To: New York State Department of Transportation

Title: RUMBLE STRIPS - CENTERLINE AUDIBLE ROADWAY DELINEATORS (CARDS) – GUIDANCE AND POLICY

<table>
<thead>
<tr>
<th>Distribution:</th>
<th>Approved:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manufacturers (18)</td>
<td>/s/Richard W. Lee</td>
</tr>
<tr>
<td>Local Govt. (31)</td>
<td>Richard Lee, P.E.</td>
</tr>
<tr>
<td>Agencies (32)</td>
<td>Acting Deputy Chief Engineer, Design</td>
</tr>
<tr>
<td>Surveyors (33)</td>
<td></td>
</tr>
<tr>
<td>Consultants (34)</td>
<td></td>
</tr>
<tr>
<td>Contractors (39)</td>
<td></td>
</tr>
</tbody>
</table>

ADMINISTRATIVE INFORMATION:

- Effective Date: This Engineering Instruction (EI) is effective beginning with projects submitted for the letting of 1/6/2011.
- Superseded Issuances: EI 97-013 “Safety Shoulder Rumble Strips (Safe Strips) Policy and Revised Installation Details.”
- Disposition of Issued Materials: The changes and additional guidance on rumble strips presented in this EI will be incorporated into a subsequent revision of Chapter 3, Typical Sections, of the Highway Design Manual. That chapter currently contains the guidance on the milled-in audible roadway delineators (MIARDs) used adjacent to the traveled way of many New York freeways.

PURPOSE: The purpose of this EI is to announce requirements and provide guidance to expand the use of CARDS, also referred to as centerline rumble strips.

TECHNICAL INFORMATION:

This EI is being issued concurrently with EI 10-029 New Standard Specification Section 649 – Audible Roadway Delineators and EB 10-037 Standard Sheets 649-01 and M649-01 – Audible Roadway Delineators. Centerline rumble strips, issued as pay item number 649.11 – Centerline Audible Roadway Delineators (CARDS), are to be considered a routine treatment option for paving contracts on undivided highways that meet the implementation criteria defined herein. Their installation is also encouraged as stand-alone work on existing pavements meeting the implementation criteria, especially where a demonstrated head-on or sideswipe crash problem or potential is noted.

The Department has performed a thorough literature search, piloted projects, and performed a systematic crash analysis that has been reviewed and endorsed by FHWA. The Department expects centerline rumble strips to:

- Be safe for motorcyclists. CARDS were tested for motorcyclist safety by MnDOT as part of K.W. Miller’s, Effects of Centerline Rumble Strips on Non-Conventional Vehicles, 2008, and found to “add no measurable risk to motorcyclists.”
- Be safe for bicyclists. After an extensive search, the Department has not found any evidence that milled-in rumble strips adversely impact bicyclists. Furthermore, the centerline location essentially precludes bicyclists riding along them.
- Have minimal noise impacts. To help reduce noise impacts, CARDS are located under the centerline markings and are only 0.5” (13 mm) deep. Compared to freeway rumble strips (MIARDs), CARDS are 12” (300 mm) wide, instead of 16” (400 mm) wide, and spaced out 24” (600 mm) on center, instead of 12” (300 mm) on center. CARDS are also discontinued before intersections, major driveways, crosswalks, left turn lanes, and concrete bridge decks.
Centerline rumble strips have been found to be a particularly effective safety device on undivided high-speed roads where there is no median or room for barriers to separate opposing lanes of traffic. They are effective in both rural and urban environments. The Department anticipates that centerline rumble strips will:

- Help prevent head-on, sideswipe and opposite direction run-off-the-road collisions. Installation of centerline rumble strips on 6% of the total highway miles in the state (7,040 miles of state highway) is expected to prevent over 20 deaths and over 250 serious injuries per year.
- Have a benefit/cost ratio of 75:1.
- Be relatively fast to install.
- Improve the visibility of centerline pavement markings, particularly in wet-night conditions.
- Extend the service life of centerline pavement markings.

Scoping
- **Project Costs:** Cost impacts are expected to be minor overall. However, on paving projects where they are used, they may constitute as much as a 1-5% increase in the project cost.
- **Project Type:** CARDs should be installed as part of all projects that will place 40 mm or more of asphalt. CARDs will not be required for limited- or single-purpose projects such as striping, joint sealing, or ditch maintenance. CARDs are encouraged to be installed as stand-alone projects on existing pavements that are in good or fair condition and meet the implementation criteria below, especially where a head-on or sideswipe crash potential is noted.

Design
- **Dimensions and Location:** Refer to the 649-01 Standard Sheet.
- **Plans:** The plans should include a Table of Centerline Rumble Strips indicating the starting and ending stations. Gaps and exclusions under 100’ (30 m) in length are paid for under item 649.11 and do not need to be detailed in the table. Gaps and exclusions 100’ (30 m) or more in length should be identified in the table.
- **Public Outreach:** In areas near residential neighborhoods and in urban areas, public outreach is recommended to help gain public acceptance of CARDs. A brochure to help inform the public on the benefits of CARDs is posted on the Department’s Internet webpage under Safety.

Construction
- **Gaps:** Prior to milling, the Contractor shall obtain EIC approval on where CARDs are to be installed and where required gaps are to be included.

