



DESIGN GUIDE

OCTOBER 10, 2017



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REFERENCED SOURCES

The following sources were consulted in the creation of this Design Guide.

- [AASHTO. *A Policy on the Geometric Design of Highways and Streets*. 2011.](#)
- [AASHTO. *Guide for the Development of Bicycle Facilities, 4th Edition*. 2012.](#)
- [AASHTO. *Guide for the Planning, Design, and Operation of Pedestrian Facilities, 1st Edition*. 2004.](#)
- [AASHTO. *Standard Specifications for Highway Bridges*. 2002](#)
- [Americans with Disabilities Act.](#)
- [APBP. *Bicycle Parking Guide 2nd Edition*. 2010.](#)
- [Architectural Barriers Act.](#)
- [FHWA . *Proven Safety Countermeasures*. 2012.](#)
- [FHWA MUTCD. *Interim Approval for Optional Use of a Bicycle Signal Face \(IA-16\)* 2013.](#)
- [FHWA, *Incorporating On-road Bicycle Networks into Resurfacing Projects*, 2015.](#)
- [FHWA. *Achieving Multimodal Networks: Applying Design Flexibility and Reducing Conflicts*. 2016.](#)
- [FHWA. *Bicycle Facilities and the MUTCD: Dashed Bicycle Lanes*. 2017.](#)
- [FHWA. *Interim Approval for Optional Use of Green Colored Pavement for Bike Lanes \(IA-14\)*. 2011.](#)
- [FHWA. *Interim Approval for Optional Use of Rectangular Rapid Flashing Beacons \(IA-11\)*. 2008.](#)
- [FHWA. *Manual on Uniform Traffic Control Devices*. 2009.](#)
- [FHWA. *Pedestrian Hybrid Beacon Guide: Recommendations and Case Study*. 2014.](#)
- [FHWA. *Public Rights-of-Way Accessibility Guidance*. 2011.](#)
- [FHWA. *Rails-with-Trails: Lessons Learned*. 2002.](#)
- [FHWA. *Separated Bike Lane Planning and Design Guide*. 2015.](#)
- [FHWA. *Small Town and Rural Multimodal Networks*. 2016.](#)
- [FHWA. *Wetland Trail Design and Construction*. 2007.](#)
- [Flink, C. *Greenways: A Guide To Planning Design And Development*. 1993.](#)
- [IDA \(International Dark Sky Association\).](#)
- [K. Fitzpatrick, et al., *Safety Effectiveness of the HAWK Pedestrian Crossing Treatment*. 2010.](#)
- [NACTO. *Urban Bikeway Design Guide, 2nd Edition*. 2012.](#)
- [National Park service. *Logical Lasting Launches*. 2012.](#)
- [National Park Service. *Prepare to Launch!*. 2014.](#)



[*Native Species Planting Guide for New York City and Vicinity, NYC Parks.*](#)

[*NCHRP 766: Recommended Bicycle Lane Widths for Various Roadway Characteristics. 2016.*](#)

[*NCHRP Report 562. Improving Pedestrian Safety at Unsignalized Crossings. 2006.*](#)

[*North Country Trail Handbook for Trail Design, Maintenance and Construction. 1998, NPS.*](#)

[*NYCDOT. Street Design Manual. 2015.*](#)

[*NYS Department of Environmental Conservation, State Protected Plants.*](#)

[*NYS. Standards and Guidelines for Trails in NYS Parks. 2010.*](#)

[*NYSDOT Highway Design Manual.*](#)

[*NYSDOT State Supplement to the Manual on Uniform Traffic Control Devices. 2009.*](#)

[*NYSDOT Traffic Safety and Mobility Instruction. 2013.*](#)

[*NYSDOT. Bridge Manual. 2008.*](#)

[*NYSDOT. Instructions, Bulletins, and Directives.*](#)

[*NYSDOT. Pedestrian Safety Action Plan. 2016.*](#)

[*NYSDOT. Project Development Manual. 2004.*](#)

[*NYSDOT. Standards Sheet.*](#)

[*Oregon Department of Transportation \(ODOT\). Neighborhood Street Design Guidelines. 2000.*](#)

[*Rails to trails conservancy \(RTC\). America's Rails-with-Trails. 2013.*](#)

[*Rails-to-Trails Conservancy \(RTC\). Trails for the Twenty-First Century, 2nd Edition. 2001.*](#)

[*Recommended Urban Trees: Site Assessment and Tree Selection for Stress Tolerance, Nina Bassuk, Cornell University, Urban Horticulture Institute, 2003, 2011.*](#)

[*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.*](#)

[*Trees of New York State, Native and Naturalized, Donald Leopold, Syracuse University Press, 2003.*](#)

[*US Access Board, ADA Accessibility Guidelines, 2004.*](#)

[*US Access Board. Proposed Guidelines for Pedestrian Facilities in the Public Right-of-Way. 2011.*](#)

[*US Forest Service. Trail Construction and Maintenance Notebook. 2007.*](#)

[*Zeeger, C., J. Stewart, and H. Huang. Safety Effects of Marked Versus Unmarked Crosswalks at Uncontrolled Locations. 2005.*](#)

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INTRODUCTION + BRAND FRAMEWORK



INTRODUCTION

In January, 2017, Governor Andrew Cuomo announced the new Empire State Trail initiative. The enacted FY2017-18 New York State budget appropriates \$200 million for construction of the trail. Upon completion in 2020, the Empire State Trail will be a continuous 750-mile bicycling and pedestrian path which will span the state from New York City to Canada and Buffalo to Albany, creating the longest multi-use state trail in the nation.

The “Empire State Trail Plan,” released as a draft in August, 2017, provides an overview of the trail, describes the initiative’s goals, and provides detailed maps of the entire trail route. The draft can be downloaded from the Hudson River Valley Greenway’s website.

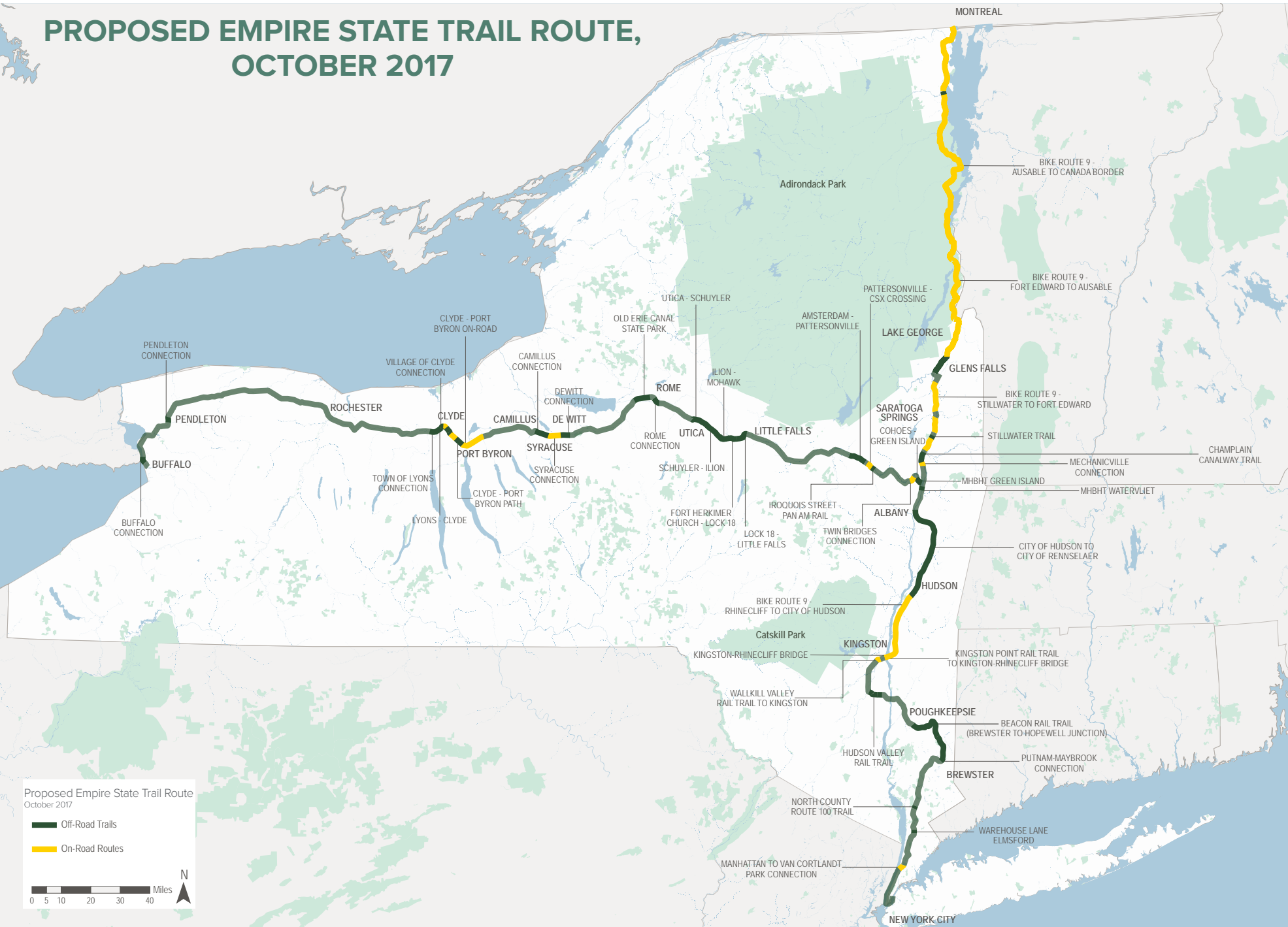
This Design Guide is a companion document to the Empire State Trail Plan. The Design Guide provides all the tools, references, and standards that can be used by communities across the state to create an epic trail experience for users of all types, for generations to come.

While the Design Guide is written in language meant to be informative to anyone interested in the Empire State 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 Empire State Trail. The Design Guide is a compilation of the latest “state of the art” 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.





PROPOSED EMPIRE STATE TRAIL ROUTE, OCTOBER 2017



Proposed Empire State Trail Route
October 2017

- Off-Road Trails
- On-Road Routes

0 5 10 20 30 40 Miles

N

BRAND STATEMENT

The brand statement sets the tone for all trail experiences - from outreach and marketing materials to the trail tread. This statement is a reflection of how users will perceive the Empire State Trail.

New York State celebrates boldness and diversity — cultural, physical, social, geographic — and welcomes experiences that weave these qualities together. The magnitude of the Empire State Trail isn't measured only in its unrivaled 750-mile length. On a human level, the Trail connects people to New York's natural beauty, rich cultural heritage, and unparalleled outdoor recreation opportunities.

The Empire State Trail provides New Yorkers and visitors the freedom and opportunity to explore and embrace New York's special places, diverse history, and iconic landscapes. The Trail promotes healthy lifestyles and provides a place for friends and families to experience everything the Empire State has to offer — connecting urban centers, village main streets, and rural communities spanning the state from New York City through the Hudson River Valley, west to Buffalo along the historic Erie Canal, and north to the Champlain Valley and Adirondacks.

The Empire State Trail connects us all to New York's extraordinary experiences, people, and places.



LOGO



ACCEPTABLE LOGO VARIATIONS



COLOR PALETTE

100/80/6/32

0/32/100/0

86/45/79/49

TYPEFACE

PROXIMA NOVA BOLD

Aa Bb Cc Dd Ee Ff Gg Hh Ii Jj Kk Ll Mm Nn Oo Pp Qq Rr Ss Tt Uu Vv Ww Xx Yy Zz

PROXIMA NOVA LIGHT

Aa Bb Cc Dd Ee Ff Gg Hh Ii Jj Kk Ll Mm Nn Oo Pp Qq Rr Ss Tt Uu Vv Ww Xx Yy Zz

BRAND FORMATION

One of the most important functions of the brand is to provide a cohesive look and feel for materials and messaging while respecting the existing brand of sections of the trail. This will be accomplished through hierarchy of brand and the addition of brand blazes to existing signage. The Champlain Canal Greenway, Hudson River Valley Greenway, and Erie Canalway are already recognizable brands within the Empire State Trail and will be the primary brand along those sections of the trail and the Empire State Trail brand will be secondary. See Wayfinding + Signage Chapter for brand placement on signage.





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WAYFINDING + SIGNING



INTRODUCTION

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 maps should employ the same symbols, fonts, color system, and style as the signs within the system.

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.

STANDARDS 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.

TYPICAL MATERIALS



GALVANIZED STEEL



CORINTHIAN GRANITE

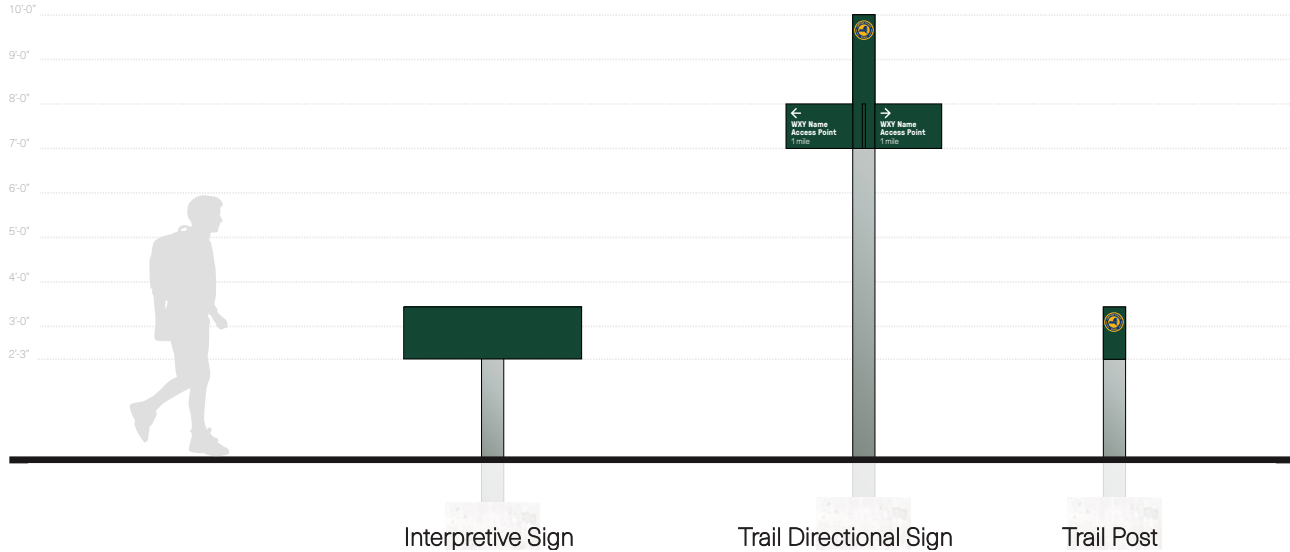
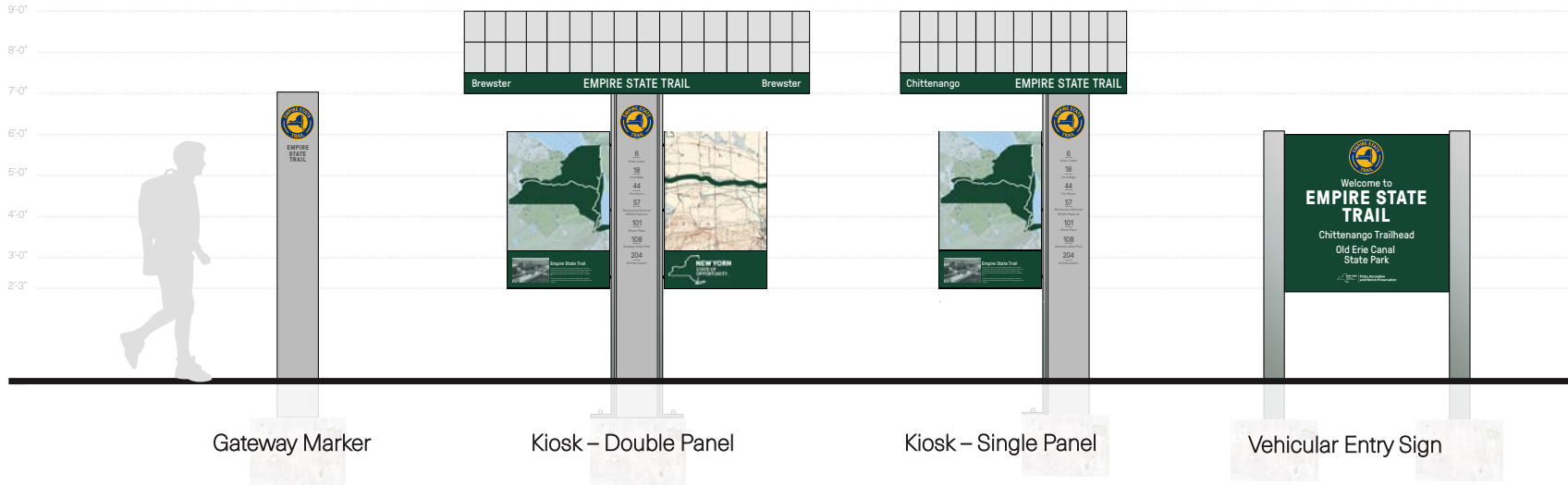


PAINTED ALUMINUM

Detailed Design Intent Drawings are available for both off- and on-road sign packages. Please request most recent Design Intent, Shop Drawings, or other technical drawings prior to fabrication and installation.



OFF-ROAD SIGNS



Plan View

Trail Blaze - Pavement

SIGN RELATIONSHIP DIAGRAM

The below diagram illustrates how the combination of sign types can be used in a typical Gateway. Care should be taken to be mindful of arrival sequencing for all modes of transportation. Sign placement should be useful, visible, and used strategically to avoid unnecessary clutter.





GATEWAY MARKER

The Gateway Marker should be used as a simple totem, used at larger Gateway or Trailhead sites, announcing the presence of the trail. The marker should be placed in a prominent and central location, ideally within view of the trail entrance.

PLACEMENT NOTES

Provide 2 feet of clearance from the edge of the sign to the edge of the travel way.

TECHNICAL NOTES

Granite stone post or column has rough carved finish on sides and honed finish on front. Front and back have inset medallion logo.

Column is pinned and secured to concrete base with stainless or metal angles. Granite should coordinate with landscape benches, Trailhead, or Gateway kiosks. Local quarried stone is recommended.

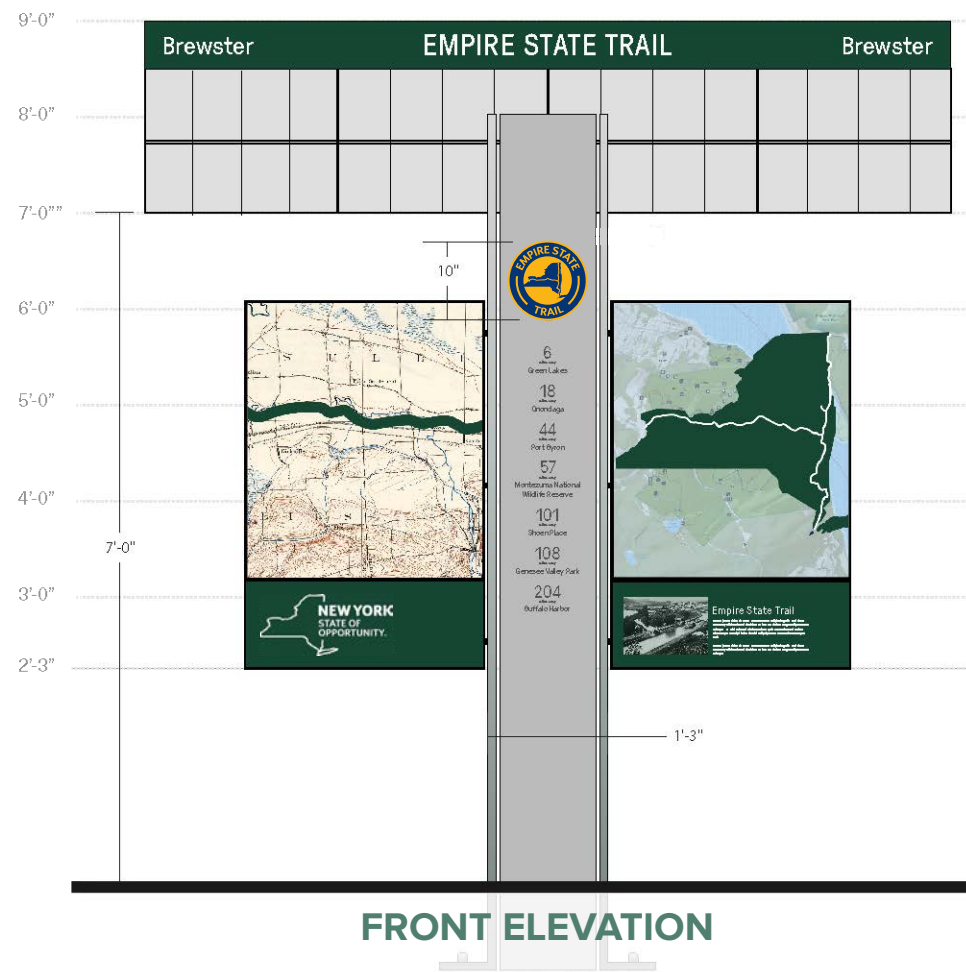


KIOSK-DOUBLE PANEL

Kiosks should be placed at Gateway to serve as system-wide education tools, trip planning devices, regulatory information centers, and interpretive signs. Maps should include the entire trail network and indicate where the user is located within the system.

PLACEMENT NOTES

- Place kiosk within plaza as illustrated on the typical Gateway and Trailhead drawings in Section Three.
- If not located within a plaza, locate at or near the access path from the 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.
- Consider orientating the kiosk to accommodate the possible future addition of solar panels.
- Consider orientating the kiosk to properly shade panels for legibility.
- Provide 2 feet of clearance from the edge of the sign to the edge of the travel way.
- Maps should be oriented in the direction of travel when possible to provide clarity for trail users.

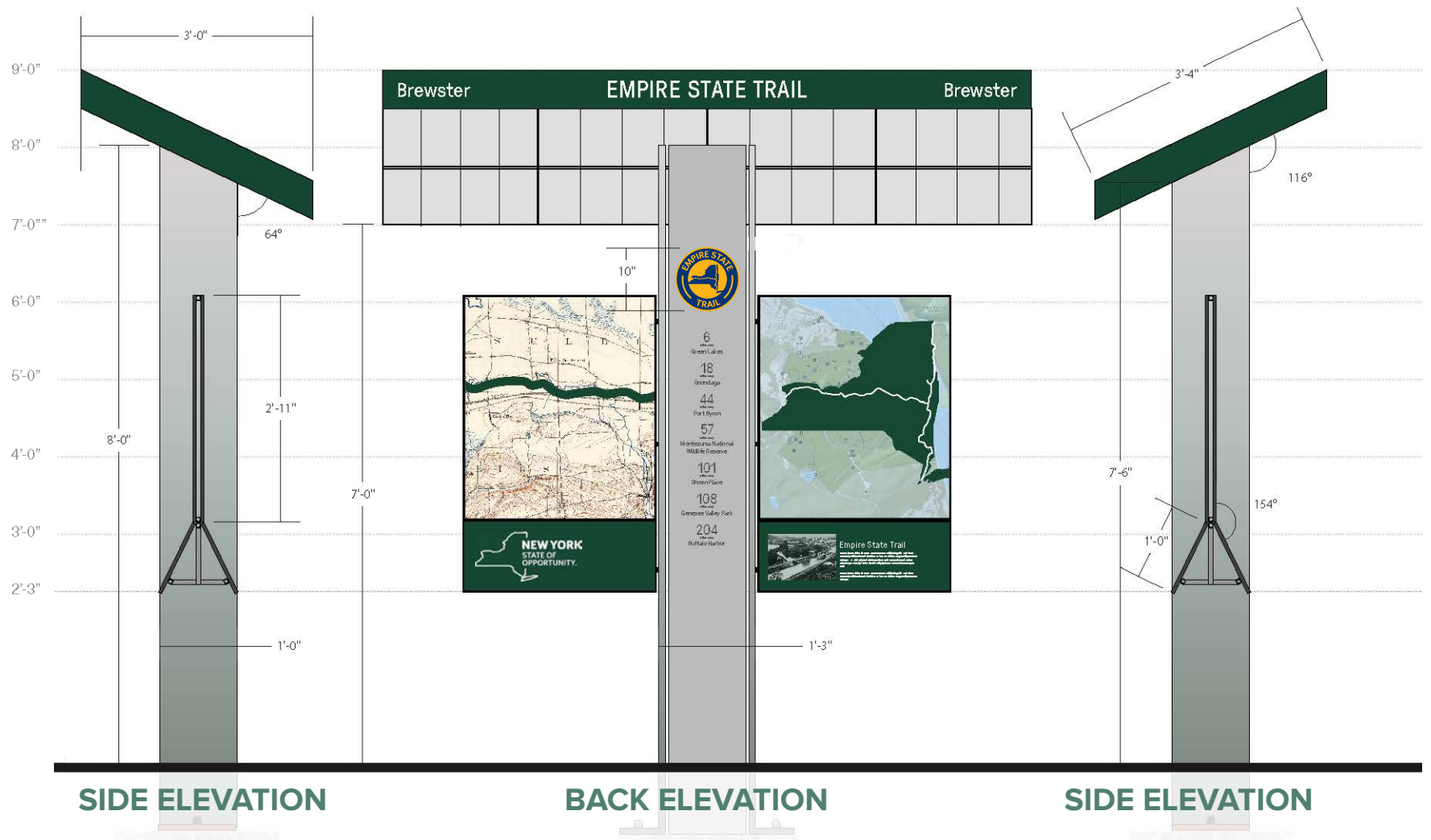




ADDITIONAL DETAILS

The main vertical element is stone with an inset EST logo medallion and sandblasted mileage to key destinations along the trail. Destination mileage will be customized for each application.

The Kiosk-Double Panel provides space for additional interpretation, local maps, and local information tailored to trail user needs and interests.

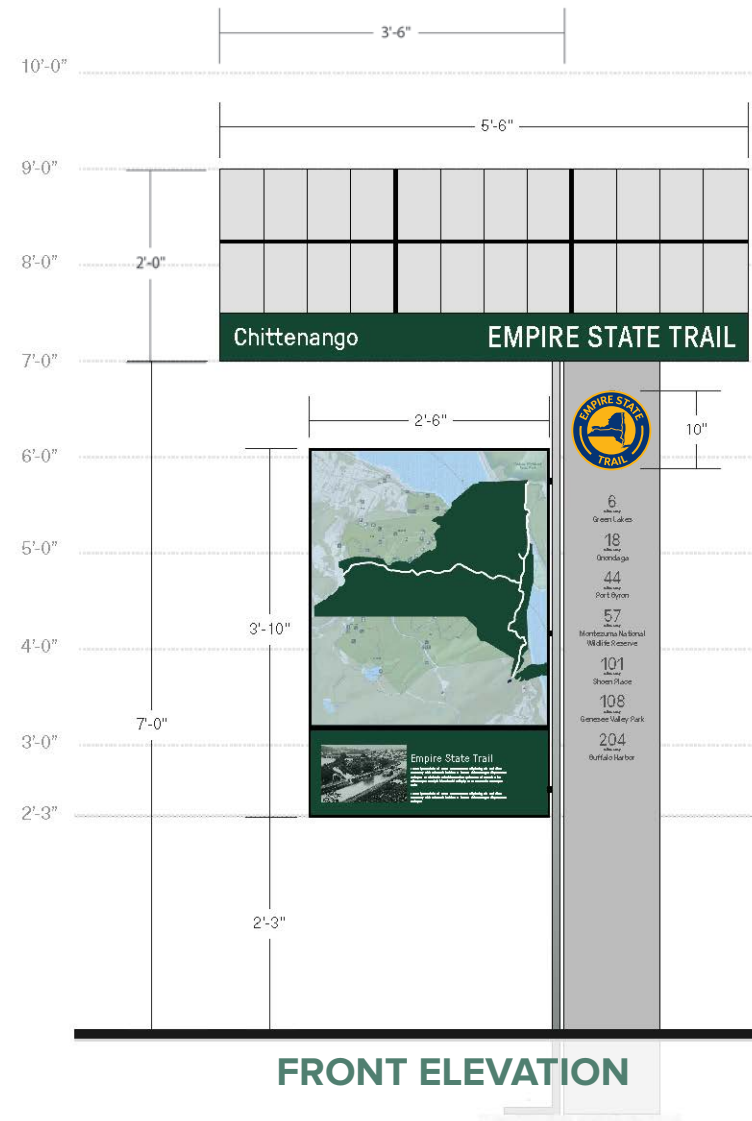


KIOSK-SINGLE PANEL

The single panel kiosk should be used in the same manner as the double panel. Use of the single or double panel kiosk is at the discretion of the designer. Considerations should be taken to provide ample circulation around the kiosk and nearby seating. The single panel kiosk can also be used as an interpretive sign if deemed appropriate for the context and interpretive element.

PLACEMENT NOTES

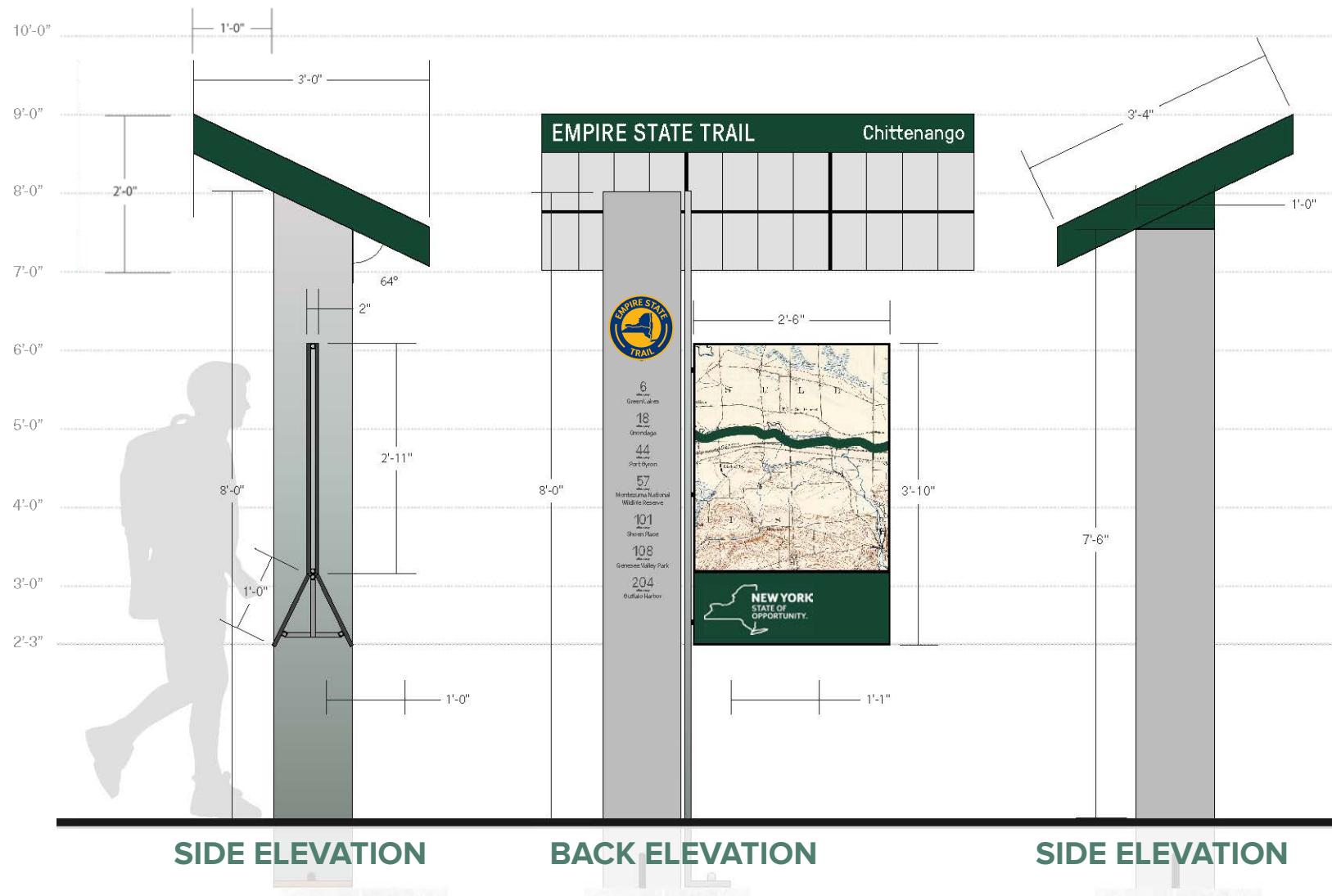
- Place kiosk within plaza as illustrated on the typical Gateway and Trailhead drawings in Section Three.
- If not located within a plaza, located at or near the access path from the parking area to the trail. If the trail is visible from the parking area, then it is recommended that the sign be placed adjacent to the trail.
- Orientate the kiosk for maximum sun exposure to accommodate the possible future addition of solar panels.
- Consider orienting the kiosk to properly shade panels for legibility.
- Provide 2 feet of clearance from the edge of the sign to the edge of the travel way.
- Maps should be oriented in the direction of travel when possible to provide clarity for trail users.





ADDITIONAL DETAILS

The main vertical element is stone with an inset EST logo medallion and sandblasted mileage to key destinations along the trail. Destination mileage will be customized for each application.



TECHNICAL NOTES (FOR DOUBLE paneled + SINGLE paneled KIOSK)

Kiosk, both double and single paneled, are composed with concrete foundation, stone column, vertical structural support tube(s), single pitch roof and cantilevered panel(s).

1. Concrete foundation is set below grade with provision to anchor support pins and angles for central granite stone post or column and vertical structural tube(s).
2. Central granite stone post or column with rough finish on sides and honed finish on front and back. Front and back have inset medallion logo and mileage text sandblasted and filled with lithochrome paint (gray color to be determined). Column is pinned and secured to concrete base with stainless or metal angles. Granite should coordinate with landscape benches, Trailhead, or Gateway kiosks. Selection of granite type should allow for lettering legibility with just sandblasted or prototype filling. Column has slanted top that follows angle of roof to minimize bird roosting and provide connection for roof support structure.
3. Vertical structural tube(s) is fabricated from galvanized steel. Vertical structural tube pins off of stone column post for lateral support and to top of column to strengthen roof structure. Raceway for potential solar panels and monitors should be detailed into vertical structural tube.
4. Roof structure is sized to accept potential future solar panels and battery array to power e-ink or other technology monitors requiring positioning of kiosk(s) towards optimum sun and free of obstruction from shade trees. Roof is constructed from powder-coated or painted steel tubes and connectors with standing metal or translucent acrylic or equivalent in-fill panels. Fascia of roof structure has etched and filled white lettering. Side panels should be detailed as digitally printed substrate (phenolic resin or aluminum tbd) attached to frame and should be secured with tamperproof fasteners. Panel thickness can be determined by structural requirements, but can also be tailored to accept future e-ink or other technology monitors.



VEHICULAR ENTRY SIGN

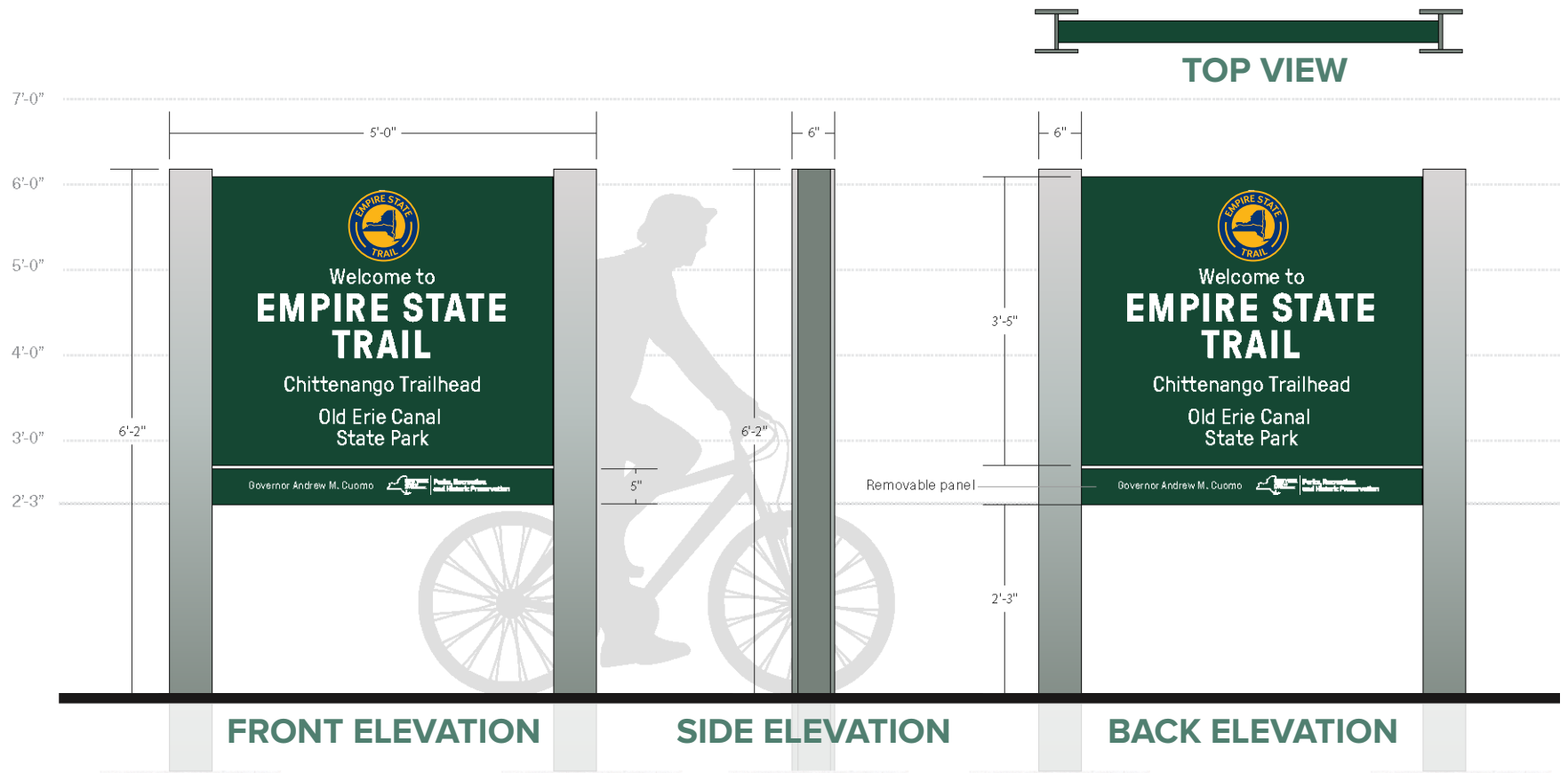
This sign is intended as a primary trail identification sign for Gateways and Trailheads with parking facilities. The sign should be within clear view of vehicles traveling along the roadway with a plan to manage or clear surrounding vegetation to provide visibility.

