TOOLBOX SECTION

7

Shared Use Paths

Shared use paths serve the needs of a variety of pedestrians.

SHARED USE PATHS

Shared use paths are typically designed to accommodate pedestrians and bicyclists. They commonly serve the needs of a variety of pedestrians, including commuters, school children, neighborhood residents, wheelchair users (and other individuals with disabilities and mobility or navigation challenges), and recreational users such as joggers and skaters.

Shared use paths may be located within roadway rights-of-way or separated from roadways in independent alignments, such as within utility easements, or along canals and waterfronts. They may also be located in parks and greenways, in open spaces, planned residential communities, and subdivisions. A wide pedestrian mall or corridor within private developments or campuses may also be considered a shared use path.

Beyond creating physical connections, shared use paths have become prominent in the national dialogue concerning the health and welfare of people and the environment. Providing shared use paths supports national efforts to improve fitness and health and provide connectivity and livability in communities. Shared use paths also provide a viable option for commuter travel.

Investment in shared use paths to facilitate pedestrian and bicycle travel will produce significant environmental, livability, health, and economic benefits in Hawaii. This is especially true for residents. The timing is right for a truly integrated mobility strategy for Hawaii that includes new and improved shared use paths in needed areas.

While this toolbox section primarily addresses shared use paths, it also touches on a few considerations related to recreational trails. Shared use paths and recreational trails both provide important linkages in a well-designed pedestrian system.

Planning for Local and Regional Connectivity

Planning of shared use paths should be integral to the planning of overall community and regional transportation systems. The planning process needs to address a broad spectrum of considerations, including but not limited to:

IN THIS SECTION

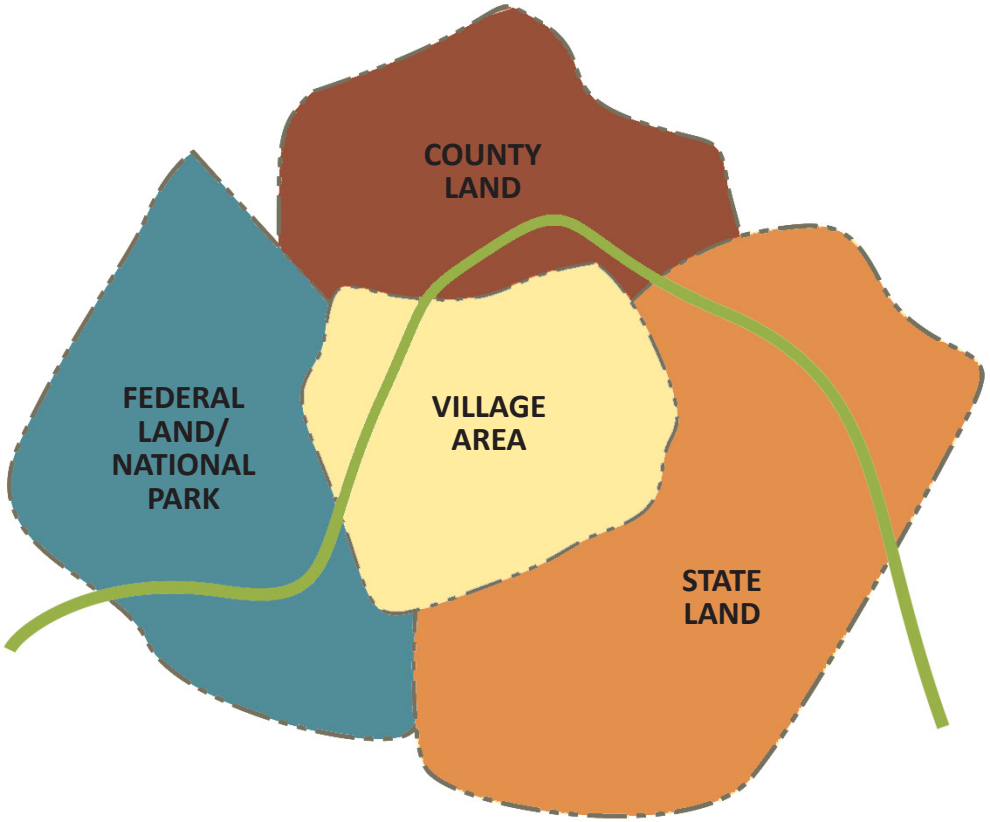
- Local and regional connectivity
- The mobility and safety needs of multiple user groups
- Minimizing conflicts between users
- Street/roadway crossing treatments
- Time periods of use
- Security and visibility
- Other issues

When well planned, designed, and maintained, shared use paths can enhance pedestrian and bicycle mobility and regional connectivity. They can provide convenient routes of travel within communities linking popular origins and destinations such as neighborhoods, parks, schools, community centers, and shopping areas, and can also facilitate access between communities.

The Importance of a System-Wide Approach

Shared use paths may not always be the most appropriate solution or an adequate substitution for a full system of on-street non-motorized improvements (such as sidewalks and bike lanes).

EXHIBIT 7.1 *Jurisdictions must work together to create successful shared use path and trail systems.*



In many communities, commuting bicyclists prefer to ride within the public right-of-way rather than adjacent to it on a shared use path combined with pedestrians. Pedestrians also often prefer to walk on facilities that are not shared with bicyclists. On the other hand, in communities where there are families with young children, shared use paths separated from the street may be a preferred alternative for slower-moving bicyclists and kids on smaller bicycles and scooters. Shared use paths also often serve important recreation and fitness needs in communities. See Toolbox Section 3—Pedestrian-Friendly Streets for more information on Complete Streets.

The Importance of Public Involvement and Cross-Jurisdictional Coordination

Because shared use paths can serve as important linkages in the overall non-motorized transportation system, public involvement and coordination between jurisdictions are essential when planning these facilities. For example, jurisdictions in Hawaii may include federal land managers, state lands, county ownership, City and County of Honolulu, and other governmental agencies, as well as private land owners. Interactions between these land owners and jurisdictions can help planners and designers better understand who will use the shared use paths, what land uses they will connect, how they will fit within the overall transportation system, and how they will meet each jurisdiction's specific needs and requirements.

Because of their linear nature, shared use paths and trails often cross over boundaries of multiple jurisdictions (state, county, city, and federal rights-of-way and private lands). Cooperative coordination between jurisdictions for the planning, design, operation, and maintenance of the facilities is essential. Communities can benefit from working together to coordinate improvements and linkages for region-wide non-motorized path and trail systems.

Hawaii's Department of Land and Natural Resource's Na Ala Hele Trail and Access Program pursues this goal for recreation trails specifically. Path and trail project planners should contact Na Ala Hele early in the project scoping process to ensure planning commences with full awareness of legal, historical, and jurisdictional issues related to recreation trail planning.

Shared Use Paths and Recreation Trails

Shared use paths and recreation trails provide transportation and recreational opportunities to variety of users. Refer to Exhibits 7.2, 7.3, 7.4, 7.6, and 7.7 for shared use path and recreation trail illustrations.

The distinctions between shared use paths and recreational trails have to do with their purpose, primary use, and design. Shared use paths are designed primarily for transportation and their primary users are pedestrians, bicyclists, and users of mobility devices such as manual and motorized wheelchairs. Their design is similar to roadway design except on a smaller scale and at much lower speeds. Recreation trails are designed primarily for recreational purposes, and not for transportation. Refer to the ***Shared Use Path Accessibiity Guidelines*** (SUPAG), Advance Notice of Public Rulemaking (ANPRM) for more information.

Shared use paths are generally paved and evenly graded, whereas recreational trails and off-road trails may not be paved at all and may have only minimal grading improvements. While these distinctions may be helpful in determining design parameters for the facility, it must be remembered that users don't always recognize them. A jogger may use a shared use path for recreation, and a mountain biker may do a partial commute on a recreation trail.

Recreational trails may also include pedestrian-only paths and unpaved paths found in parks and open spaces, as well as in undeveloped and natural areas. Unpaved paths are best used for areas with low use and limited purposes or as interim solutions until they can be fully improved. Exhibit 7.5 further compares shared use paths with recreational trails.

EXHIBIT 7.2 *Paved Shared Use Path*

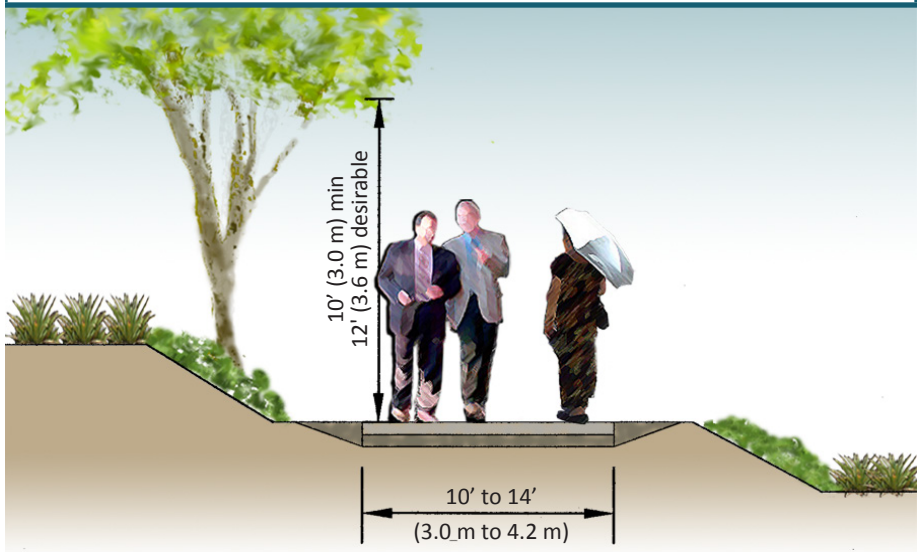


EXHIBIT 7.3 *Unpaved Shared Use Path*

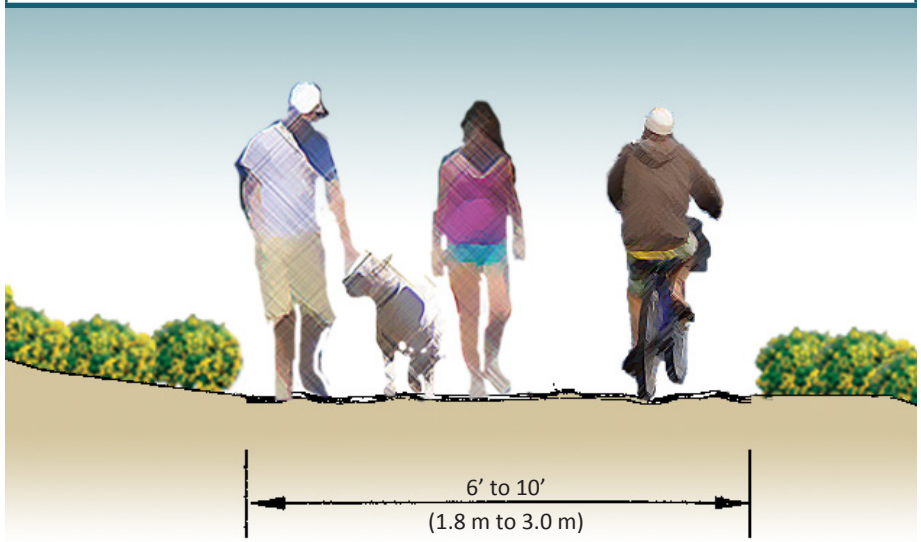


EXHIBIT 7.4 *Unpaved Pedestrian-Only Path or Trail*

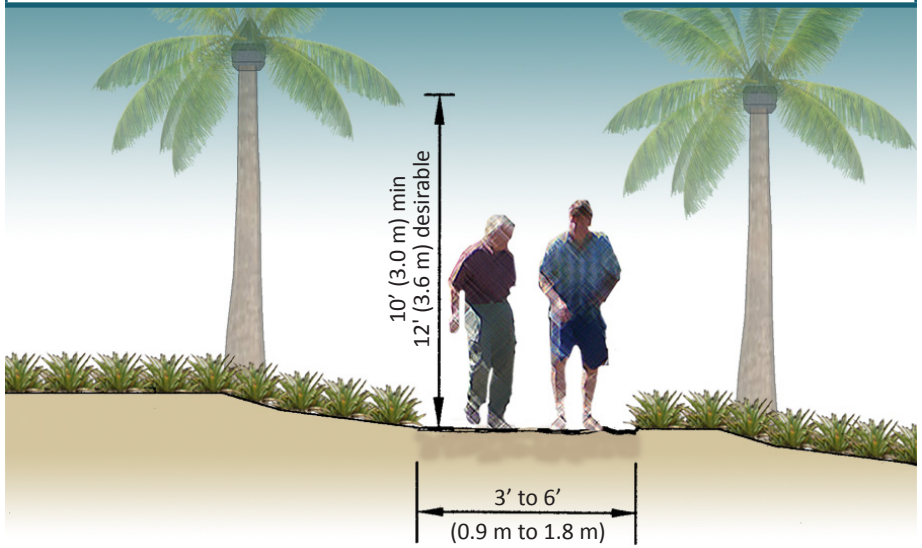


EXHIBIT 7.5 Comparison of Shared Use Paths and Recreation Trails

SHARED USE PATHS	RECREATION TRAILS
Multiple users at multiple speeds	Generally walking speed only
Usually paved	Usually not paved
Used for transportation and recreation	Used primarily for recreation
Design accommodates pedestrians, wheelchair users, bikers, skaters, skateboarders, joggers, and bicyclists	Design accommodates pedestrians, and sometimes equestrians and mountain bikers
May be required to meet Americans with Disabilities Act (ADA) standards. Should comply with the applicable accessibility guidelines (PROWAG or SUPAG) as best practice. *(Note: Hawaii's Disabilities and Communication Access Board allows pedestrian facilities to follow topography.)*	Should be designed to provide accessibility as part of an outdoor recreation experience, including use by people in wheelchairs Best practice is to comply with US Access Boards' Outdoor Developed Area Accessibility Guidelines (ODAAG)
Motor vehicle access may be needed (typically for emergency and maintenance vehicle access only)	Not usually designed to allow motor vehicles

This toolbox primarily focuses on considerations related to the design of shared use paths. There are various other resources that address considerations related to the planning and design of recreational trails (see "Other Resources" at the end of this toolbox).

