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Rumble Strips: In National Highways

Varun Meshram¹, Varun Khandagale¹, Nilza Angmo¹, Hindola Saha²

U.G. Students, Department of Civil Engineering, D.Y.Patil School of Engineering and Technology, Lohegaon, Maharashtra, India¹

Associate Professor, Department of Civil Engineering, D.Y.Patil School of Engineering and Technology, Lohegaon, India²

ABSTRACT: Rumble strips are an effective countermeasure to keep vehicles on the roadway and reduce the frequency of crashes. Drivers are alerted by the noise and vibration within the vehicle cabin caused by the uneven rumble strip surface. We examined the use of rumble strips on a national highway as a measure against head-on collisions. The rumble strips were installed on a test track before installation on a road in service. Studies were conducted on the necessary construction machinery, the construction methods, and the effects of installation on a road in service. In addition, we examined the use of rumble strips as a measure against run-off-the-road accidents. The strips were found to be less costly, and easier to install and maintain than traditional measures against head-on collisions. They were found to be safer for motorcycles than are centre poles and chatter bars, and effective in reducing head-on collisions.

KEYWORDS: Rumble Strips, Traffic Accident Countermeasure, Run-off-the-Road, Head-on Collision.

I.INTRODUCTION

Rumble strips (also known as **sleeper lines** or **alert strips**) are a road safety feature to alert inattentive drivers of potential danger, by causing a tactile vibration and audible rumbling transmitted through the wheels into the vehicle interior. A rumble strip is applied along the direction of travel following an edge line or centreline, to alert drivers when they drift from their lane. Rumble strips may also be installed in a series across the direction of travel, to warn drivers of a stop or slow down ahead, or of an approaching danger spot.

In favourable circumstances, rumble strips are effective (and cost-effective) at reducing accidents due to inattention. The effectiveness of shoulder rumble strips is largely dependent on a wide and stable road shoulder for a recovery, but there are several other less obvious factors that engineers consider during design.

What are rumble strips?

Rumble strips are texture added to a road centreline or shoulder that are meant to alert an unfocused, inattentive, or fatigued driver that their vehicle is about to leave the travelled lane (Figure 1). Rumble strips have proven to be cost-effective for reducing the frequency of collisions and state departments of transportation and local agencies are expanding their use of centreline and shoulder rumble strips, particularly on undivided rural highways.



Fig 1: Image of milled centreline rumble strip (CLRS)

Rumble strips are typically ground into the roadway along the centreline alignment or either just outside or directly beneath the outside lane fog line (Figure 2). Various construction methods and materials can be used and include button, rolled, formed and profiled rumbles strips, but ground or milled rumble strips are the most commonly used (Federal Highway Administration, 2011). Their popularity is partly due to ground and milled rumble strips being the only design proven to generate sufficient noise and vibration for commercial vehicles (Finlay and Miles, 2007).



Fig 2: Grinding CLRS

II. RELATED WORK

- Rumble strip installation costs are low.
- There is no noticeable degradation of pavement due to rumble strips.
- Rumble strips require little or no maintenance.
- Milled rumble strips can be installed on new or existing pavements. Rumble strips are effective in snow and icy conditions and may act as a guide in inclement weather for truck drivers.
- Rumble strips are easily and comfortably traversed by bicyclists.

There is flexibility in the placement of rumble strips on the roadway shoulder depending upon the roadway environment and traffic.

Although there is a concern about the noise, bicyclist concerns, and potentially the migration in crashes, there is a proven noticeable positive effect that continuous shoulder rumble strips are having on the roadways where they are installed. The number of crashes, injuries, and fatalities has been greatly reduced on roadways equipped with continuous shoulder rumble strips. Efforts need to be made to educate the public on the advantages of continuous shoulder rumble strips and the dangers of driving while drowsy. Also, alternate designs or compromises with concerned parties should be considered (for example, nearby residences) so that continuous shoulder rumble strips can continue to save lives and prevent crashes. The benefit-cost ratio reveals that continuous shoulder rumble strips are inexpensive to install as compared to the benefits that they produce.

III. METHODOLOGY

In this Case Studie an attempt would be made to the use of modern technological innovations like the rumble strip on the Mumbai-Pune expressway can help reduce accidents, diminish fatalities and also stimulate national growth. It will not only reduce the impact of collision. Considering the diverse terrain of the expressway, there can be several solutions to address the problem. The work described in this report builds on an internal report of a previous investigation about the external noise characteristics of rumble strip designs that utilize the traditional milling method, varying physical characteristics such as depth, width, and length. Among the findings was an indication of the potential for lower noise with shallower milling designs with less width. The current work also references recent work by Minnesota DOT and others about the “sinusoidal” designs that are promising in reducing external noise. The primary objective in this research was an evaluation of one sinusoidal and three traditional rumble strip designs that are promising based on previous findings in their potential for reducing external noise due to incidental contact, while maintaining their ability to alert the driver.



Fig3: Milled Rumble Strip side of the road

IV. EXPERIMENTAL RESULTS

There are significant accident reduction benefits associated with some rumble strip applications. Most of the literature on rumble strips addresses the benefits associated with shoulder rumble strips. There are few comprehensive studies that highlight statistically significant results for the use of rumble strips in the travel lane. As a result, this report will focus on the benefits associated with the use of rumble strips at centrelines and edge lines.

Increased Driver Awareness and Reduction of Accidents

Run-off-road crashes occur when fatigued or inattentive drivers, who are either tired or not paying attention, drive off the shoulder into the ditch or hit an object alongside the road. Many head-on crashes occur when drivers are drowsy and cross the centreline into oncoming traffic. Nationally, run-off-road crashes account for approximately one-third of all traffic-related fatalities and two-thirds of rural area fatalities. Edge line and centreline rumble strips have proven very effective in warning drivers that they are leaving the road or are crossing over into oncoming traffic.

Numerous states have installed rumble strips on edge lines on freeways and highways. Reports from the states vary somewhat, but it is estimated that the use of rumble strips has reduced runoff-road crashes from anywhere between 20 and 72 percent. Listed below are the states that have used rumble strips on the edge line/shoulder with the results of their efforts.

Positive Benefit-Cost Ratio

While the cost of rumble strips can vary by type and installation, they have been shown to be an economical way to significantly reduce crashes. Rumble strips can cost very little if they are rolled in during a construction or reconstruction project. When done this way, all that is needed is the roller with the attached pipe. Milled strips, however, are more expensive. They can range in price from Rs9.64 to Rs25.96 per linear foot, depending upon the number of miles that are milled.

V. CONCLUSION

Rumble strips are an inexpensive way of mitigating head-on collisions, and they cost nothing to maintain. There are fewer constraints on their installation than for conventional measures. They are much safer for motorcyclists than are centre poles and chatter bars. The facility can be installed continuously on a long section, which can provide greater accident reduction.

In the past, even after a head-on collision or run-off-the-road accident on a certain section of a two-lane road, it was often difficult to take decisive countermeasures using conventional methods because of the constraints of cost and/or roadside environment. Rumble strips are a possible solution for such sections.

Issues that need to be addressed are the noise produced in relation to the proximity of residences, and the concern for roadways that allow bicyclists. Additionally, the more roadways equipped with continuous shoulder rumble strips, the less



of a concern for crash migration on surrounding roadways. Barriers need to be broken to allow areas to introduce continuous shoulder rumble strips without hesitation. Continuous shoulder rumble strips can be a benefit for roadway safety; they are a low-cost effective method of reducing crashes and saving lives.

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