Great Streets for **Los Angeles**

CITY OF LOS ANGELES

COMPLETE STREETS

DESIGN GUIDE

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Complete Streets Design Guide
ACTIVITY LOG

Street Standards Commitee Amendments

Date	Amendment

Date	Amendment

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COMPLETE STREETS DESIGN GUIDE

INTRODUCTION

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1. INTRODUCTION

Goals of the Guide

Great Streets for Los Angeles: Complete Streets Design Guide lays out a vision for designing safe, accessible and vibrant streets in Los Angeles. As outlined in California's Complete Streets Act of 2008 (AB 1358), the goal of Complete Streets is to ensure that the safety, accessibility, and convenience of all transportation users – pedestrians, bicyclists, transit riders, and motorists – is accommodated.

Streets not only influence our mobility choices, but they also affect the safety and quality of life in our neighborhoods. When streets are designed with only vehicular throughput in mind, they create an environment that invites unsafe speeds. As a result, bicycling becomes more daunting and pedestrian walkways become less enjoyable. An overabundance of single-occupancy vehicles on the road slows down buses and other motorists, making public transit less convenient and driving more frustrating. When streets are continually widened to accommodate more vehicular volume, they create an induced demand for car travel that only encourages future traffic congestion.

Los Angeles' streets serve a much larger purpose than just moving cars. They can provide lively gathering places that foster community building and neighborhood identity. Complete Streets encourage healthy recreational activities such as walking, running, and bicycling, and they can boost the economic activity and visibility of storefront businesses. When cars travel at slower, safer speeds, the number of collisions between motorists and active transportation users decreases. Moreover, fewer cars on the road means lower levels of air pollution. Overall, a city that is designed for Complete Streets prioritizes people over cars, and safety over speed.

The Complete Streets Design Guide provides a compilation of design concepts and best practices that promote the major tenets of Complete Streets—safety and accessibility. The Guide is meant to supplement existing engineering practices and requirements in order to meet the goals of Complete Streets. Due to specific site and operational characteristics associated with any given street, any proposed street improvement project must still undergo a detailed technical analysis by the appropriate city departments. Specific design guidance that is in a demonstration phase and has yet to be incorporated into the California Manual on Uniform Traffic Control Devices (CA MUTCD)

will require provisional approval from the appropriate City departments. Overall, the Complete Streets Design Guide seeks to establish the concept of Complete Streets into Los Angeles' present and future street design so that all stakeholders are able to plan for, implement, and maintain safe and accessible streets for all users.

The Complete Streets Design Guide accompanies Mobility Plan 2035, an important update to the Mobility Element (formerly Transportation Element) of the City of Los Angeles' General Plan. Mobility Plan 2035's five goals – Safety First, World Class Infrastructure, Access for all Angelenos, Informed Choices, and Clean Environments for a Healthy Community – set the policy foundation making Complete Streets a priority in Los Angeles. The Plan's emphasis on safety, traffic calming and access are key principles that mirror the goals of the Complete Streets Design Guide.

The Complete Streets Design Guide is a living document, meaning that it will be amended as best practices and innovations in street design continue to evolve. The Guide falls under the authority of the City of Los Angeles' Streets Standards Committee, which is composed of the Director of City Planning (Chairman), General Manager of the Department of Transportation, and the City Engineer (LAMC 17.05).

Complete Streets Design

Designing is not a one-size-fits-all approach. It requires an analysis of various site conditions to determine what sort of treatments and solutions are applicable for a given street. Factors that should be considered include the physical characteristics of the street, urban vs. suburban context, surrounding land uses, collision history, and expected pedestrian and roadway demand. Treatments can vary from installing physical infrastructure, to altering signalization, or to simply reinforcing safety efforts with signage. Funding is also a major determinant of what types of treatments are feasible for certain projects.

Applicability

The Complete Streets Design Guide is intended to serve a variety of users. For City departments that oversee the implementation of street improvement projects, the Guide serves as a guiding document that ensures all projects are designed with Complete Street principles in mind. Private developers can also use the Guide to tailor their projects to support Complete Street principles. Elected officials can consult the Guide when proposing public improvements in their jurisdictions, while communities and local groups can refer to the Guide when advocating for safety treatments in their neighborhoods.

Design Immunity

Because the design of Complete Streets may involve deviations from traditional engineering standards, it is important to embrace an environment where the many benefits of Complete Streets outweigh the complexities of conventional street design. Design immunity is a powerful defense available to local agencies to defend against tort lawsuits that allege dangerous conditions of public property (e.g., streets and highways). It involves specific statutory requirements set out in section 830.6 of the Government Code. While there is no guarantee in all cases that a judge will determine that a local agency is protected against liability by design immunity, local agencies will be well-positioned if their engineers properly document engineering judgments made in approving the design of projects prior to construction.

Guide Organization

Chapter 1. Introduction

Chapter 2. Street Classifications
This chapter summarizes the various enhanced networks and illustrates the new street classifications.

Chapter 3. Complete Street Diagrams
This chapter provides a variety of sample diagrams that illustrate how Complete Street principles can be applied into the street classifications and how a network assignment can influence the division of a street into different use areas for public transit, motor vehicles, truck traffic, bicyclists, and pedestrians.

Chapter 4. Sidewalk Area
This chapter provides a "toolkit" of structural, natural, and functional components that contribute to a safe, accessible, and enjoyable pedestrian environment.

Chapter 5. Roadways
This chapter presents several infrastructure enhancements and roadway treatments that contribute to multi-modal safety, accessibility, and convenience.

Chapter 6. Intersections & Crossings
This chapter presents enhancements to infrastructure and signalization at roadway intersections and mid-block pedestrian crossings.

Chapter 7. Off-Street Non-Vehicular Treatments
This chapter presents design guidance for several features that are located outside of a street right-of-way.

Glossary

Acronyms and Abbreviations

AASHTO. American Association of State Highway and Transportation Officials

BOE. Bureau of Engineering in the City of Los Angeles Department of Public Works

BOS. Bureau of Sanitation in the City of Los Angeles Department of Public Works

BSL. Bureau of Street Lighting in the City of Los Angeles Department of Public Works

BSS. Bureau of Street Services in the City of Los Angeles Department of Public Works

Caltrans. California Department of Transportation

DCA. City of Los Angeles Department of Cultural Affairs

DCP. City of Los Angeles Department of City Planning

DPW. City of Los Angeles Department of Public Works

FHWA. Federal Highway Administration

LAPD. Los Angeles Police Department

LADOT. Los Angeles Department of Transportation

LAMC. Los Angeles Municipal Code

MUTCD. Manual on Uniform Traffic Control Devices

NACTO. National Association of City Transportation Officials

UFD. Urban Forestry Division of the City of Los Angeles Bureau of Street Services

Definitions

City departments and bureaus often have different definitions of elements within the street right-of-way. The following are definitions used in the Co Complete Streets Design Guide. If applicable, where they differ from the definition used by the Bureau of Engineering in its 1970 Street Design Manual, the difference is noted. Terminology in this document generally conforms to that found in U.S. Department of Transportation Federal Highway Administration publications in an attempt to standardize City of Los Angeles terminology and synchronize it with that of other municipalities in the United States.

Above Ground Infrastructure (AGI). Any utility structure or other appurtenance that is installed above the surrounding grade in the public right-of-way

Average Daily Traffic (ADT). The average 24-hour volume measured by the total traffic volume during a stated period divided by the number of days in that period. Unless otherwise stated, the period is 1 year.

Amenity Zone. The portion of the Sidewalk Area (Border) between the face of the curb and the Pedestrian Zone. Primary uses include street trees, landscaping, street utilities, signage, and street furniture. Where long landcaping strips exist (as in many residential areas), the Amenity Zone is commonly referred to as the “parkway”.

Border. The term used by BOE for the part of the right-of-way between the curb face and property line. In this guide, this part of the public right-of-way is referred to as “Sidewalk Area”.

Business Improvement District (BID). A group of commercial property owners or tenants that agrees to fund improvement projects, services, or programs within their designated commercial area.

Convenience Strip. A walkable strip adjacent to the curb, providing access to parking where there is a non-walkable planted parkway or tree well.

Curb extension. A curb extension extends the curb line and Sidewalk Area out into the roadway, reducing the effective roadway width while increasing the Sidewalk Area for pedestrians. Curb extensions can be in the form of a corner bulbout, neckdown, chicane, or bus bulb.

Curb radius. A geometrical measurement of the sharpness of the curb angle at intersections. Also referred to by LADOT and BOE as curb return.

Flex Zone. The part of the right-of-way – usually the width of a parking lane – adjacent to an existing curb face that can be utilized for roadway uses or for extensions of the Sidewalk Area (curb extensions).

Frontage Zone. The portion of the Sidewalk Area adjacent to the property line. There is no frontage zone in many residential districts because the pedestrian zone directly adjoins the property line.

Functional Classification. Distinct "functional" categories based on the amount of travel a street is intended to accommodate.

Green Streets. Streets that incorporate sustainable elements including stormwater management practices, street trees, and landscaping.

Highway. Per BOE, "a general term denoting a public way for purposes of vehicular travel, including the entire area within the right of way." Since few, if any, streets in Los Angeles are solely for the purpose of vehicular travel, the term "highway" is not used in this guide, except to reference the current functional classifications of arterial streets.

LADOT Manual of Policies and Procedures (MPP). The Department of Transportation's document containing design standard and guidelines for striping, channelization, special signing, and traffic signal timing and operation.

Low Impact Development (LID). A design and engineering approach for stormwater management that reduces urban runoff into the traditional stormdrain system, accomplished by treating, detaining, and/or infiltrating stormwater on-site.

Level of Service (LOS). A metric for measuring vehicle delay and traffic flow. The use of this metric has been discontinued, replaced by newer metrics such as Average Daily Traffic (ADT).

Median. The portion of divided roadway separating the traveled ways for traffic in opposite directions. It may be striped as a two-way-left-turn lane or include raised landscaped medians with left-turn lanes.

Median Opening. Per BOE, a gap in a median provided for crossing and turning traffic.

Parking Lane. A curbside lane on the roadway utilized primarily for the parking of vehicles.

Parkway. The commonly-used term for a landscaped portion of the Sidewalk Area (Border) between the face of curb and the pedestrian walkway.

Pedestrian Zone. Also known as the Pedestrian Access Route (PAR), the Pedestrian Zone is a continuous and unobstructed path of travel provided along the Sidewalk Area. The pedestrian zone is intended to be a seamless pathway for wheelchair and white cane users, composed of a firm, stable, and slip-resistant surface (typically concrete). It should be at least 5 feet wide to provide adequate space for two pedestrians to comfortably pass or walk side by side. BOE refers to the paved pedestrian path as the "sidewalk".

Raised Landscaped Median. A raised longitudinal space separating the two main directions of traffic, generally with 6-inch curbs and an unpaved, planted surface.

Right-of-Way (ROW). The entire area between property lines as shown on Navigate LA. Not as defined by BOE ("A general term denoting land, property or interest therein, usually in a strip acquired for or devoted to Public Works projects")

Roadway. The portion of the right-of-way for vehicular use, including travel lanes, parking lanes, and shoulders.

Shoulder. The curbside area that is adjacent to roadway travel lanes and is on the same level as the roadway. For roadways with curb and gutter, this area is typically delineated by solid white striping and is usually narrower than vehicular parking lanes.

Sidewalk. As defined by BOE, "the portion of the roadway primarily for the use of pedestrians." In this guide, this is referred to as the "Pedestrian Zone."

Sidewalk Area. The portion of the public right-of-way between the face of curb and property line. The term for this currently used by BOE is "Border."

Street Standards Committee. A committee consisting of representatives from the Department of City Planning, Department of Transportation and Bureau of Engineering, tasked with the responsibility of establishing street standards and applying them to streets within the City. The committee oversees amendments to the Complete Streets Design Guide.

Travel Way. Per BOE, the portion of the roadway for the movement of vehicles, exclusive of shoulders. The term is not used in this guide.

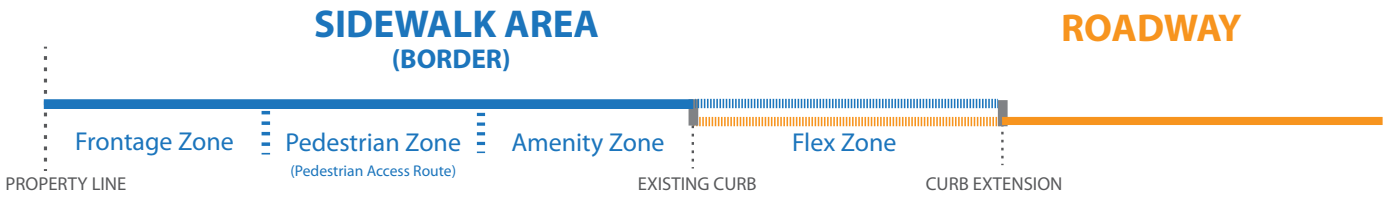
Two-Way Left-Turn Lane. ("Median Transversable Lane" per BOE). A speed change lane within the median to accommodate left turning vehicles from either direction.

Vehicle Miles Traveled (VMT). A measurement of miles traveled by vehicles in a specified region for a specified time period.

Walkway. In this guide, this is referred to as the "Pedestrian Zone" or "Pedestrian Access Route".

Right-of-Way Zones and Sample Uses

The public right-of-way is composed of two primary areas: the Roadway, which is used mainly by motor vehicles, public transit, and bicycles; and the Sidewalk Area, which represents the pedestrian realm. The Sidewalk Area is typically partitioned into three zones: Frontage Zone, Pedestrian Zone, and Amenity Zone. In addition, the Flex Zone represents a part of the right-of-way that can include Complete Streets enhancements for either roadway or pedestrian uses; vehicle uses take place at the roadway level, while pedestrian uses typically take place at sidewalk-level curb extensions. Each zone has its own distinct function in a Complete Street. Their boundaries are not always fixed, and many features can be located in more than one zone. Not all zones may be present; most low-density residential districts do not have a frontage zone because the property line abuts the walkway (Pedestrian Zone). The diagram below illustrates sample uses within each zone.



- ◘ Concrete Paving
- ◘ Building Entries
- ◘ Store signage and merchandising
- ◘ Public seating
- ◘ Outdoor dining
- ◘ Landscaping/trees
- ○ Asphalt paving
- ○ Bike racks/other
- ○ Some utilities (e.g. pedestrian light fixtures)
- ○ Ped-oriented signs
- ○ Public Art
- ○ Waste and recycling receptacles
- ○ Stormwater treatment

- ◘ Concrete paving
- ○ Asphalt paving
- ○ Nonstandard surfacing (e.g. stone, tile, brick)

- ◘ Concrete paving
- ◘ Utilities
- ◘ Landscaping
- ◘ Trees
- ◘ Parkway strip
- ◘ Public seating
- ◘ Bike racks
- ◘ Transit stop amenities
- ◘ Pedestrian-oriented signage
- ◘ Waste and recycling receptacles
- ◘ Newsracks
- ○ Asphalt paving
- ○ Stormwater treatment &management facilities
- ○ Public art
- ○ Outdoor dining
- ○ Bikeshare station
- ◘ Parking meters and pay stations
- ◘ Roadway signage

- ○ Parklet
- ○ Public seating
- ○ Dining
- ○ Bikeshare station
- ○ Bicycle corral
- ○ Stormwater treatment & management facilities
- ○ Corner Bulbout
- ○ Neckdown
- ○ Chicane
- ◘ Vehicular parking
- ◘ Vehicular travel lane
- ◘ Bus pad
- ◘ Commercial loading area
- ○ Protected bicycle lane
- ○ Two-stage turn queue
- ○ Reverse-angle parking
- ○ Bus-only lane
- ○ Shared bike-bus lane
- ○ On-street carshare parking

- ◘ Asphalt travel lane(s)
- ◘ Standard (usually offset) bike lanes
- ◘ Offset bus lanes
- ◘ Landscaped median
- ○ Concrete travel lane(s)
- ○ Median busway/BRT
- ○ Intersection and crossing enhancements (merge/ conflict zones)
- ○ Crossing refuge island
- ○ Traffic mini-circle
- ○ Mini-roundabout
- ○ Pedestrian plaza

KEY

Pedestrian and Bicycle Oriented

Vehicular Oriented

◘ **More Common**

○ **Less Common**

Frontage Zone | Pedestrian Zone | Amenity Zone

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COMPLETE STREETS DESIGN GUIDE

STREET CLASSIFICATIONS

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2. STREET CLASSIFICATIONS

Introduction

In order to be eligible for federal funding for street improvement projects, the Federal Highway Administration (FHWA) requires local governments to assign each of their streets a functional classification. In other words, cities must classify all their streets according to how they intend each street to function with respect to its roadway width and intended travel volume. Streets are broadly classified as either an arterial, collector, or local. Arterial streets can be thought of as the City's trunk lines that provide access to major commercial destinations, while local streets are typically streets in residential areas with low volumes of travel. Collector streets provide linkages between local streets and arterials.

Every street in the City of Los Angeles is given a specific street classification according to the Bureau of Engineering's Standard Plan for standard street dimensions (S-470). The S-470 Standard Plan outlines the different types of classifications and the corresponding dimensions for arterial, collector, and local streets in Los Angeles. In an effort to modernize the S-470, the City of Los Angeles has expanded its arterial street classifications to include larger right-of-way widths and to incorporate wider, more pedestrian-friendly sidewalks.

The updated street standard dimensions also attempt to address the many nuances of Los Angeles' streets by providing new nomenclature for arterial classes. For example, in the past, arterial streets in Los Angeles were classified into one of three categories: Major Class I Highway, Major Class II Highway, and Secondary Highway. According to these new standard dimensions, arterial streets are now classified as one of five types: Boulevard I, Boulevard II, Avenue I, Avenue II, or Avenue III. The wider range of arterial categories allows streets to be classified more accurately according to their existing physical character and operational function. The previous arterial classifications, due to their prevalent usage throughout the City's municipal code and in various manuals, will be parenthetically retained for reference and funding purposes. Overall, the City's updated Standard Plan for street standard dimensions includes five updated arterial classes and three new non-arterial classes.

