TOOLBOX SECTION

2

Pedestrian-Friendly Streets

Streets are important public resources in communities—often places for parades, marathons, volksmarches, demonstrations, fairs, and festivals.

PEDESTRIAN-FRIENDLY STREETS

This toolbox section provides best practices recommendations related to planning and design of pedestrian-friendly streets. Guidance is provided for general street design, as well as for elements of streets that affect pedestrian travel (such as on-street parking, access management, traffic calming, and other topics). This toolbox section describes some of the most important characteristics of pedestrian-friendly streets, which will help communities and developers interested in creating more walkable settings. More specific design guidance for sidewalks and walkways is provided in Toolbox Section 4.

What are Pedestrian-Friendly Streets?

Pedestrian-friendly streets are often the most attractive and memorable streets in our communities. They are full of life and activity. Pedestrians are attracted to these streets not only because they are safe and accessible, but also because they are interesting places. They are the places people love to stroll, meet others, and go about their daily business.

Our streets and roadways are important public resources. In urban areas and village centers, the public street network often amounts to 40 percent or more of the total land area.

Streets need to be planned and designed to accommodate all modes of transportation. But pedestrian-friendly streets in particular should be designed with pedestrians as a high priority.

Awaiting a parade in Chinatown, Honolulu

IN THIS SECTION

Lahaina, Maui

Downtown Honolulu, Oahu

Various types of pedestrian-friendly streets are found in communities throughout the United States and abroad. "Complete streets," "sustainable streets," "green streets"—streets may be known by various names, and pedestrian-friendly streets possess many of the same characteristics as these types of streets. Most importantly, they convey a strong sense of place, and accommodating pedestrians is the main focus. Typical characteristics found along pedestrian-friendly streets are listed in Exhibit 2.1.

Roadway/Street Classifications

The design of roadways and streets varies depending on the width of the right-of-way, the function of the street, adjacent and nearby land uses, and the different modes of transportation that need to be accommodated. Some streets are wider, such as arterials, and carry more traffic, while others are narrower, such as local neighborhood streets, and carry less traffic. Street classifications can be a mechanism for organizing and classifying elements within the right-of-way, including pedestrian improvements and facilities. Different streets serve different purposes, and the types of pedestrian facilities and widths of sidewalks provided will vary depending on the purpose of the street.

The Hawaii Department of Transportation (HDOT) recognizes the Federal Highway Administration (FHWA) functional classification codes. Guidance related to sidewalk dimensions and locations for various roadway classifications is found in Toolbox Section 4—Sidewalks and Walkways.

Complete Streets

Complete streets share many of the same characteristics as pedestrian-friendly streets. They are planned, designed, operated and maintained to enable safe, attractive, and comfortable access and mobility for ALL users including pedestrians, bicyclists, transit users, motorists and persons of all abilities. In 2009, the Hawaii State Legislature passed Complete Streets legislation (Act 54) requiring HDOT and county transportation departments to ensure the accommodation of all users of the road, regardless of their age, ability, or preferred mode of transportation.

HDOT's Complete Streets Policy serves as a framework for implementing complete streets throughout Hawaii to allow the State and County systems to better serve all transportation users. It envisions a statewide transportation system that reasonably accommodates convenient access and mobility for all users of public highways, roadways, and streets statewide, including pedestrians, bicyclists, transit users, motorists, and persons of all ages and abilities while providing the safe and efficient movement of people and goods. The application of such transportation improvements, whether new construction or reconstruction, shall be context sensitive and complement the surrounding area, land use, and community. Every transportation project will provide the opportunity to apply complete streets principles in Hawaii.

Complete Streets principles will serve Hawaii's pedestrians. Key principles include:

1. ***Safety***—Plan, design, and construct transportation facilities and land developments to create an environment that reduces risk and supports the safe movement of people and goods by all modes.

EXHIBIT 2.1 Typical Characteristics of Pedestrian-Friendly Streets

Sufficiently wide and continuous sidewalks or separated walkways	Clear delineation and direction for pedestrians (special paving at edge of pedestrian area, easy-to-reach signal actuators, etc.)
Sidewalks and intersection improvements designed to accommodate accessibility needs (curb ramps, pedestrian signals, etc.)	Public spaces and pedestrian "pockets" adjacent to the main pedestrian travel way provide places to rest and interact (sidewalk cafes, benches, etc.)
Streets that are interconnected on a smaller grid to promote pedestrian access and mobility	Planting buffers, with landscaping and street trees provide shelter and shade without obstructing sight distances and help to soften the surrounding buildings and hard surfaces
Narrow lane widths and narrower streets that are scaled down for pedestrians and less conducive to high vehicle speeds (Note: street trees at the sides of streets create the perception of a narrower roadway.)	Street lighting at pedestrian scale (shorter light poles with attractive fixtures are effective in illuminating the pedestrian travel way but not obtrusive or harsh)
On-street parking where feasible	Awnings/covered building entrances and shade structures shelter pedestrians from adverse weather (particularly in transit areas)
The number of driveways is reduced/consolidated to minimize crossings/potential conflicts with pedestrians	Lively building and wall faces provide architectural relief, windows, or attractive surfacing
Traffic calming devices are provided to slow traffic, or if appropriate, reduce speed limits	Signs, information kiosks, maps and other elements help pedestrians find their way
Bus routes provide frequent service, special bus lanes, and bus pullouts	Street furnishings, such as benches, garbage receptacles, drinking fountains, and newspaper stands are provided in the furnishings/planter zone
Physically-separated or marked bicycle lanes (designated cycle facilities)	Public art, murals, banners, sculpture pieces and water features add character and a sense of place
Median refuge islands provide safe areas for crossing pedestrians	Colorful planters, holiday lighting, and other attractive features add color and life
Mid-block crossings and related improvements	
Curb extensions at intersections and mid-block crossings	

SUSTAINABLE STREETS

Through a variety of design and operational treatments, sustainable streets may give priority to pedestrian, bicycle, and transit use, and also may emphasize ecologically-friendly treatments. The treatments may include sidewalk widening, landscaping, traffic calming, sustainable materials, and other pedestrian-oriented features. The purpose of a Sustainable Street is to enhance and expand public open space, and to reinforce desired land use and transportation patterns on appropriate street rights-of-way.

2. ***Flexible Design (Context Sensitive Solutions [CSS])***—Design transportation facilities using best practices that integrate community values and recognize the importance of the surrounding context and environment.

3. ***Accessibility and Mobility for All***—Plan and design transportation facilities for ease of use and access to destinations by providing an appropriate path of travel for all users, and enhance the ability to move people and goods throughout the state and its counties.

4. ***Use and Comfort of All Users***—Ensure all users of all abilities including bicyclists, pedestrians, transit riders, and drivers feel comfortable and safe using the transportation system.

5. ***Health***—Recognize the health benefits in providing alternative mode choices.

6. ***Green Infrastructure/Green Streets***—Use trees and landscaping as integral components of a Complete Street to provide both human and ecosystem benefits, such as shade, to reduce the urban heat island effect, vegetation for carbon sequestration, reducing/filtering non-point source pollution and sediments, retaining stormwater, increasing groundwater recharge, and providing wildlife habitat.

On this Complete Street the pedestrian environment is improved with wide sidewalks, curb extensions, pedestrian traffic signals, and on-street parking. (CompleteStreets.org)

Sustainable Streets

Sustainable Streets often combine the practices of Complete Streets, Great Streets, Green Streets and the intent of the National Environmental Policy Act (NEPA). Opportunities for sustainable solutions in street and roadway rights-of-way bring benefits for business, people, and nature. Business is enhanced with aesthetic and site access improvements. People are accommodated with traffic and pedestrian safety improvements, and nature is carefully considered through stormwater management and the addition of green spaces.

The following are objectives of sustainable streets:

- ***Reduce Energy Consumption***—Support non-motorized travel and energy efficient movement of people and goods. Use resources with lower operations and maintenance requirements.
- ***Reduce Consumption of Material Resources***—Use recycled materials in construction. Require less infrastructure in solutions. Increase durability and life of design solutions.
- ***Reduce Impacts to Environmental Resources***—Minimize the impact on the natural environment. Encourage and support biodiversity. Reflect the historical and cultural context.
- ***Support Healthy Urban Communities***—Incorporate features that support community and livability, support public services and adjacent land use, and enhance public health, safety, and security.
- ***Support Sustainability During Implementation***—Support local economic, social and resource management needs during construction. Reduce environmental and community impacts during construction.

