Rumble Strips: National Park Service Review

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NPS report

- Roadway Departure Warning Indicators: Synthesis of Noise and Bicycle Research
  - U.S. DOT / Volpe Center: John Cybulski, Judy Rochat, Dave Read
  - 2013 Report, work completed in 2011

- Roadway departure warning indicators (rumble strips) can successfully decrease vehicle collisions or run-off-the-road crashes
  - Main applications: centerline and shoulder

- Limited literature in relation to wayside noise
Types of rumble strips

• Basic types

- milled
- rolled
- formed
- raised
Design elements to minimize noise and maximize safety

- Include offset
- Short length
- Narrow width
- Large spacing
- Shallow depth
- Large clearance
- Include gap
## Suggested low-noise parameters

- **Traditional type: rectangular**

<table>
<thead>
<tr>
<th>Length (in)</th>
<th>Depth (in)</th>
<th>Spacing (in)</th>
<th>Width (in)</th>
<th>Offset (ft)</th>
<th>Gap (ft)</th>
</tr>
</thead>
<tbody>
<tr>
<td>≤ 8</td>
<td>0.25</td>
<td>24</td>
<td>8</td>
<td>1</td>
<td>4</td>
</tr>
</tbody>
</table>

- **Experimental type: sinusoidal**

<table>
<thead>
<tr>
<th>Wavelength (in)</th>
<th>Peak-to-peak depth (in)</th>
<th>Length (in)</th>
<th>Offset (ft)</th>
<th>Gap (ft)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Road speed/37*</td>
<td>0.16, 0.28**</td>
<td>≤ 8</td>
<td>1</td>
<td>4</td>
</tr>
</tbody>
</table>

*It is suggested that 14 in. may be ideal regardless of speed

**Both providing low-noise outcomes**
Other considerations

• Interior noise/vibration must effectively warn drivers
  o Literature shows 4-10 dB increase in sound level required
    NOTE: This is relative to standard pavement; if that pavement is loud, rumble strips would need to provide a higher absolute sound level
  o Sinusoidal single-frequency oscillation provides vehicle movement feedback

• Bicycle safety
  o Need adequate riding space in shoulder (4 ft from edge of pavement)
  o Need gaps for exiting and entering bicyclists (12 ft gap for every 60 ft of rumble strip)