

## INTRODUCTION

The design guidelines contained in this section are intended to support the recommendations presented in this Plan, and to serve as an ongoing reference for the City of Richmond Bicycle and Pedestrian Master Plan. They are not intended as comprehensive design standards. Rather, they reference existing design standards and provide clarification or supplemental information as necessary. There are six primary sources of bicycle and pedestrian facility design information that were used to develop the guidelines provided in this section:

1. Indiana Department of Transportation (INDOT) 2013 Design Manual Chapter 51 Special Design Elements – This document provides guidance for pedestrian and bicycle facilities that are included in Department of Transportation designs. This design manual is used for Wayne County projects as well.
2. Federal Highway Administration(FHWA) Manual on Uniform Traffic Control Devices (MUTCD) – The MUTCD is the national standard for signing, markings, signals, and other traffic control devices. Indiana has adopted a slightly modified version of the MUTCD, the Indiana MUTCD. The IMUTCD modifications do not impact the recommendations in this design guidance document. It should be noted that the IMUTCD does provide alternative methods for analyzing the need for pedestrian signals. Additional school bus warning signs are also included in the IMUTCD.
3. American Association of State Highway and Transportation Officials (AASHTO) Guide for the Development of Bicycle Facilities – This document is intended to present information on how to accommodate bicycle travel and operations in most riding environments. It is the design guidance upon which most state and local design guidelines are based. In many jurisdictions this document is considered to set the minimum values for bicycle facility design.

4. AASHTO Guide for the Planning, Design, and Operations of Pedestrian Facilities – This document is intended to present information on how to accommodate pedestrian travel and operations in (primarily) roadway environments. It is the design guidance upon which most state and local design guidelines are based. In many jurisdictions this document is considered to set the minimum values for pedestrian design.

5. Institute of Transportation Engineers Designing Walkable Urban Thoroughfares: A Context Sensitive Approach – This document’s development was supported by FHWA. Designing Walkable Thoroughfares helps designers understand the flexibility for roadway design that is inherent in the AASHTO guide A Policy on the Geometric Design of Highways and Streets with a focus on balancing the needs of all users.

6. National Association of City Transportation Officials (NACTO) Urban Bikeway Design Guide – FHWA has issued a memo supporting the use of this document to further develop nonmotorized transportation networks, particularly in urban areas. Many of the designs in this document have been used successfully in urban areas. However, care should be exercised when applying the treatments described in this document to suburban or rural areas.

In this guidance section of the City of Richmond Bicycle and Pedestrian Master Plan the following facility types are discussed:

- sidewalks
- curb ramps
- midblock crossings
- bike lanes
- shared lane markings
- greenways
- bike routes
- cycletracks
- shared use paths



## SIDEWALKS

Chapter 51 of the INDOT Design Manual requires pedestrian facilities comply with the Americans with Disabilities Act “Accessibility Guidelines for Buildings and Facilities” the most recent of which are the 2010 ADA Standards for Accessible Design. FHWA recommends agencies adopt the guidance found in the Notice of Proposed Rulemaking for Proposed Accessibility Guidelines for Pedestrian Facilities in the Public Right-of-Way (July 2011). The below guidance is consistent with the public right-of-way guidance.

### Sidewalk Width

The preferred minimum sidewalk width is 5 feet. Under constrained conditions, 4-foot wide sidewalks are acceptable provided a 5-foot by 5-foot area with less than 2% cross slope is provided every 200 feet (maximum) to allow for the passing of one pedestrian using a wheelchair by another. Sidewalks placed at the back of curb should be at least 6 feet wide.

### Location of Sidewalks

On roadways with curb and gutter, sidewalks should be located six feet from the back of curb. This minimizes the encroachment of curb ramps and driveway cuts into the sidewalk width. On roadways without curb and gutter, sidewalks should be separated from the roadway as shown by the following criteria, which are given in a sequence of desirability:

- at or near the right of way line (ideally, 3 feet of width should be provided behind the sidewalk for access, construction, and maintenance)
- outside of the minimum required roadway clear zone
- as far from the edge of the driving lane as practical

Sidewalk alignments, which are set back from the roadway, should taper for alignment closer to the roadway at intersections. This will allow for coordinated placement of crosswalks and stop bars.

### Sidewalk Slopes

The maximum cross slope on a sidewalk is 2%. This maximum cross slope must be maintained across driveways and crosswalks.

Sidewalks may follow the grade of the adjacent roadway. However, on new structures the grade of the sidewalk cannot exceed 5%. If a grade of more than 5% is required on a new structure, an ADA compliant ramp must be provided.

