# Bicycle and Pedestrian Facility Design Guide for the City of Lacey, WA


LACEY
Pedestrian & Bicycle Plan

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**City of Lacey Bicycle and Pedestrian Design Guide**
**May 2018**

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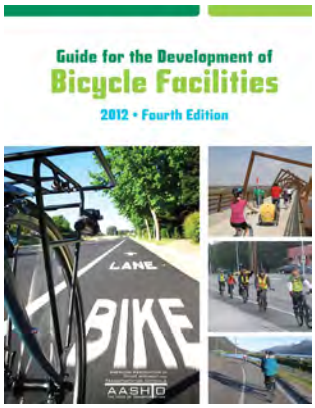
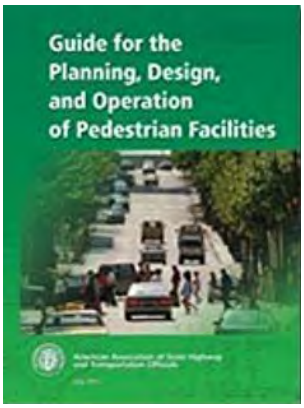
# PLANNING AND DESIGN RESOURCES

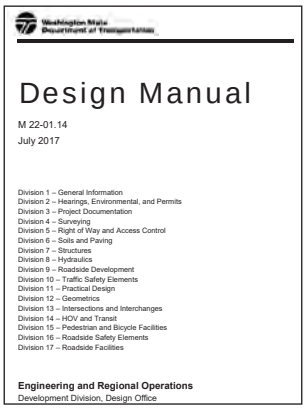
**The publications listed here are excellent resources for planning and design guidance in implementing safe, comfortable accommodations for pedestrians and bicyclists in a variety of environments. Many of these resources are available on-line at no cost. For full citation information, see Appendix A.**




### American Association of State Highway and Transportation Officials (AASHTO)

- Guide for the Development of Bicycle Facilities (2012) (Update anticipated in 2018)
- Guide for the Planning, Design, and Operation of Pedestrian Facilities (2004)
- A Policy on Geometric Design of Highways and Streets, 6th Edition (2011)




### Washington State Department of Transportation (WSDOT)

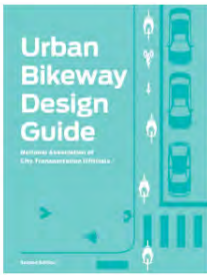
- Roadway Design Manual, Chapter 1510 Pedestrian Facilities (2017)
- Roadway Design Manual, Chapter 1520 Roadway Bicycle Facilities (2017)



### Federal Highway Administration (FHWA)

- Achieving Multimodal Networks: Applying Design Flexibility and Reducing Conflicts (2016)
- Separated Bike Lane Planning and Design Guide (2015)
- Incorporating On-Road Bicycle Networks into Resurfacing Projects (2016)







### National Association of City Transportation Officials (NACTO)

- Urban Street Design Guide (2013)
- Transit Street Design Guide (2016)
- Urban Bikeway Design Guide (2014)
- Designing for All Ages & Abilities (2017)

# GLOSSARY

**There are many terms used to describe different components of the transportation system, treatments, and bikeway facility types. To promote consistency and ease of understanding, the following terms are used throughout this guide.**

**Accessible Pedestrian Signal** – Device that communicates information about the WALK and DON'T WALK intervals at signalized intersections in non-visual formats to pedestrians who are blind or have low vision.[6]

**Amenities** – Elements such as benches, kiosks, bicycle parking, points of interest displays, or trash receptacles that are placed on a sidewalk, pedestrian mall, or at transit stops in order to improve the convenience and attractiveness of the facility.[1]

**Arterial Road** – Roadway designed for high-speed, high-volume travel between major points in both urban and rural areas.[1]

**Average Daily Traffic (ADT)** – The total volume of traffic on a street during a given time period divided by the number of days in that time period.[1]

**Bike Street** – Bike streets are streets with low motorized traffic volumes and speeds, designated and designed to give bicycle travel priority. Bike streets use signs, pavement markings, and speed and volume management measures to discourage through trips by motor vehicles and create safe, convenient bicycle crossings of busy arterial streets.[5]

**Bicycle Box** – Designated area on the approach to a signalized intersection consisting of an advanced stop line and bicycle symbols. Bicycle boxes should be primarily considered to mitigate conflicts between through bicyclists and right-turning motorists and to reduce conflicts between motorists and bicyclists at the beginning of the green signal phase.

**Bicycle Detection** – A system of hardware and software that detects the presence of bicyclists at a traffic signal and calls the green signal for the activated approach. Bicycle detection may consist of inductive loops, microwave, magnetometers, or pushbutton technologies.

**Bike Route** – A signed route that is preferred for bicycling due to low traffic or access to destinations. Does not necessarily have a delineated or dedicated space for bicycling.

**Bikeway** – Any type of bicycle facility, including paths in separate rights-of-way and on-street bikeways. Includes bike lanes, paved shoulders, signed bike routes, and sidepaths.

**Bulb-Out** – Treatment or application designed to visually and physically narrow the roadway in order to create safer and shorter crossing distances for pedestrians while increasing the available space for street furniture, benches, plantings, and trees.[5]

**Clear Width** – The width of a pedestrian facility or route that is unobstructed and passable. Minimum clear width requirements under various built environment conditions are provided in the *Americans with Disabilities Act Accessibility Guidelines* (ADAAG) and the *Proposed Accessibility Guidelines for Pedestrian Facilities in the Public Right-of-Way* (PROWAG).

**Collector Road** – Collector roads gather traffic from local roads and funnel that traffic into the arterial roadway network. In the rural environment, collectors generally serve primarily intra-county travel (rather than statewide).[2]

**Cone of Vision** – A transportation safety concept pertaining to the visual acuity of the human eye and the area of focus by a motorist or other roadway user. Motorists tend to focus on the roaday at a distance three to four times the stopping sight distance. Because of this tendency, as motorists drive at higher speeds, they are less likely to notice objects, pedestrians, or bicyclists in the area of their peripheral vision.

**Conflict Areas** – A two-dimensional zone within which potential travel paths cross and conflicts could occur between users of the same mode or users of differing modes. Typical conflict areas include approaches to intersections, intersections, and driveways.

**Crossing Island** – Raised islands placed on a street at intersections or midblock locations to separate crossing pedestrians from motor vehicles. Also known as refuge areas, refuge islands, center islands, pedestrian islands, or median slow points.[2]

**Cross Slope** – The slope that runs perpendendicular to the line of travel along a pathway.

**Crosswalk** – Legal crosswalks exist at all intersections, whether marked or unmarked. Midblock crosswalks must be marked in order for pedestrians to legally have the right-of-way.

**Curb Radius** – The radius of the arc formed where two intersecting curbs meet. Smaller curb radii encourage slower turning speeds at intersections.

**Curb Ramp** – The transition for pedestrians from the sidewalk to the street. ADA Standards require all pedestrian crossings to be accessible to people with disabilities by providing curb ramps at intersections and mid-block crossings as well as other locations where pedestrians can be expected to enter the street.

