

Longitudinal Joint Permeameter: New Non-Destructive Pavement Joint Test

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Introduction

- Problem of quality longitudinal joints
- Distresses accelerated by water intrusion
- Density measurement
- Permeability measurement
- Quality control in the field



Scope

- Literature review
- Develop longitudinal joint permeameter
- Suitable for rapid field testing
- Evaluate as QC tool
- Water tightness criterion

Existing Permeameters

- Marvil Test used in South Africa
 - 175mm diam tube, constant pressure head
- NCAT/WPI field permeameter
 - Three tiers
 - Falling head
 - Closed cell rubber seal to pavement

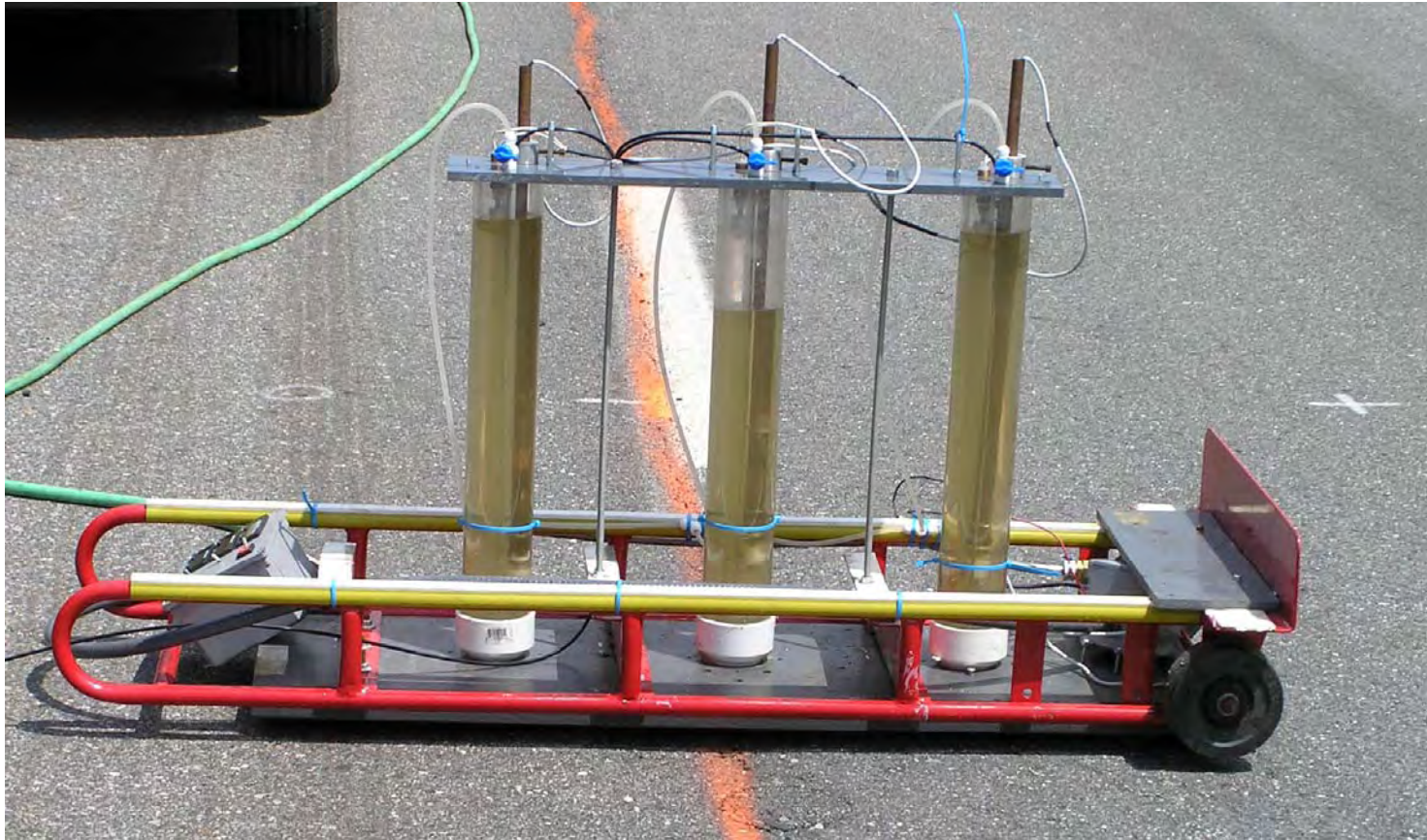


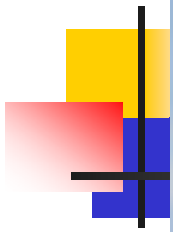


Longitudinal Joint Permeameter

- Three 2.5" diam., 24" tall Lexan standpipes (joint, both mats)
- 2" PVC base milled to accept different plate opening geometry (circular vs rectangular for joint)
- Rubber ball flaps to control water
- Linkage to operate all three standpipes simultaneously
- Closed-cell foam for seal with pavement surface
 - different thicknesses for crown
 - can core in same location after testing
- Mounted on hand truck, additional steel weights required
- Automated timing (future)

