Approved:

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Jerry Wray, Director

POLICY ON THE USE OF RUMBLE STRIPS ON SHOULDERS

PURPOSE:

The purpose of this policy statement is to establish the details and procedures for the use of rumble strips on the shoulders of Ohio roadways.

AUTHORITY:

Ohio Revised Code Statutes 5501.02, 5501.03, 5501.31.

REFERENCES:

1. NCHRP Synthesis 191, "Use of Rumble Strips to Enhance Safety," National Academy Press, Washington, D.C., 1993

2. FHWA report No. RD-85/027, "Effects of Shoulder Textured Treatments on Safety, Final Report", August, 1985

3. Ohio Department of Transportation, "Location and Design Manual, Volume 1."

4. Ohio Department of Transportation, "Standard Construction Drawings, BP-9.1M and 9.2M."

5. Ohio Department of Transportation, "Construction and Materials Specification, Item 618 Shoulder Rumble Strips."

SCOPE:

All Districts, Divisions and Offices of the Ohio Department of Transportation (ODOT) involved in the design, construction and maintenance of roadways and all consultants and contractors who provide similar services to ODOT.

BACKGROUND:

Shoulder rumble strips have proven to be effective in reducing run-off-the-road accidents due to driver inattention, monotony and fatigue. They also may serve as an audible form of roadway edge delineation in adverse weather conditions. Rumble strips are most appropriate for use on higher speed facilities where access is controlled through interchanges or widely-spaced intersections (several miles apart) and are also appropriate for other roadways with a history of run-off-the-road accidents due to driver inattention.

This policy supersedes the rumble strip information shown on Standard Construction Drawing BP-8.1M, dated 10-28-94.

This policy does not address rumble strips in travel lanes. Refer to Traffic Control Application Standard 8A-2 for installation guidelines in travel lanes.

DEFINITIONS:

Rumble Strip: As used in this policy, a pattern of grooves or depressions made in paved highway shoulders to produce an audible and/or vibratory warning to drivers whose vehicles have drifted off the traveled way.

POLICY:

1. ELIGIBLE HIGHWAY LOCATIONS

   It is the policy of the Ohio Department of Transportation to install rumble strips on the shoulders of selected roadways. Eligible locations are as follows:

   a. Rumble strips will be installed on new, reconstructed, and resurfaced shoulders of all rural fully access-controlled highways (interstates and freeways).

   b. Shoulder rumble strips will be installed on sections of any highway with a history of run-off-the-road accidents due to driver inattention, fatigue, or sleep. For this purpose, a threshold rate of 0.25 run-off-the-road accidents per million vehicle miles will be used. *(See Reference 2)*

   c. Rumble strips should be considered for installation on new, reconstructed, or resurfaced shoulders of urban fully access-controlled highways and rural partially access-controlled multilane highways.

d. Rumble strips should be considered for use at certain critical locations, such as: approaches to narrow bridges, in gore areas, ahead of impact attenuators, next to concrete median barrier, and in areas with narrow clear zones.

e. Rumble strips may be used at other locations, where deemed to be a safety enhancement, at the discretion of the District Deputy Director. This decision should be based on a review and recommendation by the District Safety Review Team.

f. The use of rumble strips on local roads and streets in Federal-aid projects that are not on the National Highway System will be at the discretion of the responsible local agency.

2. IMPLEMENTATION

This policy will apply for all new construction, major reconstruction, and 3R projects on those facilities outlined above, for which detail design commences after this date. Districts are encouraged to incorporate the policy where feasible on projects currently under plan development. Rumble strips may be installed either as part of a capital construction project or by a separate retrofit project developed exclusively for this purpose. It is not intended that this policy apply to projects where plans have been completed, nor to projects that are under construction.

The design portions of this policy statement will be incorporated into the Location and Design Manual, Volume 1. Standard Construction Drawings (BP-9.1M and BP-9.2M) will be issued that will contain design details of rumble strips and show various options for their placement on shoulders. Proposal notes will initially be used to define all the construction methods and the bases of payment for rumble strips. These will eventually be incorporated into the Construction and Material Specifications.

This policy will be updated as necessary, based on information received from experience of usage, both in Ohio and around the nation. District personnel and contractors are encouraged to provide comments and suggestions for improvement.