When possible, place this sign outside of the road right of way.

Local jurisdictions should be contacted to comply with local codes for placement, design, and required vegetation.

PLACEMENT NOTES

- Sign shall be placed outside of the right-of-way.
- Place sign perpendicular to road and within the visual field of approaching vehicles in both directions of travel.
- Sign should never be placed within the sight triangle of turning vehicles leaving a parking area or driveway.



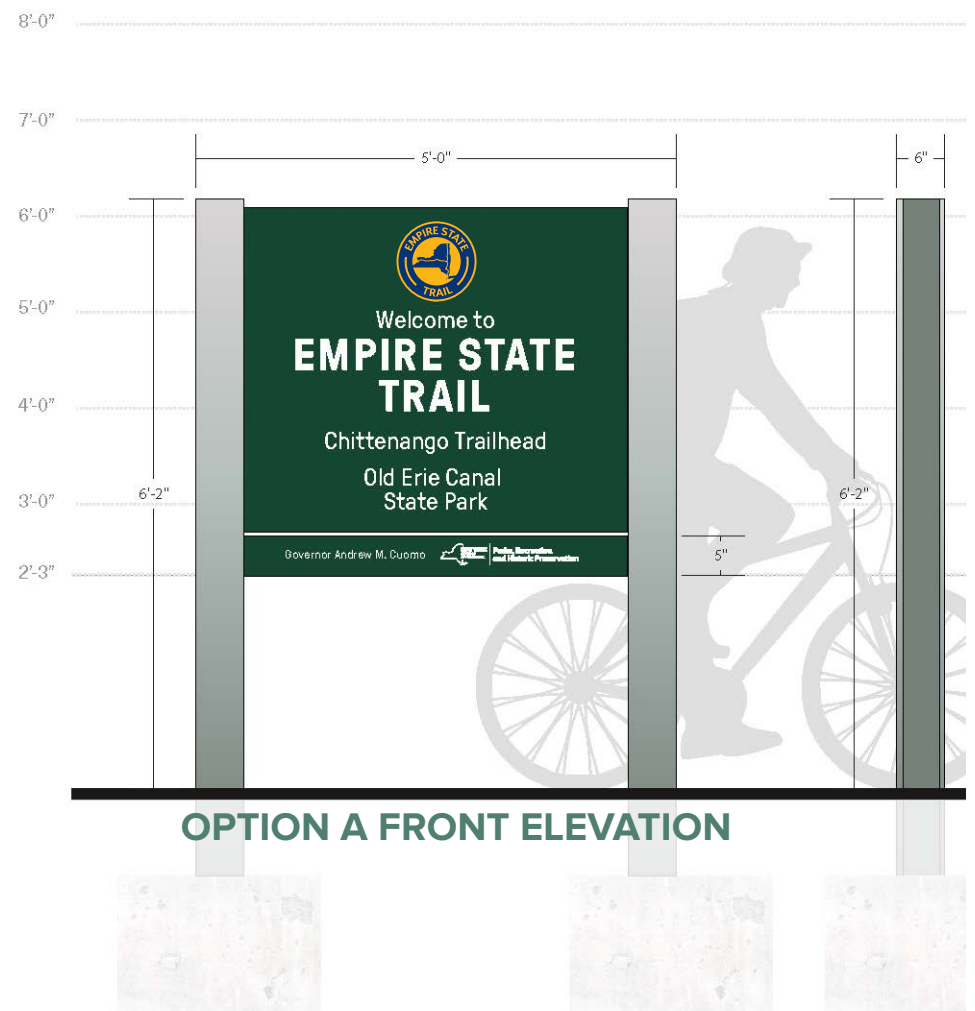
TECHNICAL NOTES

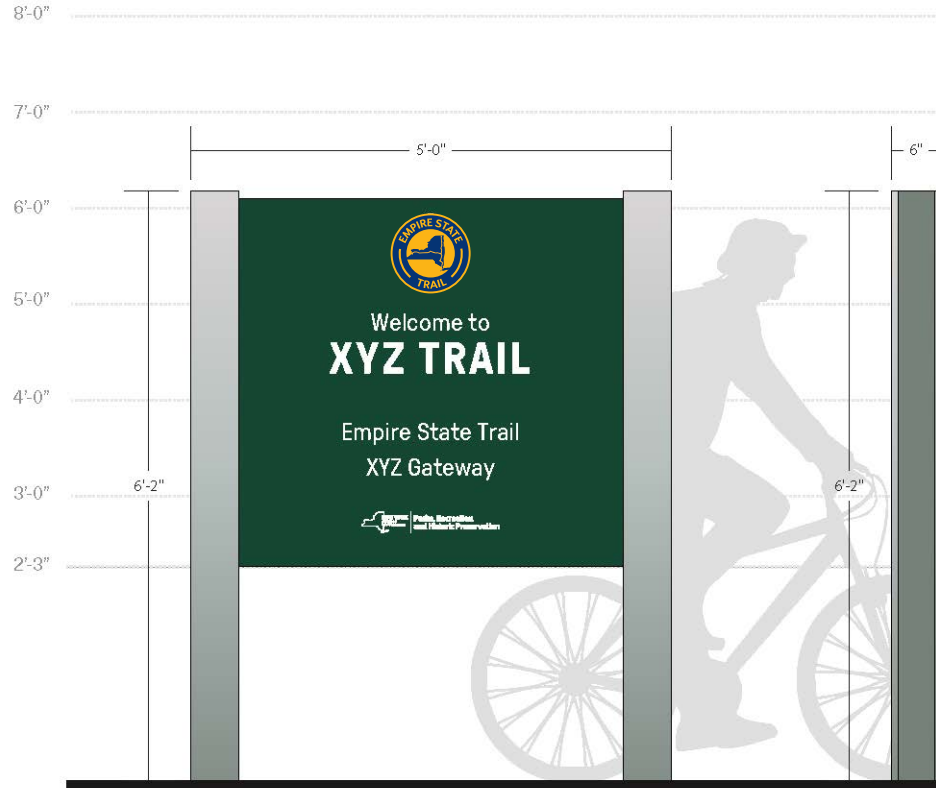
Vehicular trail entry signs are composed with concrete foundations, two posts, and sign panel.

1. Concrete foundations are set below grade with provision to anchor "I" beam posts.
2. Two structural, galvanized steel posts are secured to the foundation.
3. Sign panel is fabricated with internal structure and powder-coated or painted single piece aluminum sign face. Attachment to two posts is via top with neoprene gasket between galvanized posts and secured through web of "I" beam using tamperproof fasteners.

Graphic

- Lettering is 3M Scotchlite white offering nighttime visibility from vehicular lights.
- Logo could be raised medallion secured to sign panel or printed on panel face with UV resistant vinyl.





OPTION B FRONT ELEVATION



OPTION C FRONT ELEVATION

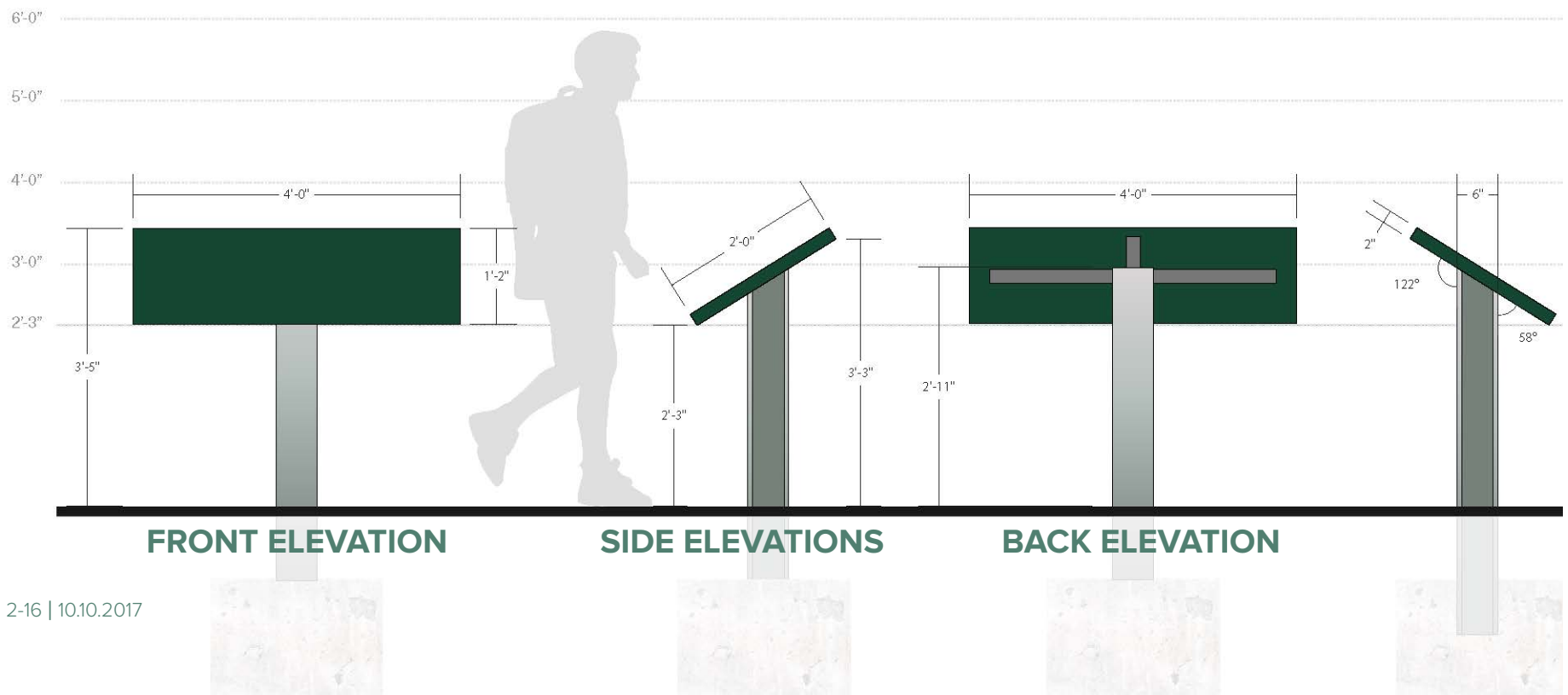
INTERPRETIVE SIGN

Interpretive displays provide greenway and trail users with information about the path, wildlife, vegetation, history and the significance of elements along the corridor. Interpretive displays may also be combined with public art and sculpture opportunities along the path. Interpretive displays are typically installed at Gateways, 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.

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.
- Provide 2 feet of clearance from the edge of the sign to the edge of the travel way.
- 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.
- Do not plant at the base of this sign.





TECHNICAL NOTES

Interpretive sign is composed with concrete foundation, single “I” beam post with outrigger supports, support panel, and interpretive graphic panel.

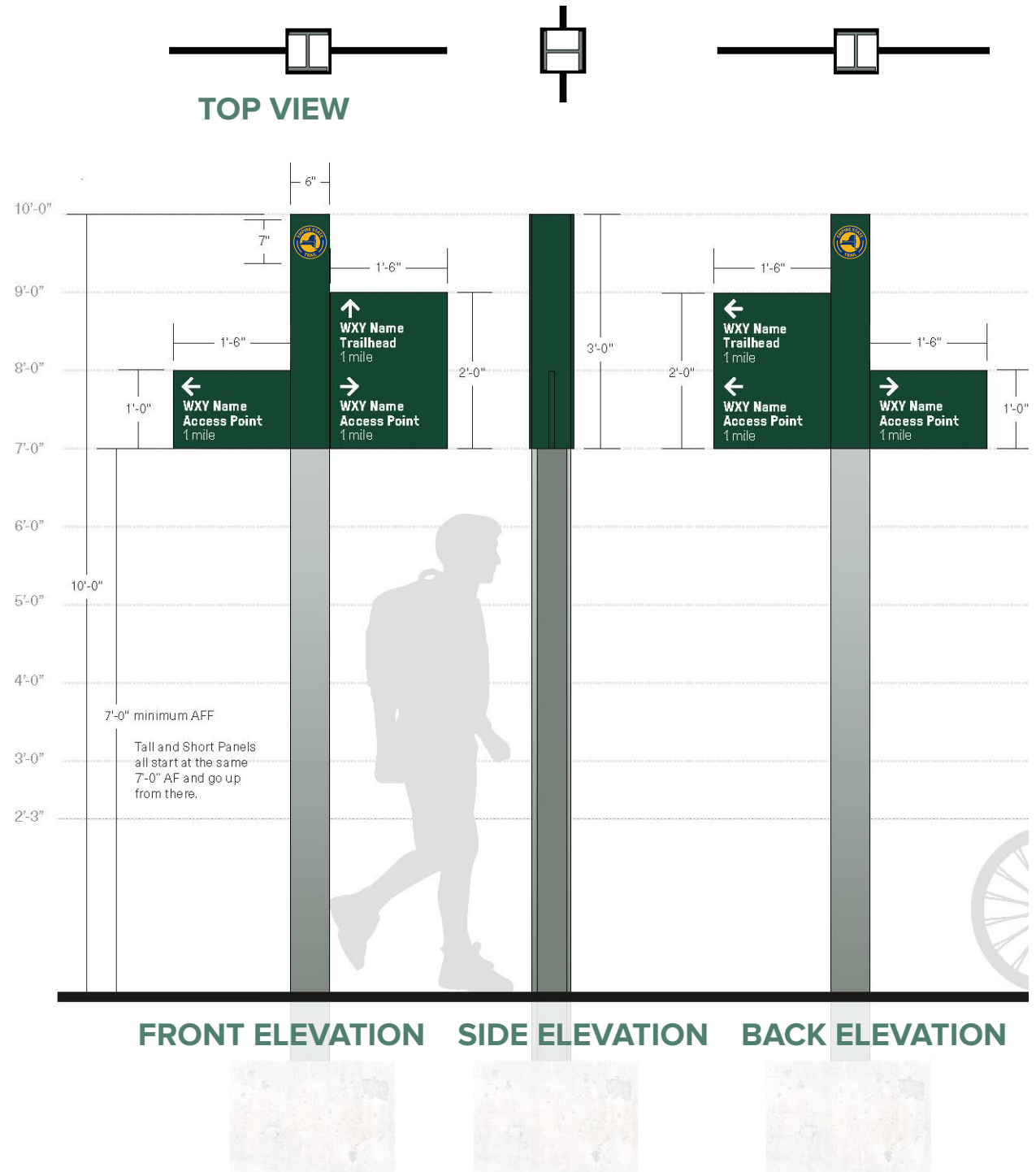
1. Concrete foundation is set below grade with provision to anchor “I” beam post.
2. One structural galvanized “I” beam is secured to the foundation. The “I” beam is cut at the angle of the panel and four outrigger supports are welded on.
3. Support panel is powder-coated aluminum with angle attachments to galvanized “I” beam and outriggers. Panel has radius corners.
4. Interpretive graphic is direct printed to aluminum or rendered in iZone, a high-resolution graphic printed panel made with phenolic resin-impregnated kraft paper.
5. Interpretive graphic panel is secured through support panel with tamperproof fasteners. Interpretive graphic panel matches dimensions of support panel.

TRAIL DIRECTIONAL SIGN

Trail directionals 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. Co-branding may be placed within the central column below the EST logo. This sign typology may also be attached to posts of existing signs as well as to community light posts (with attachment modifications).

PLACEMENT NOTES

- Provide 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.





ALTERNATIVES

TECHNICAL NOTES

Trail Directional Sign is composed with concrete foundation, single post, and sign “cap.”

1. The concrete foundation is set below grade with provision to anchor “I” beam post.
2. One structural galvanized steel “I” beam is secured to the foundation.
3. The sign cap is fabricated to slide over “I” beam post and should be secured with tamper-proof fasteners.

The sign cap is a fabricated tube with a shaped top to accept a logo on either side fastened to beam with set screws.

Extruded fasteners are attached to accept sign panels which can be added in the shop or in the field.

All sign cap elements are powder-coated or painted aluminum.

Sign Panel Configurations:

- Trail Directional Sign can have as few as 1 directional panel and as many as 4.
- The panels are all 1'-6" wide but can range in height from 1'-0" high for a short panel and 2'-0" high for a tall panel. Short panels contain 1 direction and 1 destination. Tall panels can contain 2 directions and 2 destinations.

Graphic:

- Lettering is 3M Scotchlite offering nighttime visibility from bike or snowmobile lights.
- Logo is applied to a circular shaped top section of the post cap.
- All directions start with an arrow above.
- All text is flush left.
- Destinations are bold.
- Distances are in regular.
- All text is upper and lowercase.
- Destination text is 2" high.
- All arrows are 2-1/2"
- Color: White
- Typeface: Proxima Nova



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

- Provide 2 feet of clearance from the edge of the sign to the edge of the travel way.

TECHNICAL NOTES

1. Concrete foundation is set below grade with provision to anchor "I" beam post.
2. One structural, galvanized steel "I" beam is secured to the foundation.
3. Sign cap is fabricated to slide over "I" beam post and secured with tamperproof fasteners.

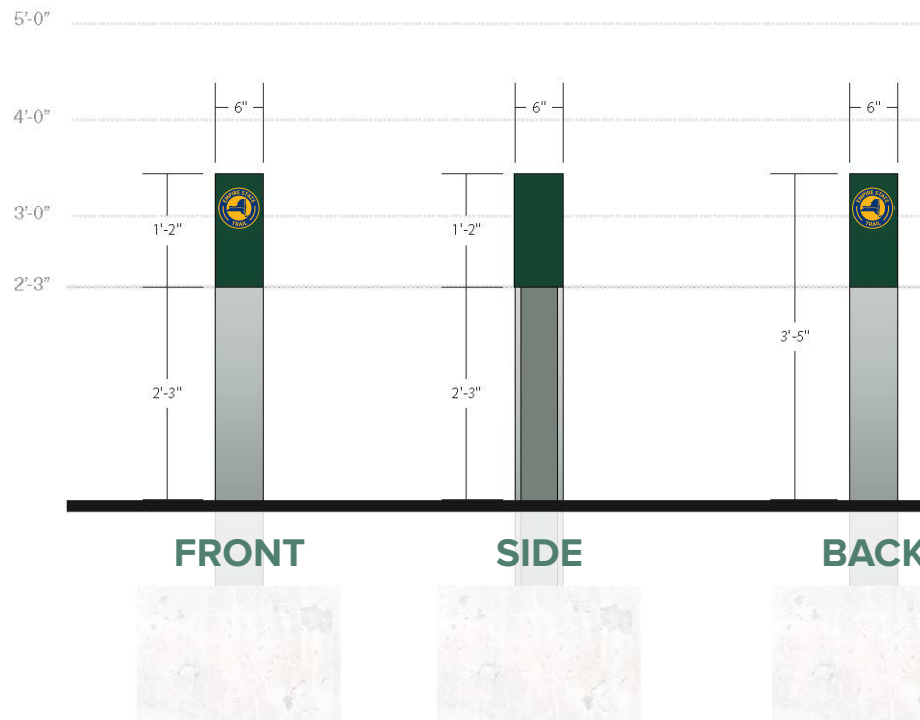
All sign cap elements are powder-coated or painted aluminum.

Graphic

- Lettering is applied in white or 3M Scotchlite white for nighttime visibility from bike or snowmobile lights.

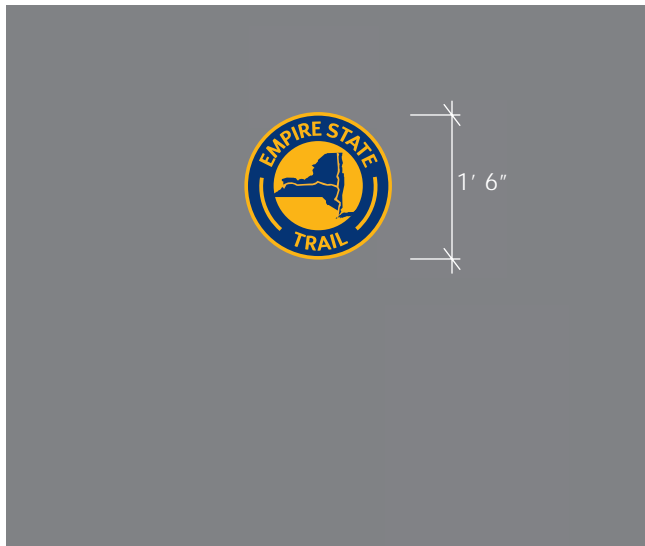


TOP VIEW



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 Empire State Trail is still needed.



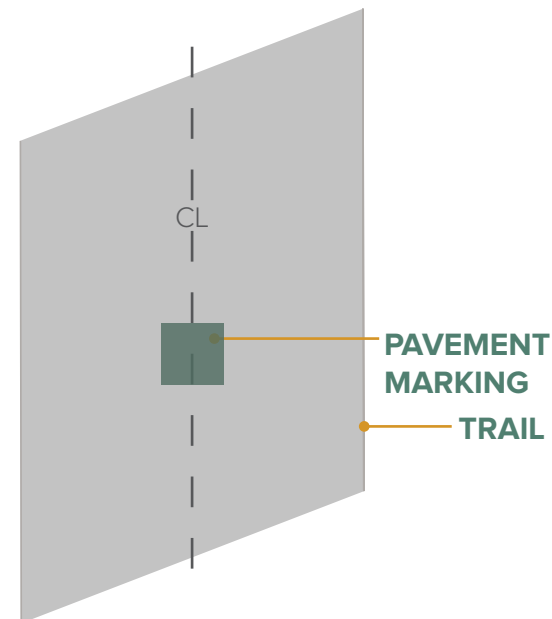
TOP VIEW

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.

TECHNICAL NOTES

Install blazes per manufacture recommended methods. Color sample shall be provided prior to full-run fabrication and installation.





DONOR RECOGNITION

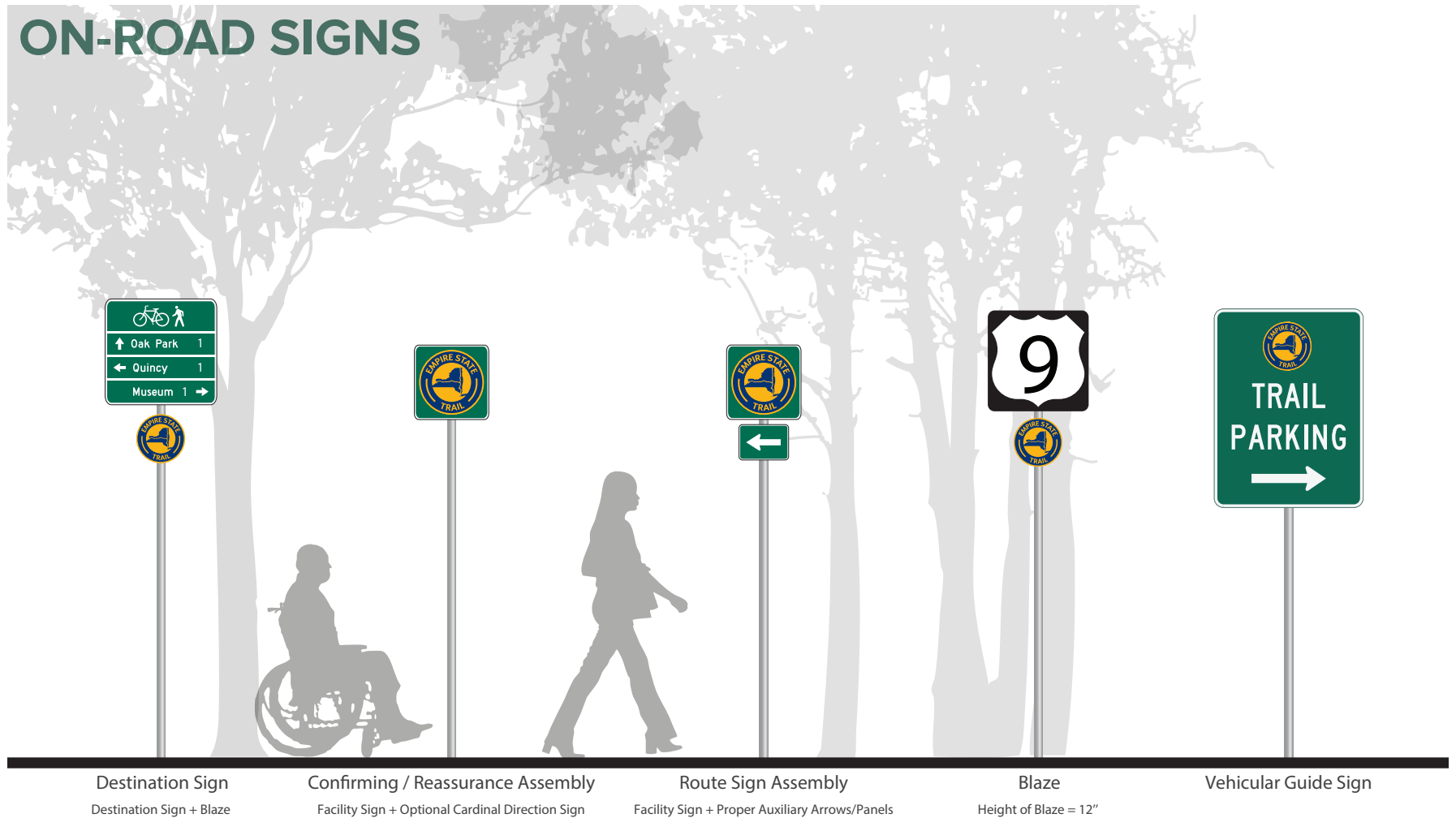
Contributions from private entities can aid in building Gateways, Trailheads, Access Points, and the main trail alignment. Private and corporate donors can also purchase or fund key trail elements from sign benches and trees to packages of multiple elements including shade structures, vegetation, benches, and picnic tables. Creation of a donor recognition program will encourage support of initial construction and maintenance of the Empire State 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



ON-ROAD SIGNS



TYPICAL APPLICATION

All signing must conform to the requirements in Chapter 2A of the MUTCD.

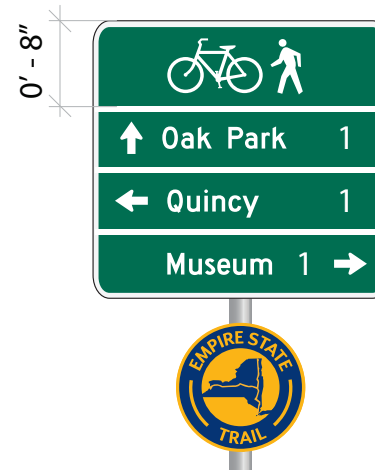


DESTINATION SIGN

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 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.



TYPES OF AUXILIARY ARROW PANELS



M5-1



M5-2



M6-1



M6-5



M6-7



M6-2



M6-3



M6-4



M6-6



BLAZE

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



DESIGN CRITERIA

Sign messages should be considered in the context of the sign placement for safety and convenience. Signs should never direct users to destinations which they cannot access safely. For this reason, signs might need to be phased in or revised along sections of trails with proposed connection facilities.

Sign clutter can confuse users of all modes and should be avoided. Signs should not repeat messages that already appear on existing vehicular or bicycle signs. Sign clutter can sometimes be reduced by grouping signs on the same supports. See Section 2A.16 of the MUTCD for more information.

Sign colors shall conform with MUTCD unless otherwise stated.

MESSAGE HIERARCHY AND LETTERING

The order of placement from top to bottom on any sign shall be straight, left, then right. If more than one destination is displayed in the same direction, the name of a nearer destination shall be displayed above the name of a destination that is further away.

In situations where two destinations of equal significance and distance may be properly designated but two destinations cannot appear on the same sign, the two names may be alternated on successive signs.

When placing destination names on signs, the use of abbreviations should be kept to a minimum whenever possible. When insufficient space is available for full wording, MUTCD approved abbreviations may be used (see MUTCD Section 1A.15, Table 1A-1).

Only the Standard Alphabet may be used for on-road signs.

All on-road signs must be retroreflective or illuminated to show the same shape and similar color by both day and night. The requirements for sign illumination shall not be considered to be satisfied by street or highway lighting.

The lettering for names of places, streets, and highways on conventional road guide signs shall be a combination of lower-case letters with initial upper-case letters. All other word legends on conventional road guide signs shall be in upper-case letters.

The principal legend on guide signs shall be in letters and numerals at least 6 inches in height for all upper-case letters, or a combination of 6 inches in height for upper-case letters and 4.5 inches in height for lower-case letters. On low-volume roads (as defined in MUTCD Section 5A.01) with speeds of 25 mph or less, and on urban streets with speeds of 25 mph or less, the principal legend shall be in letters at least 4 inches in height for all upper-case letters, or a combination of 4 inches in height for upper-case letters and 3 inches in height for lower-case letters.

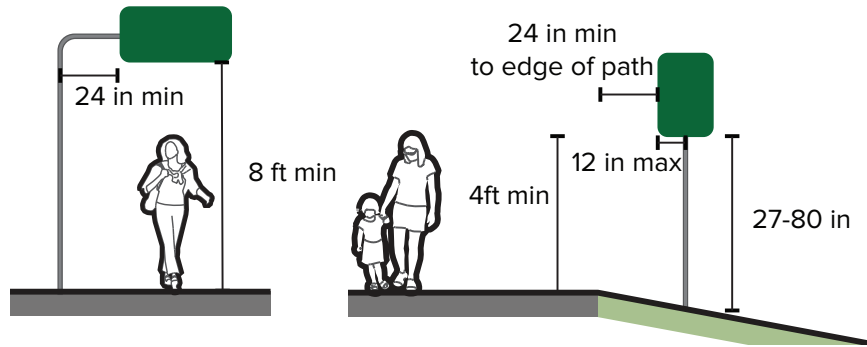
Destination signs intended only for the use of bicyclists and pedestrians shall follow the size information contained in Table 9B-1 for “Bicycle Destination” signs. The layouts shall be as shown in the “Standard Highway Signs and Markings” book.



PLACEMENT

Sign placement is key for wayfinding. A sign must be within a view sign line without inhibiting the flow of all users movement. MUTCD, AASHTO, as well as American with Disabilities Act (ADA), provide guidance for the placement of on and off road signs.

CLEARANCE REQUIREMENTS FOR SHARED USE PATHS



PLACEMENT DETAILS

- All on-road signs must be placed in accordance with Section 2A.16 of the MUTCD.
- All overhead signs over a shared use path must have a clearance of 8 ft and be 24 in minimum from edge of path to the post (MUTCD 9B-1).
- All signs along a shared use path must be 2 ft from edge of path to sign edge and be a minimum of 4 ft from bottom of sign to the top of path (MUTCD 9B-1).

APPROVAL PROCESS

In addition to MUTCD and ADA requirements, coordination with local jurisdictions may be necessary, as they may have additional requirements, which will influence the messaging and placement of signs.

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TRAIL DESIGN



TRAIL CONTEXT

Trail amenities are critical to the experience of the Empire State Trail. Just as a logo will become the calling card of the trail, amenities become the breadcrumbs of recognizable forms, patterns, texture, color, and rhythm that all contribute to a consistent brand expression of safety, comfort, legibility, and community pride. Since the Empire State Trail traverses landscapes from the picturesque Adirondacks to historic canalways and into the urban core of Manhattan, it is essential to provide a pattern of experiences - from Gateways to crossings - that reflect the local color and context of rural, suburban, and urban communities across the state. With over 400 miles of trail completed, these patterns are already established by the Hudson River Greenway, Erie Canalway, and Champlain Canalway Trail. This Design Guide will build upon the trail amenities, wayfinding, and character of these trails to create a framework for completing over 750 miles of on- and off-road segments that will be treasured by generations of residents and visitors, for years to come.

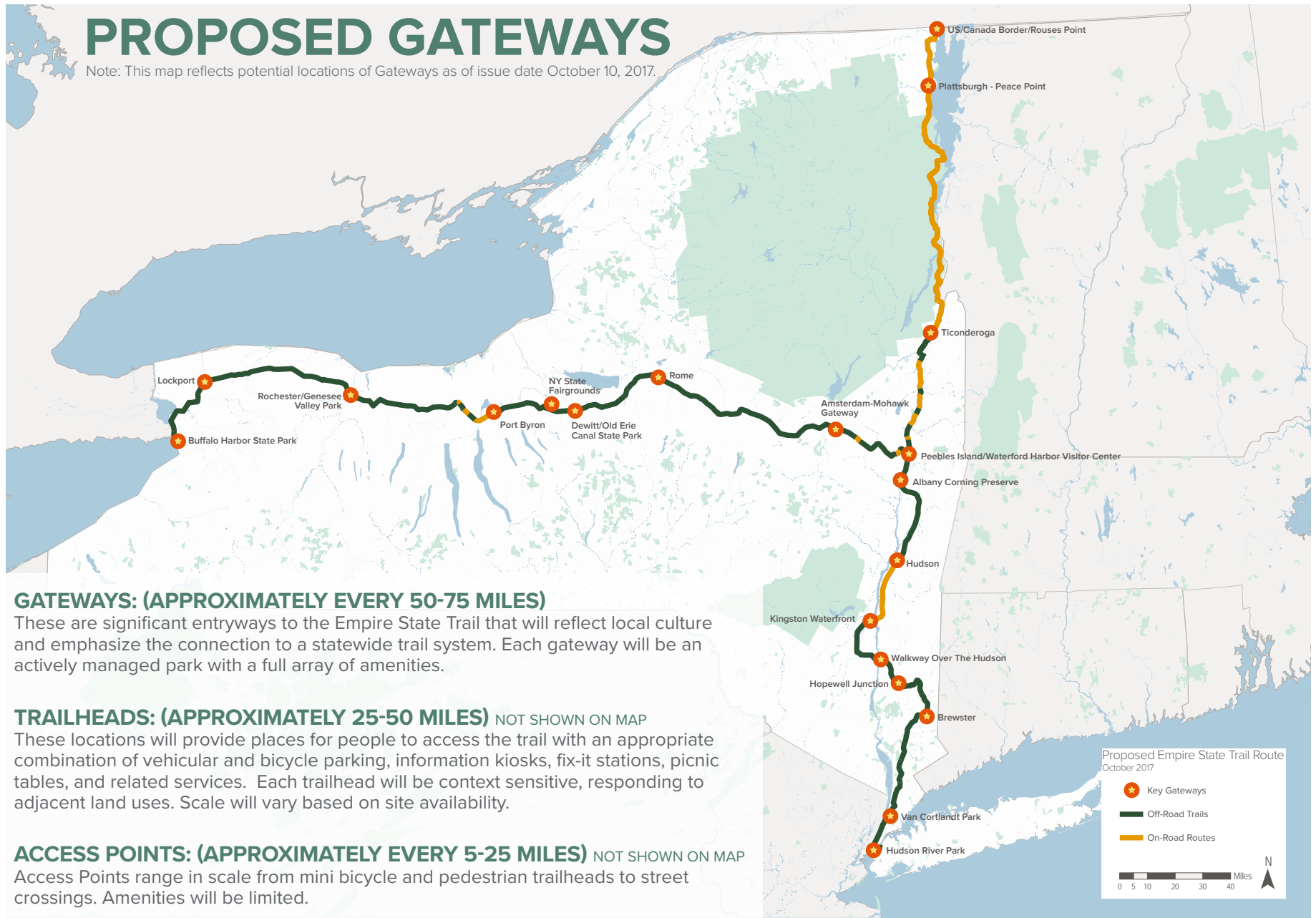
Each component of the trail experience contains guidance for placement, materials, and methods with notes for appropriate use in varying contexts. Moving forward into design development, this Design Guide should be seen as a “guidance” tool, not a “prescriptive” rule book. Each Gateway, Trailhead, Access Point, and trail alignment should be designed to suit the surrounding land use and follow standards set forth by the Federal Highway Administration (FHWA), American Association of State Highway and Transportation Officials (AASHTO), NYSDOT’s Highway Design Manual, local regulations, current best practices, and Americans with Disabilities Act (ADA) standards.





