Kansas Department of Transportation

TECHNICAL SUMMARY

Analysis of Speed Profiles and Evaluation of Dynamic Signs in Kansas Work Zones

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Aerial view of the counter locations for Work Zone 1, located near the interchange of I-35 and US-59

Introduction

Work zones are essential for maintaining and improving roadways in the United States and monitoring these work zones is vital to the safety of all roadway users, including motorists and work zone laborers. Work zones are accountable for 10% of overall traffic congestion and 24% of freeway delays. From 2016 to 2017, 799 work zone fatalities occurred, an increase of 3%, with vehicle speed as a main contributing factor. These fatalities cost civil engineering construction industries up to $3.5 billion per year. The evaluation of vehicle speed profiles in work zones will increase highway agency understanding of work zone safety and provide solutions for safety improvements.

Project Description

A limited number of studies have evaluated vehicle speed profiles using dynamic speed signs in a work zone. Therefore, the study for this paper used three work zone sites on a roadway with a speed limit of at least 55 mph, and four road tubes, separated so that multiple interchanges were located at two of these sites, to track vehicles and their speeds with and without dynamic speed signs. The data were analyzed via computer software. The objective of the study was to develop actual vehicle speed profiles for the three work zone sites using four counters that collected speed profiles, giving data for various points throughout the work zone. Additionally, the study sought to analyze which vehicle classes comprised the largest percentage of speeding vehicles passing through all three sites. One of the three sites did not use a dynamic speed sign, while the other two sites utilized the signs. The effects of the signs at the two sites were compared to verify effectiveness of the dynamic speed signs.

Data from all work zones was sorted to determine average and 85th percentile speeds. Data from Work Zone 1 were processed manually using a computer program. Because Work Zone 2 and Work Zone 3 contained dynamic speed signs, data for these work zones were processed before and after sign deployment to determine their effectiveness at reducing speeds through the work zone.

Project Results

Work Zone 1 was used to validate a computer program and compare its output to statistical analysis. The limited number of traces through the work zone resulted in nearly identical average and 85th percentile speeds. In Work Zone 2, the dynamic speed sign did not significantly reduce vehicle speeds, while data from Work Zone 3 showed that the dynamic speed sign consistently decreased vehicle speed, with the 85th percentile speed occurring 5 mph over the average speed.

Passenger vehicles and tractor-trailers comprised the largest percentage of speeding vehicles. In Work Zone 2, a large percentage of these vehicles traveled at the 66–70 mph speed bin before and after the dynamic speed sign was installed. In fact, the number of speeding vehicles actually increased after the dynamic speed sign was installed. Passenger cars and four-tire, single-unit vehicles comprised the majority of vehicles in Work Zone 3. However, the highest speed bins for these vehicles were 56–60 mph and 51–55 mph, which were the highest speeds for every class after the dynamic speed sign was installed.

Although the results from this speed study showed that dynamic speed signs were slightly effective, inconsistences between the work zones rendered the results inconclusive. The limited number of work zones studied in this research reduced the amount of data available for analysis. In addition, future studies should include work zones of similar length with the same number of exit and entrance ramps and the same type of dynamic speed signs.

Project Information

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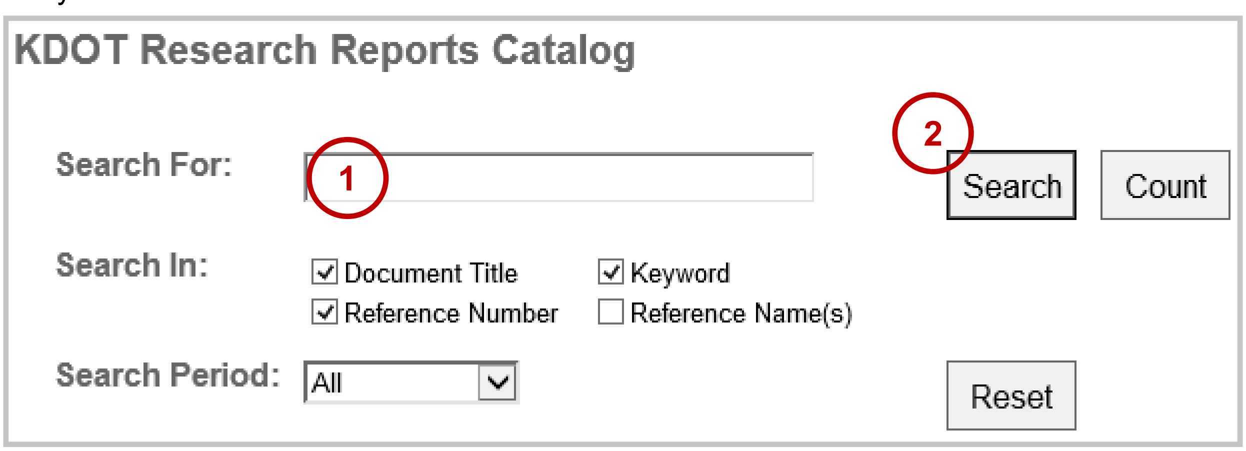

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