National Center for Asphalt Technology
NCAT
AUBURN UNIVERSITY

Permeability

Allen Cooley

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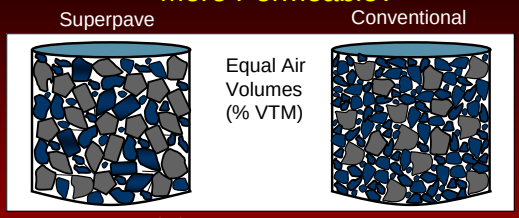
Why is Coarse-Graded Superpave More Permeable?



- Coarser Gradation
- Larger Sized Voids (more chance for inter-connected voids

- Denser Gradation
- Smaller Sized Voids (less chance for inter-connected voids)

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Field Permeameter Device

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Factors Affecting Permeability in the Field

- Pavement Density
- NMAS
- Gradation Shape
- Lift Thickness
- Construction Equipment?

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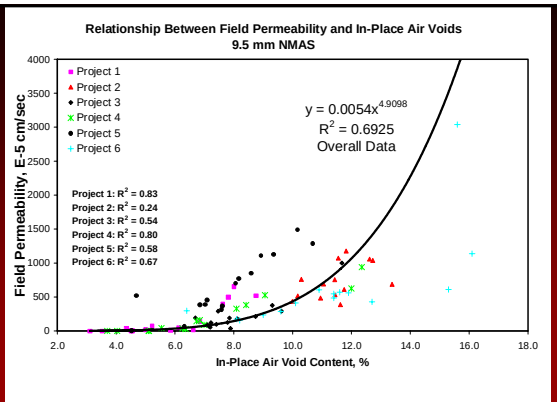

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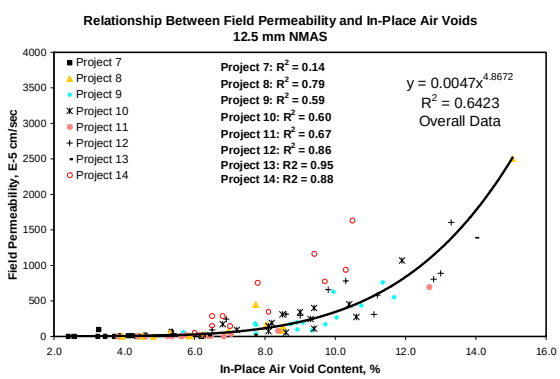

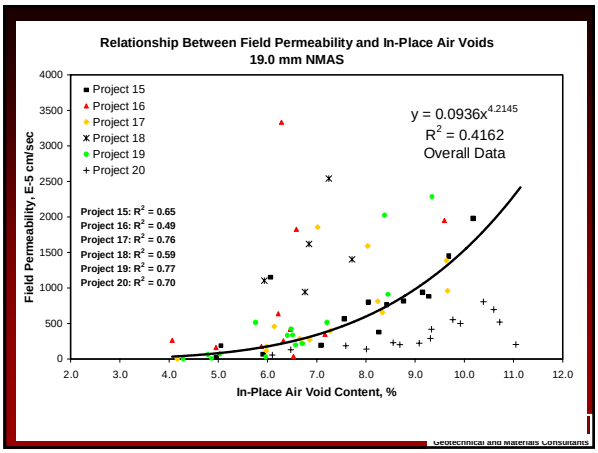

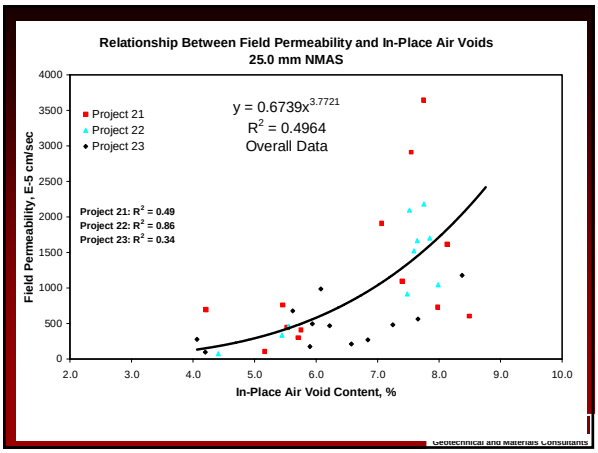

Critical Density Values

- 9.5 and 12.5 mm NMAS ~ 7.5 – 8.0 %
- 19.0 mm NMAS ~ 6.0 – 6.5 %
- 25.0 mm NMAS ~ 5.5 – 6.0 %