PROPOSED GATEWAYS

Note: This map reflects potential locations of Gateways as of issue date October 10, 2017.



GATEWAYS: (APPROXIMATELY EVERY 50-75 MILES)

These are significant entryways to the Empire State Trail that will reflect local culture and emphasize the connection to a statewide trail system. Each gateway will be an actively managed park with a full array of amenities.

TRAILHEADS: (APPROXIMATELY 25-50 MILES) NOT SHOWN ON MAP

These locations will provide places for people to access the trail with an appropriate combination of vehicular and bicycle parking, information kiosks, fix-it stations, picnic tables, and related services. Each trailhead will be context sensitive, responding to adjacent land uses. Scale will vary based on site availability.

ACCESS POINTS: (APPROXIMATELY EVERY 5-25 MILES) NOT SHOWN ON MAP

Access Points range in scale from mini bicycle and pedestrian trailheads to street crossings. Amenities will be limited.

Proposed Empire State Trail Route
October 2017

- Key Gateways
- Off-Road Trails
- On-Road Routes

0 5 10 20 30 40 Miles

N

EMPIRE STATE TRAIL AMENITIES BY SITE TYPE	SIGNAGE							FURNISHINGS					AMENITIES				PLANTING					
	Gateway Marker	Kiosk-Double Panel	Kiosk-Single Panel	Vehicular Entry Sign	Interpretive Sign (Optional)	Trail Directional Sign	Trail Blaze-Post	Trail Blaze-Pavement	Picnic Tables	Wooden Benches-Armrests & Backs	Wooden Benches-Backless	Stone Block Benches	Wooden Barrier Rail (As required)	Bicycle Repair Station	Bicycle Racks	Shade Structure (Optional)	Litter & Recycling Receptacles	Bottle Filler & Drinking Fountain	Solar Area Lighting	Canopy Trees	Understory Trees	Herbaceous Plants
GATEWAYS	1	2		4	5	6		8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
<i>Gateways are significant entry points to the Empire State Trail and provide an array of site amenities for both trail visitors and local residents. Gateways are placed approximately every 50 to 75 miles along the trail. Each site celebrates local culture as well as it's connection to the larger trail system. Gateway sites are actively maintained and programmed by municipal or community based partners. These locations typically have access to utilities such as water and power and are frequently in close proximity to existing comfort stations or visitors centers.</i>																						
TRAILHEADS			3	4	5	6		8				12		14	15					20	21	
<i>Trailheads are important access points to the Empire State Trail. These sites have small to medium sized parking areas are placed approximately every 25 to 50 miles along the trail. Trailheads are equipped with a simple array of site amenities for visitors such as wayfinding maps, seating and bike repair stations. These sites are minimally maintained and do not have access to existing water, power or comfort stations.</i>																						
ACCESS POINTS - MAJOR						6		8				12									21	22
<i>Major access point are those portions of the trail which cross busy streets and are woven into the fabric of the communities through which the trail passes. In some instances these access points can have an array of simple site amenities such as benches and directional signage. There is an opportunity for communities to adopt their local trailheads by tending plantings or helping to maintain them. Both on-road and off-road signage is deployed to alert people to the trail location and ensure safe crossing.</i>																						
ACCESS POINT - MINOR								7	8													21
<i>Minor access points occur frequently throughout the system where the trail intersects minor roadways. Typically on-road signage and high visibility striping will alert people to the trail location. Small trail blaze posts or on-pavement trail blazes will be incorporated into both existing and newly constructed portions of the trail.</i>																						



TYPICAL GATEWAY

MATERIAL PALETTE

FURNISHINGS Pages 3-8 and 3-9 provide a snapshot of the materials that will be used along the trail. Specific details, manufacturers, product codes, and placement are provided throughout this Design Guide.



Galvanized Steel



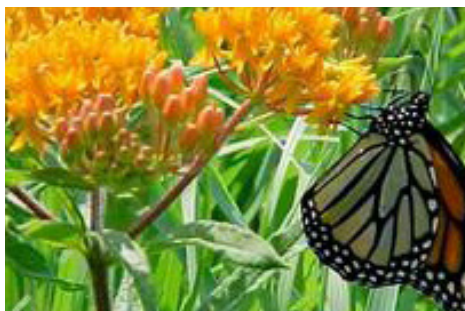
Powder Coated Site Amenities



Treated Douglas Fir



Corinthian Granite



Seasonal Color



SURFACES A variety of surfaces may be used through the trail alignment and within Gateways, Trailheads, and Access Points. Design will be per site and context sensitive.



Flexi-Pave

Flexi-Pave is a soft, porous and accessible paving surface for use in natural areas where a paved, impervious surface may be inappropriate or not allowed. Signage and benches would require individual setting beds.



Screenings-Limestone, Brownstone or Bluestone based on regional availability. Screenings are the most economical surface and can be sourced from local quarries. Sufficient compaction and periodic replenishment are required to continue to meet ADA standards.



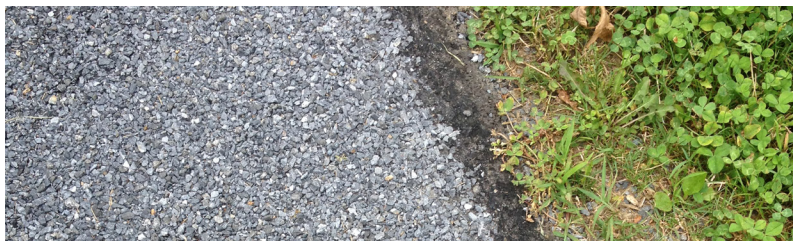
Integrally Colored Concrete: Scofield Shadow Slate C-31

Colored concrete is durable, easy to install. The addition of pigment and a scoring pattern provide color and texture which enhance the pedestrian scale feel of the gathering areas near kiosks and beaches. Site amenities can be anchored directly into the pavement.



Permeable Unit Pavers

Permeable pavers are recommended for larger paved gathering areas. Install "Aqua-Lock" by Hanover or an appropriate equal based on stone selection and site context. Sub-surface soil conditions need to be assessed to determine the depth of the aggregate setting bed for the pavers. Utilize light colored pavers in areas in full sun.



Asphalt Trail

A majority of the off road portions of the trail and trail head parking areas will consist of standard asphalt pavement. The areas connected to the trailhead parking areas should be made of different surfaces to further define those spaces.

TYPICAL GATEWAY

Gateways are significant entryways to the Empire State Trail that will reflect local culture and emphasize the connection to a statewide trail system. These actively managed sites may serve as miniparks or be integrated into already existing recreation facilities with a full suite of amenities including architectural elements, monuments, public art, seating, shade, nearby access to restroom facilities, access to drinking water, bicycle parking, bicycle repair stations, and interpretive elements. A sample Gateway design is illustrated on the adjacent page to show how the “kit of parts” in the matrix on page 3-6 fit together. These elements can be juxtaposed in a variety of combinations to suit the natural features of the site, environmental constraints, and existing circulation patterns. Any specific arrangements or relationship are diagrammed per site element within this section.

TYPICAL APPLICATION: APPROXIMATELY EVERY 50-75 MILES

Key locations include:

- Existing Parks
- Existing Visitor Centers
- Existing Trailheads of the Hudson River Greenway, Erie Canalway, and Champlain Canalway Trail

KEY COMPONENTS

- A full suite of wayfinding and interpretive signs
- Bicycle and pedestrian connections from existing street infrastructure to the trail and Gateway site elements (connections shall be made to avoid conflict with circulating vehicles)
- Parking stalls and lanes that accommodate loading and offloading bicycles
- Combinations of shade (trees or architectural elements) with a full suite of seating options (including benches with backs)
- Access to potable water
- Signature “Gateway” feature
- Parking with adequate ADA accessible spaces
- ADA access points shall be provided to site features in accordance with current ADA standards.



TYPICAL GATEWAY SITE PLAN ELEMENTS



- 1 GATEWAY MARKER
2-7
- 2 KIOSK - DOUBLE PANEL
2-8
- 4 VEHICULAR ENTRY SIGN*
2-12
- 6 TRAIL DIRECTIONAL SIGN
2-14
- 8 TRAIL BLAZE - PAVEMENT
2-16
- 9 PICNIC TABLES
3-19, 3-21
- 12 BENCHES
3-19, 3-20, 3-21
- 14 BIKE REPAIR STATION
3-24
- 15 BIKE RACKS
3-24
- 16 SHADE STRUCTURE
3-23
- 18 BOTTLE FILLER & DRINKING FOUNTAIN; 3-17
- 20 CANOPY TREES
3-26
- 21 UNDERSTORY TREES
3-26
- 22 HERBACEOUS PLANTS
3-26

*Any planting should be 36" high max.

TYPICAL TRAILHEAD

Trailheads are entryways to the Empire State Trail that will provide a comfortable place to pause for trail users, adequate parking, and a limited amount of site features based on the management capacity of the local jurisdiction. A sample Trailhead design is illustrated on the adjacent page to show how the “kit of parts” in the matrix on page 3-6 fit together. These elements can be juxtaposed in a variety of combinations to suit the natural features of the site, environmental constraints, and existing circulation patterns. Any specific arrangements or relationship are diagrammed per site element within this section. Scale of the Trailhead will vary based on site availability. All elements selected should proportionately related to the overall design, for instance, vehicular parking should not overwhelm the site and limit the use of the elements as indicated in the matrix on page 3-6.

TYPICAL APPLICATION: APPROXIMATELY EVERY 25-50 MILES

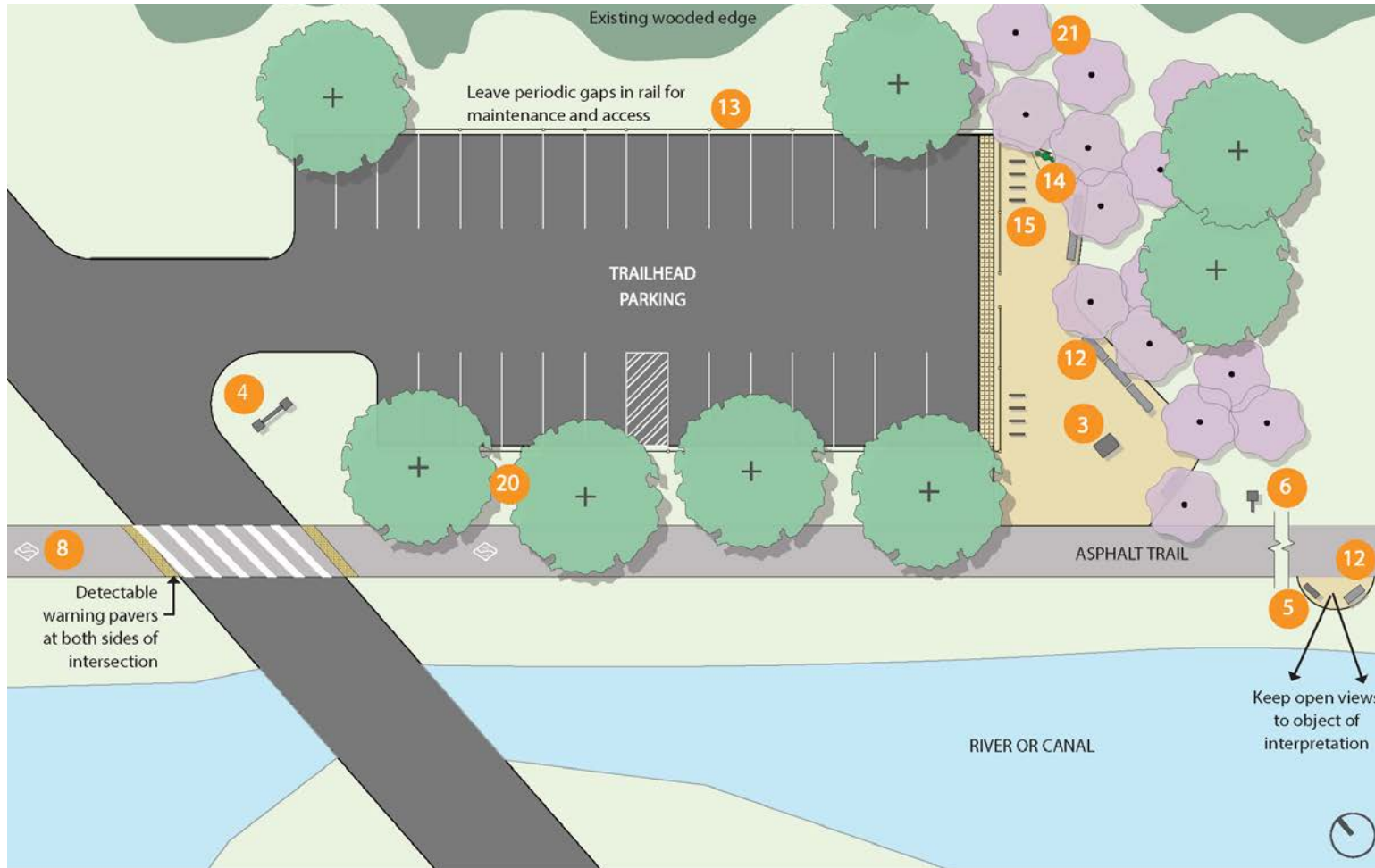
Key locations include:

- Beginning and end of each major new and existing trail section, (AHET, Beacon Line, etc.)
- Major Erie and Champlain Canal Locks
- Parks and Historic Sites (Saratoga National Historic Park, etc.)
- Amtrak and bus stations near or on the Empire State Trail (Hudson, Poughkeepsie, etc.)
- Main Streets and Downtowns along the Empire State Trail (Essex, Syracuse, etc)

KEY COMPONENTS

- Wayfinding and interpretive signs as appropriate (indicate nearby restroom facilities and access to potable water on directional signs if these elements are not featured within the Trailhead)
- Bicycle and Pedestrian connections from existing street infrastructure to the trail and Gateway site elements (connections shall be made to avoid conflict with circulating vehicles)
- Parking stalls and lanes that accommodate loading and off-loading bicycles with adequate ADA accessible spaces
- Shade areas and seating with backs
- ADA access shall be provided to as many site features as possible based on site conditions

TYPICAL TRAILHEAD SITE PLAN ELEMENTS



- 3 KIOSK - SINGLE PANEL
2-10
- 4 VEHICULAR ENTRY SIGN
2-12
- 5 INTERPRETIVE SIGN
2-13
- 6 TRAIL DIRECTIONAL SIGN
2-14
- 8 TRAIL BLAZE - PAVEMENT
2-16
- 12 STONE BLOCK BENCHES
3-19, 3-20
- 13 WOODEN BARRIER RAIL
5-28
- 14 BIKE REPAIR STATION
3-24
- 15 BIKE RACKS
3-24
- 20 CANOPY TREES
3-26
- 21 UNDERSTORY TREES
3-26

TYPICAL ACCESS POINT

Access Points are frequent, use a limited number of site amenities, should orient users within the trail system, and use safe and appropriate crossing features as illustrated in Section Five of this Design Guide. Typical minor and major Access Points are illustrated to the right.

TYPICAL APPLICATION ACCESS POINTS: AS NEEDED

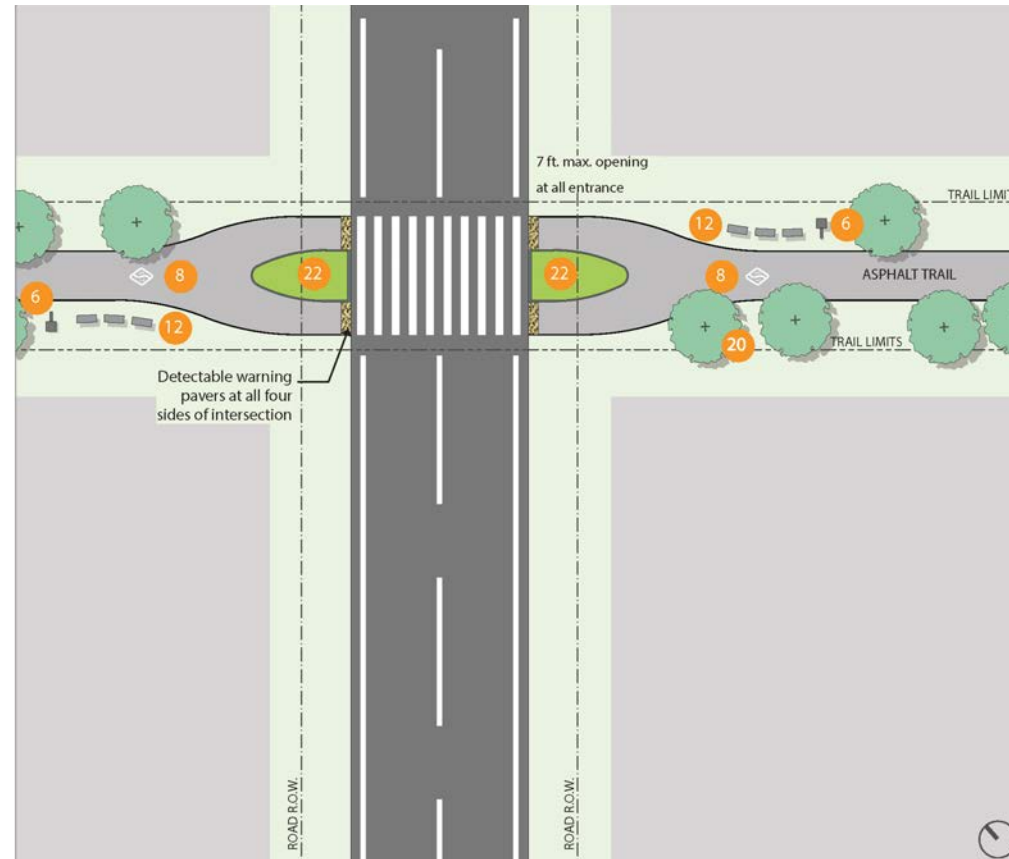
Possible locations include:

- Minor Erie/Champlain Canal locks
- Trail Junctions
- Key roadway/trail intersections
- Existing public parks
- Trailside business locations (camping, lodging, retail, food or other services)
- Main Streets (libraries or municipal buildings)

KEY COMPONENTS

- At least one EST branded sign

OPTION ONE: MAJOR ROAD CROSSING



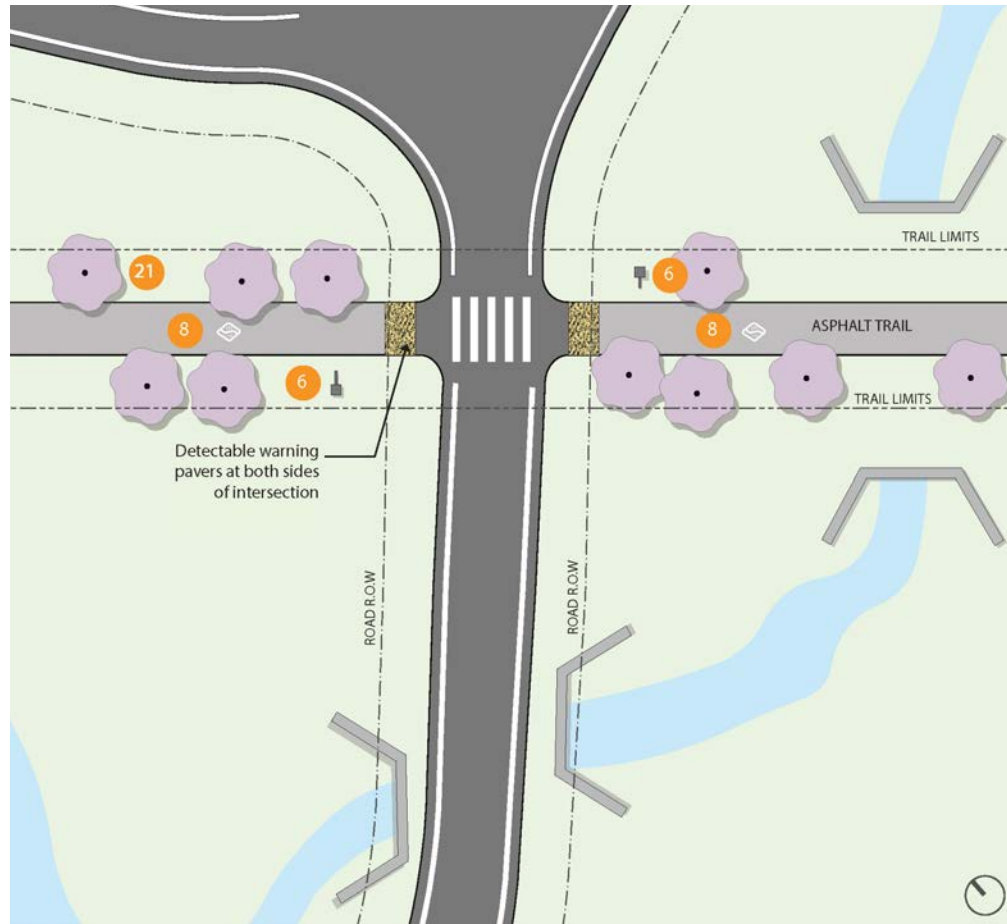
- 6 TRAIL DIRECTIONAL SIGN
2-14
- 8 TRAIL BLAZE - PAVEMENT
2-16
- 12 STONE BLOCK BENCHES
3-19
- 20 CANOPY TREES
3-26
- 22 HERBACEOUS PLANTS*
3-26

FOR ADDITIONAL INFORMATION
AND SITE CONDITIONS SEE:

6-16 through 6-58

*Any planting should be
36" high max.

OPTION TWO: MINOR ROAD CROSSING



- 6 TRAIL DIRECTIONAL SIGN
2-14
- 8 TRAIL BLAZE - PAVEMENT
2-16
- 21 UNDERSTORY TREES
3-26

FOR ADDITIONAL INFORMATION
AND SITE CONDITIONS SEE:
6-41 through 6-58

NOTE: Trail Directional sign should be 3'
minimum clear from path 5' Min if there is
winter use.

KEY CONSIDERATION: RESTROOM ACCESS

Careful consideration should be given to a number of factors before locating restrooms including available land, size of Gateway or Trailhead, frequency of use, existing restroom facilities within the trail system, utility availability, and user need.

Prior to undertaking any restroom building design, 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 required for each restroom building depends on the number of toilets to be provided.

Public restrooms require considerable maintenance and service. Access to these resources should be a strong consideration when planning for restroom buildings.

Partnerships with adjacent private business can be secured to increase frequency of restroom and water facilities for trail users.

TYPICAL APPLICATION

Restrooms should be strategically located along trail

Use wayfinding guide signs to indicate distance and bike/walk timing to the next available comfort station.

DESIGN FEATURES

- Local, state, and federal codes take precedence for all restroom facilities.
- Prioritize location of restrooms at trailheads, within existing parks, and review gaps for placement at other trailheads or locations within the system.
- Restroom structures should be located adjacent to vehicular access points for security, maintenance, and access to water and sewer (unless they are self-composting).
- Restrooms should make use of natural light and ventilation to the extent possible.
- Place bicycle parking close to restroom structures so that bicyclists do not impede trail access. Inadequate bicycle parking encourages informal propping of bicycles at or against restroom buildings.
- Always provide restroom facilities outside of floodprone areas.
- Composting toilets should be considered in remote areas or where utility connections are unavailable.

MAINTENANCE

Determine a locking schedule for restrooms to prevent habitation.

Monitor daily for vandalism, supply requirements, and cleanliness.



KEY CONSIDERATION: ACCESS TO POTABLE WATER

Access to potable water is crucial to safety and trail enjoyment for multiple user types. As a statewide trail, users will range from local recreational users to through-hikers, and ages from youth to active adults. Water access points will be available at all Gateways. Between Gateways, wayfinding signs will lead users to potable water sources that may be accessible through public spaces such as parks, convenience stores, restaurants, and other trail-friendly businesses.

TYPICAL APPLICATION

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. As both a long-distance trail and short recreation path, the Empire State Trail will comply with shorter spacing wherever possible. If potable water access points are more than five miles apart, signs should be placed at potable water access points to indicated distance to next source.

MAINTENANCE

Include hose bib connections for maintenance purposes.

Schedule regular inspections to monitor leaks, clogged drains, cracked pipes, and vandalism.

REFERENCES

United States Access Board. Public Rights-of-Way Accessibility Guidelines (PROWAG). 2011.
North Country Trail Handbook for Trail Design, Maintenance and Construction. 1998, NPS



SPECIFICATIONS

Product: Most Dependable Fountains - 10145

Finish: NYS Parks Green (PMS 3435C) (C 91 M44 Y82 K50)

Setting: Concrete

DESIGN FEATURES

- A** Locate drinking fountains at least 5' from trail edge.
 - Standard, accessible, and dog height bowls should be installed to accommodate all trail users.
 - Drinking fountains should be placed on a well drained surface (for example: 2% sloped concrete slab, with 3 in gravel strip to prevent erosion)
 - Consider the use of durable and vandalism-resistant materials such as steel, or stone.
 - Ensure the use of "auto off" features to prevent waste, bowl overflow, and open lines.

LIGHTING

Lighting for trails should be analyzed per segment context with full consideration for 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 improve visibility of the crossing and trail users for motorists. Lighting may also be necessary for day-time use in trail tunnels and underpasses.

TYPICAL APPLICATION

Recommended locations for lighting include parking areas, restroom facilities, major trail intersections, bridges, underpasses, tunnels, and street crossings.

DESIGN FEATURES

- Design lighting levels appropriate to each situation.
- Lighting should be at pedestrian scale and depends on the type and intensity of lights. 30-50 ft spacing is common for pedestrian scale lighting.
- Lighting should avoid trees and be placed outside of canopy edge where possible.
- Solar powered lighting is available where utility connection is difficult or when alternative energy sources are desired. Daylight hours should be analyzed per season prior to specifying solar lighting.

- Avoid light fixtures at eye level that could impair visibility.
- Dependent upon trail hours, consider uses in urban and/or commercial land use areas.

FURTHER CONSIDERATIONS

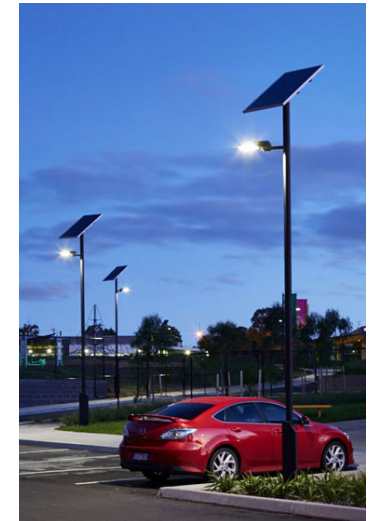
- Local jurisdiction ordinances should be consulted to determine lighting requirements and limitations.
- Lighting placement and fixtures should minimize light pollution for adjacent neighborhoods and environments. According to IDA (International Dark-Sky Association), light pollution can contribute to the disturbance of ecosystem cycles, therefore lighting placement and fixtures should minimize light pollution for adjacent neighborhoods and environments.

MAINTENANCE

Low-cost light emitting diodes (LED) offer a wide range of light levels and can reduce long term utility costs.

REFERENCES

IDA (International Dark Sky Association)



SPECIFICATIONS

Product: Ligan Lighting
- PowerMission 2 Solar
Lighting LED

Finish: Galvanized

Setting: All surfaces

SEATING

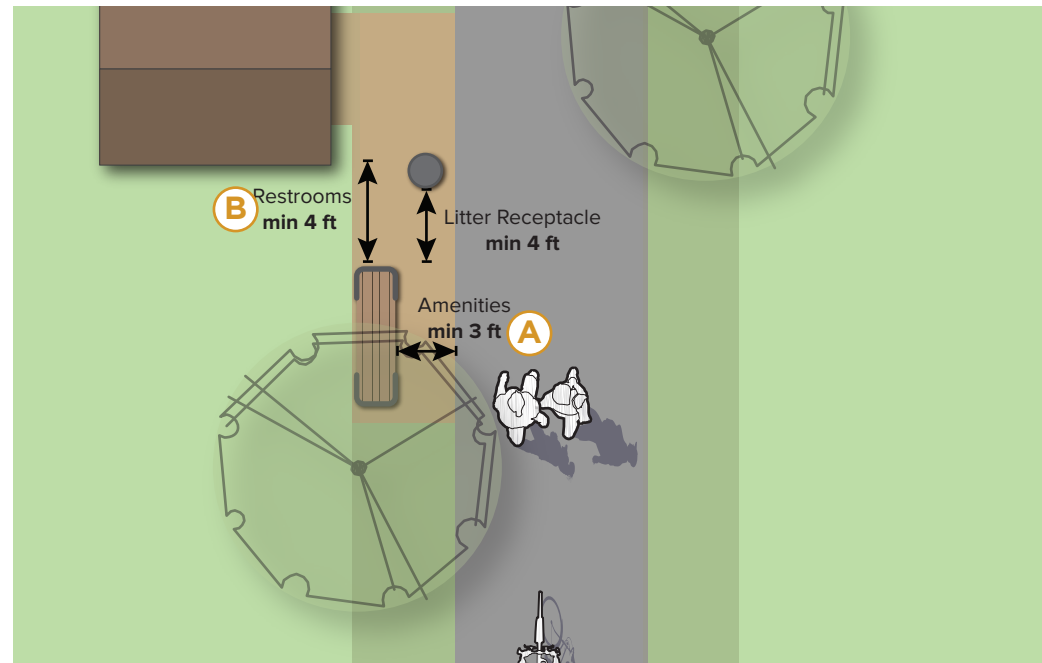
Seating along trails provides a place for trail users to rest, congregate, contemplate, or people-watch along trails and throughout the trail system. Benches can be designed to create identity in a place or along the trail or be strictly utilitarian. Picnic tables provide places for trail users to congregate for meals or to just and relax.

TYPICAL APPLICATION

Locate benches at all Gateways, Trailheads, picnic areas and at regular intervals along the trail.

DESIGN FEATURES

- A** Locate all seating (and other site furniture) a minimum of 3' from the edge of the trail.
- B** Locate benches a minimum of 4' from restrooms, phone booths and drinking fountains and a minimum of 2' from trash receptacles, light poles and sign posts.
 - Seating should be placed in shaded area, especially where there is minimal shade available.
 - Drainage should slope away from the bench and the trail.



FURTHER CONSIDERATIONS

- Placement of bench should provide interesting views, are close to an educational or historical trail element, and offer shade or shelter from seasonal winds.
- 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 sections. ADA Standards for Accessible Design seating and turn radius should be considers for access to seating.

MAINTENANCE

Site furnishing should be securely anchored to the ground.

REFERENCES

ADA Standards for Accessible Design, 2010

STONE BENCH



SPECIFICATIONS

Product: Locally quarried stone

Finish: Top: Sandbasted

Sides: Vertical Rock face

Bottom: Sawn

Setting: Aggregate or Grass

OPTIONS: PER GEOGRAPHIC LOCATION

Dolomitic Limestone-Erie Canal

Corinthian Granite-Champlain Trail & Hudson River Valley



PICNIC TABLE



SPECIFICATIONS

Product: TimberForm - Diller

Finish: Metal - Galvanized

Wood - Treated Douglas Fir

Setting: Concrete

BENCH WITH BACK



SPECIFICATIONS

Product: TimberForm - Diller Bench - 2011-6 Bench

Finish: Metal - Galvanized

Wood - Treated Douglas Fir

Setting: Concrete

TRASH + RECYCLING RECEPTACLES

Trash and recycle receptacles provide for proper maintenance and appearance of the trail system.

TYPICAL APPLICATION

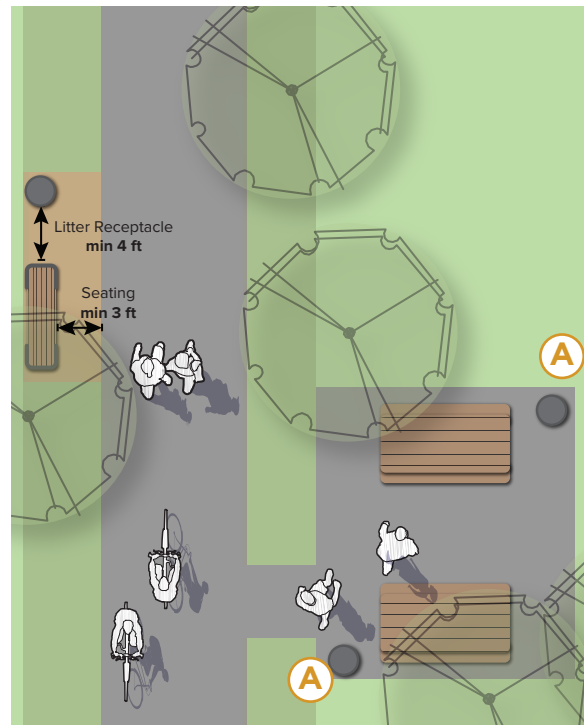
Trash and recycle receptacles should be placed at Gateways, rest stops or comfort stations, concession facilities, or area where users might stop to drink and eat.

FURTHER CONSIDERATIONS

Wildlife, especially bears, are drawn to Trash + Recycling Receptacle. In rural areas or areas with high concentration of wildlife, animal proof receptacle should be considered

MAINTENANCE

Receptacles need to be accessible to maintenance personnel and trail users.



DESIGN FEATURES

- A** Locate receptacles 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 and areas of group activities.
- Receptacles should be selected using the following criteria:
 - Expected trash amount
 - Maintenance program requirements
 - Types of trail users
 - Durability



SPECIFICATIONS

Product: Victor Stanley - Recycling Suit DYN-336

Finish: NYS Parks Green (PMS 3435C) (C 91 M44 Y82 K50)

Setting: Concrete

SHADE STRUCTURE

Whether it be protection from the rain or a place to rest during a sunny day, shade structures and shelters create comfort and protection for all trail users.

TYPICAL APPLICATION

Shade Structure should be sensitive to context and designed to integrate with intended function of the site and trail user needs.

DESIGN FEATURES

- The orientation of structures should be considered to provide maximum protection from elements.
- Can be placed in any setting (grass, concrete, asphalt, etc) with considerations for ADA access to and into the structure.
- Plants may be incorporated into the design of the structures especially where they can provide additional user benefits (vines or greenwall for cooling effect). Plant additional should be context sensitive and mindful of the maintaining agency's capacity.
- Structures should not impede bicycle and/or pedestrian movement and shall be located adjacent to the trail (not within the travelway).
- Structures should not block viewsheds of historic, natural, or cultural elements.
- Structures should incorporate other amenities, especially benches and picnic tables.



SPECIFICATIONS

Product: Custom Designed Per Site

Finish: Metal - Galvanized

Wood - Treated Douglas Fir

Setting: Concrete, Aggregate, or Grass

BICYCLE AMENITIES

BICYCLE PARKING

Short-term bicycle parking is meant to accommodate users departing in two hours or less. 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 regulations.

TYPICAL APPLICATION

Bicycle parking should be placed at Gateways, Trailheads, near town centers, and where there are multiple amenities.

FURTHER CONSIDERATIONS

- All bicycle parking spaces 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 be easily removed and shall be of sufficient strength and design to resist vandalism and theft.



Minimum 4' spacing between racks



Minimum 3' spacing between racks

SPECIFICATIONS

Product: TimberForm - Cycloop Arch - 2178-84-E-C

Finish: Galvanized

Setting: Concrete

DESIGN FEATURES

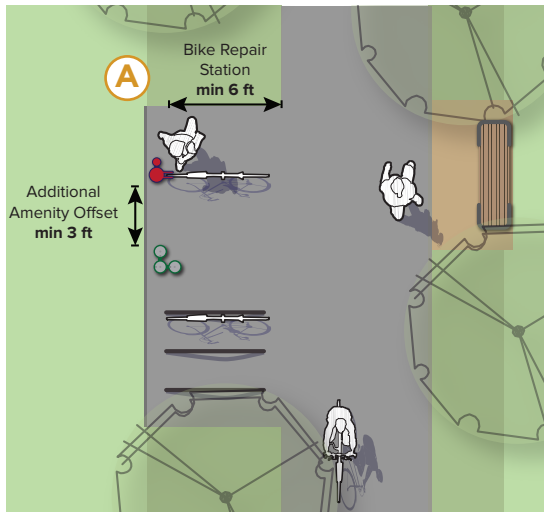
- In urban settings: 2' minimum from the curb face to avoid 'dooring.'
- Close to destinations; 50' maximum distance from main building entrance.
- Minimum clear distance of 6' should be provided between the bicycle rack and a property line.
- Should be highly visible from adjacent bicycle routes and pedestrian traffic.
- Locate racks in areas that cyclists are most likely to travel.

BICYCLE REPAIR STATIONS

Bicycle repair stations are self-serve kiosks designed to offer a complete set of tools necessary for routine bicycle maintenance. Popular locations include Gateways, Trailheads, plazas, farmer's markets, and any public center of activity that is well monitored and easily accessible by foot or bicycle.

TYPICAL APPLICATION

Bicycle repair stations can be grouped with other amenities. Typically locations for repair stations are Gateways, Trailheads, parking lots, the intersection of two trails, and public gathering spaces.



