**State DOT Experience with Pedestrian Hybrid Beacons (PHBs)**

**June 2017**

On April 5th, 2017, MDOT SHA sent a short survey to the AASHTO Subcommittee on Traffic Engineering to learn about the use of Pedestrian Hybrid Beacons in other states. Below are a few key pieces of information. A table of the responses by state is attached for additional information.

**KEY POINTS:**

- **31 states responded to the survey; 25 are using PHBs**.

- **Three of the states not using PHBs cited concerns:**
  - **Kentucky** – prefer to use a full signal in most situations but as a rural state congestion is not generally a problem. They would be supportive if they had the right location.
  - **Maine** – concerned about how they work within coordinated signal systems and the public's understanding of how to use them.
  - **Pennsylvania** – believe it would be problematic to drivers and in conflict with current operational and conformance standards. *They cited the concern that it is in conflict with their vehicle code how to negotiate a dark signal*.

- **A couple of states have made modifications to the PHB Operating Sequence**:
  - **Delaware** – minor modification to the "all-red" interval. They are consistent with FHWA interim approval 4(09)-14(I) – Red Clearance Interval in PHB Sequence
  - **Wyoming** – Skip sequence 5 (alternating flashing red) and hold 4 (steady red) through the flashing don't walk
  - **The City of Minneapolis** has installed a red beacon similar to a PHB but does not have the flashing red phase.

- **Most states have not collected data to determine the safety improvement resulting from PHBs.**

- **Operating and human factors issues identified by the states**:
  - **Driver confusion over the flashing red interval** – states have added signing to address this. *This is the most common issue; identified by 10 of the states.*
  - **Pedestrians activate the PHB but still cross at the first available gap instead of waiting**. This is confusing for drivers because they have to stop but there are no pedestrians waiting to cross.
  - **Initial confusion after installation** – Wisconsin developed a video to explain how they work.
  - **Some pedestrians disregard the signal altogether**.

- **Best Practices and Lessons Learned**:
  - In many cases the state approves locations requested by locals. Locals maintain and operate them.
  - Public relations outreach and educating motorists and pedestrians is important. The engineering is not much different than a designing a standard signal.

- Consider why the reds on a PHB are allow to flash like a railroad signal. Many drivers won't move when the flashing beacon comes on.
- Michigan would be interested in discussing more about operations especially in urban settings.
- Idaho mentioned that the public expressed "too many PHB's have been installed and that in some applications the PHB negatively affects the mobility of many for the improved mobility of a few."

- **Recent National Research that May Be Helpful:**
  - NCHRP 841 – Development of Crash Modification Factors for Uncontrolled Pedestrian Crossing Treatments. The study developed crash modification factors for four pedestrian crossing treatments including PHBs. The study found that PHBs and PHBs with advanced YIELD or STOP markings and signs were associated with the greatest benefit to pedestrian crash risk (more than a 50% safety improvement). The report also includes criteria for PHB installation and 7 considerations (warning signs, experimental signs, outreach, warning beacons, supporting signs, refuge island, crosswalk type) for their use.

