LTRC Technical Summary Report 381

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Louisiana Transportation Research Center

4101 Gourrier Ave., Baton Rouge, LA 70808

Louisiana Traffic Sign Inventory and Management System

Introduction

Currently, the Louisiana Department of Transportation and Development (LADOTD), like most state DOTs, has no comprehensive system with which to inventory and maintain records of traffic signs. Recently, however, several DOTs began developing computer based sign inventory systems to take advantage of the more advanced and affordable spatial referencing systems and data recording storage technologies that provide accurate measurements and increased data access.

When used to their full potential and combined with geographic information systems (GIS), the sign inventory systems being developed can serve as the cornerstone for a fully comprehensive asset management system that includes information on a variety of highway agency properties, such as guardrails, traffic signals, pavements, bridges, and survey markers. Since these types of systems allow agencies to precisely count and locate the items in the field, monitor their condition, and track changes over time, they can be used by construction, maintenance, and engineering personnel to help highway agencies maintain their inventories. They can also be used by trained personnel to find unwarranted or "exception" signs and equipment, help to determine whether additional signs may be needed, and monitor field maintenance and replacement programs.

Objective

This project initiated the development of such a comprehensive asset management system in Louisiana, starting with traffic sign inventory in a single parish. The project's primary goal was to undertake a pilot field inventory of sign attribute data for Ascension Parish. Objectives included training regional LADOTD officials for its own inventories and providing the department with a basis for estimating time, labor, and equipment requirements for future sign inventory programs.

A pilot field inventory of sign attribute data was undertaken for Ascension Parish and, using a commercially available software system, a data entry/storage system was developed, and sign inventory information was entered into a database. The inventory used state-of-the-practice mapping and referencing systems that may serve as a model for future statewide inventory and management systems. These future systems could permit LADOTD to track and monitor the number, location, and condition of every traffic sign within their inventory.

As part of the project, LADOTD officials were also trained to develop procedures to use in their own inventories and databases. A final objective of the project was to evaluate the amount of effort needed for the project so the department will be able to estimate future time, labor, and equipment needs that may be involved in similar sign inventory programs in the future.

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Principal Investigator:
Brian Wolshon, PhD., P.E.

LTRC Contact:
Chester G Wilmot, PhD, P.E.
Phone (225) 767-9109

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Sponsored jointly by the Louisiana Department of Transportation and Development and Louisiana State University

4101 Gourrier Avenue
Baton Rouge, LA 70808-4443
www.ltrc.lsu.edu

Scope

This pilot study involved the collection of key data items from traffic signs adjacent to state roadways within Ascension Parish. To assess the variation between rural and urban conditions, a variety of different roadway locations, as well as functional classifications (arterial, collector, etc.), were selected for data collection to provide LADOTD with a variety of road environment conditions. The key data collected included sign type, location (based on GPS coordinates, route number, and log mile and with respect to the roadway), condition, and support device. All data were initially recorded by hand then later entered and stored in a computerized database.

In addition to the field inventory database, the project also included the purchase, set up, and testing of all the systems and equipment that may be used to perform similar inventories by LADOTD personnel. The investigators trained selected department personnel regarding the operation of equipment and the methods used in data collection and database set-up. Additional information, such as sign density and labor requirements, was also documented. This information should assist LADOTD in developing cost and labor estimates for future inventories.

Research Approach

The project was completed within a framework of six task items over a period of approximately 20 months. The task items included 1) equipment acquisition and set up, 2) data collection, 3) data validation, 4) inventory, 5) updating, and 6) training. The final task was the transfer of the data and equipment to LADOTD.

Data collection took place exclusively on LADOTD highways in Ascension Parish, starting with the portion of the parish east of the Mississippi River. The data attributes that were collected for each sign included the following:

- **Sign type,** including the MUTCD designation. In cases where the sign was not a MUTCD standard sign or a location specific guide sign, and in cases of signs that were damaged in some way, a digital photograph was also taken.
- **Date of installation** The installation date, when it was available, was recorded for each sign as found in the field. As such, this date may not necessarily reflect the installation date of the original sign.
- **Size** In cases where the sign was inaccessible, the size was estimated.
- **GPS latitude and longitude coordinate locations**
- **LADOTD control section location**
- **Sign condition**
- **Retroreflectivity,** reading in its existing state and after wiping with cleaning solution
- **Sign support system**
- **Inventory number**

To maintain the integrity and quality of the database, a periodic validation of the inventory was also conducted. Over the duration of the project, 200 signs were randomly selected for secondary verification. The information collected during the validation effort was used to determine what errors existed in the data set, their source, and what appropriate corrective actions could reduce future occurrence of those errors.

