

Ozarks Transportation Organization
Bicycle & Pedestrian Trail Investment Study

Appendix D: Trail Types and Typical Sections

alta PLANNING + DESIGN

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APPENDIX D: TRAIL TYPES AND TYPICAL SECTIONS

Introduction

Like most transportation facilities, one size does not fit all. Development of trails and greenways is no different. From single-track hiking and mountain biking trails to crushed limestone shared-use paths to paved urban greenways, trails are designed with specific users in mind and with great attention to the surrounding environment in which they are located. This study focuses specifically on linear shared-use paths. Unlike a trail located entirely within a park, a linear shared-use path serves as a link between destinations, not just a recreational amenity within a single site. As such, linear shared-use paths can serve both recreation and transportation purposes, and connectivity is critical to and from destinations.

The section of the appendix describes and illustrates the five trail types that were used as part of the public engagement efforts to learn more about local preferences and desires for future trail development. Each of the five trail types represents a distinct context for trail development: urban, suburban, rural, rail-with-trail or rail-to-trail, and riparian. The section includes cross sections that serve as trail design references for local agencies as they pursue individual trail projects. The section concludes with general trail design practice and design guidance for various trail contexts.

Trail Types

The existing and planned shared-use trails in the Springfield region can be divided into five general trail types. These types reflect the character of the trail facility itself, as well as the context and surrounding environment. These trail types are not meant to be mutually exclusive. Some trails may exhibit charcateristics from more than one of these trail types. For example, a suburban trail may also travel along a stream or extend into a more rural setting.

Examples of trail projects from communities across the country, including Indianapolis, Indiana, Chesterfield, Missouri, and San Francisco, California.

Urban Trails

Urban trails are located within the urban core and are often integrated into the roadway infrastructure. These trails are often placed within constricted rights-of-way, and their design may change from one segment to the next to address varying right-of-way widths or other conflicts with existing infrastructure or land uses.

An urban trail can take the shape of a shared-use path that accommodates all trail users, or a combination of a sidewalk and a separate bike facility like bicyle lanes on the roadway or a two-way cycle track. The latter design, as shown in the middle image to the right, is not programmed as the preferred design option for any of the planned priority trails considered for this study, but may be considered for other trail projects.

While their proximity to motor vehicle traffic may discourage some people from using the facility, these urban greenways include ample connections to nearby destinations and serve a valuable function in the walking and bicycling networks.

These examples of urban greenways show how creative re-use of valuable urban spaces can increase walking and bicyling opportunities. Urban trails like the Cultural Trail in Indianapolis, Indiana (shown in the bottom right) have functioned as economic development catalysts, leading to redevelopment of adjacent properties, increased spending and tourism activities, and increased tax revenue.

Suburban Trails

Suburban trails are located in less dense areas of the region and are characterized by less right-of-way constraints and fewer interactions with motor vehicles than urban trails. Suburban trails can be located alongside major roadways, through subdivision common ground, and through public properties like schools, parks, and utility corridors. Suburban trails also provide connectivity to local destinations like schools, parks, or local commercial destinations.

Like urban trails, surburban trails use a concrete or asphalt surface to support a diversity of trail users, from people bicycling and walking, to people using mobility assistance devices like wheelchairs or walkers.

Surburban trails adapt to and blend in with their surroundings, taking advantage of roadways, subdivision common grounds, utility corridors, and other opportunities to create valuable corridors for active transportation and recreation.

Rural Trails

Rural trails provide a unique user experience within the regional trail sytsem by offering a more remote and pastoral setting than most other trail types. These trails are often surrounded by agricultural lands and offer very few connections to surrounding land uses.

Rural trail surfaces can be asphalt or crushed limestone, depending on intended user composition and projected volumes. In some cases, trails may be first developed with a crushed limestone or aggregate surface, and later paved as additional funding becomes available or as the surrounding land uses transition to more dense use types.

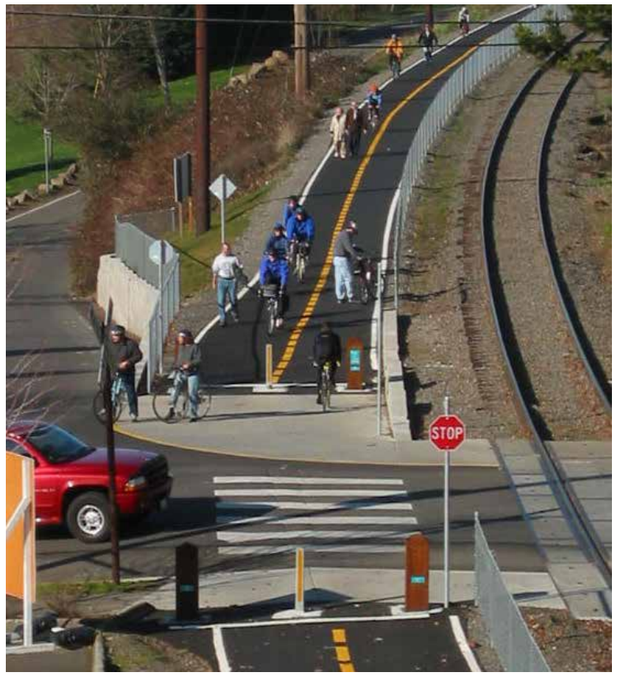
While rural trails may lack a variety of destinations, they often serve as valuable links between communities. In addition, their pastoral character can offer visitors a different trail experience from those found in urban and suburban settings.