IMPLEMENTATION:

- CARDs should be installed on any project that will place 40 mm or more of asphalt and meets the following criteria:
  - **Median:** There is no raised median, two-way left-turn lane (TWLTL), or median barrier. CARDs are appropriate for flush medians.
  - **Length:** The total quantity of CARDs in a project is 1,500 feet (500 m) or more. Because of the cost of mobilizing the equipment to mill in the CARDs, projects that would result in the total placement of less than 1,500 feet (500 m) may be exempted.
  - **Speed:** The posted speed is 45 mph or greater. The likelihood of a severe injury or fatality increases dramatically in collisions of 45 mph (70 km/h) or greater.
  - **Volume:** A current AADT of 2,000 vpd or more. The primary benefit of CARDs is to reduce the incidence of head-on and opposite direction sideswipe collisions. As traffic volumes decrease, the likelihood of such collisions decreases, with or without the use of CARDs.
  - **Roadway Width:** The combined width of the lane(s) and shoulder, in each direction, must be at least 13 ft (3.9 m).
- Installation of CARDs is encouraged as stand-alone work on existing pavements that are in good or
fair condition and meet the criteria above, especially where a head-on or sideswipe crash potential is noted.

The Department is collecting data on the effectiveness of centerline rumble strips to guide future changes to Department guidance and policies. Therefore, project managers should e-mail the location of new CARD installations to the Regional Traffic Office so the location may be entered into the Project Support System (PSS) or the Post Implementation Evaluation System (PIES) for evaluation.

**TRANSMITTED MATERIALS:** No materials are transmitted with this EI. However, a standard 649 series specification may be downloaded from the Department’s Internet site at [www.nysdot.gov](http://www.nysdot.gov).

**BACKGROUND:** In New York State there are about 120 deaths and 3,500 injuries from head-on and opposite direction sideswipe crashes each year. Nationwide, about one in five non-intersection fatal crashes involves two vehicles crashing head-on. Of these, 75% occur on rural roads. For all roads, one-third of head-on crashes involve vehicles “negotiating a curve” and two-thirds are related to vehicles “going straight.” Where they are used, centerline rumble strips have the potential to significantly reduce these types of collisions, with some studies showing up to a 64% reduction in these types of accidents. These kinds of reductions would save many lives and prevent scores of severe injuries.

For over 10 years, the Department has utilized rumble strips on the shoulders of freeways, just outside the edge lines. NYSDOT’s installation of those rumble strips has thus far helped achieve a significant reduction in the number of interstate run-off-the-road crashes. Nationally, other states have used centerline audible roadway delineators in an attempt to reduce the number of head-on collisions due to drivers drifting across centerlines. Their results were typically very positive. NYSDOT piloted installations of centerline rumble strips at spot locations (6.1 centerline miles total) to gain some firsthand experience with installation methods for centerline rumble strips and develop a NYSDOT specification. A combined before and after Safety Information Management System (SIMS) analysis showed a reduction in fatal crashes (from 3 to 1). By themselves, these test sites are far too limited to rely on solely for a statewide policy. In addition, NYSDOT relied on:

- A 2005 NCHRP Synthesis 339 (data from the Insurance Institute for Highway Safety study on centerline rumble strips in September 2003), which found that head-on and opposite direction sideswipe injury crashes were reduced by an estimated 25% at sites treated with centerline rumble strips or stripes. This early study concluded that centerline rumble strips/stripes provide a crash reduction factor of 14% of all crashes, and 15% of injury crashes, on rural two-lane roads.

- A 2009 NCHRP Report 641 “Guidance for the Design and Application of Shoulder and Centerline Rumble Strips,” which supports the use of centerline rumble strips as an extremely cost-effective collision countermeasure. Based on this more recent and complete study, fatal and injury crashes in urban areas were reduced an average of 64%. Fatal and injury crashes in rural areas were reduced an average of 44%.

- The experiences of 25 other states, which cumulatively have tens of thousands of miles of centerline rumble strips. For example, Pennsylvania has over 3,200 miles of centerline rumble strips and has reduced fatal head on crashes by nearly 50%, saving approximately 150 lives per year. Washington State has over 2,000 miles of centerline rumble strips and has reduced fatal and serious injury cross over and side swipe crashes by 57%.

- The recommendations and encouragement of FHWA, which considers centerline rumble strips, a proven safety measure that will save lives, consistent with the accommodation of cycling.

NYSDOT prepared a systematic crash analysis, as recommended by AASHTO, FHWA and NCHRP Report.
“Alternative Strategies for Safety Improvements,” January 2010. The analysis, which has been reviewed and endorsed by FHWA, concludes that centerline rumble strips have a benefit to cost ratio of over 75:1, and are anticipated to save over 20 lives and prevent over 250 serious injury crashes each year.

Based on the lack of any significant technical problems, and in light of the positive safety experience in other states, plus the strong endorsement from FHWA, the Department decided to begin using CARDs as a preferred treatment. Additional information is available on the FHWA website at: http://www.fhwa.dot.gov/crt/lifecycle/rumblestrips.cfm

REFERENCES:


CONTACT: Questions on this EI may be directed to Richard Lee at rlee1@dot.state.ny.us.