



**STREET TYPOLOGY**

UC	E/F	MS	NB	CB	CC	NN	EN	LN
Req.	Req.	Req.	Req.	Req.	Req.	Req.	Req.	Req.

**PATHWAYS**

# PEDESTRIAN AREAS & SIDEWALKS

## DESCRIPTION & INTENT

Pedestrian areas provide physical space at the sides of the public rights-of-way for people to access adjacent land uses, including housing, shops, jobs, and public properties.

Pedestrian areas must be safe, comfortable, and accessible places for people of all ages and abilities. All public streets in the city should provide pedestrian areas and associated sidewalks, to ensure that all people have the opportunity to move through the city without reliance on a vehicle.

On public streets, pedestrian areas should provide adequate lighting and shade to support comfort and safety at all times of day and seasons. Sidewalks must, at a minimum, provide a clear, unobstructed pathway sufficient to accommodate persons with disabilities.

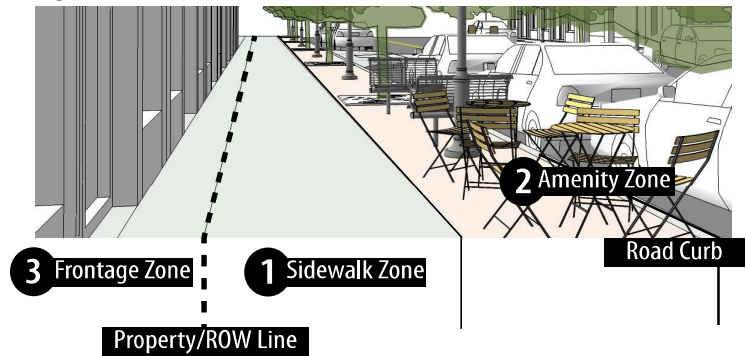
The design of pedestrian areas should support and reinforce adjacent land uses and is a vital component of encouraging active transportation and public health. Well-designed sidewalks support and enable walking as an appealing form of urban transportation. More people using sidewalks creates a greater sense of activity and “eyes on the street” - further improving the sense of safety.

Appropriate designs are wide enough to enable small groups to walk side-by-side engaging in conversation and passing oncoming pedestrians without significant conflict.

### Pedestrian Area - Key Terms

This pedestrian area typically extends from the roadway curb to the adjacent property / ROW line. Pedestrian areas may also extend beyond the property line to building frontages where those areas are intended for public use and access.

Figure 4.1.1 - Pedestrian Areas



The pedestrian area is typically comprised of the following zones:

- 1 Sidewalk Zone:** This refers specifically to the paved, continuous, walking zone for use by pedestrians when moving along the street, aka sidewalks. Sidewalks are typically located directly along the property line/right-of-way line.
- 2 Amenity Zone:** This zone is located adjacent to the street curb and extends to the sidewalk zone. Street fixtures such as street lights, street trees, parking meters, bicycle racks, bus stops and shelters, signage, signal poles, and landscaping are typically located within the amenity zone. The amenity zone also supports curbside uses such as parking and loading.
- 3 Frontage Zone:** This zone, when present, refers to the space between the property line and building walls, which may be intended for general pedestrian use depending on the land use context and physical conditions. In commercial districts, this zone may include items such as building breezeways or entries, door wells, recesses, and step backs.

## USE & APPLICATION

### Street Type and Placement

- **Pedestrian areas are required on all public streets, on both sides of the street, for all street typologies.** Gaps in the sidewalk network should be identified and filled overtime by establishing pedestrian areas and associated sidewalks on both sides of the street. Exceptions may be considered where pedestrian areas cannot be physically located within the public right-of-way.
- **Continuous:** Sidewalks shall be continuous throughout the city, connecting to one another via well marked crosswalks (with curb ramps) at roadway intersections and mid-block crossing locations.

### Users

- Pedestrians (including wheelchair users) are the priority users of the sidewalk. However, other means of mobility may need to be accommodated on sidewalks, such as bicycles, skaters, scooters, joggers, people with strollers, etc.
- While cycling on the sidewalk is not ideal for all but the most vulnerable bicycle riders, riding on the sidewalk is not prohibited in Kalamazoo. When cycling on the sidewalk, low speeds must be encouraged and bicycles are required to yield to pedestrians.
- Sidewalks should not be used for parking or travel by any motorized vehicle except assistance devices for persons with disabilities.



### Related Design Elements

- **Street Tree Accommodations:** Amenity zones shall provide adequate space for street trees to provide shade and buffer for pedestrian comfort (see [Street Tree Design](#) section for more details).
- **Lighting:** Pedestrian areas shall be well lit, preferably with pedestrian-scaled lighting rather than relying on ambient light from roadway lighting systems or building windows. Reliance on privately owned buildings to light the sidewalk via building-mounted lights is not a desirable alternative to pedestrian lighting (see [Lighting](#) section for more details).

### References

- Americans with Disabilities Act Accessibility Guidelines (ADAAG)
- City of Kalamazoo Code Chapter 33
- The National Association of City Transportation Officials (NACTO) urban Street Design Guide provides guidance on urban sidewalk design to support downtowns.
- The American Association of State Highway and Transportation Officials (AASHTO) "A Policy on Geometric Design of Highways and Streets." 6th Edition, (2011), also known as the Green Book, offers detailed guidance on the appropriate placement and configuration of sidewalks.
- Americans with Disabilities Act Accessibility Guidelines (ADAAG)



# DESIGN & OPERATIONS

## Design Requirements

- **Alignment:** Sidewalks must be as straight running as possible over the entire length of the block, and should not make unnecessary bends or jogs that impede straight movement.

### Pedestrian Area Widths

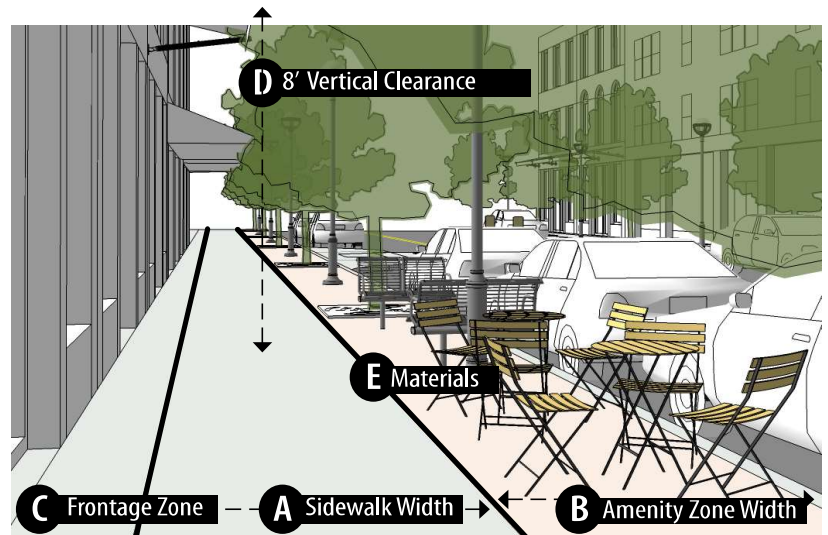
- The table below provides target and minimum widths for zones in the pedestrian area. **Widths less than target widths may only be used with clear documentation for why that width cannot be achieved.**

- A Sidewalk Width:** Width varies based on the street typology (see [Table](#)).
- B Amenity Zone Width:** Width varies based on the street typology (see [Table](#)).
- C Frontage Zone Width:** The width of frontage zones may be contingent on zoning code requirements for building step backs from the from public rights-of-way. Where pedestrian space in the public right-of-way is limited, buildings should include a step back in order to achieve the overall dimensions listed below.
- **Overall Pedestrian Area Widths:** The overall pedestrian area width must provide adequate separation from the roadway. The “A” minimum width is where a curbside lane exists and provides a buffer against the roadway. The “B” minimum width is where the pedestrian zone is adjacent to a vehicle travel lane. This overall

width can also include frontage zone width for buildings that are stepped back, provided the space is designed and intended for public access.

