

Update on ACPA/IGGA Surface Characteristics Research



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Lets Look Back In Time.....



Noise ... a Quality of Life Issue?



Consumer Perception:
Concrete is
Noisier than
Asphalt

Concrete Industry Off to Slow Start!!

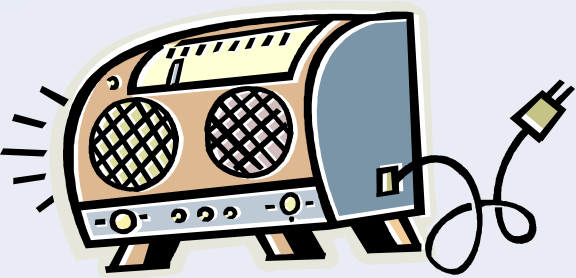
---The 3 dBA Rule---



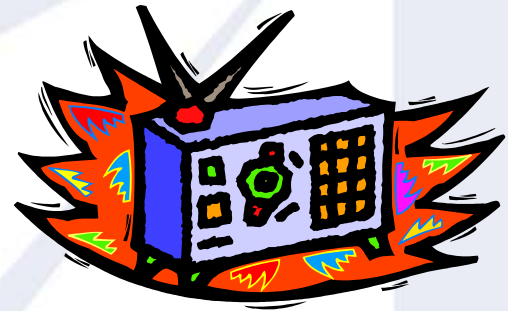
No Standardized Test Method For Measuring Tire/Pavement Noise



Transverse Tining Most Widely Used Texture- FHWA Tech Advisory



**Volume
(Too Loud)**



**Frequency
(Off Station)**

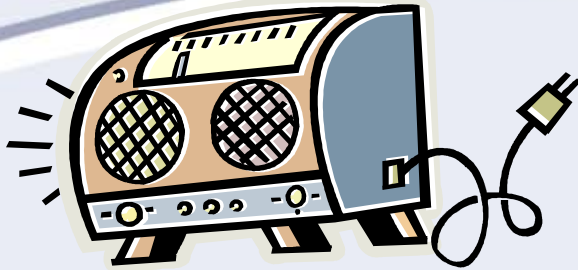
Noise Issues

- Quality of Life
- Investment Decisions
- The Future is Different



AASHTO TP-76

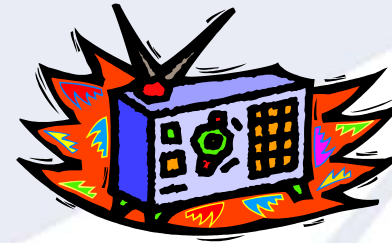
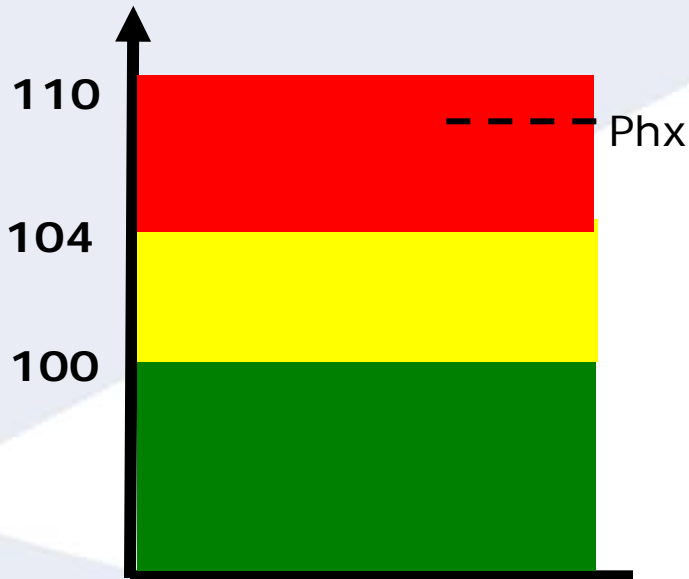
Two Types of Annoyance



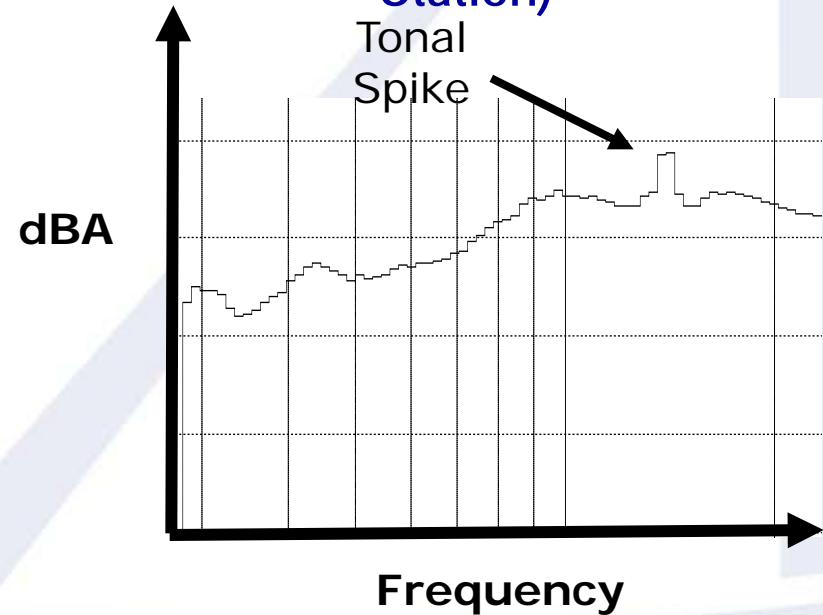
Volume (Too Loud)



dBa



Frequency (Off Station)



2005 Concrete Industry Mobilizes

- PCA Provided Funding to ACPA to Conduct a Three Year Research Project on Noise
- ACPA Contracted with Purdue University to Conduct Noise Research on:
- IGGA Developed Grinding Head and Provided Technical Expertise to Purdue

Purdue Noise Research

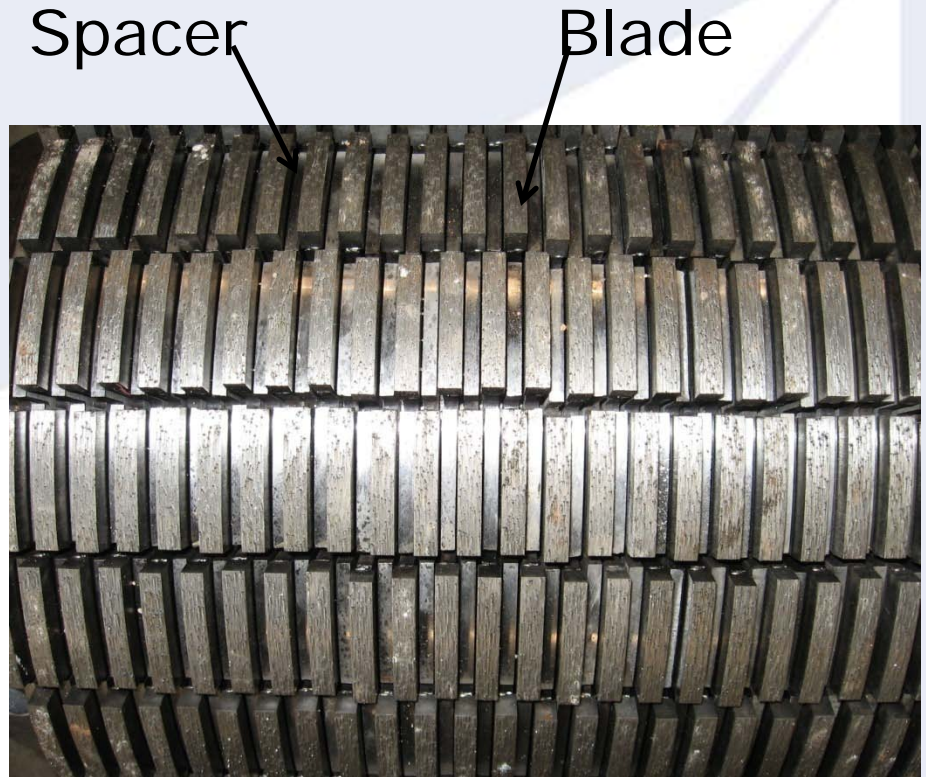
- Evaluate Existing Texture Modification
- Evaluate New Innovative Textures Construction
- Rolling Resistance, Texture, and Friction of Tested Surfaces

Purdue Research-- Tire Pavement Test Apparatus (TPTA)



Purdue Existing Texture Research (Diamond Grinding)

