Trail Design Guidelines

INTRODUCTION

The following Design Guidelines were adapted from the expansive Empire State Trail, to ensure there is cohesiveness between the two trail networks. These Design Guidelines provide tools, references, and standards that can be used by different segments and communities across Sullivan County.

While the Design Guide is written in language meant to be informative to anyone interested in the Sullivan O&W Rail Trail, the guide is primarily intended for state agencies, local governments, engineering design firms, and trail organizations charged with designing, building, and operating segments of the Sullivan O&W Rail Trail. This Design Guideline has the latest guidelines and approaches for creating shared-used trails, and as such serves as a valuable reference for design professionals working on the development of trail projects anywhere in New York State and across the nation.

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USER TYPES

The Sullivan O&W Rail Trail corridor will serve a variety of user types. The specific user types accommodated may change to reflect local community amenities and desires. The most common user types, along with key design characteristics, are identified in this section.

PEDESTRIANS

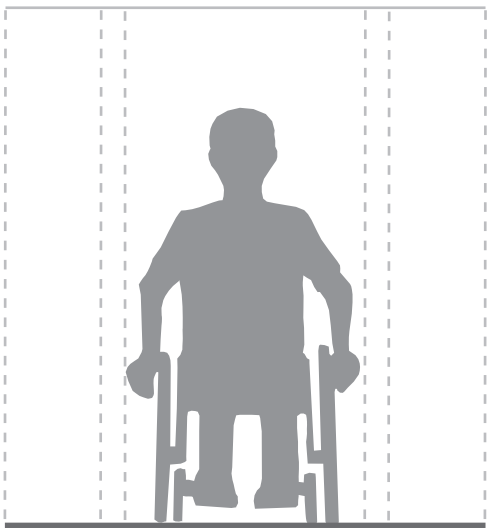
Pedestrians have a variety of characteristics and the transportation network should accommodate a variety of needs, abilities, and possible impairments. Age is one major factor that affects pedestrians' physical characteristics, walking speed, and environmental perception. Children have low eye height and walk at slower speeds than adults. They also perceive the environment differently at various stages of cognitive development. Older adults walk more slowly and may require assistive devices for walking stability, sight, and hearing.

Users of Mobility Devices

A mobility device is designed to assist walking or otherwise improve the mobility of people with a mobility impairment. Wheelchairs or mobility scooters are used for more severe disability or longer journeys which would otherwise be undertaken on foot.

Key Considerations

Maneuvering around a turn requires additional space for wheelchair devices. Providing adequate space for 180 degree turns at appropriate locations is a required element for accessible design.



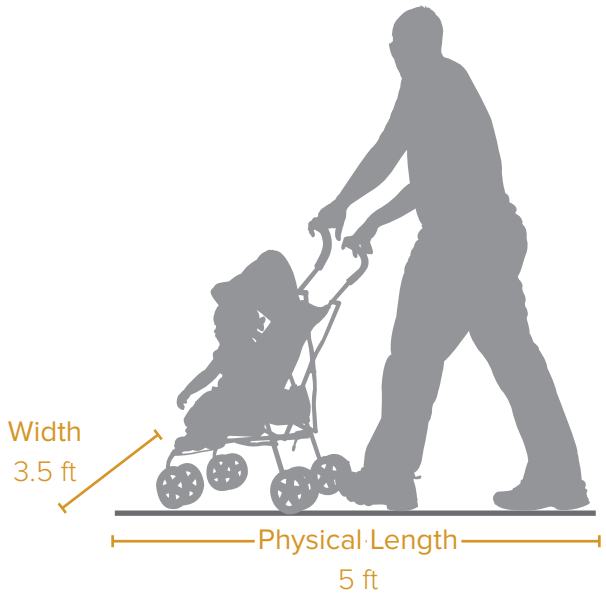
Stroller Users

Strollers are wheeled devices pushed by pedestrians to transport babies or small children. Stroller models vary greatly in their design and capacity. Some strollers are designed to accommodate a single child, others can carry two or more. The design needs of strollers depend on the wheel size, geometry and ability of the adult who is pushing the stroller.

Key Considerations

Strollers commonly have small pivoting front wheels for easy maneuverability, but these wheels may limit their use on unpaved surfaces or rough pavement.

Curb ramps are valuable to these users. Lateral overturning is one main safety concern for stroller users.



Bicyclists

Bicyclists and their bicycles exist in a variety of sizes and configurations. These variations occur in the types of vehicle (such as a conventional bicycle, a recumbent bicycle, or a tricycle), and behavioral characteristics (such as the comfort level of the bicyclist). The design of a shared use path should consider expected bicycle types on the facility and utilize the appropriate dimensions.

Key Considerations

The expected speed that different types of bicyclists can maintain under various conditions also influences the design of facilities such as shared use paths.

Three Types of Bicyclists

In accordance with the Federal Highway Administration Bikeway Selection Guide (2019), research has identified three types of potential and existing bicyclists. Individuals can be profiled as one type of user when they are riding solo, but profiled in a different group if riding with children or others. Therefore, it is important to understand and account for the general needs of different types of bicyclists. The three user groups are defined as follows:

Highly Confident

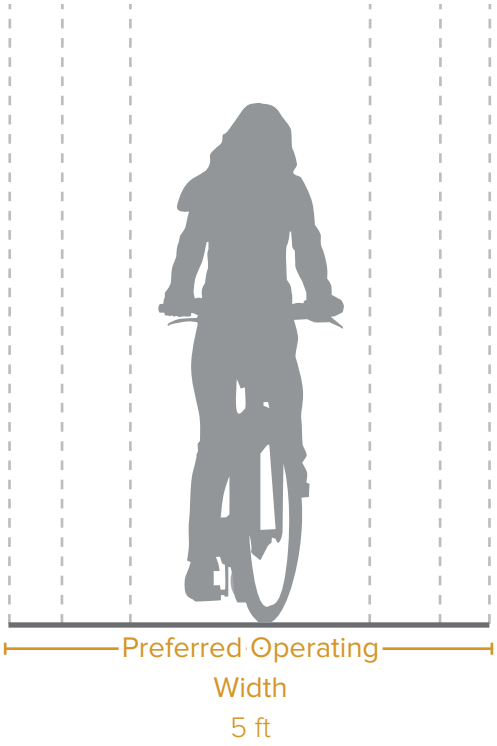
Willing to ride on any roadway. Comfortable taking the lane and riding in a vehicular manner on major streets without designated bike facilities.

Somewhat Confident

This user group can also be known as the “Enthused and Confident Bicyclists”. Confident riding in most roadway situations but prefer to have a designated facility. Comfortable riding on major streets with a bike lane.

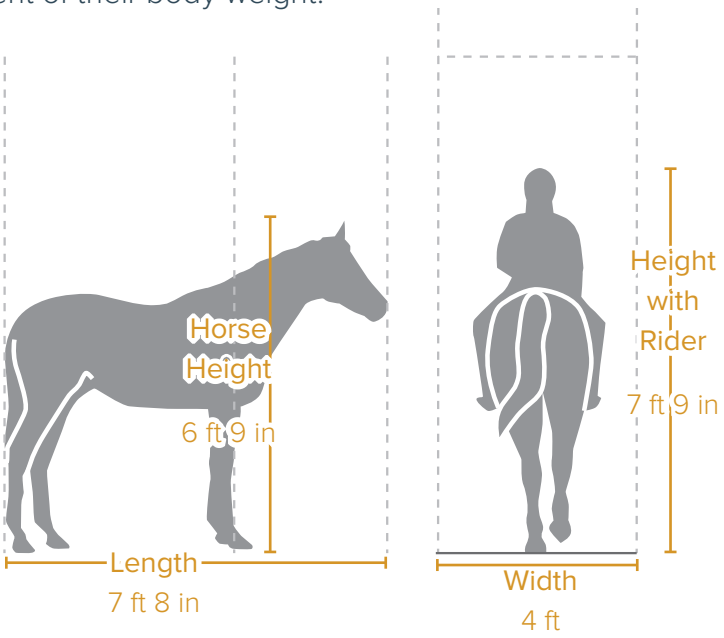
Interested But Concerned

Cautious and has some inclination towards biking but are held back by concern over sharing the road with cars. Prefer separated bikeways or low-volume neighborhood streets with safe roadway crossings.



Equestrian Users

On shared use paths that permit equestrian uses, riders on their mounts are the heaviest, widest and tallest potential user type. Mounts include horses, mules and donkeys, which all vary in size. Size depends on breed and age. Trail stock usually weigh between 800 and 1,500 pounds, and a well-conditioned horse or mule can carry up to 20 percent of their body weight.

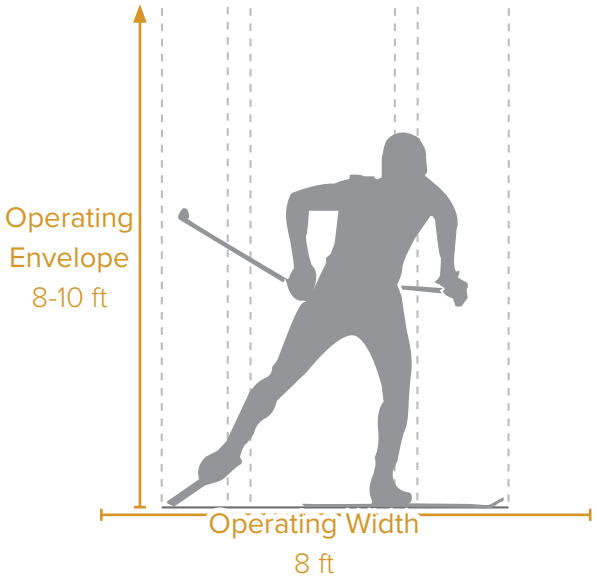


Nordic Skiers

Many multi-use trails used for bicycling, walking, and horseback riding during warm weather months are suitable for cross-country skiing in winter months.

Key Consideration

- Cross country skiers prefer gradual curves that allow skiers to glide through them easily. At sharp turns, provide additional trail width to allow skiers to snowplow and negotiate the turn.
- If trail grooming for track setting is to take place, trail clearance must be at least 14 feet wide.



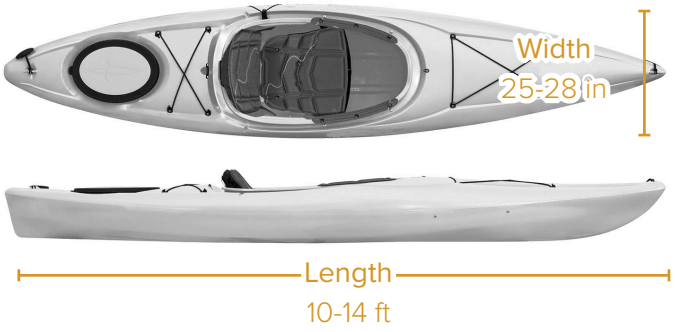
Paddle Users

The Sullivan O&W Rail Trail may connect users to and from water activities.

Variations of a typical canoe and kayak also require consideration when planning and designing paddling facilities. These variations occur in the types of canoe or kayak (such as expedition, whitewater) and behavioral characteristics (such as the comfort level of the paddler).

Key Consideration

- The figure below illustrates physical components of a typical recreational canoe and kayak, which are the basis for typical trail selection and design.
- Non-motorized canoe and kayak access sites should be simple, low maintenance, and inexpensive. A stable riverbank or shoreline is typically adequate as long as there is a path that is flat and hard enough to carry boats.



Paddle Trail Access

Non-motorized canoe and kayak access sites should be simple, low maintenance, and inexpensive. A stable riverbank or shoreline is typically adequate as long as there is a path that is flat and hard enough to carry boats.

Paddlers may use natural features such as riverbanks, rock outcrops or existing shorelines with decks or boardwalks.

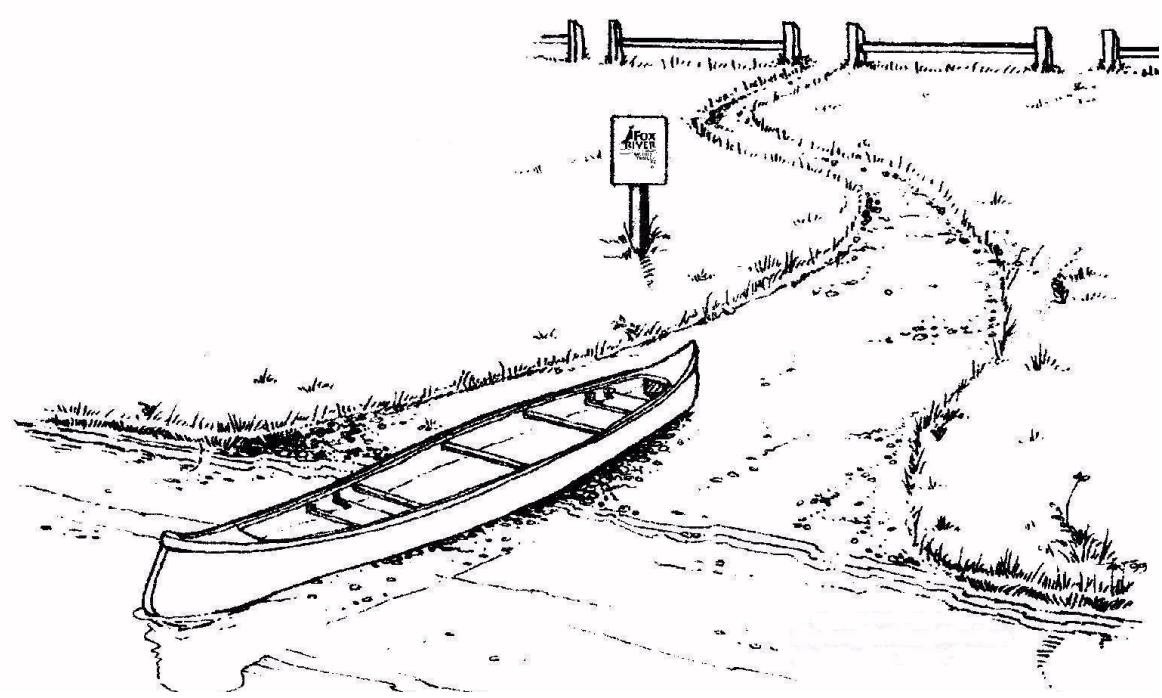


Image source: Openlands, Paddle Illinois Water Trails.

Further Considerations

- The availability of parking at a launch site will depend upon the specific site's accessibility. Launch sites in areas of high use will need more space and available parking than those that are in remote areas. Canoe and kayak slips can also be provided at trailheads, allowing more convenient access for frequent visitors.
- For ecologically sensitive sites, low-impact access points (sometimes only requiring a sign or marker) may be explored to reduce erosion and degradation at multiple sites, caused by a lack of designated access.

Design Features

Natural Surface Launches:

- 12' wide at the water line
- Tapered to 9' wide at the top entrance area
- 15' in length
- 3:1 slope at the stream bank

References

National Park service. Logical Lasting Launches. 2012.
National Park Service. Prepare to Launch!. 2014.

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GUIDANCE BASIS

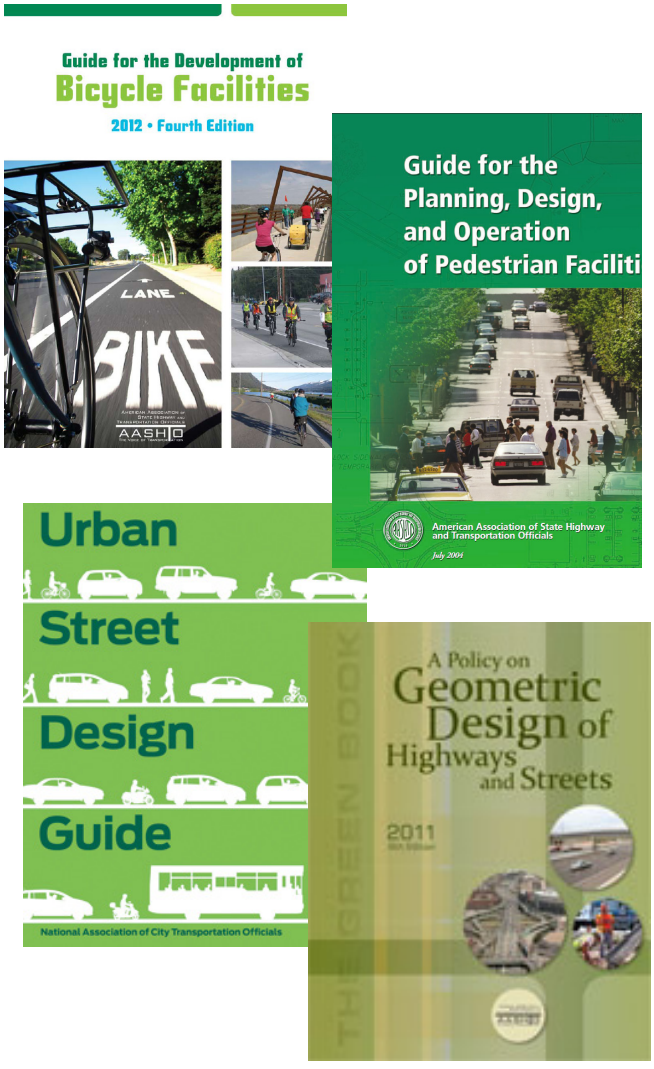
The design guidance in the following documents should be considered throughout design. These guides are referenced nationwide and some have been formally adopted and are widely used by the NYSDOT. While not every document listed will be applicable on every project, this list is intended to serve as a resource library when approaching various design issues and considerations.

National Guidelines

The Manual on Uniform Traffic Control Devices, or MUTCD defines the standards used by road managers nationwide to install and maintain traffic control devices on all public streets, highways, bikeways, and private roads open to public travel.

Traffic control devices in New York on all streets, highways, bikeways, and private roads open to public travel are currently regulated by two documents: the National Manual on Uniform Traffic Control Devices for Streets and Highways (MUTCD) and 17 NYCRR Chapter V (New York Supplement).

Users must follow a two-step process in order to properly understand traffic control standards in New York State. First, the user should refer to the MUTCD for information regarding a particular device. Second, the user should consult the New York State Supplement to determine if alternative or additional guidance is provided for the traffic control device in question.



The American Association of State Highway and Transportation Officials (AASHTO) Guide for the Development of Bicycle Facilities 2012 provides guidance on dimensions, use, and layout of specific bicycle facilities. **The Guide for the Planning, Design, and Operation of Pedestrian Facilities 2004** provides guidance for pedestrian facilities.

The National **Association of City Transportation Officials' (NACTO) Urban Bikeway Design Guide 2012** offers guidance on the current state of practice in the design of urban areas.

The **AASHTO A Policy on Geometric Design of Highways and Streets 2011** commonly referred to as the "Green Book," contains the current design research and practices for highway and street geometric design.

FHWA's Separated Bike Lane Planning and Design Guide 2015 offers guidance on separated bike lanes (also known as protected bike lanes, or cycle tracks). The guide includes information on design and implementation of facilities including intersection treatments and interactions with parking, transit, and loading.

FHWA's Small Town and Rural Multi-modal Networks 2016 document is a design resource and idea book to help small towns and rural communities support safe, accessible, comfortable, and active travel for people of all ages and abilities.

The **United State's Access Board's Proposed Rights-of-Way Accessibility Guidelines (PROWAG)** provides guidelines for the design, construction, and alteration of pedestrian facilities in the public right-of-way. These guidelines ensure that sidewalks, pedestrian street crossings, pedestrian signals, and other facilities for pedestrian circulation and use, constructed or altered in the public right- of-way by state and local governments, are readily accessible to and usable by pedestrians with disabilities. NYSDOT has voluntarily adopted PROWAG as current best practice; however, ADAAG remains the minimum acceptable standard by other State and local agencies.

New York state and local Guidelines

The Manual on Uniform Traffic Control Devices, or MUTCD defines the standards used by road managers nationwide to install and maintain traffic control devices on all public streets, highways, bikeways, and private roads open to public travel.

Traffic control devices in New York on all streets, highways, bikeways, and private roads open to public travel are currently regulated by two documents: the National Manual on Uniform Traffic Control Devices for Streets and Highways (MUTCD) and 17 NYCRR Chapter V (New York Supplement).

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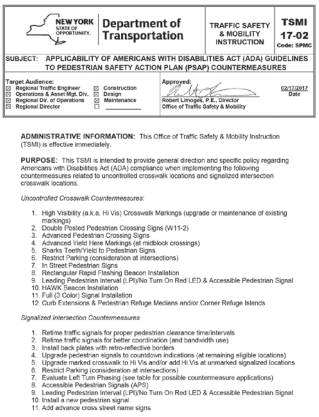
The primary source of state level geometric design guidance is the **New York State Highway Design Manual (HDM)**, which provides department criteria and practices for roadway construction. This guidance includes information on sidewalks, on-street bike lanes, shared use paths, and traffic calming.

In addition to the HDM, NYSDOT has issued a series of Official Issuances, including **Traffic Safety & Mobility Instruction (TSMI), Traffic Engineering Directive (TED), Engineering Instructions (EI), Bulletins (EB, and Directives (ED).**

The **New York State Pedestrian Safety Action Plan 2016** identifies current safety conditions on state roadways, and recommends engineering, education and enforcement countermeasures to improve pedestrian safety. New York State Parks issues Trails Technical Documents, including **Standards and Guidelines for Trails in NYS Parks** that provides standards and guidance for trail design and development, accessibility, and trail assessment and maintenance techniques.

New York State Complete Streets Act

Governor Andrew M. Cuomo signed the Complete Streets Act (Chapter 398, Laws of New York The preceding external link opens a new browser window) on August 15, 2011, requiring state, county and local agencies to consider the convenience and mobility of all users when developing transportation projects that receive state and federal funding.



NEW YORK STATE Department of Transportation | TRAFFIC SAFETY & MOBILITY INSTRUCTION | TSMI 17-02 Code: SPMC

SUBJECT: APPLICABILITY OF AMERICANS WITH DISABILITIES ACT (ADA) GUIDELINES TO PEDESTRIAN SAFETY ACTION PLAN (PSAP) COUNTERMEASURES

Target Audience: Regional Traffic Engineer; Operations & Asset Mgt. Div.; Regional Div. of Operations; Regional Director; Construction; Design; Maintenance

Approved: Robert Limoges, P.E., Director, Office of Traffic Safety & Mobility — 02/17/2017 Date

ADMINISTRATIVE INFORMATION: This Office of Traffic Safety & Mobility Instruction (TSMI) is effective immediately.

PURPOSE: This TSMI is intended to provide general direction and specific policy regarding Americans with Disabilities Act (ADA) compliance when implementing the following countermeasures related to uncontrolled crosswalk locations and signalized intersection crosswalk locations.

Uncontrolled Crosswalk Countermeasures:

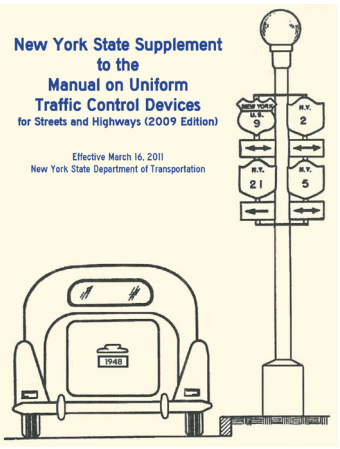
1. High Visibility (a.k.a. Hi Vis) Crosswalk Markings (upgrade or maintenance of existing markings)
2. Double Posted Pedestrian Crossing Signs (W11-2)
3. Advanced Pedestrian Crossing Signs
4. Advanced Yield Here Markings (at midblock crossings)
5. Sharks Teeth/Yield to Pedestrian Signs
6. Restrict Parking (consideration at intersections)
7. In Street Pedestrian Signs
8. Rectangular Rapid Flashing Beacon Installation
9. Leading Pedestrian Interval (LPI)/No Turn On Red LED & Accessible Pedestrian Signal
10. HAWK Beacon Installation
11. Full (3 Color) Signal Installation
12. Curb Extensions & Pedestrian Refuge Medians and/or Corner Refuge Islands

Signalized Intersection Countermeasures

1. Retime traffic signals for proper pedestrian clearance time/intervals
2. Retime traffic signals for better coordination (and bandwidth use)
3. Install back plates with retro-reflective borders
4. Upgrade pedestrian signals to countdown indications (at remaining eligible locations)
5. Upgrade marked crosswalk to Hi Vis and/or add Hi Vis at unmarked signalized locations
6. Restrict Parking (consideration at intersections)
7. Evaluate Left Turn Phasing (see table for possible countermeasure applications)
8. Accessible Pedestrian Signals (APS)
9. Leading Pedestrian Interval (LPI)/No Turn On Red LED & Accessible Pedestrian Signal
10. Install a new pedestrian signal
11. Add advance cross street name signs

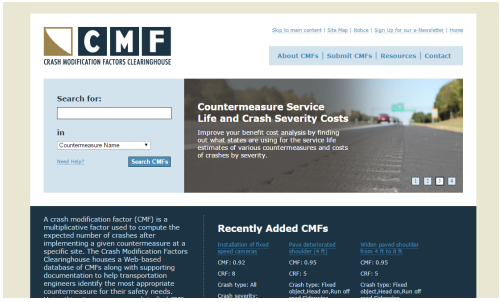
NEW YORK STATE
PEDESTRIAN SAFETY ACTION PLAN
DATE: JUNE 20, 2016

NEW YORK STATE Department of Transportation | Governor's Traffic Safety Committee | Department of Health



Impact on Safety and Crashes

The FHWA Crash Modification Factor Clearinghouse (http://www.cmfclearinghouse.org/) is a web-based database of Crash Modification Factors (CMF) to help transportation engineers identify the most appropriate countermeasure for their safety needs. Where available and appropriate, CMFs or similar study results may be referenced.



Abbreviations References

For easy reference, abbreviated titles are used within the body of this document for common resources. The table below includes both the abbreviated title used in this document and full document title.

