



Summary of User Surveys for Centerline Rumble Strips on STH 142 Kenosha County, Wisconsin

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Introduction

Centerline rumble strips (CLRS) have become a popular safety treatment for many states attempting to prevent cross-centerline collisions on two-way undivided roadways. CLRS were installed on a nearly eight mile two-lane section of Wisconsin State Trunk Highway (STH) 142, from 1,400 ft west of I-94 to STH 75 in Kenosha County in late June of 2005. This is believed to be the first installation of CLRS in Wisconsin. Two different CLRS patterns were installed:

- CLRS directly over the centerline (i.e., the “alternative” pattern) were installed in a 2,800 ft section of the project from 224th Ave. to 216th Ave. (see Figure 1a) and
- CLRS straddling the centerline (i.e., the “standard” WisDOT pattern – similar to Mn/DOT’s current pattern) were installed on the remaining 38,400 ft of the project (see Figure 1b).

For both CLRS patterns, the CLRS groove was eight inches square with a longitudinal gap of 16 inches between successive grooves. The only installation difference is the lateral offset from the centerline. The effects of the CLRS installations have been evaluated by both a driver survey and a before/after speed analysis. This paper describes only the survey findings. The findings from the before/after speed analysis are presented in a separate paper. Other analyses, including lateral placement and before/after crashes, will be performed and documented at a later date.



a. Alternative Pattern (2800 ft installed)



b. Standard Pattern (38,400 ft installed)

Figure 1. CLRS Patterns Installed on STH 142.

Survey Details

To better understand the opinions of local road users towards centerline rumble strips, survey questionnaires were administered to four target groups along the CLRS section of STH 142: general roadway users, special roadway users (i.e., motorcyclists, fire/rescue drivers, truck drivers), residents, and business owners/employees. Surveys were administered in person to general roadway users at the Bong Recreation Area on Friday, September 9, 2005. Many of these drivers had driven over the CLRS for the first time just minutes before. Residents and employees along the CLRS section of STH 142 were surveyed in person on Friday, September 16, 2005. Nearly all of these people had frequently driven over the CLRS. Rescue workers, police officers, truck drivers and other special roadway users were interviewed over the phone. Similar, although slightly different versions of the survey questionnaires were administered to each of the target groups. Responses were received from:

- 10 residents in the CLRS sections,
- five business owners/employees,
- 10 general roadway users,
- two motorcyclists,
- one police officer,
- one fire/ambulance driver,
- one county engineer,
- three Bong Recreation Area park rangers, and
- 145 truck drivers for J.W. Peters Gravel Pit.

A copy of the basic questionnaire form is included in the Appendix. The following sections present a summary of the responses to the questionnaires.

Survey Findings

Individual Responses

Tables 1-3 present the summarized survey responses for residents/business owners, general roadway users, and special users, respectively. Detailed analysis of the survey responses will be presented in the sections that follow Tables 1-3.

Table 1. Survey Responses for Residents and Business Owners/Employees

| Category | Sex | Age | Have you driven over the CLRS? | Initial Reaction | Discomfort/handling problems? | Impression of rumble effect | Like/dislike CLRS? | Do you believe CLRS are a viable safety treatment? | Is the noise a problem? | Other potential problems? | Would you like to see CLRS implemented elsewhere? |
|------------------------------|-----|-----|--------------------------------|------------------------------|------------------------------------|-----------------------------|--------------------|--|-------------------------|--|---|
| Resident | M | 60 | Yes | Very noticeable in small car | No | Strong | Like | Possibly for inattentive drivers | No | Noise for residents closer to road | Yes |
| Resident | M | 55 | Yes | Fine | | | Like | Yes | No | | Yes |
| Resident | F | 65 | Yes | Alerted | No | Weaker than in-lane RS | Like | Yes | No | Holding water, ice in winter | Yes |
| Resident | F | 35 | Yes | | No | Similar to shoulder RS | Like | Yes | No | Winter maintenance | Yes |
| Resident | F | 65 | Yes | Strong | No | Similar to shoulder RS | Like | Yes | No | | Yes |
| Resident | F | 30 | Yes | | No | | Like | Yes | No | | Yes |
| Resident | F | 40 | Yes | Surprised | No | Stronger than shoulder RS | Dislike | No | Yes | Holding water, ice in winter | No |
| Resident | M | 65 | No | | | | Dislike | | Yes | | No |
| Resident (also Motorcyclist) | M | 50 | Yes | Strong | Handling on motorcycle was jarring | Strong | Dislike strongly | No | Yes | Handling on a motorcycle, holding water, ice in winter | No |
| Resident (also Motorcyclist) | F | 40 | Yes | Loud | No | Strong | Dislike | No | Yes | Holding water, ice in winter | No |
| Business | F | 55 | Yes | Surprised | No | Strong | Like | Yes | No | | Yes, thinks they are great |
| Business | F | 35 | Yes | Liked them | No | Similar to shoulder RS | Like | Yes | No | | Yes |
| Business | F | 45 | Yes | Too loud | Too strong | | Dislike | Yes | Yes | Young drivers may be driving on CLRS for fun | No |
| Business | F | 40 | Yes | Strong | No | Strong | Like | Yes | No | Noise for residents | Yes, but not on her road |
| Business | F | 30 | Yes | Surprised | No | Strong | Like | Yes, drowsy and seniors | No | Noise for residents | Yes |

