



Longitudinal and Transverse Variable Application Seal Design for long life seals

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SaferRoads2017
5th International Conference

SAFE AND SUSTAINABLE
ROAD SURFACES

- Problems
- Root Cause
- Solution – TVAS
- Trials – Increased Lives
- Design – Back to Basics
- Future



Problem

- Reduced Funding
- Less Renewals
- Impractical Requirements
- Rapidly Deteriorating Substrates
- Variable surface condition
- Increasing Risk
- Shortening Seal Lives
- Economically driven treatment selection
- LCCA – Ignored



- Main inputs to Seal Design Algorithm
 - Chip Size ALD
 - Traffic
 - Existing Texture
- ALD okay
 - Modern chip shape more cubic
 - Different crushing methods



- Designs use 100% traffic everywhere
 - Uses AADT
 - Changes HCVs into cars (x10)
- HCVs do all of the damage
- Most HCVs run in wheelpaths
- Very few HCVs run elsewhere



Texture

Wheelpaths have least texture

- Traffic embeds chip into substrate
- Traffic reorients chip
- Traffic pumps water into surface
- Traffic suck binder to surface

Flushing

- Binder level up to chip height

Repairs

- Digouts - coarse texture
- Asphalt – fine texture



Result of Current Seal Design Practice **Fulton Hogan**

- Too Much Binder in the Wheelpaths
- Not enough Binder Elsewhere
- Compounding Errors
 - Less void fills and texturing
 - Early reseal on coarse polished seals
 - Early reseal on prematurely failed seals
- Seals over coarse texture
 - Binder to fill voids – Increases B:S Ratio
 - Chip bridges existing chip



Solution – TVAS

- TVAS – Transverse Variable Application Sealing
- Simple just calculate the appropriate rate for each transverse location:
 - Wheelpaths
 - Shoulders
 - Between Wheelpaths
 - Centreline
- Possible methodology for design?
 - Design for shoulders and deduct for wheelpaths
 - Design for wheelpaths and add for shoulders
 - Design for site and deduct from wheelpaths



- Design for each location across the road need:
 - Location
 - Texture
 - Traffic
- Texture – simple
 - Sand Circles
 - Lasers
- Location
 - Measure



- Issue Ignored
- Our designs aren't that bad – are they
- All NZ design algorithms use total traffic
- Total traffic doesn't run in wheelpaths
- How much traffic runs on the centreline?
- What about the shoulders?
- Does any traffic run between the wheelpaths?



Research suggests:

- Most reduction of seal texture caused by HCVs
- Straight sections of two laned highway with edge lines and narrow shoulders.
 - 60-80% of HCVs travel in identified wheelpaths
 - Wheelpath width ranges from 0.5 – 0.9m depending on lane width
- On curved sections traffic distribution is too variable



Design for Wheelpaths

- Current factors use 100% of traffic and too heavy
- 70% of HCVs for Traffic Factor
- Need a lower traffic factor
- Trials have shown that 20% reduction from current design application rate works for wheelpaths
- Factor based on 70% of HCVs and 20% lower than standard



Design for Other than Wheelpaths

- Research Traffic Location data suggests:
 - 15% HCVs Between Wheelpaths
 - 7.5% HCVs on Shoulders
 - 7.5% HCVs on Centreline
- Performance of trial seals suggests:
 - Shoulders, Centreline and Between Wheelpaths all lose chip with standard design
 - No flushing with up to 35% more binder on shoulders
 - Increase by 15% for improved results



Construction using Multispray™



- 7m Telescopic
- Infinitely Variable width
- Spray width 0.3m to 7m
- Change up to 5 pre-set spray patterns on run
- 70% to 170% variation for each 100mm increment