Abbreviated Title	Full Reference
ADA	Americans with Disabilities Act
ABA	Architectural Barriers Act
AASHTO Bike Guide	AASHTO. Guide for the Development of Bicycle Facilities, 4th Edition. 2012.
AASHTO Green Book	AASHTO. A Policy on the Geometric Design of Highways and Streets. 2011.
AASHTO Pedestrian Guide	AASHTO. Guide for the Planning, Design, and Operation of Pedestrian Facilities, 1st Edition. 2004.
FHWA Multi-modal Networks	FHWA. Achieving Multi-modal Networks: Applying Design Flexibility and Reducing Conflicts. 2016.
FHWA MUTCD	FHWA. Manual on Uniform Traffic Control Devices. 2009.
FHWA Rural Guide	FHWA. Small Town and Rural Multi-modal Networks. 2016.
FHWA Separated Bike Lane Guide	FHWA. Separated Bike Lane Planning and Design Guide. 2015.
HDM	NYSDOT Highway Design Manual
NACTO Bike Guide	NACTO. Urban Bikeway Design Guide, 2nd Edition. 2012.
NYC Street Design Manual	NYCDOT. Street Design Manual. 2015.
PSAP	NYSDOT. Pedestrian Safety Action Plan. 2016.
PROWAG	US Access Board. Proposed Guidelines for Pedestrian Facilities in the Public Right-of-Way. 2011.
ADAAG	US Access Board, ADA Accessibility Guidelines, 2004.

FACILITY SELECTION

Selecting the best facility type for a given roadway can be challenging, due to the range of factors that influence user comfort and safety. In some cases, there is no single correct facility, and the selection of an appropriate bikeway must balance traffic conditions, land use context, and implementation cost.

There are four primary steps to selecting facility types for the Sullivan O&W Rail Trail corridor:

1. Identify the proper area type for your roadway segment, based on classification maps and consideration of urban character area attributes.
2. Identify the prevailing daily traffic volume and travel speed on the existing roadway, and locate the facility type(s) indicated by those key variables on the appropriate facility selection chart.
3. Consider the desire for consistency with connecting segments. This may result in selection of a higher-order facility than implied by the facility selection chart.
4. Consider the implementation feasibility of the preferred facility type, and select the highest quality feasible facility type possible.

1. Character Type Selection

As a starting point to identify a preferred facility, the designer should first identify the appropriate land use context.

Based on AASHTO guidelines, roadway classification systems identify a roadway as either as “urban” or “rural” in addition to a functional classification. AASHTO does not currently designate roadways as “suburban.” Roadways should be classified as either “urban” or “rural” and then consider land use context and roadway characteristics when determining recommendations. The identification of this area type is the first step in selecting an appropriate facility for use on the Sullivan O&W Rail Trail.

Area type identification is determined by NYSDOT classification maps, urban area boundaries and an evaluation of indicators of urban character. Judgment should be used to determine the appropriate design area type.

Indicators of Urban Character

Because they have fundamentally different characteristics, urban and rural areas are classified separately. Project developers and designers have the responsibility to determine this classification. The area type selected should be made on the basis of the anticipated character of an area during the design life, rather than political or urban area boundaries.

The urban area boundaries, as shown on the Functional Classification Maps, should not be used to determine whether urban or rural design criteria applies. If an area within an urban boundary, indicated on the Functional Classification Maps, is rural in character and is anticipated to remain rural in character for most of the design life of the project, it should be designed utilizing rural criteria. Likewise, if an area within a rural boundary is urban in character, such as a hamlet or village, or it is anticipated to become urban in character during the design life of the project, it should be designed utilizing urban criteria.

Characteristics of urban areas are identified in the list below. More than one of the indicators is usually needed to classify an area as urban:

- Presence of sidewalks
- Presence of curbs and closed drainage systems
- Observations of and/or development associated with more than occasional pedestrian travel
- Transit stops
- Driveway densities greater than 24 driveways/mi.
- Minor commercial driveway densities of 10 driveways/mi. or greater
- Numerous right-of-way constraints
- High density of cross streets
- 85th percentile speeds of 45 mph or less

Indicators of Rural Character

Areas that meet one or more of the above indicators, but are not clearly urban in character, may be considered rural in character.

Implications of Area Type Selection

While traffic speed and volume conditions influence the degree of facility separation necessary for user comfort, the area type can inform design details of those facilities. Land use context influences the degree of pedestrian activity and accommodation.

Within urban areas, pedestrians should generally be accommodated by a sidewalk, physically separated from the roadway with a curb edge or unpaved roadway separation. Bicycle facilities in these areas are for use by bicyclists, and not by pedestrians. For example, a bike lane or separated bike lane is for bicycle use only and should be paired with a separated sidewalk for pedestrians.

Outside of urban areas sidewalks are not commonly provided. Pedestrians may travel in the roadway, potentially sharing space with bicyclists or motorists. Sulllivan O&W Rail Trail facilities in these areas support bicyclists and pedestrians together, for example, by providing a wide shoulder or separated sidepath.

2. Facility Selection Charts

Once the area type has been identified the chart below can be used to determine the recommended type of bikeway to be provided in particular roadway speed and volume situations. To use these figures, select the chart appropriate for your area type, identify the appropriate daily traffic volume and travel speed for the existing or proposed roadway, and locate the facility types indicated by those key variables.

Other factors beyond speed and volume which affect facility selection include traffic mix of automobiles and heavy vehicles, mix and volume of pedestrians, the presence of on-street parking, intersection density, surrounding land use, and roadway sight distance. These factors are not included in the facility selection chart, but should always be considered in the facility selection and design process. Design decisions should reflect current and projected conditions, but these projections should also be monitored and kept up-to-date.

Preferred
Consider
Requires Review
Not Recommended

Posted Speed	AADT	Shared Roadway	Sidewalk	Marked Shared Roadway	Signed Shared Roadway	Shoulder Bikeway	On Street Bike Lane	Buffered Bike Lane	Separated Bike Lane	Side Path
2 or 4 Lane road, shoulder less than 4 feet										
≤30	<400									
	>400 to 2000									
	>2000 to 10000									
	>10000 to 25000									
	>25000									
>30 to 55	<400									
	>400 to 2000									
	>2000 to 10000									
	>10000 to 25000									
	>25000									
>55	<400									
	>400 to 2000									
	>2000 to 10000									
	>10000 to 25000									
	>25000									
2 or 4 Lane road, shoulder 4 feet wide or more										
≤30	<400									
	>400 to 2000									
	>2000 to 10000									
	>10000 to 25000									
	>25000									
>30 to 55	<400									
	>400 to 2000									
	>2000 to 10000									
	>10000 to 25000									
	>25000									
>55	<400									
	>400 to 2000									
	>2000 to 10000									
	>10000 to 25000									
	>25000									

3. Corridor Consistency

While separated bike lanes and sidepaths are best applied in conditions with high-speeds and high-volumes, they may also be considered in other roadway contexts to provide consistent facilities within a contiguous corridor alignment.

For example, an existing or proposed alignment primarily consisting of shared use paths may route along segments of existing roadways. In these conditions, the designer should consider the potential for maintaining a path-like experience along the roadway. By configuring a sidepath or separated bike lane on one side of the roadway, users can have a more consistent experience, and may reduce conflicts introduced at transitions between facility types.

Special Considerations for Separated Bike Lanes and Sidepath Facilities

On two-way streets, bidirectional separated bike lanes should be used with caution, but may be considered for short segments to fill a gap or complete a critical connection. Long segments of bidirectional separated bike lanes may be appropriate on streets with few intersections or driveways, such as along rivers or in parks.

Sidepaths share similar operational characteristics and challenges as bidirectional separated bike lanes. Like bidirectional separated bike lanes, sidepaths are most appropriate on streets with few intersections or driveways, but may be considered for short segments or to fill a gap between shared use-path connections.

Sidepaths generally require significant right of way to provide a wide unpaved buffer separation from the roadway, but they may be configured on-road, in constrained conditions with a physical barrier. Refer to the entry on sidepaths in this guide for more information.

4. Exceptions

It is not always possible to provide the preferred facility type due to physical or funding constraints. In these situations, the highest quality feasible alternative should be provided. This is generally a facility with less separation between bicyclists and pedestrians, and/or less separation from motor vehicle traffic.

For example, if the identified facility type is a separated bike lane, but implementation is considered infeasible at this time due to physical or financial constraints, a buffered bike lane should be considered due to reduced width and cost requirements.

Similarly, due to constraints along a corridor, the desired facility type may not be feasible for the entire length of a roadway. It may be necessary to implement a compatible alternative facility type such as shoulders in these locations. Consider the need to safely transition between facility types.

In locations where the preferred facility type is unable to be implemented, the need for future enhancement should be noted for future programming and funding.

Where roadway conditions do not meet what is need for the preferred facility type in the Facility Selection Chart, consider the potential to manage speeds and volumes to create more compatible conditions for the implemented facility. Using geometric design and other treatments to reduce speed and volume may allow for the implementation of a facility type previously unavailable or inappropriate under current traffic conditions.

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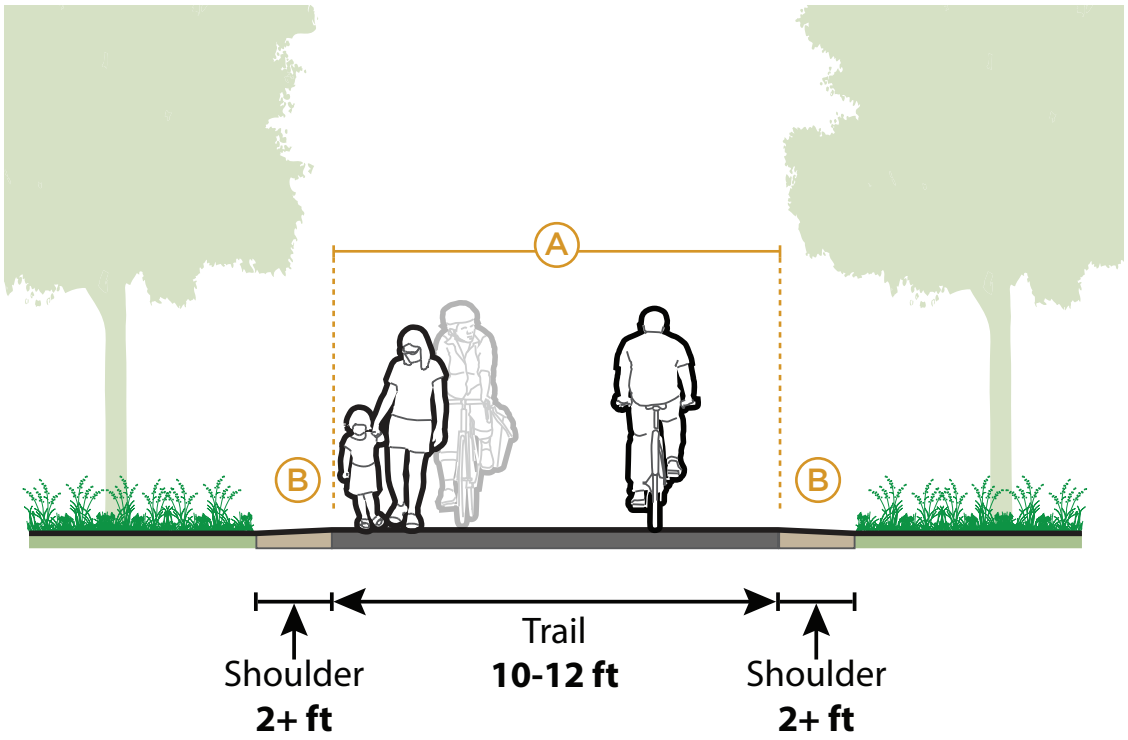
GENERAL DESIGN PRACTICES

The Sullivan O&W Rail Trail will primarily be an unpaved shared use path. A shared use path provides a travel area separate from motorized traffic for bicyclists, pedestrians, wheelchair users, joggers, and other users. Shared use paths are desirable for bicyclists of all skill levels preferring separation from traffic. These off-road travelways generally provide routes and connections not provided by existing roadways. Most shared use paths are designed for two-way travel of multiple user types.

Typical Application

Shared use paths are typically located in independent rights of way, separate from roadways.

Refer to guidance on sidepaths for information on shared use paths adjacent to roadways.



Design Features

(A) Standard shared use path width is 12 ft (3.6 m), which is suitable for heavy-use with high concentrations of multiple user types. This width is needed to enable a bicyclist to pass another path user going the same direction, while another path user is approaching from the opposite direction. Where volumes are extremely high, a separate path of 5 ft (1.5 m) can be provided to separate pedestrian and bicycle circulation.

- The minimum width of a shared use path is 10 ft (3.0 m), which is adequate for moderate use, or a low level of mixing between bicyclists and pedestrians (AASHTO Bike Guide Section 5.2.1).
- In rare circumstances a constrained minimum width of 8 feet may be used. This should only be considered in constrained conditions, for short distances (AASHTO Bike Guide Section 5.2.1).
- B A 2 ft (0.6 m) or greater shoulder on both sides of the path should be provided free of obstacles.
- MUTCD requires 2 ft (0.6 m) lateral clearance from the edge of path for post mounted sign faces or other traffic control devices. Standard clearance of overhead signs and traffic control devices should be 8 ft (2.4 m).

New York State Standards and Guidelines for Trails - Trails Technical Document #1

	Trail Development Standards							
	Vertical Clearance	Corridor Clearance	Treadway Width	Surfacing Materials**	Trail Length	Sight Distance	Grade	Turning Radius
Biking Class 1 (Greenway Trail)	8-10 ft.*	10-12 ft. (1 lane) 12-16 ft. (2 lane) 16-20 ft. (2 lane – high volume)	6 ft. (1 lane) 8-10 ft. (2 lane) 12-14 ft. (2 lane – high volume)	Smooth pavement, asphalt, concrete, crushed stone, clay or stabilized earth.	Min. – 5 mi. loop (1.5-2 hour) 15-25 mi. of linear or loop trails (day trip)	Min of 50 ft. up to 100 ft. on downhill curves or road crossings	0-5% Max; 5-10% sustained; 15% shorter than 50 yrds; Outslope of 2-4%	8-14 ft depending on speed depending upon speed.

* 2 additional feet needed for snowshoeing, and equestrian trails.

** See New York State Standards and Guidelines for Trails for further details.

Further Considerations

- Under most conditions, centerline markings are not necessary. Centerline markings should only be used if necessary for clarifying user positioning or preferred operating procedure: solid line = no passing, dashed line = lane placement
- Trails with a high volume of bidirectional traffic should include a centerline. This can help communicate that users should expect traffic in both directions and encourage users to travel on the right and pass on the left.
- Where there is a sharp blind curve, painting a solid yellow line with directional arrows reduces the risk of head-on collisions.
- Word pavement markings should be applied differently on a path context than on a roadway.
- Small scale signs should be used in path environments (MUTCD 9B.02).
- Terminate the path where it is easily accessible to and from the street system, preferably at a trailhead, controlled intersection or at the beginning of a dead-end street.
- Planners and designers should also reference Standards and Guidelines for Trails where applicable.

Maintenance

Trail width can influence maintenance vehicle access. Asphalt is the most common surface for bicycle paths. Crushed stone trails require minimal maintenance unless there is a large storm event. The use of concrete for paths has proven to be more durable over the long term in some regions. Saw cut concrete joints rather than troweled improve the experience of path users.

References

AASHTO. Guide for the Development of Bicycle Facilities. 2012.
FHWA. Manual on Uniform Traffic Control Devices. 2009.
Flink, C. Greenways: A Guide To Planning Design And Development. 1993.
NYS. Standards and Guidelines for Trails in NYS Parks. 2010.

STONE DUST TRAIL SURFACING

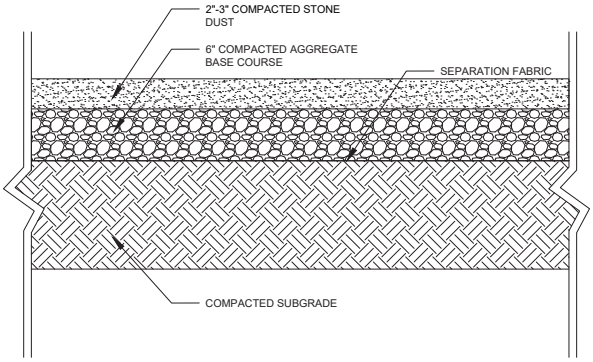
The proposed shared use path for the Sullivan O&W Rail Trail will primarily be unpaved. The trail will utilize stone dust for the trail surface. The stone dust is designed with a stone base underneath the wearing surface (stone dust). This surface provides a user-friendly, all-season surface that is ample for many users types such as equestrians, joggers, bicyclists, strollers, and wheelchairs. Vehicles will also be able to drive on this surface when it is necessary for maintenance, emergencies, etc.

Users on the Highline Canal Trail near Denver Colorado - American Trails (https://www.americantrails.org/resources/faq-tips-and-techniques-for-using-crusher-fines-surfacing-for-trails) Photo by Stuart Macdonald.

Best Practices (Derived From American Trails)

- When utilizing crusher fines for trails the surface material should be irregular and angular rock particles that interlock and bind into a firm matrix.
- The rock particles should range in size from dust to 3/8 of an inch.
- Gravel surfaces are different than crusher fines surface. Gravel is screened to remove the fines which contain the natural binders/cements.
- For ADA accessibility and to ensure the crushed stone surface is stable the slope should not exceed 4%.
- Ensure the material being used is crushed rock, not decomposed granite, pea gravel, or river rock.
- Ensure there is an appropriate cross slope (2% Max.) for adequate drainage to prevent puddling.

Puddling on crusher fines after snow melts due to insufficient cross slope in Adams County, Colorado - American Trails (https://www.americantrails.org/resources/building-crusher-fines-trails) Photo by Stuart Macdonald.



Repairing Existing Crusher fines Surfaces

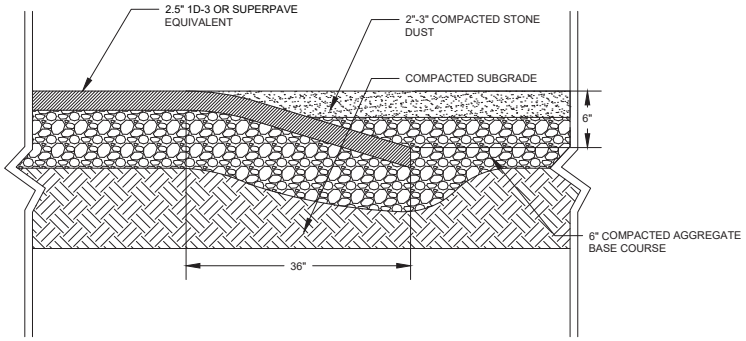
The trail stone base should first be prepared to meet proper grades. After grading, repairs, and construction improvements, the trail surface should be proof rolled using a fully laden dump trump or equivalent heavy pneumatic wheeled large vehicle. If deflection (plasticity) of the trail surface is identified, the area exhibiting deflection shall be excavated to a depth of 12" and replaced with modified angular crushed gravel with a maximum particle size of 3" which should be compacted in 6" lifts. The affected area should then be proof rolled again. After a suitable, properly stable based has been prepared, the base should be rolled with a vibratory roller. Screenings should be applied to a maximum depth of 2"-3", applied with a paver, then rolled with a vibratory roller.

After rolling, the cross slope of the trail surface should be verified to be less than 2%. All trail surface should have a longitudinal or cross slope of at least 1% to avoid standing water.

At all road crossings, provide a pavement apron to safely transition from the edge of road to the stone surface.

GRAVEL MEETING PAVEMENT

Where the trail meets pavement materials when intersecting with streets, and sidewalks. The subbase for the gravel path will be designed to create a flush transition between gravel and pavement. Pavement apron should taper down at least 6" below the finished grade of the trail surface to avoid any abrupt edges.



SHARED USE TRAIL WHEN NEAR UTILITY CORRIDORS

Typical Application

These guidelines are for segments of trails within utility corridors. There are locations along the Monticello spur that may require this condition.

Design Features (Graphics on Page 6-27)

(A) Typical trail width will be 10 feet; in constrained areas, the width may be reduced to 8 feet, in high-volume locations (usually in more urban areas) the width may increase to 12 feet.

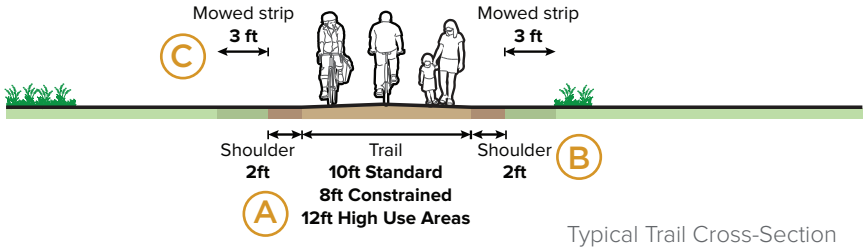
(B) Shoulders 2 feet in width will be provided on both edges of the trail. These areas will be graded as an extension of the trail surface, to allow riders to recover should they leave the trail. The shoulder surfaces may be grass or stone dust, depending on local conditions.

(C) A mowed area 3 feet wide will be maintained on either side of the trail surface. Where the shoulders are grass, they will be part of the mowed area.

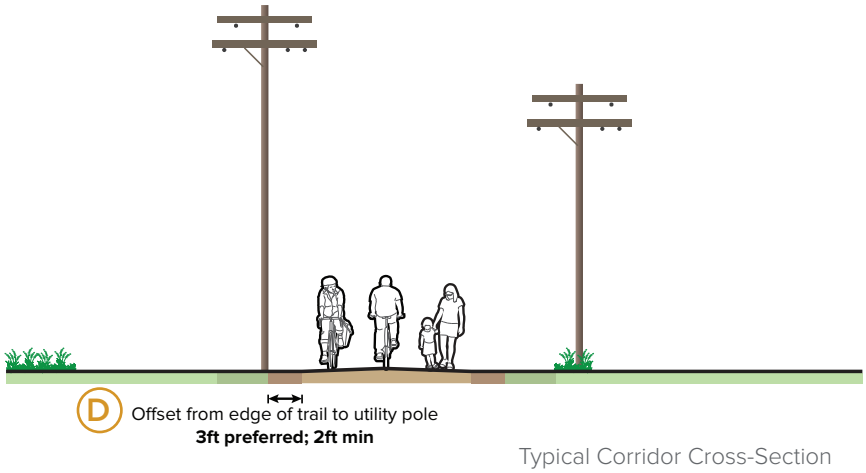
(D) Preferred offset from the trail surface to utility poles and other equipment is 3 feet (the width of the shoulder); the minimum offset is 2 feet.

(E) When trail crosses beneath the conductors, a minimum clearance of 18 ft to the lowest point of the conductors will be maintained. Clearances shall meet requirements of National Electrical Safety Code.

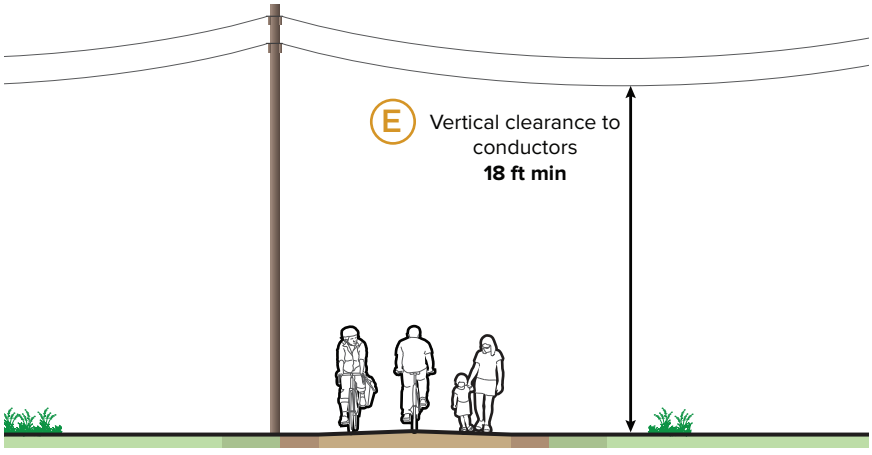
- The trail shall meet minimum requirements of latest version of the AASHTO Guide for the Development of Bicycle Facilities.



Typical Trail Cross-Section



Typical Corridor Cross-Section



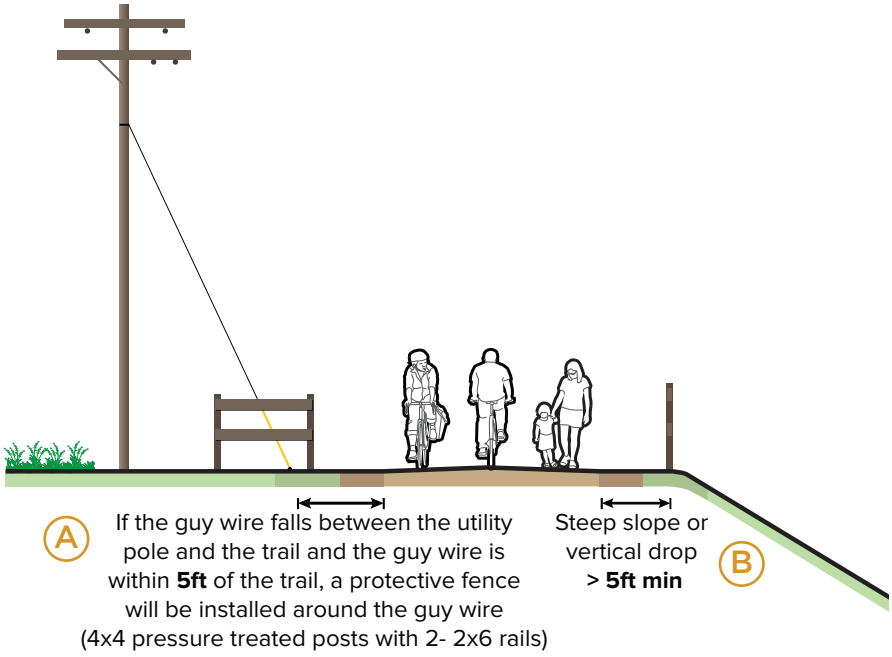
Typical Corridor Crossing Cross-Section

Additional Design Features (Graphics on Page 6-29)

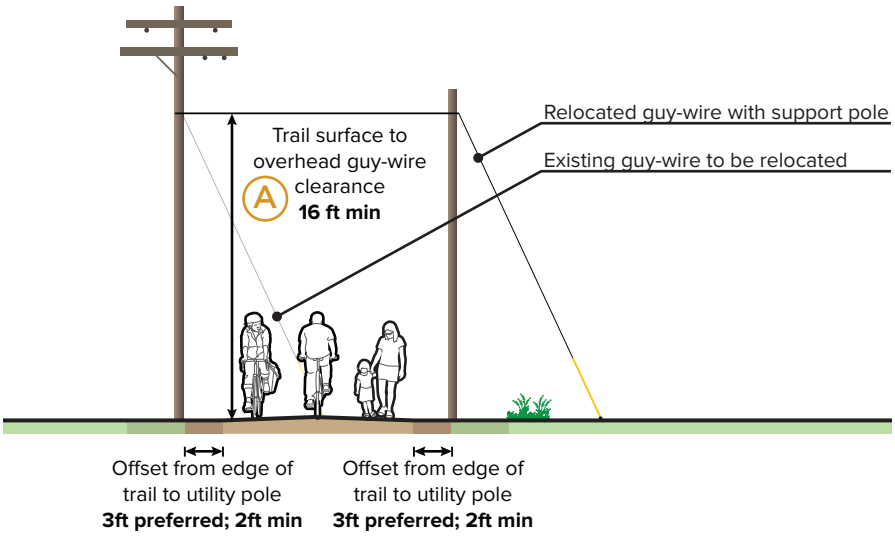
Ⓐ Where guy-wires extend from utility poles towards the trail, a minimum buffer of 4 feet (including shoulders) to the trail surface to the anchor point of the guy-wire will be maintained. If this is not possible, the guy-wire will be crossed over the trail to a support pole. 16' minimum clearance to the overhead guy-wire will be maintained.

