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RESEARCH PROJECT TITLE

Work Zone Speed Limits and Motorist Compliance

SPONSORS

Smart Work Zone Deployment Initiative
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SWZDI

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The Smart Work Zone Deployment Initiative (SWZDI) is a transportation pooled fund that supports research investigations into better ways to improve the safety and efficiency of traffic operations and highway work in work zones. The primary objective is to promote and support research and outreach activities that focus on innovative practice-ready policies, processes, tools, and products that enhance the implementation and constructability, safety, and mobility impacts of all types of work zones. The fund is administered by Iowa State University's Institute for Transportation, and the lead agency is the Iowa Department of Transportation.

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The results of this work provide a synthesis of current practices regarding the setting of work zone speed limits and guidance on how to best obtain work zone speed limit compliance.

Project Objectives

This study sought to identify best practices for setting work zone speed limits by state departments of transportation (DOTs) and to evaluate select strategies for improving compliance with work zone speed limits. The objectives of this project were achieved by synthesizing information from a literature review, a state DOT survey, and field evaluations of select speed management strategies.

Problem Statement

Work zone speed limits and management of work zone speeds continue to be critical areas of concern for state DOTs. In 2018, an estimated 123,000 work zone crashes resulted in 45,000 injuries and 755 fatalities, including 124 worker fatalities (ARTBA 2022a, 2022b). Many work zone crashes can be attributed to excessive speed or speed variance given that speeding has been identified as a contributory factor in about 25 percent of all work zone fatal crashes (FHWA 2022). Consequently, setting appropriate work zone speed limits is an important component in improving work zone safety.

Project Background

Previous studies have generally shown that speed limit reductions in work zones are associated with lower vehicle speeds, but the magnitude of the effect varies. While the 10 mph speed limit reduction is often viewed as effective, the use of a 45 mph work zone speed limit when workers are present may require the use of additional speed reduction countermeasures to be effective.



Speed feedback trailer positioned at the end of lane closure taper on westbound I-69 work zone in Michigan

Research Description

The research team reviewed and synthesized resources including research reports, journal articles, and DOT guidelines, policies, and standards. In addition, the researchers developed and distributed an online survey to practitioners from all 50 state DOTs and the District of Columbia DOT.

Based on the findings from the literature review and DOT survey, a field study was performed to assess the effectiveness of two common speed management strategies for work zones: use of a speed feedback trailer (SFT) and law enforcement.

The SFT was tested at the start and end of the work zone taper within a freeway work zone single lane closure to determine which position provided the most favorable speed reduction effects. The second field evaluation assessed the effectiveness of a specialized work zone enforcement strategy that included a covert speed measurement vehicle positioned near the end of the work zone lane closure along with four police cars positioned just beyond the end of the work zone to stop speeding drivers.

Key Findings

Literature Review and Survey Results

Survey responses were received from 43 DOTs for a response rate of 86 percent, and the response rate was 100 percent for the Smart Work Zone Deployment Initiative (SWZDI) participating states. Results from the literature review and survey indicated that work zone speed limits are typically based on the characteristics and conditions of the site, including permanent speed limit, facility type, worker presence, positive protection, work duration, and type and location of work activity.

Work zone speed limit reductions of 10 mph are most frequently utilized on high-speed (i.e., 50 mph and higher) facility types, with further reductions provided based on worker presence in the absence of positive protection (e.g., concrete barrier). Speed limit reductions are often not used on lower speed (i.e., 45 mph and below) facilities. Many respondents to the state DOT survey emphasized the need to set appropriate work zone speed limits based on the specific conditions for the work zone.

To facilitate implementation of work zone speed limits, most DOTs have developed their own guidelines, policies, or standards. These policies provide for a wide range of work zone speed limits based on various criteria, such as permanent posted speed limit, worker presence, positive protection, work duration, and type and location of work activity.

