



## Podcast 12:

### Wake Up! Using Temporary Rumble Strips in Work Zones to Improve Driver Alertness

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Hello and welcome to the American Traffic Safety Services Association's Work Zone Safety podcast series. This podcast is based on work supported by the Federal Highway Administration under the 2011 Work Zone Safety Grant. This podcast will focus on raising practitioners' awareness of how to properly deploy portable rumble strips in the vicinity of a work zone to alert distracted drivers to the presence of a work zone and to reduce speeds through the work area.

Today's podcast is a companion to the guidance document entitled *Guidance for the Use of Temporary Rumble Strips in Work Zones*. This resource, and many other products developed under the FHWA Work Zone Safety Grant, is available at [workzonesafety.org](http://workzonesafety.org).

This podcast will run for about 11 minutes.

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#### **So, I know about rumble strips, but what exactly are rumble strips for work zones, and what do they do to improve safety?**

Before we start, let's keep this simple. I'll use the term "rumble strips," but keep in mind I'm talking about *portable* work zone rumble strips, not the permanent rumble strips that you may have seen ground into the pavement.

So, to answer your question, portable rumble strips are placed in a series of sets called "arrays" that extend transversely across the travel lane upstream of the work zone. They can be an effective countermeasure to prevent work zone crashes because they can cause drivers to "wake up," so to speak, and to slow down.

In general, rumble strips are considered an active safety countermeasure because they provide audible and tactile feedback to the driver as a vehicle passes over the strips, which causes the driver to react. By grabbing a driver's attention before they reach the work zone, rumble strips also alert the driver to other warnings or navigational guides, such as signs and arrow boards, and increase the driver's overall situational awareness.



Research has also shown that drivers can reduce speed by up to several miles per hour when they encounter rumble strips on the approach to a work zone,<sup>1</sup> which contributes to work zone safety.

Here's a tip to remember: while speed is always an important factor, reducing speed in the work zone becomes an even greater concern when flaggers and workers on foot are present. If you are planning a work zone where this will be the case and speed control is a concern, rumble strips could be an important strategy for achieving speed reduction goals. North Carolina is one example of a state that has developed specifications for using rumble strips in conjunction with flagger traffic control,<sup>2</sup> and Texas mandates the use of temporary portable rumble strips for one-way flagging operations on two-lane roads with speed limits of 70 mph or less.<sup>3</sup>

### You mentioned sets, or arrays. How many rumble strips make up an array, and how many arrays do I need?

That's a good question. Rumble strips are often deployed in multiple sets of three or possibly more for long-term work zones. States that use rumble strips often times will have guidelines for spacing of both the rumble strips and the arrays based on how they are used and what they are made of. For example, Colorado developed a special provision that requires a minimum of three thermoset cast urethane temporary portable rumble strips per array, with the actual number and spacing of strips in each array determined by the manufacturer.<sup>4</sup> When used in advance of a flagger station, Florida DOT requires the use of sets of three 12-inch molded engineered polymer rumble strips per array, with each strip in an array placed at a distance of 5 feet (plus or minus 1 inch center to center) from the next. The spacing of the arrays is determined by the speed on the roadway.<sup>5</sup>

Part 6F.87 of the *Manual on Uniform Traffic Control Devices*, or MUTCD, recommends that array spacing be reduced as drivers approach the work zone. This conveys that an action is imminent and gives the impression that the driving speed is too fast. However, rumble strips are often most effective when they give drivers time to react, so they should not be placed too close to the work zone. According to Maryland's work zone policy, rumble strips should be placed no closer than 300

<sup>1</sup> T. Datta, D. McAvoy, V. Reddy, J. Santos, and P. Savolainen, "Evaluation of Temporary Removable Rumble Strips for Speed Reduction," *TRB 88th Annual Meeting Compendium of Papers*, CD-ROM, January 11-15, 2009, Transportation Research Board of the National Academies, Washington, D.C.

<sup>2</sup> North Carolina Department of Transportation, Division of Highways, Work Zone Traffic Control Office, "Typical Placement of Temporary Rumble Strips." Available at:

<https://connect.ncdot.gov/projects/WZTC/Documents/TempRumbleStrips.pdf>

<sup>3</sup> Texas Department of Transportation, "Memorandum: Work Zone Temporary Rumble Strip Standard Sheet," Carol T. Rawson, PE, Director Traffic Operations Division, November 12, 2012. Note: flagging operations may include flaggers, portable traffic signals, or automated flagging devices.