### Other Design Requirements

- D Height Clearance:** Objects overhanging the sidewalk, such as signs, banners, planter boxes or baskets, or other features shall provide at least 8-feet of clear vertical height.
- E Materials:** Materials in the sidewalk and amenity zone as follows:
  - » Sidewalk: Concrete with basic (i.e. broom) finishes. Provides greatest accessibility and easy maintenance and snow clearing.
  - » Amenity Zone: Materials can be more flexible. Concrete to be used as a default material. Concrete unit pavers (porous and non-porous versions) or brick pavers may be used, subject to engineers approval.

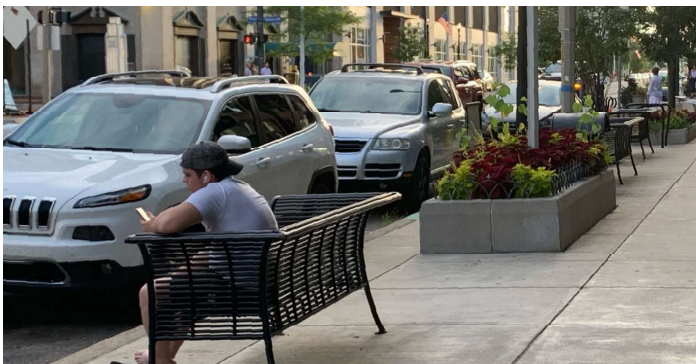


Street Typology	Overall Widths			Sidewalk Width		Amenity Zone Width	
	Target	Min. “A” (parking)	Min. “B” (no park.)	Target	Minimum	Target	Minimum
Urban Center (UC)	22'+	18'	19'	10-12'	8'	12'+	10'
Event/Festival (E/F)	16'+	12'	19'	10-12'	8'	8-12'	4'
Downtown Main (MS)	14'+	12'	19'	6-10'	6'	8'+	6'
Neighborhood Business (NB)	14'+	12'	19'	6-10'	6'	8-10'	6'
Commercial Business (CB)	16'+	12'	19'	8-10'	6'	8-12'	4'
City Connector (CC)	16'+	12'	19'	8-10'	6'	8-12'	4'
Neighborhood Network (NN)	14'+	12'	19'	6-10'	6'	8'-12'	6'
Enhanced Neighborhood (EN)	12'+	9'	12'	6-8'	5'	6'-12'	4'
Local Neighborhood (LN)	12'+	9'	12'	6'	5'	6'-12'	4'

- **Cross-slope:**
  - » Sidewalks must have a positive cross-slope away from buildings, with a maximum cross-slope of 2% to achieve ADA accessibility.
  - » The amenity zone should maintain the same cross-slope to the extent possible, but may increase to 5% maximum where pedestrian activities/uses are anticipated (e.g. cafe dining, curbside uses).

## Additional Design Considerations

- **Separation and Buffers:** Pedestrian areas shall be separated from the vehicular travel way via a raised curb. Exceptions may occur where the street is specifically designed to share space freely between all street users including vehicles and pedestrians. Street fixtures such as trees, lights, meter posts, and landscape should be used to provide additional buffers and sense of separation.
- **Sidepaths and Shared-Use Trails:** Where sidewalk widths are 8-feet or more in width, consideration should be given for designing the sidewalk as a sidepath or shared-use trail in order to better accommodate bicycles in addition to pedestrians. This approach is appropriate on more commercial business streets.
- **Snow Melt:** Downtown area sidewalks should be coordinated with the City's snow melt system plans.



## Utility Considerations

- Utility vaults should be avoided in the sidewalk area. Where vaults cannot be avoided, they should be located in the frontage or amenity zones of the sidewalk. Vaults should be discrete and, where possible, screened by landscaping. The tops of vaults should favor solid materials over grates. Materials should not be slippery when wet or during cold conditions.

## Sustainability Considerations

- Lighter color sidewalk materials that increases the reflectivity lowers the urban heat island effect. Avoid using dark colors for sidewalk materials and finishes.
- Amenity zones provide opportunities for landscaping and stormwater management features. The frontage zone may also provide space for landscaping and stormwater management where buildings are set back from the right-of-way and there is adequate space available for landscaping.
- Street trees can dramatically lower the urban heat island effect and retain stormwater.

## MAINTENANCE & MANAGEMENT

- **Construction Impacts:** Continuous pedestrian accommodation and connectivity should be maintained where feasible. Refer to applicable city and building code documents for further information on sidewalk protections and closures.
- Sidewalks are prone to many incidences that degrade accessibility and the quality of the walking environment. Sidewalk heaving due to tree roots and shifting sidewalk pavers, including historic bricks, are two very common special maintenance needs. Providing adequate soil volume, quality non-compacted soil, and sufficient growing space can minimize the potential for adverse impacts on sidewalk pavement.
- Sidewalk pavers, even in historic areas, may be reset to smooth sidewalk surfaces. Quality workmanship at installation is essential.
- Innovative materials, such as porous concrete or rubber pavement blends, provide some distinct advantages but require special monitoring and maintenance. Maintenance plans and commitments must be in place prior to the use of these materials.



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## PATHWAYS

# CROSSWALKS

## DESCRIPTION & INTENT

Crosswalks are designated and marked locations where pedestrians and other sidewalk users should cross the roadway. Marked crosswalks provide a safe, clear, place to cross the street and combine with appropriate intersection controls that require motorists to stop for pedestrians using crosswalks. Crosswalks signal to other road users, especially motorists, that pedestrians are, or may be, present. Frequent crossings support greater walkable and encourage more active transportation choices.

## USE & APPLICATION

### Location

- Marked crosswalks should be provided on streets with traffic volumes above 3,000 Average Daily Traffic (ADT), speeds higher than 20 MPH and/or with multiple travel lanes. It is especially important that crosswalks be provided in the vicinity of schools, parks, senior centers or other facilities that have concentrations of more vulnerable pedestrians.
- When crosswalks are used at an intersection, crosswalks should be provided across all legs of all intersections and must have a curb ramp and sidewalk to land on.
- Crosswalks should be provided at the ends of every block, which is typically every 300- to 400-feet. Longer distances between crossings may prompt pedestrians to choose unsafe and unprotected crossing points if marked crosswalks are too far apart. When crossings are needed between intersections, mid-block crossings should be used (see [Mid-Block Crossings](#)).

## Related Design Elements

- **Bumpouts:** Bumpouts reduce the length of crosswalks, and thus the crossing time for pedestrians. Use bumpouts with crosswalks either at intersections or at mid-block crossings (see [Bumpouts](#)).
- **Mid-Block Crossings:** Mid-block crossings must use crosswalk markings (see [Mid-Block Crossings](#)).
- **Signs and Signals:** At high volume or high concern crossings where there is no signal or other traffic stop controls, use other appropriate means of highlighting crosswalks, such as hybrid beacons, rapid flash beacons, raised crossings, medians, and other safety measures (see [Pedestrian Signals](#)).
- **Medians:** Medians used in the roadway, at either mid-block or intersection approaches, are an opportunity to integrate with crosswalks (see [Pedestrian Refuge Islands](#) and [Mid-Block Crossings](#)).

