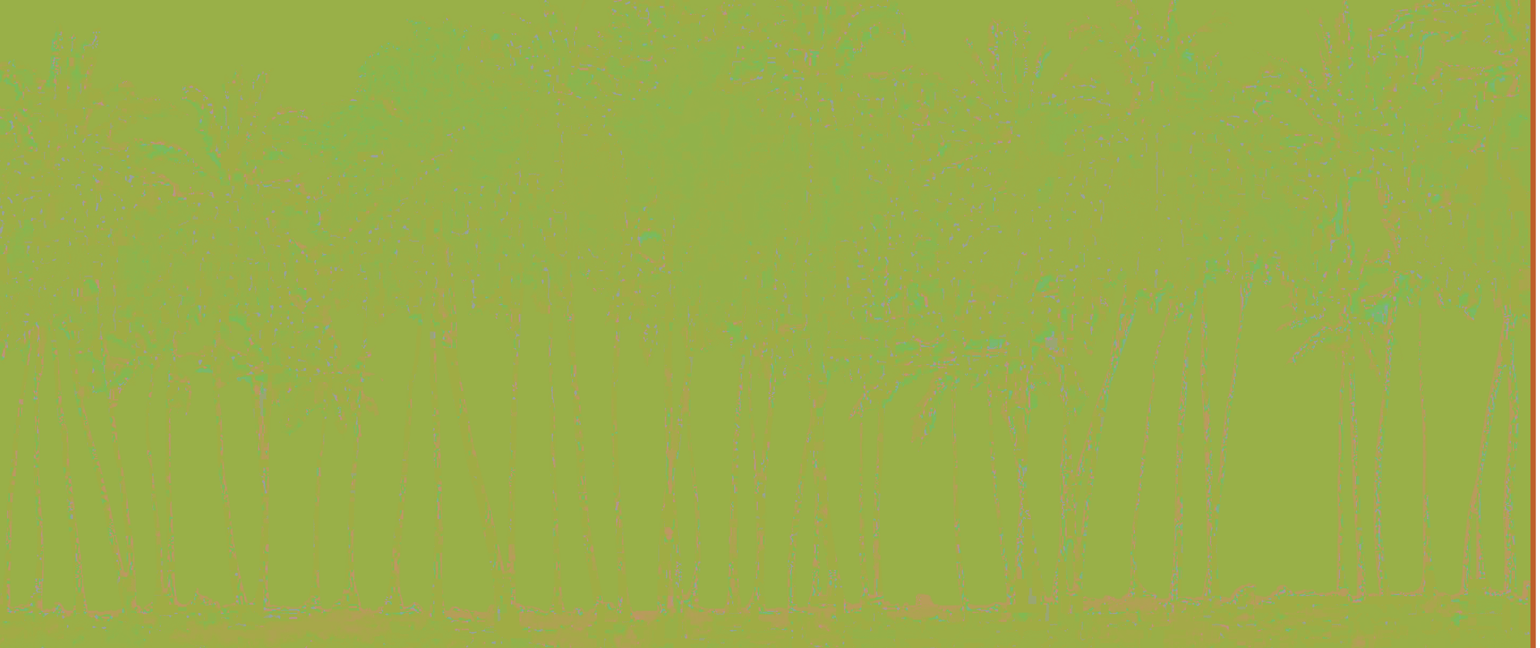


TOOLBOX SECTION 4

Sidewalks and Walkways

A wider sidewalk in a shopping area at Waikiki provides more space for pedestrians and creates an attractive walking environment.

SIDEWALKS AND WALKWAYS

Pedestrian facilities addressed in this toolbox section include those located within street rights-of-way that are primarily adjacent to or parallel with the roadway, such as sidewalks, walkways, and roadside spaces used for pedestrian travel.

Sidewalks and Walkways Defined

Sidewalks and walkways are integral components of streets and roadways where pedestrians need to experience safety, comfort, accessibility, and efficient mobility. Sidewalks and walkways increase pedestrian safety by separating pedestrians from vehicle traffic vertically (raised with a curb) and/or horizontally if space is available.

A sidewalk is the space within the right-of-way dedicated to pedestrian travel. Hawaii State Statutes define a "sidewalk" as *that portion of a street between the curb lines, or the lateral lines of a roadway, and the adjacent property lines, intended for use of pedestrians* (Hawaii Revised Statutes 291C-1).

The term "walkway" is often used synonymously with "sidewalk." It is common for sidewalks to be thought of as the paved (typically portland cement concrete) surfaces along a road or street that are raised from the street level and separated by a curb, and they are often constructed to formal standards and drawings. Whereas walkways are often thought to encompass a broader range of either raised or at-grade improved paths for exclusive use by pedestrians.

Sidewalks and walkways provide places for physical activity and recreation.

IN THIS SECTION

Shops and markets attract high levels of pedestrian activity.

PRIORITIES FOR PEDESTRIANS TRAVELING ALONG STREETS

- *Efficient mobility – the route takes people to and from their destinations*
- *Safety and security*
- *Defined space*
- *Visibility between motorists and pedestrians*
- *Accessibility – a firm, stable surface and clear path of travel*
- *A comfortable and attractive environment*

Paved walkways are sometimes used in lower density areas, such as with cluster development or larger lot sizes along roads without curbs or sidewalks. Paved walkways are typically separated from the roadway.

Pedestrian paths that are unpaved and unimproved may be referred to as foot paths or trails. Pedestrian paths that are shared with bicyclists and typically paved are formally called “shared use paths." See Toolbox Section 7 for more information on shared use paths and trails.

In some areas, when no sidewalks, walkways, or shared use paths are available, pedestrians might be seen walking on roadside shoulders. Unpaved foot paths or trails may form as a result of repeated pedestrian traffic. But shoulders and foot paths/trails are not formally recognized as pedestrian facilities. If pedestrians are present or if they potentially could be present, sidewalks, walkways, or shared use paths should be considered to accommodate their travel.

Determining When and Where Sidewalks and Walkways are Needed

Studies have shown that pedestrian travel increases in areas where more pedestrian facilities are available. Higher numbers of pedestrians can be found in areas where more complete and continuous sidewalks, walkways, crossings, and other pedestrian facilities exist.

Sidewalks and walkways separated from the roadway contribute greatly to pedestrian safety. Pedestrians walking along the road account for 10-15 percent of pedestrian crashes nationally. The majority of these crashes happen along high speed roads in rural areas, because urban areas are typically designed for pedestrians. Sidewalks and separated walkways can prevent crashes. Based on the crash reduction factor (CRF), paved shoulders have a CRF of 70 percent and sidewalks have a CRF of 88 percent. (Federal Highway Administration Pedestrian and Bicycle Information Center)

Given these and other research findings, as well as state and federal initiatives to increase and encourage pedestrian travel, there is a general need to provide more pedestrian facilities and improve existing facilities in our communities. In Hawaii, the Statewide Pedestrian Master Plan has documented the need for various pedestrian projects specific to state facilities. Exhibit 4.1 lists various types of technical analyses that can be conducted to determine the need for pedestrian facilities. Other general considerations are summarized below.

Local jurisdictions can prioritize pedestrian projects based on context and land use. For example, locations where the mix and density of land uses results in more pedestrian activity may need improvements before other areas. Major pedestrian generators include (but are not limited to) schools, hospitals, open space, shopping districts, tourist destinations, and senior centers.

Funding sources are not always available to complete large projects at once, causing the retrofitting of pedestrian facilities along existing streets, roadways, and highways to be implemented over time.

To reach the overall goal of a more complete pedestrian travel network, local agencies often

EXHIBIT 4.1 ***Technical Analyses to Determine Pedestrian Improvement Needs***

Context/land use analyses
Walkability audits
Connectivity analyses
Roadway and traffic control device inventories
Sight distance studies
The adequacy of gaps in the stream of traffic for pedestrian crossings analyses
Crash summaries and diagrams
Conflict analyses
Pedestrian volumes and characteristics analyses
Collection of volumes/counts
Speed spot studies

Roads with sidewalks on only one side greatly constrict pedestrian movement.

Pedestrians make good use of limited space in Paia town, Maui

require pedestrian facilities to be constructed as part of private development projects. State and local agencies can then fill in missing links in the network through public funding and capital investment projects. Determining when and where pedestrian facilities are needed is often left up to local jurisdictions. When the needs are great, prioritizing where pedestrian facilities should be constructed, widened, extended, and repaired can be challenging.

The need to improve safety can be a strong factor in determining when and where sidewalk improvements should be made. Analysis of the specific context, including land uses and the transportation network, can help determine pedestrian safety needs. Various types of technical studies can be conducted to further analyze where problems and barriers occur and to identify the types of improvements needed to address these. Exhibit 4.2 lists recommended sidewalk and walkway locations based on land use.

A Policy on Geometric Design of Highways and Streets, by the American Association of State Highway and Transportation Officials (AASHTO) also provides guidance to help determine when and where to provide pedestrian facilities. These recommendations as well as additional suggestions are summarized below.

- Consider the need for pedestrian facilities as part of all street and roadway projects.
- In areas where pedestrian activity exists or is anticipated, pedestrian facilities should be provided.
- Give consideration to connecting nearby urban communities with pedestrian facilities, even though current pedestrian traffic may be light. (The existing level/volume of pedestrian traffic is not an accurate determinant of the future potential level/volume of pedestrian use.) In the future, with growth and development, there will be an even stronger need for pedestrian connectivity between communities.
- Pedestrian facilities are often needed in rural and suburban areas to provide access to schools, parks, community centers, local businesses, employment centers, transit stops and stations, and residential areas.

EXHIBIT 4.2 Recommended Sidewalk/Walkway Locations Based on Land Use

LOCATIONS	RECOMMENDATION
Commercial centers, downtowns, town/ village centers, and high to medium density residential areas	Both sides of all streets and roadways
Low-density residential (1-4 units/ac.)	Preferably on both sides, but at least one side with sufficient shoulder width* on the other side
Rural residential (less than 1 unit/ac.)	Preferably on at least one side with sufficient shoulder width* on other side
Areas near schools, parks, community centers, senior housing, hospitals, employment centers, and other pedestrian generating land uses	Both sides of all streets and roadways
Areas with higher exposure risk, such as with higher incidence of collisions/speeding	Review on a case-by-case basis. May require more improvements than standard approach.

** See pages 4-12 and 4-13 for recommended shoulder widths*

As a general best practice, Complete Street principles should be considered on all streets, roadways, and highways in Hawaii.

- Pedestrian warrants for sidewalks along highways have not been established. In general, whenever the roadside and land development conditions are such that pedestrians may travel along a highway, they should be furnished with a sidewalk, walkway or shared use path, as suitable given the conditions.
- The higher speeds of traffic and the absence of consistent lighting in rural areas reinforce the need for separated pedestrian facilities. Studies show that providing pedestrian facilities in rural areas reduces pedestrian/ motor vehicle crashes.

When considering the need for pedestrian facilities in rural areas, clear zone requirements need to be evaluated, along with crash data and pedestrian demand. To address both the goal of having safe places to walk and that of the community to retain a rural atmosphere, pedestrian facilities can be developed that do not look like traditional sidewalks, but do meet walking needs. More rural and natural looking walkways may include separated asphalt or compacted crushed stone paths, for example. Even in rural areas, people want and need to walk, and as such facilities should be provided.