**Design Speed** – Design speed is a selected speed used to determine various geometric design features of the roadway. The assumed design speed should be logical with respect to the topography, anticipated operating speed, adjacent land uses, and the functional classification of the roadway.[1]

**Detectable Warning** – Standardized feature usually comprised of truncated domes of a contrasting color, which are built into, or applied to, walking surfaces. Detectable warnings alert people with vision impairments that they have reached a location where caution should be exercised. At these locations, visually-impaired pedestrians typically stop and determine their position relative to the roadway before proceeding further.[1]

# GLOSSARY (CONTINUED)

**Easement** – An easement provides the easement holder the right to use land for a specific purpose. The easement holder is not the land owner.

**Flexible Delineator Posts** – Flexible delineator posts, also called flex posts or flex stakes, are used to provide vertical demarcation of a roadway feature, including some bike lanes. These posts are typically made of plastic with an internal spring mechanism mounted to a base plate. The color of the plastic post should match the color of the pavement marking or striping with which it is associated.

**Free-Flowing Right Turn Lane** – Free-flowing right turn lanes (also called channelized right turn lanes) provide larger turn radii and allow for higher vehicular turning speeds. The right turn may operate as a free-flow movement if an acceleration lane is provided on the cross street, or the movement may be controlled by a YIELD sign where the turning roadway enters the cross street.

**High-Intensity Activated Crosswalk Beacon (HAWK)** – The pedestrian hybrid beacon (also known as the **H**igh-Intensity **A**ctivated cross**W**al**K**, or HAWK) is a pedestrian-activated warning device located on the roadside or on mast arms over midblock pedestrian crossings. The beacon head consists of two red lenses above a single yellow lens. Chapter 4F of the MUTCD includes information on the HAWK pedestrian hybrid beacon and how it should be used.[3]

**Horizontal Alignment** – The design of a path that determines whether a path continues straight or curves to the left or right.

**Horizontal Radius** – The horizontal radius indicates the radius of a curve along the horizontal alignment of a path. The minimum recommended radii are intended to allow bicycle travelers to follow the curve of a path without slowing substantially.

**Horizontal Deflection Treatment** – Traffic calming techniques that compel motorists to reduce their travel speed by changing the width or directionality of travel lanes at defined locations along a street. Examples include narrow lanes, chicanes, neckdowns, traffic circles, and bulb-outs.

**Landing Area** – A level area at a curb ramp or raised crossing with less than 2% grade or cross slope, designed for wheelchair users to wait, maneuver into or out of a curb ramp, or to bypass a ramp altogether.[1]

**Lane Reconfiguration** – Reconfiguring a roadway to remove lanes in order to provide more space for pedestrians and bicyclists. Lane reconfigurations are most typically performed on roadways where traffic volumes do not necessitate the existing number of lanes.

**Lane Narrowing** – A design strategy used for traffic calming effects and for reallocating existing pavement width to create designated space for other uses, including bicycle lanes.

**Local Road** – Locally classified roads account for the largest percentage of all roadways in terms of mileage. Local roads are not intended for long-distance travel, instead providing direct access to abutting land on the origin and/or destination end of a trip. Local roads are often designed to discourage through traffic.[2]

**Longitudinal Grade** – The slope that runs parallel to the line of travel along a path.

**Mid-Block Crossing** – Designated crosswalks away from an established intersection provided to facilitate crossings at places where there is a significant pedestrian desire line such as bus stops, parks, and building entrances.[5]

**Mixing Zone** – A mixing zone requires turning motorists to merge across a separated bike lane at a defined location in advance of an intersection. Unlike a standard bike lane, where a motorist can merge across at any point, a mixing zone design limits bicyclists' exposure to motor vehicles by defining a limited merge area for the turning motorist. Mixing zones are compatible only with one-way separated bike lanes.

**Mountable Curb/Curb Apron** – Mountable curbs with curb aprons deter passenger vehicles from making higher-speed turns but accommodate the occasional large vehicle without encroachment or off-tracking into pedestrian areas.

**MUTCD** – The *Manual on Uniform Traffic Control Devices* is a compilation of national standards for all traffic control devices, including traffic signals.[3]

**Offset Intersection** – Offset intersections are locations where two segments of a street connection do not directly align where they meet another street. These configurations are most challenging for bicyclists when offset local streets serving as bike routes or bike streets intersect with larger collector or arterial streets.

**Paved Shoulder** – Paved area at the edges of rural roadways. A paved shoulder is suitable for bicyclists if it is at least 4 feet in width.

**Pavement Markings** – Pavement markings are used to convey messages to roadway (or shared use path) users. They indicate which part of the road to use, provide information about conditions ahead, and indicate where passing is allowed. Symbols are used to indicate permitted lane uses. The MUTCD provides specifications regarding pavement markings.[3]

**Peak Hour Volume** – The volume of traffic that uses the approach, lane, or lane group in question during the hour of the day that sees the highest traffic volumes for that intersection.

**Pedestrian Signal Head** – Provide special types of traffic signal indications exclusively intended for controlling pedestrian traffic. These signal indications consist of the illuminated symbols of a WALKING PERSON (symbolizing WALK) and an UPRAISED HAND (symbolizing DON'T WALK). Chapter 4E of the MUTCD provides specifications regarding pedestrian signals.[3]

**Raised Crosswalk** – Traffic calming device at a pedestrian crossing or crosswalk that raises the entire wheelbase of a vehicle to encourage motorists to reduce speed.[5]

**Rectangular Rapid Flashing Beacon (RRFB)** – User-actuated amber light-emitting diodes (LEDs) that supplement warning signs at unsignalized intersections or mid-block crosswalks. The can be activated by pedestrians manually by a push button or passively by a pedestrian detection system.[2]

**Right(s)-of-Way** – Land or property that is used for public purposes including streets, sidewalks, utilities, etc.

**Separated Bike Lane (Protected Bike Lane)** – One- or two-

# GLOSSARY (CONTINUED)

way bikeway that combines the user experience of a sidepath with the on-street infrastructure of a conventional bike lane. They are physically separated from both motor vehicle and pedestrian traffic.

**Shared Lane Marking** – Shared lane markings (or "sharrows") are pavement markings that denote shared bicycle and motor vehicle travel lanes. The markings are two chevrons positioned above a bicycle symbol, placed where the bicyclist is anticipated to operate.

**Shared Roadway** – Roadway that is open to both bicycle and motor vehicle travel.

**Shared Use Path** – Paved off street transportation facility designed for a variety of non motorized users, including bicyclists, pedestrians, skaters, joggers, and others.

**Shoulder** – The portion of the roadway contiguous with the traveled way that accommodates stopped vehicles, emergency use, and lateral support of the subbase, base, and surface courses. Shoulders, where paved, are often used by bicyclists.[1]

**Sidepath** – A separated path along a roadway that serves people bicycling and walking within the street right-of-way. Compared to paths in independent rights-of-way, sidepaths have a higher likelihood of interactions with motor vehicles at driveways and intersections.

**Sidewalk Buffer** – The space between the sidewalk and the adjacent roadway designed to improve pedestrian safety and to enhance the overall walking experience. Sidewalk buffers also provide an area for snow storage and splash protection for pedestrians, as well as space for curb ramps, light poles and traffic signs. [1]

**Sight Distance** – Sight distance is the visually unobstructued distance required to execute a stopping maneuver (stopping sight distance), pass another vehicle (passing sight distance), perform an unexpected maneuver (decision sight distance), or execute a movement at an intersection (intersection sight distance). Sight distances depend on roadway geometry, travel speeds, deceleration rates, and reaction times.

