

# Evaluation of The Effectiveness of Clearview Font and Fluorescent Yellow Sheeting on Michigan's Freeways

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## Abstract:

Halation and irradiation make guide sign fonts hard to recognize. Drivers missing the needed information tend to be anxious and confused potentially causing fatal accidents. In order to avoid or mitigate the situation a newer font, Clearview, is installed to provide better readability in nighttime and from far distances. In a similar context, the lack of brightness in sheeting material for warning signs leads to missing the cautionary information. Installation of fluorescent yellow sheeting has provided signs with more noticeable and brighter materials. This study evaluates the effectiveness of the Clearview fonts along with fluorescent yellow sheeting installed in Michigan freeways. Through observational before and after studies Safety Performance Functions (SPFs) and Crash Modification Factors (CMFs) are developed and estimated, respectively. Thus, crash reductions provided by the fonts and sheeting materials are presented. Significant reductions in total crashes (e.g. 24.10% overall) are observed for different crash conditions including age, time of the day and crash severity.

## Research Objectives and Scope:

1. Evaluating the safety benefits of Clearview font legend on guide signs on freeways, and fluorescent yellow sheeting on warning signs.
2. Developing Safety Performance Functions (SPF) and Crash Modification Factors (CMF) for these improvements.

## Findings from Literature Review:

- Clearview font is mostly effective during night time (decreases crashes by 8-10%)
- Fluorescent yellow sheeting are easier to detect from farther distances