DESIGN FEATURES

- A** Bicycle repair stations should be at least 6' from trail edge to allow room to repair bicycles.
- Stations should be secured to a durable pad, such as concrete.
- Bicycle repair station tools are secured by high security cables, but will still be an attractive target for theft. Proper placement of kiosks in areas of high activity is one key strategy to reduce potential vandalism.

SPECIFICATIONS

Product: Dero FixIt Station with or without Air Pump

Finish: NYS Parks Green (PMS 3435C) (C 91 M44 Y82 K50)

Setting: Concrete

MAINTENANCE

Use of proper anchors will prevent vandalism and theft. Racks and anchors should be regularly inspected for damage. Educate snow removal crews to avoid burying station during winter months.

REFERENCES

- AASHTO. Guide for the Development of Bicycle Facilities. 2012.
- APBP. Bicycle Parking Guide 2nd Edition. 2010.

PLANTINGS

Native Vegetation along the Empire State Trail provides visual interest as well as habitat for animals and insects that may use the corridor for migration or habitat. A primarily native plant pallet is depicted on the following pages. A list of acceptable canopy trees, understory trees, and herbaceous plants can be found on pages on the following pages. Planting plans should consider local guidance for canopy goals, habitat creation, stormwater best practices, screening, disease resistance, avoidance of invasive species, and maintenance requirements.

TYPICAL APPLICATION

Planting should be used to provided a buffer between off-road sections of the trail and adjacent uses. Shade trees should be strategically placed near comfort stations to provide shade to seating areas and other amenities. Soil and drainage conditions should be considered prior to final plant pallet selection.

FURTHER CONSIDERATIONS

Plants should also be chosen for seasonal color and cultural significance to the area, such as tulips in Albany and lilacs in Rochester. When selecting planting material, the site's micro climate and the USDA Plant Hardiness Zone Map (see PG 3-30) should be considered.

MAINTENANCE

Depending on variety of vegetation, regular maintenance will be necessary. Trails should be cleared of all intruding plant material. Paths and shoulders should be kept clear of vegetation. Crime Prevention Through Environmental Design principles should be followed to ensure plant material does not become a hazard for trail users.

REFERENCES

NYS Department of Environmental Conservation, State Protected Plants
Native Species Planting Guide for New York City and Vicinity, NYC Parks
Recommended Urban Trees: Site Assessment and Tree Selection for Stress Tolerance, Nina Bassuk, Cornell University, Urban Horticulture Institute, 2003, 2011.
Trees of New York State, Native and Naturalized, Donald Leopold, Syracuse University Press, 2003.



CANOPY TREES



CANOPY TREE SAMPLE PALETTE

Acer rubrum

Quercus rubra

Celtis occidentalis

	NATIVE	SPACING ON CENTER	MATURE SPREAD	MATURE HEIGHT	HARDINESS ZONE
ACER RUBRUM 'AUTUMN SPIRE' Autumn Spire Red Maple	Y	30'	50'	40'-60'	3b to 9
ACER SACCHARUM 'ADIRONDACK' Sugar Maple	Y	30'	35'-50'	50'-70'	3b to 9
CELTIS OCCIDENTALIS 'DELTA' Common Hackberry	Y	50'	30'	40'-60'	3b to 9
GYMNOCLADUS DIOICUS 'ESPRESSO' Coffee Tree	Y	25'	35'	60'-75'	3b to 8
LARIX LARICINA Eastern Larch	Y	25'	30'	40'-80'	3a to 7
LIRIODENDRON TULIPIFERA Tulip Poplar	Y	30'	40'	80'-120'	to 5a
PINUS STROBUS White Pine	Y	25'	20'-40'	50'-80'	to 3a
QUERCUS ALBA White Oak	Y	40'	50'	50'-80'	to 3b
QUERCUS BICOLOR Swamp White Oak	Y	25'	50'-60'	50'-60'	3 to 8
QUERCUS RUBRA Red Oak	Y	35'	40'	60'-75'	to 3b
TILIA AMERICANA American Linden, Basswood	Y	30'	40'	60'-80'	to 3a
HUDSON RIVER SOUTH OF ALBANY	USDA Zone 7b to 5b				
HUDSON RIVER NORTH OF ALBANY	USDA Zone 5b to 5a				
ERIE CANALWAY	USDA Zone 7b to 3b				

UNDERSTORY TREES

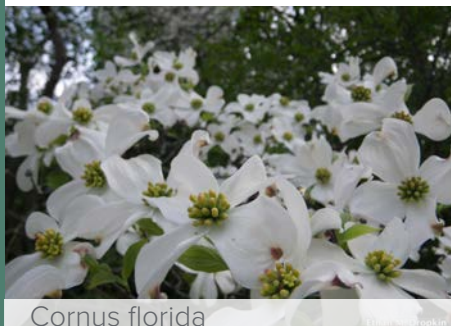
UNDERSTORY TREE SAMPLE PALETTE



Amelanchier laevis



Cercis canadensis



Cornus florida

AMELANCHIER 'AUTMUN BRILLIANCE'

Shadblow Serviceberry

AMELANCHIER LAEVIS

Allegheny Serviceberry

CARPINUS CAROLINIANA

Ironwood

CERCIS CANADENSIS VAR. 'ALBA'

White Flowering Eastern Red Bud

CORNUS ALTERNIFOLIA

Pagoda Dogwood

CORNUS FLORIDA 'WEAVERS WHITE'

Flowering Dogwood

OSTRYA VIRGINIANA

Hop Hornbeam

PRUNUS VIRIGINIA 'SCHUBERT'

Chokecherry

VIBURNUM LENTAGO

Nannyberry Viburnum

HUDSON RIVER SOUTH OF ALBANY

USDA Zone 7b to 5b

HUDSON RIVER NORTH OF ALBANY

USDA Zone 5b to 5a

ERIE CANALWAY

USDA Zone 7b to 3b

NATIVE	SPACING ON CENTER	MATURE SPREAD	MATURE HEIGHT	HARDINESS ZONE
Y	15'	10'-20'	25'	to 3b
Y	15'	20'-30'	20'-25'	to 3b
Y	20'	30'	30'	to 3b
Y	25'	30'	25'-35'	to 5b
Y	20'	10'	20'	3 to 7
Y	20'	20'	20'-30'	to 5b
Y	25'	30'	30'-50'	to 3b
Y	20'	15'-20'	20'-30'	2 to 7
Y	6'-12'	14'	12'-18'	2 to 8



HERBACEOUS

HERBACEOUS PLANT SAMPLE PALETTE



Panicum virgatum



Geranium maculatum



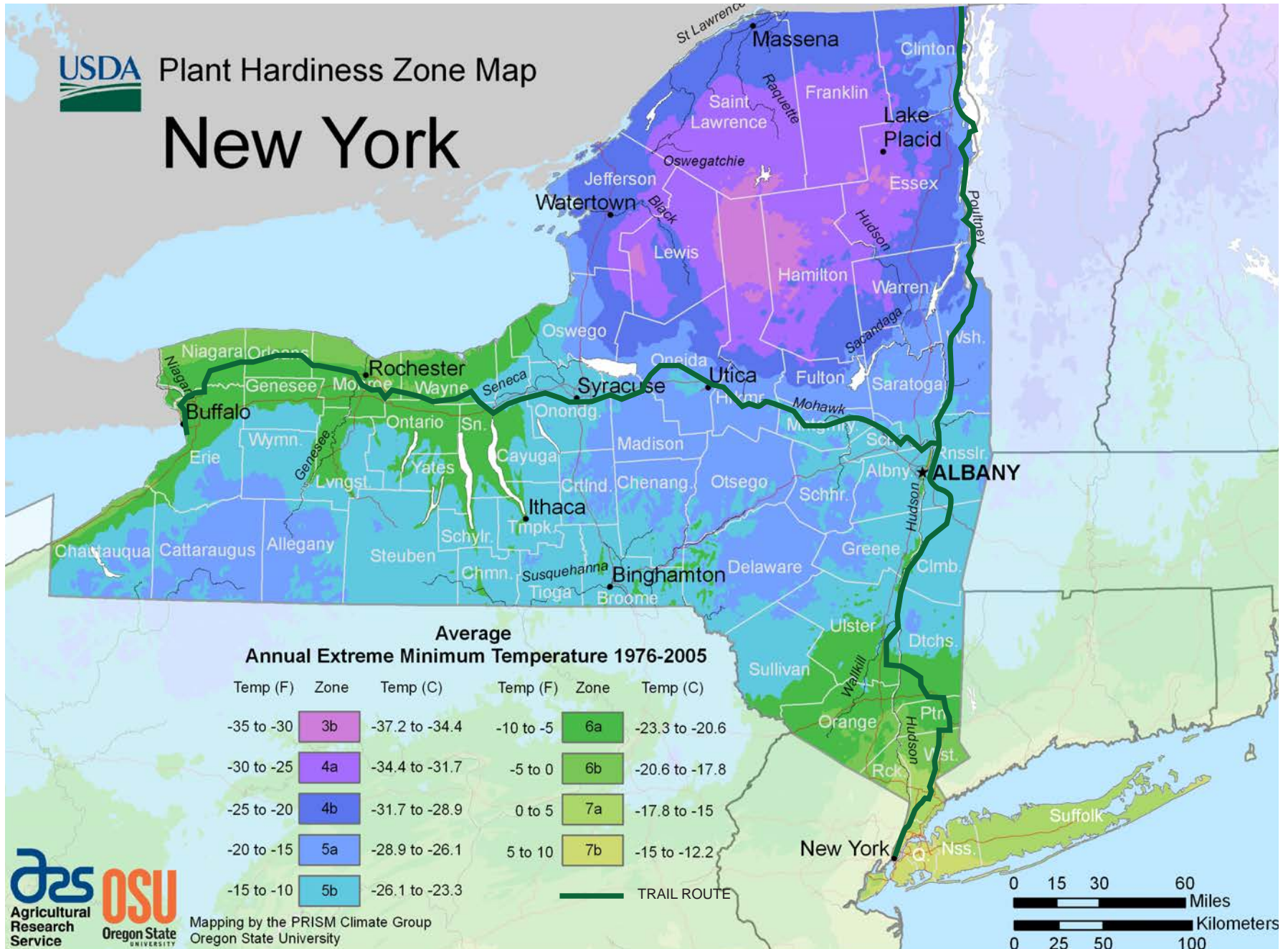
Rudbeckia hirta

	NATIVE	SPACING ON CENTER	MATURE SPREAD	MATURE HEIGHT	HARDINESS ZONE
ANEMONE CANADENSIS Anemone	Y	18"	24"	12"-24"	2 to 9
ASCLEPIAS TUBEROSA Butterfly Weed	Y	12"-18"	12"-30"	24"-36"	to 3
AQUILEGIA CANADENSIS Columbine	Y	12"	24"	24"	3 to 8
ASTER OBLONGIFOLIUS Aromatic Aster	Y	24"	12"-36"	12"-36"	to 3
ECHINACEA PURPUREA Purple Cone Flower	Y	24"	12"-30"	36"	4 to 8
GERANIUM MACULATUM Wild Geranium	Y	18"	12"-24"	24"-30"	4 to 8
MONARDA FISTULOSA Wild Bergamot	Y	18"	20"-24"	24"-36"	3 to 9
PENSTEMON DIGITALIS Smooth White Beardtongue	Y	18"	20"-24"	12"-36"	3 to 9
PANICUM VIRGATUM 'CAPE BREEZE' Dwarf Switch Grass	Y	18"	20"-24"	24"-30"	to 4
RUDBECKIA HIRTA Black-Eyed Susan	Y	18"	12"-24"	12"-24"	4 to 8
SOLIDAGO CAESIA Bluestem Goldenrod	Y	24"	12"-24"	30"-36"	4 to 8
SOLIDAGO NEMORALIS Compact Goldenrod	Y	18"	18"-24"	24"	4 to 8
SYMPHYOTRICHUM LAEVE Smooth Blue Aster	Y	24"	12"-24"	12"-36"	3 to 9
TIARELLA CORDIFOLIA Foamflower	Y	14"	12"-18"	12"-18"	4 to 8
HUDSON RIVER SOUTH OF ALBANY	USDA Zone 7b to 5b				
HUDSON RIVER NORTH OF ALBANY	USDA Zone 5b to 5a				

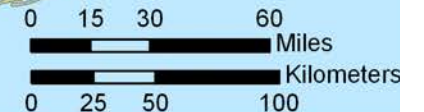


Plant Hardiness Zone Map

New York



Mapping by the PRISM Climate Group
Oregon State University





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USER TYPES



USER TYPES INTRODUCTION

The Empire State 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 on the following pages.

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.

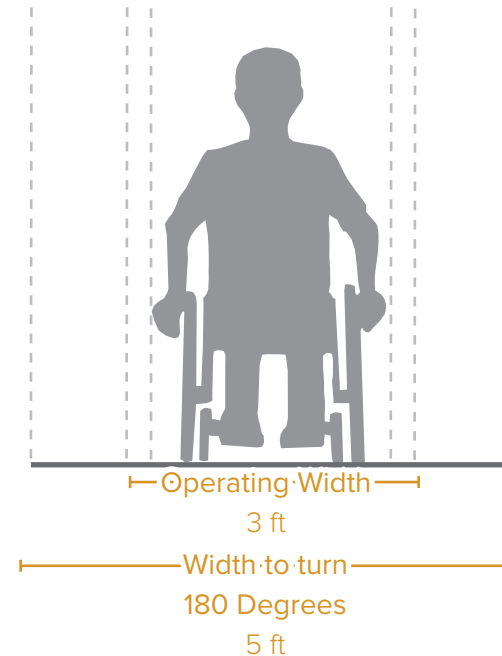


USERS OF MOBILITY DEVICES

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 Consideration

- 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.

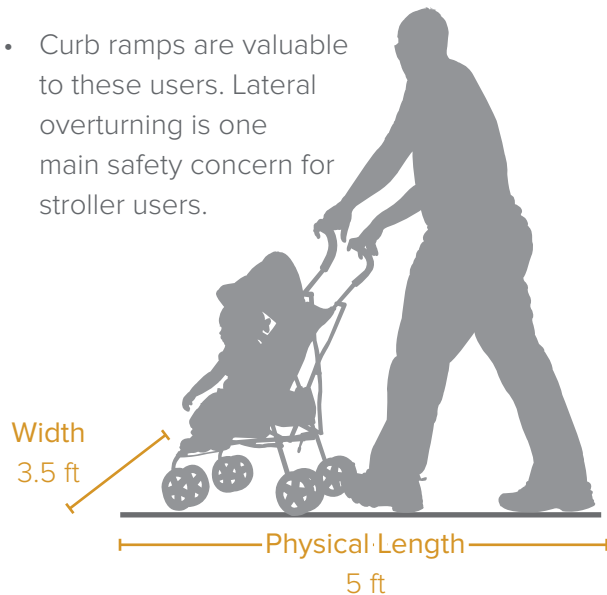


STROLLER USERS

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 three 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 Consideration

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

Four Types of Bicyclists

Strong and Fearless

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

Enthusiastic and Confident

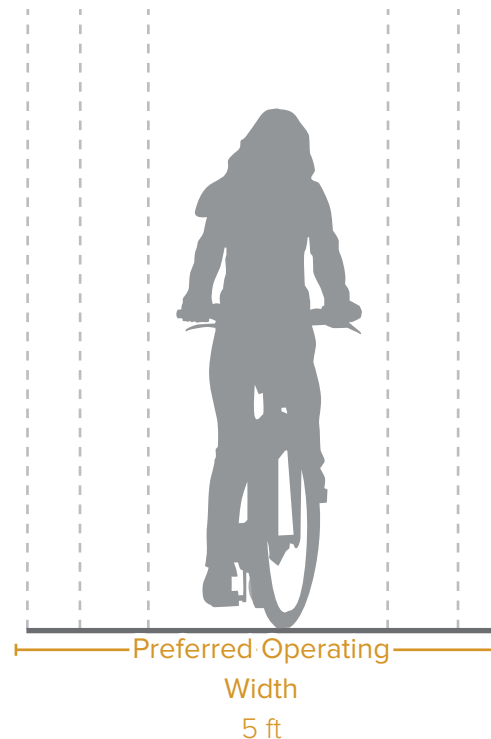
Confident riding in most roadway situations but prefer to have a designated facility. Comfortable riding on major streets with a bike lane.

Interested But Concerned

Cautious and has some inclination towards biking but are held back by concern over sharing the road with cars. Prefer separated pathways or low traffic neighborhood streets.

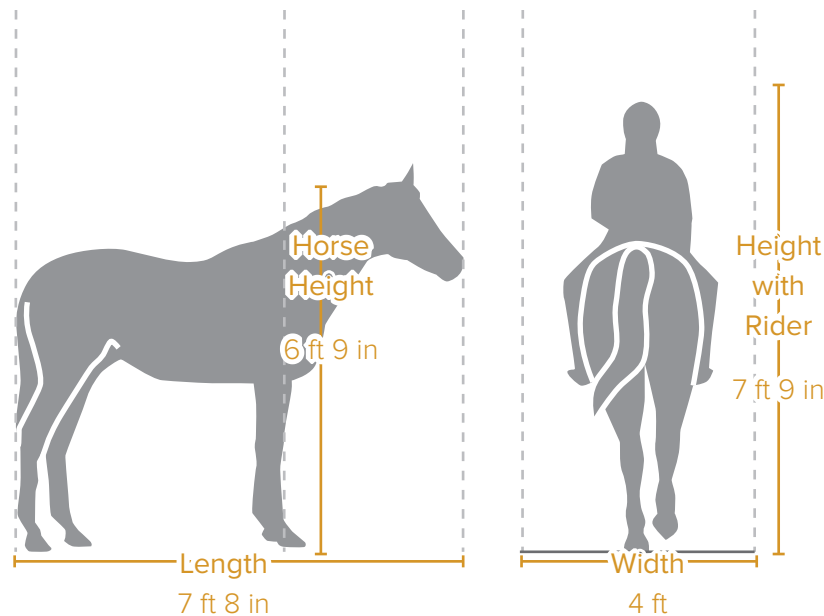
No Way No How

Residents who simply aren't interested at all in biking, may be physically unable or don't know how to ride a bike, and they are unlikely to adopt biking.



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.

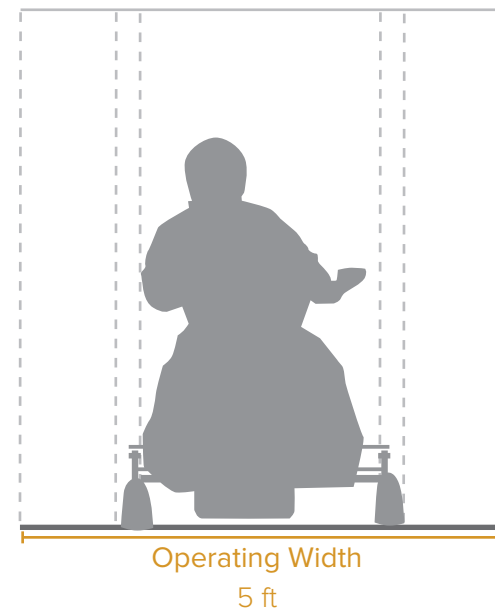


SNOWMOBILES USERS

The physical space required for snowmobile users to operate defines the width for snowmobile compatible facilities. Two-way trails are the most common type of snowmobile trail, but one-way trails may be used as a part of a snowmobile trail system or where facilities are provided in both directions.

Key Considerations

- Operation on asphalt trail surface is possible where snowfall is sufficient (12 inches or greater).
- 10 ft preferred for one-way operation (8 ft minimum)
- 12-14 ft preferred for two-way operation (10 ft minimum)

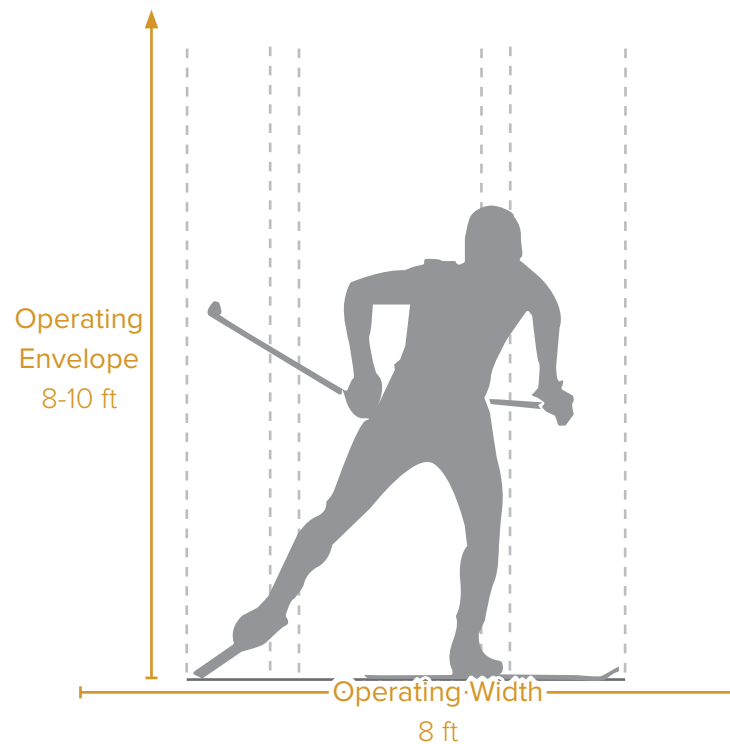


NORDIC SKIERS

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.



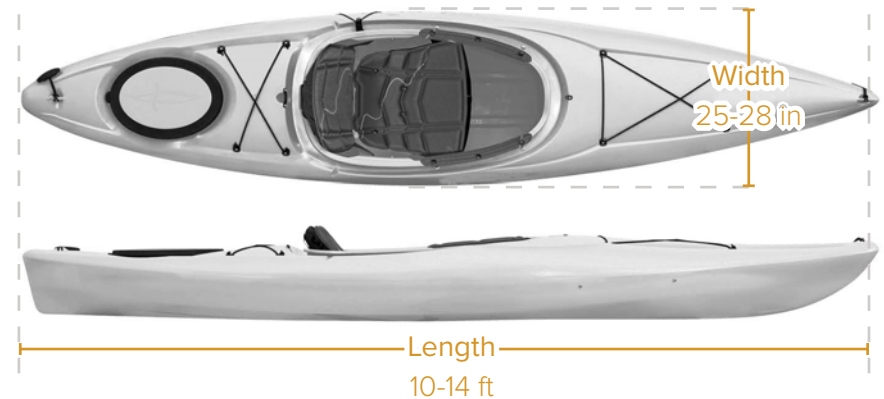
PADDLE USERS

The Empire State 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 Considerations

- 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.

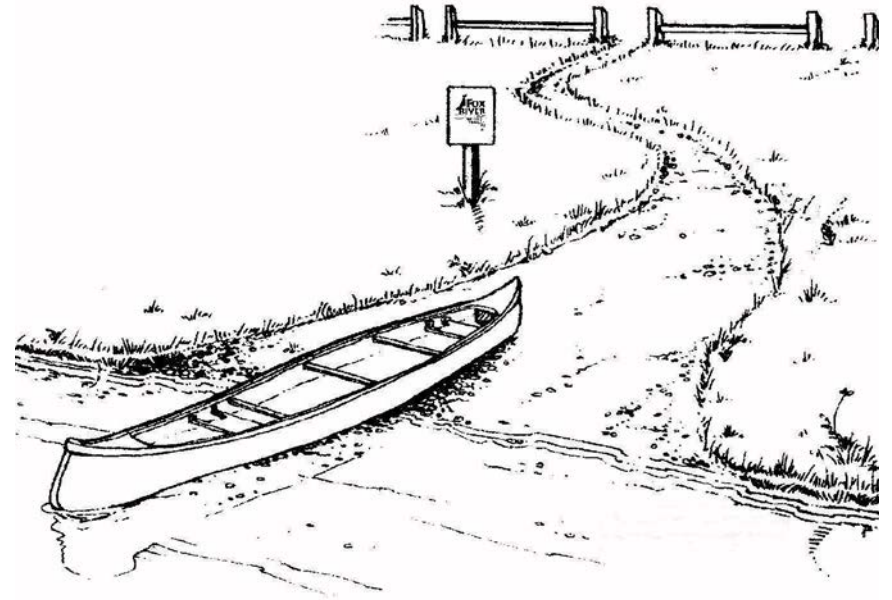


Image source: Openlands, Paddle Illinois Water Trails.

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.

FURTHER CONSIDERATIONS

- The availability of parking at a launch site will depend upon the specific site's accessibility. Remote sites will require less parking while sites located in areas with higher use will require more. Launch sites in areas of high use will need more space and available parking than 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.



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FACILITY DESIGN GUIDELINES



GUIDANCE BASIS

The following guidelines are referred to in this guide.

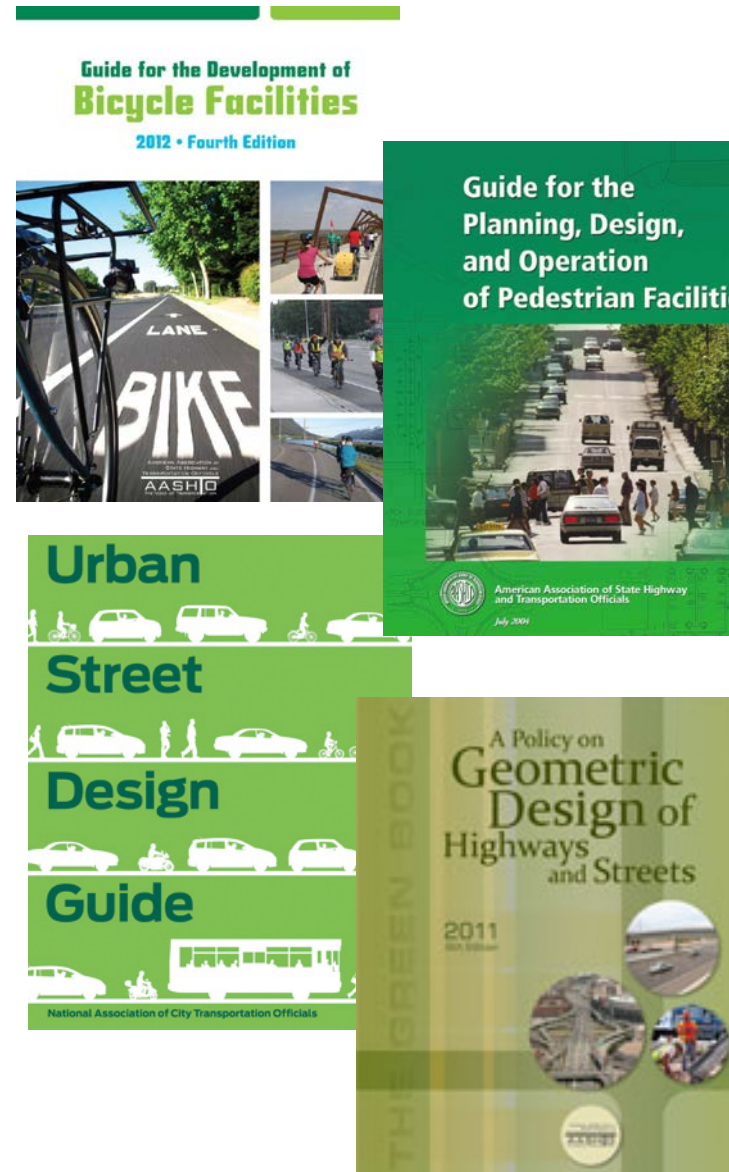
NATIONAL GUIDELINES

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.





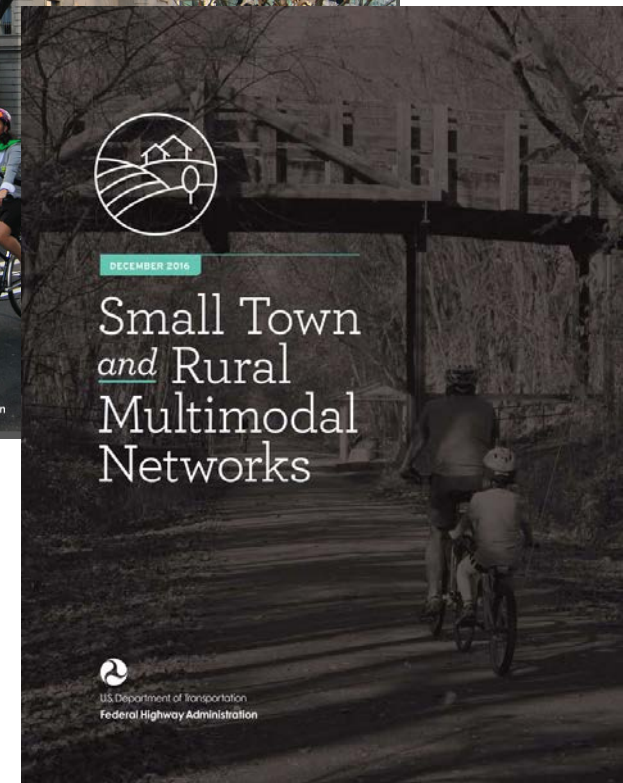
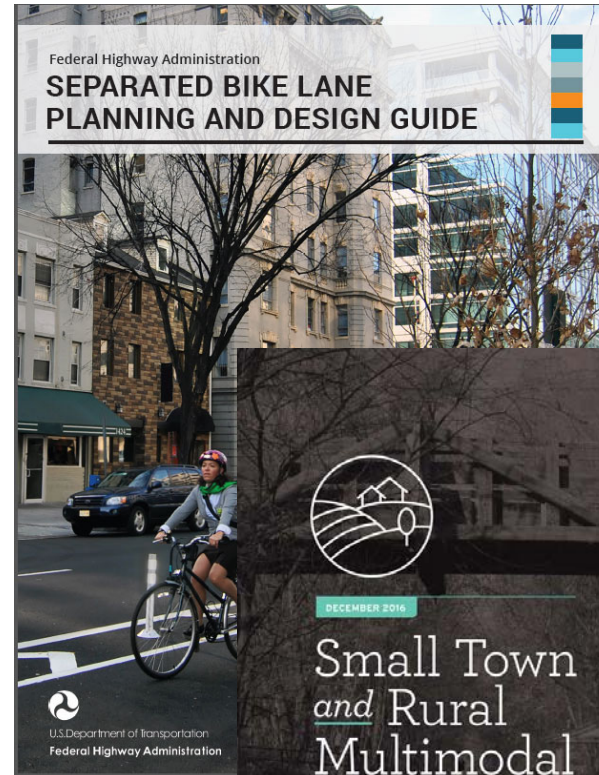
The National Association of City Transportation Officials' (NACTO) **Urban Bikeway Design Guide 2012** offers guidance on the current state of practice in the design of urban areas.

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 Multimodal 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).

Users need to 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 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 Supplement to the Manual on Uniform Traffic Control Devices for Streets and Highways (2009 Edition)
Effective March 16, 2011
New York State Department of Transportation

NEW YORK STATE OF OPPORTUNITY	Department of Transportation	TRAFFIC SAFETY & MOBILITY INSTRUCTION	TSMI 17-02 Code: SP8C
SUBJECT: APPLICABILITY OF AMERICANS WITH DISABILITIES ACT (ADA) GUIDELINES TO PEDESTRIAN SAFETY ACTION PLAN (PSAP) COUNTERMEASURES			
Target Audience: <input type="checkbox"/> Regional Traffic Engineer <input type="checkbox"/> Operations & Asset Mgmt. Div. <input type="checkbox"/> Regional Dir. of Operations <input type="checkbox"/> Regional Director	<input type="checkbox"/> Construction <input type="checkbox"/> Design <input type="checkbox"/> Maintenance	Approved: Robert Lengua, P.E., Director Office of Traffic Safety & Mobility	08/12/2017 Date

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

intended to provide general direction and specific policy regarding Act (ADA) compliance when implementing the following uncontrolled crosswalk locations and signalized intersection

intermeasures:

- H/Via Crosswalk Markings (upgrade or maintenance of existing)
- strian Crossing Signs (W11-2)
- n Crossing Signs
- Markings (at midblock crossings)
- o Pedestrian Signs
- redirection at intersections
- Signs
- Warning Beacon Installation
- Interval (L/P)No Turn On Red LED & Accessible Pedestrian Signal Station
- Installation
- pedestrian Refuge Medians and/or Corner Refuge Islands

intermeasures:

- l for proper pedestrian clearance time/intervals
- l for better coordination (and bandwidth use)
- th retro-reflective borders
- signals to countdown indications (at remaining eligible locations)
- eswalk to H/Via and/or add H/Via at unmarked signalized locations
- redirection at intersections
- training (see table for possible countermeasure applications)
- in Signals (APS)
- Interval (L/P)No Turn On Red LED & Accessible Pedestrian Signal
- ten signal
- 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 Multimodal Networks	FHWA. Achieving Multimodal 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 Multimodal 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 Empire State 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. AREA TYPE SELECTION

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

Roadway classification systems identify a roadway as either as “rural” or “urban” in addition to a base functional classification. The identification of this area type is the first step in selecting an appropriate facility for use on the Empire State 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:

Characteristics of Urban Character Areas

- 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

SUBURBAN AREA TYPES

Areas that meet one or more of the above indicators, but are not clearly urban in character, may be considered suburban in character. Suburban character should select the area type based on the presence of curbs and sidewalks. Areas with curbs and sidewalks should be considered an urban area type, and routes without curbs and sidewalks should be considered a rural area type.

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. Empire State 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 adjacent chart 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	Preferred	Preferred	Preferred	Preferred	Consider	Preferred	Requires Review	Requires Review	Requires Review	Requires Review	Requires Review
	>400 to 2000	Preferred	Preferred	Preferred	Preferred	Consider	Preferred	Requires Review	Requires Review	Requires Review	Requires Review	Requires Review
	>2000 to 10000	Preferred	Preferred	Preferred	Preferred	Requires Review	Preferred	Consider	Requires Review	Requires Review	Requires Review	Requires Review
	>10000 to 25000	Consider	Preferred	Preferred	Preferred	Requires Review	Consider	Consider	Requires Review	Requires Review	Requires Review	Requires Review
	>25000	Consider	Preferred	Preferred	Preferred	Requires Review	Consider	Consider	Requires Review	Requires Review	Requires Review	Requires Review
>30 to 55	<400	Consider	Preferred	Requires Review	Requires Review	Requires Review	Consider	Consider	Consider	Consider	Consider	Consider
	>400 to 2000	Consider	Preferred	Requires Review	Requires Review	Requires Review	Consider	Consider	Consider	Consider	Consider	Consider
	>2000 to 10000	Requires Review	Preferred	Requires Review	Requires Review	Requires Review	Consider	Consider	Consider	Consider	Consider	Consider
	>10000 to 25000	Requires Review	Preferred	Requires Review	Requires Review	Requires Review	Consider	Consider	Consider	Consider	Consider	Consider
	>25000	Requires Review	Preferred	Requires Review	Requires Review	Requires Review	Consider	Consider	Consider	Consider	Consider	Consider
>55	<400	Consider	Preferred	Requires Review	Requires Review	Consider	Consider	Consider	Consider	Consider	Consider	Consider
	>400 to 2000	Consider	Preferred	Requires Review	Requires Review	Consider	Consider	Consider	Consider	Consider	Consider	Consider
	>2000 to 10000	Requires Review	Preferred	Requires Review	Requires Review	Requires Review	Consider	Consider	Consider	Consider	Consider	Consider
	>10000 to 25000	Requires Review	Preferred	Requires Review	Requires Review	Requires Review	Consider	Consider	Consider	Consider	Consider	Consider
	>25000	Requires Review	Preferred	Requires Review	Requires Review	Requires Review	Consider	Consider	Consider	Consider	Consider	Consider
2 or 4 Lane road, shoulder 4 feet wide or more												
≤30	<400	Preferred	Preferred	Preferred	Preferred	Preferred	Preferred	Requires Review	Requires Review	Requires Review	Requires Review	Requires Review
	>400 to 2000	Preferred	Preferred	Preferred	Preferred	Preferred	Preferred	Requires Review	Requires Review	Requires Review	Requires Review	Requires Review
	>2000 to 10000	Preferred	Preferred	Preferred	Preferred	Preferred	Preferred	Consider	Requires Review	Requires Review	Requires Review	Requires Review
	>10000 to 25000	Consider	Preferred	Preferred	Preferred	Preferred	Preferred	Consider	Requires Review	Requires Review	Requires Review	Requires Review
	>25000	Consider	Preferred	Preferred	Preferred	Preferred	Preferred	Consider	Requires Review	Requires Review	Requires Review	Requires Review
>30 to 55	<400	Consider	Preferred	Requires Review	Requires Review	Requires Review	Consider	Consider	Consider	Consider	Consider	Consider
	>400 to 2000	Consider	Preferred	Requires Review	Requires Review	Requires Review	Consider	Consider	Consider	Consider	Consider	Consider
	>2000 to 10000	Consider	Preferred	Requires Review	Requires Review	Requires Review	Consider	Consider	Consider	Consider	Consider	Consider
	>10000 to 25000	Consider	Preferred	Consider	Consider	Consider	Consider	Consider	Consider	Consider	Consider	Consider
	>25000	Consider	Preferred	Consider	Consider	Consider	Consider	Consider	Consider	Consider	Consider	Consider
>55	<400	Consider	Preferred	Requires Review	Requires Review	Consider	Consider	Consider	Consider	Consider	Consider	Consider
	>400 to 2000	Consider	Preferred	Requires Review	Requires Review	Consider	Consider	Consider	Consider	Consider	Consider	Consider
	>2000 to 10000	Requires Review	Preferred	Requires Review	Requires Review	Requires Review	Consider	Consider	Consider	Consider	Consider	Consider
	>10000 to 25000	Requires Review	Preferred	Requires Review	Requires Review	Requires Review	Requires Review	Consider	Consider	Consider	Consider	Consider
	>25000	Not Recommended	Preferred	Requires Review	Requires Review	Requires Review	Requires Review	Requires Review	Consider	Consider	Consider	Consider



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 side path 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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SHARED USE PATH GUIDELINES



GENERAL DESIGN PRACTICES

A shared use path provides a travel area separate from motorized traffic for bicyclists, pedestrians, skaters, 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.

