

# Mumble Strips

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# Biggest Rumble Strip Complaint?

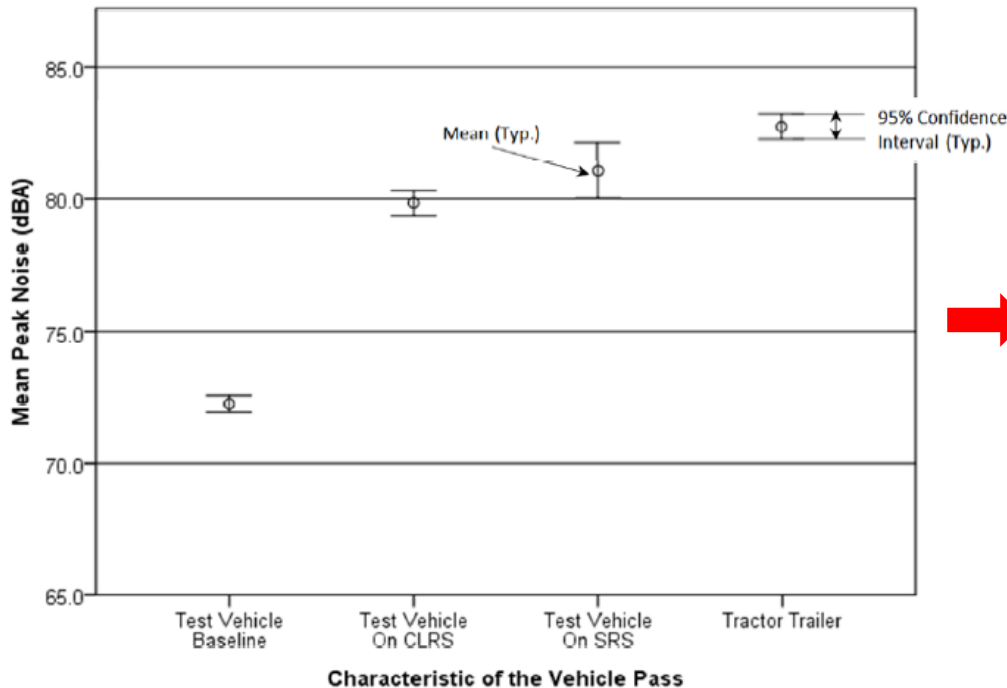
**NOISE**

# Traditional Rumble Strips

- ▶ Separated grooves with flat pavement between
- ▶ Widely used design
- ▶ Provide adequate warning inside vehicles, but produce high exterior noise as well



