



Automated Speed Enforcement Slows Down Drivers in Work Zones

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In 2009, the United States recorded 667 fatalities and more than 40,000 injuries in highway work zones—a rate of one fatality every 13 hours and one injury every 13 minutes. Crashes are more likely in work zones than on regular highways. Work zone safety must improve to achieve the national goal of zero deaths from traffic crashes.

Problem

More than 7,000 crashes occur annually in highway work zones in Illinois, causing approximately 2,000 injuries. The number of work zone fatalities in the state reached a peak of 44, including 5 workers, in 2003. The percentage of work zone–related fatalities in Illinois is higher than the national average. Speeding is one of the most important contributors, affecting the frequency and severity of work zone crashes. Improving compliance with speed limits in work zones therefore is a pressing need.

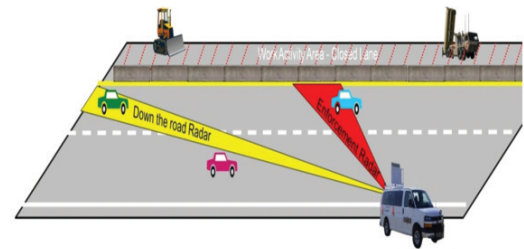


FIGURE 1 Operation of speed-radar photo enforcement.

Solution

Because state resources are limited, novel approaches were needed to make the most from minimal investment. In 2004, Illinois passed the Automated Traffic Control Systems in Highway Construction or Maintenance Zones Act, authorizing speed-radar photo enforcement (SPE) in work zones on highways. For the first time, a state department of transportation

PHOTO: ILLINOIS DOT



Speed-radar photo enforcement vehicle; enforcement radar unit is mounted on the rear door; down-the-road radar generates the “Your Speed” reading on the rooftop display.

(DOT) was authorized to implement SPE in work zones on the Interstate Highway System. The objective was to improve speed limit compliance and work zone safety.

Illinois DOT initially deployed two self-contained vans to implement the program (1). The speeds of vehicles approaching the SPE are monitored with two radar systems: down-the-road radar and across-the-road radar (Figure 1, page 29). The speed obtained from the down-the-road radar is displayed on a light-emitting diode display on top of the SPE van (see photo, page 29). The display gives speeding drivers a final chance to reduce speed and comply with the work zone speed limit. The range of a down-

the-road radar is similar to that of a radar typically used in work zones—approximately one-quarter to one-half mile.

Across-the-road radar measures the speeds of vehicles at approximately 150 feet upstream from the van. If the speed of the vehicle, measured by across-the-road radar, is greater than a specified value, the two onboard cameras are activated to take pictures of the driver and rear license plate of the vehicle. Operation of the SPE van is shown in Figure 1; trained Illinois State Police officers staff the vans.

Regular speeding fines in work zones apply to violations detected by SPE. The fine for the first violation is \$375; for the second, \$1,000, along with a

TABLE 1 Average Speeds of Vehicles

		Data Set	Shoulder Lane			Median Lane		
			Mean Speed, mph (Sample Size)		Speed Reduction, mph	Mean Speed, mph (Sample Size)		Speed Reduction, mph
			Base	SPE		Base	SPE	
Treatment location	Passenger cars	1	61.4 (204)	53.7 (218)	7.7	63.9 (106)	56.0 (101)	7.9
		2	51.2 (135)	47.0 (191)	4.2	57.0 (119)	50.6 (146)	6.4
		3	50.2 (141)	44.8 (71)	5.5	55.4 (181)	49.1 (95)	6.3
	Heavy vehicles	1	57.4 (39)	51.3 (44)	6.1	56.2 (120)	52.2 (100)	4.0
		2	50.3 (41)	46.1 (54)	4.1	53.7 (40)	50.3 (41)	3.4
		3	48.8 (42)	44.8 (40)	4.0	53.2 (40)	46.3 (41)	7.0
Downstream location	Passenger cars	1	59.8 (207)	57.2 (226)	2.6	62.5 (102)	60.5 (102)	2.0
		2	58.6 (188)	57.9 (209)	0.6*	61.8 (98)	61.6 (126)	0.2*
		3	58.6 (165)	55.6 (125)	3.0	63.5 (158)	59.7 (107)	3.8
	Heavy vehicles	1	56.5 (40)	55.6 (35)	0.9*	56.2 (134)	55.4 (107)	0.7*
		2	57.3 (57)	56.4 (73)	1.0*	59.4 (43)	56.8 (52)	2.5
		3	57.8 (57)	53.0 (39)	4.8	59.5 (33)	54.2 (32)	5.2

*Not significant at 95 percent confidence level.