- Blade Width
- Blade Spacing
- Joint Slap

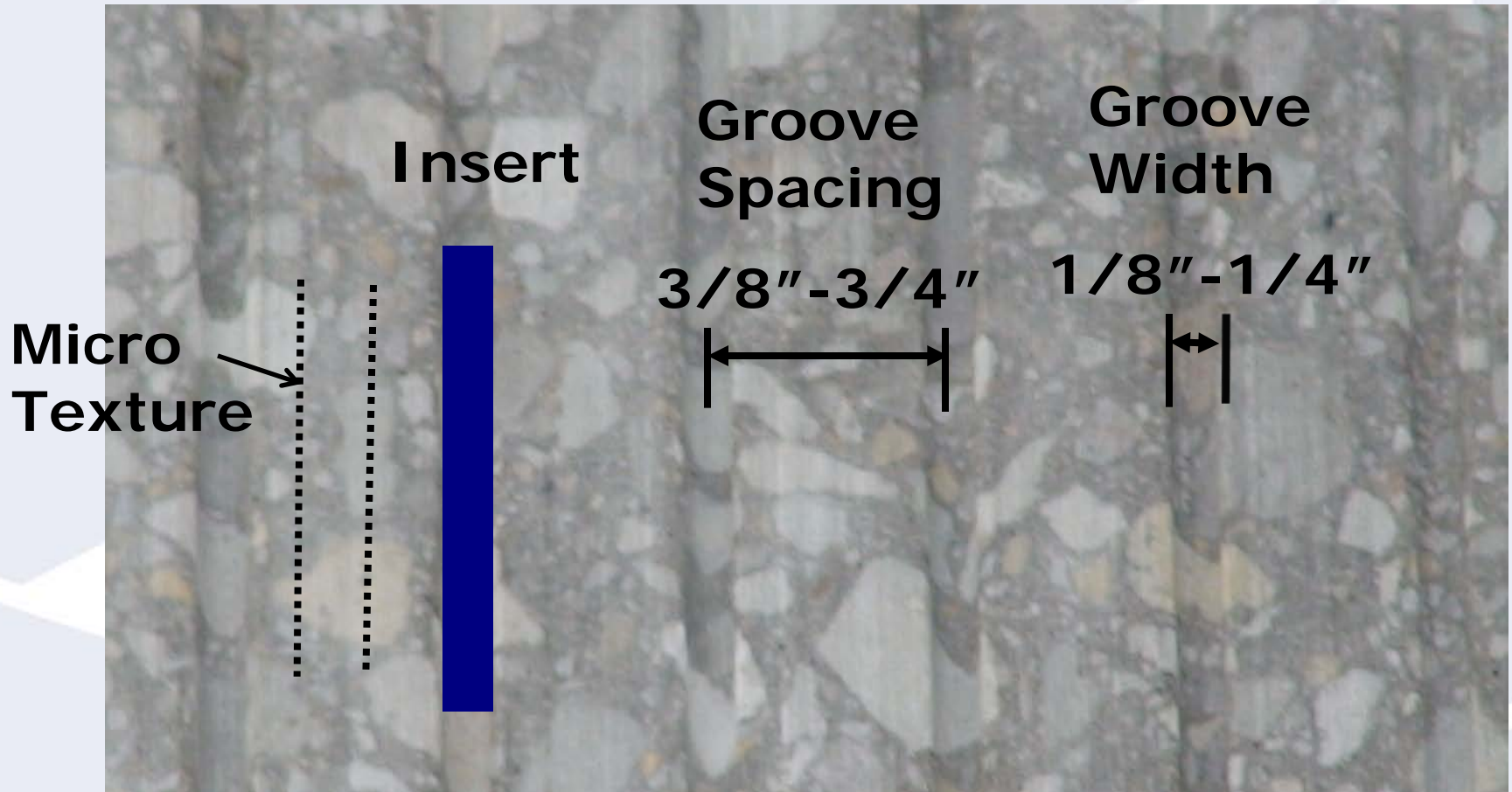


Purdue Existing Texture Research Results: Fin Profile, Not Blade Width and Spacing, Was What Was Important

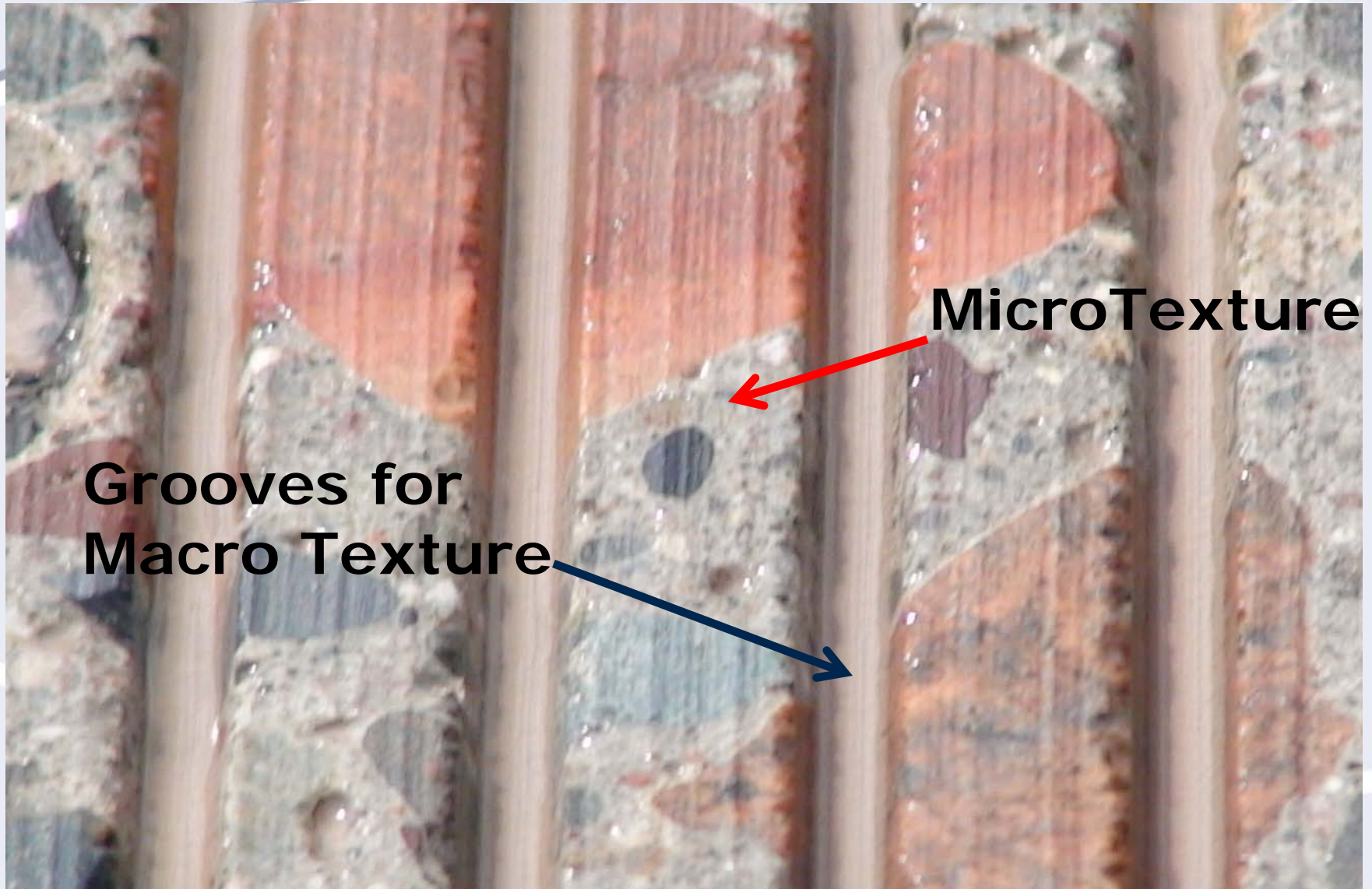


Final NGCS Research at Purdue

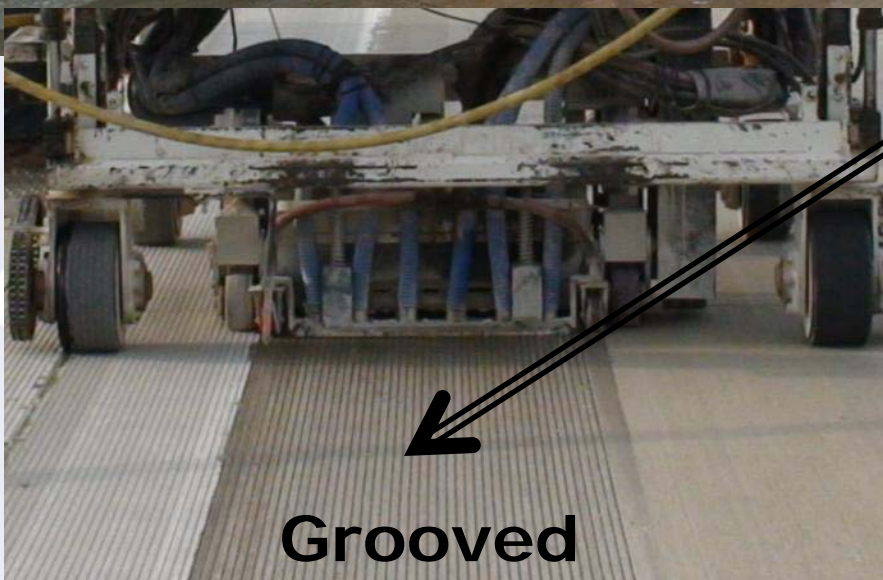
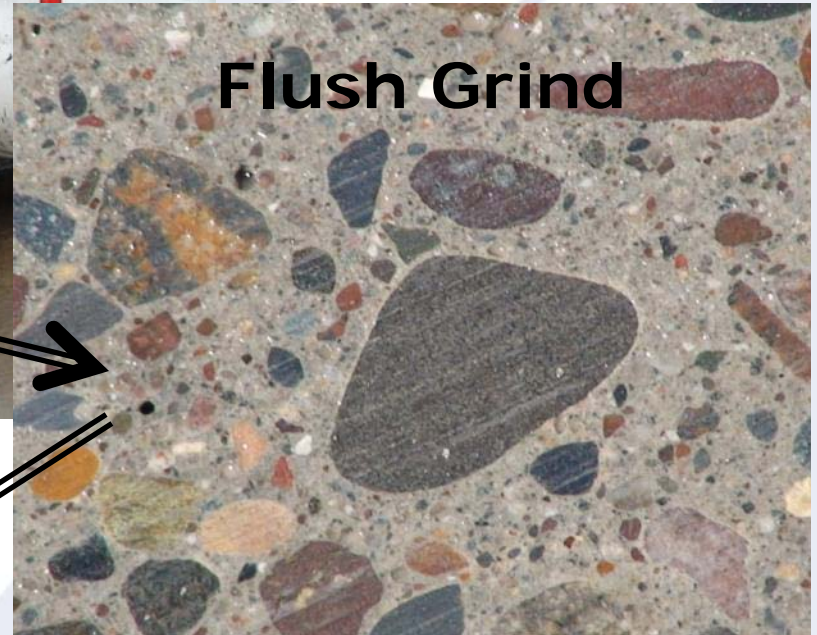
- Effect of Groove Spacing, Width, Depth, Insert



