Pedestrian Hybrid Beacons (PHB)
High-Intensity Activated CrossWalks (HAWK)

Review and Education Efforts
Introduction

• Review of Crash Modification (CMF or CRF%)

• Review of Policy and Guidance

• Present some Education Efforts
1. Dark until activated
2. Flashing yellow upon activation
3. Steady yellow
4. Steady red during pedestrian walk interval
5. Alternating flashing red during pedestrian clearance interval
6. Dark again until activated

Legend:
SY Steady yellow
FY Flashing yellow
SR Steady red
FR Flashing red

1. Dark until activated
2. Flashing yellow light for 3–6 s
3. Steady yellow light for 3–6 s
4. Steady red light during pedestrian interval
5. Alternating flashing red lights during pedestrian clearance interval
Crash Modification (CMF or CRF,%)
CMF / CRF(%)  

• CMF is a decimal  
  – It is a multiplicative factor  
  – Known crashes x CMF = new expected crashes  
  – Less than 1 is GOOD!  

• CRF (%)  
  – Expressed as a percent  
  – Indicates a percent reduction of known crashes  
  – Larger the better!
CMF / CRF(%) 

• CRF (%) range from 15% to 69%
  – FHWA states it this way:
    • 69% in ped crashes
    • 29% in total crashes
    • 15% in serious injury and fatal crashes
The pedestrian hybrid beacon (PHB) is a traffic control device designed to help pedestrians safely cross busy or higher-speed roadways at midblock crossings and uncontrolled intersections. The beacon head consists of two red lenses above a single yellow lens. The lenses remain “dark” until a pedestrian desiring to cross the street pushes the call button to activate the beacon. The signal then initiates a yellow to red lighting sequence consisting of steady and flashing lights that directs motorists to slow and come to a stop. The pedestrian signal then flashes a WALK display to the pedestrian. Once the pedestrian has safely crossed, the hybrid beacon again goes dark.

More than 75 percent of pedestrian fatalities occur at non-intersection locations, and vehicle speeds are often a major contributing factor. As a safety strategy to address this pedestrian crash risk, the PHB is an intermediate option between a flashing beacon and a full pedestrian signal because it assigns right of way and provides positive stop control. It also allows motorists to proceed once the pedestrian has cleared their side of the travel lane, reducing vehicle delay.
A crash modification factor (CMF) is used to compute the expected number of crashes after implementing a countermeasure on a road or intersection. The Crash Modification Factors Clearinghouse provides a searchable online database of CMFs along with guidance and resources on using CMFs in road safety practice. It also provides guidance to researchers on best practices for developing high quality CMFs.

**Recently Added CMFs**

- **Provide a raised median**
  - CMF: 0.49
  - CRF: 51
  - Crash type: Other
  - Crash severity: All

- **Install separated bicycle lane**
  - CMF: 0.963
  - CRF: 3.7
  - Crash type: All
  - Crash severity: All

- **Install intersection conflict warning systems (ICWS) for two-lane at two-lane intersections**
  - CMF: 0.7
  - CRF: 30
  - Crash type: All
  - Crash severity: Serious injury, Minor injury
**Countermeasure: Install a pedestrian hybrid beacon (PHB or HAWK)**

<table>
<thead>
<tr>
<th>Compare</th>
<th>CMF</th>
<th>CRF (%)</th>
<th>Quality</th>
<th>Crash Type</th>
<th>Crash Severity</th>
<th>Area Type</th>
<th>Reference</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0.712</td>
<td>29</td>
<td>3⭐️⭐️⭐️⭐️⭐️</td>
<td>All</td>
<td>All</td>
<td>Urban and suburban</td>
<td>Fitzpatrick, K., and Park, E.S., 2010</td>
<td>The authors of this study ... [read more]</td>
</tr>
<tr>
<td></td>
<td>0.453</td>
<td>54.7</td>
<td>3⭐️⭐️⭐️⭐️⭐️</td>
<td>Vehicle/pedestrian</td>
<td>All</td>
<td>Urban and suburban</td>
<td>Zegeer et al., 2017</td>
<td>Methodology used was a combination ... [read more]</td>
</tr>
<tr>
<td></td>
<td>0.849</td>
<td>15</td>
<td>3⭐️⭐️⭐️⭐️⭐️</td>
<td>All</td>
<td>K,A,B,C</td>
<td>Urban and suburban</td>
<td>Fitzpatrick, K., and Park, E.S., 2010</td>
<td>The authors of this study ... [read more]</td>
</tr>
<tr>
<td></td>
<td>0.309</td>
<td>69</td>
<td>3⭐️⭐️⭐️⭐️⭐️</td>
<td>Vehicle/pedestrian</td>
<td>All</td>
<td>Urban and suburban</td>
<td>Fitzpatrick, K., and Park, E.S., 2010</td>
<td>The authors of this study ... [read more]</td>
</tr>
</tbody>
</table>