## DESIGN & OPERATIONS

### Design Requirements

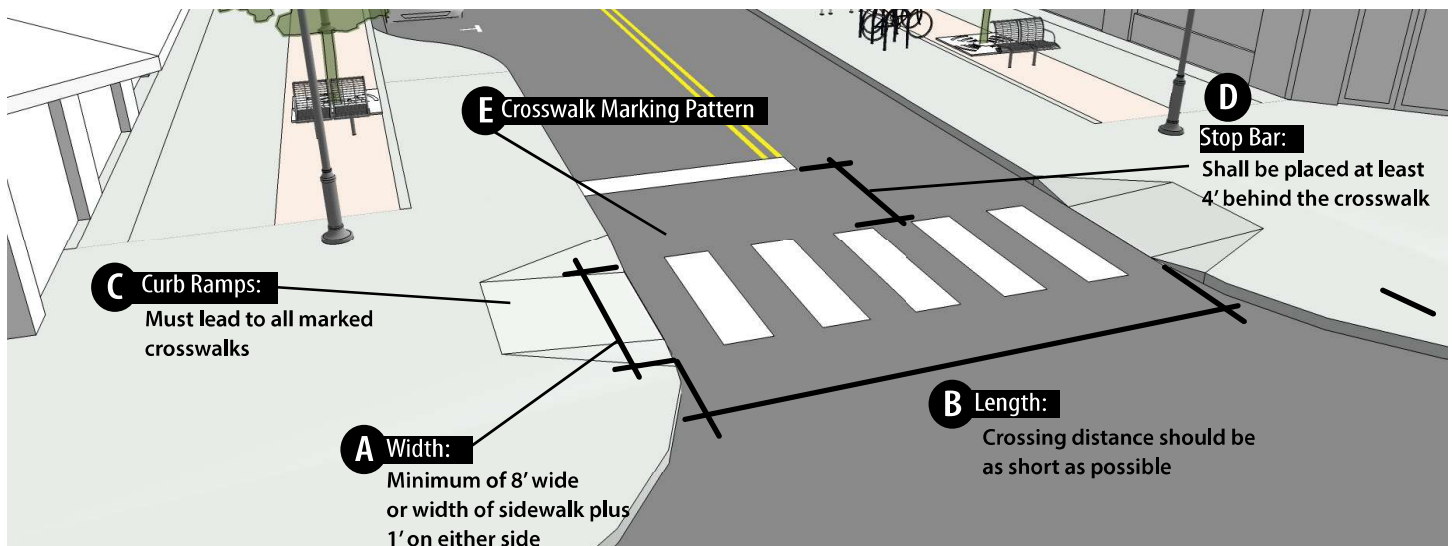
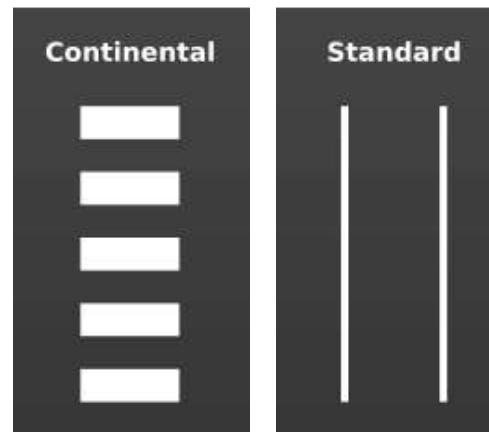
- **Alignment:** Crosswalks should be in line with the center of the connecting sidewalk, to provide as direct and clear a route as possible across the street.

- A Width:** Crosswalks shall be at least 8-feet wide, or equal to the width of the connecting sidewalk plus an additional 1-foot on either side.
- B Length:** Street designs should strive to shorten the length of crosswalks to the extent feasible to reduce exposure. Utilize bumpouts, medians, or crossing islands where appropriate to narrow crossing lengths.
- C Curb Ramps:** Curb ramps with detectable warnings shall lead to all marked crosswalks to meet accessibility requirements (see [Curb Ramps](#)).
- D Stop bars:** At stop or signalized intersection approaches for vehicle and bicycle lanes, solid white bars 18 to 24 inches wide must extend across all lanes approaching a crosswalk. These should be placed at least 4-feet behind of the crosswalk line.
- **Materials:** Underlying crosswalk material should be constructed of asphalt or concrete. Unit pavers or bricks should be avoided in crosswalks due to impacting the clarity of markings and/or for creating trip hazards resulting from loose materials.

- E Crosswalk Marking Pattern:** High visibility pavement markings, using a reflective material, shall be used to mark crosswalks. The type of crosswalk marking pattern used depends on the roadway conditions as follows:

- » **Continental Pattern:** This pattern should be used at all signalized intersections and at uncontrolled (non-signalized) crossings that cross over a primary road (all street typologies except Enhanced Neighborhood and Local Neighborhood). Continental crossings may also be used at any crossing where there are visibility concerns. The white bars should be 12 inches wide with 24-inch spacing. Bars should be aligned parallel with the direction of the vehicle travel lane. Angled crossings should be stepped along the crossing with markings parallel to the travel lane.
- » **Standard Pattern:** The standard pattern should be used when crossing enhanced neighborhood or local neighborhood streets at stop controlled and uncontrolled crossing points. This pattern uses a pair of 6-inch wide bars to indicate the crossing zone.

Figure 4.1.2 - Crosswalk Marking Pattern



## Additional Design Considerations

**F Raised crosswalks** should be considered in locations where high volumes of pedestrian crossings occur and/or at locations where managing vehicle speeds is critical.

- » Raised crossings are typically used as part of a mid-block crossing and function as a speed table to reduce vehicle speeds (see *Volume and Speed Management*). Raised crossings may also be considered at crossings over side streets that run parallel to a free-running primary street. In these cases, raised crossings force slower vehicle turning speeds and better awareness of pedestrians.
- » Raised crossings help elevate the visibility of pedestrians and prioritize pedestrian users. Raised crosswalks can also make the sidewalk and crossing zones more accessible, due to not requiring pedestrians to navigate curb ramps. Detectable warning must still be used on crosswalk approaches.
- » Geometry: Raised crossings must cover the entire crossing distance. Slopes for vehicle ramp should be between 1:10 to 1:25

**G In-Road Pedestrian Crossing Markers (R1-6):** In-road pedestrian markers (or “Gateway Treatments”) may be utilized at normal crossings and mid-block crossings to alert drivers and constrain the perceived lane width, thereby encouraging lower speeds and greater compliance with stopping for pedestrians.

- » Markers should be placed minimally on the centerline of the roadway, typically on both sides of the crossing point. Markers may also be placed in the road gutter or just outside of the travel lanes.



**H Hardened Centerlines/Corners:** This treatment uses small speed bumps and/or tight groupings of delineator posts positioned before and after a crosswalk on a road centerline in order to force drivers to take sharper and slower turns. This is particularly applicable for vehicles turning left onto a multi-lane receiving road.

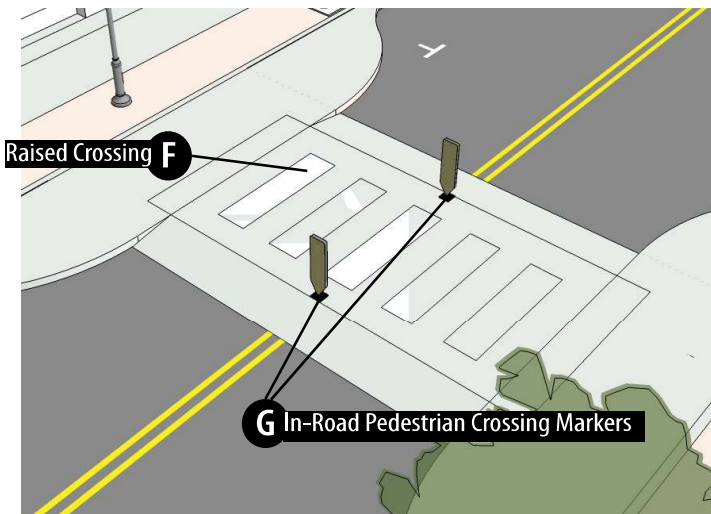
- » Typical treatment is to apply 6- to 20-foot long sections of speed bumps/delineators following the centerline. Where larger vehicle traffic is expected, use of speed bumps only allow larger vehicles to turn and travel over the bumps.

- **Special Crossing Pavings/Materials:**

- » Projects can utilize temporary decorative crosswalk treatments to enhance place making or introduce public art elements (e.g. such as crosswalk tattoos). However, no part of the decorative treatments may cover up intersection or touch the actual crosswalk markings.
- » Stamped or colored asphalt or concrete crosswalks treatments can increase maintenance requirements and decrease night time visibility and legibility. These treatments are typically discouraged.

## Utility Considerations

- There should be a clear path from the crosswalk to the curb ramp and onto the sidewalk. Ensure that utility infrastructure, such as signal boxes, signal poles, light fixtures, or fire hydrants are outside of the walking zone at the end of the crosswalk to create a clear path.



## MAINTENANCE & MANAGEMENT

### General Maintenance

- **Crosswalk Re-Striping:** Crosswalks are in the travel way of the roadway. As such, they are subjected to substantial wear and tear and fading. Crosswalk markings should be refreshed at regular intervals.
- **Street Resurfacing:** After repaving, crosswalks should be remarked as soon as possible. Use repaving as an opportunity to install higher-visibility patterns.

