



TECHNICAL SUMMARY

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PROJECT COST:

\$149,659



Drivers reduced speed earlier and to a greater extent at rural intersections with rumble strips.



RESEARCH
SERVICES SECTION

The Effect of Rumble Strips on Drivers Approaching Rural, Stop-Controlled Intersections

What Was the Need?

A common cause of traffic accidents at low-volume rural intersections is the failure of drivers on secondary roads to obey stop signs. To mitigate this problem, highway agencies frequently install in-lane rumble strips in advance of intersections on secondary roads. Rumble strips—rough-textured portions of the road surface meant to alert drivers by causing noise and vibrations—are often used to supplement devices such as “Stop Ahead” signs to alert drivers of intersections and traffic controls. A recent survey by SRF Consulting Engineers revealed that nearly 60 Minnesota counties have installed in-lane rumble strips on county routes.

While in-lane rumble strips are generally thought to reduce intersection crashes, there is little research to validate their effectiveness, and they are not listed in the [Manual on Uniform Traffic Control Devices](#). County engineers needed research to confirm the utility of including rumble strips at problem intersections. The Local Road Research Board consequently sponsored a series of three studies designed to provide a comprehensive assessment of the effectiveness of in-lane rumble strips. The first two studies, completed in [2001](#) and [2005](#), used laboratory simulations of rural intersections to evaluate the effect of in-lane rumble strips on drivers’ stopping behavior.

What Was Our Goal?

The objective of this project was to build on and validate the results of the previous two studies by conducting field research to identify the real-world effects of full-width, in-lane rumble strips on drivers approaching rural intersections. A key goal was to identify characteristics common to intersections at which rumble strips are beneficial, including those related to visibility, or how well drivers on a secondary road approaching an intersection can see cross traffic on the major road, and roadway design, or the horizontal and vertical curvature of the secondary approach.

What Did We Do?

With the help of county engineers across Minnesota, researchers identified 151 intersections in 16 counties as good candidates for investigation. Based on field visits, researchers then selected 10 intersections that provided a good cross section of visibility, roadway design characteristics and rumble strip use. Next, they divided this sample into five pairs of intersections with similar secondary approach design characteristics; one within each pair employed rumble strips and one did not.

Researchers then used a radar gun and a laser rangefinder to document vehicle speeds on secondary approaches, taking measurements at 19 different distances from each intersection, with the longest at 1,700 feet. Speed data were collected for more than 400 vehicles. Researchers also identified targeted vehicles as belonging to one of three types: passenger car, SUV/pickup truck/van or commercial vehicle/heavy truck.

What Did We Learn?

Results confirmed the findings of the preceding studies, which showed that drivers reduce speeds earlier and to a greater degree when they encounter rumble strips. In the present study, drivers crossing rumble strips proceeded at an average of 2 to 5 mph slower than drivers who did not cross rumble strips, with variations depending on

“This study provides counties with some justification for implementing in-lane rumble strips as well as useful information for formulating rumble strip policies.”

—Brad Wentz,
Becker County Engineer

“This research clearly shows that rumble strips make a difference in the stopping behavior of drivers approaching intersections.”

—Kathleen Harder,
Senior Research Associate, University of Minnesota Center for Human Factors Systems Research and Design

Produced by CTC & Associates for:

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Researchers investigated the slow-down effect of full-width, in-lane rumble strips at Minnesota intersections like this one in Rock County, which features rumble strips, trees obscuring traffic on the main road and a visible warning sign.

vehicle type, visibility and the design of the intersection approach. This improves safety, as drivers have more time to respond to an unexpected event such as a slippery road surface. Further, drivers traveling at excessive speeds were more likely to slow down earlier on approaches with rumble strips than on those without.

Rumble strips had the greatest effect on approaches in which a driver’s view of cross traffic on the major road was obscured on one or both sides by buildings or vegetation; out of the 274 intersection approaches visited, 54 percent were obscured on at least one side, with 33 percent obscured on both. Researchers concluded that rumble strips will have the greatest benefit when installed on intersections with these types of approaches, and will be less useful on approaches that provide drivers with a clear view of cross traffic in both directions.

Together, the three studies provide compelling evidence that in-lane rumble strips promote safer stopping behavior on approaches to stop-controlled intersections. The investigators warned, however, that rumble strips are often ineffective on snow-covered roads, and that they do not actually force drivers to stop or help them judge gaps in traffic, so they need to be part of a comprehensive accident-prevention strategy.

What’s Next?

Researchers expect the results of this study to be used by county engineers across Minnesota to help guide the development of policies for implementing in-lane rumble strips in the most beneficial way.

This Technical Summary pertains to the LRRB-produced Report 2006-42, “Stopping Behavior at Real-World Stop-Controlled Intersections with and without In-Lane Rumble Strips,” published November 2006. The full report can be accessed at <http://www.lrrb.org/PDF/200642.pdf>.

The previous studies referred to above were documented in the LRRB-produced reports 2002-11, “The Effects of In-Lane Rumble Strips on the Stopping Behavior of Attentive Drivers,” and 2005-16, “The Effects of In-Lane Rumble Strips on the Stopping Behavior of Sleep-Deprived Drivers,” published October 2001 and March 2005, respectively. These reports can be accessed at <http://www.lrrb.org/PDF/200211.pdf> and <http://www.lrrb.org/PDF/200516.pdf>.