Table 2. Survey Responses for General Roadway Users

| Sex | Age | Frequency of Travel on STH 142 | Did you drive over the CLRS? | Why did you initially drive over the CLRS? | Initial Reaction | Discomfort/handling problems? | Impression of rumble effect | Like/dislike CLRS? | Do you believe CLRS are a viable safety treatment? | Would you like to see CLRS implemented elsewhere? |
|-----|-----|--------------------------------|------------------------------|--|------------------|-------------------------------|--|--------------------|--|---|
| M | 60 | Frequently | Yes | Inadvertently | Just about right | No | Moderate | Like | Yes | Yes |
| F | 40 | Frequently | Yes | | | No | | Like | Yes | Yes |
| F | 55 | Frequently | Yes | Inadvertently | Surprised | No | Similar to shoulder RS | Like | Yes | Yes |
| M | 25 | 5-10 times | Yes | Inadvertently | Surprised | No | Similar to in-lane RS | Like | Yes, drowsy and drunks | Yes |
| F | >65 | Fewer than 5 times | Yes | Inadvertently | Surprised | No | Strong | Like | Yes | Yes |
| F | 40 | First | Yes | Moved over for bicycle | Strong | No | Strong | Like | Yes | Yes |
| M | 45 | First | Yes | | Strong | No | Moderate when first contacted, stronger as more direct | Like | Yes | Yes |
| M | >65 | Rarely | No | | | | | | | Yes |
| M | 55 | Rarely | No | | | | | | | Yes |
| M | 35 | Rarely | No | | | | | | Yes | Yes |

Table 3. Survey Responses for Special Roadway Users

| User Type | Sex | Age | Frequency of Travel on STH 142 | Initial Reaction When Driving Over CLRS? | Discomfort/handling problems? | Impression of rumble effect | Like/dislike CLRS? | Do you believe CLRS are a viable safety treatment? | Potential problems? | Would you like to see CLRS implemented elsewhere? |
|--|-----|-----|---------------------------------|--|------------------------------------|--|---|--|---|---|
| Motorcyclist (also Resident) | M | 50 | Frequently | Strong | Handling on motorcycle was jarring | Strong | Dislike strongly | No | Handling on motorcycle, holding water | No |
| Motorcyclist (also Resident) | F | 40 | Frequently | Loud | No | Strong | Dislike | No | Holding water | No |
| Police Officer | M | 50 | Frequently | Surprised | No | Just about right - not as strong as in-lane RS | Like | Yes | Had heard complaints about noise from a resident | Yes |
| Fire/Rescue Driver | M | 50 | Frequently | Loud | No | Strong | Like | Yes | | Yes |
| County Engineer | M | 40 | Frequently | | No | Weaker than both in-lane and shoulder RS | Like | Yes | Restriping centerline might be difficult | Yes |
| Park Ranger | M | 25 | Frequently (both day and night) | Surprised | No | Similar to shoulder RS | Like | Yes, drowsy and drunks | Possibly passing for older drivers, noise may be an issue for residents | Yes |
| Park Ranger | M | 45 | Frequently | Not as strong as in-lane RS | No | Weaker than in-lane RS | Like | Yes | Possibly durability during winter maintenance activities | Yes |
| Park Ranger | F | 50 | Frequently | Surprised | No | Much stronger than shoulder RS | Like | Perhaps for drowsy, not for drunks | Small cars might have discomfort, poor handling | Yes |
| 145 gravel truck drivers interviewed at J.W. Peters gravel pit | | | Frequently (All) | | No | | 50 liked, 45 waste of money, 32 didn't like, 18 didn't care | Many who didn't like or thought waste of money thought that money should be spent on signal at J and 142 | | |