### Seasonal Use and Maintenance

- **Snow Removal:** Crosswalks must be cleared of snow and ice. Crosswalk curb ramps should not be blocked by obstacles of snow, ice or large pools of water.







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## PATHWAYS

# CURB RAMPS

## DESCRIPTION & INTENT

Curb ramps are a short ramp cutting through a curb or built up to it. Curb ramps provide the transition from the sidewalk to the street, and benefit all users, especially those in wheelchairs, people pushing strollers or luggage, and children on bicycles.

## USE & APPLICATION

### Location

Curb ramps are appropriate, encouraged, and required on all streets of all street types. Curb ramps are required to be installed during road resurfacing projects or corner construction impacts. They are also required by law with any sidewalk construction or reconstruction at intersections or other crossing points.<sup>1</sup>

As part of a creating an accessible sidewalk network, pedestrian crossings on public streets must include a curb ramp, regardless of whether the crossing is marked or not.

Curb ramps should be used along a sidewalk length if the sidewalk is cut by vehicle paths located below the grade of the sidewalk, such as alleys. However, in general, driveways and curb cuts should maintain the sidewalk at grade across them.

Curb ramps, including temporary ones, should be provided when a pedestrian detour is needed to maintain access during sidewalk closures.

## Related Design Elements

- **Crosswalk Markings:** See [Crosswalk Markings](#) for details on which crossings should be marked and what pattern of marking to use.
- **Bumpouts:** Bumpouts can provide an opportunity to create more pedestrian space to accommodate curb ramps and level landings where sidewalk conditions are constrained (see [Bumpouts](#)).
- **Pedestrian Refuge Islands:** Curb ramps should be used as part of the design of pedestrian refuge islands (see [Pedestrian Refuge Islands](#)).
- **Pedestrian Signals:** Crosswalk pushbutton location should be coordinated with the crosswalk, curb ramp and level landing in accordance with PROWAG<sup>3</sup> (see [Pedestrian Signals](#)).
- Curb ramps should be designed as an integral part of an overall intersection. They should work in concert with crosswalks, pedestrian refuge islands, stormwater drainage and all other features of the intersection.

## Policy References

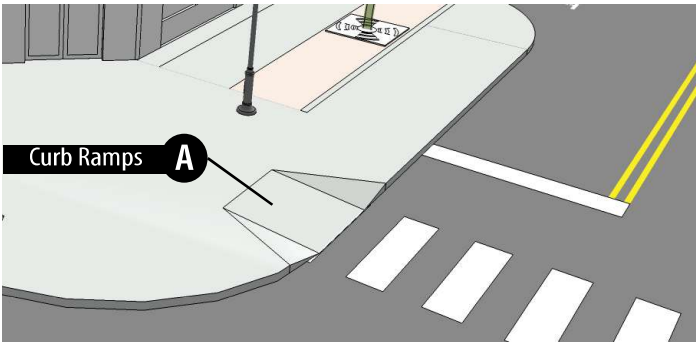
- Title II of the Americans with Disabilities Act (ADA) requires state and local governments to provide access for persons with disabilities to utilize pedestrian crossings. The U.S. Access Board provides detailed guidance on the use, design and location of curb ramps.<sup>2</sup>

<sup>1</sup> Michigan Public Act 8 of 1973

<sup>2</sup> <http://www.ada.gov/pcatookit/chap6toolkit.htm#fn1>

<sup>3</sup> Revised Draft Public Rights-of-Way Accessibility Guidelines (PROWAG), November 23, 2005.

<sup>4</sup> [http://www.fhwa.dot.gov/environment/bicycle\\_pedestrian/publications/sidewalk2/sidewalks207.cfm](http://www.fhwa.dot.gov/environment/bicycle_pedestrian/publications/sidewalk2/sidewalks207.cfm)



## DESIGN & OPERATIONS

### Design Requirements

- A Standard Design:** Curb ramps must be ADA accessible and in compliance with Public Right-of-way Accessibility Guidelines (PROWAG).
  - » The City’s preference is for directional curb ramps in-line with the adjoining sidewalk and perpendicular to the centerline of the crosswalk. Curving or blended curb ramps should only be used where this is insufficient space for separate directional curb ramps.
- Crosswalk Alignment:** The curb ramp shall lie within the centerline of the crosswalk. Side flares may extend beyond the width of crosswalk if necessary.
  - » Curb ramps should provide an individual directional ramp for each crossing direction that is oriented perpendicular (not angled) to the crossing path and lines up with the “receiving” ramp on the opposite side of the street, to provide clear directionality for visually impaired users. At intersections where there is not sufficient space for separated curb ramps at the corner, a combined curb ramp (aka blended transition ramp) may be used.
- Crosswalk Accessibility:** Where curb ramps provide access to a crosswalk, they shall be provided at both ends of the crosswalk to prevent entrapment within the intersection.
- Materials:** Curb ramp shall be constructed from concrete pavement when possible. Do not install pavers at curb ramps.
- Detectable Warning Tiles:** Curb ramps should have prefabricated composite detectable warning tiles with truncated domes meeting ADA standards. Color: Colonial Red.

### Additional Design Considerations

- Curb ramps should be designed to avoid pooling of water at the base of the ramp along the gutter pan.
- Increase the width of the curb ramp in areas of high pedestrian volume and crossing activities. Curb ramps facilitate the movement of all pedestrians and their benefit is not limited only to pedestrians with mobility impairments.
- Strengthen the curb section and curb ramp to handle heavy vehicles (e.g. trucks and buses) that may frequently mount the curb during turning movements.
- Do not use pedestrian actuated signals at downtown crossings. Frequent pedestrian crossings should be common and expected.

### Utility Considerations

- Provision of ADA curb ramps take precedence and utilities should be moved to permit the provision of the ramp.
- Do not install curb inlet within ramp and crosswalk limits.

### Design References

- Public Right-of-way Accessibility Guidelines (PROWAG).
- The FHWA has developed detailed guidance on the design and installation of curb ramps.<sup>4</sup>

## MAINTENANCE & MANAGEMENT

### Maintenance

- Snow Removal:** Perpendicular curb ramps on tangent or directional ramps on radius of corner aid snow removal because plows are traveling straight along the edge of the ramp. Ramps that are located on the radius of the ramp are more susceptible to plows leaving a wedge of snow in front of ramp from traveling past.
  - » Snow clearance of sidewalks should also include clearing of curb ramps to ensure that snow does not block access from the sidewalk to and across the street at crosswalk locations.
  - » City ordinance require the adjacent property owner to ensure the sidewalk and any curb ramps are clear from snow and ice.



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## PATHWAYS

# MID-BLOCK CROSSINGS

## DESCRIPTION & INTENT

Mid-block crossings allow pedestrians to safely cross the street away from the intersection. These crossings are used where there is a destination or gap in the street network that generates demand for a crossing. Marking mid-block crossings indicates to both pedestrians and motorists where to cross and tend to concentrate pedestrian activity in that location, thus decreasing jaywalking. Mid-block crossings increase predictability and safety for both pedestrians and motorists.

## USE & APPLICATION

### Location

- Mid-block crossings should be located wherever there is significant pedestrian demand, such as at mid-block bus stops, parks, building entrances to major destinations, or mid-block passageways.
- Mid-block crossings are ideal for corridors with pedestrian access or bicycle transport emphasis, but are an opportunity on all street types.
- AASHTO recommends mid-block crossings where there are already a substantial number of uncontrolled mid-block crossing movements, where a new development is expected to produce many mid-block crossings, or where the nearest intersections are at least 660-feet (1/8 mile) apart.

## Related Design Elements

- **Raised Crosswalks:** Raised crosswalks (see [Crossings Design Element](#)) can increase the visibility of the mid-block crossing. At crossings without signals, raised crosswalks can encourage greater compliance on roads where average traffic speeds may exceed posted speeds.
- **Lighting:** Use high-visibility lighting and markings to highlight unsignalized mid-block crossings.
- **Curb Cuts:** Crossings should be carefully placed when close to driveways or loading zones due to potential for conflicts with motor vehicles.
- **Curb Ramps:** Crossings should be paired with curb ramps (see [Curb Ramps Design Element](#)).
- **Landscaping:** To maintain visibility, landscaping around mid-block crossings should be limited to low vegetation.
- **Bumpouts and Curbside Uses:** Where a curbside zone is present along the block, the mid-block crossing should be integrated with a bumpout in order to enhance visibility to waiting pedestrians around parked vehicles.
- **Refuge Islands:** Where the crossing involves three or more vehicle lanes, mid-block crossings should include pedestrian refuge islands, which make it easier for pedestrians, especially those with limited mobility, to cross safely (see [Pedestrian Refuge Islands](#)).