*NOTE: You can compare CMFs across countermeasures, subcategories, and categories.*

http://www.cmfclearinghouse.org/
Countermeasure: Install pedestrian hybrid beacon (PHB or HAWK) with advanced yield or stop markings and signs

<table>
<thead>
<tr>
<th>Compare</th>
<th>CMF</th>
<th>CRF (%)</th>
<th>Quality</th>
<th>Crash Type</th>
<th>Crash Severity</th>
<th>Area Type</th>
<th>Reference</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0.82</td>
<td>18</td>
<td>★★★★</td>
<td>All</td>
<td>All</td>
<td>Urban and suburban</td>
<td>Zegeer et al., 2017</td>
<td>Study sites were a combination ... [read more]</td>
</tr>
<tr>
<td></td>
<td>0.432</td>
<td>56.8</td>
<td>★★★☆☆</td>
<td>Vehicle/pedestrian</td>
<td>All</td>
<td>Urban and suburban</td>
<td>Zegeer et al., 2017</td>
<td>Methodology used was a combination ... [read more]</td>
</tr>
<tr>
<td></td>
<td>0.876</td>
<td>12.4</td>
<td>★★★☆☆</td>
<td>Rear end,Sideswipe</td>
<td>All</td>
<td>Urban and suburban</td>
<td>Zegeer et al., 2017</td>
<td>Study sites were a combination ... [read more]</td>
</tr>
</tbody>
</table>

*NOTE: You can compare CMFs across countermeasures, subcategories, and categories.

http://www.cmfclearinghouse.org/
Policies / Guidance
Policies / Guidance

Evaluation of Pedestrian Hybrid Beacons and Rapid Flashing Beacons

PUBLICATION NO. FHWA-HRT-16-040

PEDESTRIAN AND BICYCLE SAFETY

JULY 2016

5/3/2018

2018 Spring OTEA
Policies / Guidance

• 20 location in Tucson, AZ and Austin, TX
• 78 hours of video and 1979 peds
• When veh queuing and flashing red, ½ of the crossings had at least one driver who did not stop completely
• However, 96% yielding rate to peds
• 7% of peds departed on dark (majority had acceptable gap)
• Peds departing on dark is more likely at coordinated sites
Policies / Guidance

• If coordinated sites had red-illuminated button, peds more likely waited

• 91% peds pushed the button
  – Went up for 45mph (rather than 40mph)
  – Went up for increased veh volume

• The conflict rate was higher when non-compliant ped was involved

• It has shown to be a safety improvement

• Associated with less delay compared to TCS
Policies / Guidance

• MUTCD
  – Either does not meet traffic signal warrants, or
  – Meets but decision has been made not to install

• Low speed and high speed guidelines
  – Figures 4F-1 and 4F-2
  – Based on vehicles (VPH) compared to peds (PPH) to crossing lengths
  – Min. of 20 PPH
  – Got all the right variables. It’s OK.
  – However ....
Policies / Guidance

• Traffic Engineer Division’s current policy
  – Crosses a highway (ODOT’s LG might have something different)
     – At least 3 lanes (back to the MUTCD and FHWA’s philosophy)
     – More than 300 feet from signal or stop control
Policies / Guidance

