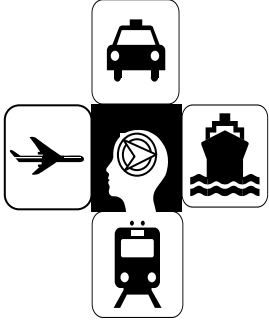


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## Tech Brief

### Shoulder Rumble Strips and Bicyclists

FHWA-NJ-2002-020

June, 2007



#### SUMMARY

The objectives of the work performed under Task Order NCTIP-38, Project 2000-01, Shoulder Rumble Strips (SRS) and Bicycles were to:

- To develop a comprehensive report covering the design, installation and costs of shoulder rumble strips, identifying the impacts of these rumble strips on bicyclists;
- To develop recommended policies and guidelines for implementing shoulder rumble strips so that they are compatible with bicyclists and beneficial to motorists as well; and
- To identify the most bicycle-friendly rumble configurations.

The tasks to be performed to achieve these objectives include:

Task 1. Perform a literature review.

Task 2. Survey the Shoulder Rumble Strips (SRS) policies and practices of State Departments of Transportation, including detailed descriptions of rumble strip designs, shoulder widths, the placement of the rumble strips within the shoulder, how rumble strips are installed, installation cost, installation

location policies, and the experience and opinion of bike coordinators and local cyclists.

- Task 3. Prepare an NCHRP first and second stage problem statement, a request for a pooled fund study and/or write a Request for Proposal (RFP) using Research's RFP format that is based upon Tasks 1 and 2.

## **INTRODUCTION/BACKGROUND**

Shoulder rumble strips (SRS) have been implemented by many highway agencies and State Departments of Transportation (DOTs) across the United States. Introduced in the early 1950s, shoulder rumble strips have been extensively used as a countermeasure to single-vehicle run-off-the-road (ROR) accidents on freeways caused by driver inattention. Placed in the shoulder of a roadway, SRS provide motorists with both audible and tactile warning that the vehicle has left the roadway.

Shoulder rumble strips have primarily been used on limited access roadways. The effectiveness of this treatment, however, has led to the consideration of using shoulder rumble strips for implementation on non-freeway roadways. There are concerns, however, that shoulder rumble strips may pose safety concerns to bicyclists using the shoulder as a bicycle path. Of concern is the potential for loss of control if the bicyclist strikes a rumble strip. Although rumble strips are installed in only about half of the paved shoulder width, the area between the rumble strip and the outside edge of the shoulder is often littered with debris making it unusable for bicyclists. As a result, there is concern that rumble strips encourage bicyclists to ride in the traveled way of a roadway. Some have claimed that shoulder rumble strips may pose maneuverability problems for bicyclists who claim discomfort and loss of control of the bicycle as a result of riding over the rumble strips. As a result, several research projects have been initiated to develop policies and configurations of rumble strips that can meet the requirements of the motorists without affecting bicyclists' safety.

## **RESEARCH APPROACH**

The research approach included two primary tasks: a literature review and a survey of SRS policies and practices of State Departments of Transportation. The literature review investigated several areas including: the design and placement of shoulder rumble strips and State design guidelines.

The Design and Placement of Shoulder Rumble Strip review provided background on design and placement of shoulder rumble strips. The various types of shoulder rumble strips are identified including the noise and vibration levels of these rumble strip designs. A crash analysis of run-off-road accidents in New Jersey is also provided along with a discussion of bicycle safety issues.

A review of surveys performed to obtain State policies on the design and placement of shoulder rumble strips was also performed. A survey of State Departments of Transportation was conducted in this research to determine current design practices and bicycle policies related to the placement of shoulder rumble strips. The survey was administered through email, with follow-up telephone calls made to agencies not responding to the email messages. Responses were received from 40 States. A total of seven questions were asked including the following:

- What types of shoulder rumble strips does your State use?
- What are the specifications for these rumble strips?
- What is your state's policy on the placement of shoulder rumble strips?
- On what types of roadways and shoulders are they used?
- What is the offset of the rumble strip from the travel lane?
- What guidelines does your State follow to mitigate the impact of shoulder rumble strips on bicyclists?
- Are special designs of the shoulder rumble strip used?

Finally, conclusions and recommendations are provided including a description of what was found to be the most bicycle-friendly rumble strips and recommendations for consideration on the use of shoulder rumble strips in New Jersey.

## **FINDINGS**

There are four primary types of rumble strips: milled, rolled, formed or corrugated, and raised. Milled rumble strips are currently the most commonly used type of rumble strip among various highway agencies. FHWA, in their review of state practices, found that in order to provide more clear area in the shoulder for use by bicycles, some states have installed milled-in shoulder rumble strips 300 mm (12 in) in the direction perpendicular to the travel lane instead of the usual 400 mm (16 in). This was considered the minimum width as any smaller width may allow the tires of vehicles, especially for large trucks, to bridge the indentation and reduce the vibration level of the rumble strip.

In most cases, shoulder rumble strips are continuous for the length of the roadway and section where it is implemented. Shoulder rumble strips have also been placed intermittently in the shoulder using a gap pattern. Arizona is one State that recommends that shoulder rumble strips on all non-controlled access highways include periodic gaps of 3.6m (12 in) in length. The gaps are placed at periodic intervals of spacing of 12.19m (40 in) or 18.29m (60 in). These gaps were provided as a solution to reduce the discomfort of bicyclists associated with crossing continuous shoulder rumble strips.

Several policies have been identified on the use of shoulder rumble strips to minimize the impact to bicyclists. In general, the guidelines do not recommend the use of rumble strips on routes where bicyclists are permitted, while other guidelines have

suggested remedial measures to reduce the adverse effect of rumble strips on the bicyclists. These remedial measures include:

- Installing shoulder rumble strips as close to the pavement edge as the specifications can allow;
- Designing narrower rumble strips in order to provide the bicyclists adequate space to ride; and
- Installing rumble strips only on shoulders wide enough to provide sufficient space for the bicyclists to ride.

## **RECOMMENDATIONS**

Based on this study the follow strategies have been identified as holding potential for accommodating bicycles and rumble strips:

1. Minimum shoulder width to accommodate rumble strips. Do not use rumble strips if the shoulder width is less than 8 feet.
2. Widen the shoulder to provide at least a 4 foot continuous riding surface (Florida).
3. Provide an offset of 1.2 m (4 feet) from edge of shoulder for bicycles and motorcycles (Hawaii).
4. Moving the rumble strip as close to the travel lane as possible (Minnesota)
5. Use of continuous rumble strips only on limited access facilities.
6. Use periodic gaps in the rumble strip on non-controlled access highways. Gaps of 12 in every 40 to 60 inches of rumble strips used in Arizona. Use of skip pattern on multilane rural highways with a speed limit greater than 50 mph (Georgia).
7. Not allowing bicycles on roadways where shoulder rumble strips are installed. (Connecticut)
8. Not allowing rumble strips on roadways used by bicyclists. (Maine)
9. Reducing the width of the rumble strip from 2 feet to 1 foot (Kentucky).
10. Requiring approval of the Pedestrian/Bicycle Coordinator if rumble strip is to be installed on a shoulder width less than 8 feet.

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A final report is available online at <http://www.state.nj.us/transportation/research/research.html>

If you would like a copy of the full report, please FAX the NJDOT, Division of Research and Technology, Technology Transfer Group at (609) 530-3722 or send an e-mail to [Research.Division@dot.state.nj.us](mailto:Research.Division@dot.state.nj.us) and ask for:

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