

# Reflecting on Roadmarkings

Delineation and Improved Visibility – NZTA M7 specification



Talking today about the soon to be released NZTA roadmarking materials specification

## Roadmarkings & safety

Device and context	Crash reduction	Source
Edgelines on curves	26% to 33%	FHWA
Edgelines on straights	6%	FHWA
Edgelines on curves and straights	3%	Elvik et al and FHWA <sup>2</sup>
	8%	FHWA
	30%	Austroads
Centrelines	1%	Elvik et al and FHWA <sup>3</sup>
	33%	FHWA <sup>4</sup>
	30% to 35%	Austroads
Edgeline and centreline markings at higher crash locations	24%	Elvik et al and FHWA <sup>3</sup>
	14%	FHWA

Roadmarkings are often taken for granted,

But we know that the presence of road markings contribute to safety

Many studies showing a crash reduction benefit.

Federal Highways Administration Crash Modification Factor Clearinghouse (FHWA 2012)

Austroads Road Safety Engineering Toolkit (Austroads, 2012a)

Effectiveness of Road Safety Engineering Treatments, (Austroads, 2012b),

The Handbook of Road Safety Measures (Elvik et al, 2009)

## Roadmarkings & safety

Must be effective in all conditions

- Day & Night
- Dry & Wet



Specification needs to cater for the fact we want road markings to perform under a variety of conditions,

Day and night, Dry and wet

We assess these products against our M7 specification

Give a brief run down on some performance factors

## Roadmarking specifications

### Current situation

#### Materials

- M7 – Specification for roadmarking paints
- M20 – Long life roadmarking materials

- Retroreflectivity
  - 100 mcd/m<sup>2</sup>/lux white
  - 80 mcd/m<sup>2</sup>/lux yellow

Materials specifications, broken into paints under M7 and long life materials (CAP, thermoplastic) under M20

Standard measures of wear, colour, skid, luminance and durability assessed via a transverse field trial

Retroreflectivity (30 metre), one level, dry only

## Roadmarking specifications

As it will be

### Materials

- M7 –Specification for roadmarking products
- Paints and high build
- Retroreflectivity
  - Dry and wet
  - Standard and high

New specification incorporates paints and high build materials (CAP, Thermoplastic)

Additional retroreflectivity requirements

Two levels of performance standard which reflects current practice and high

Have also added Wet retroreflectivity requirements

## Performance Standards

### European Standards

Performance criteria – white markings

Retro-reflection (dry)		Retro-reflection (wet)	
Class	R <sub>L</sub> Value	Class	R <sub>w</sub> Value
R <sub>0</sub>	NIL	R <sub>w0</sub>	NIL
R <sub>2</sub>	≥ 100 mcd	R <sub>w1</sub>	≥ 25 mcd
R <sub>3</sub>	≥ 150 mcd	R <sub>w2</sub>	≥ 35 mcd
R <sub>4</sub>	≥ 200 mcd	R <sub>w3</sub>	≥ 50 mcd
R <sub>6</sub>	≥ 300 mcd	R <sub>w4</sub>	≥ 75 mcd

Skid Resistance	
Class	SRT Value
S <sub>0</sub>	NIL
S <sub>1</sub>	≥ 45
S <sub>2</sub>	≥ 50
S <sub>3</sub>	≥ 55
S <sub>4</sub>	≥ 60
S <sub>5</sub>	≥ 65

EN 1436 White Road Markings

To provide some back ground European standards En 1436

Where does NZ sit on this scale

Current M7 spec criteria the low end,

## Performance Standards

NZTA - M7

### White markings

Classification	Dry $R_L$	Wet $R_L$	Dry $Q_d$	Wet $Q_d$
"High Visibility"	150	50	120	120
"Standard Visibility"	100	35	80	80

### Yellow markings

Classification	Dry $R_L$	Wet $R_L$	Dry $Q_d$	Wet $Q_d$
"High Visibility"	120	35	80	80
"Standard Visibility"	75	25	60	60



New Zealand Government

New values presented here,

These are end of life.

High visibility comes from desire to improve performance

Gives network managers option to improve marking performance, at sites say where accident history

Maintain standard visibility, current practice understand may still appropriate in some circumstances considering also used by Local govt.