This chapter discusses how the impacts of land uses and transportation characteristics inform the classification of streets. In addition, the chapter describes the concept of enhanced networks (as introduced in Mobility Plan 2035) and how they help achieve the goal of Complete Streets by prioritizing different modes of travel on certain streets. Lastly, general descriptions of each street classification help distinguish how streets differ according to their right-of-way widths, sidewalk widths, and target operating speed. For each classification, a typical number of travel lanes is provided, although there is no requirement as to the minimum or maximum number of lanes a street must include.

Network Overlays

Mobility Plan 2035's enhanced networks concept takes a layered approach to designing Complete Streets in Los Angeles. Under this concept, a subset of the City's streets is selected to prioritize travel for a specific transportation mode. In all, there are four enhanced networks: the Bicycle Enhanced Network, Transit Enhanced Network, Vehicle Enhanced Network, and Neighborhood Enhanced Network. In addition to these networks, many areas that could benefit from additional pedestrian features are identified as Pedestrian Enhanced Districts.

Bicycle Enhanced Network

The Bicycle Enhanced Network (BEN) is comprised of streets that prioritize bicycle travel by providing specific bicycle facilities and improvements. Improvements along the BEN primarily consist of right-of-way infrastructure improvements, signal timing infrastructure improvements, and end-of-trip facilities. Enhancements include protected bicycle lanes (or cycle tracks) that offer an increased degree of separation between bicyclists and the adjacent travel lanes (e.g., an on-street parking buffer between the vehicular travel lanes and the cycle track). In addition, the installation of protected bicycle lanes would likely include signalization enhancements for bicycles along with turning-movement restrictions for motor vehicles.

Transit Enhanced Network

The Transit Enhanced Network (TEN) is comprised of streets that prioritize travel for transit riders. Moderate enhancements typically include bus stop enhancements and increased service, with transit vehicles continuing to operate in mixed traffic. An upgraded enhancement would include an exclusive bus lane during the peak travel period only, while comprehensive enhancements typically include transit vehicles operating in an all-day exclusive bus lane.

Vehicle Enhanced Network

The Vehicle Enhanced Network (VEN) includes a select number of arterials that enhance long-distance travel on corridors. Moderate enhancements typically include technology upgrades and peak-hour restrictions for parking and turning movements. Comprehensive enhancements can include improvements to access management, all-day lane conversions of parking, and all-day turning movement restrictions or permanent access control.

Neighborhood Enhanced Network

The Neighborhood Enhanced Network (NEN) is comprised of local streets that benefit from pedestrian and bicycle-related safety enhancements while preserving the connectivity of local streets to other enhanced networks. There are many appropriate treatments for streets on the NEN including curb bulbouts, mini traffic circles, neckdowns, raised crosswalks, and diagonal diverters. These enhancements encourage lower vehicle speeds, providing added safety for pedestrians and bicyclists. They can also reduce vehicular traffic volumes by making the street less desirable for through traffic.

Pedestrian Enhanced Districts

Pedestrian-Enhanced Districts (PEDs) include streets where pedestrian improvements are prioritized to provide safe and enjoyable walking connections to and from major destinations within communities. PEDs are selected based on safety, public health, equity, access, social, and/or economic benefits. Examples of pedestrian enhancements include wayfinding signage, street trees, pedestrian-scale street lighting, enhanced crosswalks, automatic pedestrian signals, reduced crossing length (e.g., corner bulbouts and crossing refuge islands), sidewalk widening, and public seating areas.

Additional Overlays

The design of Complete Streets considers additional overlays that are not formally designated networks in Mobility Plan 2035. For example, the design and dimensioning of truck routes (and other roadways designated for goods movement) might include features such as wider travel lanes and larger turning radii in order to accommodate large trucks.

Roadways that are designated as Scenic Highways also present distinct factors to consider, such as preserving landscaping treatments, ensuring views, and incorporating appropriately-designed street amenities.

Arterial Streets

Arterial streets represent around 40% of the City's streets (approximately 3,000 of the total 7,500 miles) and carry a large volume of regional through traffic not handled by the freeway system. Arterial streets are typically characterized by commercial uses, but single-family and multi-family residential uses are also located along existing arterial streets.

Historically, the City has maintained three arterial street classifications: Major Highway Class I, Major Highway Class II, and Secondary Highway. These classifications will now be referenced under a "Boulevard" and "Avenue" category. Not all streets classified as a type of "Boulevard" or "Avenue" may contain a "Blvd" or "Ave" in their street name. For example, Sunset Blvd has been classified as an "Avenue I."

Boulevards represent the City's widest streets that typically provide regional access to major destinations. They include two categories:

- Boulevard I
- Boulevard II

Avenues may vary in their land use context, with some streets passing through both residential and commercial areas. This classification has been divided into three categories:

- Avenue I
- Avenue II
- Avenue III

An operating speed limit of 25mph is established for arterials located in areas with high pedestrian volume and areas located within the regional centers, community centers and/or mixed-use boulevards identified in the City's General Plan. A universal target operating speed of 15 mph is established for all turning movements at intersections.

Boulevard I (Major Highway Class I)

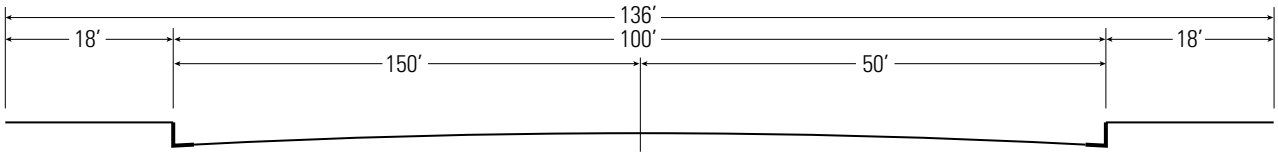
Roadway Width: 100 ft.

Right-of-Way Width: 136 ft.

Typical Number of Lanes: 3-4 lanes in each direction

Typical Sidewalk/Border Width: 18 ft.

Target Operating Speed: 35 mph



Boulevard II (Major Highway Class II)

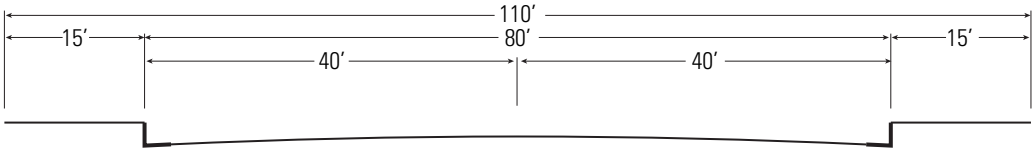
Roadway Width: 80 ft.

Right-of-Way Width: 110 ft.

Typical Number of Lanes: 2-3 lanes in each direction

Typical Sidewalk/Border Width: 15 ft.

Target Operating Speed: 35 mph



Avenue I (Secondary Highway)

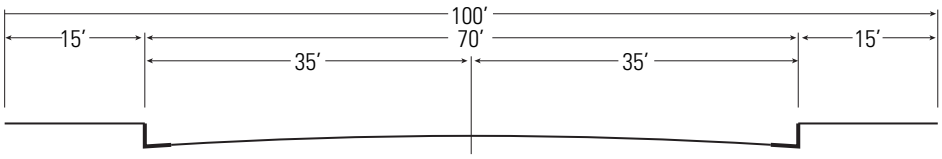
Roadway Width: 70 ft.

Right-of-Way Width: 100 ft.

Typical Number of Lanes: 1-2 lanes in each direction

Typical Sidewalk/Border Width: 15 ft.

Target Operating Speed: 35 mph



Avenue II (Secondary Highway)

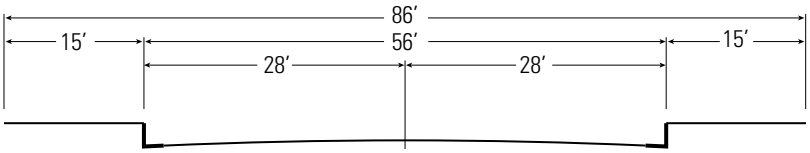
Roadway Width: 56 ft.

Right-of-Way Width: 86 ft.

Typical Number of Lanes: 1-2 lanes in each direction

Typical Sidewalk/Border Width: 15 ft.

Target Operating Speed: 30 mph



Avenue III (Secondary Highway)

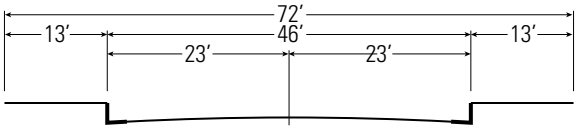
Roadway Width: 46 ft.

Right-of-Way Width: 72 ft.

Typical Number of Lanes: 1-2

Typical Sidewalk/Border Width: 15 ft.

Target Operating Speed: 25 mph



Non-Arterial Streets

Non-arterials represent 60% (over 4,500 miles) of the overall street system (not including alleys). Non-arterial streets connect travelers to local residential neighborhoods or industrial areas through a more fine-grain street network than the arterial street system.

Collector

Collector streets are generally located in residential neighborhoods. They provide access to and from arterial streets for lo**c**al traffic and are not intended for cut-through traffic.

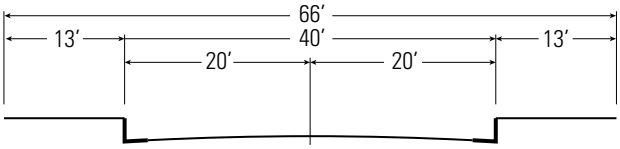
Roadway Width: 40 ft.

Right-of- Way Width: 66 ft.

Typical Number of Lanes: 1 lane each direction

Typical Sidewalk/Border Width: 13 ft.

Target Operating Speed: 25 mph



Industrial Collector

To accommodate larger vehicles, a typical Industrial Collector has larger curb radii to allow for the wider lane widths and turning radii required of trucks.

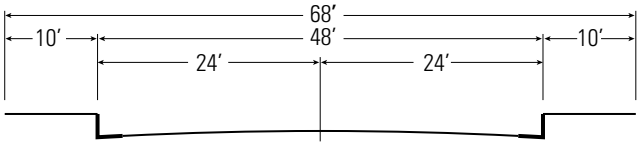
Roadway Width: 48 ft.

Right-of-Way Width: 68 ft.

Typical Number of Lanes: 1 lane in each direction

Typical Sidewalk/Border Width: 10 ft.

Target Operating Speed: 25 mph



Industrial Local

Industrial Local streets provide the first- and last-mile connections for goods movement. Compared to a typical local street, an Industrial Local street provides a wider roadway to better accommodate truck traffic while still providing parking on both sides.

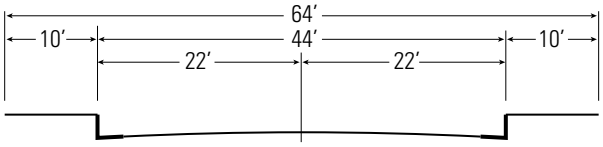
Roadway Width: 44 ft.

Right-of-Way Width: 64 ft.

Typical Number of Lanes: 1 lane in each direction

Typical Sidewalk/Border Width: 10 ft.

Target Operating Speed: 20 mph



Local Street Standard

Local streets are intended to accommodate lower volumes of vehicle traffic. Local streets have one lane in each direction and have parking on both sides of the street.

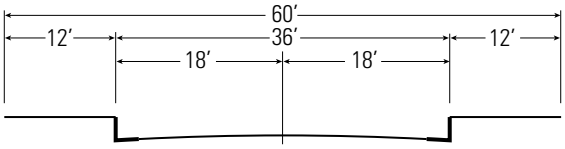
Roadway Width: 36 ft.

Right-of-Way Width: 60 ft.

Typical Number of Lanes: 1 lane in each direction

Typical Sidewalk/Border Width: 12 ft.

Target Operating Speed: 20 mph



Local Street Limited

These are local streets that lead to a dead-end rather than providing through traffic.

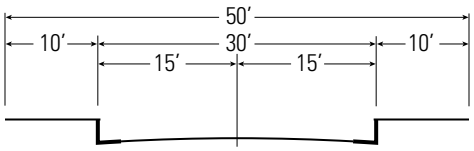
Roadway Width: 30 ft.

Right-of-Way Width: 50 ft.

Typical Number of Lanes: 1 lane in each direction

Typical Sidewalk/Border Width: 10 ft.

Target Operating Speed: 15 mph



Hillside Streets

Hillside streets are often narrow, winding roadways in residential areas. They provide access to hillside communities, such as parts of the Silver Lake and Echo Park neighborhoods of Los Angeles.

Hillside streets are designed as either Collector, Local, Standard, or Limited. Hillside Collectors are the primary streets leading into a hillside area. Hillside Local and Hillside Standard streets are narrower streets that branch off Hillside Collectors. Hillside Limited streets branch off Hillside Locals and typically provide access to a limited number of homes.

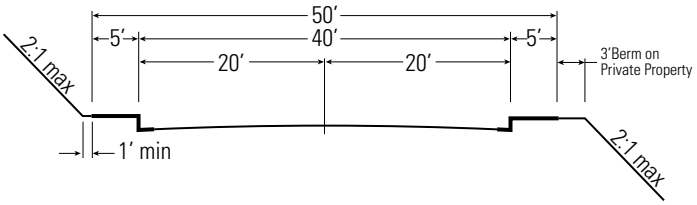
Hillside Collector

Roadway Width: 40 ft.

Right-of-Way Width: 50 ft.

On-Street Parking: both sides of street

Target Operating Speed: 15 mph



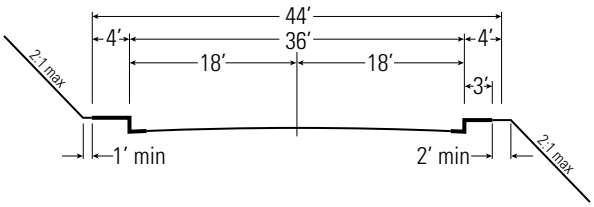
Hillside Local

Roadway Width: 36 ft. min

Right-of-Way Width: 44 ft.

On-Street Parking: both sides of street

Target Operating Speed: 15 mph



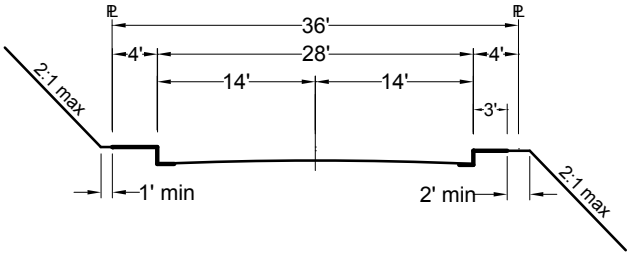
Hillside Standard

Roadway Width: 20 ft. min

Right-of- Way Width: 26 ft.

On-Street Parking: one side of street

Target Operating Speed: 10 mph



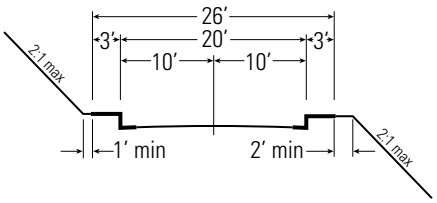
Hillside Limited

Roadway Width: 20 ft. min

Right-of- Way Width: 26 ft.

On-Street Parking: one side of street

Target Operating Speed: 10 mph



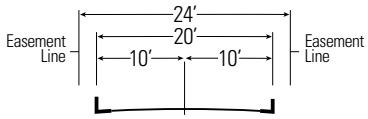
Service Road

Usually parallel to a divided highway, Service Roads (also known as frontage roads) provide local access and additional parking for nearby uses.

Access Roadway

Right-of-way width: 24'

Roadway width: 20'



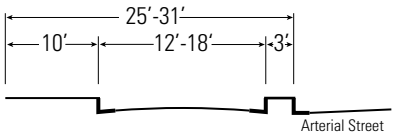
Limited to private streets only that access no more than four dwelling units and are a maximum of 300' in length

One-Way Service Road

Right-of-way width: 25-31'

Roadway width: 12-18'

Curb separation from arterial street: 3'

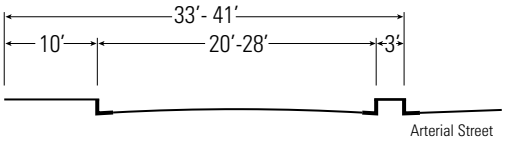


Bi-Directional Service Road

Right-of-way width: 33-41’

Roadway width: 20-28’

Curb separation from arterial street: 3’



Other Public Rights-of-Way

The streets and other public rights-of-way in this category offer opportunities to meet unique access conditions. Shared Street is a new classification presented in this guide.

- Shared Street
- Pedestrian Walkway
- Service Road
- Alley

Shared Street

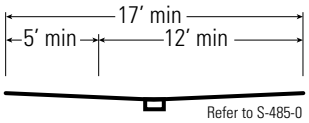
In neighborhoods where the context is appropriate, a shared street provides a slow-speed environment where cars, bikes, pedestrians, and scooters are able to all comfortably utilize the same space. The addition of landscaping and other traffic calming elements enhances the aesthetics and reinforces the safety aspects of a shared street.

Roadway Width: 20 ft. min

Right-of- Way Width: 30 ft.

Typical Buffer Zone Width: 5 ft.

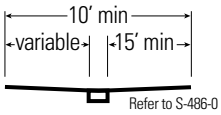
Target Operating Speed: 5 mph



Pedestrian Walkway

A pedestrian walkway is designed for pedestrian use but may also be appropriate for slow-moving bicyclists.

Walkway Width: 10-25 ft.

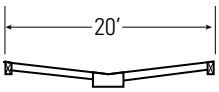


Alley

Alleys provide additional access outside of the main street network. They also offer opportunities for implementing green features such as permeable paving, stormwater management, lush plantings, and other sustainable practices.

Alley width: 20'

Target Operating Speed: 5 mph



Standard Cross Section
for 90° Intersection
(Plan View)

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COMPLETE STREETS DESIGN GUIDE

COMPLETE STREET DIAGRAMS

3

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3. COMPLETE STREET DIAGRAMS

Introduction

The following cross-sections and plan-view illustrations provide examples of how Complete Streets principles may be implemented within different street designations and along different networks. The illustrations do not represent a finite list but merely represent a series of examples that could be applied depending upon the street classification and the network assignment.

