

Preservation and Surface Characteristics

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What are pavement surface characteristics?

- ▶ Friction / Skid Resistance
- ▶ Texture
- ▶ Noise
- ▶ Ride Quality – International Roughness Index (IRI)
- ▶ Rutting
- ▶ Faulting
- ▶ Cracking
- ▶ Color

Friction and Texture

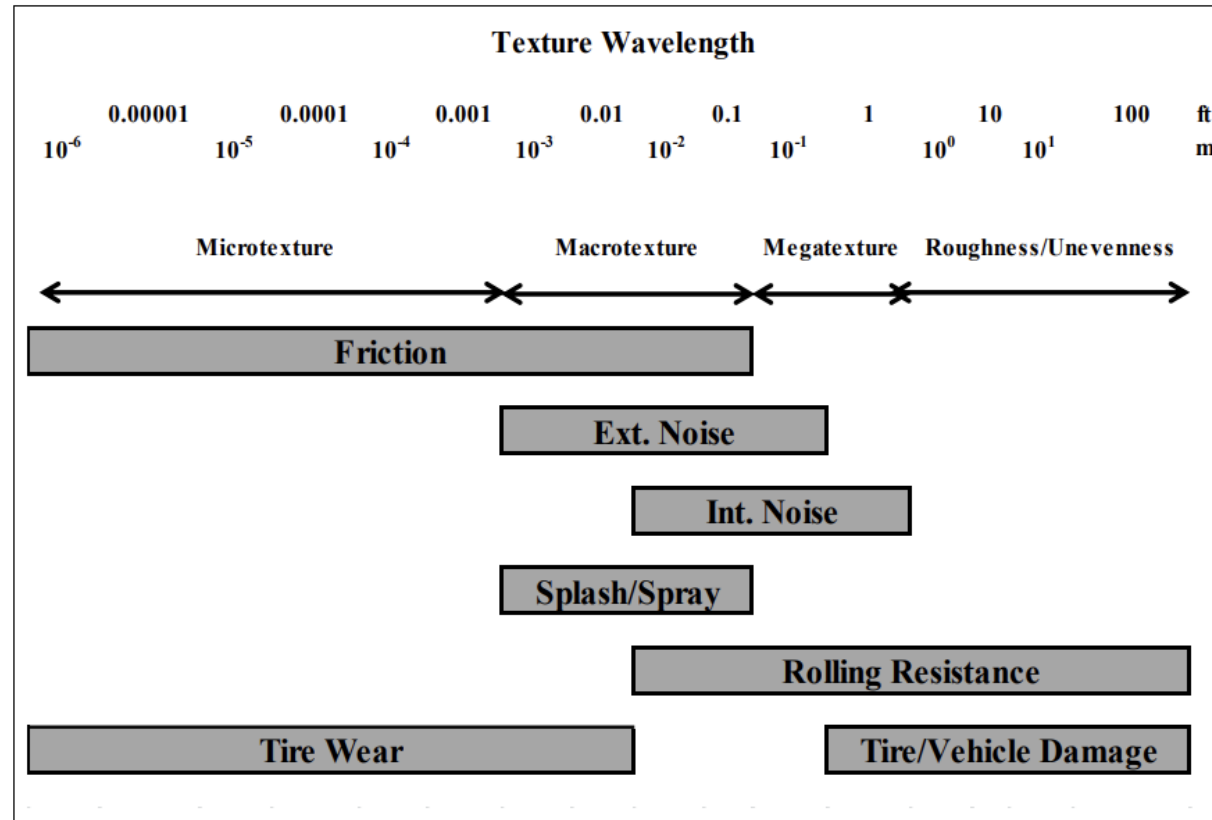


Figure 2 Influence of texture wavelength on tire pavement interaction (after Henry, 2000)