**Signal Warrant** – Traffic control signal warrants define the minimum conditions under which installing traffic control signals might be justified. An engineering study of traffic conditions, pedestrian characteristics, and physical characteristics of the location shall be performed to determine whether installation of a traffic control signal is justified at a particular location. The satisfaction of a traffic signal warrant or warrants shall not in itself require the installation of a traffic control signal. Chapter 4C of the MUTCD provides specifications regarding traffic control signal warrants. Warrants for installation of multi-way stop sign control are provided in Chapter 2B of the MUTCD.[3]

**Speed Cushion** – Speed cushions are either speed humps or speed tables that include wheel cutouts to allow large vehicles to pass unaffected, while reducing passenger car speeds. Speed cushions extend across one direction of travel from the centerline, with a longitudinal gap provided to allow vehicles with wide wheel bases to straddle the hump.[5]

**Speed Hump** – Parabolic vertical traffic calming devices intended to slow traffic speeds on low-volume, low-speed streets.[5]

**Steep Grade** – Steep grades in landscaped areas are grades exceeding a slope of 4 (horizontal) to 1 (vertical) or 25%. Steep grades along a trail are typically 5% or greater. Refer to ADA and AASHTO for steep grade recommendations.

**Stop Bar** – Solid white pavement marking line extending across approach lanes to indicate the point at which a stop is intended or required to be made.[3]

**Street Buffer** – The portion of a separated bike lane design that divides the bike lane from motor vehicle traffic [4]

**Street Amenity Zone** – The section of the sidewalk between the curb and the through zone in which street furniture and amenities, such as lighting, benches, newspaper kiosks, utility poles, tree pits, and bicycle parking are provided. The street furniture zone may also consist of green infrastructure elements, such as rain gardens or flow-through planters.[5]

**Traffic Calming** – A strategy and toolkit to slow the speeds of motor vehicle traffic to a "desired speed" by incorporating physical features, such as chicanes, mini traffic circles, speed humps, and bulb-outs.

**Traffic Control** – Devices such as traffic signals, warning signs, stop signs, yield signs, and other regulatory signs.

**Traffic Diversion** – A traffic calming technique in which raised areas are constructed to redirect motor vehicle traffic to alternate routes but permit passage of bicyclists and pedestrians. Traffic diverters are common treatments on bicycle streets.

**Traffic Volume** – The number of vehicles passing a given point over a specific period of time.

**Two-Stage Turn Queue Box** – Two-stage turn queue boxes are areas set aside for bicyclists to queue to turn at signalized intersections outside of the traveled path of motor vehicles and other bicycles. In addition to mitigating conflicts inherent in merging across traffic to turn, two-stage bicycle turn boxes reduce conflicts between bicycles and pedestrians and separate queued bicyclists waiting to turn from through bicyclists moving on the green signal.[3]

**Underpass** – Grade-separated facility designed to convey vehicular, bicycle, and/or pedestrian traffic under an intersecting roadway or railroad.[6]

**Vertical Alignment** – Vertical alignment is the change in elevation along a trail centerline represented by numerical grade or slope.

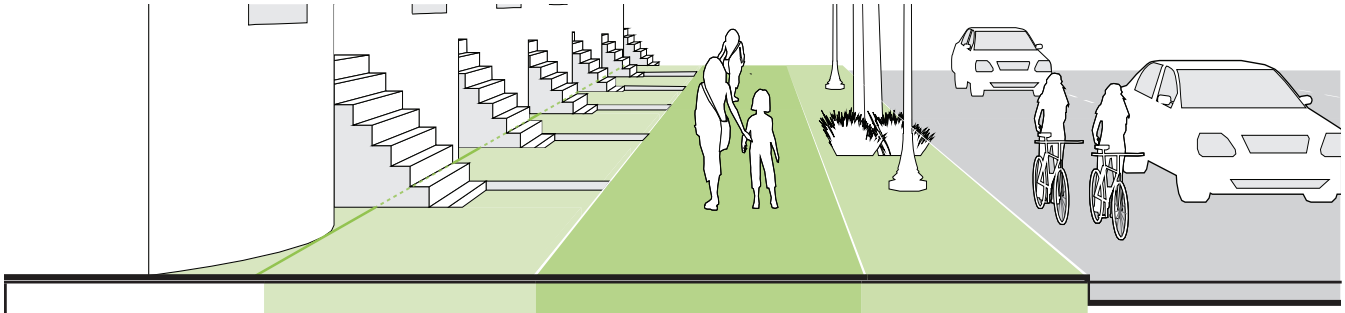
**Vertical Deflection Treatment** – Traffic calming techniques that compel motorists to reduce their travel speed by changing the elevation of the roadway at defined locations along a street. Examples include speed humps, speed tables, and raised crosswalks.

**Wayfinding** – A system of directional signs along streets or paths that assist people in finding major destinations. Wayfinding can be designed specifically for drivers, bicyclists, or pedestrians.


# PEDESTRIAN FACILITES

# PREFERRED WIDTHS FOR SIDEWALK ZONES

**The width of the various sidewalk zones will vary given the street type, the available right-of-way, scale of the adjoining buildings and the intensity and type of uses expected along a particular street segment. A balanced approach for determining the sidewalk width should consider the character of the surrounding area and the anticipated pedestrian activities. For example, is the street lined with retail that encourages window shopping or does it connect a residential neighborhood to a commercial area where pedestrians frequently need to pass one another? Does the scale of the buildings and the character of the street indicate a need for a wider sidewalk?**



| Area Type | Frontage Zone<br>door swings, awnings, café seating, retail signage and displays, building projections, utility easements | Pedestrian Zone<br>zone should be clear of any and all fixed obstacles; clear space for pedestrian travel only. | Amenity Zone<br>street lights and utility poles, street trees, bicycle racks, parking meters, transit stops, stormwater facilities, street furniture and signage | Preferred Total Width |
|---|---|---|---|---|
| **Transit Station Areas** | 2 to 5 feet | 6 to 10 feet | 5 to 6 feet | 13 to 21 feet |
| **School Zones** | 2 to 6 feet | 6 to 10 feet | 7 to 14 feet | 15 to 30 feet |
| **Commercial Urban Center*** | 2 feet | 6 to 8 feet | 6 to 8 feet | 14 to 18 feet |
| **Residential Areas** | 2 feet | 5 to 10 feet | 6 feet | 13 to 18 feet |
| **Rural Areas** | N/A | 5 to 6 feet | 3 to 6 feet | 8 to 12 feet |

Also see the City of Lacey Development Guidelines
*Woodland District Formed-Base Code supersedes these preferred widths

## CONSIDERATIONS

- In locations with severely constrained rights-of-way, it is possible to provide a narrower Frontage Zone and Pedestrian Zone.
- Frontage Zones used for sidewalk cafés are a special condition and should generally be no less than 6 feet in width.
- Where on-street parking is not present, the wider dimensions should be provided.
- The provision of tree wells or landscape strip within the Amenity Zone will be based on the existing or planned character of the neighborhood.
- Sidewalk stormwater facilities (including rain gardens) require a minimum of 7 feet of width for the Amenity Zone. The final dimensions will be established based on the context of each landscape area. Where stormwater facilities are not provided in the Amenity Zone, this area may be at the lower end of the range.