## CAN YOU SEE ANY DIFFERENCE ? ☺

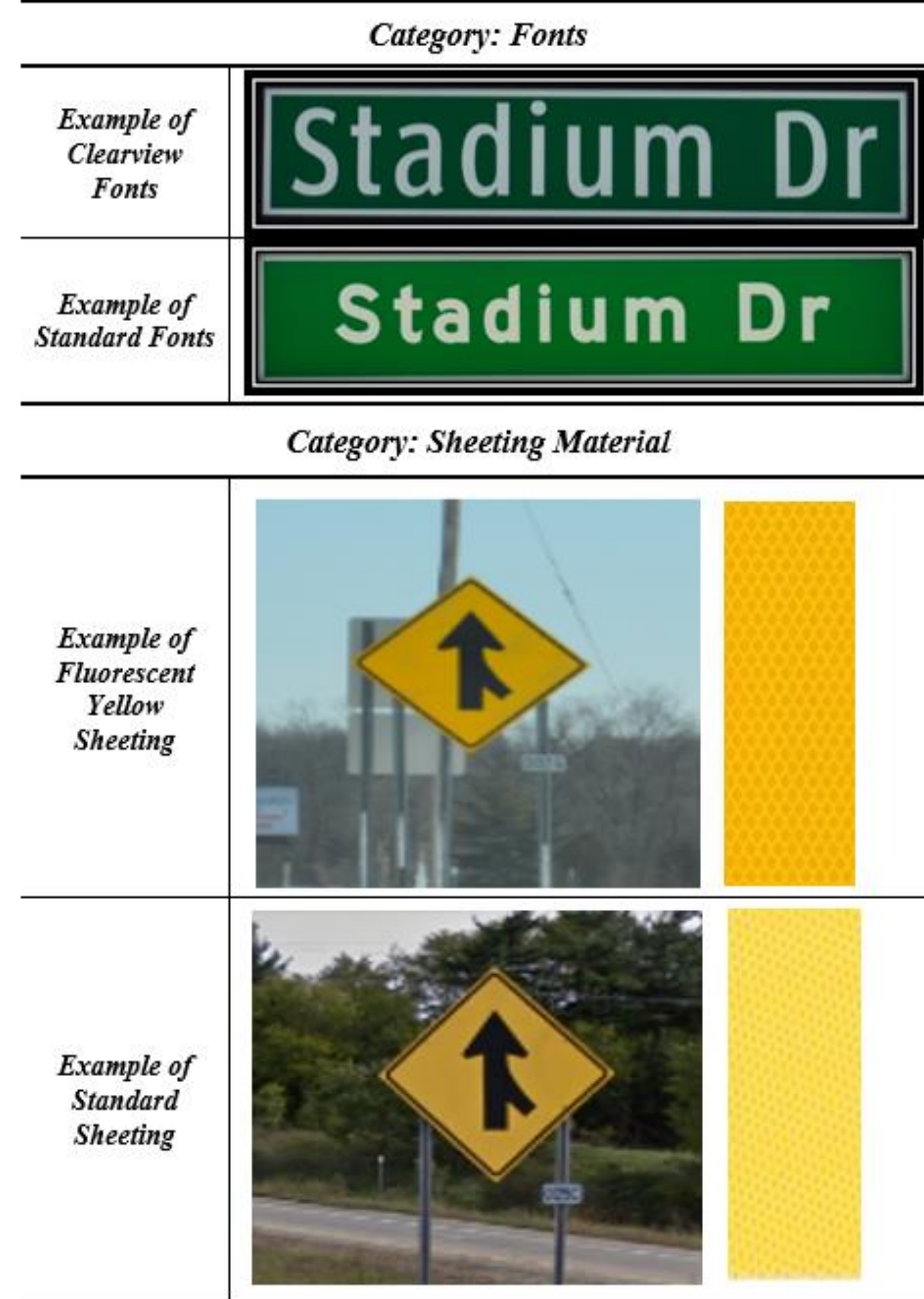


Fig. 1. Example of Countermeasures

## Survey of Michigan Drivers Data Collection:

- The data consisted of 1590 participants from Michigan metropolitan areas
- Analyses distinguished between those who had noticed the difference between the standard and countermeasure and those who have never noticed before

