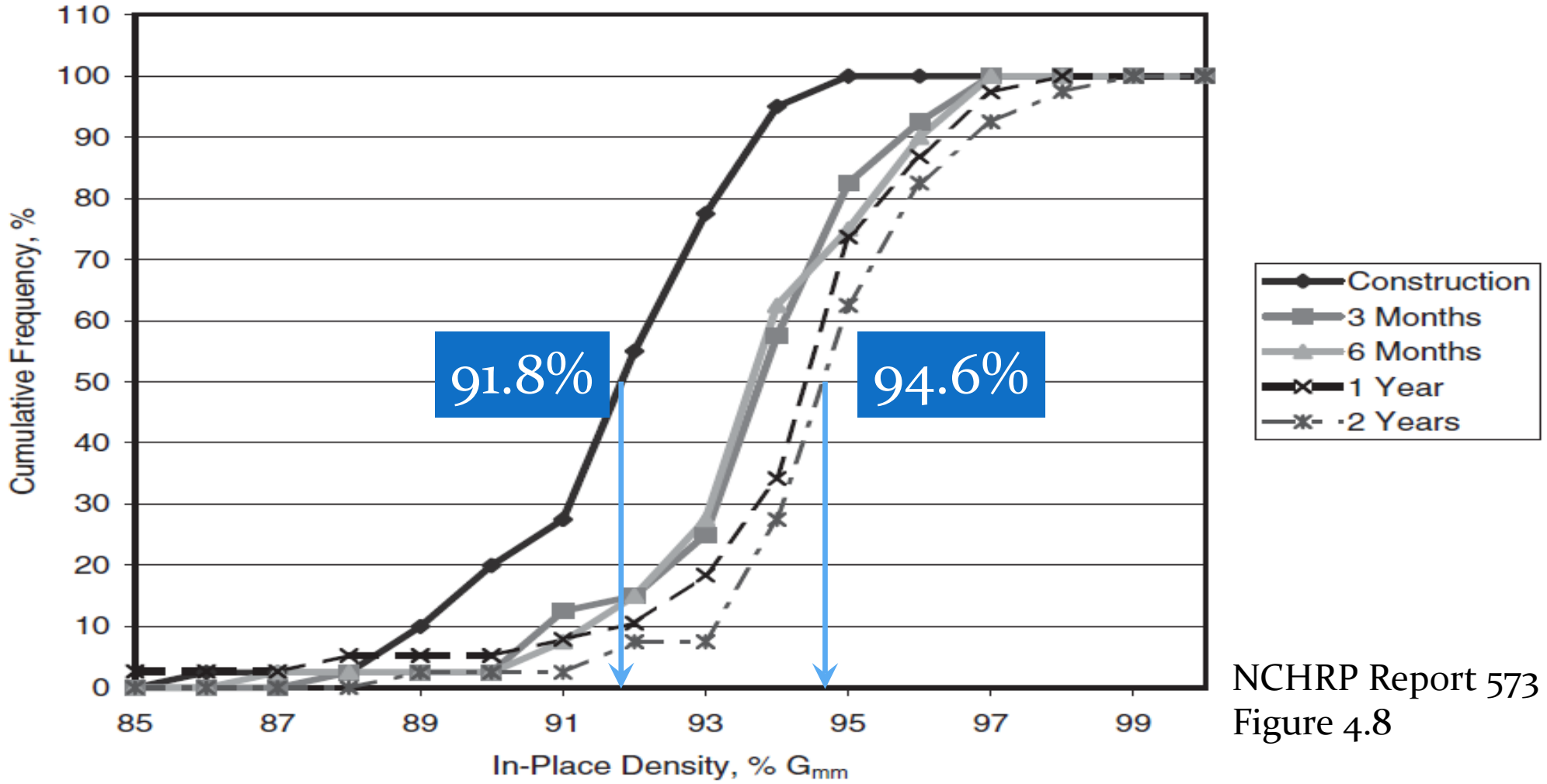

And end up
looking like this


High Air Void
Area


No Crack
Crack

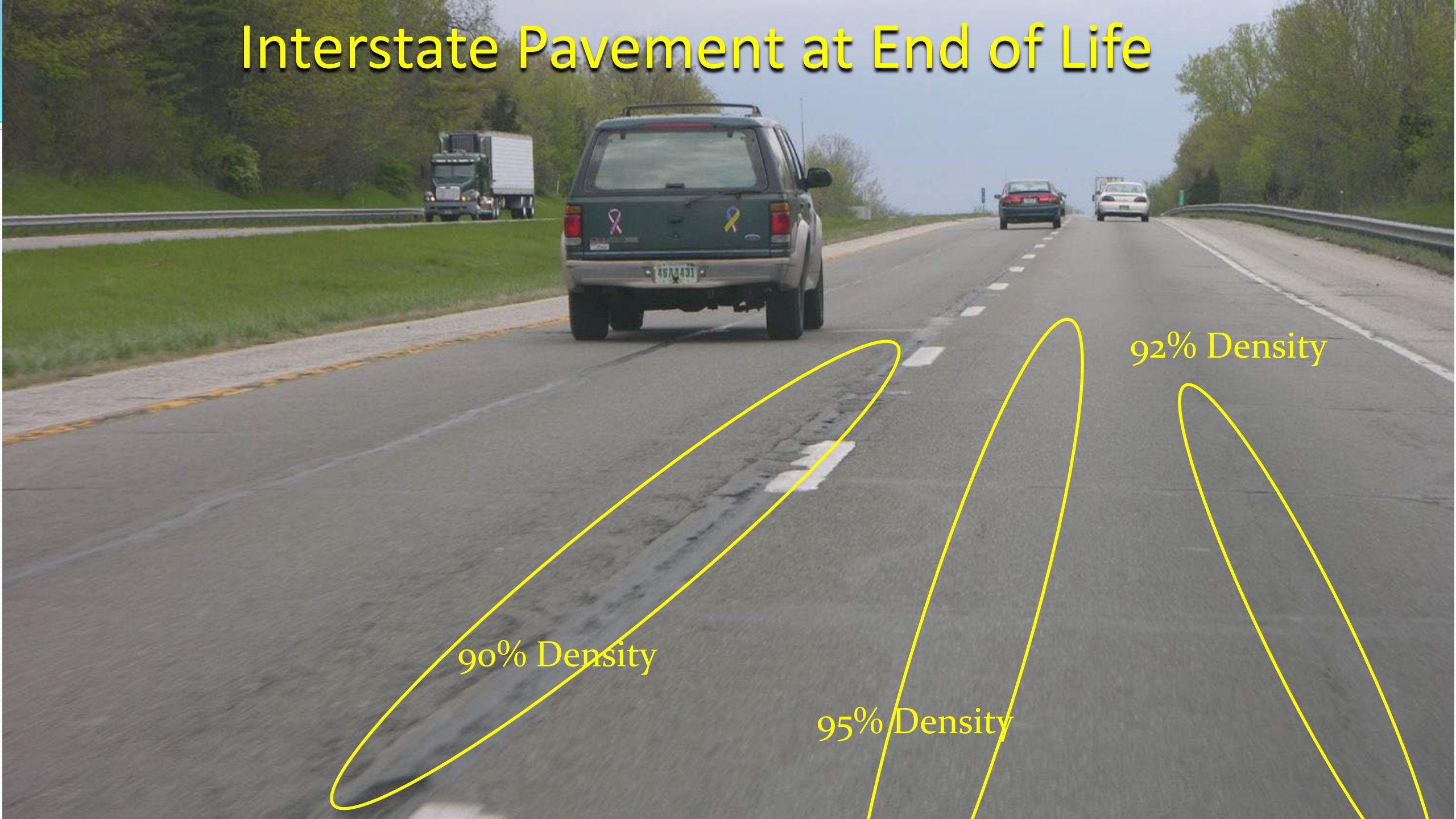

The difference is in-place air voids
The difference is permeability

Final Density (Wheelpath)



NCHRP Report 573
Figure 4.8

Interstate Pavement at End of Life



Superpave5 Concept

- Higher Density = More Durability
- Why do we make density difficult to achieve?

- We can design mixtures to be more compactible
  - Without compromising rutting resistance

Superpave5 Concept

Mix Design
5% air voids

Field Compaction
95% Gmm

- Setting Design Conditions for Superpave5
- Implementation of Superpave5
- Impact on Mix Design and Construction

Superpave 5 Concept

- Mix Design
  5% air voids
- Field Compaction
  95% Gmm

Design Gyration Changes

Superpave5 Compaction

Same Rolling Train

Aggregate Requirements

- Properties that stay same
  - Coarse Aggregate Angularity
  - Fine Aggregate Angularity
  - Flat and Elongated
  - Soundness
  - LA Abrasion