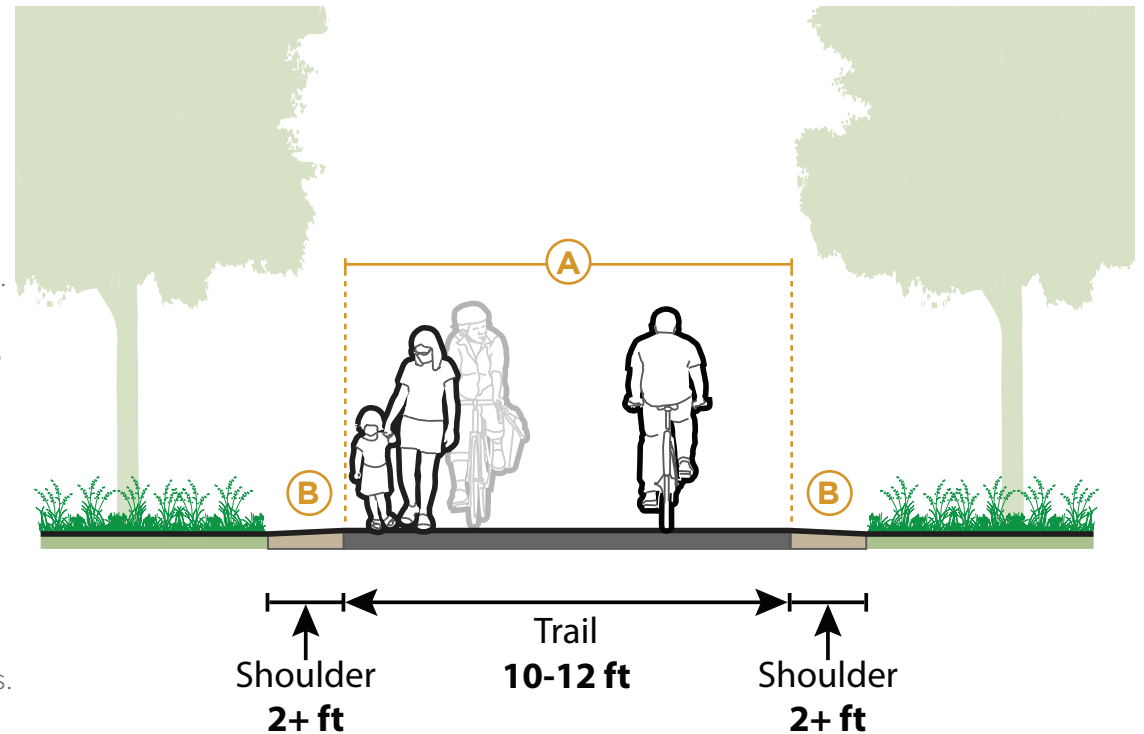
TYPICAL APPLICATION

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

- 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 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).
- 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 yr; Outslope of 2-4%	8-14 ft depending on speed depending upon speed.

* 2 additional feet needed for snowmobiles, 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. The use of concrete for paths has proven to be more durable over the long term. 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.

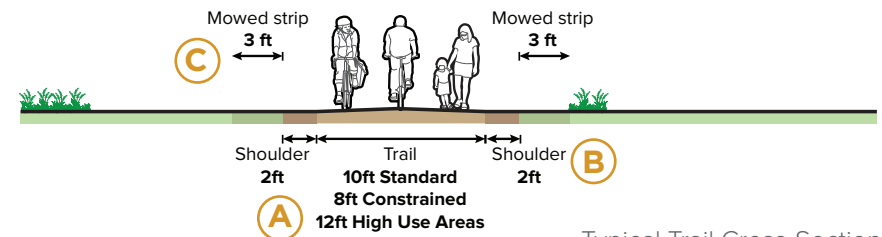
SHARED USE PATHS WITHIN NATIONAL GRID UTILITY CORRIDORS

TYPICAL APPLICATION

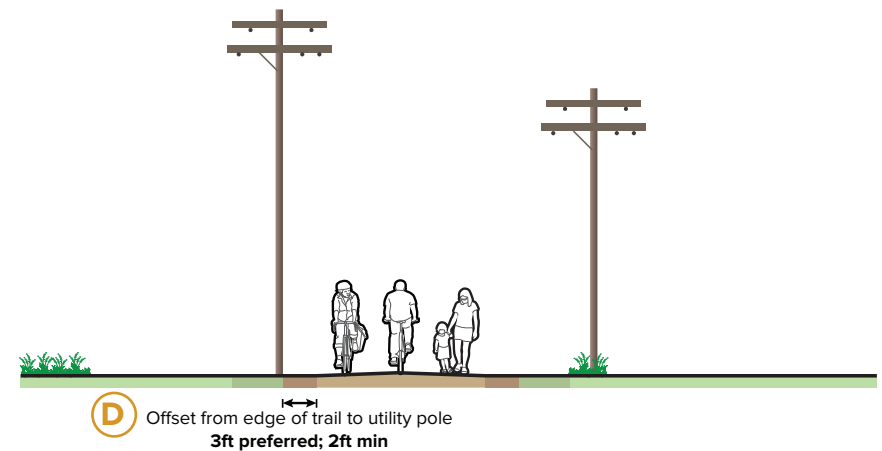
These guidelines are for sections of trails within National Grid utility corridors.

DESIGN FEATURES

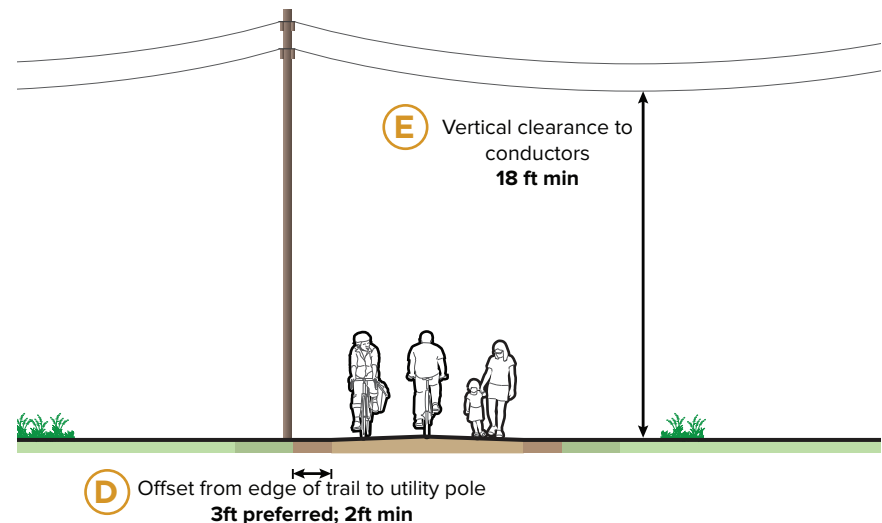
- A** Typical trail width will be 10 feet; in constrained areas, the width may be reduced to 8 feet, in high-volume locations (usually in more urban areas) the width may increase to 12 feet.
- B** Shoulders 2 feet in width will be provided on both edges of the trail. These areas will be graded as an 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.
- F** The trail shall meet minimum requirements of latest version of the AASHTO Guide for the Development of Bicycle Facilities.



Typical Trail Cross-Section



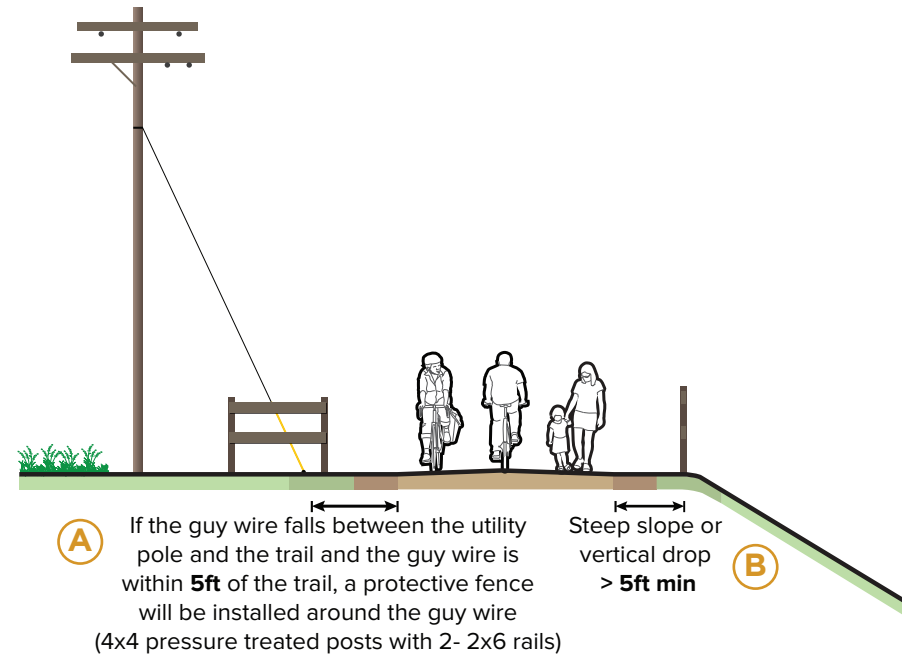
Typical Corridor Cross-Section



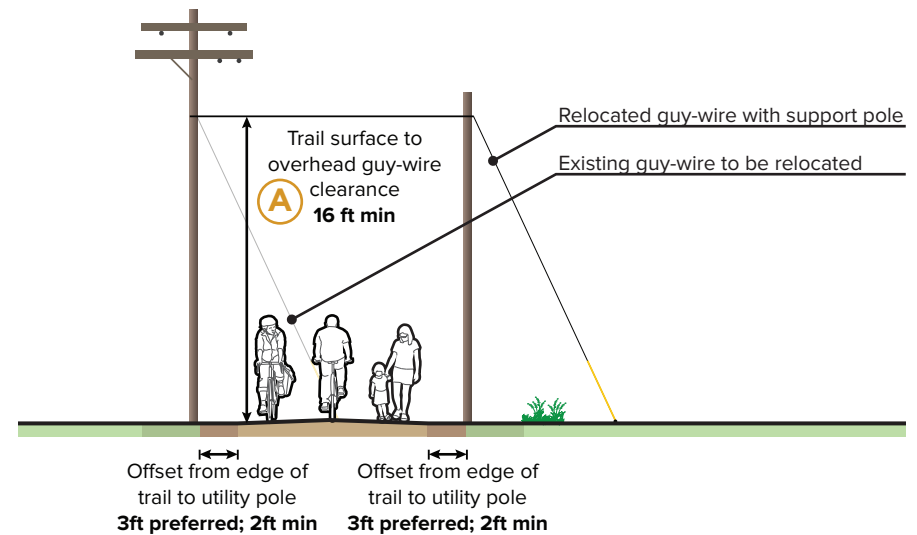
Typical Corridor Crossing Cross-Section

DESIGN FEATURES

- A** 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.
- B** 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.
 - The trail will be designed to accommodate H-20 loads for emergency and maintenance vehicles. Bridges constructed for the trail will 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 sections 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 sections will be signed as open to the public “Dawn to Dusk” only.



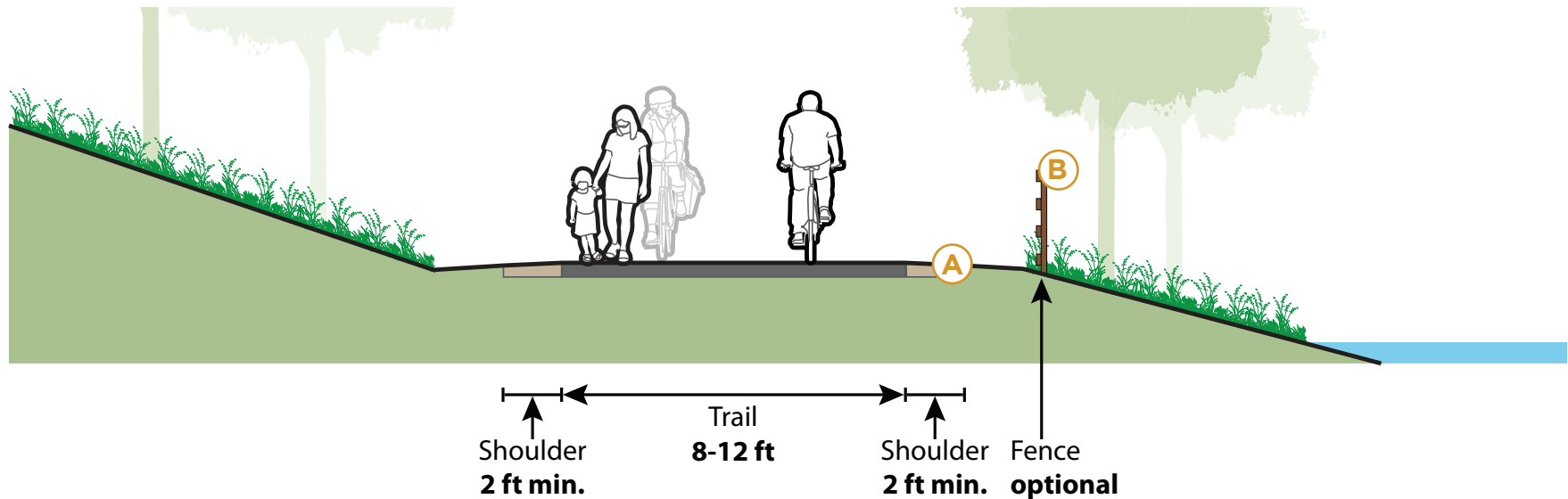
Typical Trail Location at Utility Pole Guy-wire



Typical Trail Location at Relocated Guy-wire

SHARED USE PATHS ALONG CANALS

Canals often offer excellent shared use path development and bikeway gap closure opportunities. These corridors provide outstanding transportation and recreation opportunities for bicyclists of all ages and skills.



DESIGN FEATURES

- Shared use paths adjacent to waterways should meet or exceed general design practices. If additional width allows, wider paths, and landscaping are desirable.

A B Where the path is adjacent to canals, 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 path users within the designated travel way. Creative design of fencing is encouraged to make the path facility feel welcoming to the user.
- Any access point to the path should be well-defined with appropriate signage designating the pathway as a bicycle facility and prohibiting motor vehicles.



Canal Trail (Source: Ronald Saunders, CC BY-SA 2.0 via Flickr)

FURTHER CONSIDERATIONS

It is not desirable to place the pathway 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 path users from leaving the path in an emergency, and impedes emergency response (AASHTO Bike Guide p.5-6).

Public access to flood control channels or canals 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:

- Canal/flood control channel or other maintenance activities
- Inclement weather or the prediction of storm conditions

MAINTENANCE

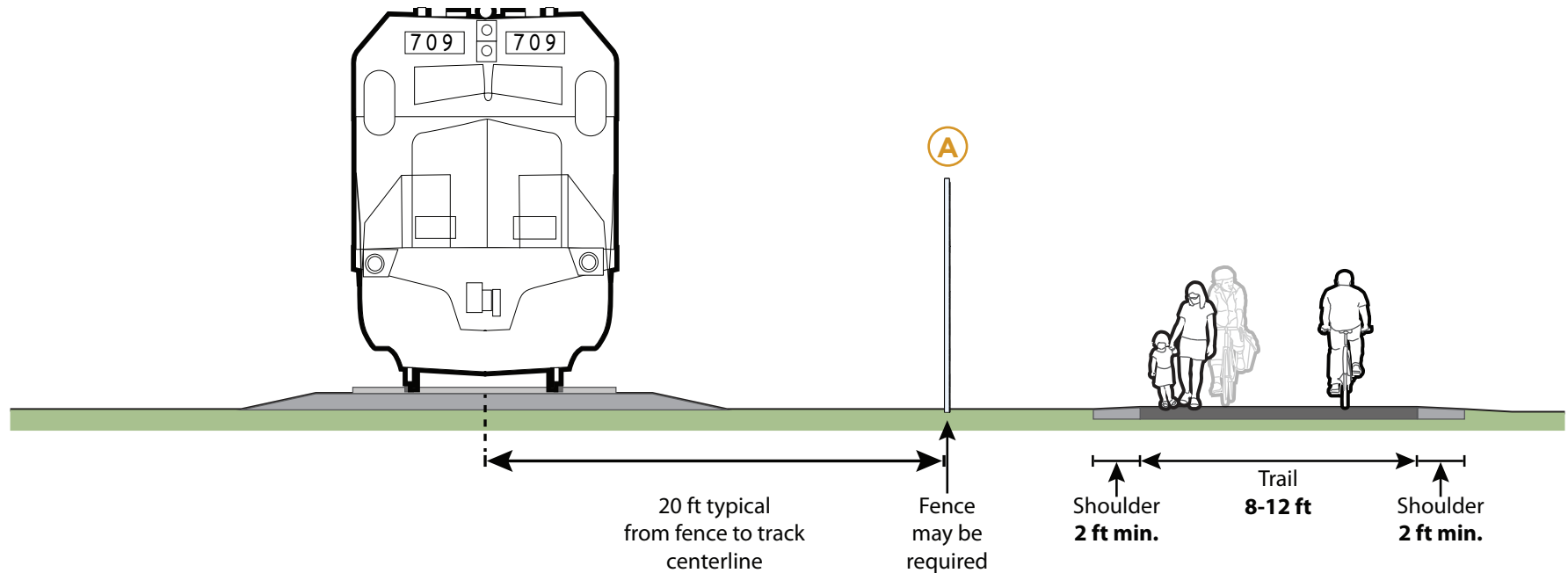
Asphalt is the most common surface for bicycle paths. The use of concrete for paths has proven to be more durable over the long term. Saw cut joints rather than troweled improve user experience.

REFERENCES

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

SHARED USE PATHS ALONG RAIL CORRIDORS

“Rails-with-Trails” are shared use paths located adjacent to active rail lines. Rail-with-trail designs vary widely, depending on factors such as their proximity to trains, the frequency and speed of rail service, and the presence of at-grade crossings.



TYPICAL APPLICATION

Many rails-with-trails have segments of trail that are within 30 feet of active railroad tracks (RTC 2013).

In some cases, space needs to be preserved for future planned freight, transit or commuter rail service. In other cases, limited right-of-way width, inadequate setbacks, concerns about safety/ trespassing, and numerous crossings may affect a project's feasibility.

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DESIGN FEATURES

- Shared use paths along rail corridors should meet or exceed general design standards. If additional width allows, wider paths, and landscaping are desirable.
- A** If required, fencing should be a minimum of 5 feet in height with higher fencing than usual next to sensitive areas such as switching yards.
- The FHWA Rails-with-Trails document provides no consensus on an appropriate setback distance between the paved edge of a shared use path and the centerline of the closest active rail track. Setbacks from the active rail line will vary depending on the speed and frequency of trains, topography, sight distances, and available right-of-way (FWHA 2002).



Rail with trail (Source: Michael Hicks, CC BY 2.0 via Flickr)



Hiawatha LRT Trail, Minneapolis, MN (Source: airbus777, CC BY 2.0 via Flickr)

FURTHER CONSIDERATIONS

- Railroads may require fencing with rail-with-trail projects. Concerns with trespassing and security can vary with the volume and speed of train traffic on the adjacent rail line and the setting of the shared use path, i.e. whether the section of track is in an urban or rural setting.
- Refer to the AASHTO Bike Guide for guidance for “Railroad Grade Crossings” in (Section 4.12.1), addressing crossing angle, surfaces, bikeway width and flange opening.
- Refer to the MUTCD Chapter 8D for guidance on shared use pathways that cross railroad corridors at grade.

MAINTENANCE

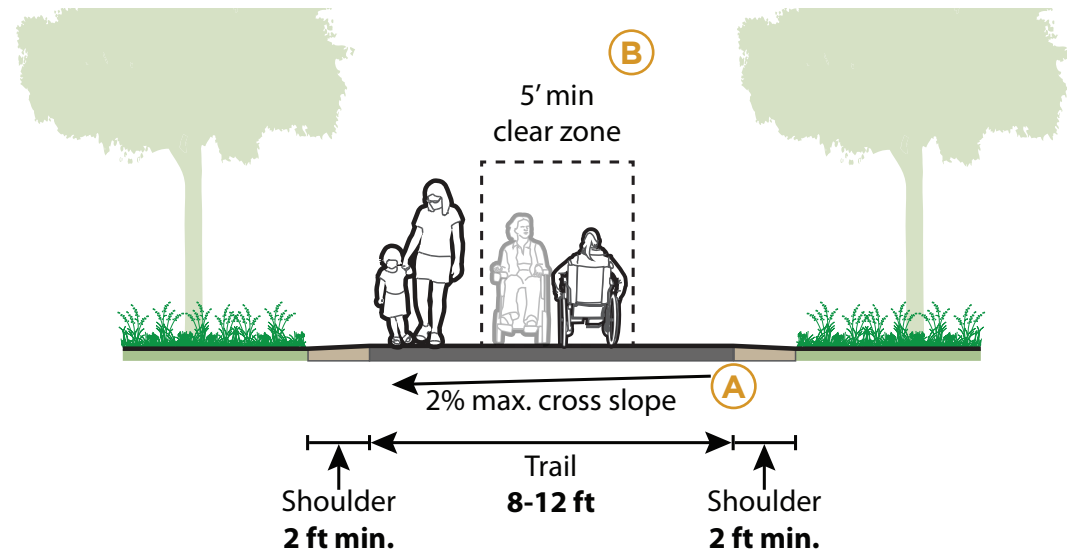
Proper management and maintenance is an important factor in creating a safe environment for trail users. Asphalt is the most common surface for bicycle paths. The use of concrete for paths has proven to be more durable over the long term. Saw cut concrete joints rather than troweled improve the experience of path users.

REFERENCES

AASHTO. Guide for the Development of Bicycle Facilities. 2012.
FHWA. Manual on Uniform Traffic Control Devices. 2009.
FHWA. Rails-with-Trails: Lessons Learned. 2002.
Rails to trails conservancy (RTC). America's Rails-with-Trails. 2013.

ACCESSIBILITY OF SHARED USE PATHS

New shared use paths must meet accessibility guidelines to ensure that paths, 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 paths and 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

- Path 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 path 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 path 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 path 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 must provide a 5 ft (1.5 m) minimum clear width to serve as an accessible pedestrian access route. A minimum clear width is 4 ft is acceptable if passing spaces are provided every 200 ft. Most shared used paths 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.



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)

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

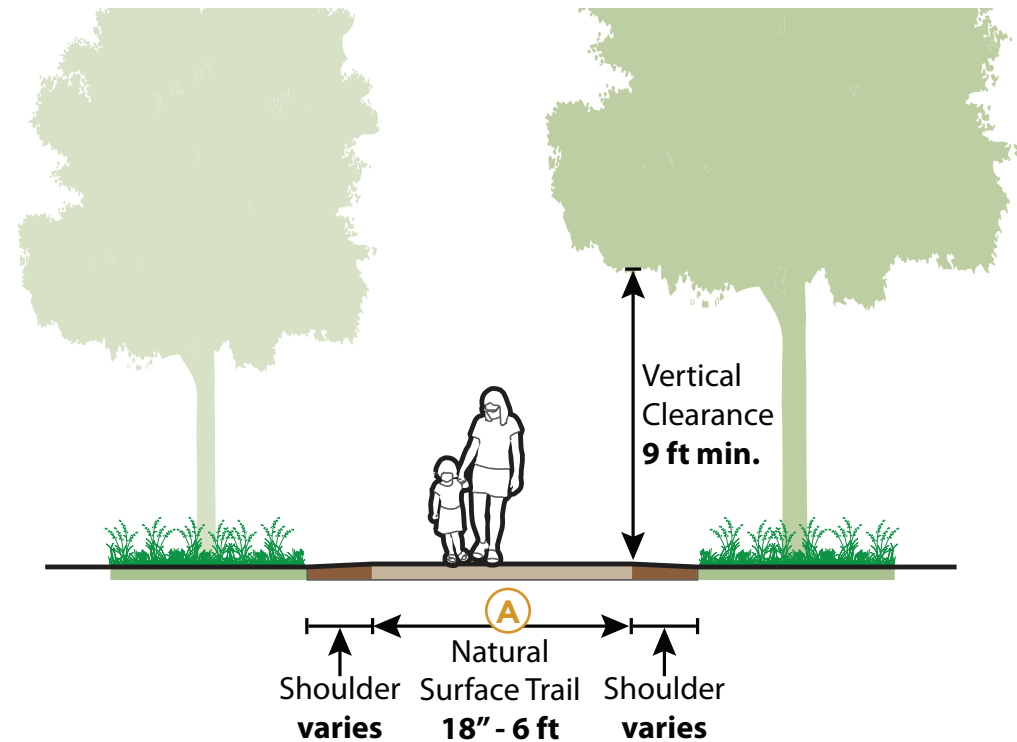
The trail surface should be solid, free of obstacles and tripping hazards. Trail edge vegetation/screening, and signage should be maintained and located so as not to present obstacles for visually impaired trail users.

REFERENCES

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

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 Empire State Trail route.



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.

DESIGN FEATURES

- A** 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).



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



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

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.

MAINTENANCE

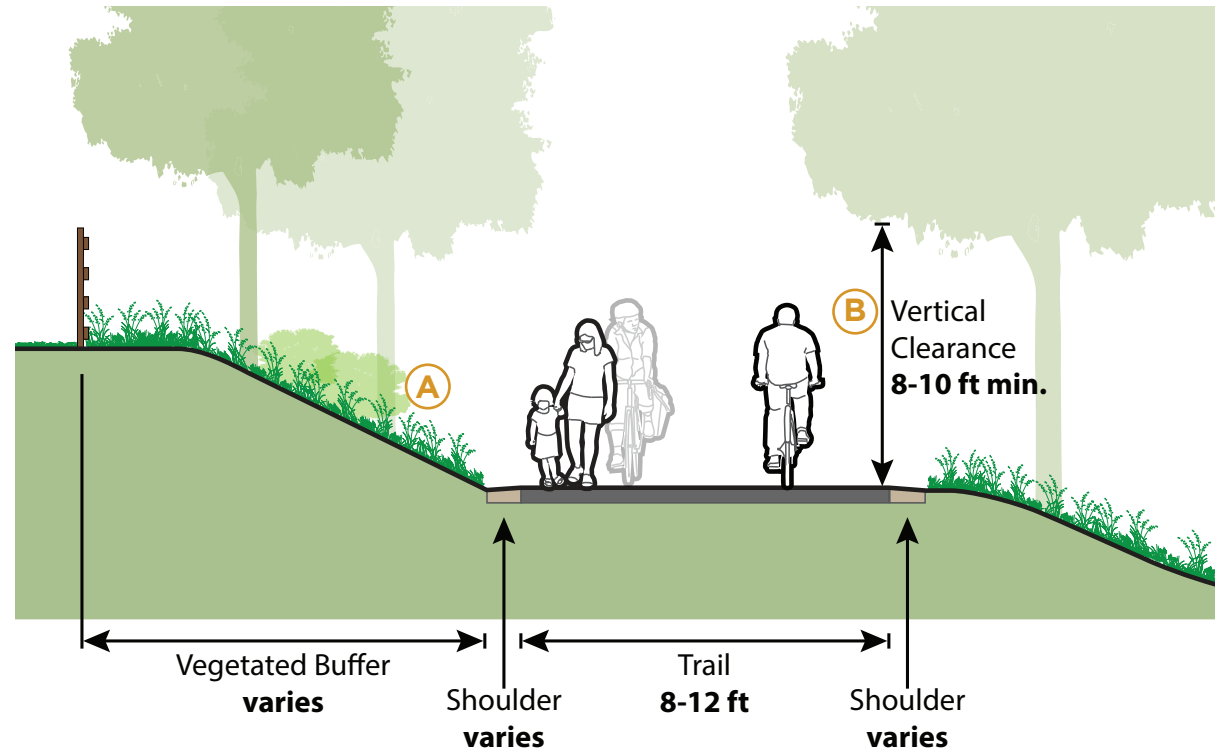
If trails remain unused during storm events, and are constructed correctly, they can remain virtually maintenance free. Use signs on-site that discourage use in wet weather, or just after wet weather.

REFERENCES

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

VEGETATIVE SCREENING

Landscape features, including trees and shrubs along paths, can enhance the visual environment and improve the path user experience. Trees and shrubs can also shade users from sun and shelter users from rain.



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.

See Trail Style - Native Planting for plant selection details.

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DESIGN FEATURES

- A** All groundcover and shrubs to be trimmed to a maximum of 24" above ground level height.
 - Where vegetative screens are recommended to provide privacy for private properties, they are not to exceed 4' in height.
- B** 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.



Example of vegetative screening along a trail corridor



Native and culturally significant plants should be selected for trail screening, see Trail Style - Native Planting for additional details.

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.

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

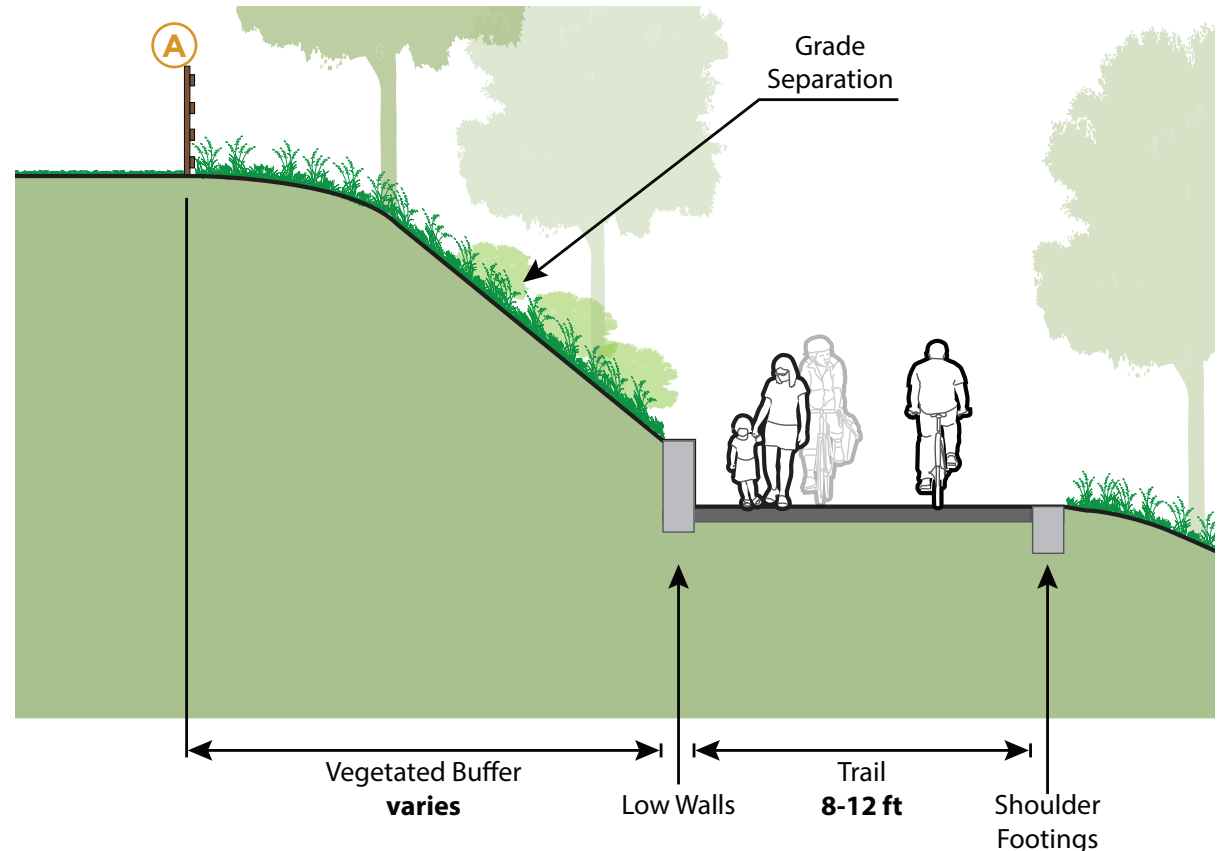
Vegetation, topography, ditches, fencing, railings, or walls may be used to clearly mark trail edges. Such features serve multiple purposes, including:

- 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.

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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).



Low wall at Parkersberg Riverpoint Park (Source: Redi-Rock International, CC BY 2.0 via Flickr)

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. Trail segments adjacent to active rail lines may require fencing, at the discretion of the owner and operator of the rail corridor.

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

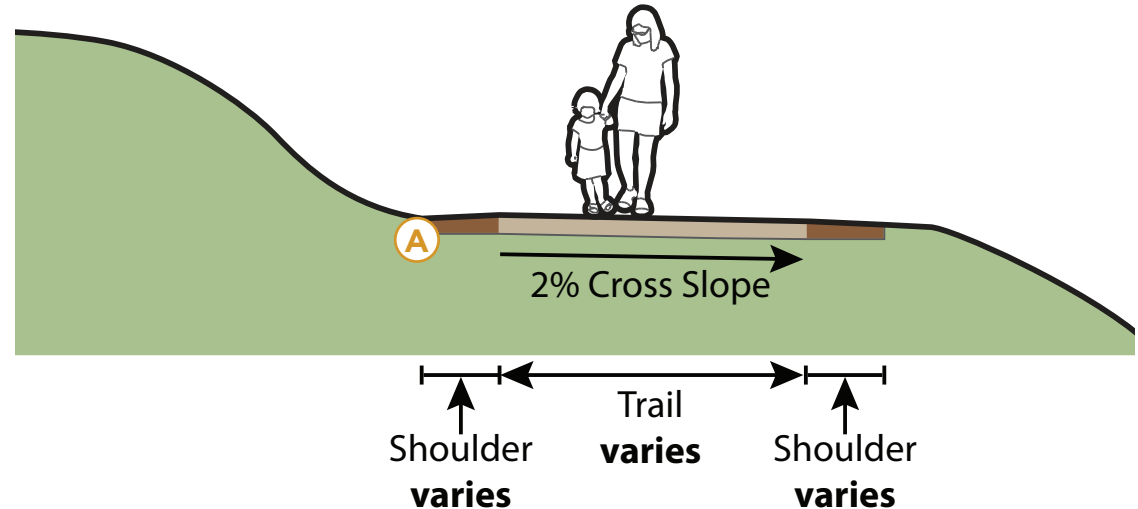
AASHTO. Guide for the Development of Bicycle Facilities. 2012.

DRAINAGE AND EROSION CONTROL

Drainage and erosion control is necessary to maintain a stable walkway and trail surface.

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:

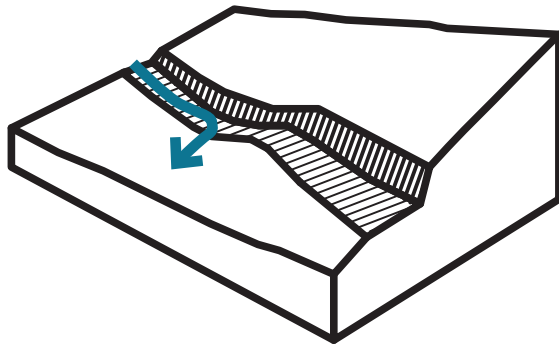
- A** A 2% cross slope will resolve most drainage issues on a paved path and should be used for both the trail and its shoulders. Design with a 1.5% cross slope target is recommended to account for variation in construction tolerances. A maximum 1V:6H slope may be used for the shoulders although 2% is 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:

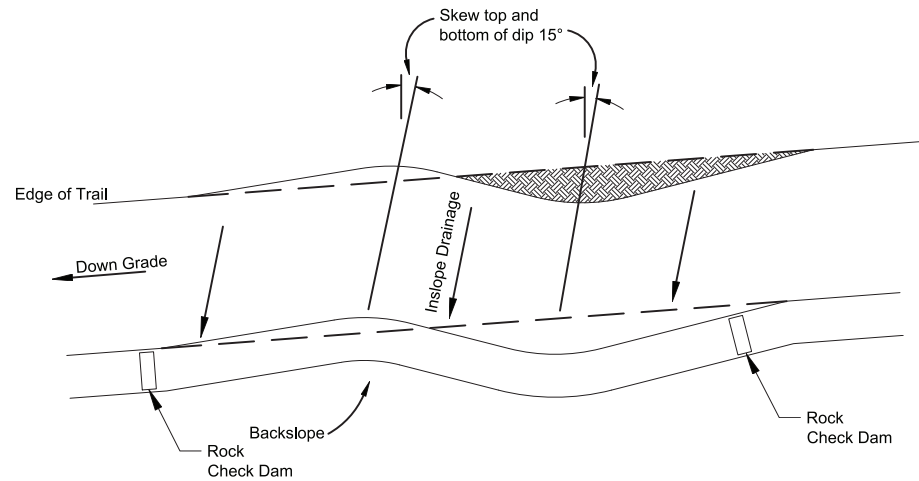
- Erosion will occur on natural surface trails. Natural surface trails should be designed to accommodate erosion by shaping the tread to limit how much erosion occurs and to maintain a

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.