90-day suspension of license. A court appearance is mandatory for each violation. The vans are provided under contract by a vendor at a cost of \$2,950 per month each—this includes the vehicle, equipment, maintenance, upgrades, and training—plus a processing fee of \$15 per ticket.

Application

SPE was pilot-tested in two work zones in Illinois—one on Interstate 64 in summer 2006 and the other on Interstate 55 in summer 2007. Both work zones were part of major reconstruction projects.

Under the supervision of faculty member Rahim Benekohal, a research team from the University of Illinois at Urbana–Champaign led by Madhav Chitturi collected three data sets in the two work zones. The team evaluated the effectiveness of SPE in reducing motorist speeds in work zones and compared the results with those of traditional enforcement approaches, such as police presence with and without patrol lights, speed display trailers, and a combination of police presence and a speed display trailer.

The spatiotemporal effects of SPE and traditional approaches also were measured. To evaluate the spatial effect, speeds were measured at a location 1.5 miles downstream. For temporal effect, speeds were measured immediately after enforcement was removed from the work zone for a period of 1 hour.

Benefits

SPE significantly reduced the speeds of cars and trucks by 3 to 8 mph in work zones (2). At the work zone location, SPE reduced the average speeds significantly below the speed limit of 55 mph in all but one scenario, as shown in Table 1 (page 30).

The percentage of free-flowing vehicles—with headways greater than 4 seconds—exceeding the speed limit at the treatment location was reduced drastically (Figure 2, this page). The percentage of speeding free-flowing cars decreased from 93, 40, and 30 percent to 45, 8, and 4 percent, respectively, for the three data sets. The percentage of speeding heavy vehicles dropped from 69, 17, and 6 percent to 15, 4, and 1 percent, respectively.

SPE reduced the speeds of vehicles 1.5 miles downstream of the van location by 2 to 5 mph, as shown in Table 1. SPE had a limited halo effect—that is, influence after the departure of the van—reducing the speeds of vehicles by 2 mph or less. Details of the results are available in the final report from this study (3).

Aggressive law enforcement, including the use of SPE vans, in conjunction with educational campaigns and improvements to work zone traffic control, have reduced work zone fatalities from a high of

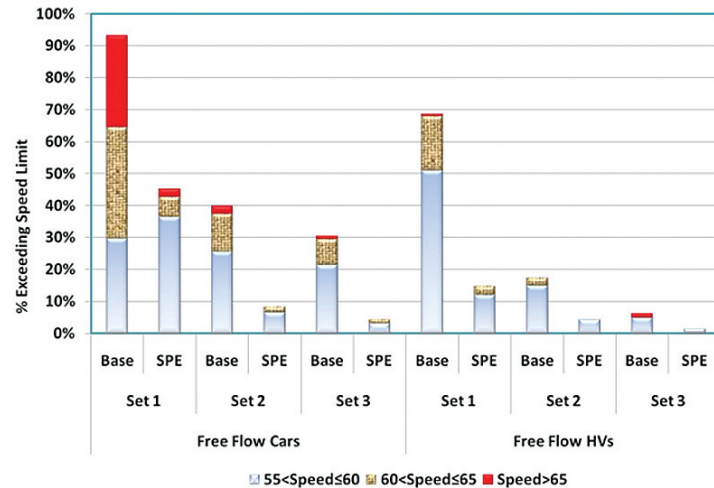


FIGURE 2 Percentage of free-flowing vehicles exceeding speed limit at the treatment location (HV = heavy vehicles).

44 in 2003 to 31 in 2009. Illinois DOT has expanded the SPE program to five SPE vans, one for each region in the state.

The success of SPE in Illinois led to similar initiatives in Maryland, Oregon, and Washington. The Research Advisory Committee of the American Association of State Highway and Transportation Officials recognized “Speed Photo Enforcement in Illinois Work Zones” as a high-value research project at the regional level.

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Suggestions for “Research Pays Off” topics are welcome. Contact G. P. Jayaprakash, Transportation Research Board, Keck 488, 500 Fifth Street, NW, Washington, DC 20001 (202-334-2952; gjayaprakash@nas.edu).