REFERENCES

*NACTO Urban Street Design Guide (2013)*

*Proposed Accessibility Guidelines for Pedestrian Facilities in the Public Right-of-Way (PROWAG) (2011)*

# CURB RAMPS

**The transition for pedestrians from the sidewalk to the street is provided by a curb ramp. The designs of curb ramps are critical for all pedestrians, but particularly for people with disabilities. The ADA Standards require all pedestrian crossings be accessible to people with disabilities by providing curb ramps at intersections and mid-block crossings as well as other locations where pedestrians can be expected to enter the street. Curb ramps also benefit people pushing strollers, grocery carts, suitcases, or bicycles.**

## CONSIDERATIONS

- Amenity zones or terraces (the space between the curb and sidewalk) that are 7 feet wide provide just enough width at intersections for curb ramps to gain sufficient elevation to a sidewalk without impinging on sidewalk space.
- Separate curb ramps should be provided for each crosswalk at an intersection rather than a single ramp at a corner for both crosswalks.
- Curb ramps are required to have landings. Landings provide a level area with a cross slope of 2% or less in any direction for wheelchair users to wait, maneuver into or out of a ramp, or bypass the ramp altogether. Landings should be 5 feet by 5 feet. ADA regulations require that landings shall, at a minimum, be 4 feet by 4 feet.
- Flares are required when the surface adjacent to the ramp's sides is walkable, however, they are unnecessary when this space is occupied by a landscaped buffer. Excluding flares can also increase the overall capacity of a ramp in high-pedestrian areas.

## GUIDANCE

- See Standard Details 4-11 through 4-11.4 in City of Lacey Development Guidelines

REFERENCES

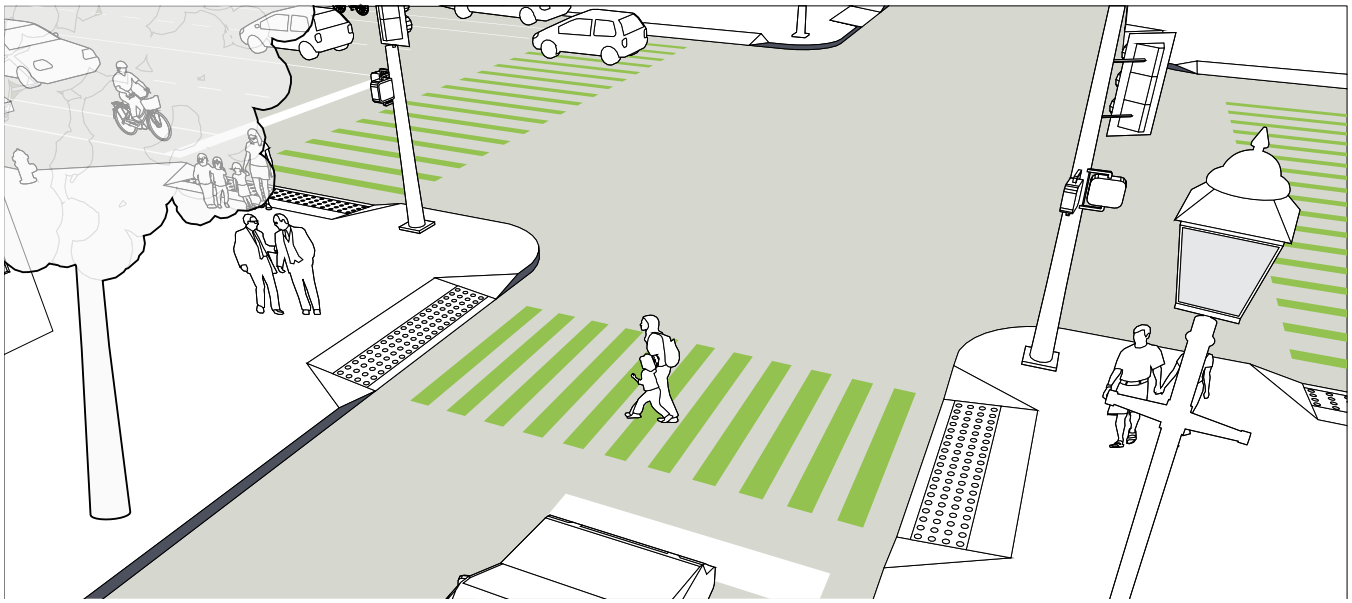
*City of Lacey Development Guidelines and Public Work Standards (2014)*

*Proposed Accessibility Guidelines for Pedestrian Facilities in the Public Right-of-Way (PROWAG) (2011)*

*WSDOT Design Manual, Chapter 1510 (2017)*

# MARKED CROSSWALKS

**Legal crosswalks exist at all intersections, regardless of whether pavement markings are present, unless there is a sign prohibiting pedestrians from crossing the street. Drivers are legally required to stop for pedestrians in the crosswalk. Providing marked crosswalks communicates to drivers that pedestrians may be present, and helps guide pedestrians to locations where they should cross the street. In addition to pavement markings, crosswalks may be enhanced with crossing islands, signage, active warning beacons, curb bulbs and other features.**



## CONSIDERATIONS

+ Refer to the City of Lacey Pedestrian Crossing Policy (see appendix A) for information on when the City will consider installation of marked crosswalks at uncontrolled intersections and mid-block locations.
+ Continental, zebra, ladder or other high visibility crosswalk striping should be used.
+ Raised crossings can calm traffic and increase the visibility of pedestrians. For additional guidance see "Traffic Calming - Vertical Deflection Treatments" on page 30.
+ Bulb-outs, also known as curb extensions and bump-outs, reduce the distance pedestrians have to cross and calm traffic.
+ On busy, multilane streets with transit and other pedestrian activity generators, safe and convenient crossing opportunities should be provided. Generally, a person is willing to spend 3 minutes walking and waiting to cross before they decide to cross at undesignated locations that may be less safe.

## GUIDANCE

+ Place crosswalks on all legs of signalized intersections, in school zones, and across streets with more than minimal levels of traffic.
+ Crosswalks should be at least 9 feet wide or the width of the approaching sidewalk if it is greater. In areas of heavy pedestrian volumes (such as Transit Station Areas, School Zones, and Main Streets) wider crosswalk can be used.
+ Stop lines at stop-controlled and signalized intersection approaches should be striped no less than 4 feet and no more than 30 feet from the edge of crosswalks.
+ For crossing treatments, refer to the City of Lacey Pedestrian Crossing Policy, including for information on enhanced crossing treatments (i.e. Flashing Beacons and HAWK Pedestrian Signals), which is included as Appendix B and C.
+ Crosswalks should be oriented perpendicular to streets, minimizing crossing distances and therefore limiting the time that pedestrians are exposed.