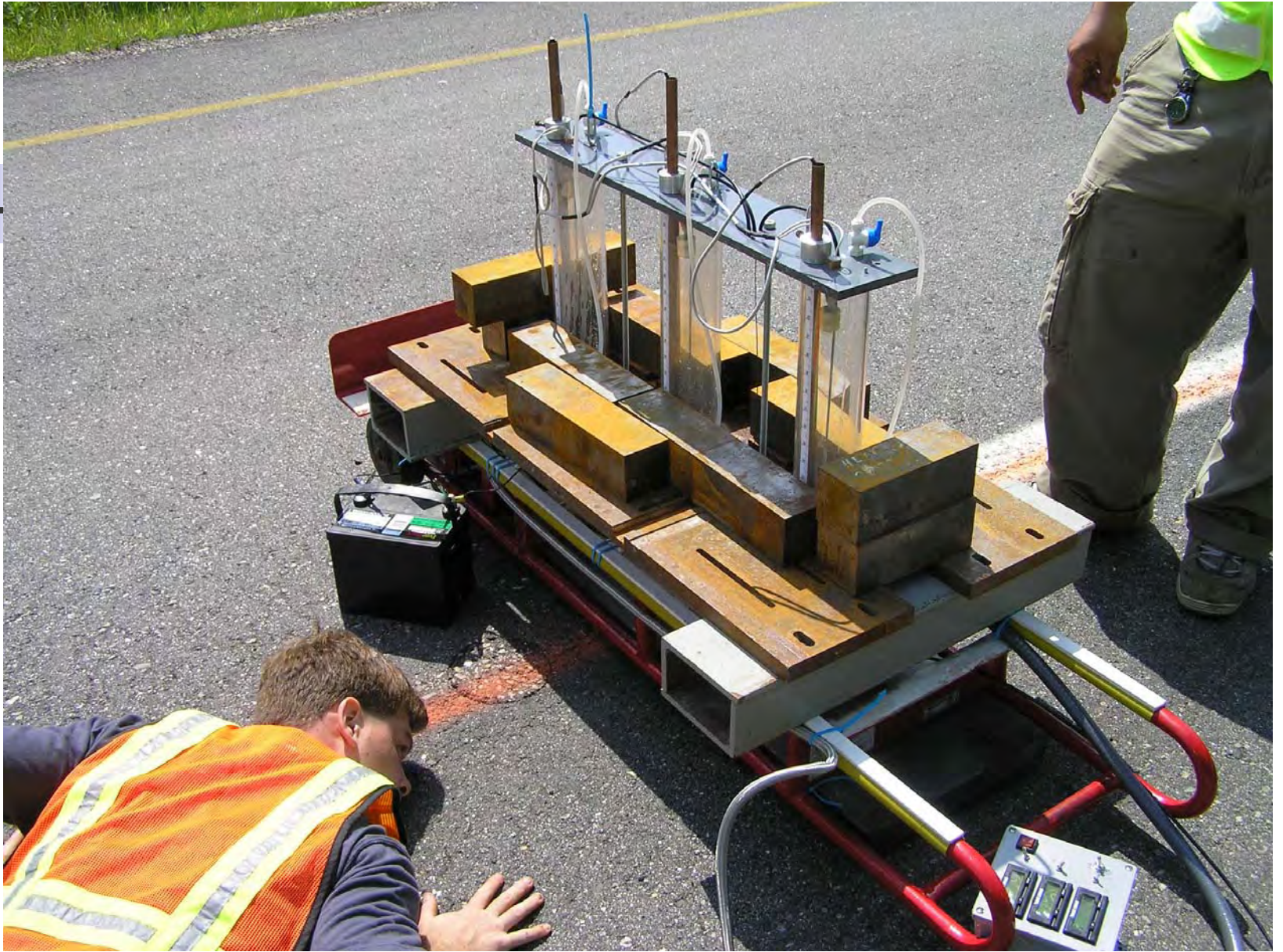
Longitudinal Joint Permeameter











Permeability (cm/s)

$$k = \left(\frac{aL}{At} \right) \ln \left(\frac{h_1}{h_2} \right)$$

permeability

x-sect pipe

thickness of HMA layer

initial water head

x-sect hole

elapsed time

final water head



Infiltration (cm/hr)