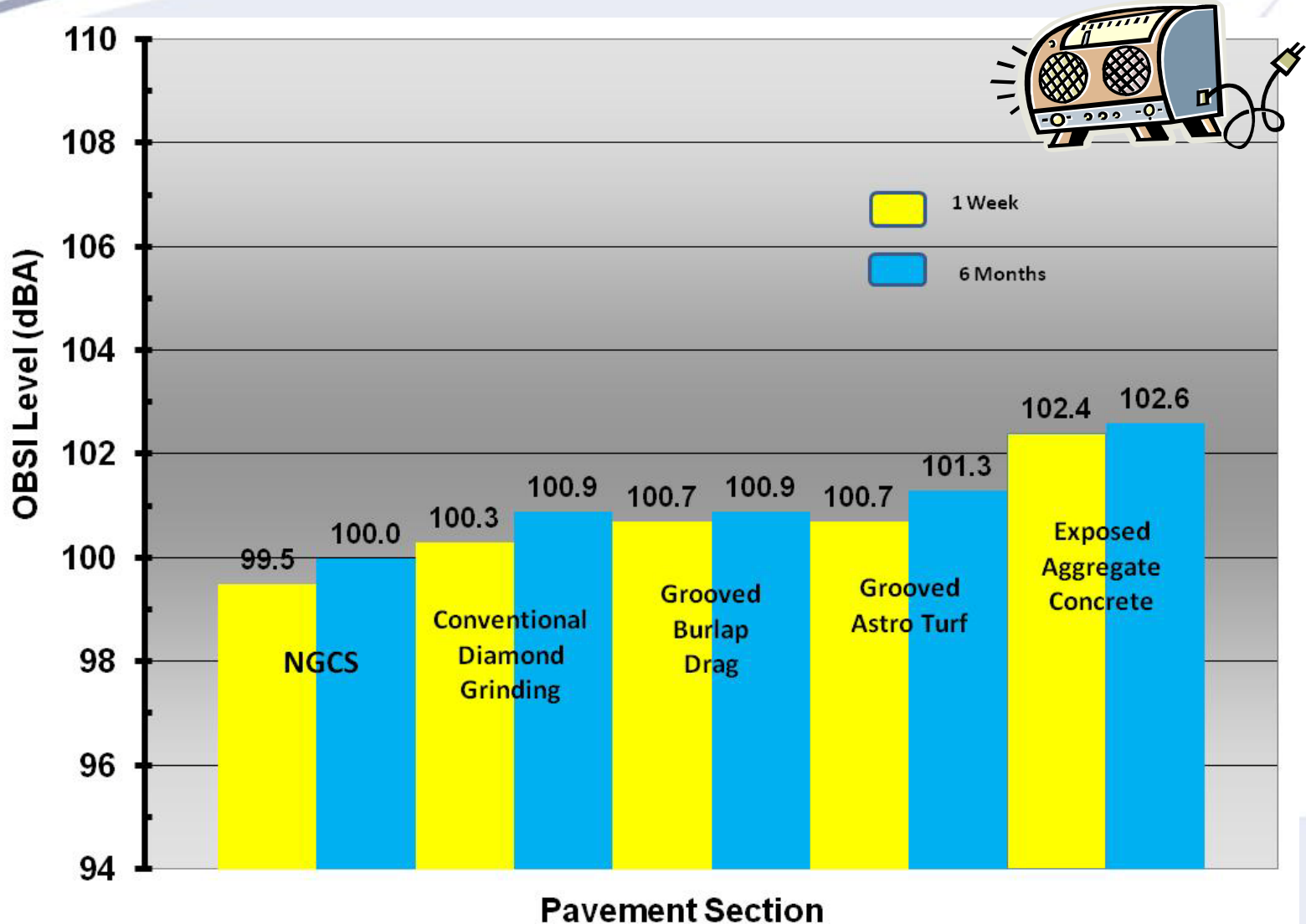
NGCS LITE---Renewable Surface Texture



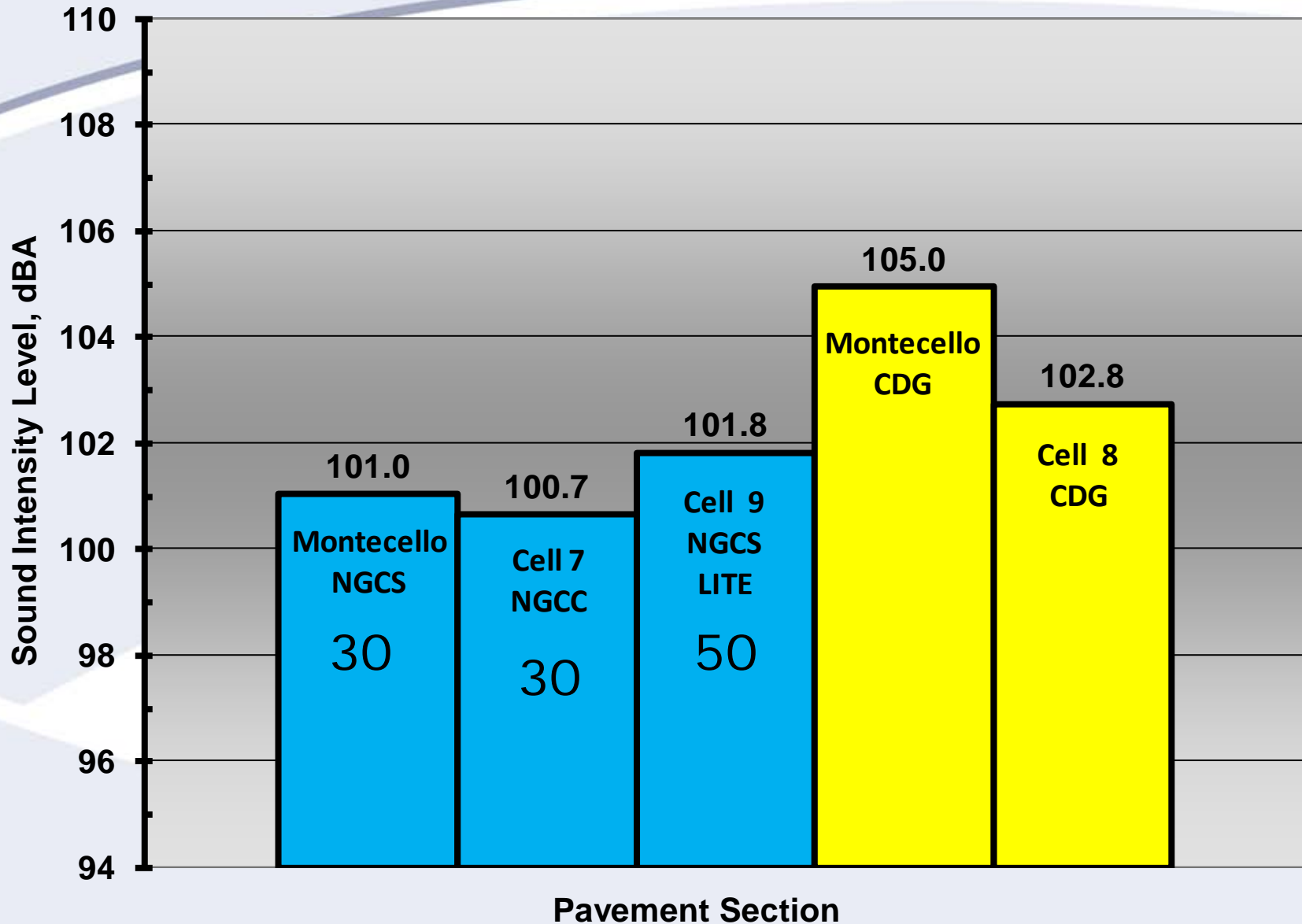
NGCS Construction



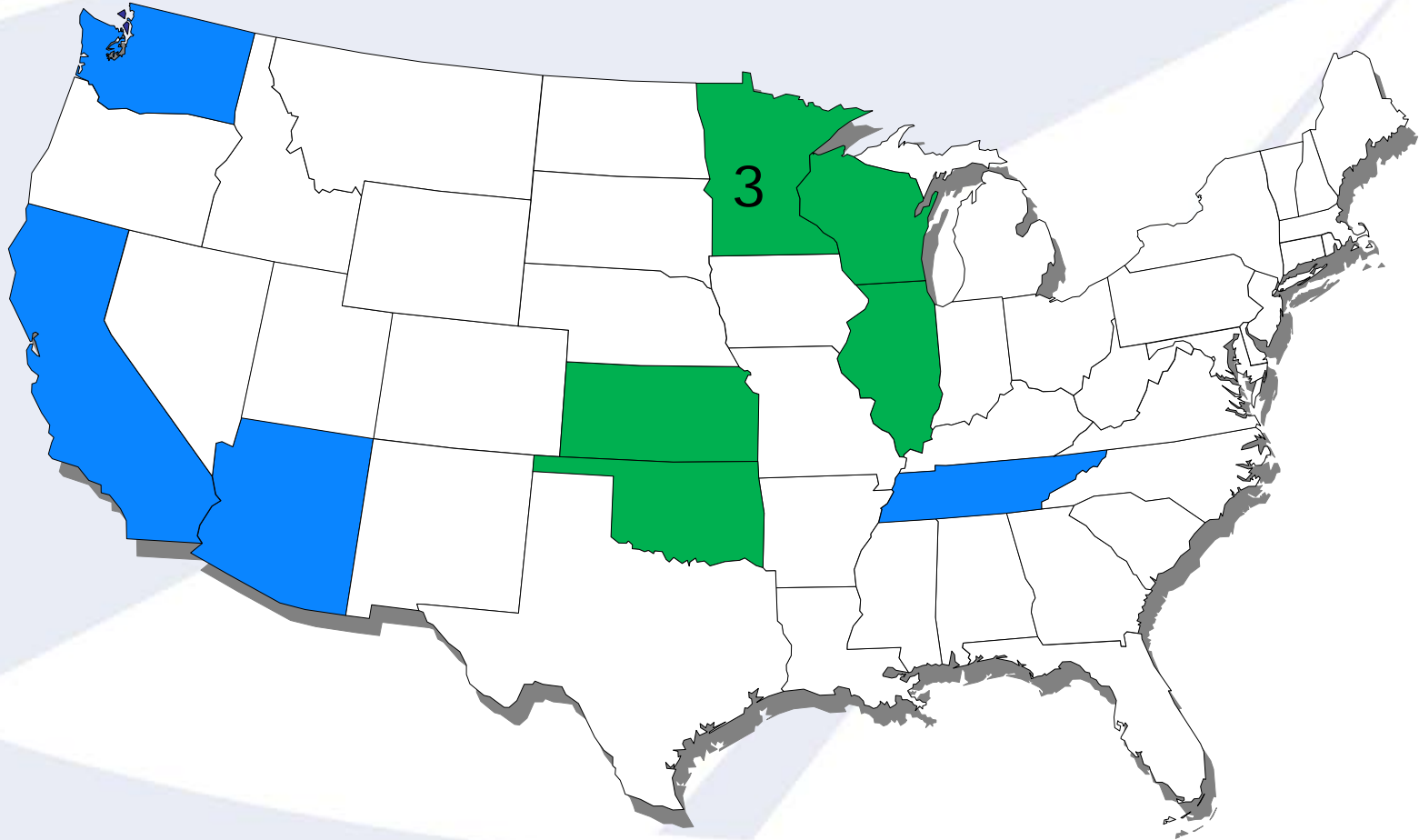
Changes in Kansas I-70 OBSI Overall Level Over Time (ISU Data)



NGCS Update at MnROADs

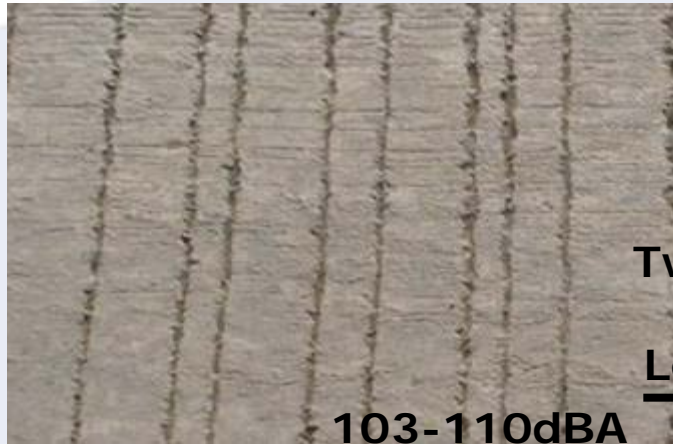


to Evaluate—In 2010 20%



How Does Grinding Stack Up

Transverse Tine

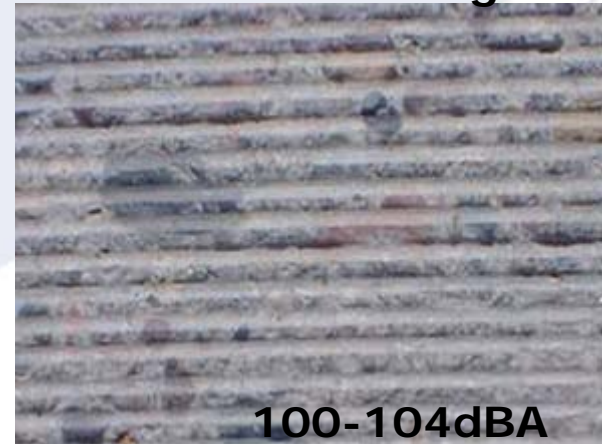


Twice
as
Loud

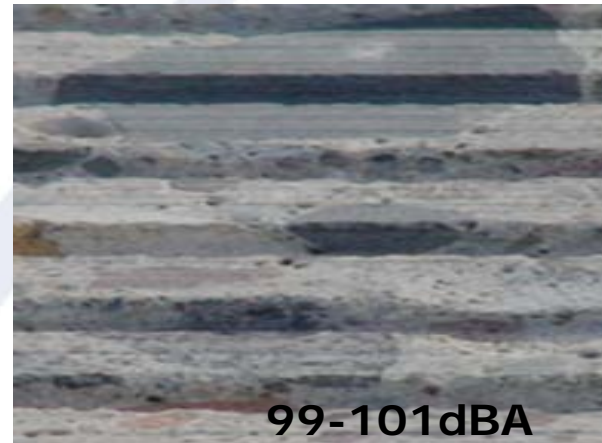


