Diamond Saw-Cut Pavement Textures

Improving Pavement Performance and Customer Satisfaction

IGGA International Grooving & Grinding Association

October 13, 2016

npcc16

Introduction

- John H. Roberts
- Executive Director - International Grooving and Grinding Association
- Vice President – American Concrete Pavement Association's Concrete Pavement Preservation Partnership

IGGA
International Grooving & Grinding Association

ppc16

Looking Back In Time

- In the not so distant past noise, ride quality, friction and customer comfort took a back seat to structural considerations

Performance Matters!

Bristol Motor Speedway 2012

Transportation Authorities React

- Specifiers place greater emphasis on noise, smoothness and construction delays
  - Develop tighter smoothness and friction requirements
  - Develop low noise surface treatments
  - Increased use of sound walls
  - Safety concerns still paramount!

Surface Characteristics Matter!

Back to the Future

- The first Concrete Pavement constructed in US was located in Bellefontaine, Ohio, 1891
- Used two lift construction
  - Hard aggregate on surface so horseshoes wouldn't wear pavement
  - Grooved 4" squares so horses would not slip

Diamond Saw Cut Textures

- Increasingly Specifiers are utilizing diamond saw cut surfaces to improve ride, reduce noise and increase the friction of their pavements and bridges
  - Economical
  - Long-lasting
  - Environmentally Sound

Equipment

- Specialty built machines have been developed over the years to impart diamond saw-cut textures into the pavement surface

Diamond Grinding Process

Minimal Traffic Control

Saw Cut Texture Flexibility

Saw-Cut Texture Options

- Conventional Diamond Grinding (CDG)
- Longitudinal (Safety) Grooving
- Conventional Diamond Grinding With Grooving
- Next Generation Concrete Surface (NGCS)

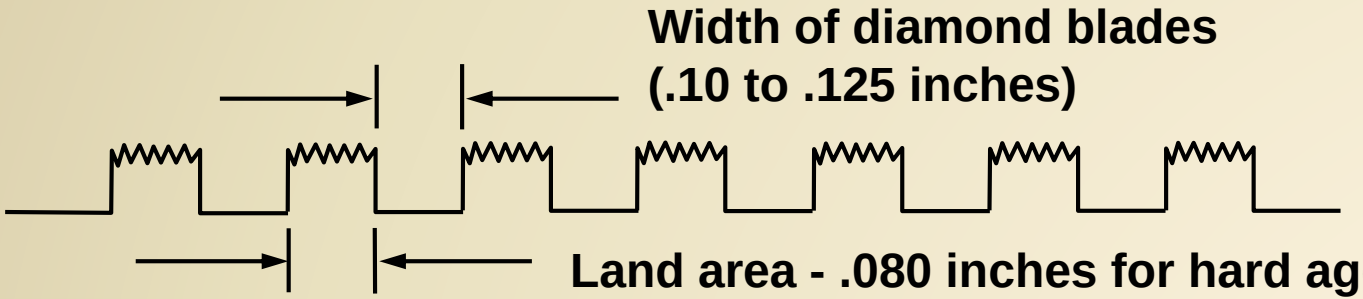
Conventional Diamond Grinding

Conventional Diamond Grinding

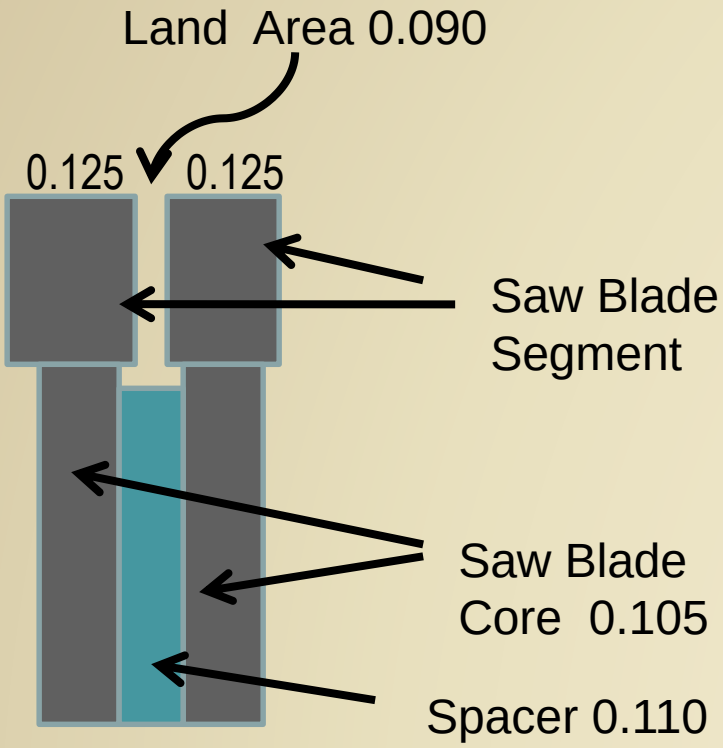
- Removal of a thin surface layer of hardened PCC using closely spaced diamond blades
- Improves drainage, friction, ride and minimizes noise
- Corrects faulted joints and extends pavement life by reducing vehicle impact loading
- Reduces wet weather accidents
- Can be used on both concrete and asphalt