Complete Street Cross Sections

Street Classification and Network Assignments

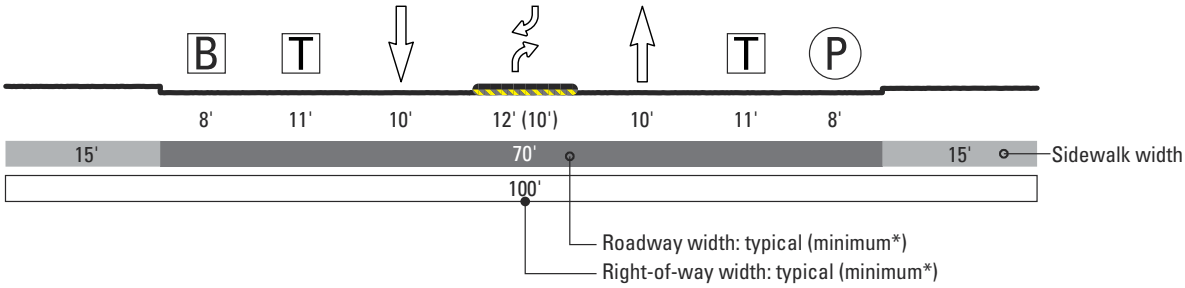
The cross section diagrams are numbered according to Street Classification (lettered “A” to “H”) and Network Assignment (numbered 1-4)

		Typical Row Width	Typical Roadway Width
A	Boulevard I (Major Highway Class I)	136’	100’
B	Boulevard II (Major Highway Class II)	110’	80’
C	Avenue I (Secondary Highway)	100’	70’
D	Avenue II (Secondary Highway)	86’	56’
E	Avenue III (Secondary)	72’	46’
F	Collector Street	66’	40’
G	Industrial Collector Street	68’	48’
H	Local Street	60’	36’

Network Assignments	
1	**Neighborhood Enhanced (NEN)**
2	**Bicycle Enhanced (BEN)**
3	**Transit Enhanced (TEN)**
4	**Vehicle Enhanced (VEN)**

Legend for Complete Street Cross Sections

LEGEND FOR ALL EXAMPLE CROSS SECTIONS



Symbols:

B Cycle track/Bicycle lane

T Full-time or peak period transit lane

BRT Bus rapid transit

11'(10') Typical (minimum) dimension

Travel lane

P Curbside parking lane

Center Lanes & Raised Medians or Platforms:

Striped roadway-level left-turn lane

Raised median or roadway-level turn lane (variable depending on location along the street segment)

Raised median or Platform

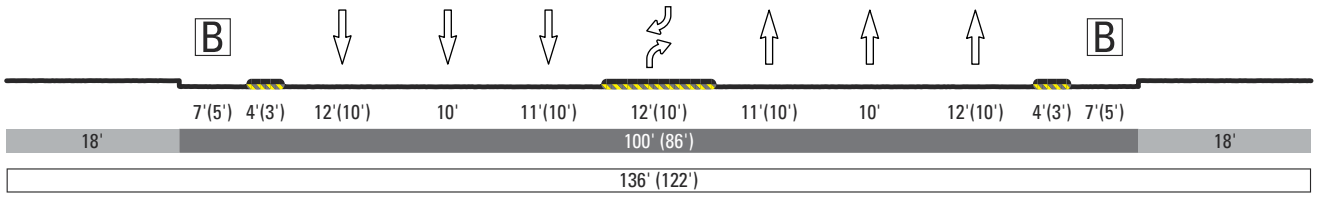
Painted Buffer or Raised median

Painted Buffer

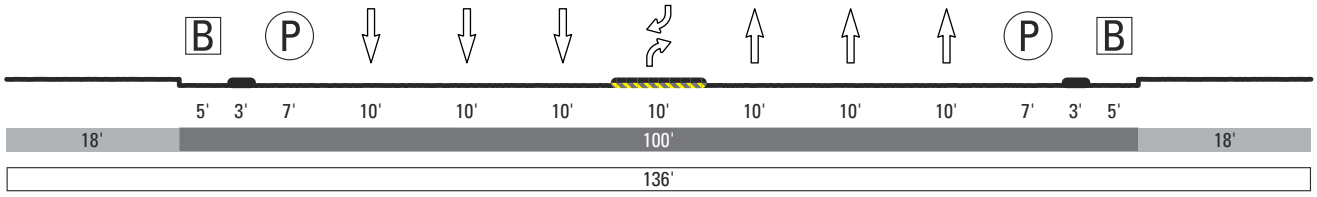
* Minimums illustrate the minimum width in which the illustrated cross section could be accommodated.

Sample Cross Sections

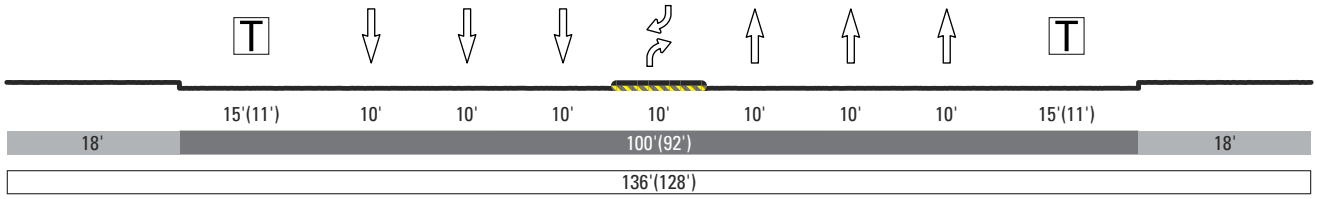
A.	Boulevard I (Major Highway Class I)
2	**Bicycle Enhanced (BEN)**
2.1	Cycle Track-without curbside parking



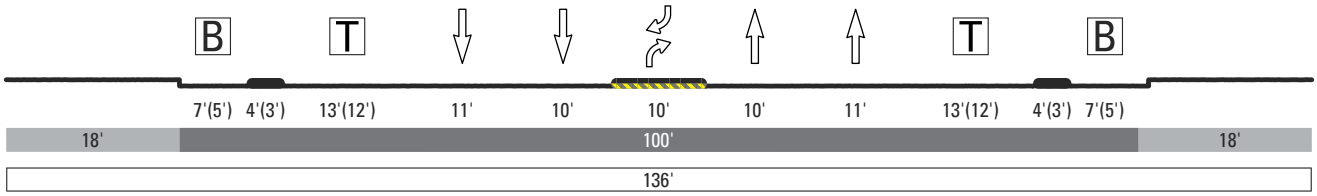
2.2	Cycle Track-with curbside parking



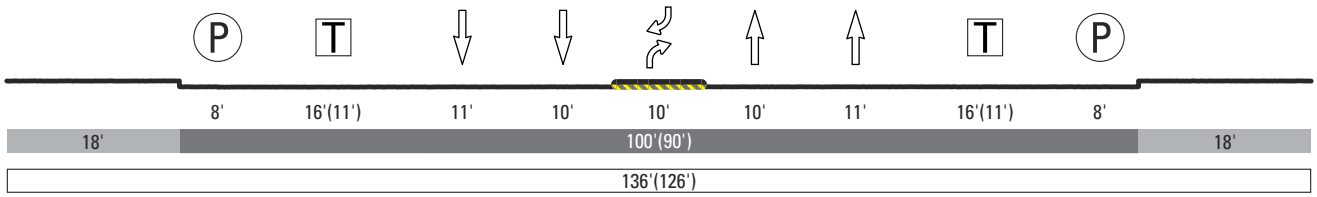
3	**Transit Enhanced (TEN)**
3.1	Full-time or peak period transit lane



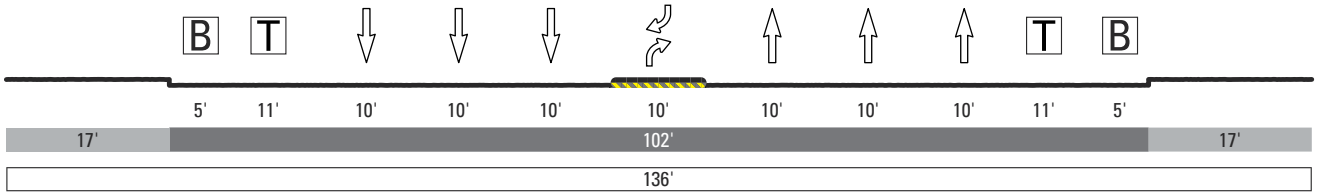
3.1	Full-time or peak period transit lane +
3.1	.1 Cycle Track



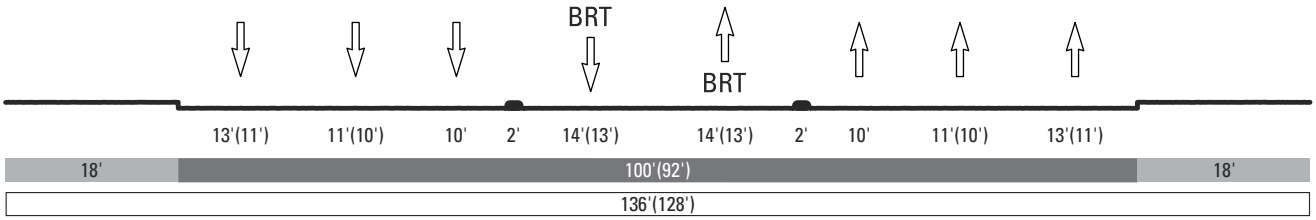
A.	Boulevard I (Major Highway Class I)--136’ ROW, 100’ Roadway (Typical)
3.1	Full-time or peak period transit lane
3.1 .2	Curbside Parking



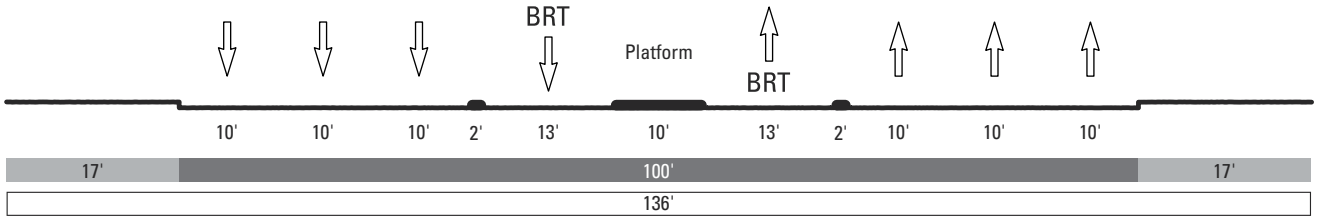
3.1	Full-Time or peak-period transit lane +
3.1 .3	Bicycle lane



3.2	Bus Rapid Transit (BRT) (center running)
	Midblock



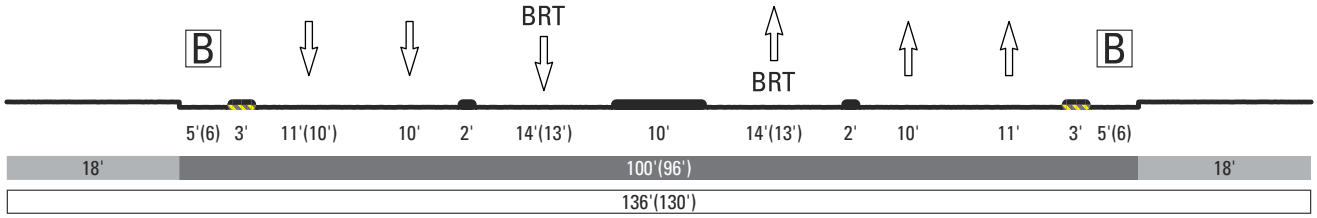
At/approaching platform - 1’ additional roadway each side (shown) or 1’ wide BRT shoulder



A. Boulevard I (Major Highway Class I)--136' ROW, 100' Roadway (Typical)

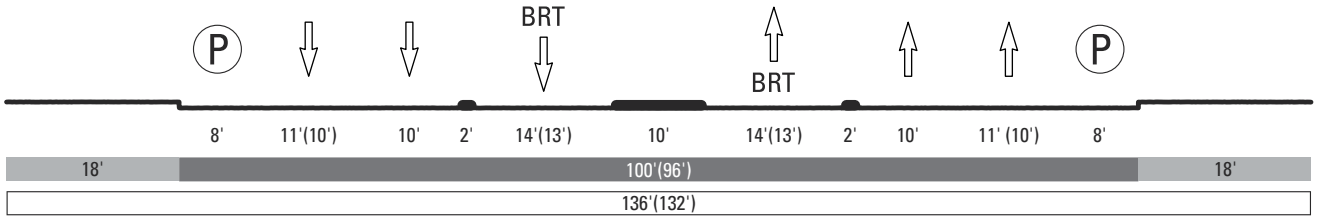
3.2 Bus Rapid Transit (BRT) (At Platform) +

3.1 .1 Cycle Track



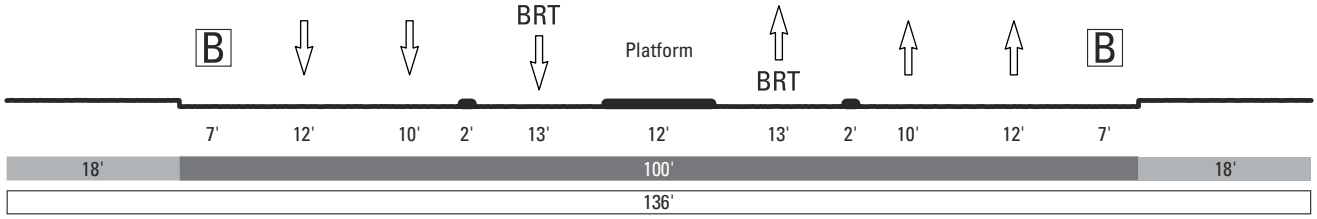
3.2 Bus Rapid Transit (BRT) (at platform) +

3.2 .2 Curbside parking



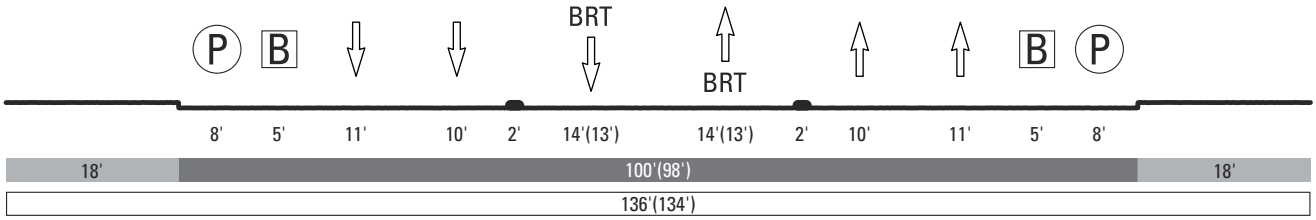
3.2 Bus Rapid Transit (BRT) (At Platform)+

3.2 .3 Bicycle lane



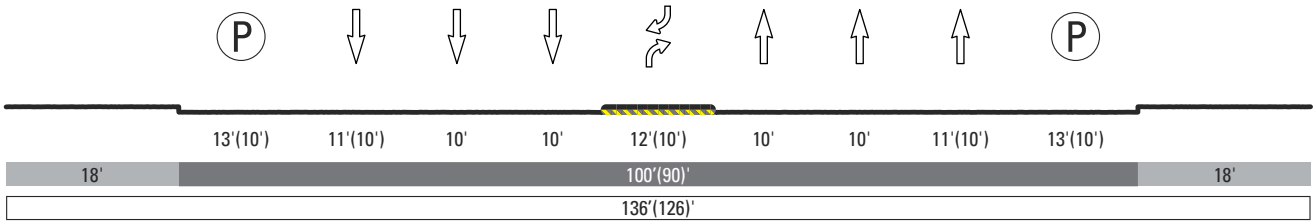
3.2 Bus Rapid Transit (BRT) (mid-block) +

3.2 .4 Bicycle lane and curbside parking

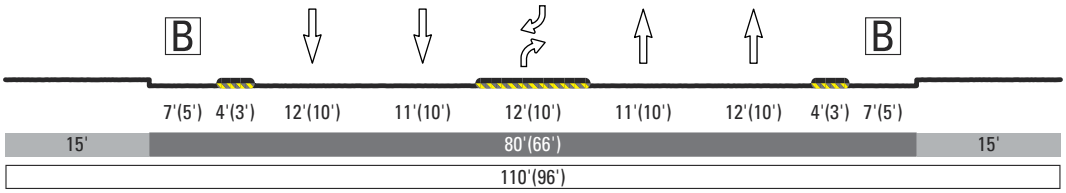


4 Vehicle Enhanced (VEN)

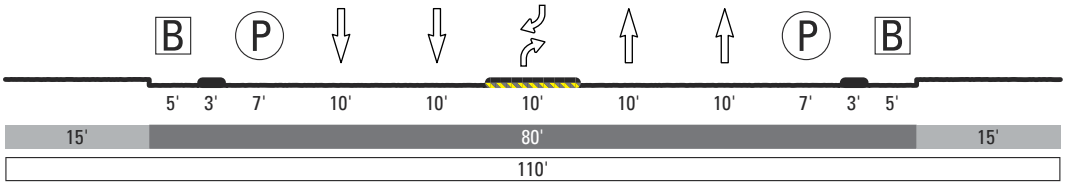
4.1 With full-time or off-peak curbside parking



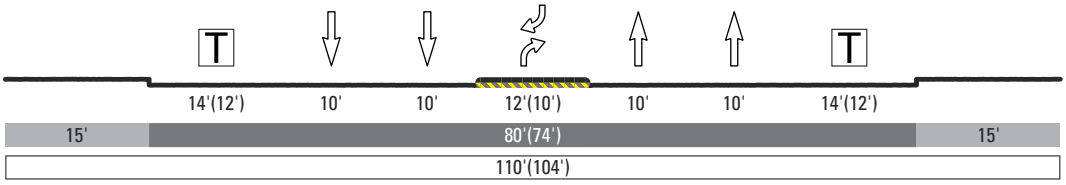
B.	Boulevard II (Major Highway Class II)--110’ ROW, 80’ Roadway (Typical)
2	Bicycle Enhanced (BEN)
2.1	Bicycle lane without parking