Rail Trails

Rail trails are located within existing or abandoned railroad rights-of-way and can be found in urban, suburban, or rural environments. While rail trails generally provide long, uninterrupted corridors for bicycling and walking, they can experience greater conflicts within urban and industrial areas.

There are two types of rail trail projects. Rail-to-Trail projects convert abandoned railroads into exclusive trail corridors. Rail-with-Trail projects provide a shared-use path adjacent to an active railroad.

Trail surface may vary for rail trail projects depending on intended use types and volumes, as well as the surrounding context. Rail trails in more rural contexts, like the Frisco Highline Trail, may have a crushed limestone surface, while rail trails in more populated areas may have a concrete or asphalt surface.



These examples of rail trail projects, including the Frisco Highline Trail (right middle), show how both active and abandoned rail corridors can be transformed into valuable recreation and transportation corridors for walking and bicyling

Riparian Trails

Most often located in urban or suburban settings, riparian trails parallel creeks, rivers, and other waterways to provide a unique, natural environment for bicycling and walking. Many trails in the Springfield region can be classified as riparian trails, including the Fassnight Creek Greenway, the Galloway Creek Greenway, the South Creek Greenway, and the Wilson's Creek Greenway.

These desirable riparian trails often face the most significant development and permitting constraints given their proximity to waterways, floodplains, and other environmentally sensitive areas. However, the benefits they provide in terms of recreation, transportation, and connections to the natural environment outweigh these challenges.

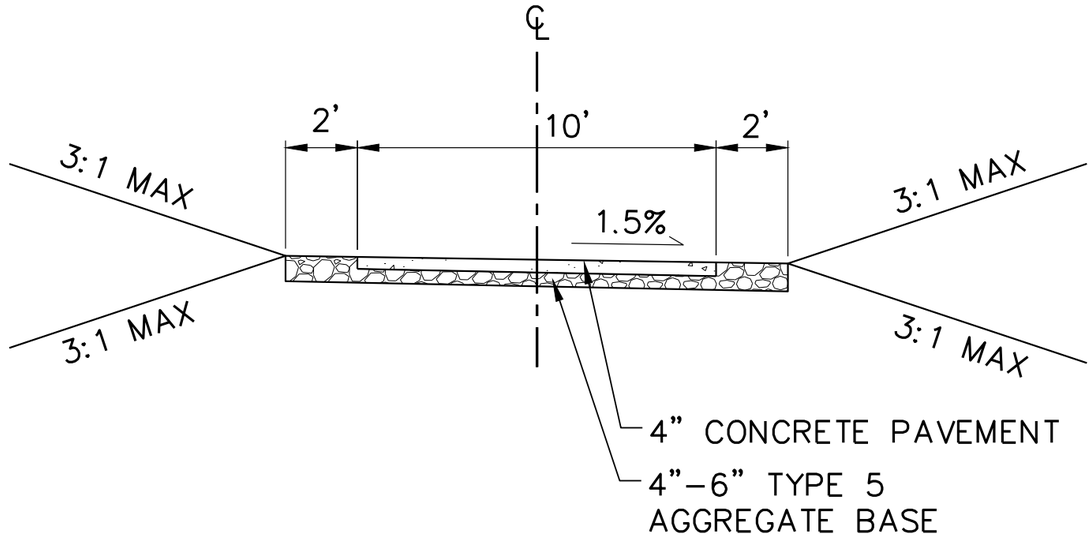
Riparian trails are a significant part of the regional trail network. Above: Fassnight Creek Greenway. Top right: Galloway Creek Greenway (photo courtesy of Ozark Greenways). Middle right: Wilson's Creek Greenway. Bottom right: James River Greenway Trail of Honor (photo courtesy of Ozark Greenways)

