Performance and Maintenance of OGFC Surfaces

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Tennessee Quality Initiative

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The Project

- I74 Eastbound East of Indianapolis
- Constructed August 2003
- Steel Slag SMA and Steel Slag PFC
  - PFC = Porous Friction Course
- Conventional HMA Section on US52, West Lafayette, constructed July 2003

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Porous Friction Course

- Similar to Georgia's Porous European Mix (PEM)
- Interconnected voids
  - High permeability provides drainage and prevents clogging
- Worldwide literature shows benefits:
  - Increased friction, especially wet
  - Reduced noise
  - Improved wet weather visibility

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Growing Noise Problem

- Noise causes sleep disturbance, hearing problems, health problems.
- Transportation-related noise is a major factor.
    - Tire-Pavement Noise is a major contributor.
- Noise barrier walls going up across the country.
    - Expensive and of limited effectiveness.

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Why Porous Asphalt Surfaces?

- Control noise generation and propagation at the source, tire-pavement interface
- More cost effective
- Impact more people over a larger area
- Offer other benefits, particularly safety
  - Improved friction
  - Reduced splash and spray

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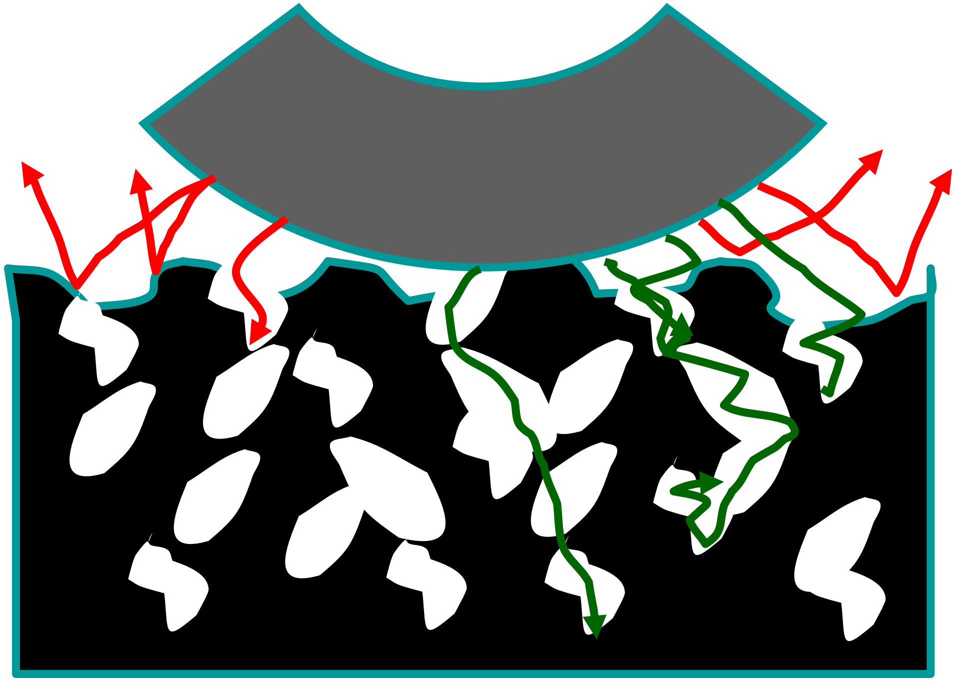
Pavement Porosity



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The Materials

- 9.5mm mixtures used Steel Slag and PG76-22 binder
- PFC designed at 18-22% air voids
  - Old OGFC designed at 12-15% voids
  - Polymer modified binder and fiber
- SMA has fairly open aggregate structure, but voids are largely filled with matrix of binder and filler (fiber)