Longitudinal Tine

**Conventional
Diamond Grinding**



Traffic



**Next Generation
Concrete Surface**

Purdue New Surface Textures Results

- Establish the Lower Limit Possible with Concrete
- Evaluate Unique Geometric Patterns
 - Circles
 - Diamond
 - ARFC Texture
 - Waffle Pattern
 - Random Waffle
 - Spherical

Imprinting Roller for Diamond Pattern Texture



Cast Diamond Pattern



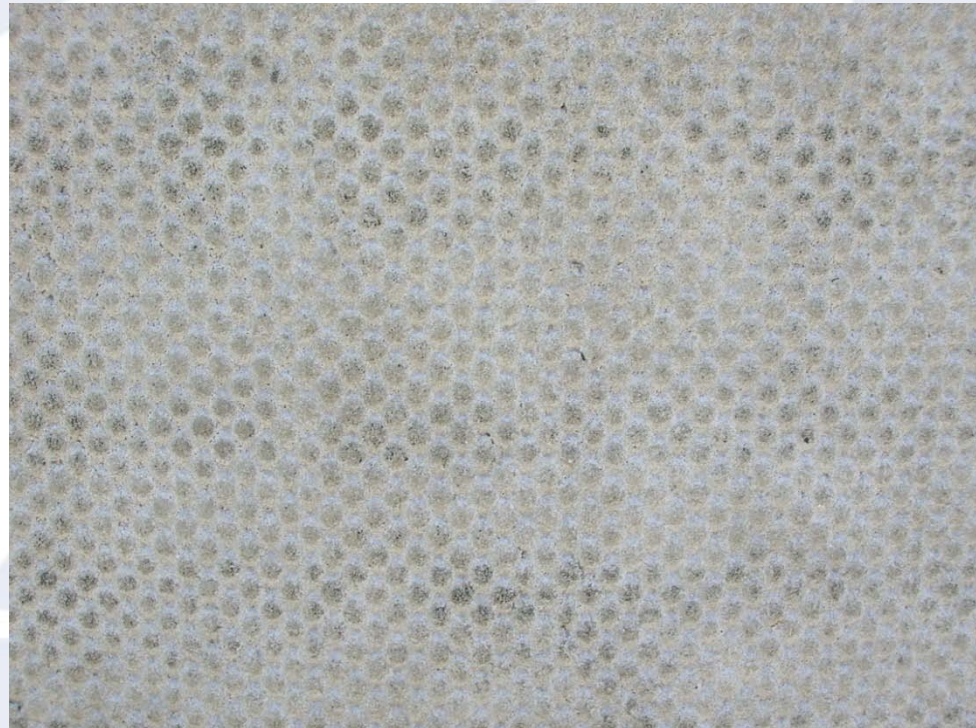
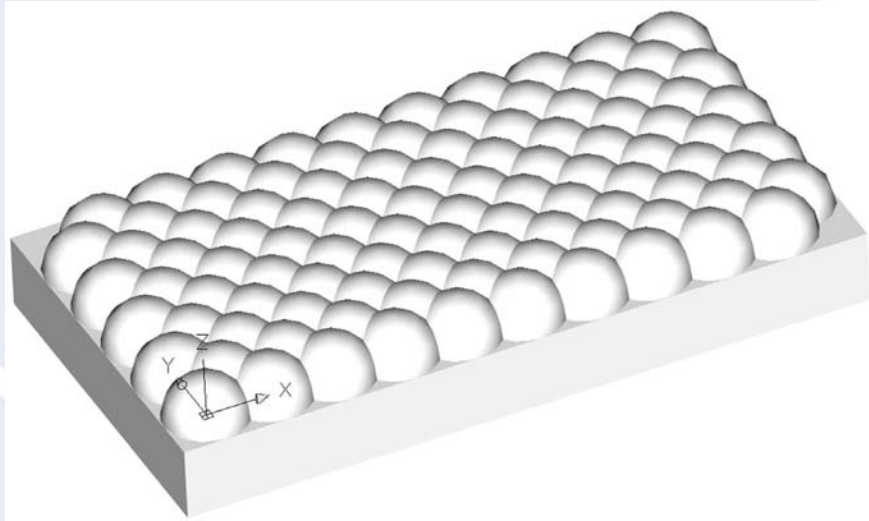
Circle