**REFERENCES**

*NACTO Urban Street Design Guide (2013)*

*ADA Accessibility Guidelines (2004)*

*Manual on Uniform Traffic Control Devices (2009)*

*WSDOT Design Manual, Chapter 1510 (2017)*

*Proposed Accessibility Guidelines for Pedestrian Facilities in the Public Right-of-Way (PROWAG) (2011)*

*Safety Effects of Marked Versus Unmarked Crosswalks at Uncontrolled Locations: Final Report and Recommended Guidelines (2005)*



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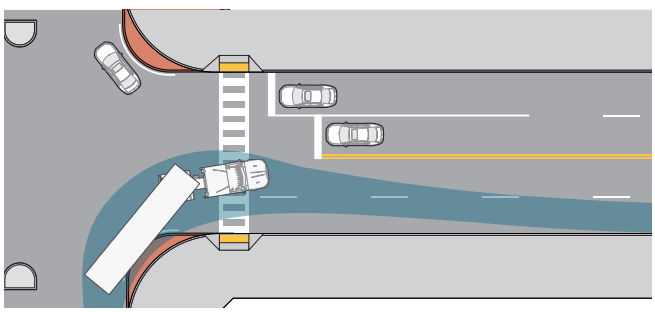
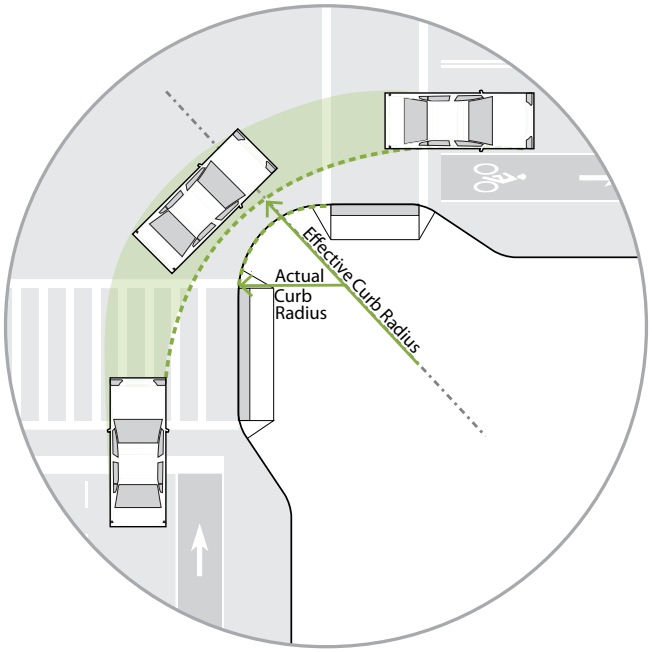
# CORNERS AND CURB RADII

**Pedestrian safety and comfort is enhanced by smaller curb radii, which shorten crossing distances for pedestrians and reduce vehicle speeds in turn. However, streets must accommodate large turning vehicles, including school buses and transit vehicles. One of the most challenging aspects of intersection design is to determine methods of accommodating large vehicles while keeping intersections as compact as possible. This requires a great deal of design flexibility and engineering judgment, as each intersection is unique in terms of the angles of the approach and departure, the number of travel lanes, the presence of a median, and a number of other features that fundamentally impact corner design.**

## CONSIDERATIONS

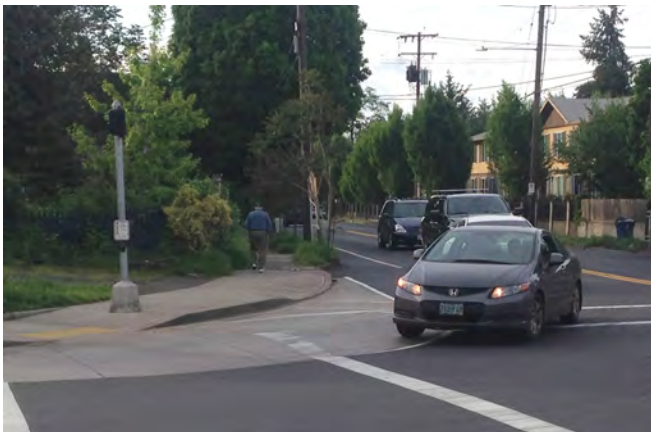
+ On-street parking and bicycle lanes may provide a larger effective radii to accommodate the appropriate design vehicle.
+ At signalized intersections where additional space is needed to accommodate turning vehicles, consideration can be given to recessing the stop bar on the receiving street to enable the vehicle to use the entire width of the receiving roadway (encroaching on the opposing travel lane).
+ A compound curve can be used to vary the actual curb radius over the length of the turn so that the radius is smaller as vehicles approach a crosswalk and larger when making the turn.
+ In some cases where there are alternative access routes, it may be possible to restrict turning movements by large vehicles (via signage) at certain intersections and driveways to enable tighter curb radii. Turn restrictions and alternate access routes should be properly signed and locally approved.
+ On low-volume (less than 4,000 vehicles per day), two-lane streets, corner design should assume that a large vehicle will use the entire width of the departing and receiving travel lanes, including the oncoming traffic lane.
+ At signalized intersections, corner design should assume that a large vehicle will use the entire width of the receiving lanes on the intersecting street.
+ In some cases, it may be possible to allow a large turning vehicle to encroach on the adjacent travel lane on the departure side (on multi-lane roads) to make the turn.
+ Mountable truck aprons deter passenger vehicles from making higher-speed turns, but accommodate the occasional large vehicle without encroachment or off-tracking into pedestrian areas. Mountable truck aprons should be visually distinct from the adjacent travel lane and sidewalk.






## GUIDANCE

+ See minimum street width standards listed on page 4-4 of City of Lacey Development Guidelines



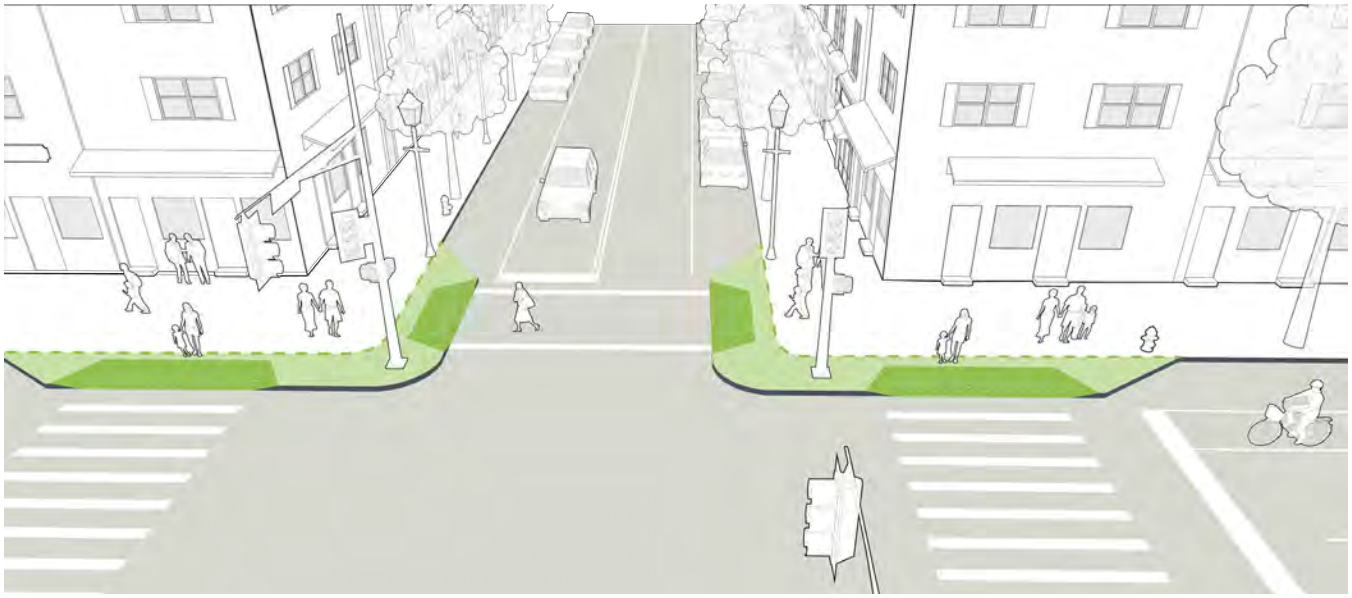
REFERENCES

*City of Lacey Development Guidelines and Public Work Standards, Chapter 4 (2014)*