Ⓑ Consistent with recommendations in the AASHTO Guide for bicycle facilities, where the edge of the trail is within 5 feet from a steep slope or a vertical drop, a fence will be installed as a barrier to protect trail users. The fence will be designed to be easily dismantled for emergency and maintenance access.

- In National Grid utility corridors, the trail should be designed to accommodate H-20 loads for emergency and maintenance vehicles. Bridges constructed for the trail should be designed to H-5 loading criteria and signed appropriately.
- Trail entrances will be designed to discourage vehicular access while allowing free entry to emergency and maintenance vehicles. Bollards or gates will not be used, unless local conditions warrant it.
- Signage and other trail amenities will be located outside the shoulders and in areas which minimize conflicts with utility maintenance access.
- Emergency and maintenance access points for the trail will be determined during planning to ensure all segments are accessible.
- Ground-mounted equipment may be enclosed by chain link fencing of minimum 6 ft. height (with barbed wire where appropriate), and will display safety signage. Open air substations shall have 7 foot chain link fence with barbed wire.
- Lighting generally will not be installed on the trail. Unlighted segments will be signed as open to the public "Dawn to Dusk" only.



Typical Trail Location at Utility Pole Guy-wire

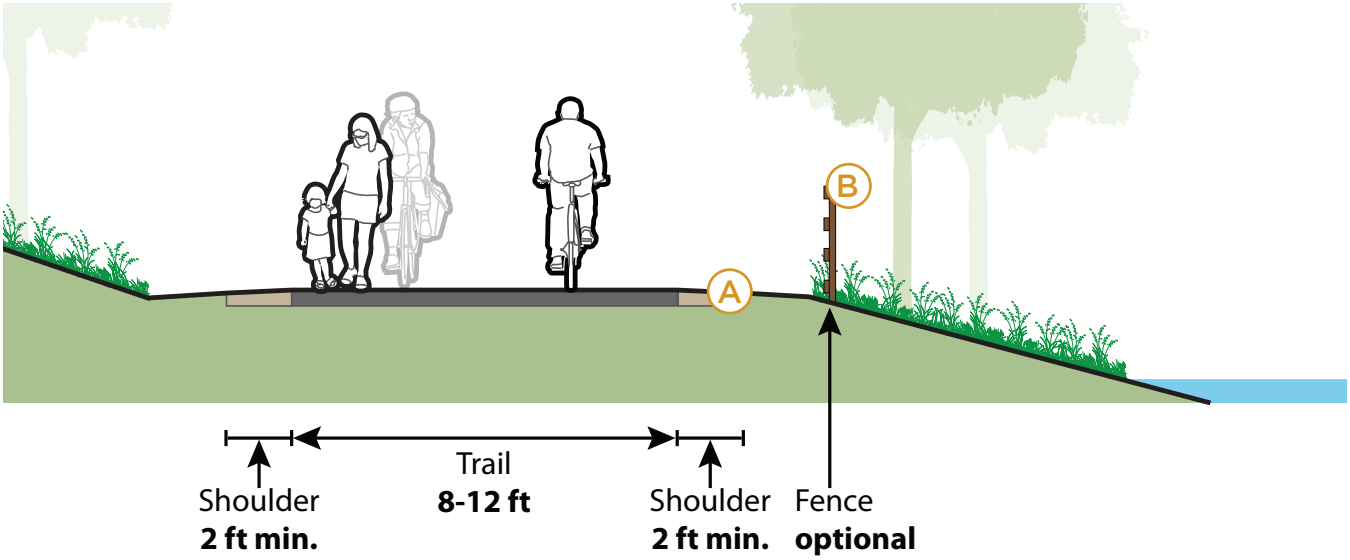


Typical Trail Location at Relocated Guy-wire

SHARED USE TRAIL NEXT TO WATER

Design Features

- Shared use trails adjacent to waterways should meet or exceed general design practices. If additional width allows, wider trails, and landscaping are desirable.
- (A) (B) Where the trail is adjacent to water, ditches, or slopes steeper than 1 vertical to 3 horizontal units (1V:3H), a wider separation should be considered. A 5-foot separation from the edge of the path to the top of slope is desirable under these circumstances. Where a slope of 1V:2H or greater exists within 5 feet of a path and the vertical drop is greater than 4 ft, a physical barrier such as dense shrubbery, railing, or chain link fence should be provided along the top of slope (AASHTO Bike Guide p.5-5).
- Appropriate fencing may be desired to keep trail users within the designated travel way. Creative design of fencing is encouraged to make the trail facility feel welcoming to the user.
- Any access point to the trail should be well-defined with appropriate signage designating the trail as a bicycle facility and prohibiting motor vehicles.



Further Considerations

It is not desirable to place the trail in a narrow corridor between two fences for long distances, as this creates personal security issues, prevents users who need help from being seen, prevents trail users from leaving the trail in an emergency, and impedes emergency response (AASHTO Bike Guide p.5-6).

Public access to flood prone areas or water bodies may be undesirable. Hazardous materials, deep water or swift current, steep, slippery slopes, and debris all may constitute risks for public access.

Public access to the shared use path may be prohibited during the following events:

- Flood control channel or other maintenance activities
- Inclement weather or the prediction of storm conditions

References

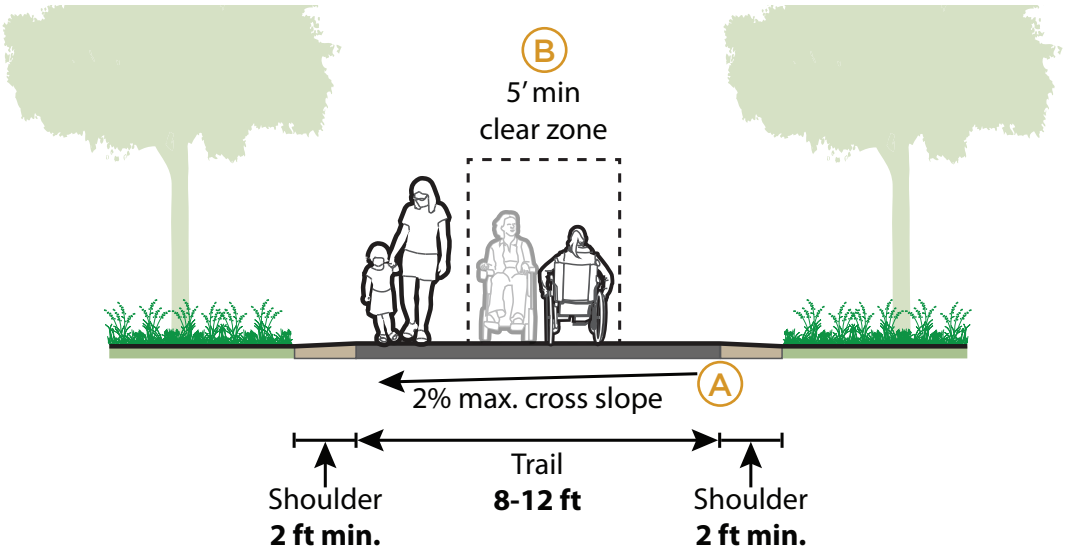
AASHTO. Guide for the Development of Bicycle Facilities. 2012.

ACCESSIBILITY OF SHARED USE TRAILS

New shared use trails must meet accessibility guidelines to ensure that trails, street crossings, signals, and other facilities for pedestrian circulation and use are readily accessible to and usable by pedestrians with disabilities.

Typical Application

Constructing outdoor shared use trails may have limitations that make meeting ADA guidelines difficult and sometimes prohibitive. Prohibitive impacts include harm to significant cultural or natural resources; a significant change in the intended purpose of the trail; requirements of construction methods that are against federal, state, or local regulations; or terrain characteristics that prevent compliance.



Design Features

- Trail surfaces must be firm, stable surfaces, and are generally limited to hard surface such as asphalt, concrete, wood, compacted gravel. Some surface materials must be periodically maintained to meet accessibility requirements.
- The trail running slope must be less than 5% without use of landings. Design with a 4.5% running slope target is recommended to account for variation in construction tolerances. Where the shared use trail is contained within a street or highway border, its grade shall not exceed the general grade established for the adjacent street or highway.

(A) The trail cross slope must not exceed 2%. Design with a 1.5% cross slope target is recommended to account for variation in construction tolerances.

(B) Paths and trails must provide a 5 ft (1.5 m) minimum clear width to serve as an accessible pedestrian access route. A minimum clear width of 4 ft is acceptable if passing spaces are provided every 200 ft. Most shared used trails designed for bicycle access will meet this requirement (PROWAG 2011).

- On trails designated as accessible, provide rest areas or widened areas on the trail, optimally at every 300 feet.

Further Considerations

- Trailhead signage should provide accessibility information, such as trail gradient/ profile, distances, tread conditions, location of drinking fountains, and rest stops.
- At trailheads there should be at least one accessible parking area per every 25 vehicle spaces.
- Trail amenities, drinking fountains and pedestrian-actuated push buttons should be placed no higher than four feet off the ground.

Maintenance

The trail surface should be solid, free of obstacles and tripping hazards. Trail edge vegetation/screening, and signage should be maintained and located so as not to present obstacles for visually impaired trail users.

References

United States Access Board. Public Rights-of- Way Accessibility Guidelines (PROWAG). 2011.

Some gravel and crusher fine trail material types are considered to be ADA compliant (Source: National Trails Training Partnership). Trails should always use materials and be constructed such that they are well drained and dry as much as possible (Source: National Trails Training Partnership)

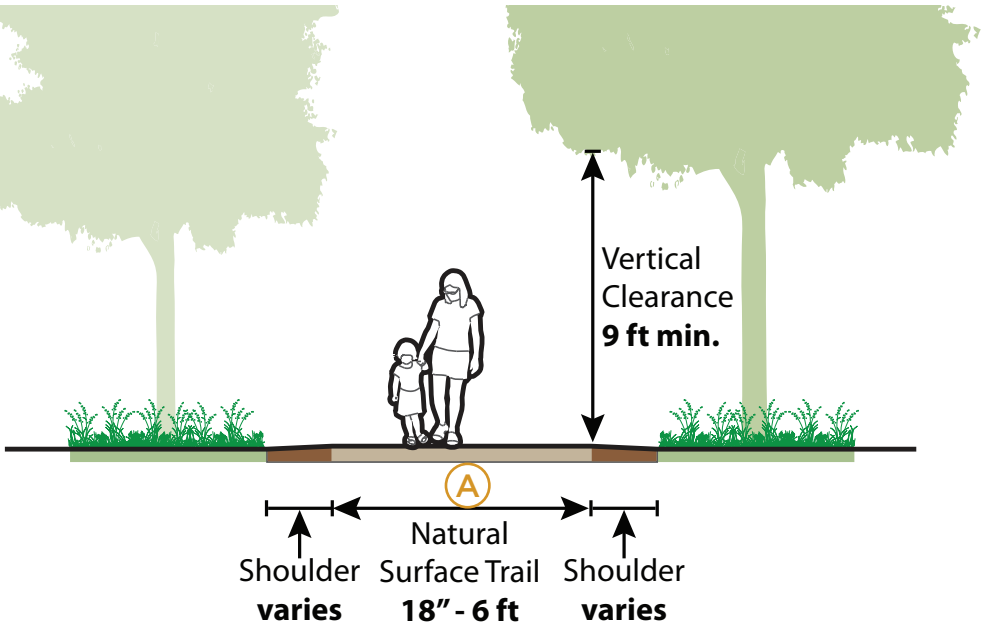
NATURAL SURFACE SPURS AND CONNECTORS

Sometimes referred to as footpaths or hiking trails, the natural surface trail is used along corridors that are environmentally-sensitive but can support bare earth, wood chip, or boardwalk trails. Soft surface trails may be used as spur trails, or as parallel hiking trails to the primary Sullivan O&W Rail Trail route. These types of trails offer lower cost additions to the Sullivan O&W Rail Trail network, adding to the variety of experiences.

Typical Application

Natural surface trails are a low-impact solution and found in areas with limited development or where a more primitive experience is desired. These are not intended to be ADA compliant or accommodate all non-motorized uses.

Any access point to the trail should be well-defined with appropriate signage designating the trail as a bicycle facility and prohibiting motor vehicles.



Design Features

Ⓐ Trails can vary in width from 18 inches to 6 feet or greater; vertical clearance should be maintained at nine-feet above grade.

- Base preparation varies from machine-worked surfaces to those worn only by usage.
- Trail surface can be made of dirt, rock, soil, forest litter, or other native materials. Some trails use crushed stone (crusher run) that contains about 4% fines by weight, and compacts with use.
- Provide positive drainage for trail tread without extensive removal of existing vegetation; maximum slope is five percent (typical).

Further Considerations

- Consider implications for accessibility when weighing options for width and surface treatments. Refer to guidance on Accessible Shared Use Paths for more information on design for accessibility and shared use.
- Trail erosion control measures include edging along the low side of the trail, steps and terraces to contain surface material, and water bars to direct surface water off the trail; use bedrock surface where possible to reduce erosion. Refer to the US Forest Service 2007 Trail Construction and Maintenance Notebook for detailed guidance on erosion control methods.

Trail surface material can be further stabilized with a variety of products (Source: National Trails Training Partnership)

Smooth crusher fines can be a good surface material for natural surface trails for all user types (Source: National Trails Training Partnership)

Maintenance

If trails remain unused during storm events, and are constructed correctly, they can remain virtually maintenance free. Use signs on-site that discourage use in wet weather, or just after wet weather.

References

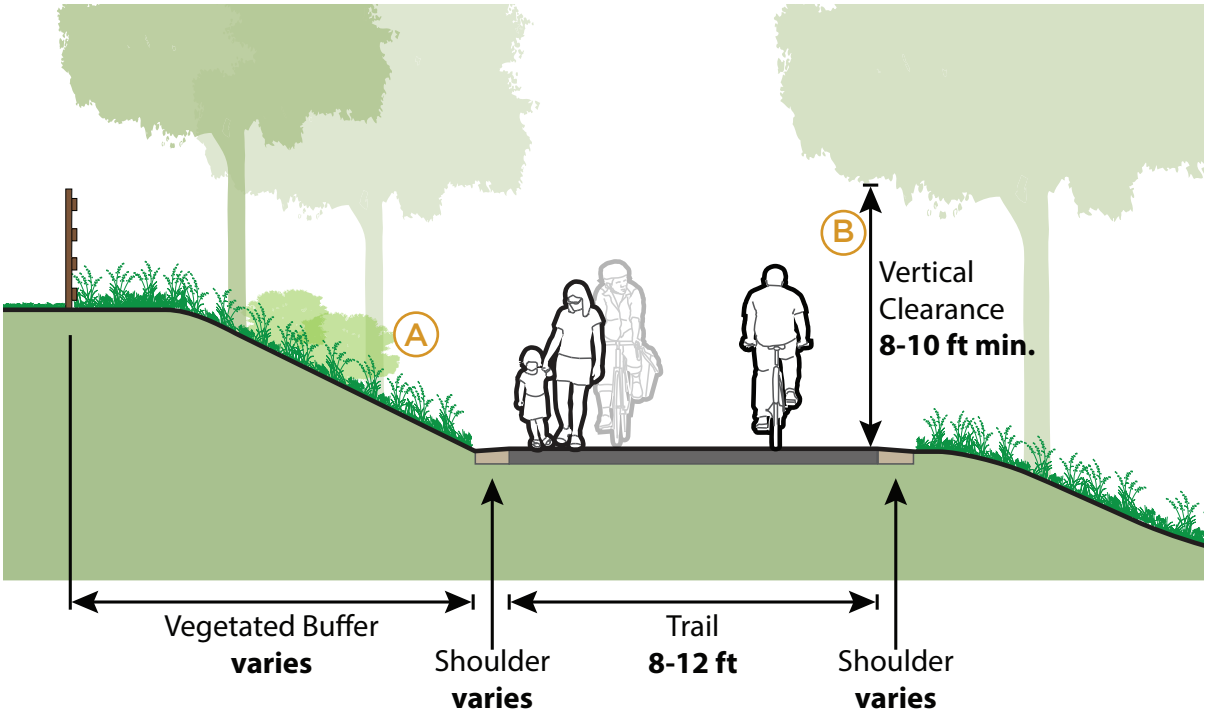
US Forest Service. Trail Construction and Maintenance Notebook. 2007.

VEGETATIVE SCREENING

Landscape features, including trees and shrubs along trails, can enhance the visual environment and improve the trail user experience. Trees and shrubs can also shade users from sun and shelter users from rain. Screening is recommended when the trail is in close proximity to residences. It is important not to plant edible fruit trees or shrubs along the trail due to the potential for the fruit to carry toxins as a result of the former industrial land uses in the area.

Typical Application

When possible, landscaping is the first choice for creating separation between the trail and adjacent properties. Vegetative buffers create a natural privacy screen, provide habitat for wildlife, and stabilize erodible soils. Select landscaping material (e.g. vegetation with thorns) can deter unwanted access or exit points, entrapment areas, and undesired off-path routes.



Design Features

A All groundcover and shrubs to be trimmed to a maximum of 24” above ground level height.

B Where vegetative screens are recommended to provide privacy for private properties, they are not to exceed 4’ in height.

- Trees should be trimmed to provide a minimum of 8 ft (2.4 m) of vertical clearance, 10 ft (3.0 m) preferred (AASHTO Bike Guide).
- Tree canopies should not obstruct pathway illumination
- Select and place trail vegetation to provide seasonal comfort; shade in the warmer months and sunlight in colder months.

Further Considerations

- Select plant species based on the desired effect or function along trail segments. For example, consider the use of plant species that assist with stormwater management along trail edges. In some situations, vegetative buffers alone may not create the desired degree of separation. Where separation is desired to protect users from hazardous materials, deep water or swift currents, or steep slopes, consider additional treatments.

Example of vegetative screening along a trail corridor

Maintenance

Use native plant species and plants appropriate to the region that are already adapted to the local soil and climate. Maintain the vegetation buffer so that it does not impede views or interfere with trail circulations.

References

AASHTO. Guide for the Development of Bicycle Facilities. 2012.

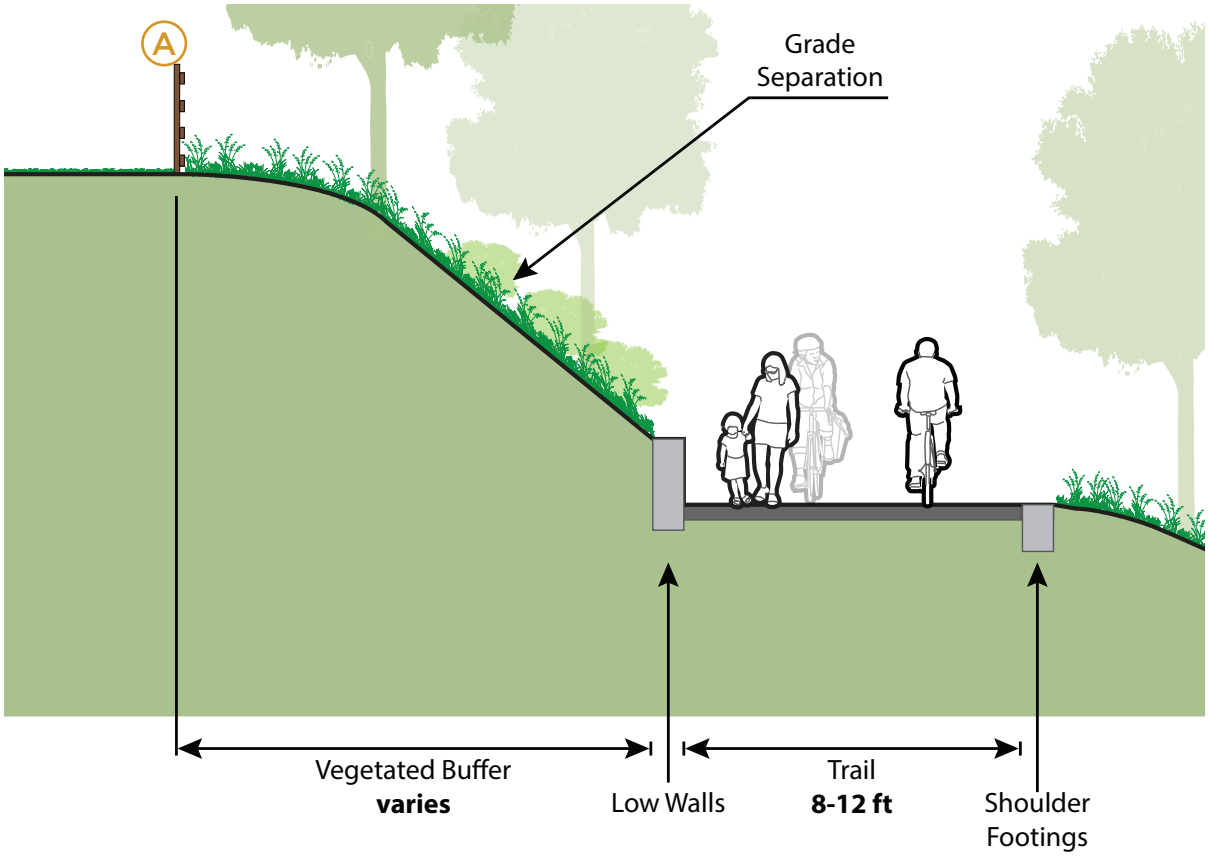
TRAIL EDGE DEFINITION

Vegetation, topography, ditches, fencing, railings, or walls may be used to clearly mark trail edges. Such features serve multiple purposes, including:

- Providing visual separation/privacy screens,
- Delineating public space from private property adjacent to the trail,
- Discouraging the development of informal access trails, and/or
- Separating users from hazardous drop-offs or land uses such as active rail lines.

Typical Application

If separation is desired purely for privacy reasons, vegetative buffers or the use of topography are recommended where possible. For physical separation aimed at preventing trespassing or guarding against hazardous slopes, consider the use of topography, ditches, semi-transparent fencing or railings, and hostile vegetation.



Design Features

(A) Fencing should strike a balance between adjacent residents' privacy and informal surveillance of the trail. Permeable fencing of four feet tall or less can provide a barrier sufficient to denote property boundaries or to deter most access. Opaque fencing or walls can degrade the experience of trail users, obscure views, and create a "tunnel" effect that makes trail users feel trapped.

- Railings on bridges, boardwalks, and at the edges of steep drop-offs should be at least 42'' above the surface. A 54'' railing height is recommended where more hazardous conditions exist, such as a bridge over a highway (AASHTO Bike Guide).

Further Considerations

- Wildlife passage and safety for trail users are important factors in determining appropriate trail edge treatments. Although the public often perceives fencing as a means of providing safety by prevention of unwanted access, fencing that blocks visual access completely can have the opposite effect by impairing informal trail surveillance.

Boulder Retaining Wall at Woodland Park (Source: Bantly's Landscape & Design, via http://www.bantlyslandscape.com/gallery/)

Maintenance

Use native plant species to reduce maintenance costs and enhance local identity. When possible, consider using locally sourced materials for fencing such as timber from trees native to the region.

References

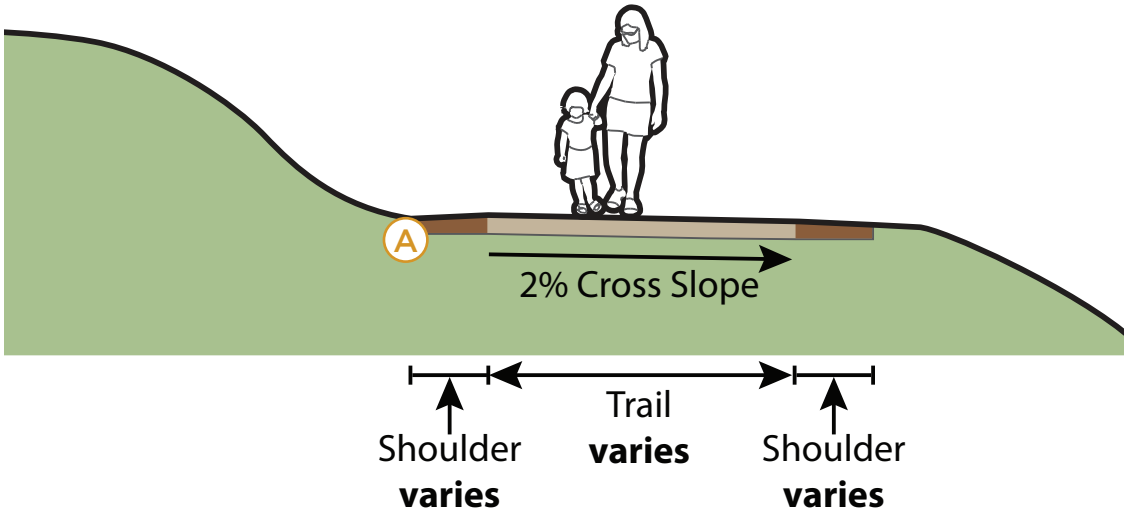
AASHTO. Guide for the Development of Bicycle Facilities. 2012.

DRAINAGE AND EROSION CONTROL

Drainage and erosion control is necessary to maintain a stable walkway and trail surface. There are many areas along the Sullivan O&W Rail Trail that are prone to washout.

Typical Application

Following land contours helps reduce erosion problems, minimizes maintenance and increases comfort levels on all trail types. Drainage impacts should be considered for all shared use paths, including paved and natural surface trails.