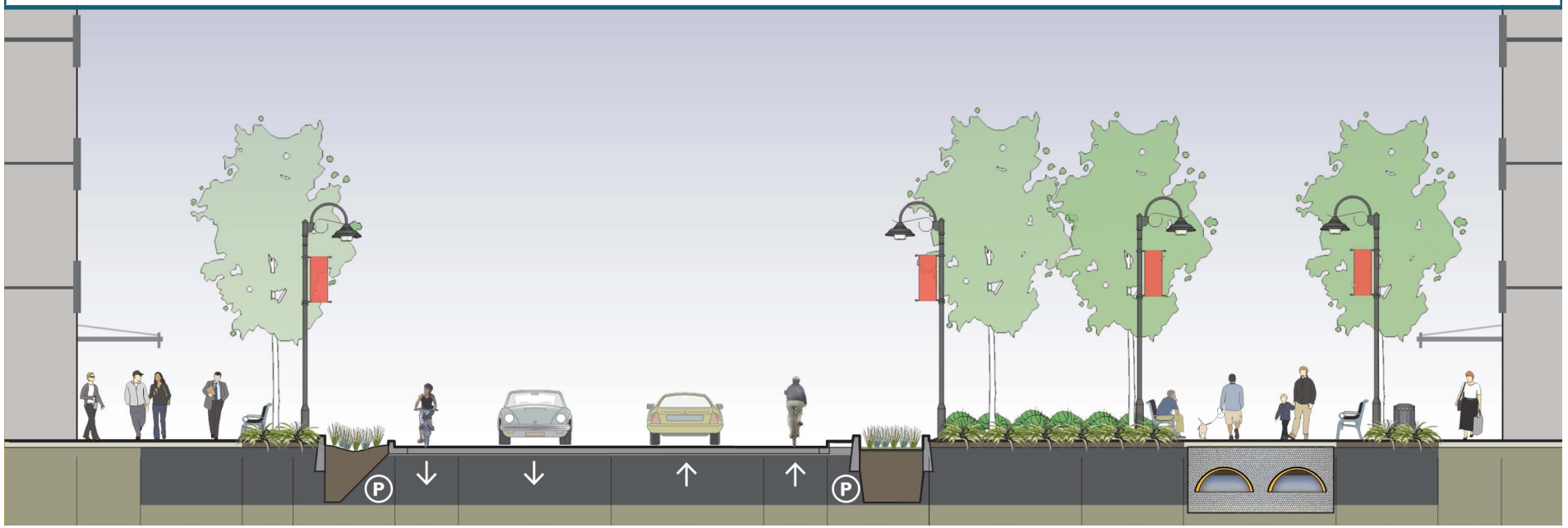
Green Streets

Green streets commonly integrate treatments to reduce stormwater runoff and associated pollutants. These may include rain gardens, filter planting strips, and other features. Stormwater planting and rain gardens next to sidewalks need to be carefully designed. Adequate width of the adjacent sidewalk should be provided to support the level of pedestrian use. With recessed planters, a raised edge wall or curb along the edge should be provided as a safety measure. Green streets may

Stormwater planters in Ontario, Canada

Shared streets can be designed without curbs. Large granite bollards take the place of curbs in this example from Chinatown Portland, Oregon.

EXHIBIT 2.2 Example of a Green Street with Integrated Stormwater Features



also transform some impervious surfaces within the right-of-way into landscaped green spaces that capture stormwater runoff and let water soak into the ground, as plants and soil filter pollutants. A common example is the installation of rain gardens within curb extension areas near intersections and mid-block crossings. These features slow the flow of environmentally-detrimental runoff by reducing impervious surfaces. The techniques aim to return the streetscape as closely to its pre-development water-absorbing state as possible.

Shared Streets/Woonerfs

"Woonerf" is the Dutch name for a 'living street' in which the needs of motorists are secondary to the needs of all users of the street as a whole. This type of street functions as a "shared space" that may be used by pedestrians, playing children, bicyclists, low-speed motor vehicles, and sometimes vendors. In such applications, the street becomes a public place for people instead of a single-purpose conduit for automobiles. In a woonerf or shared street, vehicles may not impede pedestrians, who in turn may not unreasonably hinder the progress of drivers. These streets are typically narrower and all travel modes share the same paved surface so that there are no defined travel lanes. They often have a surface paved with unit pavers or colored concrete to differentiate from other types of streets. They are often constructed all at one level, without curbs or with minimal curbs, tactile warning strips, and other features to define edges.

Often seen in European cities, shared streets are now much more common in cities across North America. Many cities and communities use shared streets as flexible public space. They may close these street segments during festivals and special events, such as St. Patrick's Day or Mardi Gras. Shared streets can also serve as focus areas for street vendors and farmers markets. They may doubly share as pedestrian plazas or transit waiting areas. Shared streets are commonly an urban application—integrated into areas of cities where there is heavy pedestrian and multimodal traffic. They can also be found in the core of many small town centers and village squares.

Roadway/Street Elements

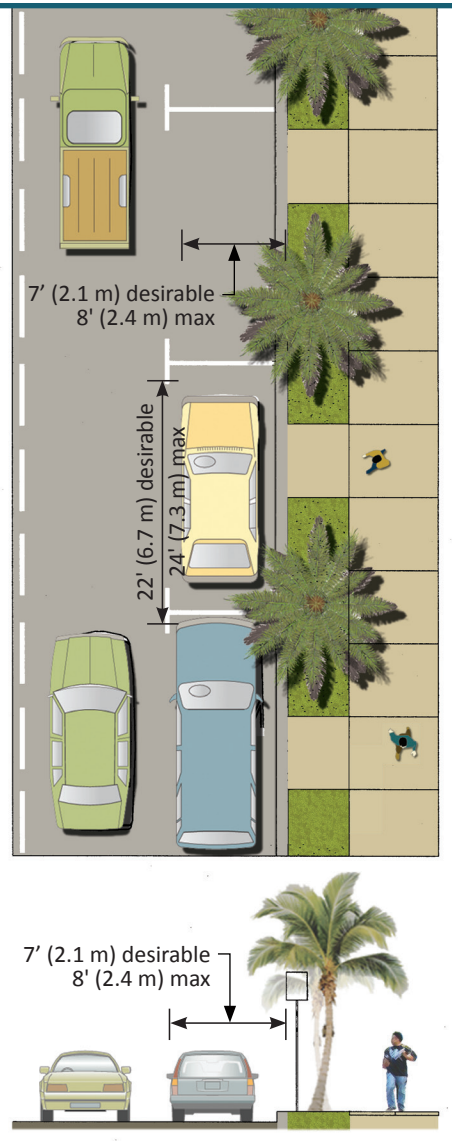
Pedestrian design considerations for roadways and streets are described below.

On-Street Parking

On-street parking can be beneficial for pedestrians because it provides a buffer zone between the roadway and the sidewalk, and its presence tends to reduce vehicle speeds. This includes on-street parallel parking and angled parking. On-street parking is often provided in urban areas and town centers. It allows people to access the sidewalk and adjacent businesses directly from their vehicles, and it increases street activity. For these reasons, on-street parking is often supported in business and shopping districts, neighborhoods, and other high activity areas. Exhibit 2.3 illustrates how on-street parking provides a buffer between street traffic and pedestrians.

On-street parking may present problems when there is not enough space for people to safely get out of their cars or walk between cars. On roadways where there are neither adjacent pedestrian facilities nor delineated crossings, parking is not desirable because pedestrians may be forced to walk in the roadway to get to their destination. They may also cross at several points along the roadway. A common cause of crashes is the lack of visibility of pedestrians entering the roadway from between parked cars. For example, informal on-street parking adjacent to a park or ball field can be hazardous due to the high numbers of children who are not paying attention to traffic conditions.

EXHIBIT 2.3 ***On-street parking acts as a buffer between street and pedestrian walkway. Periodic curb ramps along a planting strip can facilitate pedestrian access onto the sidewalk.***



ON-STREET PARKING DESIGN

The Institute of Transportation Engineers (ITE) Design and Safety of Pedestrian Facilities recommends:

- *Restricting parking within 50 ft (15.2 m) of all intersection and mid-block crossings where the speed of travel is 35 to 45 mph (56 to 72 km/h) and within 100 ft (30.5 m) of crossings on streets where the speed of travel is above 45 mph (72 km/h);*
- *A setback of less than 50 ft (15.2 m) is desirable with 20 ft (6.1 m) minimum in central business districts, downtowns, or areas where travel speeds are typically slower (25 to 35 mph or less) and at signalized intersections or crossings; and*
- *A setback distance of 100 ft (30.5 m) may also be appropriate:*
  - *— near schools where many children are crossing;*
  - *— at intersections or crossings that are not signalized; and*
  - *— on roadways with higher speed limits and elements that affect sight and stopping distances (curves, bridges, vegetation, etc.).*

DESIGN OF ON-STREET PARALLEL PARKING

The American Association of State Highway and Transportation Offices (AASHTO) Green Book indicates a desirable width of 8 ft (2.4 m) for on-street parking, but allows flexibility. Some communities may use a minimum width of 7 ft (2.1 m) for on-street parallel parking stalls. A general rule of thumb is that the narrower the width of the stalls, the closer people will tend to park to the curb. The stall length for on-street parking spaces is typically 22 to 24 ft (6.7 m to 7.3 m). Reducing excessive length in stalls to fit many of today's smaller vehicle sizes can bring benefits, such as opportunities to add curb extensions at pedestrian crossings, as well as landscaping and stormwater treatment areas.

In all cases, it is important that parallel parking stalls provide adequate space for pedestrian movement around the parked car without forcing pedestrians into the stream of traffic. (Also see Toolbox Section 3—Accessibility for on-street accessible parking design guidelines).