## Conditions Targeted:

1. High-speed roads,
2. Far distances (for Clearview fonts only),
3. Inclement weather, and
4. Nighttime visibility

## Survey of Michigan Drivers Cont'd Survey Results:

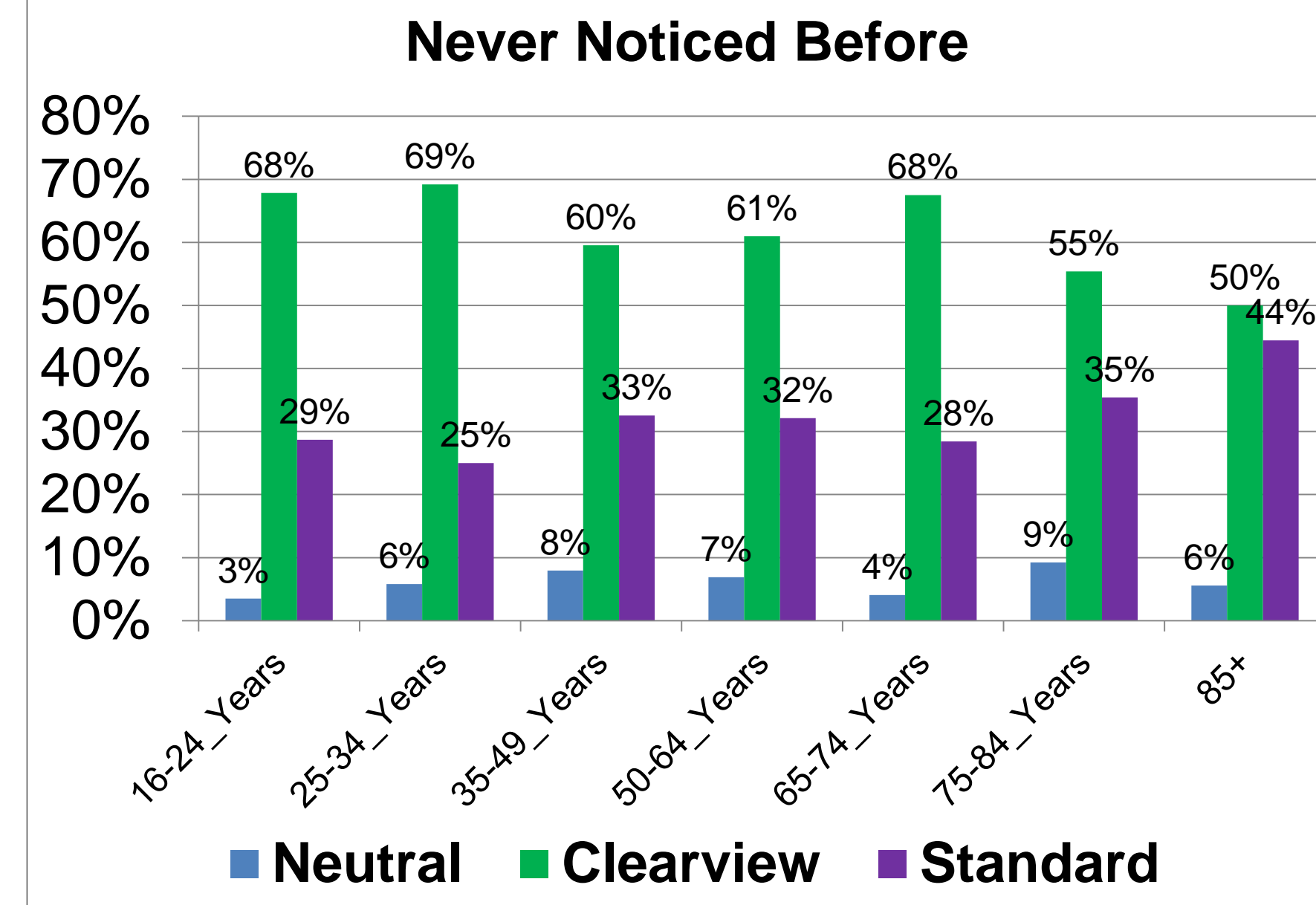


Fig. 2. Example of Preference of Clearview Fonts in Nighttime

## Major Finding From the Survey:

- Countermeasures are highly preferred compared to the standard installations

## Crash Data Collection

- Crash data records (2004-2013) from the Office of Highway safety planning (OHSP)

## Development of Safety Performance Functions (SPFs)

- Used data collected from reference sites

General equation:

$$N_{Crash\_category} = exp(Constant + B_1 * X_1 + ... + B_n * X_n)$$

where:

- $N_{Crash\_category}$  = Crashes per year for the category considered
- Constant,  $B_i$  = Estimable parameters. For example, for total crashes estimates were -7.718 (for constant), 0.270, and 0.974 (variable coefficients)
- $X_i$  = Variables affecting crashes (traffic volume and length in miles for this case)

- It was not possible to estimate SPFs for all age categories due to sample size

- Before-after with comparison method was used.