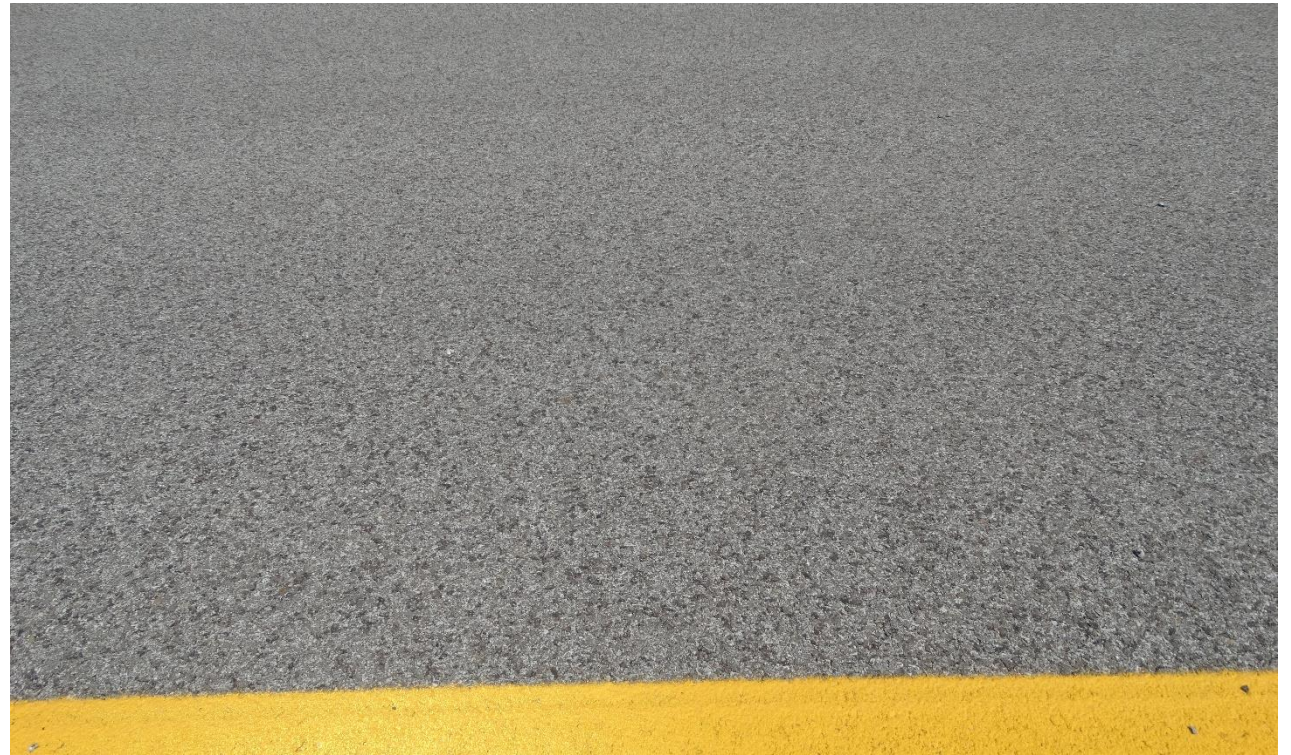
The Little Book of Tire Pavement Friction

Pavement Textures



9.5 MM Dense Grade HMA

Friction	Ribbed Tire	50–55
	Smooth Tire	35–40
Macrotexture		0.55 mm
IRI Values		35–40 in./mi.



ICART Lane 2

12.5 MM Stone Matrix Asphalt

Friction	Ribbed Tire	50–55
	Smooth Tire	40–50
Macrotexture		1.3 mm
IRI Values		40–50 in./mi.

