


HMA Quiet Pavement Overview

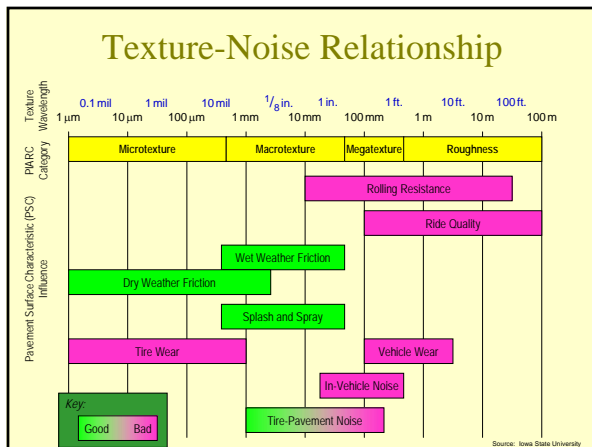
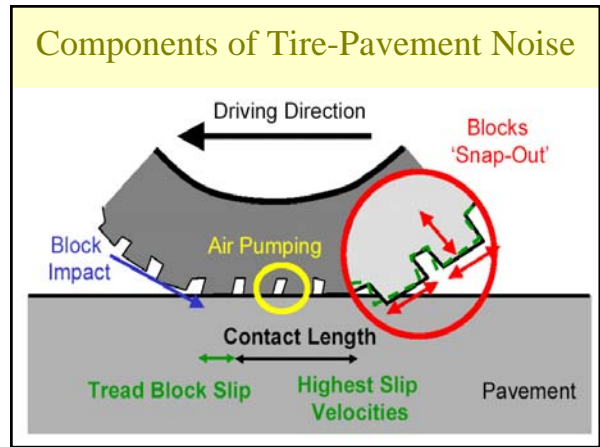
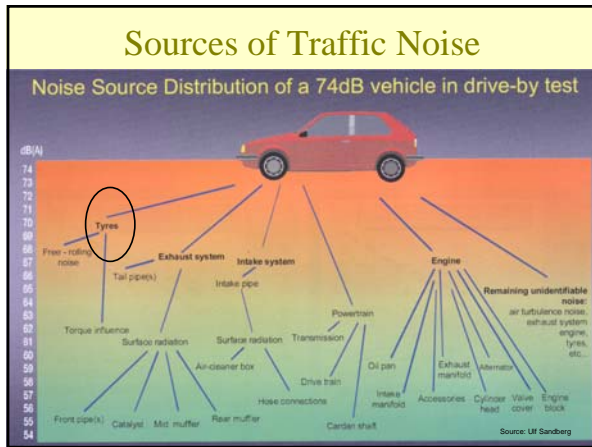
SE Asphalt User Producer Group
San Antonio, Texas
November 13, 2007

Mark Swanlund
Office of Pavement Technology



Presentation Outline

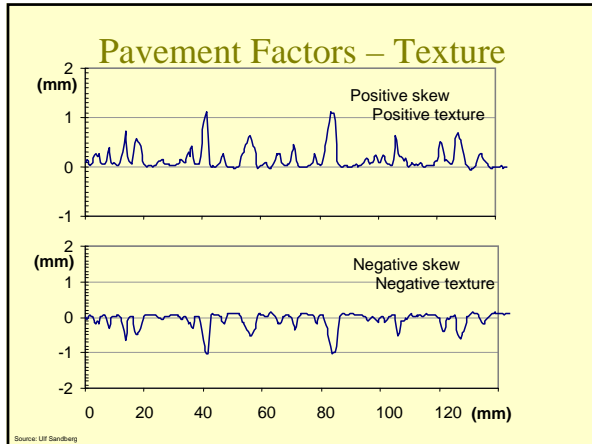
- Sources of traffic noise
- Tire-pavement noise mechanisms
- Methods for reducing noise on HMA
- Ongoing research



