South Carolina
Department of Transportation

CLEMSON
UNIVERSITY

The Citadel

U.S. Department
of Transportation

Federal Highway Administration

PROJECT SUMMARY

Report No. FHWA–SC–12–01
February 2012

South Carolina
Department of Transportation
P. O. Box 191
Columbia, SC 29202-0191

Estimating the Lifecycle of Pavement Markings on Primary and Secondary Roads in South Carolina

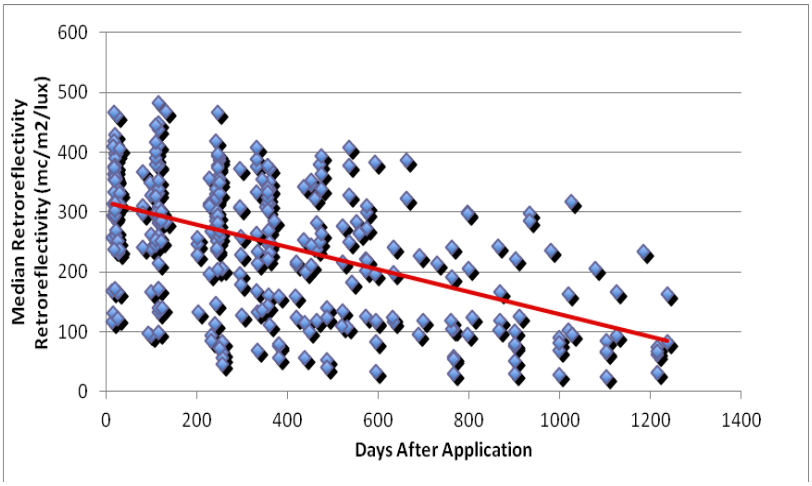
Overview

In 2008, SCDOT issued a problem statement for research supporting development of guidelines for pavement marking applications. Objectives of this research focused on determination of evidence-based guidelines and recommendations to support pavement marking best practices for consistent implementation across the state. Through the use of a data-driven research methodology and measured retroreflectivity values systematically collected at selected representative control sites, lifecycle models and degradation models were determined for waterborne, high-build and thermoplastic pavement marking applications for the State's primary and secondary road network. A comparison of marking lifecycles was performed and recommendations regarding material selection for typical applications were developed.

Key Findings

Pavement marking data showed a great deal of variability in initial readings as illustrated in the figure below. The models developed in this research require initial readings to be taken in order to predict a marking's lifespan. High-build markings were found to perform comparable to thermoplastic markings on roads with volumes less than 2000 ADT. High-build installations are roughly half the cost of thermoplastic making them a cost effective alternative. Conventional waterborne markings had the fastest deterioration rates. Pavement marking performance varied considerably for different brands. Yellow markings tend to have lower initial values and higher degradation rates than white markings.

Waterborne White Edge Line Marking Performance



Estimate of Pavement Marking Service Life

Pavement marking degradation models for high-build, waterborne, and thermoplastic markings developed to predict retroreflectivity and determine service life estimates, are summarized as follows:

Retroreflectivity Degradation Models

Material	Model	Avg. Initial Value	Estimated Marking Lives	
White Edge HB	DIFF = -57.8900 (C)	390	5.01 C (13.6 years @1000 ADT)	
	% DIFF = -15.6744 (C)		4.74 C (13 years @ 1000 ADT)	
White Edge WB	DIFF = -0.1317(D)	315	1632 Days	4.47 Years
	% DIFF = -0.0537(D)		1271 Days	3.48 Years
White Edge T	DIFF = 54.142 – 0.0403 (D)	426	6745 Days	18 Years
	% DIFF = 13.699 – 0.0079 (D)		9279 Days	25 Years
Yellow Solid WB	DIFF = -0.0721 (D)	141	569 Days	1.56 Years
	% DIFF = -0.0569 (D)		511 Days	1.40 Years
Yellow Skip WB	DIFF = -0.0594 (D)	150	879 Days	2.41 Years
	% DIFF = -0.0366 (D)		911 Days	2.50 Years
Yellow Solid T	DIFF = -0.0764 (D)	260	2094 Days	5.74 Years
	% DIFF = -0.0270 (D)		2279 Days	6.24 Years
Yellow Skip T	DIFF = -0.1123(D)	290	1691 Days	4.64 Years
	% DIFF = -0.0364(D)		1800 Days	4.93 Years

Legend
HB high-build, T thermoplastic, WB waterborne, DIFF change from initial value, % DIFF percent change from initial value, C cumulative traffic passages in million vehicles, D days since initial reading,

Selection of Pavement Marking Material

A variety of factors should be considered when selecting and specifying waterborne, high build, or thermoplastic pavement marking materials. Primary factors for consideration in selecting optimal pavement marking materials include traffic volumes, roadway functional class, roadway surface type, expected remaining service life of pavement, and whether marking materials will be provided by in-house crews or by external pavement marking contractors. Based on models developed from the field-collected data, recommended criteria for selection of white edge pavement markings are summarized in the table below. For yellow markings, the average life span is roughly half of the white edge markings, dependent on the initial retroreflectivity of the markings.

Criteria for Selection of White Edge Pavement Markings

Traffic Volume (veh/day)	Recommended Marking	Avg. Estimated Lifespan (Years)	Cost/LF/year ($)
< 1000	Waterborne	3.5 - 4.5	0.026 - 0.020
500 – 2000 +	High-Build	5 +	< 0.036
> 2000	Thermoplastic	5 +	< 0.060

Wayne Sarasua (Clemson Univ.) and William J. Davis (The Citadel) were Principal Investigators on this research. For further information, contact Terry Swygert at SCDOT: 803.737.6652; swygerttl@scdot.org