$$Inf = \frac{a(h_1 - h_2)}{At}$$

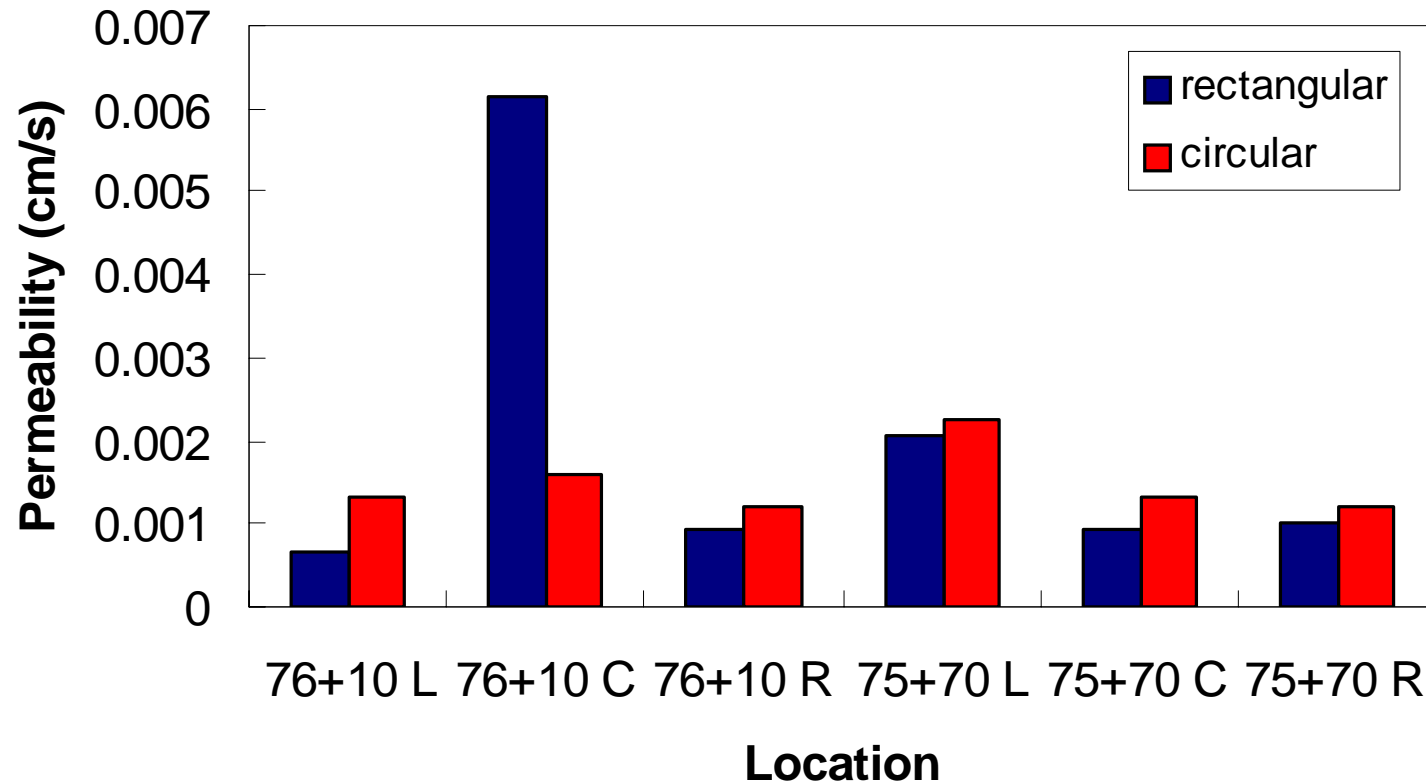
x-sect pipe

Change in water head

x-sect hole

elapsed time