Sometimes, natural paths or desire lines are created as a result of frequent travel at the side of the roadway. These paths may suggest the need for more formal pedestrian improvements.

AASHTO has developed levels of service to quantify the relative mobility of pedestrians and conflicts with other pedestrians that influence walking speed, maneuvering room, and the feeling of comfort. Levels of service (A to F, see Exhibit 4.3) reflect increasing crowding and decreasing freedom of movement. The levels of service are based on the available area per person. (For more information, refer to the Walkway Capacities section within Chapter 2

EXHIBIT 4.3 AASHTO Sidewalk Levels of Service

Level-of-Service A	Allows each person to choose a desired walking speed and to avoid conflicts with other pedestrians.
Level-of-Service B	Pedestrians begin to be aware of other pedestrians.
Level-of-Service C	Requires minor adjustments to speed and direction by pedestrians to avoid conflicts.
Level-of-Service D	Freedom to select individual walking speed and bypass other pedestrians is restricted. Frequent changes in speed and position are required.
Level-of-Service E	Provides for very crowded walking, at times reduced to shuffling, making reverse or cross-traffic flow very difficult. The speed of virtually all pedestrians is reduced.
Level-of-Service F	A person is likely to be standing stationary in a waiting area or is able to walk only by shuffling. There is frequent, unavoidable contact with other pedestrians.

of AASHTO's *A Policy on Geometric Design of Highways and Streets*.) It is important to note that this approach may not adequately consider future potential volumes of pedestrians since it is based on existing levels of pedestrian use.

To achieve the recommended best practice, new roadway projects should include sufficient budget for pedestrian facilities. As discussed above, pedestrian improvements, as needed, should be retrofitted along existing streets, roadways, and highways incrementally as public funding or private redevelopment opportunities allow.

Controlled-access freeways are typically the only traffic rights-of-way that are not suitable locations for pedestrian facilities.

Along some highways, roadways, and streets, there may be natural barriers that limit the available space for pedestrian facilities (such as steep topography, shorelines, natural resources or other conditions). Even in these locations, analysis should be performed to consider the best methods for providing a continuous pedestrian travel way to the maximum extent feasible (which may require narrowing the width of the pedestrian facility for a short distance, installing structural spans, or other solutions to create a continuous path of travel for pedestrians.)

All designated pedestrian access routes in public rights-of-way must meet the requirements of the Americans with Disabilities Act (ADA). Refer to Toolbox Section 3—Accessibility for guidance.

Very Low Volume/Low Speed Streets and Shared Streets

Very low volume streets and shared streets require special consideration regarding design for pedestrian use. In rare cases, typically in local neighborhood alleys and shared streets specifically designed for multi-modal use, pedestrian sidewalks and walkways may not be needed. Traffic volumes and speeds must be very low–low enough that pedestrians, including children, feel comfortable in the street. The AASHTO Guide for the Planning, Design, and Operation of Pedestrian Facilities states that in these cases, roadways should have traffic volumes of less than 400 vehicles per day with minimal pedestrian use.

The pedestrian bridge on the east shore of Kauai provides people with a place to exercise and enjoy the outdoors safely. (www.kauaipath.org)

This shared street bustles with activity on a sunny afternoon in Asheville, NC. (www.pedbikeimages.org/DanBurden)

Both Sides or One Side

As a recommended best practice, continuous sidewalks or walkways should be provided along both sides of all streets, roadways, and highways used by pedestrians. However, a sidewalk on one side may be adequate for some local streets, especially when this improves a condition where there were no sidewalks previously.

Various factors can influence the decision to place sidewalks along both sides or one side, such as available space within the right-of-way, existing physical limitations at the roadside, and which side of the street the most pedestrian origins and destinations (such as schools and bus stops) are located. Evaluating land uses can help to inform these decisions.

When sidewalks are placed on both sides, pedestrians can more easily walk on either side of the roadway. Sidewalks on one side of the road constrict pedestrian movement, typically causing pedestrians to walk in the roadway or illegally cross to reach their destination. According to Hawaii state law, where sidewalks are not provided, any pedestrian walking along and upon a highway shall, when practicable, walk only on the left side of the roadway or its shoulder, facing traffic that may approach from the opposite direction. (Hawaii Revised Statutes 291C-76)

Recommended Dimensions for Sidewalks and Walkways in Various Settings

The widths of sidewalks and walkways can vary depending on adjacent land uses, local requirements, the type of street or roadway, presence of trees and utilities, and predicted pedestrian activity. Recommended minimum dimensions are shown in Exhibit 4.4 for various types of streets and roadways (based on Hawaii recognized street classifications). As a general best practice, sidewalks and walkways along streets and roadways should be a desirable minimum of 6 ft (1.8 m) wide (a width that allows two people to walk side by side or to pass each other, either standing or in wheelchairs, comfortably).

See Toolbox Section 3—Accessibility for minimum horizontal clearances required by ADA. To meet ADA, sidewalks and walkways must contain a clear passage area with a minimum width of 4 ft (1.5 m). When located in urban areas, downtowns, or medium to high density residential areas, sidewalks generally

WHEN DETERMINING SIDEWALK AND WALKWAY DIMENSIONS, DESIGNERS SHOULD CONSIDER:

- *Local standards and preferences*
- *Characteristics of pedestrians using the facility*
- *ADA standards*
- *Surrounding land uses*
- *Pedestrian volumes (existing and projected)*
- *Type of street/roadway*
- *Roadside environment*
- *Available space within the right-of-way*
- *Location of existing utilities, poles, and structures*
- *Traffic characteristics*
- *Additional space that may be needed for landscape, trees, and furnishings*

EXHIBIT 4.4 Recommended Dimensions for Sidewalks and Walkways

ROAD TYPE	PRINCIPAL ARTERIAL	MINOR ARTERIAL	MAJOR COLLECTOR	MINOR COLLECTOR	LOCAL RESIDENTIAL	LOCAL COMMERCIAL WITH ACCESS
Right-of-Way (Typical)	100 ft (30.5 m)	84 ft (25.6 m)	60 ft (18.3 m)	60 ft (18.3 m)	50-60 ft (15.2-18.3 m)	60 ft (18.3 m)
No. of Travel Lanes / Width of Roadway (Typical)	4-6 Lanes	4 Lanes	2 Lanes	2 Lanes	28 ft (8.5 m)	44 ft (13.4 m)
SIDEWALK WIDTHS						
Desirable	8 - 10 ft (2.4 - 3.0 m)	8 ft (2.4 m)	6 - 8 ft (1.8 - 2.4 m)	6 to 7 ft (1.8 - 2.1 m)	5 ft (1.5 m)	6 ft (1.8 m)
Minimum	6 ft (1.8 m)	6 ft (1.8 m)	6 ft (1.8 m)	6 ft (1.8 m)	5 ft (1.5 m)	6 ft (1.8 m)
With Planting Strip/Buffer	6 ft (1.8 m)	6 ft (1.8 m)	6 ft (1.8 m)	5 ft (1.5 m)	5 ft (1.5 m)	5 ft (1.5 m)
With Street Trees, No Buffer	10 ft (3.0 m)	10 ft (3.0 m)	8 ft (2.4 m)	8 ft (2.4 m)	–	–
Urban Center/Business District	10-15 ft (3.0-4.6 m)	10-15 ft (3.0-4.6 m)	Varies	–	–	–
LOCATION						
Desirable					Both Sides	Both Sides
Minimum	Both Sides	Both Sides	Both Sides	Both Sides	One Side	One Side
PLANTING BUFFER WIDTH WHEN USED						
Desirable	5 ft (1.5 m)	5 ft (1.5 m)	5 ft (1.5 m)	5 ft (1.5 m)	5 ft (1.5 m)	5 ft (1.5 m)
Minimum	4 ft (1.2 m)	4 ft (1.2 m)	4 ft (1.2 m)	4 ft (1.2 m)	4 ft (1.2 m)	4 ft (1.2 m)

Note: Refer to the AASHTO Guide for the Planning, Design, and Operation of Pedestrian Facilities, as well as other AASHTO guides for additional information.

need to be wider to accommodate higher volumes of pedestrians. For example, a common standard width for urban arterial sidewalks is minimum 8 ft (2.4 m) wide, but this is not wide enough in areas that experience frequent pedestrian activity.

Sidewalks and walkways should be designed to comfortably accommodate the typical volume of pedestrians that will be using them. In high use areas like central business districts, sidewalks generally should be 10 to 15 ft (3.0 to 4.6 m) or wider to accommodate high pedestrian flows. However, It is important to avoid "over design" of excessively wide sidewalks. Wide spans of empty pavement can appear uninviting to pedestrians.

If the facility is a shared use path (shared with bicyclists), it must be an absolute minimum of 8 ft (2.4 m) wide and often wider depending on the use (see Toolbox Section 7—Shared Use Paths).

The dimensions listed in Exhibit 4.4 are guidelines. Dimensional requirements may vary within each local jurisdiction (check local requirements). Consider each project on a case-by-case basis to find the best possible design solution to fit the anticipated volume of pedestrian use.

Buffers/Separation

Providing a buffer can improve pedestrian safety and enhance the overall walking experience. Buffer width is the distance between the sidewalk and the adjacent roadway. Per the AASHTO Guide for the Development of Bicycle Facilities, desirable minimum buffer widths as measured from the edge of the traveled way are:

- Local or collector streets – 2 to 4 ft (.6 to 1.2 m)
- Arterial or major streets – 5 to 6 ft (1.2 to 1.8 m)

  Note: These measurements are typically for roadways and streets with curbs; check clear zone requirements on roads without curbs.

However, if the buffer area is landscaped and includes trees, 2 ft (0.6 m) is not wide enough. A minimum of 4 ft (1.2 m) is recommended. Some trees may require more space. Consult with a landscape architect and/or arborist to determine spatial needs for the trees proposed. See Exhibit 4.4 for recommended buffer widths related to street type. Buffer areas also provide space for light poles, utilities, signs, and street furniture, as well as protection from splashing and car door openings.

Double check the clear zone requirements as part of the design of buffers along all streets and roadways.

Highways as Main Streets, Rural Areas, and Shoulders

In many small towns and villages, state highways are the main street and primary arterial through the center of town. They function as the major route into which local arterials and collectors feed. In many towns in Hawaii, the state highway is often the only arterial connecting virtually all major destination points (such as schools, parks, scenic stops, and residential and commercial areas). Providing sidewalks and walkways along these sections of highway that have many potential pedestrian trip generators is important.

Providing adequate pedestrian facilities along the state highways in these settings is an important step to incorporating pedestrians into the state's overall transportation network. Sidewalks for these main streets need to be designed the same as they would be for the urban centers of larger cities, with sufficient width to support anticipated pedestrian use. It is important to remember that

Lahaina storefront

A pedestrian walks on the grassy shoulder on this Maui roadway.

WHEN ROADSIDE SHOULDERS ARE USED BY PEDESTRIANS

- *They can be paved or compacted crushed surface (firm and stable), but high visual contrast from adjacent roadway is best.*
- *Signs to prohibit parking should be installed unless sufficient width is provided to accommodate parking and pedestrians.*
- *Pedestrian use of roadside shoulders should be recognized as a need for more formal facilities/improvements, and treated as a temporary condition. The ultimate objective should be to construct sidewalks, walkways or shared use paths in these areas as soon as possible.*

there are differences between the small town main street environment and the larger city street environment, and applied design treatments should reflect community preferences.