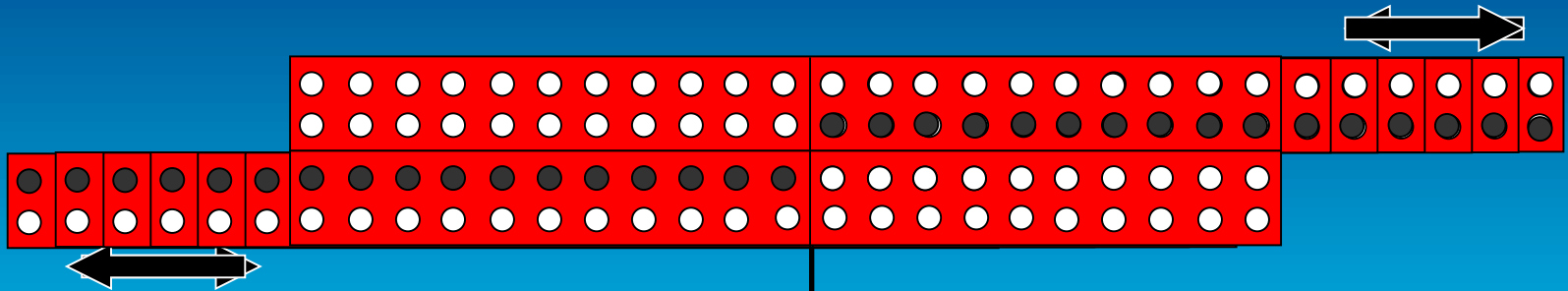


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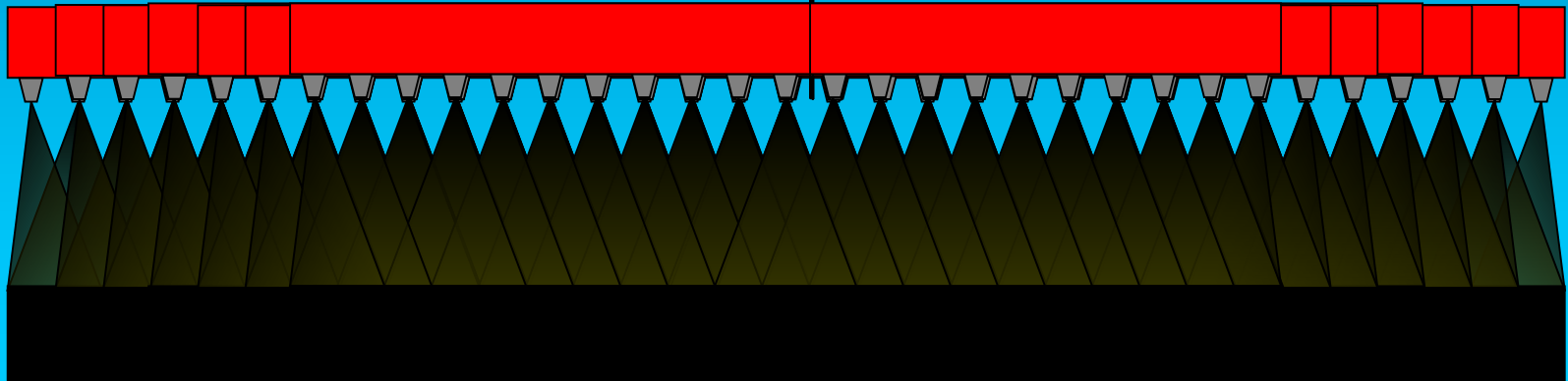
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Plan View of Spray Bar