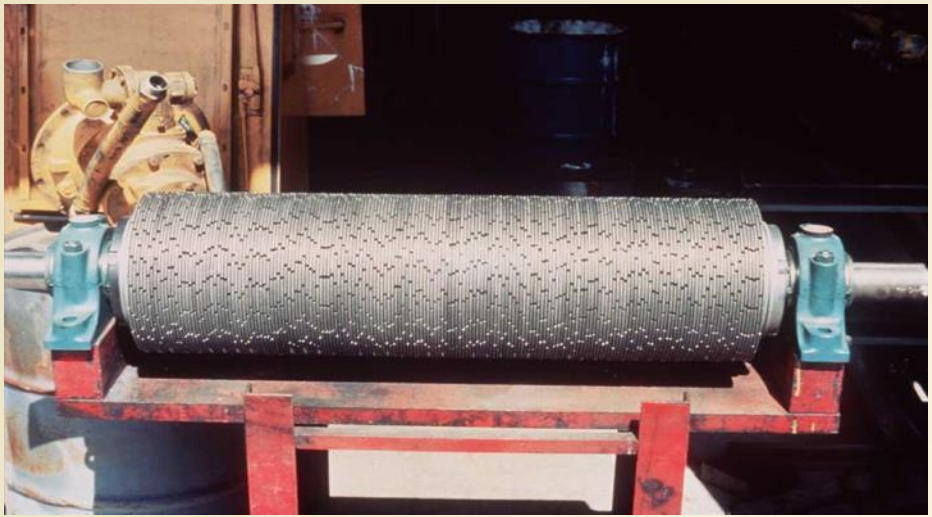
Typical CDG Texture Dimensions

Conventional Diamond Grinding



Typical CDG Configuration





Diamond Grinding Equipment

Textures Smooth Surfaces

Safety, Surface Texture and Friction

- Increased macrotexture of diamond ground surface provides improved drainage of water at tire-pavement interface
- Longitudinal texture provides directional stability and reduces hydroplaning (side-force friction)
- Grooves provide “escape route” for water trapped between tire and pavement surface

Safety, Surface Texture & Friction

- In Wisconsin, overall accident rates for ground surfaces were 40% less than for un-ground surfaces over a 6-year period, 57% in wet weather conditions

Final CDG Texture

Can be used on asphalt too!

Longitudinal Safety Grooving

- A procedure that utilizes diamond tipped saw blades, mounted and spaced on a horizontal shaft, to cut channels through which water can drain from the pavement surface

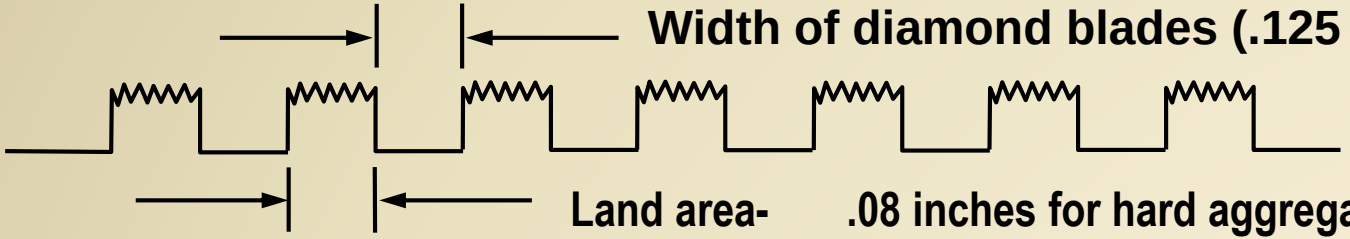
Safety Grooving

- Can be oriented either in a longitudinal or transverse direction
- Reduces splash/spray, hydroplaning and wet weather accidents by up to 70%
- Enhances tire/pavement interlock and lateral stability
- VERY INEXPENSIVE
- Can be used on both concrete and asphalt pavement

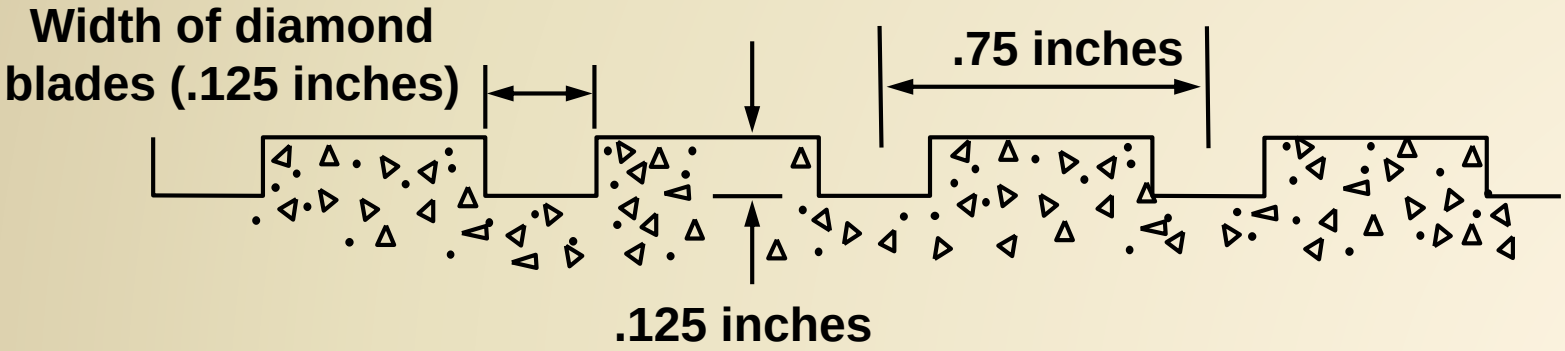
Safety Grooving

- Roadway pavement is grooved the same way that it is diamond ground, except that the diamond blades are spaced further apart

