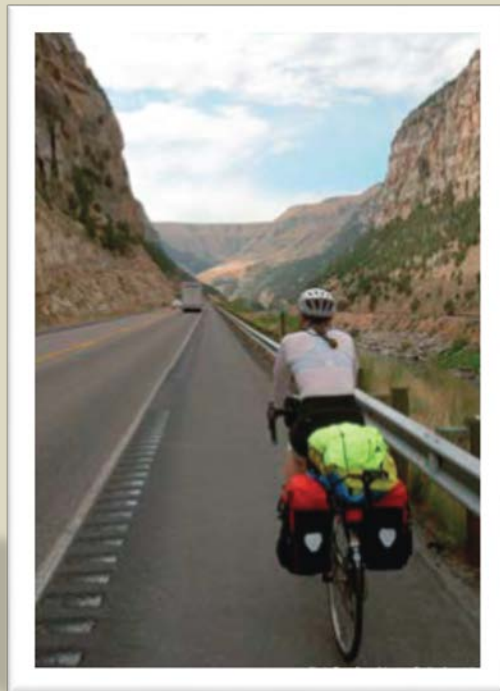

Rumble Strips: National Park Service Review



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ATS Consulting

July 2016

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

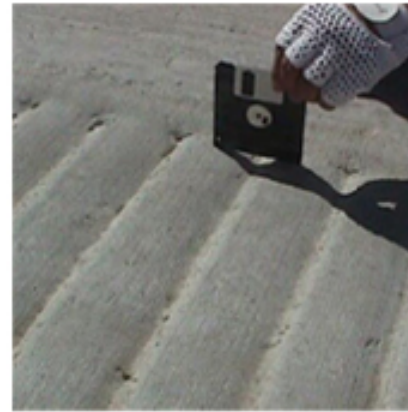
- Basic types



milled



rolled

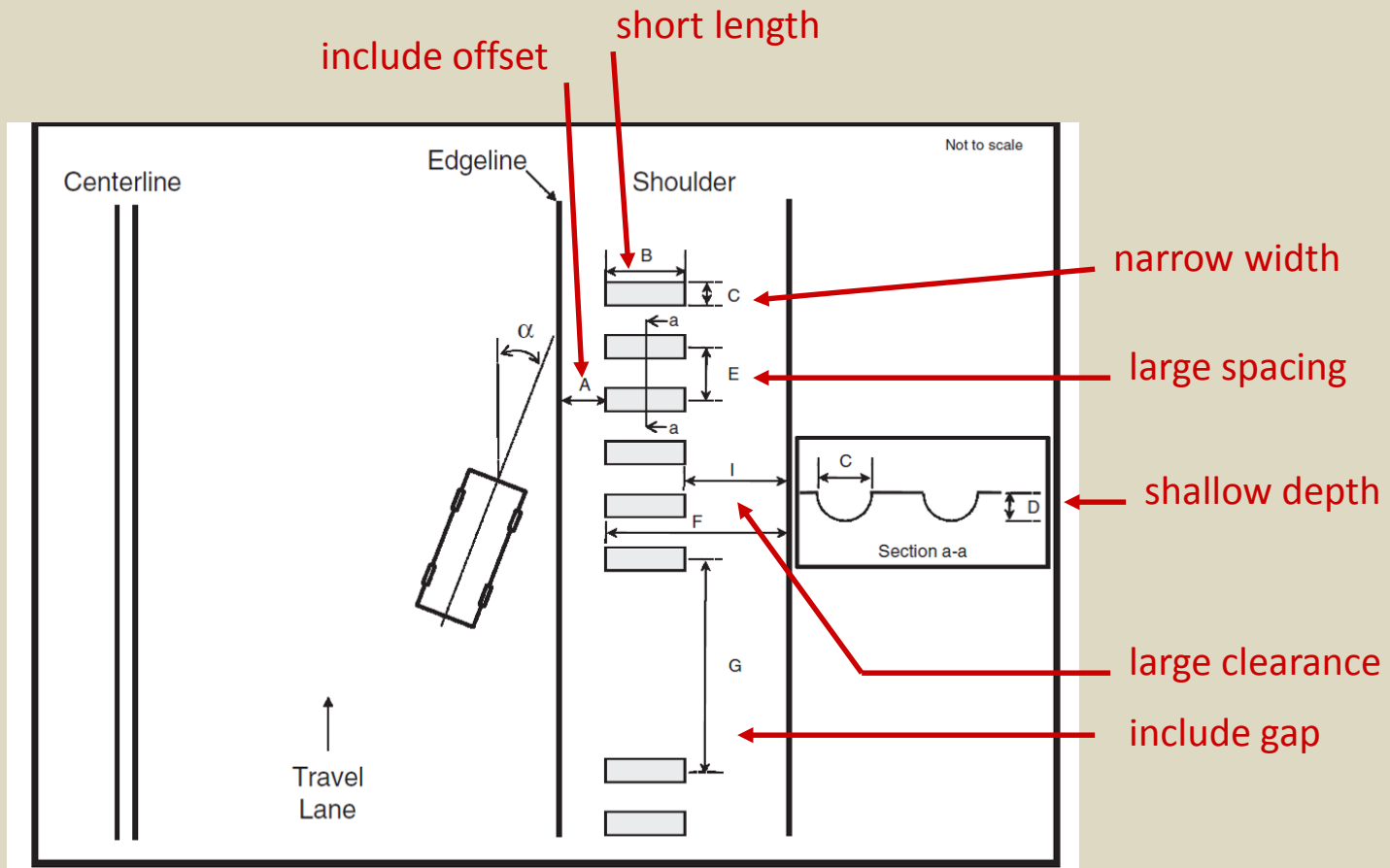


formed



raised

Design elements to minimize noise and maximize safety



Suggested low-noise parameters

- Traditional type: rectangular

Length (in)	Depth (in)	Spacing (in)	Width (in)	Offset (ft)		Gap (ft)
				Outward from edge of lane	Inward from edge of pavement	
≤ 8	0.25	24	8	1	4	12 for every 60

- Experimental type: sinusoidal

Wavelength (in)	Peak-to-peak depth (in)	Length (in)	Offset (ft)		Gap (ft)
			Outward from edge of lane	Inward from edge of pavement	
Road speed/37*	0.16, 0.28**	≤ 8	1	4	12 for every 60

*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
 - 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
 - Sinusoidal single-frequency oscillation provides vehicle movement feedback
- Bicycle safety
 - Need adequate riding space in shoulder (4 ft from edge of pavement)
 - Need gaps for exiting and entering bicyclists (12 ft gap for every 60 ft of rumble strip)