Typical Trail Sections

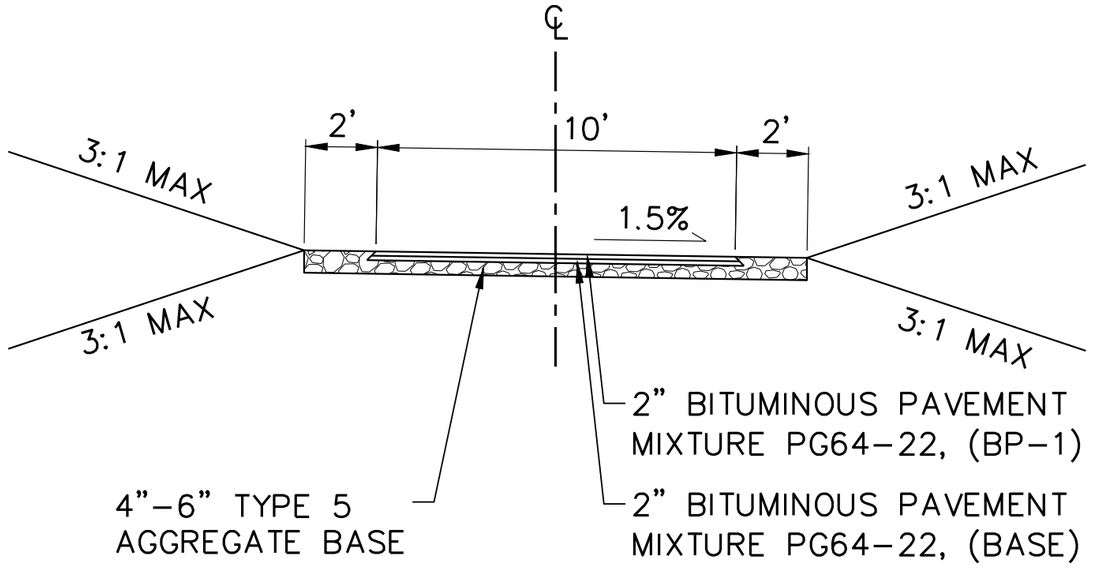
Typical trail cross sections have been developed as part of this trail study to offer local agencies additional guidance for subsequent project development and trail design. These cross sections can serve as the basis for discussions with property owners, project engineers and landscape architects, and other project stakeholders to develop a shared understanding of typical trail design elements. Additional trail design resources should be referenced in preliminary and final design phases.

The following typical sections are provided:

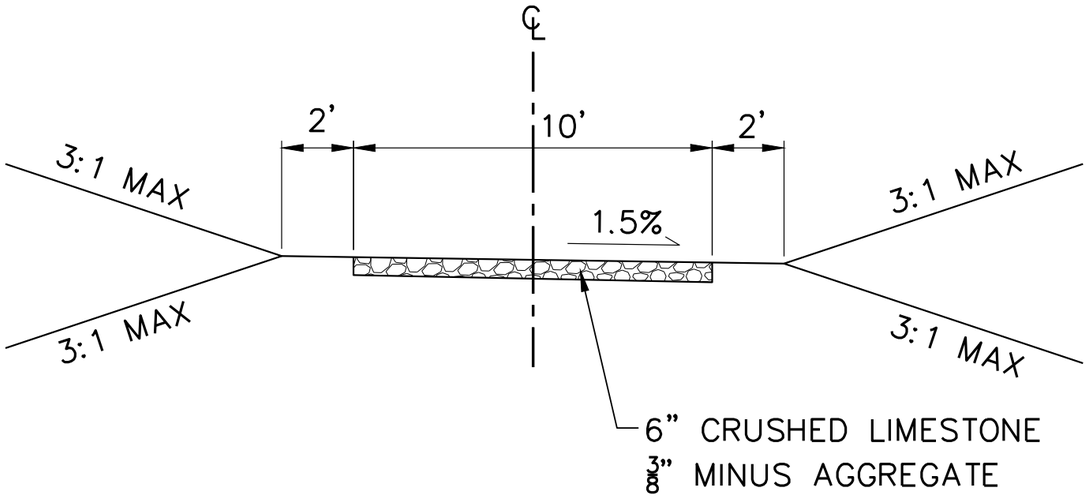
- Concrete Shared-Use Path
- Asphalt Shared-Use Path
- Gravel Shared-Use Path
- Porous Asphalt Shared-Use Path
- Asphalt Two-Way Cycle Track
- Cycle Track Buffer Options