## Sample SPF Results:

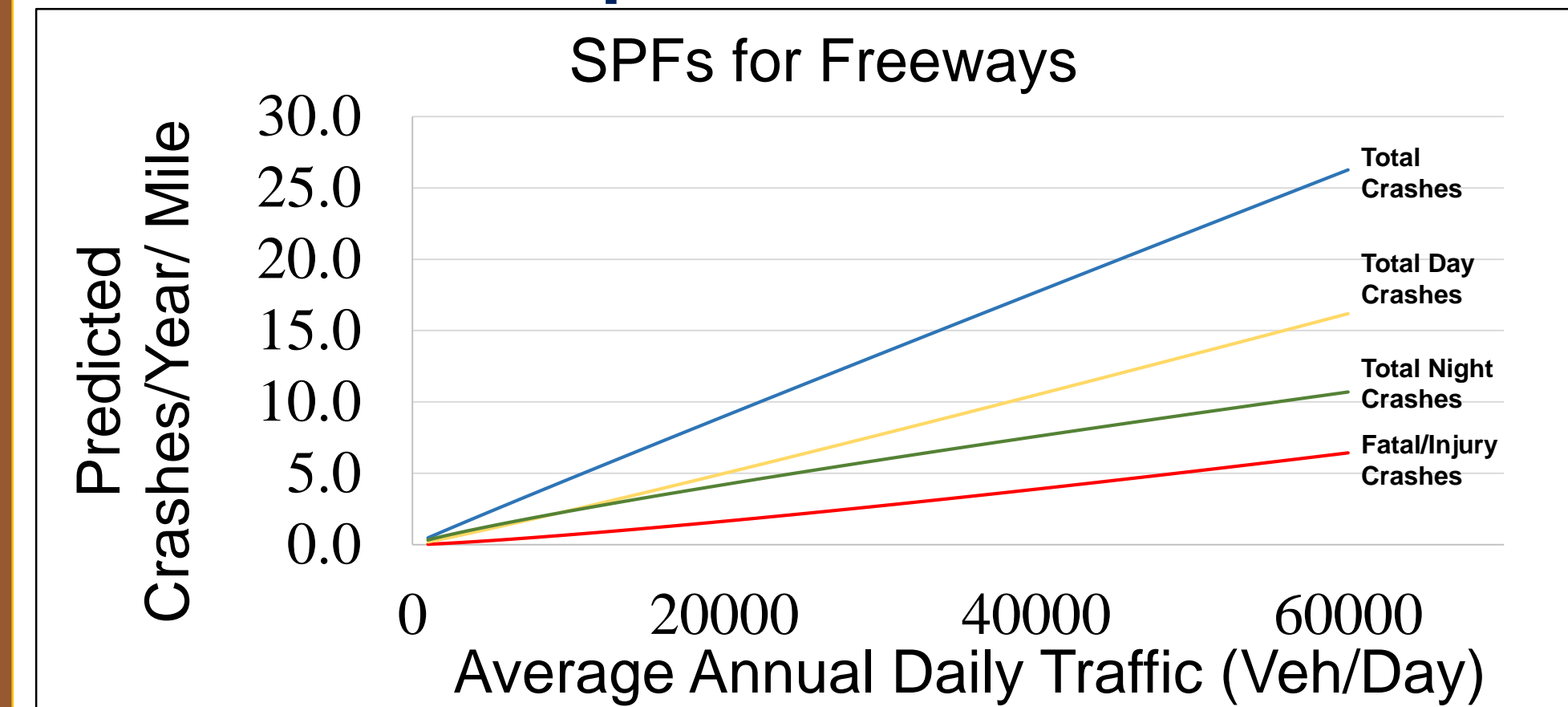


Fig. 3. Graphical Form of SPFs

## Estimation of Crash Modification Factors

- Crash Modification Factors (CMFs) and Crash Reduction Factors (CRF) described:
  - ❖ Crash Reduction (%) =  $100 * (1 - CMF)$
- In 2006 fluorescent yellow sheeting only were installed. A year later, both countermeasures were installed simultaneously.
  - ❖ CMFs for Clearview Fonts only were derived as:  $CMF_{CV} = \frac{CMF_{CV-FY}}{CMF_{FY}}$
  - $CMF_{CV-FY}$  = CMF for both Fluorescent Yellow Sheeting and Clearview font
  - $CMF_{FY}$  = CMF for Fluorescent Yellow Sheeting only

## Summary of Safety Benefits

Table1. Crash Reductions (%)

Crash Type	CF & FYS	FYS Only	CF Only
Total	24.10***	14.90***	10.81
Total fatal/injury	7.00	3.70	3.43
Total Day	20.20***	18.10***	2.56
Total Night	25.90***	0.2	25.75
Total Under- 65	24.10***	15.40***	10.28
Total Under- 65 Day	19.30***	12.80***	7.45
Total Under- 65 Night	27.20***	9.8	19.29
Total 65-and-above	10.00	0.20	9.82
Total 65-and-above Day	8.80	6.20	2.77
Total 65-and-above Night	9.8	8.7	1.2

Where: CF = Clearview Font and FYS = Fluorescent Yellow Sheeting

Note:

1. Underlined CMF refer to EB method; not underlined CMF refers to B/A with comparison Groups
- 2.\* Significant at 85% Confidence Level
- 3.\*\* Significant at 90% Confidence Level
- 4.\*\*\* Significant at 95% Confidence Level
- 5.No star refers to No significant

## Findings on Crash Reductions:

- Overall, reductions are observed in all crash conditions, which highlights the effectiveness of all countermeasures
- The nighttime crash reductions were the largest, in the summarizing table above, when using both countermeasures (27.20% for under-65-years at night)

## Benefit-Cost Ratio for Average Site:

Countermeasure	Costs and Benefits			Benefit to Cost Ratio (BCR)
	Average Annual Savings	Present Value Benefits	Present Value Costs	
CF & FYS	\$25,085.86	\$300,559.34	\$110.65	2716
FYS Only	\$19,853.37	\$237,867.64	\$57.92	4107

Where: CF = Clearview Font and FYS = Fluorescent Yellow Sheeting

Table 2. Benefit to Cost Ratios for Improvements

- The countermeasures are not only reducing crashes but also providing significant annual cost savings.

## Conclusions:

- Significant reductions in total number of crashes were observed when both countermeasures were installed by during time of the day (nighttime), age-groups, and crash severity (fatal/injury)

## Recommendations:

- The continue use of the countermeasures as they reduce crashes and are economically beneficial. This study serves as a reference for transportation agencies future informed decisions.

## Acknowledgments:

The following are acknowledged for their participation in the project:  
 Kimberly Lariviere, MDOT; Valerian Kwizile, PhD, WMU (advisor); Jun-Seok Oh, PhD, WMU; Ron Van Houten, PhD, WMU; Diana Prieto, PhD, WMU; and Richard Boateng, MSE, WMU;