Design Features

Paved Surfaces:

(A) A 2% cross slope will resolve most drainage issues on a paved path and should be used for both the trail and its shoulders. Design with a 1.5% cross slope target is recommended to account for variation in construction tolerances. A maximum 1V:6H slope may be used for the shoulders although 2% is preferred. For sections of cut where uphill water is collected in a ditch and directed to a catch basin, water should be directed under the trail in a drainage pipe of suitable dimensions.

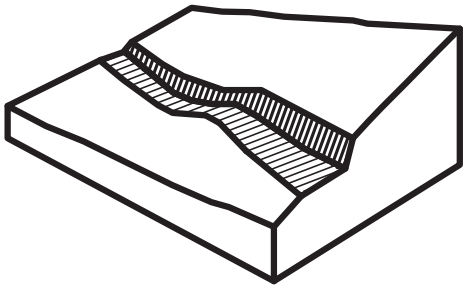
Natural Surfaces:

- Erosion will occur on natural surface trails. Natural surface trails should be designed to accommodate erosion by shaping the tread to limit how much erosion occurs and to maintain a stable walkway and trail surface. The goal is to outslope the trail so that water sheets across, instead of down, its tread.
- Designing trails with rolling grades is the preferred way to build sustainable natural surface trails. “Rolling grade” describes the series of dips, crests, climbs and drainage crossings linked in response to the existing landforms on the site to form a sustainable trail (US Forest Service 2007).

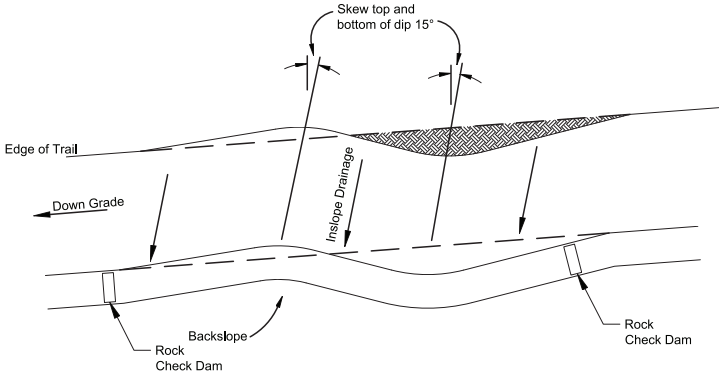
- Frequent grade reversals (grade dips, grade brakes, drain dips or rolling dips) are a critical element for controlling erosion on sustainable trails. A general rule-of-thumb is to incorporate a grade reversal every 20 to 50 linear feet along the trail to divide the trail into smaller watersheds so the drainage characteristics from one section will not affect another section.

Further Considerations

- Grade reversals have the added benefit of adding interest to any trail. Retaining walls or other structural elements may also be required for stable construction and to protect the trail from erosion and flood damage.



Rolling grade diagram, draining outward



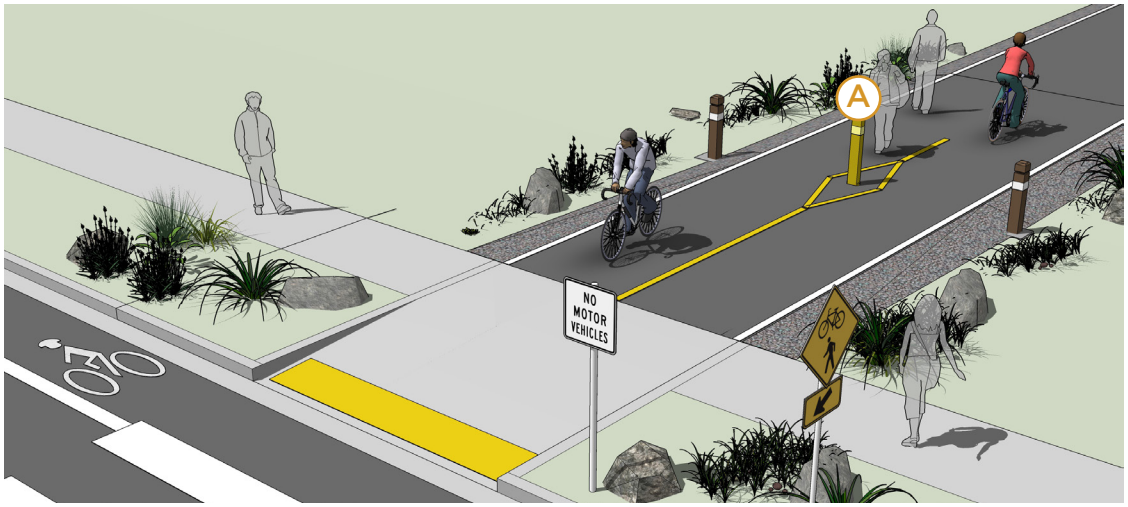
Inslope rolling grade drainage

BOLLARDS

Bollards are physical barriers designed to restrict motor vehicle access to trails. Bollards should never be a default treatment, and should not be used unless there is a documented history of intrusion by unauthorized cars, trucks, or other unauthorized vehicles. Refer to Bollard Alternatives in this guide for guidance on alternative design solutions to this concern.

Typical Application

Bollards should only be used under specific circumstances, properly placed, marked and designed to be as safe and conspicuous as possible when there is a demonstrated danger of people mistaking the trail for a roadway and there isn't a feasible alternative design.



Design Features

Ⓐ Bollards must be easily visible, especially in low light conditions. The MUTCD requires retroreflectorization of any obstruction in the traveled way of a shared use path (Section 9C.03). This includes posts along the edge of a path.

- Must not restrict access for people with disabilities
- Should have sufficient sight distance to allow users to adjust speed. Insufficient sight distance increases the likelihood that bollards will be dangerous hazards.
- Should permit passage, without dismounting, for adult tricycles, bicycles towing trailers, and tandem bicycles. All users legally permitted to use the facility should be accommodated.
- Bollards must be at least 3.2 ft (1 m) tall and should be placed at least 20 ft (6.0 m) from the intersection. This will allow trail users to cross the intersection before negotiating the barrier posts.
- MUTCD Figure 9C-2 defines a diamond-shaped marking that should be used around bollards or other obstructions within a path.

Further Considerations

- Even properly installed bollards constitute a serious and potentially fatal safety hazard to trail users.
- Bollards should be designed to be knock-down, removable, or hinged to permit entrance by emergency and service vehicles. A knocked-down bollard must be reinstalled or removed immediately to avoid additional safety hazards.
- One bollard is generally sufficient to indicate that a path is not open to motorized vehicles. The post should be placed in the center of the trail tread. Where more than one post is necessary, a 5 ft (1.5 m) minimum spacing between bollards is used to permit passage of bicycle trailers, adult tricycles, and wheelchairs. Always use one or three bollards, never two (RTC 2001).

Trail bollards at street crossing

Interurban Trail, Seattle, WA (Source: SounderBruce, CC BY-SA 2.0 via Flickr)

Maintenance

Retroreflectorization will need to be maintained and replaced according to product specification and local requirements.

References

FHWA. Manual on Uniform Traffic Control Devices. 2009.

Rails-to-Trails Conservancy (RTC). Trails for the Twenty-First Century, 2nd Edition. 2001.

BOLLARD ALTERNATIVES

The routine use of bollards and other similar barriers to restrict motor vehicle traffic is not recommended (AASHTO Bike Guide p. 5-46). Bollards are often ineffective at preventing undesired motor vehicle access to shared use paths, and create obstacles to legitimate trail users.

Alternative design strategies use signage, landscaping and curb cut design to reduce the likelihood of motor vehicle access. They are also a visual indicator of the Sullivan O&W Rail Trail.

Typical Application

At the entrance to shared use paths, or at roadway crossings, where motor vehicle use is prohibited and should be discouraged.

Where the need for bollards or other vertical barriers in the pathway can be justified despite their risks and access issues, refer to the guidance on Bollards in this guide and the AASHTO Bike Guide Section 5.3.5.

Design Features

- (A) "No Motor Vehicles" signage (MUTCD R5-3) may be used to reinforce regulatory access rules.
  - Design path entries to not be mistaken for vehicle access point, and to make intentional access my motor vehicles difficult.
- (B) At intersections, split the path tread into two sections separated by low landscaping (2' Max. Height). Each tread should be 7 ft (2.1 m) to allow for side-by-side riding, while appearing too narrow for motor vehicle access.

- Emergency vehicles can still enter by straddling the landscaping median.
- Vertical curb cuts may be used to discourage motor vehicle access.
- Consider targeted surveillance and enforcement at specific intrusion locations.
- Planting should be low and/or ground cover to permit emergency vehicles access.

Further Considerations

- Bollards or other barriers should not be used unless there is a documented history of unauthorized intrusion by motor vehicles. If unauthorized use persists, assess whether the problems posed by unauthorized access exceed the risks and issues posed by bollards and other barriers.

Bollard alternative, split trail entrance/exit

Maintenance

Landscaping separation between treads should be maintained to a height easily straddled by emergency vehicles.

References

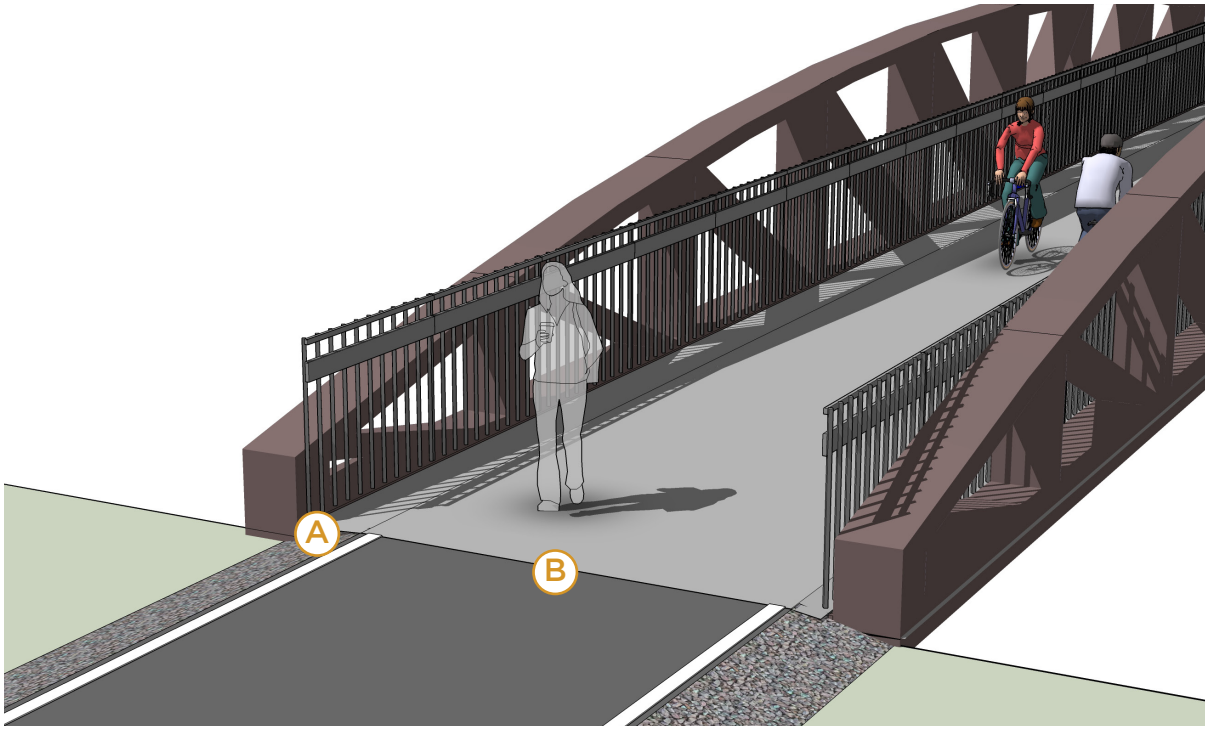
AASHTO. Guide for the Development of Bicycle Facilities. 2012.

TRAIL BRIDGES

Shared use path bridges provide trail access over natural and man made features, such as streams, rivers, and roadways. The type and size of bridge can vary widely depending on the trail type and specific site requirements. Bridges often used for multi-use trails include suspension bridges, prefabricated span bridges and simple girder bridges. When determining bridge design for multi-use trails, it is important to consider emergency and maintenance vehicle access.

Typical Application

Bridges are used to provide trail access over man-made and natural features such as streams and rivers, where a culvert is not an option.



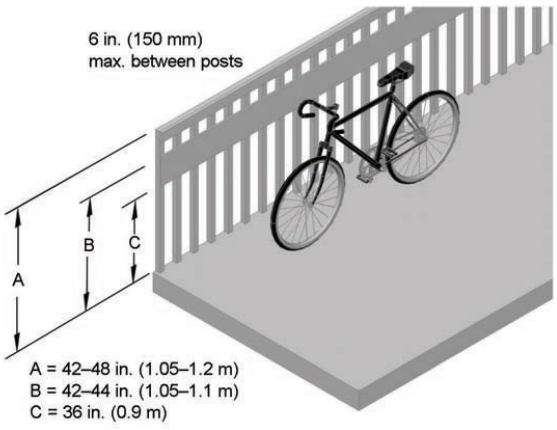
Design Features

- (A) The clear width of the bridge should allow for 2 ft (.6 m) of clearance on each side of the pathway.
- (B) Bridge deck height should match that of the path surface to provide a smooth transition.
  - Shared-use bridges should have a minimum clear width of 10 ft (3.6 m) for emergency vehicle access. (NYSDOT Bridge Manual)
  - Bicycle and shared use paths should include a 48 in guide rail where hazardous conditions exist.
  - Refer to AASHTO Bike Guide Figure 5-11 for specifications for a bridge “rub rail.”

- Vertical clearance over the bridge should be 10 ft (3 m) minimum for maintenance and emergency vehicle access.
- Refer to NYSDOT Bridge Manual for vertical and horizontal clearance below bridges
- A trail bridge should support 6.25 tons if motor vehicle access is permitted (AASHTO 2002).

Further Considerations

- If a corridor already contains a structure, such as an abandoned rail bridge, an engineer should be consulted to assess the structural integrity before deciding to remove or reuse it.
- Bridge styles should be context sensitive and conform with the overall design of the Sullivan O&W Rail Trail.
- All bridge components should be design and sealed by a New York certified structural engineer and all relevant permits should be filed.



Source: AASHTO Guide for the Development of Bicycle Facilities (2012), Figure 5-11: Bridge "Rub Rail".

Vasona Lake County Park Bridge, Los Gatos, CA

Maintenance

High quality prefabricated pedestrian bridges are available. Bridges should be maintained per manufacturers specification.

References

AASHTO. Guide for the Development of Bicycle Facilities. 2012.
AASHTO. Standard Specifications for Highway Bridges. 2002.
NYSDOT. Highway Design Manual
NYSDOT. Bridge Manual

BOARDWALKS

A boardwalk is a constructed pathway, slightly elevated over a natural surface otherwise unsuitable or inappropriate for at grade path construction. Boardwalks are usually constructed of wooden planks or recycled material that form the top layer of the boardwalk. A number of low-impact support systems are also available that reduce the disturbance within wetland areas to the greatest extent possible.

Typical Application

May be required when crossing streams, rivers, creeks, as well as for travel through wetlands or other poorly drained areas.

Design Features

Boardwalk width should be a minimum of 10 feet when no rail is used. A 12 foot width is preferred in areas with average anticipated use and whenever rails are used.

A 6” curb rail is recommended, however, a 42” guiderail is required at locations where there is a 30” or greater difference in the low water bridge elevation and the ground elevation below (AASHTO 2012).

If access by vehicles is desired, boardwalks should be designed to structurally support the weight of a small truck or a light-weight vehicle.

Further Considerations

- Recycled decking has gained popularity in recent years since it lasts much longer than wood, especially in wet conditions.
- Permitting within wetlands and water crossings is a consideration. In general, building in wetlands is subject to regulations and should be avoided (FHWA 2001).
- Refer to NYSDOT's Project Development Manual (PDM) for permitting and other guidelines.
- Consult a structural engineer for member sizing and post footing design. The foundation normally consists of wooden posts or auger piers (screw anchors). Screw anchors provide greater support and last much longer.

Mine Creek Trail, Raleigh, NC

Maintenance

Decking should be either non-toxic treated wood or recycled plastic. Cable rails are attractive and more visually transparent but may require maintenance to tighten the cables if the trail has snow storage requirements.

References

AASHTO. Guide for the Development of Bicycle Facilities. 2012.
FHWA. Wetland Trail Design and Construction. 2001.
NYSDOT. HDM
NYSDOT. Bridge Manual. 2008
NYSDOT. Project Development Manual. 2004

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CROSSING TREATMENT SELECTION

The specific type of treatment at a shared use path crossing may range from a simple marked crosswalk to full traffic signal or grade separated crossing. Appropriate selection of crossing treatments was evaluated following the tables in the NYSDOT Pedestrian Safety Action Plan and other resources. At all road crossings, provide a pavement apron to safely transition from the edge of road to the stone surface. Pavement apron should taper down at least 6" below the finished grade of the trail surface to avoid any abrupt edges.

The table below presents a high-level assessment of potential crossing treatment options for a variety of contexts. Enhanced treatments require additional site by site analysis and should be implemented based upon a safety engineering evaluation, identified community need and NYSDOT guidance. The evaluation should consider the number of lanes, the presence or lack of a median, the distance from adjacent signalized intersections, the pedestrian volumes and delays, the average daily traffic (ADT), the posted or statutory speed limit or 85th-percentile speed, the geometry of the location, the possible consolidation of multiple crossing points, the availability of street lighting, and other appropriate factors.

For dirt roads, paved crossing is recommended to meet the minimal recommended requirements for Trail Crossing Treatments. Stone surface trails should incorporate asphalt aprons at road crossings.

Sullivan O&W Rail Trail Crossing Treatment Selection

Street Posted Speed Range	15-25 mph		25-30 mph			30-45 mph							
FACILITY TYPE	2 lane	3 lane	2 lane	2 lane with median refuge	3 lane	2 lane	2 lane with median refuge	3 lane	4 lane	4 lane with median refuge	5 lane	6 lane	6 lane with median refuge
Marked and Signed Crosswalk*	✓	✓	EJ	EJ	X	EJ	EJ	X	X	X	X	X	X
Crosswalk with Yield Lines	EJ	✓	✓	✓	✓	EJ	EJ	EJ	X	X	X	X	X
Raised Crosswalk	✓	✓	EJ	EJ	EJ	EJ	EJ	EJ	X	X	X	X	X
Rectangular Rapid Flashing Beacon Crossing	X	EJ	✓	✓	✓	✓	✓	✓	X	✓	X	X	X
Pedestrian Hybrid Beacon Crossing	X	X	EJ	EJ	EJ	EJ	✓	✓	✓	✓	✓	✓	✓
Full Traffic Signal Crossing	X	X	EJ	EJ	EJ	EJ	EJ	EJ	✓	✓	✓	✓	✓
Grade Separated Crossing	X	X	EJ	EJ	EJ	X	EJ	EJ	✓	✓	✓	✓	✓

LEGEND	
Desirable	✓
Engineering Judgement	EJ
Not Recommended	X

*NOTE: All treatments shall include a marked crosswalk. The "Marked and Signed Crosswalk" line item indicates contexts where ONLY a marked and signed crosswalk is an appropriate treatment.

MARKED AND SIGNED CROSSWALK

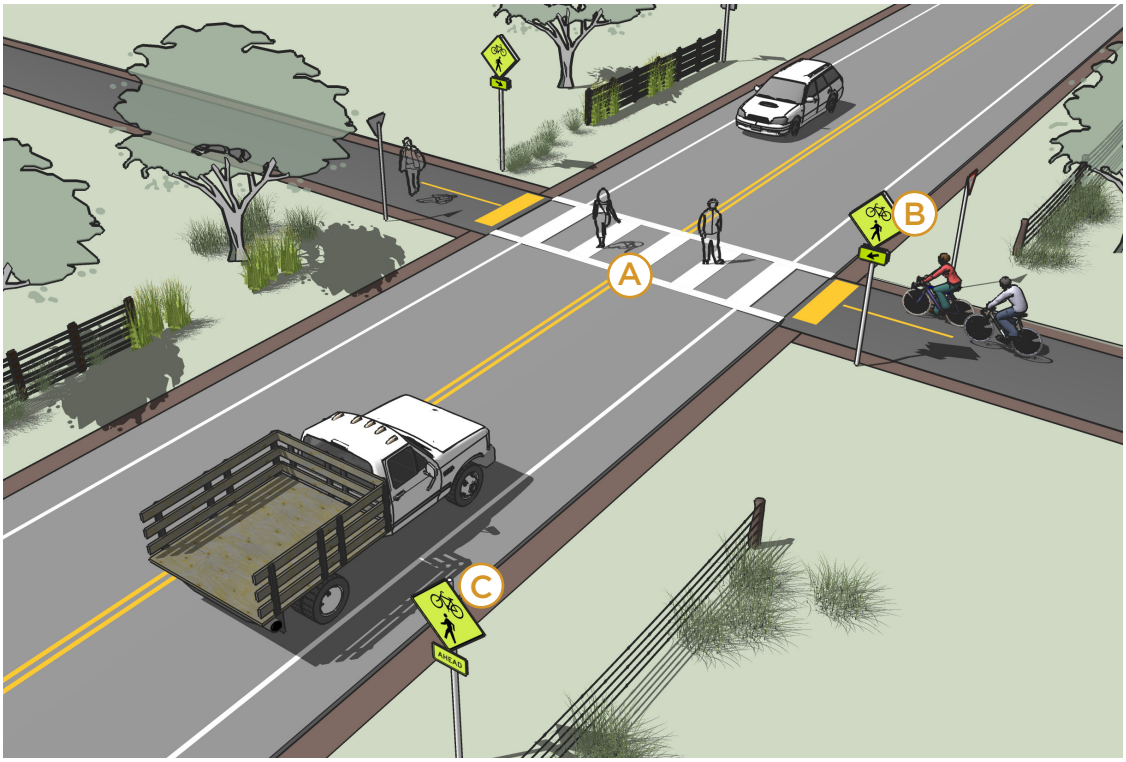
Where a shared use path crosses a roadway at a midblock location, markings must be used to establish a legal crosswalk. Well designed midblock crossings can provide many benefits for path user safety and comfort.

The most simple marked crossing type uses high visibility crosswalk markings with crossing warning signs. This is the most typical crossing along the Sullivan O&W Rail Trail. Rectangular Rapid Flashing Beacon Crossing may be required after engineering judgment.

Typical Application

Where shared use paths intersect with collector or minor arterial streets.

Midblock path crossings should not be provided within 250 feet of an existing signalized intersection. When an existing intersection is in close proximity, route the path directly to the signal.



Design Features

- (A) High visibility "ladder" style crosswalk markings
- (B) A Bicycle/Pedestrian warning sign (W11-15) with downward arrow plaque (W16-7P) at the crossing, on both sides. Bicycle and Pedestrian figures on the sign should always face toward the crosswalk.
- (C) A Bicycle/Pedestrian warning sign (W11-15) with "ahead" plaque (W16-9) before the crossing. See table NYC2C-4 in the NYS Supplement to the MUTCD for guidance on advance posting distances.

Further Considerations

- NYSDOT Pedestrian Safety Action Plan and TSMI 16-05 recommend high-visibility "ladder" style crosswalk markings as the preferred marking type at uncontrolled marked crossings (see NYSDOT HDM Ch. 18, pg 18-45 for ladder crosswalk marking details).
- Installation of high visibility crosswalks at previously unmarked crosswalk locations must meet accessibility guidelines. Refer to NYSDOT TSMI 17-02 for information on ADA Applicability of various crossing treatment countermeasures.
- On roadways with high speed and high volumes of motor vehicles, crosswalk markings alone are often not a viable safety measure. This should not discourage the implementation of crosswalks, but should rather support the creation of more robust crossing solutions (Zeeger 2005).

This path crossing includes many enhancements to slow traffic and promote yielding.

Along pathways with high volumes of users and at path crossings in highly developed areas with crosswalks, path crossings should provide adequate room for path users to wait outside of the path of crossing sidewalks.

Maintenance

Because the effectiveness of marked crossings depends entirely on their visibility, maintaining marked crossings should be a high priority. Thermoplastic or epoxy markings offer increased durability over conventional paint.

References

NYSDOT. TSMI 16-05: High-Visibility Crosswalk Markings. 2016.
NYSDOT. TSMI 17-02: Applicability of ADA Guidelines to PSAP Countermeasures. 2017.
NYSDOT. Supplement to the MUTCD. 2011.
NYSDOT. Pedestrian Safety Action Plan. 2016.
Zeeger, C., J. Stewart, and H. Huang. Safety Effects of Marked Versus Unmarked Crosswalks at Uncontrolled Locations. 2005.
NYSDOT. HDM Ch 18: Bicycle Facility Design. 2015.

Further Guidance Available

NYSDOT TSMI | **NYSDOT** Supplement | **NYSDOT** PSAP | **HDM** Ch 18

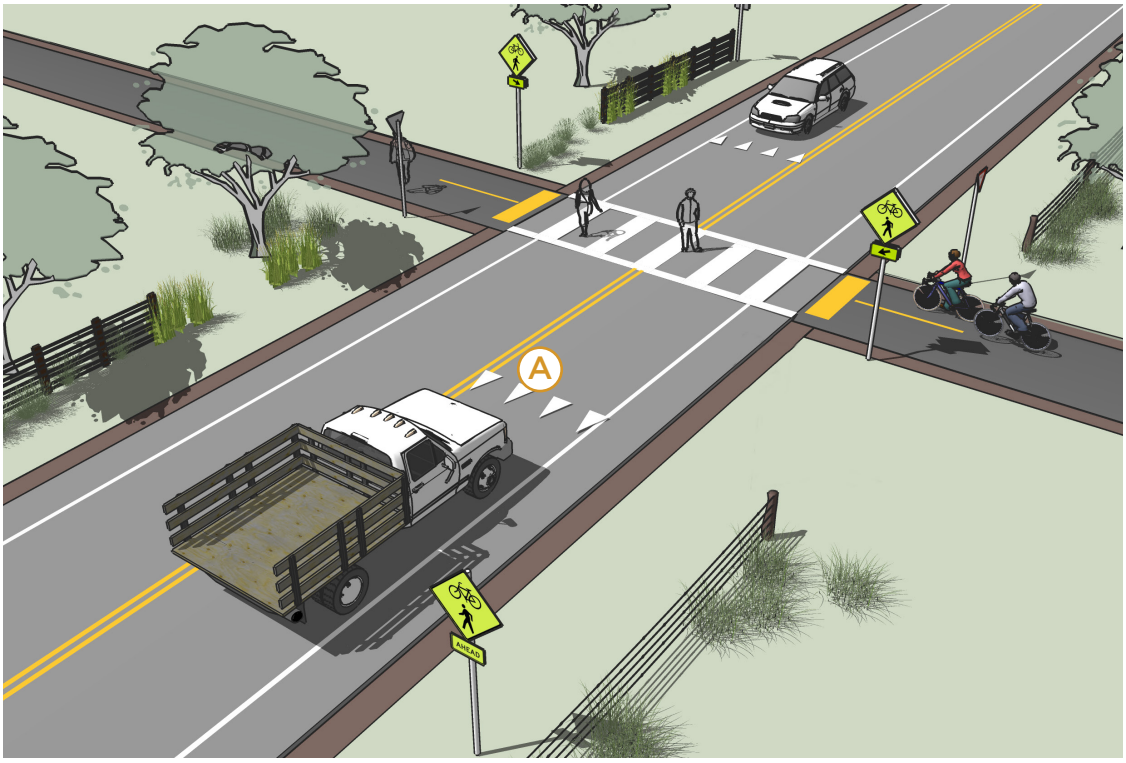
MARKED CROSSWALK WITH YIELD LINES

Where additional awareness and regulatory instruction is desired at marked path crossing, advanced yield lines and yield signs remind people to yield to crossing path users. Rectangular Rapid Flashing Beacon Crossing (pg. 5-54) may be required after engineering judgment.