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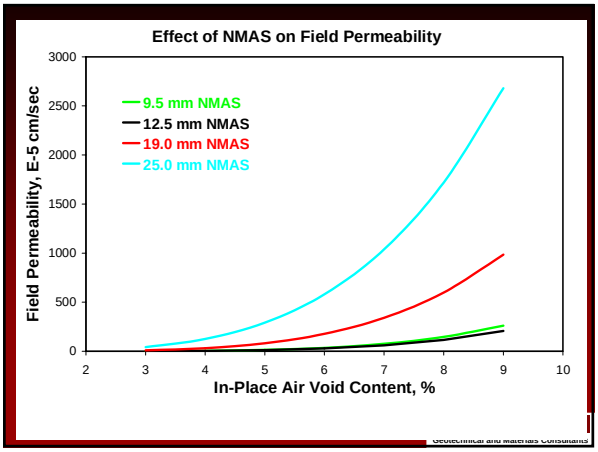

Effect of Thickness and Equipment

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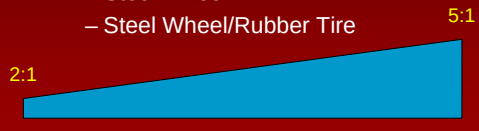
Effect of Thickness and Equipment

- Seven Mixes at NCAT Test Track
- Vary Thickness (Crank Screed Up)
- Roller Type
  - Steel Wheel
  - Steel Wheel/Rubber Tire



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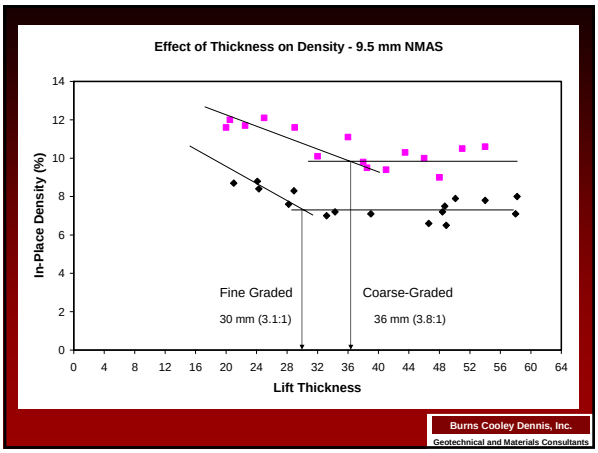