### Curb Ramps and Blended Transitions

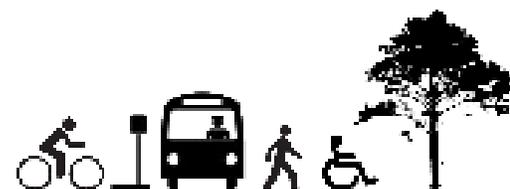
A curb ramp is a ramp that cuts through or is built up to the curb. A blended transition is a relatively flat area where a sidewalk meets a roadway. Curb ramps and blended transitions are primarily used where a sidewalk meets a roadway or driveway at a pedestrian crossing location. Blended transitions include raised pedestrian street crossings, depressed corners, or similar connections between pedestrian access routes at the level of the sidewalk and the level of the pedestrian street crossing that have a grade of 5% or less. Accessibility requirements for blended transitions serve two primary functions. First, they must alert pedestrians that have vision impairments to the fact that they are entering, or exiting, the vehicular area. Second, they must provide an accessible route for those using wheelchairs or other assistive devices. Ideally, a separate ramp should be provided for each crossing of the roadway.

### Curb Ramp Slopes

The slope of a curb ramp shall not exceed 8.33%. The only exception to this standard is when a sidewalk is located along a roadway with a significant slope, in which case the maximum length of the curb ramp is 15 feet.

### Landings

All curb ramps must have a landing at the location where a wheelchair user would have to turn to prepare to enter the roadway. For perpendicular ramps, this means a 4-foot by 4-foot landing at the top of the ramp (5-foot by 5-foot if there is a vertical obstruction adjacent to the landing). For parallel ramps where the sidewalk is depressed, the 4-foot by 4-foot landing is required at the bottom of the ramp.



## Detectable Warnings

Detectable warning surfaces shall extend a minimum of 2 feet in the direction of pedestrian travel and shall extend the full width of the curb ramp. Detectable warning surfaces are not required, nor desirable, at crossings of residential driveways since the pedestrian right-of-way continues across residential driveway aprons. However, where commercial driveways are provided with yield or stop control, detectable warnings should be provided at the junction between the pedestrian and vehicular routes.

## BIKE LANES

A bike lane is a portion of the roadway that has been designated for preferential or exclusive use by bicyclists by striping, signing and pavement markings (the MUTCD does not require signs). Bike lanes are intended for one-way travel, usually in the same direction as the adjacent travel lane. Bike lanes should be designed for the operation of bicycles as vehicles. They should be designed to encourage bicyclists and motorists to interact in a safe, legal manner. Bike lanes should be designated with bike lane markings, arrows, and signs.

### Width

The AASHTO Guide for the Development of Bicycle Facilities provides guidance on the width of bike lanes. The following points summarize this guidance:

- under most circumstances the recommended width for bike lanes is 5 feet
- for roadways with no curb and gutter and no on-street parking, the minimum width of a bike lane is 4 feet
- along sections of roadway with curb and gutter, a usable width of 4 feet measured from the longitudinal joint to the center of the bike lane line is recommended (this means that 4 feet of pavement is sufficient when coupled with the gutter pan; it is also conceivable to interpret the guidance as meaning that even narrower pavement can be used as long as a total of 5 feet of rideable surface is maintained)
- additional width may be desirable on higher speed roadways.

## Intersections

At intersections, bike lanes must be designed to encourage legal movements at the intersection; this includes proper positioning of bicyclists and motorists. Bike lane stripes should be dashed on the approaches to intersections without right turn lanes. Where there are right-turn lanes, through bike lanes must be placed to the left of the right turn lane. Section 4.8 of the AASHTO Guide for the Development of Bicycle Facilities (2012) provides numerous graphics illustrating bike lane markings at intersections.

Bike lanes should be continuous through intersections. That is, if a bike lane is provided to the intersection, a receiving bike lane should be provided on departure side of the intersection.

## SHARED LANE MARKINGS (SHARROWS)

Traffic lanes are often too narrow to be shared side by side by bicyclists and passing motorists. Where parking is present, bicyclists wishing to stay out of the way of motorists often ride too close to parked cars and risk being struck by a suddenly opened car door (being “doored”). Where no parking is present bicyclists wishing to stay out of the way of motorists often ride too close to the roadway edge, where they run the risks of being run off the road; being clipped by motorists who do not see them off to the side or misjudge passing clearance; or encountering drainage structures, poor pavement, debris, and other hazards.

Riding further to the left avoids these problems, and is legally permitted where needed for safety. However, this practice can run counter to motorist expectations. A Shared Lane Marking (SLM) is a pavement symbol that indicates it is legal and appropriate for bicyclists to ride away from the right hand edge of the roadway, and cues motorists to pass with sufficient clearance.