<sup>4</sup> Colorado Department of Transportation, "Revision of Section 630 - Temporary Portable Rumble Strip," May 5, 2011. Available at: <http://www.coloradodot.info/business/designsupport/construction-specifications/2011-Specs/standard-special-provisions/section-600-revisions/630tprs/view>

<sup>5</sup> Florida Department of Transportation, *Design Standards eBooklet 2014*, "Index 600: General Information for Traffic Control Through Work Zones," Available at: <http://www.dot.state.fl.us/rddesign/DS/14/STDs.shtm>



to 500 ft. in advance of the work zone location, but states will vary on the distances they prefer, so be sure to check your local guidelines for specifics.<sup>6</sup>

**You mentioned spacing can vary based on the type of material the strips are made of. So, what exactly *are* they made of?**

As with many devices the MUTCD covers, the guidance on rumble strips allows for different types of devices to address many possible applications, so industry has developed products such as raised profile removable tapes, thermoplastic strips, portable plastic or rubber strips. Even raised pavement markers set in a staggered pattern can create the rumble effect. Rumble strips generally vary in height depending on what they are made of and how an agency may plan to use them; for example, some agencies that use removable tapes will apply them in layers up to a specific height. The document *Guidance for the Use of Temporary Rumble Strips in Work Zones* has more detailed information and provides several examples of state specifications.

**Let's talk a little more about how the different type of rumble strips work. How do I decide which type to use?**

Well, the first place to look is in your state standards. Some states specify only one type. But, if you have the option of selecting a type to use, then let's talk about them in order of work zone duration. The reason that duration is an important factor is that temporary rumble strips have different levels of durability, making some more or less appropriate for longer term use. First there are raised plastic or rubber strips. These are well suited to short-term work zones since this group of rumble strips is designed to be placed directly on the roadway, which means they are not good for roads that are cracked or uneven. They are kept in place by a combination of their own weight and a non-slip rubber or plastic material that grips the roadway.

Next is adhesive pavement marking tape. This is a raised profile device appropriate for intermediate-term work zones. It is made of either a single thick layer or multiple layers of marking tape. It is easy to install and remove, and is available in MUTCD-approved colors, which are black, white, and orange. This type of tape may be self-adhesive or may require the manual application of an additional adhesive. Several of these types of adhesive strips may be reused with proper storage and reapplication of adhesive.

Next are thermoplastic rumble strips. These are pre-formed strips similar to those often used in permanent installations. This material is best suited for use in long-term work zones as it can stand up to long-term wear.

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<sup>6</sup> Maryland State Highway Administration, Office of Traffic and Safety, "Use of Temporary Transverse Rumble Strips in Work Zones," August 2005. Available at: <http://www.sha.maryland.gov/OOTs/04RumbleStrips.pdf>



Finally we have raised pavement markers (or RPMs), which, as I mentioned, are applied in a staggered pattern to create the rumble. Like thermoplastic strips, RPMs are best suited for long-term work zones due to the level of effort involved in installation and removal.

### **And what about cost? Are they expensive?**

Rumble strips are considered a low-cost safety enhancement. Depending on the type of rumble strip selected, costs can range from a few dollars each for RPMs to about \$1200 for reusable rubber or plastic strips, but because they are reusable, the more they are used the lower the life-cycle cost. The costs of labor for installation and removal, traffic control, and equipment must also be factored in. You can find specific cost and estimating information in the resource links of the ATSSA document entitled *Guidance for the Use of Temporary Rumble Strips in Work Zones*.

### **Different colors, materials, placement... All I can think is “where do I start?”**

It's not as complicated as you think. Selection and use of rumble strips should be determined by a few basic work zone factors: work zone duration, traffic speed, and vehicle type, although other factors may also apply given the specific work zone conditions, such as road surface type and condition. For example, you don't want to try to use an adhesive strip on a road surface that is badly cracked or broken as the strip will likely break loose. That said, work duration is probably the primary factor to consider in selecting the type to use as temporary rumble strips vary in durability, as we just discussed.

Vehicle-related factors can also influence rumble strip selection. For example, if your work zone is going to be in an area with heavy truck traffic, adhesive tapes and plastic or rubber strips may potentially become displaced, so it may be more effective to use the more durable types of rumble strips for heavy traffic conditions. The *Guidance for the Use of Temporary Rumble Strips in Work Zones* document has a flow chart that can help you select the right type of rumble strip.

Keep in mind that rumble strips are not without some disadvantages, however. For example, when a work zone is near a residential area, road noise from vehicles passing over the arrays can become a nuisance for residents. In addition, rumble strips can be difficult for motorcycle riders to navigate safely.

As we wrap up our discussion on portable rumble strips in work zones, let's summarize some key points.

- First, rumble strips are effective because they are active, not passive.
- Next, rumble strips “wake up” drivers as they approach the work zone and may have a positive speed reduction effect. While driver alertness and speed are always important, they can be especially significant when there are workers on foot present.
- And finally, keep in mind that heavy truck traffic may be detrimental to some types of rumble strips.



This podcast has been a presentation of the Federal Highway Administration's Work Zone Safety Grant Program. Thank you for joining us, and please visit [workzonesafety.org](http://workzonesafety.org) often to view the latest training and guidance products.



## Selected Resources [ Not to be read aloud ]

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