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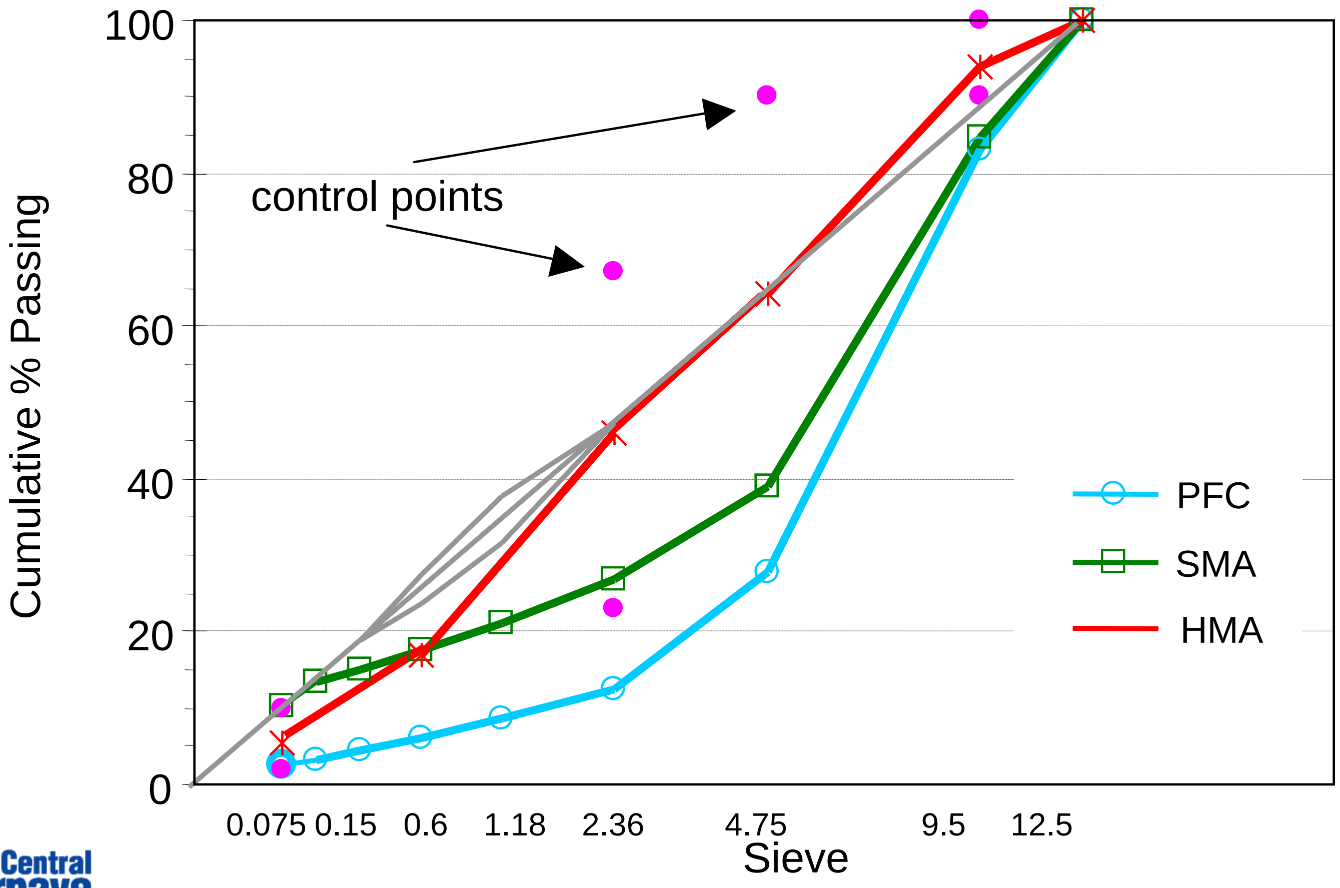
Design Gradations