Aggregate Requirements

- Property that changes
  - Gradation

- Fine-Graded mixes are coarser
- Coarse –Graded mixes are finer

Volumetric Properties

- Air Voids increase (4.0% to 5.0%)
- VMA increases by 1.0%
- Voids Filled with Asphalt decreases
- Fines : Effective Asphalt stays same
- Tensile Strength Ratio stays same

Setting Design Conditions for Superpave5

Impact on Design and Construction

Implementation of Superpave%

Counter-Flow Drum Mix Plant


Milestone
ROADTEC


MEIJER
ROADTEC
CAT


9.5 mm
N50
Superpave5


19.0 mm
N30
Superpave5


Texture
19.0 mm N30
Superpave5


19.0-mm
N30
Superpave5


DANGER

SR 13 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

First Project

Georgetown Road Mix Construction Properties

Second Project

	Superpave4		Superpave5	
	Design	QA	Design	QA
Asphalt, %	4.6	4.7	4.8	4.6
Air Voids, %	4.0	4.4	5.0	4.5
Density, %Gmm	-	92.2	-	95.8

US 40 Mix Construction Properties (QA)

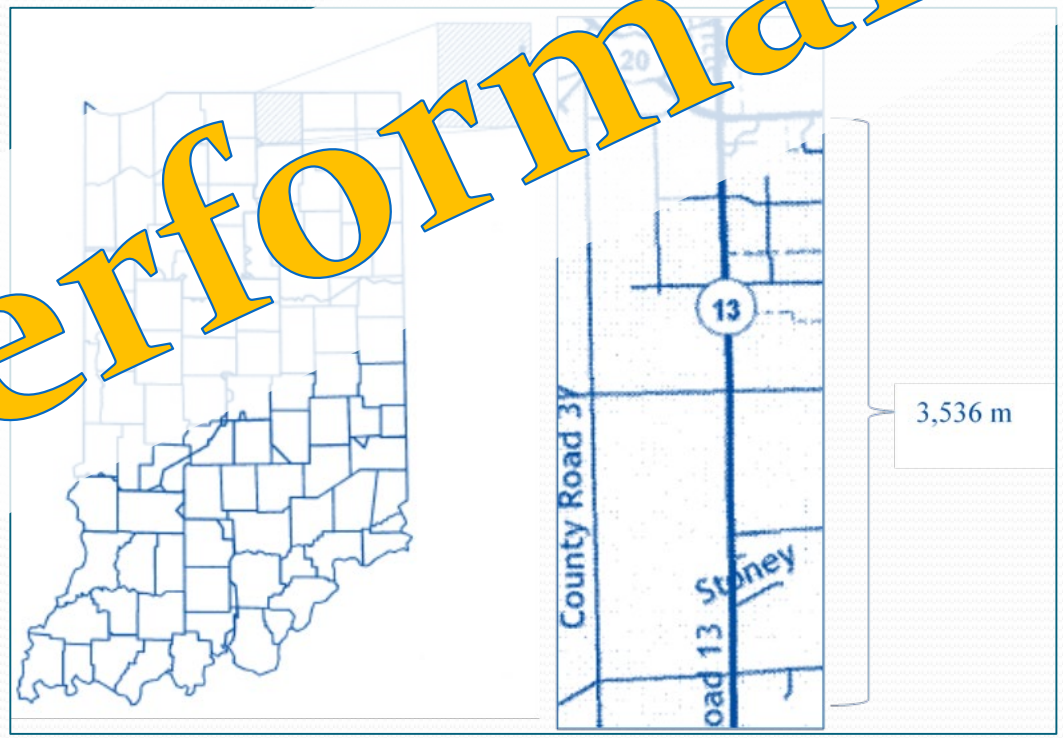
Third Project

	Superpave4	Superpave5
Asphalt, %	6.5	6.8
Air Voids, %	4.8	5.9
Density, %Gmm	93.2	95.2