DESIGN OF ON-STREET ANGLED PARKING

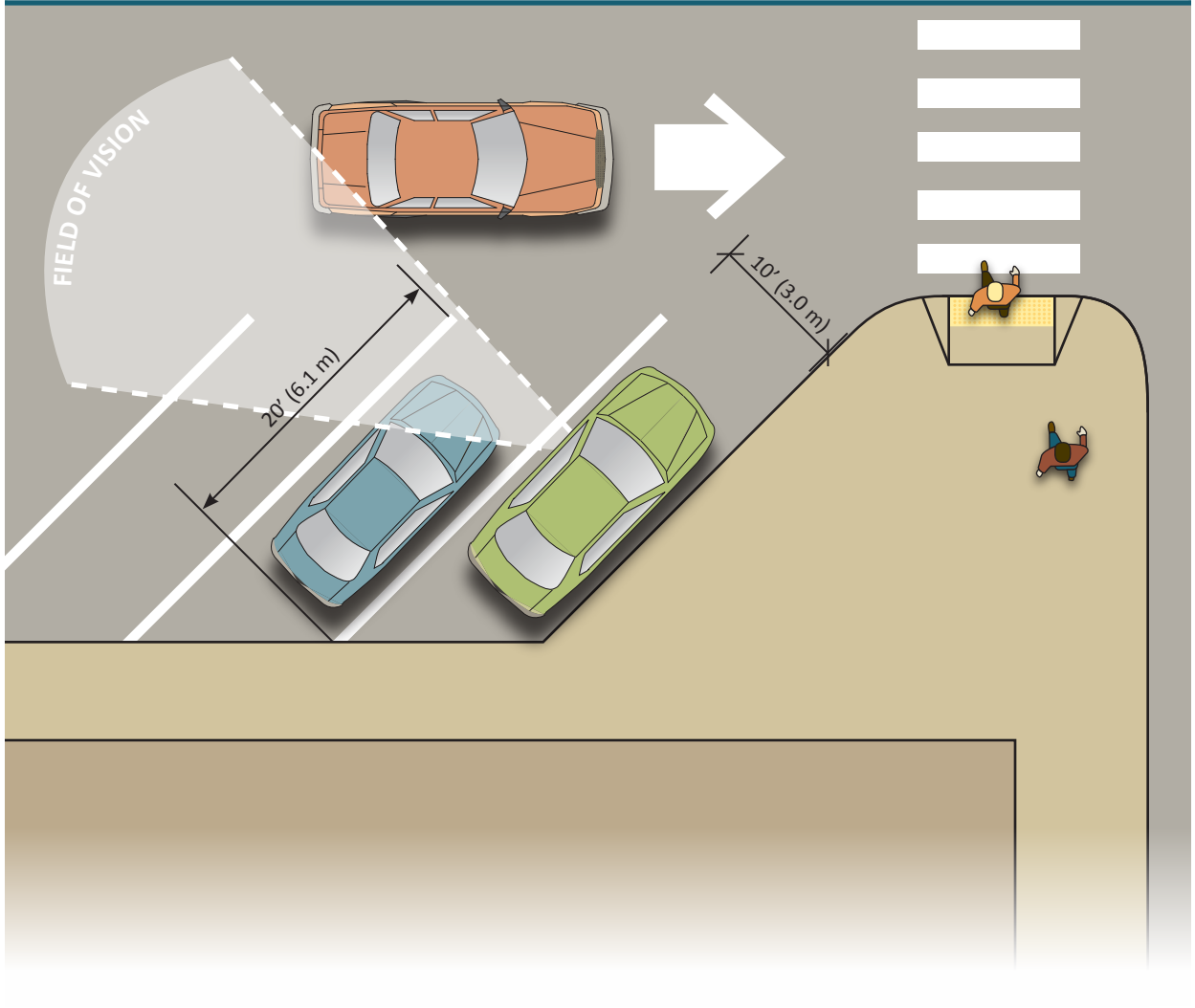
Typical dimensions for on-street angled parking stalls are: 60-degree angle stalls about 10 ft (3.0 m) wide and 20 ft (6.1 m) deep. Angled parking can either be front-in or back-in. Exhibit 2.4 illustrates back-in angled parking. Back-in angled parking provides motorists with better vision of bicyclists, crossing pedestrians and vehicles as they exit a parking space and enter moving traffic. Back-in angle parking benefits include clear sight lines when pulling out, ease of loading and unloading cargo, and protection for children because the open car door now directs young children back to a point of safety rather than out onto the street. Diagonal parking may require more attention to improve visibility at crossings and intersections, and it should not be used on high speed and high volume roadways. Please note that HDOT does not promote angled parking along state highways.

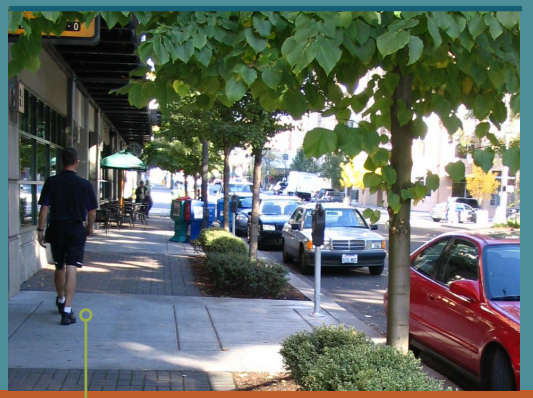
BIKE LANES ADJACENT TO ON-STREET PARKING

When bike lanes are adjacent to on-street parking, providing a buffer area (within the width of the striped bike lane), between the parking lane and the bike lane, allows space for car doors to swing without encroaching into the bike lane. A narrower parking lane helps to encourage cars to park tight to the curb, opening up more space for a buffer zone for the

bike lane. When adjacent to parked cars, it is recommended that the bike lane be striped at a width of 6 ft (1.8 m). Increasing the bike lane width allows for additional maneuvering space and creates a narrower travel lane, which helps lower vehicle speeds.

EXHIBIT 2.4 Back-in Angled Parking





Trees and parked cars provide a sense of enclosure and protection from traffic for pedestrians.

Example of back-in angled parking and bike lane

Parking Setbacks from Crossing Points

When on-street parking is provided, adjacent pedestrian walkways and clearly identified street crossing points are also necessary. On-street parking or loading zones that are too close to intersections and mid-block crossings can block views between pedestrians and motorists. Parking areas should be set back from intersections and crossings to allow pedestrians to see oncoming traffic and to enhance visibility.

Curb extensions (bulb-outs) at intersections and crossing points shorten the crosswalk distance and provide space for pedestrians to stand in better view of approaching vehicles. If curb extensions are provided, on-street parking does not affect the visibility of pedestrians. Exhibit 2.5 illustrates this situation.

Parking Overhangs

When perpendicular parking stalls are located adjacent to sidewalks, wheel stops or curbing are recommended to eliminate vehicle overhangs that impede required clear width of an accessible route. Exhibit 2.6 illustrates this treatment.

EXHIBIT 2.5 *On-street parking should be set back from the crosswalk so that pedestrians can see on-coming traffic, and motorists can see pedestrians.*

