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Dynamic Speed Feedback Signs for Rural Traffic Calming

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Background

Small rural communities often lack the expertise and resources necessary to address speeding and the persistent challenge of slowing high-speed through traffic. The entrances to communities are especially problematic given that drivers must transition from a high-speed, often-rural roadway setting to a low-speed community setting.

The rural roadway provides high-speed mobility outside the community, yet the same road within town provides local access and accommodates pedestrians of all ages, on-street parking, bicycles, and other features unique to the character of a small community. Drivers who have been traveling for some distance on the high-speed road, and are traveling through the community, may not receive the appropriate clues that the character of the roadway is changing and may not adjust their speeds appropriately.

Addressing speeding issues is an even greater challenge given that smaller communities typically lack engineering staff and resources, which can lead to decisions that may not conform to accepted design guidance. For instance, many rural communities set speed transition zones too low a significant distance outside the community, before there is any practical need for drivers to slow down.

Communities may also have unrealistic expectations about what speed reductions are practical and, in some cases, may even implement strategies to reduce speeds that are not appropriate for the situation. For instance, some small communities with speeding issues simply use stop signs to slow traffic, which can diminish both enforcement and compliance.

A number of traffic-calming devices were evaluated to determine their effectiveness in reducing speeds along the main road through a small rural community. Five different treatments were selected and installed in six rural Iowa communities. This tech brief highlights use of two different dynamic speed feedback signs (DSFSs).

DSFS installed at Rowley east community entrance

Description

Dynamic speed feedback signs consist of a speed-measuring device, which may be a loop detector or radar, and a message sign that displays feedback to drivers who exceed a predetermined speed threshold. The feedback may be the driver's actual speed, a message such as SLOW DOWN, or activation of some warning device, such as beacons or a curve-warning sign, when a vehicle exceeds a certain speed. The devices can be portable or permanent. They alert drivers that they are speeding and create a sense of being monitored. They may also slow drivers who have radar detectors.

The Texas Transportation Institute (TTI) evaluated the use of a portable speed display trailer in work zones (Fontaine et al. 2000). The researchers found that passenger vehicle speeds were reduced by 7 to 9 mph at one site and 2 to 3 mph at another. Truck speeds were reduced 3 to 10 mph at both sites.

The Department of Transport, United Kingdom, found that average speeds can be reduced by 1 to 7 mph using dynamic speed signs; they also suggest that signs are more effective on a mobile basis, given drivers may become immune when the signs are installed on a permanent basis (Sustrans 2005).

Chang et al. (2004) tested the use of radar speed signs in reducing speeds and found the devices were effective and had a sustained effect in maintaining lower 85th percentile and average speeds.

Two different signs were evaluated as part of the previous traffic-calming research project by Hallmark et al. (2007). One sign technology involving displaying the current speed of the driver in Union, Iowa was effective at reducing speeds significantly. Another sign was evaluated in Slater, Iowa that was capable of providing different messages to the driver in addition to their current speed. The sign reduced the average speed of the drivers by 5 mph and the 85th percentile speed by 7 mph.

Radar-activated LED speed limit sign

Treatment Installation

This project used two different DSFSs. The first was a speed limit sign that has radar-activated light-emitting diodes (LEDs) embedded around the border of the sign. One radar-activated LED speed limit sign was placed at the east community entrance along State Highway 251/West Main Street in St. Charles, Iowa. The second was placed on County Road D-47 at the west community entrance to Rowley, Iowa. The signs were programmed so that the LEDs activated when vehicles were traveling over the mean speed, which was established in a before speed study.

The second DSFS evaluated was a sign that displayed vehicle speed. The sign activated when vehicles were traveling over the mean speed, which was established during a speed study before installation of the sign. This sign does not display over 55 mph so that drivers are not tempted to "test" their speeds against the sign. The sign was placed on County Road D-47 at the east community entrance to Rowley, Iowa.

Results

Pneumatic road tubes were used to collect speed and volume data before and after installation of the rural traffic-calming treatments. Pneumatic road tubes are fairly accurate (99 percent accuracy for individual vehicle speeds), can collect individual vehicle data (speed, volume, headway, and classification), and are fairly low-cost. Data were collected using JAMAR FLEX HS counters. Road tubes were typically laid just downstream of the treatment or at the treatment.

Data were typically collected for 48 hours on a Monday through Friday under mostly dry weather conditions. In a few cases, due to issues with the traffic counters, data were available for only a 24 hour period. Use of full 24 hour periods avoids biasing the speed sample to speed choices based on time of day. The collection periods occurred Monday through Friday while avoiding holidays to avoid any unusual traffic patterns.

Typical speed statistics, such as change in average speed, were calculated for each location where data were collected.

For the radar-activated LED speed limit signs, in one community, mean and 85th percentile speed decreases of up to 1 mph resulted with moderate decreases in vehicles traveling 5 or 10 mph over the posted speed limit. In the second community, significant decreases were noted with a reduction of 5 to 7 mph in mean and 85th percentile speeds. Decreases in the fraction of vehicles traveling 5, 10, or 15 mph over the posted speed limit of up to 53 percent occurred.

For the dynamic speed feedback sign, mean speed decreased by up to 8 mph and 85th percentile speed decreased by up to 9 mph. Decreases in the fraction of vehicles traveling 5 or more mph over the posted speed limit of 45 percent were noted and a decrease of 73 and 79 percent occurred for the fraction traveling 10 and 15 or more mph over.

Results for speed feedback sign treatment after installation

	St. Charles LED		Rowley LED		Rowley Speed Sign	
	1 Month	12 Months	1 Month	12 Months	1 Month	12 Months
Mean Speed	-0.4	-0.6	-5.9	-5.4	-7.6	-5.9
85th Percentile Speed	0	-1	-7	-6	-9	-6
Fraction of Vehicles Traveling Over Posted Speed Limit						
≥ 5 mph	-8.7%	-10.9%	-25.3%	-18.7%	-45.2%	-33.3%
≥ 10 mph	-11.1%	-22.2%	-40.3%	-37.3%	-73.4%	-53.1%
≥ 15 mph	25.0%*	-25.0%	-52.9%	-51.0%	-78.9%	-71.1%

* Not statistically significant at 95% level of significance

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