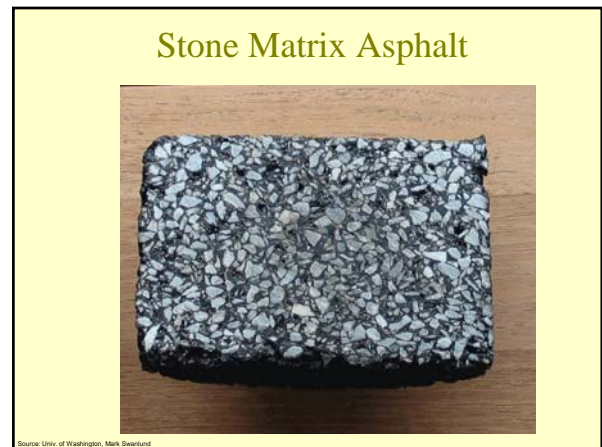
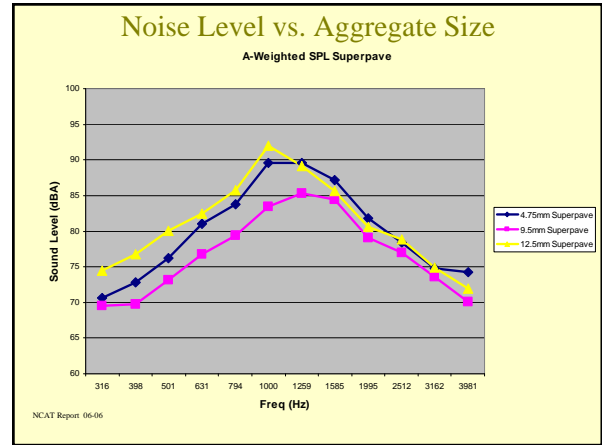
Pavement Factors

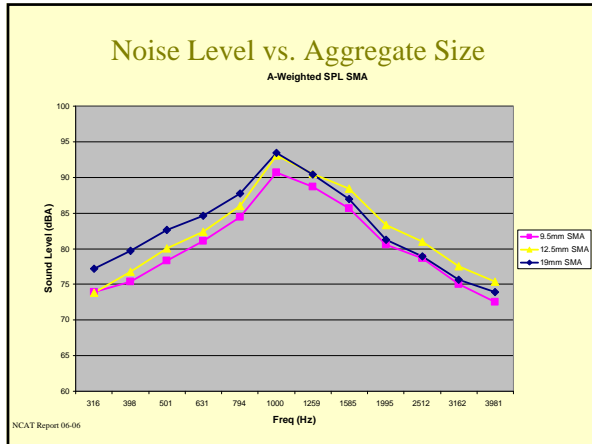
No.	Parameter	Degree of influence
1	Macrotexture	Very high
2	Megatexture	High
3	Microtexture	Low - moderate
4	Unevenness	Minor
5	Porosity	Very high
6	Thickness of layer	High, for porous surfaces
7	Adhesion (normal)	Low/moderate
8	Friction (tangent.)	See microtexture
9	Stiffness	Uncertain, moderate (?)

Source: Ulf Sandberg



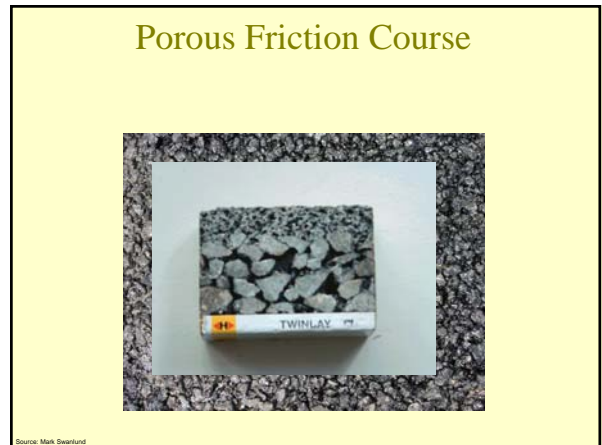
- ### Pavement Technologies
- Asphalt technologies
 - Fine Superpave mixes
 - Stone Matrix Asphalt (SMA)
 - Porous Friction Course