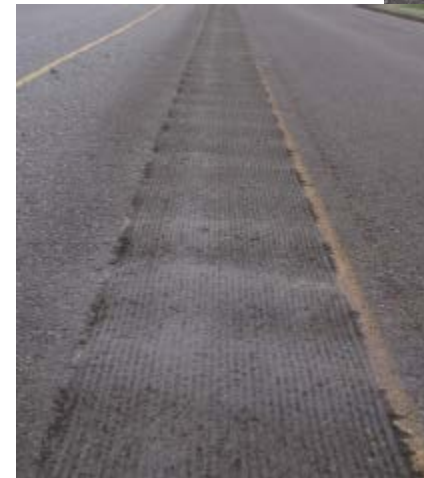
# Current Noise Levels



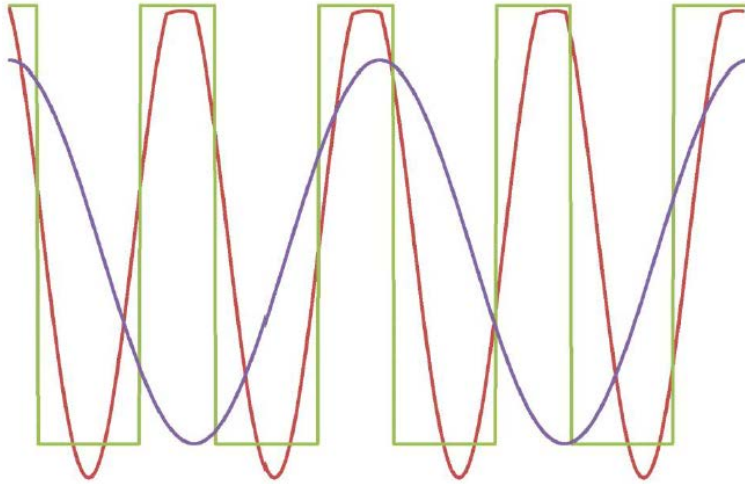
Sound Source or Location	Level (dBA)
Rocket launching pad	180
Artillery at shooter ear	170
Rifle at shooter ear	160
Loud trumpet at 5 inches	150
Jet takeoff 200 ft	140
Jet aircraft workers on tarmac	130
20 ft from rock band speakers	120
Discoteque, diesel generator room	110
Subway, chain saw, stereo headphone	100
Noise appliances, lawn mower at user ear	90
Typical home stereo level, inside factory	80
Freeway at 200 ft	70
Speech at 3 ft, air conditioner at 20 ft	60
Typical urban ambient	50
Typical rural ambient (35-40), quiet office	40
Quiet rural ambient, quiet library, soft whisper	30
BWCA with no wind, concert hall	20
BWCA in winter	10
Threshold of hearing	0

# Introducing the “Mumble Strip”

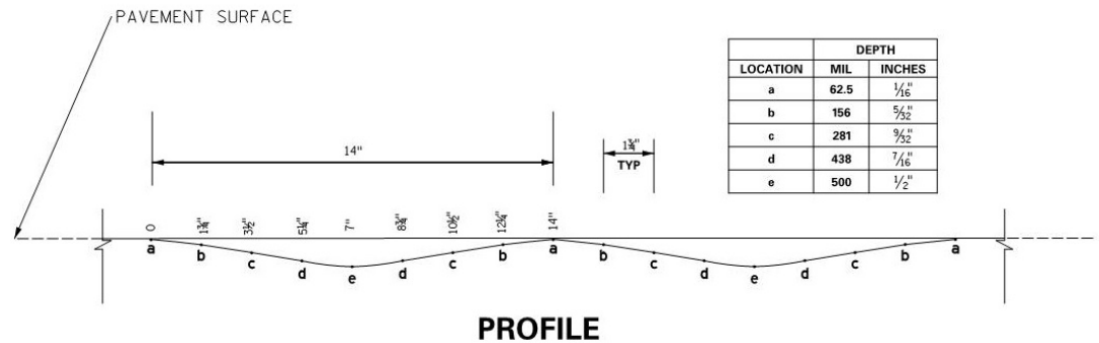
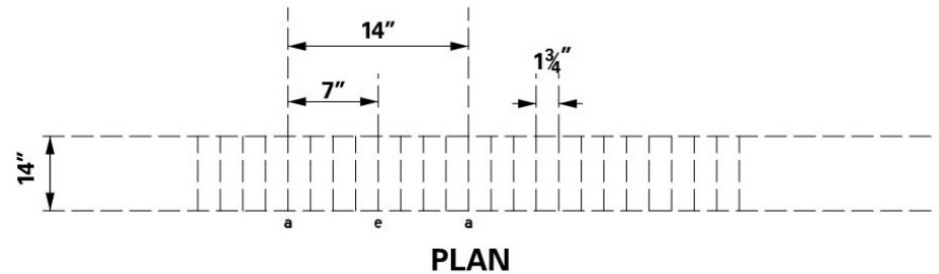
- ▶ Sinusoidal continuous pattern
- ▶ Still provide adequate warning inside vehicles while reducing exterior noise generation