Rolling grade diagram, draining outward



Inslope rolling grade drainage

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.

MAINTENANCE

Asphalt is the most common surface for bicycle paths. The use of concrete for paths has proven to be more durable over the long term. Saw cut concrete joints rather than troweled improve the experience of path users.

REFERENCES

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

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

- A** 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.



Trail bollards at street crossing



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

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).

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.

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 by motor vehicles difficult.
- B** At intersections, split the path tread into two sections separated by low landscaping. 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.
- C** 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.



Bollard alternative, split trail entrance/exit

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.

MAINTENANCE

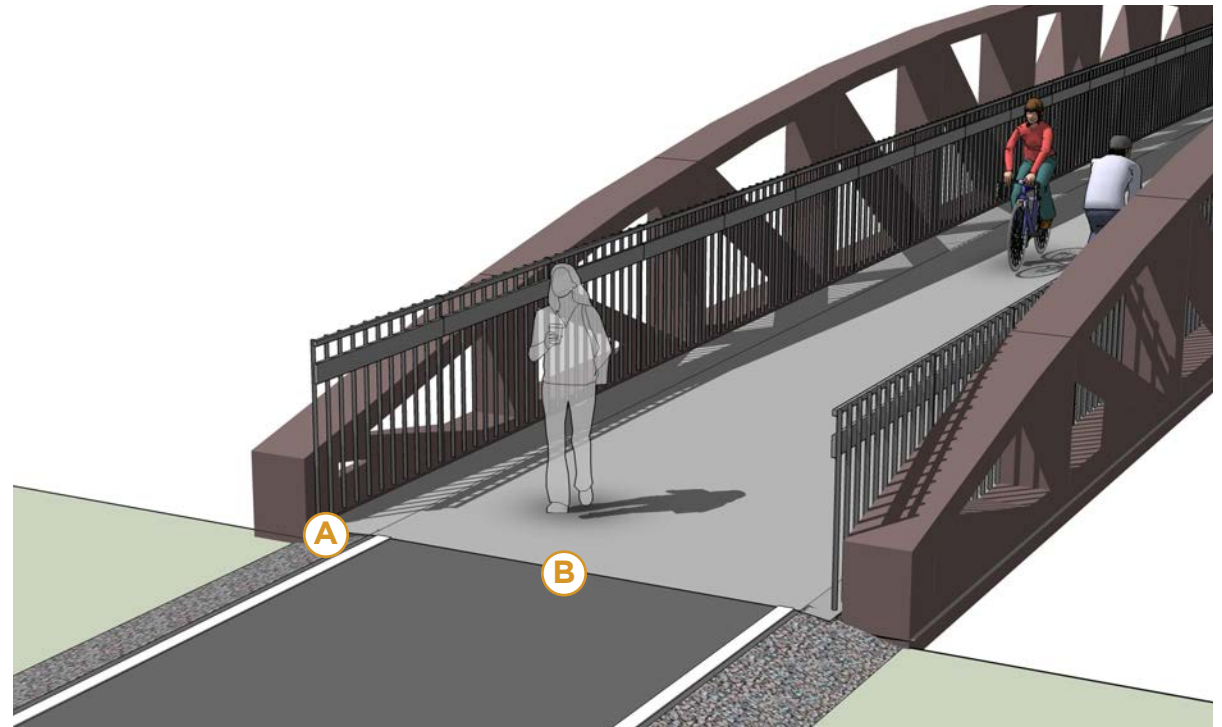
Landscaping separation between treads should be maintained to a height easily straddled by emergency vehicles.

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.

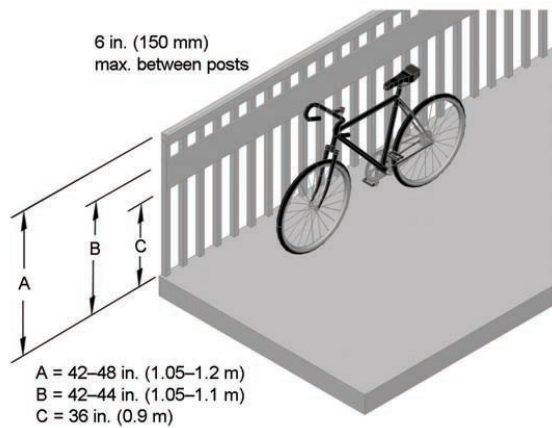


TYPICAL APPLICATION

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 12 ft (3.6 m). (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).



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



Vasona Lake County Park Bridge, Los Gatos, CA

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 Empire State Trail material palette shown on page 3-8 wherever possible.

All bridge components should be design and sealed by a New York certified structural engineer and all relevant permits should be filed.

MAINTENANCE

High quality prefabricated pedestrian bridges are available.

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.



Mine Creek Trail, Raleigh, NC

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.

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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SHARED USE PATH CROSSINGS



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SHARED USE PATH 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 should be evaluated following the tables in the NYSDOT Pedestrian Safety Action Plan and other resources.

The table below present 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.

TABLE X-X: EST Crossing Treatment Selection

Street Posted Speed Range	15-25 mph		25-30 mph			30-45 mph							
	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.



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.



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.

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).

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

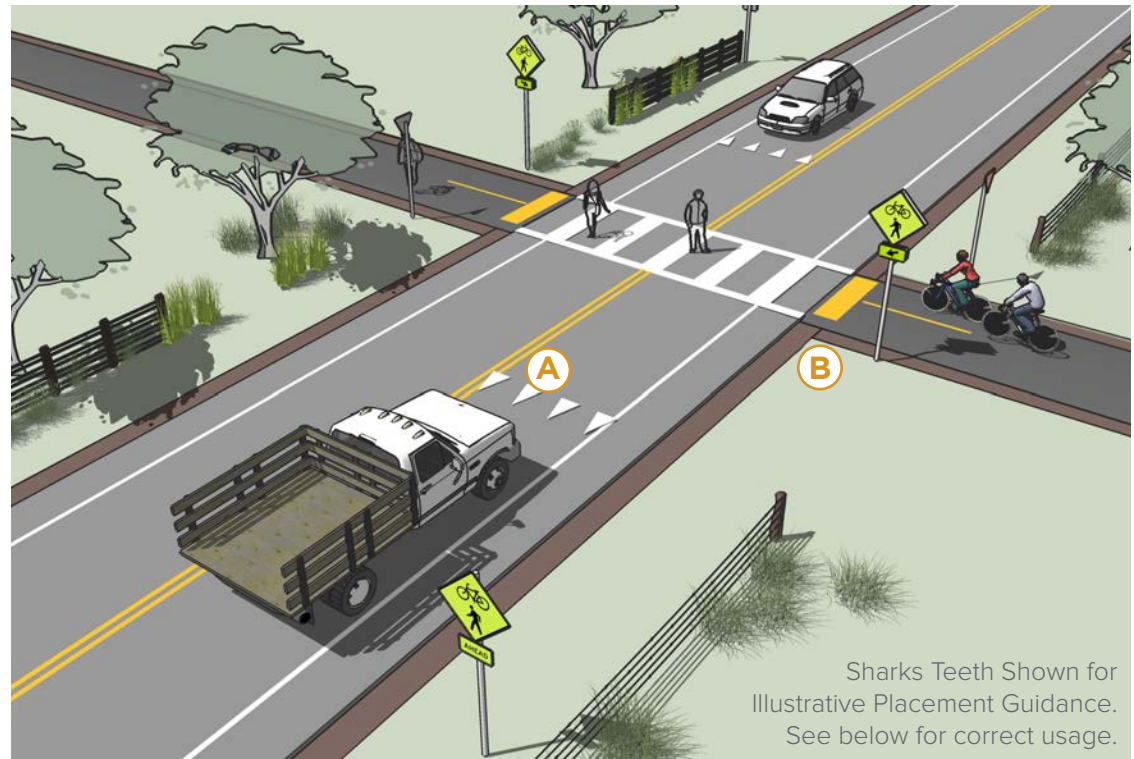
NYSDOT
Supplement

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.



Sharks Teeth Shown for Illustrative Placement Guidance. See below for correct usage.

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 **EST Crossing Treatment Selection Table** 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.



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



Yield sign (R1-2)

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).

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.

Further Guidance Available

HDM
Ch 18

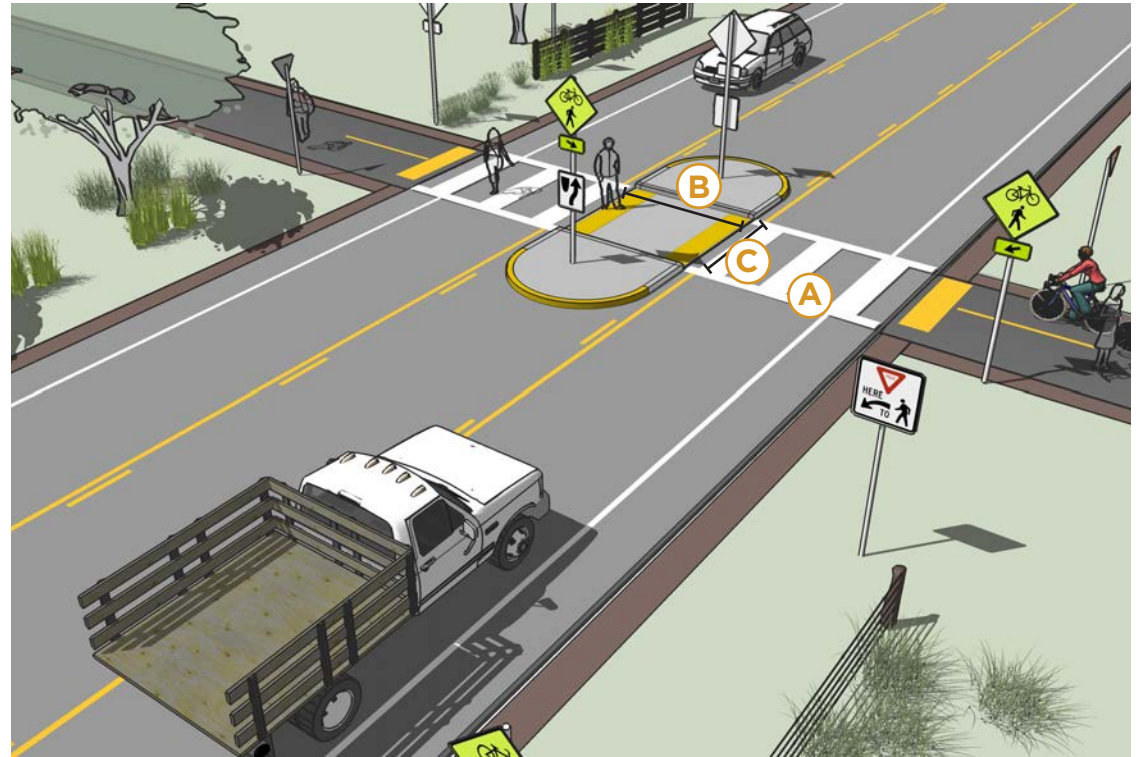
NYSDOT
PSAP

REFERENCES

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

MEDIAN REFUGE ISLAND CROSSING

Median refuge islands are located at the mid-point of a marked crossing and help improve path user safety by allowing pedestrians to cross one direction of traffic at a time. Refuge islands minimize pedestrian exposure by shortening crossing distance and increasing the number of available gaps for crossing.



TYPICAL APPLICATION

Can be applied on any roadway with a left turn center lane or median that is at least 8' wide, or where wide traffic lanes and/or shoulders can be narrowed to provide at least 8' of space for the island.

DESIGN FEATURES

- A** Median islands should be paired with a Marked Crosswalk and Advanced Yield Line crossing treatment package.
 - Configure the island with an at-grade passage through the island rather than ramps and landings. Detectable warning surfaces must be full-width and 2 ft (0.6 m) deep to provide indication for people with vision disabilities.
- B** To accommodate bicyclists, the standard refuge area depth is 10 ft (3.0 m), 8 ft (2.4 m) minimum (AASHTO Bike Guide 2012).
- C** The path through the median should be the same width of the crosswalk and approaching shared use path.



This midblock median refuge island and raised crosswalk allows pedestrians to cross the street in two stages.



Median refuge islands can have angled passages to orient path users to face oncoming traffic.

FURTHER CONSIDERATIONS

- Any refuge landscaping should not compromise the visibility of pedestrians crossing in the crosswalk. Shrubs and ground plantings should be no higher than 1 ft 6 in.
- On multi-lane roadways, consider pairing as a **Rectangular Rapid Flashing Beacon Crossing** for improved yielding compliance.
- Installation of a median safety island must meet accessibility guidelines. Refer to **NYSDOT TSMI 17-02** for information on ADA Applicability of various crossing treatment countermeasures.

MAINTENANCE

Refuge islands may collect road debris and may require somewhat frequent maintenance. Trees and plantings must be maintained so as not to impair visibility. Refuge islands should be visible to snow plow crews and should be kept free of snow berms that block access.

REFERENCES

AASHTO. Guide for the Development of Bicycle Facilities. 2012.
NYSDOT. TSMI 17-02: Applicability of ADA Guidelines to PSAP Countermeasures. 2017.

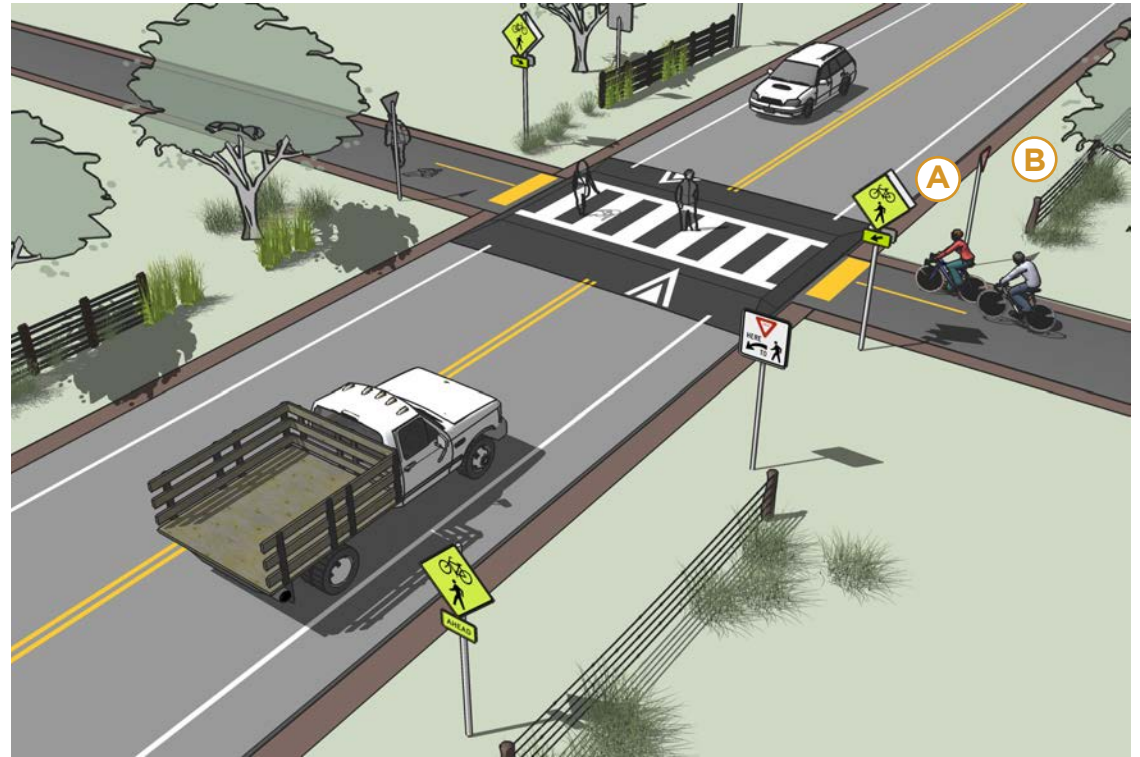
Further Guidance Available

AASHTO
Bike Guide

NYSDOT
TSMI

RAISED CROSSWALK

Raised crosswalks combine a marked crosswalk with raised speed-table geometry to increase yielding rates and clarify road user priority with geometric design.



TYPICAL APPLICATION

The NYSDOT EI 13-018 on raised crosswalks states that raised crosswalks may be used on midblock crosswalks that have or will have very high pedestrian volumes.

DESIGN FEATURES

- Raised crosswalks that may slow motorists should be paired with a **Marked Crosswalk and Advanced Yield Line** crossing treatment package.
- Ⓐ Raised crossing creates vertical deflection that may slows motorists and encourage yielding to path users, while high-visibility crosswalk markings establish a legal crosswalk away from intersections. Refer to **Standard Sheets 608-07** for specific guidance on the design of raised crosswalks.
- Where parking lanes exist, curb extensions should be used shorten crossing distance and position users in a visible location. Parking should be prohibited between the yield line and marked crosswalk.



This trail crossing combines a median safety island with raised crosswalk.



Raised crossings help to prioritize pedestrian movements across roadways.

FURTHER CONSIDERATIONS

- In areas with high pedestrian demand, data acquisition to determine pedestrian volumes for raised crosswalks should be performed in accordance with **NYSHDM Chapter 5 Basic Design, Section 5.2.1.1**. At locations where bicycles will routinely use the crossing, cycling volume data may be acquired in the same way.
- The approach to designing path crossings of streets depends on an evaluation of vehicular traffic, line of sight, pathway traffic, use patterns, vehicle speed, road type, road width, and other safety issues such as proximity to major attractions.
- Installation of a raised crosswalk must meet accessibility guidelines. Refer to **NYSDOT TSMI 17-02** for information on ADA Applicability of various crossing treatment countermeasures.
- For a curbed roadway, introduction of raised crossings may require adjustments to drainage catch basins.

MAINTENANCE

The raised crosswalk should use a sinusoidal profile to facilitate snow plow operation.

REFERENCES

NYSDOT. HDM Ch. 25: Traffic Calming.
NYSDOT. EI 13-018: Raised Crosswalks. 2013.
NYSDOT. TSMI 17-02: Applicability of ADA Guidelines to PSAP Countermeasures. 2017.

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.



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.

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** for information on ADA Applicability of various crossing treatment countermeasures.

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-11). 2008.
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

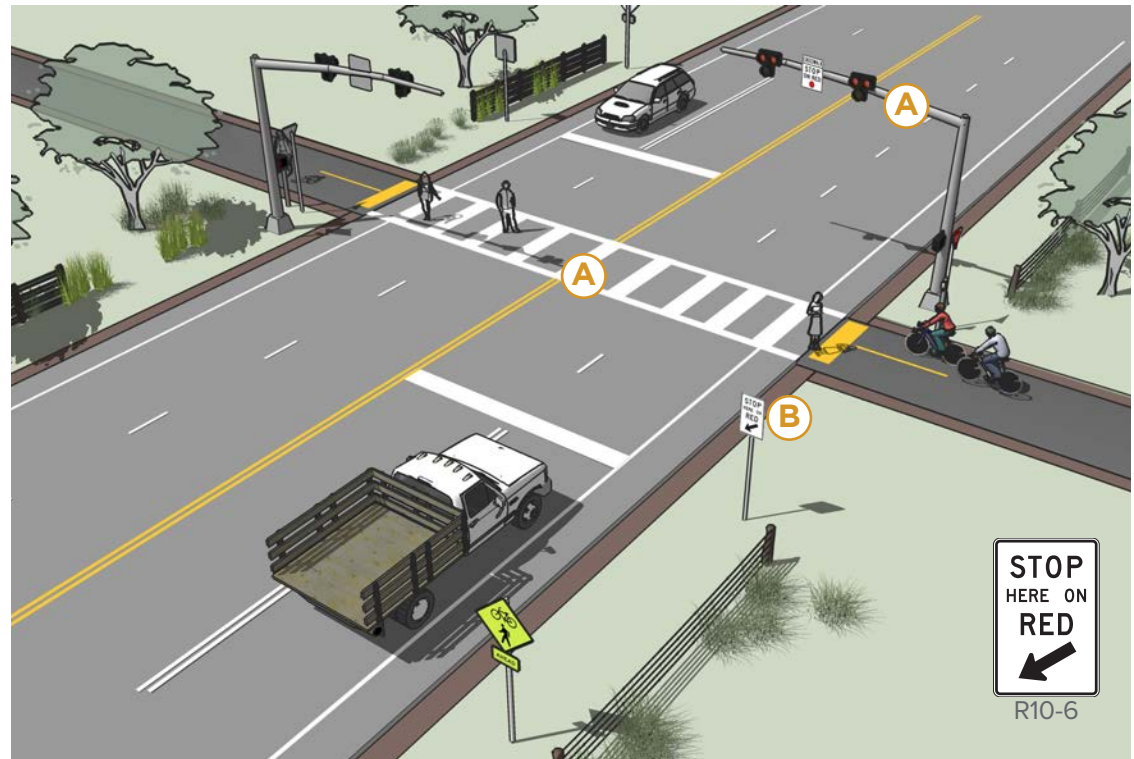
FHWA
MUTCD 1A-11

NYSDOT
TSMI

PEDESTRIAN HYBRID BEACON CROSSING

A Pedestrian Hybrid Beacons (PHB), also called a HAWK Beacon, consists of a signal-head with two red lenses over a single yellow lens on the major street, and pedestrian signal heads for the shared use path.

A PHB is distinct from pre-timed traffic signals because it rests in dark and is only activated by pedestrians and bicyclists when needed.



TYPICAL APPLICATION

The FHWA PHB Guides states, “If a traffic control signal is not justified or warrants are not met through an engineering study...[Agencies must pursue solutions], such as PHBs, to improve safety for pedestrians and motorists” (p.11).

The NYSDOT Pedestrian Safety Action Plan recommends PHBs be used at crossings where a two stage crossing with a Median Refuge Island can be implemented (p. 50).

DESIGN FEATURES

- A** Pedestrian Hybrid Beacon Crossings with a R10-23 or R10-23a should be paired with a Marked Crosswalk and Advance Stop Bar crossing treatment package.
- B** A stop line and STOP HERE ON RED sign (R10-6) should be used.
 - 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.
 - Parking and other sight obstructions should be prohibited for at least 100 feet in advance of and at least 20 feet beyond the marked crosswalk to provide adequate sight distance.



Pedestrian hybrid beacons are particularly effective on multi-lane streets that would otherwise have a multiple-threat risk if no active indication of pedestrian presence were provided.

FURTHER CONSIDERATIONS

- Installation of a PHB controlled crosswalk must meet accessibility guidelines (TSMI 15-01). Refer to NYSDOT TSMI 17-02 for information on ADA Applicability of various crossing treatment countermeasures.
- Each crossing, regardless of traffic speed or volume, requires additional review by a registered engineer to identify sight lines, potential impacts on traffic progression, timing with adjacent signals, capacity and safety. If installed within a signal system, signal engineers should evaluate the need for the hybrid signal to be coordinated with other signals.
- An FHWA study published in 2010 found that pedestrian hybrid beacons can reduce pedestrian crashes by 69 percent and total crashes by 29 percent (Fitzpatrick 2010).
- During the red “wig wag” clearance interval, motorists may proceed when the crosswalk is clear. This may reduce vehicle delay when compared to a full traffic signal.
- For additional technical information regarding PHBs, see MUTCD chapter 4F.

MAINTENANCE

Hybrid beacons are subject to the same maintenance needs and requirements as standard traffic signals. Signing and striping need to be maintained to help users understand any unfamiliar traffic control.

REFERENCES

- FHWA. Pedestrian Hybrid Beacon Guide: Recommendations and Case Study. 2014.
- K. Fitzpatrick, et al., Safety Effectiveness of the HAWK Pedestrian Crossing Treatment. 2010.
- FHWA. Manual on Uniform Traffic Control Devices. 2009.
- NYSDOT. Pedestrian Safety Action Plan. 2016.
- NYSDOT. TSMI 15-01: Applicability of ADA Guidelines on Traffic Signals. 2015.
- NYSDOT. TSMI 17-02: Applicability of ADA Guidelines to PSAP Countermeasures. 2017.

Further Guidance Available

FHWA
PHB Guide

FHWA
MUTCD

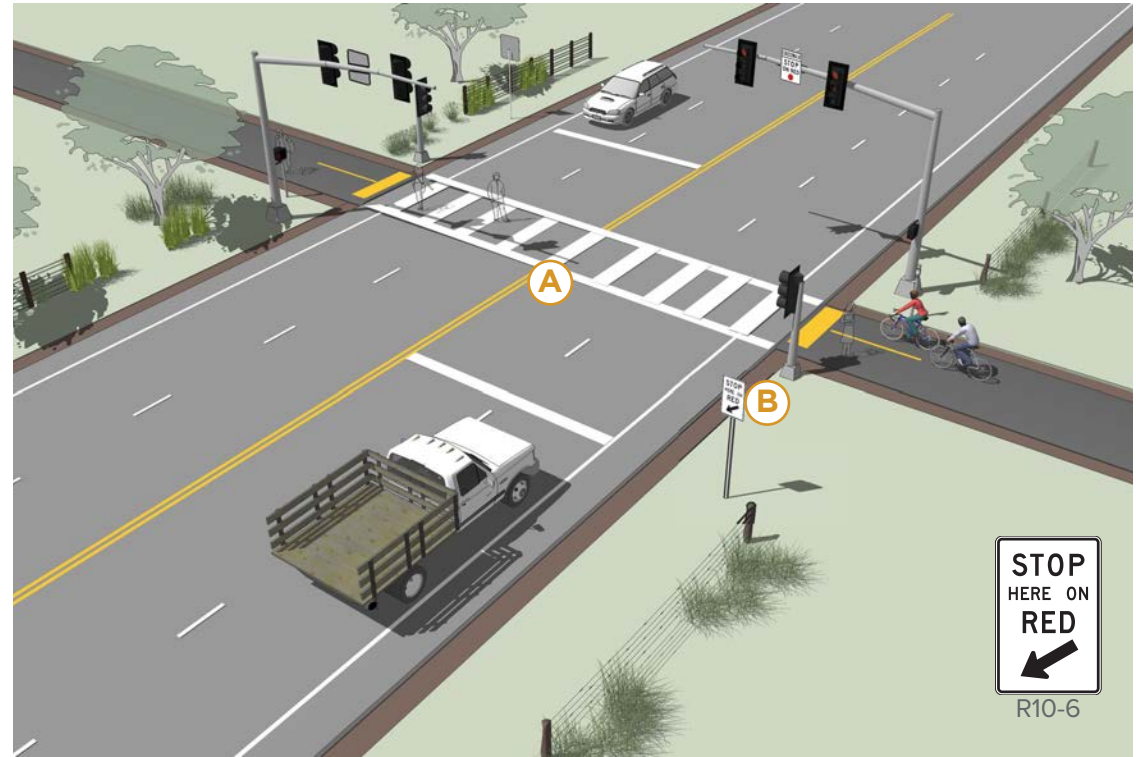
NYSDOT
PSAP

NYSDOT
TSMI

FULL TRAFFIC SIGNAL CROSSING

A full traffic signal installation treats the path crossing as a conventional 4-way intersection and provides standard red-yellow-green traffic signal heads for all legs of the intersection.

Signalized crossings provide the most protection for crossing path users through the use of a red-signal indication to stop conflicting motor vehicle traffic.



TYPICAL APPLICATION

- Full traffic signal installations must meet MUTCD warrants.

The NYS DOT Pedestrian Safety Action Plan recommends full signals be used at locations with a crash history where a two stage crossing cannot be implemented.

DESIGN FEATURES

- A** Full Traffic Signal should be paired with a Marked Crosswalk and Advance Stop Bar crossing treatment package.
- B** A stop line and STOP HERE ON RED sign (R10-6) should be used.
 - 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.
 - Parking and other sight obstructions should be prohibited for at least 100 feet in advance of and at least 20 ft (6 m) beyond the marked crosswalk to provide adequate sight distance.



Full traffic signals include signals facing trail users to indicate when it is or is not safe for path users to cross the roadway.



Traffic signals may be used in conjunction with other treatments, such as median islands. In these cases, additional push-buttons may be required, depending on signal phasing, crossing distance, and anticipated bike and pedestrian crossing times.

FURTHER CONSIDERATIONS

- Installation of full signal controlled crosswalk must meet accessibility guidelines (TSMI 15-01). Refer to NYSDOT TSMI 17-02 for information on ADA Applicability of various crossing treatment countermeasures.
- Each crossing, regardless of traffic speed or volume, requires additional review by a registered engineer to identify sight lines, potential impacts on traffic progression, timing with adjacent signals, capacity and safety.
- Shared use path signals are normally activated by push buttons but may also be triggered by embedded loop, infrared, microwave or video detectors. The maximum delay for activation of the signal should be two minutes, with minimum crossing times determined by the width of the street.

MAINTENANCE

Traffic control signals should be regularly maintained to ensure that all lights and detection hardware are functional.

REFERENCES

- FHWA. Manual on Uniform Traffic Control Devices. 2009.
- NYSDOT. Pedestrian Safety Action Plan. 2016.
- NYSDOT. TSMI 15-01: Applicability of ADA Guidelines on Traffic Signals. 2015.
- NYSDOT. TSMI 17-02: Applicability of ADA Guidelines to PSAP Countermeasures. 2017.

Further Guidance Available

FHWA
MUTCD

NYSDOT
PSAP

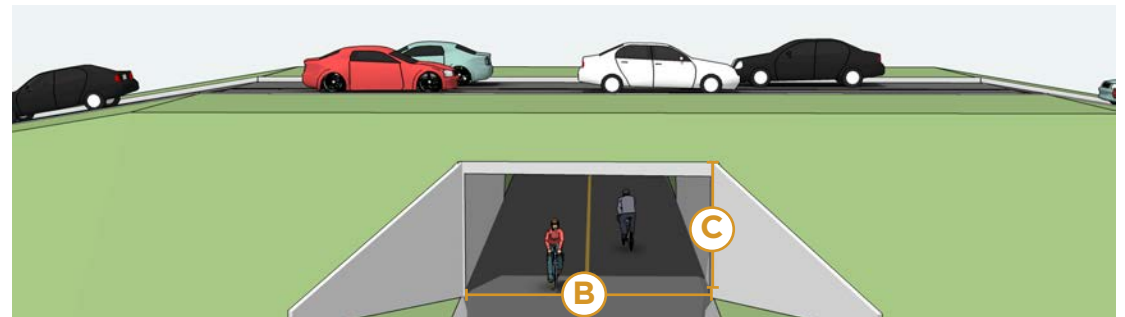
NYSDOT
TSMI

GRADE SEPARATED CROSSINGS

Overcrossings and undercrossings provide critical non-motorized system links by joining areas separated by barriers such as deep canyons, waterways, or major transportation corridors. In most cases, these structures are built in response to user demand for safe crossings where they previously did not exist.



Typical Overcrossing



Typical Undercrossing

TYPICAL APPLICATION

The *AASHTO Bike Guide* recommends the use of grade separated crossings to provide continuity of a shared use path where a barrier exists.

There are no minimum roadway characteristics for considering grade separation. Depending on the type of facility or the desired user group grade separation may be considered in many types of projects.

DESIGN FEATURES

- A** Clear width should allow 2 ft (.6 m) of clearance on each side of the pathway. Under constrained conditions, a bridge may taper to the pathway width (AASHTO 2012).
- B** 10 ft (3 m) headroom on overcrossings; clearance below will vary depending on feature being crossed: Roadway: 17 ft (5.1 m), Freeway: 18.5 ft (5.6 m), Heavy Rail Line: 23 ft (7 m).
 - For undercrossings, 14 ft (4.2 m) minimum width, greater widths preferred for lengths over 60 ft (18.2 m). As an exception, in constrained conditions, width may be reduced to 10 ft (3 m) minimum.
- C** For undercrossings, there is a 10 ft min. height, and a balanced proportion of 1.5:1 width to height is desired.



This overpass helps children cross a busy street at a midblock location.



A well-proportioned undercrossing feels open and safe.

FURTHER CONSIDERATIONS

- If overcrossings have any scenic vistas additional width should be provided to allow for stopping.
- Overpasses require a minimum of 17 ft (5.1 m) of vertical clearance to the roadway below versus a minimum elevation differential of around 12 ft (3.6 m) for an underpass. This results in potentially greater elevation differences and much longer ramps for bicycles and pedestrians to negotiate.
- Overpasses for bicycles and pedestrians typically fall under the Americans with Disabilities Act (ADA), which strictly limits ramp slopes to between 5% (1:20) and 8.33% (1:12) with landings at 50 ft (15.2 m) intervals with 5% slopes, or 30 ft (9.1 m) intervals with 8.33% slopes (PROWAG).
- Safety is a major concern with underpasses. Shared use path users may be temporarily out of sight from public view and may experience poor visibility themselves. To mitigate safety concerns, an underpass should be designed to be spacious, well-lit, equipped with emergency cell phones at each end and completely visible for its entire length from end to end (AASHTO 2012).

MAINTENANCE

Poorly maintained undercrossings can create unsafe feeling conditions, discouraging use. Grade separated crossings should be cleared of snow and other debris across the entire width of the facility.

REFERENCES

AASHTO Guide for the Development of Bicycle Facilities. 2012.
US Access Board. Proposed Guidelines for Pedestrian Facilities in the Public Right-of-Way 2011.

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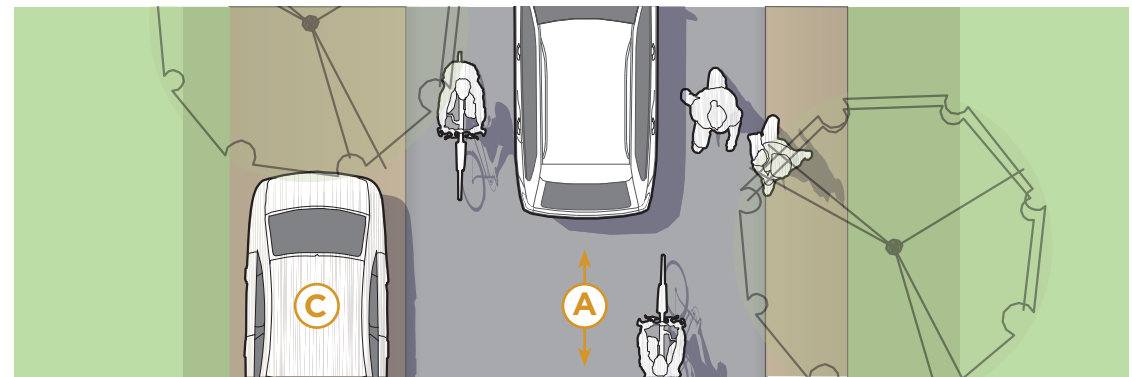
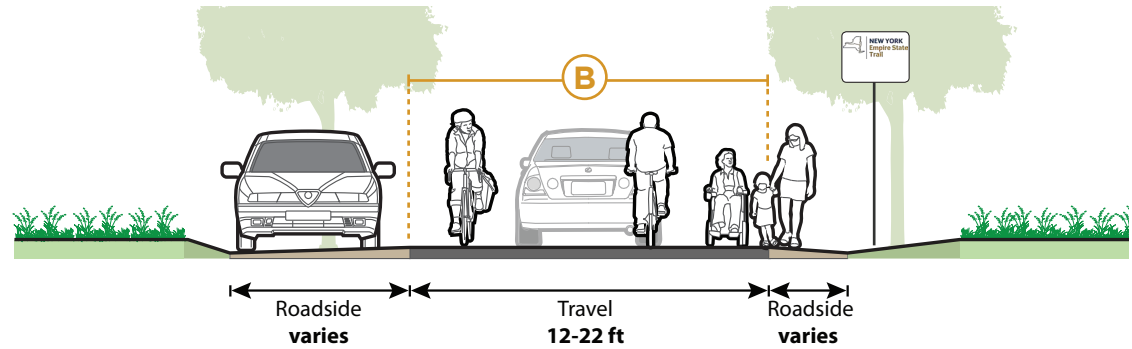
ON-ROAD FACILITIES



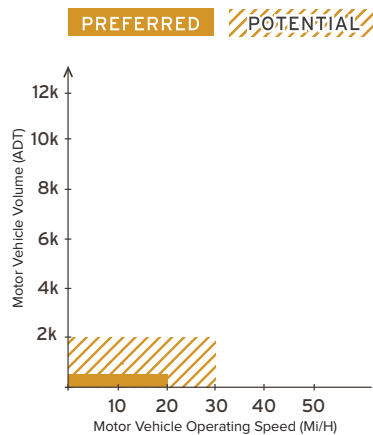
WALK/BIKE ROADWAY

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



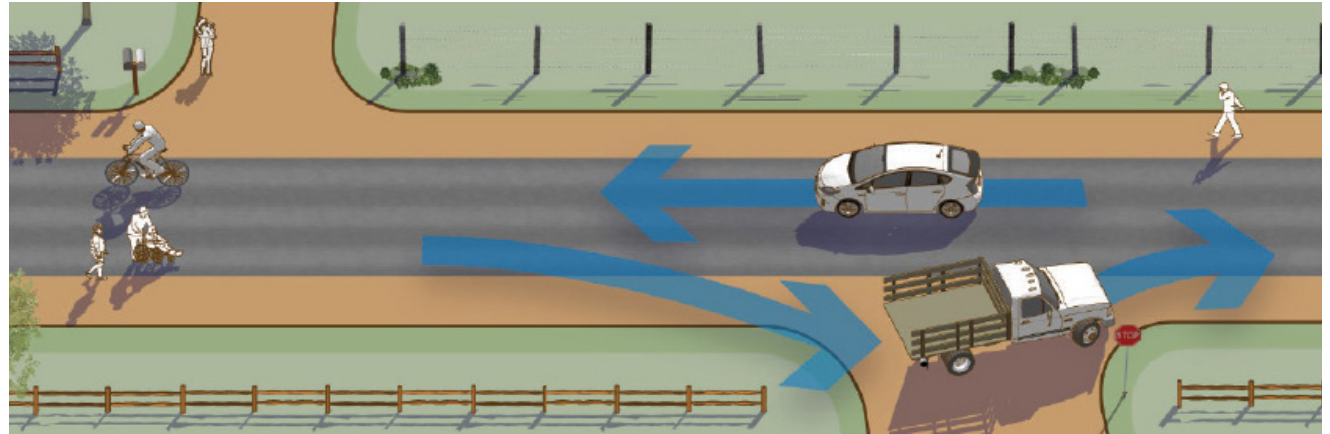
AASHTO Green Book defines a “very low volume” road as a local road with 400 or fewer motor vehicles per day (p. 5-34).