Problems Encountered While Driving Over CLRS

Tables 1-3 show that nearly all of the roadway users experienced no physical problems with the CLRS when driving over them (i.e., discomfort, handling problems, overcorrection, instrument problems), including the fire/ambulance driver, the police officer, truck drivers, and the park rangers. However, one motorcyclist did complain of discomfort and another driver commented on the CLRS effect being quite strong. Both motorcyclists and numerous other users were concerned about the potential for the CLRS to hold water and become icy and dangerous in the winter. There may also be durability issues with the CLRS after numerous freeze/thaw cycles and snow plow passages. Winter issues will be verified by TOPS researchers after the first few snowfall events. The county engineer noted that restriping over the CLRS may also be difficult since the guide wheel for the paint gun will ride over the CLRS. Figure 2 shows a breakdown of the responses for handling problems or discomfort when contacting the CLRS.

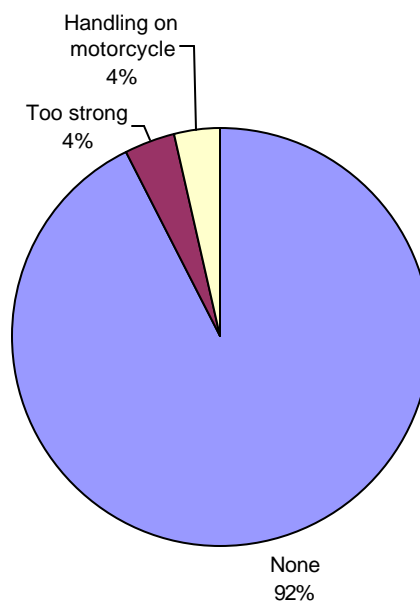


Figure 2. Experience of Discomfort or Handling Problems when Driving over CLRS

Impression of Rumble Effect

Many of the drivers surveyed commented that their initial reaction when driving over the CLRS for the first time was “surprised”, “strong”, or “loud”, although it appeared that this initial opinion softened over time for many who commented that they didn’t feel the CLRS to be quite as strong or alarming as their initial impression. Many found the effect to be similar to that of shoulder rumble strips, but weaker than in-lane lateral rumble strips (i.e. rumble strips on the approach to a stop sign). Everyone agreed that the CLRS were not strong enough to prevent them from making a legal passing maneuver. A few drivers also said that their cruise control did not disengage when contacting the CLRS. One driver said that the CLRS did not prevent her from moving over into the opposing lane when passing a bicyclist riding on the shoulder. Figure 3 shows a nearly equal breakdown between those who felt the rumble effect was strong versus moderate/subtle.

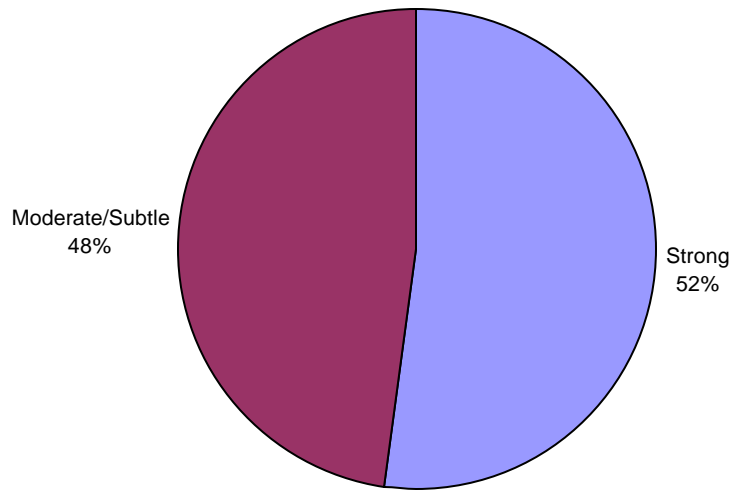


Figure 3. Drivers' Impression of the Rumble Effect

Overall Opinion of CLRS

By-and-large, most of the roadway users, residents, business owners/employees, and special users liked the CLRS and were in favor of the use of CLRS on other roadways. Figure 4 shows a summary of the overall opinion of the CLRS for further implementation in Wisconsin.