SR 13, Middlebury, Indiana

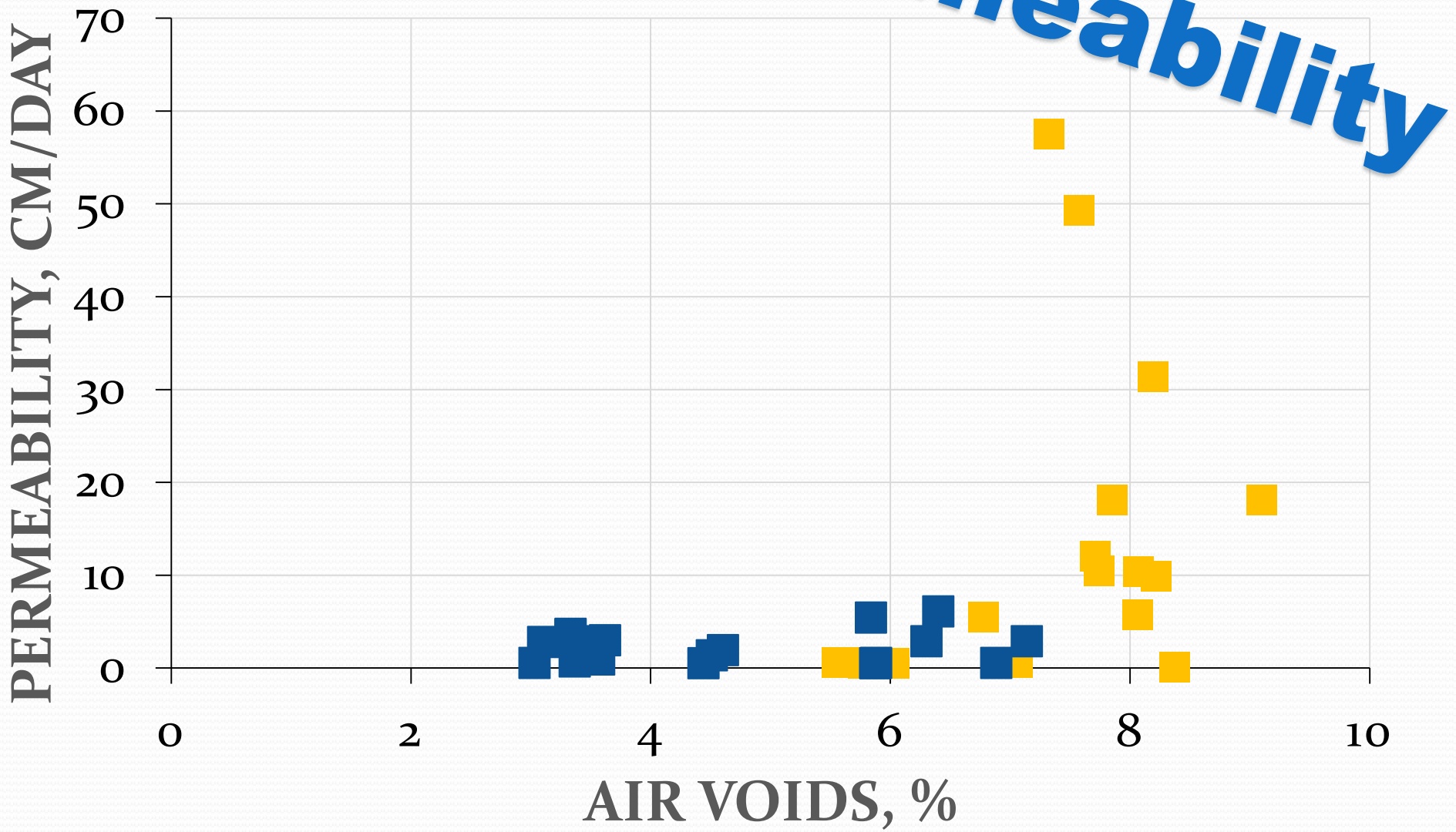
- 2013 Trial Project
  - 13,400 AADT
  - 19% heavy trucks