# State DOT Experience with Pedestrian Hybrid Beacons (PHBs)

| State | Does Your State Use PHBs? | Has Your State Made any Modifications to the PHB Operating Sequence? | An FHWA Study Found that PHBs can Reduce Pedestrian Crash by 69% and Total Crashs by 29% . Has Your State Experienced a Similar Safety Improvement? | Has Your State Experienced any Operating or Human Factors Issues Since Implementing PHBs? | Does Your State Have Guidelines/Standards for PHBs? | Please Share any Lessons Learned or Best Practices Related to PHBs | Contact |
|---|---|---|---|---|---|---|---|
| Alabama | No - we may consider using PHBs in the near future | N/A | N/A | N/A | N/A | N/A | Kerry NeSmith<br>Deputy State Maintenance Engineer<br>334-242-6777<br>nesmithk@dot.state.al.us |
| Arkansas | Yes - less than 10 | No | N/A | Yes - confusion over operation | No | N/A | Joseph D. Hawkins<br>State Traffic Engineer<br>501-569-2567<br>Joseph.Hawkins@ahtd.ar.gov |
| California | Yes, 25-30 locations | No | Comparable | No | No | N/A | Duper Tong, Chief<br>Office of Traffic Engineer<br>916-654-5176<br>duper.tong@dot.ca.gov |
| Delaware | Yes - 4 locations | Yes - Minor modification regarding "all-red" intervals - we are consistent with FHWA Interim Approval 4(09)-14 (I) - Red Clearance Interval in Pedestrian Hybrid Beacon Sequence | Unknown. Location 1 was a difficult location to cross but did not have ped crashes. Location 2 was installed in conjunction with a new High School - so ped volumes were negligible in the "before" period. Locations 3 and 4 are relatively new so the verdict isn't in yet. | Yes - More red light running than other studies. Poor understanding of flashing red interval. Peds tend to disregard the ped signals, particularly when run in coordinated mode. | No | Delaware sent a recent report via e-mail. | Mark Luszcz<br>Chief Traffic Engineer<br>302-659-4062<br>mark.luszcz@state.de.us |
| Florida | Yes - 50 locations | No | Smaller safety improvement | Yes - Vehicles still wait at the signal bar during the flashing red indication. | Yes - We make reference to the MUTCD design criteria and guidelines | *Installation of Ped countdown signals with the PHB to alert pedestrian of crossing time remaining<br>*Installation of rectroreflective backplates for all signal indications<br>*Installation of lighting<br>*Installation of special emphasis crosswalks<br>*Option to use passive activation | Humberto Castillero<br>State Traffic Studies Engineer<br>950-410-5417<br>humberto.castillero@dot.state.fl.us |
| Georgia | Yes - 24 locations | No | We have not yet conducted a pre/post crash analysis. | Yes - Anecdotal observations of drivers stopping and staying stopped when signals transition to red flash, rather than stopping and proceeding with caution. | No | N/A | Katelyn DiGioia<br>State Bicycle and Pedestrian Engineer<br>404-635-2834<br>kdigioia@dot.ga.gov |

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| Idaho | Yes - approximately 75 - 100 | No | I'm not aware of any crash studies that have been conducted. | No | No | A few PHB's have been installed on state highways. The majority of the PHB installations have been off-system on local roads. PHB's have become a favorite request of school districts, pedestrian advocates, and to some extent even bicycle advocates (an inappropriate use if for bicycles only). Feedback from the public has been mixed. Some point to increased mobility for pedestrians. Others opine that too many PHB's have been installed and that in some applications the PHB negatively affects the mobility of many for the improved mobility of a few. | Ryan Lancaster, P.E., PTOE<br>ITD Design/Traffic Services<br>208-334-8528<br>ryan.lancaster@itd.idaho.gov |
| Illinois | Yes - 5 locations | No | Most PHBs in Illinois are on the local system. We are not aware of any safety studies conducted in Illinois on the safety benefits of these devices | No | Yes - None other than the IL supplement to the MUTCD. They are not allowed within 100 ft of an intersection or entrance | N/A | Kyle Armstrong<br>Acting Engineer of Traffic Operations<br>217-782-2076<br>Kyle.armstrong@illinois.gov |
| Indiana | Yes - 1 on the state system and some on local roads | No | The one installed to date has not been in place for a long enough period to draw conclusions. | No | No | N/A | David Boruff<br>Manager, Office of Traffic Administration<br>317-234-7975<br>dboruff@indot.in.gov |
| Iowa | Yes - I am not aware of any on a state highway, but there are some on local roads. | No | Not aware of any studies on the effectiveness. | No | No | N/A | Tim Crouch<br>State Traffic Engineer<br>515-239-1513<br>tim.crouch@iowadot.us |

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| Kentucky | No- We have some concerns with PHBs - In most situations, we feel that a full signal would be the better option as drivers are familiar with their operation. The primary benefit of a HAWK would be in a location where congestion is a significant concern. Since we are a rural state, congestion is usually not a problem. Our more urban areas (Louisville, Lexington, and Covington) are the most likely candidates for an installation. We have just not found a "good" location for our first HAWK. We would be supportive in the right location. | N/A | N/A | N/A | N/A | N/A | Jeff Wolfe, Director<br>502-782-5546<br>jeff.wolfe@ky.gov |
| Louisiana | No - we may consider using PHBs in the near future | N/A | N/A | N/A | N/A | N/A | Jody Colvin<br>Traffic Engineering Division Administrator<br>225-242-4635<br>jody.colvin@la.gov |
| Maine | No - we have some concerns with PHBs - many places where we have had requests are inside coordinated signal systems and while we have been assured that they can fit in with the coordinated system, other states have said that isn't necessarily the case. I also think there are issues with the publics understanding | N/A | N/A | N/A | N/A | N/A | Stephan Landry<br>State Traffic Engineer<br>207-557-0347<br>stephen.landry@maine.gov |
| Michigan | Yes - 9 state owned PHBs | No, but discussions are being had about the coordination of PHBs with adjacent signals. Whether to run a coordination or free or to half cycle it. These conversations are to determine the best efficiencies for both vehicles and pedestrians | We do not have specific follow up crash analysis for the PHBs in place. This is relatively new for our state. | Yes - See discussions on coordination for operations. Would pedestrians wait for the WALK to cycle? Right now, we notice pedestrians pressing the button to activate the PHB but still crossing at the first available gap instead of waiting for the indication. This is confusing for drivers as well because they are stopped with no pedestrians waiting to cross the roadway. | Yes - We have threshold criteria for when a PHB is applicable that considers volumes, gaps, etc. | We would be interested in discussing more about operations, especially in urban settings (corridor settings). Determining optimum operations - coordinated or uncoordinated. What are pedestrian and driver expectations to make the PHB as safe for all users as possible. | Carissa McQuiston<br>Non-Motorized Safety Engineering Specialist<br>517-335-2834<br>mcquistonc@michigan.gov |

