- How does background complexity affect driver sign detection and reading performance?

B. Data of guide sign evaluation measures need to be gathered nationally so there are standards or norms for interpreting results obtained at the local level.

Considerable research on the human factors aspects of guide signs has been conducted. There are many questions still to be answered and benefits to be derived by the driving public from future research.

Reference

1. F. R. Manscom, and W. G. Berger, Motorist Response to Highway Guide Signing, Volume 1, Field Evaluation of Measures, BioTechnology, Inc. for NCHRP, January 1976.

REFLECTORIZATION OF CURVES

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The driver's use of roadway delineation for guidance and control information along curved paths is addressed in this presentation. The driver needs strong curvature cues for positive guidance, although the critical components of curvature cues are still not completely understood. Godthelp and Riemersma (1) make a strong case for perceiving curvature in perspective, which is most strongly presented by delineation at or near the road surface as opposed to higher post-mounted information. Brummelaar (2) discusses various features of the perspective road picture that may result in curvature cues for the driver. The primary thesis of this presentation is that all information on reflectorization of curves (e.g., raised pavement markers (RPMs), markings, curvature alignment signs, post-mounted reflectors) should be integrated and evaluated for its overall collective ability to give the driver strong curvature cues on which to base steering and speed guidance commands.

The effect of curvature information on steering performance has previously been demonstrated in simulator and field experiements (3). Steering performance improves under reduced visibility conditions such as night driving, in the presence of road surface delineation with characteristics such as small gaps, long dashes, and short repetition cycle lengths. The extent to which chevron alignment signs and other post-mounted devices contribute to curvature cue perception is not known, although they certainly have an important alerting and warning function that is critical for speed control.

Several perspective scene slides of a table top model of a delineated road were shown to illustrate how various delineation elements contribute to curvature cue perception. Past research has shown that curvature perception is strong with increased eye height above delineation. Road surface markings give the strongest curvature cues, while chevron designs on post-mounted panels give the strongest guidance cues (1). Other work with drunk drivers has shown that chevron alignment signs are best for long-range guidance, while wide edge lines are best for providing short-range steering control commands (4).

The requirement for integrating road surface, elevated guard rail, and post-mounted delineation and advance warning signs is not well understood. Issues that should be addressed for information on elevation include placement relative to curves and spacing between individual elements. For road surface information, retroreflector spacing and edge line width should also be considered. These issues should be addressed from the point of view of optimizing the overall delineation system at given curve locations.

References

1. H. Godthelp, and J. B. J. Riemersma, Perception of Delineation Devices in Road Work Zones During Nighttime, SAE Paper 820413 presented at the International Congress and Exposition, Detroit, Michigan, February 1982, pp. 22-26.

2. T. tenBrummelaar, The Reversal Point in the Perspective Road Picture, Australian Road Research, Volume 13, Number 2, June 1983, pp. 123-127.

3. R. W. Allen, and J. F. O'Hanlon, Driver Steering Performance Effects of Roadway Delineation and Visibility Conditions, Driver Performance, Passenger Safety Devices, and the Bicyclist, in Transportation Research Record 739, TRB, National Research Council, Washington, D.C., 1979, pp. 5-8.

4. I. R. Johnston, The Effects of Roadway Delineation on Curve Negotiation by Both Sober and Drinking Drivers, Australian Road Research Board, Volume 13, Number 3, Research Report ARR Number 128, September 1983, p. 243.

GUIDERAIL DELINEATION

Arthur W. Roberts, New Jersey Department of Transportation

In New Jersey, state traffic engineers have become interested in guiderail delineation. There has been increasing construction of guiderails on roadsides. Like the New Jersey concrete median barriers, of which hundreds of miles have been installed, hundreds of miles of guiderails are now being installed. More thought needs to be given to letting drivers know that guiderails are there, because they are fixed objects and colliding with them can cause some damage to both the vehicle and the guiderail itself. Of course guiderails are designed to cause less damage than colliding with trees, poles, abutments, and many other fixed objects.

In few, if any, states, there are no detail standards, warrants, or criteria to help traffic engineers determine when and how guiderails should be delineated. Guiderails are lower than 4 ft., so there is a question about whether a guiderail-mounted reflector can substitute for a 4-ft. delineator.

The compatibility between guiderail-mounted reflectors and other roadsides or even roadway reflectors has not been determined. If a large number of reflectors are installed at a curve or another critical driver decision location, the scene can be visually chaotic unless these reflectors are carefully organized according to the driver's view and decision needs throughout the approach.

Visually effective and useful reflective treatments appear to be lacking in many critical guiderail situations. The most easily maintained and cost effective installations, devices, and mounting methods are not well known and documented. The New Jersey Department of Transportation alone has approximately 1,000 miles of guiderail installed along its highway systems. In 1980 the total annual cost of guiderail accidents in New Jersey was in the millions of dollars and estimates vary up to $12 million. This does not include about $500,000 required to repair guiderails annually in the state. The guiderail does appear to be an area worth research investment, and reflectorization has the potential for improvement.

Reflectorization research should be oriented toward

1. Determining where and under what conditions there is a need for better guiderail visibility, especially at night;

2. Finding the best ways, where needed, to improve the visibility of guiderails for both clear and adverse weather conditions at night; and

3. Determining if there are any improvements in traffic flow or substitute safety measures that can be found and documented.

The most difficult and expensive to perform research is demonstrating improvements with substitute safety measures, yet it is the type of research that is most needed because it would provide the most highly quantified and least subjective evidence to justify the installation and maintenance of reflector treatments on guiderails.

Because each state or contractor would approach such a study differently, guiderail reflectorization policy, warrants, and treatments would be more solidly based on a variety of findings, if a number of agencies were involved in performing this research.

There are some guiderail installations in New Jersey that have low visibility under certain nighttime conditions including the following:

1. No opposing headlights
2. Wet nights
3. No leading taillights.

The visibility of guiderails on a wet night is especially heavily dependent on external light sources bouncing off the wet steel surface. Therefore, the guiderail visibility on wet nights is not reliable because external lights such as opposing headlights and leading taillights are not always present when the driver needs them.

The research that needs to be conducted is fairly obvious. It is easy to observe low visibility guiderail conditions and recommend that this and that needs to be done, but traffic engineers usually want to know something more definite, more quantitative, and more related to improving safety. Traffic accidents are generally insensitive to delineation improvements. Even with large numbers of accidents to study, many research efforts have had inconclusive results. As a result, we have resorted to more sensitive measures such as lane-changing, speed continuity, and speed variances used in combination with delineation studies.

The guiderail, under many geometric conditions and at least on wet nights, has low visibility. Its construction provides several mounting options that could have some advantages over post delineators. The effects of snow, dirt accumulation, visibility around curves, and vandalism needs to be considered.

Where and when is guiderail reflectorication needed? How does its use improve safety and annual repair costs? What materials and mounting methods should be used? What are the maintenance costs?

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