Shoulder Use in Rural Areas

Shoulders along roadways in rural areas are sometimes used by pedestrians, even though shoulders are not formally recognized as pedestrian facilities. While this use is generally not the preferred condition, it does occur. As such, it is important for rural roadways and highways to meet at least minimum standards for shoulder width on both sides.

Even in completely undeveloped areas, where the roadways may not be intended as pedestrian routes, it is desirable to provide walking space along the traveled way for occasional or emergency use by pedestrians. This can be achieved by delineating the shoulder for added safety for non-motorized use.

Where a pedestrian route is needed to provide access between buildings or facilities, shoulders are not usually adequate or appropriate as pedestrian facilities, particularly when adjacent motor vehicle traffic may be traveling at higher speeds. Shoulders are not an appropriate option for pedestrian accessible routes (refer to Toolbox Section 3—Accessibility). In such cases, a full sidewalk or paved walkway, raised and/or separated from the roadway should be provided to the maximum extent feasible.

Shoulder Dimensions

Refer to local and state standards for applicable shoulder width requirements. As a general best practice, per the AASHTO Guide for the Planning, Design, and Operation of Pedestrian Facilities, shoulders should be:

- 4 to 6 ft wide (1.2 to 1.8 m) minimum adjacent to a bike lane and on local roads with lower traffic volumes
- 4 ft (1.2 m) minimum on roads with less than 400 ADT and 6 ft minimum on roads with 400 to 1500 ADT
- 6 ft (1.8 m) width is acceptable on roads with 1500-2000 ADT if minimum width of traveled way is 24 ft (7.3 m)
- 8 ft (2.4 m) wide minimum on roads over 2000 ADT

EXHIBIT 4.5 ***Minimum Roadside Shoulder Widths (AASHTO)***

ADT (Average Daily Traffic) Trips	< 400	400-1500	1500-2000	>2000
ROAD CLASSIFICATION				
Local Roads and Streets	4 ft (1.2 m)	5 ft (1.5 m)	6 ft (1.8 m)	8 ft (2.4 m)
Collector Roads and Streets	4 ft (1.2 m)	5 ft (1.5 m)	6 ft (1.8 m)	8 ft (2.4 m)
Rural and Urban Arterials	4 ft (1.2 m)	6 ft (1.8 m)	6 ft (1.8 m)	8 ft (2.4 m)

Shoulders along higher speed highways and roadways are generally not appropriate as roadside parking lanes (except during emergencies). Shoulders should be signed to prohibit parking. However, in the case that parking is expected along lower volume/ lower speed rural roads, shoulders should be a minimum of 12 ft (3.7 m) wide.

Shoulders may need to be wider in the vicinity of school bus stops or if located on major collectors/arterials (more than 2000 ADT). Refer to Toolbox Section 8—Children and School Zones for more information.

In rural areas experiencing heavy pedestrian use, the best solution is to construct a sidewalk, walkway, or path. If this can't be implemented immediately, the shoulder width should be expanded to be as wide as possible to serve the use–10 ft (3.0 m) minimum.

Shoulder Delineation

In areas where pedestrians and bicyclists may be using shoulders, extra-width striping should be provided to delineate the shoulder space. In some areas, it may also be possible to use a contrasting paving color (colored asphalt compacted fine cinders, chip seal, etc.) to help delineate these areas and visually separate the shoulder from street. This can provide an added benefit of traffic calming (perceived width of travel way is narrowed). Innovative approaches, such as dashed stripes or angled stripes could also be considered for delineation to draw motorist attention to the edge use by other modes.

Example of paved shoulder on Kamehameha Highway, Oahu

Runner along Maui highway walkway

Hamakua Heritage Corridor, Big Island (Rosa Say)

North Share Path on Oahu–parallel to the state highway

In unpaved conditions or natural areas, well-compacted crushed rock or stone material can be provided adjacent to the roadway to provide extra space. Compacted earth or low-growing grass shoulders can also provide space for pedestrians if there are no other alternatives (but they perform poorly during wet weather). Unpaved shoulders are usually less costly to install, but more expensive to maintain. These are not formally recognized as pedestrian travel ways and generally should only be used in cases of emergency.

Clear Zone Requirements

AASHTO and HDOT have specific requirements limiting lateral obstructions along highways and roadways that can be potentially dangerous to motorists during crashes. The term “clear zone” is used to designate the unobstructed, relatively flat area provided beyond the edge of the traveled way for the recovery of errant vehicles. The clear zone includes any shoulders or auxiliary lanes. Clear zone widths are prescribed based on traffic volumes and vehicle speeds.

For rural collectors and local roads with speed limits of 45 mph or less, a minimum clear zone width of 10 ft (3 m) should be provided (AASHTO Green Book). No trees, poles, bollards, signs (unless designed with break-a-way posts and bases) or other fixed objects that create lateral obstructions can be located in this zone.

For urban arterials, collectors, and local streets where curbs are utilized and speeds are lower, less space for clear zones is required. A minimum offset distance of 18 in (500 mm) should be provided beyond the face of the curb (AASHTO Green Book). It should be noted that most curbs do not have a significant capability to redirect vehicles on highways and higher speed roadways. Where design/posted speed is greater than 45 mph, refer to AASHTO as well as state and local standards for additional clear zone guidance.

Additional offset from edge of roadway/face of curb may be needed depending on crash experience, number and location of driveways, type of adjacent development, on street parking, bike lanes, and available right-of-way widths. Necessary sight triangles for motorists and pedestrians should be examined and provided in design.

Separation on Higher Speed Roads

Along higher speed roadways and highways, sidewalks, walkways, and shared use paths should be removed from the traveled way, outside the clear zone, and separated by as much space as available within the right-of-way. In the case of extremely wide rights-of-way, the pedestrian route generally should be located within 20 to 30 ft or less from the roadway as suggested maximum separation. It is important that the pedestrian route is as convenient and direct as possible. Pedestrian facilities can also be situated within easements on private property. In these situations, the paths often function as two-way shared use facilities serving both pedestrians and bicyclists.

Where it is not possible to locate the paths outside the clear zone, traffic barriers may be needed to adequately protect the path users from high-speed vehicles, or speed reduction may need to be considered. (Fixed objects such as bollards or trees should not be installed in the clear zone along higher speed highways as measures to protect pedestrians.)

Ditches and Swales

On many rural roadways, an open ditch or swale is located along the edge to provide conveyance and treatment of stormwater runoff. Where there is sufficient space within the right-of-way, the sidewalk or walkway can be located beyond the ditch, providing a buffer area between motor vehicle traffic and pedestrians. Where a ditch or swale is constructed along a sidewalk, the adjacent slope should generally not exceed a 3 horizontal to 1 vertical grade, or at least 4 ft (1.2 m) of horizontal space should be provided adjacent to ditches with steeper slopes. Otherwise railing may be required (see discussion later in this section). A sidewalk separated from the roadway by a ditch is illustrated in Exhibit 4.16, later in this toolbox section.

Historic and Scenic Highways

Historic and scenic roads are unique resources with special management considerations. In 2006 in Hawaii, legislation was passed to include flexible design guidelines consistent with practices used by the FHWA and AASHTO in highway design for special areas. This legislation allows flexibility in highway design to meet local

Old Mamaloa Highway, Big Island (Marjolein Visser)

Streetscapes are an essential part of the public space in cities and towns. (www.pedbikeimages.org/DanBurden)

conditions. The law addresses access for other modes of transportation along scenic and historic routes, including but not limited to, bicycle and pedestrian transportation.

Any improvements proposed to historic and scenic highways shall be designed to minimize environmental, scenic, aesthetic, historic, community, and preservation impacts. (Hawaii Revised Statutes 264)

Many historic and scenic roads are narrow in character, with little to no shoulder, and pedestrian/bicycle needs must be balanced with sensitive resources. When historic roads are part of a developed area or in a town center, pedestrian facilities are likely needed, but should be designed to retain the historic character of the corridor. Separation from the roadway edge can help to retain rural/historic character. Also, colored paving, special paving (unit pavers), or even compacted crushed stone can be considered for surfacing to help preserve and enhance the corridor character.

Applying design flexibility for scenic byways, historic routes, roadways adjacent to steep terrain, and other special conditions is important. Refer to AASHTO's *A Guide for Achieving Flexibility in Highway Design* for context-sensitive solutions that may be applicable in these areas. Also design of improvements on designated scenic byways needs to be consistent with HDOT scenic byway policy and plans. Corridor management plan have been developed for some scenic byways, and these plans should be referenced to confirm specific design guidelines and improvement needs.

Sidewalk Corridors and the Pedestrian Realm

The "sidewalk corridor" is a term often used in urban areas or town centers and generally encompasses the space between curb or street edge and the face of buildings or property lines along the street. The sidewalk corridor may include sidewalks or walkways, as well as space for landscaping, street trees, furnishings, utility appurtenances, signs, street lights, and other features.

Another term used to describe pedestrian areas in urban, suburban, or rural settings is the "pedestrian realm." The pedestrian realm encompasses the space between the edge of the street and the outside limit of the right-of-way (building line/property line), as well as any area pedestrians may travel within the right-of-way, including intersections and mid-block crossings.

The Streetside Pedestrian Realm in Urban Areas, Business Districts, and Downtowns

Urban streetscapes are important public resources, and collectively they are an essential part of the public space in urban areas. They represent a city's vitality and livability. Sidewalks in business districts, downtowns, and village/town centers need to be designed to efficiently accommodate heavy volumes of pedestrian traffic.

In urban areas, business districts, downtowns, and village/town centers, the streetside pedestrian realm serves multiple purposes and generally consists of the following zones.

- Building frontage zone
- Pedestrian through/travel zone
- Furnishings zone (aka fixtures/planting zone)
- Edge/curb zone
- Extension zone

The typical widths of each of these zones will vary depending on specific circumstances in the right-of-way. The function and typical dimensions for each zone are further described below. Refer to Exhibits 4.6 and 4.7, which show the zones of the streetside pedestrian realm.

Refer to Toolbox Section 5 for design guidance related to intersections and crossings, which are also important areas of the pedestrian realm.

Building Frontage Zone

The building frontage zone is where people enter and exit buildings and where pedestrians may travel at a slower pace to window-shop or to stop and chat. The frontage zone starts adjacent to the building or property line. In urban and developed areas, this zone can vary in width from approximately 2 to 10 ft (.61 m to 3.0 m) or more. Designers should allow a minimum of 2 ft (.61 m) "shy" distance, as people prefer

PEDESTRIAN REALM DESIGN CHECKLIST

- *Clearly visible through zone*
- *No obstacles or protruding elements in the through zone*
- *Moderate grades and cross slopes*
- *No vertical changes in grade levels*
- *Passing and resting areas in the through zone, as well as areas to gather and socialize in the furnishings zone*
- *Firm, stable, slip resistant surfaces*
- *Paving properly installed and maintained in a smooth condition*
- *Good lighting*
- *Good security and visibility—open sight lines, access to emergency services, an active environment*
- *Comfort—shade and heat mitigating features*
- *Attractive environment for pedestrians—vibrant, interesting and well designed*

this width when walking adjacent to buildings. The frontage zone width should provide space for door openings, steps, architectural features, utilities, window shopping, signs, displays and similar provisions. Other recommendations:

- Keep this space as narrow and clear as possible.
- Construct the frontage zone at the same grade and level as the through zone.
- The surface material may be the same as the through zone, but accent paving or color can be used to delineate and distinguish the building frontage zone from the through zone.

