Florida Department of Transportation Research

Use of High Intensity Reflective Sheeting in lieu of External Lighting of Overhead Roadway Signs
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Integral to every road are signs that provide essential information to drivers. The design of signs is the result of careful study from every viewpoint, including sign position, size, shape, color, background, and lettering. Also well studied are vehicle geometries, drivers' natures, and sign setting. Sign visibility at night is critical, especially for drivers with diminished night vision, so signs are often lighted, but new retroreflective materials which are more visible at greater distances bring the need for lighting into question. Several states have moved away from lighting to building signs with the latest reflective materials. Therefore, the Florida Department of Transportation (FDOT) engaged University of North Florida researchers to study whether high intensity reflective sheeting can replace sign lighting.

The researchers reviewed literature about visibility factors of traffic signs, retroreflective sheeting material, lighting sources, and luminance of signs. There was little work on retroreflective sheeting in Florida, reinforcing the need for this project. Some surveys indicated that many older signs were not up to current national standards for retroreflectivity, and no work was found on sign luminance levels needed for older drivers, despite its importance for Florida's elder citizens and visitors. Adverse weather conditions and dirt were found to degrade visibility, suggesting the next phase of the research.

To evaluate the effect of dirt and adverse weather conditions on sign visibility, the researchers measured retroreflectivity of signs facing north, south, east, and west, before and after cleaning. Weather data for several Florida cities were used to assess nighttime weather effects. In comparisons of the beaded retroreflective material common in Florida with newer prismatic materials, researchers found that the prismatic material was more reflective both before and after cleaning. Also, dirt had less impact on the reflectivity of prismatic sheeting.

A technician measures the retroreflectivity of a sign in southwest Florida.

To discriminate between where unlighted signs could safely replace lighted ones under a wide variety of conditions, the researchers simulated overhead sign visibility using luminance as the primary metric, based on human factors studies and calibrated using literature data. Collecting field data for such studies with the required scope is difficult, if not impossible, making accurate simulations an essential aid to designers and planners. Needed legibility luminance was compared to available luminance for many situations, such as different headlamps, different sign lighting methods, and different amounts of sign dirt and aging.

Cost of both new materials and replacement is an important aspect of implementing new technology. Therefore, the researchers examined costs of upgrading sign sheeting and sign lighting. They examined life cycle costs over the expected 20-year life of the signs and reported recommendations for retaining/changing signs.

Better sign technology offers many advantages to Florida's drivers and taxpayers. New sign materials are more visible to a wider range of drivers, and eliminating lighting, where possible, reduces infrastructure investment and the costs of replacement and maintenance.

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For more information, visit http://www.dot.state.fl.us/research-center