## DESIGN & OPERATIONS

### Design Requirements

- A Crosswalk Marking:** Mid-block crossings shall conform to the requirements of the crosswalk design element for markings. Mid-block crossings shall feel like a deliberate part of the pedestrian network and should show where pedestrians have priority and where motorists should yield. Crossings shall be visible and easily distinguished from other street features. They are an opportunity to calm traffic and reduce speeds.
- **Visibility:** Mid-block crossings can be used to increase visibility, restrict parking, or extend the curbs around a crossing at least 20-feet to either side of the crosswalk.
- B Width:** Mid-block crossings shall be at least 8-feet wide but ideally 10-feet in width.
- C Stop bars or yield lines** shall be provided at mid-block crossings. Stop bars shall be between 12 and 24 inches wide.
  - » Stop bars or yield lines should be set back at least 20-feet back from the crossing to increase the visibility of pedestrians, especially on multi-lane roadways. At signalized mid-block locations, the 2009 MMUTCD recommends the stop line be placed a least 40-feet from the nearest signal indication.
- **Signal Controls:** Mid-block crossings over primary roads should evaluate the appropriateness of using additional signal indication to increase pedestrian visibility and control vehicles, such as HAWK Signals or RRFBs (see [Pedestrian Signals](#)).

- **Special paving** materials or markings can visually highlight the crossing and alert motorists that pedestrians are present. They can also be used to extend streetscape elements from the sidewalk.

### Utility Considerations

- Maintain a clear path from the crosswalk to the curb ramp and onto the sidewalk. Ensure that utility infrastructure, such as signal boxes, signal poles, light fixtures, trash receptacles, and fire hydrants are outside of the walking zone at the end of the crosswalk.

### Sustainability Considerations

- Mid-block bumpouts and refuge islands that are part of a mid-block crossing provide an opportunity to incorporate stormwater management facilities into the street design (see [Stormwater Management](#)).

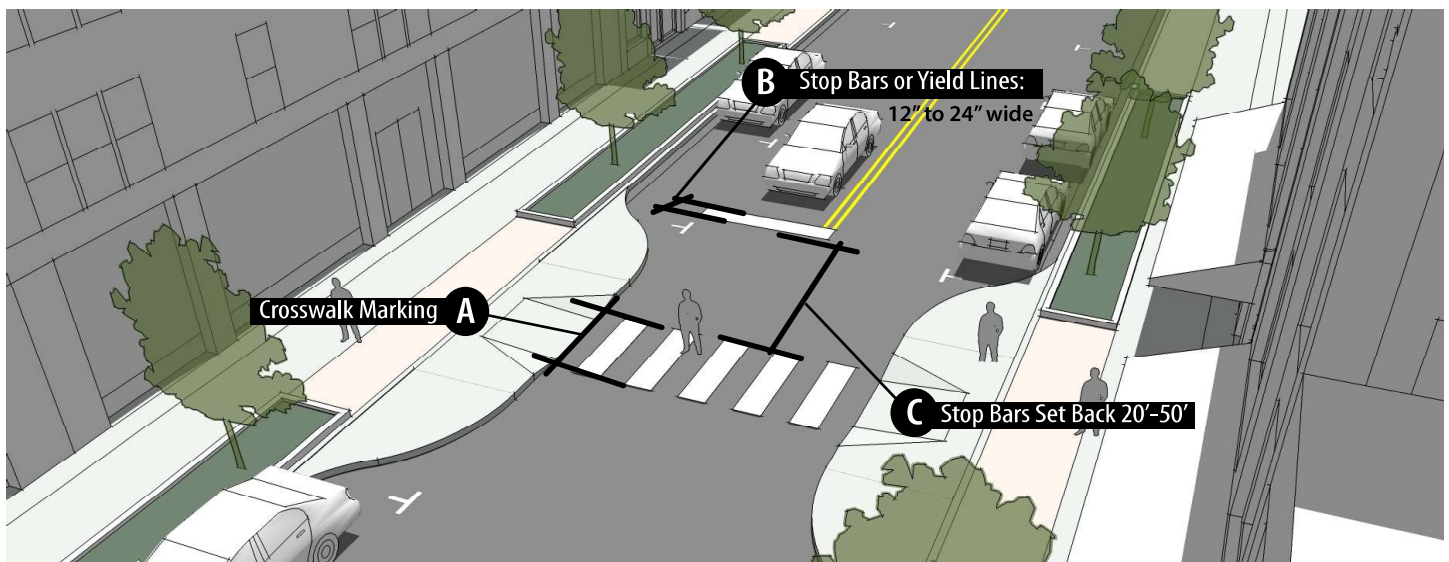
### Design References

- The MMUTCD recommends providing a signal at mid-block crossings where pedestrian demand is high.

## MAINTENANCE & MANAGEMENT

### Seasonal Use and Maintenance

- Keep crosswalks and curb ramps clear of snow to facilitate pedestrian movement after a snowfall.





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# PEDESTRIAN REFUGE ISLANDS

## DESCRIPTION & INTENT

Pedestrian refuge islands are protected sections within the roadway that provide a safe landing zone for pedestrians to use while crossing a street. These protected spaces reduce pedestrian risk by reducing the crossing distance and breaking up longer crossings into two or more stages. Because the pedestrian is crossing fewer lanes of traffic, pedestrians more easily find gaps to cross at unsignalized crossings. At signalized crossings, it provides a safe place to wait between cycles if a pedestrian is unable to make it across the street in one signal cycle.

Pedestrian refuge islands improve safety and also function as a traffic calming device. The Pedestrian and Bicycle Information Center, a FHWA project, reports that “crossing islands have been demonstrated to decrease pedestrian-vehicle incidents by 46% at marked crossings, and by 39% at unmarked crossings.”<sup>1</sup>

Existing medians can often be redesigned to accommodate pedestrian refuge islands both mid-block and at intersections. Both new and existing medians should accommodate pedestrian refuge islands at intersections whenever possible, and should be the default solution.

When implementing a three lane road diet or introducing a continuous left turn lane, all intersections should be studied to see if pedestrian refuge islands can be accommodated. This is often the case when intersecting roadways are one-way, staggered, or if left turns are banned.

It is vital that pedestrians are visible to vehicles and vice versa. Best practice in higher speed roadways is to angle or jog the pedestrian waiting area to allow the pedestrian to be slightly facing on-coming traffic.

<sup>1</sup> Pedestrian and Bicycle Information Center, Facility Design, [http://www.ped-bikeinfo.org/planning/facilities\\_crossings\\_islands.cfm](http://www.ped-bikeinfo.org/planning/facilities_crossings_islands.cfm) Accessed December 2014

## USE & APPLICATION

### Location

- Pedestrian refuge islands are appropriate to consider on all street types.
- Pedestrian refuge islands are most often used on multi-lane roadways where a pedestrian must cross three or more lanes. They are highly recommended at mid-block crosswalks.