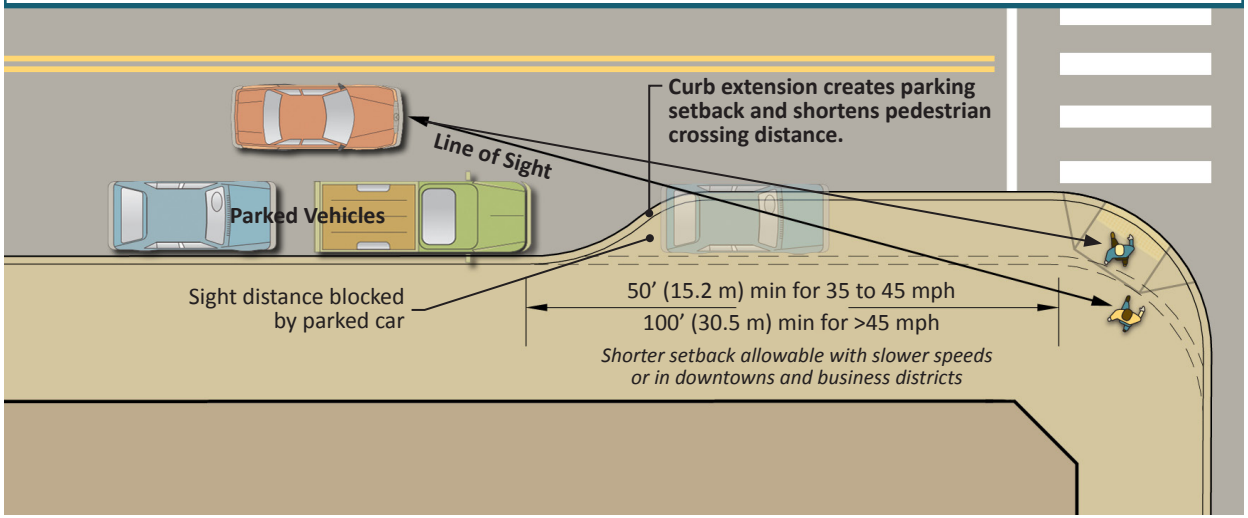


EXHIBIT 2.6 *Provide parking overhang space for perpendicular parking stalls.*

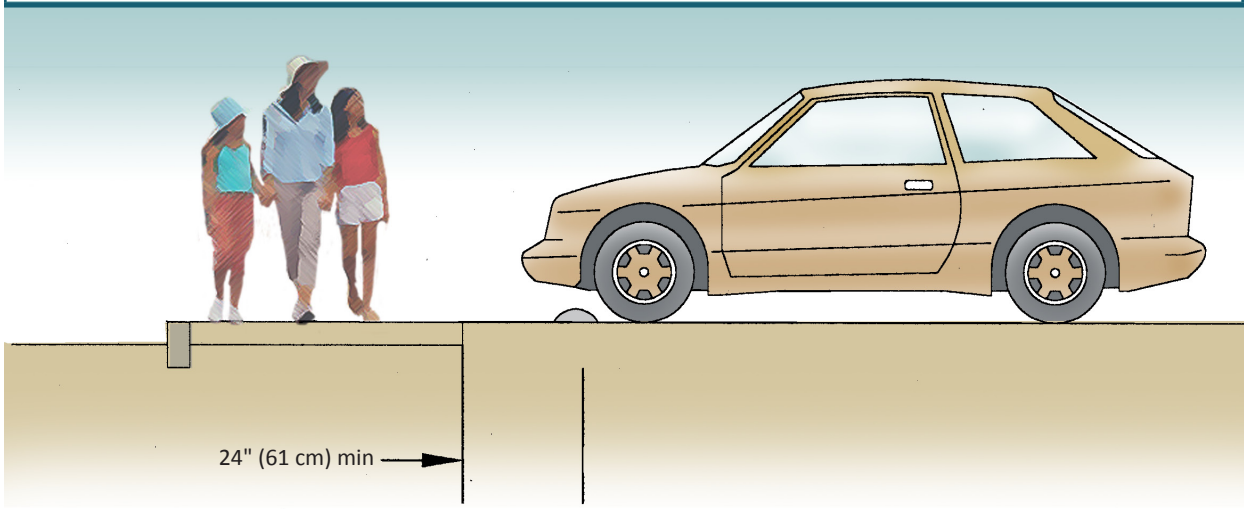
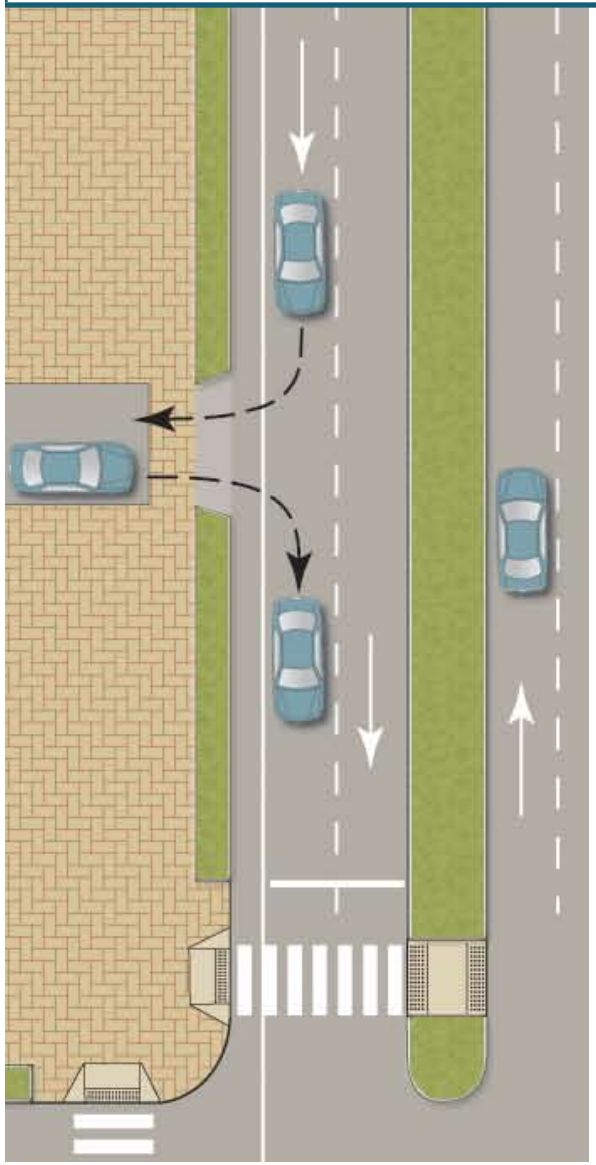


EXHIBIT 2.7 *Medians and fewer driveways reduce conflict points in the pedestrian realm.*



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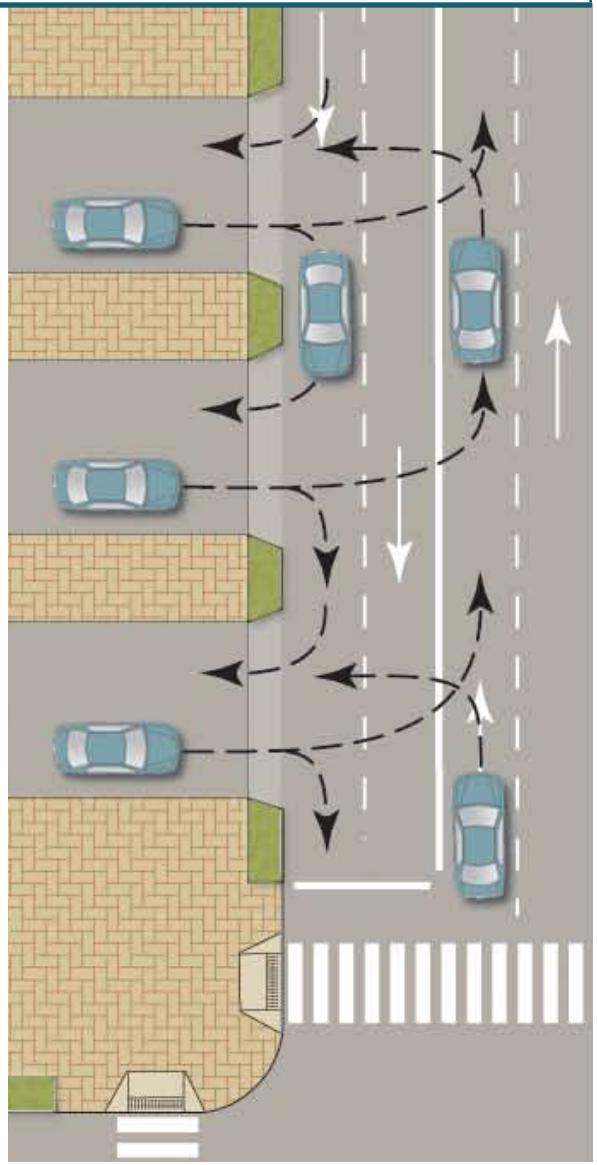

AVOID

Access Management

Well designed access management can benefit pedestrians because:

- Conflict points are reduced;
- Crossing opportunities are enhanced with an accessible raised median; and
- Improved traffic flow reduces the need for road-widening, allowing more space within the right-of-way for use by pedestrians, bicyclists, and enhancements, and maintaining fewer travel lanes to cross at intersections.

There are several access management techniques including:

- Reducing the number of existing driveways and consolidating driveways of parking areas and businesses; and
- Providing raised or landscaped medians or concrete barriers in the roadway center to control turning movements.

Exhibit 2.7 illustrates how controlled access and limited driveways reduce conflict points between

pedestrians and motorists. Good design can minimize conflicts where driveways and walkways intersect.

A Note about the Disadvantages of Uncontrolled Access—Most pedestrian/motor vehicle crashes occur on busy streets, intersections, driveways, and alleys. Uncontrolled vehicle access to and from roads increases the potential of conflicts between pedestrians walking along the roadway and cars entering or leaving the roadway. Pedestrians crossing the roadway need gaps in the traffic stream. But with uncontrolled access, vehicles entering the roadway quickly fill the available gaps. Pedestrian access to transit may also be complicated by excessive driveway access points, creating obstacles on the way to the bus stop.

Driveways

Guidelines for designing driveways to optimize pedestrian mobility, accessibility, and safety are as follows.

- The number and width of driveways should be minimized.
- Space driveways a minimum of 75 ft (22.9 m) from intersections, with preferred dimension of 200 ft (61 m). (Check local and state requirements.)
- Consolidate driveways.
- Sidewalks should be continuous across driveways. The cross slope of the sidewalk should be maintained (2 percent max) and the driveway should be sloped so that the driver goes up and over the sidewalk.
- Access to private property can be designed in various ways. For pedestrian safety and comfort, the conventional driveway design is preferred because:
  - Motorists must slow down more when turning into the driveway.
  - The pedestrian right-of-way can be more easily established where the sidewalk is extended across the driveway.
  - Driveways that resemble intersections may encourage high-speed turns, and as such create hazards for pedestrians. They also create a longer crossing distance.

Exhibit 2.8 illustrates the preferred driveway

EXHIBIT 2.8 *Conventional driveway slows turning vehicles.*

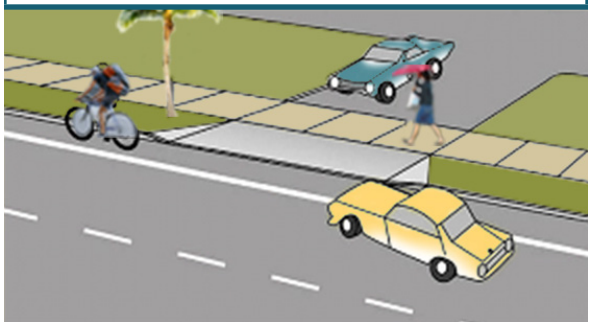

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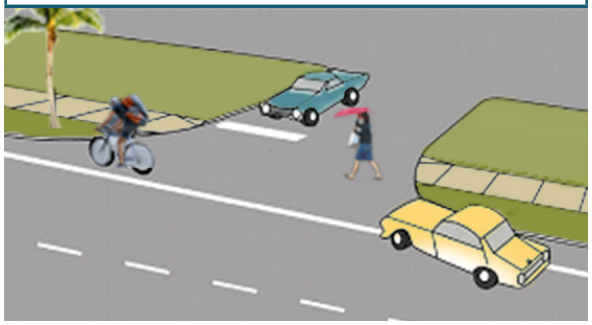
EXHIBIT 2.9 *Intersection-style driveway may encourage high-speed turns and create a longer crossing distance.*



AVOID

design solution. Exhibit 2.9 illustrates an intersection-like design that creates hazards for pedestrians and should be avoided.

- Where an intersection-style driveway must be used:
  - The radius of the curb should be kept as small as possible;
  - Driveway widths should be the minimum needed for entering and exiting vehicles; and
  - Where the volume of turning vehicles is frequent, right-turn channelization should be considered, to remove slower turning vehicles from the traffic flow, allowing them to stop for pedestrians; or a traffic signal should be considered if warranted.

Traffic Calming

Traffic calming can bring benefits by slowing motor vehicles and making motorists more aware of the potential for pedestrians. Even though traffic calming is not specifically a "pedestrian facility," it relates to pedestrians by improving their environment.

Traffic calming is not appropriate for all streets. Traffic calming typically works best on lower speed streets in urban areas and village centers and in residential areas. A case-by-case analysis of each street or roadway should be completed to determine if traffic calming is appropriate, and if so, the specific types of traffic calming methods that will be most effective.

There are many types of traffic calming techniques and strategies. Traffic calming techniques use various means to influence the behavior of motorists: physical, psychological, visual, social, and legal (regulatory and enforcement). Exhibit 2.10 provides a quick reference guide for typical traffic calming goals and the methods for achieving the goal.

INTRODUCTION TO TRAFFIC CALMING/ WHY IS TRAFFIC CALMING USED?

