Florida Department of Transportation Research

Variable Speed Limit — Best Management Practices
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In variable speed limit (VSL) zones, the speed limit changes in response to traffic congestion, adverse weather, or road conditions. VSL zones are often highly automated and have been employed successfully in several U.S. and European locations. Dynamic signs display the current speed limit, adjusted according to a specific set of rules and based on data transmitted from highway sensors. Sometimes, VSL signs are paired with signs that inform drivers about road conditions or minimum speed. Ideally, approaching traffic will slow down and pass through the problem area at a slower but more consistent speed, reducing stop-and-go traffic. This also reduces the probability of an accident by giving drivers more time to react to changing road conditions and helping them avoid the need to brake sharply as they approach congestion.

A study of the VSL zone on I-4 in Orlando indicated that most traffic exceeds the speed limit more when the speed is reduced, compared to baseline posted speeds. In an effort to better understand the I-4 VSL operational system, University of Florida researchers planned to obtain drivers' perception of the I-4 VSL system, to evaluate the operations along the I-4 VSL zone, and to investigate VSL strategies having potential to improve overall operations along I-4.

First, the researchers conducted focus groups in which drivers shared experiences and perceptions of the current I-4 VSL system. Among other observations, drivers were clear that their compliance with the speed limit depended more on whether other drivers within the traffic stream obeyed the speed limit signage.

The researchers next began field studies by asking participants to drive a specially instrumented vehicle through the VSL zone. Drivers had no prior knowledge of the purpose of this task. Afterwards, they completed a questionnaire regarding their driving experience and perceptions.

Variable speed limit (VSL) signage on I-4 in Orlando.

In a second field study, speed and flow data were collected from fifty-four sensors on the I-4 corridor, with the goal of identifying bottleneck locations. Data were obtained from FDOT's STEWARD database for a nine-month period beginning in August 2010.

Aerial reconnaissance along the I-4 corridor confirmed bottleneck locations and the effects of the VSL system. Twenty hours of aerial observations were recorded. Flights were conducted during morning and evening traffic periods on several days over a period of weeks.

Finally, the researchers simulated the I-4 VSL zone using CORSIM, designing scenarios to examine changes in VSL algorithms, sign and detector locations, and the impact of driver compliance on traffic operations. The current I-4 VSL algorithm was modeled and calibrated to replicate existing operations.

Study results confirmed the FDOT impression that the current configuration of the I-4 VSL zone has not improved traffic conditions. Study findings suggested improvements to the current system, but no single VSL configuration or algorithm emerged as most beneficial. VSL zones have improved traffic flows in many locations, but additional investigation is needed to achieve optimum performance of the I-4 VSL zone.

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