

LEADING PEDESTRIAN INTERVAL (LPI) POLICY FOR TRAFFIC SIGNALS

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1. PURPOSE

To establish guidance for implementing leading pedestrian interval (LPI) signal applications at new and existing signalized intersections.

2. BACKGROUND

- (1) LPI is a low-cost countermeasure for pedestrian and vehicular traffic control at signalized intersections. LPI is also known as “pedestrian head start” or “delayed vehicle green” that gives pedestrians an advance “Walk” signal indication before a concurrent green signal is provided to vehicles. This will allow pedestrians to establish a presence in the crosswalk, thereby increasing the visibility of pedestrians to drivers and potentially reducing conflicts with turning vehicles.
- (2) LPI has been recommended as a Federal Highway Administration (FHWA) “Proven Safety Countermeasure” to reduce vehicle-pedestrian crashes at signalized intersections. According to the Crash Modification Factor (CMF) Clearinghouse, the [estimated LPI crash reduction factor for vehicle-pedestrian](#) crashes in suburban and urban areas is 19%.

3. IMPLEMENTATION

- (1) The decision process for LPI implementation should be documented using the TE-672 “Pedestrian Accommodations at Signalized Intersections” Form.
- (2) Prior to implementing a new exclusive pedestrian phase, LPI should be implemented and evaluated for effectiveness.
- (3) The decision to implement LPI should be based on engineering judgement. The following are considerations that influence the engineering judgement decision:
 - a) *Crash Data:* In the last three (3) years, at least one (1) crash per year between turning vehicles on green and pedestrians crossing the street while in a crosswalk with the pedestrian “Walk” signal indication.
 - b) *Visibility Issues:* Identified visibility issues blocking a drivers’ view of pedestrians due to obstructions or poor sight distance. At a minimum the following should be considered:
 - Sun angle
 - Lighting
 - Intersection geometry
 - c) *Local Experiences:* Citizen complaints about turning vehicles not yielding to pedestrians.
 - d) *Intersection Type and Operation:* Intersections with a high proportion of vehicle turning movements that conflict with pedestrians, such as T-intersections or one-way streets.
 - e) *Land-Use Context:* LPI can also be particularly useful in pedestrian generator locations such as playgrounds, parks, schools, recreation centers, urban areas, hospitals, retirement/assisted-living communities, etc.
 - f) *Controller Capabilities:* Prior to recommending LPI, confirm that the controller can support LPI programming.
- (4) LPI can increase vehicle delay when there is no pedestrian actuation, as the LPI will be provided even when pedestrians are not actively crossing.

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4. DESIGN & CONSIDERATIONS

- (1) LPI signal applications shall comply with Section 4D.05F and Section 4E.06 of the Manual on Uniform Traffic Control Devices (MUTCD).
- (2) LPI timing should allow pedestrians to clear at least the width of one lane of traffic, in addition to the width of a parking and/or bicycle lane, or in the case of a large corner radius, to travel far enough for the pedestrian to establish their position ahead of the turning traffic before the turning traffic is released. A minimum of 3-second LPI duration is required by the MUTCD and LPI durations generally fall within a 3 to 6-second range.
 - a) Extended LPI timing should be considered at:
 - Approaches with large portions of users with slower crossing speeds (children, older adults, persons with physical disabilities)
 - Approaches where the pedestrian detector location is not immediately adjacent to the curb (or, if no pedestrian detector is present, allocation of 6-feet from the face of the curb or from the edge of the pavement may be considered for calculating extended LPI)
- (3) If a LPI is used, consideration should be given to turning movements across the crosswalk during the LPI.
 - a) Protected/Prohibited Left Turn
 The LPIs shall not be timed with the opposing protected left-turn interval. For opposing leading left-turn movement, the LPIs shall be timed prior to the green interval for through vehicle movements and after the opposing protected left-turn movement. When utilizing LPI, the opposing protected left-turn all-red clearance interval must be extended to include time for the turning vehicle to advance through the far side of the associated crosswalk, instead of the edge of the farthest travel lane. This will ensure the LPI does not begin prematurely, prior to a left-turn vehicle unexpectedly entering the crosswalk at the end of the protected left turn cycle. For opposing lagging left-turn movement, the LPI shall also be timed prior to the green interval for through vehicle movements.
 - Example signal timings for the use of LPI with left turns are illustrated in Figure 1 below.
 - b) Protected/Permissive Left Turn
 Under situations with protected/permissive left turns, LPIs should not be considered without mitigation of the conflicts with the advanced left turns, particularly under non-concurrent terminations of the left-turn phases.
 - For example, a red-revert between the protected left turns and the permissive left turns could be a mitigation when the left-turn phases ended concurrently. Some potential mitigation efforts for when the left turns don't end concurrently include red-reverts, signage, etc.
 - Example signal timings for the use of LPI with left turns are illustrated in Figure 1 below.

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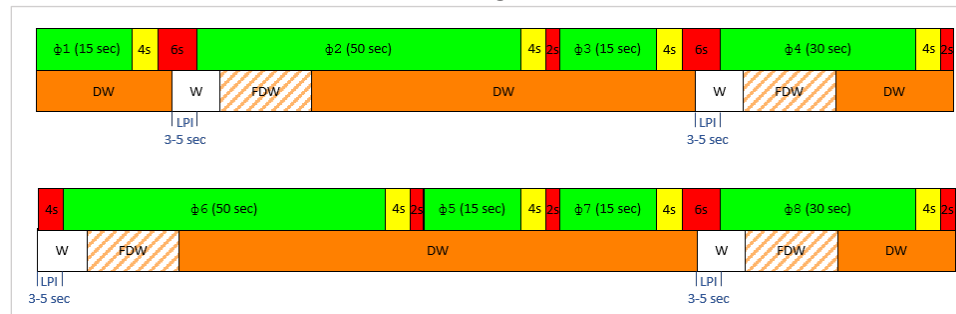
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Figure 1. Schematic Diagram for Example Signal Timing with LPI

A - Lead/Lead Left Turn



B - Lead/Lag Left Turn



c) Right Turns on Red

Prohibition of right turns on red should be considered to enhance LPI implementation compliance. This can be accomplished through the use of a standard or electronic blank-out “NO TURN ON RED” sign (R10-11), or “TURNING VEHICLES YIELD TO PEDESTRIANS” sign (R10-15). Implementation of the prohibition of rights on red shall comply with Subchapter B, Section 212.116 of Publication 212: *Official Traffic Control Devices*. Consider the use of the electronic blank-out signs that are illuminated during the pedestrian intervals at locations with inconsistent pedestrian volumes, low/non-illuminated crosswalks, locations with high volumes that could see capacity issues with continual right-turn prohibitions, etc.

- (4) At locations where LPI is used without Accessible Pedestrian Signals (APS) (Sections 4E.09–4E.13 of the MUTCD), the minimum required time for the Walk Interval shall be provided in addition to the time provided for the LPI, as vision-impaired pedestrians use the sound of moving traffic to start crossing.