Diamond Grinding



Diamond Grooving



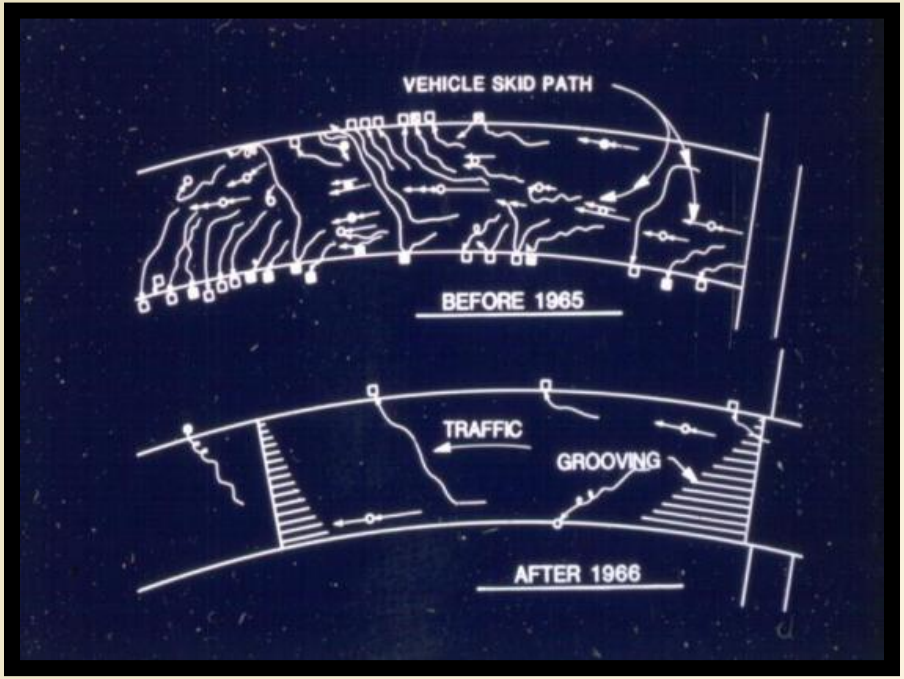
Grooving Head

CDG Head Assembly

Grooving Head Assembly

Effects of Groove Geometry

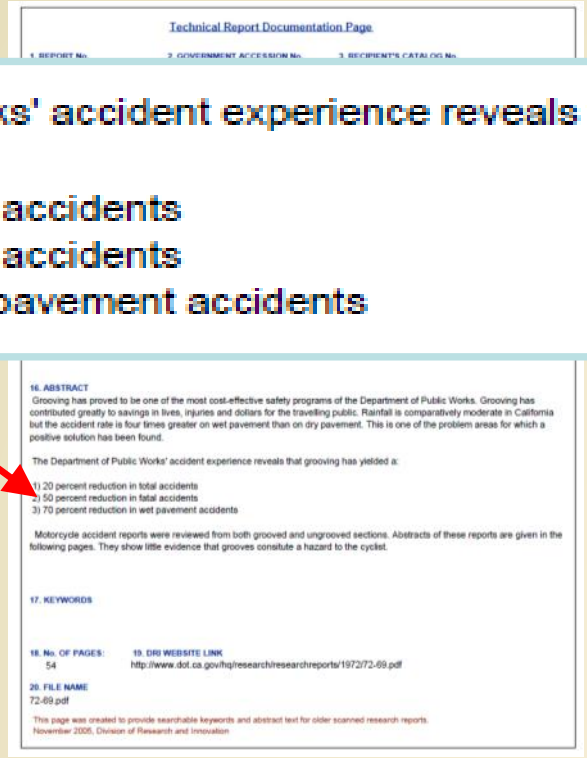
- 1st Reported CA Installation- 1961
- Standardized 1969
- Friction Increase
- Wear Resistance
- Handling Benefits



Caltrans Grooving Research Report

The Department of Public Works' accident experience reveals that grooving has yielded a:

1) 20 percent reduction in total accidents
2) 50 percent reduction in fatal accidents
3) 70 percent reduction in wet pavement accidents



Technical Report Documentation Page

1. REPORT No. 2. GOVERNMENT ACCESSION No. 3. RECIPIENT'S CATALOG No.

16. ABSTRACT

Grooving has proved to be one of the most cost-effective safety programs of the Department of Public Works. Grooving has contributed greatly to savings in lives, injuries and dollars for the travelling public. Rainfall is comparatively moderate in California but the accident rate is four times greater on wet pavement than on dry pavement. This is one of the problem areas for which a positive solution has been found.

The Department of Public Works' accident experience reveals that grooving has yielded a:

1) 20 percent reduction in total accidents
2) 50 percent reduction in fatal accidents
3) 70 percent reduction in wet pavement accidents

Motorcycle accident reports were reviewed from both grooved and ungrooved sections. Abstracts of these reports are given in the following pages. They show little evidence that grooves consitute a hazard to the cyclist.