Circular vs Rectangular Opening

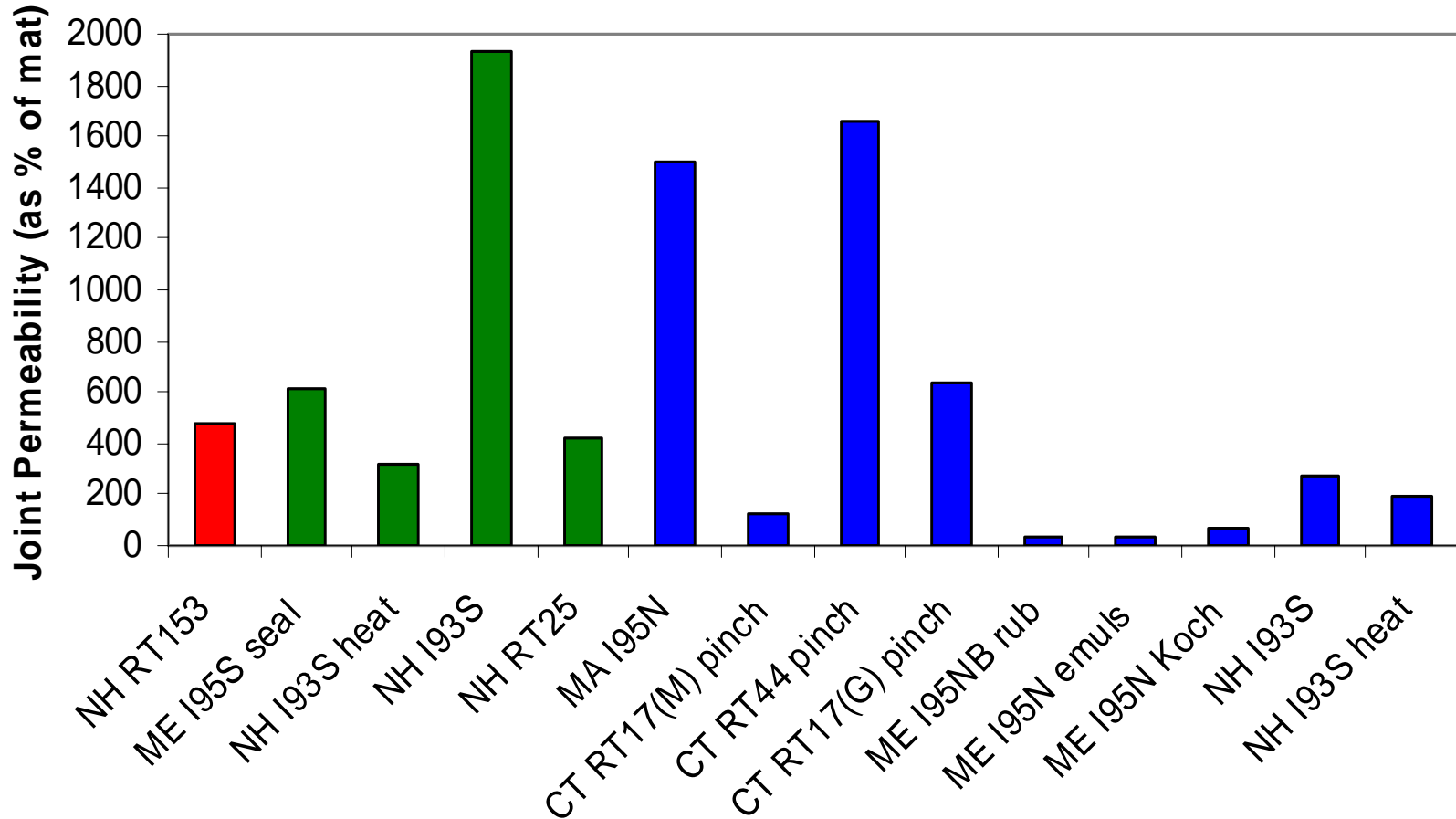




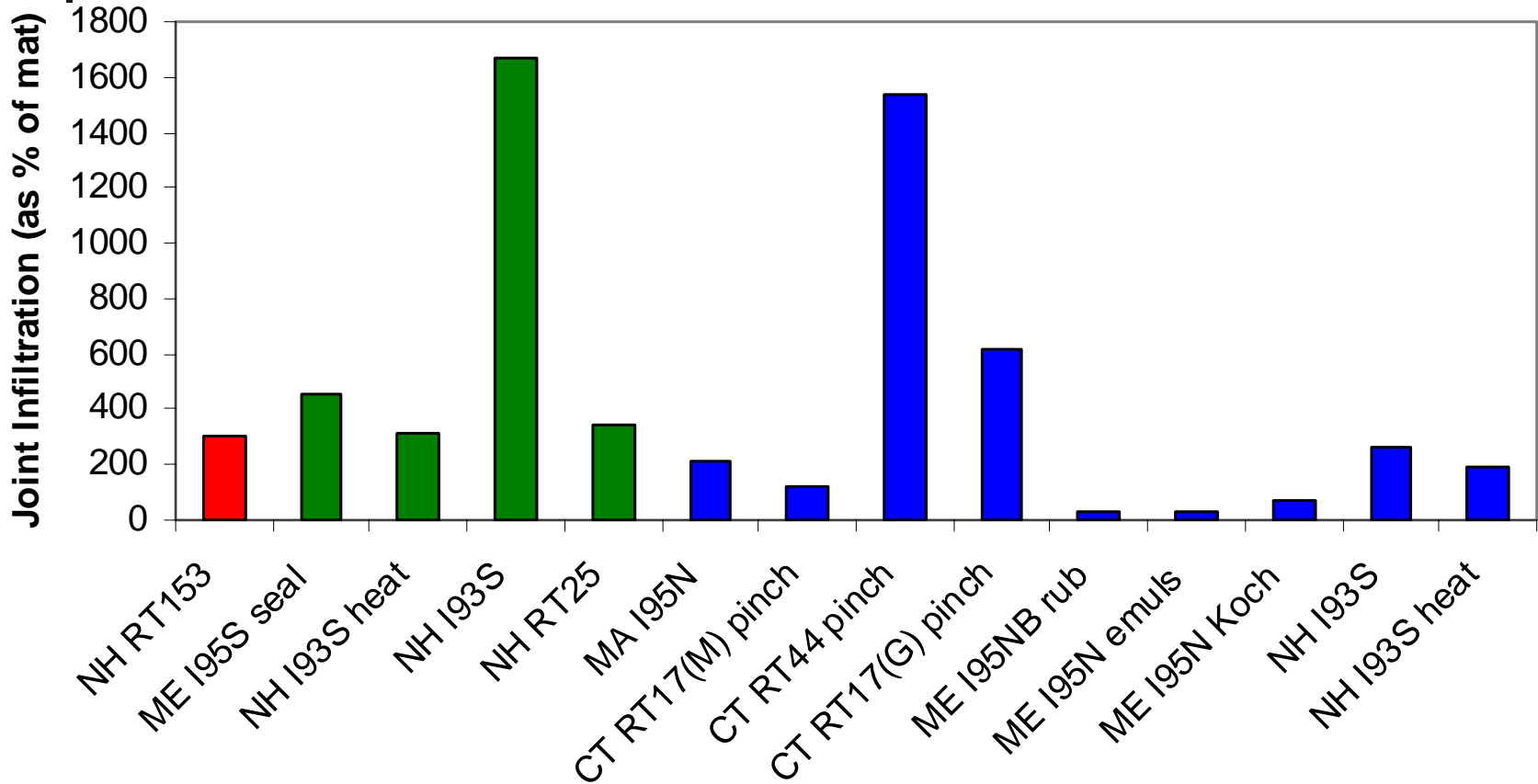
Test Parameters (to date)