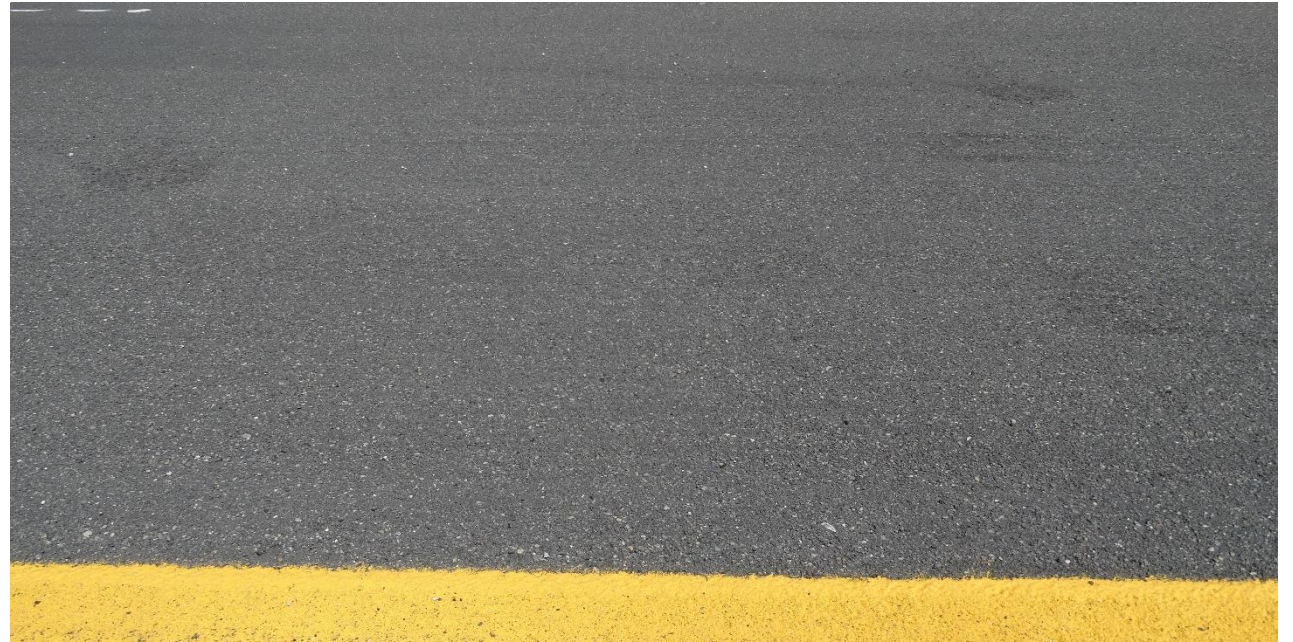


ICART – Lane 2

Micro surfacing (30% Calcined Bauxite & 70% ACBF Slag)

Friction Ribbed Tire 60-70
 Smooth Tire 50-60

Macrotexture 0.45 mm



ICART Lane 2

CA 15 Chip Seal

Friction Ribbed Tire 60–70
 Smooth Tire 50–60

Macrotexture 2.83 mm

Note: Only tested once with two units
at 30, 40, and 50 MPH



ICART Lane 2

PCC with no texturing

Friction	Ribbed Tire	44.5
	Smooth Tire	25.4
Macrotexture		0.16 mm
IRI Values		37 in./mi.



ICART Lane 1

Smooth PCC with Diamond Grooving

Friction	Ribbed Tire	55
	Smooth Tire	58
Macrotexture		0.93 mm
IRI Values		40 in./mi.



ICART Lane 1

Noise

- ▶ Tire-pavement noise is usually measured with OBSI system
- ▶ Noise is generated from the pavement surface macrotexture
- ▶ Tire-pavement noise transmission can be affected by absorption and void structure
- ▶ Negative and Positive Macrotexture
- ▶ Often confused with roughness



AVEC Website –
<https://www.avec-engineering.com/OBSI.html>

International Roughness Index

FHWA Metrics	Good	Fair	Poor
IRI	<95 in./mi.	95–170 in./mi.	>170 in./mi.

Number 1 Rule – Whatever Dr. Steve Karamihas says goes!

New Construction IRI Results

HMA Overlays – Average Pre-construction IRI – 110.76 in./mi.
Average Post Construction IRI – 46.59 in./mi.

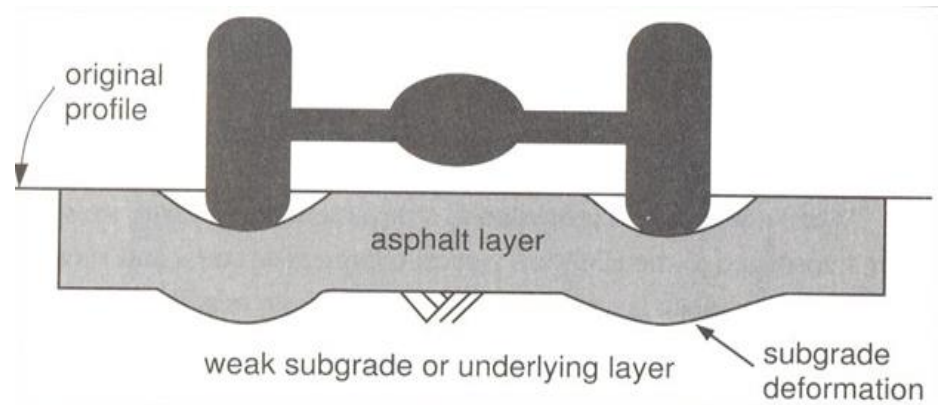
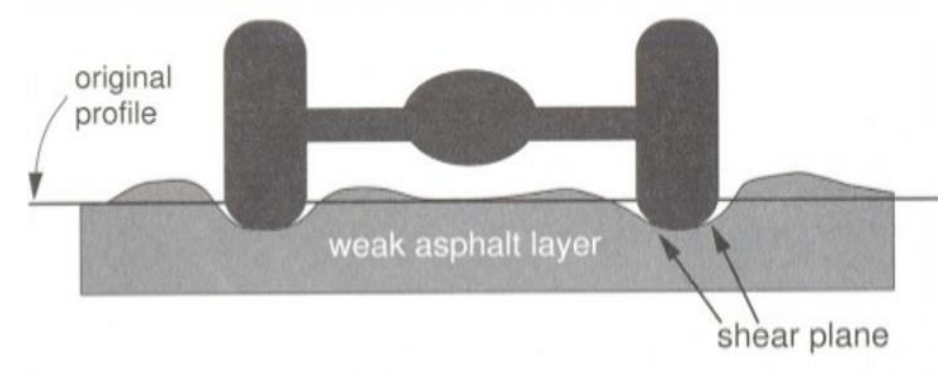
FD HMA – Average IRI – 37.5 in./mi.