• Traffic Engineer Division’s current policy
  – We expected far more requests, but
  – $60k or so
  – 12 item points award system for ranking
    • Have not had to use yet
    • But as they become more popular we might
<table>
<thead>
<tr>
<th>Criterion</th>
<th>Points</th>
<th>Max</th>
<th>Awarded Points</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Distance 'd' from the requested beacon to the nearest signalized or stop-controlled crossing.*</td>
<td>0</td>
<td>10</td>
<td>0</td>
<td>if ( d \leq 300 ) ft</td>
</tr>
<tr>
<td></td>
<td>( \frac{d - 300}{100} )</td>
<td>10</td>
<td></td>
<td>if ( 300 &lt; d &lt; 1300 ) ft</td>
</tr>
<tr>
<td></td>
<td>10</td>
<td>10</td>
<td></td>
<td>if ( d \geq 1300 ) ft</td>
</tr>
<tr>
<td>85th percentile speed, if known, or posted speed plus 7 mph of roadway being crossed.*</td>
<td>0</td>
<td>10</td>
<td>0</td>
<td>if ( v \leq 30 ) mph</td>
</tr>
<tr>
<td></td>
<td>( \frac{v - 30}{2} )</td>
<td>10</td>
<td></td>
<td>if ( 30 &lt; v &lt; 50 ) mph</td>
</tr>
<tr>
<td></td>
<td>10</td>
<td>10</td>
<td></td>
<td>if ( v \geq 50 ) mph</td>
</tr>
<tr>
<td>Total of pedestrian crossing for 1 hour (any four consecutive 15-minute periods of an average day.)**</td>
<td>0</td>
<td>10</td>
<td>0</td>
<td>0 to 9 pedestrians per hour</td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>10</td>
<td>10</td>
<td>10 to 19 pedestrians per hour</td>
</tr>
<tr>
<td></td>
<td>10</td>
<td>10</td>
<td></td>
<td>\geq 20 pedestrians per hour</td>
</tr>
<tr>
<td>Median width. TWLTL counts as a median if proposed location is more than 150 ft from an intersection or a major driveway</td>
<td>-10</td>
<td>0</td>
<td>-10</td>
<td>if ( w \geq 9 ) ft</td>
</tr>
<tr>
<td></td>
<td>-5</td>
<td>0</td>
<td>-5</td>
<td>if ( 6 \leq w &lt; 9 ) ft</td>
</tr>
<tr>
<td></td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>if ( w &lt; 6 ) ft or no median</td>
</tr>
<tr>
<td>Pedestrian crash history</td>
<td>10 per crash</td>
<td>20</td>
<td></td>
<td>20 points maximum. Qualifying crashes occurred within catchment area in the most recent 5 complete years and may be any severity, including PDO, with pedestrian or pedal cycle as a harmful event.</td>
</tr>
<tr>
<td>Special needs pedestrian generators within catchment area</td>
<td>0</td>
<td>10</td>
<td>None</td>
<td>Senior center, senior assisted living facility, nursing home, other elderly-related generators within catchment area</td>
</tr>
<tr>
<td></td>
<td>10</td>
<td>10</td>
<td></td>
<td>Land uses for the blind within catchment area</td>
</tr>
</tbody>
</table>

* Round awarded points to nearest whole number.

** Count number of individual people (walking, biking, wheelchairing or other means on crosswalk) per hour, regardless of groups. Count as two people for assisted walking (pushed wheelchair, baby on a cart, or other means).
Policies / Guidance

1. Distance from signal or stop control
2. 85\textsuperscript{th} percentile speed
3. Ped crossings
4. Median width or TWLTL
5. Ped crash history
6. Special need ped generators nearby
Policies / Guidance

7. Traffic volume
8. Catchment area for peds
9. Part of a area transportation plan?
10. School location
11. Some environment justice language
12. Documented engineering judgement
Education

• Why the need?
  – The need is always here.
  – Things are always changing.
  – Drivers are always changing.
  – It’s our job. Whose job?
    • Traffic Engineers
    • Enforcement (Education and Tickets)
    • Public Safety / Highway Safety Offices
    • Driver Schools
    • Courts / Judges
Education

• Why the need?
  – The need is always here.
  – Things are always changing.
  – Drivers are always changing.
  – It’s our job. Whose job?
    • Traffic Engineers
    • Enforcement (Education and Tickets)
    • Public Safety / Highway Safety Offices
    • Driver Schools
    • Courts / Judges
    • BUT no spouses (let the above handle)
Education - ODOT

CROSSWALK

STOP ON RED

STOP ON FLASHING RED

THEN PROCEED IF CLEAR
Policies / Guidance

• FHWA now recommends a new sign

Figure 58. Photo. Sign recommended by FHWA to address comprehension issues with the flashing red phase.
Education - ODOT

• Know the Road, Video Series
  – On ODOT’s youtube channel and reoccurring broadcasts on facebook
  – General Education to educate most drivers
    • Know your audience
    • Let’s look at a couple of examples
Education - ODOT
Education – WI DOT

How To Use A Pedestrian Hybrid Beacon - Live Action

Published on Nov 11, 2013
Short video on how drivers and pedestrians should use a Pedestrian Hybrid Beacon (PHB), also known as a HAWK.
The lights begin to flash in an alternating red pattern.

Pedestrians will see a Don't Walk symbol and should clear the crosswalk.

Traffic should remain stopped until the crosswalk is clear.
DO YOU KNOW WHAT TO DO AT A PEDESTRIAN BEACON SIGNAL?
Traffic Engineering Brochures

Central Offices ➤ Traffic Engineering ➤ Collision Analysis and Speed Studies ➤ Brochures

Don't Cut the Cable

Speed Studies

OHP Brochure

Pedestrian Hybrid Beacon Ranking Matrix

High Intensity Activated Crosswalk Signal

Quality Standards for Temporary Traffic Control Devices

http://www.okladot.state.ok.us/traffic/collision_analysis/brochures.htm

5/3/2018  2018 Spring OTEA
How do they work?