## Performance Standards

### Update to M7

Transverse trials

Laid Nov 2013

Two site - Chipseal and asphalt

Assessed against

- Wear, skid resistance, colour
- Dry  $R_L$ , Wet  $R_L$ , Wet & Dry  $Q_d$



Update to M7 approved products list

Approval process involves transverse road trials across two sites

Chip seal which is widely used in NZ and asphalt

Markings do behave differently on different surfacings

- Chipseals – wear
- Asphalt – wet  $R_L$

Laid in 2013 and completed late 2016, up to 5 million vehicle passes

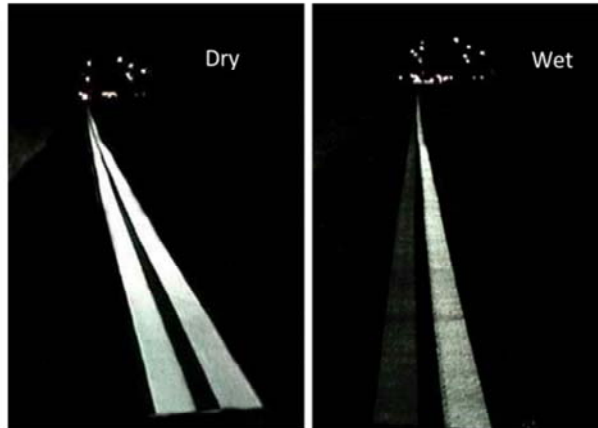
Assessed against retroreflectivity, wear, skid resistance, colour



## Wet night visibility

### Benefits of better visibility

- Better lateral lane control
- Better speed control
- Less mentally demanding on driver
- Less frustration



Photos courtesy Potters Industries

Wet condition the most difficult environment for drivers, sure many of us have had trouble seeing roadmarking in the wet

Improving marking visibility has numerous benefits

See in the photo the impact of water, in the wet line in left poor retro while line on right still clearly visible

## Wet night visibility

### Benefits of better visibility

- FHWA study
- Crash reduction
- Applied to NZ
  - 5% overall crash reduction
- BCR
  - 4 to 25
  - Above 1200 AADT



FHWA report (Safety Evaluation of Wet Reflective Pavement Markers, FHWA 2015) find a link between reduced crashes and improved wet retroreflectivity

Recommended Crash Modification Factors for wet reflective markings

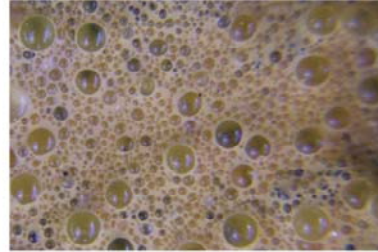
Applied to NZ translates to a 5% crash reduction

BCR varies with traffic volumes but range from 4 up to 25 depending on ONRC

## Wet night visibility

### How to achieve better visibility

- Values achievable through
  - Larger beads
  - Thicker paint films
- Will affect drying times
  - Protect lines for longer
  - Additional traffic control