Typical Application

Where a shared use path crosses a road with higher volumes, higher speeds, or more lanes than is desirable for a marked crosswalk only installation.

Refer to the **Crossing Treatment Selection Table** on page 5-49 in this guide, and the **NYSDOT Pedestrian Safety Action Plan 2016** for guidance on identifying recommended treatment packages.



Design Features

In addition to a high visibility crosswalk and crossing sign assemblies described in the Marked and Signed Crosswalk treatment package, enhancements include:

- (A) Advance yield line (sharks teeth - currently only used on multi-lane roadways)
  - Yield Here to Pedestrian sign (R1-5) should be used in urban areas.
  - Parking should be restricted between the yield line and the crosswalk.

Further Considerations

- Application of an advance yield line with a Yield (R1-2) sign gives yield priority to path users over crossing motor vehicle traffic. This requirement for motorists to yield is not explicitly extended to bicyclists, and the rights and responsibilities for bicyclists within crosswalks is ambiguous. The Yield (R1-2) sign is typically only used in single lane approaches. Design solutions should resolve this ambiguity where possible by using geometric design features to give people on bicycles priority within the crossing. This may include **Raised Crosswalks**, and **Median Refuge Island Crossings**.
- Yield markings may be applied to any mid-block crossing, but are especially encouraged on roadways with multiple lanes in each direction to mitigate a multiple-threat crash **(NYSDOT HDM Ch. 18, pg. 18-34)**.

Yield line clearly indicates expected behavior at this mid block crossing.

Yield sign (R1-2)

Maintenance

Because the effectiveness of marked crossings depends entirely on their visibility, maintaining marked crossings should be a high priority. Thermoplastic or epoxy markings offer increased durability over conventional paint.

References

NYSDOT. HDM Ch 18: Bicycle Facility Design. 2015.
NYSDOT. Pedestrian Safety Action Plan. 2016.

Further Guidance Available

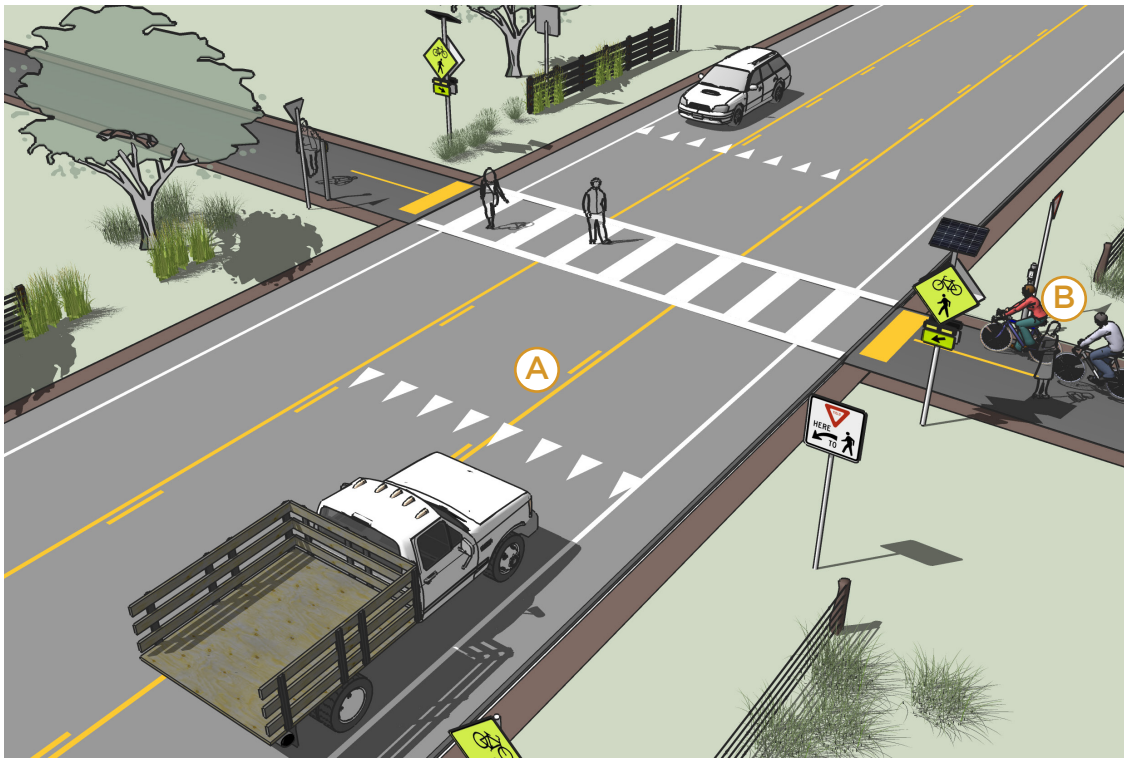
HDM Ch 18

NYSDOT PSAP

RECTANGULAR RAPID FLASHING BEACON CROSSING

Rectangular Rapid Flashing Beacons (RRFBs) are user-actuated warning beacons to supplement pedestrian warning signs at unsignalized intersections or mid-block marked pedestrian crosswalks.

RRFBs have been shown to increase motor vehicle yielding compliance at crossings of multi lane or high volume roadways.



Typical Application

Use RRFBs at high-volume pedestrian crossings, or at priority bicycle route crossings, including shared use paths.

The use of RRFBs may not be appropriate at locations where there is a combination of both high traffic volumes and high pedestrian volumes (TSMI 15-03). Consider Pedestrian Hybrid Beacon Crossings at those locations.

Design Features

- (A) Rectangular Rapid Flashing Beacon Crossings should be paired with a **Marked Crosswalk and Advanced Yield Line** crossing treatment package.
- (B) Push buttons should be easy to identify and located on the right-hand side of the path. They should be positioned so that bicyclists do not have to dismount to activate.
- Where possible, RRFBs work well as multi-beacon installations on mast arms, or **Median Refuge Island Crossings** to improve driver yielding behavior.

Further Considerations

- Refer to **TSMI 15-03** for information on guidelines and responsibility for the installation, operation and maintenance of rectangular rapid flashing beacons on State highways.
- Installation of a RRFB controlled crosswalk must meet accessibility guidelines **(TSMI 15-01)**. Refer to **NYSDOT TSMI 17-02 f**or information on ADA Applicability of various crossing treatment countermeasures.

RRFB bikeway crossing with separate push buttons for pedestrians and bicyclists.

On multilane streets, multiple beacon installations are critical for awareness by motorists in all approach lanes.

Maintenance

Depending on power supply, site conditions, the equipment used, and other variables, maintenance can be minimal. If solar power is used, active warning beacons can run for years without issue.

References

FHWA. Interim Approval for Optional Use of Rectangular Rapid Flashing Beacons (IA-21). 2018.
NYSDOT. TSMI 15-01: Applicability of ADA Guidelines on Traffic Signals. 2015.
NYSDOT. TSMI 15-03: Rectangular Rapid Flash Beacons. 2015.
NYSDOT. TSMI 17-02: Applicability of ADA Guidelines to PSAP Countermeasures. 2017.

Further Guidance Available

FHWA MUTCD 1A-11

NYSDOT TSMI

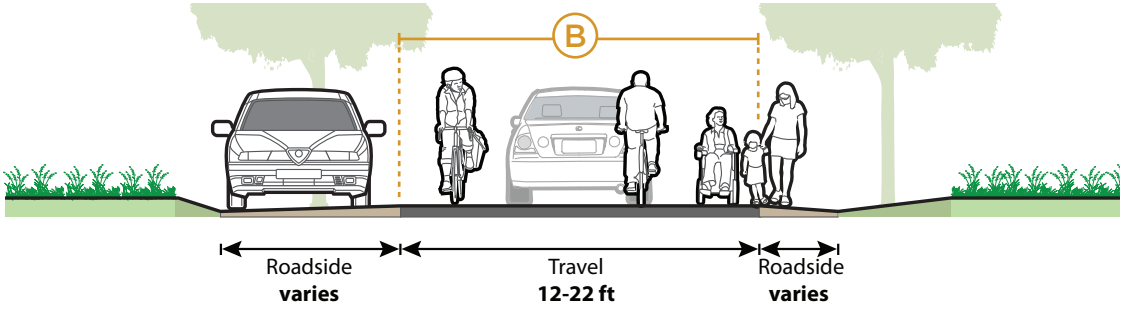
ON-ROAD FACILITIES

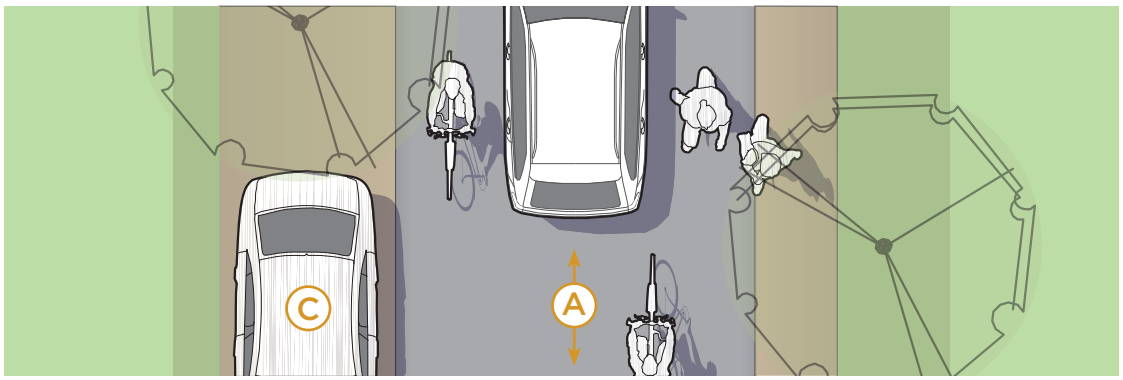
A traffic study is recommended prior to the installation of any on-road facilities.

WALK/BIKE ROADWAY

A walk/bike roadway is a type of shared roadway, utilizing a local roadway that is designed to serve pedestrians, bicyclists and motor vehicle traffic all within the paved travel area. These roads are used by such low volumes of traffic that crashes are rare, as vehicles hardly encounter other vehicles.

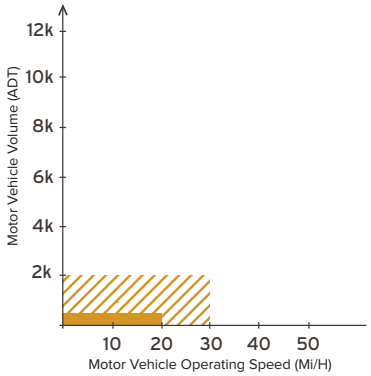
This facility is able to maintain service for local traffic volumes, as well as, maintain local aesthetics, and should be considered the typical for local rural roads.





Typical Application

PREFERRED POTENTIAL



AASHTO Green Book defines a “very low volume” road as a local road with 400 or fewer motor vehicles per day (p. 5-34).

Design Features

A Due to low volumes and narrow roadway widths, no center lane should be marked (MUTCD 2009, p.349).

B A travel area width of 12 to 18 ft (3.6 – 5.5 m) is appropriate for low volumes of two-way traffic and will require queueing or slowing during motor vehicle meeting events. The AASHTO Green Book 2011 notes that “The level of user inconvenience occasioned by the lack of two moving lanes is remarkably low…” (p. 5-13).

C Where widths are ≤ 14 ft (4.2 m) provide regular pull-out areas to allow for infrequent

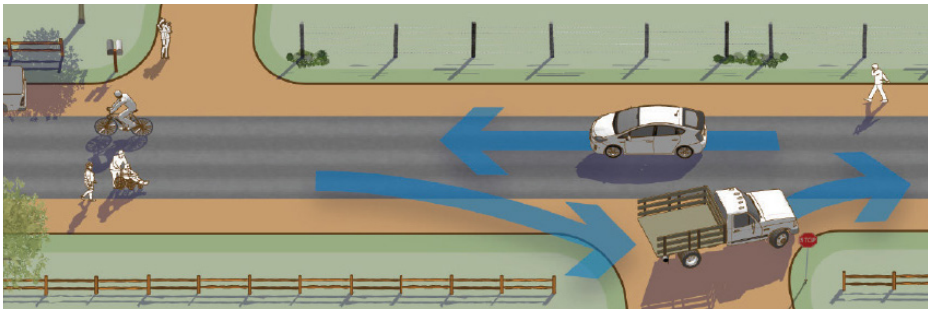
meeting and passing events between motor vehicles. Pull out areas may be established in driveways, the parking lane or roadside.

Pedestrian Accommodation

- When operating at very-low volumes, pedestrians may be comfortable walking within the travel area of the roadway. As volumes increase, consider providing an exclusive pedestrian facility such as a sidewalk. When a Pedestrian Access Route (PAR) is incorporated into a roadway, the PAR must meet accessibility guidelines for grade, cross slope, and surface stability. (PROWAG).

Further Considerations

- When possible, the parking lane should be constructed with a contrasting material to differentiate the lane from the travel area. Bituminous, crushed stone, gravel, and grass shoulders can be used as contrasting materials to the traveled way (AASHTO Green Book 2011, p. 4-13).
- Access for fire trucks and emergency vehicles should be provided. This requires adequate width along the road for an emergency response vehicle, and frequent opportunity to park and access equipment from the vehicle. There is no single fire code standards for local roads, however an acceptable range of clear roadway for parking/deploying fire department apparatus is between 16 and 20 ft (5.0 – 6.0 m) (ODOT 2000).



Vehicles approaching from opposite directions must slow and may need to yield to negotiate the roadway space. Source: FHWA Small Town and Rural Multi-modal networks, 2016.

A W11-2 sign may alert drivers to the potential presence of pedestrians.

Maintenance

Shared roadways should be cleared of snow through routine snow removal operations.

References

AASHTO. A Policy on Geometric Design of Highways and Streets. 2011.
AASHTO. Guide for the Development of Bicycle Facilities. 2012.
FHWA. Public Rights-of-Way Accessibility Guidance. 2011.
FHWA. Manual on Uniform Traffic Control Devices. 2009.
Oregon Department of Transportation (ODOT). Neighborhood Street Design Guidelines. 2000.

Further Guidance Available

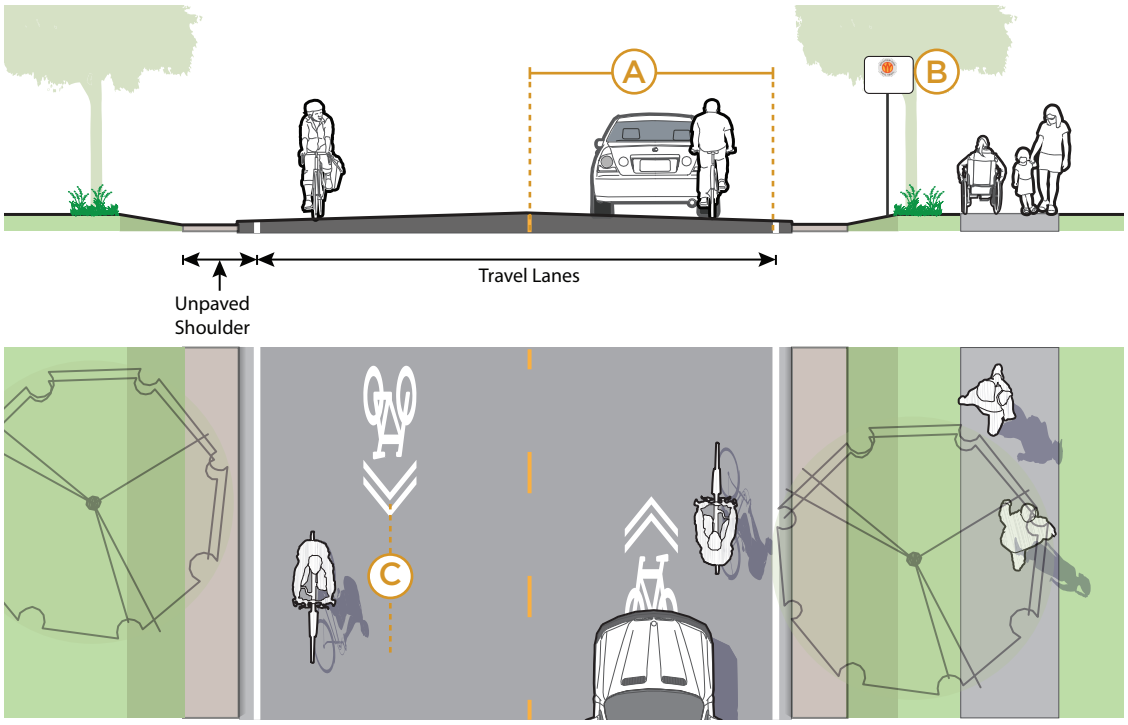
AASHTO Green Book | **AASHTO** Bike Guide | **FHWA** PROWAG | **FHWA** MUTCD | **ODOT** NSDG

SHARED ROADWAYS

Shared roadways are roadways with travel lanes shared by bicyclists and motorists, with no dedicated or separated space for bicyclists. This may be an existing roadway, street with wide curb lanes, or a road with narrow paved shoulders.

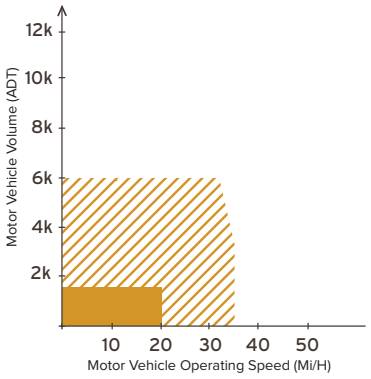
Signs should be used to identify the route as a preferred bicycle route and as part of the Sullivan O&W Rail Trail.

Shared lane markings may be used on shared roadways to remind motorists of the potential presence of bicyclists within a narrow travel lane.



Typical Application

PREFERRED POTENTIAL



Design Features

(A) Lane width varies depending on roadway configuration. The AASHTO Bike Guide recommends wide curb lanes with widths between 12 ft (3.6 m) and 13.5 ft (4.2 m). Beyond this width, Bike Lanes or Shoulders may be provided.

(B) Sullivan O&W Rail Trail Guide Signs or MUTCD Bike Route Guide Signs should be applied at intervals frequent enough to keep users informed of changes in route direction (i.e. after intersections) and to remind motorists of the presence of bicyclists and pedestrians.

- If shared lane markings are used, place them in the center of the effective travel lane to reduce marking wear and encourage bicyclists to occupy the lane outside the potential door zone of parked cars (TSMI 13-07).
- Where used, shared lane markings should be placed at the beginning of the facility and immediately after intersections (MUTCD 2009, 9C.07.06).

Pedestrian Accommodation

- Shared roadways are a bicycle facility, not intended for use by pedestrians. Pedestrians are expected to travel along a separate pedestrian facility such as a sidewalk or path. In the absence of a pedestrian facility, pedestrians may legally walk along the roadway.

Further Considerations

- Designers should consider opportunities to calm the roadway to limit undesirable conditions, or widen the roadway to provide a bike lane or separated facility. Refer to the section on Traffic Calming in this guide for more information on potential traffic calming techniques.
- On shared roadways with speeds at or below 25 mph and volumes below 4,500 ADT, no continuous centerline should be marked. This is intended to encourage motorists to provide ample room when passing bicyclists.

W11-1 with IN LANE plaque can inform users to narrow lane shared roadway conditions (TSMI 13-07).

Maintenance

Shared roadways should be cleared of snow through routine snow removal operations. Maintenance needs for bicycle guide signs are similar to other signs, and will need periodic replacement due to wear.

References

AASHTO. A Policy on Geometric Design of Highways and Streets. 2011.
AASHTO. Guide for the Development of Bicycle Facilities. 2012.
FHWA. Public Rights-of-Way Accessibility Guidance. 2011.
FHWA. Manual on Uniform Traffic Control Devices. 2009.
Oregon Department of Transportation (ODOT). Neighborhood Street Design Guidelines. 2000.

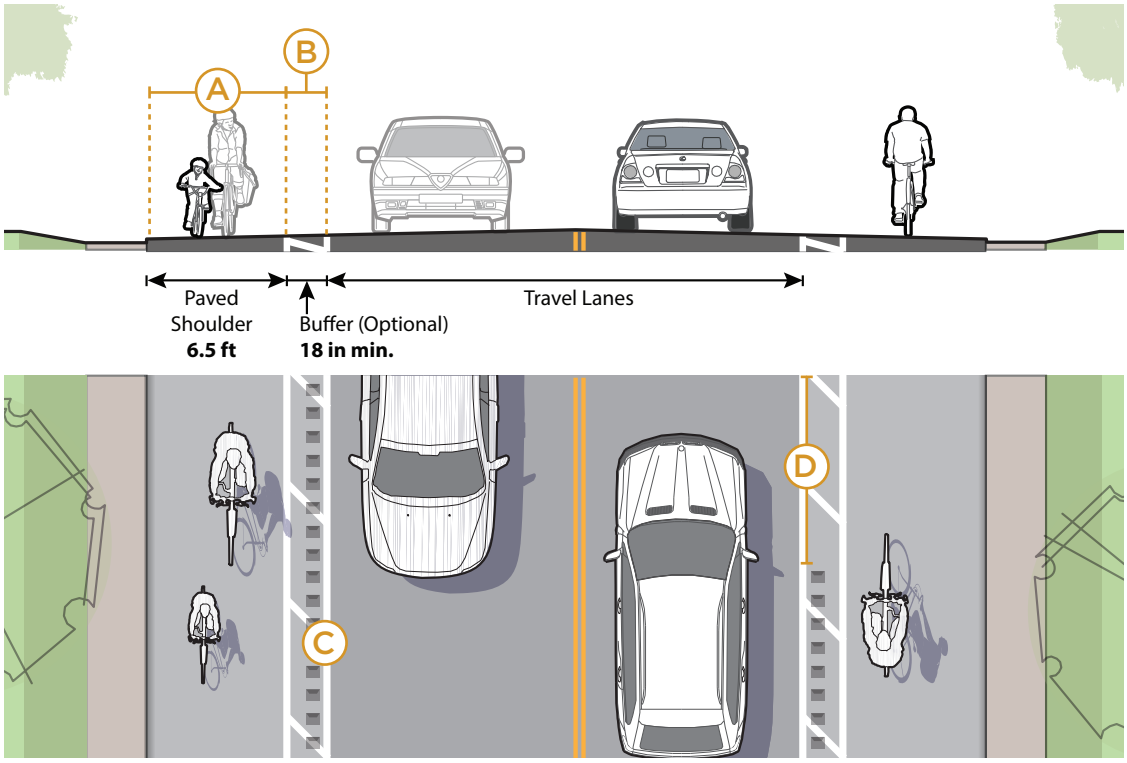
Further Guidance Available

AASHTO Bike Guide | **FHWA** MUTCD | **NACTO** Bike Guide | **HDM** CH 25 | **NYSDOT** TSMI

PAVED SHOULDERS

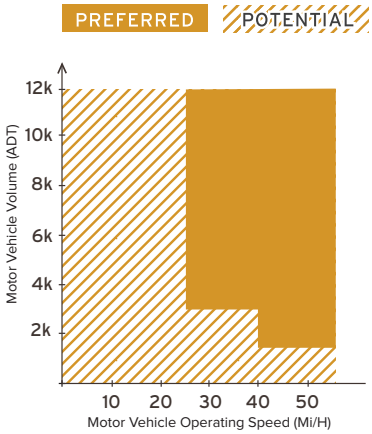
Typically found in less-dense areas, paved shoulders are wide enough for bicycle travel.

To offer enhanced comfort and usability, paved shoulders should configured with a buffer area and use bicycle-tolerable rumble strip designs.



Typical Application

While paved shoulders may function on roads with high vehicle speeds and volumes, consider the use of a separated bike lane or sidepath for increased comfort.



Design Features

(A) Standard paved shoulder width is 7 ft (2.1 m). A minimum of 4 ft (1.2 m) of ridable surface should be available for bicycle travel (AASHTO Bike Guide 2012). A minimum shoulder width of 5 ft (1.5 m) is recommended where a curb and gutter, guardrail, or other roadside obstacle exists.

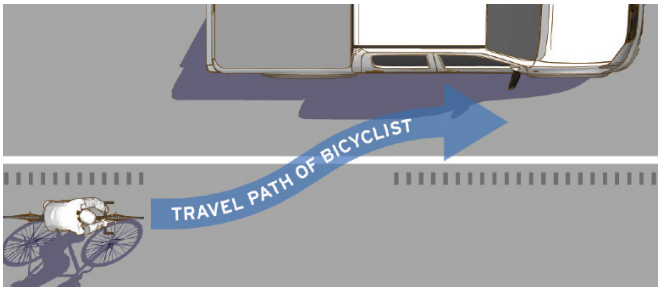
- (B) An optional buffer space may be used to provide additional horizontal distance between moving vehicles and bicyclists.
- To minimize negative impact to bicyclists, (C) rumble strips should be located as close as possible travel lane, while maintaining a 4 ft (1.2 m) clear width (EI 16-04).

(D) Rumble strips should include a “bicycle gap” pattern of 12 ft (3.3 m) gaps every 60 ft (12.1–18.2 m) to allow access as needed (EI 16-014).

