

New Dynamic Signage Makes Lane Merges Smoother and Safer

Traffic research helps Michigan DOT explore technologies to positively impact driver behavior and improve traffic flow. Michigan DOT's research program strategically assesses potential new tools for managing traffic and making roads safer and less congested.

Problem

In a typical work zone that has lane closures, drivers do not merge at a single, defined point. As a result, the haphazard merging of traffic can cause sudden interruptions in traffic flow, longer delays, and the potential for accidents.

Different solutions to this problem have been tried in Michigan, across the United States, and in other countries with varying degrees of success. Each approach includes a defined merge point—either early (well in advance of the lane closure) or late (near the lane closure)—and uses static or dynamic signage.

Approach

Michigan DOT sought to demonstrate the effectiveness of a dynamic late lane merge system (DLLMS). The potential benefits were compelling:

- Late lane merging leaves usable traffic lanes open, which takes full advantage of road capacity to reduce queue lengths in freeway travel lanes.
- Dynamic signage responds to real-time changes in traffic patterns and can be automatically activated only when a merging system is needed.

This system also promises safety advantages as well, taking driver guesswork out of when to merge and thwarting aggressive driving among motorists who would otherwise drive past an early merge point.

Research

Michigan DOT undertook a field study of the DLLMS. This system's network of sensors continuously monitors traffic conditions in a construction zone. The sensors activate the DLLMS when a preset level of congestion is reached. Portable changeable message signs instruct drivers to stay in their current travel lane until reaching a specified merge point.



The DLLMS improves traffic flow and safety for vehicles merging in high-congestion work zones.

The DLLMS carefully takes into account human reaction and response factors in the frequency and complexity of the signage it uses. A typical series of activated signs display the following messages:

- Sign 1 (farthest from the taper). STOPPED TRAFFIC AHEAD / USE BOTH LANES
- Sign 2. USE BOTH LANES / STAY IN YOUR LANE
- Sign 3. TAKE YOUR TURN / MERGE HERE

At the merge point, drivers take turns in a “zipper-like” fashion, tapering from two lanes to one.

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Project Information

Report Name: *Evaluation of the Dynamic Late Lane Merge System at Freeway Construction Work Zones*

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When the DLLMS is inactive, the signs flash typical construction messages, such as DRIVE SAFELY, MERGE 2 MILES AHEAD, and 45 WHERE WORKERS PRESENT.

To measure the system's effectiveness, Michigan DOT implemented a field study of the DLLMS on three sections of roads under construction in 2006, and compared it to a construction site where the system was not in place. The comparison site used identical signage as the DLLMS displays in its "off" mode. The study measured and analyzed data such as travel time, queue length, traffic speed, and traffic volume. It also recorded work zone traffic characteristics and vehicle merge locations using digital video cameras.

Results

The analysis showed the DLLMS fulfilled its intended function by significantly improving traffic flow. Delays were reduced and average travel speeds were higher at the test sites where the system was in use. Although not demonstrable with this small-scale implementation, investigators expect a measurable reduction in traffic accidents if the DLLMS were put into practice on a larger scale.

As part of this study, researchers also determined the most appropriate implementation strategies for this technology. Benefit-cost analysis provided specific guidelines on where this application can achieve the greatest savings, such as with freeways that experience long periods of high-volume traffic. This economic analysis included the costs associated with installing and operating the DLLMS. By comparison, the study highlighted

other traffic configurations, such as in rural locations, where early lane merging may be more appropriate than late lane merging.

Finally, the study recommended that a larger implementation of the DLLMS should include a media campaign to help familiarize Michigan drivers with this type of merging system.

"This system will become even more effective in relieving construction traffic as Michigan drivers get used to late lane merging."

*Dale Spencley, P.E.
Project Manager*

Value

As a result of this study, the DLLMS is now an option for work zone safety and traffic control in Michigan. When applied appropriately, the system will not only save travel time for motorists, but will provide additional positive effects of increased traffic flow, including lowered fuel consumption and air pollution.

These benefits combine to meet Michigan DOT's mission to enhance its transportation services while maintaining and improving its infrastructure. Research helped point the way to identifying a winning transportation technology in Michigan. ■

Michigan Department of Transportation



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