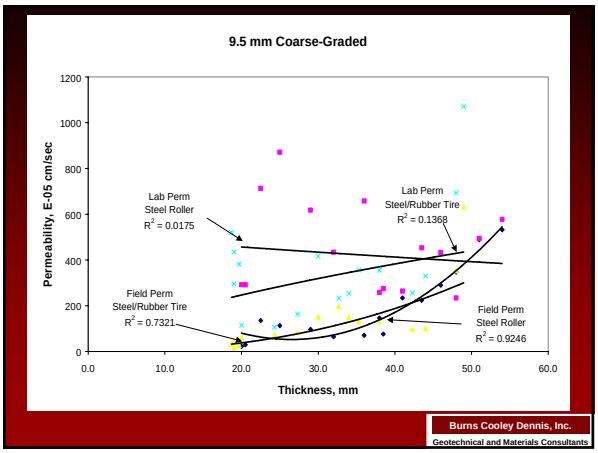

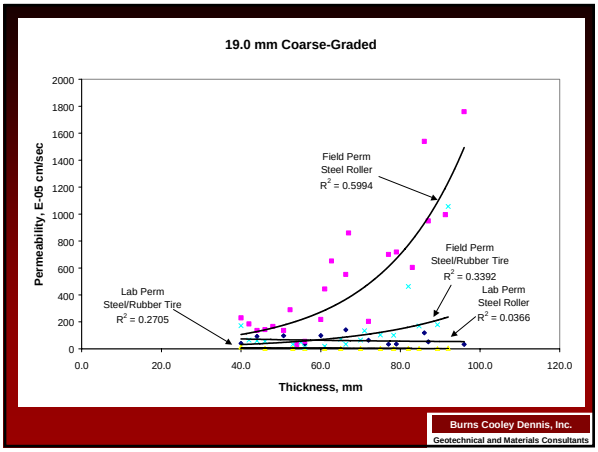

Is There a Tool to Predict Permeability at Design or QC?

- Water Absorption from T166?
  - Defining permeable voids?
- Lab Permeability during Design

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Predict Field Problems During Mix Design/QC?

- Relationship Between Field and Lab Permeability Results?
- Relationship Between Lab Permeability of Field and Lab Compacted Samples?
- Relationship Between Water Absorption and Density?
- Relationship Between Water Absorption and Permeability?

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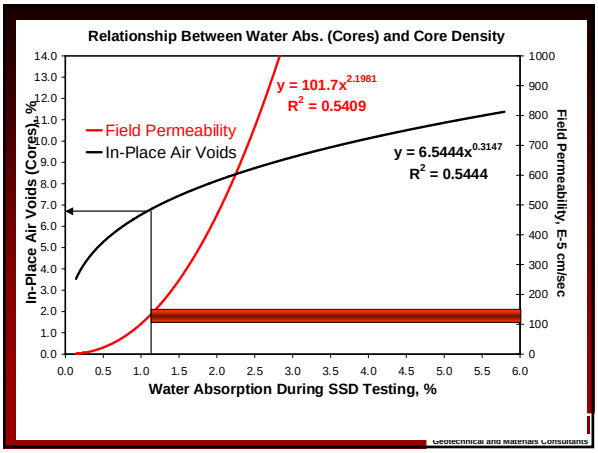

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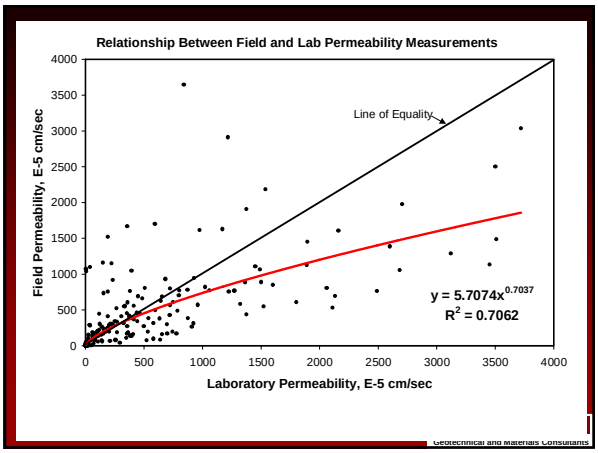