In addition to the guidance in this toolbox section, shared use paths in Hawaii also should be designed in compliance with guidelines in Bike Plan Hawaii and the soon to be completed Oahu Bike Plan.

Compliance with the Americans with Disabilities Act (ADA)

Paths and trails provide important transportation alternatives and outdoor recreational opportunities for everyone. It is always the best design practice to apply universal design principles, providing paths and trails as accessible facilities. Paths and trails within public rights-of-way that are part of a designated Pedestrian Access Route (PAR) must comply with Americans with Disabilities Act (ADA) requirements. See Toolbox Section 3—Accessibility for more information on PARs.

Designing shared use paths that meet the gradient and dimensional requirements to accommodate bicyclists generally also meets the requirements for ADA. Even if the path is not a designated pedestrian access route or accessible route of travel, the best practice is to design the facility to meet ADA requirements. If the path is not functioning as an accessible route of travel between buildings and facilities and cannot be designed to be fully accessible due to topography or other physical site constraints, it may be exempt from some of the design requirements related to the ADA.

UNIVERSAL DESIGN

Universal design is "The design of products and environments to be usable by all people, to the greatest extent possible, without the need for adaptation or specialized design." The seven principles include: equitable use, flexibility in use, simple and intuitive use, perceptible information; tolerance for error; low physical effort; size and space for approach and use.

- The Center for Universal Design at North Carolina State University.

Check with the HDOT, the Hawaii Disabilities and Communication Access Board (DCAB), the US Access Board, Federal Highway Administration (FHWA), and the local jurisdiction of the project to determine if your project is eligible for certain exemptions from the ADA design provisions.

US Access Board Design Guidelines

The US Access Board has issued guidelines for both shared use paths (SUPAG) and recreation trails. The SUPAG include clarifying definitions of shared use paths and recreation trails, as well as technical provisions for shared use path design. An ANPRM has been issued and is currently in a period of public comment. Guidelines for recreation trails and beach access are included in the Access Board's ***Outdoor Developed Areas Accessibility Guidelines*** (ODAAG). The Draft Final Guidelines are available at the Access Board website.

Providing Accessibility and Preserving the Environment

Because of the challenges inherent in balancing the goal to provide access with the goal to minimize disturbance of natural resources, the US Access Board has identified four conditions where departure from the technical provisions for accessibility are permitted in the design of recreation trails and beach access. These exceptions apply where adherence to accessibility guidelines in trail construction:

1. Would not be feasible due to terrain
2. Cannot be accomplished with the prevailing construction practices
3. Would fundamentally alter the function or purpose of the trail or setting
4. Is precluded by: the Endangered Species Act, the National Environmental Policy Act, the National Historic Preservation Act, The Wilderness Act, or other Federal, State, or local law the purpose of which is to preserve threatened or endangered species; the environment; or archaeological, cultural, historical or other significant natural features

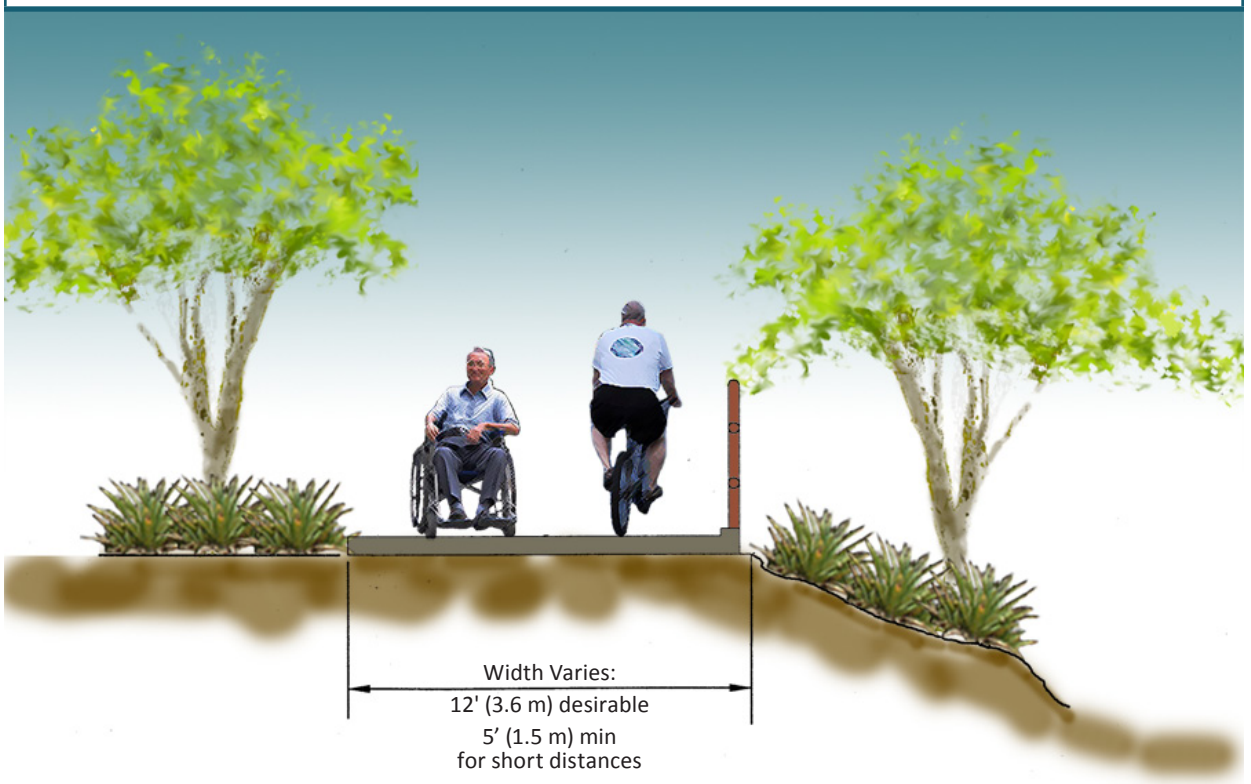
For more accessibility design guidelines and information related to the ADA, refer to Toolbox Section 3—Accessibility.

Path Components, Dimensions, and Other Design Treatments

General Design Considerations

Paths for exclusive pedestrian use should be designed to meet the same clearances and dimensional guidelines as pedestrian sidewalks. Exhibit 7.6 shows a typical shared use path, and Exhibit 7.7 shows the major components of shared use paths. Shared use paths for pedestrians and bicyclists need to be designed with dimensions appropriate for shared use, proper horizontal and vertical curvature, stopping distances before crossings, and other requirements. Often the biggest challenge in the design of shared use paths is accommodating multiple user groups and minimizing conflicts that can arise with the shared use of one facility.

EXHIBIT 7.6 An accessible path can be enjoyed by all kinds of users.



Components

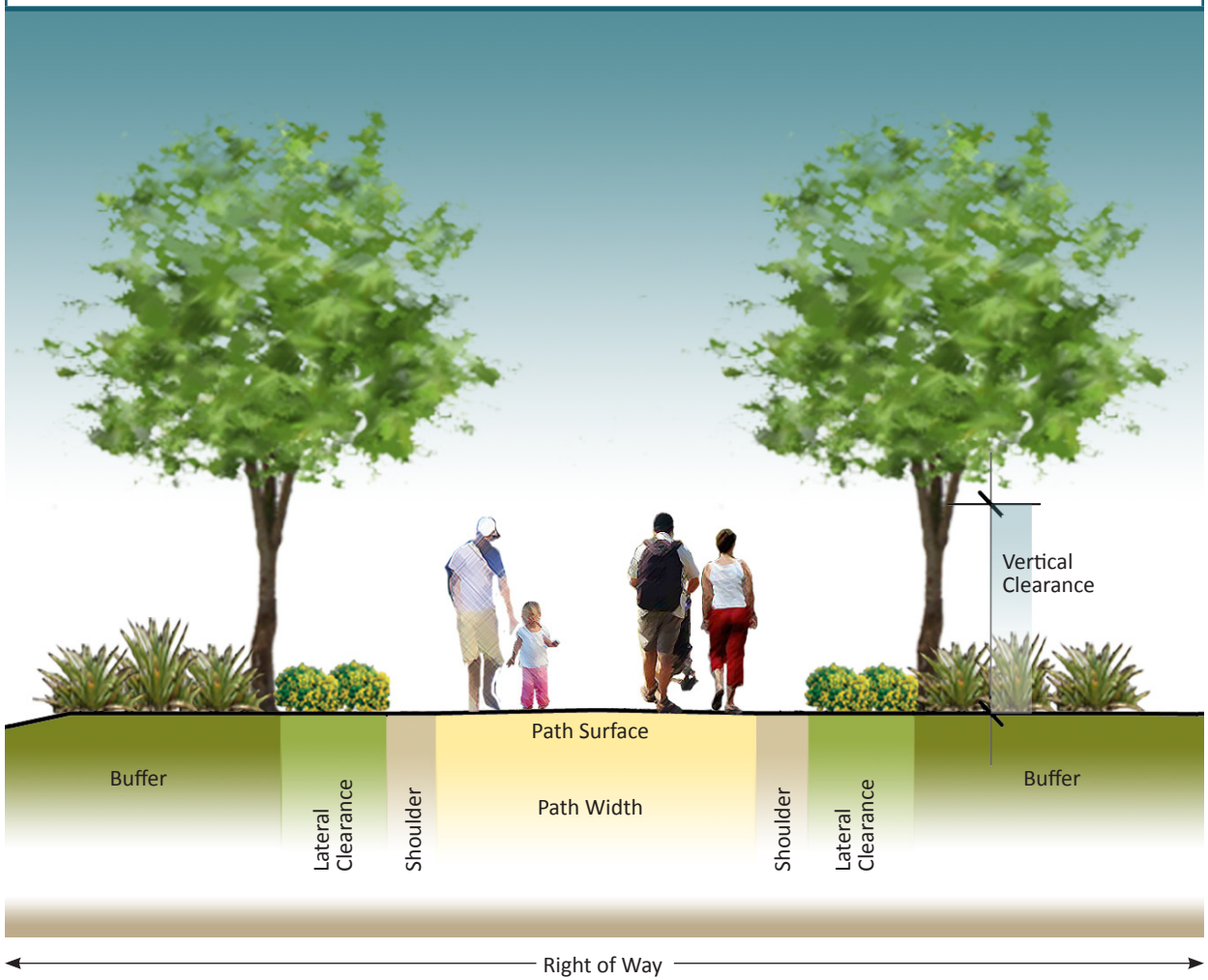
Path corridors include various components:

- The path itself, width, level of vertical clearance provided, and surfacing treatment;
- Lateral clearance areas , which are the additional level, clear spaces beyond the shoulders on each side of the path; and
- Shoulders on both sides of the path;
- The buffer area or separated distance between the path and the outside edge of the corridor, the adjacent roadway edge or other feature. The buffer zone often contains landscaping, trees, and/or open space.