When a pedestrian activates the system by pressing a button, overhead flashing yellow lights alert the drivers that pedestrians have activated the signal. The yellow light then turns solid, preparing drivers to make a complete stop at the intersection. When the light turns red, pedestrians receive a white “walk” signal, and may proceed across the intersection. A flashing red appears when the pedestrian countdown starts, telling the driver that if the intersection is clear, they may proceed through it with caution. Under this flashing red phase, each vehicle still has to stop and then can proceed if clear. When the pedestrian countdown has expired, the beacon goes dark and traffic continues on its way.

How effective is a HAWK?

- Researchers for the Federal Highway Administration (FHWA) found a HAWK can reduce auto-pedestrian crashes by nearly 70%.
- Drivers correctly yield to pedestrians at a HAWK at much higher rates (over 90%) than at traditional crosswalks (about 30%).
- A HAWK can be used in locations where a traditional traffic signal cannot be justified or would present too great a disruption to automobile traffic; but there is a need for a higher level of pedestrian protection than regular crosswalks.

For more information:

There are several informative videos on the internet that show how HAWKS work. One example can be found at: https://vimeo.com/223672024

High Intensity Activated CrossWalk Signal (HAWK)

(Also known as a Pedestrian Hybrid Beacon)

WHAT IS IT?

A HAWK acts like a traffic signal and is designed to catch drivers’ attention at pedestrian crosswalks and improve safety. Because a HAWK operates similarly to a regular traffic signal, both drivers and pedestrians already have the skill set to respond easily and quickly, but they do not require traffic to stop unless a pedestrian needs to cross.
WHAT USERS SEE:

What the Driver sees:
- All lights are off. Drivers proceed normally.
- Flashing yellow light. Drivers approach with caution. Pedestrian has activated the HAWK.
- Steady yellow light. Drivers prepare to stop.
- Steady red lights. Drivers stop like at a traffic signal.
- Alternating flashing red lights. Drivers stop and then proceed like at a stop sign, yielding to pedestrians. All vehicles are in a stop and go situation under this phase.
- All lights are off. Drivers proceed normally.

What the Pedestrian sees:
- Steady Don't Walk. Pedestrians do not cross the street.
- Steady Don't Walk.
- Steady Don't Walk. Pedestrians wait to cross the street.
- Walk. Pedestrians cross the street.
- Flashing Don't Walk with Countdown Timer. Pedestrians finish crossing the street.
- Steady Don't Walk. Pedestrians do not cross the street.

http://www.okladot.state.ok.us/traffic/collision_analysis/brochures.htm
Crosswalks are intended to encourage people to cross only at certain locations. As you know, some people will cross when and where they want to, regardless of traffic signals, marked crossings, or even their own safety. As the person controlling a potentially dangerous machine, it’s your job to “play it safe” where pedestrians are concerned and protect them when you see they may be in danger.

• Be alert to people entering the roadway or crosswalks any place where pedestrian traffic is heavy.
• Yield to blind pedestrians carrying a white or chrome cane or using a guide dog.
• Be especially careful in school zones, school crossings, or where children are playing.
• Yield to pedestrians using the sidewalk when you’re entering or leaving a driveway or alley.
• Don’t honk, gun your engine, or do anything to rush or scare a pedestrian crossing in front of your car, even if you have the legal right-of-way.
WATCH OUT FOR “ACCIDENT MAKERS”

Good drivers think ahead. They not only watch the road but also the total traffic pattern. The smart driver is a defensive driver, looking out for “trouble in the making.”

Watch out for:

- Exhaust fumes coming from a parked car, indicating it may pull out into traffic.
- An impatient driver ahead or behind, nosing out around a car and then cutting in sharply.
- A driver distracted by something and not watching the road.
- A bad driver who speeds up to beat changing signal lights or runs through stop signs or lights.
- A pedestrian crossing or about to cross the street in front of you.
- Children playing near the street.
- A slight movement at a street-side door of a parked car, indicating that someone may step out of the car.
WATCH OUT FOR “ACCIDENT MAKERS”
Good drivers think ahead. They not only watch the road but also the total traffic pattern. The smart driver is a defensive driver, looking out for “trouble in the making.”
Watch out for:
• Confusing traffic signs and signals.
• Exhaust fumes coming from a parked car, indicating it may pull out into traffic.
• An impatient driver ahead or behind, nosing out around a car and then cutting in sharply.
• A driver distracted by something and not watching the road.
• A bad driver who speeds up to beat changing signal lights or runs through stop signs or lights.
• A pedestrian crossing or about to cross the street in front of you.
• Children playing near the street.
• A slight movement at a street-side door of a parked car, indicating that someone may step out of the car.
Questions