South Carolina
Department of Transportation

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U.S. Department
of Transportation
Federal Highway Administration

PROJECT SUMMARY

Report No. FHWA-SC-06-10
December 2006

South Carolina
Department of Transportation
P. O. Box 191
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Better Management for Speed Control in Work Zones

Overview

Statistics from the South Carolina Department of Transportation (SCDOT) for incidents between 1998 and 2002 reveal that a leading cause of crashes in work zones is driving too fast for conditions. In April, 2005, a team of researchers led by Clemson University's Transportation Systems Laboratory embarked on research to better manage speed control in work zones. The research tasks included field trials of several devices, a literature review, and survey of states.

Based on the literature review and meetings with the project steering committee, a number of devices and deployment strategies were selected for field evaluation. The selected devices included drone radar, changeable message sign with radar (CMR), speed monitoring display (SMD) with CMS, portable rumble strips, and a novel speed activated sign designed by the researchers. After initial laboratory testing, field surveillance of the speed management devices at a variety of different work zone sites on Interstates and State Route highways in South Carolina was completed to collect the empirical data needed for evaluation. Both quantitative and qualitative analyses of the performance of the devices and strategies were completed. Some of the devices were also studied in combination with police enforcement.

Literature Review

Researchers reviewed an extensive array of literature related to this project. Many of the speed reduction measures included in this research have been studied in other states. While CMS with radar, drone radar, and temporary rumble strips have been studied extensively, only limited research has been conducted on novel speed activated signs. Variations from previous study designs included the combination of CMS with speed monitoring signs, and an analysis of drone radar effectiveness in combination with a study of radar detector usage. Most of the previous research on drone radar was conducted over 5 years ago, thus this project sought to update the analysis based on the latest technology advancements.

Though the conclusions by previous reasearchers for different speed reduction stratregies are diverse and dependent on a variety of factors, it appears that in no case did the deployment of these strategies worsen the existing operational conditions. As a result, it was apparent that the findings of devices tested as part of this research would be promising.

Survey of States

The survey of work zone speed reduction strategies indicates that there are a wide variety of strategies being employed across the United States. Researchers found that the most popular speed reduction strategy is active police enforcement followed by speed monitoring displays and changeable message signs. These three strategies are also those that had the most effective speed reductions as found in the literature review. However, several states indicated issues of cost as a real limitation in choice of speed reduction measures, and thus low cost solutions are greatly needed. Novel signs are also widely used, yet no indications of novel signs with radar exist.

Data Collection and Analysis

Evaluation of the speed reduction devices required numerous types of data, which the research team collected using a variety of methods including digital video surveillance, radar and laser speed detection, and monitoring CB radio. Data was collected for 60 field studies at 17 different work zone sites throughout South Carolina. A wide range of roadway conditions and work zone types on rural highways, and interstate freeways were studied. Data was collected at up to three stations in each work zone studied. The stations were typically positioned before, at, and after the deployed speed reduction measure. In most cases, speed data was collected for two conditions—one with the speed reduction measure in place and one without (control)—to allow the researchers to determine the effect of the speed reduction measure on driver behavior. In the event that topography and roadway geometries were similar, Station 1 was used for baseline data collection, allowing data collectors to record speeds for both conditions simultaneously. A single data collection study lasted from three to four hours.

Statistical tests were used to analyze the data collected for this study. Specifically, the data collected were examined to: 1) test for significant differences in the change in mean speed and change in percent of vehicles exceeding the speed limit (for 5+ and 10+ mph) for each of the three data collection stations under the control (speed reduction device absent) and treatment (speed reduction device present) conditions; and 2) determine the change in 85^{th} percentile speeds between the control and treatment conditions.

Results and Recommendations

The table below summarizes the results of the speed reduction devices studied in this research. The table indicates that all of the devices reduce mean speeds. All of the devices also have a positive influence on 85^{th} percentile speeds as well as the proportion of vehicles exceeding the speed limit by 5+ and 10+ mph.

Speed Control Technique	Change in Mean Speed	Approximate Cost
Speed Monitoring Display with CMS	1.1 -9.8 mph	$3100-$5000
Changeable Message Signs with Radar	4.0 -13.0 mph	$20,000
Speed Activated Sign	1.74 – 6.12 mph	$1,500
Drone Radar with Mounting Structure	0.3 – 3.5 mph *4.6 -7.9 mph *vehicles with radar detectors	$250

The researchers recommend that each of the devices be considered for routine use in future work zones. The deployment of the devices can only be accomplished based on available resources. Consideration should be based on cost, manpower, and the characteristics of the work zones. All of the devices should be used in combination with some level of enforcement to help ensure that drivers take the speed reduction devices seriously in long-term use. Detailed recommendations for the devices are included in the project final report.

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