17. KEYWORDS

18. No. OF PAGES: 54

19. DRI WEBSITE LINK
http://www.dot.ca.gov/hq/research/researchreports/1972/72-69.pdf

20. FILE NAME
72-69.pdf

This page was created to provide searchable keywords and abstract text for older scanned research reports.
November 2005, Division of Research and Innovation


BRITISH AIRWAYS

CDG with Longitudinal Grooving

CDG With Longitudinal Grooving

- CDG surface enhanced with longitudinal grooving
- Provides long term texture on soft, polish prone surfaces
- Provides the benefits of CDG (Ride, Noise, Friction)
- Increases service life by reducing vehicle impact loading
- Increased macro-texture provided by grooves delivers enhanced drainage at tire-pavement interface
- Reduces hydroplaning and accident potential

CDG With Safety Grooving

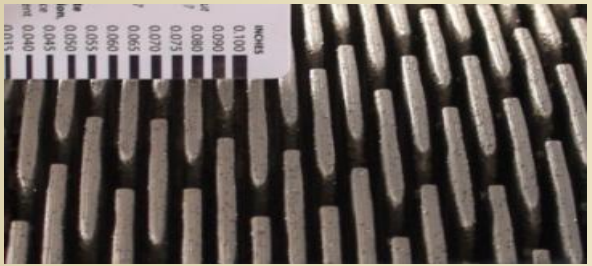
Next Generation Concrete Surface (NGCS)

NGCS

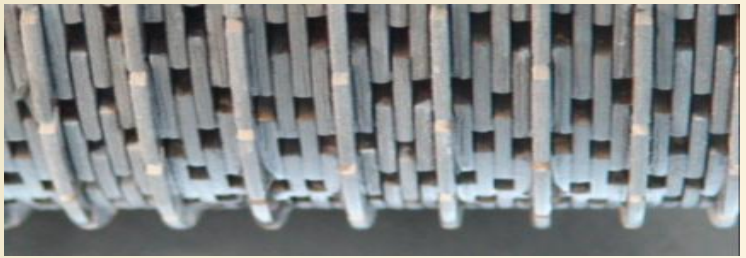
- A hybrid saw cut texture developed to provide the **safest and most quiet** surface for concrete pavement
- Constructed using conventional grinding equipment
- Provides a smoother ride than any other available surfaces
- Longitudinal groove channels provide increased drainage resulting in safer wet weather performance