Dimensions

Dimensions for paths can vary depending on the type of facility, the levels of use, types of users, and the setting. Typical dimensions shown in Exhibit 7.8 for shared use paths are based on the American Association of State Highway and Transportation Officials (AASHTO) *Guide for the Development of Bicycle Facilities.* Refer to the AASHTO guide, as well

EXHIBIT 7.7 Path Components



as the *Bike Plan Hawaii*, and the *Oahu Bike Plan* for more information. The recommended dimensions for shared use paths is 12 ft (3.7 m) desired minimum and with 2-ft-wide (0.6 m) shoulders on both sides. A 10-ft-wide (3.0 m) path may be acceptable where right-of-way is restricted, while a 14 ft-wide (4.3 m) path may be best for heavy use. Exhibit 7.8 also lists typical dimensions for recreational trails.

Wider path widths of 11 to 14 ft (3.4 to 4.2m) are recommended in locations where a high percentage of use will be by pedestrians (30 percent or more of the total volume of use), as well as where there will be high use overall (more than 300 total users in the peak hour).

A minimum of 11 ft (3.4 m) in width is needed to enable a bicycle to pass another path user going in the same direction at the same time another path user is approaching from the opposite direction. Wider paths are also recommended where:

- There will be significant use by inline skaters, adult tricycles, children, or other users that need more operating width;
- The path will be used by larger maintenance vehicles;

EXHIBIT 7.8 Recommended Dimensions for Shared Use Paths and Recreation Trails

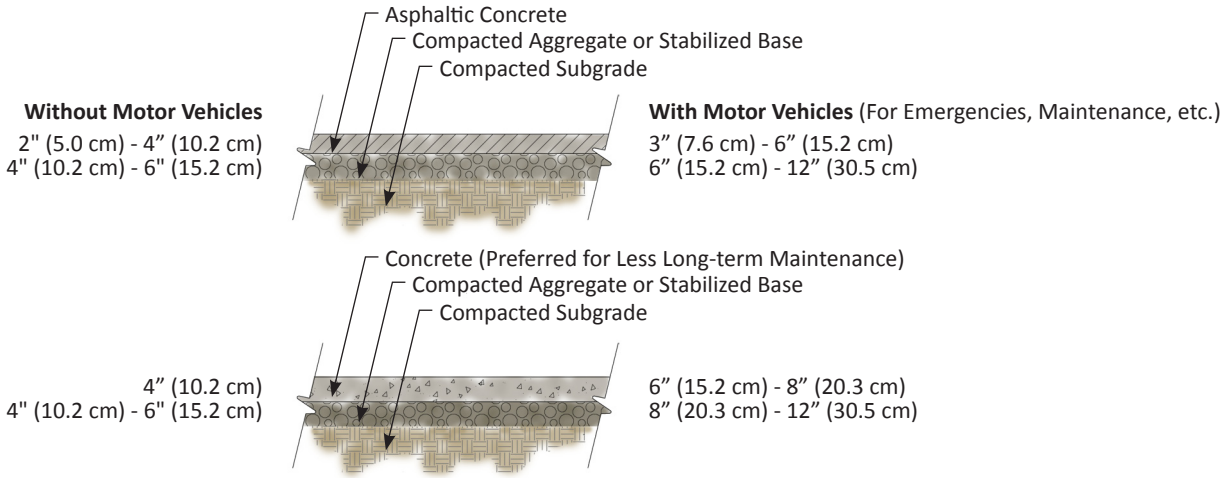
	RECOMMENDED DIMENSIONS			COMMENTS
SHARED USE PATHS				
Path Widths	10' 12' 14'	3.05 m 3.66 m 4.27 m	Minimum Desirable Heaviest Use	Minimum width should only be used where volumes are low and sight distances are good; higher speed users (bicyclists and skaters) and heavier use require greater widths (see AASHTO Guide for the Planning, Design, and Operation of Pedestrian Facilities).
Buffer/Roadway Separation	5'	1.52 m	Minimum	Minimum separation between the roadway and parallel, adjacent path; a physical barrier should be installed where minimum separation cannot be met (see AASHTO).
Shoulders	1' 2'	.31 m .52 m	Minimum (Peds only) Minimum (Shared Use)	Shoulders provide pull-off, resting and passing space; should be graded to the same slope as the path; minimum shoulder width of 1 ft should only be used in constrained areas.
Lateral Clearances	2' 4'	.52 m 1.22 m	Minimum Desirable	Lateral clearances are additional level and clear spaces on each side of the path beyond the shoulders. All obstructions (e.g. trees, signs, etc.) should lie outside of the lateral clearances.
Vertical Clearances	10' 12'	3.05 m 3.66 m	Minimum Desirable	Additional clearance improves visibility.
Pedestrian Corridor/Mall (Urban Areas, Typically)	10' 12' 14'	3.05 m 3.66 m 4.27 m	Minimum Desirable Min. Heavy Use Min.	Paths in urban areas or those that receive heavy use should be wide enough to accommodate several people walking side-by-side or groups of people walking in opposite directions.
RECREATION TRAILS				
Paved Pedestrian-Only Trail Width	5' 7'	1.52 m 2.13 m	Minimum Desirable	These trails are for exclusive use by pedestrians.
Unpaved Pedestrian-Only Trail Width	2' 4'-7'	0.62 m 1.22-2.13 m	Minimum Desirable	Best as limited purpose facility in rural or semi-primitive areas; can provide interim solution; minimum width should only be used in constrained areas.
Unpaved Shared Use Trail Width	7' 8'-10'	2.13 m 2.44-3.05 m	Minimum Desirable	Suggested only as an interim solution and not appropriate for high use trails; best in rural or semi-primitive areas.
Vertical Clearance	8'	2.44 m	Minimum	Additional clearance improves visibility. Ten ft is minimum when equestrian use is expected.

- On steep grades to provide additional passing area; or
- Through curves to provide more operating space.
- In very rare cases, a reduced width of 8 ft (2.4 m) may be used for a shared use path where the following conditions prevail:
  - Bicycle traffic is expected to be low, even on peak days or during peak hours. (In this case consider leaving space to widen the path in the future as bicycle traffic may increase.)
  - Pedestrian use is not expected to be more than occasional.
  - Horizontal and vertical alignments provide frequent, well-designed passing and resting opportunities.
  - The path will not be regularly subjected to maintenance vehicle loading conditions that would cause pavement edge damage.

A path width of 8 ft (2.4 m) also may be used for a short distance due to a physical constraint such as an environmental feature,

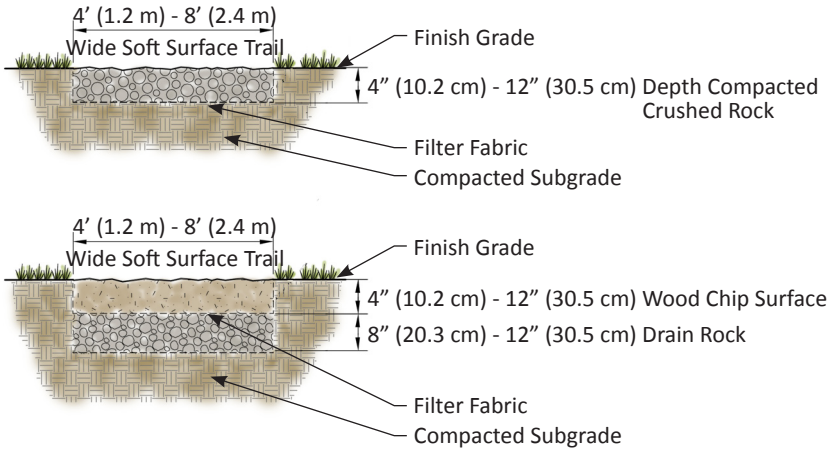
EXHIBIT 7.9 Typical Path Cross Sections

PAVED SURFACES



SOFT SURFACES

Note: Surface should be firm and stable. Gravel and wood chip surfaces may require a high level of maintenance.



bridge abutment, utility structure, fence, or other element. Warning signs that indicate the pathway narrows per the MUTCD should be considered at these locations.

Paving and Surfacing

When selecting paving and surfacing materials, long-term durability, safety, accessibility, cost, and maintenance are usually the most important criteria.

In general, paths in urban areas should be paved or constructed of hard-surfaced materials. Shared use paths used by pedestrians and bicyclists function best when constructed of a smooth, paved, all-weather surface such as asphalt or concrete, regardless of the setting. Good compaction of the surface and subsurface layers is important to minimize the settling.

All paths and trails need to provide a firm, stable, and slip-resistant surface throughout the primary seasons of use. A good sub-base, such as compacted aggregate material or fully compacted native soil (if structurally suitable), is also important for structural support of shared use paths. Pavement conditions should be checked periodically for potholes or cracks, and repairs should be made when necessary to maintain a smooth surface.

Recommended pavement and surfacing cross sections are illustrated in Exhibit 7.9.

Cross Slope and Longitudinal Grades

Paths and trails can be designed and constructed with various grades, but as previously stated, the best practice is to design shared use paths in compliance with ADA grade requirements. Provide a minimum 2 percent cross slope (see Exhibit 7-11).

In general, longitudinal grades on paths should be kept to a minimum, especially on long inclines. For shared use paths, grades greater than 5 percent are generally undesirable. Where steep terrain exists, grades of 5 to 10 percent can be tolerated for short segments less than 500 ft (152.4 m). On grades exceeding 5 percent, the design speed should also be increased and additional trail width of 3 ft (0.9 m) should be provided for maneuverability. Speed limit signs and signs alerting users to the maximum slope are also good measures. The draft technical provisions for SUPAG also require a maximum grade of 5 percent with an exception that allows the grade to match the street grade where the shared use path is confined within the street right-of-way.

Horizontal Alignment

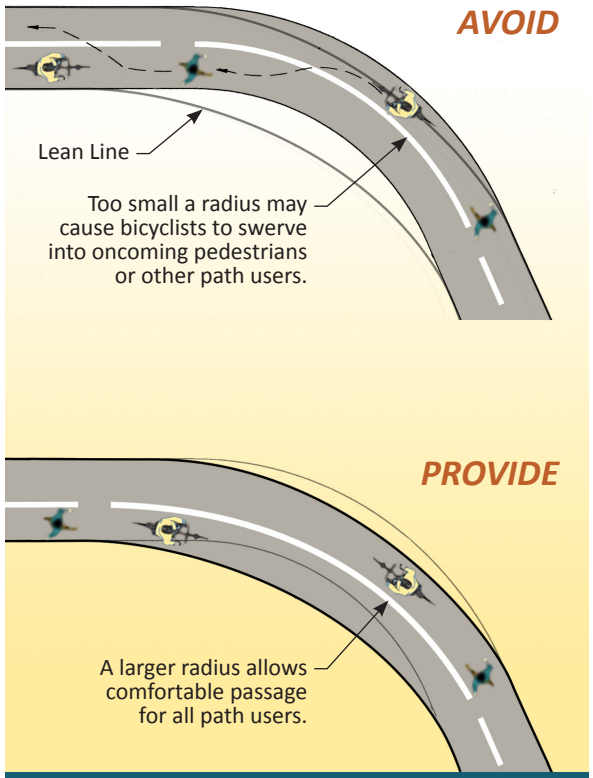
Design of curves for shared use paths should be comfortable and safe for all users. Design speed, the "lean angle" of the bicyclist, available right-of-way, topographical features, and other factors all contribute to curve design. AASHTO bicycle design guidelines should be followed when designing the horizontal alignment of shared use paths. Exhibit 7.10 shows important considerations related to curve radius design for shared use paths.

Shoulders, Side Slopes, and Railings

Recommended widths for shoulders at the sides of paths are provided in Exhibit 7.8. In areas where there are side slopes or ditches, a minimum 4 ft (1.2 m) wide, level clear zone (including the shoulder and lateral clearance area) is needed before any changes in topography (upslope or downslope) on each side of the path.

Beyond the level clear area, swales, ditches, or sloping topography can occur within a shared use path corridor. For adjacent changes in grade, maximum side slopes of 3:1 are recommended.