The Institute of Traffic Engineers (ITE) publication *Traffic Calming: State of the Practice* provides the following definition for traffic calming: *"Traffic calming is the combination of mainly physical measures that reduce the negative effects of motor vehicle use, alter driver behavior, and improve conditions for non-motorized street users."*

TRAFFIC CALMING

Most traffic calming treatments (other than speed reduction) are typically not appropriate for higher speed state highways and higher volume arterial streets. However, when the highway becomes the "main street" of a town or village center, or when an arterial is in a commercial business core or downtown, some types of traffic calming devices may be appropriate (such as on-street parking, street trees, curb extensions, or other treatments).

In the United States, the need for reduced speeds in residential areas is cited in ITE's *Handbook on Residential Street Design:*

". . . research has shown that pedestrians are not usually seriously injured when hit by a car moving at a speed of less than 20 miles per hour at the time of impact. If impact speeds are between 20 and 35 mph, injuries are usually serious, while at speeds above 35 mph they usually endanger life and are fatal."

STUDIES AND STATISTICS

A study of 43 international traffic calming programs found that traffic calming solutions decreased traffic crashes by 8-100 percent (ITE *Traffic Calming: State of the Practice*).

Speed humps were associated with a 53-60 percent reduction in the odds of injury or death among children struck by an automobile in their neighborhoods (*American Journal of Public Health*).

The FHWA report *The Effects of Traffic Calming Measures on Pedestrian and Motorist Behavior* evaluated the effects of selected traffic calming treatments, at both intersection and mid-block locations, on pedestrian and motorist behavior.

EXHIBIT 2.10 Common Residential Traffic Calming Program Actions

REDUCING	BY WHAT MEANS	EXAMPLES
Traffic volumes	Physical	Traffic diverters
Vehicle noise	Legislative	Speed limits, truck/bus restrictions
Visual impacts	Visual	Landscaping to block through views
Traffic speeds	Social, Physical	Neighborhood "Speed Watch" program, speed humps/ tables, radar speed signs
Crashes/speeding	Social, Physical	Neighborhood traffic circles, speed limits, strict speed enforcement, spot safety improvements
Exposure risk	Physical	Shorter crossing distances and priority at signals reduce pedestrian and bicycle exposure to the risk of a crash

"Before" and "after" data were collected in Cambridge, MA, Corvallis, OR and Seattle, WA. Data were also collected at "treatment" and "control" sites in Durham, NC, Greensboro, NC, Montgomery County, MD, Richmond, VA and Sacramento, CA.

Previous to the study, 16 speed humps were installed in 5 residential neighborhoods in Bellevue, Washington. The 85th percentile speeds declined from 36 to 39 mph prior to installation to 24 to 27 mph after installation. Traffic volumes fell when alternate routes existed. Most residents felt that the humps were effective and favored their continued use.

Similarly, survey respondents in Ontario, Canada, reported speed reductions on five raised and narrowed intersections and seven mid-block bulb-outs, in conjunction with lowering the speed limit to 20 mph. The proportion of motorists who exceeded 20 mph was 86 percent before the devices were built, but only 20 percent afterwards.

RESIDENTIAL AREAS

Traffic calming programs are often focused in residential areas to reduce traffic speeds and volumes on streets, making them safer for pedestrians, bicyclists, and those with special needs (children, older adults, and people with physical challenges and disabilities).

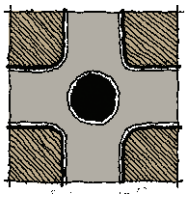
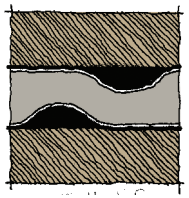
Although traffic calming techniques are also used in areas other than residential neighborhoods, most programs are focused on areas where traffic problems impact the day-to-day livability of the community. Traffic calming brings benefits to residential areas because it not only reduces speed and improves safety, but also reduces traffic noise and enhances the neighborhood. A wider range of techniques is generally more acceptable in residential areas where streets provide local access and do not function as major conveyors of commuting traffic.

TRAFFIC CALMING METHODS AND TECHNIQUES

Exhibit 2.11 illustrates some of the more common types of traffic calming methods currently used. Each of the techniques has successfully resulted in slowing traffic and reducing crashes.

EXHIBIT 2.11 Traffic Calming

COMMON TYPES OF TRAFFIC CALMING METHODS

			TYPICAL APPLICATIONS:		CONTROLS:	
DRAWING	TECHNIQUE	DESCRIPTION	ARTERIAL	LOCAL	VOLUME	SPEEDS
	**Traffic Circles**	• Circular islands centered within intersections • Can be landscaped or surfaced with special paving • Landscaping can be maintained by the local jurisdiction or neighborhood volunteers • Speed humps on approach to the circle can promote the smooth flow of traffic at slow speeds of about 20 to 25 mph • Traffic circles are smaller than the larger roundabouts that focus on moving traffic • Often found at the cross streets of residential neighborhoods		x	Possible	Yes
	**Chicanes**	• Alternately placed curb extensions into the street that force motorists to drive in serpentine pattern • Offset from each other in mid-block locations • Can be used to keep through-trucks (versus local deliveries) off residential streets		x	Possible	Yes

Example of a traffic circle

Curb bulb-out (Dan Burden)

EXHIBIT 2.11 Traffic Calming, Continued

COMMON TYPES OF TRAFFIC CALMING METHODS

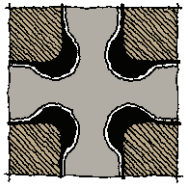
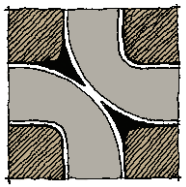
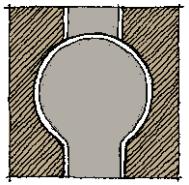
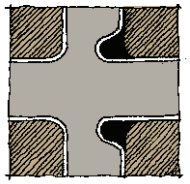
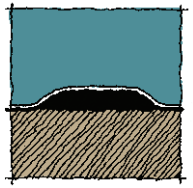
			TYPICAL APPLICATIONS:		CONTROLS:	
DRAWING	TECHNIQUE	DESCRIPTION	ARTERIAL	LOCAL	VOLUME	SPEEDS
	**Curb Bulb-Outs, Chokers/ Neckdowns**	• Curb extensions at mid-block locations or intersections provide visual distinction and reduce pedestrian crossing distances • Help to provide a clear visual signal to drivers that a crossing is approaching • Make waiting pedestrians more visible and allow them to better see oncoming vehicles • Neckdowns are often longer than bulb-outs and may line up with and help define parallel street parking areas • Narrow the appearance of the street and can be attractive, especially when landscaped • Can provide space for furnishings and streetscape elements	x	x	Possible	Yes
	**Diagonal Diverters**	• Diverters eliminate through traffic while providing partial access in opposite directions • The island can become an amenity and provide refuge for pedestrians	x	x	Yes	Possible
	**Forced Turns and Partial Dividers**	• Truncated diagonal diverters (one end remains open) and other types of partial diverters discourage commuter traffic by forcing turns while still providing local access opportunities.	x	x	Yes	Possible

EXHIBIT 2.11 Traffic Calming, Continued

COMMON TYPES OF TRAFFIC CALMING METHODS

			TYPICAL APPLICATIONS:		CONTROLS:	
DRAWING	TECHNIQUE	DESCRIPTION	ARTERIAL	LOCAL	VOLUME	SPEEDS
	**Cul-de-sac/ Street Closures**	• Street is closed to vehicular traffic and turned into a cul-de-sac • End of street becomes a neighborhood amenity and focal point (landscaped mini park); the ongoing provision of pedestrian and bicycle access is important		x	Yes	Yes
	**One-Way Entry and Exit**	• Curb bulbs/extensions are used to close one lane of traffic at intersections • This approach stops through traffic but allows ingress or egress depending on the direction and location of the closure		x	Yes	Possible
	**Narrower Streets and/or Street Trees**	• Narrower streets limit the expanse of pavement visible to the driver and can be effective in slowing traffic, especially when lined with trees and/or on-street parking • Street trees visually narrow the field of vision for motorists, causing them to move more slowly	x	x	No	Yes
	**Speed Humps/ Tables/ Cushions**	• Wider and smoother than a speed bump, and effective in slowing cars as they approach pedestrian zones • Most appropriately used on neighborhood streets • Cushions provide space for emergency vehicles to drive through rather than over the ramp		x	Possible	Yes

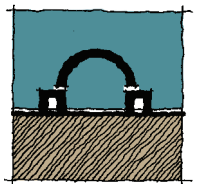
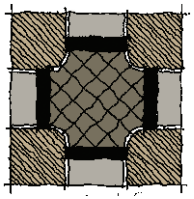
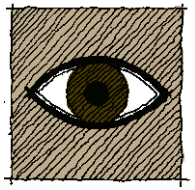
Speed cushions (Dan Burden)

Narrowed street with trees

Special paving used at a crossing (Dan Burden)

Palms serve as neighborhood gateway

EXHIBIT 2.11 Traffic Calming, Continued

COMMON TYPES OF TRAFFIC CALMING METHODS						
			TYPICAL APPLICATIONS:		CONTROLS:	
DRAWING	TECHNIQUE	DESCRIPTION	ARTERIAL	LOCAL	VOLUME	SPEEDS
	**Signs and Neighbor-hood Gateways**	• Signs such as "Residential Street" or other terms can help to deter through traffic • Monuments and landscaping that identify neighborhood districts can be effective, especially when used in conjunction with other techniques	x	x	No	Yes
	**Special Paving**	• Alternate road surfaces, such as brick, colored concrete or special pavers, can be used at crossings, intersections, or along the sides of the street (must meet MUTCD requirements) • Breaks up the visual expanse of pavement and define pedestrian travel areas	x	x	Not Likely	Yes
	**Police Enforce-ment Speed Watch Programs**	• Police, as well as citizens and organizations, can utilize electronic sign boards to measure speeds of passing vehicles in their neighborhoods • Letters of warning can be sent to the registered owners of offending vehicles • Promote neighborhood awareness of speeding	x	x	No	Yes

Note: Other emerging practices are being developed on an ongoing basis. Check with local jurisdictions and HDOT for other possible solutions.

