South Carolina Department of Transportation

FACT SHEET

Sign Life Expectancy

PROJECT TITLE

Sign Life Expectancy

STUDY TIMELINE

May 2016 – February 2018

SENIOR INVESTIGATORS

Dr. Nathan Huynh (PI) and Dr. Robert Mullen (Co-PI), University of South Carolina

RESEARCH ASSISTANTS

Zane Pulver (M.S.) and Samaneh Shiri (Ph.D.), University of South Carolina

William Campbell (B.S.), Zach Perry (B.S.), Brandon Coggins (B.S.), Tanya Thompson (B.S.) and Davis Peacock (B.S.), University of South Carolina

SCDOT CONTACTS/CHAMPIONS

David Cook – Champion, Director of Maintenance

Terry Swygert – Submitter, Research Engineer

For more information, please contact SCDOT Research Unit, 803-737-1969, HeapsMW@scdot.org

FURTHER RESOURCES

Final Report: https://www.scdot.scltap.org/wp-content/uploads/2018/06/SPR_727_Final-Report_4_12_2018.pdf

SCDOT Office of Materials and Research Website: http://www.scdot.scltap.org/

Introduction or Problem Statement

In 2007, the Federal Highway Administration adopted new retroreflectivity standards for traffic signs to be implemented by agencies in their jurisdictions. To ensure traffic signs meet the required retroreflectivity standards, South Carolina Department of Transportation (SCDOT) adopted a sign replacement strategy to replace signs before the 10 year warranty end date. This project investigated the expected life of traffic signs managed by SCDOT to determine the appropriate sign replacement interval.

Shade rating system used in this project (from left to right): full shade, mostly shade, partial shade, and no shade.

Methodology or Action Taken

Linear and non-linear regression models were developed to predict sign life using data collected from 1,600 traffic signs in S.C. Regression models were developed for four sign colors (i.e., red, yellow, white, and green) to determine which factors influence the retroreflectivity of signs. This work introduced a new variable not considered in previous studies, degree of shade, which was found to have a significant effect on the degradation of sign retroreflectivity, primarily from mildew growth. The major findings from the regression models are the following:

- The regression model with exponential form provided the best fit for red signs, while the regression model with quadratic form was the best fit for white, yellow, and green signs.
- The explanatory variables, age and degree of shade, were found to be statistically significant for all four sign colors. For red signs, the variable, northwest facing direction, was also found to be significant.

Conclusions or Next Steps

Based on the modeling results, it was recommended that SCDOT extend the sign replacement interval to 12 years. This conclusion was supported by both SCDOT historical sign replacement data and measurements taken from older signs. In addition, it was recommended that SCDOT incorporate sign washing in future sign maintenance activities to extend the life of signs. A simple wash with a glass cleaner and paper towels showed an average improvement of 22.5%; this equates to a lengthened life span of about two years for yellow, white, and green signs and about five years for red signs.

Potential Impacts and Benefits

SCDOT revised Engineering Directive #57 in response to the findings of this research project to extend the planned replacement cycle from 10 years to 12 years. This life extension will lead to a reduction of approximately 1,250 sign replacements per year with an estimated annual savings of $93,000 per year, while maintaining compliance with federally required retroreflectivity standards. Additionally, SCDOT has transitioned to Type XI sheeting for selected warning signs. It is anticipated that this transition to a sheeting type with higher retroreflectivity characteristics will lead to an even longer life while improving safety performance.