*NACTO Urban Streets Design Guide (2013)*

# BULB-OUTS

**Bulb-outs, also known as neckdowns, curb extensions, or bump-outs, are created by extending the sidewalk at corners or mid-block. Bulb-outs are intended to increase safety, calm traffic, and provide extra space along sidewalks for users and amenities. In addition to shortening crossing distances, bulb-outs can be used to change the geometry of intersections resulting in smaller corner radii and slowing turning motor vehicles.**



## CONSIDERATIONS

+ The turning needs of emergency and larger vehicles should be considered in bulb-out design.
+ Care should be taken to maintain direct routes across intersections by aligning pedestrian desire lines on either side of the sidewalk. Bulb-outs often make this possible as they provide extra space for grade transitions.
+ Bulb-outs can be used to effectively restrict parking at intersections, enhancing visibility at pedestrian crossings.
+ When bulb-outs conflict with turning movements, reducing the width and/or length of the bulb-out should be prioritized over elimination.
+ Bulb-outs often improve emergency access because intersections are kept clear of parked cars.
+ Installation of bulb-outs often requires re-routing of stormwater catch basins, which can impact costs.
+ IWhere vehicle turning movements are restricted (such as at one-way streets) bulb-out geometry can be optimized for pedestrians.

## GUIDANCE

+ Bulb-outs should be considered only where parking is present or where motor vehicle traffic deflection is provided through other curbside uses such as bicycle share stations or parklets.
+ Bulb-outs are particularly valuable in locations with high volumes of pedestrian traffic, near schools, at unsignalized pedestrian crossings, or where there are demonstrated pedestrian safety issues.
+ See City of Lacey Development Guidelines, DPW Standard Plan 4-4.5 for bulb-out parking
+ The minimum length of a bulb-out is the width of the crosswalk, allowing the curvature of the bulb-out to start after the crosswalk, which should deter parking. The length of a bulb-out can vary depending on the intended use (i.e., stormwater management, transit stop waiting areas, parking restrictions). Retrofit implementation of bulb-outs should consider impacts to existing utility structures and drainage collection points (low points).
+ Bulb-outs should not reduce a travel lane or a bicycle lane to an unsafe width.

**REFERENCES**

*City of Lacey Development Guidelines and Public Work Standards, Chapter 4 (2014)*

*AASHTO Guide for the Development of Bicycle Facilities (2012)*

*NACTO Urban Street Design Guide (2013) - Curb Extensions*



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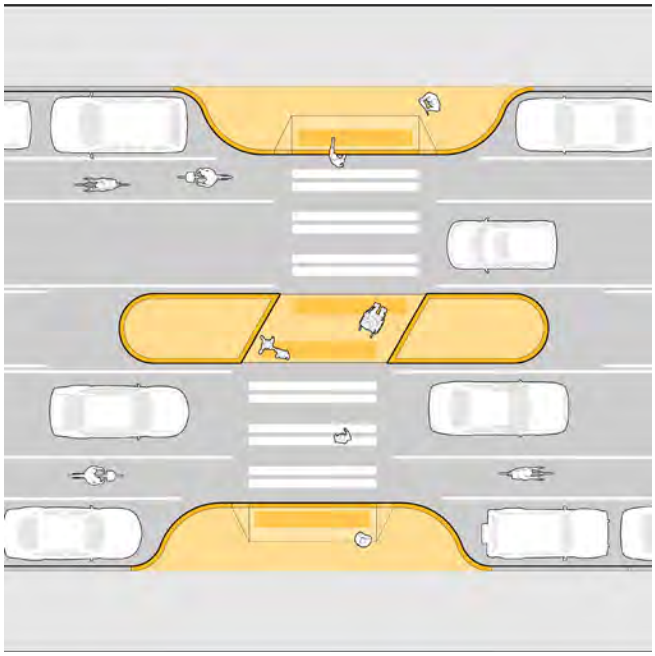
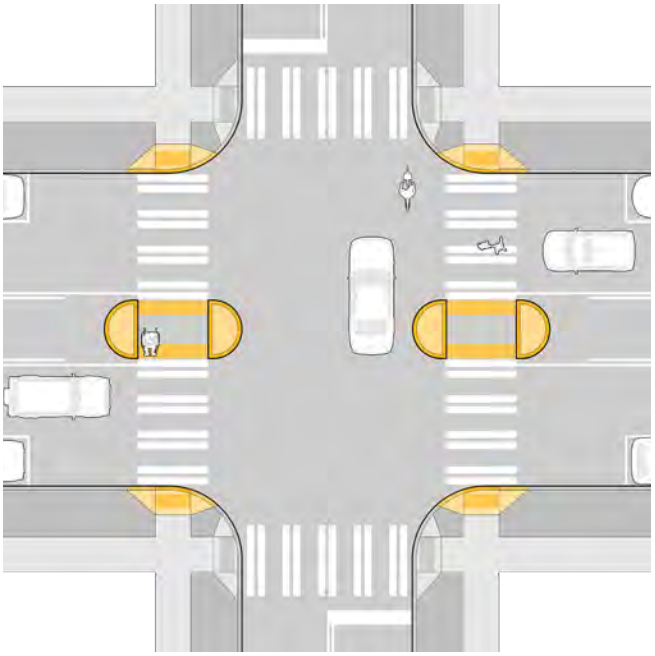
# CROSSING ISLAND

**Crossing islands are raised islands that provide a pedestrian refuge and allow multi-stage crossings of wide streets. They can be located mid-block or at intersections and along the centerline of a street, as roundabout splitter islands, or as "pork chop" islands where right-turn slip lanes are present.**



*Mid-block Crossing Island with Bulb-Outs*



*Intersection Crossing Islands (Left Turns Prohibited)*

## CONSIDERATIONS

+ There are two primary types of crossing islands. The first type provides a cut-through of the island, keeping pedestrians at street-grade. The second type ramps pedestrians up above street grade and may present challenges to constructing accessible curb ramps unless they are more than 17' wide (accommodating for ramp width and landing area).
+ Crossing islands can be coupled with other traffic calming features, such as partial diverters and bulb-outs at mid-block and intersection locations.
+ At mid-block crossings where width is available, islands should be designed with a stagger, or a "Z" pattern, encouraging pedestrians within the median to face oncoming traffic before crossing.