Porous Friction Course

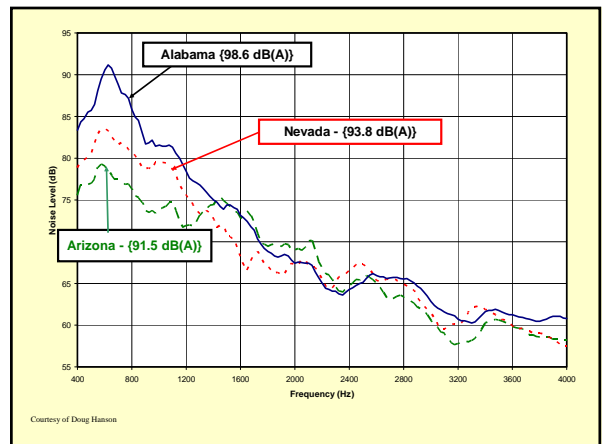
- Small aggregate size
- Open-graded aggregate
 - High volume of voids ≥ 20% air voids, in place
- Thick asphalt binder coating
- Array of tortuous pores
- Dissipates energy through friction
- Reduce surface area and slip-stick or slap
- Reduces horn effect
- Modified binders may increase elasticity

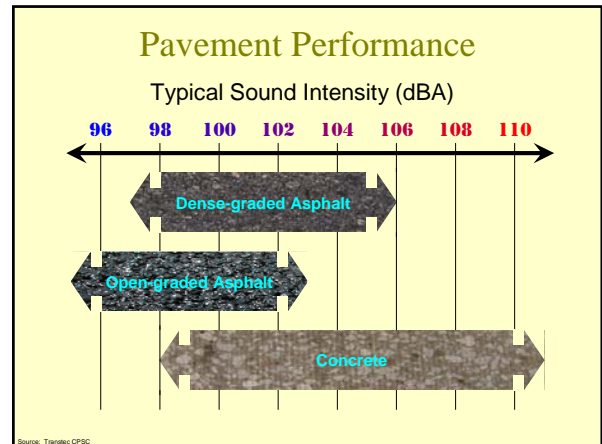
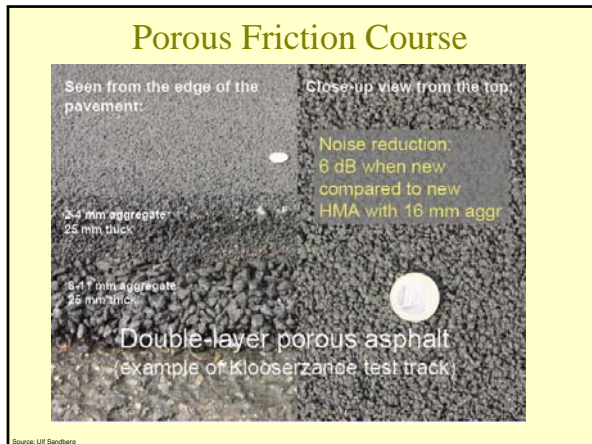


OGFC GRADATIONS

Gradation	Arizona ¹	Nevada ¹	AL 1 – 7 ²
Nominal Max Size	4.75 mm	9.5 mm	12.5 mm
¼ inch	-	-	100
½ inch	-	100	89
¾ inch	100	95	56
No. 4	38	45	14
No. 8	6	-	9
No. 16	-	11	-
No. 200	1.2	2	3.2
Fineness Modulus	5.42	5.00	6.14
Air Voids	-	-	17 %
Noise Level	91.5	93.8	98.6

