RESEARCH
PROJECT CAPSULE [13-2P]
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TECHNOLOGY TRANSFER PROGRAM

A Comprehensive Study on Pavement Edge Line Implementation

JUST THE FACTS:

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Duration:
12 months

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Funding:
Safety

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POINTS OF INTEREST:

Problem Addressed / Objective of Research / Methodology Used Implementation Potential

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PROBLEM

Like the rest of the country, Louisiana has made great strides in reducing the number of crashes, particularly fatal crashes in recent years. Over the past three years, traffic fatalities were reduced from 915 in 2008 to 720 in 2010. However, Louisiana's fatal crash rate of 1.58 [fatalities per 100 million vehicle miles traveled (VMT)] is still higher than the national average of 1.02. To further improve roadway safety in Louisiana, efforts must be made in reducing the number of lane-departure crashes because this type of crash still accounts for nearly 20% of crashes in the state. Edge line implementation has been considered as one of most promising lane-departure crash countermeasures.

The previous two Louisiana Transportation Research Center (LTRC) projects concerning the safety of pavement edge lines on narrow, rural two-lane highways have essentially concluded that the edge lines make vehicles' lateral position more centralized [from the first project based on the vehicle lateral position data collected from 10 sites in the Louisiana Department of Transportation and Developments (LADOTD's) District 03] and crashes were reduced after edge line installation (from the second project based on the crash data collected from sites in all LADOTD districts). Due to the time restriction after the site selection and edge line implementation, the second project only used the one-year-after crash data for the analysis.

Constructing and maintaining these edge lines require significant financial commitment of LADOTD. The cost-effectiveness of these safety features need to be investigated and documented, which can help LADOTD make better and more informed decisions on safety improvement projects.

OBJECTIVE

The goal of this project is to comprehensively evaluate edge lines on narrow, rural two-lane highways. Specifically, the objectives are to complete edge line safety analysis on the narrow, rural two-lane highway segments with three-years-after crash data (2009-2011); conduct crash characteristic analysis for the before-and-after crash study; and perform cost-benefit analysis for edge line implementation.

METHODOLOGY

Accomplishment of the stated objectives calls for the following tasks:

Task 1 – Segment verification

More than 40 sections total about 150 miles of narrow, rural two-lane roadway under the LADOTD system were selected for edge line implementation in 2008. Since it has been four years, it is possible that some changes may have occurred, such as additional safety improvements. The quality of the lines' painting may also be a concern on these highway segments. To ensure the before and after crash analysis is solely focused on edge lines, all sections must be surveyed first to identify any significant changes that may affect crash occurrences since the edge line implementation in 2008.

Task 2 – Before and after crash data analysis
Two methods will be used in this before and after analysis. In addition to the improved four-step procedure introduced by Dr. Hauer, which was used by the previous research, the research team would also explore the potential application of the Empirical Bayes (EB) method that has been highly promoted for safety analysis in recent years. The biggest benefit of applying the EB method is to record the changes that may have occurred on these segments since the edge line implementation.

Task 3 – Crash characteristics analysis
It is interesting to note that not only does the total crash frequency change but also a change occurs in the type and severity of crashes before and after crash countermeasure implementation. Crash-contributing factors such as the surface condition and type of the pavement, lighting conditions, and weather conditions before and after the implementation will also be investigated.

Task 4 – Cost benefit analysis
A cost benefit analysis will be performed during this task. The anticipated benefits include a reduction in crash frequency and a reduction in the level of severity. The benefit estimation will be based on the latest information from the FHWA and the state regarding average cost per fatality, injury, and property-damage-only (PDO) crashes. The unit cost for pavement markings will be estimated with the data from LADOTD and the project contractor. If necessary, the total cost will be estimated by labor cost, material cost, overhead cost, and as well as maintenance cost. Considering the various cost-benefit analysis methods, the research team intends to use at least two methods for the cost-benefit analysis.

IMPLEMENTATION POTENTIAL

Reducing lane-departure crashes and alleviating crash severity of the crashes call for the most effective safety improvement actions. Pavement marking is an important performance-oriented practice. While from a safety perspective, it may be desirable to have edge lines on all rural, two-lane highways, it should be recognized that the implementation of edge lines will require a considerable increase in the annual pavement marking budget that is already consists of millions of dollars. Thus, the results of this project in crash reduction (by type and severity) and benefit cost will lead to recommendations to the pavement marking policies, practice, and large scale implement strategies. Particularly, the implementation of the project will lead to a re-evaluation of existing pavement marking practice and policy on the scope of edge line implementation concerning the entire LADOTD rural two-lane roadway network; an edge line prioritizing process for narrow, rural two-lane roadways based on annual average daily traffic (AADT); and the future development of a comprehensive pavement marking program refined and tailored to Louisiana conditions as more performance data become available, such as quality of painting materials, retro-reflectivity, and thickness of lines.

Locations before and after edgelines implementation (pictures taken from different travel direction)