Bicycle Facilities

How bicycle facilities are located and designed directly affects the pedestrian environment. Often, pedestrians and bicyclists may have competing needs. It is important that designers understand these so they can adequately address both sets of needs. It should be noted that bicyclists enjoy traveling through environments that are active and interesting, just as pedestrians do. Refer to HDOT for standards and details on any bicycle requirements within the street design area.

Common types of bicycle facilities in the United States include:

- Bike lanes (on-street lanes for cyclists)
- Yield lanes where bicyclists and motorists are sharing the lane, and sharrows may be used to delineate the shared space
- Shared use paths where bicyclists and pedestrians share a path that is separated from the street (either inside or outside the right-of-way)
- Cycle tracks, located for exclusive use by bicyclists, are physically separated from motor traffic and are distinct from the sidewalk. Cycle tracks can be separated from motor traffic with car parking, medians, a difference in grade level, and/or other features. They may be at the road level, sidewalk level, or an intermediate level. *Note: cycle tracks are common in some European cities and are gaining popularity in the United States.*

Exhibit 2.12 illustrates some of these types of on-street bicycle facilities, including a typical bike lane, a bike lane adjacent to on-street parking, a typical yield lane/shared lane (with sharrow treatment), and cycle tracks.

PEDESTRIANS AND BICYCLISTS AT INTERSECTIONS

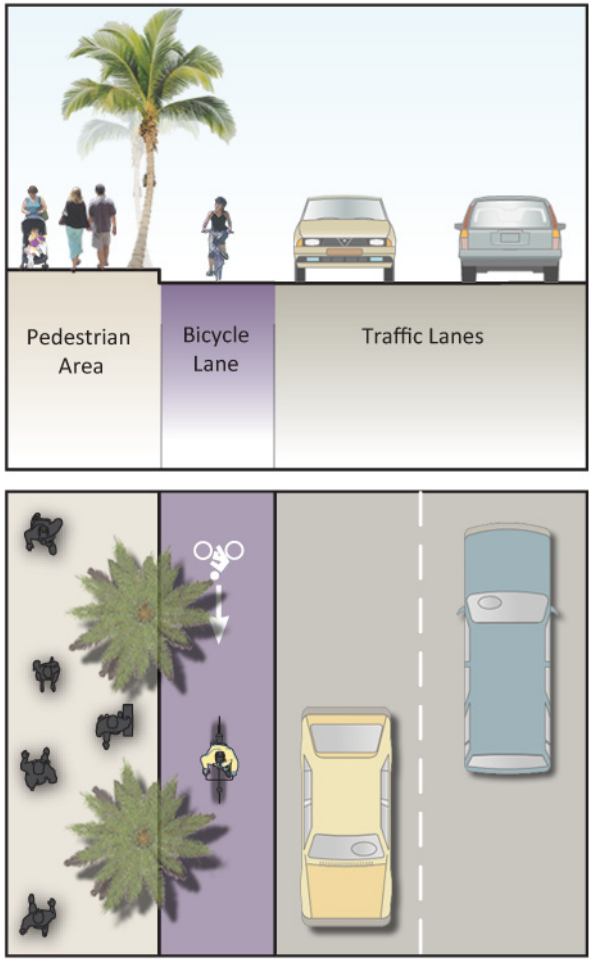
Because pedestrians move more slowly than bicyclists and some pedestrians with disabilities have special needs at crossings, intersection and crosswalk design is typically geared toward pedestrians' needs (in terms of signal timing, crossing phases, etc).

Bicyclists typically have the option of either moving with traffic in bike lanes or cycle tracks, or they may choose to dismount their bicycles and cross the street as pedestrians, following the same procedures pedestrians would. At

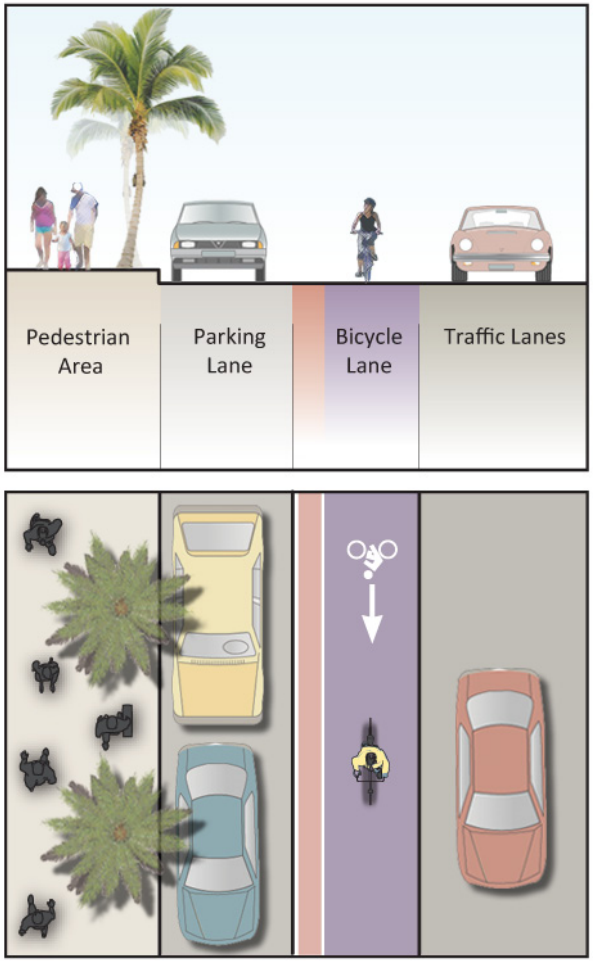
Bike rack in Honolulu, HI

Bike parking takes over former on-street parking space in Portland, Oregon.

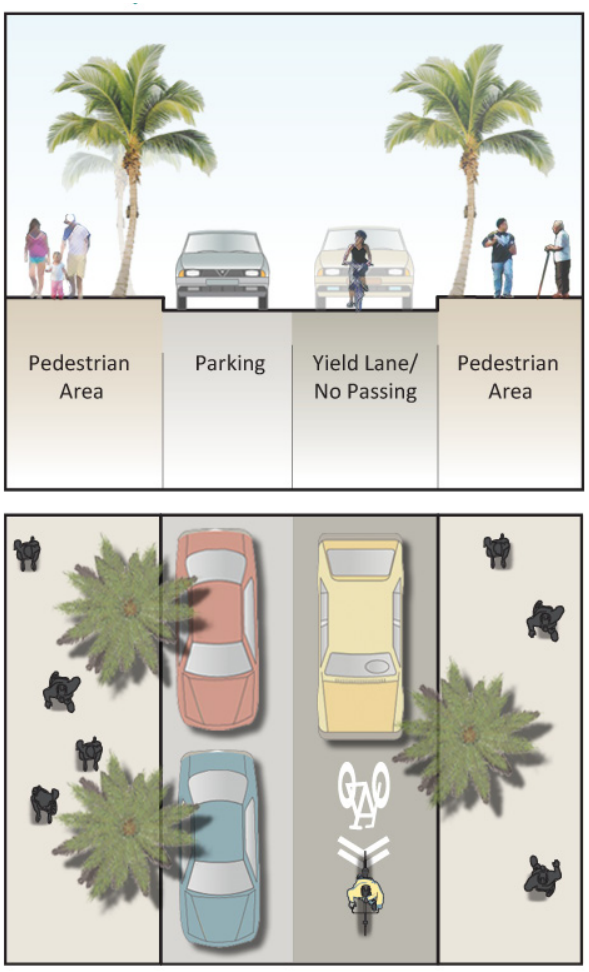
EXHIBIT 2.12 *Bicycle Facilities in Street Right-of-Way*



Bicycle Lane

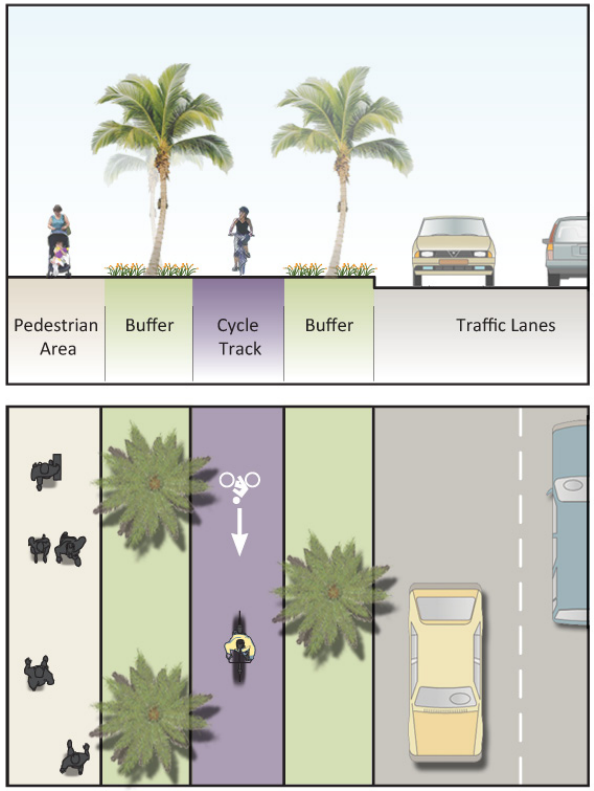


Bicycle Lane Next to Parking



Yield Lane/Shared Lane

EXHIBIT 2.12 Continued



Cycle Track

intersections where there are higher numbers of pedestrians and bicyclists sharing crosswalk facilities, crosswalks may need to be wider. Some communities are delineating crosswalk space specifically for bicyclists.