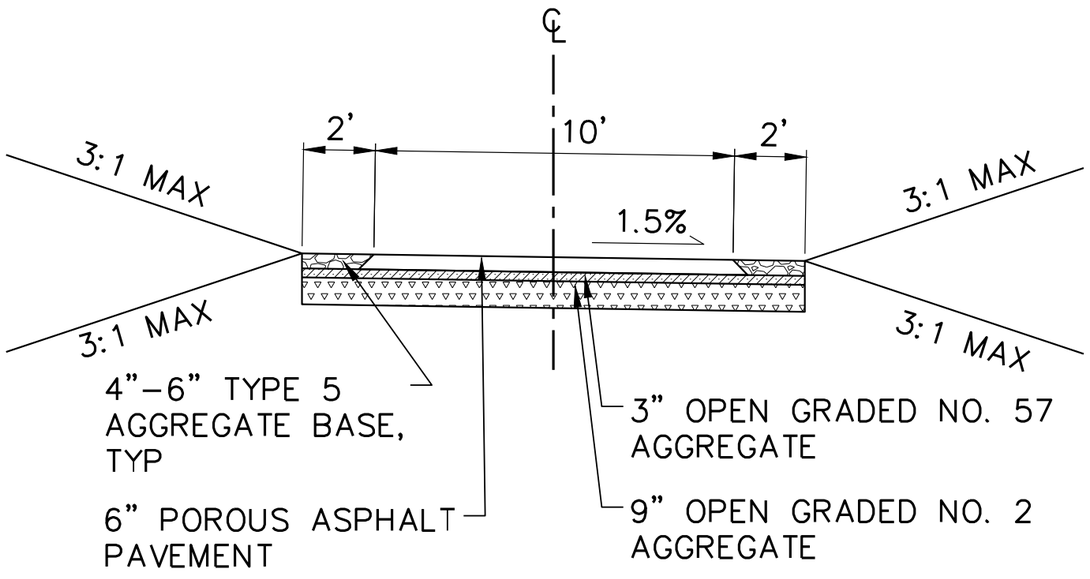
TYPICAL SECTION – CONCRETE SHARED USE PATH



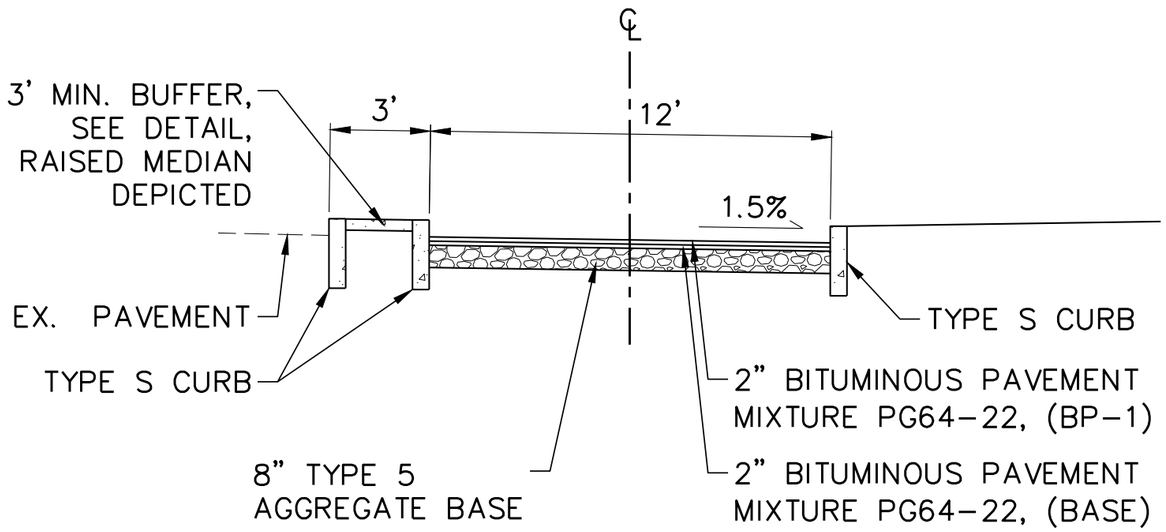
TYPICAL SECTION – ASPHALT SHARED USE PATH



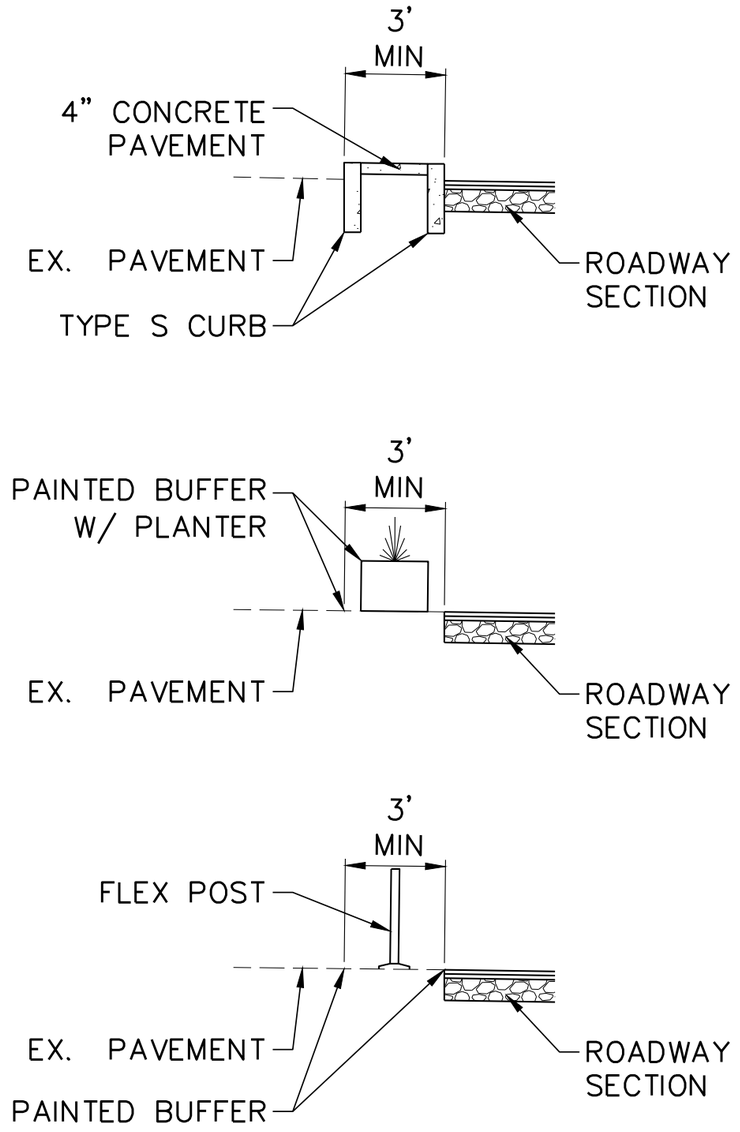
TYPICAL SECTION – GRAVEL SHARED USE PATH



TYPICAL SECTION – POROUS ASPHALT SHARED USE PATH



TYPICAL SECTION – ASPHALT TWO-WAY CYCLE TRACK



TYPICAL SECTION – CYCLE TRACK BUFFER OPTIONS

Shared Use Paths and Off-Street Facilities

A shared use path allows for two-way, off-street bicycle use and also may be used by pedestrians, skaters, wheelchair users, joggers and other non-motorized users. These facilities are frequently found in parks, along rivers, beaches, and in greenbelts or utility corridors where there are few conflicts with motorized vehicles. Path facilities can also include amenities such as lighting, signage, and fencing (where appropriate).

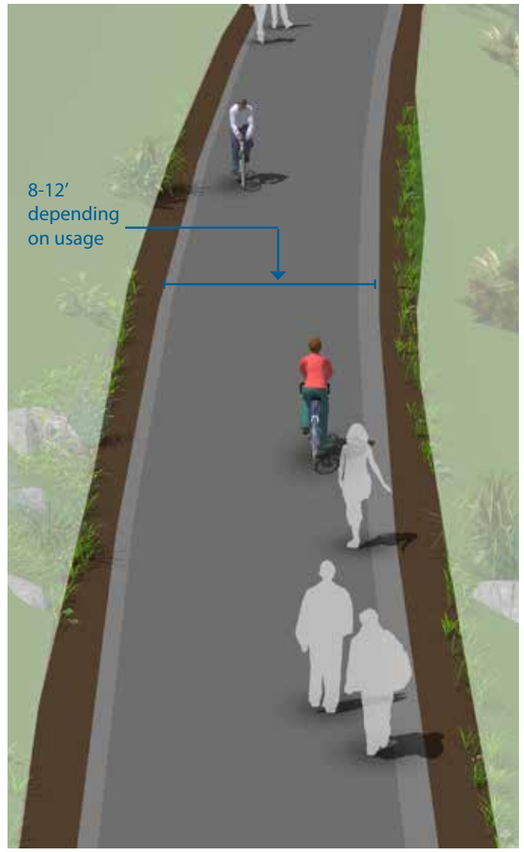
Key features of shared use paths include:

- Frequent access points from the local road network.
- Directional signs to direct users to and from the path.
- A limited number of at-grade crossings with streets or driveways.
- Terminating the path where it is easily accessible to and from the street system.
- Separate treads for pedestrians and bicyclists when heavy use is expected.

General Design Practices

Description

Shared use paths can provide a desirable facility, particularly for recreation, and users of all skill levels preferring separation from traffic. Bicycle paths should generally provide directional travel opportunities not provided by existing roadways.



Guidance

Width

- 8 feet is the minimum allowed for a two-way bicycle path and is only recommended for low traffic situations.