Research suggests that SLMs:

- alert motorists to the lateral location bicyclists are likely to occupy within the traveled way
- encourage safe passing of bicyclists by motorists
- assist bicyclists with lateral positioning in lanes that are too narrow for a motor vehicle and a bicycle to travel side by side within the same traffic lane



- reduce the incidence of wrong-way bicycling
- where on-street parking exists, to align bicyclists with lateral positioning in a shared lane with on-street parallel parking to reduce the chances of a bicyclist impacting the open door of a parked vehicle

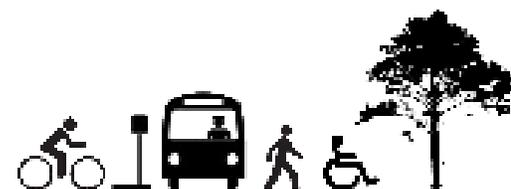
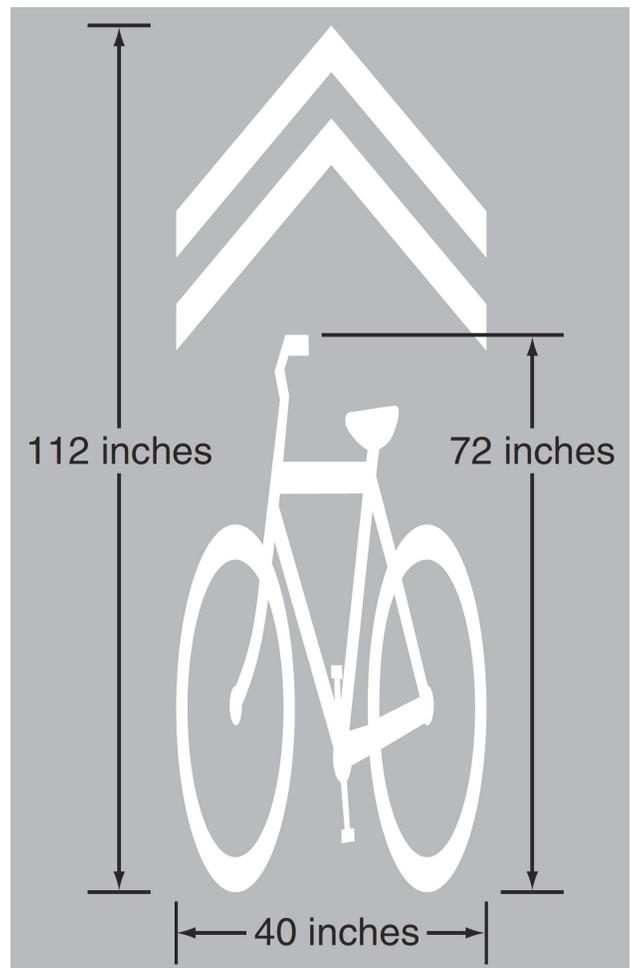
SLMs are not to be used on shoulders or in designated bike lanes. MUTCD guidance suggests SLMs not be placed on roadways that have a speed limit above 35 mph. While this does not preclude the use of SLMs on higher speed roadways, no research is available as yet to suggest how effective they may be on such roadways.

SLMs encourage good lane positioning by bicyclists, and discourage them from riding too close to the pavement edge, curb, or parked cars. Riding away from the road edge allows bicyclists to avoid road edge hazards like drainage structures, poor pavement, and debris. It also places the bicyclist more directly in the motorist's field of vision which, along with proper SLM treatments, encourages the safe passing of bicyclists by motorists.

Consequently, on roadways with on-street parking, the MUTCD requires that SLMs be placed with the centers of the markings at least 11 feet from the face of curb. On other roadways, the centers of the markings are required to be placed at least four feet from the edge of pavement.

SLMs are sometimes used at the ends of bike lanes or shoulders to inform motorists that bicyclists no longer have a separate space and will be sharing the main travel lane.

SLMs should be installed strategically and judiciously to ensure that their value is not reduced by overuse. When used, SLMs should be placed after each intersection and then periodically on spacings not exceeding 250 feet between markings.



## SHARED USE PATHS

Shared use paths are facilities separated from motor vehicle traffic by an open space or barrier and either within the highway right-of-way or an independent right-of-way. They are open to many different user types and are often used by bicyclists, pedestrians, skaters, wheelchair users, joggers, and other non-motorized users. Motor vehicles are not allowed on shared use paths except for maintenance and emergency vehicles in specific circumstances. Most shared use paths are two-way facilities.