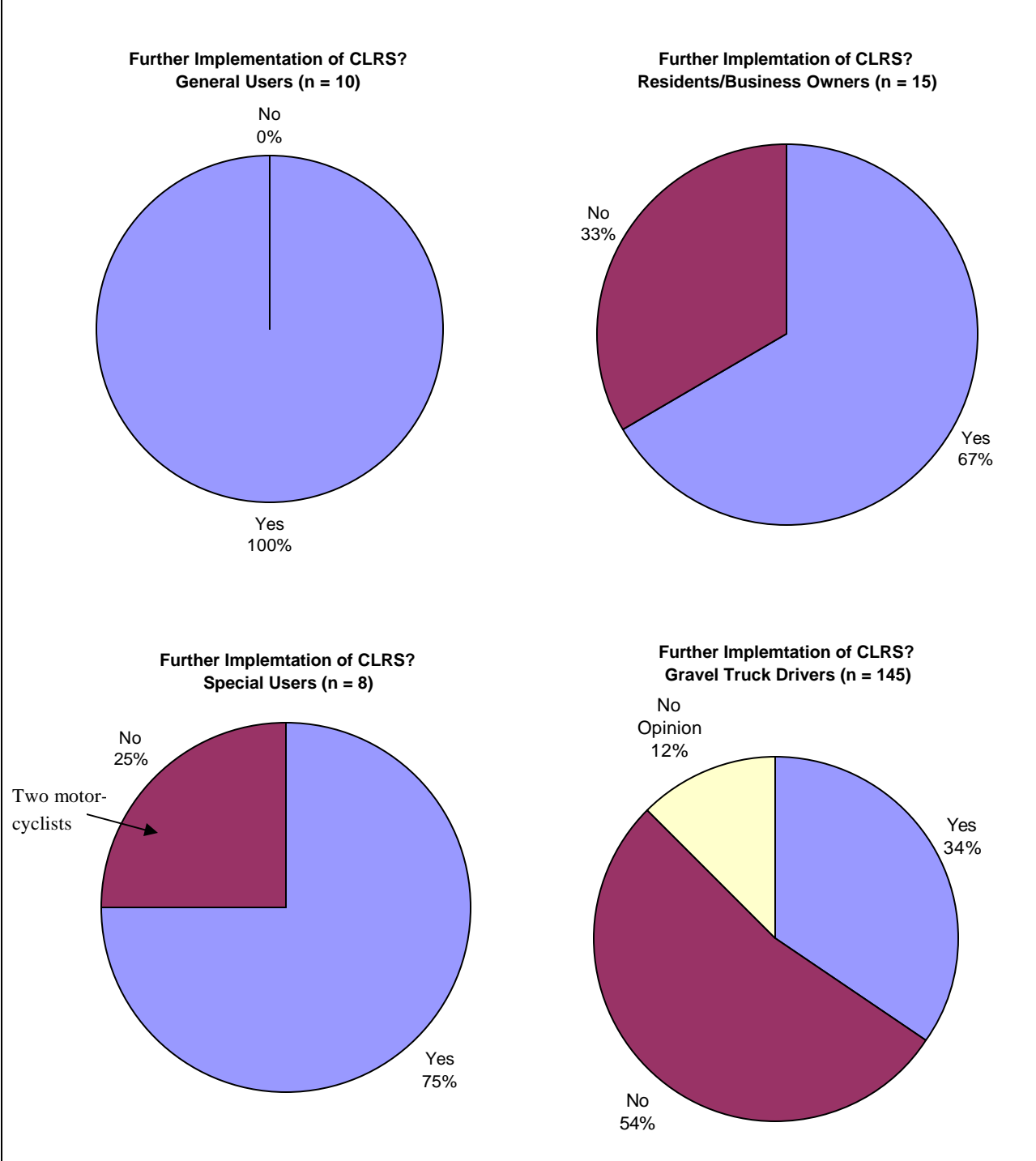


Figure 4. Opinion towards Further Implementation of CLRS in Wisconsin.

It appears that, with the exception of motorcyclists, commercial truck drivers, and some residents, nearly all roadway users that were interviewed had a favorable opinion of CLRS. The two motorcyclists that were interviewed gave perhaps the most dissenting opinions against the CLRS and were not in favor of their use elsewhere largely because of discomfort and the potential for the CLRS to hold water and become dangerous due to ice in the winter (see Table 3).

Truck drivers who were surveyed at J.W. Peters Gravel Pit were divided in their opinions of the CLRS. The majority were against the use of CLRS, although most drivers said this was because they felt CLRS were a waste of money and that safety money should be spent making improvements elsewhere (i.e., traffic signals at blind intersections on the corridor). However, the truck drivers made no mention of any handling problems or discomfort when contacting the CLRS, so unlike the motorcyclists, their negative opinions appear to be subjective in nature and not influenced by safety issues with CLRS.