Pedestrian Through/Travel Zone

The pedestrian through or travel zone is the predominant, obstacle-free space for pedestrian movement. This zone must remain both horizontally and vertically clear and provide a direct connection along pedestrian desire lines. In urban and developed areas, the through zone should typically be 6 to 10 ft (1.8 m to 3.0 m) wide, with a 4 ft (1.2 m) absolute minimum in accordance with ADA requirements. Other recommendations:

- Provide a firm, stable, and slip-resistant surface.

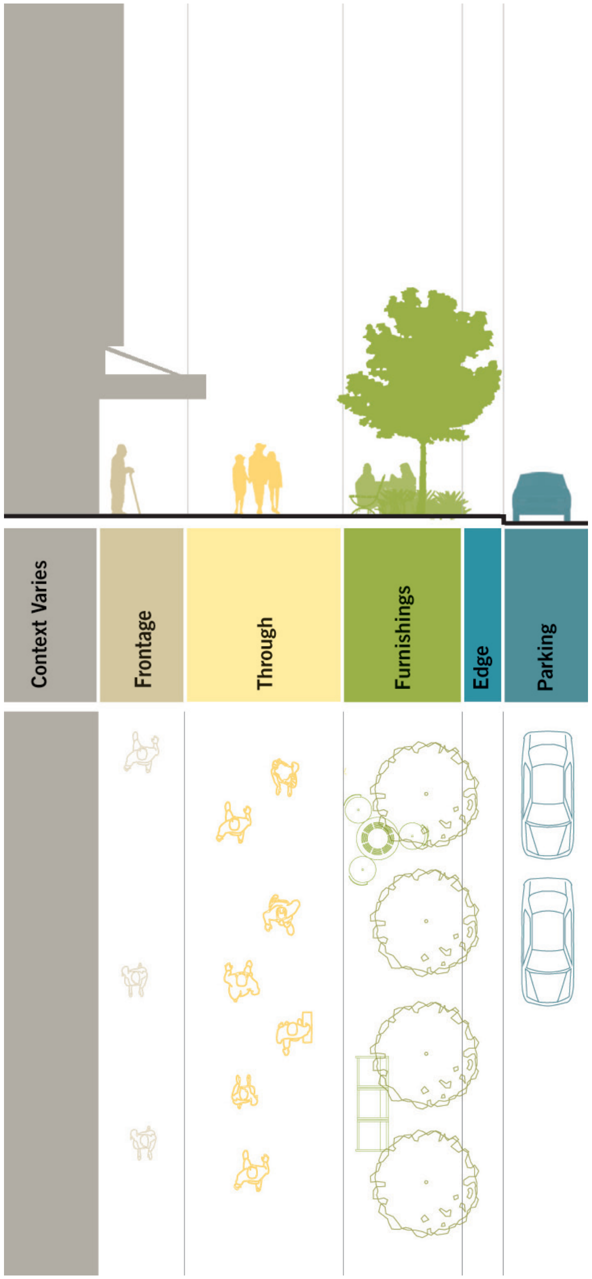
EXHIBIT 4.6 *Streetscapes should be designed to be complete systems that blend all components into a safe, functional, attractive, and cohesive place. Kaimuki, Honolulu.*

- Increase the width of the through zone in places that will attract high volumes of pedestrians (near transit stops, malls, plazas, and other areas).

Refer to later in this section and Toolbox Section 3 for vertical clearance requirements.

Furnishings Zone

The furnishings zone may also be known as the fixtures or planting zone. This zone is often where street furniture, utility equipment, trees, landscaping, stormwater facilities, newspaper and entertainment flyer boxes, transit stops, and other features such as kiosks, sidewalk cafes,



vendors, and public art are located. This zone provides a buffer between street traffic and the pedestrian through/travel zone. Dimensions for this zone can vary widely.

If these areas are landscaped and contain street trees, a minimum width of 4 ft (1.2 m) is recommended. Certain trees may require more space. Involve a landscape architect and/or arborist in the design process to confirm special requirements. Other recommendations:

- Consolidate and organize furnishings to maximize public use and benefit.
- Provide paved areas across the furnishings zone where needed to allow pedestrian

EXHIBIT 4.7 ***Functions of the Pedestrian Realm Zones***

Frontage	Through	Furnishings	Edge	Parking
Area along the right-of-way that functions to provide space between the building façade, wall or fence and the through zone of the sidewalk	Obstacle-free space for clear pedestrian through travel that is often the primary walking area of the sidewalk	Primary buffer space between the active pedestrian walking area of the through zone and adjacent throughfares	Interface between the on-street parking or motor vehicle travel lane	
		Extension		
		Additional space for pedestrians and streetscape elements		

As well as improving pedestrian safety, curb extensions create added space for plantings.

access to crossings, taxi stands, bus stops, and other facilities.

- Provide screening/buffering of utility fixtures in this zone while maintaining clear access to utility providers for maintenance.
- Refer to Streetscape Furnishings (Exhibit 4.12) later in this toolbox section for examples of streetscape elements often provided in this zone.

Edge/Curb Zone

The edge or curb zone is adjacent to on-street parking, bike lanes, or motor vehicle lanes. It provides space to open a car door. It also may be where pedestrians wait for taxis and buses when combined with the furnishings zone (to become the extension zone). This zone is often where street lights, signals, traffic signs, parking meters, and street-related infrastructure are placed (these elements may also be placed in the furnishings zone. The width of this zone can vary. It is generally preferable to keep the edge/curb zone as narrow as possible. 12 in to 18 in (30.5 cm to 45.7 cm) is common. Other recommendations:

- Ensure that signs, street lights, parking meters, and other elements located in the edge/curb zone will not conflict with the use of the adjacent lane (whether for on-street parking, bike travel, or motor vehicle traffic). Provide adequate clear space/shy space around all appurtenances in the zone.
- Combine the furnishings zone and edge zone where necessary for transit stops and taxi stands. If not possible, provide a minimum of 5 ft (1.5 m) horizontal clearance where pedestrians are likely to wait for taxis or buses.

Extension Zone

The extension zone refers to locations where the streetside pedestrian realm may extend into the parking lane. Conditions include curb extensions (bulb outs), flexible use of parking lanes, bicycle parking, tree planting, landscaping, stormwater facilities, seating, and additional site furnishing areas. Extension zones are generally the same width as on-street parking lanes.

Interactions Between Zones

Because interaction occurs between these zones, development of a cohesive design for the pedestrian realm is important. Design must consider the unique conditions associated with each zone (such as adjacent land uses and context), as well as how the pedestrian realm interacts with other elements of the street (bike facilities, transit facilities, and intersections). Maintaining clear sight lines between pedestrians, bicyclists, and motorists in these areas of interaction is critical.

The Furnishings Zone as a Planting Buffer

The furnishings zone often functions as a planting buffer with street trees, landscaping, and/or natural vegetation. Planting buffers (also referred to as planting strips, landscape strips or buffers, verges, greens, and nature strips) are considered to be an effective separation treatment between walkways and streets in all types of settings. The added separation of a planting buffer helps a pedestrian feel more comfortable when walking along the street. Trees and landscaping also soften the urban environment, provide shade, reduce heat, and create a more pleasant walking environment. Planting buffers can be landscaped in a variety of ways to aesthetically enhance the streetside environment. (Refer to Street Trees and Landscaping in Toolbox Section 2.)

A bioswale was designed to convey and filter stormwater along this street in Seattle, WA. (www.epa.gov)

Stormwater infiltration system on a green street in Portland, OR. (www.pedbikeimages.org/LauraSandt)

EXHIBIT 4.8 Summary of Pedestrian Realm Guidelines

ZONE	FRONTAGE	THROUGH	FURNISHINGS	EDGE	EXTENSION
WIDTH					
	18 in wide as a general rule	**6 ft** desirable min width in urban areas/downtown, can be wider to accomodate pedestrian volumes	**3 ft** suggested absolute min in urban areas, may be wider for specific furnishings/public space	**6 in** (just the width of the curb, where there is no parking lane, or no continuous planting)	Width of parking lane - **7 ft to 8 ft**, typically in urban areas
	Up to **24 in** wide on commercial and mixed-use streets	Absolute min of **5 ft** in urban areas, not including edge or furnishings zone	**4 ft** min where trees or large shrubs are provided	**2 ft** min where there is a parking lane	
	Less width where a continuous building setback is provided	**4 ft** min clear travel space must be provided for ADA	**4 ft** (+ 1 ft for every 5 mph increment over 25 mph)	**2 ft 6 in** min where there is angled or perpendicular parking to allow space for car overhang	
		On narrower sidewalks or with a narrow furnishings zone, tree grates may extend into this space (not preferable)	Tree grates may be located in this area (typically 4 ft or 5 ft square or round)	**5 ft** min where pedestrians may wait for taxis or buses	
USE					
	Pedestrian shy distance along the building facade	Main path of travel for pedestrians, clear of obstacles; accessible walking surface	Streetscape furnishings, street trees and landscaping, newpaper boxes, utilities (fire hydrants, electrical boxes, etc.), and other elements	Walkable surface when adjacent to parking or part of transit	Provides for flexible use of parking lane for curb extensions at crossings, such as additional space for stormwater facilities and furnishings
	Window displays, cafe settings			Place for vertical elements such as street signs, street lights, utility poles, parking meters, etc. with 18 in clearance to curb	
	Furnishings aligned with frontage			Street trees and basins, with non-continuous planting	
	Overhanging elements				

Planting buffers can also be bermed and bordered by curbing, or developed at the same grade level as the roadway. Along state highways, where trees are planted, HDOT requires planting buffers to be two times the diameter of the root ball. In areas where there is limited space or right-of-way, the width of the planting buffer can be reduced or eliminated and provided again where there is more space or right-of-way available. Photos on pages 4-20 and 4-22 and Exhibits 4.6, 4.7, and 4.17 illustrate various types of planting buffers between sidewalks and streets.

The planting buffer also can house a number of natural drainage facilities. Sustainably-minded designers can:

- Install a street swale within planting strip rather than groundcover vegetation alone to better manage stormwater.
- Design planted areas within the curb extension so as to capture stormwater according to current standards.
- Install stormwater street planters that are designed to control flow and improve water quality.
- Install tree pits or tree box filters with drought and water-tolerant trees, under drains, and directed gutter flow.

Horizontal and Vertical Clearances

Urban streetscapes should be carefully designed in order to provide adequate space for furnishings and utility facilities outside the main travel way used by pedestrians. A clear path of 4 ft (1.2 m) absolute minimum is required within the width of all sidewalks and walkways by the ADA. Please note this is only the minimal clearance required, and is not a sufficient overall width for sidewalks or walkways in any location. This minimal clearance is required for wheelchair passage, but in areas where pedestrian use is moderate to high, this minimum clearance is not sufficient. This clearance should be increased to the maximum obtainable, or the full width of the sidewalk. Obstacles, such as signs, street furniture, and newspaper stands, should be placed off to the side of the travel way, in the furnishings/planting zone, as discussed in this toolbox section.

