Improving Guide Sign Legibility

New Lettering Reads Larger, Clearer, Farther

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The traditional font—or lettering design—used for text on highway guide signs was developed in the 1950s and was tested on signs using white text on black backgrounds. The test conditions were nearly static—subjects walked toward the signs until they could read the words correctly.

Problem

In the past 50 years, sign fabrication techniques and materials, driver characteristics, and highway speeds have changed substantially. The text on guide signs usually is fully retroreflective, incorporating the latest and most efficient types of retroreflective sheeting materials. The sign lighting can be reduced, along with the costs of sign construction, maintenance, and operation.

Some older drivers, however, have difficulty reading the fully retroreflective text—the reflected light causes the edges of the characters to appear fuzzy. This effect is known as blooming and can be particularly acute for older drivers.

Clearview lettering on highway signs in Texas.

A 1994 study by the Federal Highway Administration (FHWA) found that guide signs did not provide adequate viewing distance and reaction time for older drivers. The report recommended enlarging the size of the letters on signs by 20 percent to increase the legibility distance.

The use of larger letters, however, would require increasing the size of the signs by 40 to 50 percent. Signs would cost more, as would the supporting structures.

Solution

For more than 10 years, a new font, Clearview, has been under development and testing to improve the legibility of highway guide signs. The Pennsylvania Department of Transportation (DOT) cosponsored research on Clearview in the early 1990s at the Pennsylvania Transportation Institute (PTI), Pennsylvania State University.

In the first study, subjective field evaluation and objective laboratory studies with computer simulation identified deficiencies in the current font, Series E Modified (Figure 1), and guided the development of Clearview as an alternative (Figure 2). Two major improvements—a reduced and variable stroke width and larger holes in letters like "e" and "o" —reduced the blooming effect. A second study concluded that a 5-inch tall Clearview font was legible at substantially greater distances than was a 5-inch tall Series E Modified font.

To build on these findings, Texas DOT sponsored a full-scale legibility study of the Clearview font at Texas Transportation Institute (TTI), part of the Texas A&M University System. Working with larger sizes of letters revealed minor improvements that could be made to the font.

In a second study by Texas DOT and TTI, 60 participants—20 young, 20 middle-aged, and 20 older—drove along a closed course and read full-size guide signs. Each guide sign had a randomly selected test word in either the Clearview or the Series E Modified

FIGURE 1 Guide sign with Series E Modified lettering, which has served as the standard font.

FIGURE 2 Clearview version of guide sign increases legibility at greater distances without increasing letter or sign sizes.

font. The legibility distance was recorded when the participants correctly read the guide sign aloud.

This study showed conclusively that the legibility distance for the Clearview font is 12 percent greater on average than that for the Series E Modified font. This corresponds to an approximately 25 percent increase in reading time at 70 miles per hour. In addition, older drivers experienced the largest gains in legibility distance and reading time with the Clearview font.

A third Texas DOT–TTI study used the Clearview font on guide signs to determine the best combinations of retroreflective sheeting for the white Clearview text on a green background. The study showed that the greatest legibility distance was obtained with the most efficient microprismatic materials; moreover, high-intensity retroreflective material in the green background did not compromise the legibility distances.

A combination of the most efficient microprismatic materials for the legend with high-intensity materials for the background yields win-win results. The signing agency gains durability and cost-efficiency in the signs, and drivers gain contrast, which is beneficial for legibility in dark conditions.

Application

As a result of the research, in September 2004 FHWA's Office of Transportation Operations granted interim approval for use of the Clearview font on guide signs.[1] At least 12 states, including Pennsylvania and Texas, have adopted the Clearview font for signs.

Research on Clearview continues. Texas DOT and TTI are evaluating the Clearview font for regulatory and warning signs. Because these signs have nonreflective black letters instead of the bright white letters used on guide signs, separate research is needed to evaluate the font's performance.

[1] http://mutcd.fhwa.dot.gov/res-ia_clearview_font.htm.

Benefits

The research shows that use of the Clearview font can improve sign legibility and reading time substantially without increasing the size of the sign. This helps all drivers—particularly older drivers—and will decrease the occurrence of navigational errors and crashes.

Quantifying these effects, however, is not possible, because data on navigational errors are not available, and crash reports do not indicate if the signs were a contributing factor in the crash. A before-and-after study is unlikely to develop a statistically significant crash-reduction factor for the Clearview font because so many other factors are involved.

A definite benefit is that the Clearview font can meet FHWA's recommendations for accommodating older drivers without having to increase the sign size. This allows state DOTs to improve service for drivers age 65 and older at a minimal cost.

Critical to the successful development of the Clearview font is the collaboration and coordination between the developer of Clearview (Don Meeker of Terminal Design), the PTI research team (Phil Garvey and Martin Pietrucha), and the TTI research team (Paul J. Carlson, Gene Hawkins, and Sue Chrysler). The vision, guidance, and support of Art Breneman, formerly with Pennsylvania DOT, and of Greg Brinkmeyer, Texas DOT, were equally vital. For more information about this research or this article, please contact Paul J. Carlson, Division Head, Operations and Design, TTI, at 979-845-6004; paul-carlson@tamu.edu.

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Suggestions for "Research Pays Off" topics are welcome. Contact G. P. Jayaprakash, Transportation Research Board, Keck 488, 500 Fifth Street, NW, Washington, DC 20001 (telephone 202-334-2952, e-mail gjayaprakash@nas.edu).