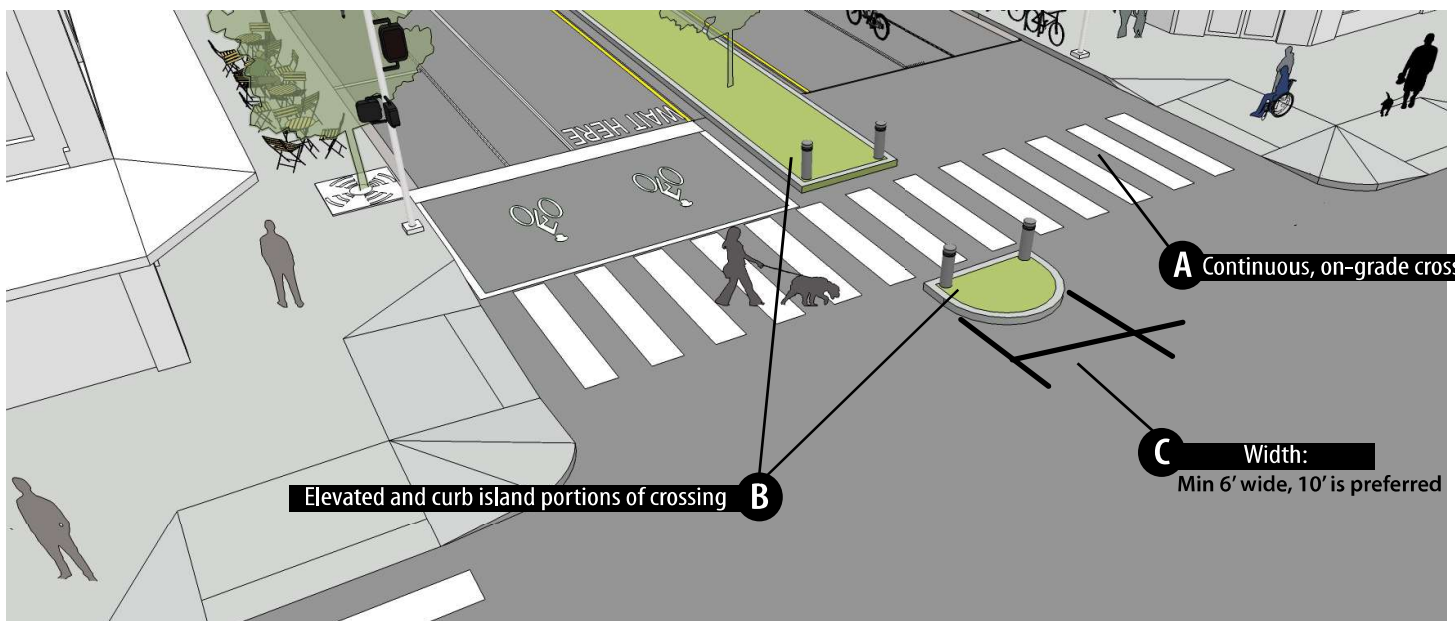
### Related Design Elements

- **Mid-Block Crossing:** Pedestrian refuge islands may also be used as part of a mid-block crossing.
- **Bumpouts and Protected Intersections:** Pedestrian refuge islands may be used in conjunction with bumpouts, raised crossings or other applications as a traffic calming device. They may be used to create a pedestrian waiting area between protected bicycle lanes or bus lanes and the regular travel lanes.
- **Traffic Calming:** Pedestrian refuge islands may also be used as a channelization device, often in concert with mini roundabouts. See [Volume and Speed Management](#).

## DESIGN & OPERATIONS

### Design Requirements

- A Crosswalks:** Pedestrian refuge islands shall have marked crosswalks leading to and from them. The pedestrian walk should continue at-grade through a pedestrian island when too narrow to accommodate curb ramps. Use detectable warnings such as ADA domed tiles where crosswalks intersect islands.
  - B Elevation:** Pedestrian refuge islands need to be protected. At a minimum, they require paint, bollards and signage. Whenever feasible the crosswalk/waiting area should be raised above the level of the roadway and protected with a vertical curb and made accessible with ADA compliant curb ramps. If there is not enough width to accommodate curb ramps the pedestrian zone can be kept at street level with a raised island on either side.
  - C Width:** Pedestrian refuge islands shall be at least 6-feet wide and preferably 10-feet wide in order to comfortably accommodate single pedestrians, pedestrians with strollers or assisted mobility devices, or pedestrians with bicycles.
- **Signage:** Shall include placement of MMUTCD “Stop Here for Pedestrians” signs and stop bars as needed per crosswalk requirements.
  - **Landscaping:** Landscaping on pedestrian refuges shall be less than 18 inches, so as not to impeded sight-lines and visibility. If the refuge is part of a larger median, taller landscaping, such as trees and large shrubs should be designed to allow for proper sight lines.



**A** Continuous, on-grade crosswalk

**B** Elevated and curb island portions of crossing

**C** Width:  
Min 6' wide, 10' is preferred

### Utility Considerations

- Pedestrian refuge islands should be carefully coordinated to minimize conflicts. Do not place utility vaults in pedestrian waiting areas if possible and ensure that any lids or manholes are ADA compliant.

### Sustainability Considerations

- Pedestrian refuge islands provide opportunities to introduce stormwater management systems such as infiltration pits, rain gardens, or pervious areas in the roadway.

### Design References

- The NACTO Urban Street Design Guide provides additional guidance on the design of pedestrian islands.
- The MMUTCD provides standards for the design of pedestrian islands and refuges.
- The AASHTO Guide for the Planning, Design, and Operation of Pedestrian Facilities provides additional guidance.

## MAINTENANCE & MANAGEMENT

### Special Maintenance

- **Repaving:** Pedestrian refuge islands will introduce some additional costs to routine maintenance such as street repaving. However, during repaving is a great time to add needed pedestrian refuge islands.
- **Landscape:** Landscaped pedestrian refuge islands will need regular landscape maintenance and may need irrigation. Due to their location in the middle of the street, hardy plant material that is salt, drought, and pollution tolerant should be specified.

### Seasonal Use and Maintenance

- **Snow Removal:** Pedestrian refuge islands can introduce some complications for snow removal if not properly designed.

- » Islands should accommodate the turn radii of snow clearance equipment. Pedestrian refuge islands that are lane diverters or channelization features must provide adequate width from curb-to-curb to enable snow plows to proceed through the gap.
- » Pedestrian refuge islands should not generally be used for snow storage; however, portions of the island not used for a walking surface may accommodate some temporary snow storage as long as it does not impede sight lines.
- » Clearly assign responsibility for removing snow from walking surfaces on pedestrian islands.
- » Walking surfaces should be designed for adequate drainage to avoid the pooling of water and propensity to ice over. Walking surfaces should be wide enough to accommodate snow removal equipment.
- » Use vertical reflective delineators to alert snow removal crews to the presence of the island, median or refuge.



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STREET TYPOLOGY								
UC	E/F	MS	NB	CB	CC	NN	EN	LN
Rec	Rec.	Rec.	Rec.	Opt.	Opt.	Rec.	Rec.	Rec.

## PATHWAYS

# BUMPOUTS

## DESCRIPTION & INTENT

Bumpouts, also known as curb extensions or bulb-outs, visually and physically narrow the street by extending the sidewalk and reducing pedestrian crossing distances. Bumpouts increase safety and pedestrian comfort by increasing visibility.

At signalized locations, reduced crossing distance enables shorter walk phases and greater flexibility in signal timing. At intersections, the narrower street profile, coupled with the tighter turn radii, can encourage slower driving, calm traffic, and increase safety for everyone. Bumpouts can also be used as part of a mid-block crossing.

Bumpouts can also be used to create additional space for landscape or stormwater management facilities to be located, especially where the width of amenity zones is narrow and precludes such features. Trees near corners and in bumpouts can create a calmer street atmosphere.

Multiple types of bumpouts exist and have different applications.

- **Corner bumpouts**, located at intersections and typically wrap around the corner extending the curb into both intersecting streets, are the most common type of curb extension.
- **Mid-block bumpouts** are installed in the curbside zone along a block. Mid-block bumpouts can be used to narrow a street for traffic calming, additional sidewalk space, or in conjunction with a mid-block pedestrian crossing. Mid-block bumpouts may also be used to define entrances to alleys or other curb cuts and to preclude curbside parking from encroaching on and blocking these access points.

## USE & APPLICATION

### Location

- Bumpouts are recommended on most street types. Street types with curbside use lanes are natural candidates for bump outs.
- Streets with travel lanes directly against the curb are generally not suitable for bumpouts.

### Related Design Elements

- **Curb Ramps:** Bumpouts intended as pedestrian crossings must include curb ramps and marked crosswalks.
- **Bus Stops:** Bumpouts can be integrated with bus stops to create a bus bulb or boarding island (see [Bus Bulbs](#)).
- **Bicycle Facilities:** Bumpouts should carefully consider the design and function of on-street bicycle facilities. Bumpouts can be used to provide protected intersections for cyclists (see [Protected Intersections](#)).
- **Parklets and Platform Dining:** Bumpouts may be used in conjunction with sidewalk platforms, which can temporarily expand the sidewalk in the parking lane.
- **Street Trees:** Street trees should only be used in corner bumpouts where placement does not impact sight visibility at the intersection.