The vertical clearance needed for sidewalks and walkways is 6 ft 8 in minimum (2.0 m), 7 ft (2.1 m) preferred. The ADA requires that “objects protruding from walls (e.g., signs, fixtures, telephones, canopies) with leading edges between 2.25 ft (68.5 cm) and 6.7 ft (2.0 cm) above the finished sidewalk shall protrude no more than 4 in (10.0 cm) into any portion of the public sidewalk." A detectable railing must be provided if protruding objects exist and can not meet the above requirements. (Refer to PROWAG.)

Traffic signs located directly adjacent to or within the sidewalk need to be mounted and tree branches need to be pruned high enough to meet the recommended vertical clearance between ground level and the bottom of the sign. Informational and directional signs for pedestrians can be lower, if located a minimum of 3 ft (1.0 m) from the sidewalk.

A typical pedestrian travel way, designed to be clear of obstructions, is illustrated in Exhibit 4.9.

Gradient, Cross Slope, Drainage, and Utility Covers

Sidewalks and walkways should be designed with maximum longitudinal grades of 5 percent. Since sidewalk grades are typically designed to match adjacent roadways, sometimes it may be necessary to exceed this gradient, such as in areas of rolling or mountainous terrain. Where the walkway of a pedestrian access route is contained within a street or highway border, its grade shall not exceed the general grade established for the adjacent street or highway. (PROWAG 301.4.2) However, exceeding the 5 percent gradient should be avoided to the maximum extent feasible. Refer to Toolbox Section 3—Accessibility for additional information.

Sidewalk cross slopes shall be designed to a maximum of 2 percent. This facilitates positive drainage toward the street or adjacent planting buffer. Avoid surfaces that are too flat (less than .5 percent), because this may cause poor drainage and pooling on the sidewalk surface. Highway shoulders should also be designed at a 2 percent cross slope if pedestrian use is anticipated.

Locate drainage grates, manhole covers, hatches, vaults, and other utility covers outside the route of pedestrian travel. If this is not possible, openings in ground surfaces shall not permit passage of a sphere more than .5 in (1.3 cm) in diameter and should be mounted flush with

EXHIBIT 4.9 *Clear Travel Way and Proper Positioning of Street Furniture*

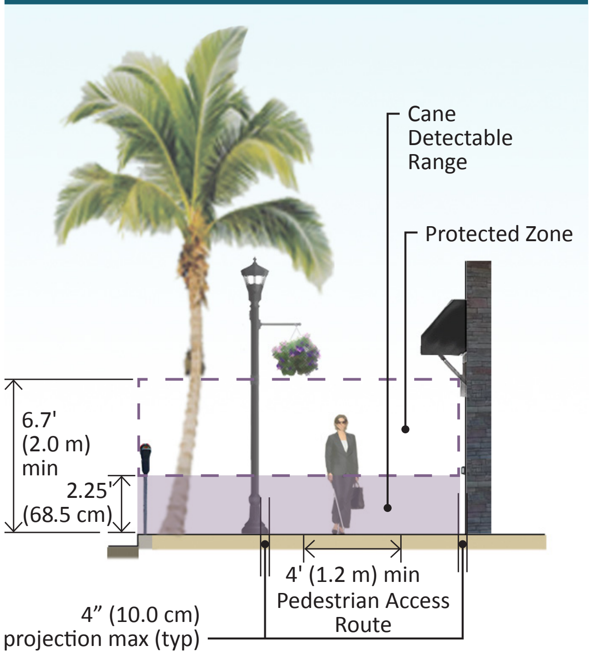
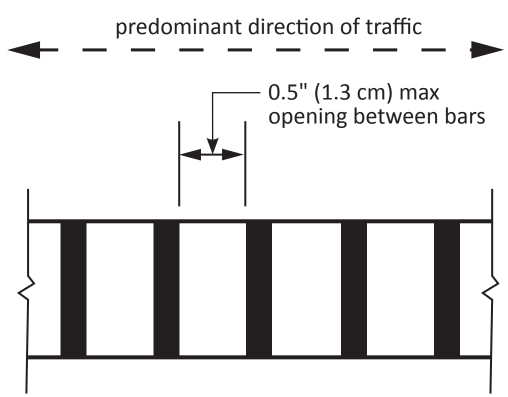


EXHIBIT 4.10 *ADA Grating Requirement*



the surrounding sidewalk surface. They should have a non-slip surface. Elongated openings shall be placed so that the long dimension is perpendicular to the dominant direction of travel (See Exhibit 4.10). (Refer to PROWAG R301.7.1 and ADAAG 302.3.) For more information refer to the Toolbox Section 3—Accessibility.

Paving and Surfacing

Any material used for sidewalks and walkways must be slip-resistant and easy to maintain (resistant to buckling and cracking). Surfaces must be accessible by meeting the "stable, firm, and slip-resistant" criteria required by the ADA.

Types of Paving

Sidewalks and walkways in urban areas are typically constructed of portland cement concrete (PCC). This provides a smooth, long-lasting, and durable finish that is easy to grade and repair. Scoring patterns prevent cracking as the concrete sets, and may be designed to match historic patterns within a neighborhood or district where appropriate. Colored concrete is common, particularly in urban areas where sidewalks are often designed to blend with adjacent development.

A wide spectrum of unit paving options, such as concrete unit pavers, granite and other stone pavers, and brick are available. Special districts and downtown streets often incorporate special paving into the design of sidewalks and pedestrian areas. Special paving can enhance aesthetics and break up the monotony of a continuous concrete surface. Paving accents such as unit paver bands can provide a sense of scale and rhythm appropriate to surrounding buildings. Extensive use of unit paving with joints is not recommended on PARs. Refer to Toolbox Section 3—Accessibility for recommendations related to providing a vibration free zone within the PAR per PROWAG.) Exhibit 4.11 shows a number of surfacing options.

There are advantages and disadvantages to implementing unit pavers. They add visual interest and can complement the character of a setting. However, unit pavers may require repairs due to settling and crushing, resulting in the need for periodic re-setting. With sand joints, weed control is often a maintenance issue. When used, unit pavers must be set carefully, with a well-designed and constructed sub-base or else they may settle or buckle

EXHIBIT 4.11 Surfacing Options

SCORED CONCRETE

COBBLESTONE

STAMPED COLORED CONCRETE

BRICK

CONCRETE - INTERLOCKING

GRANITE

Note: Refer to the MUTCD (2009) for guidance on paving and striping of pedestrian crossings. Colored pavement located between crosswalk lines should not use colors or patterns that degrade the contrast of white crosswalk lines.

Tree grates and unit pavers

A band of brick unit pavers recalls the historic character of this downtown district, while the concrete provides a smooth surface walkway.

and cause a tripping hazard. They should be designed to be easy to reset and replace. Unit pavers (that are not mortared in place) over utility lines are easier to take up and replace/reset when repairs are needed.

Stamping molds can create the visual appearance of bricks and pavers and have the advantages of traditional concrete without the maintenance issues and roughness associated with bricks and pavers. Still, stamped surfaces can also have maintenance requirements. Compared to unit pavers, the sidewalk will never look the same after repairs are made because it is difficult to match patterns and colors.

Asphaltic concrete pavement (ACP) can be used as an alternative to PCC, but it generally has a shorter life expectancy. ACP is often used for paths in low density residential areas as well as the less developed urban areas. ACP will tend to settle and wear down faster than PCC sidewalks. It is also more susceptible to deterioration, root and vegetation damage, and requires more frequent maintenance. In areas where walkways are aligned adjacent to shallow-rooted shrubs and trees, root damage to the pavement can be prevented by installing root barriers. Refer to the HDOT standard plans for root barrier installation details.

Permeable Surfaces/ Recycled Materials

Pervious and permeable surfaces for pedestrian use are becoming more common in US cities due to the green building/sustainability movement. Pervious pavement brings environmental benefits because it allows the flow through of surface water. Pervious concrete, unit pavers with pervious joints, compacted crushed granite, rock and stone, and other treatments may be installed as permeable surfaces.

The use of recycled content in paving or for sub-base materials is also becoming a more common practice. With sidewalk replacement projects, it is sometimes possible to demolish old curb, gutter, sidewalk, and street paving and crush and grind the concrete and aggregate for reuse on-site during construction. Recycled pavement grindings can be inexpensive and easy to grade.

When considering the use of permeable paving and recycled content in paving, designers should examine construction costs and life cycle/maintenance costs, and jurisdictions need to adequately budget for these.

Rural and Natural Areas

In rural and natural areas, alternative surfacing, such as gravel or compacted earth (often with soil cement/binding agents) is occasionally used for walkways and trails. In many cases, these treatments may not be fully accessible to people using strollers or wheelchairs. Compacted crushed rock or stone is preferred in these uses because it can be constructed as a very smooth, firm, and stable surface. Typically, when facilities are regularly used by pedestrians, more permanent surfaces, including well-designed pervious or impervious paving treatments, are the most preferred solutions.

Any surfaces that are designated pedestrian access routes or accessible routes of travel must be firm, stable, and slip-resistant per accessibility standards.

Color/Reflection

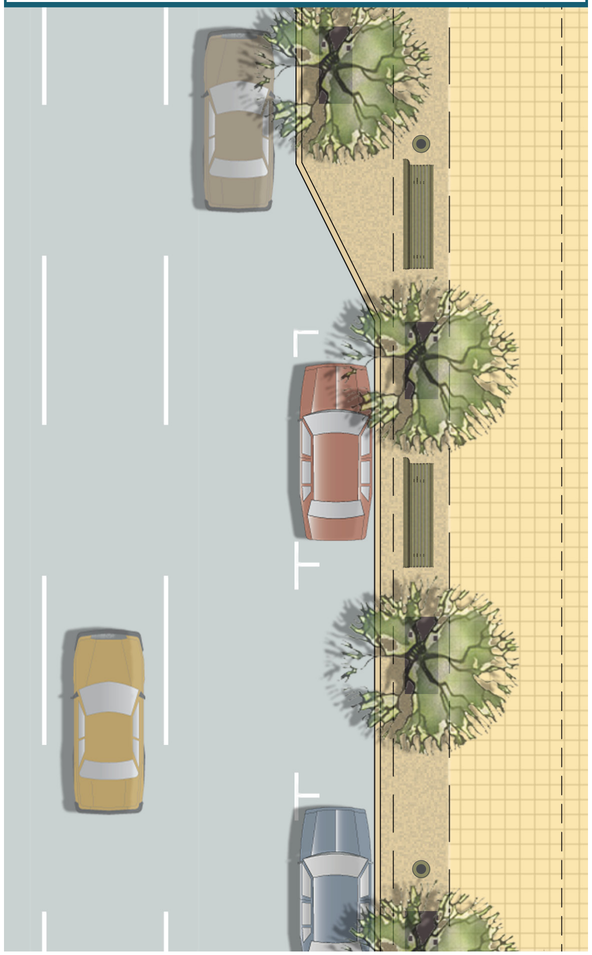
The color and reflectivity of paved surfaces is an important consideration in sunny climates. The Solar Reflectance Index (SRI) value of sidewalk materials may be increased to reduce urban heat island impact. This impact causes metropolitan areas to become significantly warmer than surrounding rural areas due to building and road materials. Material finishes may also be chosen that can reduce sidewalk glare and reflectivity.