Construction


igloo


CAT
INGERSOLL-RAND

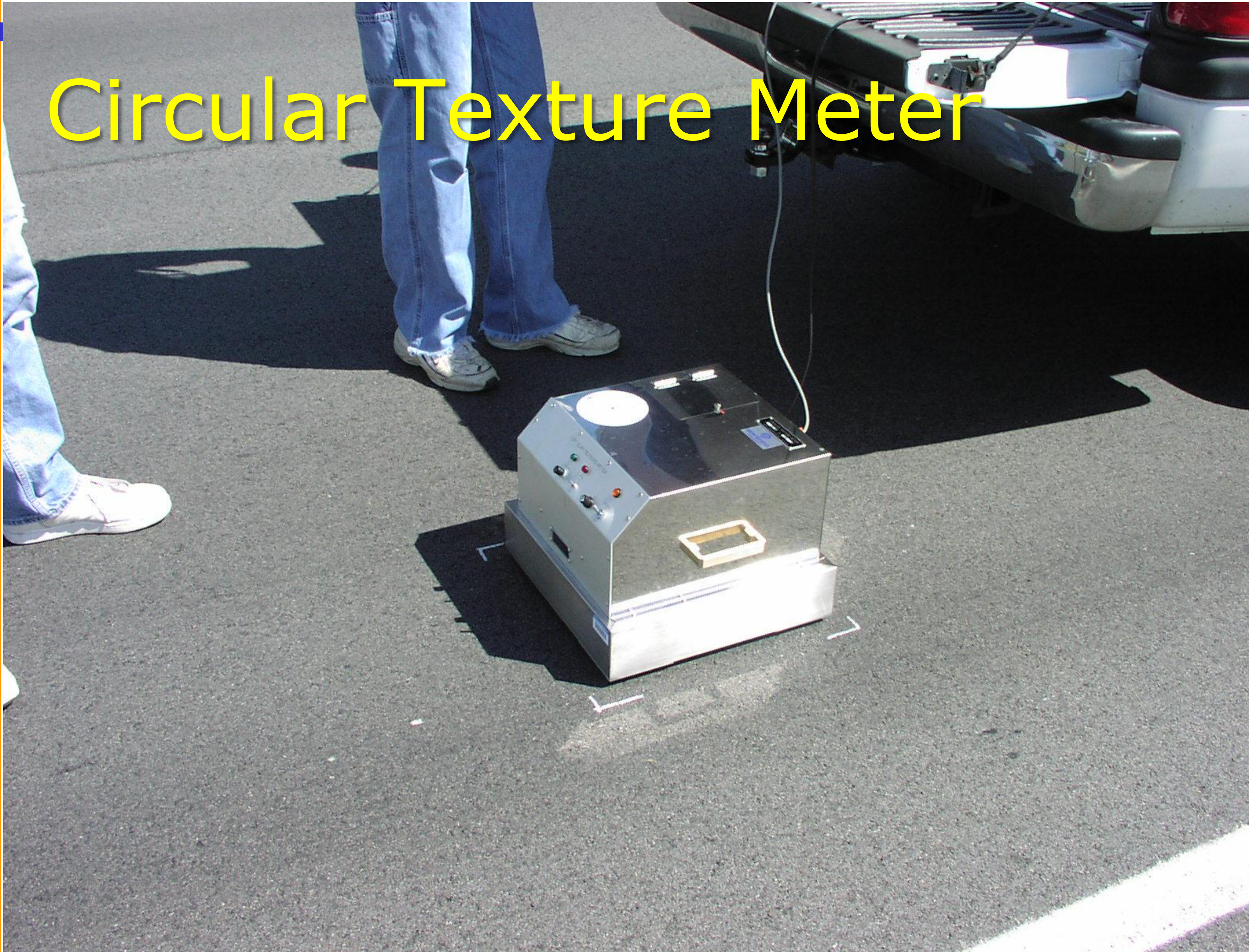

SMA vs. PFC

Conventional HMA

Performance

- Friction and Surface Texture
- Noise Measurements
- Splash and Spray

Circular Texture Meter



Dynamic Friction Tester

DFT and CTM

- DFT readings influenced by both micro- and macrotexture
- CTM measures macrotexture
- DFT and CTM used together to determine International Friction Index
  - Correlates well with other standard devices

Initial Field Data Comparison

Surface	DFT 20	CTM	F60
Porous	0.51	1.37	0.36
SMA	0.37	1.17	0.28
HMA	0.52	0.30	0.19

Porous and SMA tested before trafficking.