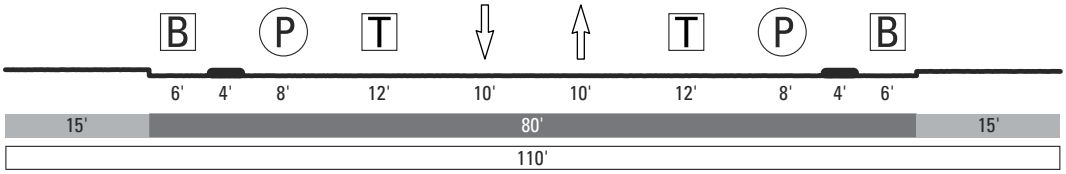
2.2	Cycle Track - with curbside parking



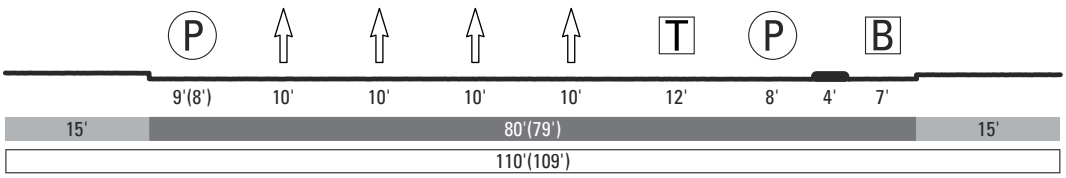
3	Transit Enhanced (TEN)
3.1	Full-time or peak period transit lane (curbside)



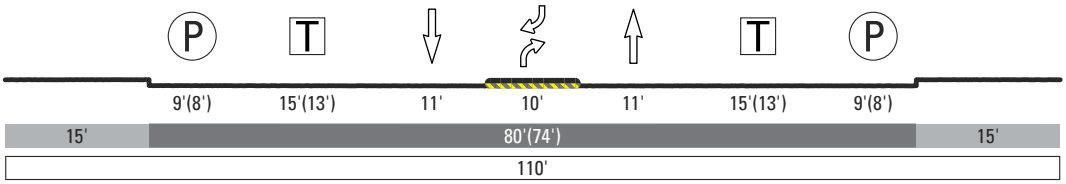
3.1	Full-time or peak period transit lane+
3.1 .1	a. Cycle track with curbside parking



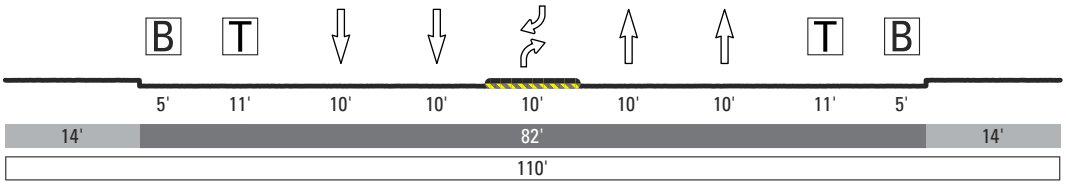
B.	Boulevard II (Major Highway Class II)--110’ ROW, 80’ Roadway (Typical)
3.1 .1	b. Cycle Track with curbside parking (one-way example)



3.1	Full time or peak period transit lane +
3.1 .2	Curbside parking

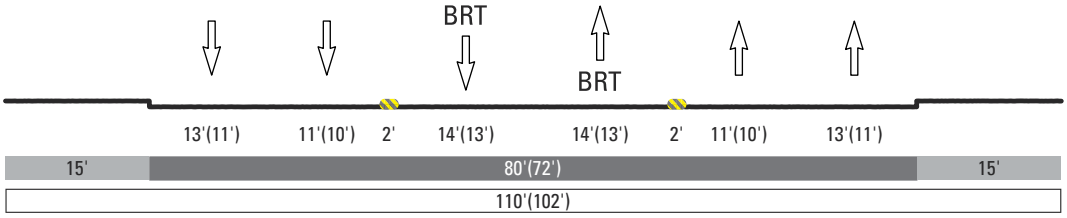


3.1	Full-time or peak period transit lane+
3.1 .3	Bicycle lane



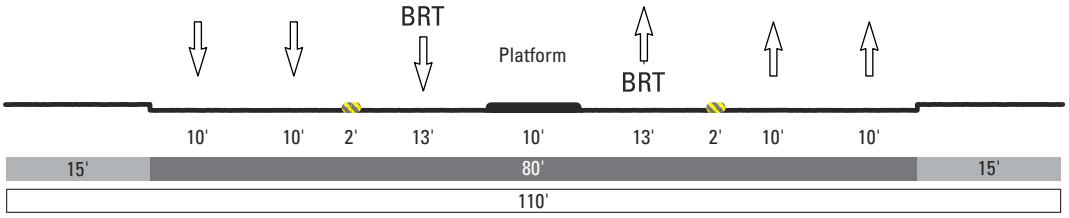
3.2	Bus Rapid Rransit (BRT) (center-running)

Midblock

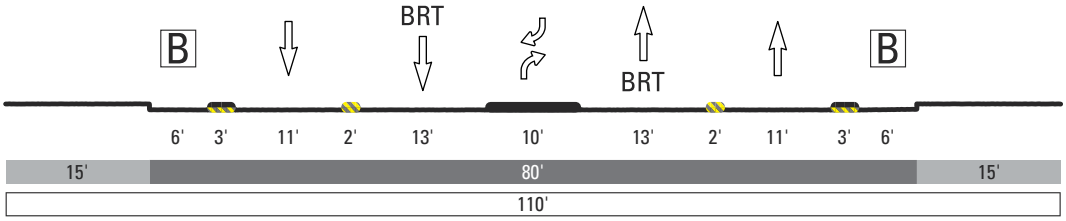


B.	Boulevard II (Major Highway Class II)--110’ ROW, 80’ Roadway (Typical)
3.2	Bus Rapid Transit (Center-running)

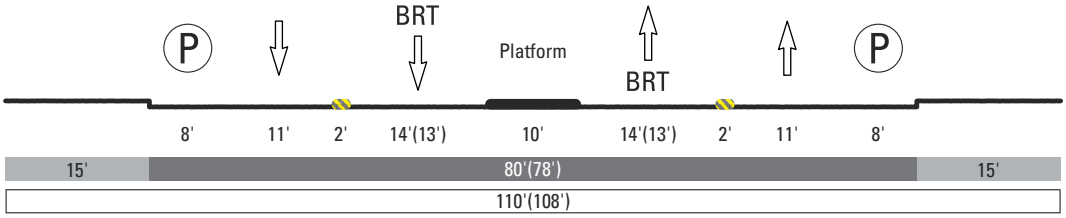
At approaching platform



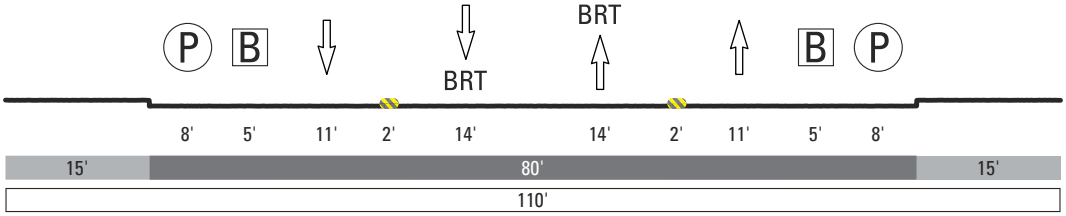
3.2	Bus Rapid Transit (at platform)+
3.2 .1	Cycle Track



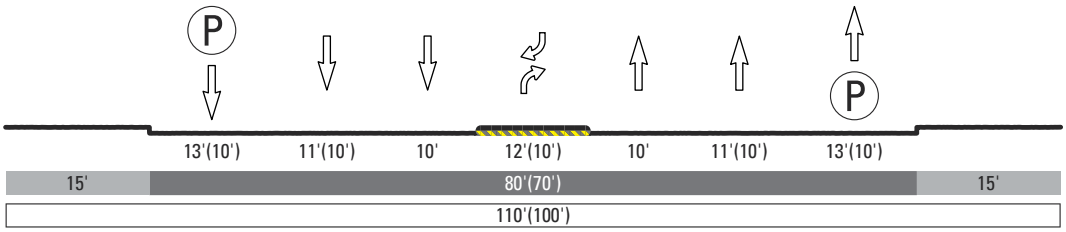
3.2	Bus Rapid Transit (BRT)(center-running)+
3.2 .2	Curbside parking



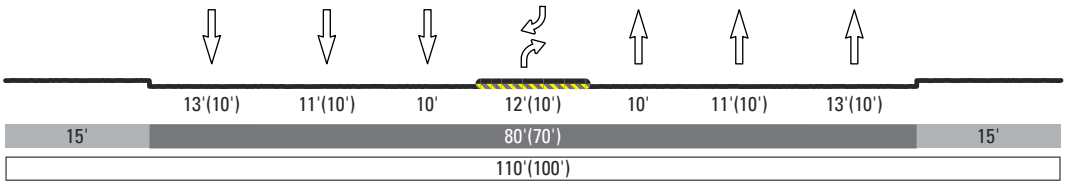
3.2	Bus Rapid Transit (BRT) (Midblock)+
3.2 .3	Bicycle lane and curbside parking



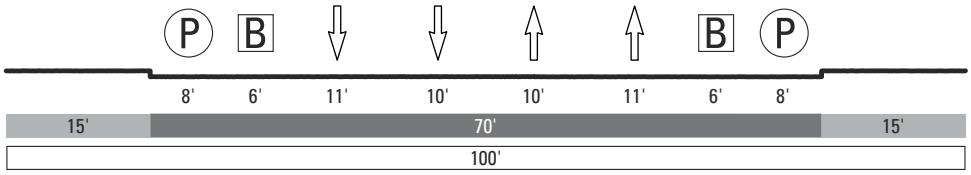
B.	Boulevard II (Major Highway Class II)--110’ ROW, 80’ Roadway (Typical)
4	Vehicle Enhanced (VEN)
4.1	b. With full-time or off-peak curbside



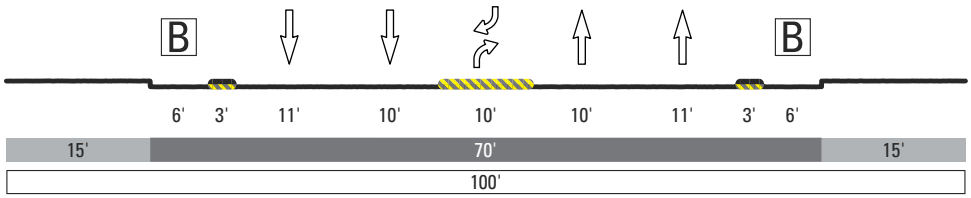
4.2	Without curbside parking



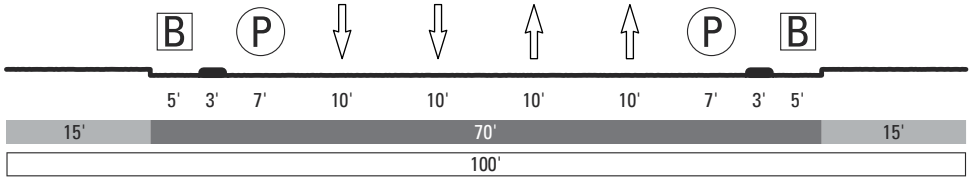
C.	**Avenue I (Secondary Highway)--100' ROW, 70' Roadway (Typical)**
1	Neighborhood Enhanced Network (NEN)
1.1	Bicycle lane and curbside parking



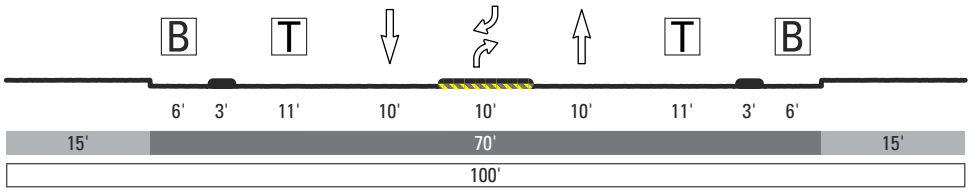
2	Bicycle Enhanced Network (BEN)
2.1	Cycle track - without curbside parking



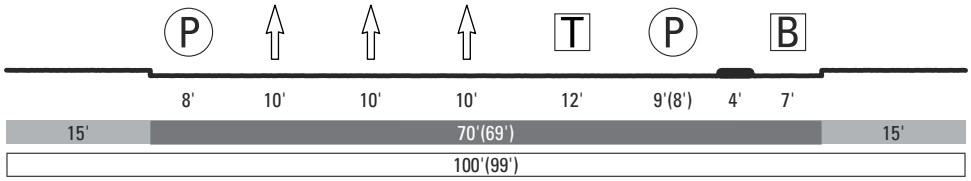
2.2	Cycle track with curbside parking



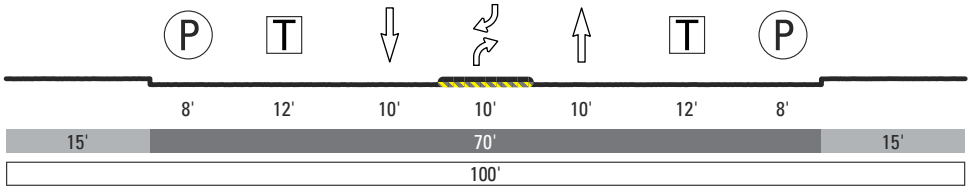
3.	**Transit Enhanced (TEN)**
3.1	Full-time or peak period transit lane+
3.1 .1	a. Cycle track (two way)



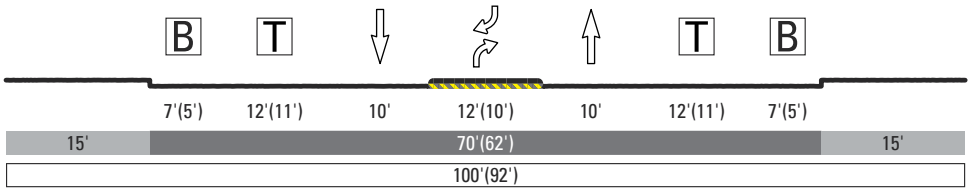
3	Transit Enhanced (TEN)
3.1	.1 b. Cycle Track (one-way)



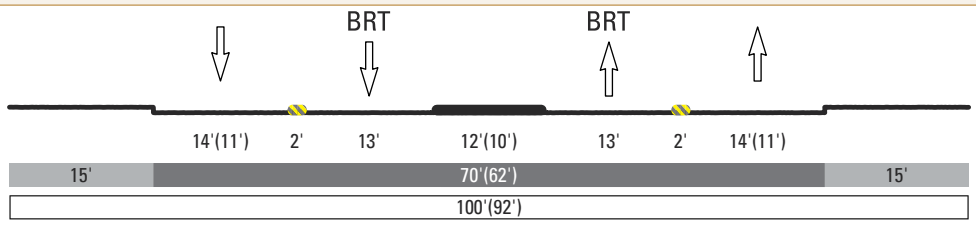
3.1	Full-time or peak period transit lane
3.1	.2 Curbside Parking



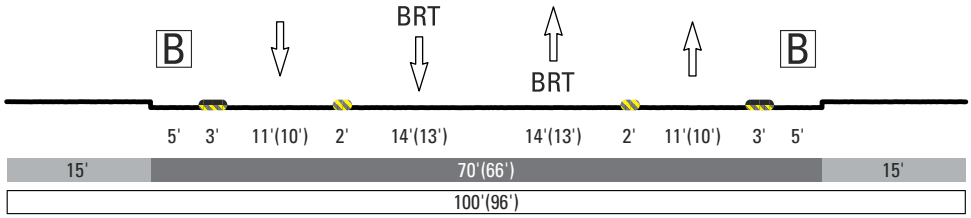
3.1	Full-time or peak period transit lane+
3.1	.3 Bicycle lane



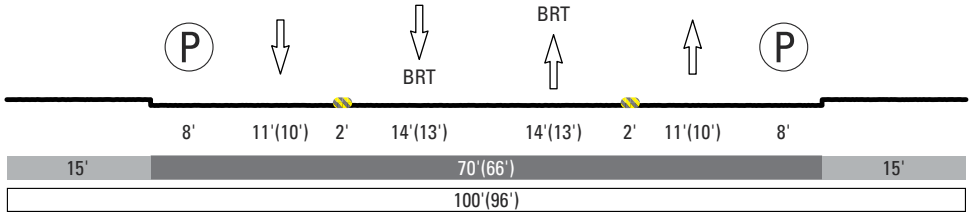
c.	**Avenue I (Secondary Highway) -- 100’ ROW, 70’ Roadway (Typical)**
3.2	Bus Rapid Transit (BRT) (at platform)
	at platform



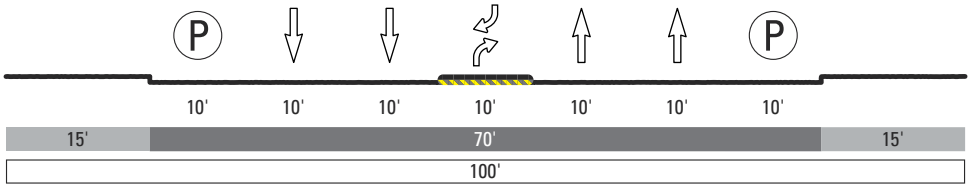
3.2	Bus Rapid Transit (BRT) (Midblock)+
3.2	.1 Cycle Track



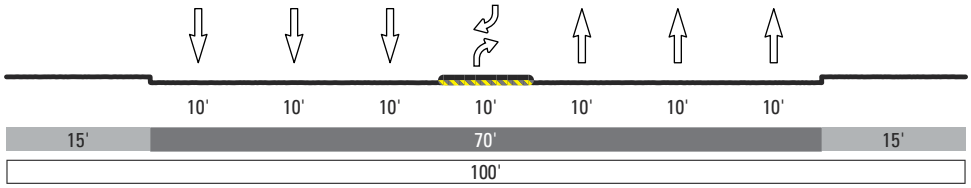
3.2	Bus Rapid Transit (BRT) (Midblock)
3.2	.2 Curbside parking