BICYCLE PARKING

Having widespread bicycle parking is also key to encouraging cycling – particularly for errands and commuting. It is generally recommended that, when provided, bike racks and bike lockers be located within the furnishings zone along sidewalks (see Toolbox Section 4), or in areas adjacent to the right-of-way, outside of the pedestrian through zone and the street/roadway clear zone. Appropriate design and placement of bicycle parking facilities is important to avoid conflicts with pedestrian mobility and accessibility. See ***Bike Plan Hawaii*** for guidelines on the location of bike racks.

Sidewalks, Walkways, and Sidewalk Corridors

The sidewalk corridor includes elements located within street rights-of-way that are adjacent to or parallel with the roadway. This includes all elements from the property line to the edge of the roadway, including pedestrian sidewalks or walkways, planting strips, furnishings zones, and frontage areas. For more information, refer to Toolbox Section 4—Sidewalks and Walkways.

Signing and Wayfinding for Pedestrians

A minimum of signing and wayfinding can be helpful to pedestrians. Most regulatory and warning signs are directed at motor vehicle traffic along streets and prior to crossings. Directional and informational signing installed for motor vehicle use may not adequately serve pedestrians. Pedestrians have different needs, characteristics, and desired routes. Because of their relatively slow travel speed, they need to know about the most direct and safest routes between origins and destinations, and where it is possible to cross roads, access buildings, link to public transport, and find facilities.

Pedestrian oriented signs enhance pedestrian circulation and sense of place. Care should be taken to identify key origins and destinations, such as schools, parks, libraries, museums, entertainment centers, and shopping districts.

SIGNING & WAYFINDING CHECKLIST

- ***Create a mission statement for the signing and wayfinding system***
- ***Analyze specific urban conditions, including project goals, and vehicular, pedestrian, transit and bicycle routes***
- ***Convene the stakeholders who will be involved in developing and maintaining the system. Understand their needs and design to address them.***
- ***Review all regulatory requirements related to signing and wayfinding***
- ***Use multiple design elements to devise a more complex system, instead of relying on one element***
- ***Incorporate complementary design elements***
- ***Limit the amount of information per sign to ensure visibility and comprehensibility***
- ***Use colors and type that enhance legibility***
- ***Create signs that are attractive to pedestrians, even if they are oriented only to motorists***
- ***Plan route based on the history and development of the city***
- ***Build signs to withstand physical, stylistic, and technological changes***
- ***Develop a maintenance and management system prior to wayfinding system installation***

Source: Planning and Urban Design Standards, 2006, Craig M. Berger, Society for Environmental Graphic Design, Washington DC.

Consider giving distances to these origins and destinations in blocks, average walking time, or other measurements meaningful to pedestrians. The provision of walking maps, including information about transit routes, makes it easier for pedestrians to find their way around a new environment. Some cities and towns provide maps inscribed in the sidewalk or on manhole covers. Information for pedestrians can also be displayed on kiosks or other designated areas.

Providing easy-to-read signs with simple phrases and graphics is important. Letters and symbols need to be bold with high contrast to the background. Generally, light letters and symbols against dark backgrounds are easiest to read.

As much as possible, signing needs to be understood universally, including non-English speaking people and children, especially in areas where there are a lot of tourists. The use of

EXHIBIT 2.13 ***Signing and Wayfinding Examples***

DISTRICT IDENTIFICATION **VEHICLE & PEDESTRIAN DIRECTION** **PEDESTRIAN INFORMATION**

internationally recognized symbols can be an effective way to identify features to all pedestrians.

The “Signing and Wayfinding Checklist” (see sidebar on previous page) provides further guidelines for creating a cohesive system.

Furnishings and Utilities

Well-designed walking environments are enhanced by urban design elements and street furniture, such as benches, bus shelters, trash receptacles, and water fountains. Urban streetscapes should be carefully designed in order to provide adequate space for furnishings and utility facilities, such as light and signal poles, signal boxes, and fire hydrants. A continuous and clear travel way is required on sidewalks, walkways, and all accessible routes of travel. Additonal guidelines for streetscape furnishings can be found in Toolbox Section 4.

Context Appropriate Street Trees, Landscaping, and Sustainability

Landscaping and street trees in planting buffers and along streets can greatly enhance the pedestrian environment by softening the hardscape, providing shade and shelter, and fostering a vital connection to the natural world. Still, careful thought must be given to the selection of trees and shrubs installed.

In special districts, landscaping can be used to promote and create distinct individual identities. In accordance with specific guidelines and regulations in zoning code, landscaping is often required by local zoning codes for open spaces, setback areas, and all required yards to enhance the pedestrian experience.

The ability to remove street trees 6 in (15.2 cm) or greater in diameter may be limited. Remember to check local requirements that may apply to your project. If removal is warranted, replacement trees should be provided and may be required in some jurisdictions. Use of fragrant, lush, tropical vegetation and native plant species are encouraged. These include Coco Palms, Banyans, Monkeypods, Formosan Koa, Kukui, Plumeria, Wiliwili and Hau. All landscaped areas must be provided with adequate irrigation systems.

APPROPRIATE PLANT SELECTION IN PEDESTRIAN ENVIRONMENTS

- Street trees are typically spaced evenly along the street, ranging from 25 to 50 ft (7.6 to

Monkeypod - Samanea saman

Royal Palm - Roystonea regia

Plumeria - various species

Carob Tree - Ceratonia siliqua

15.2 m) apart, depending on the size of the tree at maturity. Trees can also be placed informally and clustered in areas. Do not locate trees where they will be an obvious obstruction to visibility.

- When tree wells are installed on urban sidewalks, they should be placed out of the pedestrian travel way. Tree wells can vary in size depending on the width of the sidewalk. Tree grates adjacent to or within sidewalks need to meet the accessibility requirements of the ADA—top mounted flush with grade and no openings larger than 0.5 in (1.3 cm) in diameter. Elongated openings shall be perpendicular to the dominant direction of travel.
- Street trees generally need a minimum width of 4 ft. More space may be needed for some species. Consult with a landscape architect or arborist to confirm spatial needs.
- Using low height shrubs and upward branching trees will maintain visibility and sight distance at intersections, driveways, crossings, and other critical areas along the street system. It is also important to consider how high and wide the shrubs and trees will be at maturity.
- Selection of plant material also needs to consider the availability of irrigation water, ways to minimize maintenance, and community preferences for landscape materials (such as the use of native species and informal plantings versus ornamental or formal landscapes).
- Parking structures, service areas, driveways, utilities, and blank walls should be screened from public view with the use of extensive planting. This can be established by the use of vertical and mid-height canopy form trees, flower shrubs, or non-invasive climbing or cascading vines. Designers may specify pre-fabricated trellis or cable systems or other types of green screening or living walls for these applications.
- Wherever possible, water runoff from roofs, planter boxes, and parking facilities should be directed to landscaped areas for retention and percolation.

Additional design guidelines related to landscaping adjacent to pedestrian facilities, including recommendations to minimize root damage to adjacent paved areas, are provided in Toolbox Section 7—Shared Use Paths. For more recommended species and additional information, see the *Honolulu Standard Procedures for the Planting of Street Trees* and future *Hawaii Department of Transportation Sustainable Landscape Master Plan*.

APPROPRIATE PLANT SELECTION NEAR UTILITIES

The location and depths of utility lines should be confirmed before developing the planting plan. Because trees spread as they grow and are effective conductors of electricity, steps must be taken to minimize electrical outages or safety hazards. Prior to planting, the Hawaiian Electric Company's (HECO) arborists should be contacted at (808) 543-7836 with questions regarding the placement and correct type of tree to plant.

Tall trees that can contact wires, poles or equipment should not be planted near overhead lines. According to the Planting Trees Near HECO Facilities Guidelines:

- Trees that mature at heights below 20 ft may be planted under lines.
- Trees that mature at 20 ft to 30 ft should be planted at least 10 ft horizontally from overhead lines.
- Taller, columnar trees should not be planted closer than 15 ft horizontally from overhead lines.
- Taller trees with spreading crowns that mature at heights greater than 30 ft should be planted at least 30 ft horizontally from overhead lines.

Large trees and/or trees with invasive roots must not be planted over or near underground lines. Refer to the HECO planting guidelines for a list of plants that may be planted in the vicinity of underground lines. Large tree species like Monkeypod, Albizia, Eucalyptus, and Banyan will require an onsite investigation by a HECO System Arborist to determine appropriate planting distance from any underground electrical facilities.

Living wall in Kailua, Oahu. (Yvonne Jaramillo Ahearn)

Street Lighting—Lighting the Travel Lanes and the Pedestrian Environment

Street lighting is designed to serve a variety of purposes. Primarily it facilitates visibility (clear, accurate, and comfortable) at night for motorists. National statistics indicate that more crashes occur at night, which in some cases could attributed to impaired visibility. Street lighting has also been shown to reduce pedestrian crashes, reduce fear of crime, and promote business through use of public streets and spaces at night. According to the Pedestrian and Bicycle Information Center (PBIC), in some locations lighting can reduce the odds of pedestrian fatalities by 42 percent at mid-block crossings and by 54 percent at intersections. Street lighting type, spacing, light levels, and equipment need to be designed to meet the appropriate jurisdiction standards.