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Initial Sideline Noise Data

At 80 kph (50 mph)

Vehicle	HMA	SMA	PFC
Impala	72.6	74.8	68.1
Volvo	75.2	75.5	70.1
Silverado	74.5	77.0	71.6

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CPX Data (dBA)

Speed	HMA	SMA	PFC
72 kph	93.0	94.2	89.7
97 kph	96.4	97.6	92.6

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Preliminary Findings

- PFC significantly quieter than SMA or conventional HMA – CPX and sideline
- In car noise significantly different and lower on PFC
- PFC provides higher macrotexture than SMA and much higher than HMA
- Friction levels were higher for PFC and SMA than HMA
- Significantly reduced splash and spray

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Splash and Spray

- Video by Wayne Jones, Asphalt Institute

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Long Term Performance

- Questions remained -- how long will these effects persist?
  - Does the PFC clog and lose effectiveness?
  - High permeability is supposed to help prevent that, but ….
  - Will traffic wear off film and increase IFI on PFC and SMA?
  - Will PFC lose macrotexture and friction?
  - Will special maintenance be needed?

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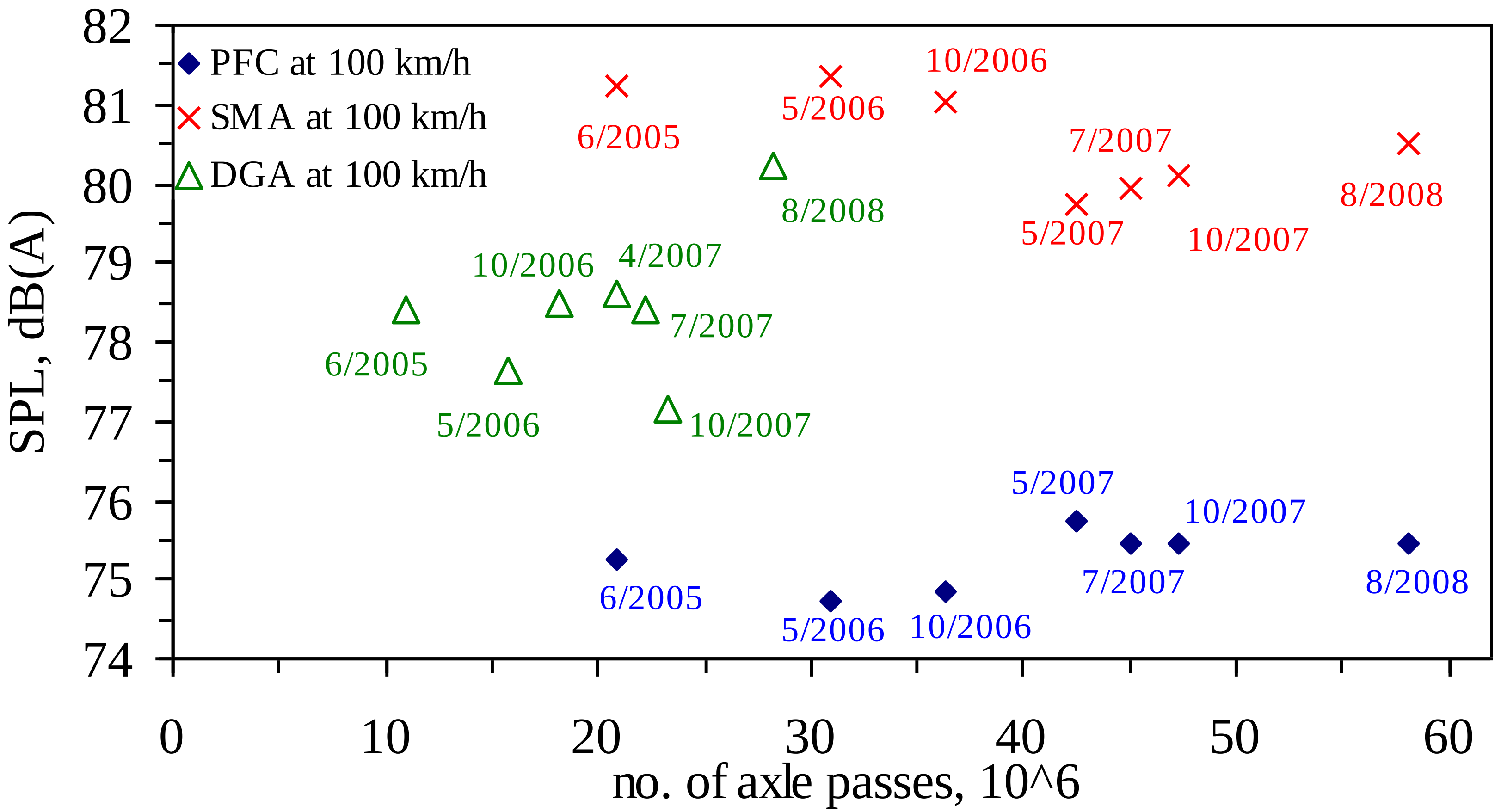
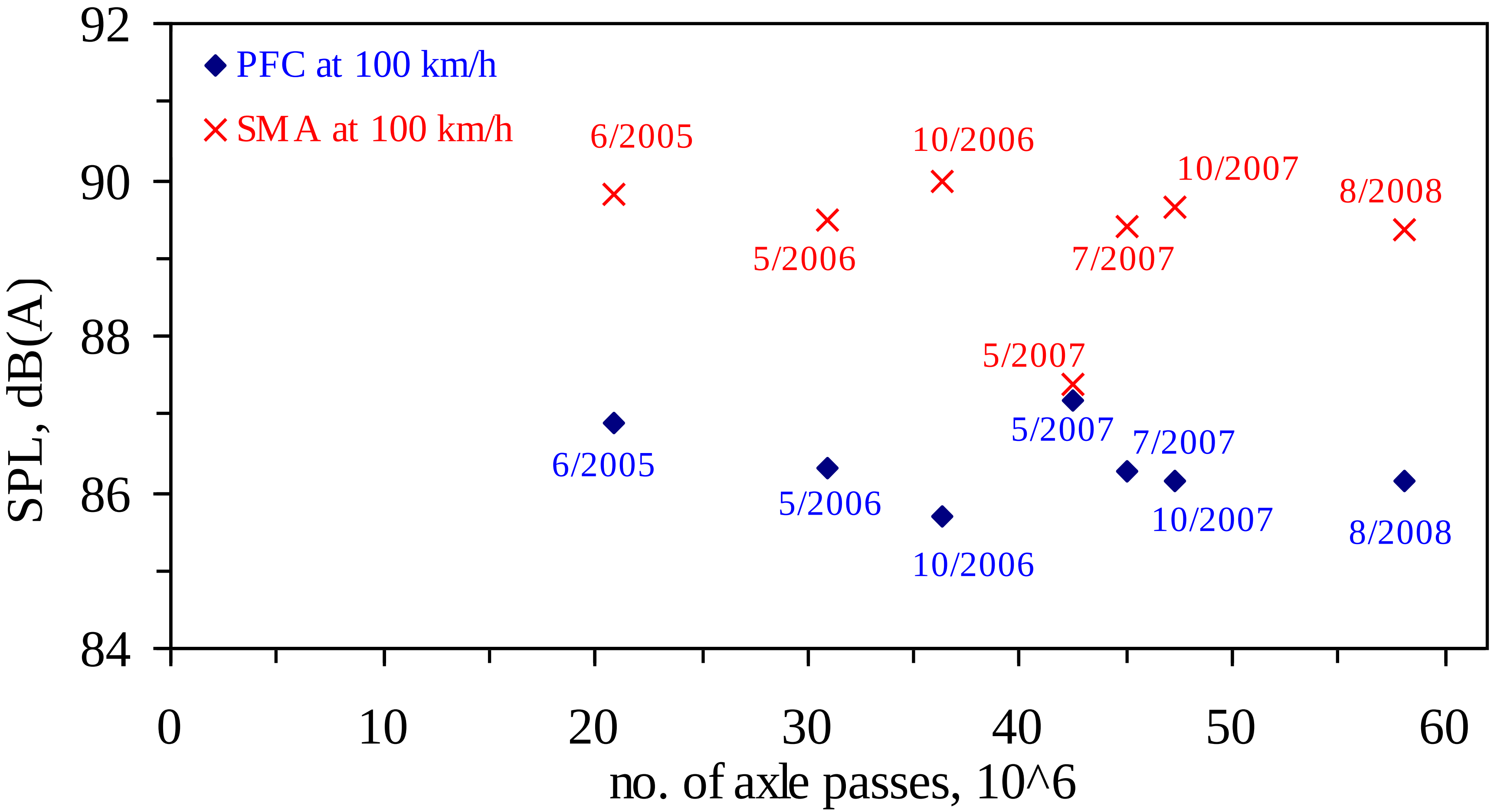
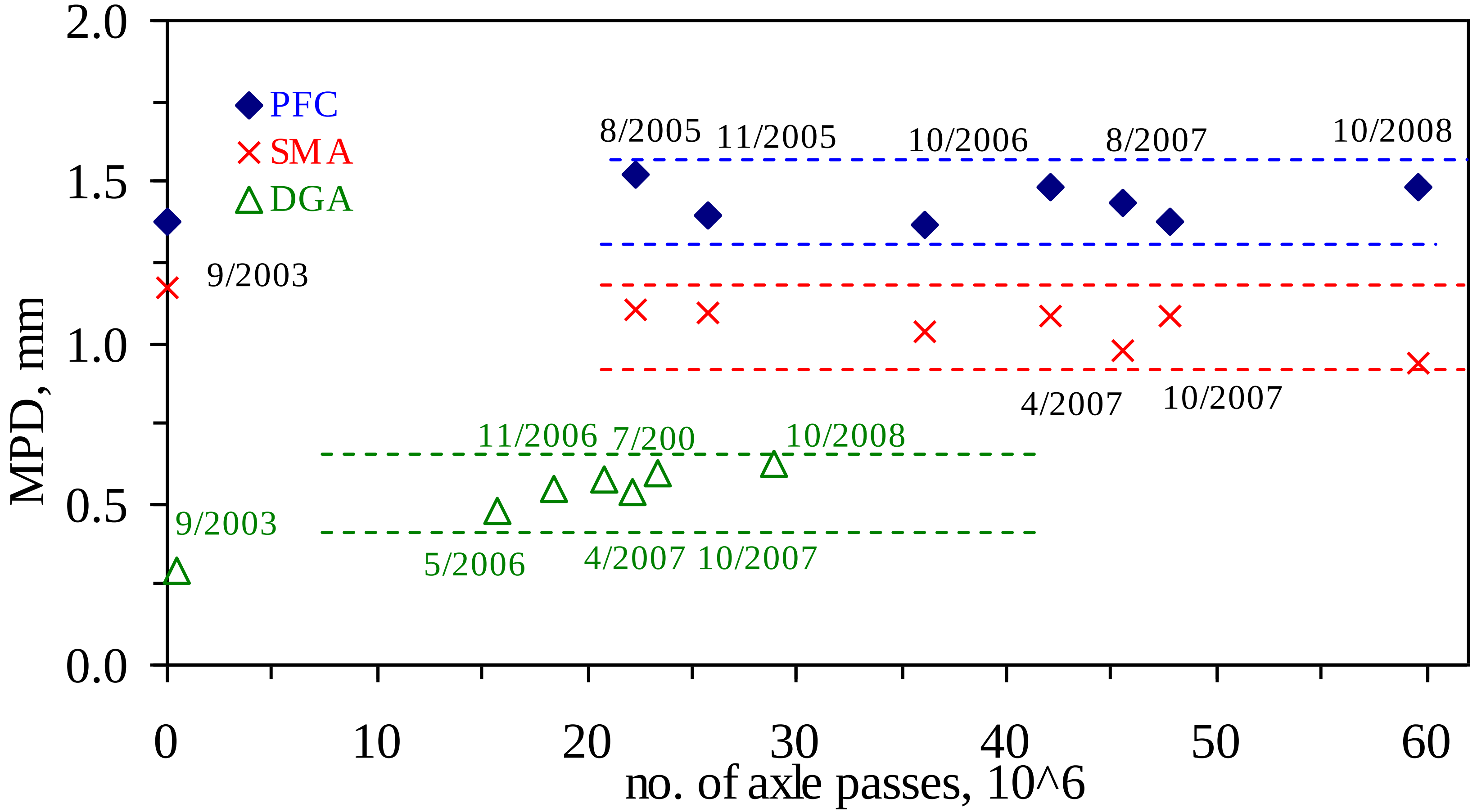
Changes in Noise vs. Traffic



