Diamond Saw-Cut Pavement Textures

Improving Pavement Performance and Customer Satisfaction

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Introduction

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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

I-40 Oklahoma City Oklahoma
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

Width of diamond blades
(.10 to .125 inches)

Land area - .080 inches for hard aggregate
- .110 inches for soft aggregate
Typical CDG Configuration

Land Area 0.090

0.125

Saw Blade Segment

0.125

Saw Blade Core 0.105

Spacer 0.110
Diamond Grinding Equipment
Textures Smooth Surfaces

ASTM Sand Patch Test
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
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

- Width of diamond blades (.125 inches)
- Land area: .08 inches for hard aggregate, -.110 inches for soft aggregate

Diamond Grooving

- Width of diamond blades (.125 inches)
- .75 inches
- .125 inches
Grooving Head

Grooving Head Assembly

CDG Head Assembly
Effects of Groove Geometry

- 1st Reported CA Installation - 1961
- Standardized 1969
- Friction Increase
- Wear Resistance
- Handling Benefits
The Department of Public Works’ accident experience reveals that grooving has yielded:

1) 20 percent reduction in total accidents
2) 50 percent reduction in fatal accidents
3) 70 percent reduction in wet pavement accidents
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
Grooves for Macro Texture

MicroTexture
NGCS Site Locations in The USA
Mean Texture Depths KDOT I-70

Mean Texture Depth (mm)
Pavement Section
Mean Texture Depth
NGCS
Grooved Astro Turf
Exposed Aggregate
CDG
Astro Turf Drag
Long Tined
Burlap Drag

NGCS: 1.9
Grooved Astro Turf: 1.5
Exposed Aggregate: 1.2
CDG: 1.0
Astro Turf Drag: 0.9
Long Tined: 0.7
Burlap Drag: 0.3
Kansas I-70 EB

Friction (FN40)

- Longitudinally Tined 6 Yrs: 43.0
- CDG 6 Yrs: 56.5
- NGCS 6 Yrs: 50.7
- Exposed Aggregate 6 Yrs: 52.3
- Longitudinally Grooved: 60.4
- Drag Texture 6 Yrs: 28.4
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

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