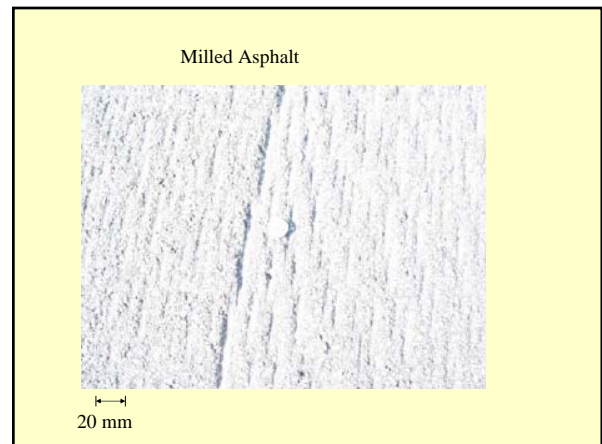
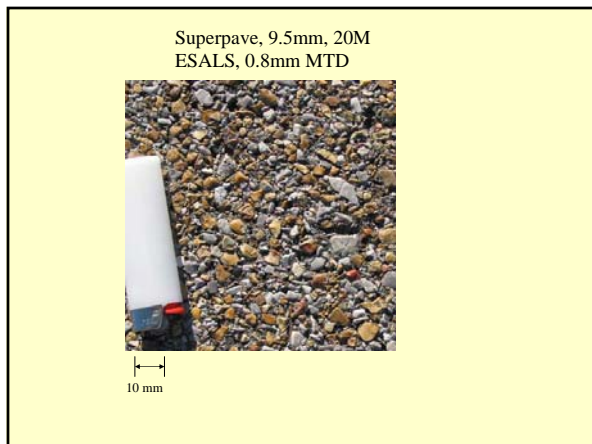
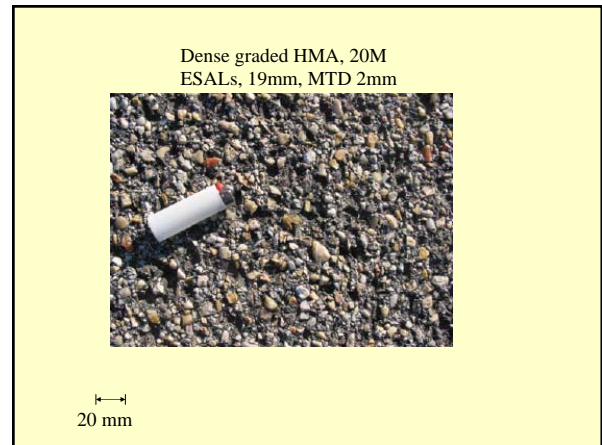
Courtesy of Doug Hanson

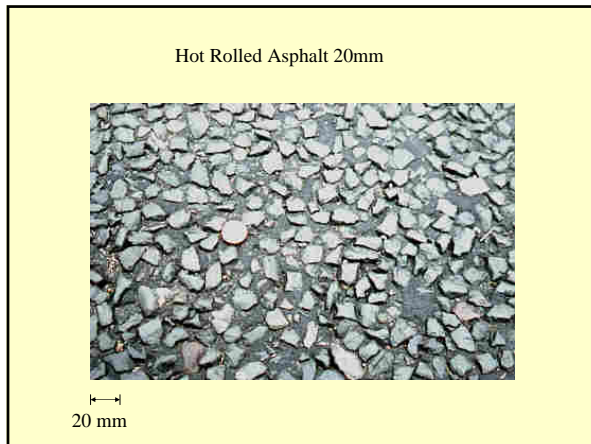




POP QUIZ

Quiet or Loud?





Ongoing Research

- NCAT and Purdue University
 - development & evaluation of low noise pavements
- Poroelastic Road Surface (PERS)

NCAT and Purdue Quiet Pavement Development

- Develop and evaluate quiet pavement technology
 - Double layer porous
 - Thin, gap-graded asphalt layers

AU 4-C2 Sections

North Tangent

	N 5	N 6	N 7	N 8	N 9
Layer 1 (1 1/4 inches)	AZ OGFC	AZ OGFC	AZ OGFC	PEM	PEM
Layer 2 (1 1/4 inches)	Track	AZ OGFC	PEM	PEM	Track

South Tangent

	S 4	S 5	S 6	S 7	S 8
Layer 1 (1 1/4 inches)	< 4.75 SMA	4.75 SMA	9.5 SMA	4.75 DGA	9.5 DGA
Layer 2	Track				