Further Considerations

- NYSDOT HDM states that the recommended shoulder widths on projects designed specifically to accommodate bicycling may exceed the minimum shoulder widths shown in the NYSDOT 3R Standards (p. 17-6).
- Shoulders are not substitutes for a pedestrian facility, however, there may be a need to design shoulders as walkways where roadside space is constrained and will not accommodate a separate pedestrian facility. These shoulders should meet ADA accessibility guidelines to the greatest extent practicable. ADA accessibility may be challenging to achieve on existing roadway edges and shoulders due to cross slopes, and/or surface irregularities. Discontinuities should be corrected when a project scope presents an opportunity to do so. Shoulders that are built or reconstructed with a primary purpose to serve as a Pedestrian Access Route (PAR) must meet accessibility guidelines or be justified as a nonstandard feature. (NYSDOT HDM).
- Rumble strips are an FHWA Proven Safety Countermeasure for reducing roadway departure crashes. Research has shown that installing rumble strips can reduce severe crashes but may negatively impact bicycle travel if they are poorly constructed. For more detailed information on the implementation of rumble strips, see NYSDOT EI 16-014.

A wide paved surface, paired with a buffer area provides a more comfortable experience for bicyclists travelling on this shoulder.



Provide a bicycle gap pattern to allow access into and out of the shoulder area by bicyclists.
Image Source: FHWA Small Town and Rural Multi-modal Networks, 2016.

Maintenance

Paved shoulders should be cleared of all snow and debris through routine maintenance operations.

References

FHWA. Manual on Uniform Traffic Control Devices. 2009.
FHWA. Public Rights-of-Way Accessibility Guidance. 2011.
FHWA . Proven Safety Countermeasures. 2012.
NYSDOT. EI 16-014. 2016.
NYSDOT. HDM Ch 17: Bicycle Facility Design. 2006.

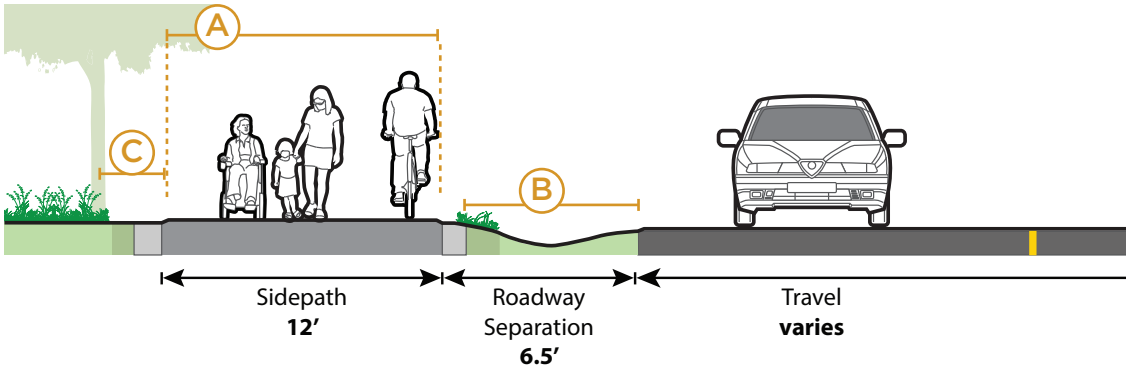
Further Guidance Available

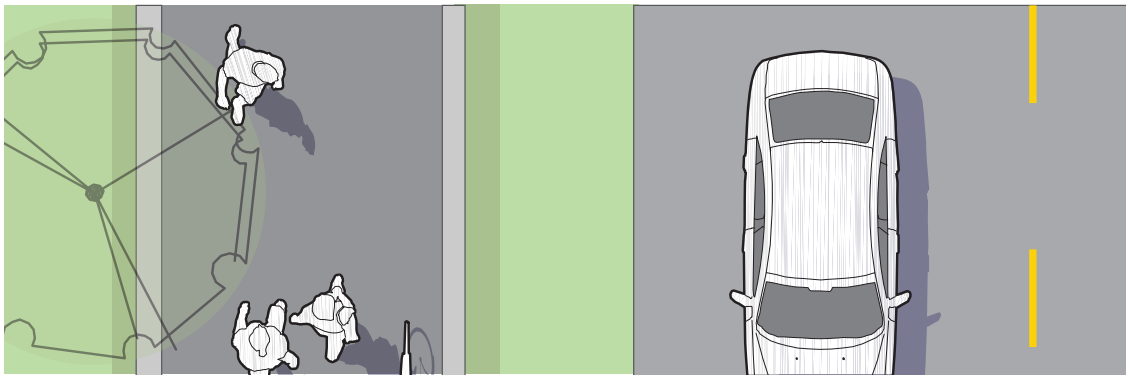
FHWA MUTCD | **FHWA** PROWAG | **FHWA** PSC | **NYSDOT** EI 16-014 | **HDM** CH 17

SIDEPATHS

A sidepath is a bidirectional shared use path located immediately adjacent and parallel to a roadway, typically within the roadway ROW. Sidepaths can offer a high-quality experience for users of all ages and abilities as compared to on-roadway facilities in heavy traffic environments, allow for reduced roadway crossing distances and maintain community character.

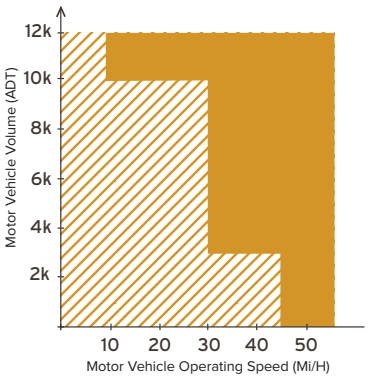
Due to operational concerns, the ideal location for sidepaths are roadways with few intersections or driveways.





Typical Application

PREFERRED POTENTIAL



To fill gaps in the network of low-stress local routes such as shared use paths and bicycle boulevards.

Design Features

(A) Standard sidepath width at locations with the potential for mixed pedestrian and bicyclist activity is 12 ft (3.6 m) (NYSDOT HDM p. 17-15).

- Minimum width of a sidepath is 10 ft (3.0 m) (NYSDOT HDM p. 17-15).

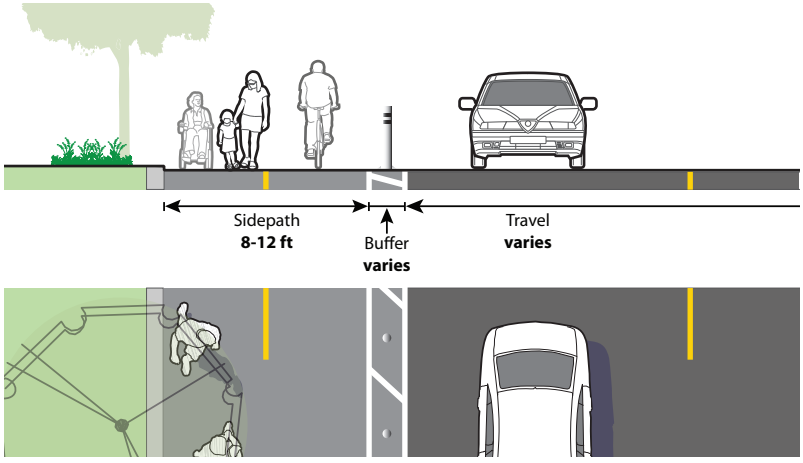
(B) The preferred minimum roadway separation width is 6.5 ft (2.0 m) (Schepers, 2011), with an absolute minimum separation width of 5 ft (1.5 m) (AASHTO Bike Guide 2012, p. 5-11).

(C) A horizontal clearance of 3 ft (1.8 m) should be provided on each side of the pathway from signs, poles, trees or other fixed objects.

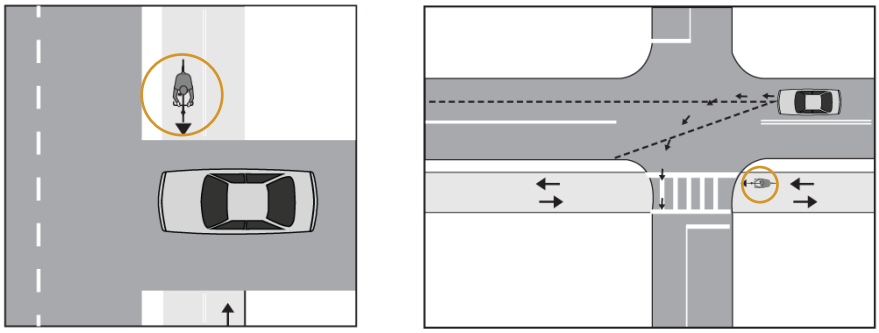
Constrained Conditions

Separation narrower than 5 ft is not recommended, although may be accommodated at roadway grade with the use of a physical barrier or railing between the sidepath and the roadway.

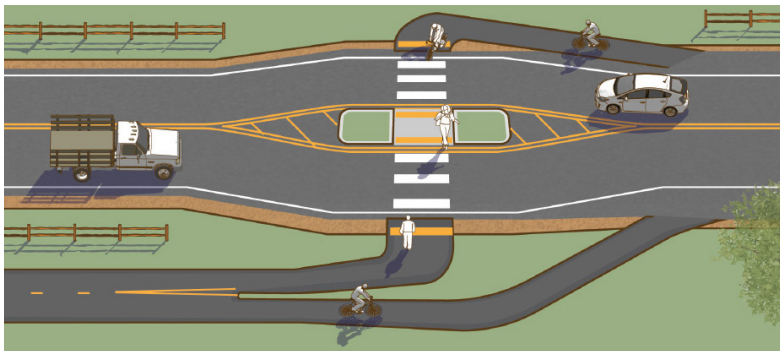
- Define the roadway separation with a marked buffer.
- The barrier need not be of size or strength to redirect errant vehicles. On high speed roadways, the barrier should be crashworthy (AASHTO Bike Guide 2012, p. 5-11).
- Barriers that serve to separate the area for motor vehicles from the sidepath should have a minimum height of a standard guide rail.
- Separation barriers or railings should not impair sight distance at intersections.
- The AASHTO Bike Guide also notes that “treatments such as rumble strips can be considered as alternatives to physical barriers or railings” (p. 5-11).
- In constrained conditions where space for landscaping is not possible, slopes and drainage should be directed away from the roadway to prevent drainage issues on the roadway.



Some segments of the Razorback Greenway Trail operate in the roadway, with minor physical separation between the roadway and the trail.



Sidepaths running along streets with many driveways or street crossings can create operational issues. Drivers may block the sidepath (left) or fail to look for bicyclists traveling in both directions (right). (Image source: AASHTO Bike Guide Figure 5-4)



When a sidepath ends, users must transition to directional facilities on each side of the roadway. (Image source: FHWA Rural Guide)

Driveways and Minor Intersections

The AASHTO Bike Guide lists 14 "potential conflicts" with bidirectional sidepath facilities in 3 categories:

1. Design related concerns, including issues sight distance and motorist encroachment.
2. Motorist lack of awareness of path users, particularly "wrong way" traveling bicyclists.
3. End point concerns, where the sidepath must transition to directional facilities.
   - Design crossings to promote awareness of conflict points, and facilitate proper yielding of motorists to bicyclists and pedestrians. Special attention should be paid to the geometric design and sight lines at the crossings of driveways, minor streets and intersections. Refer to Sidepath Crossings in this guide.
   - In some situations, it may be better to place one-way sidepaths on both sides of the street or highway, directing wheeled users to travel in the same direction as adjacent motor vehicle traffic. This is similar to a Directional Separated Bike Lane discussed in this guide.
   - Any physical barriers shall be discontinued at driveways or private access points to allow vehicular access.

Pedestrian Accommodation

- A sidepath is intended for use by pedestrians and must meet accessibility guidelines for walkways and curb transitions, grade, cross slope, and surface stability (PROWAG).

Further Considerations

- Where sufficient roadway width or right of way is available, designers should consider the simultaneous provision of both sidepaths and bicycle accessible shoulders to serve a diverse range of user types.

Typical sidepath, separated with a landscaped separation area. The sidepath has priority over driveways and minor intersections, and motorists must yield to pedestrians and bicyclists on the facility.

Maintenance

Sidepaths should be cleared of all snow and debris through routine maintenance operations.

References

AASHTO. Guide for the Development of Bicycle Facilities. 2012.
FHWA. Manual on Uniform Traffic Control Devices. 2009.
FHWA Small Town and Rural Multi-modal Networks, 2016.
NYSDOT. Highway Design Manual (HDM) Chapter 17. 2006.
Schepers et al. Road factors and Bicycle-Motor vehicle crashes at unsignalized priority intersections. 2011.

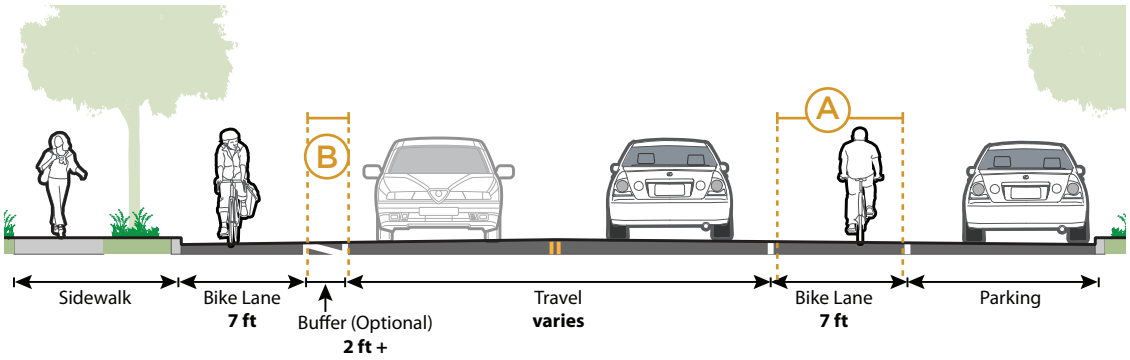
Further Guidance Available

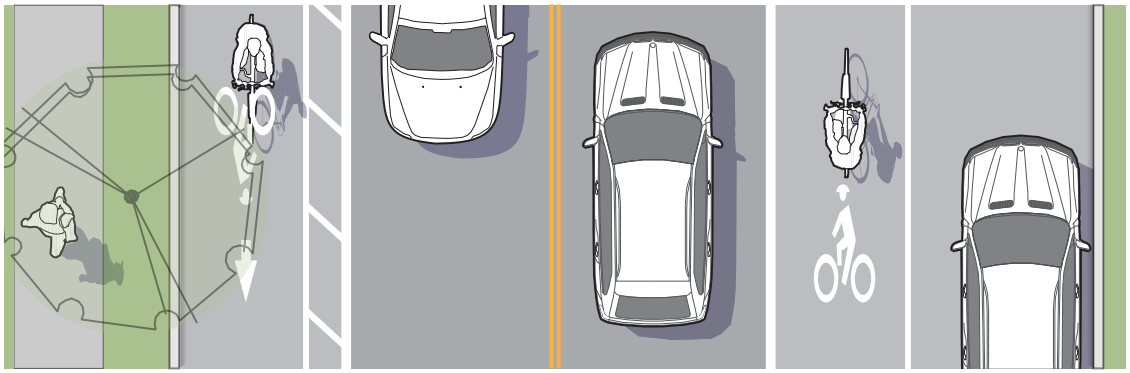
AASHTO Bike Guide | **FHWA** MUTCD | **RURAL GUIDE** | **HDM** CH 17

BIKE LANES

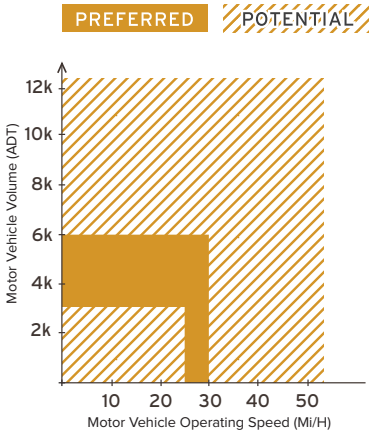
On-street bike lanes designate an exclusive space for bicyclists through the use of pavement markings and signs. Bike lanes are located adjacent to motor vehicle travel lanes and travel in the same direction as motor vehicle traffic.

Where additional width is available, or where additional distance from motor vehicles is desired, a marked buffer may be included between the bike lane and travel/parking lane.





Typical Application



On streets with multiple travel lanes in any one direction, consider **buffered** or **separated bike lanes** for increased separation.

Design Features

(A) • Standard bike lane width along the Sullivan O&W Rail Trail corridor is 7 ft (2.1 m) preferred. In constrained conditions, minimum width is 6 ft (1.8 m) adjacent to on-street parking, 5 ft (1.5 m) adjacent to curb faces, and 4 ft (1.2 m) adjacent to road edge (AASHTO Bike Guide 2012).

• Bicycle lane markings and signs (R3-17) shall be placed per details and notes on Standard Sheet 685-01.

(B) • If used, buffers should be at least 2 ft (.6 m) wide. If buffer area is 4 ft (1.2 m) or wider, white chevron or diagonal markings should be used (MUTCD 2009, 3D.02). At driveways, mark the inside buffer line with dotted lines.

Pedestrian Accommodation

- Bike lanes and buffered bike lanes are not intended for use by pedestrians. Pedestrians are expected to travel along a separate facility such as a sidewalk or path. In the absence of such a facility, pedestrians may legally walk along the roadway, potentially occupying the bike lane.

Further Considerations

- Where on-street parking is permitted, NCHRP Report 766 recommends installing a buffer space between the parking lane and bicycle lane rather than between the bicycle lane and vehicle travel lane.
- There are many strategies available to implement bicycle lanes into roadway resurfacing projects, including road widening, lane narrowing, travel lane reconfiguration and parking lane reconfiguration (FHWA Resurfacing Guide, 2016).
- On high speed streets (≥ 45 mph) or multi-lane streets, a physically separated bike lane or sidepath is preferred over a bike lane or buffered bike lane for safety.

Bike lane signs R3-17 (BIKE LANE) are required for use in conjunction with bike lanes; and additional supplemental signs, such as R3-17aP (AHEAD) and R3-17bP (END) may be used to indicate bike lane provision. Refer to NYSDOT Standard Sheets 685-01.

A 2 foot buffer between the bike lane and the parking lane increases the distance from the door zone of parked cars.

Maintenance

Paint can wear more quickly in high traffic areas. Bicycle lanes or buffered bike lanes should be cleared of snow and debris through routine maintenance operations. Maintenance needs for bike lane signs are similar to other signs, and will need periodic replacement due to wear, damage, or loss of reflectivity of the sign panel.

References

FHWA. Manual on Uniform Traffic Control Devices. 2009.
FHWA, Incorporating On-road Bicycle Networks into Resurfacing Projects, 2015.
NACTO Urban Bikeway Design Guide. 2012.
NCHRP 766: Recommended Bicycle Lane Widths for Various Roadway Characteristics. 2016.
NYSDOT. Standards Sheet 685-01. 2013.

Further Guidance Available

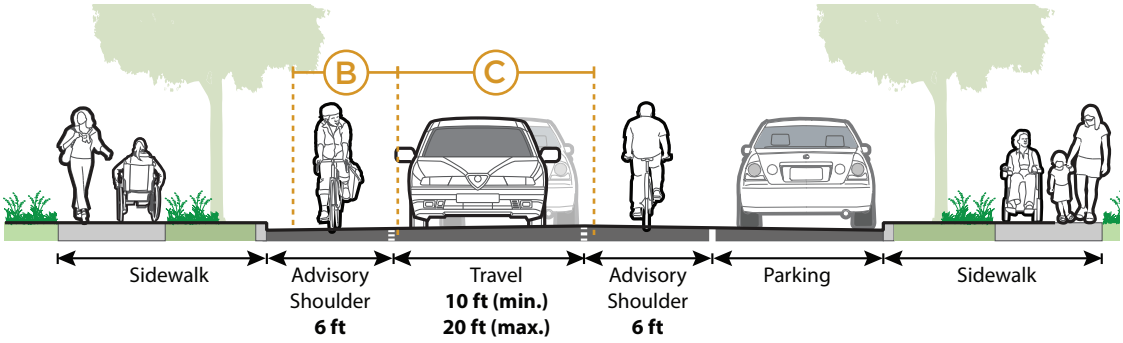
FHWA MUTCD | **FHWA** IORBNRP | **NACTO** Bike Guide | **NCHRP** 766

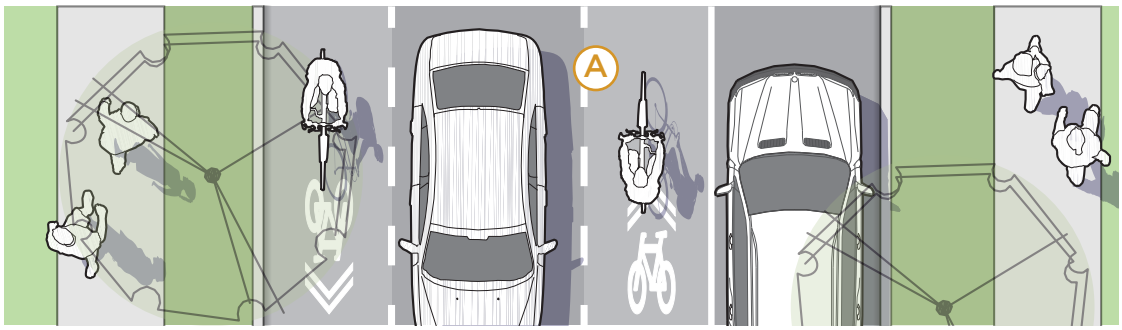
ADVISORY SHOULDERS

Advisory shoulders, also known as advisory bike lanes or dashed bicycle lanes, clarify operating positions for bicyclists and motorists to minimize conflicts and increase comfort. Similar to bike lanes, advisory shoulders are distinct in that they are temporarily shared with motor vehicles during turning, approaching, and passing, with little or no widening of the paved roadway surface.

Advisory shoulders are a new treatment type and no data has been collected to compare to international experience. To install advisory shoulders, an approved Request to Experiment is required as detailed in the MUTCD. FHWA is also accepting requests for experimentation of a similar treatment, “dashed bicycle lanes”.

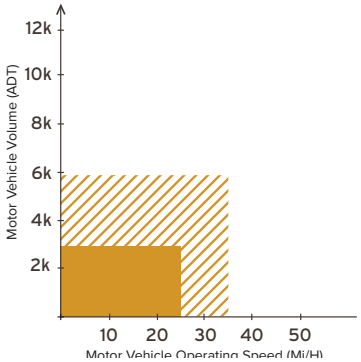
Although there are no current recommendations for this condition, its use should be considered when connecting residential and tourist areas to the trail via on-road facilities.





Typical Application

PREFERRED POTENTIAL



Works best on roads with few bends, inclines or sightline obstructions.

Design Features

- (A) A broken white line indicates permissive operation.
- (B) Standard advisory shoulder width is 6 ft (1.8 m), with and absolute minimum of 4 ft (1.2 m) with no existing curbs or gutters (FHWA Rural Guide 2016, pg 2-17).
- (C) Minimum two-way center travel lane width is 10 ft (3.0 m). Maximum lane width is 20 ft (FHWA Rural Guide 2016).
- No centerline should be marked on roadway.

- Shared use lane markings should be used within the advisory shoulders to increase the conspicuity and intent of the treatment. This treatment and use of shared lane markings is experimental, and does not conform to the MUTCD or TSMI 13-07.

Further Considerations

- Pedestrian use of advisory shoulders is governed by state vehicle code section 1156. Pedestrians may walk in the roadway, generally facing oncoming traffic and as far to the edge as practicable. When advisory shoulders are intended for use by pedestrians, they must meet accessibility guidelines for grade, cross slope, and surface stability. This may be challenging to achieve on existing roadway edges, due to surface irregularities or discontinuities.
- Advisory shoulders are not appropriate on streets with under-utilized on-street parking lanes. In these conditions, the parking lane space should be allocated for dedicated bike lanes.
- Advisory shoulders are considered experimental by FHWA, and implementation requires participation in the Request to Experiment process as described in section 1A.10 of the MUTCD. FHWA is accepting experiments under the name “Dashed Bicycle Lanes”.
- Supplementary signs with Advisory Shoulders may include, NO CENTER LINE (W8-12), NO PARKING ON PAVEMENT (R8-1), and/or two-way road sign (W6-3) (FHWA Rural Guide 2016, pg. 2-21).

Where no sidewalk is present, pedestrians may walk within advisory shoulders and should walk facing oncoming traffic.

Advisory shoulders are located within the travel area, outside of any on-street parking lanes. Additional width should be allocated to the advisory shoulder area when configured adjacent to parking.

Maintenance

The full travel area width, including advisory bike lanes, should be cleared of snow through routine snow removal operations.

References

FHWA. Manual on Uniform Traffic Control Devices. 2009.
FHWA. Bicycle Facilities and the MUTCD: Dashed Bicycle Lanes. 2017.
FHWA. Small Town and Rural Multi-modal Networks. 2016.

Further Guidance Available

FHWA MUTCD

FHWA Dashed Bike Lanes

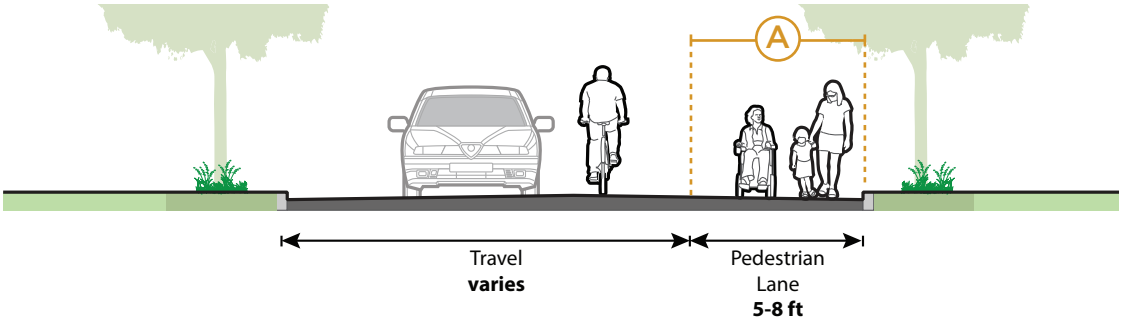
RURAL GUIDE

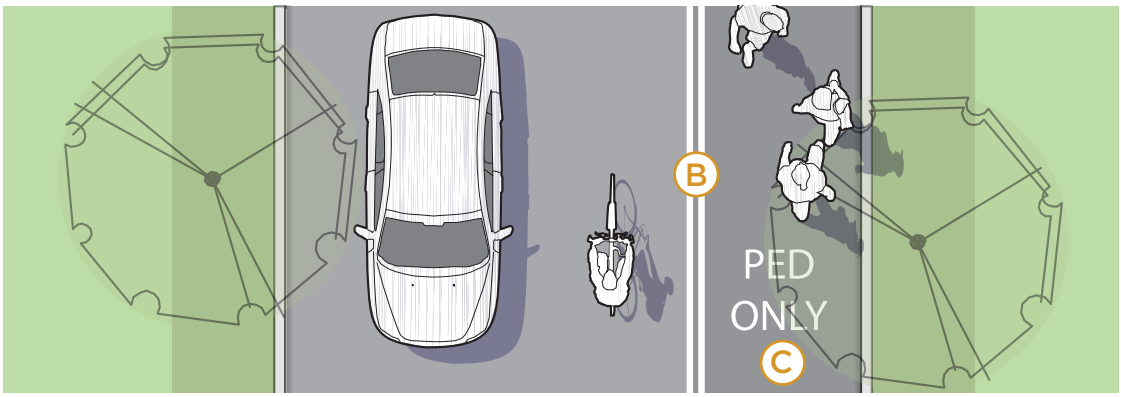
PEDESTRIAN LANE

A pedestrian lane is an interim or temporary facility that may be appropriate on roads with low to moderate speeds and volumes. The lane provides a space for pedestrians to walk and separated from motor vehicle traffic by roadway striping.