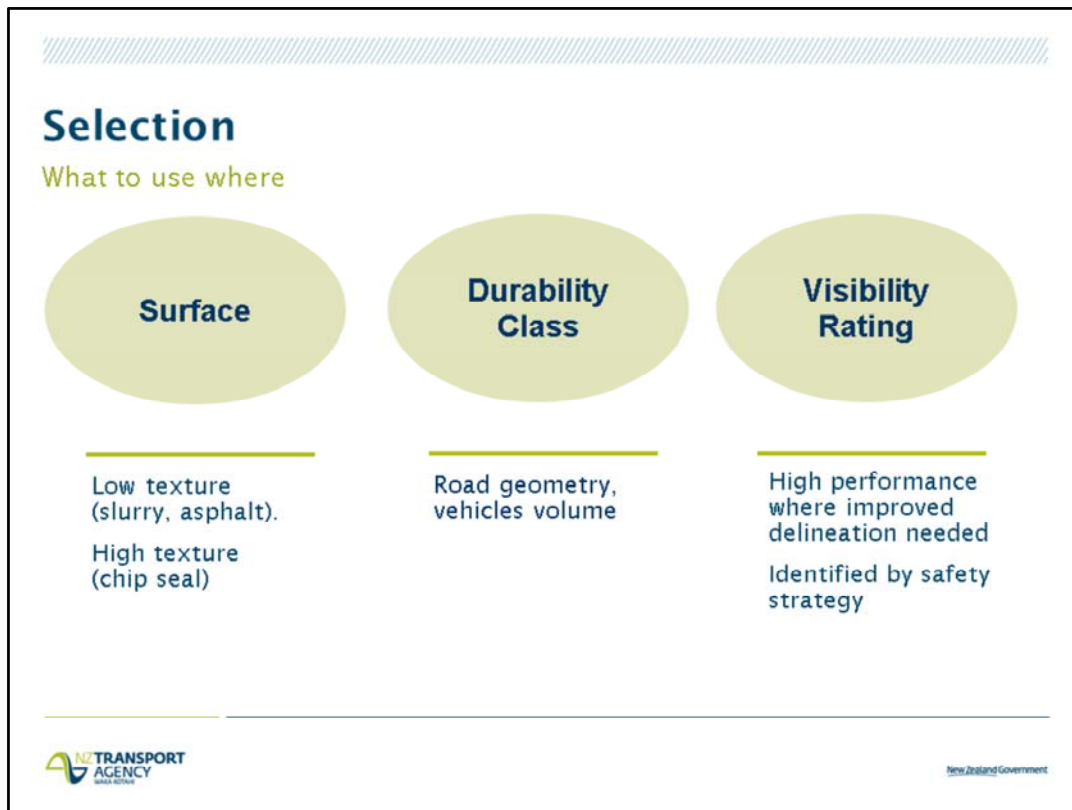


- Larger beads (Type D v Standard Type B) and the type of glass have an affect on wet visibility
- Greatest benefit on low textured surfacings such as asphalt

## Selection

Surface type		Asphalt			Chip seal		
Product durability		Normal	Extended	Long	Normal	Extended	Long
Visibility	High	AN1	AE1	AL1	CN1	CE1	CL1
	Standard	AN0	AE0	AL0	CN0	CE0	CL0

Classified products according to visibility and durability, how long that visibility level can be achieved



Selection will need an understanding of site, traffic and necessary performance.

Developed Guidance on:

When higher durability products may be warranted,

When high levels of visibility are needed, looking at high traffic volumes (> 10000) on undivided roads

## Delineation Advisory Group

*Provide impartial guidance, advice and strategic direction on delineation including topics related to materials, application methods and performance requirements to achieve the best outcomes for New Zealand road users in terms of safety and value*

In implementing changes the need to engage with industry and users recognised

Established an industry advisory group

Delineation advisory Group, DAG for short

Purpose is to provide impartial guidance, advice and strategic direction on delineation

Achieve the best outcomes for New Zealand road users in terms of safety and value.



Make up of the Delineation advisory group

Purchasers – responsible for specifying and managing

Suppliers – product knowledge,

Applicators - application knowledge

Draw on expertise from across industry, range of perspectives

## Future work

- Accelerated assessment
  - CAST machine
  - Reproducible conditions
  - Speed up introduction of new materials



Photo courtesy Opus Research

Need for a more rapid and flexible method to approve product

Considering several options

One is accelerated wear of markings in a laboratory environment

This is a device developed by Opus, called a Circular Accelerated Surface Tester (CAST)

Advantages in terms of time and reproducibility

Does not take into account environmental effects.

May be a first gate in approval process

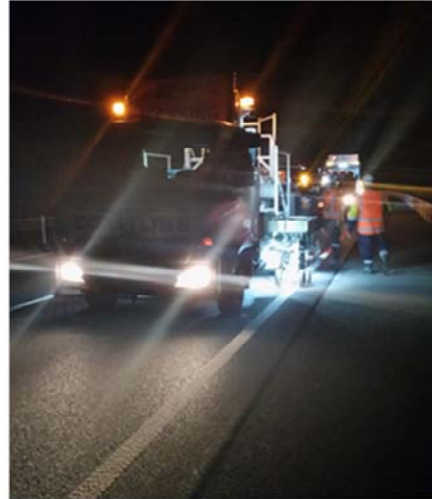


## Conclusion

Recognition of safety benefits of road marking

New specification raise standards for markings on NZ roads

Review approval process, reduce lead time for introduction of new products



Thank you