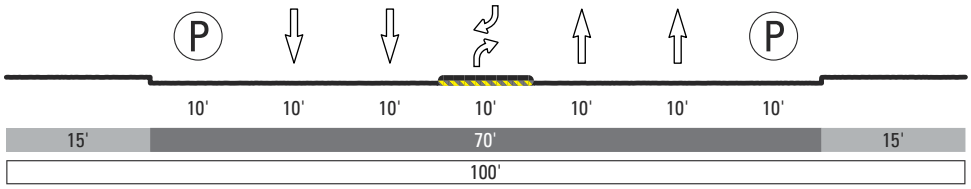
4	**Vehicle Enhanced (VEN)**
4.1	With full-time or off peak curbside parking



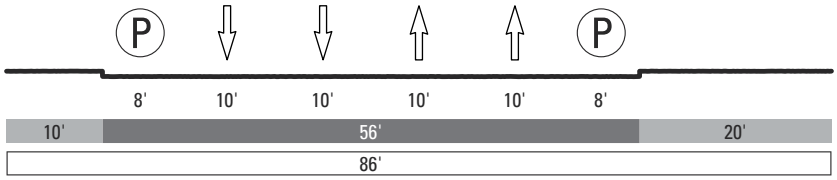
4.2	Without curbside parking



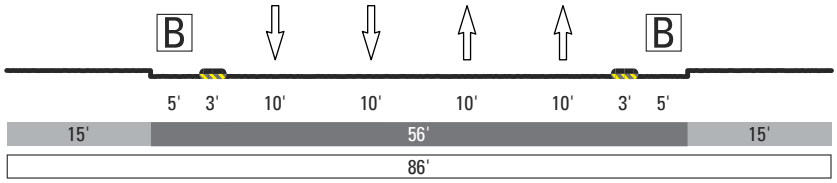
D.	**Avenue II (Secondary Highway) -- 86’ ROW, 56’ Roadway (Typical)**
1	Neighborhood Enhanced (NEN)
1.1	Bicycle lane and curbside parking



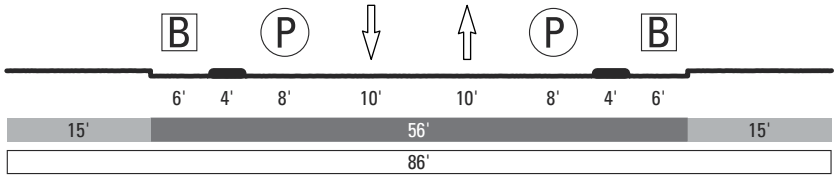
1.2	Equestrian Trail (one-side)



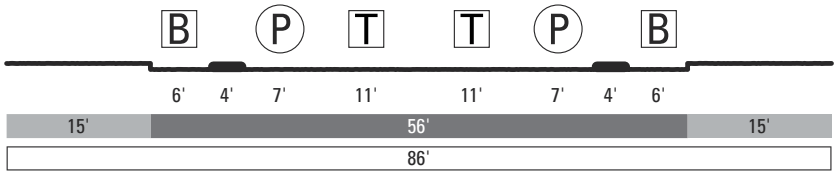
2	Bicycle Enhanced (BEN)
2.1	.1 Cycle Track without curbside parking



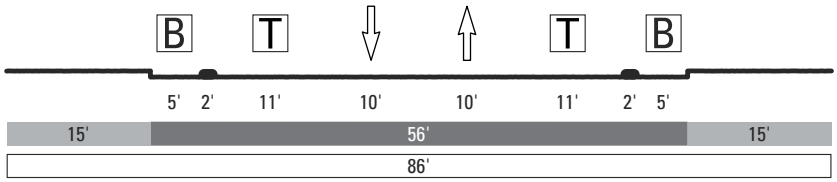
2.2	Cycle Track - with curbside parking



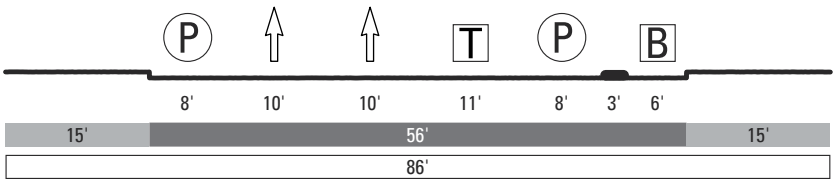
3	**Transit Enhanced (TEN)**
3.1	Full-time on peak period transit lane+
3.1	a. Cycle Track with parking



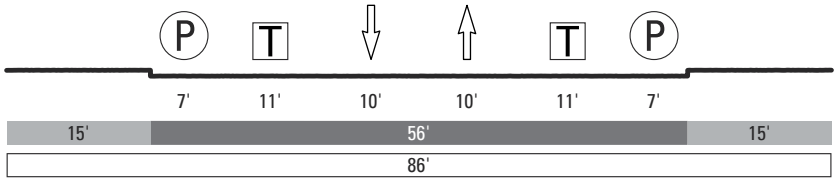
D.	Avenue II (Secondary Highway) -- 86’ ROW, 56’ Roadway (Typical)
3.1 .1	b. Cycle Track without parking



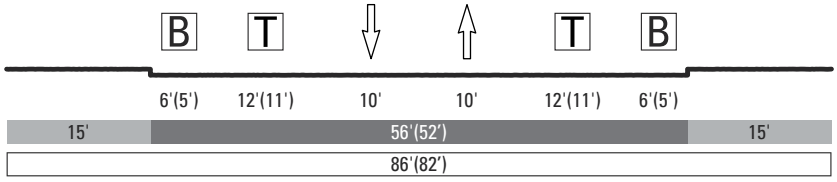
3.1 .1	c. Cycle Track (one-way)



3.1	Full-time or peak period transit lane+
3.1 .2	Curbside parking

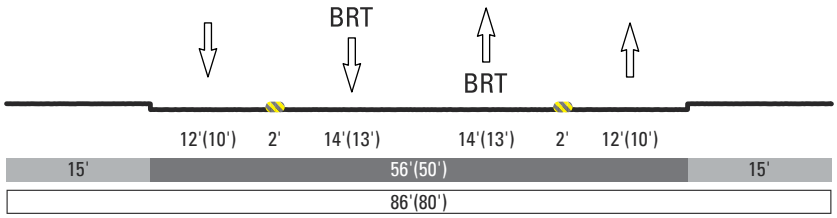


3.1	Full-time or peak period transit lane+
3.1 .3	Bicycle lane

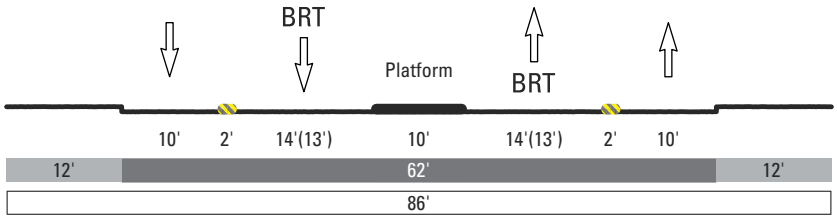


3.2	a. Bus Rapid Transit (BRT) (Center-running)

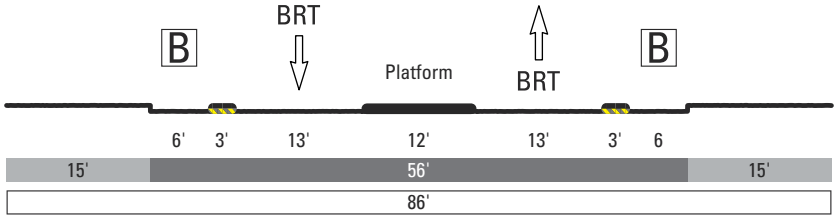
Midblock



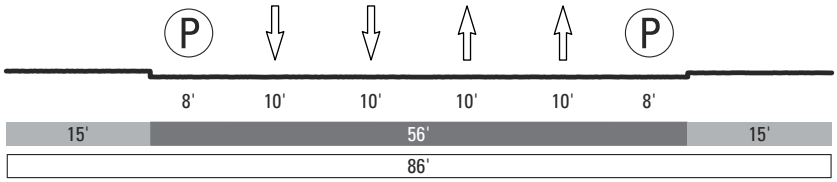
D.	**Avenue II (Secondary Highway) -- 86’ ROW, 56’ Roadway (Typical)**
at / approaching platform	



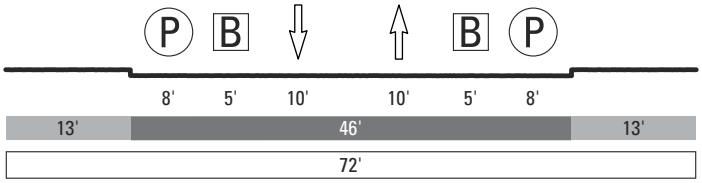
3.2	Bus Rapid Transit (BRT) (at platform)
3.2 .1	Cycle Track



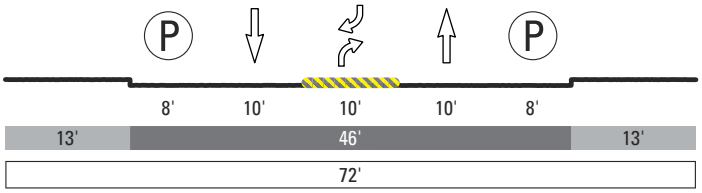
4	**Vehicle Enhanced Network (VEN)**
4.1	With curbside parking



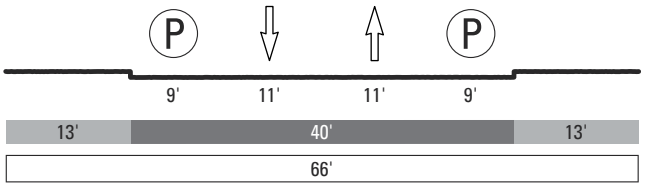
E.	**Avenue III (Secondary Highway) -- 72’ ROW, 46’ Roadway (Typical)**
1	**Neighborhood Enhanced (NEN)**
1.1	Bicycle lane and curbside parking



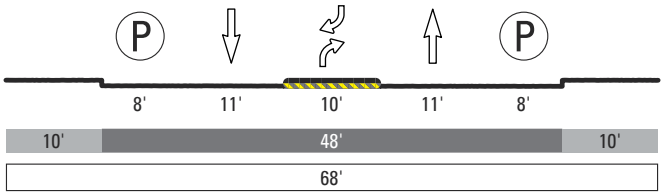
1.2	Shared lane markings and curbside parking



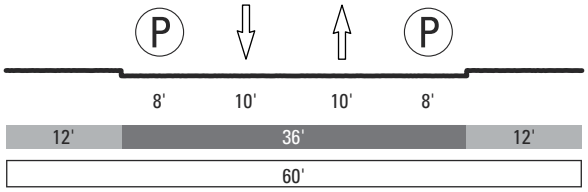
F.	Collector Street -- 66’ ROW, 40’ Roadway (Typical)
1	**Neighborhood Enhanced (NEN)**
1.1	Shared lane markings and curbside parking



G.	Industrial Collector Street - 68’ ROW, 48’ Roadway (Typical)
1	**Neighborhood Enhanced (NEN)**
1.1	Shared lane markings and curbside parking

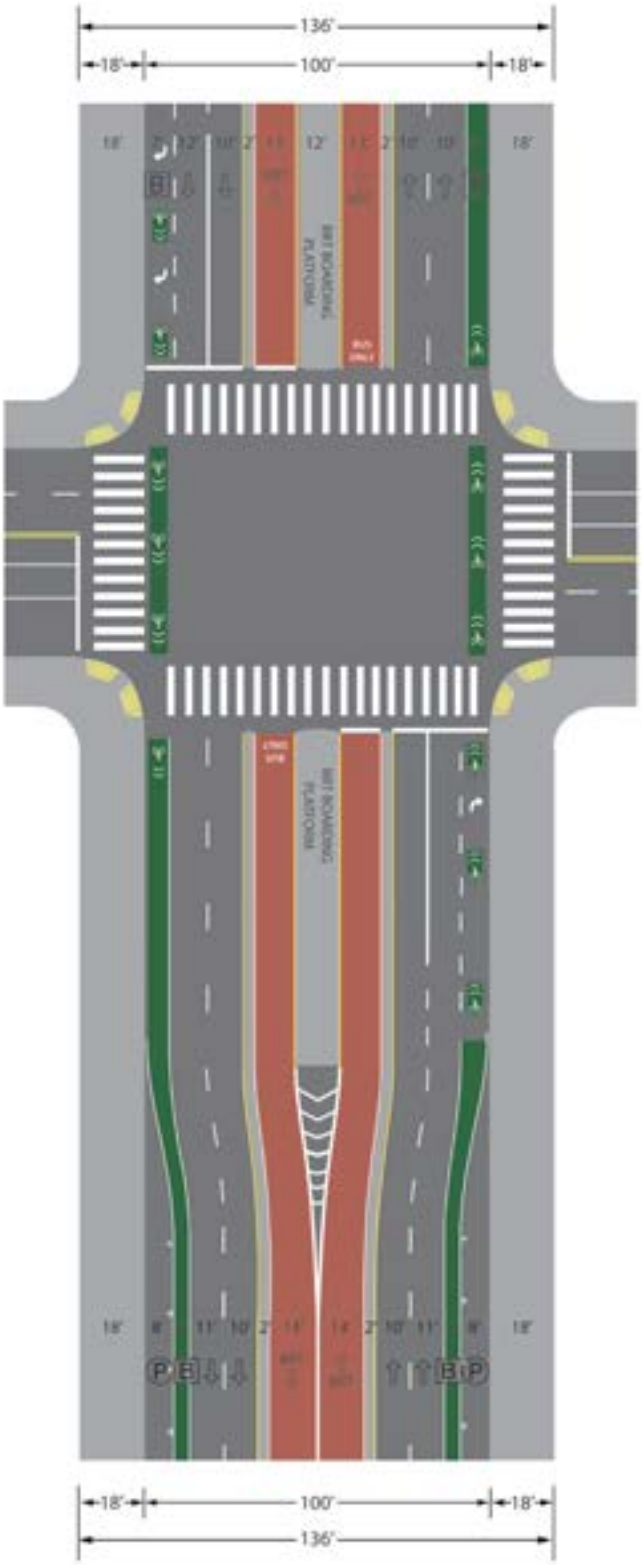


H.	Local Street (Standard) -- 60’ ROW, 36’ Roadway (Typical)
1	**Neighborhood Enhanced (NEN)**
1.1	Shared lane markings and curbside parking

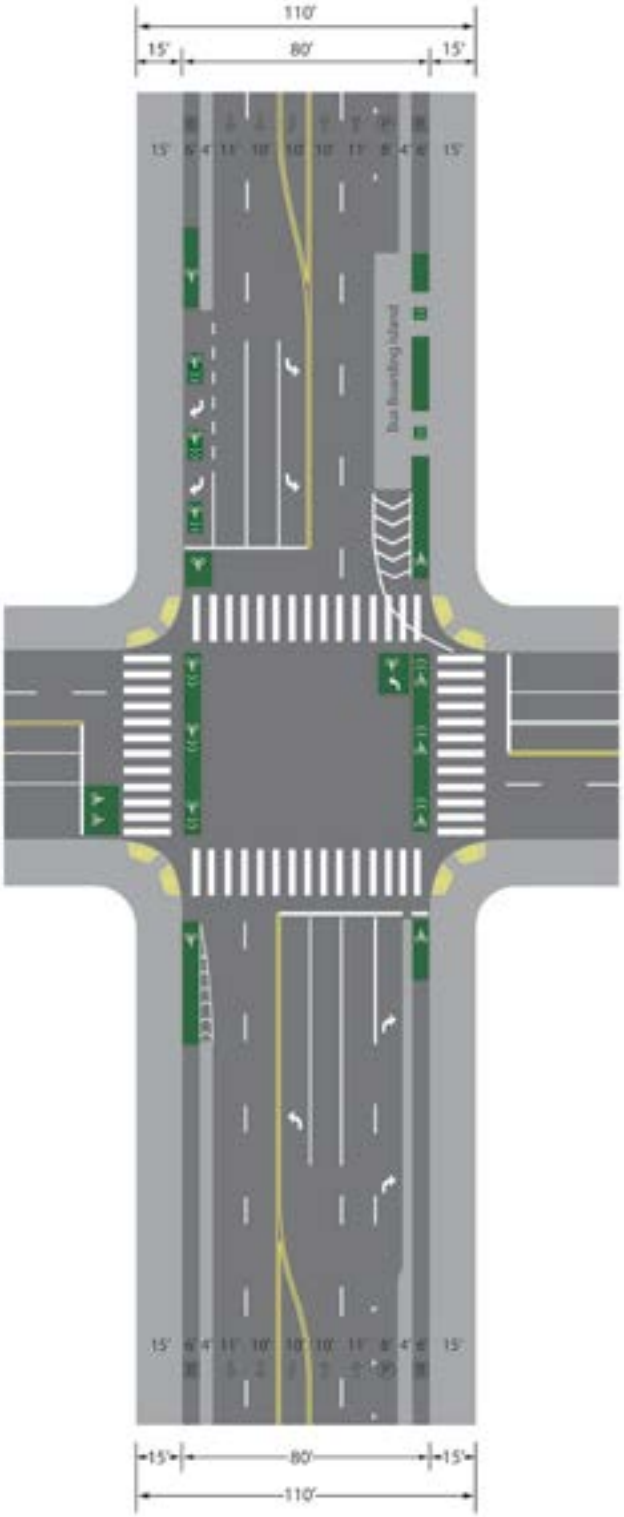


Complete Street Sample Plan Views

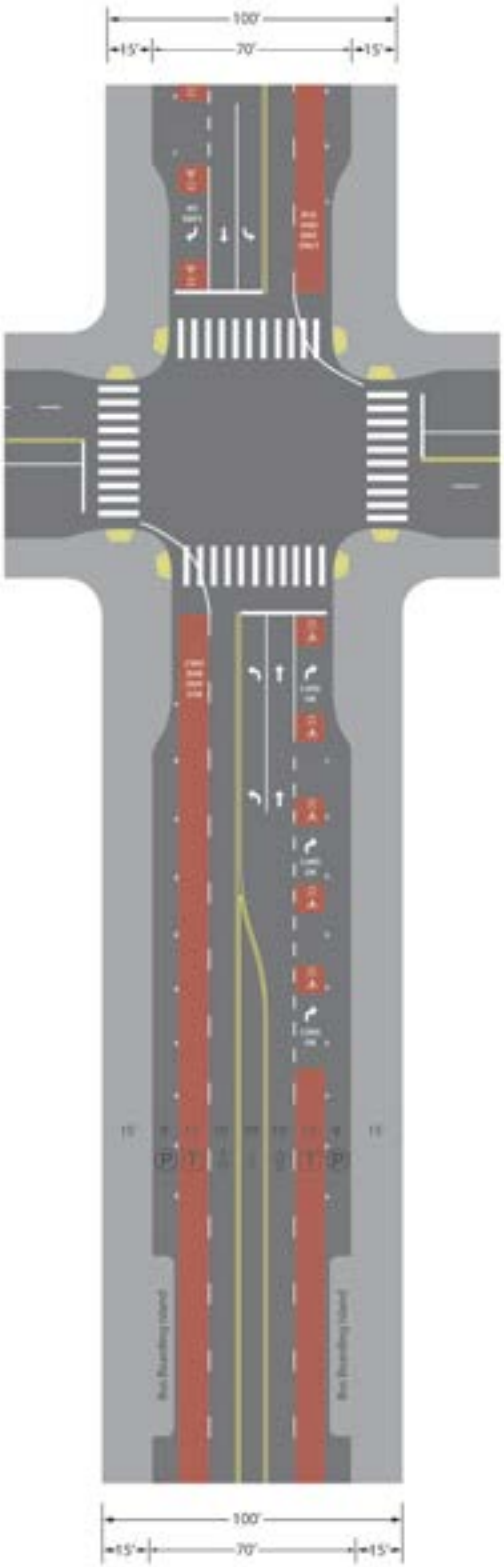
Boulevard I (Major HIghway Class I) - Transit Enhanced Network with Bus Rapid Transit (BRT)