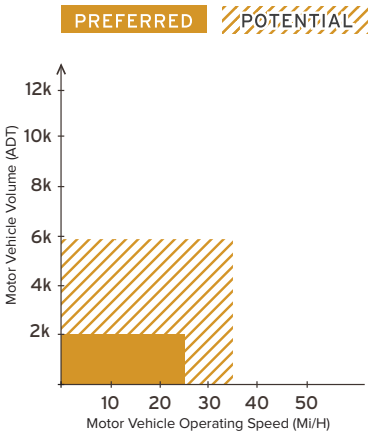
These roadways operate at low motor vehicle volumes and speeds, and where bicyclists are expected to travel in the roadway travel lane.

Although there are no current recommendations for this condition, its use should be considered when connecting residential and tourist areas to the trail via on-road facilities.





Typical Application



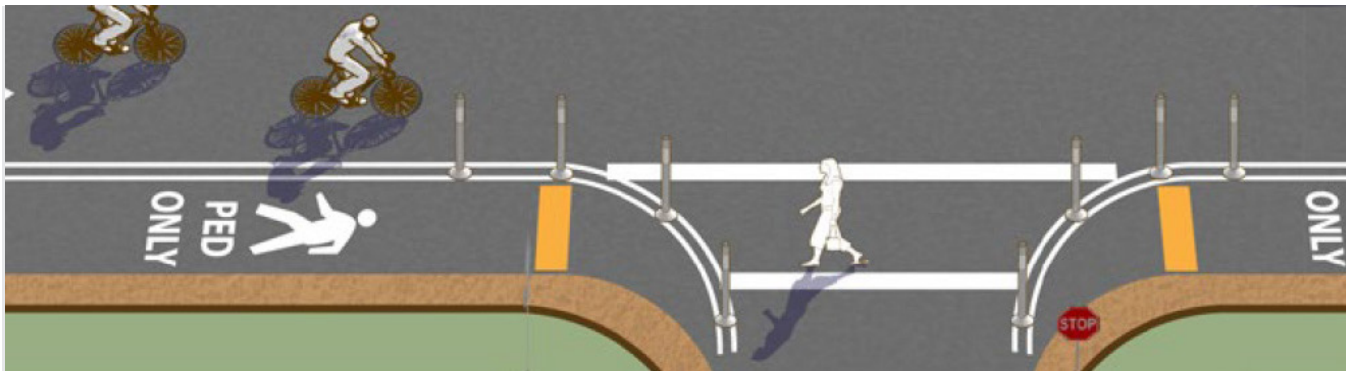
The NYSDOT HDM states that when, "sidewalks are not a feasible solution, the project designer must consider other pedestrian facility options", (p.18-16).

Design Features

- (A) Standard pedestrian lane width is 8 ft (2.4 m) to allow for comfortable two-way walking. Minimum width is 5 ft (1.5 m).
- (B) A pedestrian lane must be separated from the adjacent travel lanes with some form of lane delineation, such as a double white line. A marked buffer may also be used to provide additional separation.
- (C) "PED ONLY" markings must be white and be positioned laterally in the center of the lane (MUTCD 2009).
- Pedestrian Warning Sign (W11-2) paired with an "ON ROADWAY" legend sub plaque may be used to indicate to drivers to expect pedestrians within the paved road surface.

Further Considerations

- Because pedestrian lanes are intended for use by pedestrians, they must meet accessibility guidelines for grade, cross slope, and surface stability. This may be challenging to achieve on existing roadway edges, due to surface irregularities or discontinuities.
- Pedestrian lanes provide interim or temporary pedestrian accommodation on roadways lacking sidewalks. They are not intended to be an alternative to sidewalks and often will fill short gaps between other higher quality facilities. As part of the planning process, agencies should explore issues and the potential challenges a pedestrian lane may face, including: Detectability by people with vision disabilities; Undesired use by bicyclists; Accessible cross-slope requirements; Maintenance strategies, such as sweeping and snow removal.
- Implementing pedestrian lanes may share some strategies with the implementation of bicycle lanes. In some instances sufficient space to provide a pedestrian lane may already exist or may be created through configuration changes including removing or consolidating on-street parking, or narrowing of travel lanes.



To preserve the integrity and accessibility of crossings, detectable warnings should be used at street crossings, along with clearly marked crosswalks. Flexible delineators may be used to discourage motor vehicle encroachment at corners.
Source: FHWA Small Town and Rural Multi-modal Networks, 2016.

Maintenance

Pedestrian lanes should be cleared of snow and debris through routine maintenance operations.

References

FHWA. Manual on Uniform Traffic Control Devices. 2009.
FHWA. Small Town and Rural Multi-modal Networks. 2016.
United States Access Board. Proposed Guidelines for Pedestrian Facilities in the Public Right-of-Way. 2011.
NYSDOT. Highway Design Manual (HDM) Ch 18: Pedestrian Facility Design. 2006.

Further Guidance Available

FHWA MUTCD | **RURAL GUIDE** | **HDM** CH 18

ON-ROAD FACILITY CROSSINGS

SHARED ROADWAY MAJOR STREET CROSSINGS

Along the Sullivan O&W Rail Trail alignment, shared roadway facilities prioritize bicyclists along a roadway, and should also prioritize bicyclist and pedestrian crossings of major streets.

Crossing enhancements at major streets can use a variety of engineering tools to address user comfort, provide additional gap acceptance opportunities, and increase yield-to-pedestrian rates.

Shared Roadway Crossing Treatment Selection Quick Reference

Legend:
☑ = Desirable
EJ = Engineering Judgement
X = Not Recommended

	Cross Street Characteristics				
	Local	2 Lanes		4 or More Lanes	
		With Median	No Median	With Median	No Median
Marked and Signed Crosswalks	☑	☑	☑	X	X
Rectangular Rapid Flashing Beacon	X	☑	☑	EJ	X
Pedestrian Hybrid Beacon/ Traffic Signal	X	EJ	EJ	☑	☑

Treatment selection guidelines presented here are high-level recommendations only. Shared roadway crossings should follow similar crossing recommendations as shared use paths. Refer to the Sullivan O&W Rail Trail Crossing Treatment Selection Table in this guide or the NYSDOT Pedestrian Safety Action Plan for more detailed guidelines for selecting crossing treatments.

Typical Application

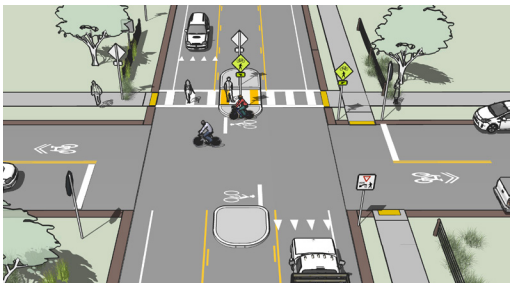
- Crossing treatments should be selected in response to motor vehicle volumes, speeds, sight lines, and number of lanes to cross.
- NCHRP 562 and the NYSDOT Pedestrian Safety Action Plan offers guidance and methodology for identifying appropriate crossing treatments at uncontrolled locations.

Design Features

- Median Refuge Islands decrease crossing distances and traffic exposure, allowing bicyclists and pedestrians to cross a roadway in two-stages.
- Rectangular Rapid Flash Beacons (RRFBs) may be used to enhance awareness of the crossing, and are effective at increasing motor vehicle yield-to-pedestrian rates. In some cases, bicyclists may benefit from motorist yielding behavior.
- A Pedestrian Hybrid Beacon (PHB), also called a HAWK Beacon, function similarly to a full traffic signal, and offer the highest degree of motorist stopping through the use of a red signal indication.

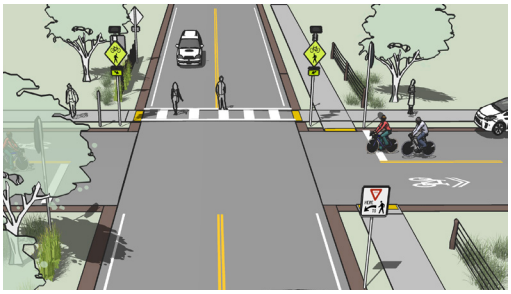
Further Considerations

- Median refuge islands may be designed to require horizontal deflection of the motor vehicle path. This should be used to slow motor vehicle speeds, which increases safety, improves sight lines, and increases yielding rates.



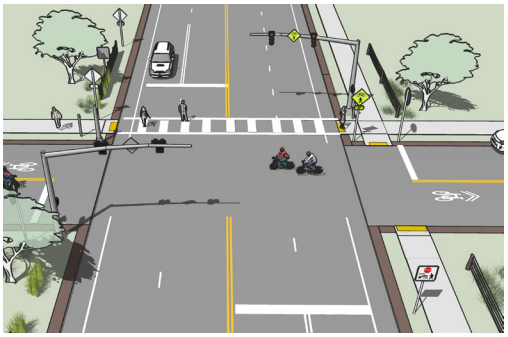
Median Island and Marked Crosswalks

Median islands can provide refuge for both bicyclists and pedestrians, while still allowing motor vehicle access.



Rectangular Rapid Flashing Beacons

RRFBs can increase yielding compliance over marked and signed crossings.



Traffic Signals

Signals are the best option for desirable motor vehicle stop/yield compliance rates to maximize safety of shared roadway crossings.

Maintenance

Median islands may collect debris and need additional cleaning maintenance. Median islands should be visible to snow plow crews, cleared of snow and kept free of snow berms that block access. Beacons should be regularly maintained to ensure that all lights and detection hardware are functional.

References

NCHRP Report 562. 2006.
NYSDOT. Pedestrian Safety Action Plan. 2006.
NYSDOT. HDM Ch 5 & Ch 18

Further Guidance Available

NCHRP 562

NYSDOT PSAP

BICYCLE LANE CROSSINGS

Key strategies for bicycle lanes at intersections are to:

- Provide adequate lines of sight
- Minimize exposure to conflicts
- Reduce speeds at conflict points
- Communicate right-of-way priority
- Maximize comfort for bicyclists

Bike Lane Crossing Treatment Selection Quick Reference

Legend:
☑ = Desirable
EJ = Engineering Judgement
X = Not Recommended

	≤35 mph			≥ 40 mph
	Peak Hour Right Turn Lane Volume			
	< 50 Veh/hr	50-150 Veh/hr	> 150 Veh/hr	All
Intersection Crossing Markings	☑	☑	EJ	EJ
Combined Bike Lane/ Turn Lane	X	☑	X	X
Added Right Turn Lane	X	EJ	EJ	EJ
Protected Bicycle Signal Phase	X	EJ	☑	☑

Typical Application

- Under most conditions, thru travelling bicyclists have priority over turning traffic. Traffic control markings and signs should support this priority and remind motorists of the obligation to yield.
- A variety of design treatments exist depending on the roadway configuration, available curb-to-curb width, traffic volumes, and desire to provided a dedicated turn lane.

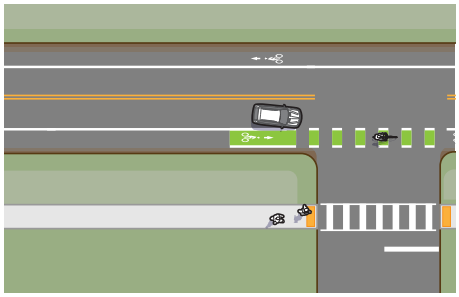
Design Features

Intersection treatments for bicycle lanes at intersections include:

- Intersection crossing markings
- Combined bike lane/turn lanes.
- Through bicycle lane at an added right turn lane.
- On the Sullivan O&W Rail Trail route, green colored pavement surfacing should be used within dotted bike lane extension where motor vehicles may cross bike lanes. Refer to FHWA Interim Approval 14 for more information.

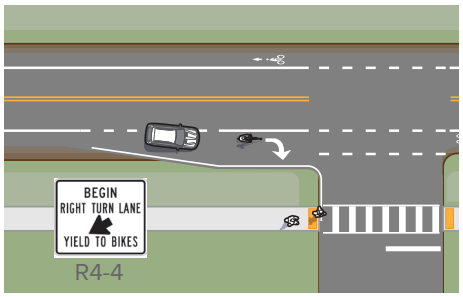
Further Considerations

- Dropped lanes, where a through lane transitions to the right turn lane, can be particularly challenging for bicyclists. The AASHTO Bike Guide suggests that "This scenario is the least preferred option and should be avoided where practicable", (p. 4-25).
- Where special emphasis is desired, green pavement color may be used within bike lanes where motor vehicles may cross bike lanes. Refer to FHWA Interim Approval 14 for more information on the of green colored pavement within bike lanes. Refer to the NACTO Bike Guide 2012 for information on colored pavement materials, installation, durability and cost (p. 125).



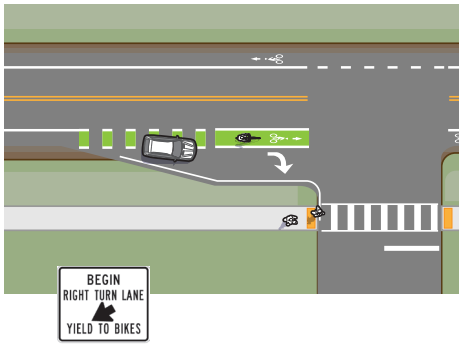
Intersection Crossing Markings

The MUTCD allows the use of a dotted line to define the path of bicyclists through intersections can guide bicyclists and alert motorists to the bike lane path (p. 371, 806).



Combined Bike Lane/Turn Lane

Where a right turn lane is desired but there isn't room to provide both a through bike lane and right turn only lane, a combined bike lane/turn lane creates a shared-lane condition in advance of the intersection.



Added Right Turn Lane

Where right turn lanes are desired, the MUTCD recommends providing a bike lane to the left of an added right turn lane (p. 806-808).

Maintenance

Bicycle lanes should be cleared of snow through routine snow removal operations.

References

AASHTO. Guide for the Development of Bicycle Facilities. 2012.
FHWA. Manual on Uniform Traffic Control Devices. 2009.
FHWA. Interim Approval for Optional Use of Green Colored Pavement for Bike Lanes (IA-14). 2011.
NACTO. Urban Bikeway Design Guide. 2012.

Further Guidance Available

AASHTO Bike Guide | **FHWA** MUTCD | **FHWA** IA-14 | **NACTO** Bike Guide

SIDEPATH CROSSINGS

Sidepaths can provide a high degree of comfort on long uninterrupted roadway segments, but have operational and safety concerns at driveways and intersections with cross streets.

Crossings should be designed to promote awareness, lower speeds, and facilitate proper yielding of motorists to bicyclists and pedestrians.

Sidepath Crossing Treatment Selection Quick Reference

	≤ 35		≥ 40 mph
	Constrained ROW or limited sightlines	Wide ROW	
Separated Crossing (16.5 ft) (5 m)	EJ	☑	EJ
Adjacent Crossing (6.5 ft) (1.9 m)	☑	EJ	EJ
Deceleration Lane with Adjacent Crossing (6.5 ft) (1.9 m)	X	EJ	☑

Legend:

Typical Application

- At controlled and uncontrolled sidepath crossings of driveways or minor streets.
- To increase the predictability of sidepath and road user behavior through clear, unambiguous right of way priority.

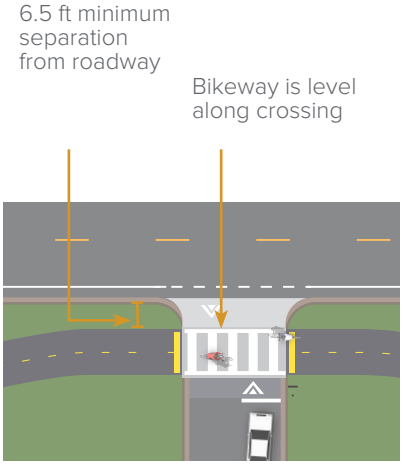
Design Features

- The sidepath should be given the same priority as the parallel roadway at all uncontrolled crossings. Geometric design should support this priority by providing clear sight triangles for all approaches of the crossing.
- Maintain physical separation to the crossing of 16.5 ft (5.0 m), 6.5 ft (2.0 m) min. (Schepers 2011). As speeds on the parallel roadway increase, so does the preference for wider separation distance.
- Maintain a level surface for the sidepath through the crossing, potentially as type of raised crosswalk.
- A high visibility crosswalk marking is recommended to indicate the through area of the crosswalk.
- Turning Vehicles Yield to Pedestrians sign (R10-15) is recommended in advance of turns across sidepath crossings to remind motorists to yield to path users.

Further Considerations

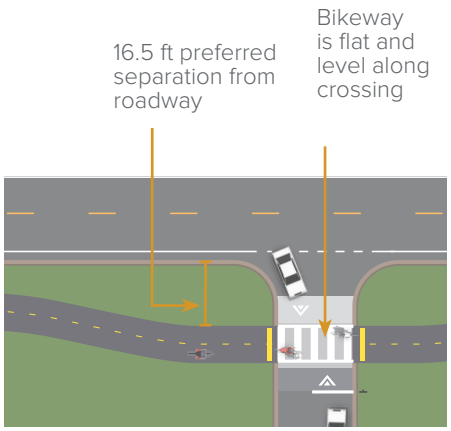
- NYSDOT EI 13-018 allows raised crosswalks at locations where shared use paths cross commercial driveways or ramps. Raised intersection crossings should be marked with a high visibility crosswalk, and configured with tactile warning indications.
- At uncontrolled crossings, such as driveways or minor street crossings, sidepaths should remain level, similar to a raised crosswalk, but no tactile warnings should be used. Crosswalk markings and crossing signs are not required unless it is considered necessary.
- Refer to the New York Highway Design Manual, Chapter 5 for clear site distances.

Adjacent Sidepath Crossing



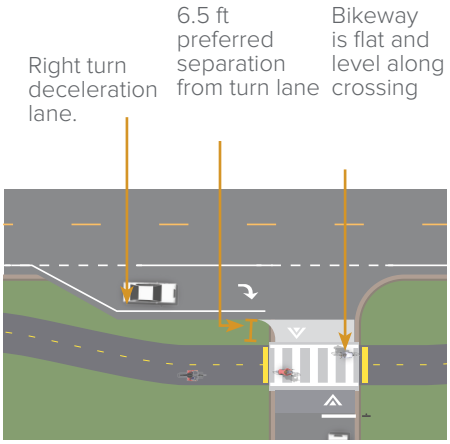
Where space is constrained or sight distance is limited, an adjacent crossing can promote visibility of path users.

Separated Sidepath Crossing



Where space is available, a separated crossing provides room for most motorists to yield to path users outside of the flow of through traffic.

With Declaration Lane



On high-speed roadways, a deceleration lane is recommended to allow motorists to slow down as needed to yield to path users.

Maintenance

Sidepaths should be cleared of snow through routine snow removal operations.

References

Schepers, J.P., Kroeze, P.A., Sweers, W., Wust, J.C., 2011. Road factors and bicycle-motor vehicle crashes at unsignalized priority intersections. Accident Analysis and Prevention, 43(3), 853-861.
NYSDOT. EI 13-018: Raised Crosswalks. 2013.

Further Guidance Available

NYSDOT EI 13-018

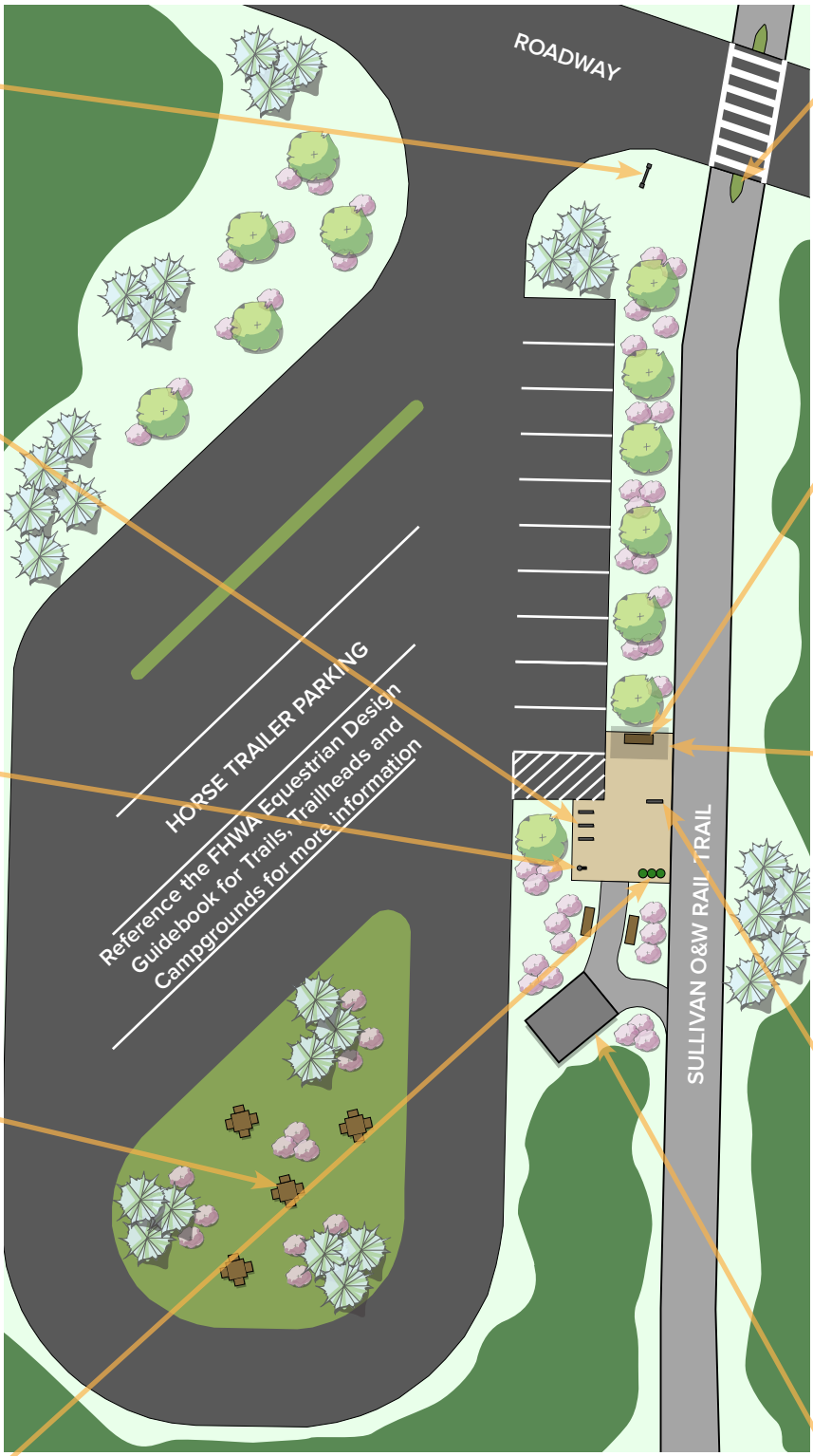
Vehicular Entry Sign

Bike Racks

Bike Repair Station

Picnic Tables

Trash + Recycling Receptacles



Bollard Alternative

Benches

Shade Structure

Information Kiosk

Double Vault Restroom

TYPICAL TRAILHEAD

Amenities along a trail present a consistent design for visitors. Benches, Plantings, or Pavement Materials together represent recognizable forms, patterns , colors, and textures that create a rhythm that contributes to a brand expression of safety, comfort, legibility, and community pride.

A conceptual trailhead is shown on page 6-80 to represent example amenities, which if possible should be consistent with other trailheads along the Sullivan O&W Rail Trail. Trailer parking for horses will not be necessary for all trailheads however, it is recommended for areas where horses are allowed on the trail. Scale of the trailhead will vary based on site availability. All elements selected should proportionately relate to the overall design, for instance, vehicular parking should not overwhelm the site and limit the use of valuable elements such as benches or bike racks.

Trailheads should be located in areas where there is shade but should be visible from the nearest road. Trailheads should provide ADA access to as many site features as possible and have access to potable water and electricity. If possible, trailheads should also include restrooms, and parking which has enough stalls and lanes to accommodate loading and off-loading bicycles and handicap users. Restrooms should be centrally located, easily accessible to both trail users and maintenance crews, and should be placed in such a way to discourage vandalism. The use of wayfinding and interpretive signs is recommended as appropriate for the site.

These trailhead amenities should be considered as "guidance" for future trailhead implementation and not strict rules. Each trailhead should be designed to suit the surrounding land use and follow local standards set forth by the local jurisdiction involved.

TRAILHEAD MATERIALS PALLETE

Serviceberry

Red Maple

Colorado Blue Spruce

Asphalt

Crushed Stone

Permeable Paving

TRAILHEAD AMENITIES

Restroom Access

Before adding restrooms to a trailhead, factors such as available land, access to water, access to public sewers or availability of land for septic fields, trailhead size, frequency of use, utility availability, and user need should be considered beforehand. Consultation with a structural and civil engineer, state building codes, health and safety codes, 2010 US DOJ Standards for Accessible Design, and local development codes (UDO) is required. The space for each restroom building depends on the number of toilets to be provided. Public restrooms require considerable maintenance and service.