- Pavement layer
 - surface, intermediate, base
- NMSA
 - 9.5 mm, 12.5 mm, 19 mm, 25 mm
- Joint type
 - Conventional (butt), pinched, infrared heater, various joint sealers
- Locations
 - NH, ME, CT, VT, MA

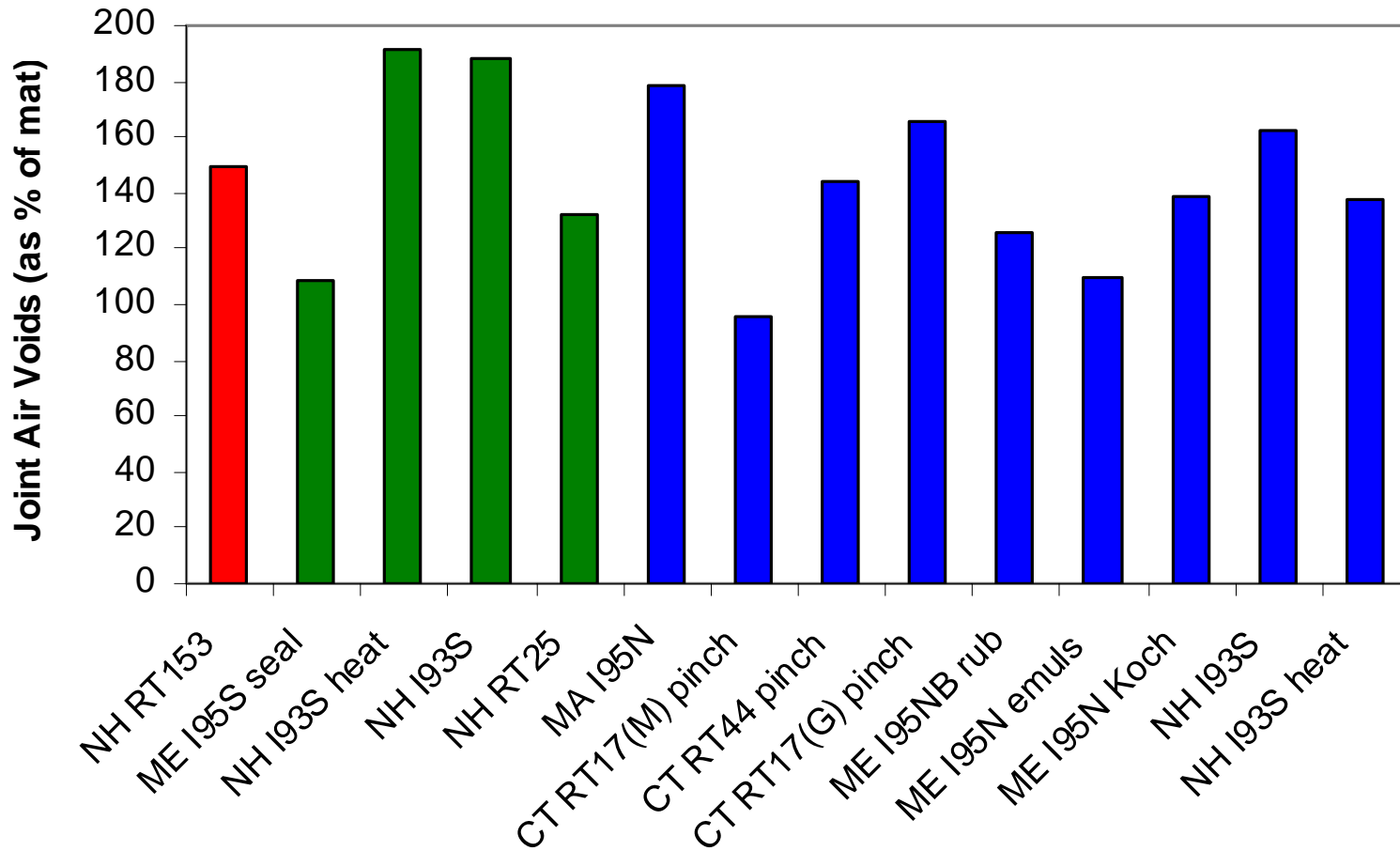
Joint Permeability (% of Mat)