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.



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



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

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 turf 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).

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

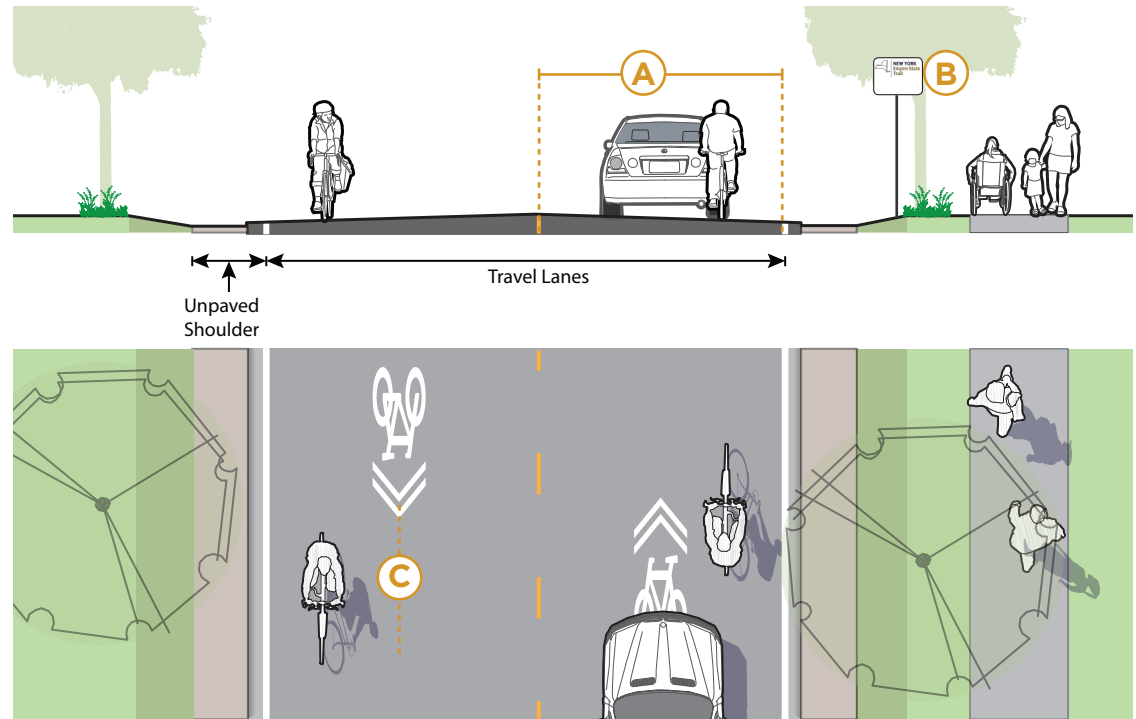
ODOT
NSDG

SHARED ROADWAYS

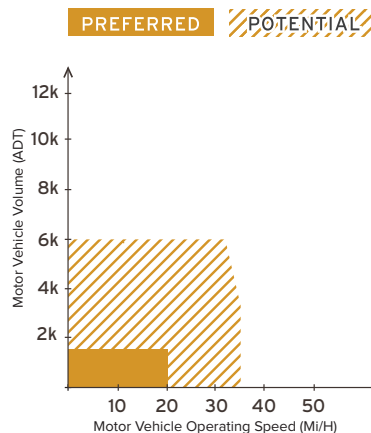
Shared roadways are roadways with travel lanes shared by bicyclists and motorists, with no dedicated or separated space for bicyclists. This may be an existing roadway, street with wide curb lanes, or a road with narrow paved shoulders.

Signs should be used to identify the route as a preferred bicycle route and as part of the Empire State 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



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** **EST Guide Signs** or **MUTCD Bike Route Guide Signs** should be applied at intervals frequent enough to keep users informed of changes in route direction and to remind motorists of the presence of bicyclists and pedestrians.
 - C** 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**).



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

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.

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. Guide for the Development of Bicycle Facilities. 2012.
FHWA. Manual on Uniform Traffic Control Devices. 2009.
NACTO. Urban Bikeway Design Guide. 2012.
NYSDOT. Highway Design Manual (HDM) Ch 25: Bicycle Facility Design. 2006.
NYSDOT Traffic Safety and Mobility Instruction. 2013.

Further Guidance Available

AASHTO
Bike Guide

FHWA
MUTCD

NACTO
Bike Guide

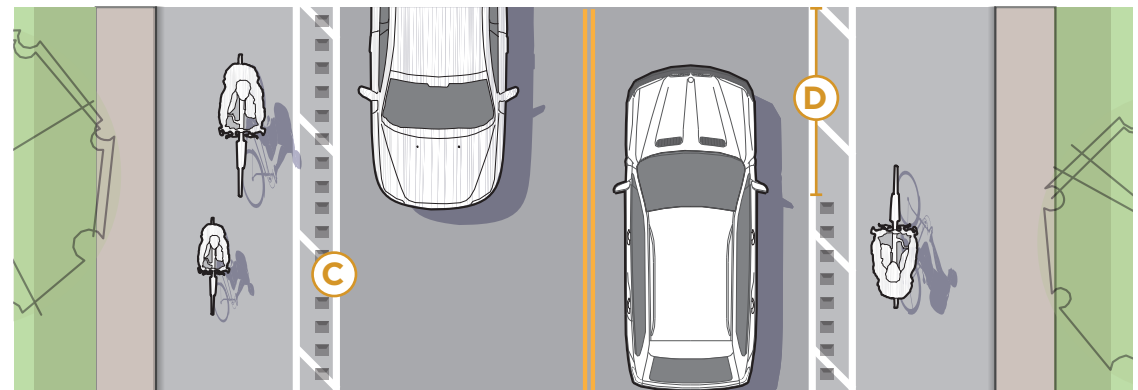
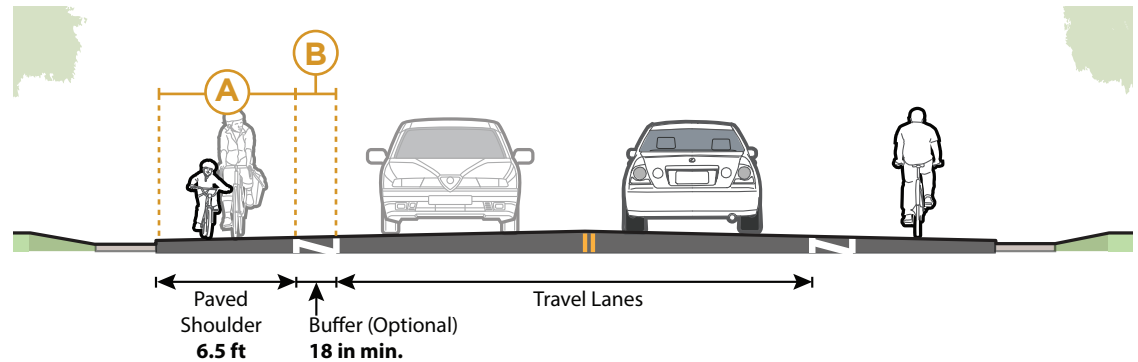
HDM
CH 25

NYSDOT
TSMI

PAVED SHOULDERS

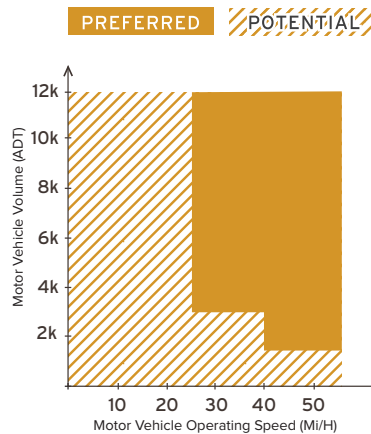
Typically found in less-dense areas, paved shoulders are wide enough for bicycle travel.

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



TYPICAL APPLICATION

While paved shoulders may function on roads



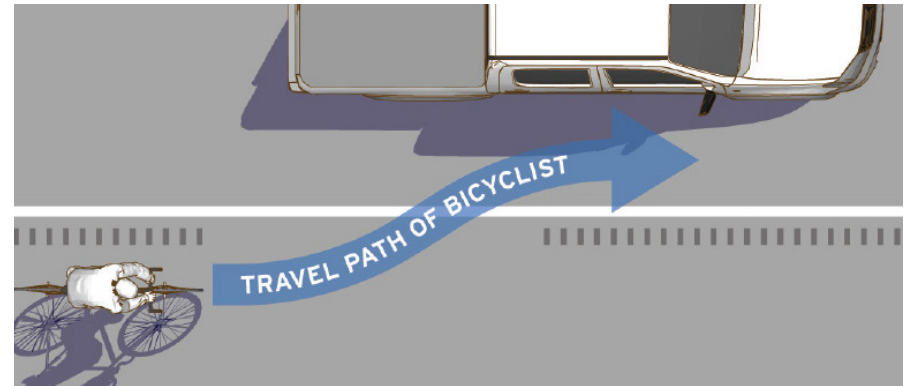
with high vehicle speeds and volumes, consider the use of a separated bike lane or sidepath for increased comfort.

DESIGN FEATURES

- A** Standard paved shoulder width is 7 ft (2.1 m). A minimum of 4 ft (1.2 m) of rideable 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.
- C** To minimize negative impact to bicyclists, rumble strips should be located as close as possible to the travel lane, while maintaining a 4 ft (1.2 m) clear width (EI 16-04).
 - 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).
- D**



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 Multimodal Networks, 2016.

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.

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

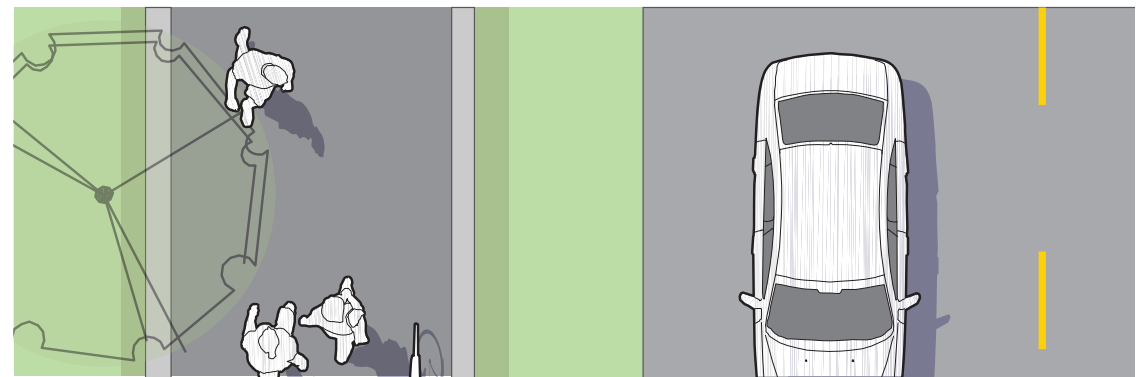
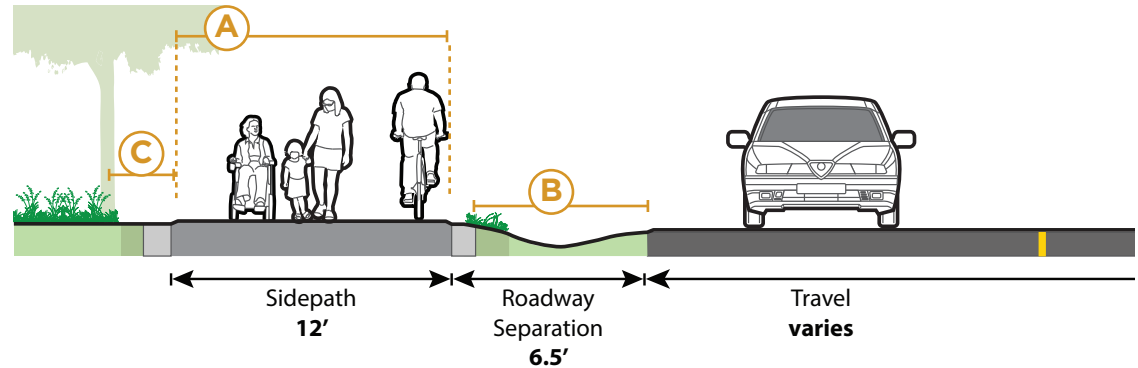
NYSDOT
EI 16-014

HDM
CH 17

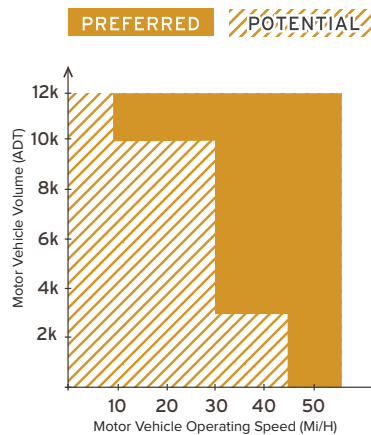
SIDEPATHS

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



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

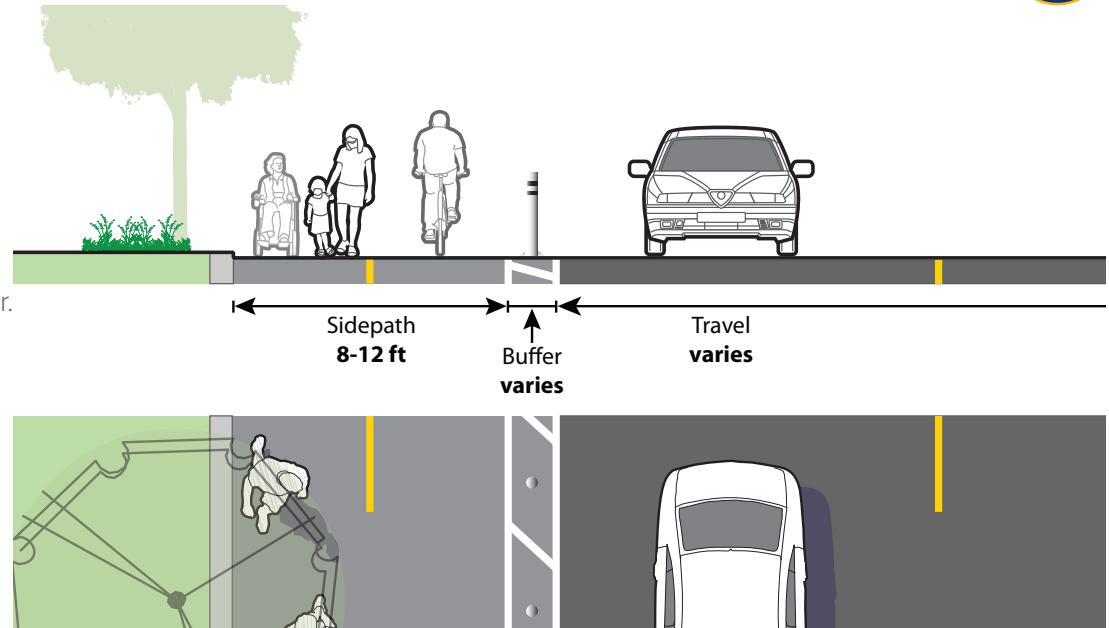
DESIGN FEATURES

- 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).
- D** 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.

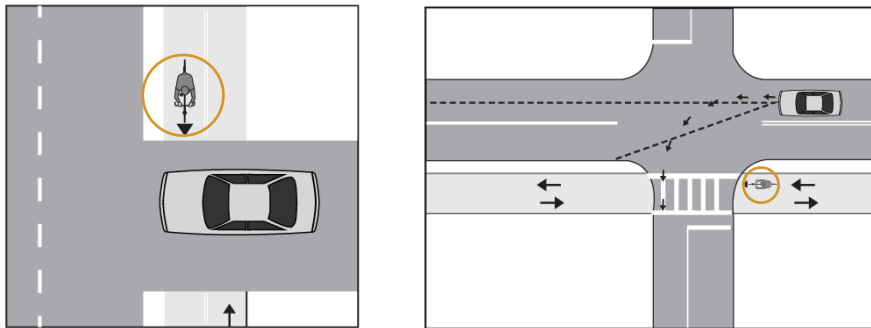
CONSTRAINED CONDITIONS

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.

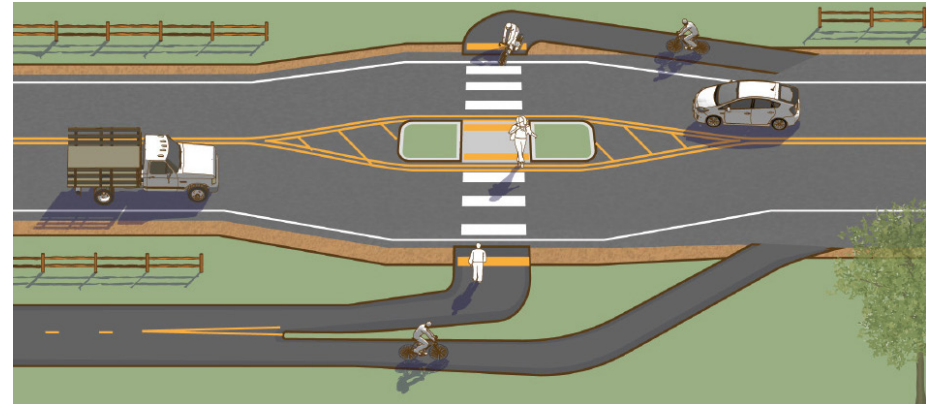
- Define the roadway separation with a marked buffer.
- The barrier need not be of size or strength to redirect errant vehicles. On high speed roadways, the barrier should be crashworthy (AASHTO Bike Guide 2012, p. 5-11).
- Barriers that serve to separate the area for motor vehicles from the sidepath 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:

- Design related concerns, including issues sight distance and motorist encroachment.
- Motorist lack of awareness of path users, particularly “wrong way” traveling bicyclists.
- 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.



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.

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.

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 Multimodal 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

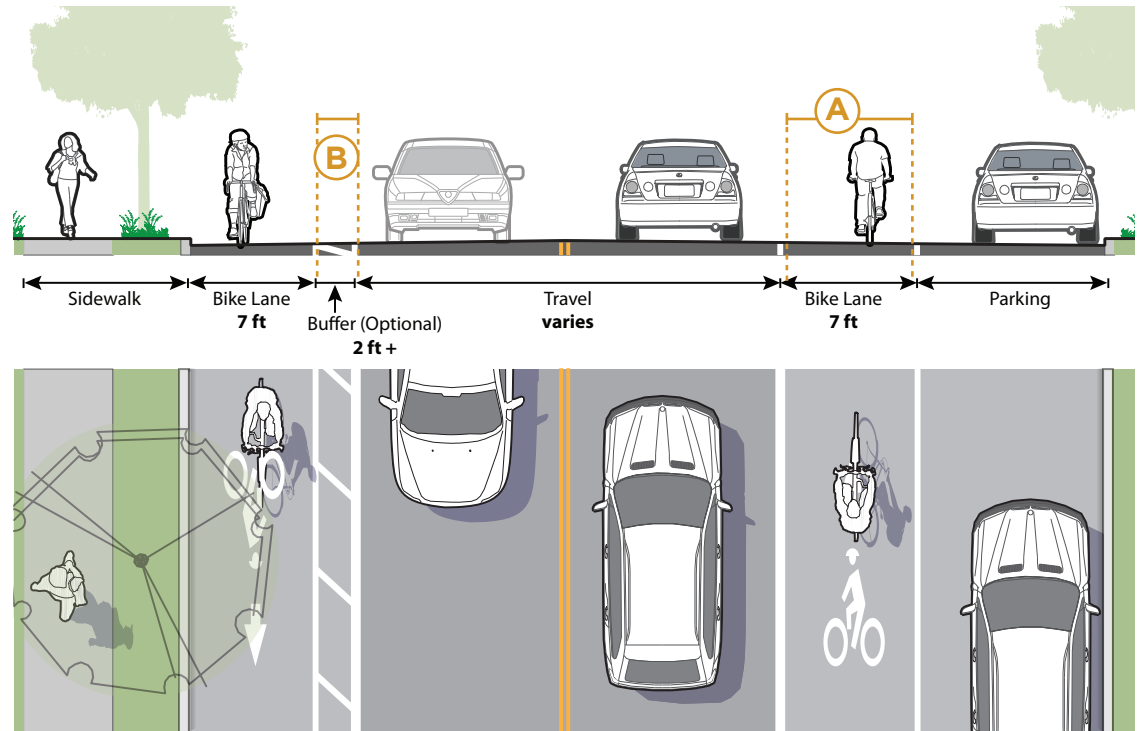
RURAL
GUIDE

HDM
CH 17

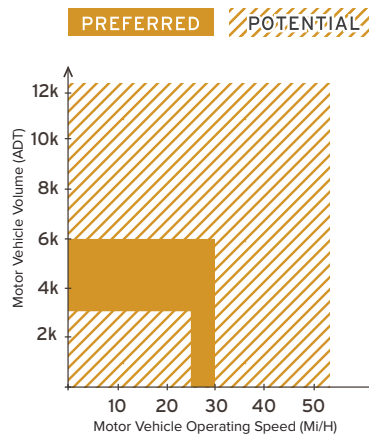
BIKE LANES

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 EST 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.



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.

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.

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.

Further Guidance Available

FHWA
MUTCD

FHWA
IORBNRP

NACTO
Bike Guide

NCHRP
766

REFERENCES

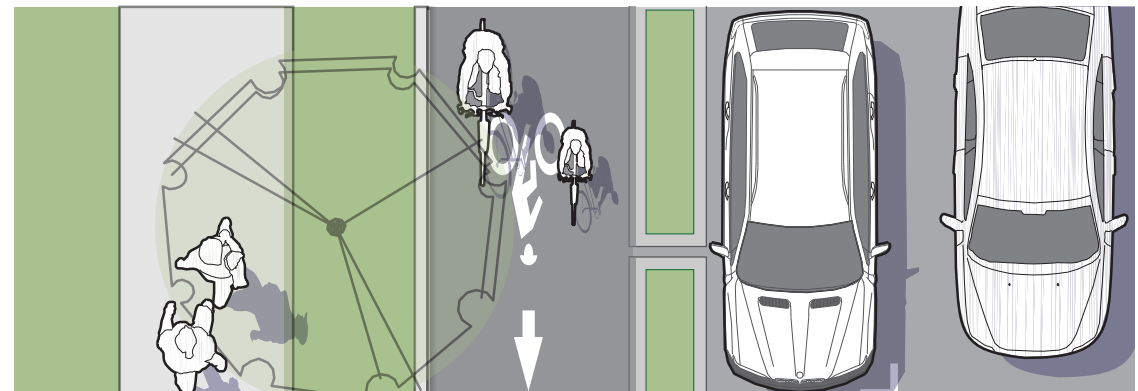
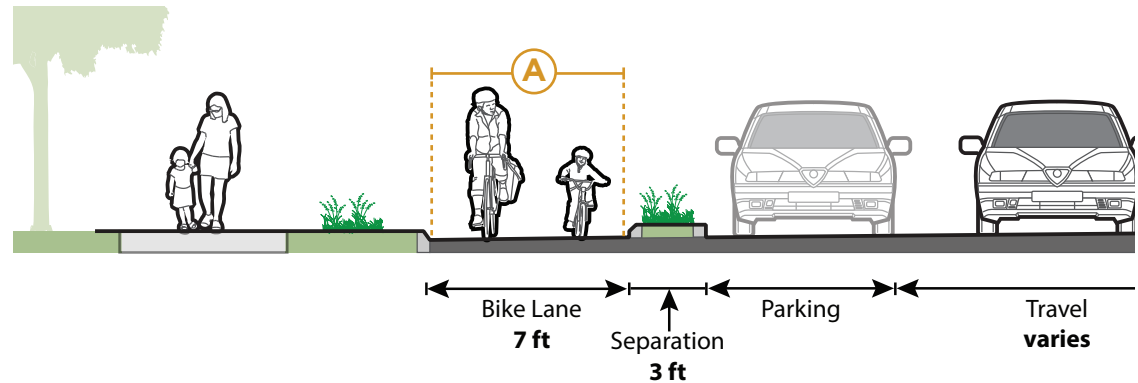
- FHWA. Manual on Uniform Traffic Control Devices. 2009.
- FHWA, Incorporating On-road Bicycle Networks into Resurfacing Projects, 2015.
- NACTO Urban Bikeway Design Guide. 2012.
- NCHRP 766: Recommended Bicycle Lane Widths for Various Roadway Characteristics. 2016.
- NYSDOT. Standards Sheet 685-01.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

SEPARATED BIKE LANE (DIRECTIONAL)

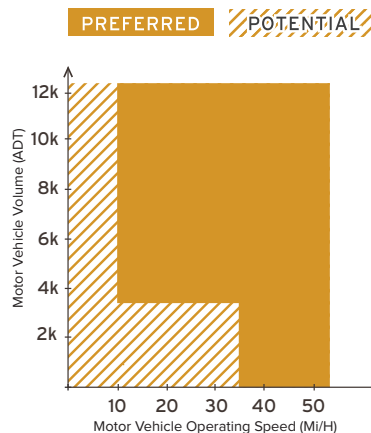
One-way protected bicycle lanes bikeway facilities that are at-grade with the adjacent roadway, within the road right-of-way (ROW), but physically separated from vehicle traffic by a vertical element.

The separating element can include flexible delineators, extruded curbs, on-street parking, or other barriers.

Separated bike lanes using these barrier elements typically share the same elevation as adjacent travel lanes, but the bike lane may also be raised above street level.



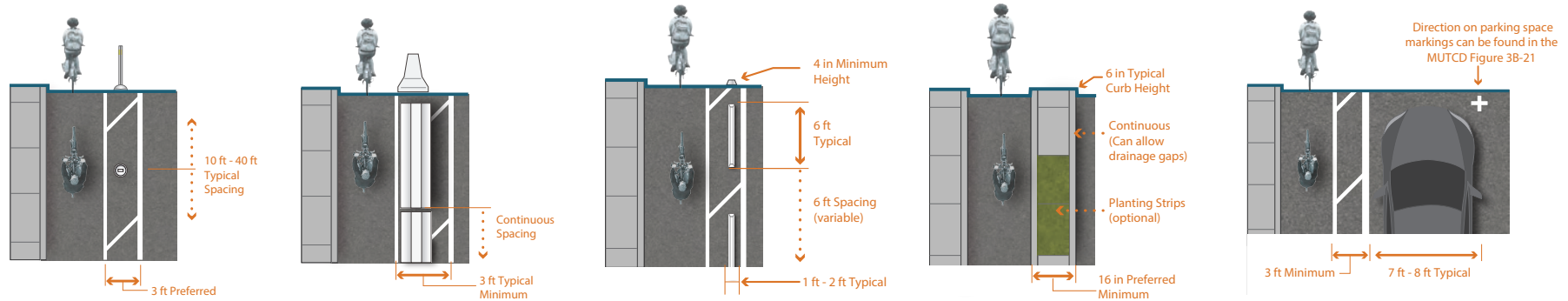
TYPICAL APPLICATION



Where conventional bicycle lanes would cause many bicyclists to feel stress because of factors such as multiple lanes, high motor traffic volumes and speeds.

DESIGN FEATURES

- A** Standard directional separated bike lane width is 7 ft (2.1 m) to allow for safe passing behavior. Minimum width is 5 ft (1.5 m). (FHWA Separated Bike Lane Guide 2015).
- B** Separation width depends on physical separation method. Minimum separation width next to parking is 3 ft (0.9 m) to accommodate opening doors (NACTO Bike Guide 2012).
- C** Pavement markings, symbols and/or arrow markings must be placed at the beginning of the separated bike lane and at intervals along the facility based on engineering judgment to define the bike direction.



Separated bike lanes can use a variety of separation methods, depending on cost, durability and aesthetics. Low cost separation methods are often used for interim implementation to provide a functional facility prior to full capital construction with curbs and planted medians. Image: FHWA Separated Bike Lane Planning And Design Guide.

PEDESTRIAN ACCOMMODATION

- Separated bike lanes are not intended for use by pedestrians and 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

- Federal guidance on separated bike lanes can be found in the **FHWA Separated Bike Lane Planning and Design Guide, 2015**. Separated bike lane buffers and barriers are covered in the **MUTCD** as preferential lane markings (**section 3D.01**) and channelizing devices (**section 3H.01**). If buffer area is 4 feet or wider, white chevron or diagonal markings should be used (**section 9C.04**). Curbs may be used as a channeling device, refer the **NY State Supplement to the MUTCD** section on traffic divisional islands (**section 3I.01 paragraph 01C**).
- Refer to the **FHWA Separated Bike Lane Guide 2015** for information on the treatment of transit stops, accessible parking, and loading zones (pgs. 92, 97, and 99).
- Any physical barriers shall be discontinued at driveways or private access points to allow vehicular access.

MAINTENANCE

The design of separated bike lanes and separation methods can impact the ease and cost of routine maintenance, and all bicycle facilities should be cleared of snow and debris through routine maintenance operations.

REFERENCES

- FHWA. Manual on Uniform Traffic Control Devices. 2009.
- FHWA. Separated Bike Lane Planning and Design Guide. 2015.
- FHWA. Small Town and Rural Multimodal Networks. 2016.
- NACTO Urban Bikeway Design Guide. 2012.
- NYSDOT State Supplement to the Manual on Uniform Traffic Control Devices. 2009.

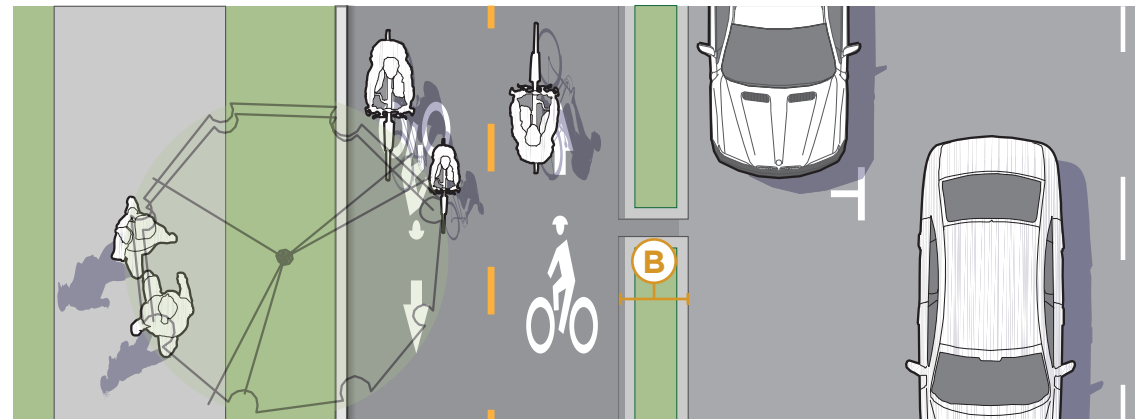
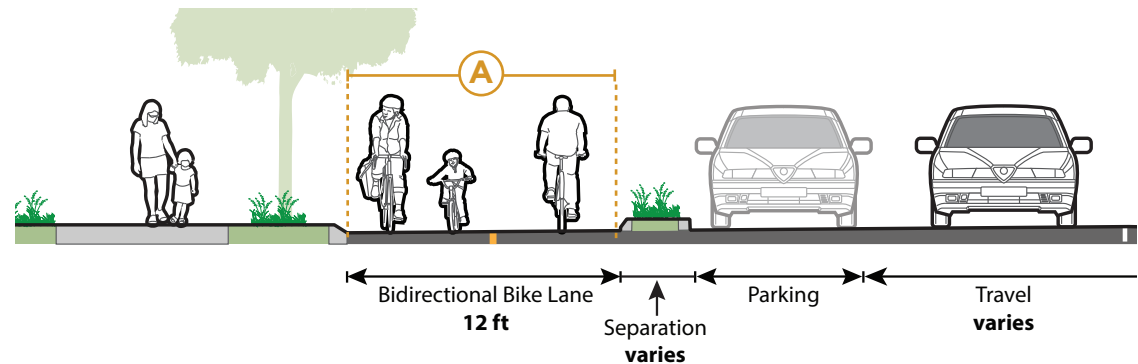
Further Guidance Available



SEPARATED BIKE LANE (BIDIRECTIONAL)

Bidirectional separated bike lanes are bicycle facilities that allow bicycle movement in both directions on one side of a road. These facilities are also at-grade with the adjacent roadway, within the road ROW, and physically separated by a vertical element. Two-way separated bikeways share some of the same design characteristics as one-way separated bicycle lanes, but may require additional considerations at driveway and side-street crossings.

To simplify operational concerns, bidirectional separated bike lanes function best on the left-side of one-way streets.



TYPICAL APPLICATION

- Generally follows speed and volume ranges for directional separated bike lanes.
- Functions well to fill gaps in shared use path corridors.
- Functions well on streets with few conflicts such as driveways or cross-streets on one side of the street.

DESIGN FEATURES

- A** Standard bidirectional separated bike lane width is 12 ft (3.6 m) (FHWA Separated Bike Lane Guide 2015). Reduced width is 10 ft (3.0 m) (NACTO Bike Guide 2012).
- B** Separation width depends on physical separation method. Minimum separation width next to parking is 3 ft (0.9 m) to accommodate opening doors (NACTO Bike Guide 2012).
- In constrained conditions for short segments, minimum width is 8 ft (2.4 m) (AASHTO Bike Guide 2012).



The bidirectional separated bike lane is separated from both the sidewalk, as well as the roadway. A bidirectional separated bike lane does not necessarily need to be at-grade with the adjacent roadway.

PEDESTRIAN ACCOMMODATION

- Bidirectional separated bike lanes are not intended for use by pedestrians and 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

- Federal recognition and guidance on separated bike lanes can be found in the **FHWA Separated Bike Lane Planning and Design Guide 2015**. Separated bike lane buffers and barriers are covered in the **MUTCD** as preferential lane markings (**section 3D.01**) and channelizing devices (**section 3H.01**). If buffer area is 4 feet or wider, white chevron or diagonal markings should be used (**section 9C.04**). Curbs may be used as a channeling device, refer the **NY State Supplement to the MUTCD** section on traffic divisional islands (**section 3I.01**).
- Two-way bikeways introduce additional complexities at intersections and driveways. Protected signalization, modified geometric design or other markings and signs may be necessary to mitigate conflicts. Refer to **Separated Bike Lanes at Intersections** in this guide.
- Refer to the **FHWA Separated Bike Lane Guide 2015** for information on the treatment of transit stops, accessible parking, and loading zones (pgs. 92, 97, and 99).

MAINTENANCE

Bidirectional separated bike lanes tend to be easier to maintain due to increased bikeway width, and all bicycle facilities should be cleared of 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. Separated Bike Lane Planning and Design Guide. 2015.
FHWA. Small Town and Rural Multimodal Networks. 2016.
NACTO. Urban Bikeway Design Guide. 2012.

Further Guidance Available

AASHTO
Bike Guide

FHWA
MUTCD

FHWA
SBL Guide

RURAL
GUIDE

NACTO
Bike Guide

TRAFFIC CALMING

Traffic calming is the combination of mainly physical measures that reduce the negative effects of motor vehicle use, alter driver behavior, and improve conditions for nonmotorized street users.

Along the Empire State Trail alignment, traffic calming may be considered to reduce speeds an/or volumes of motor vehicles in order to improve conditions for pedestrians and bicyclists operating within or near the roadway.



