



RESEARCH SERVICES SECTION

TECHNICAL SUMMARY

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PROJECT COST:

\$0



Grinding machines in Minnesota use specially designed cutting teeth to mill rumble strips, creating both sides in a single pass.

Safety Effects of Centerline Rumble Strips in Minnesota

What Was the Need?

Government transportation agencies must continually look for ways to improve safety and reduce the number of accidents on roadways. Minnesota's numerous rural two-lane roadways require particular attention, as these roads generally have only a 12-inch-wide centerline separating opposing traffic, making them vulnerable to vehicles crossing into the opposing lane and crashing into an oncoming vehicle head-on or sideswiping it.

These crashes are the most severe types of crashes both in terms of injuries and costs, and they account for 25 percent of all crashes on Minnesota rural two-lane roads, while accounting for only 11 percent of crashes statewide.

Rumble strips in the centerline (grooves in pavement that, when driven on, produce an audible "rumble" and vehicle vibration) provide a potential low-cost way of reducing these crashes. Shoulder rumble strips have been used for years to reduce the number of run-off-the-road crashes. Centerline rumble strips are gaining momentum nationally and internationally as an effective countermeasure for centerline crashes. These strips alert drivers that they have begun to cross over into oncoming lanes of traffic.

What Was Our Goal?

The objectives of this research were to examine the relationship between centerline rumble strips and traffic safety on rural roads, and to recommend best practices for using these strips.

Given the extremely severe nature of centerline-crossing crashes and their overrepresentation on rural two-lane roads, targeting these crashes for reduction by using centerline rumble strips presents an excellent opportunity to help save lives in Minnesota.

What Did We Do?

Researchers examined crash statistics from 203 miles of Minnesota rural roadways from Mn/DOT's Office of Traffic, Safety and Technology, including such resources as video surveillance data from District 3, where most centerline rumble strips in Minnesota are concentrated. To determine the effect of these strips on accident reduction, investigators considered variables such as vehicle speed, lateral placement of vehicles on tangent sections and centerline encroachment. This information was used for two types of analysis:

- **Before-After Crash Analysis:** This method simply counted the total number of crashes in the predefined period "before centerline rumble strips" and compared it to the total number of crashes in the period "after centerline rumble strips."
- **Cross Section Analysis:** A cross-sectional study compared safety performance of similar roadways during the same years, with a treatment group that contained roadways with centerline rumble strips measured against a control group that did not.

What Did We Learn?

In the before-after analysis, the presence of strips had a profound effect on centerline encroachments and crossings; reductions in encroachments ranged from 40 percent to 76 percent. There were fewer encroachments on horizontal curves; neither did vehicles drive closer to the shoulder. The number of centerline-crossing crashes was reduced, though the number of crashes central to this study (where opposite-traveling vehicles crash head on or sideswipe, or a car goes off the left side of the road) showed no improvement. The overall crash rate increased slightly (as more vehicles were reduced. Though the overall crash rate increased slightly (as more vehicles were added

“In these tight budget times, justifying extra cost is tough. But the relationship between centerline rumble strips and accident reduction is clear. And the benefits are simple: saving lives.”

–Marc Briese, Traffic Engineer, City of Woodbury

“Because Marc Briese conducted this study as the Capstone project for his infrastructure systems engineering degree, there was no cost to Mn/DOT in acquiring this valuable research.”

–Sue Lodahl, Director, Mn/DOT Research Services Section

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After grinding is complete, a street sweeper removes debris from the road. A finished stretch of road, complete with centerline rumble strip, is shown here.

to the roads over the time period), but the severity of crashes decreased slightly.

In the cross section analysis, the treatment group (with strips) experienced a 73 percent lower rate of fatal and very severe crashes, a 42 percent lower crash rate overall, a 37 percent lower crash severity rate and a 19 percent reduction in crash density (the number of crashes per mile).

Overall, the results show that roads with centerline rumble strips exhibit better safety characteristics than roads without these strips. At \$1,000 per mile, centerline rumble strips offer a cost-effective way to increase safety on rural two-lane state and county roads.

What's Next?

To systematically implement centerline rumble strips, Mn/DOT needs to promote the strips' safety benefits (to secure funding) and define best practices in their use. Mn/DOT's Safety unit is currently working on research to update and verify this project's findings with a more extensive literature review and analysis of a larger pool of crash data from multiple states.

Preliminary recommendations on the use of centerline rumble strips given in the report include:

- Developing a policy for installing the strips with a phased, statewide implementation strategy based on data such as existing crash characteristics, average daily traffic or future construction plans
- Standardizing guidance on strip design and placement, where locations receiving the strips have them installed continuously and not just in no-passing zones
- Defining possible treatments to the strips to increase the longevity of the centerline pavement, including fog sealing or spraying with a black epoxy