Maintaining the effectiveness of audio tactile profiled roadmarkings

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Maintaining the effectiveness of audio tactile profiled roadmarkings

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Presented by
• Dr Kym Neaylon
Intro: Audio tactile profiled road markings

- NZ has adopted the raised rib ATP road marking
- Safety benefits
- Visual effects
- Audio effects
- Tactile effects
- What happens at reseal time?
  - Early practice was to remove ATPs
  - This removed any remaining value.
  - ‘In-lane reseal’ or ‘seal-over’?
- What should happen?
Safety benefits

- ATPs significant breakthrough in driver safety
- Proactive implementation by NZTA
- 3,300 linear km by end 2012
- Review by Steve James (2014) NZTA
- 34% reduction in fatal crashes
- 24% reduction in serious crashes
- BCR ≈ 25

The problem

- ATPs last 6 to 8+ years
- Roads may require a reseal whilst ATPs have remaining life
- 2 techniques commonly practiced:
  - ‘In-lane reseal’
  - ‘seal over’
- Which method should be preferred?
- Why?
‘In-lane’ reseal or ‘seal over’?
Existing knowledge

- Australia has ATPs on chip seals, UK & USA do not
  - ‘sealing over’ gives reasonable results with smaller chip sizes
- NZ practices, experiences & observations workshop
  - Advantages and disadvantages for both
    - In-lane reseals
    - Sealing over ATPs
- NZ practices very subjective

Example of in-lane reseal in heavy rain
Visual effects of ATP

- Visibility of road marking is expected
  - Day
  - Night
  - Wet
  - Dry
- Conspicuity (day)
- Retroreflectivity (night)
- ATPs considered to have better reflectivity
  - Raised faces shed water
Audio/tactile effects

Audio/tactile effects depend on spacing and prominence of the raised ribs

Depends on the vehicle speed and vehicle type

Tactile effects are felt through the steering wheel, seat, pedals, foot-well

Audio effects are heard at the drivers ear level

Vehicles are designed for occupant comfort

Sounds and vibrations entering the cabin are dampened

Dampening focuses on particular frequencies
Audio effects

- Graph shows noise measured inside and outside a car cabin
- ATP road marking noise is distinctive inside

Dravitzki, V 2013, ‘Are the audio tactile profiled road markings still effective?’
Audio/tactile effects measured

- In-lane reseal:
  - Audio/tactile effects unchanged

- Seal over:
  - Variable success
  - Initial condition of the raised ribs
  - Chip size of reseal

Dravitzki & Thomas 2011, Measuring the effect of audio tactile profiled road markings
Audio/tactile effects simulated

- Real road markings
  - Variations in block profile
  - Variations in cars

- Simulation
  - Block profile constant
  - Car a constant
  - Different block heights can be compared
Audio/tactile simulation

- Headphones
  Generating ATP marking
  noise (plus music)

- Television stimuli
  Showing Stroop test

- Steering wheel
  With buttons for participant
to respond to Stroop test

- Computer with operator
  Controlling test

- Sub woofer
  Generating vibrations under
participant’s seat

- Foot pedal
  For participant to press
when detecting ATP
marking
Findings #1

- Visual effects of ATP road markings are largely independent of their audio/tactile effects - must be considered separately.
  - Visual performance can deteriorate first
  - Audio/tactile performance can deteriorate later
Findings #2

- If a reseal is intended where ATP road markings have still effective audio/tactile effects, it is recommended in-lane reseal be considered.
  - Particularly effective on edgelines where the ribs are placed adjacent to the continuous line
  - Lines and ribs can be remarked later to renew visual effects
Findings #3

- ATP road markings should be included in the RAMM database, and monitored like signs or road surfaces.
- There are subjective and objective measures
- Regularly monitor visual effects (e.g. dynamic retroreflectometer)
  - Once per year
  - Ideally monitor visuals day & night, wet & dry
- Regularly monitor audio tactile effects
  - Once every two years
  - If objectively – use sound and vibration measurements
  - If subjectively – use two people
Findings #4

- Define ‘effective’.
- ‘The effects are easily discerned and recognisable’?
  - otherwise considered not effective.
- Need consistency & uniformity
- Provide a training video
- Subjective interpretations can be variable
- Research has found no ‘noticeable’ audio/tactile difference in rib spacing’s 250 mm to 500 mm
Further information

- NZ Transport Agency Research Report 615 ‘Maintaining the effectiveness of Audio tactile profiled road markings for their full life cycle’
- Dravitzki, V, Thomas, J and Mora, K (2012), Improved effectiveness and innovation for audio tactile profiled roadmarkings, Research Report 478, NZ Transport Agency,
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Dravitzki, VK and Thomas, J (2011). Audio tactile profiled roadmarkings: Understanding how they work and when they are effective. NZRF/RIAA Roadmarking Conference. Rotorua.