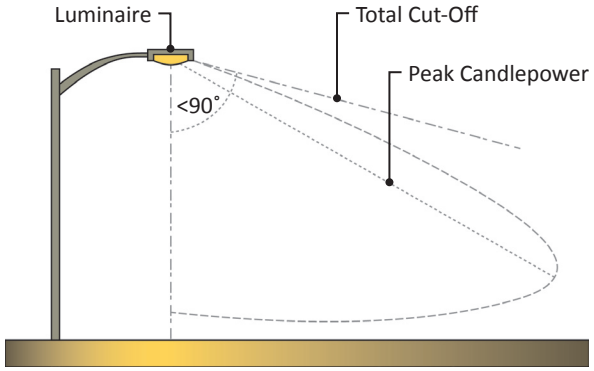
The following design guidelines apply to general lighting of public rights-of-way:

- Illumination along roadways increases the driver's ability to see pedestrians at night. Lighting should be provided along both sides of wide arterial roadways.
- Increasing the lighting in a sidewalk corridor can improve pedestrian access.
- Pedestrian-scale lighting encourages a sense of security and increases pedestrian activity, which in turn reinforces general safety.
- The preferred pedestrian-level lights are metal halide (MH), light-emitting diode (LED), or incandescent. Low-pressure sodium lights may be energy-efficient, but can create considerable color distortion. High-pressure sodium (HPS) lights produce less distortion and are a more desirable alternative.
- Choose energy efficient light sources, such as LED, that have a longer lamp life to minimize repeated replacement of lamps. LED technology is becoming competitive for outdoor applications with the commonly employed high intensity discharge light sources such as HPS and MH. The expectation is that LED street lighting technology will not only provide more efficient light distribution and increased uniformity, but will also save energy and reduce maintenance costs.
- Cut-off luminaires should be provided to minimize glare and light pollution.
- Street lights for motor vehicle lanes should generally be located in the edge zone or the median, while pedestrian lighting is best located in the frontage zone.
- Light pole locations need to be coordinated in design to avoid conflicts with other above and below grade utilities and street signing.
- Transition lighting should be provided along streets that lead from more intensely

Above: "Before" image of a Seattle street illuminated with high pressure sodium streetlights.

Below: "After" image of the same street with LED streetlights and much improved visibility. (City of Seattle)

EXHIBIT 2.14 Cut-Off Luminaire



illuminated urban areas to outer, less developed areas. This involves a gradual change in lighting level as motorists transition to a different type of street and/or significant change in urban density.

- The spacing of street lights and trees establishes the rhythm of the streetscape. Street light spacing should be consistent along the length of a block or corridor, but flexibility in design is necessitated by infrequent driveway cuts. Lighting should be offset from street trees in a regular pattern, either mid-way between trees or at a consistent distance on either side, so that the tree canopies do not interfere with illumination coverage.
- Choose fixtures that are durable and resistant to vandalism and environmental conditions.

SPECIAL CONSIDERATIONS RELATED TO PEDESTRIAN LIGHTING

Lighting of sidewalks at a pedestrian scale increases security and pedestrian safety and comfort. Environments with high levels of pedestrian activity require more intense and even lighting because pedestrians move at a slower pace, look at more detail, and stop frequently for longer periods of time when compared with people in a moving vehicle. Standard street lighting fixtures on tall poles are not sufficient to meet the needs of pedestrians. However, a pedestrian-scaled light fixture may be integrated and/or retrofitted into the pole design. Guidelines are as follows:

- When introducing a new lighting system to replace or supplement the existing street lighting, incorporate light posts and fixtures that are pedestrian-friendly (shorter and more in scale with pedestrians, with less obtrusive and harsh light sources). Certain locations may require additional lighting (beyond uniformly spaced fixtures) to meet the prescribed lighting levels, including:

Special lighting allows pedestrians to navigate this waterfront path by day or night. (Dan Burden)

Existing street light poles can be retrofitted with pedestrian fixtures

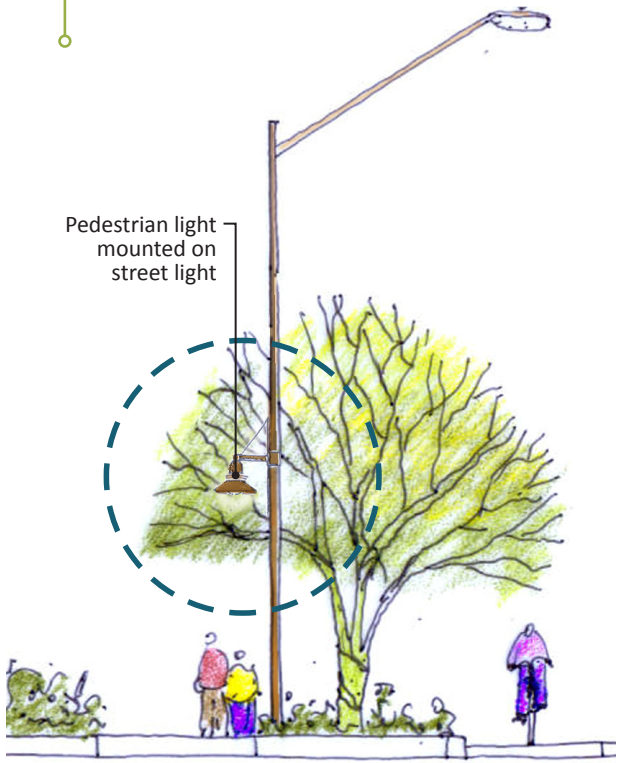
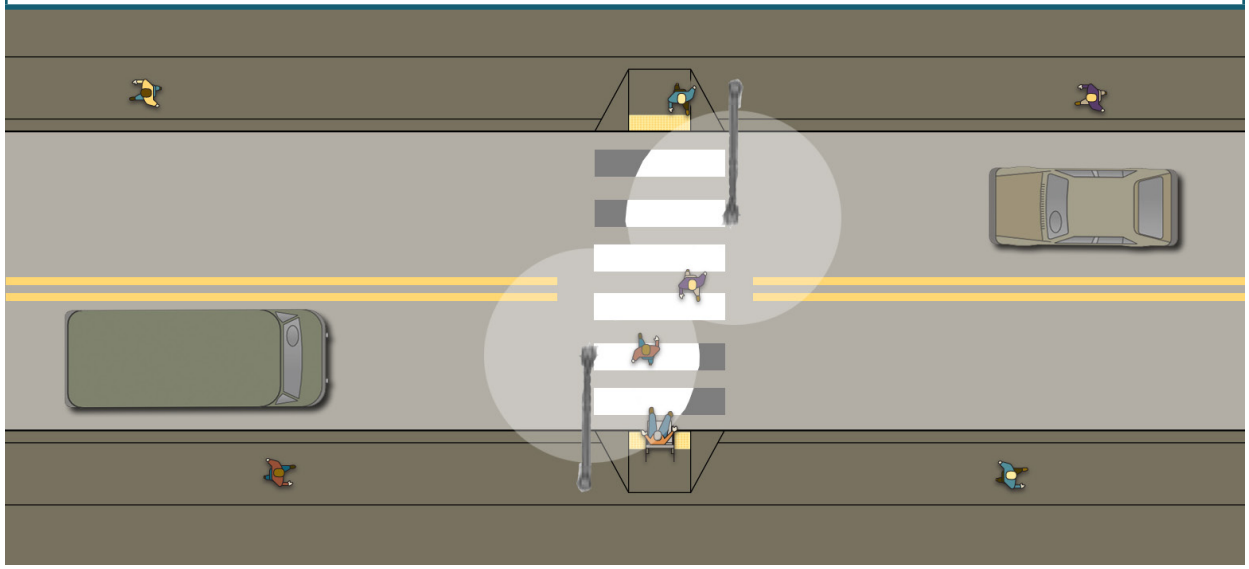


EXHIBIT 2.15 ***Nighttime Lighting at a Mid-Block Crossing***
(Adapted from Hawaii County Pedestrian Safety Action Plan Template, Draft)



— Intersection crosswalks and mid-block crossings (see Toolbox Section 5—Intersections and Crossings)
— Stairs and ramps
— Transit stops
— Pedestrian underpasses
— Building entrances
— Plazas and public spaces
— Parking garages
— Under awnings and colonnades

- Pedestrian lighting fixtures shall be spaced closely and evenly to allow the use of lighting fixtures with low wattage luminaires, as opposed to a less frequent spacing of fixtures that require high wattage. This approach will reduce the overall lighting power density, reduce glare, and provide consistent lighting levels.

Lighting should be evenly distributed to avoid alternating bright and shadowed areas. Lighting should be designed to increase recognition of other people and not create inordinate shadows. The best type of lighting for pedestrians focuses on the sidewalk and shines down rather than out.

- Provide between 0.5 and 2.0 footcandles of light along pedestrian travel ways, depending on conditions. A minimum intensity of 1 footcandle is required on the surface of accessible routes of travel.
- The same requirements regarding placement of light poles to avoid conflicts with trees and utilities mentioned for street lights apply for pedestrian lights.

LIGHTING TO ENHANCE NEIGHBORHOOD/ DISTRICT IDENTITY

Some designers use lamp styles to provide a sense of neighborhood continuity or preserve the atmosphere of a historic district. Specialty light pole styles can be selected to convey a particular theme or design character in coordination with the local municipality.

Light poles can include brackets for hanging banners for special events or to reinforce district/neighborhood identity.

Different types of illumination should be chosen with great attention, taking into consideration land use, population characteristics and the goals and objectives of each community.

Other Resources

The following sources of information are recommended for planning and design of pedestrian-friendly streets.

- 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. Ewing, Reid, and Brown, Steven J., *US Traffic Calming Manual.* 2009.
- American Planning Association, Wiley & Sons, Inc. publishers. *Planning and Urban Design Standards.* 2006.
- Bain, Lesley, Gray, Barbara, and Rodgers, Dave. John Wiley & Sons. *Living Streets—Strategies for Crafting Public Space.* 2012.
- 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.
- Institute of Transportation Engineers, *Designing Walkable Urban Thoroughfares: A Context Sensitive Approach.* 2010.
- Institute of Transportation Engineers, *Traffic Calming for Communities.* ***www.ite.org/traffic/index.asp*** (May 2013).
- Hawaii Department of Transportation, Bike Plan Hawaii, ***https://hawaii.gov/dot/highways/Bike/bikeplan/index.htm#bikeplan*** (May 2013).
- 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. ***http://www.smartgrowthamerica.org/complete-streets*** (May 2013).
- New Zealand Transport , Lester, T. *Public Lighting for Safe and Attractive Pedestrian Areas. Agency Research Report 405.* 2010.
- Transportation Research Board. *Access Management Manual.* 2003.


Big Island Built
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