But what about Skid Resistance
Retexturing- the sustainable approach

Tim Naidu
Briser Road Safety
Outline

The Problem: Litigation
Provision of Skid Resistance
Causes of Low Skid Resistance
Measurement

Maintenance Options
Retexturing Methods
Practical Applications
Considerations
Reliable Road Surface Requirements

- Ride quality
- Waterproof
- Contamination resistant
- Economic Maintenance
- Strength & Durability
- Noise reduction
- Spray reduction
- Water dispersion
- Grip
Macro and Microtexture

1.8 Ford Focus driven at 70MPH

Breaking distance with 1.6mm tread: 135M
Breaking distance with 3.0mm tread: 91M (-30%)

Auto Express Magazine: Wet Grip Shock
Seasonal Variations

FIGURE 3.3 Example of the Seasonal Variation of SFC
Litigation issues

Civil Action:
10 years: 8 fold increase- +9% per annum
80%: highway maintenance- Surface is third

New Protocols for Road Death Investigation
Investigate all incidents as “Unlawful Killings” until the contrary is proved

HSE - MORR

EuroRap
(European Road Assessment Programme)

AA Foundation: Get a Grip-Tyres, Road Surfaces & Traffic Accidents
Litigation issues

Codes of Practices

HD28/04 Management of Skid Resistance
HD28/04 Management of Skid Resistance

4. Setting Investigation Levels
4.12 Factors: low texture depth

6. Prioritising of Treatment
6.2 HD36-Surfacing materials for new and maintenance construction (departures)
   HD37- Bituminous surfacing materials and techniques
   HD38-Concrete surfacing and materials
   ...retexuture-SR and/or Texture Depth
HD28/04 Management of Skid Resistance

Annex 1: Background information...........
.................................road surface properties
A 1.4 Micro & Macro texture
A 1.5 Tabled effect
A 1.8 Traffic/Temp/Surface characteristics
HD29/94 Structural Assessment Methods

A 4.14 Content of Site Investigation-Texture
Litigation issues

Codes of Practices

HD28/04 Management of Skid Resistance

CSS Guidance Note: Skidding Resistance

Well-maintained Highways

Code of Practice for Highway Maintenance Management

Road Liaison Group    July 2005
9.8 Skid Resistance Survey Requirements

9.8.1 HD28/04 Management of Skid Resistance
CSS Guidance Note: Skidding Resistance
IAN 49/03 or Early Life SR Strategy

9.8.5 Appoint a member of staff to be responsible

9.8.6 SR Policy as part of their HAMP:
the documentation, to be retained to enable
implementation of policy to be demonstrated
(in court if necessary)

9.8.17 Where skidding resistance is low...
remedial treatment should be prioritised

SA3: % SCRIM surveyed
**Designing for Safety: Skid Resistance**

### Table 1: Investigatory Levels recommended for the revised HD28

<table>
<thead>
<tr>
<th>Site category and definition</th>
<th>Investigatory level at 50km/h</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0.30</td>
</tr>
<tr>
<td>A Motorway class</td>
<td></td>
</tr>
<tr>
<td>B Dual carriageway non-event</td>
<td></td>
</tr>
<tr>
<td>C Single carriageway non-event</td>
<td></td>
</tr>
<tr>
<td>F Approaches to and across minor and major</td>
<td></td>
</tr>
<tr>
<td>junctions, approaches to roundabouts</td>
<td></td>
</tr>
<tr>
<td>K Approaches to pedestrian crossings and other</td>
<td></td>
</tr>
<tr>
<td>high risk situations</td>
<td></td>
</tr>
<tr>
<td>L Roundabout</td>
<td></td>
</tr>
<tr>
<td>G1 Gradient 5-10% longer than 50m</td>
<td></td>
</tr>
<tr>
<td>G2 Gradient &gt;=10% longer than 50m</td>
<td></td>
</tr>
<tr>
<td>H Bend radius &lt;500m – dual carriageway</td>
<td></td>
</tr>
<tr>
<td>H Bend radius &lt;500m – single carriageway</td>
<td></td>
</tr>
</tbody>
</table>
Designing for Safety: Risk

Statistical analysis of site category accident rates determines default SR level

TRL Report 622:
Accidents and the SR standard for strategic roads
### Designing for Safety: Surface

**Quality of Aggregate: PSV**

<table>
<thead>
<tr>
<th>Site Definitions</th>
<th>Traffic (cv/lane/day) at design life</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0-250</td>
</tr>
<tr>
<td>Motorway (mainline). Dual carriageways (non-event)</td>
<td>50</td>
</tr>
<tr>
<td>Motorway mainline, 300 m approaches to off-slip roads</td>
<td>50</td>
</tr>
</tbody>
</table>

**DMRB Vol.7 Sec.5 Ch.3: HD36/06**
Loss of Skid Resistance

Contamination
Factors affecting Macro Texture

Surfacing:
- Failure to meet spec
- Over-rolling/mix

Fatting up:
- Curing/Mix
- Multi layers

Aggregate:
- Depression
- Wear

Detritus blockage
Factors affecting Micro Texture

Contamination:
- Rubber
- Detritus
- Bitumen

Polishing:
- PSV/AAV/Traffic
The Early Life SR of New Surfaces

**Issues**

Skid Resistance during first 3-6 months

Melting of binder film in the dry

Blinding of Microtexture in the wet
Skid Resistance Testing
HD 28/04 Management of Skid Resistance

CSC - Characteristic SCRIM Coefficient

Code of Practice for Highways Management:
MSSC, Annual with Benchmark or Annual
Macro Texture Testing

