Cable Guardrails – How Does that Grab ya?

Centerline and Edgeline Rumble Strips

Presented By: Jeremy L. VanVleet, P.E.
Office of Traffic Safety

Purdue Road School
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Agenda

- Introduction – What are Centerline and Edgeline Rumble Strips?
- Crash Data and Analysis
- Decision tree for implementation
- INDOT Statewide Programmatic Studies Results
- INDOT's next step for implementation
- Questions

Introduction

- What are centerline (CLRS) and edgeline (ELRS) rumble strips?
  - NCHRP Report 500, Volumes 4 and 6, states that the CLRS are tried and the ELRS are experimental
  - Rumble strips (milled or rolled) along edgeline of roadway or along the centerline
  - Provides a warning device for drivers that are about to leave their lane

FHWA Crash Reduction Factors – CLRS

Desktop Reference for Crash Reduction Factors — Roadway Departure Crashes

Countermeasure(s)	Crash Type	Crash Severity	Area Type	Road Type	Daily Traffic Volume (veh/day)	Ref	Effectiveness: Crash Reduction Factor / Function	Effectiveness: Std Error	Effectiveness: Range Low	Effectiveness: Range High	Study Type
Improve pavement friction (skid treatment with overlay)	Ped	Fatal/ Injury				15	3				
Install centerline rumble strips	All	All	Rural	2-lane	5,000-22,000	5	**14**	5			EB Before-After
	All	Injury	Rural	2-lane	5,000-22,000	5	**15**	8			EB Before-After
	Head-on	All	Rural	2-lane highway		26	55				Simple Before-After
	Head-on	Fatal	Rural	2-lane highway		26	68				Simple Before-After
	Head-on	Injury (minor)	Rural	2-lane highway		26	26				Simple Before-After
	Head-on	Injury (major)	Rural	2-lane highway		26	33				Simple Before-After
	Head-on/ Sideswipe	All	Rural	2-lane	5,000-22,000	5	21	12			EB Before-After
	Head-on/ Sideswipe	Injury	Rural	2-lane	5,000-22,000	5	25	15			EB Before-After
Install or upgrade curbing	Fixed object	All				15	50				
Install shoulder rumble strips	All	All	Rural	Multilane divided		8	16				Simple Before-After
	All	Injury	Rural	Multilane divided		8	17				Simple Before-After
	ROR	All	Rural	2-lane	>4,000	41	13	8			
	ROR	All	Rural	Multilane divided		8	10				Simple Before-After
	ROR	All	Rural	Highway		16	27	22	22	33	
	ROR	All	All	Freeway		19	18	7			Comparison Group Before After
	ROR	All	Rural	Freeway		19	21	10			Comparison Group Before After

FHWA Crash Reduction Factors – ELRS

Desktop Reference for Crash Reduction Factors — Roadway Departure Crashes

Countermeasure(s)	Crash Type	Crash Severity	Area Type	Road Type	Daily Traffic Volume (veh/day)	Ref	Effectiveness: Crash Reduction Factor / Function	Effectiveness: Std Error	Effectiveness: Range Low	Effectiveness: Range High	Study Type
Install shoulder rumble strips (cont'd)	ROR	All	Rural	All		57	34				
	ROR	All	Rural	Arterial		57	16				
	ROR	All	Rural	Between ramps		57	34				
	ROR	All	Rural	Highway		57	38				
	ROR	All	Rural	Three-lane		57	36				
	ROR	All	Rural	2-lane		57	32				
	ROR	Fatal/ Injury	Rural	2-lane	>4,000	41	18	12			
	ROR	Injury	Rural	Multilane divided		8	22				Simple Before-After
	ROR	Injury	All	Freeway		19	13	12			Comparison Group Before After
	ROR	Injury	Rural	Freeway		19	7	16			Comparison Group Before After
Install shoulder rumble strips on illuminated highways	ROR	All	Rural	All		57	41				
Install shoulder rumble strips on unilluminated highways	ROR	All	Rural	All		57	31				
Pave shoulder	All	All				15	15				
	Head-on	All				15	86				
	Night	All				15	62				
Vary centerline rumble strip width	All	All	Rural	Rural Highway		6	12	6			
Vary shoulder rumble strips	All	All	Rural	Rural Highway		6	100(1-(-0.07Pi+1.0)); Pi=proportion of crash type subset (for values of Pi, refer to source).				
	All	All		Freeway		6	100(1-(-0.12Pi+1.0)); Pi=proportion of influential crashes that occur on roadway type i				

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Crash Data and Analysis

- Crash Data Time Frame:
  - Centerline Rumble Strips: Jan. 1, 2003 thru Dec. 31, 2006
  - Edgeline Rumble Strips: Jan. 1, 2003 thru Oct. 31, 2007
- Target Crash Types – Fatal and Injury Only
  - Centerline Rumble Strips
    - Opposite Direction Sideswipes
    - Head On Collisions
  - Edgeline Rumble Strips
    - Run off Road Crashes
- The Crash data was filtered for the above types of crashes and were placed in ArcGIS using the latitude and longitude fields from the crash data that was pulled from ARIES.

Crash Data and Analysis

Figure A1: Left of Centerline Crashes in 5 Mile Segments

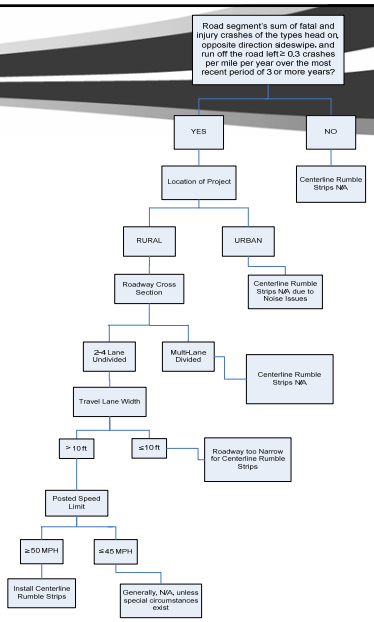
Crash Data and Analysis

Figure A1: ROR crashes in 5 mile segments

Crash Data and Analysis

- After the crash data was graphically shown using ArcGIS, candidate locations were determined and were then field checked to verify the feasibility of the rumble strips as a counter measure.
- A decision tree was produced to determine appropriate locations for the use of the rumble strip countermeasures.
- Along with checking the feasibility of the rumble strips during the field check, logical start and end points were also determined.

CLRS Decision Tree



Notes:

1. The posted speed limit determines where centerline rumble strips should be implemented; advisory speed limit signs have no affect on the placement of centerline rumble strips.
2. Rumble strips should be broken at intersections and driveways. A suggestion would be a 500 ft gap centered on the intersection and driveways. If there is a left turn lane present at the intersection then the rumble strips should stop at the beginning of the left turn lane.
3. Rumble strips should also be broken at bridges so that the rumble strips are not milled into the bridge deck.

INDOT Programmatic Studies

- CLRS Study
  - Study was completed August of 2008
  - Report produced 28 candidate sites
    - Approximately 380 miles of centerline rumble strips
- ELRS Study
  - Study was completed November 2009
  - Report produced 24 candidate sites
    - Approximately 250 miles of edgeline rumble strips

INDOT's Next Step

- INDOT has not yet implemented these countermeasures. The Office of Traffic Safety is planning to have specifications and detail sheets completed for centerline and edgeline rumble strips sometime during 2010.
- Sometime, within 2010, test projects using rumble strips will be going in on the state system.

Questions?