Current Research:
Increasing the RAP Content

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RAP ETG
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Current RAP Research - NCSC

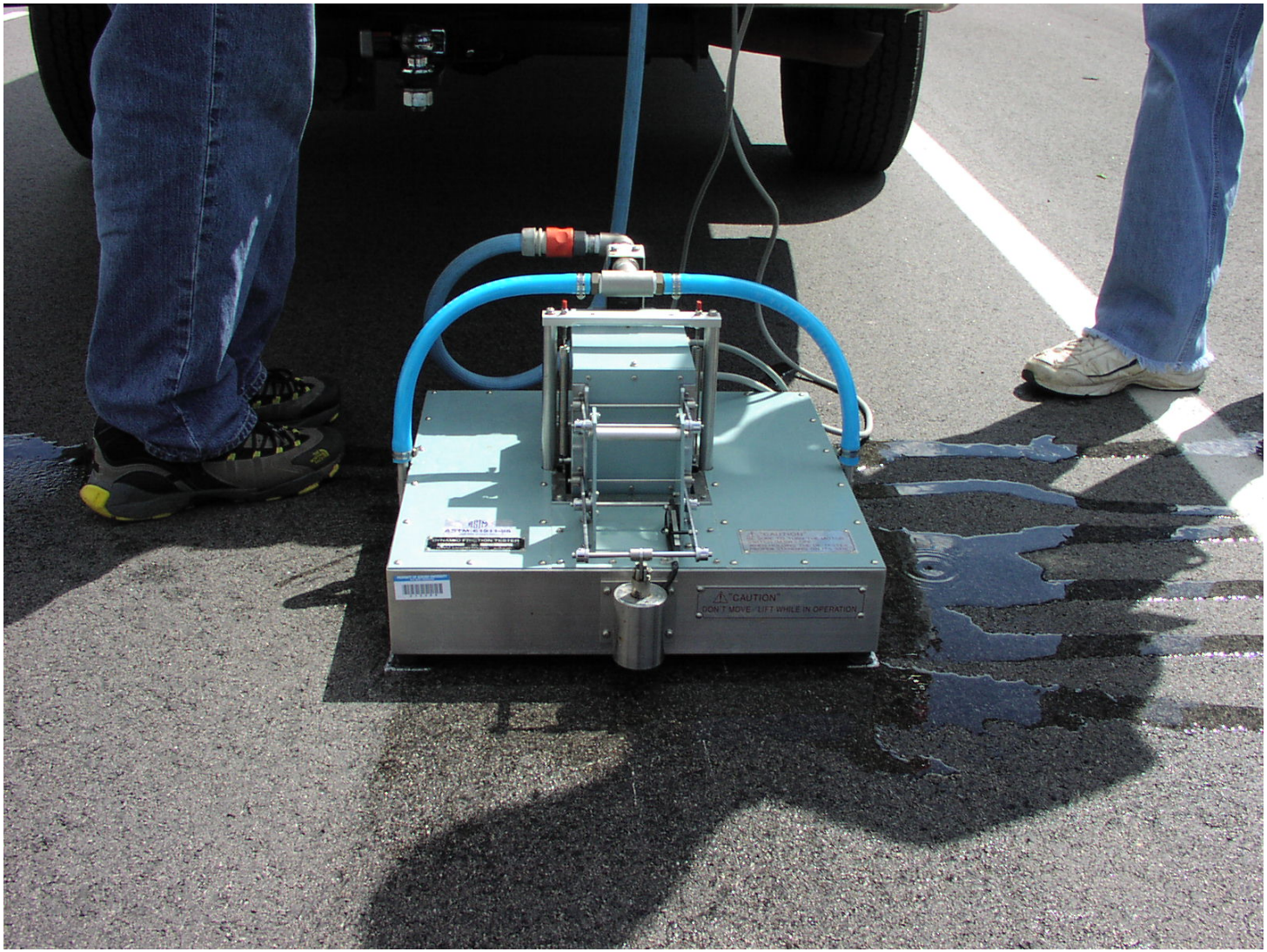
- *Evaluation of RAP for Surface Mixtures*
  - Determine if INDOT can allow the use of RAP in mainline surface courses for high volume roadways
    - Either develop method to ensure RAP agg meets certain properties and provides adequate friction
    - Or determine threshold level of RAP that will not have negative impact on friction
  - INDOT funded

RAP for Surfaces

- Evaluate different blends of
  - RAP -- lab fabricated “worst case” RAP
  - Mix Types – SMA and HMA
  - NMAS – 9.5mm
  - Agg Types – slag and dolomite
- Fabricate slabs, polish in lab and test texture and friction
- Test field friction of existing RAP surfaces
- Verify acceptable friction and mechanical properties with 6-8 sources of real RAP

Slab Polisher

Dynamic Friction Tester



Circular Texture Meter

Current RAP Research - NCSC

- *Low-Temperature Performance Properties of Hot Mix Asphalt Containing RAP*
  - 2006 -- Evaluated plant-produced mixes with up to 40% RAP and two virgin binder grades
  - Originally proposed to focus on effects of RAP on low temperature properties
  - 2007 -- Expanded – 4 more contractors/plants
  - FHWA funded

What We Did - 2006

- Milestone Contractors LP produced six mixes through one plant over two days.
- Heritage Research Group and NCSC tested RAP, virgin and mixture properties
  - Binder properties – PG binder tests
  - Mix properties – Indirect Tensile Strength, Dynamic Modulus, Shear Modulus

