

# Technical Brief: Rumble Strips

Rumble strips are installed as a low-cost safety countermeasure that can reduce vehicle roadway departures and cross-center line crashes. The purpose of rumble strips is to alert inattentive or drowsy motorists whose vehicles are beginning to drift out of the travel lane. The noise and vibration caused by the tires passing over the strips alerts drivers and provides both an auditory and tactile warning to correct their steering. Rumble strips can be used in a variety of locations but are most often used on center line of two-lane roads, on the shoulders, or perpendicular to the travel lane.

As roadway departure crashes account for more than half of the fatal roadway crashes annually in the United States, rumble strips are one of the most effective ways to combat drowsy and distracted driving. Further still, two third of these fatal crashes occur in rural areas. Since rumble strips are placed as a countermeasure for driver error, rather than roadway deficiencies they can be tailored to meet the needs of the crashes experienced at a certain area. They are most effective when deployed in a systemic application since driver error may occur on all roads.

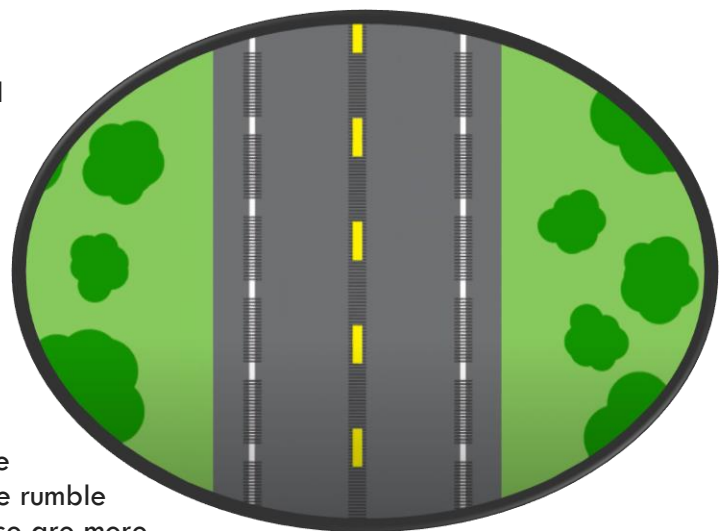
Statistics show there is a significant reduction in crashes in areas where rumble strips are installed. Rural two-lane roads have seen a reduction of 45% crashes, and urban two-lane roads a reduction of 64% of total crashes. Rumble strips have also shown a reduction of 20% of roadway departure crashes on rural freeways, one of the leading causes of death in those corridors. Across the board this technology has shown benefits in improved lane positioning, the reduction of corner cutting, and decreased centerline encroachments.

## What types of Rumble Strips exist?

**Center line rumble strips** are an effective countermeasure to reduce head-on collisions and opposite-direction sideswipes (often referred to as cross-over or cross-center line crashes). Center line rumble strips are primarily used to warn drivers whose vehicles are crossing center lines of two-lane, two-way roads.

**Shoulder rumble strips** are an effective means of reducing run-off-the-road crashes. They are primarily used to warn drivers when they have drifted from their lane. **Edge line rumble strips** are a variation on shoulder rumble strips and place the pavement marking within the rumble strip, improving the visibility of the marking. These are more commonly used on roads with narrow shoulders.

**Transverse rumble strips** are used to alert drivers of a need to slow down or stop, or to other upcoming changes that may not be anticipated by an inattentive driver. These rumble strips are placed in the travel lane perpendicular to the direction of travel. Typical locations for these rumble strips are on approaches to intersections, toll plazas, horizontal curves, and work zones.



## How are Rumble Strips installed?

There are two versions of rumble strips that can be used; milled and paved. Milled rumble strips are created by a machine with a rotary head, created grooves in the pavement. The tires will pass over the strip, drop into the groove, causing noise and vibration. Raised rumble strips are usually 2-12 inch wide rounded or rectangular markers that adhere to existing pavements. Because they are raised above ground to a height of about 1/2 inches, their use is generally restricted to warmer climates that don't require snow removal. Also, because they are usually installed with epoxy, they are more prone to wear or displacement than milled rumble strips. Due to their versatility, cost, and durability, milled rumble strips are becoming the industry standard.

## Can all road users be accommodated?

Whenever designing and installing rumble strips, the safe accommodation of all road users must be considered. As they are primarily intended as a safety device for passenger vehicles, agencies must ensure that their use does not interfere with cyclist and truck traffic. Depending on the location, bicyclists are often most impacted by edge line rumble strips.

However, there are many options to accommodate bicycle users, name adjusting the dimensions, locations, and offset of the rumble strips. The most common design medication is increasing the offset, which enlarges the usable shoulder space for the cyclist. Many states use of gap pattern so cyclists can move between the shoulder and travel lane every 40-60 feet, so that cyclists are not "trapped" on one side of the strips. Similarly, the rumble strips themselves can be designed to be smaller from the typical 12-16 inches to 8 inches, to give them more space. While reducing the dimensions of the of the strip reduces its safety effectiveness for drivers, it some locations with heavy cyclist traffic it may be a useful tradeoff, as having the danger would actually be increased by forcing cyclist and motorists to negotiate a tighter space.



## How do maintenance and weather affect the rumble strips?

During inclement weather, rumble strips actually improve driver recognition of the centerline or edgeline by extending and enhancing line visibility. Even in snowy conditions, the rumble pattern is still audible and can possibly be seen in the snow. This allows the driver to see their travel lane in difficult conditions. Milled rumble strips are resistance to freeze/thaw cycles, so there is little worry of water or snow ponding inside the rumbles, and snow plows can safely pass over milled strips.

While there were initially concerns about how the installation of milled rumble strips may shorten pavement life, numerous studies have been conducted by State DOT's around the country that have found little if any effect on the rate of pavement deterioration. Milled rumble strips typically require little to no maintenance. Some agencies have used asphalt fog seals where rumble strips are milled into joints; however, most States do not perform any preventative maintenance treatments on their rumble strips.



## Further Resources

FHWA's website currently hosts a clearinghouse on rumble strips with information on safety, maintenance, and encouraging rumble strip adoption on the local level. You can also find numerous reports highlighting the benefits of rumble strips in real life test cases from around the world. Check out the website at

[https://safety.fhwa.dot.gov/roadway\\_dept/pavement/rumble\\_strips/](https://safety.fhwa.dot.gov/roadway_dept/pavement/rumble_strips/)

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