- Circles 8 mm in diameter

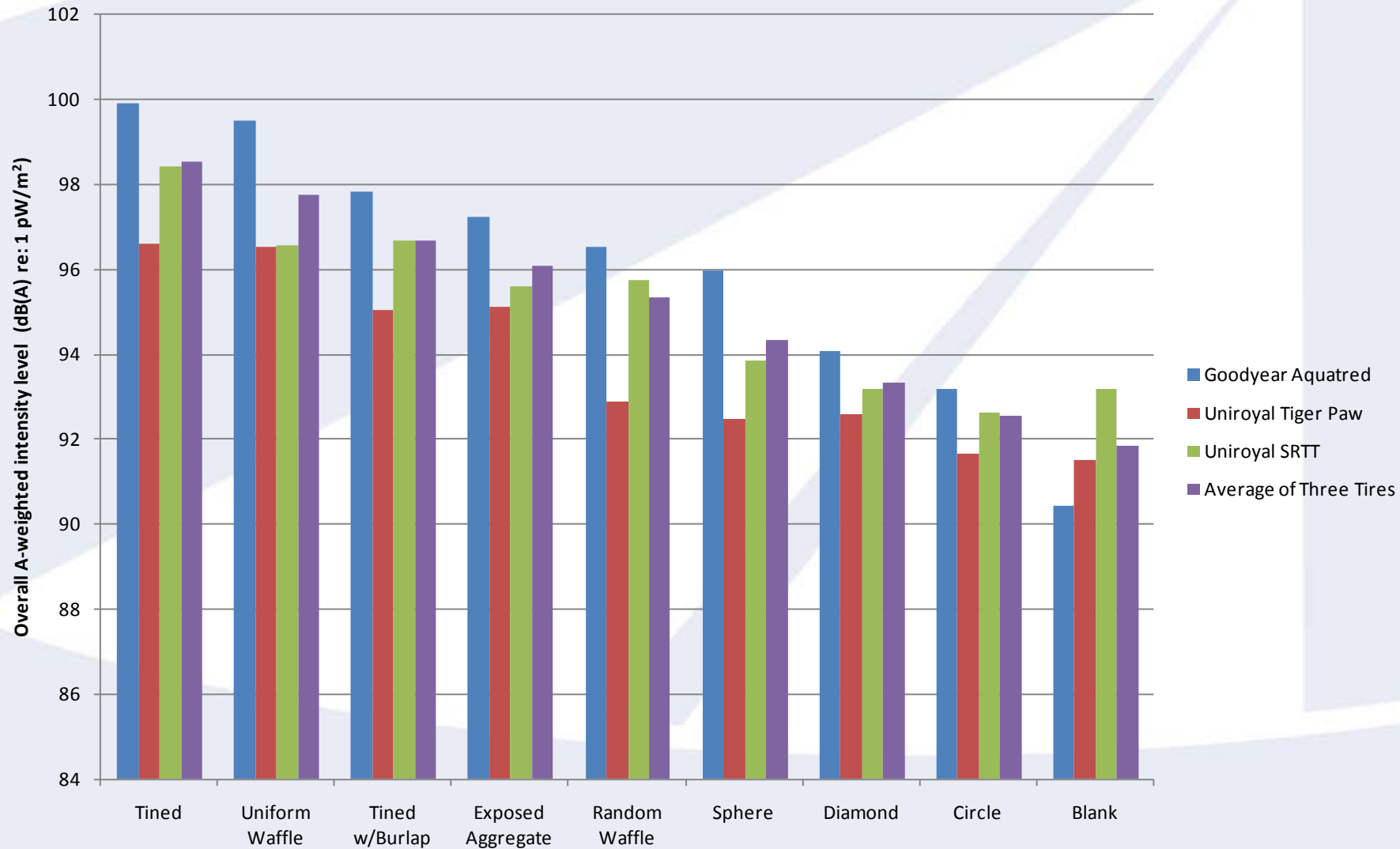


Spheres

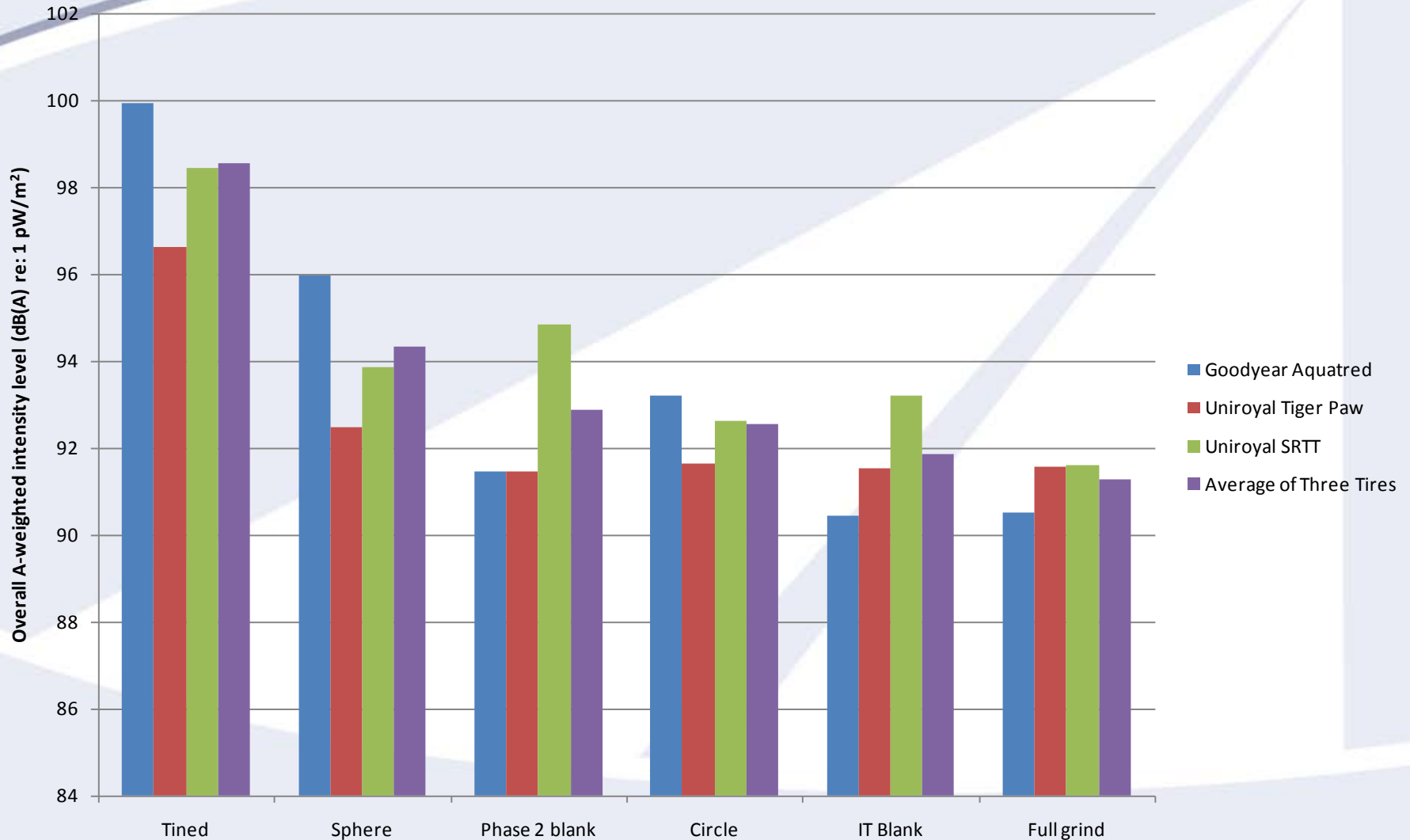
- Spheres 8 mm in diameter
- Overlap so only about 6 mm between peaks of adjacent spheres