## DESIGN & OPERATIONS

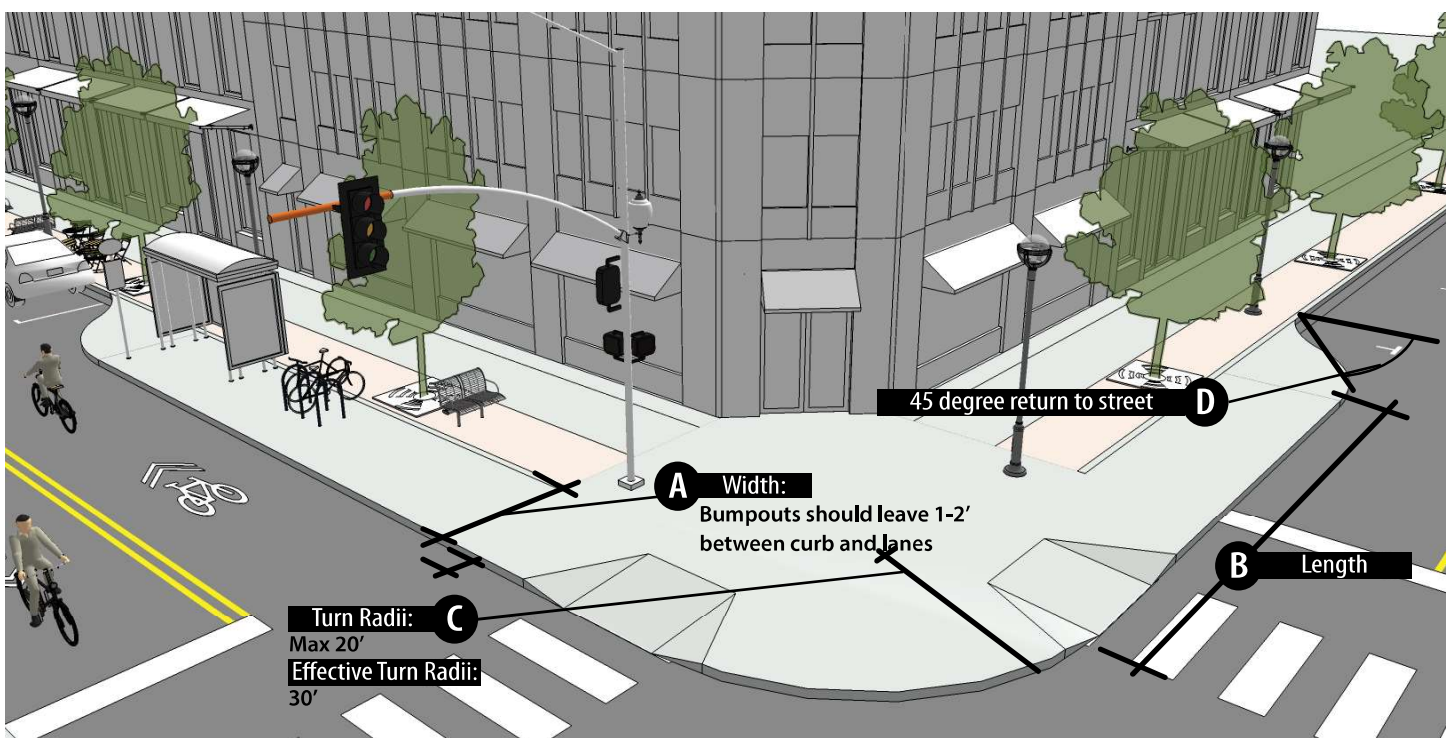
### Design Requirements

- A Width:** Bumpouts shall not narrow any bicycle or general traffic lanes to an unsafe width. The width of bumpouts shall preserve 1- to 2-feet of shy distance between the curb face and the first travel lane or bicycle lane (or the width of the gutter pan). When applied to streets with on street parking, bumpouts are typically 6-feet wide.
- B Length:** Corner bumpouts or mid-block bumpouts with crosswalks shall be at least as wide as the crosswalk, and ideally extend to the stop bar. The curve of bumpouts must fit outside of any crosswalks.
  - » Bumpouts are an effective way to restrict parking near intersections and maintain or increase visibility at corners. Consider making bumpouts at least 20-feet long, from the intersection side of the crosswalk back, to prevent motorists from parking within 20-feet of an intersection.
- C Corner Radius:** Bumpouts are intended to narrow pedestrian crossing distance and slow traffic speeds. To accomplish this, maintain tight turning radii no more than 20-feet. The effective turning radius, however, must still be 30-feet.
- D Returns:** Bumpouts shall have a 45-degree return to the street.

- **Sight Lines:** Any street furniture or landscaping in a bumpout shall maintain clear pedestrian paths and access to ramps. Any objects located in the bumpout such as furnishings or landscaping, must not interfere with corner sight triangles.

### Additional Design Considerations

- **Turn Restrictions:**
  - » At corners with turn restrictions, use the turning radii of the bumpout to make that turn more difficult, ensuring that transit vehicles or through traffic is not delayed by motorists turning.
  - » Carefully design bumpouts at intersections where turning movements by transit vehicles or long wheel base trucks are common. Curb radii may need to be adjusted wider to accommodate the tracking patterns of these vehicles and/or other design or management solutions explored.
  - » Where vehicles may frequently mount the curb during turning, stronger concrete materials should be used to ensure durability.



- **Stormwater:** Bumpouts must be cognizant of stormwater drainage and avoid pooling of water at the curb. Where bumpouts conflict with storm drains, storm drains must be relocated and/or additional inlets provided to enable proper drainage.
- **Floating Bumpouts:** These bumpouts are built in a manner that leaves the existing roadway curb and drainage lines intact, and is separated from the sidewalk. These are generally not preferred but may be considered where project constraints preclude normal construction. Floating bumpouts are best used where the bumpout area is used for landscape plantings and/or stormwater management.
- **Temporary Installation:** Bumpouts can be a temporary installation, using low-cost materials such as paint, bollards, and planters. This may be useful for a location where a more expensive installation may not be warranted, or as a trial for a permanent solution.
- **Bicycle Parking:** Bumpouts may be ideal locations for bicycle parking. Ensure parked bicycles do not obstruct pedestrian paths nor block the sight triangle at corners.
- **Outdoor Space Use:** Bumpouts may be used for public seating or outdoor dining, again with careful attention paid to paths of movement and required sight lines.
- **Curbside Uses:** Bumpouts may have an impact on business loading, delivery access, garbage removal, and street sweeping. If well-managed and designed, bumpouts serve as a location to consolidate business waste for removal where alleys do not exist.
- **Flexibility:** Bumpouts may limit the ability to change the street design in the future, such as the location of bus zones, lane layout, and crosswalks. Bumpouts also make the street less flexible for construction routing.

## Design References

- The NACTO Urban Street Design Guide provides additional guidance on how to design a bumpout.
- The Institute of Transportation Engineers “Designing Walkable Urban Thoroughfares: A Context Sensitive Approach” describes in detail how to design a bumpout as part of a complete street.

## Sustainability Considerations

- Combine bumpouts with stormwater management features, such as rain gardens or bioswales, to absorb and collect rainwater and reduce impervious surface area.
- Create opportunities for additional plantings through bumpouts, particularly mid-block bumpouts. Plantings at corner bumpouts must not block driver or pedestrian vision. Plantings at bus bumpouts must not conflict with bus doors or transit operations.
- All green applications in bumpouts should have well developed and committed maintenance plans prior to installation.

## Utility Considerations

- Bumpouts are good locations for fire hydrants, as they can provide direct curbside access to hydrants and avoids hydrant conflicts with curbside uses.
- Bumpouts may require relocating utilities or storm drains. They may also require moving a fire hydrant closer to the extended curb to ensure emergency vehicle access, which may increase cost. If a bumpout impacts a storm drain, the storm drain must be moved.