Boulevard II (Major HIghway Class II) - Bicycle Enhanced Network with Protected Bike Lanes



Avenue I (Secondary Highway) - Transit Enhanced Network with Bus-Bike Only Lanes



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COMPLETE STREETS DESIGN GUIDE

SIDEWALK AREA

4

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4. SIDEWALK AREA

Introduction

The Sidewalk Area represents the pedestrian realm located between the curb and the property line. While its primary function is to provide a safe and accessible means of travel for pedestrians travelling along the street, the sidewalk area can also be a vibrant place where people can enjoy the urban environment. This chapter introduces a variety of structural, natural and functional components that may be applied based on contextual factors including adjacent land uses, pedestrian volumes, and sidewalk area dimensions. Used individually or in coordination with other interventions in this guide, these components enhance safety, security, accessibility, and the overall urban experience for all users.

The Sidewalk Area can be partitioned into four zones: Frontage Zone, Pedestrian Zone, Amenity Zone, and Flex Zone. Each zone (defined and illustrated in chapter 1) has its own distinct function in a Complete Street. Their boundaries are not always fixed, and many features can be located in more than one zone.

4.1 Building Entries

Building entries can be enhanced by revsourceful and imaginative utilization of the frontage zone. Treatments include lighting, awnings, pavement decoration, and landscape planters.

Benefits

- Enlivens the pedestrian environment by adding visual and spatial interest to the sidewalk area
- Highlights building entry points as an important feature of the urban environment
- Provides retail businesses with additional opportunities to attract passersby

Applications

- The usage of the frontage zone for entrance enhancements occurs most commonly in pedestrian-oriented districts where building frontages adjoin the sidewalk, especially in commercial and mixed-use districts with high pedestrian activity.
- In districts with lower densities where buildings are generally set back from the public right-of-way, sidewalk-adjacent property entry points (e.g. entry paths, gates, portals, or columns) can also be enhanced in similar fashions.

Design Guidance

- Elements including landscaping planters and lighting must not encroach upon the minimum pedestrian access route (PAR). Additionally, entry treatments should ensure a fully-accessible access route from the walkway zone to the point of entry.
- The aesthetic qualities of entrance treatments should complement and visually reinforce the design of both the building and the streetscape.
- Planters must be durable and highly-visible so they do not become hazards to visually-impaired pedestrians. If necessary, awnings may extend over the walkway zone. Canopies with structural supports can be allowed when the supports are located outside of the walkway zone within the frontage or amenity zone.
- Light fixtures should be oriented and directed to provide light only within the entrance area, so that skyward and horizontal light pollution is kept to a minimum.
- Pavement textures and/or materials should meet ADA standards for accessible surfaces.

Landscape planters and awnings can distinguish a building entry.

Marquees and entrance canopies mark important entries and can contribute to a vibrant, enjoyable street environment.

- In many older sidewalk-oriented commercial districts in Los Angeles, building owners gave prominence to their entranceways by utilizing decorative paving, marquees, and/or metal awnings. These provide visual and spatial interest in the pedestrian realm, and they should be preserved when possible

Resources

BOE/BSS R-Permit procedure BOE Entrance Canopy Permit procedure

Other Discussion

In Los Angeles, a business owner is granted conditional use of the public right-of-way by a Revocable Permit (R-Permit) issued by the Department of Public Work's Bureau of Engineering (BOE), with approval from the Bureau of Street Services (BSS). The R-Permit review process ensures that encroachments are checked for compliance with the City's specifications for design and use. BOE also issues Entrance Canopy Permits for canopies with structural supports away from the building (not awnings), assuring that they meet standards for design, size, material, and placement.

Metal roll-up doors, used as a security feature, conceal urban storefronts during non-business hours and present road users with a blank, opaque streetwall lacking in visual interest. At a minimum, semi-transparent metal gate/screen roll-up doors or side fold-away doors with windows should be encouraged as an alternative to fully-opaque metal roll-up doors. Business and property owners should be encouraged to remove these doors entirely to ensure a more transparent and interesting streetwall even during non-business hours.

Metal roll-up security doors should generally not be used, because they detract from the street experience and conceal storefronts and entries.

Compared to solid metal roll-up doors, grated security gates provide a more interesting street environment and a more pleasant pedestrian experience, while still ensuring security.

4.2 Portable Signage and Sidewalk Merchandising

In pedestrian-oriented commercial areas, many retail businesses utilize the frontage zone for pedestrian-scale signage and merchandise displays. Typically, sidewalk signage consists of sandwich boards placed in front of businesses. Merchandise displays can range in scale – from a single rack placed beside a store entrance to a collection of tables/racks that extend a storefront into the public realm.

Benefits

- Adds visual and spatial interest to the public realm
- Enlivens the street environment by promoting activity and public interaction
- Provides retail establishments with a valuable opportunity to attract customers and to be more visible to passersby

Applications

- Sidewalk signage and merchandising are primarily located in pedestrian-oriented shopping districts, although they are used by retail- and service-providing businesses in a variety of land use contexts.

Design Guidance

- The utilization of the sidewalk area for signage and/or merchandising is possible only when the sidewalk area has sufficient width to ensure the required accessible pedestrian access route (PAR). When determining placement of signage and merchandise displays, owners and permitting agencies must take into account the active space around the fixtures likely to be used by shoppers.

- The size of portable sidewalk signage (sandwich boards) should conform to BSS standards. Businesses should generally be limited to one portable sign to avoid clutter.
- Signage and merchandise displays should be freestanding so they are removable at the end of business hours.
- Businesses sometimes place portable signage that is oriented toward automotive traffic instead of the sidewalk environment. Examples include signs at curbside valet zones parking lot entrances. These signs, where permitted, should be designed to be in scale with the pedestrian environment. Display fixtures shall be fabricated of durable materials that are compatible with the surrounding visual character and that are resistant to sun and water damage. Fixtures must be stable and have sufficient weight to avoid being tipped over by wind.
- In addition to being located outside of the walkway zone, design considerations should be made to ensure maximum visibility and safety for visually-impaired pedestrians. For example, display racks may incorporate bright colors, and highly-visible diverters can be placed at either end of the merchandising area.

Other Discussion

In Los Angeles, a business owner is granted conditional use of the public right-of-way by obtaining a Revocable Permit (R-Permit) issued by the Department of Public Work's Bureau of Engineering (BOE) with approval from the Bureau of Street Services (BSS). The R-Permit review process ensures that encroachments are checked for compliance with the City's specifications for design and use.

Other sidewalk merchandising includes newsracks and newsstands, although both are becoming less utilized in today's urban environment. BOE grants newsrack permits after BSS has approved their placement per guidelines in the municipal code. Newsstand permits are granted in a similar manner. Both newsracks and newsstands should be located near areas of high pedestrian activity. Newsracks should be consolidated in groups of two or more; a multi-unit newsrack is preferred to individual racks placed side-to-side. As trends continue to shift toward non-print media, there is a decline in the utilization of newsracks and newsstands. Unused and/or unmaintained newsracks can be a visual blight; the removal of under-utilized newsracks should be encouraged.

Resources

BOE R-Permit procedure
BOE Newsrack Permit procedure

The placement of portable signage should not encroach on the pedestrian zone. Sandwich boards should be located fully within either the frontage or amenity zones.

Multiple newspaper racks consolidated into a single location can be artfully screened from the street, making an attractive contribution to the sidewalk environment.

4.3 Streetscape Signage and Wayfinding

Signage in the public right-of-way is a ubiquitous feature of the urban streetscape. At a minimum, signs convey essential information to motorists, cyclists and pedestrians. Within the pedestrian realm, signage can also highlight gateways to neighborhoods or districts, provide directional and wayfinding information, and offer educational opportunities. The placement of signs is as important as the information they convey. Poor placement and/or excessive signage can reduce effectiveness and create a cluttered street environment.

Benefits

- Facilitates safe streets through the effective design and placement of essential traffic signs such as speed limit and warning signs
- Enhances pedestrian mobility by providing directional information to nearby destinations, transit stops/stations, other districts, etc.
- As placemaking tools, provides a coherent image of a neighborhood or district, marks entry points, and gives information about places of interest and/or local history.

Applications

- Generally, roadway-oriented signage is sited according to existing standards (e.g., distances from intersections/crossings, distances between signs, etc.). The placement of pedestrian-oriented signs, however, is largely dependent on specific contexts. As for all other physical features in the sidewalk area, these signs should comply with required clearances from other street elements and comply with ADA accessibility requirements.
- Pedestrian-oriented signage is most appropriate in areas with high pedestrian volumes including commercial districts, tourist-oriented locations, historic districts, and cultural districts. Wayfinding programs can be used to provide signage to enhance pedestrian mobility throughout the city; they can deliver directional information to guide pedestrians to special destinations such as parks, historic buildings, cultural amenities, bus stops and Metro stations. Signs can be used to convey spatial information through the use of maps and written directions.

Informational displays are an important placemaking tool to highlight a district's history, culture, and uniqueness.

Considerations

- A major challenge is to avoid adding to the visual clutter that often exists along the roadways and sidewalks in Los Angeles. Too many signs clustered together can make them indecipherable and ineffective.

Guidance

- Sign installation should be coordinated between departments and agencies in order to provide a less-cluttered streetscape and to encourage clear and effective communication. Currently, at transit stops serving multiple transit agencies, it is common practice for each agency to post flag signs on its own individual sign pole. This results in visual clutter, obscuration of one flag sign by another, and reduced space for boarding and alighting. Transit-providing agencies (e.g. LA Metro, LADOT, Santa Monica Municipal Bus Lines, and Culver CityBus) should coordinate the placement of flag signs to minimize the number of poles at shared bus stops.

At many transit stops, multiple sign poles create obstructions for transit riders boarding and exiting the bus, and they produce visual clutter. Transit signs can be consolidated in order to limit the number of sign poles.

Roadway-oriented signage

- The number of sign poles should be minimized by placing traffic and parking signs onto single poles and by placing new signs on existing poles wherever possible. On the other hand, too many signs attached to one pole can result in a jumble that renders the signs ineffective. Sign placement should comply with MUTCD guidelines.

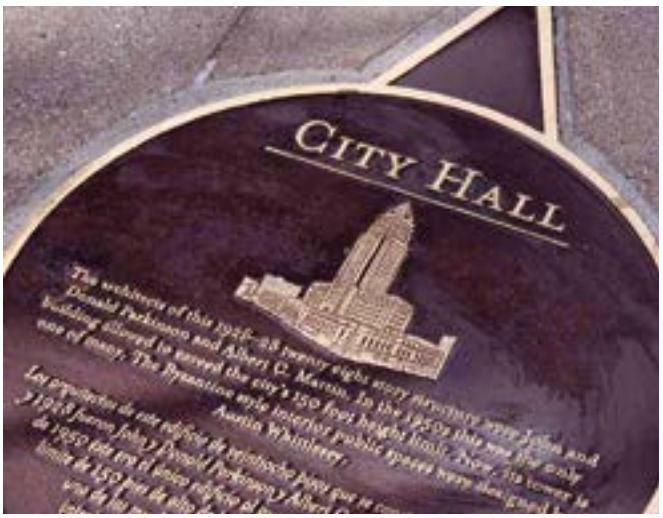
- Traffic and parking signs should be placed so that they are unobstructed by other streetscape elements.

- Signs should be placed away from locations ideal for landscaping, lighting, and site furnishings wherever possible.

- Signs should not be placed in locations where they obstruct the minimum clearance width for, or protrude into, the pedestrian walkway.

- Roadway-oriented signs with two posts where one or both posts are located in the pedestrian zone should not be utilized. These interior posts often intrude upon the pedestrian clear path and are hazards for visually-impaired pedestrians.

- Parking sign designs that utilize graphics and numbers (in lieu of an abundance of text) should be considered for use in the City. These designs communicate parking hours and restrictions in a clear manner for all road users including non-English speakers.



Pavement plaques can be an enjoyable alternative to above-ground wayfinding signage.

Pedestrian-oriented signage

- Wayfinding signage should have a distinct and coordinated design that reflects the culture and character of the surrounding neighborhood or district. Well-designed signage supports a neighborhood or district's distinct identity.

- Kiosks in public areas provide valuable information such as maps, bulletin boards, and community announcements. Kiosks can often be combined with gateway signs and are an attractive and useful street feature. They may be located in any of the following areas:

- Wayfinding signage and/or kiosks should be provided at all major transit stops. They should be visible to transit users without negatively affecting accessibility.

- Signage should utilize clear, concise and consistent language and provide easily-understood graphic information.

- Placemaking signage that provides destination descriptions and local history should be supplemented with tactile information to be accessible to people with visual impairments.

Bicycle-oriented signage

Bicycle lanes have unique signage requirements that are included in chapter nine of the California Manual of Uniform Traffic Control Devices (MUTCD). The MUTCD should be consulted during the design of any facility.

Directional and wayfinding signage should be visually distinguishable from vehicle-oriented roadway signage.

References

Traffic and directional signage: CA MUTCD
Los Angeles Municipal Code Sign Regulations-

4.4 Public Seating

Public seating contributes to an active pedestrian environment by enhancing the role of the sidewalk as an enjoyable public space. Seating serves short-term needs to rest or wait, and it also fosters socialization and enjoyment of the urban environment. Examples of public seating include fixed benches, sitting rounds, seats built into other amenities like landscape planters, and even movable chairs and tables.

Benefits

- Activates and enlivens the sidewalk environment
- Forms active social spaces, especially when grouped in areas of higher pedestrian activity
- Provides valuable places for pedestrians to rest along the path of travel
- Contributes to economic vitality by creating a pedestrian-oriented environment that is attractive for shopping

Applications

- Seating is a valuable public amenity on all streets in Los Angeles regardless of surrounding land uses.
- Providing well-distributed seating furniture is especially important in areas with high concentrations of pedestrian activity and on streets with pedestrian-oriented destinations.
- Seating may be located anywhere within the sidewalk area as long as the minimum walkway clear width is maintained.
- Benches and other seating areas are most commonly located in the amenity zone. Seating is also a primary component of many curb extensions in the flex zone. In addition, seating can be located in the frontage zone, where users benefit from an added buffer from the roadway.
- Business and building owners, Business Improvement Districts, and neighborhood groups are encouraged to install and maintain public seating fixtures as a public benefit.
- Benches to accommodate transit users should be provided at all transit stops.
- Seating in outdoor dining areas is discussed in “Outdoor Dining”, section 4.5 below.

Curb extensions can provide additional space for sidewalk seating.

Public seating can be oriented perpendicular to the curb. Ideally, seats should face each other to encourage social interaction. instead of being placed back-to-back as shown above.

Considerations and Guidance

- Seating should not impede ADA clear widths (Pedestrian Access Route) in the pedestrian zone. This determination must account for the seated persons' utilization of space beyond the boundaries of the seating element.

- Seating must not conflict with access to building entries, loading zones, parked vehicles, driveways, and fire hydrants.

- Poorly-located seating is often under-utilized seating. City agencies must ensure proper locational placement so that seating fixtures situated in areas where people would like to-or need to-be seated. Seating is especially valuable in shaded areas, preferably under trees.

- Public-private partnerships between City agencies (mainly the Bureau of Street Services) and business or neighborhood groups are a powerful tool for installing and maintaining abundant and varied seating opportunities throughout the City's diverse districts and neighborhoods. Other creative financing opportunities include bench sponsorship programs and incentives to business owners for the installation and maintenance of public amenities outside their businesses. These methods can support broader streetscape improvements incorporating other streetscape elements such as trees, landscaping, wayfinding signage, and lighting.

- The placement of seating fixtures must be balanced with other sidewalk elements and functions. Seating should be integrated with the placement of other street furniture (e.g., pedestrian lighting and trash receptacles).

- The aesthetic qualities of seating fixtures should complement and visually reinforce the design of the streetscape. Seating should be designed to complement other street furniture in material and scale, and it can harmonize with architectural qualities of surrounding buildings.

- Public seating on the sidewalk should be permanently affixed unless an adjacent business agrees formally to be responsible for its maintenance and security.

- Where there is sufficient space (for example, on curb extensions and in wide amenity zones), seating can be clustered to form social spaces.

