

# Linking Higher Measures of Retroreflectivity with Extended Durability and Safety Improvements.

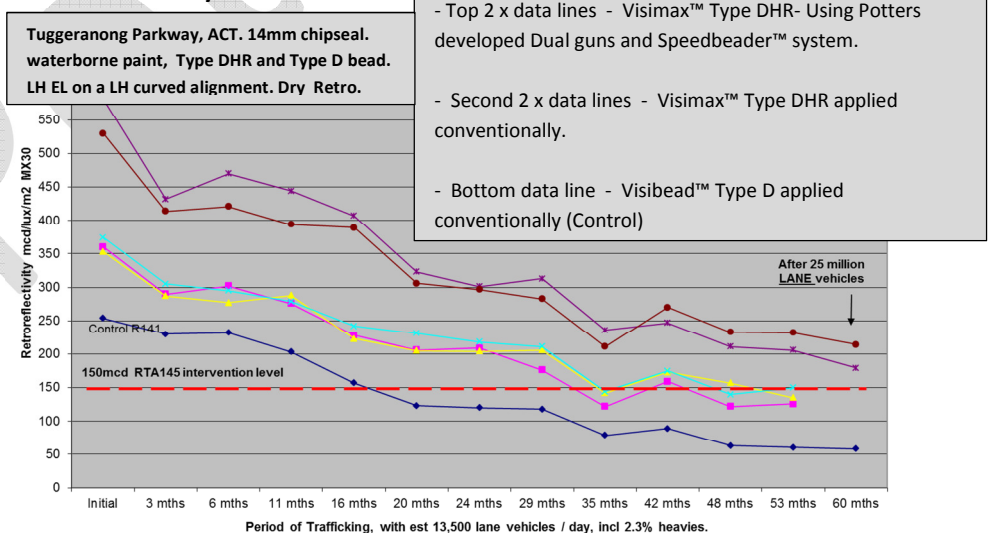
As a world leader in glass bead technology Potters has been involved in research and development of pavement marking methods / systems for many years. The aim has been to assist industry in achieving optimum performance from Potters range of glass bead road safety products. The outcome of this research and development is provided to Potters customers as Technical Bulletins.

Some in industry question if brighter road markings are worth the effort. We have heard it all before, “brighter markings contribute to faster driving” and “street lighting is good enough, we don’t need the lines to be brighter” Both statements are commonly repeated, but are they correct?

- Brighter Markings - Do they provide extended durability?
- Brighter Markings - Are they safer?
- Brighter Markings - Do drivers drive faster?
- Do we need reflective road markings where street lighting is provided?

## Brighter Markings - Do they provide extended durability?

In all of the painted roadmarking R&D field trials that Potters partnered with the NSW RMS Scientific Services Team, during the mid 90’s and over the ensuing 15 or so years, the benefits of initially brighter markings has proven to provide increased serviceable life and road safety. An example of this is given in the illustrated performance graph.



## Brighter Markings - Are they safer?

End-of-line-detection distances are affected by age. Zwahlen (1998) conducted a study assessing end-detection distances with different types of pavement markings and different illumination conditions with younger (average age 23) and older drivers (average age 68). End-detection distances were 55% higher for the younger age group. Although both retro reflectivity and headlamp illumination influenced end-detection distance, retro reflectivity had more effect. This indicates that improving night

time visibility of edge and centre lines cannot be achieved solely by providing greater illumination of the roadway. The physical properties of the markings themselves are also of great importance in determining visibility.

#### **Brighter Markings - Do drivers drive faster?**

In January 2004 a report detailing research undertaken by the Monash University Accident Research Centre (MUARC). They compared the relative effectiveness under simulated wet night driving conditions when using Visimax™ brand Type DHR glass beads by Potters Industries with standard Type B glass beads in waterborne paint markings. The research comprised a controlled study in the MUARC advanced driving simulator. Before the experimental trials began, extensive development and evaluation took place to ensure that the simulated markings were realistic and accurate compared to 'real world' markings. A major part of this development and evaluation involved an independent panel of road marking experts from around Australia who on two separate occasions evaluated the realism of the markings created in the simulator.

Part of the finding during this research study found that when driving with Visimax brighter markings, drivers were able to maintain a speed that was closer to the target speed of 100km/hr than when they drove with the Standard markings. The average mean speed for the Standard markings was 87.82 km/h and for the Visimax beads, 92.18 km/h. This represents a 4.36 km/h overall speed difference between the two sets of markings. In road safety and driver performance a difference of 2 or 3 km/h is usually considered to be sizeable. As such, the 'better' performance of the Visimax markings by over 4 km/h is significant. The findings suggest that the Visimax markings enabled drivers to maintain a higher speed because of the increased visual guidance provided, compared to the Standard markings. The Standard markings drivers compensated for the low visibility by driving more slowly. However the Research findings also concluded the increased visual guidance provided by the Visimax markings led to lower workload and less stress in the task of driving and more controlled driving, including better lane-keeping.

In addition, other research by Ranney and Gawron (1986) found that although drivers drove at higher speeds, fewer drivers exceeded the speed limit. They also suggested that higher speeds were associated with lower workload, leading to faster but more controlled driving. In a study by Godley, 1999 effective markings were required to influence driver behaviour in lateral control, and increased lateral control reduces accident rates.

In a simulator study of the effect of edge lines of varying widths and visibility, it was found that low visibility edge lines were associated with more lane-keeping errors. When the visibility of the edge lines was higher, driving speeds increased and lane-keeping errors decreased (McKnight, McKnight and Tippetts, 1998).

So, it appears that brighter markings may contribute to driving marginally faster, although not necessarily exceeding the posted speed limits. With brighter markings drivers were found to have lower workload and experienced less stress in the task of driving and more controlled driving, including better lane-keeping and lateral control, leading to safer driving.

#### **Do we need reflective road markings where there is street lighting?**

Street lighting competes with conventional pavement markings, reducing their conspicuity. It's not a matter of if the reflectivity is required, but rather if the retroreflectivity can be improved to better compete.

Singapore's Land Transport Authority Maintenance Management approached Potters Australia some years ago seeking assistance with their local road safety dilemma. Singapore, to a visitor, appears to have the best of everything. Drive from the airport to the city and you will experience the cleanest roadsides, best kept lawns and gardens, most wonderful motorway, best street-lighting etc. But repeat the same drive on most early evenings, and the vision may be quite different; particularly if you want to identify the bounds of the traffic lane in which you are travelling. The experience can be exacerbated on most evenings, when it is raining. The LTA asked Potters if they had a system of retroreflective markings that might better compete with the overhead street-lighting, which was diminishing the effectiveness of their markings.

The successful trialling of Visimax Type DHR has now seen wider use of higher visibility markings in well lit environments.