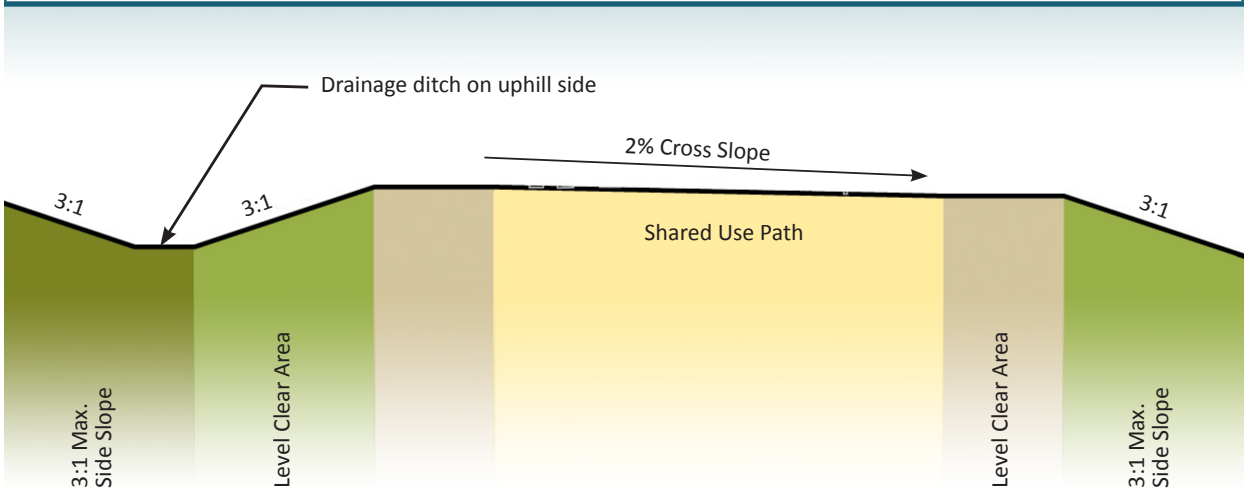
EXHIBIT 7.10 *Horizontal Alignment: Curve radii on shared use paths should follow the minimum guidelines in the AASHTO Guide for the Development of Bicycle Facilities.*



SHARED USE PATHS			
DESIGN SPEED		MINIMUM RADIUS	
mph	kph	feet	meters
12	19	27	8
16	26	47	15
20	32	74	22
25	40	115	35
30	48	166	50

**Design speed is for bicycles, assuming a lean angle of 20 degrees.*
(Table Source: AASHTO Guide for the Development of Bicycle Facilities)

EXHIBIT 7.11 *Typical Path Cross Slope and Drainage*

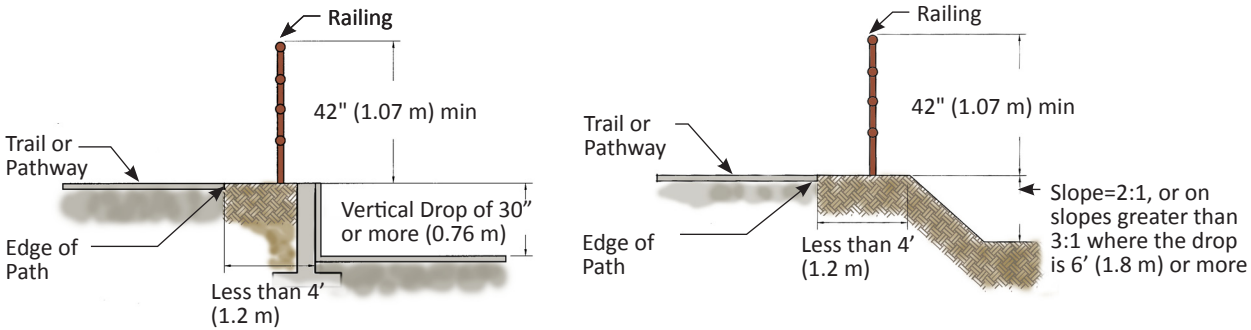


When the grade drops abruptly adjacent to the shoulder/lateral clearance area of a pedestrian or bike travel way, railings are typically required. For shared use paths in urban areas, refer to AASHTO design requirements. Where a vertical drop is more than 30 in, exceeds a down slope grade of 2:1, and is located less than 4 ft (1.2 m) from the edge of the trail, walkway, or sidewalk, a railing needs to be installed along the extent of the grade drop. Exhibit 7.12 illustrates conditions where railing is required. Railings should not be obstructions in the clear zone (including the clear zone of the shared use path and that of the adjacent roadway, as applicable).

Railings adjacent to shared use paths should be a minimum of 42 in (1.07 m) high. Railings are required to be designed with vertical posts, pickets, bars, and top and bottom rails spaced so that a 4 in (10.2 cm) sphere cannot be passed through the spaces (International Building Code). Refer to Toolbox Section 4 for more information.

A maximum 3:1 slope is recommended for steep side slopes on the uphill side of the path corridor. It's best to avoid high retaining walls immediately adjacent to paths since they may be out of scale with creating a pedestrian-friendly environment. Walking adjacent to a very tall,

EXHIBIT 7.12 *Railing Requirements*



blank wall can be uncomfortable for pedestrians. High walls should be terraced back from the edge of the path shoulder. Blank walls should be screened with landscaping or designed with an attractive face or artwork.

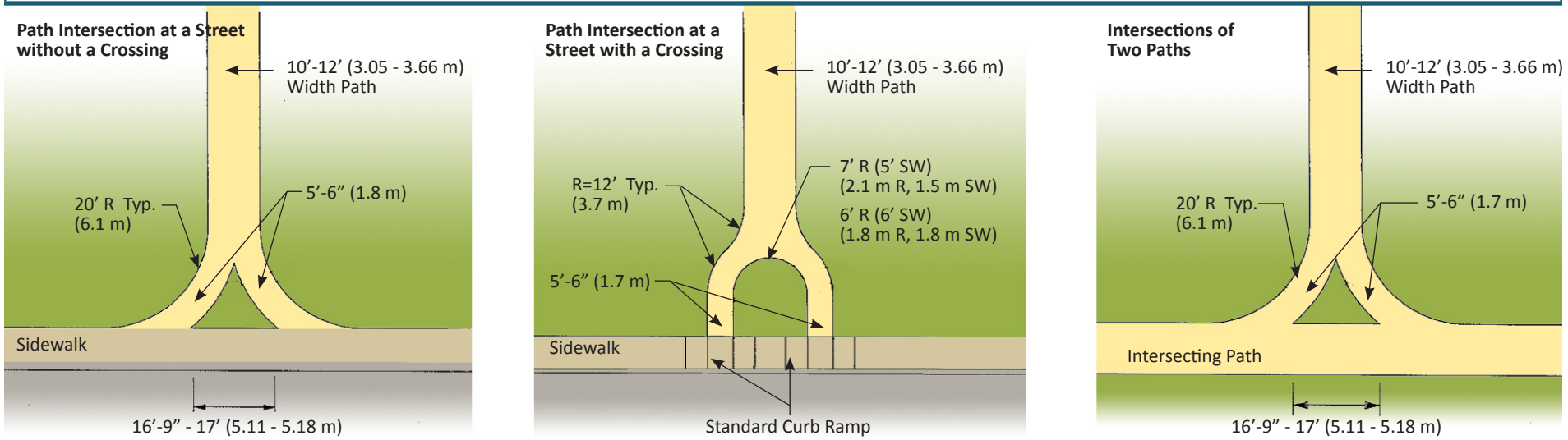
Connections and Crossings

Initial planning of the routes of shared use paths should minimize crossing points with roads and driveways as much as possible. Paths should connect to street systems and destination sites in a safe and convenient manner. Connections should be clearly identified with destination and directional signing.

Where a path that follows a given street encounters a cross street, the path crossing should utilize the normal pedestrian crosswalk at the intersection of the streets. Where shared use paths approach roadway intersections, bicyclists should dismount and cross as pedestrians.

Where an intersecting path and street have orientations that are skewed, a realignment should be made that brings the angle at the intersection as close to 90 degrees as possible. Road crossings that are not close to intersections

EXHIBIT 7.13 *Path Intersections*



should be designed to mid-block crossing design standards including signage and lighting. (Refer to Toolbox Section 5—Intersections and Crossings.) Exhibits 7.13 and 7.14 show suggested traffic control treatments at path and trail crossings. Exhibits 7.15 shows suggested traffic control treatments for four or more lane road crossings.

Bollard Use and Placement

Bollards are sometimes placed at a shared use path entrance to block motor vehicle access. Refer to the AASHTO Bike Guide (2012) for the most up-to-date guidance for the use and placement of bollards. Marking the bollards with bright colored reflective paint or emblems increases their visibility to pedestrians and bicyclists. Emblems can also be used for trail identification and wayfinding. AASHTO recommends striping or delineating a clear envelope around the bollard to highlight the area to path users (see photo on following page).

The recommended minimum height for bollards is 30 in (76.2 cm). Bollards need to be adequately spaced to allow easy passage by bicyclists, bicycle trailers, and wheelchair users, with one bollard in the center of the trail dividing the two-way traffic flow. If more than the center bollard is needed, other bollards should be placed outside the paved area at trail edges. Removable bollards should be considered to allow access for maintenance and emergency vehicles. See Exhibit 7.16.

Vegetation and Landscaping

The primary objective of landscaping within a path corridor should be identified from the start. The purposes may include screening, aesthetic value, and ecological values. Xeriscaping and climate adapted plants that do not require

permanent irrigation are recommended. Plant materials placed along paths also need to be selected to avoid the need for excessive pruning, cleanup of fallen debris, and other maintenance. Native, non-invasive plants are often a good choice. Trees and shrubs with aggressive root systems may raise and buckle adjacent pavement. These types of trees and shrubs should be avoided near paths, or root barriers should be installed. See Exhibit 7.17 and Toolbox Section 11 for further recommendations on the prevention of tree roots buckling walkways.

Signing and Marking

Signage is an important element in design. Signs and wayfinding elements help identify routes, help users find their way from one destination to another, and create an identity for the path,

Intersections between shared use paths and roadways must be designed with care.

A bollard at the entrance to a path prevents unauthorized vehicles from driving on the path.

EXHIBIT 7.14 Suggested Traffic Control Treatments where Shared Use Paths Cross Two-Lane Roads

	AVERAGE DAILY TRAFFIC ON THE ROADWAY			
VEHICLE SPEED (85 PERCENT)	<2,000	2,000-4,999	5,000-9,000	10,000+
<= 25 mph (40 kph)	Yield with traffic calming or Stop sign, calming optional	Stop sign calming optional	Stop sign with added traffic calming	Consider signal
	Yield, refuge not needed	Yield or Stop Refuge optional	Stop sign with Refuge area or Signal	
30-35 mph (50-60 kph)	Stop sign calming optional	Stop sign with added traffic calming	Stop sign with Refuge area or Signal	Consider signal
	Yield or Stop Refuge optional	Stop Refuge optional		
40-45 mph (65-75 kph)	Stop sign Refuge optional	Stop sign with Refuge area	Stop sign with Refuge area or Signal	Consider signal
50+ mph (80+ kph)	Stop sign Refuge optional	Stop Sign with Refuge area	Consider signal	Consider signal
When the Path or Trail is Given the Right-of-Way	*When the Roadway is Given the Right-Way*	*Notes:* • *Criteria shown are for two thru lanes. In general, if turn lanes are present, move one cell to the right for each turn lane.* • *Yield conditions must satisfy MUTCD Warrant 1. Give precedence to Yield over Stop.* • *Path/trail as speed table is acceptable traffic calming for cell <2000/<=25 mph only. For other cells, the traffic calming may be lane narrowing (splitter island/refuge area/ choker) or some other accepted method appropriate to functioning of the roadway.*		

Source: Florida Pedestrian Planning and Design Handbook, Refer to the AASHTO Guide for the Planning Design, and Operation of Bicycle Facilities for Additional Guidance.