Streetscape Furnishings

Design and select streetscape furnishings in accordance with the following considerations:

- A palette and placement plan should be developed for each streetscape project that includes furnishings, lighting, trees, landscaping, and paving. Placement of other features, such as signs, kiosks, parking meters, electric car charging stations, newspaper stands, etc. also needs to be carefully considered. Choose materials and styles for maximum durability, comfort, safety, security, and usability. The palette should illustrate how the streetscape will enhance the identity and character of the corridor and surrounding district in accordance with municipal requirements.

EXHIBIT 4.12 *Street Furnishings Located within the Furnishing and Extension Zones*



- Concentrate streetscape furnishings where pedestrians will benefit most from them. Furnishings will receive the most use and appreciation in predictable locations such as shaded areas of the street, transit stops, near intersection crossings and building entrances.
- Locate furnishings primarily in the furnishings zone, and secondarily in other areas, such as at curb bulbs at intersections, transit stops, and and where space permits.
- Integrate adjacent site furnishings with other streetscape elements to reduce clutter and creative a cohesive pedestrian environment.
- Furnishings can be located in the spaces at the block ends (curb extension areas) if the furnishings zone is narrow. When curb extensions/bulb outs are provided at mid-block—these spaces can support furnishings as well. Clustering furnishings at block ends and mid-block also will make it easier for passengers to access their parked vehicles.
- Providing good-quality street furniture will show that the community values its public spaces and is more cost-effective in the long run (i.e. more durable and vandal resistant; less maintenance required).

Exhibit 4.13 Streetscape Furnishings provides examples and placement guidelines for a variety of streetscape furnishings.

Meandering Sidewalks and Walkways

Sometimes, a meandering walkway is constructed, creating a planting strip with an informal, curving appearance. Although meandering walkways may look nice, they may not be the most efficient way of getting people from one place to another. They may also be misguiding to pedestrians with sight impairments who need better predictability.

If a meandering walkway is desired, minimize the number of curves to avoid creating a route that is too awkward and indirect. Meandering walkways can be used as a solution to avoid obstacles such as telephone poles, utility features, signs, etc. providing a smooth transition in the sidewalk alignment. Exhibit 4.14 illustrates a straight walkway and a walkway with a slight meander.

EXHIBIT 4.14 ***Straight vs. Meandering Walkways***

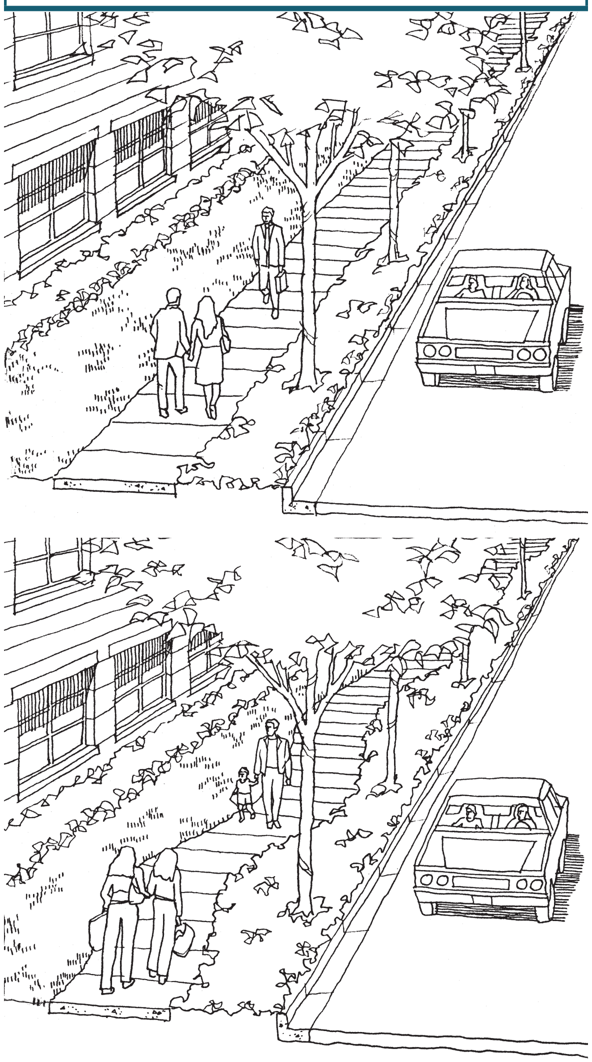
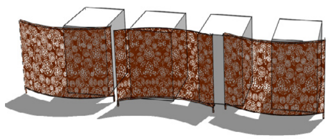


EXHIBIT 4.13 ***Streetscape Furnishings***

STREETSCAPE FURNISHINGS				
 	 	 	 	 
TREE GRATES AND GUARDS	CUSTOM MANHOLES/ UTILITY SCREENS*	KIOSKS/ PEDESTRIAN SIGNS	TRANSIT STOPS/ SHELTERS	DRINKING FOUNTAINS*
• When combined with tree pits/ boxes and good sub-structure, grates can provide enhanced growth environment • Grates maximize space on sidewalk • Guards only needed in areas where trees are susceptible	• Screens can hide unsightly elements • Add character and interest to the pedestrian realm	• Locate in key areas where pedestrians may change their route; pedestrian gathering areas, etc. • Should be professionally designed by graphic artists • Refer to Toolbox Section 2	• Maximize shade • Providing lighting for security • Can be customized with special designs, artist and community involvement	• Provide only in essential areas such as pedestrian gathering areas • Provide good drainage to avoid wet surfaces • Provide accessible height drinking fountains

*****Note: These elements may be located in special improvement districts or private developments.*

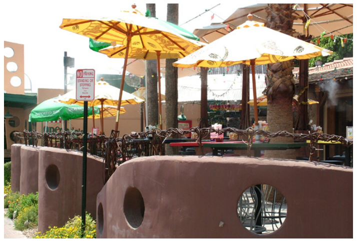
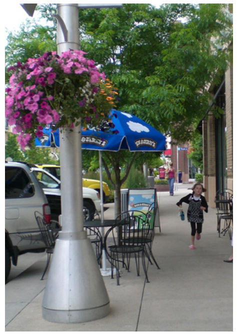
EXHIBIT 4.13 ***Streetscape Furnishings, Continued***

STREETSCAPE FURNISHINGS

BENCHES/ SEATING	BICYCLE RACKS*	BOLLARDS	TRASH/ RECYCLING RECEPTACLES	LEANING RAILS/ PROTECTION RAILING*
  	 	  	 	 
• Essential for pedestrian areas • Provide center/intermediate armrests on benches. • Wide variety of materials and styles • Low heat reflecting	• Essential for transit stops and at key bicycling destinations • See Bicycle Parking in Chapter 5	• Delineate pedestrian space. • Provide protection from vehicle movements. • Can be lit or unlit. • Keep height in scale with pedestrians.	• Street/pedestrian realm stay cleaner. • Coordinate recyclable containers with municipality programs. • Wide array of styles, colors, materials	• Provide protection from vertical drops of 30 in or more • Leaning rails are popular at transit stops

**Note: These elements may be located in special improvement districts or private developments.*

EXHIBIT 4.13 ***Streetscape Furnishings, Continued***

STREETSCAPE FURNISHINGS				
 	 	 	 	 
TABLES AND CHAIRS/ SIDEWALK CAFES*	HANGING BASKETS, BANNERS/ PEDESTRIAN LIGHTING	PLANTING BOXES/ POTS	PUBLIC ART	OTHER AMENITIES*
• Usually provided by adjacent property owners/businesses • Pedestrians prefer movable seating options • Shade is essential	• Add color, life, identity to the streetscape • Maintain horizontal and vertical clearances • Pedestrian-scale lighting enhances nighttime walkability	• Add color, life • Maintain horizontal and vertical clearances • Maintenance needs should be considered	• Adds character, enlivens the streetscape • Can be interactive; attracts pedestrians • Locate in special places • Can help with wayfinding • Involve local/regional artists	• Custom designed shade shelters, street clocks, and other elements add unique identity to the streetscape

**Note: These elements may be located in special improvement districts or private developments.*

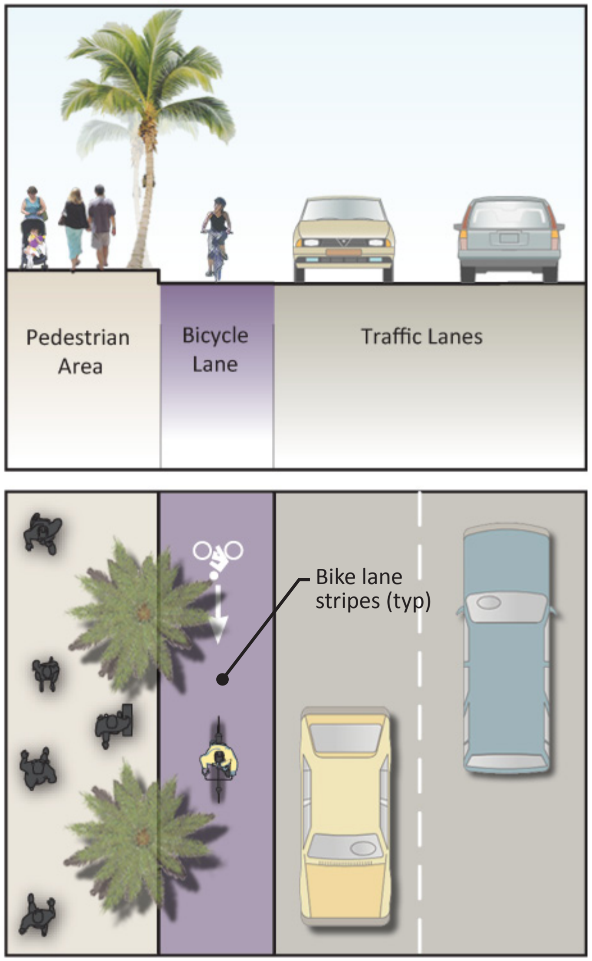
Bicycle Use Adjacent to and within the Streetside Pedestrian Realm

Bike lanes are beneficial for pedestrians because they provide an additional buffer between pedestrians and motor vehicles. Providing bicycle facilities and pedestrian facilities on streets, roadways, and highways helps to fulfill Hawaii's commitment to creating complete streets.

Bicycle facilities should be designed in accordance with the AASHTO Guide for the Development of Bicycle Facilities, Bike Plan Hawaii, and local jurisdiction standards and guidelines.

When bike lanes are located adjacent to the edge/curb zone, provide adequate clearance/ shy distance from signs and other elements in the edge zone. Consider that bicyclists will ride as close the curb as possible and handle bars may come close to or overhang the curb edge. Bike lanes are typically located at the same level as the street grade, separated from the pedestrian realm by a curb. Exhibit 4.15 illustrates how a bike lane provides an additional buffer between pedestrians and motor vehicles.

EXHIBIT 4.15 Bike Lanes as Separation



Bicycles on Sidewalks

In the state of Hawaii, bicycles may be ridden on the sidewalk outside of business districts and Waikiki, at a speed of ten miles per hour or less provided that the bicyclists yield to any pedestrians (HRS 291C-148(b), ROH 15-4.6).