- Where seating in the amenity zone is oriented parallel to the curb, it should face toward buildings and away from the street (except at transit stops). In frontage zones, seating that is oriented parallel to the building wall should generally face away from buildings. Where sidewalk width permits, seating in either zone can be perpendicular to the curb or building wall, placed either individually or in pairs facing one another; this orientation can create spaces that encourage socialization.

Wide sidewalks provide abundant space for public seating that encourages social interaction. Trees placed adjacent to seating provide shade and contribute to a comfortable, attractive pedestrian environment

There are many innovative alternatives to traditional bench seating, including seating at the edge of landscape planters.

This fanciful seating is part of a streetscape project completed through the City's Great Streets Initiative.

- Curbside seating should be avoided where there is a curbside vehicular travel lane, although it is acceptable at transit stops (see further discussion in "Transit Stops", below). The lack of an adequate buffer between seating and traffic results in lower safety and comfort.

- Informal seating opportunities may be used as an alternative to free-standing benches. These include low walls, sitting rounds, seating built into planter walls, or leaning bars.

- On streets with ground-floor commercial uses and medium to high pedestrian volumes, seating for 3 (e.g. one 6-foot-long bench) should be provided at least every 200 feet.

- In locations where production filming is common, the placement of street furniture should take into consideration the movement of large production equipment between the roadway and the sidewalk area. This can be accomplished by allowing sufficient clear space along the curb between street amenities and/or by placing street amenities further away from the curb. (In both cases, four feet of clear space is generally desired).

Other Discussion

In Los Angeles, a property owner is granted conditional use of the public right-of-way by a Revocable Permit (R-Permit) issued by the Department of Public Work's Bureau of Engineering (BOE), with approval from the Bureau of Street Services (BSS). The R-Permit review process ensures that encroachments are checked for compliance with the City's specifications for design and use.

4.5 Outdoor Dining

Sidewalk dining facilities encourage social use of the public realm, helping to foster a vibrant urban environment. Common features include tables, chairs, sheltering elements (e.g., awnings and umbrellas), and enclosing elements (e.g., planters and fencing). Dining uses in the public right-of-way exist in a variety of forms and intensities; for example, sidewalk dining can be as simple as a pair of small tables placed in front of a local cafe, or it can be as substantial as a semi-enclosed dining patio.

Benefits

- Provides opportunities for patrons to enjoy the surrounding urban environment and the outdoors
- Activates and enlivens the sidewalk environment
- Provides visual interest to the streetfront
- Increases business revenue by attracting patrons and providing additional seating space

Applications

- Sidewalk dining areas are encouraged in commercial districts with active pedestrian-oriented environments. They are most commonly located in the frontage zone directly adjacent to the restaurant establishment. Dining facilities may also be permitted in the amenity and flex zones as long as some additional considerations are addressed (see discussion below). Curb extensions and parklets (further discussed in Section 4.15 below) can provide valuable space for outdoor dining while maintaining full pedestrian functionality on narrow sidewalks.
- The minimum width (perpendicular to the building frontage and curbline) necessary to accommodate dining facilities is generally considered to be 6 feet.

Considerations

- Care must be given to the design and layout of sidewalk dining facilities to ensure that sidewalk functionality is maintained. The minimum (or desired) Pedestrian Access Route (PAR) should remain clear, and ADA requirements must be met. When considering the effects of non-enclosed dining facilities on pedestrian mobility, business owners and city staff should account for space used for wait staff and for additional items like strollers and shopping bags.

- Tables and chairs in the amenity and flex zones should maintain access to parked vehicles, and they should not be located on sidewalks adjacent to handicap-accessible parking, commercial loading, and passenger loading lanes. Placement of tables and chairs on the sidewalk must not interfere with curb ramps, access to building entries, intersection/driveway/alley visibility, fire escapes, and access to above-ground infrastructure. Minimum clear widths between dining furniture and the above street elements are identical to those for seating and other physical sidewalk elements.

- The design and layout of dining facilities placed in the amenity and flex zones require additional considerations, including accounting for restaurant-related cross-traffic across the walkway zone and maintaining curbside access for parking, utilities, emergency access, etc.

- As a private use of public space, it is necessary to hold the restaurant establishment accountable for maintenance and upkeep.

Design Guidance

- Diverters at either end of a dining area (perpendicular to or angled away from the facade) are required to guide the visually impaired toward the clear path of travel. These can be in the form of fencing, low walls, or planters – preferably in highly-visible colors. Enclosures along the long edge (parallel to the facade) are required only where alcohol is served, but they may be provided elsewhere to help delineate space and to create a sense of security for patrons.

- Since the public purpose sidewalk dining is to stimulate activity on the street, the City should prohibit restaurants from fully enclosing the dining area, which effectively privatizes public space. The use of low movable planters to define a sidewalk dining area is encouraged. To maintain permeability between the dining area and the public realm, enclosures (including plant heights) shall not exceed 42 inches in height.

- Dining furniture – including tables, umbrellas, chairs, and enclosing elements – can be either freestanding or fixed. In most settings, furniture should be freestanding so it is removable at the end of business hours, yet care must be taken in its placement to ensure a clear walkway. Dining furniture should be fabricated of durable materials that are compatible with the surrounding visual character and that are resistant to sun and water damage. Furniture must be stable and have sufficient weight to avoid being tipped over by wind.

- For dining areas in the amenity and flex zones, sufficient buffering elements (e.g., parked vehicles or landscape planters) must be present to protect patrons from passing vehicles. Generally, dining areas should not be located in the amenity or flex zones on streets with design speeds over 30mph.

Other Discussion

Currently, a business owner is granted conditional use of the public right-of-way by a Revocable Permit (R-Permit) issued by the Bureau of Engineering (BOE), along with an approval by the Bureau of Street Services (BSS). The R-Permit review process ensures that encroachments are checked for compliance with the City's specifications for design, use, material, and inspection. The City is encouraged to further refine this process city-wide to simplify and expedite the permitting process for businesses.

Resources

BOE R-Permit procedure

4.6 Public Art

Public art takes many forms with a wide array of functions and benefits. For example, art can reward passersby with a moment of visual delight, provide interactive/participatory opportunities for learning and play, act as a focal point, and/or provide a functional use (e.g., wayfinding, seating or bicycle parking). On a larger scale, public art can be a placemaking element that reinforces a community's identity and culture.

Benefits

- Activates and enlivens the sidewalk environment, providing passersby and users of public space with opportunities for visual stimulation, interaction, and delight
- Reinforces a community's or district's identity when themed to reflect its culture and/or character
- Can provide a focal point for a shared public space such as a park, plaza or seating area

Applications

Public art can be situated in a variety of areas and locations, especially on streets and public spaces with high concentrations of pedestrians. Art can be located anywhere in the sidewalk area (except the pedestrian zone) and on exterior building walls that are adjacent to or nearby the sidewalk area. In addition, art for public benefit is encouraged on private property through various city programs.

Considerations and Guidance

- Public art should be considered during the planning and design phase of development in order to be more closely integrated with other streetscape elements.
- Public art can be incorporated into utilitarian street elements (e.g., landscaping, light standards, benches, trash receptacles, bicycle parking facilities, and utility boxes). This is especially beneficial to areas with high pedestrian volumes such as commercial, civic and cultural districts.
- Public art can also be interactive, encouraging play and recreation. The best art provides these benefits for people of all ages.

Utility boxes provide abundant opportunities to enliven the street environment.

- Art murals on private property are an integral part of LA's urban environment. Non-commercial murals should especially be encouraged for blank exterior walls that are visible from the roadway and sidewalk.
- Public art should be accessible to persons with disabilities, and its placement must not compromise the clear pedestrian zone.
- The siting of public art should maintain all clearances and applicable Americans with Disabilities Act (ADA) requirements.
- Maintenance should be coordinated with sponsoring agencies or groups.
- Large-scale public art (e.g., murals or "supergraphics") can be oriented toward roadway users as long as it does not pose a distraction hazard.

Other Discussion

Public art affords a rich opportunity for public-private partnerships to improve the built environment through collaboration and coordination. A successful public arts program involves a robust public-private partnership including City agencies, business owners, cultural organizations and neighborhood groups.

In Los Angeles, the Department of Cultural Affairs' Public Art Division currently coordinates four arts programs: the Public Works Improvements Arts Program (PWIAP, more commonly known as Percent-for-Public-Art; the Private Arts Development Fee Program (ADF); the Murals Program; and the City's Art Collection.

Ordinance number 182706 (2013) amended the Los Angeles Municipal Code (Sections 14.4.2, 14.4.3 and 14.4.20) to allow for the creation of new non-commercial art murals and the preservation of existing art murals on private property including residential single-family residences. The purposes of the new regulations are to "encourage artistic expression, foster a sense of pride, prevent vandalism at mural sites through the installation of murals that vandals are reluctant to disturb and preserve existing murals that are a valued part of the history of the City of Los Angeles.

Section 91.107.4.6 of the Los Angeles Municipal Code (amended in entirety in 1997) developed an "Arts Development Fee". This fee applies to any private developer of a commercial or industrial project with a construction permit value of at least $500,000. If the developer pays the fee when pulling their permit at the Department of Building and Safety, then the Department of Cultural Affairs is responsible for providing cultural and artistic amenities that will be available to the community.

References

Municipal Code Section 14.4.20
Municipal Code Section Section 91.107.4.6

Bicycle racks can be works of public art.

4.7 Street Trees and Landscaping

Street trees and landscaping are essential for an attractive, enjoyable and sustainable urban environment. They provide numerous aesthetic, environmental, health, and even psychological benefits.

Benefits

- Enriches the visual qualities of a street and enhances the experience for all road users
- Reduces stormwater runoff by increasing permeable surface area
- Improves air quality by cooling the air, producing oxygen, filtering airborne pollutants, and absorbing greenhouse gases
- Street trees provide valuable shade and shelter for pedestrians, and they ameliorate the heat-island effect
- Provides habitat, food, and nesting sites for indigenous wildlife
- Increases property values and sales revenues for residences and businesses along the street
- Contributes to traffic calming by reducing the perceived width of the street, which encourages drivers to slow down and to pay more attention to their surroundings

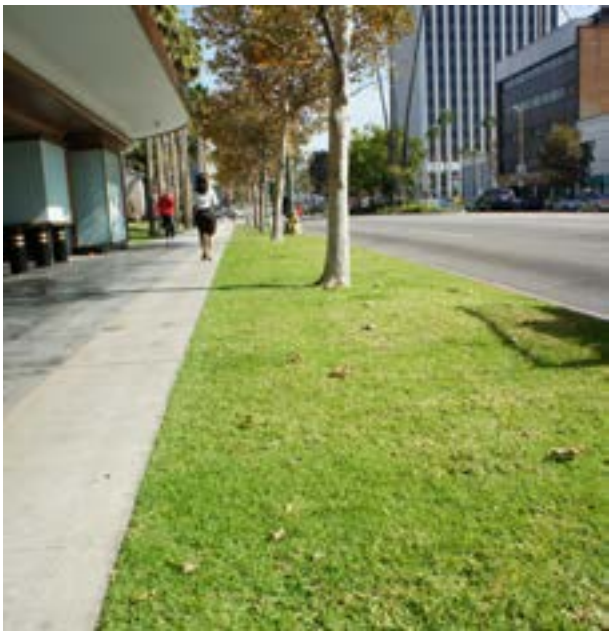
Street trees provide shade and shelter for pedestrians and make the street more visually attractive

Applications

- Landscaping and trees in the public right-of-way are like any other street element in that their selection, placement, and style are products of surrounding land use contexts, street uses and practical considerations such as utility placement and underground infrastructure.
- The planting of landscaping and trees in the public right-of-way occurs mainly in the sidewalk amenity zone. On most non-residential streets in Los Angeles, landscaping and trees are often located in tree wells and/or sidewalk-level planters, interspersed with paved areas that provide curbside access. In residential areas, planting in the amenity zone generally takes the form of a parkway strip divided only by driveway entrances; although this land is public property, private property owners are responsible to plant and maintain the parkway area in front of their property.

Nontraditional landscaping in the parkway might provide accessibility issues to parked cars, and should be approved by the Bureau of Street Services' Urban Forestry Department.

- Generally, adjacent property owners and/or community/business groups are responsible to care for plantings in the amenity zone. Landscaping and trees are also planted in center medians within the roadway; generally, the city is responsible for planting and maintaining a landscape median.



Long, wide parkway strips provide a substantial permeable area that is a good place for street trees to flourish.

- Landscaping and trees can also be planted in the frontage zone where there is sufficient width; trees should only be placed in the frontage zone when they are spaced appropriately far enough away from buildings. (In residential settings, there is typically no frontage zone between the pedestrian walkway and the property line; the property line abuts the sidewalk.) In addition, trees and landscaping should be an integral part of sidewalk curb extensions in the flex zone.

Considerations

- In order for street trees and landscaping to provide these benefits, they must be provided with conditions that allow them to thrive, including adequate uncompacted soil, water, and air.

- Urban soils have become highly compacted through construction activities and the passage of vehicle and even foot traffic. Compaction reduces the soil's capacity to hold and absorb water. In these conditions, the tree roots of many tree types will expand directly beneath the sidewalk surface to take advantage of water that does not infiltrate compacted soils. In addition to tree selection, this is a primary factor in the damage of urban sidewalks.

Appropriate plantings (such as climbing vines) can turn an unsightly fence into a "green wall" that separates pedestrians from unsightly land uses and adds comfort to the pedestrian environment.

Plant Selection and Placement

- Selecting plants and trees that are adapted to a site's climate and local rain cycles can create a more-sustainable urban forest. Landscaping and trees in Los Angeles need to survive with minimal irrigation upon establishment. Selected plants should tolerate urban environmental elements, such as radiant heat from the sidewalk or street surface.
- Planting in the amenity zone (in parkway strips or planter beds) should use species that:
    - Are drought tolerant
    - Do not exceed a height of 2 feet within 5 feet of a driveway/curb cut and within 20 feet of a crosswalk, and, excluding trees, 3 feet elsewhere. Drought-tolerant perennials, shrubs, and/or groundcover that do not exceed 36 inches in height
    - Do not have thorns or sharp edges adjacent to any walkway or curb
    - Raised planter beds can be incorporated into larger sidewalk elements such as public seating areas. Planter bed edges can be used as seating walls when designed with adequate width. Planter beds must meet all required clearances to ensure an unobstructed pedestrian access route and access to other street elements such as utilities.
- Above-ground planters should generally be considered interim solutions, or they can be used where in-ground landscaping is not possible (for example, on sidewalks above basements).
- Soil analyses should address the concentration of elements that may affect plant growth, as well as pH, salinity, infiltration rate, and other factors. Remove and replace or amend soil as needed. Good preparation saves money in the long run because it reduces the need to replace plants, lowers water consumption, and reduces fertilizer applications.
- Where there is no water irrigation, plants and trees that are as mature as possible should be selected because they can better survive dry periods.
- An 18" walkable convenience strip should be provided when planting areas (such as a residential parkway strip) extend more than 10' along a curb.

Trees

Tree Selection

- Refer to the Urban Forestry Division (UFD) Street Tree Selection Guide for suitable tree species for Los Angeles' urban environment.
- Avoid planting trees with aggressive root systems known to damage the surrounding pavement, sidewalks, and substructures.
- In choosing a street tree, consider what canopy, form, and height will maximize benefits over the course of its life.

Long planter strips provide beneficial conditions for tree growth and health. They also provide a large permeable area to infiltrate rainwater runoff from the sidewalk. In a commercial setting, curbside access should be accompanied by a walkable "convenience strip" along the length of the curb; in addition, planter strips must be spaced apart regularly in order to provide walkable strips connecting the convenience strip to the primary pedestrian walkway.

Tree Location and Placement

- Permeable surfaces and planting areas complement and support street trees, in particular by providing uncompacted, permeable areas that accommodate roots and provide air, water and nutrients. Generally, a planted parkway should be as wide as possible where there are trees: when feasible, at least 6 to 8 feet wide. However, many existing parkways and medians are narrower. Narrower parkways can support understory plants and some tree species. The preferred size for a tree pit is at least 4' x 10' x 3' deep or 120 cubic feet.

- Subsurface/utility investigations should be completed before selecting locations for (and types of) street trees. In addition, tree location at corners should comply with the City's site distance requirements designated by BOE.

- Closer spacing of large canopy trees is encouraged to create a lacing of canopy, as trees in groups or groves can create a more favorable microclimate for tree growth than is experienced by isolated trees exposed to heat and desiccation from all sides. Where constraints prevent an even spacing of trees, it is preferable to place a tree slightly off the desired rhythm than to leave a gap in the pattern.

- Typically, trees on commercial streets will not achieve the same scale as they will on residential streets where greater effective root zone volumes may be achieved. On commercial streets with existing multi-story buildings and narrow sidewalks, select trees with a narrower canopy than can be accommodated on the limited sidewalk width.

- In commercial areas where the visibility of façade-mounted signs is a concern, choose species whose mature canopy allows for visibility.

- While consistent use of a single species helps reinforce the character of a street or district, a diversity of species may help the urban canopy resist disease and insect infestations.

- General Clearances (mostly as specified by UFD):

    - Mature height under power lines: 5 feet lower than electrical power line (excludes phone, cable, other non-electrical lines, which need not clear the tree canopy).

Ample space should be allotted between street trees and commercial signs so that the trees do not impede the visibility of the signs

- Mature height: no limits/maximums, but should be appropriate and complement roadway scale/ use and land uses.
- Spacing from other elements: Trees with mature canopy diameter of 30 feet or less may be 20 feet from street lights. Trees may be 10 feet from pedestrian lights if their canopies are pruned up 2 feet above the lights. Trees may be 10 feet from utility poles if canopies are pruned to allow access on the poles. In certain locations, smaller clearances may provide greater flexibility in tree spacing and allow for a more complete tree canopy; these clearances may be used with UFD approval. Tree size at planting: Arterials: 36-inch box recommended (not currently standard); Non-arterials: 24-inch boxTrunk diameter: Arterials – 2-2.5 inches; Non Arterials – 1-1.5 inches
- Height: recommended Arterials – 14'; Non Arterials– 10'
- Adequate clear space should be provided between trees and awnings, canopies, balconies, and signs so they will not come into conflict through normal growth or require excessive pruning to remediate such conflicts.