2018 Performance

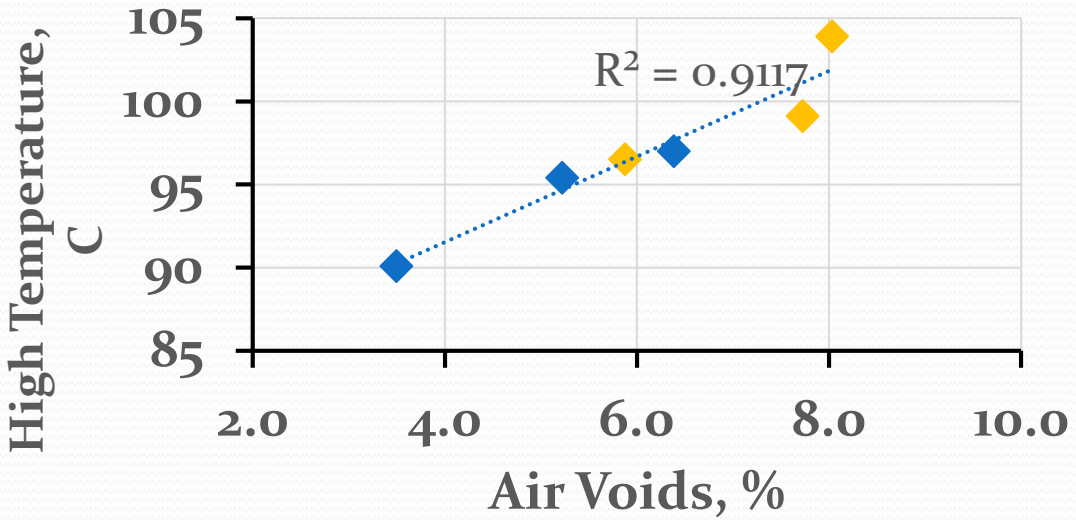


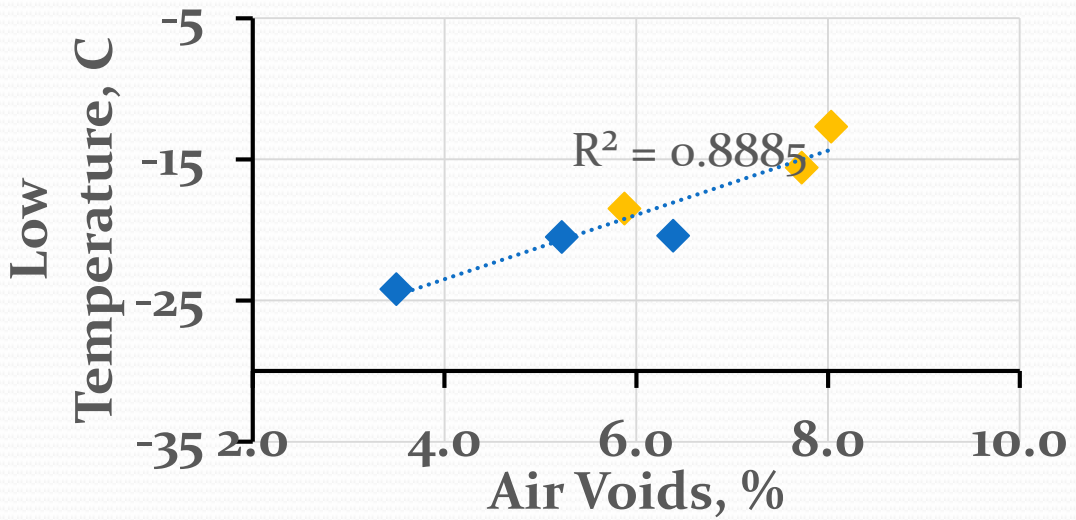

2018 (5 years old)
Superpave4
Superpave5

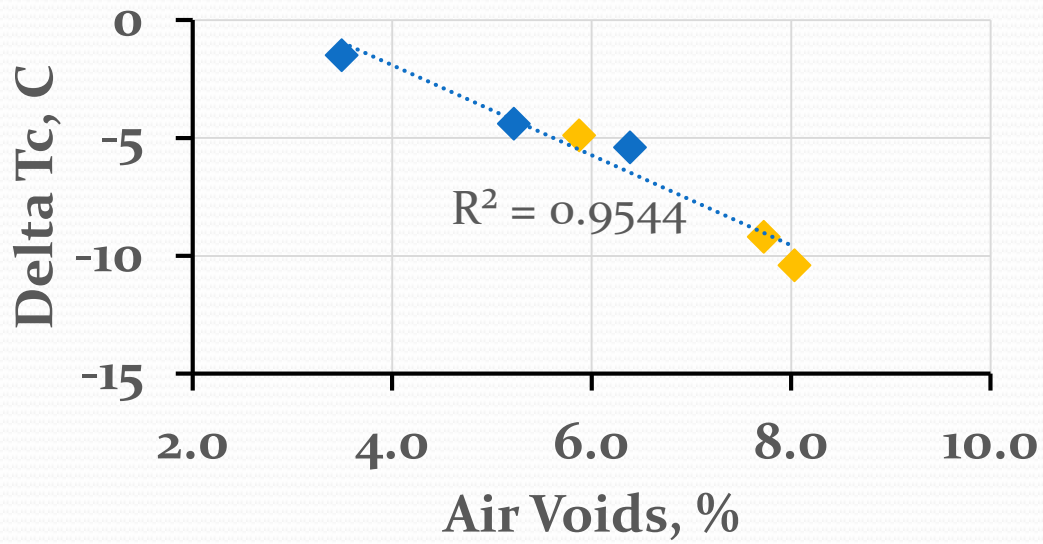
Permeability



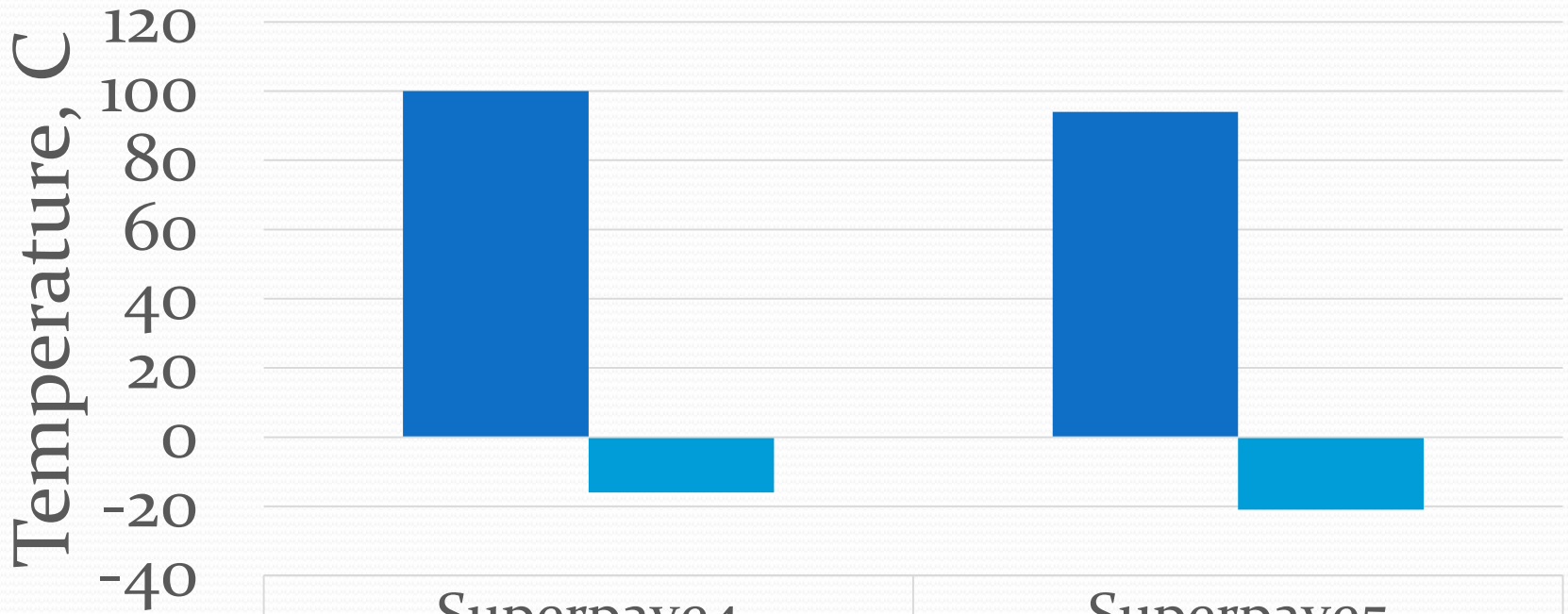
Binder Grade Correlation to In-Place Air Voids







Asphalt Binder Grade



	Superpave4	Superpave5
HT	100	94
LT	-16	-21

- Setting Design Conditions for Superpave5
- Impact on Design and Construction
- Implementaton of Superpave5

Does it Change Asphalt Content?

	Superpave4	
NMAS	VMA	Effective Asphalt (volume)
9.5	15.0	11.0
12.5	14.0	10.0
19.0	13.0	9.0
25.0	12.0	8.0

Does it Change Asphalt Content?

	Superpave4		Superpave5	
NMAS	VMA	Effective Asphalt (volume)	VMA	Effective Asphalt (volume)
9.5		11.0		11.0
12.5		10.0		10.0
19.0		9.0		9.0
25.0		8.0		8.0

Asphalt Content Stays Same

Asphalt Content

Design Gradation Changes

NMAS	Superpave4 VMA	Superpave4 Effective Asphalt (Volume)	Superpave5 VMA	Superpave5 Effective Asphalt (Volume)
9.5	15.0	11.0	16.0	11.0
12.5	14.0	10.0	15.0	10.0
19.0	13.0	9.0	14.0	9.0
25.0	12.0	8.0	13.0	8.0