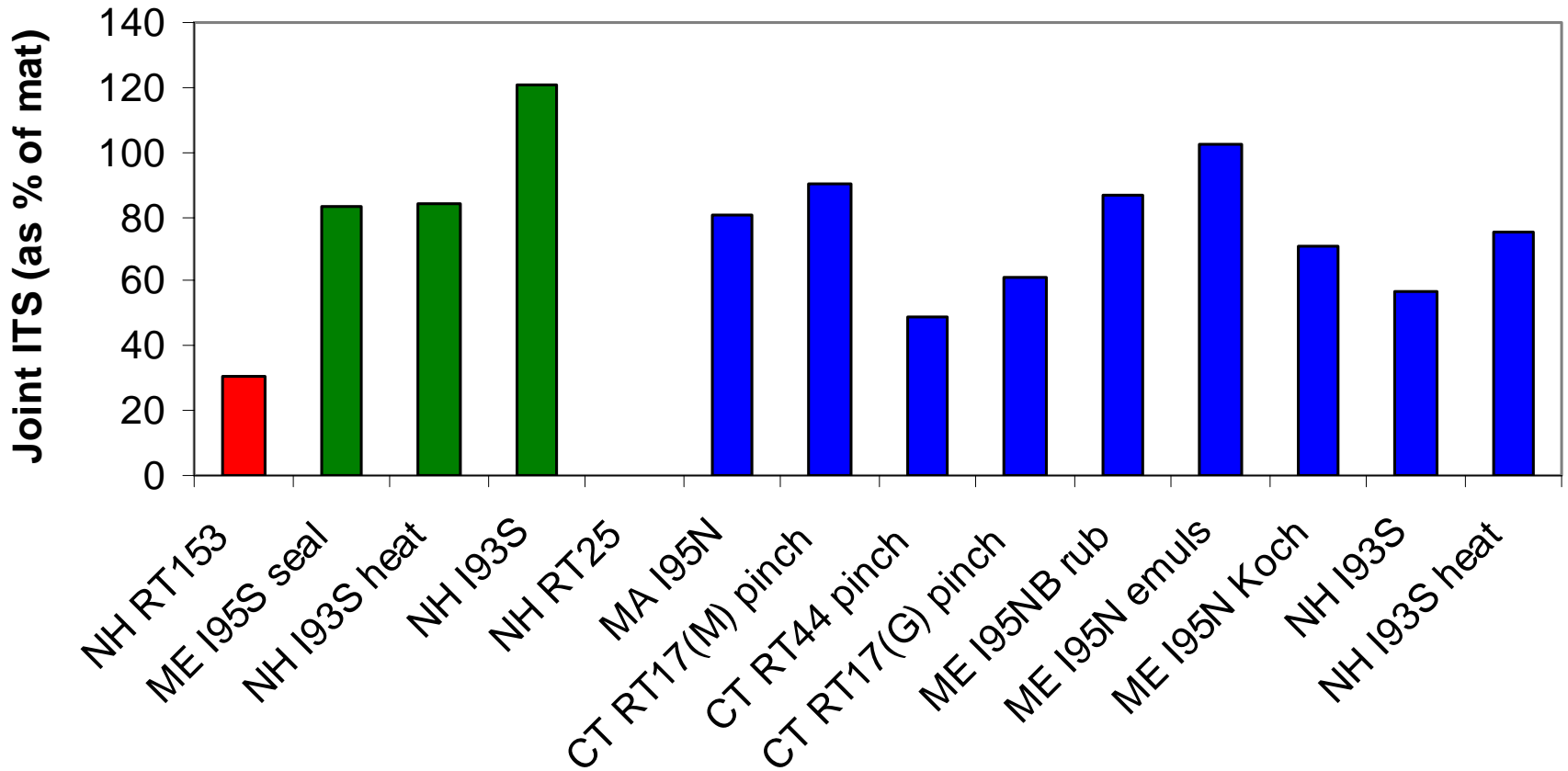
Infiltration (as % of mat)