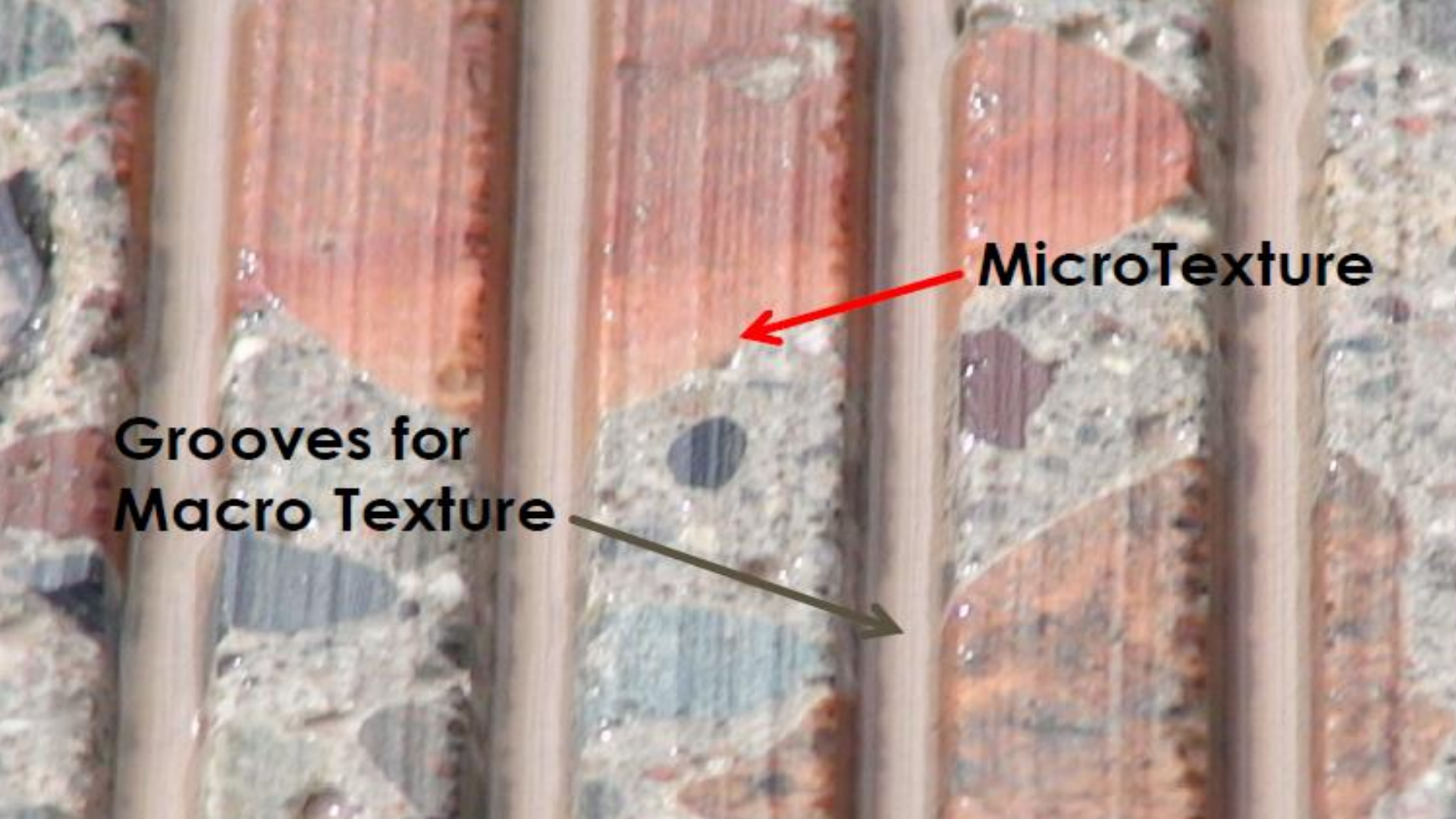
NGCS is Built Using DG Technologies

CDG



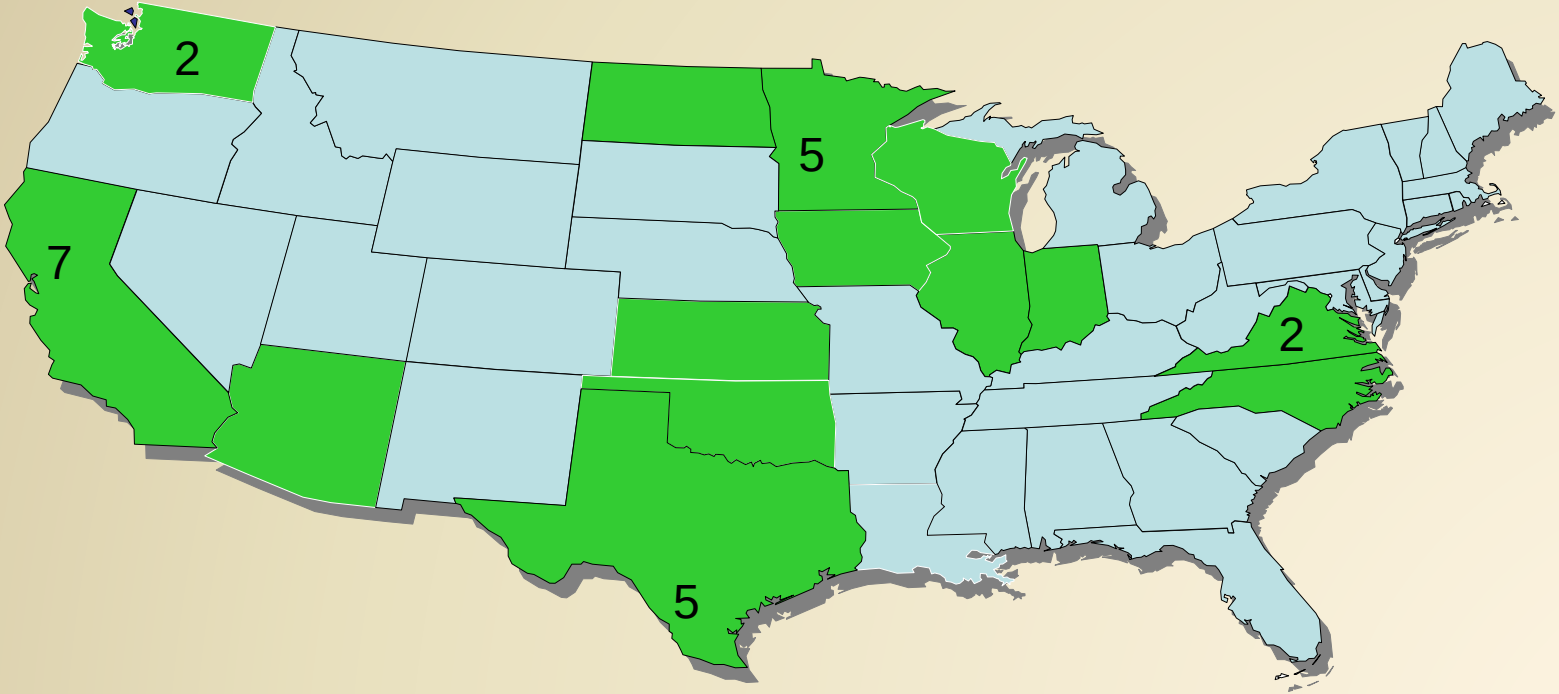
NGCS



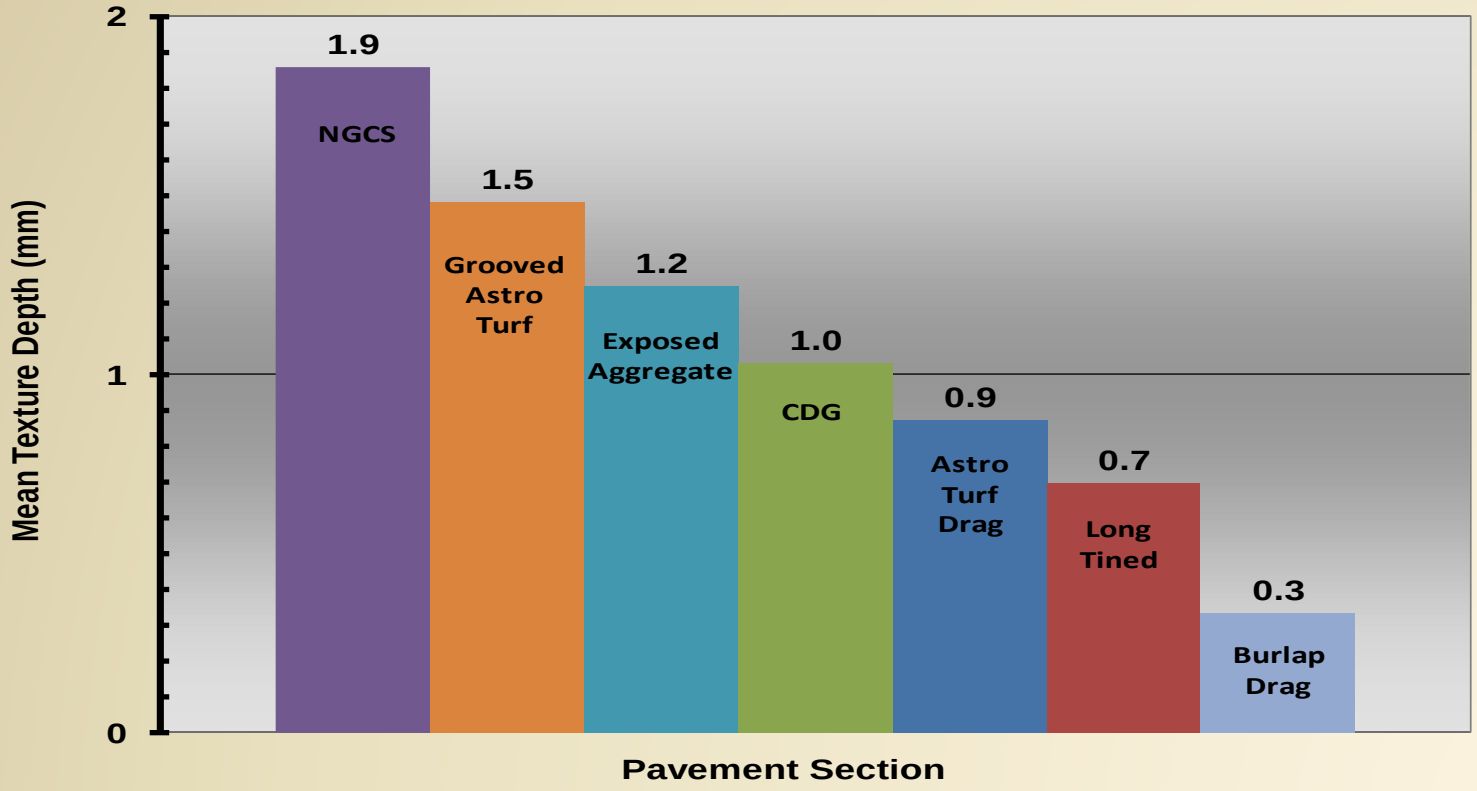

MicroTexture
Grooves for
Macro Texture

Duluth Minnesota NGCS

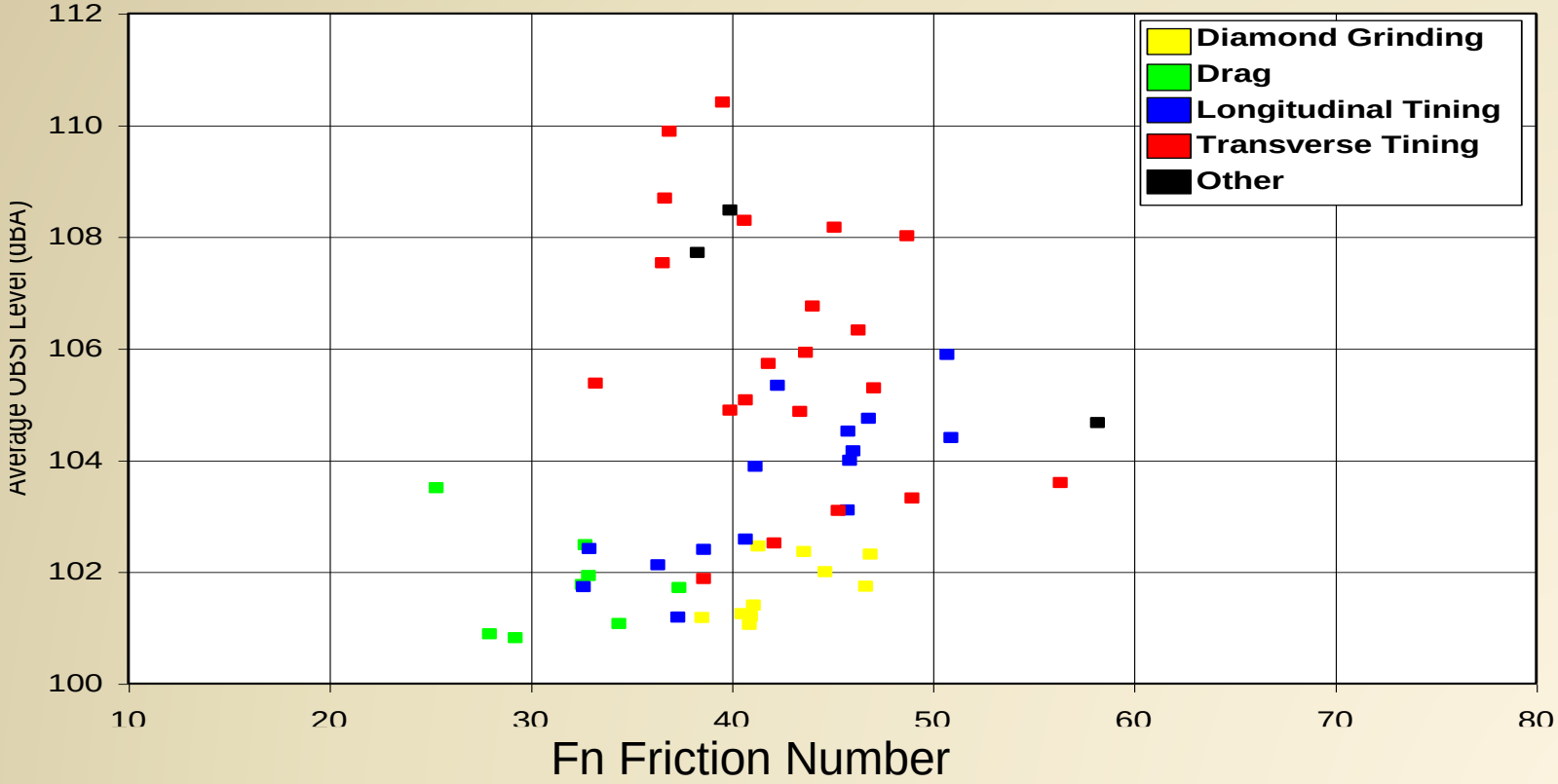
NGCS Site Locations in The USA



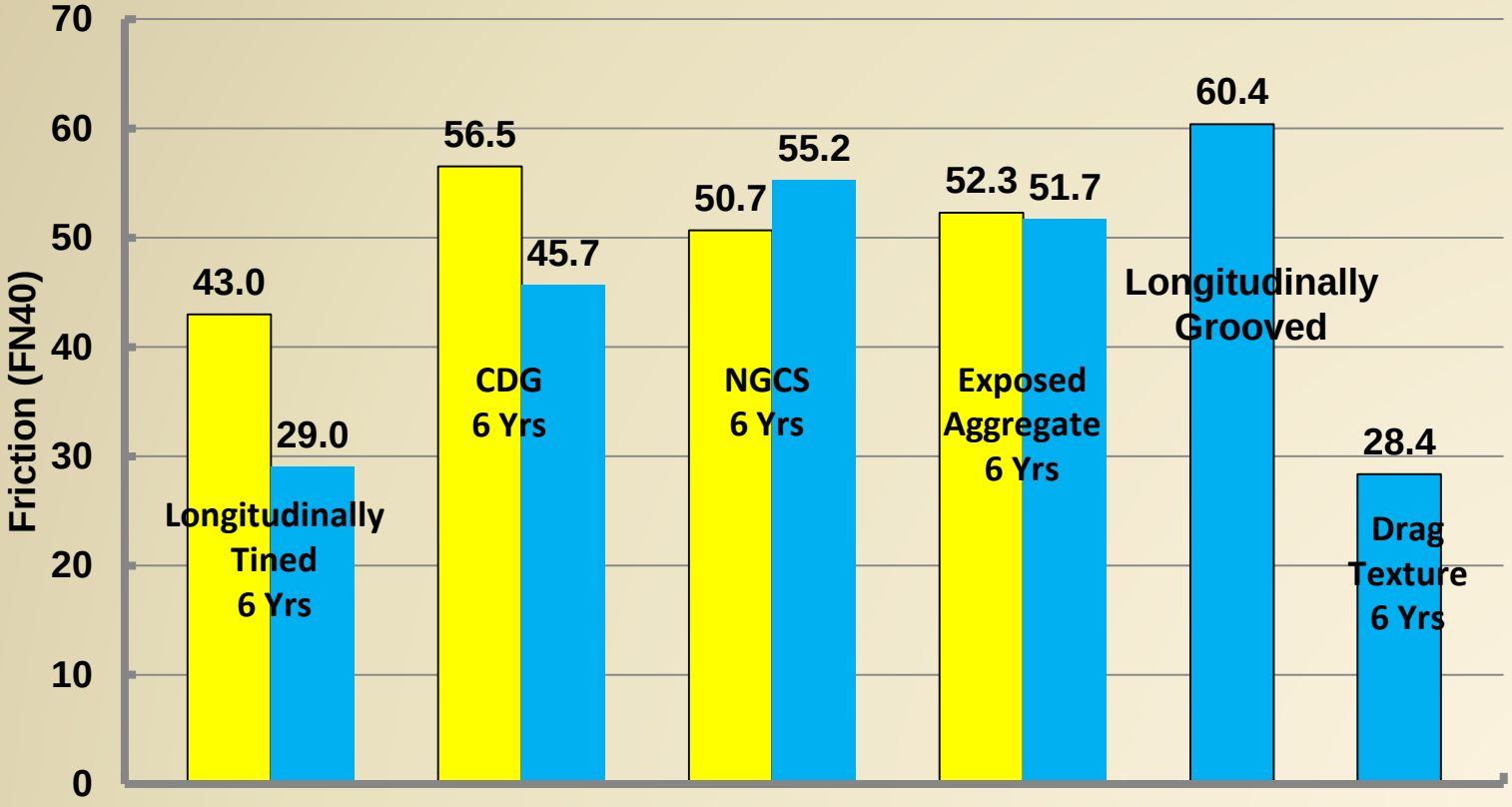