## MAINTENANCE & MANAGEMENT

### Seasonal Use and Maintenance

- **Temporary Use:** Temporary bumpouts defined by rubber curbing, flexible posts or similar, should be removed in winter months to facilitate snow removal.
- **Snow Removal:**
  - » Bumpouts may make snow removal more complicated, though special equipment should not be necessary if bumpouts are designed with turn radii adequate to accommodate snow removal vehicles.
  - » Bumpouts may be appropriate locations for temporary snow storage if pedestrian pathways and crossings remain clear. Bus bulbs are not generally appropriate locations for snow storage.





STREET TYPOLOGY								
UC	E/F	MS	NB	CB	CC	NN	EN	LN
Req.	Req.	Req.	Req.	Req.	Req.	Req.	Req.	Req.

PATHWAYS

# PEDESTRIAN SIGNALS

## DESCRIPTION & INTENT

This section describes different types of signals, signal timing, and signal technology that is used to provide safe, accessible, and comfortable street crossings for pedestrians, improving safety outcomes for all users.

Intersection operations should anticipate the presence of pedestrians, ensure that pedestrian crossings are logical and predictable to all users, and provide adequate time for pedestrians to fully cross the street.

All street types must consider the appropriate method for providing safe access for pedestrians in consideration of the roadway conditions, types of pedestrians, and surrounding land use.

The following treatments are described on the following pages:

- Countdown Pedestrian Signals
- Pre-timed vs. Actuated Signals
- Accessible Pedestrian Signals (APS)
- Leading Pedestrian Intervals
- All Walk/Scramble Phase
- Rectangular Rapid Flashing Beacons (RRFBs)
- HAWK Signals

## COUNTDOWN PEDESTRIAN SIGNALS

Countdown pedestrian signals are similar to conventional pedestrian signal heads, but in addition to the standard WALK/DON'T WALK symbols, the signal also includes a numeric display showing how many seconds remain in flashing DON'T WALK phase. This countdown timer better allows pedestrians to gauge whether they will have time to cross an intersection, and can improve safety for all users.

- **Location and Applicability:** Countdown timers should be used for all pedestrian signal heads at all signalized intersections and associated crosswalks.
  - » Replacement of non-countdown pedestrian heads should occur when signal modifications or upgrades take place, during street reconstruction projects, or as part of a safety improvement.
- **Crossing Timing:** Pedestrian crossing time shall, minimally, meet the current MMUTCD standard, but additional pedestrian time may be needed or desired, especially at crossings with high pedestrian volumes or crossings used by a number of children, seniors, or persons with disabilities.
  - » Pedestrian time should be increased at areas with significant volumes of pedestrians or where pedestrians are the dominant users and/or areas where leisurely pedestrian speeds are welcomed or desired.
  - » Installation of pedestrian refuge islands and bumpouts can affect the length of crosswalks, and must be consider with signal timing adjustments as part of installation.



Example of an accessible push button for an activated crosswalk

## PRE-TIMED VS. ACTUATED SIGNALS

- **Pre-timed signals** provide pedestrian walk phases as part of the regular signal phasing scheme, whether pedestrians are present or not. These do not require push-button activation, but may be supplemented with APS activation to provide extra assistance crossing (see APS later in this section).
- **Actuated signals** provide a walk phase only when pedestrians are present. Most actuated signals require the pedestrians to explicitly request the phase by pushing a button.
- **Applicability:** In locations with frequent and regular pedestrian crossings, crossings should be pre-timed and part of the regular signal phasing.
  - » Pre-timed signals should be utilized for the following street typologies: urban center, event/festival, main street, neighborhood business, and commercial business.
  - » Other locations may consider using actuated signals, but pre-timed signals are still preferred.
- **Button Placement:** All actuated signal buttons and/or APS signal buttons must be located in-line with the edge of the clear sidewalk zone and within 1.5-feet to 6-feet of the face of the road curb. Buttons should be located 3.5- to 4-feet in height above the sidewalk surface.
  - » Actuated signals require signage indicating that the button must be pushed in order for the WALK indication to be phased into the cycle.

## ACCESSIBLE PEDESTRIAN SIGNALS (APS)

**Accessible Pedestrian Signals (APS)** provide push-button activated audible and vibrotactile (sense of touch) notifications of the signal status (e.g. WALK / DON'T WALK) at regular intervals to aid pedestrians with visual impairments in making safe crossings. APS signals are always pre-timed as part of the normal signal phasing, regardless of whether the APS button is used to provide notification.

- **Applicability:** The land use context for APS signals is an important consideration. In quiet areas close to residences or dwellings, use of APS systems should be considered carefully to ensure they do not create a noise nuisance in quieter contexts.
- **Push-button integrated APS:** Audible queues that are emitted from the push-button box are preferred over audible queues from the signal head, the latter of which tends to be louder and carry over longer distances.



## LEADING PEDESTRIAN INTERVALS

**Leading Pedestrian Intervals (LPIs)** is a signal timing treatment that provides the WALK indication typically 3 to 4 seconds in advance of the parallel vehicle GREEN/GO signal.

This treatment allows pedestrians to enter the crosswalk and be more visible (and have the clear priority) ahead of vehicles that may wish to turn across the crosswalk. LPIs have been shown to improve safety and reduce crash rates.

- **Applicability:** LPIs are recommended at all signalized intersections. Priority should be given to installing LPIs where there are safety concerns and/or regular, higher volumes of pedestrian traffic.

## ALL WALK / SCRAMBLE PHASE

**All Walk Phases:** All Walk Phasing allows pedestrians to cross any leg of the intersection during the phase. This can be useful at high volume pedestrian crossings where large numbers of pedestrians may be queuing and clear walking paths for opposing foot traffic. An All Walk phase allows all movements to occur and can reduce conflicts.

- **Applicability:** All Walk phasing can be a tool for improving vehicle consistency, as vehicle movements (including left and right turns) can be phase separated from pedestrian crossing movements, reducing conflicts and delays for vehicles that must wait for pedestrians to clear the crosswalk.
- Signal timing must be adjusted to consider the timing required for the longest leg of the crossing.

**Scrambles:** A scramble is a specific type of All Walk Phase that allows pedestrians to cross diagonally through the intersection.

- **Applicability:** Scramble should only be considered at high pedestrian volume intersections and where pedestrians frequently desire to make diagonal crossings.
- Signal timing must be adjusted to consider the length of the longest diagonal crossing.
- **Crosswalk Markings:** Standard crosswalk markings can be used to indicate the allowed diagonal crossing distances. Other markings approaches include “striping out” the entire intersection with elongated crosswalk bars.
- Supplemental signage, such as those indicating that diagonal crossings are allowed, may be considered.





## RECTANGULAR RAPID FLASHING BEACONS

**Rapid flashing beacons** (RRFBs) are a pedestrian activated light that flashes brightly and rapidly to alert drivers that a pedestrian is waiting to cross at a location and should yield to crossing pedestrians. RRFBs are typically mounted onto the standard pedestrian crossing signage.

- **Applicability:** RRFBs should be considered for all mid-block crossing locations that cross primary streets (non-enhanced neighborhood or local neighborhood streets) in order to increase pedestrian visibility and better alert drivers. RRFBs are especially important to consider on multi-lane roadways, higher volume streets, and where speeds are over 25 MPH.
  - » RRFBs may also be suitable at intersections where side streets are stop controlled by the primary street if operating in a free-flow condition. In this situation, the crossing should be treated similar to a mid-block crossing, but additional care must be taken to ensure that the cross-street traffic also has clear visibility throughout the crossing.



## HAWK SIGNAL

**HAWK signals**, or High-intensity Activated crosswalk, is a lighted beacon that displays a flashing yellow signal to motorists when a pedestrian is attempting to cross the street pushes a button.

The beacon runs through a series of cycles ultimately giving approaching motorists a red light. This allows pedestrians to safely cross on their own cycle. A separate pedestrian signal provides information to pedestrians. This type of signal is dark to the roadway users when not in use, which may be confusing for motorists. It typically shows a “DON’T WALK” signal to pedestrians when not activated.

- **Applicability:** Consider in mid-block locations where it can be difficult for pedestrians to find a gap in traffic to cross and/or where it is a large multi-lane roadway where visibility to pedestrians may be difficult for drivers.

## REFERENCES

- MDOT Best Design Practices for Walking & Bicycling in Michigan provides usage considerations for many of the pedestrian signal and crossing treatments in this section.