Results of Geometric Patterns



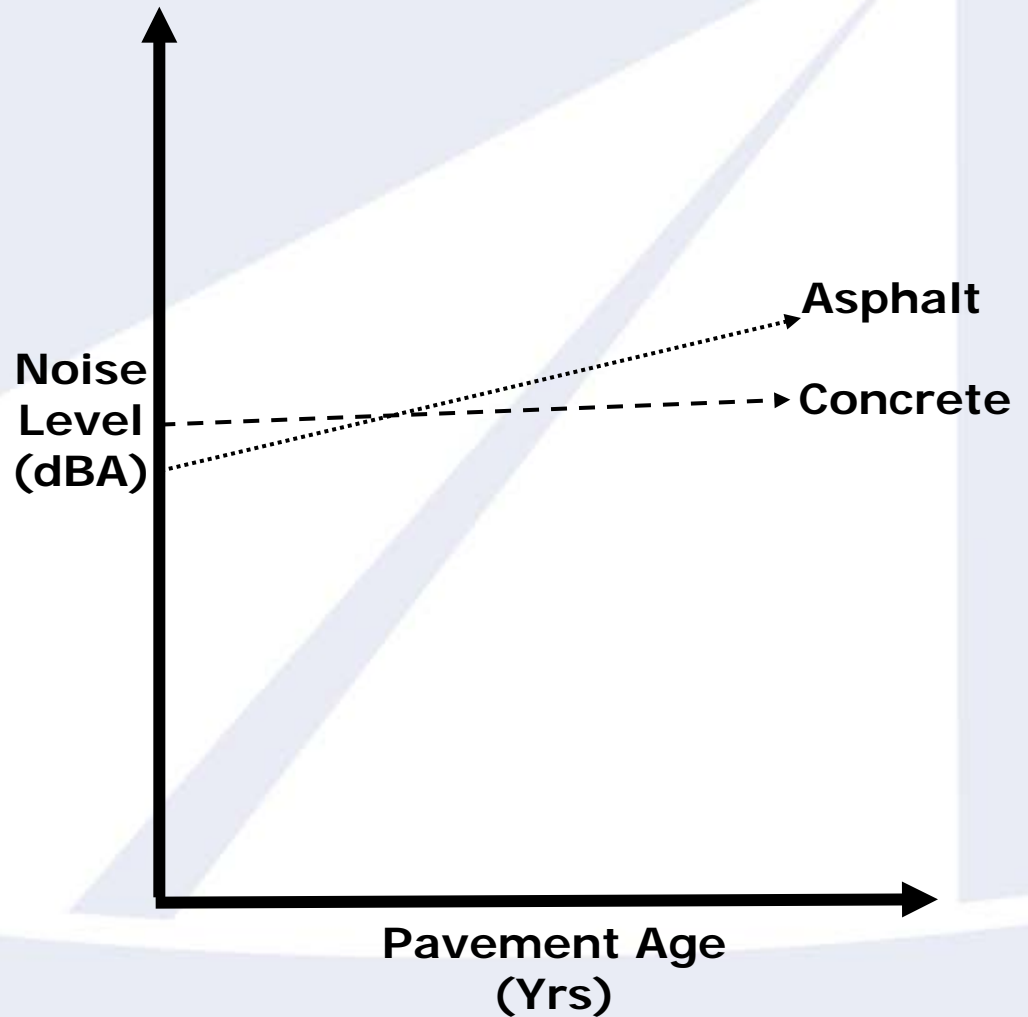
Comparison of Different Textures



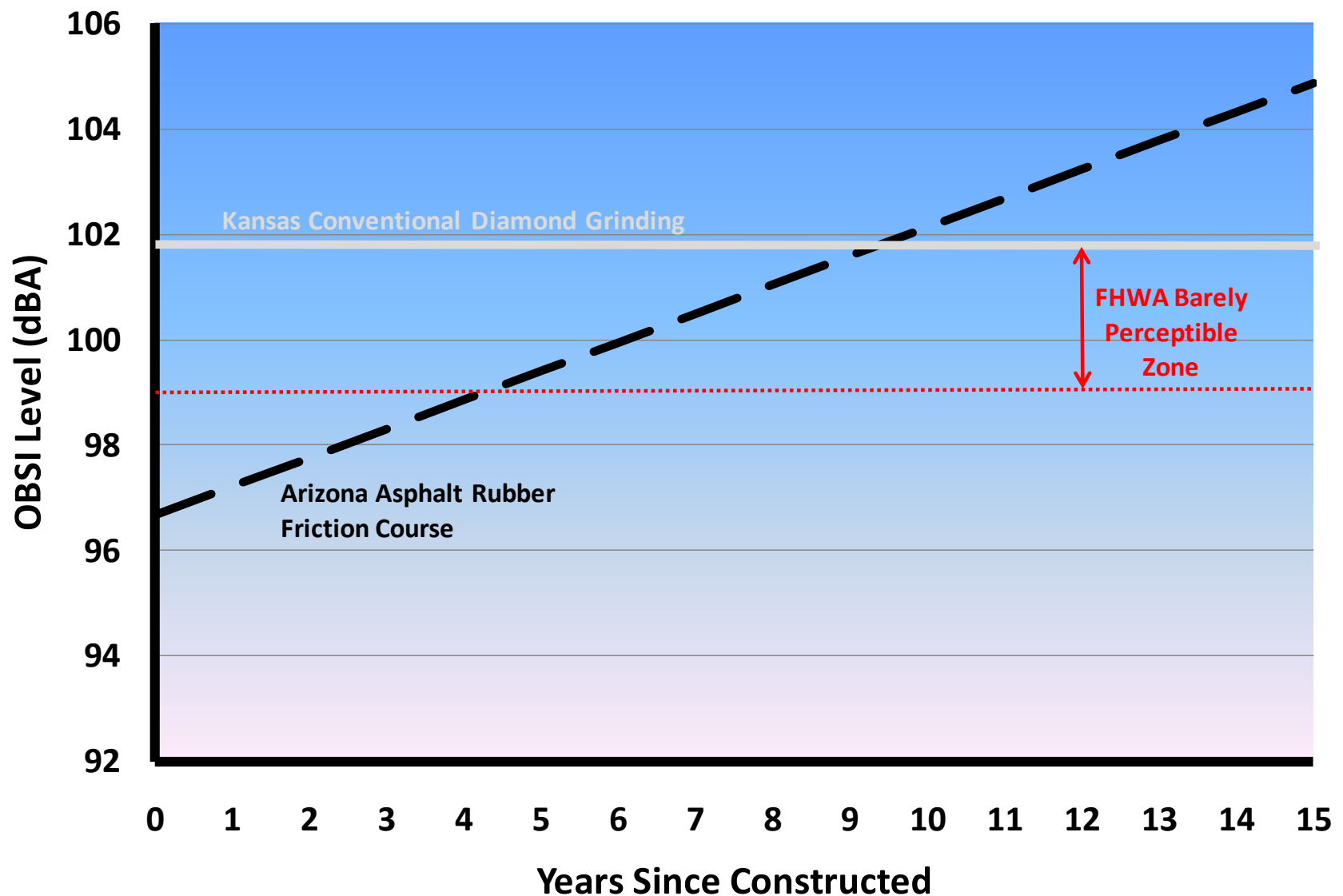
Growing Old Or "Acoustic Longevity"



Changing
Performance Over
Time



Why Is Acoustic Longevity Important?



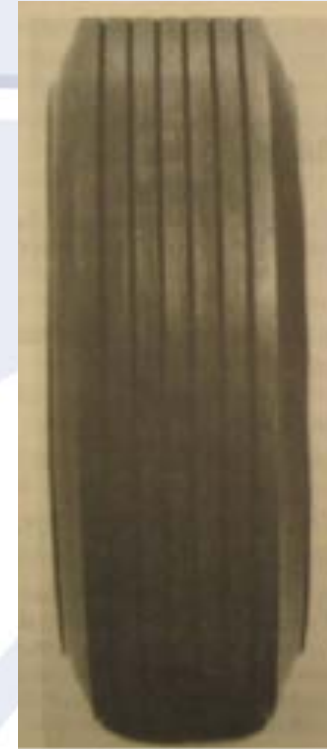
Joint Slap Spreadsheet

Joint Calculation

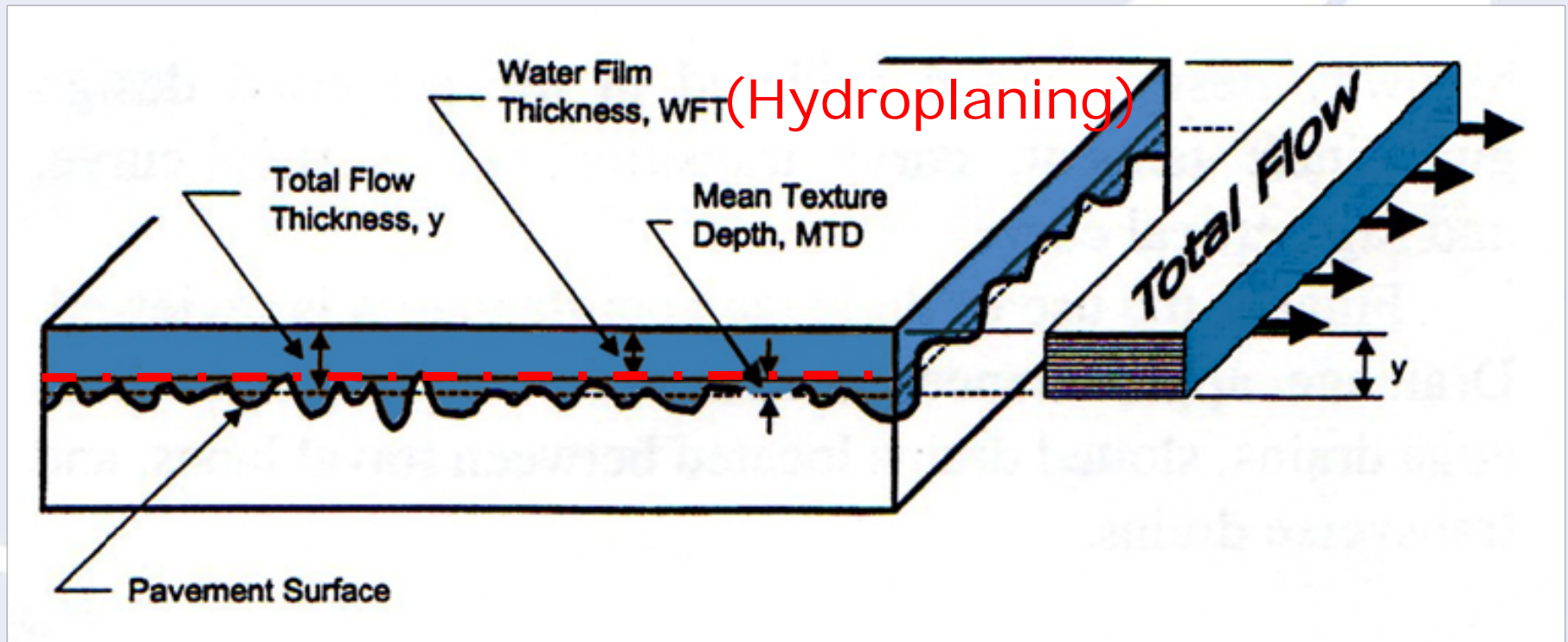
- Distance between joints
- Vehicle speed
- Groove width and depth