EXHIBIT 7.15 ***Suggested Traffic Control Treatments on Four (or more) Lane Road Crossings***

SPEED OF AVG DAILY TRAFFIC ON ROADWAY (85%)	<10,000 ADT	10,000-19,999 ADT	20,000+ ADT
<=35 mph (60 kph)	Refuge area, preferably protected	Protected Refuge or Signal	Signal or grade separated
>=40 mph (65 kph)	Protected Refuge or Signal	Signal	Signal or grade separated

Source: Florida Pedestrian Planning and Design Handbook

EXHIBIT 7.16 ***Bollard Placement***

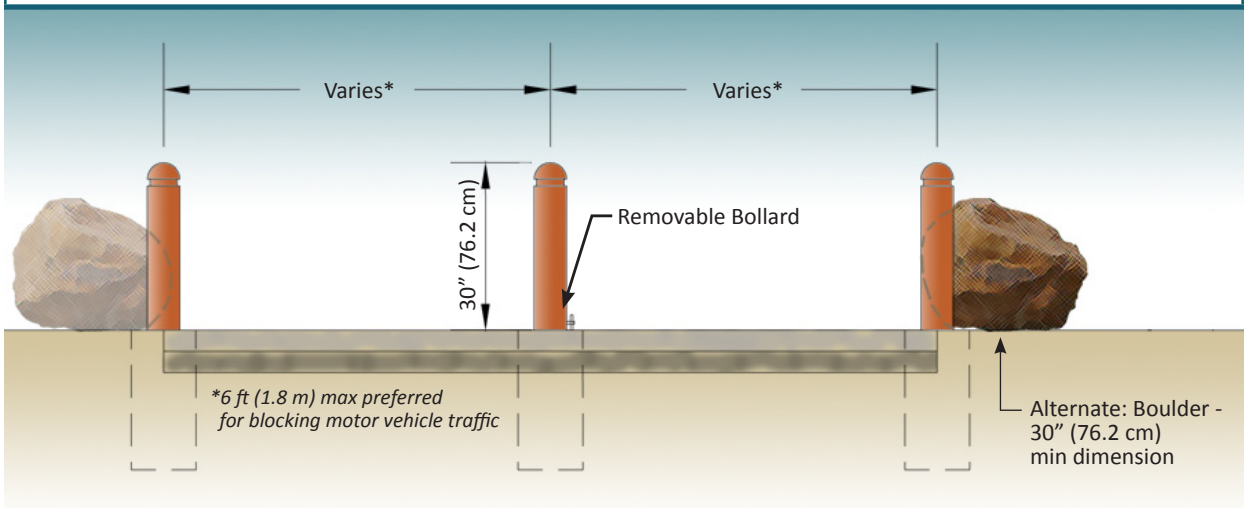
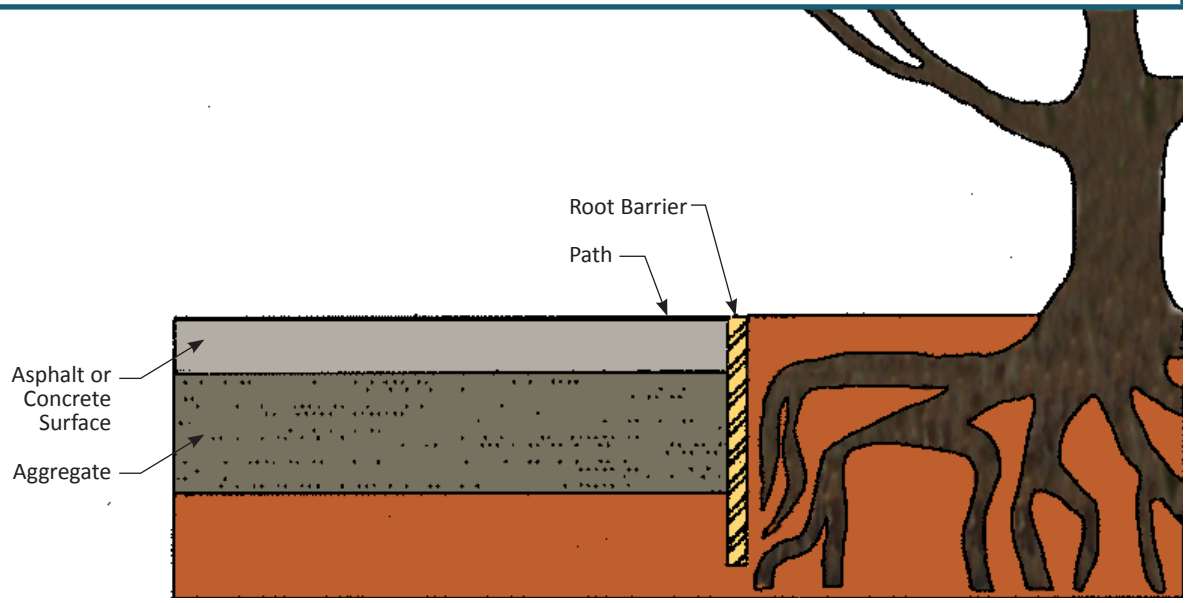


EXHIBIT 7.17 ***Root Barriers Can Prevent Tree Roots from Buckling Paved Path Surfaces.***



pathway system, or even the area the path moves through. Sign designs should be consistent throughout the pathway system, but can also be used to differentiate portions of the path (for example when moving from a trail to a spur, or when crossing jurisdictional boundaries). Milepost markers can also be integrated into the corridor to identify distances between geographic points.

Signs and wayfinding elements can be free-standing or attached to bollards, entry gates, or other entry features.

On shared use paths, regulatory signs are important in addressing safety for path users. Signs should be posted that indicate the speed limit and alert users to conditions that require caution such as curve ahead, steep grades, surface changes, crossing ahead, types of users, and other key messages to path users.

Warning signs should be placed on roadways wherever there is a path/trail crossing. Exhibit 7.18 shows typical trail and crossing signs. Placement should comply with recommendations in the MUTCD. See Toolbox Section 5—Intersections and Crossings for more information. Exhibit 7.19 summarizes guidelines for signing along paths and trails.

Path striping should also be considered for shared use paths (not necessary on pedestrian-only paths) to separate opposite directions of travel. See Exhibit 7.20. Although in most cases, there is no need to segregate pedestrians and bicyclists on a shared use path, even in areas with high volumes of use, consider providing a 4 to 6 in (10.2 to 15.2 cm) wide yellow centerline stripe under the following circumstances:

- On paths where there is a constant, heavy volume of use;
- On curves with restricted sight distance or design speeds less than 14 mph (24 kmh); and
- On unlit paths where night-time riding is not prohibited.

The yellow center stripe should be broken wherever there is adequate sight distance for passing. In other places it should be solid (particularly at curves or where passing bicycles should be discouraged). The material used for pavement markings should be slip-resistant.

EXHIBIT 7.18 Trail Crossing Signs
(Graphic Adaped from 2009 MUTCD)

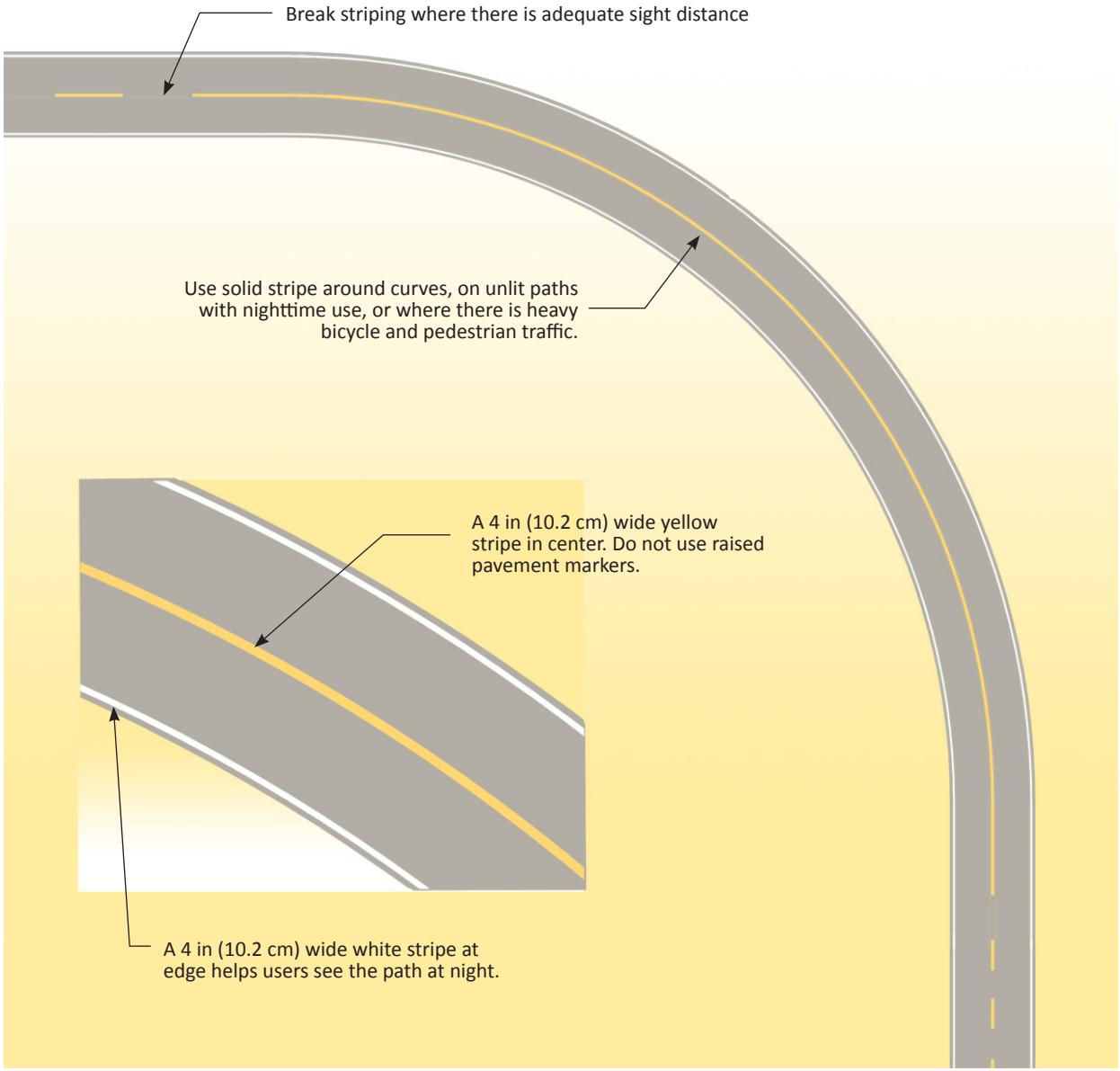
EXHIBIT 7.19 Signing Guidelines

Signs should be low maintenance.
Signs should be vandal proof.
Signage must conform to local ordinances.
Graphic elements and their placement on signs should be consistent.
Signs need to be clearly visible to attract attention, while not being visually intrusive or negatively impacting the scenery.

A curbed median separates bicyclists and pedestrians.

Special paving and markings define uses on this shared use path.

EXHIBIT 7.20 Striping on Shared Use Paths



Minimizing Conflicts

Shared use paths are typically designed to accommodate a wide range of speeds and types of motion among pedestrians and bicyclists. Design of shared use paths should carefully consider the characteristics of the different users, such as skill levels, age, speed of travel, and experience.

The mix of pedestrians and bicycles on a shared use path is not always a desirable situation because the potential for conflicts is high. Paths heavily used by commuting bicyclists present problems for pedestrians. Children are particularly at risk on shared use paths because they tend to travel at slower speeds than average bicyclists, and their movements are unpredictable. They may change direction unexpectedly in front of an approaching bicyclist. Conflicts between bicyclists and pedestrians can be avoided by designing the corridor to separate these uses, if possible.

Adequate visibility and sight distance are crucial. Design treatments that can help minimize conflicts on shared use paths are summarized in Exhibit 7.21. In most cases, multiple design treatments will be necessary.

EXHIBIT 7.21 Design Treatments and Activities to Minimize Conflicts on Shared Use Paths

Horizontal and vertical alignment should ensure clear lines of sight for pedestrians and bicyclists.
Sufficient shoulders (2 ft minimum on each side) should be provided to allow space for stopping and resting, as well as passing.
The path should be widened at curves to provide additional space.
Objects that obstruct path users' views at edges of the path should be avoided. Place signs, poles, utility boxes, garbage cans, benches, and other elements away from the edge of the path. Use low-growing landscaping and high-branching trees, or limb up trees. Landscape should be located outside lateral clearance areas.
Signs should be used to indicate bicycle speed limits, directional signing, crossings ahead, and other warnings.
Delineation and separation treatments should be provided such as striping or colored pavement.
Pavement marking (refer to the MUTCD); a 4-in- to 6-in- wide yellow centerline stripe may be considered for shared use paths with heavy volumes of pedestrians and bicyclists, on curves with restricted sight distance, and on paths where night-time use is expected (see Exhibit 7.20). White edge lines can also be beneficial on paths where night-time use is expected.
Educational programs should be provided to promote safe path use.

Providing sufficient space for multiple uses is critical in the design of shared use paths. Exhibit 7.22 illustrates a typical shared use path for pedestrians and bicyclists. Use the wider dimension shown for paths expected to recieve heavy use by pedestrians and bicyclists.

Where right-of-way allows, a separate, soft-surface jogging path may be constructed of compacted crushed gravel or other suitable material, parallel to, but separated from, the paved path (see Exhibit 7.23).

Shared Use Paths Next to Roadways

Two-way shared use paths aligned immediately adjacent to or along a street or roadway often do not function well due to problems related to bicycle use. On a shared use two-way path, some of the bicyclists will be travelling against the normal flow of motor vehicle traffic, which is contrary to the rules of the road. See Exhibit 7.24. Bicyclists may ride so close to parked cars that they risk being hit by vehicle door openings.

Conflicts at intersections and driveways are a major concern on paths adjacent to roadways.