PCC – Average IRI – 52.5 in./mi.

Preservation Treatments have been effectively used to reduce roughness when combined with micro or fine milling.

- UTBWC
- 2 Pass Micro surfacing
- Cape Seal

Rutting



Rutting and Preservation

Pavement Conditions	Severity Levels	Proactive Maintenance		Low Preservation Treatments ¹					High Preservation Treatments ¹			
		Crack & Joint Filling/ Sealing	Diamond Grinding	Long. Jt. Micro-surfacing	Cape Seal ²	Chip Seal ²	Half-SMART ²	Micro-surfacing ³	Long. Jt. PD Repair	HIR ²	SMART Overlay	UTBWC
Alligator/ Fatigue Cracking	L1	R	R	N/A	R**	R**	R**	R**	N/A	R	R	R
	L2, L3, L4	NR	NR	N/A	NR	NR	NR	NR	N/A	NR	NR	NR
Block Cracking	M1, M2	R	R	N/A	R	R	R	R	N/A	R	R	R
	M3	R	R	N/A	NR	NR	NR	NR	N/A	R	R	R
	M4	NR	NR	N/A	NR	NR	NR	NR	N/A	NR	NR	NR
"Stable" Rutting	≤ 0.13	R	R	N/A	R	R	R	R	N/A	R	R	R
	≤ 0.25	NR	NR	N/A	NR	NR	NR	NR	N/A	R	R	R

Illinois DOT Design and Environment Manual, Figure 53-3.B

Faulting

Transverse faulting occurs when eroded or infiltrated materials build up under the approach side of the joint or crack and a corresponding depression occurs under the leave side.

Pavement Conditions	Distress Levels	Proactive Maintenance Treatments				High Preservation Treatments ¹	
		Crack Sealing	Joint Resealing	Diamond Grinding ²	Diamond Grooving	LTR ³	UTBWC
D-cracking	A1, A2	R	N/A	NR	NR	NR	R
	A3	NR	N/A	NR	NR	NR	R
	A4, A5	NR	N/A	NR	NR	NR	NR
Transverse Cracking	B1, B2	R	R	NR	NR	NR	R
	B3	R	R	NR	NR	NR	NR
	B4, B5	NR	NR	NR	NR	NR	NR
Transverse Joint Deterioration	C1, C2	R	R	R	NR	R	R
	C3, C4	NR	NR	NR	NR	NR	NR
Centerline Deterioration	D1	R	R	NR	NR	NR	R
	D2, D3	NR	NR	NR	NR	NR	NR
Longitudinal Cracking	E1, E2	R	R	NR	NR	NR	R
	E3, E4	NR	NR	NR	NR	NR	NR
Edge Punchouts (CRCP)	F1	R	N/A	F	NR	NR	R
	F2, F3	NR	NR	NR	NR	NR	NR
Faulting	≤ 0.15	NR	NR	NR	NR	NR	NR
	> 0.15	NR	NR	R*	NR	R	NR



Cracking

- ▶ Transverse
- ▶ Longitudinal
- ▶ Functional
- ▶ Structural



Transverse Cracking



Longitudinal Cracking



PCC Longitudinal Cracking



Structural Vs. Functional

- ▶ 1. Structural Failure. Structural failure is the loss of load carrying capacity of the pavement structure or a breakdown of one or more of the pavement's structural components or the underlying subgrade of such a magnitude as to make the pavement incapable of sustaining the traffic loads imposed upon its surface.
- ▶ 2. Functional Failure. Functional failure may or may not be accompanied by structural failure, but it is such that the pavement exhibits roughness or distress that prevents it from carrying out its intended function without causing discomfort to passengers or without causing high stresses in the vehicle.

Color / Oxidation

I-55 on the north side of Lincoln, IL

Structural Overlay placed in 2015

First photo was taken during our inventory collection in 2016

2017

2018

2019

2020

2021

2022



Questions



Thank you



Illinois Department of Transportation

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