- 10 feet is recommended in most situations and will be adequate for moderate to heavy use.
- 12 feet is recommended for heavy use situations with high concentrations of multiple users. A separate track (5’ minimum) can be provided for pedestrian use.

Lateral Clearance

- A 2 foot or greater shoulder on both sides of the path should be provided. An additional foot of lateral clearance (total of 3’) is required by the MUTCD for the installation of signage or other furnishings.
- If bollards are used at intersections and access points, they should be colored brightly and/or supplemented with reflective materials to be visible at night.

Overhead Clearance

- Clearance to overhead obstructions should be 8 feet minimum, with 10 feet recommended.

Striping

- When striping is required, use a 4 inch dashed yellow centerline stripe with 4 inch solid white edge lines.
- Solid centerlines can be provided on tight or blind corners, and on the approaches to roadway crossings.

Discussion

Terminate the path where it is easily accessible to and from the street system, preferably at a controlled intersection or at the beginning of a dead-end street.

Additional References and Guidelines

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.

Materials and 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.

Shared Use Paths in Abandoned Rail Corridors

Description

Commonly referred to as Rails-to-Trails or Rail-Trails, these projects convert vacated rail corridors into off-street paths. Rail corridors offer several advantages, including relatively direct routes between major destinations and generally flat terrain.

In some cases, rail owners may rail-bank their corridors as an alternative to a complete abandonment of the line, thus preserving the rail corridor for possible future use.