EXHIBIT 7.22 *A shared use path needs to be designed to minimize conflicts between pedestrians, bicyclists, and other users.*

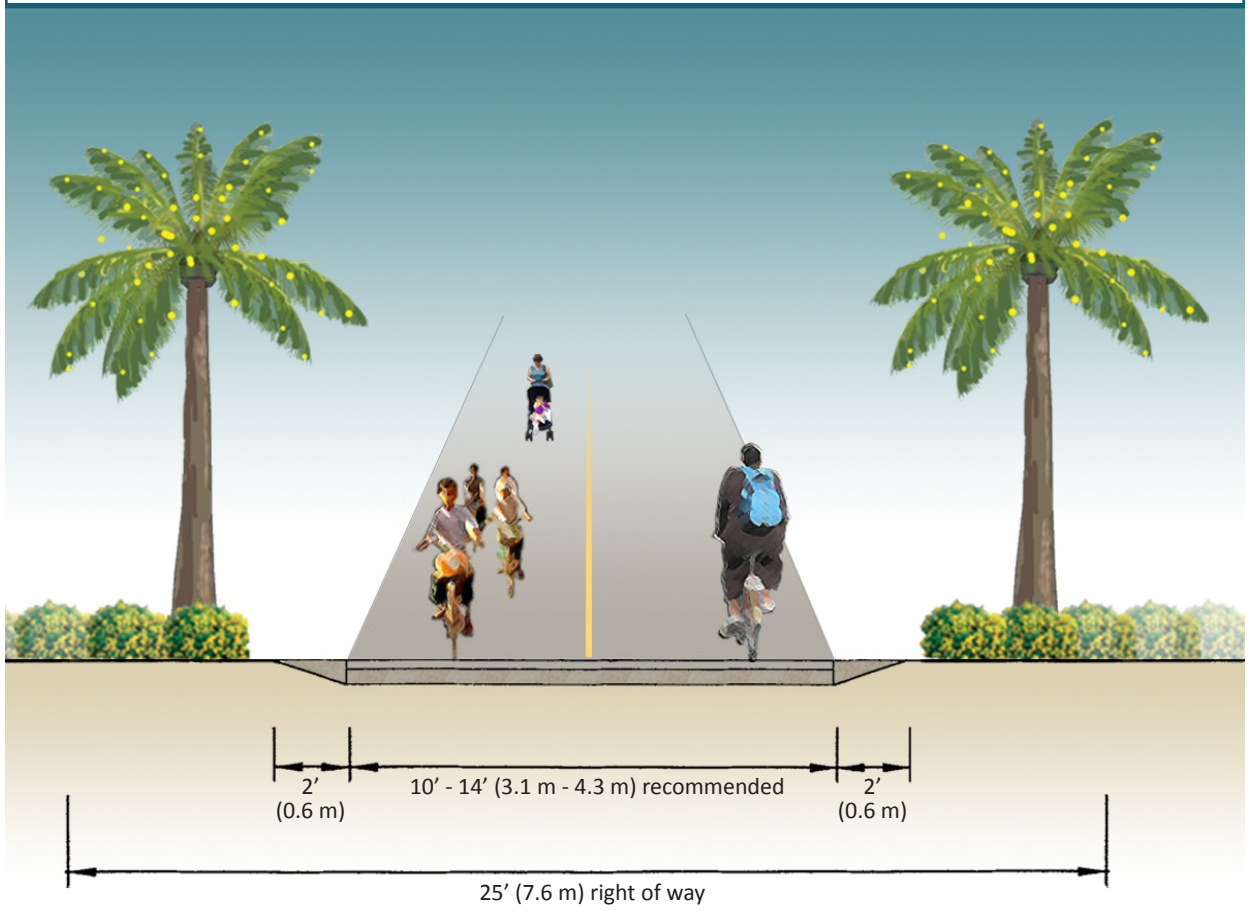


EXHIBIT 7.23 *Hard and soft surface paths can run next to each other to separate different kinds of users.*

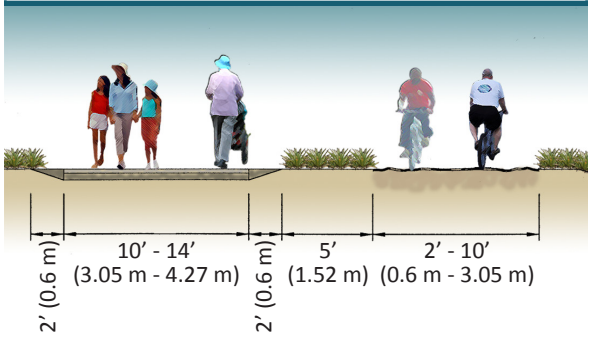
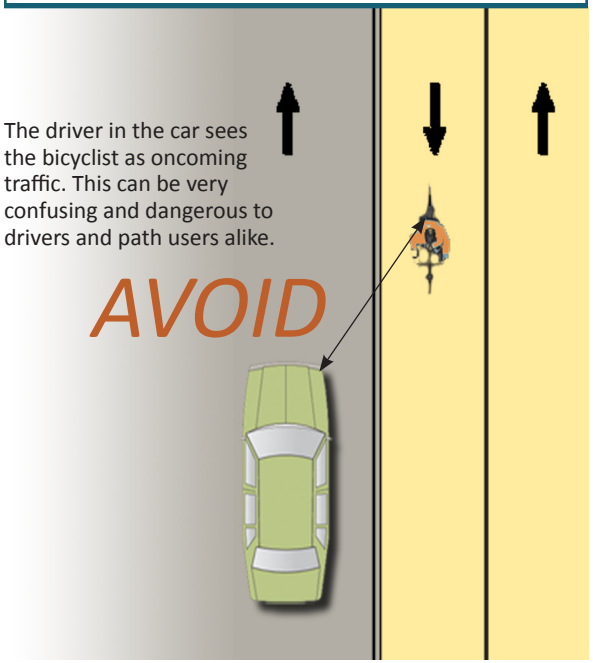


EXHIBIT 7.24 *Avoid shared use paths directly adjacent to roadways unless buffer width can be provided.*



Motorists often will not notice bicyclists coming toward them on the right, since they do not expect to see them travelling against the flow of traffic. Additional problems are listed in the AASHTO *Guide for the Development of Bicycle Facilities.*

Consider the development of a shared use pedestrian and bicycle path within the right-of-way and adjacent to a roadway only when the conditions listed in Exhibit 7.25 exist.

When there is no feasible alternative to locating a two-way shared use path within the roadway right-of-way, adequate separation of at least 5 ft (1.5 m) is required.

Beach Access

Because all beaches in the state of Hawaii are public lands, special consideration needs to be given to the ways a path or trail can connect to shorelines, especially where existing resorts, shopping centers, or housing developments create barriers to public beach access.

Many beach-front properties currently include public access easements, and path and trail planners and designers will want to take this into consideration when determining the best path alignment approach to shoreline areas. In cases where land uses and development configuration point to a beach access location where no easement exists, it will be necessary to seek agreements with property owners so that new easements can be established.

Many commercial properties include perimeter paths, alley ways, service areas, or buffer planting areas that may be adopted for use to provide public path access to the beach. Dense vegetation buffers or fencing can be introduced to provide separation between the path and potentially conflicting activities or uses.

EXHIBIT 7.25 Conditions Where a Shared Use Path May be Acceptable Next to a Roadway

The path can be separated from motor vehicle traffic. AASHTO standards require a minimum horizontal separation of 5 ft (1.5 m) or a physical barrier.
Development of bike lanes and sidewalks as an alternative to the shared use path would not be a feasible alternative. (Bike lanes and sidewalks typically take up less space than shared use paths within the right-of-way and allow bicyclists to travel with the normal flow of traffic.) Also, as stated previously, shared use paths may not be an adequate substitute to standard pedestrian and bicycle facilities within the right-of-way.
There are no reasonable alternative alignments for bikeways and sidewalks on nearby parallel routes.
There is a commitment to provide a continuous non-motorized system throughout the corridor where potential driveway and intersection conflicts can be minimized and mitigated.
Bicycle and pedestrian use is anticipated to be high.
The path can be terminated at each end onto streets with good bicycle and pedestrian facilities, or onto another safe, well designed path.
There are popular origins and destinations throughout the corridor (schools, parks, and neighborhoods).
The path can be constructed wide enough to accommodate all types of users, with delineation and separation techniques to minimize conflicts between users — 12 ft (3.6 m) desirable, 14 ft (4.3 m) optimum.

Because beach access paths have a relatively high rate of usage, special consideration should be given to enhance user comfort and safety. Beach access points offer good opportunities for constructing overlook decks for people whose disabilities limit access to sandy areas. Amenities like these need to be designed to minimize conflicts with path users.

Provide lighting in beach access areas open for night-time use. However, it may not be desirable to encourage beach use at night in all locations. Areas of active use or that receive regular patrols are best for night use.

Exhibits 7.26, 7.27, 7.28, 7.29, 7.30, 7.31, and 7.32 illustrate various recommended design solutions for beach paths and access areas. A summary of the proposed ADA guidelines for beach access is included in Exhibit 7.29.

Managing Motor Vehicle Access

As a general rule, separated paths function best when motor vehicle access is prohibited or limited to maintenance vehicles for periodic inspection, sweeping, and repairs, utility vehicles, and emergency vehicles. The following