## GUIDANCE

+ Minimum width: 6 feet
+ Preferred Width: 10 feet (to accommodate bicyclists with trailers and wheelchair users)
+ Cut-through openings should be 2 feet wider than the width of the crosswalk. Cut-throughs may be wider in order to allow the clearing of debris and snow, but should not encourage motor vehicles to use the space for U-turns.
+ Curb ramps with truncated dome detectable warnings and 5-foot by 5-foot landing areas are required when the pedestrians are taken above the street level.
+ A "nose" that extends past the crosswalk is not required, but is recommended to protect people waiting on the crossing island and to slow turning drivers.
+ Vegetation and other aesthetic treatments may be incorporated, but must not obscure visibility.

**REFERENCES**

*NACTO Urban Street Design Guide (2013)*

*Manual on Uniform Traffic Control Devices (2009)*

# PEDESTRIAN SIGNALS

**Pedestrian signal heads display the three intervals of the pedestrian phase: (1) The Walk Interval, signified by the WALK indication (or the walking person symbol) alerts pedestrians to begin crossing the street. (2) The Pedestrian Change Interval, signified by the flashing DON'T WALK indication (or the flashing hand symbol accompanied by a countdown display) alerts pedestrians approaching the crosswalk that they should not begin crossing the street. (3) The Don't Walk Interval, signified by a steady DON'T WALK indication (or the steady upraised hand symbol) alerts pedestrians that they should not cross the street.**

## CONSIDERATIONS

+ Intersection geometry and traffic controls should encourage turning vehicles to yield the right-of-way to pedestrians. Traffic movements should be analyzed at intersections in order to utilize non-conflicting phases to implement one or more WALK intervals per cycle.

+ Signal design should also minimize the time that pedestrians must wait. Requiring pedestrians to wait for extended periods can encourage crossing against the signal. The 2010 Highway Capacity Manual states that pedestrians have an increased likelihood of risk-taking behavior (crossing against the signal) after waiting longer than 30 seconds.

+ Free-flowing right-turn lanes are discouraged at signalized intersections. Where they are present and unsignalized, the pedestrian signal and pushbutton should be located on the channelization ("pork chop") island. A yield or crosswalk warning sign should then be placed in advance of the crosswalk.

## GUIDANCE: TIMING & ACTIVATION

+ Pedestrian signals should allocate enough time for pedestrians of all abilities to safely cross the roadway. The MUTCD specifies a pedestrian walking speed of 3.5 feet per second to account for an aging population. The minimum pedestrian clearance time, which is the total time for the pedestrian change interval plus the buffer interval, is calculated using the pedestrian walking speed and the distance a pedestrian has to cross the street. To the extent feasible, pedestrian clearance time should be maximized.

+ Countdown pedestrian displays inform pedestrians the amount of time in seconds available to safely cross during the flashing DON'T WALK (or upraised hand) interval. All pedestrian signal heads should contain a countdown display provided with the DON'T WALK indication.

+ In areas with higher pedestrian activity, such as near transit stations, and main streets, push button actuators may not be appropriate. People should expect to get a pedestrian cycle at every signal phase, rather than having to push a button to call for a pedestrian phase.

## GUIDANCE: ACCESSIBLE PEDESTRIAN SIGNALS (APS)

Accessible pedestrian signals and accessible detectors are devices that communicate information in non-visual formats about the pedestrian phase to pedestrians with visual and/or hearing disabilities. APS and detectors may include features such as audible tones, speech messages, detectable arrow indications and/or vibrating surfaces.

+ Pushbutton locator tones are used for locating the pedestrian pushbutton needed to actuate the WALK interval. Detectable arrows should be located on pushbuttons to point in the same direction as the crosswalk. At corners of signalized locations where two pushbuttons are present, they should be separated by at least 10'.

+ Audible walk indications should have the same duration as the pedestrian walk indication unless the pedestrian signal rests during the pedestrian phase, in which case the audible indication should be provided in the first seven seconds of the Walk interval.

+ For automatically-called pedestrian phases, pushbuttons can be used to activate accessible pedestrian signal features such as detectable arrow indications and/or speech messages.

+ When new pedestrian signals are installed, APS with pushbuttons are required. For existing pedestrian signals, the APS and pedestrian pushbuttons should be provided when the signal controller and software are altered, or the signal head is replaced.

## GUIDANCE: LEADING PEDESTRIAN INTERVAL (LPI)

The Leading Pedestrian Interval initiates the pedestrian WALK indication three to seven seconds before motor vehicles traveling in the same direction are given the green indication. This signal timing technique allows pedestrians to enter the intersection prior to turning vehicles, increasing visibility between all modes.

+ The LPI should be used at intersections with high volumes of pedestrians and conflicting turning vehicles and at locations with a large population of elderly or school children who tend to walk slower.

+ A lagging protected left arrow for vehicles may be provided.

REFERENCES

*NACTO Urban Street Design Guide (2013)*

*Manual on Uniform Traffic Control Devices (2009)*

# FLASHING BEACON

**At some uncontrolled crossings, particularly those with four or more lanes, it can be difficult to achieve compliance with laws that require motorists to yield to pedestrians. Vehicle speeds and poor pedestrian visibility combine to create conditions in which very few drivers are compelled to yield.**


## CONSIDERATIONS

+ Flashing beacons are considerably less expensive to install than mast arm-mounted signals. They can also be installed with solar power panels to eliminate the need for an external power source.
+ Flashing beacons should be limited to locations with critical safety concerns, and should not be installed in locations with sight distance constraints that limit the driver's ability to view pedestrians on the approach to the crosswalk.
+ Flashing beacons should be used in conjunction with advance stop bars and signs.
+ Flashing beacons are usually implemented at high-volume pedestrian crossings, but may also be considered for priority bicycle route crossings or locations where bike facilities cross roads at mid-block locations.

## GUIDANCE

+ Flashing beacons can be used when a signal is not warranted at an unsignalized crossing. They are not appropriate at intersections with signals or STOP signs.
+ Flashing beacons are installed on both sides of the roadway at the edge of the crosswalk. If there is a pedestrian refuge or other type of median, an additional beacon should be installed in the median.
+ The City follows FHWA's ***Guide for Improving Pedestrian Safety at Uncontrolled Crossing Locations*** to help determine where flashing beacons should be installed.