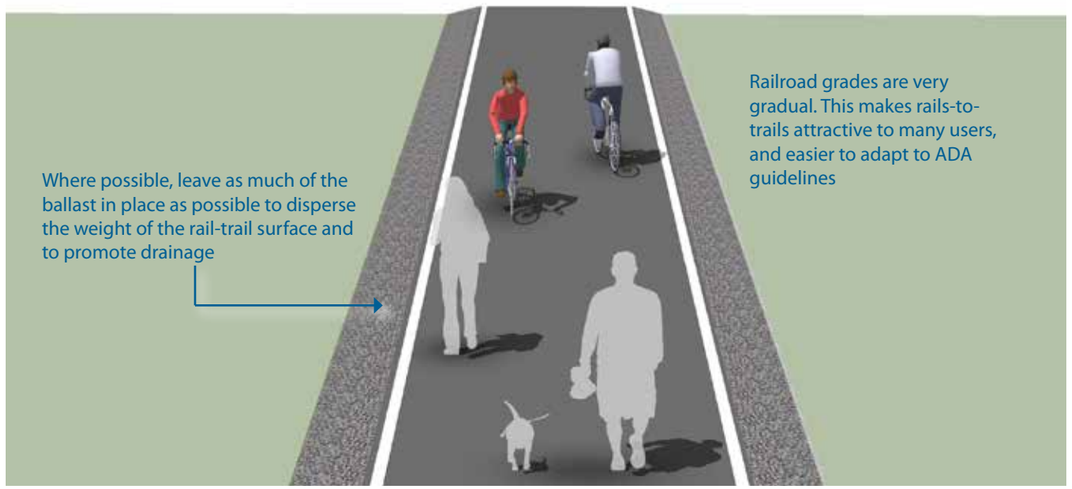
The railroad may form an agreement with any person, public or private, who would like to use the banked rail line as a trail or linear park until it is again needed for rail use. Municipalities should acquire abandoned rail rights-of-way whenever possible to preserve the opportunity for trail development.

Guidance

Shared use paths in abandoned rail corridors should meet or exceed general design practices. If additional width allows, wider paths, and landscaping are desirable.

In full conversions of abandoned rail corridors, the sub-base, superstructure, drainage, bridges, and crossings are already established. Design becomes a matter of working with the existing infrastructure to meet the needs of a rail-trail.

If converting a rail bed adjacent to an active rail line, see Shared Use Paths in Active Rail Corridors.



Discussion

It is often impractical and costly to add material to existing railroad bed fill slopes. This results in trails that meet minimum path widths, but often lack preferred shoulder and lateral clearance widths.

Rail-to-trails can involve many challenges including the acquisition of the right of way, cleanup and removal of toxic substances, and rehabilitation of tunnels, trestles and culverts. A structural engineer should evaluate existing railroad bridges for structural integrity to ensure they are capable of carrying the appropriate design loads.

Additional References and Guidelines

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.

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Shared Use Paths in Active Rail Corridors

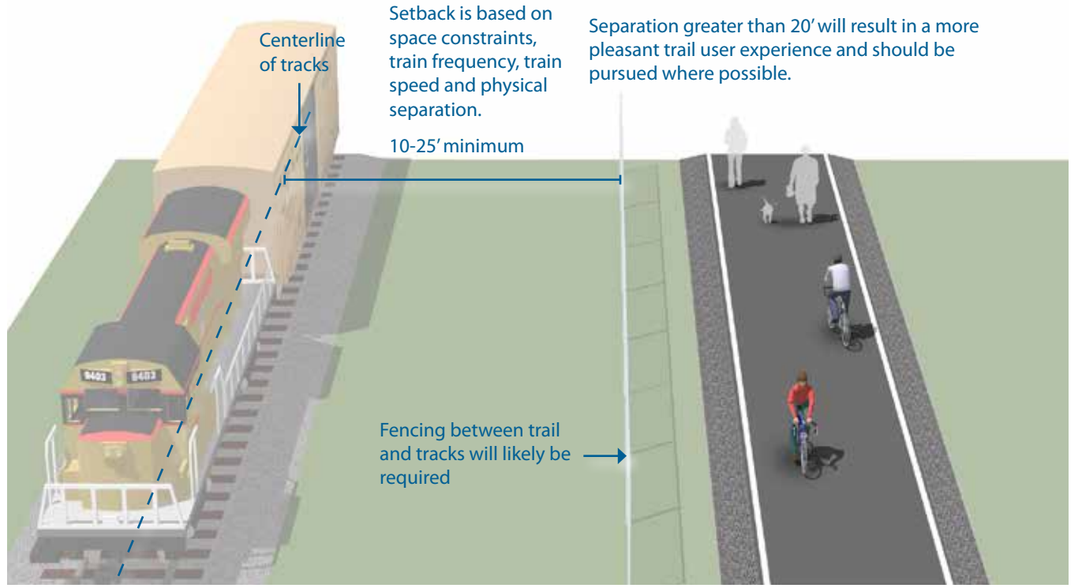
Description

Rails-with-Trails projects typically consist of paths adjacent to active railroads. It should be noted that some constraints could impact the feasibility of rail-with-trail projects. 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.

Guidance

Shared use paths in utility corridors should meet or exceed general design standards. If additional width allows, wider paths, and landscaping are desirable.

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. Setbacks from the active rail line will vary depending on the speed and frequency of trains, and available right-of-way.



Discussion

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.