EXHIBIT 7.26 Beach Access at a Resort

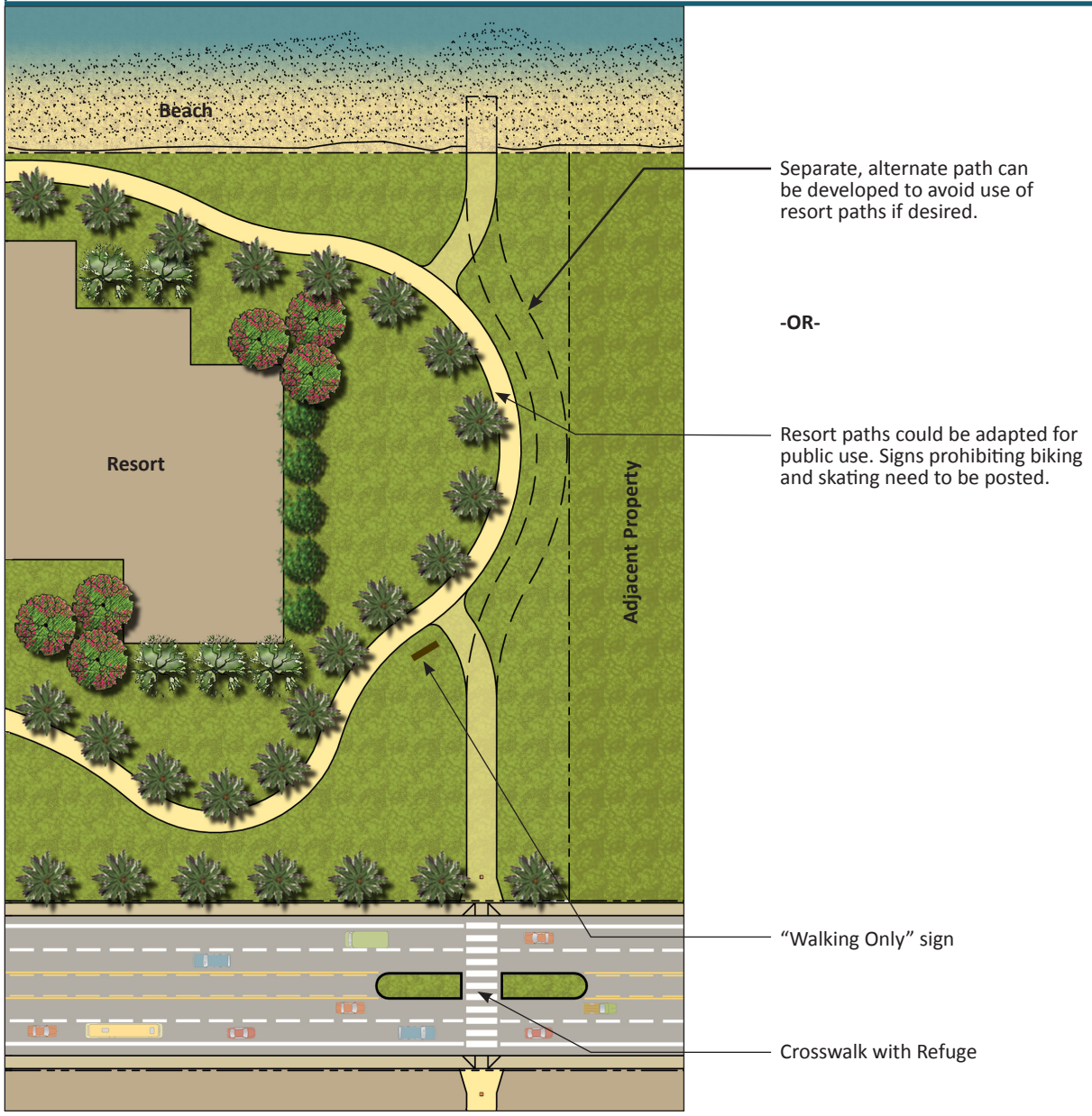


EXHIBIT 7.27 *Beach Access Between Two Units of Multi-Family Housing*

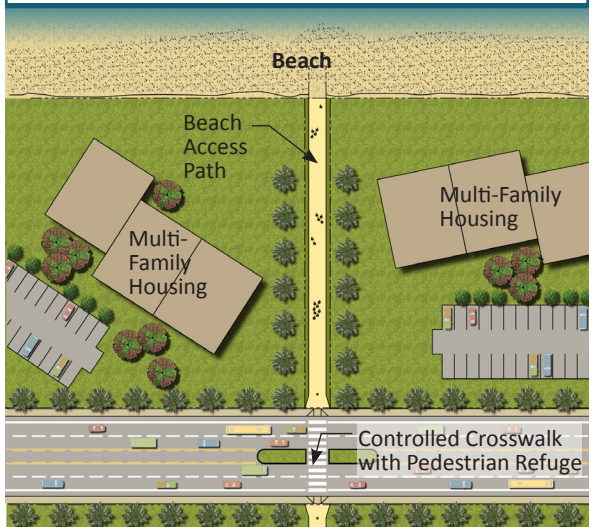


EXHIBIT 7.28 *Beach Access Between Two Single Family Homes*

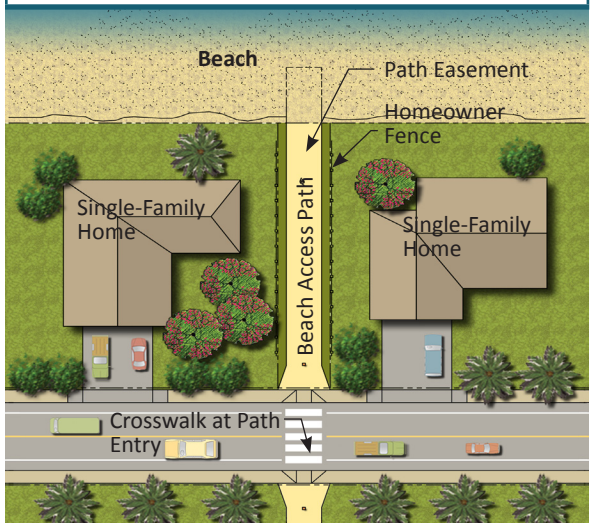
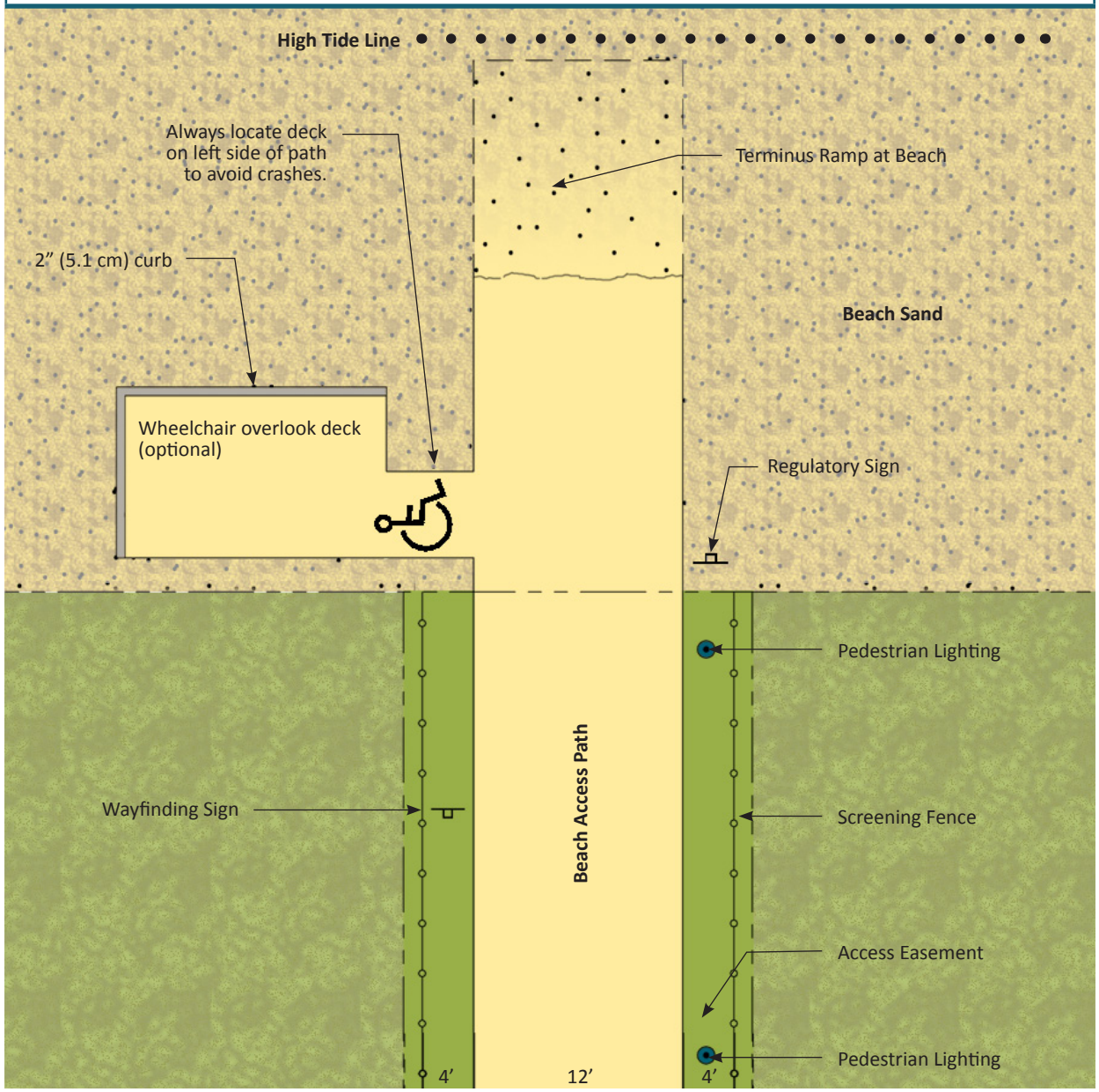


EXHIBIT 7.29 *Summary of ADA Guidelines for Beach Access*

DESIGN ELEMENT	DESCRIPTION		
Connections	Beach access routes shall connect an entry point to the beach to the high tide level at tidal beaches.		
Surface	Firm and Stable		
Width	5' (1.5 m)/60" (152.4 cm) minimum (wider with regular use of paths/higher volumes of pedestrians)		
Obstacles	Shall not exceed 1/2" (13 mm) above concrete, asphalt or board surfaces Shall not exceed 1" (25 mm) above other surfaces		
Grating or Decking Gaps/ Openings	Shall not exceed 1/2" (13 mm). Exceptions apply. See ODAAG.		
Slopes	Shall not exceed 1:10		
	For Running Slopes between 1:10 and 1:20:		
	Running Slope of Segment		Max. Length of Segment
	Steeper than	But Not Steeper Than	
	1:20	1:12	50' (15 m)*
	1:12	1:10	30' (9 m)*
	*Resting area required at end of segment.		
Cross Slopes	Shall not exceed 1:48 for concrete, asphalt or board surfaces Shall not exceed 1:33 for other surfaces		
Resting Intervals	Minimum size shall be 60" by 60" (152.4 cm by 152.4 cm)		
	Cross slope shall not exceed 1:48 in any direction for concrete, asphalt or board surfaces. Cross slope shall not exceed 1:33 in any direction for all other surfaces		
Protruding Objects	See ODAAG.		
Elevated Crossings	If elevated crossings (such as boardwalks, platforms, bridges, etc.) are part of a path or beach access route, handrails and edge protection in accordance with ODAAG shall be provided, except: • Clear width may be 48” (122 cm) minimum • Resting intervals do not need to comply with size and cross slope minimums above.		

Source: US Access Board Outdoor Developed Area Accessibility Guidelines

EXHIBIT 7.30 Typical Terminus for a High Use Beach Access Path



design treatments are suggested for managing motor vehicle access on paths:

- Pavement cross sections with sufficient base and thickness are necessary to support maintenance vehicles while minimizing deterioration. A 4 in (10.2 cm) asphalt thickness over an 8 in (20.3 cm) aggregate base is recommended.
- Trail and path edges need to be designed with added thickness to support vehicle loads. See Exhibit 7.33 for thickened-edge pavement design.
- Access points can be provided from roadways for use by maintenance and emergency vehicles, but blocked from use by other motor vehicles with removable bollards or coded gates.
- Gates or bollards at side entrances to the path can be specially designed to allow passage for pedestrians, wheelchairs, and bicyclists without providing an access point for motor vehicles.
- Signing can be installed to notify trail and path users that maintenance vehicles may