Telescopic Motion

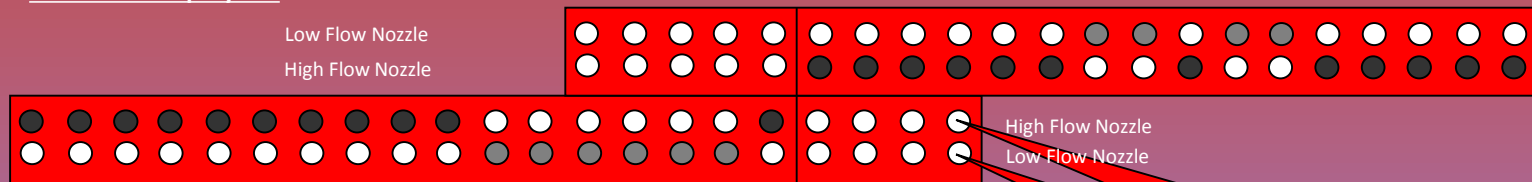


Back View of Spray Bar

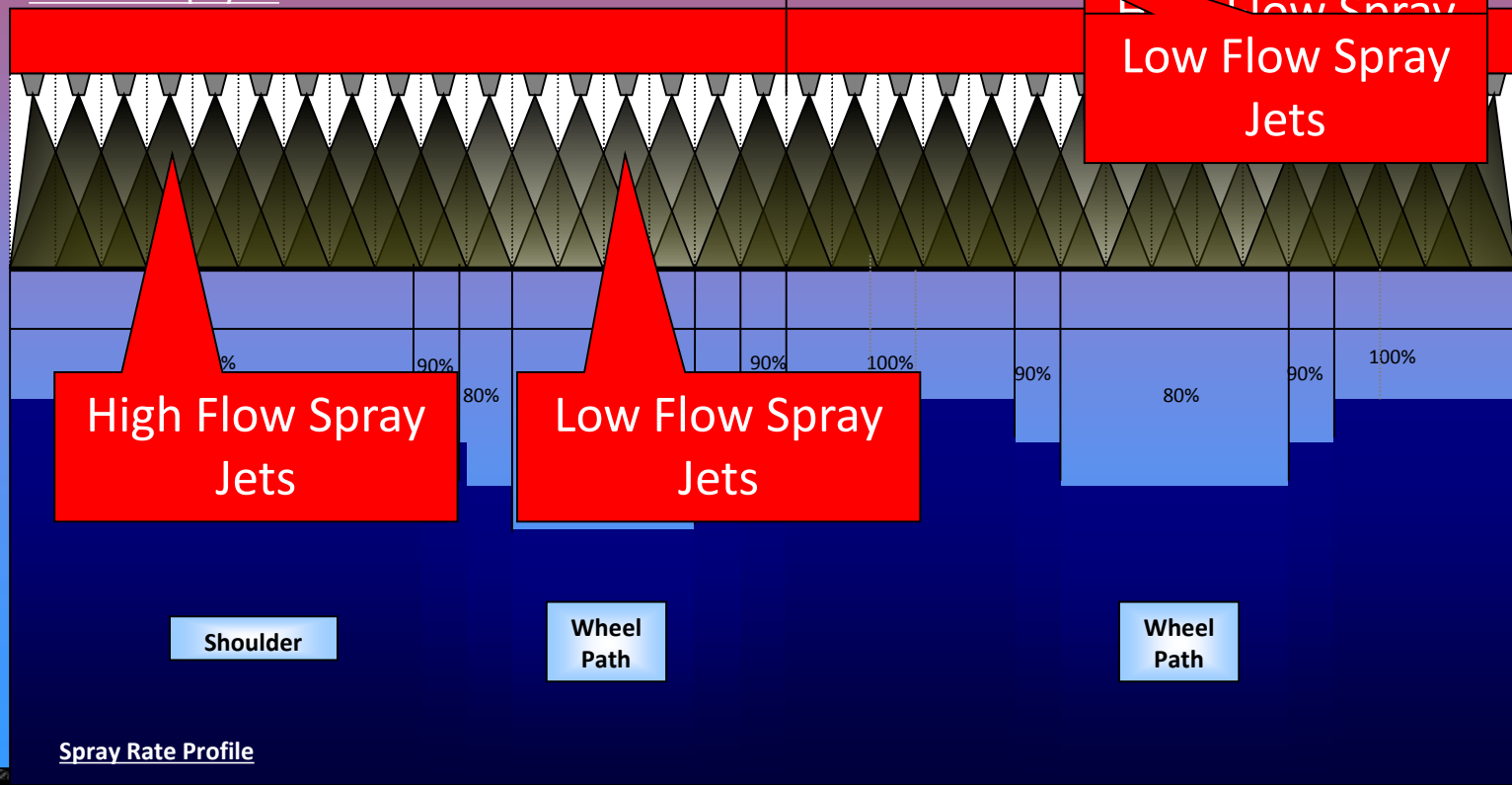


Variable Application

Plan View of Spray Bar



Back View of Spray Bar



- Safer Road Surfaces
 - Consistent texture
 - Better friction
 - Less loose chip
- Longer seal lives
 - Less flushing
 - Binder where needed
 - Chip retention

Acknowledgements

- Fulton Hogan
- NZTA
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