Additional References and Guidelines

AASHTO. *Guide for the Development of Bicycle Facilities*. 2012.
FHWA. *Manual on Uniform Traffic Control Devices.* 2009.
FHWA. *Rails-with-Trails: Lessons Learned.* 2002.

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Shared Use Paths in River and Utility Corridors

Description

Utility and waterway corridors often offer excellent shared use path development and bikeway gap closure opportunities. Utility corridors typically include powerline and sewer corridors, while waterway corridors include canals, drainage ditches, rivers, and beaches. These corridors offer excellent transportation and recreation opportunities for bicyclists of all ages and skills.

Guidance

Shared use paths in utility corridors should meet or exceed general design practices. If additional width allows, wider paths, and landscaping are desirable.

Access Points

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

Path Closure

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

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

Discussion

Similar to railroads, 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. 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.

Additional References and Guidelines

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.

Materials and Maintenance

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Shared-Use Paths Along Roadways

Description

Shared Use Paths along roadways, also called Sidepaths, are a type of path that run adjacent to a street.

Because of operational concerns it is generally preferable to place paths within independent rights-of-way away from roadways. However, there are situations where existing roads provide the only corridors available.

Along roadways, these facilities create a situation where a portion of the bicycle traffic rides against the normal flow of motor vehicle traffic and can result in wrong-way riding where bicyclists enter or leave the path.

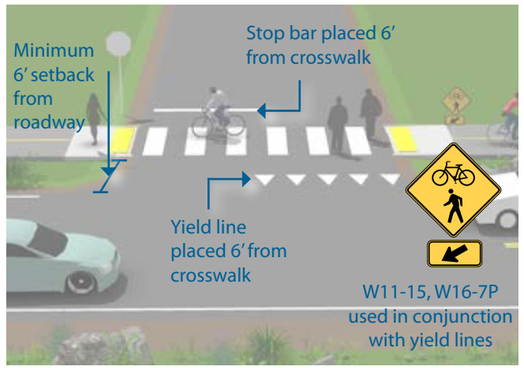
The AASHTO Guide for the Development of Bicycle Facilities cautions practitioners of the use of two-way sidepaths on urban or suburban streets with many driveways and street crossings.

In general, there are two approaches to crossings: adjacent crossings and setback crossings, illustrated below.

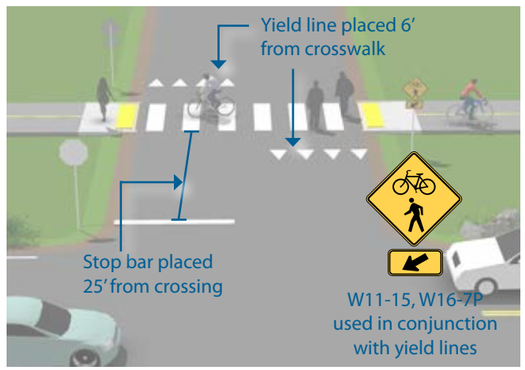
Guidance

- Guidance for sidepaths should follow that for general design practises of shared use paths.
- A high number of driveway crossings and intersections create potential conflicts with turning traffic. Consider alternatives to sidepaths on streets with a high frequency of intersections or heavily used driveways.
- Where a sidepath terminates special consideration should be given to transitions so as not to encourage unsafe wrong-way riding by bicyclists.
- Crossing design should emphasize visibility of users and clarity of expected yielding behavior. Crossings may be STOP or YIELD controlled depending on sight lines and bicycle motor vehicle volumes and speeds.

Adjacent Crossing - A separation of 6 feet emphasizes the conspicuity of riders at the approach to the crossing.



Setback Crossing - A set back of 25 feet separates the path crossing from merging/turning movements that may be competing for a driver's attention.



Discussion

The provision of a shared use path adjacent to a road is not a substitute for the provision of on-road accommodation such as paved shoulders or bike lanes, but may be considered in some locations in addition to on-road bicycle facilities.

To reduce potential conflicts in some situations, it may be better to place one-way sidepaths on both sides of the street.

Additional References and Guidelines

AASHTO. *Guide for the Development of Bicycle Facilities.* 2012.
NACTO. *Urban Bikeway Design Guide.* See entry on Raised Cycle Tracks. 2012.

Materials and Maintenance

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Local Neighborhood Accessways