Conclusions

Although this project was primarily an exercise in data collection, the results from it should permit LADOTD to evaluate and assess several issues associated with initiating and completing additional, large-scale traffic sign inventories. These issues include new data acquisition equipment and technologies, the development and assessment of techniques for collecting the data and setting up the inventory database, and a basis for estimating the number and type of traffic signs in their inventory as well as the labor requirements that would be required to conduct a similar inventory state-wide.

A total of 3,646 traffic signs were inventoried in Ascension Parish during the 20-month period from April 2001 through December 2002. The inventory includes signs from 147.7 miles of state highway, including the following routes:

LA 22 LA 427 LA 934

LA 30 LA 429 LA 936

LA 44 LA 431 LA 942

LA 70 LA 621 LA 3251

LA 73 LA 928 US-61

LA 74 LA 931

LA 75 LA 932

The data that was collected included sign type, location (based on GPS coordinates, route number, and log mile with respect to the roadway), condition, and support device. All of the data were initially recorded by hand and later entered and stored in a computerized database.

In addition to the inventory, some empirical analyses associated with sign retroreflectivity performance were also conducted. The analyses were centered primarily on the relationship between sign retroreflectivity and age and the performance of the signs relative to LADOTD performance specification criteria. The various comparisons showed that, generally speaking, the high intensity grade sheeting signs were performing very well with respect to LADOTD specification criteria, with over 80 percent of the surveyed signs in compliance with the specification, both within and after the seven-year warranty period. However, the comparisons also showed that the compliance rate of the engineering grade signs was substantially lower, with nearly 60 percent of them performing below the minimum specification rate, while still within the specification warranty period.

Recommendations

The primary user of this project's results will likely be LADOTD as part of an initiative involving more comprehensive traffic sign and field inventories. A review of practices in other states showed that these inventories are used in various highway agencies to precisely count and locate items such as traffic signs, guardrails, signals, pavements, bridges, and survey markers in the field. With this information, agencies can monitor sign condition and track changes in performance over time. These inventories (described in more detail below) can also be used by construction, maintenance, and engineering personnel to help highway agencies to find unwarranted or "exception" signs and equipment, determine whether additional signs may be needed, and monitor field maintenance and replacement programs.

A brief review showed that other states are using computerized sign inventory systems to provide timely and accurate information to support decision making. The databases are used to identify, classify, and prioritize signage assets for future replacement, repair or upgrade. History log features of the software systems can be used to develop schedules and track work orders based on the information contained in specific sign database queries. After the maintenance is performed on an asset, the activity can then be recorded and dated into the history log.

These systems can also help with documentation in legal proceedings since they can be used to track the age and condition of signs systematically. They have also been used to serve the public by providing public contacts and other information (significant dates, etc.). Complaints and any subsequent action(s) taken are recorded and stored as well. The inventory systems have also been used for conducting a life cycle cost analysis for budgeting purposes. Models have been developed to predict when certain signs are likely to need replacement by comparing the predicted retroreflective levels with minimum retroreflectivity standards. These models minimize the resources required to locate, inspect, and replace signs that are in the most serious need of maintenance.

Of course, these benefits come at a cost. The primary expenses associated with these types of inventories are the costs associated with the labor time, equipment, and materials necessary for field data collection. This project should give a reasonable indication of the approximate labor investment that would be required as well as the number of signs that would exist on certain types of roadways.

Currently, there are several different commercially available software packages that allow the development of sign inventory systems such as the one demonstrated here. These systems vary widely in terms of their complexity, flexibility, and price. The system used for this project is among the more sophisticated (and, accordingly, the more expensive). While the system appears to be comprehensive in its ability to deliver a robust platform that is adaptable to a wide range of uses, it has also been demonstrated to be very complicated for the average user. In fact, the experiences of this project have shown that most users have been unhappy with the product specifically for that reason.

LADOTD should invest in additional training (directly from the developer) for any users of the system, if the department plans to widely implement this system in the future.