Potable Water Access

Access to potable water is crucial for safety and trail enjoyment for multiple user types. Drinking fountains should be at least 5' from the trail edge and placed on well drained surfaces (for example: 2% concrete slab, with 3 inch gravel strip to prevent erosion). Durable and vandalism-resistant materials such as steel or stone should be considered for water fountains. "Auto off" features are also recommended to prevent waste, bowl overflow, and open lines. Potable sources of water should be identified along the trail alignment with spacing of five miles or less. As a best practice, spacing for drinking water access for long-distance trails ranges from 5-15 miles. If potable water access points are more than five miles apart, signs should be placed at potable water access points to indicate the distance to the next source.

Lighting

Lighting for trails should be analyzed per segment context in consideration of safety needs, sensitive habitats, trail function, and maintenance commitments. In general, lighting is not appropriate for trails in remote areas, trails with low use, or where there is little to no development. Street lighting can also improve visibility of crossings and trail users for motorists. Light may also be necessary for day-time use in trail tunnels and underpasses. Recommended locations for lighting include parking areas, trailheads, restroom facilities, major trail intersections, bridges, underpasses, tunnels, and street crossings.

Seating

Seating along trails provides a place for trail users to rest, congregate, contemplate, or people-watch along trails and throughout the trail system. Benches can be designed to create identity in a place or along the trail or be strictly utilitarian. Picnic tables provide places for trail users to congregate for meals or to just sit and relax. Seating should be placed a minimum of 3' from the edge of the trail, 4' from restrooms and drinking fountains, and be at least 2' from trash receptacles, light poles and sign posts. If possible, seating should be placed in shaded areas, especially when there is minimal shade available. The area around seating should slope away from the bench or picnic table. Benches should be placed where there are interesting views, and next to historical or educational trail elements. Finally all seating placement should consider accessibility, including grade leading to seating areas. Wheelchair access should be possible at some seating areas, especially along ADA accessible trail segments. ADA Standards for Accessible Design seating and turn radius should be considered for access to seating.

Trash + Recycling Receptacles

Trash and recycle receptacles provide for proper maintenance and appearance of the trail system. In rural areas or areas with a high concentration of wildlife, animal proof receptacles should be

considered. Wildlife, especially bears, are drawn to Trash and Recycling Receptacles. Receptacles should be placed at each trailhead and each seating area (1 per every 1 picnic table, 1 per every 2 benches). Placement of other receptacles will depend upon the location of concessions, facilities, areas for group activities, and the individual municipalities willingness and ability to monitor and maintain the receptacles. Receptacles should be selected depending upon the expected trash amount, maintenance program requirements, types of trail users, and durability.

Shade Structure

Shade structures create comfort and protection for all trail users from the rain and the sun. The orientation of structures should be considered to provide maximum protection from the elements. They can be placed in any setting (grass, concrete, asphalt, etc.) with considerations for ADA access to and into the structure. Plants may also be incorporated into the design of the structures especially where they can provide additional user benefits (vines or greenwall for cooling effect). Shade structures should not impede bicycle and/or pedestrian movement and shall be located adjacent to the trail (not within the travelway). Structures should also avoid blocking views of historic, natural, or cultural elements and incorporate other amenities especially benches and picnic tables.

Bicycle Parking

Short-term bicycle parking is meant to accommodate users departing in two hours or less. Bike racks should be placed adjacent to comfort stations, visitor centers, seating areas, and be weather protected where possible. The Association for Pedestrian and Bicycle Professionals (APBP) provides standards for bike rack design, spacing, and placement. Local, state, and federal codes should be consulted for additional count requirements and installation regulation. All bicycle parking shall permit the locking of the bicycle frame and one (1) wheel with a U-type lock, support the bicycle in a stable horizontal position without damage to wheels, frame, or components, and provide two (2) points of contact with the bicycle's frame. Bicycle parking facilities shall be securely anchored so they cannot easily removed and shall be sufficient strength and design to resist vandalism and theft. At minimum, bike racks should be 3' apart, and at least 2' away from the curb face to avoid 'dooring.' Bike racks should also be highly visible from adjacent bike routes and pedestrian traffic.

Bicycle Repair Station

Bicycle repair stations are self-serve kiosks designed to offer a complete set of tools necessary for routine bicycle maintenance. They should be at least 6' from the trail edge to allow room to repair bicycles. Stations should also be secured to a durable pad, such as concrete. Bicycle repair tools should be secured by high security cables, but can still be an attractive target for theft. Proper placement of kiosks in areas of high activity is one key strategy to reduce potential vandalism.

Plantings

Native vegetation along the Sullivan O&W Rail Trail provides visual interest as well as habitat for animals and insects that may use the corridor for migration or habitat. Planting plans should consider local guidance for canopy goals, habitat creation, stormwater best practices, screening, disease resistance, avoidance of invasive species, and maintenance requirements. Plantings should be used to provide a buffer between off-road segments of the trail and adjacent uses. Shade trees should be strategically placed near comfort stations to provide shade to seating areas and other amenities. Depending on the variety of vegetation planted, regular maintenance will be necessary.

Bike Repair Station

Bike Racks

Double Vault Restroom

Information Kiosk

Picnic Tables

Benches

Trash + Recycling Receptacles

TRAILHEAD IN EXTREME CONDITIONS

Liberty Trailhead

As a part of the feasibility study the project team explored the potential for a trailhead in Liberty, New York. The drawing to the left is a trailhead concept for a parcel in Liberty which sits between the proposed Sullivan O&W Rail Trail and a local road.

This concept is also a good example of a trailhead that sits in extreme conditions. In this location there is almost a 40' grade change from the Sullivan O&W Rail Trail to the road. To overcome this grade change the trailhead is designed with an ADA accessible winding pathway that does not exceed 5% slope. Gathering nodes are strategically placed in between the pathways to provide visitors with a level space for relaxing and recreating.

In similar situations where there is a steep slope, a trailhead concept similar to this one can be achieved so trail users can have a location to park their car, access the trail, rest, or play.

Fieldstone Retaining Wall

To help achieve ADA accessibility to the trail where there are steep slopes, retaining walls may be necessary. Fieldstone retaining walls, as depicted here, are an option to retain soil and also mantain consistency with the local materials vernacular along the Sullivan O&W Rail Trail.

WAYFINDING + SIGNAGE

A wayfinding system consists of comprehensive signage and pavement markings to safely guide users to their destinations along preferred routes. Signs throughout the network should indicate to users the direction of travel, the locations of destinations, and the travel time/distance to those destinations.

Components of a successful wayfinding system include standards for logos, color, typography, and symbols. All of these elements provide consistency across a range of sign types, including Trailhead identification signs, trail markers, mile markers, pedestrian directionals, regulatory signs, confidence markers, interpretive signs, and information kiosks. All created maps should employ the same symbols, fonts, color system, and style as the signs within the system. See chapter 7 for a detailed look at signage, wayfinding, and the consistent use of the Sullivan O&W Rail Trail logo.

Off-Road Signs

Off-road signs differ from on-road signs in that they are not intended specifically for vehicular visibility, but rather are directed towards pedestrians and cyclists, in general. This allows greater flexibility in font size, application and style.

Standard for Signs

Traffic control devices in New York on all streets, highways, bikeways, and private roads open to public travel are currently regulated by two documents: the National Manual on Uniform Traffic Control Devices for Streets and Highways (MUTCD) and 17 NYCRR Chapter V (New York Supplement) as well as the design standards set forth by the Americans with Disabilities Association (ADA).

MUTCD defines the standards used by road managers nationwide to install and maintain traffic control devices. This includes sign design specifications related to size, type and placement. It is considered a best practice to use MUTCD standards for the design and placement of off-road signs.

Each local jurisdiction may have additional requirements. During each phase of the project, design professionals should coordinate with the local jurisdiction to determine if there are any additional approval processes and procedures to take into account for the project.

Suggested Wayfinding Materials

Pressure Treated Wood

Painted Aluminum

Galvanized Steel

Kiosk

Kiosks should be placed at trailheads and trail access points and can serve as an education tool, trip planning device, regulatory information center, or interpretive sign for the entire trail system. Information placed on the sign will depend on the kiosks size and context.

Placement Notes:

A kiosk can also be placed near an access path from a parking area to the trail. If the trail is visible from the parking area, then it is recommended that the sign be placed adjacent to the trail. Kiosks should have 2 feet of clearance from the edge of the sign to the edge of the travel way. Kiosks should also be oriented in the direction of travel when possible to provide clarity for trail users.

Example Kiosk

Image Source: Walnut Creek Trail

Vehicular Entry Sign

This sign is intended as a primary trail identification sign for trailheads with parking facilities. This sign should be within clear view of vehicles traveling along the roadway with a plan to manage or clear surrounding vegetation to provide visibility.

Placement Notes:

When possible, this sign should be placed outside of the road right of way. Local jurisdictions should be contacted to comply with local codes for placement, design, and required vegetation. For night visibility retroreflective lettering is recommended for vehicle lights. The Vehicular Entry Sign should maintain a minimum distance of 2' from the edge of path or road.

Example Vehicular Entry Sign

Image Source: USDA - https://www.fs.usda.gov/recarea/crgnsa/recarea/?recid=29902

Interpretive Sign

Interpretive Signs provide trail users with information about the path, wildlife, vegetation, history and the significance of elements along the trail corridor. Interpretive Signs may also be combined with public art and sculpture opportunities along the path. Interpretive Signs are typically installed at Trailheads, vistas, or notable points along the trail. Interpretive signs primarily serve an informational or educational function. These signs should be clear, easy to understand, and engaging. Local historians or experts should be consulted when preparing content. Signs should also be weather-proof or protected from the elements and secured to the ground.

Some example areas for using an interpretive sign are historic train depots, natural features, historic tourist areas, and waterfalls.

Placement Notes:

The positioning of the sign should be based on existing site context and be oriented within clear view of the feature being described. The Interpretive Sign should have 2 feet of clearance from the edge of the sign to the edge of the travel way. Interpretive Signs along paved portions of the trail should be placed in paved bump outs to allow wheelchair accessibility. If space permits, locate one or two benches adjacent to the sign and oriented toward the relevant vistas. It is not recommended to plant at the base of this sign.

Example Interpretive Sign

Image Source: Behrends Group - https://www.behrendsgroup.com/projects/architectural-signs/business-signs/larch-park/

Trail Directional Sign

Trail Directional Signs serve as both navigation and encouragement programming devices. These signs are placed within communities to direct intended users, as well as potential new users, to the trail system. These signs will also build awareness of the system by creating a presence for the trail outside of the system. This sign typology may also be attached to posts of existing signs as well as to community light posts (with attachment modifications).

Placement Notes:

The Trail Directional Sign should have 2 feet of clearance from the edge of the sign to the edge of the travel way. The orientation of the sign should be perpendicular to the direction of travel. For night visibility retroreflective lettering is recommended for bike, patrol lights, emergency vehicle lights, or flash lights.

Example Directional Sign

Image Source: Alberta Water Fall Chasers - https://albertawaterfallchasers.com/2018/05/18/57-fan-falls-along-with-bonus-lowest-maligne-canyon-falls/

Trail Blaze - Post

Trail blazes are used to identify a given trail to users along its length to keep them oriented and certain of their location.

Placement Notes:

The Trail Post should have 2 feet of clearance from the edge of the sign to the edge of the travel way. For night visibility retroreflective lettering is recommended for bike, patrol lights, emergency vehicle lights, or flash lights.

Example Trail Blaze - Post

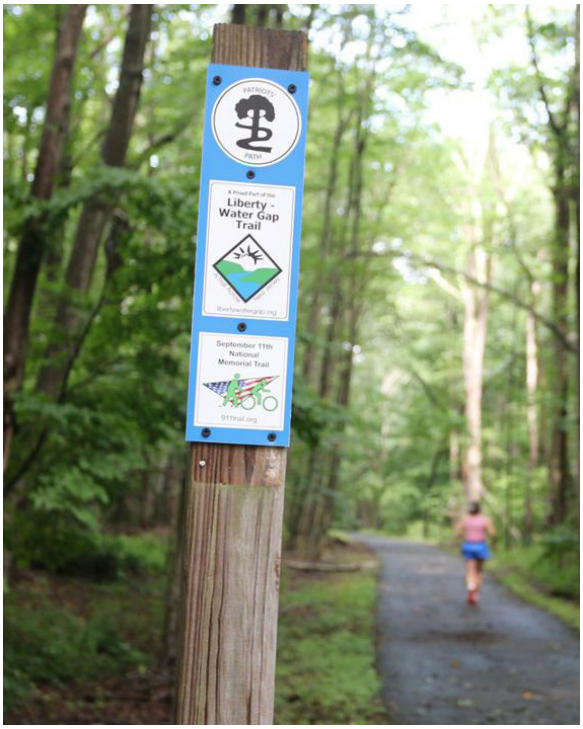


Image Source: New Jersey Hills Media Group - https://www.newjerseyhills.com/randolph_reporter/news/video-with-politics-in-mind-randolph-unveils-first-national-trail/article_b44207a0-7b45-5785-aa77-302f8db64c7e.html

Trail Blaze - Pavement

Pavement blazes are markings that reinforce user confidence and awareness of the identity of the trail along its length. Tread markings can be a variety of materials, including thermoplastic, paint, and vinyl decals, each with a variety of life span. Whichever product is chosen, they should be installed by a specialized contractor and per product specifications. Tread markings are best used in areas where directions are not needed but confirmation that users are still on the Sullivan O&W Rail Trail is still needed.

Placement Notes:

Pavement blazes can be used to indicate a variety of messages. Marking can be used after turns as confirmations, and at intervals along the trail as confidence markers. Tread markings should be placed in the center of the trail to minimize wearing from bicycle tires. The recommended minimum size for the trail blaze pavement marker is 18” by 18”

Example Trail Blaze - Pavement

Image Source: Johnny Cash Trail - https://www.yelp.com/biz_photos/johnny-cash-trail-folsom?select=UA73n9XjLr3kItzQRlY8AQ

Donor Recognition

Contributions from private entities can aid in building Trailheads, Access Points, and the main trail alignment. Private and corporate donors can also purchase or fund key trail elements from sign benches and trees to packages of multiple elements including shade structures, vegetation, benches, and picnic tables. Creation of a donor recognition program will encourage support of initial construction and maintenance of the Sullivan O&W Rail Trail. Larger donations can be encouraged by providing a tiered system of available options and levels of recognition.

"Discrete" and "Integration" are key concepts to remember when creating opportunities for recognition. Plaques or other "naming" features should not distract from the trail or Trailhead experience. Any naming features should also be well integrated into the existing design features with consideration for application on existing site features such as benches or other interpretive elements. Placement and design should be finalized prior to construction and consider the possibility of additional donors after construction is complete.

Sample Naming Features

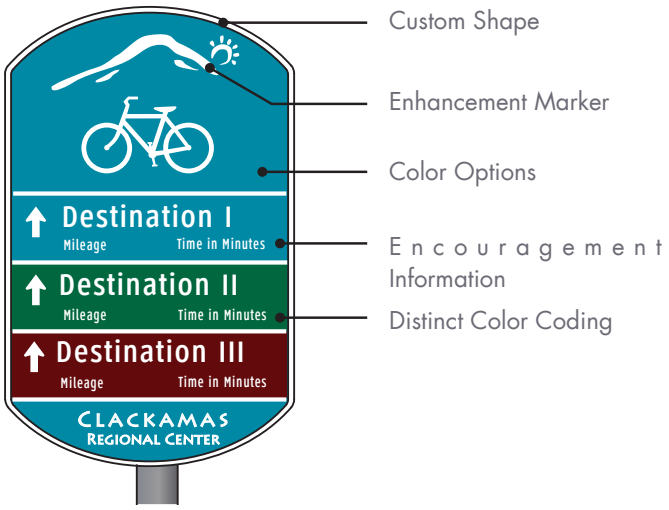
COMMUNITY WAYFINDING

Wayfinding signs that allow for an expression of community identity and pride, reflect local values and character, and may provide more information than signs which strictly follow the basic guidance of the Manual on Uniform Traffic Control Devices (MUTCD). Section 2D.50 of the MUTCD describes community wayfinding signs as follows:

- Community wayfinding guide signs are part of a coordinated and continuous system of signs that direct tourists and other road users to key civic, cultural, visitor, and recreational attractions and other destinations within a city or a local urbanized or downtown area.
- Community wayfinding guide signs are a type of destination guide sign for conventional roads with a common color and/or identification enhancement marker for destinations within an overall wayfinding guide sign plan for an area.

Sullivan County has an opportunity to use community wayfinding signs to direct trail users from the trail to key local destinations in the many hamlets, villages, and towns along the Sullivan O&W Rail Trail.

The design of the directional arrows shown below provide clarity and are approved by the FHWA. The standard arrow has been deemed by engineering study to have superior legibility. Enhancement markers may occupy up to 20% of the sign face on the top or side of the sign (for additional information see pg. 5-8, Wayfinding Navigation Elements).



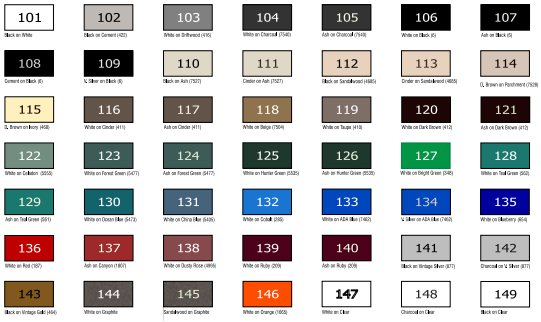
Flexible directional or decision sign incorporating community wayfinding standards.

Colors

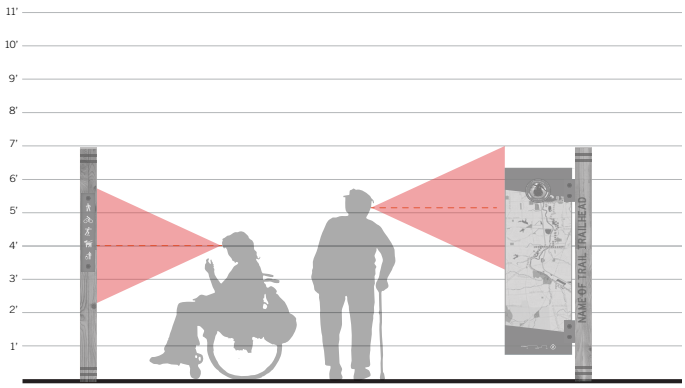
Per the community wayfinding standards, (see MUTCD section 2D.50) color coding may be used on wayfinding guide signs to help users distinguish between multiple potentially confusing traffic generator destinations located in different neighborhoods or subareas within a community or area. Community wayfinding guide signs may use background colors other than green in order to provide a color identification for the wayfinding destinations by geographical area within the overall wayfinding guide signing system.

ADA and Equality Guidelines

It is important to consider accessibility and legibility of the sign graphics and how people of all abilities will interact with the signs. In addition to the Manual on Uniform Traffic Control Devices (MUTCD), Americans with Disability Act (ADA) provides guidelines for the creation of sign graphics, including the color and finish, sign and text height, hierarchy, and size.



Above are color combinations that meet ADA contrast guidelines. Actual colors may vary from the presented colors. Graphic courtesy of Sign of our Times.



Limits of Protruding Objects

Text Colors and Finish

Low-contrast signs with a glossy finish are difficult to read at a distance as the colors can visually blur together and may create difficulty for readers due to sun glare bouncing off the sign. For this reason it is important to choose high-contrast colors between the sign message and background color, as well as a matte or similar finish to either sign face.

Sign Height and Message Hierarchy

The height and hierarchy of the sign message and graphics should be based on distance from the sign and speed of travel. Hierarchy can be created by prioritizing the message and graphic by sizing according to which are to be read at a greater distance, and which are for readers adjacent to sign. This is illustrated in the graphic on the bottom of this page and is applicable for pedestrian directionals, kiosks, maps, and interpretive signage.

A bicyclist traveling by a sign can obtain less information than a pedestrian standing next to the sign. It is permissible to use shorter text height and longer messages on kiosks, maps, and interpretive signage compared to directional or mile marker. Per MUTCD 2D.50.32., emails, URLs, QR codes, and other web access information can only be used on select pedestrian signage, as it is illegible and distracting for motorist and bicyclist.

The height of sign messages should reflect the of the height of the readers, and consider users of all abilities. For this plan, health and equity is critical and therefore signs are designed to acknowledge users of varying abilities. Maps are placed for visual clarity at both seated level, for people in a wheelchair, and standing height, for people using a cane or walker.

Text Lettering and Size

It is considered a best practice to use Highway Gothic font, as well as uppercase and lowercase lettering for legibility and clarity. Lettering size can vary depending on legibility distance. The MUTCD states that an accepted “rule-of-thumb” to follow for legibility other than Interstate is to have 1 inch (25mm) of letter height for every 40 feet (12 m) of desired legibility. Overall, MUTCD recommends 2” lettering height as a minimum for the major messages, such as destinations, with 1 ½” minimum text height for minor text, such as mileage and distance labels, as shown in the graphic to the right.

This chart is used to determine the required letter height per ADA. The mounting height of the sign should be determined first, then the average distance that someone will be reading the sign.

Graphic courtesy of Sign of our Times.

Flexibility In Standards

Both the FHWA and USDOT have made statements in recent years encouraging a flexible approach in support of facilities for biking and walking:

"...DOT encourages transportation agencies to go beyond the minimum requirements, and pro-actively provide convenient, safe, and context-sensitive facilities that foster increased use by bicyclists and pedestrians of all ages and abilities, and utilize universal design characteristics..." (2010)

Federal Highway Administration's (FHWA) support for taking a flexible approach to bicycle and pedestrian facility design. (2013)

While the MUTCD provides standards and guidelines for the design, size, and content of wayfinding signs, many jurisdictions have implemented unique signs to enhance visibility while reinforcing local identity. The MUTCD Spectrum figure to the right shows a range of wayfinding elements that have been implemented by municipalities around the nation. The range extends from rigid MUTCD on the left to the more flexible options on the right. Signs which adhere to the MUTCD basic minimum standards are readily understood by a wide audience, economical, and simple to fabricate and maintain. These signs also are clearly eligible to be implemented utilizing federal transportation funding sources.

The graphic below illustrates a continuum between signs that rigidly follow MUTCD guidance and signs that are influenced by MUTCD guidance.

- MUTCD compliant signs could more concisely convey directional information with a single sign.
- Regional context or local identity not present.

- D1 series signs consolidated into a single sign reduces the number of signs required, overall sense of sign clutter and sign dimensional variation.
- MUTCD does not provide for travel times however numerous cities (Portland OR, Eugene OR, Milwaukee OR, Nampa ID, Columbus, OH and Jackson WY) offer this additional information.

- Community signs may be augmented by unique system or municipality identifiers or enhancement markers as per Section 2D.50.
- MUTCD allows for custom framing as well as color variations for community wayfinding signs.

- MUTCD allows color variations for community wayfinding signs.
- The MUTCD allows custom framing and support structures. Sign graphic content, colors, and layout to be as per standards.

- MUTCD inspired sign.
- Includes clear directional information, high contrasting text, facility name, directional arrow, user icons, and custom framing.

alta PLANNING + DESIGN

SULLIVAN O&W RAIL TRAIL

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ON-ROAD SIGNS - EXAMPLES

Destination Sign

Destination signs lead trail users to nearby attractions and amenities. The MUTCD recommends that Destination signs contain a maximum of three destinations. Additional signing should be used, as necessary, to ensure that trail users are properly guided to their destination.

Typical Application

Destination signs should be placed so that bicyclists have sufficient time to comprehend the sign and change their course, if necessary. See Figure 2D-6 in the MUTCD for information on the proper sequencing of guide signs. Destination signs may be placed with a Route Sign Assembly, as per Section 9B.22.08 of the MUTCD.

Confirming/Reassurance Assembly

Confirming/Reassurance assemblies consist of a Facility sign and an optional Cardinal Direction auxiliary sign. A Confirming assembly is used beyond an intersection to confirm that a user has made the correct route choice. A Reassurance assembly is used between intersections to assure a user that they're continuing on the correct route.

Typical Application

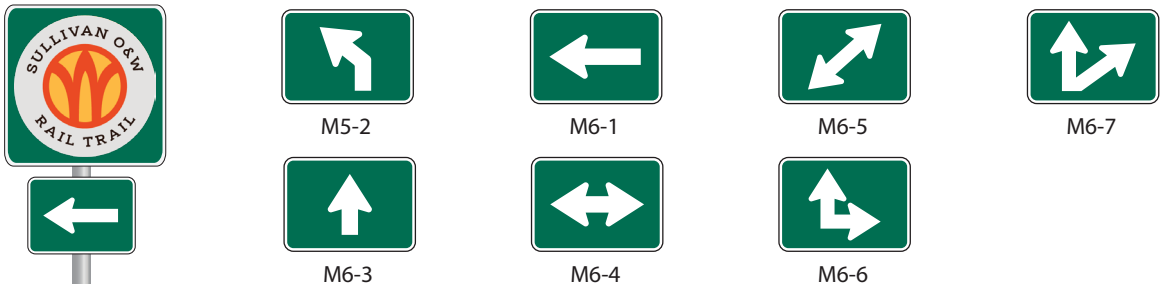
A Confirming assembly should be placed just beyond intersections where either a turn has been made, or a user may doubt their decision. Reassurance assemblies should generally be used at one-mile intervals in urban areas, and two-mile intervals in rural areas.

Route Sign Assembly

Route Sign assemblies are used to identify the route, and indicate directional changes. See Section 2D.29 in the MUTCD for an explanation of the different types of Route Sign assemblies that may be used.

Typical Application

A Route Sign Assembly should be placed so that bicyclists have sufficient time to comprehend the sign and change their course if necessary



Blaze

Blazes serve as informational identifiers for users. They are visual identifiers to make users aware of the route the Sullivan O&W Rail Trail follows, reveals that the trail is part of other systems, and to inform the user who might be unaware that they are on a section of the Sullivan O&W Rail Trail and more.

Typical Application

Blazes may be added to existing sign supports after permission has been obtained from the owner of the sign. Only guide sign supports may be used; it is not permissible to add a blaze to a regulatory or warning sign. Blazes may also be affixed to other types of objects along the highway (e.g., utility poles) after permission has been obtained from the owner of the object. Liberal use of blazes is encouraged to brand the corridor, but blazes should never attempt to guide traffic on their own.

Vehicular Guide Sign

A Vehicular guide sign is a type of Destination sign that provides a highway user with information concerning destinations that can be reached by way of both numbered and unnumbered routes.

Typical Application

See Chapter 2D in the MUTCD for guidance on sign placement.