Courtesy of Doug Hanson



AU 4-C2 Sections

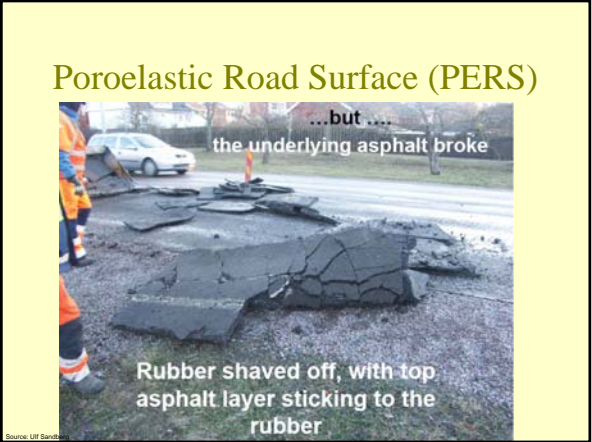
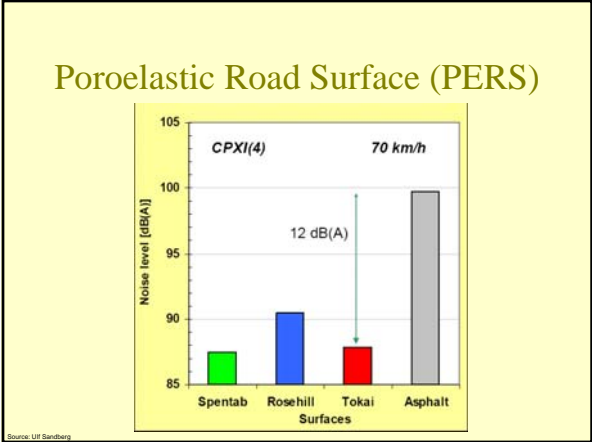
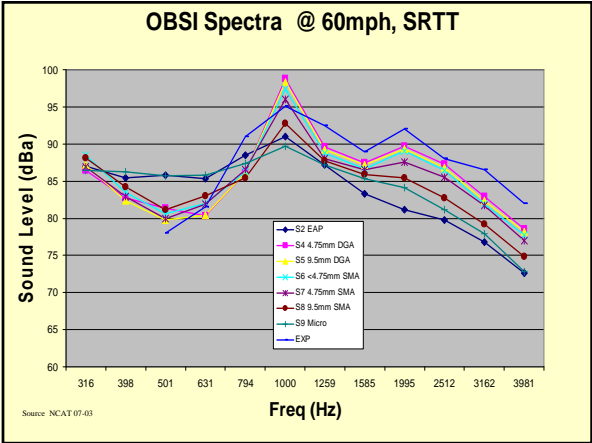
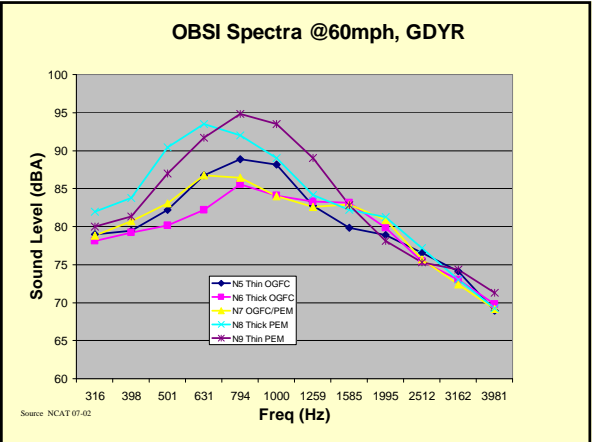
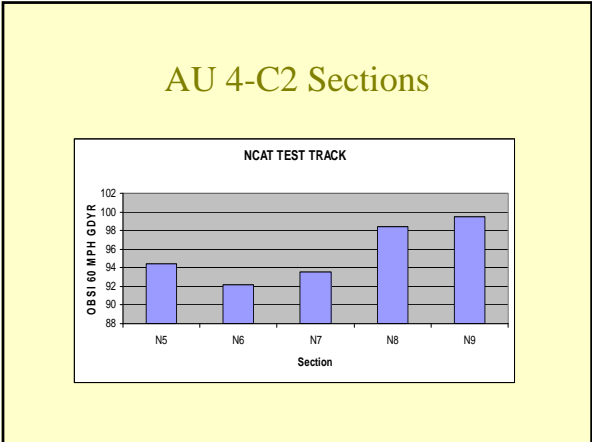
North Tangent

Section	N5	N6	N7	N8	N9
Layer 1 (1.25 in.)	OGFC	OGFC	OGFC	PEM	PEM
Layer 2 (1.25 in.)	DGA	OGFC	PEM	PEM	DGA

South Tangent

Section	S2	S4	S5	S6	S7	S8	S9
Layer 1 (2 in.)	EAP	4.75 DGA	9.5 DGA	<4.75 SMA	4.75 SMA	9.5 SMA	Micro
Layer 2	Existing Track						

Source: NCAT report 07-02, NCAT report 07-03



Thank You

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