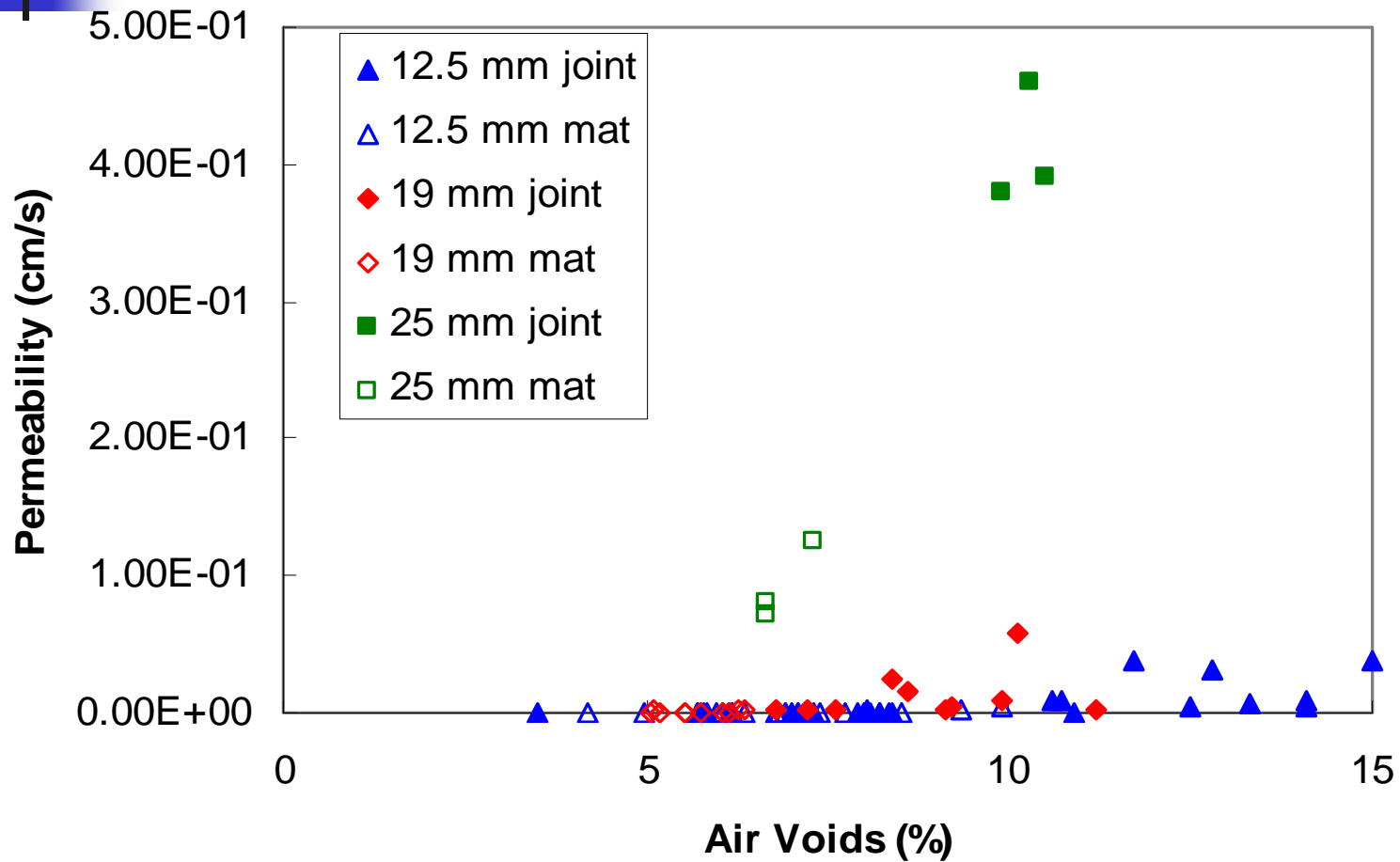
Air Voids (as % of mat)



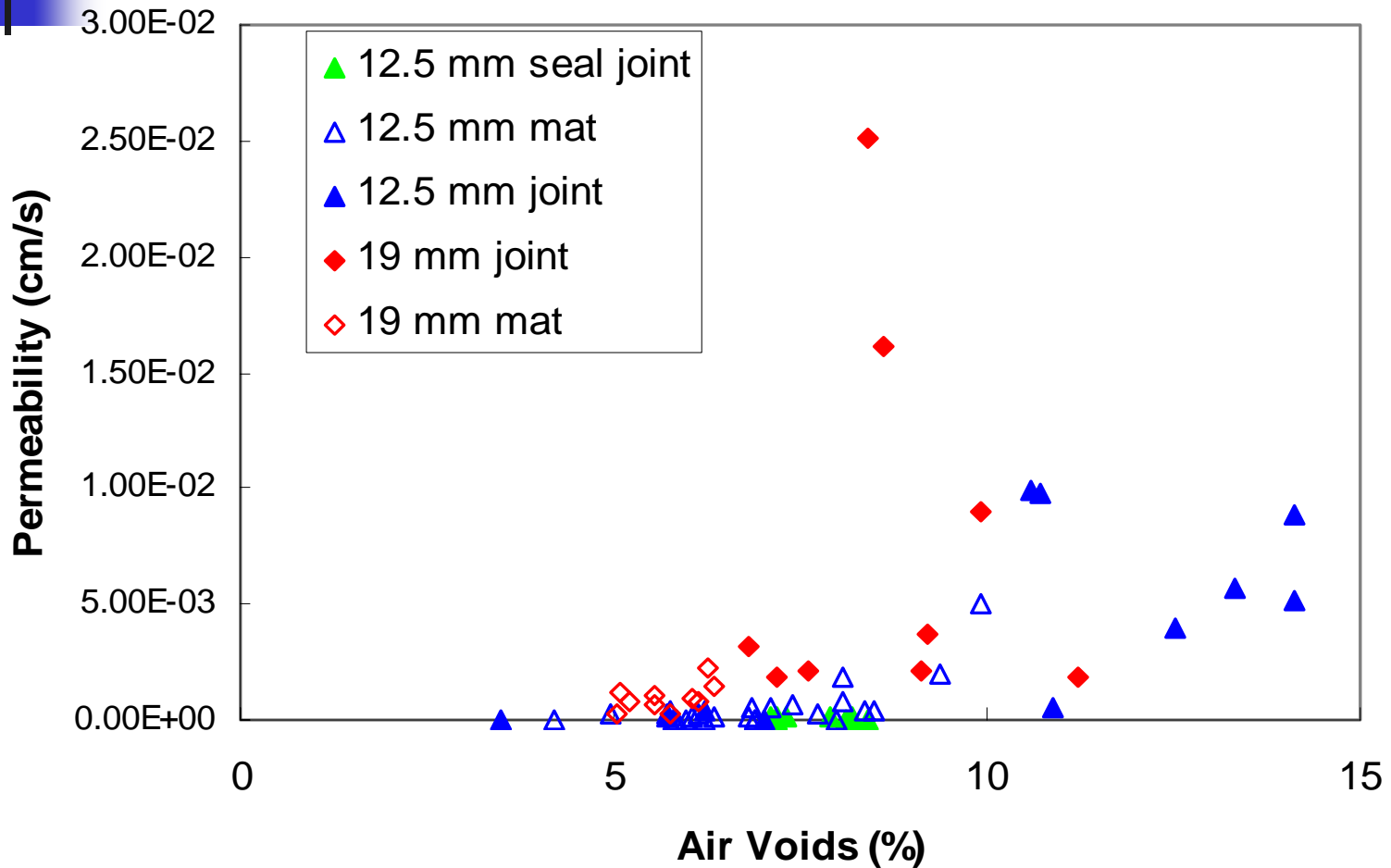
ITS (as % of mat)