Bicyclists come in all ages and abilities. It is common for children to use sidewalks and walkways for riding smaller bicycles, tricycles, scooters, and other foot powered devices. Where this activity is anticipated, provide extra width in the pedestrian path of travel where feasible.

Higher speed, commuter bicyclists tend to prefer to travel in facilities in the street and normally would not use sidewalks, unless forced to. When adequate bicycling facilities are lacking, it is more common to see bicyclists using sidewalks and walkways, facilities that really have been designed for pedestrian-use only.

When higher-speed bicyclists use sidewalks and walkways that have not been designed for shared use, problems and conflicts with pedestrians can occur. A variety of safety concerns arise. The best solution is for bicyclists to have their own dedicated space within the street right-of-way unless a properly designed shared use path is provided within the right-of-way.

Some of the concerns related to bicyclists using sidewalks include the following:

- Motorists do not expect to see bicyclists on sidewalks and may pull out of intersections and driveways and collide with a bicycle.
- Sight distances are more limited along sidewalks for bicyclists and at driveway crossings for motorists. There may also be limited sight distance and clearances due to signs, utilities, landscaping, fencing, or other obstacles beside or protruding into the sidewalk.
- The potential for conflicts between bicyclists and pedestrians greatly increases in areas of shared use, such as sidewalks and non-delineated walkways. Pedestrian movements are often unpredictable for an approaching bicyclist from behind (especially those of small children), and pedestrians cannot always predict the direction an oncoming bicyclist will take.
- Bicyclists and pedestrians travel at different speeds. For example, pedestrians coming out of storefronts have little opportunity to see an oncoming bicyclist.
- When prohibiting bikes in areas of high pedestrian volume areas, such as business districts, proper warning signs are needed.
- According to Bike Plan Hawaii, sidewalks should only be used as bikeways under very limited circumstances.
- There is a need to provide bikeway continuity along high speed or heavily traveled roadways with inadequate space for bicyclists. In these situations, the best solution is a properly designed and adequately wide shared use path. However, as an interim solution, when there are no other bicycle facilities, the shared use of existing sidewalks and walkways can be considered. These segments should be signed so that pedestrians and bicyclists will be made aware of the shared use.

Small children often ride their bikes and push scooters on sidewalks.

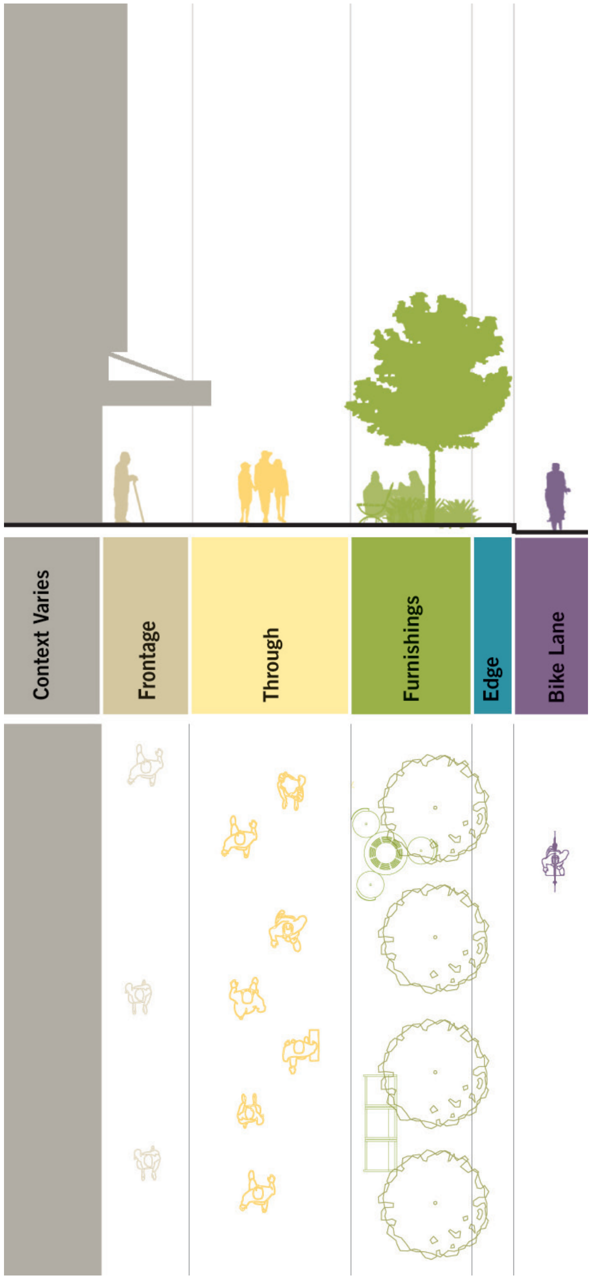


EXHIBIT 4.16 ***Functions of the Pedestrian Realm Zones Including a Bike Lane***

Frontage	Through	Furnishings	Edge	Bike Lane
Area along the right-of-way that functions to provide space between the building façade, wall or fence and the through zone of the sidewalk	Obstacle-free space for clear pedestrian through travel that is often the primary walking area of the sidewalk	Primary buffer space between the active pedestrian walking area of the through zone and adjacent throughfares	Interface between the on-street parking or motor vehicle travel lane	
		Extension		
		Additional space for pedestrians and streetscape elements		

- On long, narrow bridges, where no bike lanes are available or shoulder widths are inadequate to accommodate bicyclists, they may be forced to share the sidewalk space with pedestrians. If bicyclists are to share sidewalks across bridges they should either be encouraged to dismount and walk as a pedestrian (unless the facility meets width requirements for shared use paths. See Toolbox Section 7). Providing ramps at the sidewalk approaches on both ends of the bridge allows bicyclists to more conveniently roll their bikes up onto the sidewalk after they have dismounted to walk across.

Curbing and Concrete Barriers

Curb and Gutter/Vertical Curb

Curb and gutter provides two primary functions: 1) control of stormwater drainage, and 2) vertical separation between motor vehicles and pedestrians. Curbs are often required on streets where efficiently controlled drainage is a necessity.

Curb and gutter/vertical curb provide a non-mountable barrier adjacent to street parking that prevents cars from parking on adjacent sidewalks. Curbs provide a physical barrier between moving vehicles and pedestrians, although curbs have limited ability to stop high speed vehicles.

Curbs can be costly to construct, so they may not be practical to build in all areas. Curbs also have an urban-looking appearance, which may not be desirable in some areas, where a more natural-looking rural roadside appearance is desired. A sidewalk adjacent to curb and gutter is illustrated in Exhibit 4.17.

Concrete Barriers

Concrete barriers (also called Jersey barriers) are occasionally used as a protective separation device between roadways and pedestrian travel ways, although their primary purpose is to shield and direct vehicles away from potential hazards. Another benefit of concrete barriers is that they can guide pedestrians to where they should cross the road. The AASHTO Roadside Design Guide provides more information on barrier placement and design.

Per the HDOT, concrete barrier height shall be a minimum of 32”. Short lengths of barriers are discouraged. Where a barrier is needed in two

Example of extruded curbing. See page 4-36 for cautions related to extruded curbs.

Example of a concrete barrier protecting a pedestrian way

or more closely spaced locations, continuous barriers shall be provided. End treatment design of concrete barriers shall include guard rail, flares, accentuators, etc. as required. (Refer to HDOT and AASHTO standards.)

Concrete barriers have some potential drawbacks. They tend to collect litter, fallen leaves and debris along the roadside and could become a barrier to drainage if placed improperly. Concrete barriers cost significantly more than curbing, and may not be the most visually appealing solution.

The ITE manual, Design and Safety of Pedestrian Facilities, provides some guidance about when it is necessary to provide pedestrian barriers. Vertical concrete surfaces adjacent to pedestrian facilities should be smooth to avoid snagging of clothing or abrasive injuries from contact with the surface. Bolts or other protrusions from walls, railings, or barriers need to be cut off flush to the surface or recessed.

Strongly Discouraged Edge Treatments

ROLLED CURB

Rolled curb is a mountable type of curb design traditionally used in suburban neighborhoods. Rolled curb has provided advantages to developers in that it eliminates the need for individual driveway cuts. However, rolled curb often presents a hazardous situation when used along sidewalks. Since rolled curbs are easily mountable by motor vehicles, drivers can easily drive onto sidewalks and often park up on top of the curb and block the sidewalk. Rolled curbs do not provide as strong a barrier as vertical curb between pedestrians and vehicles and should be avoided. A sidewalk with rolled curb is illustrated in Exhibit 4.17.

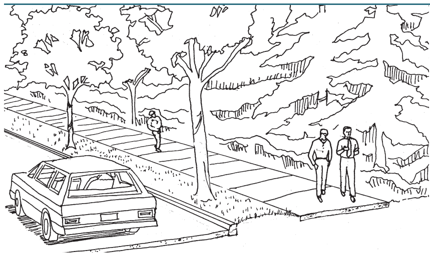
EXTRUDED CURBING

In suburban and rural areas, it is common to see extruded curb or other linear devices used to separate roadways from walkways. Although not a recommended practice today, these facilities historically have been placed along paved or unpaved walkways that are on the same grade as the adjacent roadway. Extruded curb have historically provided a relatively low cost vertical barrier between vehicles and pedestrians. However, there are several drawbacks to this type of edge treatment, and their ongoing use is generally not recommended. Strong consideration of the following problems is recommended before installing extruded curbing:

- Extruded curbs break down easily when hit by motor vehicles, increasing the need for frequent repair and replacement. Sometimes this type of curbing has difficulty staying attached to the pavement surface.
- These may become a barrier to drainage if designed and located improperly and tend to collect litter, fallen leaves, and debris along the roadside. (Breaks in the curbing at strategic locations will help, but maintenance is still more difficult than other types of curbing).
- Unless backfilled, extruded curbing can become an obstacle to pedestrian and bicycle travel as a raised element on the surface. The use of this type of curbing adjacent to bicycle lanes is strongly discouraged, unless placed outside the clearance area at the outside of edge of the bike lane. A minimum clearance of 2 ft (0.6 m) adjacent to a 5 ft (1.5 m) bike lane is recommended, creating a total lane width of 7 ft (2.1 m).