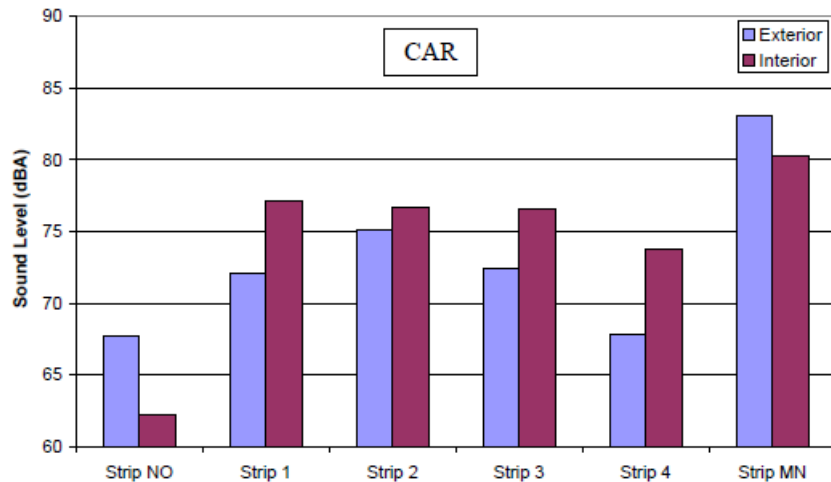
# What Makes Them Different



- California Design
- Minnesota Design
- Pennsylvania Design



# Mumble Strip Noise Levels



Rumble Strip	Increase (dBA) over No-Strip		
	Exterior at 50 ft.	Exterior at 75 ft.	Interior
<i>Car</i>			
Strip 1	4.5	3.3	14.9
Strip 2	6.4	8.6	15.2
Strip 3	5.9	5.2	14.7
Strip 4	2.3	2.4	12.5
Minnesota Design <sup>1</sup>	18.5	na	16.7
<i>Pickup</i>			
Strip 1	3.0	2.2	5.7
Strip 2	5.8	6.8	5.9
Strip 3	5.8	6.1	6.8
Strip 4	2.9	2.1	4.5
Minnesota Design <sup>1</sup>	13.7	na	8.4
<i>Truck</i>			
Strip 1	-0.4	-1.1	0.8
Strip 2	3.0	2.8	2.7
Strip 3	2.5	2.3	1.4
Strip 4	1.8	0.1	1.2

# Noise Comparison





# Bringing the Mumble to Michigan

- ▶ Only out-of-state contractors currently have the necessary equipment
  - Contractors will need new machines, so it may be difficult to get Michigan's Industry behind these unless we commit to this direction in the future
- ▶ Test installation in Michigan has already been let and awarded
  - Superior Region

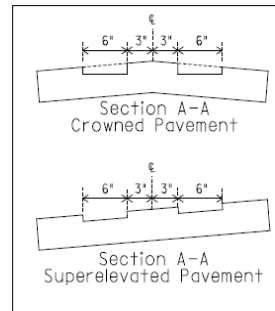
# Bringing the Mumble to Michigan

- ▶ More installations forthcoming
  - North Region
  - Macomb County
- ▶ Reasonable cost
  - Superior received \$0.32/ft
    - Relatively large quantity at 500,000ft
  - Traditional typically cost \$0.20–0.25/ft
    - Price may be higher for small quantities

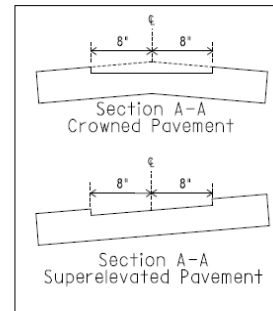
# How to Include Mumble Strips

- ▶ Approved Template Special Provision
  - Email me if you'd like a copy to go from
    - Not available online at this time

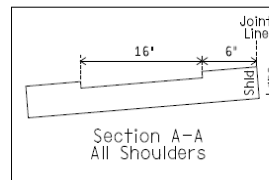
Cross-section  
Details



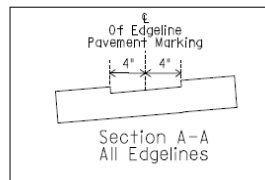
Concrete  
Centerline



HMA  
Centerline



Concrete & HMA  
Shoulder



Concrete & HMA  
Edgeline

# Questions?

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