Sand Patch-Volumetric
1.5mm new

TRACS
1.1 mm SMTD equivalence
If it’s slippery when wet what can we do?
Skid Resistance Improvement Options

- Slippery Road Signs
- High Friction Dress
- Surface Dress
- Resurface
- Recycle
- Retexture
• DMRB Vol.7 Sec.4 Ch 2
  HD 32/94 Maintenance of Concrete Roads

• DMRB Vol.7 Sec.5 Ch 3
  HD 38/97 Concrete Surfacing & Materials

• DMRB Vol.7 Sec.4 Ch 2
  HD 31/94 Surface Treatments

• TRL 298 and 299
  Mechanical retexturing of roads: Process eval. & durability

• DMRB Vol.7 Sec.5 Ch11
  HD 37/99 Retexturing (Bituminous)
“Retexturing is the mechanical reworking of a sound road surface to restore either skidding resistance, texture depth or both.”

“11.5. Advantages include:

a) Conservation of natural resources by reworking an existing surface”

Design Manual for Roads and Bridges (DMRB) - Vol 7
High Specification Aggregate Statistics

Use of NTS has seen HSA annual demand increase from 2.6Mt to 6.1Mt between 92 and 02: +135%

23 HSA quarries in UK of which 13 are in England
HSA imported from outside England increased from 0.92Mt to 2.25Mt: + 145%

Current demand/supply provides for 17 years

“The sustainable use of HSA in SR road surfacing in England”
Capita Symonds 2005
## Retexturing - DMRB

<table>
<thead>
<tr>
<th>Surfacings type</th>
<th>Original condition: effect required from treatment</th>
<th>Suitability of treatment processes</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Bush hammering</td>
</tr>
<tr>
<td>Chipped rolled asphalt</td>
<td>Polished aggregate: good texture</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td>recovery of skidding resistance</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td>poor texture</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td>Embedded chippings: good SR</td>
<td>O</td>
</tr>
<tr>
<td></td>
<td>recovery of texture depth</td>
<td>O</td>
</tr>
<tr>
<td></td>
<td>poor SR</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td>Excessive noise/excessive texture</td>
<td>✓</td>
</tr>
</tbody>
</table>
Water Retexturing/Captive Hydrology
Carbonising

Outside scope of TRL 1994 project
Grooving

Longitudinal Scabbling

Orthogonal Grooving

Micro-milling
Shot Blasting/Preening
Bush Hammering
(Klaruwtext 190)
Bush Hammering
(Klaruwtex190)

Before

After

The effect
How Retexturing can be used
### Response to SR testing

<table>
<thead>
<tr>
<th>Road</th>
<th>Location</th>
<th>Length</th>
<th>Approx Width</th>
<th>Treatment</th>
<th>Section &amp; Chainage</th>
</tr>
</thead>
<tbody>
<tr>
<td>A65 Plan No 13</td>
<td>Between Galegreen and Lane's boundary</td>
<td>185m</td>
<td>3.6</td>
<td>Retexture</td>
<td>3/74 ch 70 to 255 W/B</td>
</tr>
<tr>
<td></td>
<td></td>
<td>20m</td>
<td>3.6</td>
<td></td>
<td>ch 455 to 475 W/B</td>
</tr>
<tr>
<td></td>
<td></td>
<td>20m</td>
<td>3.6</td>
<td></td>
<td>ch 715 to 695 W/B</td>
</tr>
<tr>
<td></td>
<td></td>
<td>145m</td>
<td>3.6</td>
<td></td>
<td>ch 475 to 620 E/B</td>
</tr>
<tr>
<td>A65 Plan No 9</td>
<td>Between A657 and Ingleton</td>
<td>40m</td>
<td>3.6</td>
<td>Retexture</td>
<td>2/68 ch 400 to 500 W/B</td>
</tr>
<tr>
<td>A65 Plan No 8</td>
<td>East side of Ingleton</td>
<td>20m</td>
<td>3.6</td>
<td>Retexture</td>
<td>2/58 ch 200 to 225 +/-0.5</td>
</tr>
</tbody>
</table>
Response to RTAs
Case Study: Wet Skid Crash Reduction

Sites chosen on Wet Skid Accident Record. Graph based on data provided by Hertfordshire County Council.

Wet Skid Crashes

Time

-3 3 years before Retexturing
-2
-1 K190 Retexturing
1
2 3 years after Retexturing
3

5 sites with results for three years following retexturing
9 sites with results for two years following retexturing
15 sites with results for first year following retexturing

Key
Stop-gap measure
Accelerated Weathering
Network Asset Management

- Maintains SR above IL
- Reduces wet skid crashes
- Establishes rate of polishing
- Assists maintenance planning
- Reduces whole life costs
# Retexturing Considerations

<table>
<thead>
<tr>
<th>DMRB</th>
<th>Micro or Macro</th>
</tr>
</thead>
<tbody>
<tr>
<td>Repeatability</td>
<td>Surface</td>
</tr>
<tr>
<td>Drainage</td>
<td>Roundabouts</td>
</tr>
<tr>
<td>Selectivity</td>
<td>Collateral Damage</td>
</tr>
<tr>
<td>Surface Profile</td>
<td>Full Lane Width</td>
</tr>
<tr>
<td>Speed</td>
<td>Weather Dependency</td>
</tr>
</tbody>
</table>
Why Retexture?

- Improve safety and reduce crashes
- Make best use of resources
- Whole life cost savings
- Social and Political obligations
- 3\textsuperscript{rd} Party Claims/Litigation