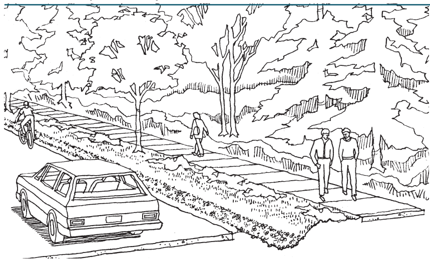
EXHIBIT 4.17 ***Street Separation and Edge Treatment Options***

CURB WITH PLANTING STRIP



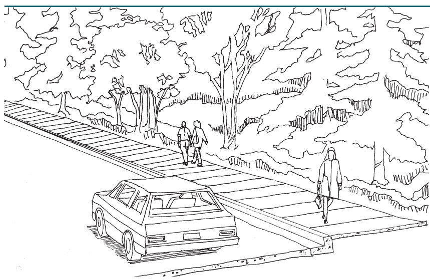
	PROS	CONS
	• Separation between pedestrians and street traffic • Pedestrian comfort • Ecological benefits • Natural drainage opportunities	• Maintenance is required, and varies depending on type of landscape selected • If not designed and maintained properly, landscaping may hinder visibility and cause security problems • Root growth can sometimes damage adjacent paved surfaces if not protected

NO CURB, DITCH/SWALE AND PLANTING STRIP



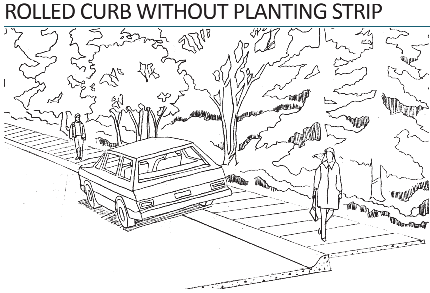
	PROS	CONS
	• A larger separation between pedestrians and street traffic • Natural drainage opportunities	• Maintenance is required, and varies depending on type of landscape selected • Can collect trash and debris

CURB WITHOUT PLANTING STRIP



	PROS	CONS
	• Controls stormwater drainage • Separation between pedestrians and street traffic • Prevents cars from parking on sidewalk	• Can be costly to construct • Urban-looking appearance may not always be desired

ROLLED CURB WITHOUT PLANTING STRIP



	PROS	CONS
	• Eliminates need for individual driveway cuts (for developers)	• Hazardous to pedestrians because easily mountable by motor vehicles • Drivers often park on curb and block sidewalk. • A weak separation betewen pedestrians and motor vehicles

Side Slopes, Railings, and Walls

Careful design treatment of areas adjacent to sidewalks and walkways, such as side slopes, railings, and walls, is important for pedestrian safety and comfort.

Edge side-slopes steeper than 3 horizontal to 1 vertical should be treated as a drop off condition and a safety rail should be provided. A level area of 4 ft wide at a minimum is recommended along sidewalks and walkways where feasible.

The International Building Code requires a safety rail for vertical drops of 30 in (76.2 cm) or more. Other situations that should be examined for safety rails include slopes in excess of 2 horizontal to 1 vertical adjacent to a pedestrian path, located less than 4 ft (1.2 m) from the edge of the walkway.

Railing height along sidewalks, walkways and shared use paths is a minimum height of 3.5 ft (1.1 m). All handrails must comply with ADAAG and PROWAG. Safety rail or railing, sometimes referred to as pedestrian guardrail, is provided to protect pedestrians from vertical drop-offs or steep slopes. Safety railing used in conjunction

Special wall treatments help to mitigate the mass of blank walls along the Burke-Gilman Trail, SR 522, Kenmore, WA.

with pedestrian or bicycle travel is different than guardrail used in roadway design.

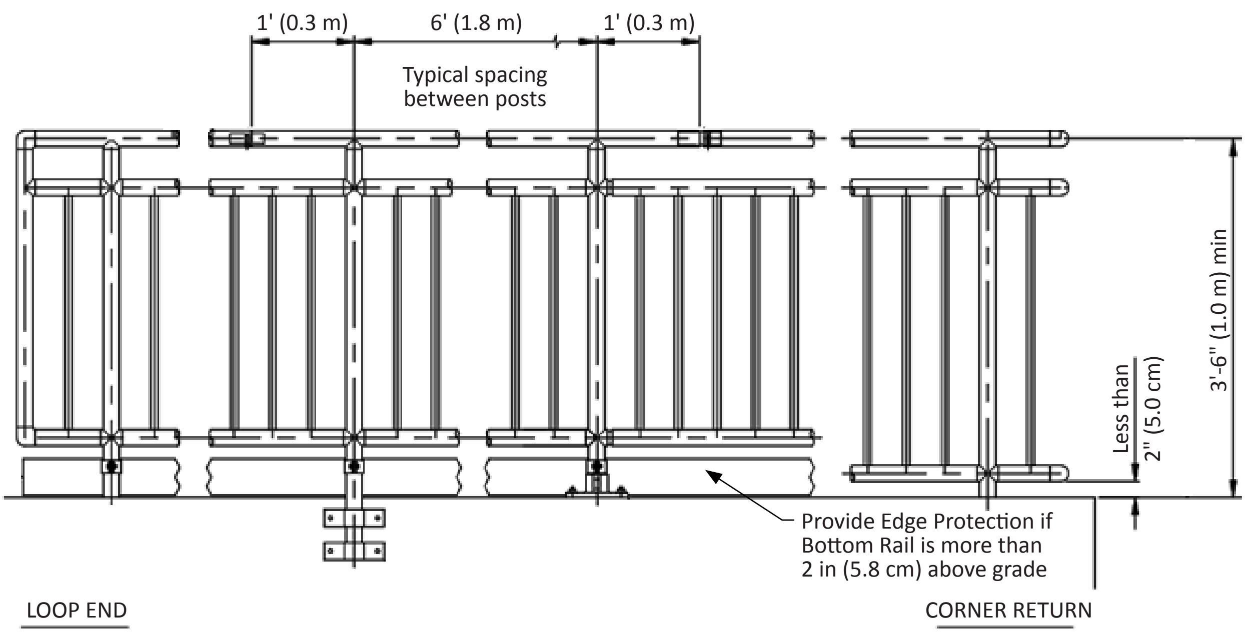
Determining the Need for Safety Railing

In areas where pedestrians are expected, regardless of frequency, the International Building Code requires safety railing for vertical drop-offs of 30 in (76.2 cm) or more. In situations where a drop-off is not adjacent to a pedestrian path, but is within a reasonable distance, the designer should determine whether a safety rail is needed on a case-by-case basis. Other situations that should be examined for including safety rail include:

- Slopes in excess of 2:1 adjacent to a pedestrian path (adjacent means located within 4 ft (1.2 m) or less from the path
- Sloped surfaces consisting of rough materials, such as revetment, adjacent to a pedestrian path
- The presence of traffic or a body of water at the bottom of a slope adjacent to a pedestrian path

EXHIBIT 4.18 *Wall Design Treatments*

EXHIBIT 4.19 *Typical Safety Rail/Type 1 Guardrail (Pedestrian)*



Safety Railing Design

All safety railing must be designed to comply with current ADA Accessibility Guidelines (ADAAG) and the International Building Code. Refer to Exhibit 4.19 for an example of typical safety railing design that meets these requirements. These requirements include the following:

- Top rail should be located minimum 3 ft-6 in (1.0 m) above grade adjacent to pedestrian areas and shared use paths and bicycling paths.
- Pickets and intermediate posts in the railing shall be designed such that a maximum size sphere of 4 in diameter cannot pass through any opening up to a height of 34 in (86.4 cm).
- Above 34 in (86.4 cm) to the height of the top rail, a maximum size sphere of 8-in diameter shall not pass through. (Note: the entire rail system can be designed so that a sphere of 4 in diameter cannot pass through openings, if desirable.)

Decorative railing example - "Big Flowers", designed by Jean Whitesavage and Nick Lyle.

Safety rail along a waterfront area

- The triangular openings formed by the riser, tread, and bottom rail at the open side of a stairway shall be of a size such that a sphere of 6 in diameter or greater cannot pass through the opening.

Railings and screens can be designed to be attractive, incorporating public art elements, aesthetically enhancing the pedestrian realm.

Because a mass of vertical walls can be imposing to pedestrians, designers should avoid high retaining walls immediately adjacent to sidewalks and walkways. The effect of retaining walls can be "softened" along pedestrian areas by terracing back on the slope with lower walls (when right-of-way is available) and providing landscaping. Avoid blank wall faces. Provide an attractive finish and texture, or screen with trellises and climbing plants.

Also refer to Exhibit 7.13 in Toolbox Section 7—Shared Use Paths.

Ongoing Sidewalk Maintenance

Well maintained sidewalks enhance pedestrian safety and mobility. Refer to Toolbox Section 11—Safety in Work Zones and Maintenance.

Other Resources

Refer to the following sources of information for additional guidance.

- American Association of State Highway and Transportation Officials (AASHTO). *A Policy on the Geometric Design of Highways and Streets, 5th Edition.* 2004.
- 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.
- Bain, L., Gray, B., and Rodgers, D. John Wiley & Sons. *Living Streets—Strategies for Crafting Public Space.* 2012.
- City of Seattle. *Creating a Thriving Business District: A Guide to City and Neighborhood Business District Resources, 5th Edition.* 2007.
- Ewing, R., *Pedestrian and Transit-Friendly Design: A Primer for Smart Growth.* R. Ewing for Smart Growth Network in Florida, 1999. **http://www.epa.gov/smartgrowth/pdf/ptfd_primer.pdf** (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.
- Federal Highway Administration. *Informational Report on Lighting Design for*

Midblock Crossings. 2008. ***www.fhwa.dot.gov/publications/research/safety/08053/index.cfm*** (May 2013).

- Federal Highway Administration. *Manual on Uniform Traffic Control Devices.* 2009.
- Federal Highway Administration, *Priorities and Guidelines for Providing Places for Pedestrians to Walk along Streets and Highways.* 2000.
- Institute of Transportation Engineers, *Designing Walkable Urban Thoroughfares: A Context Sensitive Approach.* 2010.
- Institute of Transportation Engineers, Traffic Engineering Council Committee TENC-5A-5, Zegeer, Charles V. (Chair). *Design and Safety of Pedestrian Facilities, A Recommended Practice of the Institute of Transportation Engineers.* 1998.
- Jacobs. Allen B. *Great Streets.* MIT Press. 2001
- Jacobs, Allen B., MacDonald, Elizabeth, and Rofe, Yodan. *The Boulevard Book: History, Evolution, Design of Multiway Boulevards.* MIT Press. 2003.
- National Association of City Transportation Officials (NACTO) Urban Bikeway Design Guide. 2011.
- National Complete Streets Coalition. ***www.completestreets.org*** (May 2013).
- New York City Department of Transportation. *Street Design Manual.* 2009.
- New Zealand Transport , Lester, T. *Public Lighting for Safe and Attractive Pedestrian Areas.* Agency Research Report 405. 2010.
- Oregon Department of Transportation and Oregon Department of Land Use and Conservation. Transportation Growth Management Program. *Main Street—When a Highway Runs Through It* (Main Street Handbook). 1999
- Public Rights-of-Way Access Advisory Committee (PROWAAC) to the US Access Board. *Special Report: Accessible Public Rights-of-Way Planning and Design for Alterations.* ***http://www.access-board.gov/prowac/alterations/guide.htm*** (May 2013).
- Seattle Right-of-Way Improvements Manual, City of Seattle, Washington—online access: ***http://www.seattle.gov/transportation/rowmanual/manual/4_21.asp*** (May 2013).
- US Access Board. *ADA Accessibility Guidelines for Buildings and Facilities* (ADAAG). ***http://www.access-board.gov/adaag/html/adaag.htm*** (May 2013).
- US Access Board *Public Rights-of-Way Accessibility Guidelines* (PROWAG). Draft-rulemaking in process. ***http://www.access-board.gov/prowac/*** (May 2013).
- US Access Board. Sidewalk videos. ***http://www.access-board.gov/news/sidewalk-videos.htm*** (May 2013).
- US Architectural and Transportation Barriers Compliance Board: *Accessible Rights-of-Way: A Design Guide.* 1999.
- Washington State Department of Transportation. *State Highways as Main Streets: A Study of Community Design and Visioning.* 2009.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