Some DOTs provide decision matrices or flowcharts as guidance for determining work zone speed limits based on the site and work characteristics. Approval of work



Speed feedback trailer at a work zone lane closure

zone speed limit reductions is often prescribed by DOTs, with some DOTs using customized forms to document the approval process. Most DOTs do not require approval to maintain the permanent posted speed limit on lower speed roadways.

Some DOTs also specify procedures for documenting work zone speed limits to help with enforcement and to be prepared for potential litigation. To encourage compliance with work zone speed limits, some states include provisions for higher fines in work zones.

Along with work zone speed limit reductions, various strategies are implemented by DOTs to manage work zone speeds. Research studies have generally shown several types of work zone speed management strategies, such as speed display signs, law enforcement, variable (dynamic) speed limits, temporary rumble strips, and portable changeable message sign (PCMS) messages, to be effective in reducing vehicle speeds in work zones.

State DOTs typically select speed management strategies for a work zone based on the permanent speed limit and facility type, although other factors may be considered. The work zone speed management strategies most frequently implemented by state DOTs include higher fines for speeding in work zones and lights on contractor or maintenance vehicles.

While DOTs generally view law enforcement with an officer present as the most effective strategy for managing work zone speeds, they also perceive the availability of law enforcement as the greatest challenge to managing work zone speeds, followed by driver indifference and distracted drivers.

Field Evaluation Results

In general, the magnitude of the speed reduction effects in the first work zone field evaluation was greatest in the general proximity of the SFT. Accordingly, positioning the SFT near the end of the lane reduction taper led to lower speeds for a more sustained distance into the work zone compared to when the SFT was positioned near the start of the lane reduction taper.

An interesting aspect of this evaluation was the magnitude of speed reduction. While earlier studies have reported a reduction of 8 to 10 mph in the average work zone speeds with the SFT present, this study found a decrease of only up to 1.5 mph in the average speed. This may have been due to the presence of three sets of temporary rumble strips at the site, which followed Michigan DOT standards for long-term freeway lane closures. Given the rumble strips were present from the initial implementation of the work zone and associated traffic control, the researchers could not discern the effects of the rumble strips across the various SFT test conditions.

The visible presence of law enforcement in the second work zone field evaluation reduced work zone speed by approximately 5 mph, which increased to 7 mph shortly beyond the end of the work zone as drivers passed by the police cars positioned on the shoulder. These speed reduction effects were only observed when at least one law enforcement vehicle was visibly present at the site, and the findings suggest that visible police presence has a substantial speed reduction effect on work zone speeds.

Implementation Readiness and Benefits

The work performed as a part of this study included a literature review, a survey of state DOTs, and the collection of field data, culminating in a synthesis of current practices regarding the setting of work zone speed limits and guidance on how to best obtain work zone speed limit compliance.

The researchers recommend that SFTs be positioned near the location of greatest need for speed reduction in the work area (e.g., the end of a lane closure taper in a work zone). They also recommend that future work zone enforcement deployments leave at least one police vehicle in place (with periodic active enforcement) near the work area at all times to achieve a sustained speed reduction effect.

Recommendations for Future Research

Future research should seek to determine the optimal SFT location with respect to the work area, in addition to how worker presence and work intensity influence the speed reduction effects of the SFT. Furthermore, future research should also include assessment of the distance that SFT effects are sustained within the work zone in an attempt to determine spacing guidelines for work zone SFTs.

Additional evaluations may also consider the use of SFTs in combination with dynamic speed limit (DSL) signs (which have recently been approved for use in Michigan, for example) and allow for the displayed speed limit to vary in real-time based on worker presence at the site. Future research could also evaluate the effects of SFTs at work zone lane closures without rumble strips.

Finally, future work could also assess the effectiveness of law enforcement vehicles positioned at other locations within the work zone, including in advance of the work area, in addition to assessment of whether the effects of enforcement vary as a function of work zone length and/or duration.

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