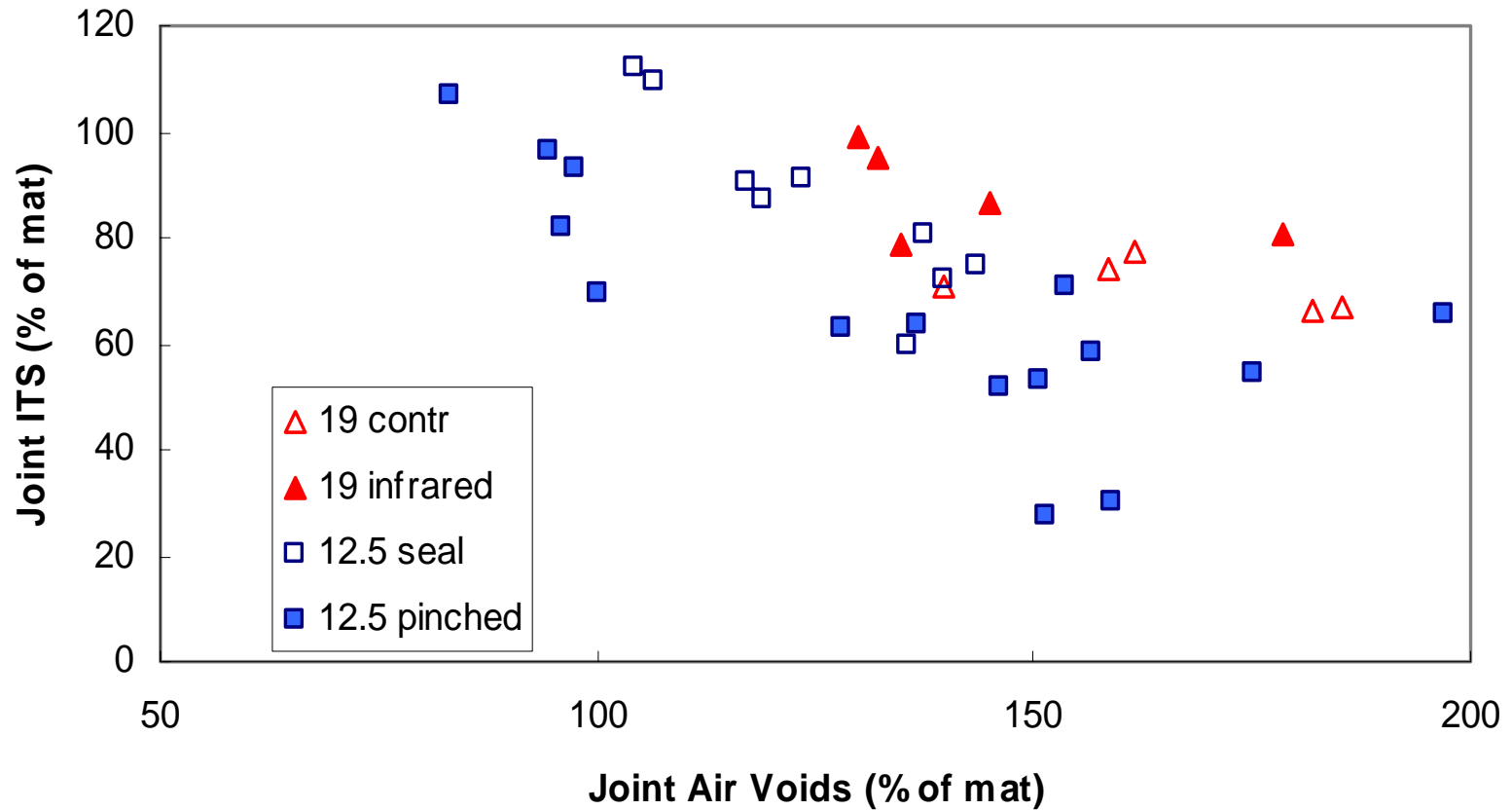
Perm. vs Air Voids – all mixes



Perm. vs Air Voids; 12.5 & 19mm



ITS vs Air Voids





Conclusions

- Joint permeameter works
- Permeability/Infiltration as % of mat
- IDs improved joint construction techniques



Continuing Research

- Additional test sites
- Performance monitoring
- Re-testing sites
- Water tightness criterion
- Permeameter improvements
 - Seal to pavement surface
 - Single operator



Acknowledgements

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Questions?