Pavement Noise Calculation

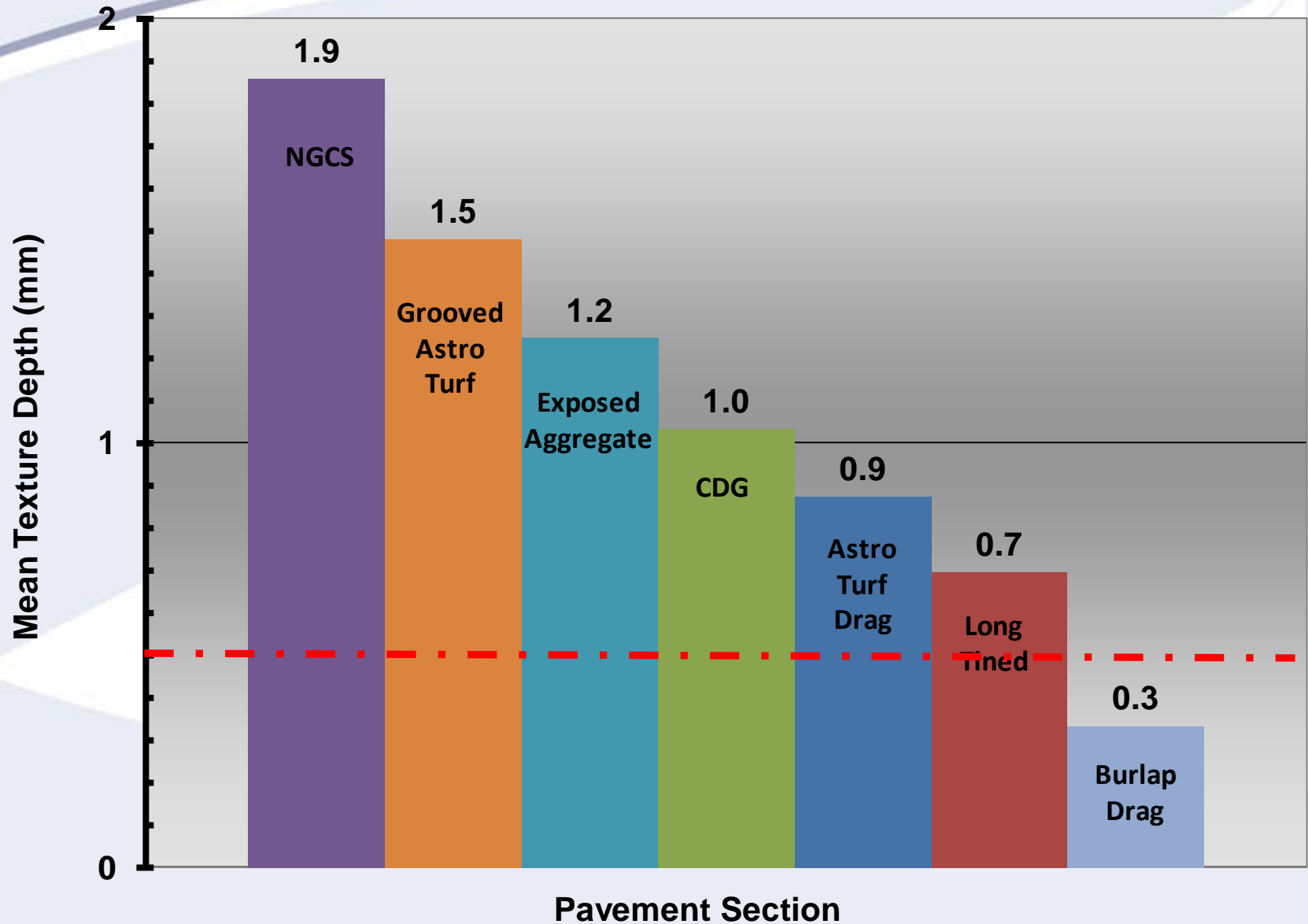
- Overall level – input texture generated noise level
- Texture noise level – input measured overall level



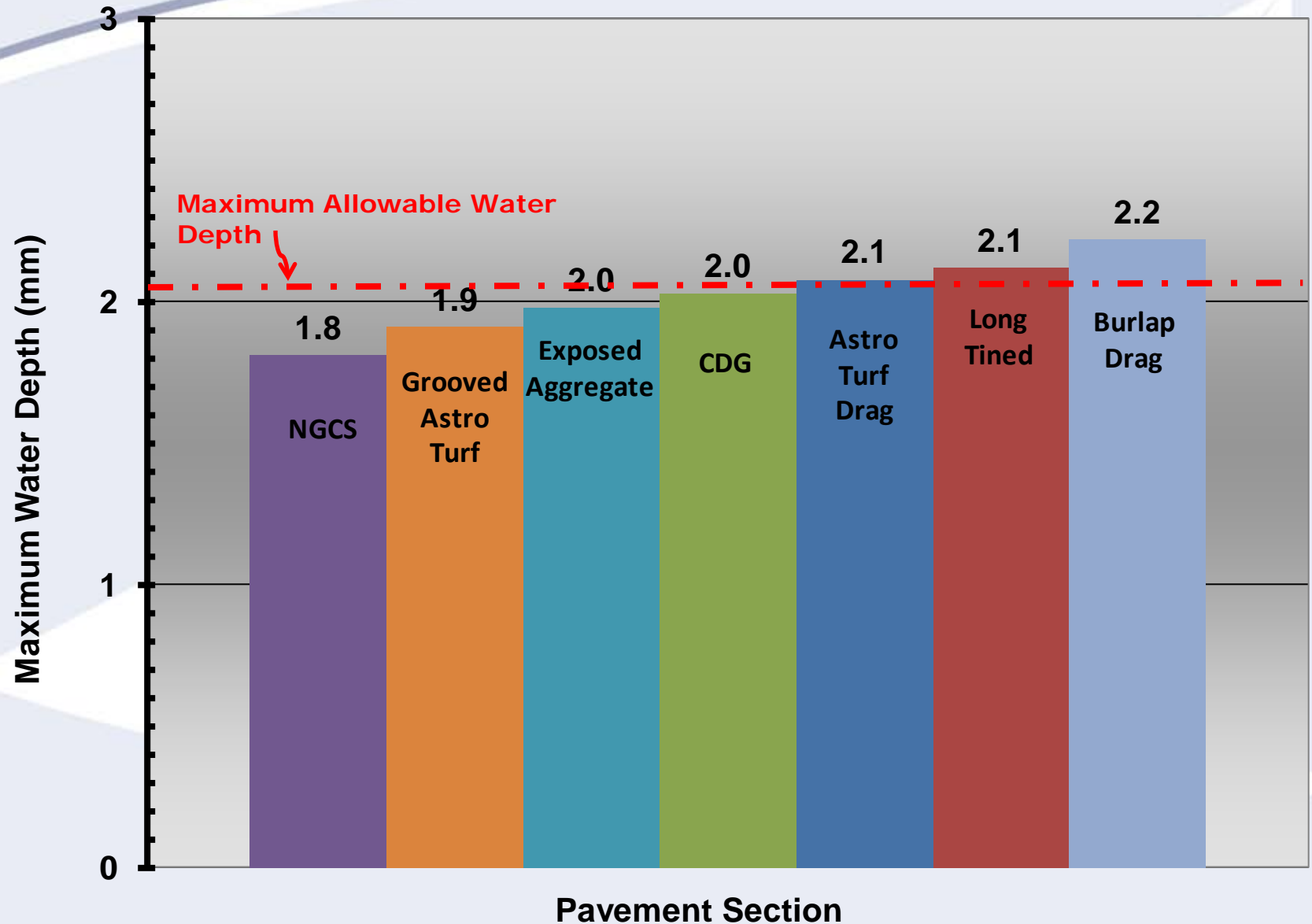
Hydroplaning



Mean Texture Depth (Kansas I-70)



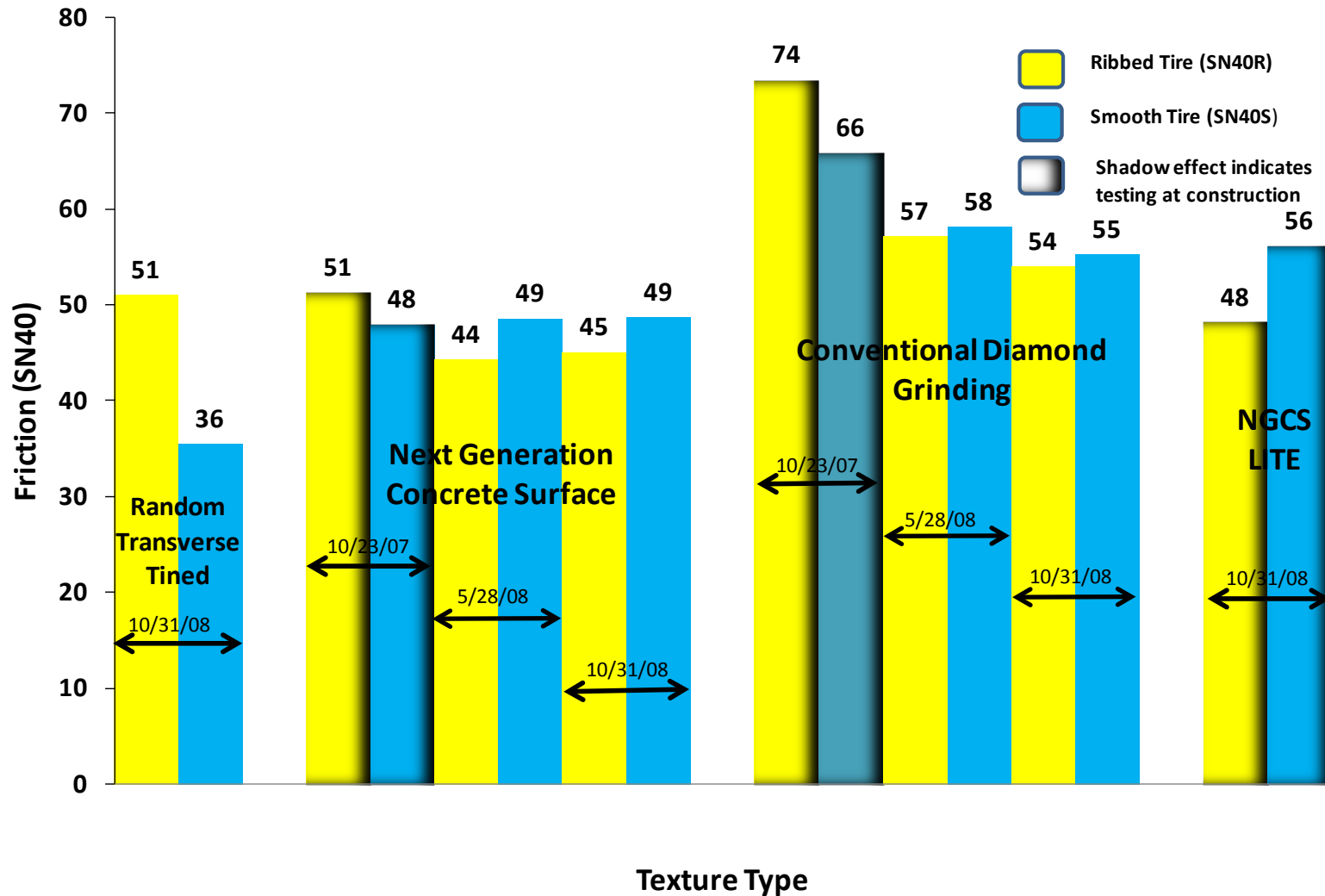
Water Depth For Hydroplaning (I-70 Data) (Utah Requirements)