Shared use paths have design criteria for many of the same parameters as roadways. These include widths, horizontal clearances, design speed, horizontal alignment, stopping sight distance, cross slopes, grades, vertical clearance, drainage, and lighting. The AASHTO Guide for the Development of Bicycle Facilities should be consulted for design values.

The MUTCD provides the standards for signing, striping, and marking shared use paths. In most cases, the signs and markings use on shared use paths are smaller versions of those used on roadways.

Many shared use paths are separated from the roadway network. Consequently, street name signs should be provided at intersecting roadways to help users orient themselves to the roadway network. Wayfinding signs should be used on paths and to potential destinations along the path such as locations where users can access water fountains and restrooms. At trailheads and rest areas, the distance and direction to the next trail head should be posted.

Most shared use path projects will be paved. Asphalt and Portland cement concrete are the two most common surfaces for shared use paths. In areas where path use is expected to be primarily recreational, unpaved surfaces may be acceptable for shared use paths. Materials should be chosen to ensure the ADA requirements for a firm, stable, slip resistant surface are met. Even when meeting ADA criteria, some users such as in-line skaters, kick scooters, and skateboarders may be unable to use unpaved shared use paths.

The geometric and operational design of shared use paths is quite similar to that of roadways. However, additional considerations such as aesthetics, rest areas, amenities, and personal security are also important ensure the maximum number of potential users is encouraged to use the path for both utilitarian and recreational purposes.

Sometimes local resistance to implementing shared use paths and other trail facilities exists because of perceived potential negative impacts to neighboring properties, usually in terms of property values and crime/vandalism. A valuable resource in discussions of these matters is a summary of national research conducted for a state department of transportation.

The studies cited collectively suggest that negative impacts are not an issue in either regard, and in fact suggests that property values frequently increase following the construction of shared use paths while crime rates are sometimes found to decrease.

Shared use paths through floodplains require special attention to design details. While the cross section and clearance requirements are the same as other trails the construction materials should be carefully chosen and installed to endure inundation by flood waters. This means special base materials should be used that are resistant to swelling and erosion. In Concrete is often selected as a surface material in flood plains. In addition, adequate cross drains need to be installed to ensure water does not pond on the upstream side of the path.

Many shared use paths have been built adjacent to active rail lines. This requires close coordination with the railroad. According to America's Rails with Trails (Rails-to-Trails Conservancy 2013), many shared use path managers require a 25 to 30-foot minimum setback from the trail to the railroad. However, this may not be an actual requirement; nearly 60 percent of shared use paths next to railroads were less than 30 feet from the tracks and more than 40 percent were less than 20 feet from the tracks. A physical barrier should be provided between the shared use paths and the railroad; chain link fences are the most commonly used type of barrier.



## Amenities along Shared Use Paths

Amenities should be provided along shared use paths to make their use more attractive for transportation use. Any long shared use paths or path network needs rest stops. These should be at intermediate points, scenic lookouts, or near amenities such as restaurants, convenience stores, picnic areas, or parking lots. Rest areas should be away from the path so users can pull off and not block traffic. At a minimum, they should include benches, shade, bike parking, and a trash receptacle. Bike parking racks should support a bike frame in two places and allow for locking of front and rear wheels. Some rest stops should include restrooms and potable water. Additional amenities should include interpretive signs and informational kiosks. Bike repair stations including free air (presta and schrader valve compatible) and vending machines that dispense patch kits or tubes can be included at some trailhead facilities.

## CYCLETRACKS

A cycle track is a designated bicycle pathway separated from pedestrian sidewalks, parking lanes, and vehicular travel lanes. Cycle tracks can be at street level or raised and can be designed for one or two-way traffic. When higher speed streets are present with few interruptions, raised cycle tracks are recommended. Raised cycle tracks are also recommended where multiple travel lanes and high traffic volumes are present.

Where on-street parking is present, cycle tracks are located on the sidewalk side of the parking and are separated from the on-street parking by a buffer a minimum of three feet wide. Often times, the surface of the cycle track is visually distinct from surrounding pavements.

Bicycle symbols and lettering are provided at the beginning and ends of cycle tracks and at specific intervals between. In two-way applications “Do Not Enter” signs (with EXCEPT BIKES supplemental plaques) should be posted to minimize confusion and minimize automobile intrusion onto the cycle track. Additionally, traffic controls should be installed at intersections and oriented towards bicyclists traveling in the contra flow direction.

Where the buffer between cycle tracks and on-street parking is painted striping, solid white lane markings should be used with the area of the buffer being comprised of painted diagonal crosshatch.



Indianapolis Cultural Trail - Cycle Track



Indianapolis Cultural Trail - Cycle Track