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| Minnesota | Yes - 5 - 10 locations | No | Because of the small number of PHBs in the state, it is hard to have reliable data on this. We are undertaking a research study to try and get at driver behavior and stopping rates at PHBs, but again we only have a few to get data from. | Yes - Drivers seem unclear how to respond during the flashing wig-wag phase. We have created signing to try and help with this. | No | The City of Minneapolis has installed a request to experiment with a red beacon that is similar in idea to a PHB but does not have the flashing wig-wag phase. If interested, contact Steve Mosing with the City of Minneapolis. | Melissa Barnes<br>Pedestrian and Bicycle Safety Engineer<br>651-234-7376<br>melissa.barnes@state.mn.us |
| Nebraska | No - we have not identified a need | N/A | N/A | N/A | N/A | N/A | Dan Waddle<br>402-479-4594<br>dan.waddle@nebraska.gov |
| New Hampshire | Yes, 4 at this time, with another 2 or 3 on the way | No | They are relatively new so we have not conducted before/after evaluations. Most have been installed at new pedestrian crossing locations (rail/trails) so there isn't any crash history before installation. | No | No | Pedestrian crossings are typically the responsibility of the requesting town/city so the state DOT approves the locations and PHB design, but is not involved in the maintenance or operation of the devices. | Bill Lambert<br>Traffic Engineer/Administrator<br>603-271-1679<br>william.lambert@dot.nh.gov |
| New Mexico | Yes - around 5, they belong to local entities | No | I am not aware of any studies. | No | No | State does not have any PHBs. The locals have utilized it. I am not aware of their experience. | Afshin Jian<br>State Traffic Engineer<br>505-827-5490<br>afshin.jian@state.nm.us |
| New York | Yes, One installed on the State highway system last year with several more in design for this year. There are some on local highways as well. | No | Don't know. The HAWK was installed in July 2016. Too early to tell. A multi-use trail crosses a 7 lane arterial. | Yes - Drivers are hesitant to go on a flashing red after stop. We are installing an educational sign to advise them. | Nothing other than the MUTCD | Public Relations and educating the motorist and pedestrian. The engineering is not much different than designing a standard signal. | Dave Woodin<br>Director, Traffic Operations Bureau<br>518-457-1793<br>David.Woodin@dot.ny.gov |
| North Dakota | Yes - 3 locations | No | Comparable | No | No | N/A | Shawn Kuntz<br>skuntz@nd.gov |
| Ohio | Yes - at least 4, not ODOT controlled | No | Too early to know results | No | Yes - Ohio MUTCD copies MUTCD | N/A | Charlie Fisher<br>Traffic Engineer<br>614-644-0270<br>charles.fisher@dot.ohio.gov |

