TEXAS TRANSPORTATION INSTITUTE
THE TEXAS A&M UNIVERSITY SYSTEM

Project Summary Report 0-4475-S

Project 0-4475: Effectiveness of Dynamic Speed Display Signs (DSDS)

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PROJECT SUMMARY REPORT

Effectiveness of Dynamic Speed Display Signs (DSDS) in Permanent Applications

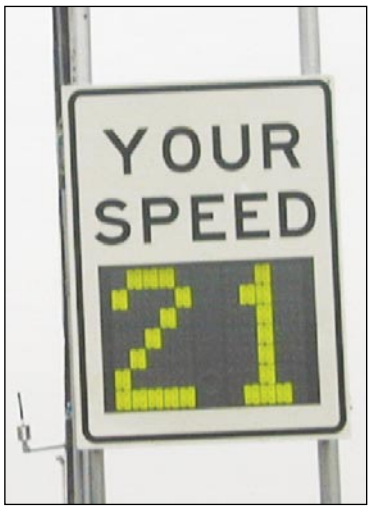

Figure 1. Permanently installed DSDS.

Dynamic speed display signs (DSDSs) reduce vehicle speeds in work zones and other temporary situations. Do such signs reduce speeds if installed permanently at critical roadway locations, as shown above? Can these speed reductions, if they occur, be maintained over significant periods of time? Those are the questions that Texas Transportation Institute (TTI) researchers were asked to answer. According to the results of a recent research study, the answer to both questions is yes, but only in certain situations.

What We Did...

Texas Department of Transportation (TxDOT) personnel identified several test sites to try out permanently installed DSDSs. TTI researchers conducted field studies to determine whether the signs reduced speeds at each site. Researchers also examined whether the signs increased vehicle conflicts or other types of erratic maneuvers.

DSDSs were installed at four common types of roadway situations where excessive speeds can be a significant safety or operational problem:

- at the beginning of regulatory school speed limit zones that are active only during the times when students are arriving or leaving school,
- at speed zones installed upstream of a school speed zone (to transition motorists down to the school zone speed limit),
- upstream of high-speed signalized intersections, and
- upstream of sharp horizontal curves.

To evaluate the effect of the permanently installed DSDSs, TTI researchers conducted three field studies at each test location. The first study was performed before installing the DSDS in order to establish baseline trends in traffic speeds and erratic maneuvers. TTI researchers then returned to each test location and collected speed and erratic maneuver data

about one week after the DSDS was installed to determine what immediate impact the DSDS had upon traffic behavior at the site. Researchers also collected speed and erratic maneuver data about four months after DSDS installation at each site to determine whether the DSDS had continued to affect traffic behavior over time.

Researchers did not believe that the DSDS would affect all motorists the same at each location. Rather, those motorists who approached much faster than the posted speed limit were expected to be more affected by the installation of a DSDS than those motorists traveling at or below the speed limit. Therefore, researchers measured the speeds of selected vehicles upstream from the DSDS and then again at the DSDS. In this way, researchers were able to assess whether vehicles approaching at higher speeds reduced their speeds by a greater amount than those approaching at slower speeds.

What We Found...

Researchers found that a DSDS significantly reduced vehicle speeds at a school speed zone. Prior to the installation of the sign, the average speed entering one speed zone was nearly 10 miles per hour (mph) higher than the posted speed limit through that zone. After the DSDS was installed, the average speed decreased more than 9 mph. Furthermore, average speeds were still 9 mph lower when researchers returned to that site and measured speeds four months after DSDS installation.

At the other test locations, the effects of DSDSs upon vehicle speeds were less impressive. When installed at transition speed zones upstream of school areas, the DSDS generated only a 3 mph reduction in average speeds in that transition zone. The effect had diminished to only 1-2 mph reductions in average speeds when measured again four months after the DSDS was installed.

Similarly, researchers detected little change in speeds of passenger vehicles or trucks when DSDSs were installed immediately upstream of the beginning of sharp horizontal curves. However, these curves already had several supplemental warning devices in place (chevrons, advisory speed plaques, right-turn warning sign, flashing beacon) to compete for the driver's attention. In fact, the DSDS might actually have been "lost" amid the myriad of other information sources present (see Figure 2).

Figure 2. DSDS effect can be "lost" within other driver information sources at a site.

Figure 3. DSDS effect may be enhanced at a restricted sight distance location.

Table 1. Site Conditions That May Increase DSDS Effectiveness	
Factor	**Effect on DSDS Effectiveness**
Perceived level of enforcement	• More effective if perception of regular enforcement (and threat of citation) exists at site
Sight distance	• More effective if sight distance to the condition being treated is less than decision sight distance
Number of travel lanes	• More effective where only one lane exists per direction
Amount and type of other traffic control devices in area of DSDS	• More effective with other information "indicators" of a need to reduce speed (school speed limit beacons, signal change warning beacons, etc.)
	• More effective if the DSDS is used to support a regulatory speed limit (as opposed to an advisory speed limit)
	• More effective if the overall information system at the location does not overwhelm the DSDS

Researchers found that a DSDS did initially reduce average speeds 3 mph when installed on the approach to one signalized intersection on a high-speed roadway. However, four months after installation, average speeds were back to their pre-DSDS levels at that site. At a second signalized intersection on a high-speed roadway, however, average speeds dropped by 4 mph, and remained lower four months after installation. This second intersection test location typically received more attention by law enforcement personnel. In addition, sight distance to the intersection was somewhat limited, which may have made motorists more sensitive to their own speeds once they were reminded by the DSDS (see Figure 3).

Researchers consider both of these factors important to the overall effectiveness of DSDSs in permanent installations.

Researchers concluded that the influence of a DSDS was not necessarily identical on all motorists at a given location. Rather, those motorists traveling faster than the posted speed did appear more likely to reduce their speeds in response to the DSDS than did motorists traveling at or below the posted speed limit. However, this differential effect did not always occur immediately after installation. Rather, there was an initial "novelty" effect of the sign whereby nearly all motorists reduced their speeds slightly, regardless of the speed at which they were initially approaching. Then, as motorists became accustomed to the presence of the sign, only those vehicles exceeding the speed limit tended to continue to reduce their speeds when they encountered the DSDS.

The Researchers Recommend...

Based on the results of these field studies, researchers have developed guidelines regarding the use of DSDSs at permanent locations. These guidelines recommend use be allowed if an assessment of factors shown in Table 1 indicates that the DSDSs are likely to be effective.

For More Details . . .

The research results, recommendations, and operating guidelines are documented in Report 0-4475-1, *Evaluation of Dynamic Speed Display Signs (DSDS)*, by Elisabeth R. Rose and Gerald L. Ullman.

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TxDOT Implementation Status
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This research project evaluated the effectiveness of dynamic speed display signs (DSDS) in permanent situations where excessive speed can pose a safety problem. One product was required for the project: guidelines on using DSDS at permanent locations. The guidelines have been submitted as an appendix in Research Report 0-4475-1, and can be implemented immediately. The information gathered from this project will also serve as an aid for further research into the effective use of DSDS in other applications.

For additional information, contact Mr. Wade Odell, P.E., RTI Research Engineer, at (512) 302-2363 or email wodell@dot.state.tx.us.

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