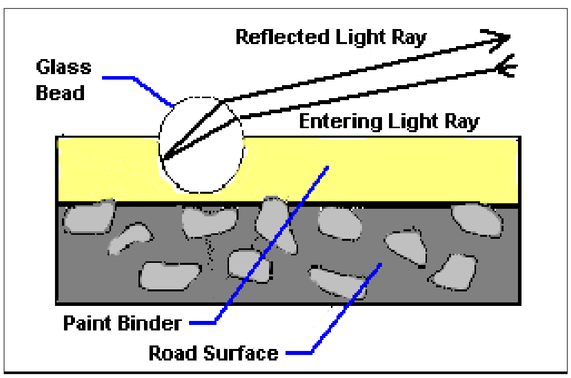
Oregon Department of Transportation

Research Notes

RSN 01-03 January 2001

A Little Light Reading

The safety of nighttime drivers is enhanced by the better visibility of "retroreflective" pavement markings. Retroreflective markings reflect light (such as car headlights) back along the same path it came from -- in the case of headlights, back toward the driver of the vehicle. Retroreflectivity is achieved by embedding tiny glass beads in the paint or other material used for the markings.



Specially coated glass beads are sprinkled onto the stripe immediately after paint application. The wet paint partially envelops the bead and anchors it to the stripe. The correct viscosity and amount of paint are critical to getting good results. If the beads do not embed far enough, they reflect light poorly and are likely to come loose. If the beads set in too deeply, they won't work because the light simply cannot reach them. The process for embedding beads is the same for pavement markings using epoxy, thermoplastic, or special resins, such as methyl methacrylate (MMA), in place of paint.

The effectiveness, or retroreflectivity, of the pavement marking is measured as a ratio of the reflected light visible to the driver compared to the light entering the glass beads. Monitoring the reflective properties of highway markings is vital for maintaining safe conditions and deciding what types of markings to use.

A variety of devices can be used to measure retroreflectivity of pavement markings. Using hand-held devices may be slow, difficult, and potentially dangerous due to traffic, weather conditions, and remote locations. As an alternative to hand-held equipment, several new devices have been developed to measure retroreflectivity of markings at highway speeds.

Mobile Retroreflectometer

The Laserlux, a van-mounted device being tested by the Oregon Department of Transportation (ODOT), uses a scanning laser. The laser can identify the stripe and measure its retroreflectivity at several points across its width, nine times each second! Measurements may be taken in full sun or in complete darkness, at speeds up to 55 mph.

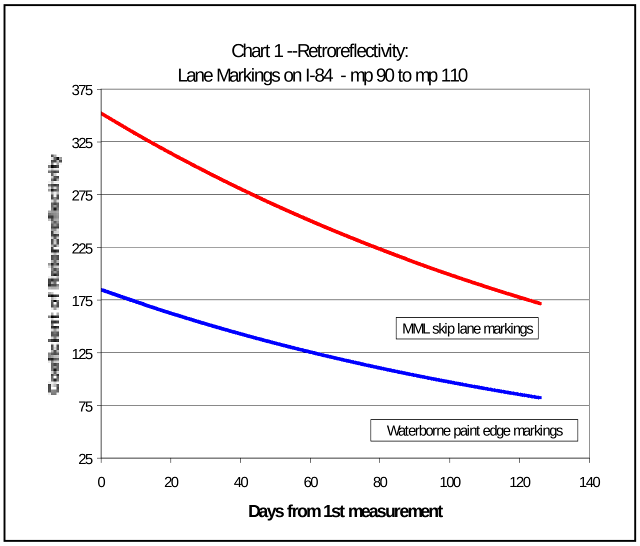
In July of 1998, ODOT and the Federal Highway Administration entered into a partnership to study the feasibility of mobile retroreflectometry, and to help establish standards for retroreflectivity by monitoring a variety of pavement markings. The monitored sites include a range of geographic locations, road geometry, snow conditions, and traffic load. Of particular interest are a series of repeated measures of the same section of highway, which shows the rate at which differing materials are losing reflectivity.

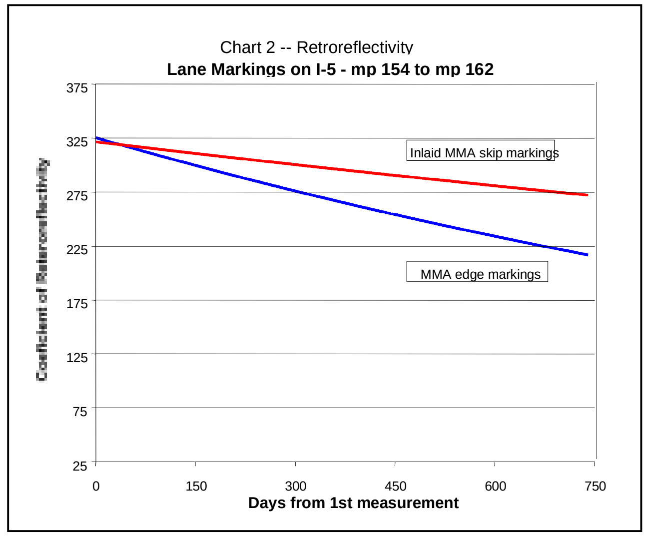
ODOT warranty requirements ae that MMA lines maintain their retroreflectivity at 150 mcd for 4 years after application.

For example, Chart 1 shows readings for a section of I-84. Although the reflectivity for the methyl methacrylate stripes was greater than that of conventional waterborne paint stripes when first measured, both materials lost their reflective power at similar rates in this environment. Each lost about 50% of their reflectivity over the 130 days from the first measurement to the last.

Chart 2 shows a much lower rate of decay for the reflective properties of MMA stripes on a section of I-5. The sampled section of I-5 shows MMA markings retained 66% of their reflectivity over two years, with inlaid MMA stripes performing even better, maintaining 85% of their reflectivity.

These results may not be typical of marking performance or measurements with other devices. Clearly, there are multiple factors at work in determining the longevity of highway markings. There is currently a national study underway to determine if setting minimum levels of retroreflectivity is realistic. Continued data gathering will eventually reveal the key to selection of optimum materials for varied conditions. More data will be collected by Mike Dunning and the ODOT Laboratory staff using the Laserlux equipment.





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