



Podcast 9:

Using Portable Changeable Message Signs to Control Speeding in Work Zones

Hello and welcome to the American Traffic Safety Services Association's Work Zone Safety podcast series. This podcast is based on work supported by the Federal Highway Administration (FHWA) under the 2011 Work Zone Safety Grant. Its purpose is to discuss how portable changeable message signs can be an effective means to control speeding in and around a work zone.

This podcast will run for just over 10 minutes.

Portable changeable message signs, or PCMS, have become a common and effective traffic control device in many work zones. PCMS are usually deployed as a component of a Temporary Traffic Control Plan or as part of a larger work zone strategy, such as speed management. Their relatively large and conspicuous message displays make them effective for providing work zone guidance and warning messages to drivers. The effectiveness of PCMS as a message device depends on the message and location, but almost all drivers recognize a PCMS and direct their attention to the information on the sign.

That's great for traffic control, but how do they help with speeding?

Well, we all know that speed variability through work zones ranks right up there at the top of the list of traffic-related work zone hazards.

Boy do we! According to FHWA, speed is a contributing factor in about 30 percent of work zone crashes.¹

Right. Speeding drivers may increase the variability in speeds and are much more likely to create a hazard for workers and other road users because their disregard for the speed limit compromises their ability to safely navigate the roadway conditions, respond to traffic control devices, or both. Lane closures, lane shifts, rough surfaces, and other work zone conditions become more difficult to navigate as vehicle speeds increase. Speeding is also an indicator that the driver may not be paying attention to work zone devices or may not think he or she needs to slow down. Here's where a PCMS can make a difference in controlling speeding: a functioning PCMS is conspicuous and almost always attracts the driver's attention.

Once the driver's attention is on the PCMS, speed-specific messages (that utilize driver feedback radar technology) or enforcement messages can be conveyed to the driver. National studies and

¹ FHWA, "Facts and Statistics - Work Zone Injuries and Fatalities: Characteristics of Work Zone Fatal Crashes Based on 2008 Data." Available at: http://www.ops.fhwa.dot.gov/wz/resources/facts_stats/injuries_fatalities.htm



best practice measurements have examined speed reduction strategies using PCMS (such as active management through real-time displays of vehicle speeds) and have found various levels of effectiveness based on the specific approach. (See the Resources section of the podcast script for more information.) Studies have shown that during work zone operations, once drivers see the PCMS, many will respond by slowing down in an effort to read the message or simply because they consciously or subconsciously react to the visual cue of the presence of the PCMS.² Using the PCMS in the work zone without any specific speed control intent may also have some speed reduction effect by increasing the alertness of drivers and heightening their perception of a need to slow down in the work zone.

That makes sense, and it sounds like PCMS can be a helpful speed management tool. What are some PCMS speed management strategies that have proven effective?

There are two types of speed control strategies: passive and active. Passive speed control strategies depend on communicating the need to slow down with drivers. Active speed control strategies deal with enforcement.

One passive approach that has proven highly effective is to use an upgraded or retrofitted PCMS with radar detection and display technology. This technology is intended to measure approaching vehicle speed and display that speed back to the driver. Providing driver feedback has shown to be effective in capturing drivers' attention and causing them to react appropriately. The message displayed usually reads something like:

“Your Speed Is 65 Mph, Slow Down”

However, a basic PCMS without radar detection can still be effective if it's programmed to display a variety of speed control messages to influence drivers to slow down. For example:

“Work Zone, Speed Limit 55 Mph”

“Work Zone, Speed Limit Enforced”

and

“Workers Present, Speed Limit Enforced”

A basic PCMS displaying speed control messages can be used to emphasize an individual message panel by using the flashing display option. The selected panel will flash the message two or three times before moving to the next message.

² Yue Li, Yong Bai, and Umar Firman, “Determining the Effectiveness of PCMS on Reducing Vehicle Speed in Rural Highway Work Zones,” TRB 89th Annual Meeting Compendium of Papers DVD, 2010.



A PCMS displaying speed control messages can also inform drivers that enforcement activities are active. Drivers may reduce their speed based on this knowledge alone.

That brings up a good point. How does law enforcement fit into a speed control strategy that uses PCMS?

Up until now we've been talking about passive speed control strategies – using PCMS in one way to alter driver behavior. But work zone speed control with a PCMS can also be part of a larger speed-control strategy that includes active enforcement by law enforcement officers. PCMS can play a valuable role in an active strategy, but the details of the strategy need to be developed jointly between highway agencies and law enforcement personnel. PCMS can assist law enforcement by displaying speed reduction messages during active, routine, or random speed patrols or in conjunction with simple police presence. This may even have a residual effect where, once drivers have become aware that speeds are being enforced, they continue to travel at safer speeds through the work zone even when the police vehicles are not visible.

Most drivers are very interested and aware of speed enforcement activities. As part of a larger speed control strategy, PCMS can be used in combination with other driver information or a publicity campaign to remind drivers not to speed in work zones. PCMS messages can also be created to direct drivers to tune to a local Highway Advisory Radio system for information on a speed enforcement campaign.

