Texas A&M Transportation Institute

PROJECT SUMMARY

Texas Department of Transportation

0-6998: Work Zone Traffic Engineering Strategies for Flagger Stations and Lane Closures

Background

Work zones in Texas experience significant numbers of end-of-queue crashes. Research was needed to identify and evaluate countermeasures for these crashes. The objective of this research project was to identify and evaluate strategies to mitigate end-of-queue crashes at flagging stations on two-lane roads.

What the Researchers Did

After a survey of Texas Department of Transportation (TxDOT) personnel and an extensive literature review, the researchers developed a list of potential countermeasures to mitigate end-of-queue crashes. Based on feedback from the project panel, the following treatments were selected for evaluation:

- Add a warning light to the BE PREPARED TO STOP (BPTS) sign.
- Add light-emitting diode (LED) strip lights to the border of the BPTS sign.
- Use a portable changeable message sign (PCMS) to display the BPTS message in lieu of the static BPTS sign.
- Use a PCMS to display a STOPPED TRAFFIC AHEAD message in lieu of the static BPTS sign.
- Use a portable traffic signal (PTS) in lieu of a flagger (see Figure 1).

Figure 1. Example of a PTS in Texas.

What They Found

Researchers collected speed and position data for arriving vehicles at 18 different two-lane work zone sites across Texas to develop speed profiles for vehicles arriving at the flagger stations. Data were collected for the standard flagger traffic control plan (TxDOT TCP [1-2]-18), as well as at least one other treatment. The data were processed and analyzed using a series of one-way analysis of variance tests to

Research Performed by:
Texas A&M Transportation Institute

Research Supervisor:
LuAnn Theiss, TTI

Researchers:
Melisa D. Finley, TTI
Emira Rista, TTI
Gerald L. Ullman, TTI

Project Completed:
8-31-2021

determine if there were any statistically significant differences in mean speeds at various points of interest for each vehicle's deceleration. Most of the test results did not find any significant differences between mean speeds of the baseline treatment and the BPTS sign with LED lights, BPTS sign with a warning light, or PCMS displaying either message. Researchers attributed these results to the reduced visibility of the LED lights and warning light during the day and the observation that improved cognitive awareness from a driver reading a sign may not translate into behavioral changes (i.e., reducing speed). Limited data revealed the propensity of a PTS to reduce the mean speed farther upstream relative to when a human flagger was used. However, data at more sites are needed before researchers can develop recommendations regarding the use of a PTS to reduce end-of-queue crashes at flagging stations.

Researchers also conducted a comparative cost analysis of the different treatments examined in this project. The cost analysis included capital costs, operation and routine maintenance costs, and transportation costs, when available. The analysis showed that the cost for purchasing and using the standard static BPTS signs was lower than for the treatments including the static signs with lights (either LED or warning) or the PCMS. However, researchers noted cost savings were possible in just two years when using a PTS in lieu of human flaggers.

What This Means

Based on the findings, the researchers recommend that:

- Additional studies investigate ways to improve the daytime visibility of LED lights in signs.
- Human factors studies be conducted to further assess the effectiveness of PCMS messages in the advance warning area at flagging operations on two-lane roadways.
- Additional studies be performed to fully understand the impact of a PTS on reducing end-of-queue crashes at flagger stations.

For More Information

Project Manager:
Wade Odell, TxDOT, (512) 465-7403

Research Supervisor:
LuAnn Theiss, TTI, (979) 317-2146

Technical reports when published are available at **http://library.ctr.utexas.edu.**

Research and Technology Implementation Office
Texas Department of Transportation
125 E. 11th Street
Austin, TX 78701-2483

www.txdot.gov
Keyword: Research