Mini Roundabout

TYPICAL APPLICATION

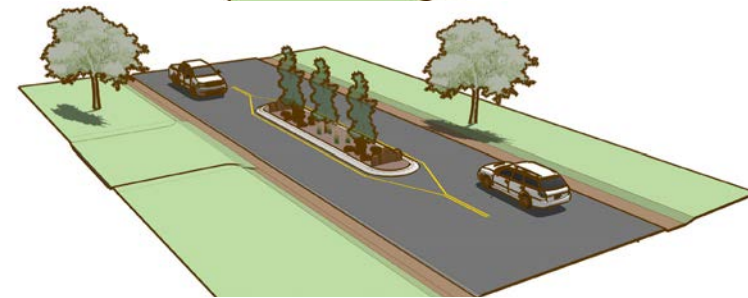
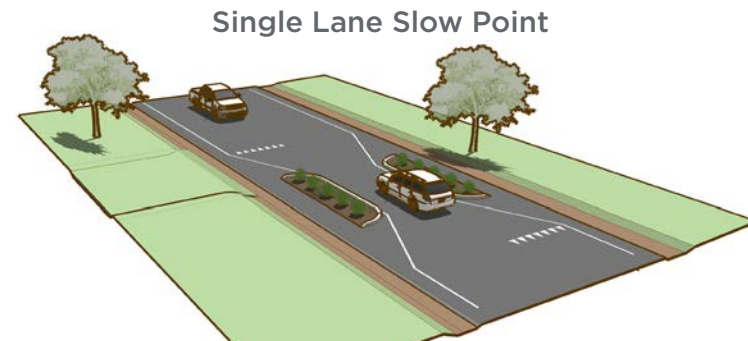
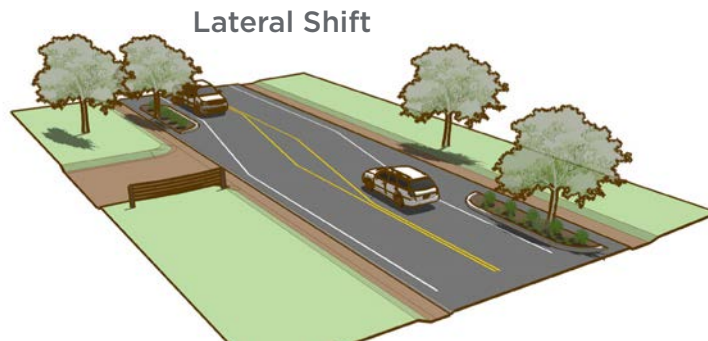
In some cases, roadway widening to create shoulders may be infeasible on some segments of the Empire State Trail route. This may require bicyclists to operate in the roadway. This shared roadway operation is most appropriate at lower speeds and volumes.

Traffic calming may be used to lower motor vehicles speeds along existing roadways. In general, cities and villages are responsible for the lower-speed highways and streets where the use of traffic-calming techniques would be appropriate.

DESIGN FEATURES

For detailed guidance on appropriate traffic calming techniques, refer to HDM Table 25-1, and the FHWA Small Town and Rural Guide.

- To create preferred conditions for bicyclists operating in the roadway, the desired vehicle operating speed is 15-25 mph. Treatments for creating these conditions are generally reserved for use on local neighborhood streets, and include vertical and lateral shifts, medians, and pinch points.
- At higher speeds, traffic calming may be used to reduce vehicle operating speeds of 25- 35 mph. Treatments for creating these conditions are less physically restrictive and emphasize change in ambiance. This includes curb extensions, median islands, gateways and patterned crosswalks.



FURTHER CONSIDERATIONS

To balance the needs and safety considerations of all highway users (motorists, pedestrians, and bicyclists) and adjacent land owners, HDM Ch. 25 generally heavily restricts traffic calming with speed reduction effects on roadways operating at 60 km/h (37-35 mph) or above. However, the HDM also notes that “it may be acceptable and consistent with good engineering practice to progress, as exceptions to design standards, a design which will lower the anticipated operating speed. The design speed could then be based on the lower anticipated operating speed.”

Those measures shown as “NOT RECOMMENDED” on HDM Table 25-1 may be considered in case specific projects.

MAINTENANCE

Traffic calming features may impact drainage and clear access by maintenance vehicles. Consider maintenance needs prior to implementation.

REFERENCES

FHWA. Small Town and Rural Multimodal Networks. 2016.
NYSDOT. Highway Design Manual (HDM) Ch 25 Revision 36. 1999.

Further Guidance Available

RURAL
GUIDE

HDM
CH 25

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ON-ROAD FACILITY CROSSINGS



SHARED ROADWAY MAJOR STREET CROSSINGS

Along the Empire State 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.

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.

TABLE X-1: Shared Roadway Crossing Treatment Selection Quick Reference

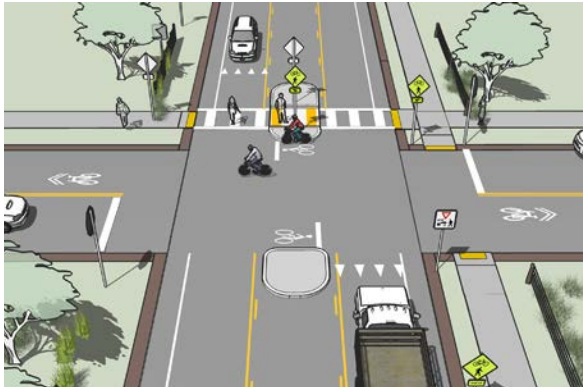
	Cross Street Characteristics				
	Local	2 Lanes		4 or More Lanes	
		With Median	No Median	With Median	No Median
Marked and Signed Crosswalks	☑	☑	☑	X	X
Rectangular Rapid Flashing Beacon	X	☑	☑	EJ	X
Pedestrian Hybrid Beacon/ Traffic Signal	X	EJ	EJ	☑	☑

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 EST Crossing Treatment Selection Table in this guide or the NYSDOT Pedestrian Safety Action Plan for more detailed guidelines for selecting crossing treatments.

DESIGN FEATURES

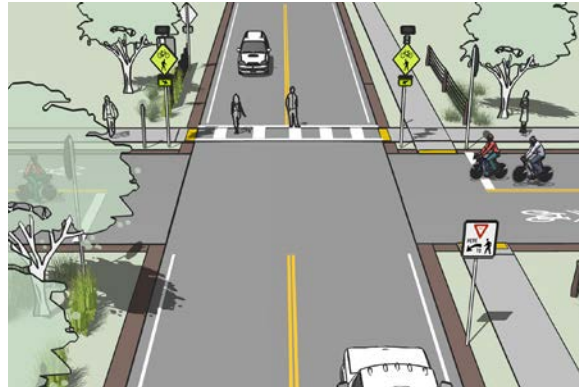
- Median Refuge Islands decrease crossing distances and traffic exposure, allowing bicyclists and pedestrians to cross a roadway in two-stages.
- Rectangular Rapid Flash Beacons (RRFBs) may be used to enhance awareness of the crossing, and are effective at increasing motor vehicle yield-to-pedestrian 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.

MEDIAN ISLAND AND MARKED CROSSWALKS



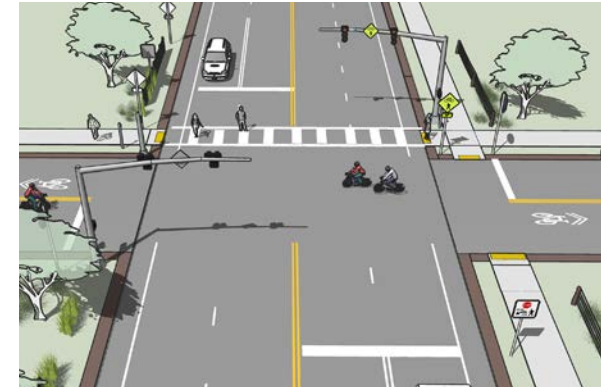
Median islands can provide refuge for both bicyclists and pedestrians, while still allowing motor vehicle access.

RECTANGULAR RAPID FLASHING BEACONS



RRFBs can increase yielding compliance over marked and signed crossings.

TRAFFIC SIGNAL



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

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.

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

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

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.

TABLE X-2: /Bike Lane Crossing Treatment Selection Quick Reference

	≤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	☑	☑	

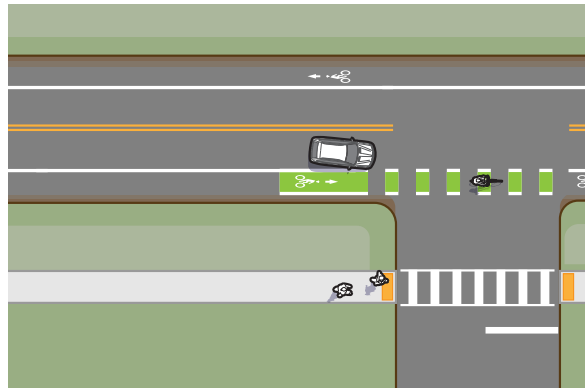
Legend:
 ☑ = Desirable
 EJ = Engineering Judgement
 X = Not Recommended

DESIGN FEATURES

Intersection treatments for bicycle lanes and s at intersections include:

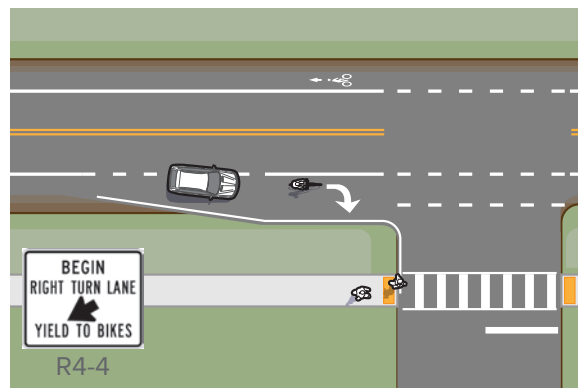
- Intersection crossing markings
- Combined bike lane/turn lanes.
- Through bicycle lane at an added right turn lane.
- On the **Empire State Trail** route, green colored pavement surfacing should be used within dotted bike lane extension where motor vehicles may cross bike lanes. Refer to **FHWA Interim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

INTERSECTION CROSSING MARKINGS



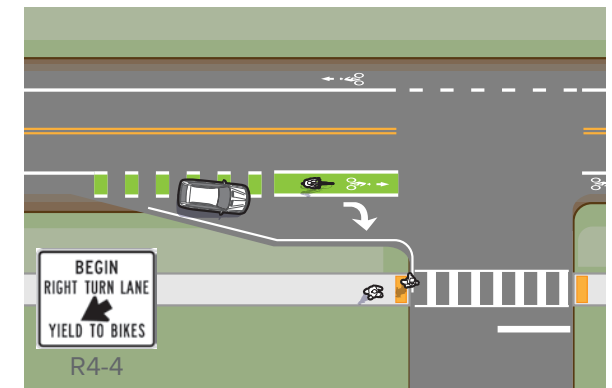
The MUTCD allows the use of a dotted line to define the path of bicyclists through intersections can guide bicyclists and alert motorists to the bike lane path (p. 371, 806).

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).

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).

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

BIKE LANES AT ENTRANCE AND EXIT RAMPS

Arterial streets may contain high speed ramp-style designs such as merge lanes which can create difficulties for bicyclists. Ramp-style entrance and exit lanes typically have intrinsic visibility problems because of low approach angles and feature high speed differentials between bicyclists and motor vehicles.

TYPICAL APPLICATION

- Streets with shoulders, bike lanes, buffered bike lanes, or separated bike lanes.
- Streets with ramp-style exit or entry lanes.

TABLE X-3: Crossing Treatment Selection at High Speed Ramps Quick Reference

	Ramp Characteristics			
	≤30 mph	≥35 mph	Ramp to/from Auxillary Lane	Multiple Lane Ramp
Marked Conflict Zones	☑	☑	EJ	EJ
Bicycle Yield Design	X	☑	X	X
Grade Separated	X	EJ	EJ	EJ

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

Grade separated crossings are preferred over at-grade crossings to offer low-stress crossings of high-speed interchange ramps. Grade separation designs utilizing a bicycle path should be considered if the approach ramp elevations are appropriate, and if both bicyclists and motorist traffic volumes are high.

DESIGN FEATURES

- Marked conflict zones maintain a dotted bike lane extension to identify the weave area. Green color should be used in the dotted bike lane area.
- Bicycle yield designs route the bike lane to create improved sightlines, but require bicyclists to yield to motor vehicles.
 - On exit ramps, use a jughandle turn to bring bicyclists to a location visible to exiting traffic.
 - On entrance ramps, angle the bike lane to increase the approach angle with entering or exiting traffic and position the crossing before a drivers' attention is focused on the upcoming merge.

MARKED CONFLICT ZONES

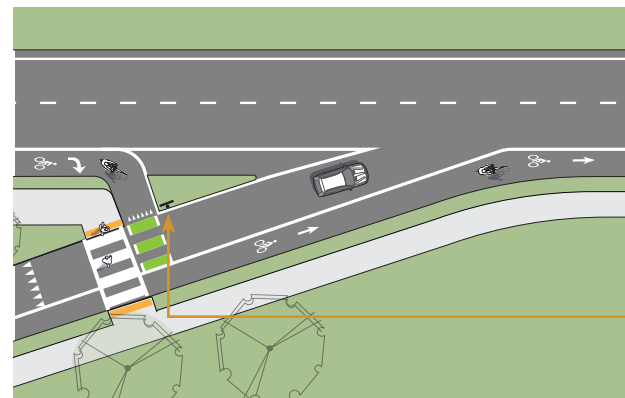
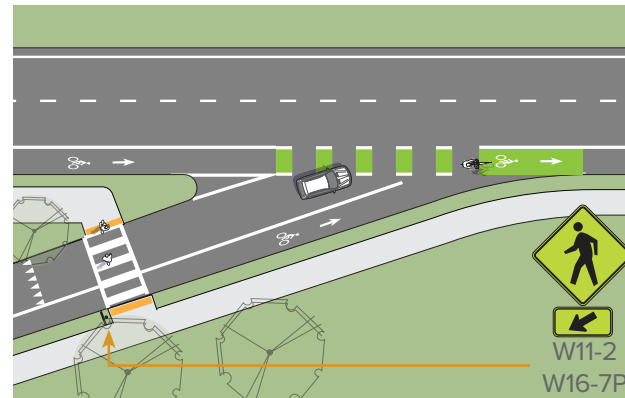
These designs encourage motorists to yield to bicyclists when merging across the bicycle lane, while bicyclists continue through the conflict zone as their expected course of travel. May use green colored pavement to highlight this potential conflict area.

BICYCLE YIELD

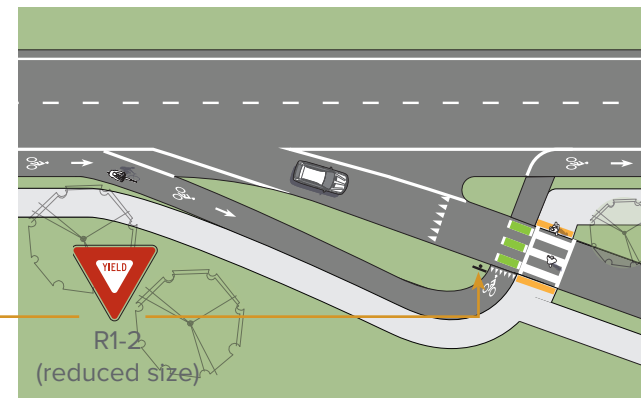
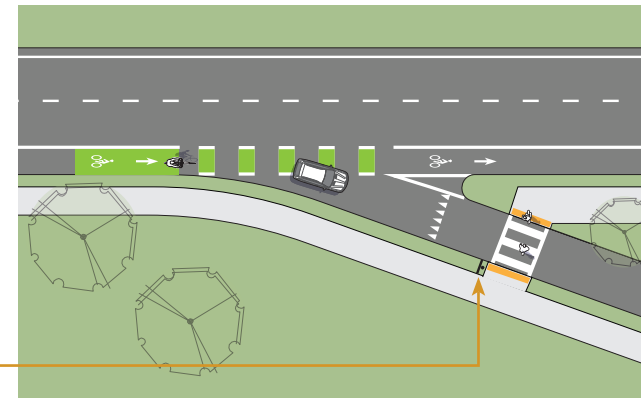
A lower stress design prioritizes bicyclist comfort over bicyclist delay. Bicyclists must yield to entering or exiting motorists and proceed when clear.

These designs may allow confident bicyclists to opt-out of the jughandle maneuver if desired.

ENTRANCE RAMP



EXIT RAMP



FURTHER CONSIDERATIONS

- High speed ramp style lanes are challenging for bicyclists. The **AASHTO Bike Guide** notes that designs that encourage high-speed and/or free-flowing traffic movements are the most difficult for bicyclists to negotiate (p. 4-57). At ramp lanes where merge distance is long “it may be appropriate to provide a design that guides bicyclists in a manner that provides a short distance across the ramp at close to a right angle, and a crossing in an area where sight lines are good and drivers’ attention is not entirely focused on merging with traffic”, (p. 4-60).

MAINTENANCE

Bicycle lanes, including separated jug handle alignments, should be cleared of snow through routine snow removal operations.

REFERENCES

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

DIRECTIONAL SEPARATED BIKE LANE CROSSINGS

The FHWA Separated Bike Lane Guide offers a range of intersection designs for creating safe interactions at intersections with separated bike lanes.

Like bike lanes, the primary design objectives of separated bike lanes at intersections are:

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

TYPICAL APPLICATION

A variety of design treatments exist depending on the configuration of the separated bike facility, available right-of-way, right turn volume, and presence of a signal.

Beyond 150 turning vehicles per hour, consider offering a protected bicycle signal phase (FHWA Multimodal Networks 2016, p. 97).

TABLE X-4: Directional Separated Bike Lane Crossing Treatment Selection Quick Reference

Legend:

- ☑ = Desirable
- EJ = Engineering Judgement
- X = Not Recommended

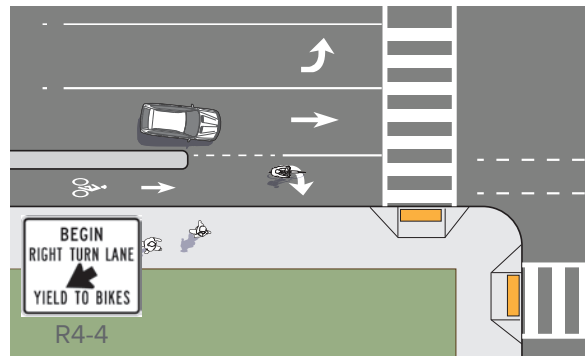
	Peak Hour Right Turn Volume		
	< 50 Veh/hr	50-150 Veh/hr	> 150 Veh/hr
Mixing Zone	☑	☑	X
Adjacent Crossing	☑	☑	EJ
Separated Crossing	☑	☑	EJ
Protected Bicycle Signal Phase	X	EJ	☑

DESIGN FEATURES

Potential bicycle lane intersection treatments include:

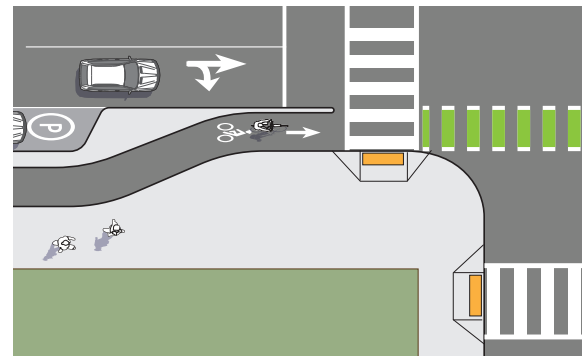
- Mixing zones (Combined bike lane/turn lane) in advance of the intersection.
- An adjacent crossing, immediately adjacent to the nearest travel lane to promote visibility prior to the turn.
- A separated crossing, where additional separation from the nearest travel lane provides motorists with space to yield to crossing bicyclists.
- Protected bicycle signal phasing, where all conflicting movements are prohibited with a red signal indication.

MIXING ZONE



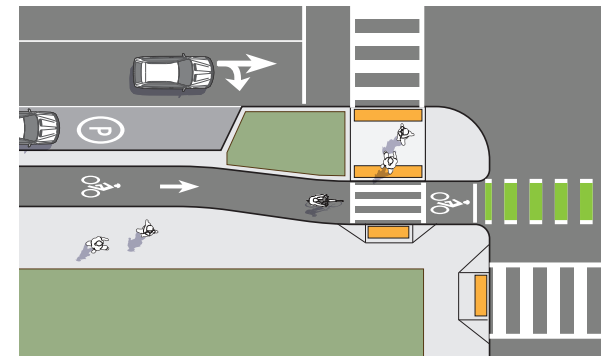
- A mixing zone creates a shared travel lane where turning motor vehicles yield to through traveling bicyclists. All users negotiate potential conflict upstream of the intersection.

ADJACENT CROSSING

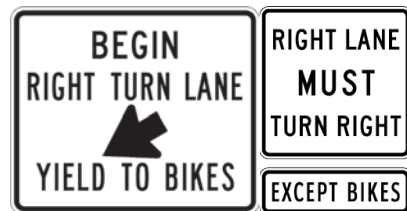


- To increase the visibility of bicyclists by turning motorists prior to the turn, an adjacent crossing (also called “bend-in”) laterally shifts the separated bikeway adjacent to the turning lane.

SEPARATED CROSSING



- A separated crossing (also called a “bend-out”) maintains or increases physical separation of the bike lane far into the intersection, and provides a space for motor vehicles to yield to bicyclists and pedestrians.



R4-4 and R3-7R should be used in conjunction with Mixing Zone treatments.



R10-15 (modified) and R10-11 are to be used in conjunction with both Adjacent and Separated Crossing treatments.

FURTHER CONSIDERATIONS

- On separated bikeways, bicyclists are often unable to merge into traffic to turn left due to physical separation, a two-stage turn box can formalize a “pedestrian style” left turn. Refer to the FHWA Separated Bike Lane Guide for guidance on Two-Stage Turn Boxes (p. 125).
- At signalized intersections with very high right turn volumes or multiple right-turn-only lanes, a bicycle signal face and protected bicycle signal phase should be used to remove conflicts entirely. Refer to FHWA Interim Approval 16 for more information on bicycle signal faces.

MAINTENANCE

Separated bike lanes should be cleared of snow and other debris across the entire width of the facility.

REFERENCES

- FHWA. Achieving Multimodal Networks. 2016.
- FHWA. Separated Bike Lane Planning and Design Guide 2015
- FHWA MUTCD. Interim Approval for Optional Use of a Bicycle Signal Face (IA-16) 2013.

Further Guidance Available

BIDIRECTIONAL SEPARATED BIKE LANE CROSSINGS

Bidirectional separated bike lanes feature complex interactions at intersections and driveways.

Most of the treatments featured in the FHWA Separated Bike Lane Guide apply to bidirectional separated bike lanes.

TYPICAL APPLICATION

Because of the added complexity of bidirectional facilities, the recommended turning volume criteria for considering protected signalization is 100 right turning vehicles per hour.

TABLE X-4: Bidirectional Separated Bike Lane Crossing Treatment Selection Quick Reference

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

	Peak Hour Right Turn Volume		
	< 50 Veh/hr	50-100 Veh/hr	> 100 Veh/hr
Adjacent Crossing	✓	✓	EJ
Separated Crossing	✓	✓	EJ
Protected Bicycle Signal Phase	X	EJ	✓

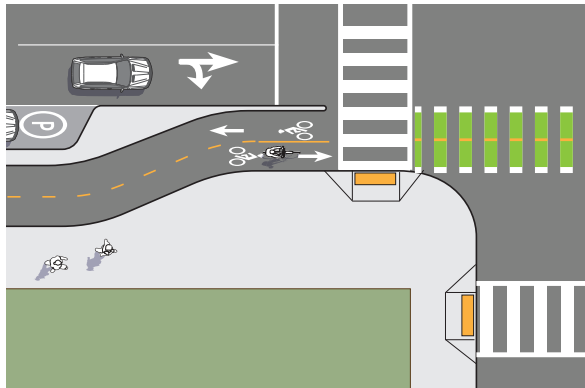
At uncontrolled crossings, bidirectional separated bike lanes face similar operational issues as sidepaths. Refer to the section on Sidepath Crossings in this guide for more information on design strategies at those locations.

DESIGN FEATURES

Potential bicycle lane intersection treatments include:

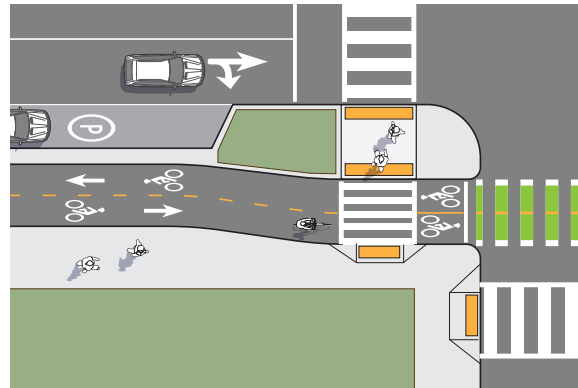
- An adjacent crossing, immediately adjacent to the nearest travel lane to promote visibility prior to the turn.
- A separated crossing, where additional separation from the nearest travel lane provides motorists with space to yield to crossing bicyclists.
- Protected bicycle signal phasing, where all conflicting movements are prohibited with a red signal indication.

ADJACENT CROSSING



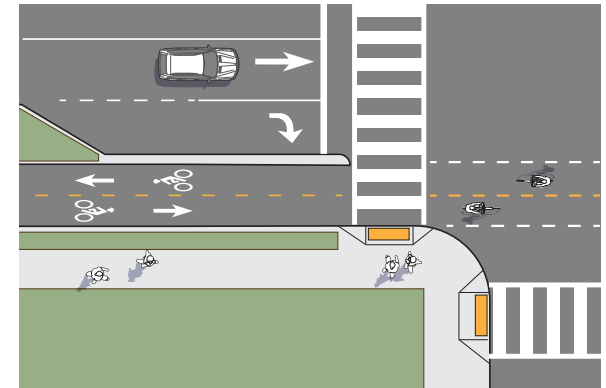
- To increase the visibility of bicyclists by turning motorists prior to the turn, an adjacent crossing (also called “bend-in”) laterally shifts the separated bikeway immediately adjacent to the turning lane.

SEPARATED CROSSING



- A separated crossing (also called a “bend-out”) maintains or increases physical separation of the bike lane far into the intersection, and provides a space for motor vehicles to yield to bicyclists and pedestrians.

PROTECTED SIGNAL PHASE



- At signalized intersections with high right turn volumes (over 100 veh/hr), a dedicated right turn lane and protected right turn signal phase should be provided.

FURTHER CONSIDERATIONS

- At signalized intersections, left turns across bidirectional separated bike lanes should be provided a protected signal phase.
- On separated bikeways, bicyclists are often unable to merge into traffic to turn left due to physical separation, a two-stage turn box can formalize a “pedestrian style” left turn. Refer to the [FHWA Separated Bike Lane Guide](#) for guidance on Two-Stage Turn Boxes (p. 125).
- At signalized intersections with very high right turn volumes or multiple right-turn-only lanes, a bicycle signal face and protected bicycle signal phase should be used to remove conflicts entirely. Refer to [FHWA Interim Approval 16](#) for more information on bicycle signal faces.

MAINTENANCE

Separated bike lanes, both at-grade with the adjacent roadway, or grade separated, should be cleared of snow and other debris across the entire width of the facility.

REFERENCES

FHWA. Separated Bike Lane Planning and Design Guide 2015
 FHWA MUTCD. Interim Approval for Optional Use of a Bicycle Signal Face (IA-16) 2013.

Further Guidance Available

FHWA
SBL Guide

FHWA
IA-16

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.

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.

TABLE X-4: Sidepath Crossing Treatment Selection Quick Reference

Legend:

- ☑ = Desirable
- EJ = Engineering Judgement
- X = Not Recommended

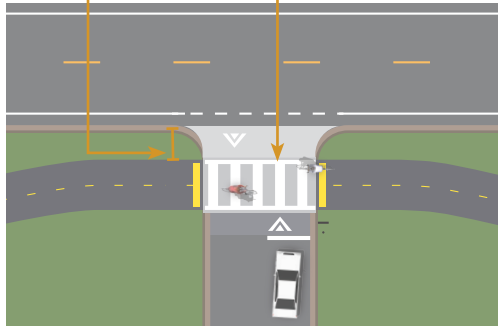
	≤ 35		≥ 40 mph	
	Constrained ROW or limited sightlines	Wide ROW	Constrained ROW or limited sightlines	Wide ROW
Separated Crossing (16.5 ft) (5 m)	EJ	☑	EJ	EJ
Adjacent Crossing (6.5 ft) (1.9 m)	☑	EJ	EJ	EJ
Deceleration Lane with Adjacent Crossing (6.5 ft) (1.9 m)	X	EJ	☑	EJ

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.

ADJACENT SIDEPATH CROSSING

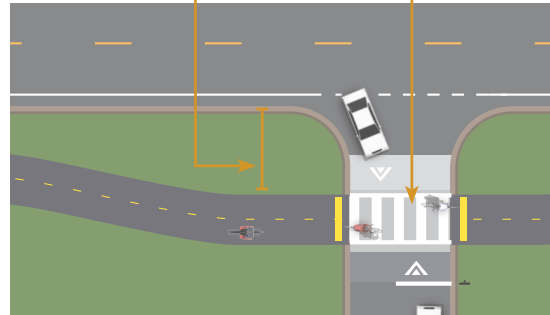
6.5 ft minimum separation from roadway
Bikeway is level along crossing



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

SEPARATED SIDEPATH CROSSING

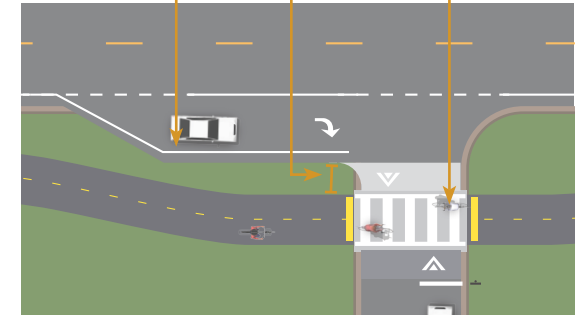
16.5 ft preferred separation from roadway
Bikeway is flat and level along crossing



- 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 DECELERATION LANE

Right turn deceleration lane.
6.5 ft preferred separation from turn lane
Bikeway is flat and level along crossing



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

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.

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FACILITIES FOR FURTHER CONSIDERATION

(NOT CURRENTLY APPROVED)



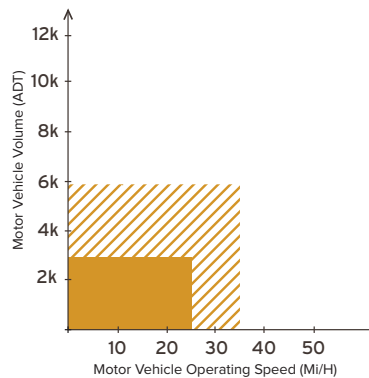
ADVISORY SHOULDERS

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.

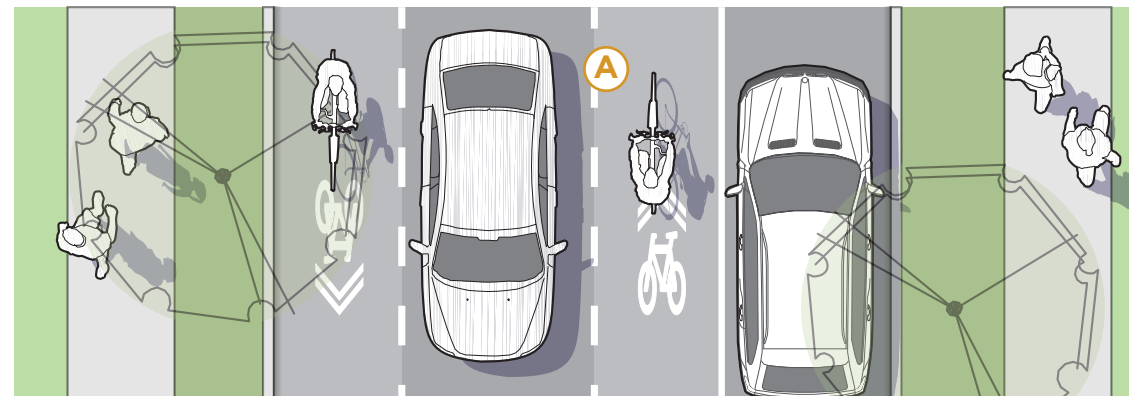
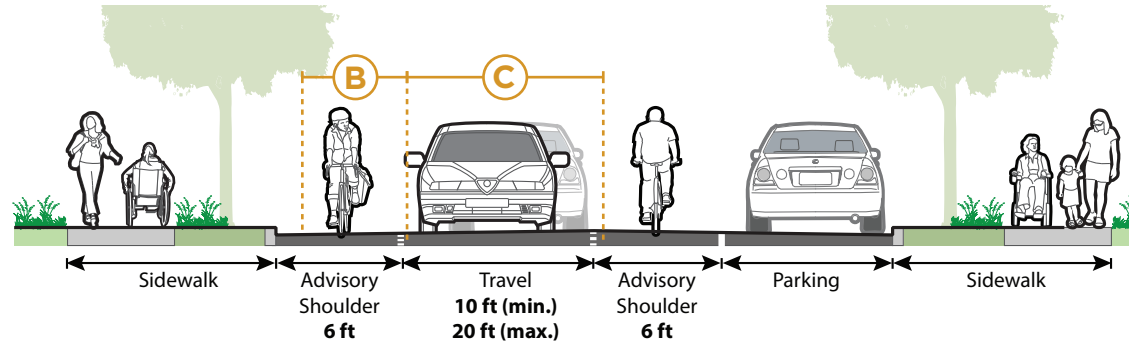
Advisory shoulders are a new treatment type and no data has been collected to compare to international experience. To install advisory shoulders, **an approved Request to Experiment is required** as detailed in the MUTCD. FHWA is also accepting requests for experimentation of a similar treatment, “dashed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

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 an 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.



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.

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).

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 Multimodal Networks. 2016.

Further Guidance Available

FHWA
MUTCD

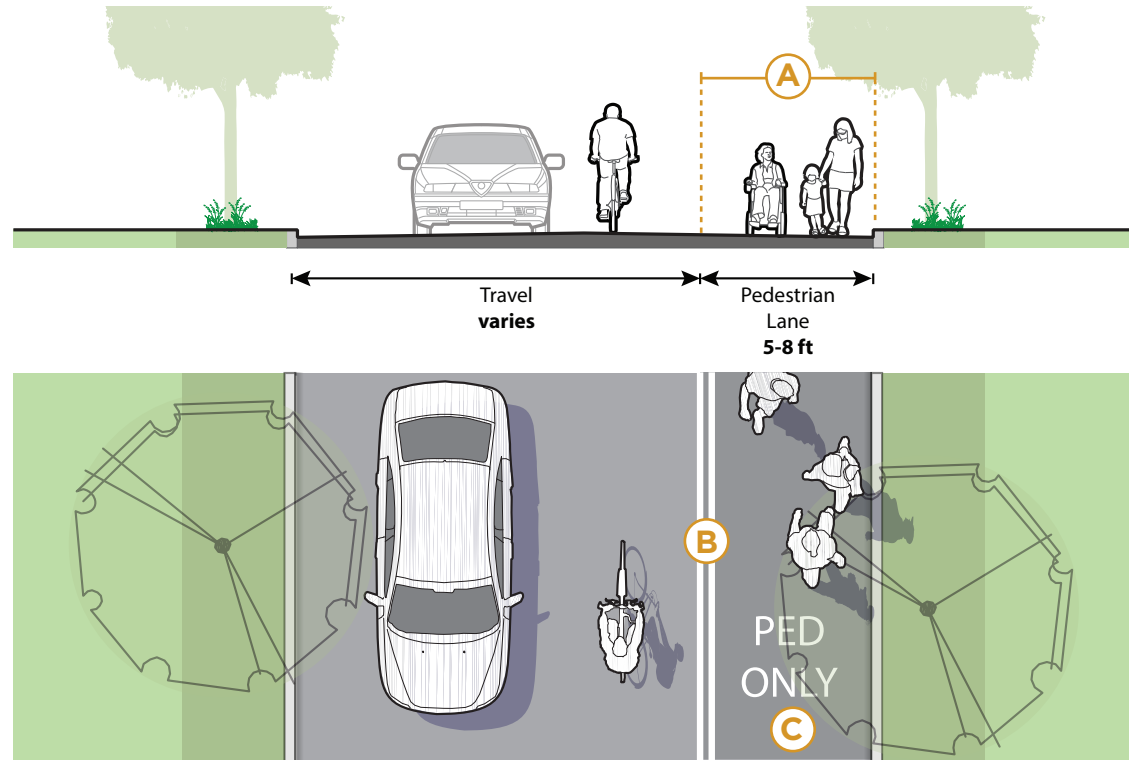
FHWA
Dashed Bike
Lanes

RURAL
GUIDE

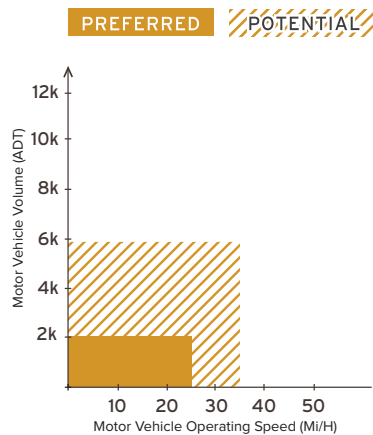
PEDESTRIAN LANE

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.



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.



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 Multimodal Networks, 2016.

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.

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 Multimodal 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



