

Performance Evaluation of Night Time Visibility (Retroreflection) & Skid Resistance of Road Pavement Markings with Ceramic Beads

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Abstract

Pavement markings play an important role by providing visual guidance to motorists, to improve road safety and road networks, to meet the social aspiration of people. In order to function properly, pavement markings must be visible under all weather conditions to any driver in any age category. In general, most pavement markings provide a satisfactory performance under dry conditions. However, under wet night conditions, the visibility of these materials degrade significantly as the marking surface gets covered with water, leading to the partial or complete disappearance of the marking.

Currently in Sri Lanka thermoplastic paint is being used for road marking intermixed with glass beads, in order to give the retroreflection promoting night time visibility. However wet night visibility of these materials are not in a satisfactory level due to these glass beads having a refractive index ranging from 1.5 to 1.9. A higher refractive index is needed to be able to reflect in wet weather conditions (Paul J. Carlson, 2007).

Therefore, this study was focused to evaluate the performance of thermoplastic road marking paints, applied with ceramic beads which have a refractive index over 2.4, and to evaluate the improvement of visibility (especially night time retroreflectivity under wet condition) & skid resistance values.

At the initial stage, retro reflectivity (dry & wet) was measured for newly applied road markings on several locations to get an idea about the current values. Lower values were reported under wet conditions.

Thereafter, laboratory investigations were carried out to evaluate the variation of retroreflection values & skid resistance, by varying the amount of glass beads & ceramic beads, 250 g/cm² to 400 g/cm². It was observed that retroreflection can be improved up to a certain level by amplifying the number of glass beads. However, further increasing of the glass beads beyond this point seemed to result in the reduction of the skid resistance value.

Subsequently a field trial was done with ceramic beads to study the improvement in visibility. In this study, road marking were made on Kotte-Bope Road (B240) over the pedestrian crossing, and night time visibility in dry & wet conditions and skid resistance were evaluated for over 9 months.

High values (622 mcd.m⁻².lx⁻¹ - dry & 420 mcd.m⁻².lx⁻¹ – wet) of initial retroreflectivity & (85) skid resistance were noted from the section applied with ceramic beads. However discoloration was observed in this section, compared to the conventional glass bead section.

Further performance evaluation needs to be carried out, especially for the expressways which have visibility issues during rainy periods with high speed & safety. The edge line of expressways are proposed to be evaluated at the preliminary stage. At the second stage, center lines need to be evaluated giving due consideration to possible improvements in staining due to traffic movements.

This research enabled the drawing of few conclusions: ceramic beads could be used to gain high retroreflection, it is necessary to introduce and implement quality control checking of the retroreflection under wet conditions and introduce these high quality materials, to gain high visibility. Also retroreflectivity should be specified based on the type of the road (Highway/Expressway), to be visible under all weather conditions, favouring all road users, since the speed of the vehicle and age will determine the most prominent factors of visibility of these markings.

Keywords: Thermoplastic Pavement Marking, Night time visibility, Skid resistance, Glass Beads, ceramic Beads

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