

# Research Spotlight

## Project Information

**REPORT NAME:** Evaluating the Performance and Making Best Use of Passing Relief Lanes

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## Assessing the impact of passing relief lanes

Limited sight distance and heavy seasonal and commercial traffic can present challenges to motorists on rural two-lane roads in Michigan. In the 1980s, MDOT began constructing passing relief lanes to enhance safety and traffic flow on these rural roadways. This research provides insight into how well the additional passing lanes are performing and can provide guidance for future installations.



This passing relief lane installation in Mackinac County is one of 10 sites selected by researchers for collecting speed data and on-site observations of driver behavior.

### Problem

Although traffic had begun to decrease on rural two-lane roads in Michigan when this research began, concerns remain about safety and travel delays on these roadways. Occasional heavy commercial traffic, hilly terrain and spikes in seasonal or holiday travelers coupled with limited passing sight distance can all contribute to frustrated drivers attempting to pass when it cannot be done safely.

Since the 1980s, MDOT has been adding passing lanes to improve the flow of traffic and enhance the safety of rural two-lane roads. A better understanding of the safety impacts of the added passing lanes will help MDOT identify the most appropriate design and location for future installations.

*“The safety performance functions and crash modification factors developed in this project allow designers to estimate crashes using site characteristics that are specific to Michigan passing lane installations.”*

**Dean Kanitz, P.E.**  
Project Manager

## Approach

To recommend guidance for future MDOT passing relief lane installations, researchers evaluated the safety impacts of passing relief lanes in Michigan, reviewed federal guidance and best practices employed by state DOTs and other transportation agencies, and identified standard configurations and installation practices.

## Research

Researchers began by identifying the 237 passing relief lanes located throughout Michigan, selecting 10 of these sites for collection of speed data in the field and general observations of driver behavior and factors that may increase collision risk. The same 10 study sites were included in an Empirical Bayes (EB) before-and-after study that applied data from the Michigan State Police crash database to estimate crash incidence at the sites. A cross-sectional analysis of the remaining 227 sites provided further evaluation of crash incidence at passing relief locations.

The study also included 100 reference sites with characteristics that were similar to the passing relief sites but did not include the additional lanes. The reference sites were used to develop safety performance functions that represent conditions before

passing relief lane construction, taking into consideration different crash types, traffic flow and other factors.

## Results

Research results provided insight into the impact of passing relief lanes in Michigan:

- **Crash reduction.** Results of the limited EB analysis suggest that passing lanes were effective in reducing injury crashes at the passing lane sites. The small number of available sites used in the EB analysis led researchers to supplement the EB results with a cross-sectional analysis of more than 200 sites that used modeling to estimate the difference in safety of sites with and without passing lanes.

The cross-sectional analysis generated crash modification factors (CMFs) specific to passing relief lanes in Michigan. CMFs indicate the expected frequency of crashes, with a CMF of less than 1.0 indicating an expected reduction in crashes after implementing a countermeasure. Reductions were noted for all types of crashes at passing relief sites, with CMFs ranging from 0.91 for night crashes to 0.53 for crashes in dry conditions.

- **Level of service.** Researchers observed operations one mile upstream and downstream of the passing relief lane, at the entrance and end of the lane, and midway through the lane in one-hour increments to determine the level of service—or the ease of traffic flow—at the 10 observation sites.

No conflicts were found during the observation periods, and results of the speed study indicated that drivers were not behaving recklessly or excessively and unsafely exceeding posted speed limits. All 10 sites received the highest rating for level of service, indicating free-flowing operations. Researchers noted that observations were conducted during non-peak times. An evaluation conducted during periods of peak volumes may generate different results.

- **Installation guidance.** Results of the literature review, which yielded best practices used by other agencies to design, locate and install signage for passing relief lanes, can provide guidance in updating the passing relief lanes section of MDOT’s *Road Design Manual*.

## Value

This project quantified the safety benefits of passing relief lanes on rural two-lane roads in Michigan, identifying reductions for all types of crashes and a high level of service at study sites. These results along with the best practices used by other agencies are under consideration by MDOT and have the potential to contribute to a revised set of guidelines for designing and installing passing relief lanes in Michigan.

## Research Administration

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### This final report is available online at

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