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| Pennsylvania | No - we have some concerns with PHBs - Driver familiarity, expectations, understanding, and negotiating the operation of the PHB is not clear. Also this violates our vehicle code on how to negotiate a dark indication. This unconventional operation we feel will be problematic to drivers especially when many struggle with the current operational and conformance standards. | N/A | N/A | N/A | N/A | N/A | Daniel Farley<br>Chief, Traffic Operations Deployment and Maintenance<br>717-783-0333<br>dfarley@pa.gov |
| Rhode Island | Yes - 1 location | No | No - For the 3 year before and after crashes went from 13 to 1. There were no reported ped crashes reported for the 6 year study period. | Yes - Some drivers are hesitant to proceed on the flashing red and drivers behind become frustrated. | No | N/A | Steve Pristawa<br>Acting State Traffic and Safety Engineer<br>401-222-2694<br>steve.pristawa@dot.ri.gov |
| South Carolina | Yes - 3 locations | No | No state study done. | No | Yes - emailed the SCDOT guidelines | N/A | Brent Dillon<br>State Traffic Design Engineer<br>803-737-1461<br>dillonbs@scdot.org |
| South Dakota | Yes - we just installed our first PHB in 2016. | No | The one installation we have has been operational for less than 6 months and we have not done any safety studies related to its performance. | No | No | N/A | Christina Bennett<br>Operations Traffic Engineer<br>605-773-4759<br>Christina.Bennett@state.sd.us |
| Texas | Yes - Will verify and submit to you separately. | No | Comparable | Yes - We only allow PHB on highways with posted regulatory speed limits of 49 mph or less. | Yes - Will submit to you separately. | N/A | Michael Chacon<br>Director of Traffic Operations Division<br>512-416-3200<br>Michael.chacon@txdot.gov |
| Utah | Yes - 20 locations | No | Comparable | No | Yes - Part of the signal design guidelines: https://www.udot.utah.gov/main/uconowner.gf?n=13679121470326565 | N/A | Jesse Sweeten<br>Traffic and Safety Engineer for Design<br>801-965-4924<br>jsweeten@utah.gov |

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| Utah - Salt Lake City | Yes - 30 locations citywide | No | No before-after studies were conducted. No non-compliance issues. | First car sitting at flashing red and second car would honk & go around it. We added new sign "STOP on Flashing Red; Proceed if Clear" - it has been working pretty well. (Nevada and Idaho are starting to use this sign too) | No - We following MUTCD. | N/A | Kurt Larson<br>801-535-7151<br>Kurt.Larson@slcgov.com |
| Vermont | Yes - 1 location | No | No crashes | Drivers not understanding when they can go on flashing red. | No | N/A | Amy Gamble<br>Traffic Operations Engineer<br>802-477-3251<br>amy.gamble@vermont.gov |
| Virginia | Yes - No Inventory exists, but the number of State maintained PHB's is low: http://www.fairfaxcounty.gov/fcdot/news/2016/16_016.htm Local agencies and colleges have them. | Yes - Although, one internal point made by a District is: The operation is in direct conflict with what drivers are supposed to do when they approach a stopped school bus: https://www.youtube.com/watch?v=moK9MZVSIQY , or railroad crossing: https://www.youtube.com/watch?v=OtXvwW9oyy8 , where drivers are required to remain stopped when the signal is flashing alternating red. In one Engineer's opinion the flashing red at the HAWK should flash simultaneously. | No evaluation to our knowledge, unless local agencies have completed a before and after. | Yes - No state-wide evaluation. One issue has been that drivers didn't know they could proceed on flashing red, so the sign was installed. The internal discussion on the sign wording: "Proceed on Flashing Red IF Clear" rather than when clear..... Fairfax Proposed to use: "CROSSWALK - STOP ON RED - PROCEED ON FLASHING RED WHEN CLEAR | Yes - http://www.virginiadot.org/business/resources/IIM/TE-384_Ped_Xing_Accommodations_Unsignalized_Locs.pdf | See: http://www.virginiadot.org/business/resources/IIM/TE-384_Ped_Xing_Accommodations_Unsignalized_Locs.pdf | Harry A. Campbell<br>Traffic Control Devices Engineering Manager<br>804-786-6374<br>Harry.Campbell@VDOT.Vorginia.gov |
| Wisconsin | Yes - I will have to verify the number, we have at least three locations on the state system. | No | I don't know if we have collected safety data. | Yes - There was some initial confusion at one location which prompted the development of a video to explain the pedestrian and driver perspective. | No | N/A | Bill McNary<br>State Traffic Engineer<br>608-266-1260<br>william.mcnary@dot.wi.gov |

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| Wyoming | Yes - 7 locations | Skip sequence 5 and hold 4 thru the FDW | No reported crashes post installation. Not many before installation. | Yes - Older peds don't push the button and can't wait. Some drivers don't stop. We decided at school phbs to not flash the reds to reduce the chance of late start peds getting hit by aggressive drivers. | No | Coordinating a phb with signals creates more jaywalking which means the ped is gone when the beacons turn on. Drivers see this and get frustrated. We don't coordinate PHBs anymore. All our PHBs are at intersections. The MUTCD got it wrong, again. Consider turn restriction LED blankout signs if trying PHBs at intersections. Maryland should consider why the reds on a phb are allowed to flash like a railroad signal. Many drivers won't move when the flashing red beacons come on. We trained them not to. Again, the MUTCD got it WRONG!!! | Joel Meena<br>State Traffic Engineer<br>307-777-4374<br>Joel.meena@wyo.gov |