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 in Michigan freeways along with 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 is easier to detect from farther distances.

Survey of Michigan Drivers Data Collection:
• The data consisted of 1590 participants from Michigan metropolitan areas.
• Analyses distinguished between those who had noticed the countermeasures and those who had never noticed before.

Crash Data Collection:
• Crash data records (2004-2013) from the Office of Highway safety planning (OHPSP)
• Development of Safety Performance Functions (SPFs)
• Used data collected from reference sites

General equation:
\[ N_{\text{Crash category}} = e^{\exp\left[\text{Constant} + \text{CF} \cdot i + \text{FYS} \cdot i\right]} \]

Where:
- \( N_{\text{Crash category}} \) = Crashes per year in the category considered
- \( \text{CF} \) = Clearview Font
- \( \text{FYS} \) = Fluorescent Yellow Sheeting

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

Before-after with comparison method was used.

Summary of Safety Benefits

Table: Crash Reductions (%)

<table>
<thead>
<tr>
<th>Crash Type</th>
<th>CF &amp; FYS</th>
<th>FYS Only</th>
<th>CF Only</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>24.10***</td>
<td>13.90***</td>
<td>10.81***</td>
</tr>
<tr>
<td>Total Fat/I</td>
<td>3.00</td>
<td>3.70</td>
<td>3.43</td>
</tr>
<tr>
<td>Total Day</td>
<td>20.20***</td>
<td>18.10***</td>
<td>2.56</td>
</tr>
<tr>
<td>Total Night</td>
<td>25.90</td>
<td>25.75</td>
<td></td>
</tr>
<tr>
<td>Total @-65</td>
<td>24.10***</td>
<td>15.80***</td>
<td>10.28</td>
</tr>
<tr>
<td>Total @-65 Day</td>
<td>19.30***</td>
<td>12.80***</td>
<td>7.45</td>
</tr>
<tr>
<td>Total @-65 Night</td>
<td>27.20***</td>
<td>9.8</td>
<td>19.29</td>
</tr>
<tr>
<td>Total @-65 and-above</td>
<td>10.00</td>
<td>0.20</td>
<td>9.82</td>
</tr>
<tr>
<td>Total @-65 and-above Day</td>
<td>8.80</td>
<td>6.20</td>
<td>2.77</td>
</tr>
<tr>
<td>Total @-65 and-above Night</td>
<td>9.8</td>
<td>6.7</td>
<td>3.2</td>
</tr>
</tbody>
</table>

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

Estimation of Crash Modification Factors
• Crash Modification Factors (CMFs) and Crash Reduction Factors (CRFs) described
• Crash Reduction (% = 100*(1-CMF))
• In 2006 fluorescent yellow sheeting only were installed. A year later both countermeasures were installed simultaneously.

Clearview fonts only were derived as: CMF = \( \frac{\text{CF and FYS total crashes}}{\text{FYS only total crashes}} \)

Countermeasure and those CMF for both fluorescent yellow sheeting and Clearview fonts CMF = \( \frac{\text{CF and FYS total crashes}}{\text{Fluorescent yellow sheeting only total crashes}} \)

Benefit-Cost Ratio for Average Site:

Table: Benefit to Cost Ratios for Improvements

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.

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Fig. 1. Example of Countermeasures

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

Fig. 3. Graphical Form of SPFs