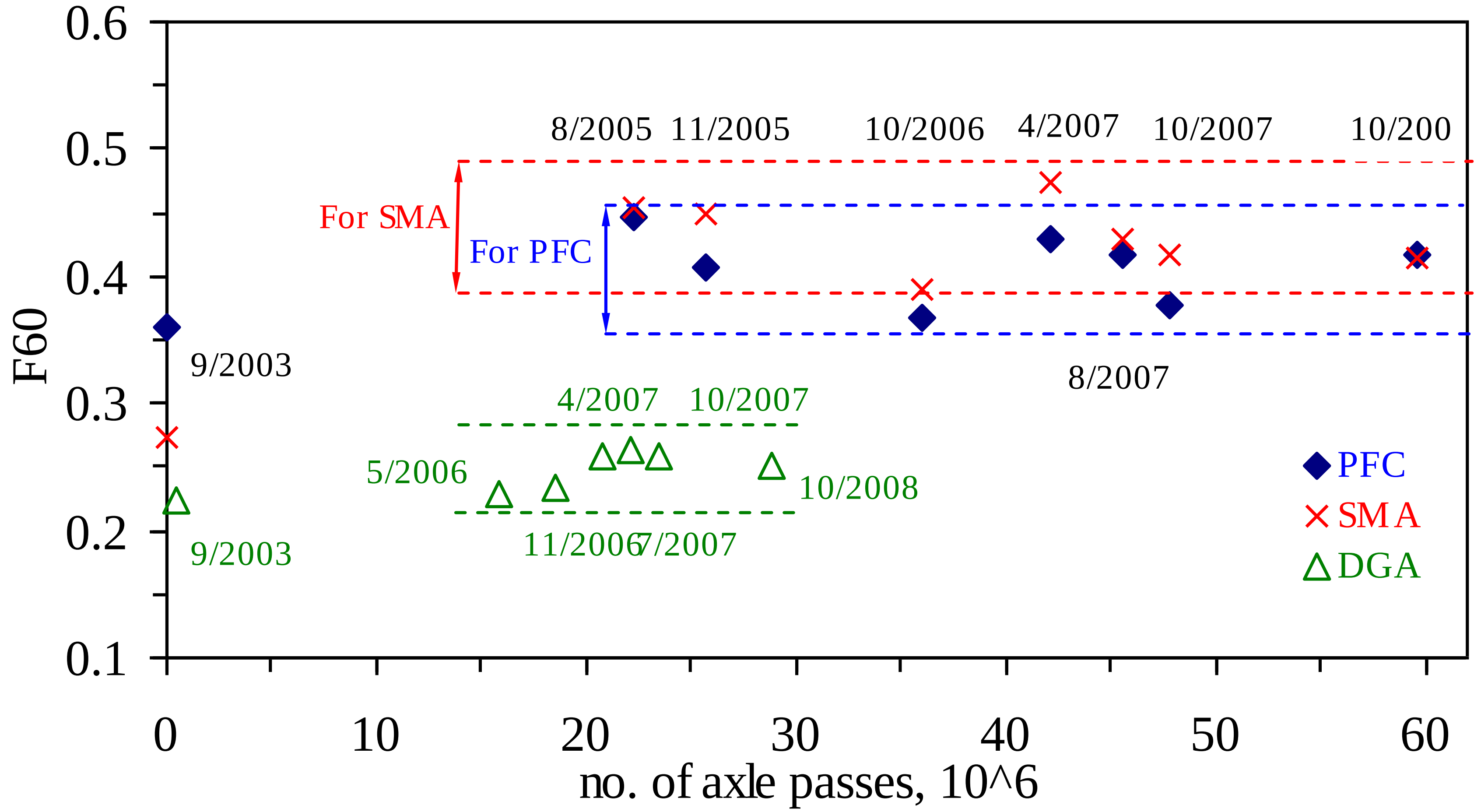
Heavy Vehicle Noise



Changes in Texture



Changes in Friction (F60)



Maintenance Issues

- No special maintenance required
- No abrasives used for snow and ice control -- but that is typical for urban areas
- Only difference – more salt applications needed
- Pavement looks wet longer

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Conclusions

- Porous Friction Courses can perform well over the long term
- Steel Slag aggregate withstood effects of traffic
- Void structure was maintained
  - Proper material selection and mix design
  - Proper maintenance
  - Proper application (high speed)

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