



The benefit/cost analysis was performed in 2003



JTRP / INDOT RESEARCH PROGRAM

Research Pays Off

Sign Retroreflectivity Study SPR 2482

In 2001 INDOT replaced 14,930 signs at a cost of \$1,067,931 and did maintenance work on 34,084 signs at a cost of \$2,136,076. These values include the cost of the material used for making the sign, equipment use, and labor costs. Replacement is defined as a sign being replaced because it is ten years of age or older. Maintenance is defined as signs needing to be cleaned or replaced due to knockdowns or vandalism. Currently the replacement of interstate and highway signs, which are ten years or older, is about one-third of the entire cost of the INDOT sign maintenance and replacement program.

Recently, guidelines have been proposed by FHWA for minimum retrore-

flectivity of traffic signs for state, county, and city roads in the United States.

The purpose of this research was to evaluate if the majority of the current signs will meet the new minimum requirements proposed by the FHWA. In addition, this research provides quantitative data to assess the effectiveness of the current sign replacement program used by INDOT and determines if the current ten year replacement schedule is adequate to keep the State of Indiana in compliance with the new guidelines or if adjustments need to be made. This research was limited to ASTM Type III sheeting.

Research Findings and Implementation

Currently, the proposed minimums are different requirements for different size and speeds for each color group. The research indicates that this needlessly complicates field inspection because the majority of the signs pass the most conservative minimums for each of the color groups.

The majority of the signs with red backgrounds and white legends will meet the proposed white to red ratio requirement because the performance of the white ASTM Type III sheeting is so good that for the most part the retroreflectivity does not change as the sign ages.

INDOT districts presently replace traffic signs in a ten year cycle. This is typically done either by replacing signs as sections of highways and interstates are repaved, or, based upon the sign's age. A third replacement procedure is recommended based upon an annual or bi-annual night observation techniques that allow trained personnel to travel at night time, when the signs are most needed, ensuring adequate field use. Unlike using a retroreflectometer, this procedure ensures that at night one can see how the entire face of the sign performs and be able to catch dead spots on the sign face.

Also unlike using a retroreflectometer this method is not as cost and labor intensive.

From the analyses, it is recommended that the life cycle of traffic signs with white and yellow backgrounds can be safely extended for at least two years to 12 years, provided there is no apparent damage or defects. Red, however, should not be left out in the field for longer than 10 years because the red coloring at that point has faded too much.

It is proposed that INDOT construct an outdoor test stand in one of their districts, and annually randomly select several samples to hang of each sheeting vendors color palette for long term monitoring. It is very important these samples be randomly selected from INDOT stock (but different lots), independent of the vendor.

Details regarding the product vendor, manufacture date, installation date, and lot number would be recorded on the back of the sample. Annual monitoring of this test stand would provide an early warning to INDOT of impending problems with a particular vendor's Type III sheeting.

Potential Benefits

It is estimated that \$28,372 in material costs and \$97,333 in labor costs would be saved annually by implementing a 12-year cycle on signs with white and yellow backgrounds. This results in an estimated \$125,705 in overall annual savings in using the proposed 12-year cycle over the current 10-year cycle. From the analyses done in the study it is recommended that the life cycle of traffic signs with white and yellow backgrounds can be safely extended for at least two

years to 12 years, providing there are no apparent damage or defects. Red, however, should not be left out in the field for longer than 10 years because the red coloring at that point has faded too much. Such a policy could save INDOT at least \$27,000 per year in material costs.

**Cost of
Research
\$66,885**

Estimated Annual Economic Value Over 10 Years At 5% Discount Rate

Costing Method	Discounted Annual Material Cost [1]	Discounted Annual Labor Cost [2]	Discounted Annual Savings [3] = [1(a-b)] + [2(a-b)]	Total Discounted Savings (10 years) [4] = [3] x 10	Benefit/Cost Ratio [5] = [4] / \$66,885
Current	\$214,548 ^a	\$736,071 ^a	\$125,705	\$1,257,050	18.79
Proposed	\$186,176 ^b	\$638,684 ^b			

Assumptions

- That in 2001 INDOT replaced 14,930 signs at a total labor cost of 1,067,931.
- That INDOT replaced 9,918 yellow and white background signs in 2001 and 99,180 will be replaced over a 10-year cycle.
- That the 10-year cycle assumes 1/10th of the signs shall be replaced each year.
- That the 12-year cycle assumes 1/12th of the signs shall be replaced each year.
- That the average labor cost per installation of signs was \$72 in 2001 (\$1,067,931(labor cost)/14,930(# of signs)).
- A 3% inflation was assumed in the study analysis.

References

- Austin B. and Darcy B., "Sign Retroreflectivity Study," Joint Transportation Research Project FHWA/IN/ JTRP-2002/22 Final Report, December 2002