EXHIBIT 7.31 *Beach Access Cross Section*

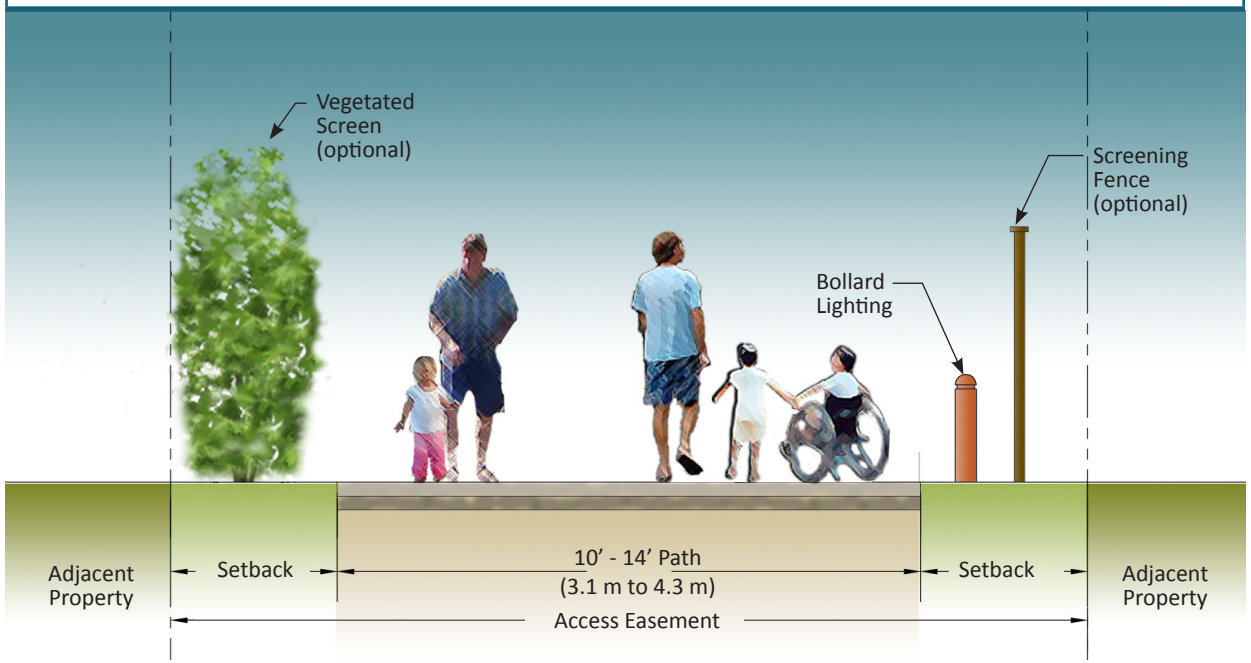


EXHIBIT 7.32 *Path Terminus Ramp at Beach*

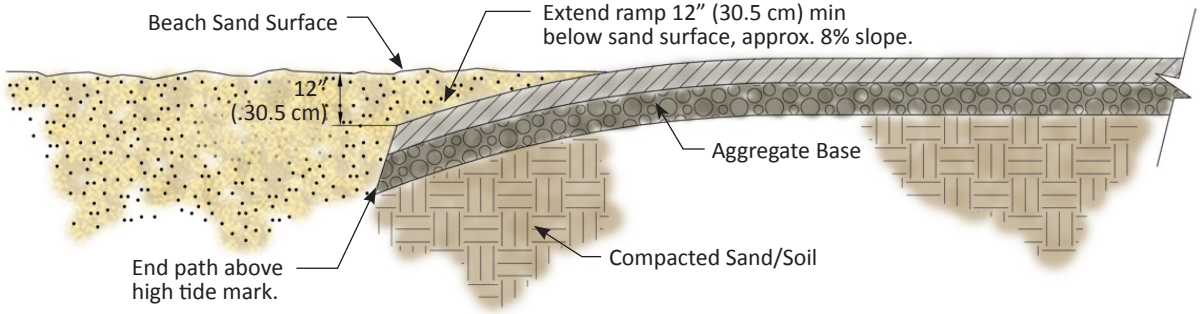


EXHIBIT 7.33 *A thickened path edge can provide extra stength if needed.*

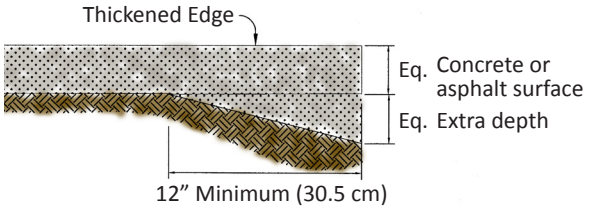
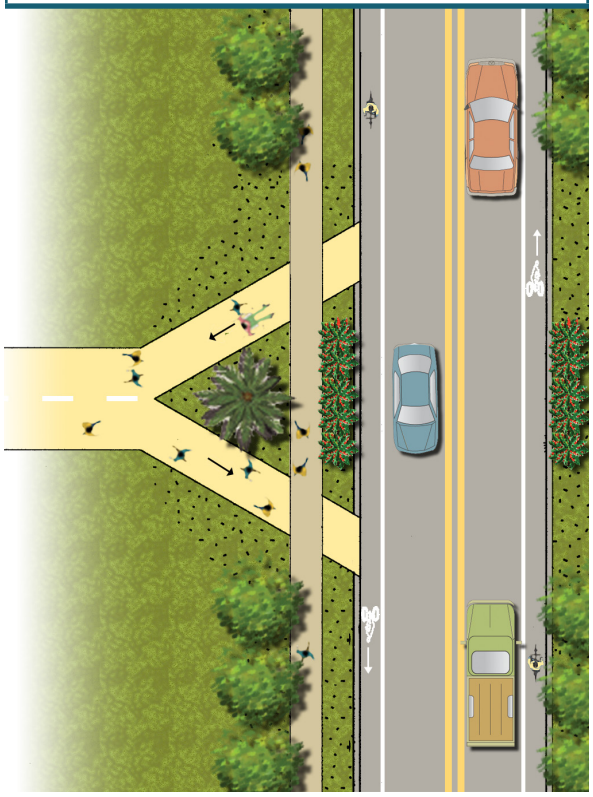


EXHIBIT 7.34 *A split design at roadway intersection can help to deter vehicles from entering the path.*



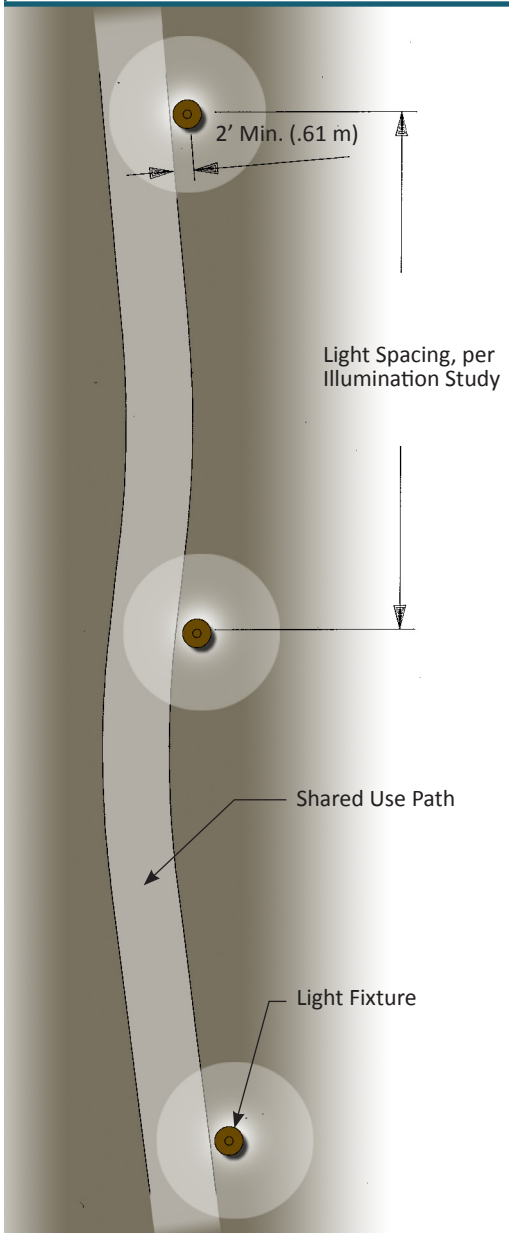
be entering the system at the identified locations. Temporary signs and markers need to be carried and placed at appropriate locations as warning devices during maintenance activities.

- Motor vehicles can be restricted from entering paths through the use of special design techniques, such as short curb radii or a split path configuration (see Exhibit 7.34 on previous page). These techniques are most appropriate at locations where maintenance and emergency vehicles do not require access to the trail.

Nighttime Use

When paths are frequently used during night-time hours, lighting is an important consideration. Lighting should be designed according to applicable local standards, with consideration toward maximizing pedestrian safety and security while minimizing glare and obtrusiveness to surrounding neighborhoods. Pedestrian-scale lighting with poles and fixtures at 12 to 15 ft (3.6 m to 4.5 m) and bollard lights are options that work well on shared use paths. Lighting may not be appropriate in more remote areas because it can inadvertently attract users to areas that may not be secure. Lighting design should comply with any applicable dark sky conservation, energy conservation, or other local lighting regulations.

EXHIBIT 7.35 Path Lighting



Illumination levels are measured in footcandles (lumens per foot). Depending on the location, average maintained horizontal illumination levels of 0.5 to 2 footcandles (5 to 22 lux) should be considered for pedestrian and bicycle use areas. Within undercrossings and near building entrances and other locations, higher lighting levels may be needed.

The use of 4 to 6 in (10.2 to 15.2 cm) wide white edge lines may be beneficial on paths where nighttime use is not prohibited to better define the edges of the path. See Exhibit 7.35.

Maintenance

Several suggestions have been provided throughout this section related to maintenance. It is important to establish a maintenance program at the time a project is developed to ensure that the path will function properly over the long term. Maintenance activities should be scheduled during times of typically low

path use, if possible. Proper work zone signing should be used when maintenance occurs on or adjacent to pedestrian travel ways. Refer to Toolbox Section 11 for additional guidance.

Interpretive and Learning Opportunities Along Paths and Trails

Path and trail users' experiences can be enhanced by introducing opportunities for interpretation and learning. School districts, cities, natural resource advocates, and other groups may want to consider developing an interpretive program for path and trail segments near points of interest in the natural environment. Programs can be geared to raise the awareness about topics such as sensitive ecologies, cultural resources and history, geologic processes, conservation, and environmental stewardship. The interpretive program can include plant and wildlife identifiers, bird blinds, colorful displays depicting native flora/ fauna/ habitat, historical/cultural information, or stations keyed to printed handouts with more in-depth descriptions of unique site characteristics. The types of amenities selected should respond to site-specific opportunities for interpretation and learning. New technologies such as GPS coordinate references and information alerting visitors to podcast availability on certain subjects are becoming more common in destinations such as national parks, wildlife refuges, and other visitor areas.

All signs and interpretive displays need to be located outside the lateral clearance areas along paths and trails. They should also be designed to require minimal maintenance. Design should maximize durability and vandal proofing. For example, placing these features in high use, public areas will minimize graffiti activity and the use of certain materials will enhance clean up and replaceability.

Other Resources

The following sources of information are recommended for design of shared use paths and recreational trails.

- American Association of State Highway and Transportation Officials (AASHTO). *A Policy on the Geometric Design of Highways and Streets, 5th Edition.* 2004.

Providing information and interpretation along paths enhances the experience for pedestrians and bicyclists.

- American Association of State Highway and Transportation Officials (AASHTO). *A Guide for Achieving Flexibility in Highway Design.* 2004.
- American Association of State Highway and Transportation Officials (AASHTO). *Guide for Development of Bicycle Facilities, 4th Edition.* 2012.
- American Association of State Highway and Transportation Officials (AASHTO). *Guide for the Planning, Design and Operation of Pedestrian Facilities.* 2004.
- American Association of State Highway and Transportation Officials (AASHTO). *Roadside Design Guide.* 2002.
- American Planning Association, Wiley & Sons, Inc. publishers. *Planning and Urban Design Standards.* 2006.
- City of Bellevue, Washington. Tr*ansportation Design Manual.* 2012. Website: ***http://www.bellevuewa.gov/pdf/Transportation/Transportation_Design_Manual.pdf*** (May 2013).
- City and County of Honolulu, Department of Transportation Services. *Oahu Bike Plan.* (Supersedes the previous Honolulu Bicycle Master Plan). Website: ***http://www1.honolulu.gov/dts/oahu+bike+plan.htm*** (May 2013).
- Federal Highway Administration. DRAFT Accessibility Guidelines for Bicycle and Pedestrian Facilities. Recreational Trails and Transportation Enhancement Activities. October 2008. Website: ***http://www.fhwa.dot.gov/environment/recreational_trails/guidance/accessibility_guidance/guidance_accessibility.cfm*** (May 2013).
- Federal Highway Administration. Kirschbaum, J.B., Axelson, P.W., Longmuir, P.E., Mispagel, K.M., Stein, J.A., and Yamada, D.A. *Designing Sidewalks and Trails for Access, Parts I and II.* 1999.
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- Federal Highway Administration. *Manual on Uniform Traffic Control Devices.* 2009.
- Federal Highway Administration. *Shared Use Path Level of Service—A User's Guide and Shared Use Level of Service Calculator.* 2006. Website: ***http://www.fhwa.dot.gov/publications/research/safety/pedbike/05138/index.cfm*** (May 2013).
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- Florida, State of. *Florida Pedestrian Planning and Design Handbook.*
- Harris, Charles W. and Dines, Nicholas T. *Timesaver Standards for Landscape Architecture, Design and Construction Data.*
- Hawaii Department of Transportation. *Bike Plan Hawaii.* Website: ***http://www.hawaii.gov/dot/highways/Bike/bikeplan/index.htm#bikeplan*** (May 2013).
- Hawaii State Legislative Report. *Hawaii Complete Streets Policy.* Website: ***http://www.Hawaii.gov/dot/administration/library/2011*** (May 2013).

- National Association of City Transportation Officials (NACTO) Urban Bikeway Design Guide. 2011.
- National Complete Streets Coalition. Website: ***www.completestreets.org*** (May 2013).
- Nelischer, Maurice. *Handbook of Landscape Architectural Construction, Volume Two, Site Works.*
- Oregon, State of, Department of Transportation, Bicycle and Pedestrian Program. *Oregon Bicycle and Pedestrian Plan—An Element of the Oregon Transportation Plan.*
- PLAE, Inc. *Universal Access to Outdoor Recreation: A Design Guide.*
- Rails to Trails Conservancy. Website: ***http://www.railstotrails.org/index.html*** (May 2013).
- Rails to Trails Conservancy. Flink, Charles, Olka, Kristine, and Seams, Robert. *Trails for the Twenty-First Century—Planning, Design, and Management Manual for Multi-Use Trails.* 2001.
- United States Access Board. *Proposed Accessibility Guidelines for Pedestrian Facilities in the Public Right-of-Way.* 2011. Website: ***http://www.access-board.gov/*** (May 2013).
- United States Access Board. Recreation Access Advisory Committee. *Recommendations for Outdoor Developed Areas Accessibility Guidelines (ODAAG), Final Draft.* 2009. Website: ***http://www.access-board.gov/*** (May 2013).
- United States Access Board. *Shared Use Path Accessibility Guidelines (SUPAG), ANPRM,* and *Architectural Barriers Act Accessibility Guidelines for Shared Use Paths.* 2011. Website: ***http://www.access-board.gov/*** (May 2013).
- US Department of Agriculture. Forest Service. *Equestrian Design Guidebook for Trails, Trailheads, and Campgrounds.* 2007.
- Van Houten, R. *The Effects of Advance Stop Lines and Sign Prompts on Pedestrian Safety in Crosswalk on Multilane Highway.* Journal of Applied Behavior Analysis, Vol. 21. 1988.
- Van Houten, R., Malenfant, J.E.L., and McCusker. *Advance Yield Markings, Reducing Motor Vehicle-Pedestrian Conflicts at Multilane Crosswalks with Uncontrolled Approach.* Transportation Research Record, Vol. 1773/2001.


STOP