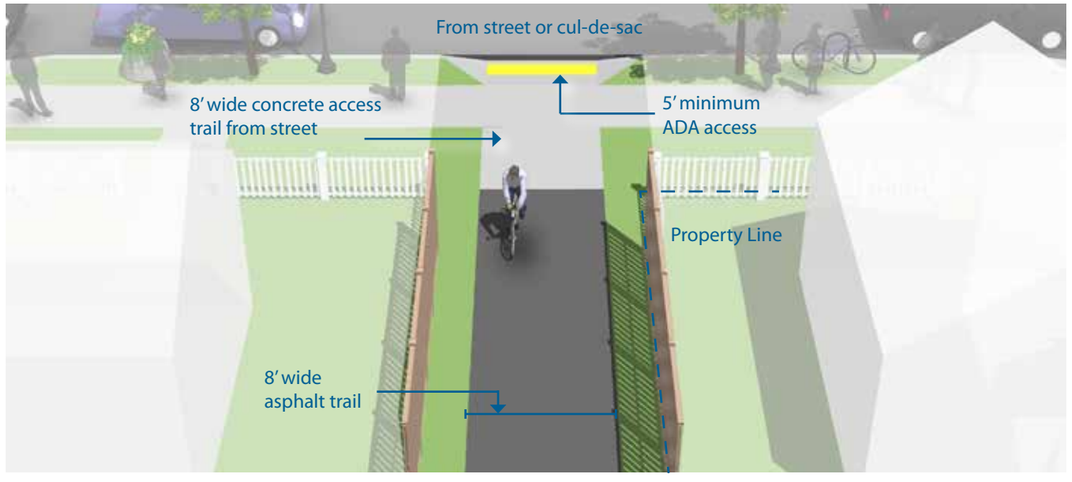
Description

Neighborhood accessways provide residential areas with direct bicycle and pedestrian access to parks, trails, greenspaces, and other recreational areas. They most often serve as small trail connections to and from the larger trail network, typically having their own rights-of-way and easements.

Additionally, these smaller trails can be used to provide bicycle and pedestrian connections between dead-end streets, cul-de-sacs, and access to nearby destinations not provided by the street network.

Guidance

- Neighborhood accessways should remain open to the public.
- Trail pavement shall be at least 8' wide to accommodate emergency and maintenance vehicles, meet ADA requirements and be considered suitable for multi-use.
- Trail widths should be designed to be less than 8' wide only when necessary to protect large mature native trees over 18" in caliper, wetlands or other ecologically sensitive areas.
- Access trails should slightly meander whenever possible.



Discussion

Neighborhood accessways should be designed into new subdivisions at every opportunity and should be required by City/County subdivision regulations.

For existing subdivisions, Neighborhood and homeowner association groups are encouraged to identify locations where such connects would be desirable. Nearby residents and adjacent property owners should be invited to provide landscape design input.

Additional References and Guidelines

AASHTO. *Guide for the Development of Bicycle Facilities.* 2012.
FHWA. *Manual on Uniform Traffic Control Devices.* 2009.
FHWA. *Federal Highway Administration University Course on Bicycle and Pedestrian Transportation. Lesson 19: Greenways and Shared Use Paths.* 2006.
NACTO. *Urban Street Design Guide.* 2013.

Materials and Maintenance

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Natural Surface Trails

Description

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. Natural surface trails are a low-impact solution and found in areas with limited development or where a more primitive experience is desired.

Guidance presented in this section does not include considerations for bicycles. Natural surface trails designed for bicycles are typically known as single track trails.

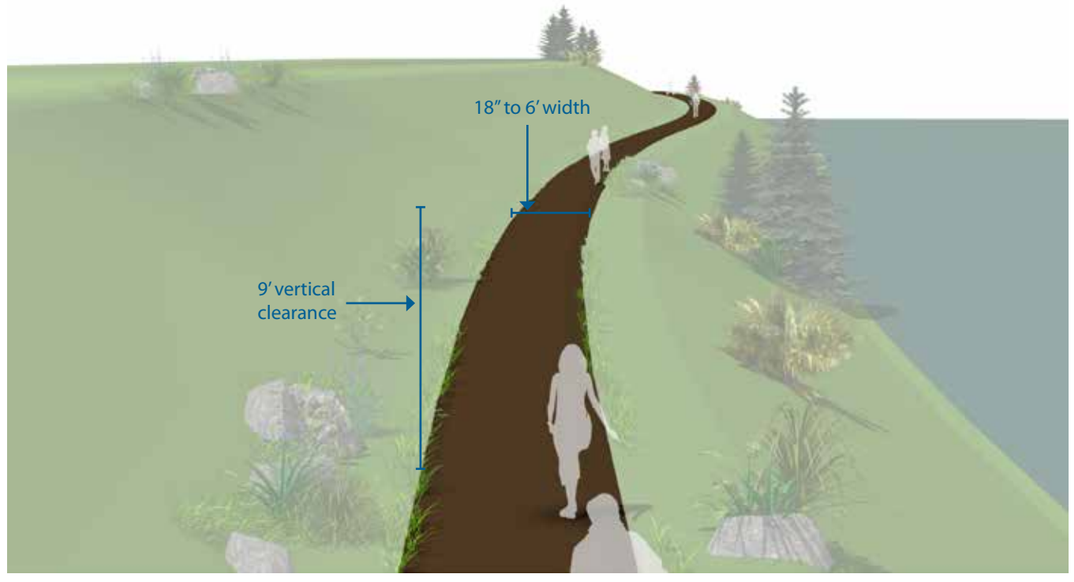
Guidance

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 (a.k.a. "crush and 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).



Discussion

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.

Additional References and Guidelines

Flink, C. *Greenways: A Guide To Planning Design And Development.* 1993.

Materials and Maintenance

Consider implications for accessibility when weighing options for surface treatments.

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