Gazing at Yellow Rapid-FlashBeacons: FHWA Studies

Kay Fitzpatrick
Texas A&M Transportation Institute

TexITE Spring Meeting, May 30, 2014

FHWA Interim Approval

- Optional use of rectangular rapid flashing beacons (RRFB)
- Pedestrian and school crosswalks across uncontrolled approaches
- July 16, 2008

Research – RRFB Driver Yielding

<table>
<thead>
<tr>
<th>Study</th>
<th># Sites</th>
<th>Driver Yielding</th>
<th>Unique</th>
</tr>
</thead>
<tbody>
<tr>
<td>2010 FHWA</td>
<td>22 (most in St. Pete)</td>
<td>72 to 96% activated</td>
<td>Original study, multiyear (2 yrs+ data)</td>
</tr>
<tr>
<td>2009 FHWA</td>
<td>2 (Miami)</td>
<td>55 to 60% day 66 to 70% night</td>
<td>Day and night</td>
</tr>
<tr>
<td>2009 Florida</td>
<td>1 (St. Pete)</td>
<td>35% overall 54% activated</td>
<td>Trail crossing</td>
</tr>
<tr>
<td>2011 Texas</td>
<td>1 (Garland)</td>
<td>80% activated</td>
<td>School, overhead</td>
</tr>
<tr>
<td>2011 Oregon</td>
<td>2 (Bend)</td>
<td>83% activated</td>
<td>45 mph</td>
</tr>
<tr>
<td>2014 Texas</td>
<td>22 (most in Garland)</td>
<td>34 to 92% activated</td>
<td>Sig: city, PSL, crossing distance, one/two way</td>
</tr>
</tbody>
</table>

Next Step – Manual?

- How to include new device in MUTCD?
  - Takes several steps
- National Committee on Uniform Traffic Control Devices (NCUTCD)
  - Makes recommendations to FHWA regarding proposed revisions / interpretations
  - Several technical committees

NCUTCD

- RRFB → Signals Technical Committee (STC)
- STC would like answers to several questions before developing draft language
  - Why rectangular? Would circular be OK? Size?
  - Could the beacons be mounted above?
  - What is optimal flash rate? Flash pattern?
  - What is the proper intensity?
  - What about potential for seizures?
  - Others

Other FHWA Studies

- Task Order #4: 2011-2015
  - 2012 Closed Course
  - 2013-2014 Open Road
- Task Order #8: 2013-2016
  - 2013/4 Closed Course
  - 2014-2015 Open Road
  - And other tasks
2012 - Closed-Course Objective
• Determine influence of flashing beacons/LEDs on object detection and legend recognition
  • Beacon shape (circular, rectangular, embedded)
  • Beacon size (circular 12-inch, circular 8-inch)
  • Placement (above, below, embedded)
• Identify up to two assemblies for testing on open road

2012 - Study Assemblies, Lap B
- C-A12
- C-B12
- C-B8
- C-V12
- R-B
- R-A
- LED
- No Beacon

2012 - Study Assemblies, Lap A
- C-A12
- C-B12
- C-B8
- C-V12
- R-B
- R-A
- LED
- No Beacon

2012 - Distractor Signs

2012 - Three Objects

2012 - Tasks
• Participants to say when they could first see
  • Warning lights (“lights”)
  • Road sign (“sign”)
  • Read the words or identify the symbol on the road sign (“word”)
• Object: pedestrian, trash can, or small box (“Ped”, “can”, or “box”)
• Slide show used prior to driving to train participants
2012 - Object Detection Observations

• Time (day / night) significant, example average detection distance to pedestrian:
  • Daytime: 911 +/- 539 feet
  • Nighttime: 116 +/- 93 feet
• Age (young = <55 / old = 55+)
  • Significant daytime only
  • Nighttime conditions impeded detection to point that effects of several variables too small to detect

2102 - Object Detection Observations

• Certain assemblies are associated with shorter object detection distance (i.e., drivers had to be closer to detect object, which is not desirable)
  • Daytime: shorter for R-B compared to C-B12, C-B8, R-A, 155 to 167 ft differences (significant)
  • Nighttime: shorter for R-B compared to C-B12, 37 ft difference (significant)

2012 – Detection Observations

2012 Recommendation for Open-Road Study

• Devices selected:
  • R-B
  • C-B12

2013/4 - Closed-Course Objective

• Determine influence of yellow flashing beacons/LEDs on identifying direction pedestrian is walking
  • Beacon brightness (0, 600, 1400, 2200 candelas)
  • Beacon placement (above, below, embedded)
  • Flash pattern (several)
  • Identify assemblies for testing on open road

2013/4 – Assembles
**2013/4 – Occlusion Glasses**

**2013/4 – Setup**

**2013/4 - Tasks**
- After vision restored, indicate via button push whether ped is walking to left or right
- Next, state whether the intensity is:
  - Comfortable
  - Irritating
  - Unbearable
- Respond to survey questions after conclusion of in-field data collection

**2013/4 – Closed Course Study Results**
- Data being analyzed
- Will select assemblies for testing on the open road – any city willing to host a test site?
- Results should be available soon

QUESTIONS?