Flashing LED Stop Signs

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Introduction

Traffic safety is dependent on motorists obeying traffic control signs. One such critical sign is the stop sign, and failure to obey can result in serious accidents. Conspicuity of a traffic sign is clearly an important factor related to a sign being detected and then obeyed. In order to increase conspicuity, traffic engineers use a number of methods, including installing larger signs, using high intensity sheeting, adding orange overhead flags, and installing flashing beacons. Most recently, stop signs with flashing light emitting diode (LED) lights embedded in the corners have been marketed by manufacturers as a tool to increase its conspicuity. See the following pictures (courtesy of Traffic and Parking Control Company – http://www.tapconet.com/blinkerstop.html)

Flashing LED stop signs are covered in the MUTCD under Section 2A.08, entitled *Retroreflectivity and Illumination*. Specifically:

"Light Emitting Diode (LED) units may be used individually within the face of a sign and in the border of a sign, except for Changeable Message Signs, to improve the conspicuity, increase the legibility of sign legends and borders, or provide a changeable message. Individual LED pixels may be used in the border of a sign.

If used, the LEDs shall be the same color as the sign legend, border, or background. If flashed, all LED units shall flash simultaneously at a rate of more than 50 and less than 60 times per minute. The uniformity of the sign design shall be maintained without any decrease in visibility, legibility, or driver comprehension during either daytime or nighttime conditions. A module of multiple LED units used as a closely-spaced, single light source shall only be used within the sign face for legends or symbols."

The Texas Transportation Institute (TTI) studied the effectiveness of flashing LED stop signs at two locations in 2004 by analyzing before and after data. Vehicle approach speeds and stop sign compliance at a standard stop sign vs. the flashing LED stop sign were compared. The overall rate of vehicles not fully stopping was reduced by 28.9% after installation of the flashing LED stop sign. The overall rate of vehicles blowing through the intersections was reduced by 52.9%. The flashing signs resulted in no statistically significant effect on vehicular speeds or decelerations on the approaches. The study recommended the use of the flashing LED stop signs as a special treatment on an as needed basis. (Tim J. Gates, Paul J. Carlson, and H. Gene Hawkins, Jr., *Field Evaluations of Warning and Regulatory Signs with Enhanced Conspicuity Properties*, **Transportation Research Record No. 1862**, 2004, pp. 64-76.)

Additionally, the Virginia Transportation Research Council (VTRC), the research arm of the Virginia Department of Transportation (VDOT), is conducting a study to determine whether certain safety measures used successfully in other states and other countries will work as well in Virginia. Based in part on the aforementioned TTI results, the Council sought to install a flashing LED stop sign and solicited potential sites from VDOT's district traffic engineers.

Problem Statement

VDOT's Lynchburg District traffic engineers identified the intersection of Virginia Primary Route 151 and U.S. Route 250 in Albemarle County as a potential location for the installation of a flashing LED stop sign. The intersection has an accident rate higher than the average rate found at similar intersections in the district, in particular as compared to a couple of nearby intersections south on Route 151. Also, several accidents were the result of drivers running through the stop sign.

Route 151 is a north-south 2-lane highway generally running parallel to U.S. Route 29. It begins in the south on Route 29 just north of Amherst, runs for approximately 35 miles through several small towns (including Piney River, Wintergreen, and Nellysford), and ends at a stop sign at a T-intersection with Route 250 at the foot of Afton Mountain. There is a small island on Route 151 at the inter-

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section. Route 250 is not controlled and is 2-lane with a left turn lane as it approaches Route 151 from the east and is 3-lane (two up the mountain away from Route 151 and one down the mountain toward Route 151) with a right turn lane as it approaches from the west. A large, year-round vacation and conference facility, Wintergreen Resort, is located approximately 20 miles south on Route 151. Motorists traveling to and from Wintergreen via I-64 and Route 250 use this intersection. The traffic volume was estimated at 7,138 vehicles per day in 2005.

District traffic engineers suggested that several factors have caused the problems experienced on the Route 151 northbound approach to the stop sign. These factors include a high approach speed (Route 151 is posted at 55 mph), limited sight distance on a horizontal curve, a downgrade into the intersection, and sign clutter at the intersection. A number of countermeasures were previously implemented on the Route 151 approach. The District installed two stop ahead signs with accompanying stop ahead horizontal pavement markings, two sets of rumble strips on either side of the second horizontal stop ahead pavement marking, and a 48-inch oversized stop sign. Additionally, the District had been considering the installation of flashing beacons on the stop sign as well as a right turn lane on northbound Route 151. These plans have been postponed pending an evaluation of a flashing LED stop sign.

A 48-inch flashing LED stop sign was installed at the intersection on June 14, 2006. Specifically, it is a solar Day-Viz™ Blinker-Stop™ sign provided by Traffic & Parking Control Company (TAPCO) for evaluation. The unit contains red 7/8-inch diameter LEDs in each of the eight corners of the sign. A 13.5 by 15-inch solar panel supplies a 4.8 volt NiMH 6-inch battery pack. The sheeting is 3M VIP/DG3 diamond grade or similar prismatic sheeting. The LEDs are wired to turn on and off simultaneously and flash continuously at a rate of one flash per second. There is automatic dimming for reduced night brightness.

Research Plan

The objective of installing the flashing LED stop sign is to heighten motorists' awareness of the stop sign and to increase motorists' compliance. Researchers at the VTRC reasoned that to be effective, motorists would discern the flashing LED stop sign sooner than with a regular stop sign and hence slow down more quickly and would more likely stop. Therefore, two measures of effectiveness were used in the evaluation – speed of vehicles approaching the stop sign and stop sign compliance.

Traffic volumes, speeds, and classifications were obtained with traffic counters before and after the installation. Counters were placed in the northbound approach lane at three locations – right at the intersection, at a point upstream just before motorists can see the stop sign, and at a point approximately midway between these two locations. The counters were placed for seven days and collected data on the basis of 15-minute intervals. The after data were collected at two separate times, the first within seven days to measure initial reaction to the sign and second within 90 days to allow evaluation of the "novelty" effect of the flashing sign.

Additionally, a stop sign compliance study was undertaken at the three times described above. Data was collected during peak periods and on the basis of 15-minute intervals. Stops were recorded as Full Stop Voluntary, Full Stop by Traffic, Rolling Stop (0 – 3 mph), and Blow Thru (>3 mph).

The study is scheduled for completion in early 2007 and a follow up article will be provided to report the results.

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The Virginia Transportation Research Council is a partnership of VDOT and the University of Virginia and is located on the University of Virginia grounds in Charlottesville. More information about VTRC is available at: http://www.vtrc.net.

For more information on the TAPCO Blinker Signs visit us at www.tapconet.com or call 800-236-0112.

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