Mean Texture Depths KDOT I-70



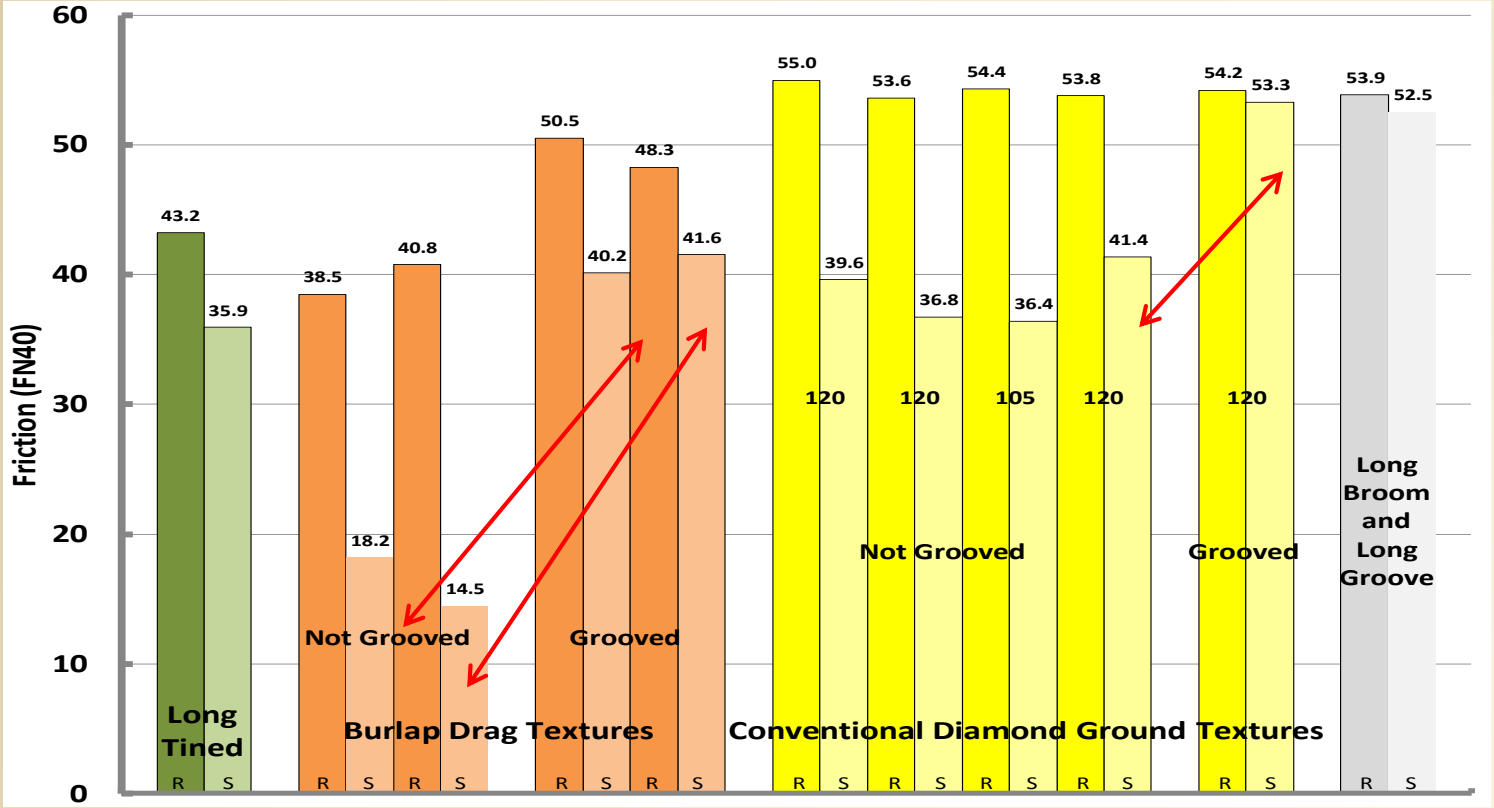
Noise vs. Friction



Kansas I-70 EB



California SR 58 - 10 Years Old



TXDOT I-35 CDG Research

- Total savings to TX DOT: **$3 million when compared to 3 inch overlay**
  - Texture: improved by 0.61 mm (SP and CTM)
  - Coefficient of Friction: improved by 0.138 (DFT)
  - Skid number: improved by 13.4
  - Roughness: reduced by 44.4 inch/mile
  - Pavement Noise: 3.2dBA (50% sound pressure reduction)

Summary

- It is a challenging time for the transportation industry.
- Motorists are increasingly demanding safe, smooth, quiet and delay free roadways while funding necessary to meet these needs remains elusive.
- Diamond saw-cut textures are a time proven, cost effective means of providing consistently smooth, quiet and **safe** textures at a fraction of the cost of overlays and/or reconstruction.

Visit Us on the Web @ igga.net

John H. Roberts

International Grooving and Grinding Assn.

12573 Rte. 9W

West Coxsackie, NY 12192

518 731-7450