TEXAS TRANSPORTATION INSTITUTE
THE TEXAS A&M UNIVERSITY SYSTEM

Project Summary Report 1879-S
Project 0-1879: Investigation and Evaluation of Newly Developed and Innovative Traffic Control Devices for Application at Construction Work Zones to Alert Drivers and/or Workers

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PROJECT SUMMARY REPORT

Use of Innovative Traffic Control Devices to Improve Safety at Short-Term Rural Work Zones

As the road system in Texas ages, drivers are coming into contact with maintenance and construction zones with increasing frequency. Workers in rural short-term maintenance work zones are placed in a particularly dangerous position. Short-term maintenance work zones are typically located on high-speed roads, with traffic control installed each day in the morning and removed by dusk. Since these work zones are

(a)

(b)

(c)

Figure 1. Most effective devices: (a) speed display trailer, (b) variable message sign, (c) fluorescent yellow-green worker garments

in place only for a short time, drivers do not expect to encounter them. Regulatory speed limits cannot be lowered at the sites, and it is difficult to get law enforcement agencies to regularly patrol temporary work zone sites in rural areas.

This project evaluated a large number of innovative traffic control devices that had the potential to improve safety in short-term work zones. Researchers examined countermeasures that would increase driver awareness of the upcoming work zone, make workers more visible, or slow down traffic. Since these work zones were in place only for a short time, it was also essential that each device be quick and easy to set up and remove.

What We Did . . .

First, the research team identified innovative traffic control devices that may be suitable for use in short-term maintenance work zones. Past studies of innovative devices were reviewed in order to determine which devices may be appropriate. As a result of the literature review, the researchers selected nine countermeasures for evaluation. The following devices were examined:

Table 1. Summary of device effectiveness

Device	Findings
Speed display trailers	• Reduced average speeds by 5 mph in the work zone • Reduced percent of vehicles exceeding speed limit • Positive worker comments
Portable variable message signs (VMS)	• Produced 1-2 mph reduction in average speed in the work zone • Half as many cars were in the closed lane approximately 1000 feet from the work zone taper when the VMS was active
Fluorescent yellow-green worker vests and hard hat covers	• Fluorescent yellow-green garments are more visible than orange garments against common work zone backgrounds • Fluorescent yellow-green garments have a greater luminance (brightness) than orange garments
Fluorescent orange signs	• Positive comments from workers and drivers on increased visibility of signs • Primary benefits of fluorescence occurs at dawn and dusk
Radar drone	• Produced a 1-2 mph reduction in average speed • Easy to implement
Retroreflective vehicle visibility improvements	• Positive comments from workers on visibility of flagger vehicle • Primary benefit would occur at night

- Fluorescent orange signs
- Fluorescent yellow-green garments and hard hats
- Portable rumble strips
- Portable variable message signs (VMS)
- Radar drones
- Safe-T-Spins
- Retroreflective vehicle visiblity improvements
- Speed display trailers
- Worker strobe lights

Each treatment was evaluated in the field at short-term, rural work zones in the Childress District. The devices' effectiveness was assessed based on a variety of measures, including traffic speeds, the number of vehicle conflicts, worker comments, and driver comments. In addition to field testing, researchers evaluated the worker garments and hard hats on a closed-course facility to determine whether the fluorescent yellow-green garments increased worker visibility.

What We Found . . .

Most of the devices evaluated did produce an improvement at short-term rural work zones. The study team found that the portable rumble strips, Safe-T-Spins, and worker strobe lights were not appropriate for use at short-term work zones. Table 1 summarizes the results for the countermeasures that had a positive impact on the work zone.

The Researchers Recommend . . .

The following three devices produced the most promising results:

- speed display trailer,
- portable variable message sign, and
- fluorescent yellow-green vests and hard hat covers.

These devices are shown in Figure 1.

The speed display trailer produced the largest speed reductions of any device tested. Use of the speed display trailer should be considered when there are concerns about speed limit compliance or safety at a site.

The portable VMS caused drivers to move out of the closed lane sooner at work zones with a lane closure, thereby reducing the number of late merges and sudden braking maneuvers near the work zone taper. Portable VMSs should be considered when there is a lane closure on a high-speed facility.

The yellow-green worker vests significantly improved the visibility of the workers over traditional orange vests. These vests should be distributed to TxDOT personnel as soon as possible.

These measures are all commercially available and are ready to be implemented immediately.

For More Details . . .

The research is documented in three reports:

1879-1, *Evaluation of Traffic Control Devices for Rural High-Speed Maintenance Work Zones*
1879-2, *Evaluation of Traffic Control Devices for Rural High-Speed Maintenance Work Zones: Second Year Activities and Final Recommendations*
1879-3, *Catalog of Effective Treatments to Improve Driver and Worker Safety at Short-Term Work Zones*

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A number of innovative traffic control devices for short-term work zones were shown to be effective, and most of them could be implemented immediately. Some of these devices have been used already in the field on a limited basis. TxDOT will likely increase the use of some or all of these devices in the future.

Several devices were identified which should not be considered for use in the field.

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