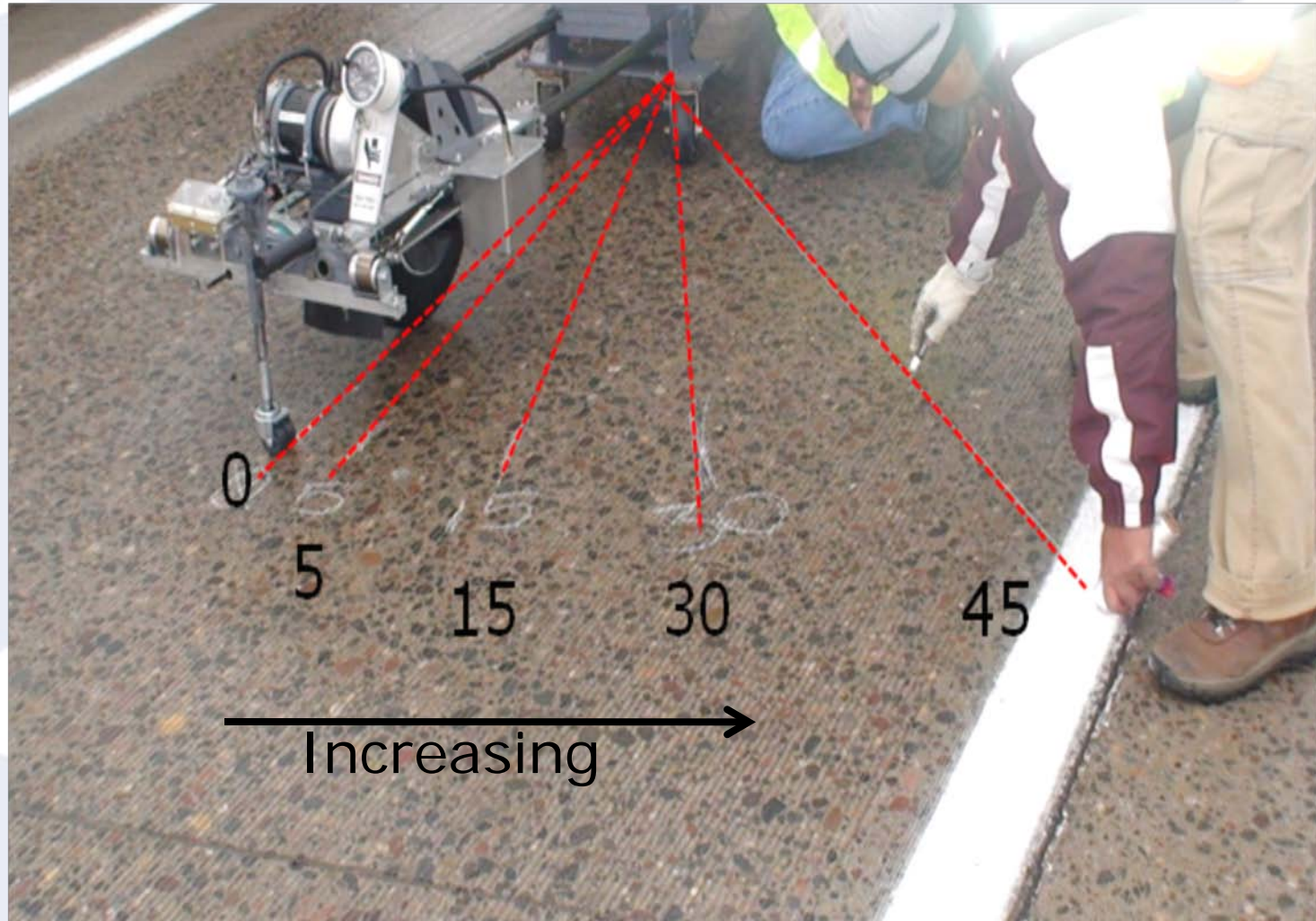
Friction Results!!!



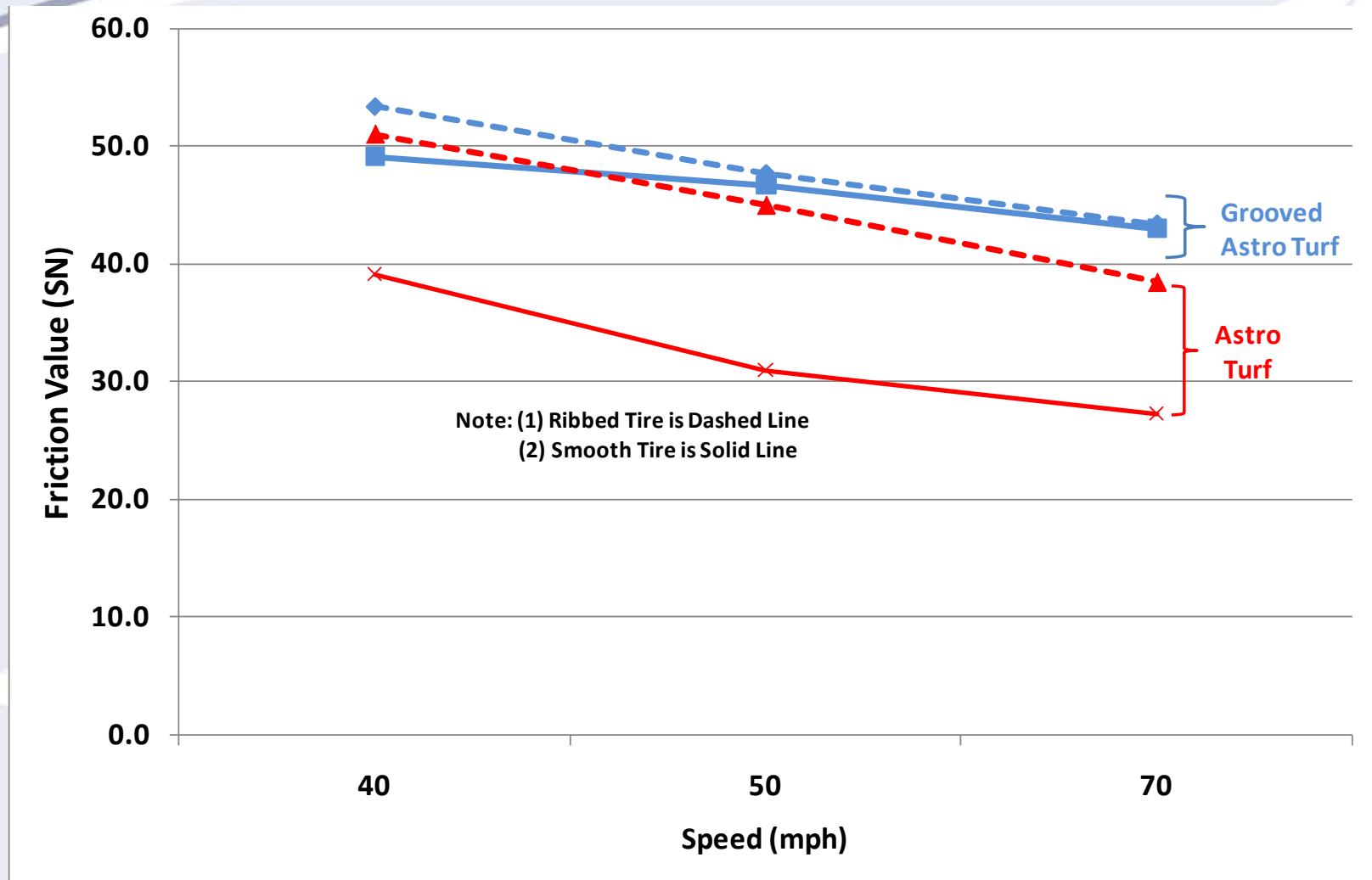
ASTM Locked Wheel Skid Testing of NGCS



CT-342 Friction Testing at Angles



Grooved Vs Non-Grooved Astro Turf Friction Results



In Summary

- The NGCS provides a quiet surface
- Joint Slap Model Can be Used to Evaluate Transverse Joint Designs for Impact on Overall Pavement Noise
- Several Geometric Patterns Developed Low Noise Surfaces
- Acoustic and Friction Longevity is Still Under Evaluation- The Journey is Underway

Questions?