3. DETAILS

a. Rumble strips are appropriate for use on either asphalt or concrete shoulders. They can be rolled into new asphalt shoulders (Type 1), milled into existing or new shoulders of either type (Type 2), or formed into new concrete shoulders (Type 3). *(See Attachments A-C and Reference 4)*

b. Of the three types of rumble strips, the milled-in pattern (Type 2) is the most effective, since it produces a vibratory, and audible, warning to drivers. It is the preferred treatment for use on most rural roadways. The rolled-in (Type 1) and formed-in (Type 3) patterns produce little vibratory effect and a less audible warning than the milled-in pattern and are therefore the recommended treatments for use in most urban areas and in all residential areas to minimize noise levels.

4. INSTALLATION GUIDELINES

a. Rumble strips should be installed on both shoulders (right and left) of divided roadways, but individual circumstances may dictate use on only one shoulder.

b. Rumble strips should only be installed on existing paved shoulders that are in good condition and have the following minimum widths for the specified type of rumble strip: 1 m (Type 1) and 0.7 m (Types 2 & 3). In asphalt shoulders, the asphalt should have a minimum thickness of 60 mm. They should not be placed on existing asphalt shoulders that have a high degree of deformation nor on shoulders with less than three years of useful life remaining.

c. Rumble strips should generally not be installed on shoulders that serve as peak hour travel lanes.

d. Where shoulders are to be used for maintenance of traffic purposes, rumble strips should be positioned to adapt to phase construction sequencing. *(See note 2 on BP-9.2M)*

e. Rumble strips generally should not be used on the shoulders of roadways designated as bicycle routes or having substantial volumes of bicycle traffic, unless the shoulder is wide enough to accommodate the rumble strips and still provide at least 1.0 m for bicyclists. Also, gaps should be provided in the rumble strip pattern ahead of intersections where bicyclists are likely to make left turns and to permit bicyclists to merge with traffic.

f. In built-up residential areas, noise generated by rumble strips could be objectionable. Where their use in such areas is warranted, the strips may be placed further from the edge of the traveled lane than shown in the details to reduce the frequency of the contact while still providing some degree of warning to drifting drivers. The distance from the edge of the traveled lane to the rumble strip pattern should not exceed 600 mm on the outside shoulder. Also, the use of either the rolled-in pattern (Type 1) or the formed-in pattern (Type 3) is preferable to the milled-in pattern (Type 2) in these areas.

g. It should be noted that the machinery used in the milling process requires a lateral clearance of at least 875 mm from the outside edge of the pattern to any obstruction (guardrail, a barrier, curbs, etc.).

5. MAINTENANCE

Rumble strips are reportedly a low-maintenance feature on roadways. *(See Reference 2, p 45)* They are generally considered to be "self-cleaning," i.e. accumulated debris is blown out by passing traffic.

a. On an annual basis, usually in the spring, the rumble strips should be checked for excessive accumulation of debris. If needed, the rumble strips shall be cleaned by either sweeping or blowing.

b. On projects where the shoulders are to be resurfaced either permanently or for maintenance of traffic conditions, the rumble strip pattern shall be restored on the new shoulder in accordance with this policy.

TRAINING:

None required. However, the Standards Section in the Office of Planning and Programming may be contacted for assistance in the application of this policy.

FISCAL ANALYSIS:

Because of their proven benefits, site-specific benefit-cost analyses for rumble strips are not necessary. *(See Reference 1)*

The estimated cost to install rumble strips on concrete shoulders is $7250/shoulder/kilometer. For rumble strips on asphalt shoulders it is $2550/shoulder/kilometer. It has been suggested that maintenance costs may be approximately $100 per linear kilometer. This cost along with other potential costs, such as for new equipment, have not been included in the fiscal analysis due to the current absence of data on which to base an estimate. We do not anticipate, however, that these costs will be substantial.

There are 6636.6 total centerline kilometers (4121.94 miles) of roadways in Ohio with four or more lanes. Assume the following: 1) it takes 15 years to resurface the entire system; therefore, 442.25 centerline kilometers are resurfaced each year, 2) there are four shoulders for every centerline and 3) 5% of the shoulders are concrete and 95% are asphalt. Based on these assumptions, the estimated annual costs to install rumble strips on concrete and asphalt shoulders are as follows

Rumble Strips on Concrete Shoulders
442.25 km/yr (4 shoulders)(.05)($7250/shoulder/kilometer) = $641,260/yr.

Rumble Strips on Asphalt Shoulders
442.25 km/yr (4 shoulders)(.95)($2550/shoulder/kilometer) = $4,285,400/yr.