**REFERENCES**

*NACTO Urban Street Design Guide (2013)*

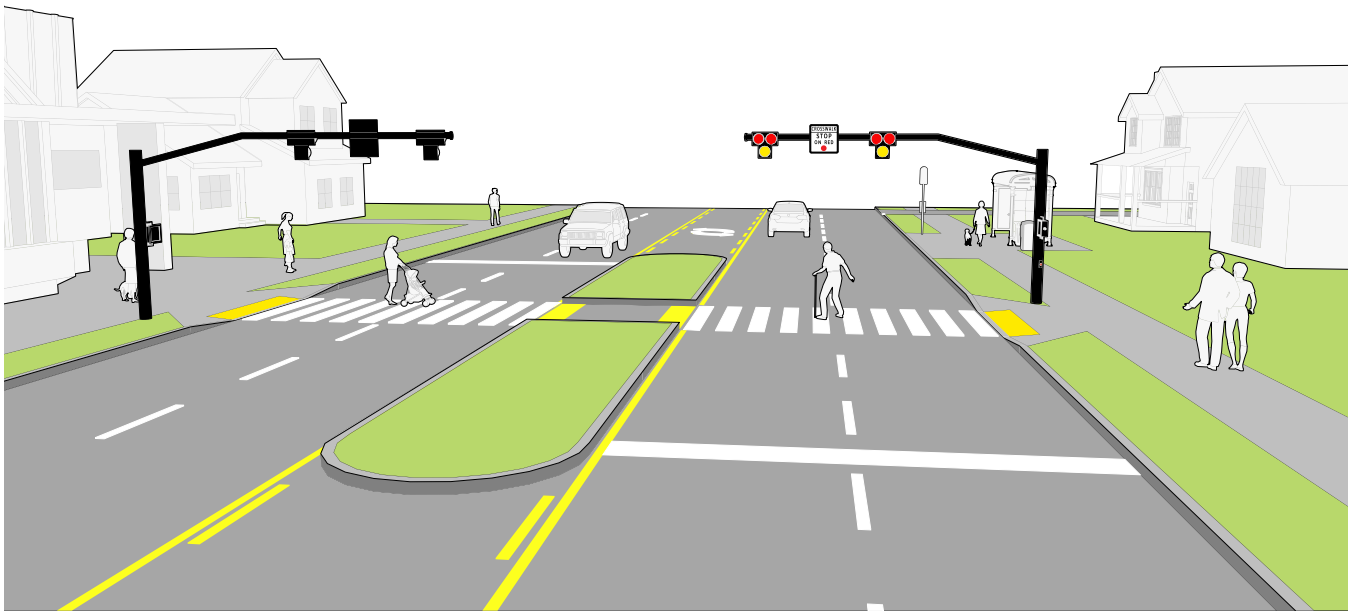
*Manual on Uniform Traffic Control Devices (2009)*

*WSDOT Design Manual, Chapter 1510 (2017)*

*Safety Effects of Marked Versus Unmarked Crosswalks at Uncontrolled Locations (2005)*

# PEDESTRIAN HYBRID BEACON

**Pedestrian hybrid beacons, also known as High-intensity Activated Crosswalk Beacon (HAWK), are a type of hybrid signal intended to allow pedestrians and bicyclists to stop traffic to cross high-volume arterial streets. This type of signal may be used in lieu of a full signal that meets any of the traffic signal control warrants in the MUTCD. It may also be used at locations which do not meet traffic signal warrants but where assistance is needed for pedestrians or bicyclists to cross a high-volume arterial street.**



## CONSIDERATIONS

+ While this type of device is intended for pedestrians, it would be beneficial to retrofit it for bicyclists as the City of Portland, Oregon has, using bicycle detection and bicycle signal heads on major cycling networks. Depending upon the detection design, the agency implementing these devices may have the option to provide different clearance intervals for bicyclists and pedestrians. The provision of bicycle signal heads would require permission to experiment from FHWA.

## GUIDANCE

+ The MUTCD recommends minimum volumes of 20 pedestrians or bicyclists an hour for major arterial crossings (volumes exceeding 2,000 vehicles/hour).
+ Pushbutton actuators should be "hot" (respond immediately when pressed), be placed in convenient locations for all users, and abide by other ADA standards. Passive signal activation, such as video or infrared detection, may also be considered.
+ The City follows FHWA's ***Guide for Improving Pedestrian Safety at Uncontrolled Crossing Locations*** to help determine where hybrid beacons should be installed.

REFERENCES

*NACTO Urban Street Design Guide (2013)*

*Manual on Uniform Traffic Control Devices (2009)*

*WSDOT Design Manual, Chapter 1510 (2017)*

*Safety Effects of Marked Versus Unmarked Crosswalks at Uncontrolled Locations (2005)*

# TRANSIT STOPS

**Any marked or signed location where transit vehicles stop and service passenger boarding and alighting is a transit stop. The most basic transit stops have only a pole-mounted "header" sign indicating the transit provider and route(s). High frequency routes and higher volume stops generally have more passenger amenities such as benches, lighting, shelters, traveler information, trash receptacles, bicycle parking, and other features.**

## CONSIDERATIONS

+ Transit stops provide a transition point from the bus (travel lane) to the sidewalk area for riders. Good design will reduce conflicts that can occur at these transition points. When planning a new bus stop consideration should be made for traffic design, pedestrian crossing zones, parking areas, driveways, building entrances and line of sight for both pedestrians and drivers.

+ Transit stops are typically located on the "far-side" of an intersection so the bus can clear the signal or intersection prior to loading/unloading passengers. In some instances bus stops are placed "near-side" or "mid-block" of intersections. Placement and design of bus stops on high volume streets and corridors should consider pedestrians/riders who will be using the bus stop(s) for both directions of the bus route as well as general traffic design considerations such as turn pockets, channelization lanes and driveways.

+ Transit stop locations are determined based on a number of factors including intersection operations, bus routing, curbside conditions, transfer points, intersection geometry and sightlines, consideration of other street users, and major generators or destinations. The location of a transit stop can affect travel time, safety, and roadway operations.

+ Generally, transit agencies prefer far-side stops when traffic flows are heavy, where there are sight distance problems, and where buses turn left. Near-side located bus stops may be appropriate where traffic flow is lower or where transit riders can more easily transfer without crossing the street. Stops can also be placed mid-block where there are major passenger generators or where space next to an intersection is insufficient.

+ Regardless of location, all transit stops must be ADA compliant, and should be safe, convenient, well-illuminated, and clearly visible. Transit stops should be connected to the larger pedestrian network with continuous sidewalks, curb ramps, and safe pedestrian crossings. Mid-block stops should provide access to mid-block crosswalks.

+ Bus bulbs may be considered where pedestrian space is limited and/or such design would support traffic considerations for transit vehicles to reenter traffic more safely and efficiently.

+ Seating at or near transit stops can improve passenger comfort, as can shade in the form of street trees or awnings. Seating need not be a unique and dedicated element, but may include leaning rails, planters, ledges, or other street elements. Seating designed for use by pedestrians at or near bus stops should consider how weather and the elements will support or detract from the intended design placement.


## GUIDANCE

+ The landing zone at each transit vehicle door should be a minimum clear zone 5 feet long (parallel to the curb) by 8 feet deep (beginning immediately adjacent to the curb). Newly constructed sidewalks should have a 10-foot by 8-foot landing zone (minimum) to provide an accessible space for loading and unloading. If the sidewalk is not wide enough to support an 8-foot landing zone and on-street parking is present, a bulb-out (bus bulb) should be built to accommodate the minimum width. Bus bulbs should extend to within 1 to 2 feet of the edge of the travel lane. All transit stops should meet ADA Standards.

+ Landing zones should be provided at all doors of the transit vehicle. For articulated buses, the distance between the front and rear landing zones is 18'. Buses can vary in length and will have different door configurations. Landing zones should be designed in coordination with all transit providers.

## REFERENCES

*NACTO Urban Street Design Guide (2013)*

*AASHTO Guide for Geometric Design of Transit Facilities on Highways and Streets (2014)*