Exhibit B

Bicycle Signal Heads at Pedestrian Hybrid Beacons

The Joint Signals and Bicycle Technical Committees developed the following recommendation. Although at this time, the recommendation did not continue on through the Signals Technical Committee, in part as a result of references to research that did not necessarily reflect crashes due to bicycles as they were rear-end type crashes, the ***City of Santa Ana****, and likely other Local Agencies are interested in being able to implement bicycle signal heads at side paths to accommodate bicycle roadway usersl. Much work and thought went into the phasing considerations proposed with input from experienced participants from the Signals Technical Committee as well as Bicycle Technical Committee. This information is provided for FHWA's consideration as it would be more permissive to allow this limited use for this application as an exception to the "shall not" with very specific phasing* ***required****. Note, there were very tight deadlines for the NCUTCD to consider every aspect of the NPA and this time pressure, along with the lack of in-person meetings limited the normal ability to more fully consider the research referenced.*

Background Research Information from Portland, OR

The following link has the study: https://nacto.org/wp-content/uploads/2011/03/Modified-HAWK-Signal-and-Bike-Signal-Draft-Report.pdf#:~:text=Modified%20HAWK%20Signal%20and%20Bike%20Signal%20--%20Portland,Crosswalk%20%28%E2%80%9CHAWK%E2%80%9D%29%20Signals%20for%20Pedestrian%20and%20Bicycle%20Crossings

The crash data is on page 13. Note: the before case had no treatment on the mainline such that the introduction of an additional device such as a PHB that stops traffic can result in rear-end crashes being increased (as could a regular traffic signal).

- There were no reported pedestrian or bicycle crashes during the study period.
- Further, since 2009, Portland has recorded no crashes on their Vision Zero Map at the subject location.

Portland's other bike signal at a PHB/HAWK is at 53rd & Burnside and it was installed some years ago after a crash in 2009. However, there were no reported crashes after the installation of the bike signals at a PHB. The Link to Portland Vision Zero Map is at: https://pdx.maps.arcgis.com/apps/MapSeries/index.html?appid=5385b143768c445db915a9c7fad32ebe

Recommendation From Joint Signals and Bicycle Technical Committee

It is recommended to add a new section (4H.13) to address the use of bicycle signal faces at a pedestrian hybrid beacon. This addresses their use to control a bicycle movement in a bicycle lane or separate facility moving on the roadway that is controlled by the pedestrian hybrid beacon signal faces. It also addresses their use when crossing the roadway adjacent to the pedestrian movement. The use of a bicycle signal face at a pedestrian hybrid beacon would not be required but, if used, certain requirements would apply. A revision to Section 4H.02 is also needed to incorporate new Section 4H.13

Legend: Base text shown in proposal is the NPA "clean" proposed text. Proposed added text. ~~Proposed deleted text.~~

Section 4H.02 Prohibited Uses of Bicycle Signal Faces

Standard:

Bicycle signal faces shall not be used to control simultaneous conflicting bicycle movements from perpendicular or nearly perpendicular directions.

Bicycle signal faces shall not be used for controlling any bicycle movement that is sharing a lane with motor vehicle traffic.

Bicycle signal faces shall not be used ~~in any manner~~ with respect to the design and operation of a pedestrian hybrid beacon except as provided in Section 4H.13.

Bicycle signal faces shall not be used with respect to the design and operation of an emergency-vehicle hybrid beacon.

Support

If pedestrian movements need to be accommodated at an emergency-vehicle hybrid beacon, the emergency vehicle hybrid beacon can be converted to a pedestrian hybrid beacon. Recommend that "pedestrian" be added to differentiate from emergency-vehicle hybrid beacon and to note the exception for the use of bicycle faces described in recommended new Section 4H.13. Additionally, a separate prohibition for bicycle signal face use at an emergency-vehicle hybrid beacon is recommended based on the recommendation to allow the use of a bicycle signal face at a pedestrian hybrid beacon under specified conditions. A new Support paragraph is recommended to provide information in the event pedestrian movements at an emergency-vehicle hybrid beacon need to be accommodated.

Section 4H.13 Use of Bicycle Signal Faces at a Pedestrian Hybrid Beacon

Option:

Bicycle signal face(s) may be used at a pedestrian hybrid beacon as described in this Section.

Standard:

If a bicycle signal face is used at a pedestrian hybrid beacon to control bicycle traffic that is travelling in a bicycle lane or facility adjacent to the general purpose lane(s) on the roadway:

A. The bicycle signal face(s) controlling that bicycle traffic shall consist of three signal sections with a YELLOW BICYCLE signal indication centered below two horizontally aligned RED BICYCLE signal indications.

B. The indications displayed in these bicycle signal face(s) shall be identical to the indications in the signal faces for the general purpose lane(s) except that they shall be YELLOW BICYCLE and RED BICYCLE signal indications instead of CIRCULAR YELLOW and CIRCULAR RED signal indications. These bicycle signal face(s) shall be dark whenever the signal faces for the general purpose lane(s) are dark.

If a bicycle signal face is used at a pedestrian hybrid beacon to control bicycle traffic that is crossing the roadway adjacent to the pedestrian movement:

A It shall be a 3-section signal face aligned vertically or horizontally with a GREEN BICYCLE, a YELLOW BICYCLE, and a RED BICYCLE signal indication.

B. It shall not display a green indication at any time other than when the pedestrian signal head is displaying a WALKING PERSON (symbolizing WALK) indication.