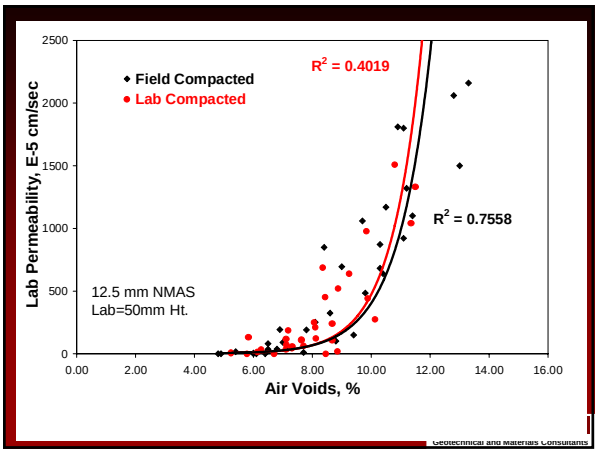

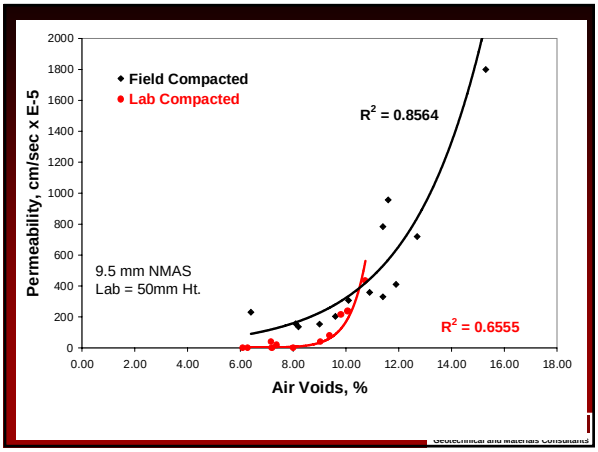

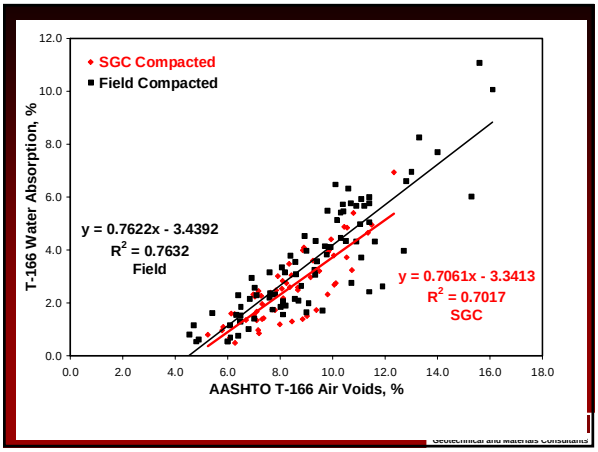

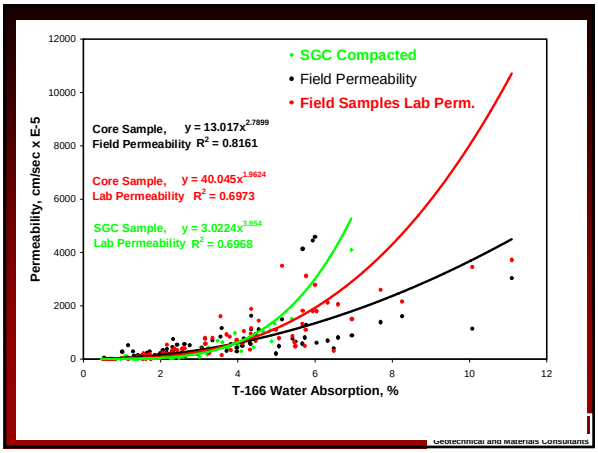

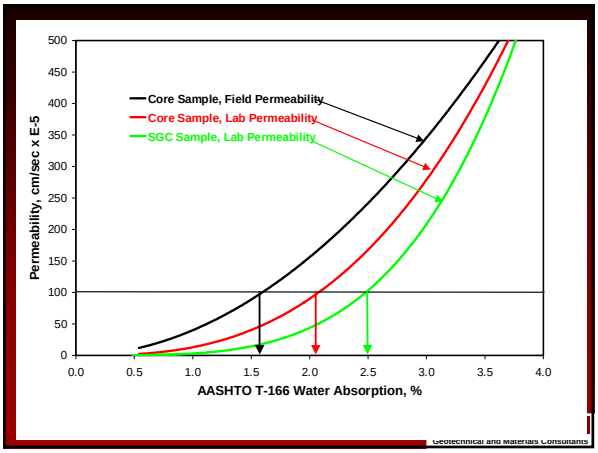

Conclusions

- There is a relationship between density and permeability.
- NMAS and lift thickness affect this relationship.
- Water absorption can be used as a quick check for permeability problems.
- Thickness and Roller type affects permeability

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Conclusions

- During Mix Design
  - Compact samples to design lift thickness
  - Vary air voids to anticipated field values
  - Determine Lab Permeability and/or Water Absorption
  - If lab permeability above 125×10^{-5} or absorption above ≈ 2.0%, may have potential permeability problems in the field

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