

RES2013-29

This study is a collaboration between the University of Tennessee Chattanooga (UTC), and Tennessee State University (TSU) to evaluate the performance of pavement markings in the state of Tennessee, and to establish pavement marking replacement (maintenance) timing for two types of pavement markings used in Tennessee: paints and thermoplastics. Pavement markings provide vital information to road users pertaining to lane restrictions and vehicle movements, which if adhered to, results in improved road safety. Retroreflectivity is a measurement of how well the markings can be seen by road users, especially at night. The Tennessee Department of Transportation (TDOT) specifies acceptable minimum pavement marking retroreflective properties 45 days from application to be a minimum of 300 mcd/m² /lux for white stripes and a minimum of 200 mcd/m² /lux for yellow stripes, (mcd/m² /lux is milli-candela per square meter per lux). Candela is a measurement of light intensity and lux is measurement of luminous light per square meter.

The study established data collection sites, collected data using a handheld retroreflectometer (LTL-X) for a period of two years, and evaluated pavement marking retroreflectivity trends over time. The data collection was performed on two types of pavement markings, paints and thermoplastic, where thermoplastic markings are expected to perform longer than paints. Sixty (60) data collection sites were randomly selected from the four TDOT regions. Data were collected approximately every forty-five (45) days on dry markings.

Pavement markings deterioration models and deterioration rates were established using the collected data. The analysis was performed at statewide and regional levels. The study therefore established the following statewide pavement marking deterioration rates per month:

- White Paints: - 4.19 mcd/m² /lux/Month
- Yellow Paints: - 3.90 mcd/m² /lux/Month
- White Thermoplastics: - 3.82 mcd/m² /lux/Month
- Yellow Thermoplastics: - 2.39 mcd/m² /lux/Month

The rates were also narrowed per TDOT region; however, the deterioration rates were not uniform across regions, with no clear patterns to differentiate one region from the other. Further analysis was performed to evaluate the influence of traffic intensity and elevation to marking deterioration rates. The study found no conclusive pattern for pavement marking deterioration rates based on traffic intensity and elevations.

The deterioration rates obtained for thermoplastic markings yielded a very low correlation to measured values. It could be that two years is not long enough for thermoplastic markings to fail to the extent of producing a defined pattern that correlates with measured values. For paint markings, the correlation value ranges were acceptable. TDOT Region 2 had the lowest coefficient of determination (R^2) values especially for yellow markings.