C. It shall display a solid red when the alternating flashing CIRCULAR RED indications are dark, displaying a flashing CIRCULAR YELLOW signal indication, or displaying a steady CIRCULAR yellow signal indication.

D. It shall display a flashing RED BICYCLE signal indication when the pedestrian signal head is displaying a flashing UPRAISED HAND (symbolizing DONT WALK).

E. It shall sequentially display a GREEN BICYCLE and a YELLOW BICYCLE signal indication when the pedestrian signal head is displaying a WALKING PERSON (symbolizing WALK). See Figure 4H-X for an illustration of the sequence of displayed indications.

F. Each time signal indications are displayed for pedestrian and/or bicycle traffic to cross the roadway, the indications and sequences in 1 and 2 below shall be displayed:

1. The pedestrian signal heads shall display signal indications in the following sequence:

a. WALKING PERSON (symbolizing WALK)

b. flashing UPRAISED HAND (symbolizing DONT WALK)

c. steady UPRAISED HAND (symbolizing DONT WALK)

2. The bicycle signal face(s) shall display signal indications in the following sequence:

a. GREEN BICYCLE signal indication

b. steady YELLOW BICYCLE signal indication

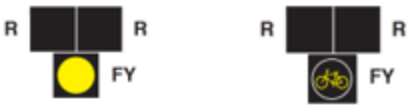
c. flashing RED BICYCLE signal indication

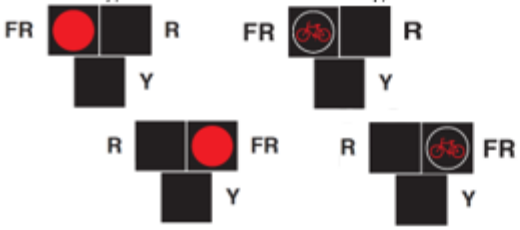
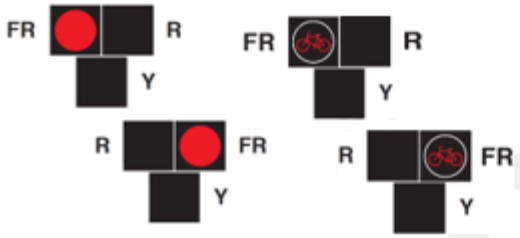
d. steady RED BICYCLE indication

G. If the indications in a median-mounted or far-side bicycle signal face at a pedestrian hybrid beacon that is at a street or driveway controlled by a STOP sign are readily visible to motor vehicle traffic approaching or at the STOP sign, the indications in the bicycle signal face shall be visibility limited.

Recommend that new Section 4H.13 be added to address the use of bicycle signal faces at a pedestrian hybrid beacon and to specify the conditions for such use.

Figure 4H-Xx Sequence for a Pedestrian Hybrid Beacon with Bicycle Signal Faces

General Purpose Lane Signal Faces / Bicycle Signal Face  1. Dark Until Activated	Pedestrian Signal Head / Bicycle Signal Face  1. Steady Dont Walk and Steady Red Bicycle Symbol Until activated
General Purpose Lane Signal Faces / Bicycle Signal Face  2. Flashing Yellow Upon Activation	Pedestrian Signal Head / Bicycle Signal Face  2. Steady Dont Walk and Steady Red Bicycle Symbol Upon Activation
General Purpose Lane Signal Faces / Bicycle Signal Face  3. Steady Yellow	Pedestrian Signal Head / Bicycle Signal Face  3. Steady Dont Walk and Steady Red Bicycle Symbol
General Purpose Lane Signal Faces / Bicycle Signal Face  4. Steady Red (OPTIONAL)	Pedestrian Signal Head / Bicycle Signal Face  4. Steady Dont Walk and Steady Red Bicycle Symbol (OPTIONAL
General Purpose Lane Signal Faces / Bicycle Signal Face  5. Steady Red During Pedestrian Walk Interval	Pedestrian Signal Head / Bicycle Signal Face  5. Walk and Green Bicycle Symbol

General Purpose Lane Signal Faces  Bicycle Signal Face  6. Steady Red During Pedestrian Walk Interval	Pedestrian Signal Head  Bicycle Signal Face  6. Walk and Yellow Bicycle Symbol
General Purpose Lane Signal Faces  Bicycle Signal Face 7. Alternating Flashing Red In Each Face During Pedestrian Change Interval	Pedestrian Signal Head  Bicycle Signal Face  7. Flashing Dont Walk and Flashing Red Bicycle Symbol
General Purpose Lane Signal Faces  Bicycle Signal Face 8. Alternating Flashing Red In Each Face To Provide a Red Clearance Interval for the Bicycle Signal Face Controlling Crossing Bicycle Traffic	Pedestrian Signal Head  Bicycle Signal Face  8. Steady Dont Walk and Steady Red Bicycle Symbol
General Purpose Lane Signal Faces  Bicycle Signal Face 9. Dark Again Until Activated	Pedestrian Signal Head  Bicycle Signal Face  9. Steady Dont Walk and Steady Red Bicycle Symbol Again Until activated
Notes: This sequence shows 1. the provision of a bicycle signal face to control a bicycle movement in a separate lane that is parallel to the general purpose lane(s). The bicycle signal face will operate simultaneously with the vehicular signals for the general purpose lane(s), and 2. the provision of a bicycle signal face to control bicyclists that are crossing the roadway adjacent roadway adjacent to eh the crosswalk.	Legend SY – steady yellow FY – flashing yellow SR – steady red FR – flashing red