Experimental Design

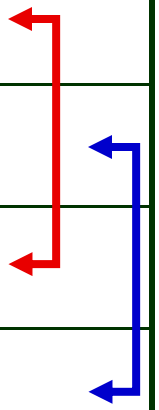
	Reclaimed Asphalt Pavement			
Binder Grade	0%	15%	25%	40%
PG 58-28			X	X
PG 64-22	X	X	**X**	X

Tests

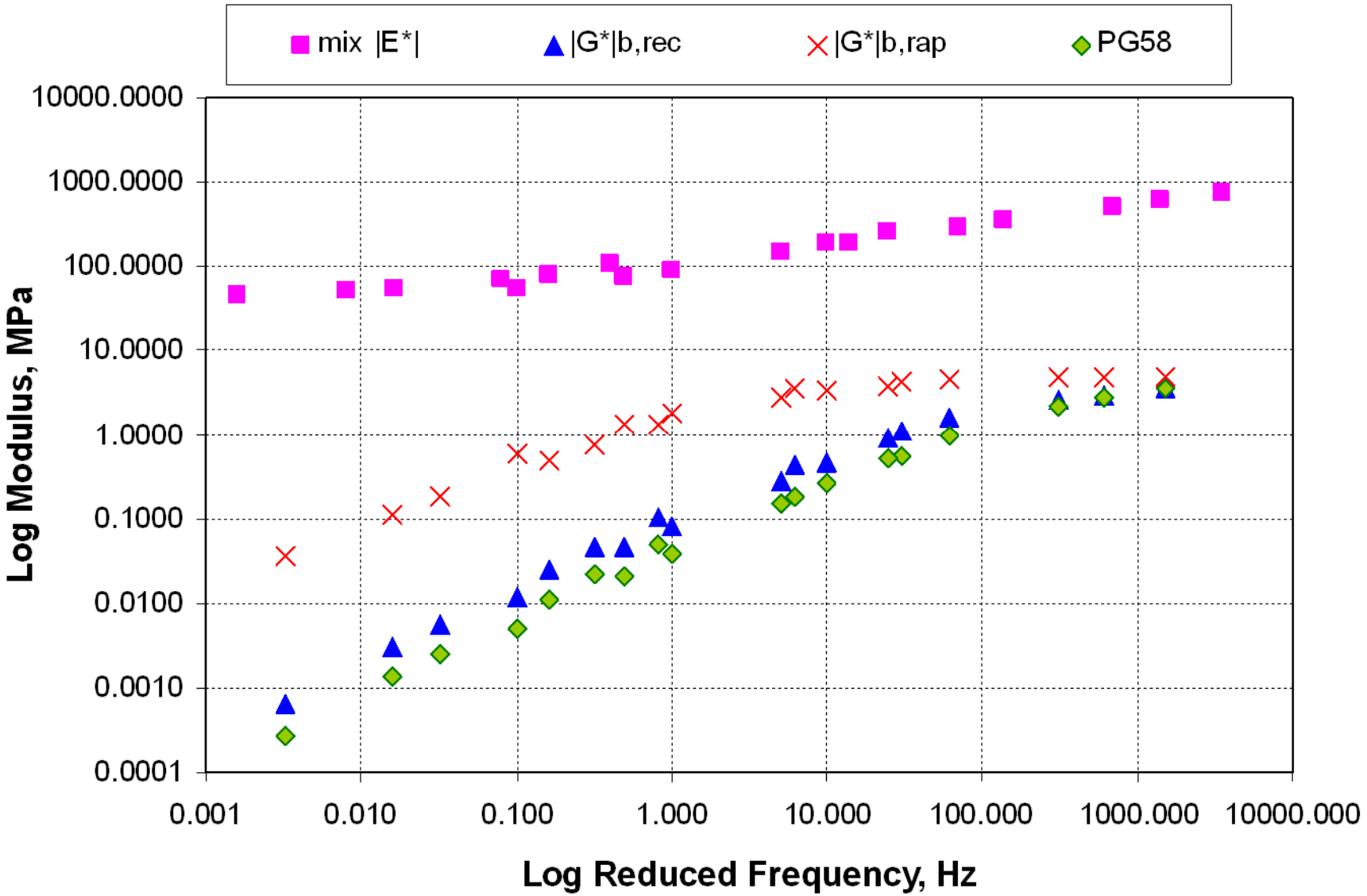
- Binder tests – look at blending in lab and plant
- Mixture tests –
  - Low temperature
  - Dynamic Modulus
  - Fatigue (FHWA)
- Extraction Technique – compare Abson to T319
- Dynamic Modulus
- Comparison of Abson vs. T319

Critical Cracking Temperatures

Mix	RAP Content	Tc (°C)
A – PG64-22	0	-28.9
B – PG64-22	15	-23.3
C – PG64-22	25	-25.6
D – PG64-22	40	-22.8
E – PG58-28	25	-27.2
F – PG58-28	40	-23.9



PG58-28, 40% RAP



What does this mean?

- For these materials and this plant, the RAP mixes were not as stiff as expected.
- The binder did not stiffen linearly with increasing RAP content.
- In this case, dropping the virgin grade to PG58-28 for 25% RAP was not necessary.

Not Conclusive

- Only one plant, one RAP source, one set of virgin materials
- E&B, J.H. Rudolph, Rieth-Riley, Phend & Brown repeated this in their plants
  - Similar testing is underway at NCSC now on these mixes
- Other evidence suggests blending does happen. *Why or why not?*