Shoulder Rumble Strips

**Problem: Roadway departures account for more than half of all roadway fatalities.**

Roadway departure fatalities, which include run-off-the-road (ROR) and head-on fatalities, are a serious problem in the United States. In 2003, there were 25,562 roadway departure fatalities, accounting for 55 percent of all roadway fatalities in the United States. That same year, more than 16,700 people died in ROR crashes (39 percent of all roadway fatalities). In 2008, 304 people were killed in non-interstate roadway departure crashes in New York State.

**Why are there so many roadway departure crashes?**

70 percent of ROR fatalities occur on rural highways, and about 90 percent occur on two-lane roads. Rural highways usually are not as well lit as urban roadways. Inclement weather such as fog, snow, smoke, or dust storms also can decrease the visibility of pavement markings. In these conditions, drivers may drive off the road.

**Potential Solution: Rumble strips are a proven, cost-effective way to help prevent roadway departure crashes.**

Shoulder rumble strips have been proven to be a very effective method to warn drivers that they are about to drive off the road. Many studies show very high benefit-to-cost (B/C) ratios for shoulder rumble strips, making them among the most cost-effective safety features available. For example, Nevada found that with a B/C ratio ranging from more than 30:1 to more than 60:1. At approximately $0.30 per foot, rumble strips are more cost effective than many other safety features, including guardrails, culvert-end treatments, and slope flattening.

NYSDOT began experimental use of shoulder rumble strips in 1978 and made them a common feature on access-controlled highways starting in 1995. As anticipated, rumble strips produced significant reductions in freeway run-off-the-road injuries and fatalities, averaging around a 60% reduction in New York State. A New York study showed a significant change in the number of ROR crashes, injuries, and fatalities after rumble strips were installed on the New York State Thruway. ROR crashes were reduced 88 percent, from a high of 588 crashes in 1993 to 74 in 1997. Total crashes were reduced 87 percent, from a 1992 high of 407 crashes to 54 in 1997. Fatalities were reduced 95 percent, from 17 in 1991 and 1992 to 1 fatality in 1997. While other states also showed positive results, New York’s results were better than most.

Transportation Research Board NCHRP Report 641, “Guidance for the Design and Application of Shoulder and Centerline Rumble Strips,” summarized the accident reduction experience of three states, Minnesota, Missouri, and Pennsylvania, where significant amounts of shoulder rumble strips had been placed, including rural two-lane roads, and where accident records were sufficient to distinguish trends. The results varied widely but the researchers concluded that the average safety effects of installing milled shoulder rumble strips on rural two-lane roads were estimated to be a 29-percent reduction in single vehicle run-off-road fatal and injury crashes. The average safety effects of installing milled shoulder rumble strips on rural multi-lane divided highways were estimated to be a 51-percent reduction in single vehicle run-off-road fatal and injury crashes. The report also looked at some of the potential hazards of using rumble strips on local roads, and found no link between the use of rumble strips on rural roads and an increase in bicycle crashes.
**Summaries from Various Studies:**

**FHWA’s Technical Advisory T 5040.35, dated December 2001 states:**

“There are a significant number of run-off-road crashes on non-freeway facilities such as rural multi-lane and two-lane roadways. Therefore, the FHWA recommends that shoulder rumble strips be used on those roadways for which an engineering study or crash analysis suggests that the number of these crashes would likely be reduced by the presence of rumble strips.

The FHWA fully supports the following statement from the 1999 American Association of State Highway and Transportation Officials (AASHTO) Guide for the Development of Bicycle Facilities:

‘Rumble strips or raised pavement markers are not recommended where shoulders are used by bicyclists unless there is a minimum clear path of 0.3 m (1 foot) from the rumble strip to the traveled way, 1.2 m (4 feet) from the rumble strip to the outside edge of paved shoulder, or 1.5 m (5 feet) to adjacent guardrail, curb or other obstacle.”


This study carried out tests on the effects of milled rumble strips on bicyclists, using two different configurations of milled rumble strips with different riders and several types of bicycles. None of the bicyclists reported any loss of control. Bicyclists reported that riding the rumble strips was annoying, but the study concluded that bicyclists are not faced with dangerous conditions if they mistakenly enter into a rumble strip area. The study also found that rumble strips were essential to ensure bicyclists’ safety, as they tend to alert the motorist before they infringe onto the vehicle part of the shoulder.

**The 1999 AASHTO “Guide for the Development of Bicycle Facilities” states:**

“Rumble strips or raised pavement markers, where installed to discourage or warn motorists they are driving on the shoulder, are not recommended where shoulders are used by bicyclists unless there is a minimum clear path of 0.3 m (1 foot) from the rumble strip to the traveled way, 1.2 m (4 feet) from the rumble strip to the outside edge of paved shoulder, or 1.5 m (5 feet) to adjacent guardrail, curb or other obstacle. If existing conditions preclude achieving the minimum desirable clearance, the width of the rumble strip may be decreased or other appropriate alternative solutions should be considered.”

**FHWA’s July, 10 2008 memo “Consideration and Implementation of Proven Safety Countermeasures” states:**

“The Office of Safety believes that widespread implementation of these safety countermeasures can serve to accelerate the achievement of local, State and national safety goals.”

The list of guidance documents included Rumble Strips and Rumble Stripes. The FHWA Guidance on Rumble Strips and Rumble Stripes states:

“Continuous shoulder rumble strips (CSRS) can be applied on many miles of rural roads in a cost-effective manner.”

http://safety.fhwa.dot.gov/roadway_dept/pavement/rumble_strips/resources/memo_rumstripso71008.cfm

**Due to the potential for significantly improved safety for all highway users, NYSDOT is developing a draft policy on the limited installation of shoulder rumble strips on secondary highways.**

NYSDOT is evaluating the benefits of installing shoulder rumble strips where there is a high risk of severe run-off-the-road crashes, by reviewing research and the experiences from other states and FHWA. In addition to improving motorist safety, there is an expectation that there will be some decrease in the incidence of drivers wandering onto shoulders and striking pedestrians and bicyclists.

Draft criteria limits the installation of shoulder rumble strips to rural, non-freeway highways; with speed limits of 45 MPH and greater; and shoulders 5’ and wider. They would also be strongly considered at any locations with a high number of run-off-road accidents. This criteria would limit the installation to approximately 7% or 8,000 miles of New York State’s total 114,481 miles of highways.

**The current draft design guidance for rumble strips on secondary highways differs substantially from freeway rumble strips, to avoid adverse impacts to bicyclists, as follows:**

<table>
<thead>
<tr>
<th>Feature</th>
<th>Freeway</th>
<th>Secondary Roads - Option A</th>
<th>Secondary Roads - Option B</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gaps for Bicyclists</td>
<td>Not Applicable</td>
<td>None</td>
<td>10’ gap every 60’</td>
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<tr>
<td>Groove Depth</td>
<td>1/2”, 5/8” max</td>
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<td>1/2’ max</td>
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<tr>
<td>Spacing between Grooves</td>
<td>12”</td>
<td>18”</td>
<td>12”</td>
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<tr>
<td>Width of Groove</td>
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<tr>
<td>Offset from Edge Line</td>
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<td>2”</td>
<td>2”</td>
</tr>
<tr>
<td>Remaining Shoulder for Bikes</td>
<td>N/A</td>
<td>4’ min, 5’ min w/ curb or barrier</td>
<td>4’ min, 5’ min w/ curb or barrier</td>
</tr>
</tbody>
</table>