Residents and business owners/employees were also divided in their opinions of CLRS. Two-thirds were in favor of further implementation of CLRS in Wisconsin, while one-third were against their use – largely due to the noise issue. While most businesses and residents along the corridor said they could hear the CLRS noise, many did not feel it was loud enough to be a nuisance – especially if they were improving safety along the corridor. Businesses and residents who were against the use of CLRS said the noise was too loud and distracting. Some even commented that they had difficulty sleeping due to the noise. It should be noted that two of the residents who were against the use of CLRS were also motorcyclists and their negative opinions about CLRS were likely magnified by discomfort experienced while contacting the CLRS on their motorcycles. It should also be noted that age of the interviewee did not seem to affect his/her opinion of the CLRS.

Summary and Conclusion

The researchers obtained numerous survey responses from residents/business owners, general roadway users, and special users (i.e., motorcyclists, fire/rescue drivers, police officers) in mid-September 2005 pertaining to the use of CLRS on STH 142. Nearly all of the roadway users experienced no physical problems with the CLRS when driving over them (i.e., discomfort, handling problems, overcorrection, instrument problems), including the fire/ambulance driver, the police officer, truck drivers, and the park rangers. One motorcyclist did complain of discomfort and another driver commented on the CLRS effect being quite strong. Many found the rumble effect to be similar to that of shoulder rumble strips, but weaker than in-lane rumble strips. With the exception of motorcyclists, commercial truck drivers, and some residents, nearly all roadway users that were interviewed had a favorable opinion of CLRS. The researchers identified three primary relevant issues that interviewees had with the CLRS:

- They generate noise that is audible from nearly every residence/business along the CLRS sections of STH 142, although the nuisance-level of this noise is debatable;
- They may create discomfort/handling problems for motorcyclists; and
- They may present winter maintenance issues (i.e., holding water/ice, durability, etc.), although it will not be possible to verify most winter issues until after the first few snowfall events.

Although not enough time has passed to accurately verify the safety effects of the CLRS, based on the information currently available (including the user surveys), the researchers currently see no substantial safety issues that have manifested in the first three months since the CLRS were installed at STH 142. As a result, the researchers believe that CLRS are a viable safety countermeasure for use elsewhere in Wisconsin.

APPENDIX

General Interview Form for STH 142 Users

1. Did you travel on State Highway 142 from the east today or at any time since July 1 (in other words, from I-94, Kenosha area, or US 45.....show them map of section)?
 - a. If YES: Proceed to Q2.
 - b. If NO: Proceed to Q3a.ii
2. Approximately how many times have you traveled on STH 142 since July 1?
3. On any of your travels on STH 142 since July 1, did you notice anything different about the centerline of the roadway?
 - a. If they don't answer CLRS, ask: Did you notice the Centerline Rumble Strips?
 - i. If YES: Proceed to Q4.
 - ii. If NO: Are you familiar with CLRS or rumble strips in general (i.e. shoulder RS)?
 1. If YES: Proceed to Q4
 2. If NO: Thank them for their time.
4. Did you happen to drive over them?
 - a. Inadvertently?
 - b. What was your initial reaction?
 - c. Were you surprised?
 - d. Did you have any discomfort?
 - e. Did you correct to the left or right or overcorrect?
 - f. Did you have any handling problems?
 - g. What were your impressions of the rumble effect (i.e., was it strong, was it weak, etc)?
 - h. Can you think of any differences between CLRS and Shoulder RS such as those found on the Interstate?
5. What was your initial overall impression of the CLRS (like, dislike)?
 - a. If you have traveled through this area more than once, has your impression of the CLRS changed?
6. Do you think they may provide a suitable safety improvement for reducing head-on collisions?
7. (For residents/business only) Have you noticed any increase in the noise levels due to vehicles passing over the rumble strips?
 - a. Is this noise a nuisance (i.e., difficult to sleep, etc)?
8. Do you think that they will have any negative impacts while driving, such as:
 - a. Discomfort
 - b. Nuisance to make legal passing maneuvers
 - c. Driver overreaction
 - d. Driver leftward correction of vehicle under certain situations
 - e. Poor vehicle handling
 - f. Instrument problems (i.e., disengage cruise control)
 - g. Vehicles crowding bicyclists under certain situations
 - h. Increased noise to the various residences along the highway
9. Should Wisconsin DOT implement CLRS at other locations across the state?
10. Any other comments?