How does using PCMS for speed enforcement impact where I place my PCMS around the work zone?

The level of effectiveness for all of the strategies and techniques we mentioned depend on the strategic placement of the PCMS so they are clearly visible to drivers and give them the opportunity to slow down in advance of the work zone. Keep in mind that you should always coordinate with local law enforcement agencies even if your selected strategy does not include law enforcement assistance. Depending on the effectiveness of the speed reduction strategy, some studies have shown that PCMS can be nearly as effective in reducing speeds as law enforcement presence. Study results have shown reductions as much as 7 mph in the 85th percentile speed.³

³ G. Pesti, P.T. McCoy, M.D. Meisinger, and V. Kannan, "Multiple Placement of Radar Speed Reporting Devices," Midwest Smart Workzone Deployment Initiative Pooled Fund Study, 2002. Available at: <http://www.intrans.iastate.edu/smartwz/>. See also G. Pesti, and P.T. McCoy. "Long-Term Effectiveness of Speed Monitoring Displays in Work Zones on Rural Interstate Highways," *Transportation Research Record* 1754: 21-32.



Do you have some general tips for how to make PCMS more effective in reducing speeds in the work zone?

Credibility is a critical element in the effectiveness of the speed reduction success attributed to the PCMS. For example, a generic speed reduction message displayed on a PCMS at the same location day after day, week after week for months whether or not the work zone is active will quickly become ineffective. Using speed reduction messages during congested traffic conditions when traffic speed is already substantially below the speed limit is also counterproductive.

Here are a few more tips to remember:

- Think about upgrading or retrofitting existing PCMS to “smart” technology that includes radar detection and driver feedback. This technology can turn your PCMS into one of your most effective tools for passive speed control.
- Partner with law enforcement when considering a speed reduction strategy.
- Gather and develop PCMS speed reduction strategies and tactics.
- Include PCMS as part of a Temporary Traffic Control Plan that shows specific locations and messages for each work operation.
- Look at historical traffic speed data when planning ahead for a work zone or get input from law enforcement to find current traffic speed conditions.
- Congested roadways may not be good candidates for generic speed reduction messages. Optimal results will be achieved by focusing on applying a speed reduction strategy during free flow traffic conditions.

In summary, using PCMS as part of a broader effort to control speeding in work zones can be effective with the right strategy, tactics, and equipment. A speed reduction strategy that incorporates PCMS must reflect the actual work zone conditions to be credible and play into the driver’s sense of a need to respond by reducing speed or at least checking their vehicle speed. Most drivers respond without question when there is a law enforcement presence, but a work zone relies on credible messages from signs and visual cues from work zone devices and conditions to initiate the proper speed reduction response.

This podcast has been a presentation of the Federal Highway Administration’s Work Zone Safety Grant Program. For more information on grant products, please visit the Federal Highway Administration’s Grant page on the work zone safety information clearinghouse at workzonesafety.org. For a list of resources that can provide additional guidance on this topic, please see the transcript of this podcast.



Resources

American Traffic Safety Services Administration, *Guidance for the Use of Portable Changeable Message Signs in Work Zones*, September 2013. Available at:

http://www.workzonesafety.org/fhwa_wz_grant/atssa/atssa_pcms_wz

Federal Highway Administration, *Comparative Analysis Report: The Benefits of Using Intelligent Transportation Systems in Work Zones*, October 2008, Available at:

http://www.ops.fhwa.dot.gov/wz/its/wz_comp_analysis/index.htm

Florida DOT, “FDOT’s Work Zone Fatality Reduction Strategies,” presentation by Stefanie Maxwell at the FHWA’s “Work Zone Fatality Reduction Strategies” Webinar on May 23, 2012.

Available at: <http://ops.fhwa.dot.gov/wz/construction/webinar92412/nycdot/index.htm>

Y. Li, Y. Bai, U. Firman, Determining the Effectiveness of PCMS on Reducing Vehicle Speed in Rural Highway Work Zones, TRB 89th Annual Meeting Compendium of Papers DVD, July 24, 2009

Maryland State Highway Administration, *Use of Portable Changeable Message Signs with Speed Display in Work Zones*, August 2005, Available at:

<http://www.marylandroads.com/OOTS/02PCMR.pdf>

M.T. Sorrell, W.A. Sarasua, W.J. Davis, J.H. Ogle, and A. Dunning, “Use of Radar Equipped Portable Changeable Message Sign to Reduce Vehicle Speed in South Carolina Work Zones,” TRB 86th Annual Meeting Compendium of Papers CD-ROM, August 1, 2006.

W.C. Zech, S.B. Mohan, and J. Dmochowski, “Evaluation of Messages on Changeable Message Signs as a Speed Control Measure in Highway Work Zones,” *Practical Periodical on Structural Design and Construction* (2008)13:1, 11-18.