References

Urban Forestry Department (UFD) Residential Parkway Landscaping Guidelines

UFD Street Tree Selection Guide

BOE Standard Plan S-456-1: Tree well, root barrier and planting

BOE Standard Plan S-450

Current permitting through Bureau of Street Services: Tree Root Prune Permits, Tree Prune Permits, Tree Removal Permits, Tree Planting Permits

4.8 Stormwater Treatment and Management

While conventional stormwater controls in the public right-of-way aim to move water off-site and into storm drains as quickly as possible, sustainable methods for stormwater treatment and management provide on-site retention, filtration, and infiltration to reduce urban runoff and naturally reduce contaminants. These methods and their associated physical systems are commonly known as Best Management Practices (BMPs). In the public right-of-way, the primary goal of BMPs is to capture, filter and treat stormwater runoff from the roadway, driveways, and sidewalk area.

Benefits

- Reduces total stormwater volume entering the conventional storm drain system
- Lowers peak flow intensities and helps to make flow rates more consistent during large rain events
- Removes pollutants (including metals, oils, and bacteria) from urban runoff, improving the water quality of runoff that flows into natural bodies of water
- Contributes to and treats groundwater recharge through infiltration
- Reduces the use of potable water for irrigation
- Provides an attractive and valuable public space amenity
- Supports the urban ecosystem and wildlife habitat

(Above and below) On Hope Street in downtown Los Angeles, several infiltration planters capture stormwater runoff through curb cuts. Stormwater enters the facility, is temporarily detained, and is treated as it slowly infiltrates natural soils.

Applications

- The choice of Best Management Practice (BMP) is a result of several factors including soil characteristics, geotechnical hazards, and the location of existing utilities and street infrastructure. Infiltration rates in existing soils will determine if the facility can be designed to achieve infiltration, partial infiltration, or no infiltration; in the latter, stormwater is treated as it flows through the facility before the flow-through is discharged (typically to the storm drain system).
    - *Infiltration* BMPs include bioswales, infiltration trenches, and some structural methods such as infiltration planters and permeable paving systems (see descriptions below). Infiltration facilities treat stormwater runoff as it percolates through surrounding subsoils; pollutant levels are reduced by the natural filtration, absorption,

and biological decomposition properties of soils, plant roots, and micro organisms. Because it is often impractical to infiltrate runoff at the same rate that it is generated, most infiltration facilities have a functional component that allows for temporary storage. In addition, infiltration BMPs recharge groundwater reserves and improve the quality of groundwater. Infiltration BMPs are most practical in areas where there is sufficient open space and where soil, hydrological, and geotechnical characteristics are favorable for infiltration.

- BMPs which allow for ***partial infiltration*** include many of the same facilities used for infiltration. Unlike infiltration BMPs, partial infiltration BMPs have a structural drainage component which conveys overflow to the conventional stormwater system or to a natural detention facility such as a detention basin. These facilities reduce runoff and recharge groundwater at rates that are lower than facilities that allow for full infiltration. Partial infiltration BMPs are typically located in areas with limited infiltration capacity due to soil and/or site characteristics.

- ***Flow-through facilities*** are structural methods that do not allow for infiltration into surrounding subsoils; infiltration is limited to the soil capacity within the facility itself. Stormwater flows through the facility and is treated before being conveyed to a discharge point. Like most BMPs, these structural facilities typically allow for temporary storage, so they also help to regularize runoff flow rates. Flow-through BMPs include self-contained planters that are impermeable to surrounding soils and utilize drain pipes to discharge treated water back into the storm drain system. Flow-through facilities are most commonly employed in areas where site conditions do not support infiltration, or in dense urban areas where soil saturation could undermine building foundations and/or street infrastructure.

- Stormwater management facilities can be located in a variety of land use contexts and densities. Generally, where land use densities are high and open space is limited, it is more appropriate to utilize structural BMPs such as planters that allow for less (or no) infiltration. Non-structural BMPs such as bioswales and drainage basins are appropriate in areas with available open space.

- Stormwater management facilities in the public right-of-way are typically placed in the amenity zone to supplement or replace existing parkway landscaping. (Existing parkway landscaping already plays a valuable role in stormwater treatment and management by creating permeable surfaces. These traditional plantings receive and infiltrate surface rainfall as well as sidewalk runoff, but they do not have the added benefit of receiving and treating roadway runoff. Additionally, groundwater quality is often worsened by the use of pesticides.)

- Opportunities for the installation of BMPs are greatest when they can be integrated into development projects, street infrastructure projects, and/or streetscape projects. When part of a multifaceted project, planning and installation costs for BMPs are reduced.

- Because LA's existing sidewalks are often too narrow to accommodate BMPs, curb extensions are an invaluable tool for integrating stormwater treatment and management into the streetscape. Stormwater facilities should be considered in the design of all curb extensions – including mid-block neckdowns, corner bulbouts, and other sidewalk extensions used to expand the pedestrian realm. (Also see discussion of curb extensions in Chapter 6 "Intersections and Crossings".) Curb extensions can also be developed solely for the purpose of stormwater treatment and management (see Vegetated Stormwater Curb Extension section below).

Considerations

- Conditions that can limit the use of infiltration include soil properties, proximity to building foundations and street infrastructure, geotechnical hazards (e.g., liquefaction and landslide potential), and potential adverse impacts on groundwater quality such as industrial pollutants and contaminated soils. To ensure that infiltration would be feasible and beneficial, a screening of site feasibility criteria must be completed prior to the use of infiltration BMPs.

- Impermeable clay soil is not conducive to infiltration facilities. Unfortunately, this soil type is prevalent in Los Angeles except for much of the San Fernando Valley. Clay limits the type of feasible stormwater treatment and management facilities to retention and flow-through rather than infiltration.

- The success of an installed BMP depends largely on the intensity of a given storm and the characteristics of the site: depth to groundwater, soil water-holding capacity, infiltration rates, and how much moisture the soil already contains.

- One of the largest obstacles to sustainable stormwater management and treatment in Los Angeles is the Southern California climate, which makes it difficult to maintain adequate vegetated cover all-year without irrigation. Because a dense vegetated cover is a requirement of stormwater facilities, it is often necessary to provide irrigation during the dry season.

- Maintenance is crucial for proper and continuous operation, effectiveness, and efficiency of a management/treatment facility. This includes maintenance of the vegetation to ensure that it is healthy and dense enough to provide a filtering function and to protect underlying soils from erosion.

- In order to ensure proper maintenance, BMPs should have active partners (e.g., neighborhood councils, BIDs, homeowners associations, etc.) that provide and finance both general upkeep and periodic maintenance.

- If the stormwater facility is not engineered correctly, high rainfall rates can cause damaging flows that cause channeling, erosion, and loss of vegetation. Because vegetation is necessary for most BMPs to be functional and beneficial, vegetation loss is a major concern. Well-engineered facilities have mechanisms for inflow attenuation and overflow conveyance.

- There is a potential for upstream flow to inundate a facility, so extra care must be taken to ensure that flows entering a facility are not greater than its handling capacity. The most-upstream facility in a series is most prone to inundation and damage by high flow rates.

Guidance

- The selection of the best method for a given site is made by considering a combination of factors, indicated in Table 4.5 “Biofiltration BMP Design Criteria” in the Low Impact Development Guide (see reference below).

- If infiltration or partial infiltration is desired, soil feasibility studies must be conducted to ensure adequate percolation rates and low liquefaction potentials. There should maintain a minimum 10-foot depth separation between the bottom of the infiltration pit and the top of the groundwater table.

- Urban conditions are generally not conducive to “end-of-line” treatments, but rather more installations that treat smaller drainage areas closer to the source of pollutants. Stormwater facilities are most effective when they are installed as a group or in a series (e.g., a series of planters along a street in a commercial district, or a set of several bioswales closely dispersed over a few residential blocks). This way stormwater runoff is distributed more evenly and the potential for upstream flow to inundate a standalone facility is lessened.

- The siting of BMPs must be coordinated with existing siting of utilities including water mains, power, fire hydrants, etc.

- All BMPs should conform to the standards of the American With Disabilities Act (ADA), the standard specifications for the public works construction (SSPWC) as amended by Los Angeles City Brown Book, and any other applicable regulations.

- Where street parking exists, design solutions should ensure pedestrian access between the sidewalk area and the parking lane. There should be a minimum 18”-wide convenience strip that is adjacent and parallel to the back of curb, allow ingress and egress for occupants of parked vehicles. The convenience strip

Riverdale Avenue before (above) and after "Green Street" improvements (below)

can be either paved, planted with low growing drought tolerant turf substitutes, or drought tolerant turf. In all cases, the convenience strip shall form a commonly accepted walking surface, and its finished surface and/or grade shall be flush with the top of curb.

- Plants are integral to the success of a BMP, so the selection of plant type(s) is exceptionally important.. Plants should be chosen based on their effectiveness in existing related BMPs and from the City-approved plant materials list provided by the Bureau of Street Services (BSS) and the Bureau of Engineering (BOE).

- Streetwater management practices can be integrated into the myriad design elements in the public right-of-way. For example, traffic calming and road diets can double as streetwater harvesting strategies.

- The functions described in this section should be made visible for street users to see, understand, appreciate, and replicate. Public right-of-way stormwater installations can inspire private property installations and serve as model installations for neighborhoods.

Common Treatments in the Public Right-of-Way

Infiltration and Flow-Through Planters

Planters are structural landscaped reservoirs that capture, manage, and treat roadway runoff. Typically, stormwater is collected and temporarily stored to allow for even rates of filtration and infiltration through the facility. Pollutants are filtered out as water percolates through the vegetation, soil media, and gravel layer. Planters can allow for infiltration into surrounding subsoils, or they can simply allow water to flow through the facility to be discharged elsewhere (typically the storm drain system).

Planters provide opportunities for stormwater treatment/management in many urban conditions because the can take up relatively little width (a minimum of 4 feet) and can be incorporated into streetscape projects. They are typically located adjacent to the curb either in the amenity zone or in a curb extension. Typically, roadway runoff enters a facility directly from the street through curb cuts. Where there is curbside parking, a paved convenience strip of at least 24" must allow access to parked vehicles.

Treating street runoff requires multiple installations in a row; this ensures their effectiveness at managing the sometimes heavy amounts of runoff by dispersing it over many facilities.

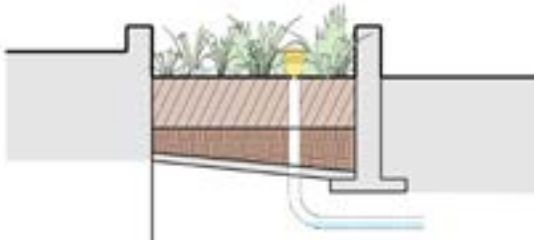
A. Infiltration Planter

- Infiltration planters are placed where site conditions are appropriate for allowing water to infiltrate surrounding native soils. Infiltration planters have impermeable sides to keep water from saturating nearby top soil, while the bottom is open to allow for water to percolate the surrounding subsoil.
- Infiltration planters may have negative effects on existing and new utility installation. Utility boxes may require waterproofing or watertight installation. Many utility boxes have opened undersides (no bottom slab) and water can get in from below.
- Infiltration planters should generally not be constructed closer than 10 feet to building footprints.
- As in all infiltration BMPs, the feasibility of infiltration planters requires geotechnical investigation and soil feasibility studies. Infiltration planters are not suitable where the seasonal high groundwater table is within 10 feet of the bottom of the facility.
- Because they have vertical walls, the vegetation used should grow taller than the planter's walls for aesthetic purposes.
- BOE Standard Plans S-481-0, S 482-0, and S-483-0 contain detailed design guidelines for planters (referred to as "parkway swales").

B. Flow-Through Planter

- ***Flow-through*** planters are completely contained in an impermeable structure and do not allow for infiltration into surrounding natural soils. Flow through planters capture runoff and provide stormwater treatment through filtration and absorption within the facility. After percolating through the facility, excess stormwater then collects in a perforated pipe at the bottom of the flow-through planter and drains to a discharge point; in an urban setting this outflow is usually discharged to the storm drain system, while in less-developed areas outflow can be directed to a natural drainage facility such as a drainage basin.

Infiltration planters have impermeable sides to keep water from saturating nearby topsoil, while the bottom is open to allow for water to percolate the surrounding subsoil. When the subsoil is saturated, excess water collects in a perforated pipe and then drains to a discharge point.



Flow-Through Planters provide stormwater treatment through filtration and absorption within a completely contained structure.

An example of an infiltration planter within a curb extension

- Flow-through planters are most appropriate in locations where infiltration is not feasible due to soil qualities, contamination, or where the groundwater table is within 10 feet of the surface. In addition, flow-through planters are often the best option for urban settings where saturated soils could cause damage to urban infrastructure and/or building foundations.

C. Vegetated Stormwater Curb Extension

- A Vegetated Stormwater Curb Extension (VSCE) is similar in function to infiltration or flow-through planters in that it captures stormwater runoff from nearby streets, sidewalks, and driveways. Guidelines for VSCEs are similar to those of planters. VSCEs can be installed as an alternative to planters in the sidewalk area, especially when sidewalk widths are inadequate, or they can be applied as supplements to planters.

- BOE Standard Plan S-484-0 contains detailed design guidelines for VSCEs.

Permeable paving

Permeable (or pervious) paving comes in two primary forms: 1) modular paving system such as concrete or brick pavers, and 2) poured-in-place pavement surface such as porous concrete or permeable asphalt. Permeable paving reduces stormwater runoff volumes by reducing the amount of impervious surfaces; typically, stormwater is conveyed to an underlying aggregate base, where it is temporarily stored for either infiltration into subsoils or gradual release to the storm drain system.

Permeable paving improves water quality by trapping contaminants (such as oils and metals) within the underlying rock materials. An additional benefit of permeable paving is that it can reduce puddling and slip hazards common to impervious surfaces with inadequate drainage slopes.

The Bureau of Street Services (BSS) also regularly uses other permeable materials such as decomposed granite or natural paths that achieve similar effect to permeable paving.

An example of permeable paving. Rainwater drains through gaps between the pavement stones.

- Permeable paving systems are appropriate for:
    - Sidewalks, plazas, cafés, and areas with very low traffic rates including parts of driveways or alleys
    - Sites where there is limited space in the right-of-way for other more-intensive BMPs
    - Sidewalk areas in the frontage, amenity or flex zones. In particular, permeable paving around tree wells provides additional permeable area to promote tree health
    - Locations that have soil characteristics and land use contexts that are conducive to infiltration into subsoils, unless the facility has a drainage component
- The installation of permeable pavement (as for all BMPs) requires a site/soil survey as well as a determination of feasibility based on storm water calculations for flow volume and duration. When infiltration into surrounding natural subsoils is not feasible, subdrainage infrastructure must convey water to offsite storage facilities or to the storm drain system.
- In denser urban environments, buildings are often too close to sidewalks to allow for porous pavement in the frontage zone or in the pedestrian zone because of the risk of destabilizing building foundations. Permeable paving should not be used within 20 feet of sub-sidewalk basements and 10 feet of building foundations
- Permeable paving systems should generally be avoided on all road surfaces because they cannot support the weight of vehicles. However, they may be considered on low-traffic driveways and alleys.
- *Modular pavers* should not be used at active pedestrian uses such as transit stops or crossings, because they are not in compliance with ADA requirements for "firm, stable, and slip-resistent" surfaces. However, *poured-in-place porous paving* is usually ADA compliant and can sometimes be used in active pedestrian areas.

An example of permeable paving

When the bioswale has reached full retention capacity, excess water can leave the facility through small curb openings.

A bioswale on Elmer Avenue in Low Angeles during a dry period.

The same bioswale during a rain event.

- High moisture content beneath sidewalk can attract tree roots and cause deformation, cracking and lifting of the sidewalk. “Structural soils” can be used to improve soil permeability and control tree root growth while maintaining tree health. (See Section 4.7 “Landscaping and Trees” for further discussion.)

- Type and pattern of permeable pavers must be approved by the Bureau of Engineering. Approved pavers are listed on the “Approved products for use in the public right-of-way pavers list”.

Other BMPs Located in the Public Right-of-Way

Vegetated Swale

A vegetated swale is a broad, shallow channel with dense, low-lying vegetation and a very gradual downstream slope. It collects stormwater runoff, allowing pollutants to settle and filter out as the water infiltrates into the ground and slowly flows through the facility to a downstream discharge location. The vegetation reduces flow velocities and the risks of both erosion and channelization. A swale may be engineered with “check dams” (typically composed of rock or earthen berms) that allow water to pool; these dams reduce peak flows by allowing some storage during high flow periods, and they also encourage gradual infiltration into the ground.

Swales are most appropriate in areas with lower-density development such as residential neighborhoods. In neighborhoods that front urban waterways (such as the Los Angeles River), swales provide a rich opportunity to treat and reduce urban runoff before it flows into rivers and bodies of water.

A vegetated swale is feasible on streets with gradual slopes. They are impractical in steep topography where high flows would result in channelization and loss of vegetation.

Filter Strip

A filter strip is a gently-sloped vegetated area designed to slow and pretreat runoff from adjacent impervious surfaces (such as walkways and driveways). Streetwater enters the linear facility through curb-cuts, spreads evenly across the slope, and then flows to a nearby

or adjacent BMP. Filter strips also provide some water absorption, and they reduce the sediment load entering a BMP; this reduces long-term maintenance needs by providing settling of large particles before runoff reaches the BMP.

Infiltration Trench

An infiltration trench is a long, narrow, rock-filled channel bordered on each side by a grass or vegetated filter strip. As discussed above, the filter strips slow and pretreat run off to limit the amount of coarse sediments entering the trench which can cause clogging. Runoff is stored in the trench and infiltrates through the bottom into the soil matrix.

Because of their long, narrow configuration, infiltration trenches are most appropriate for urban applications along street medians or along the sidewalk

Other Discussion

Bureau of Street Services (BSS) standard practice already includes sidewalks constructed with a mild slope that helps direct runoff and irrigate adjacent street trees and plants along parkways.

The City's Low Impact Development (LID) Ordinance (2011), ensures that many development and redevelopment projects mitigate runoff in a manner that captures rainwater at its source, while utilizing natural resources. The LID Ordinance requires the first ¾-inch of rain from a storm event to be captured, infiltrated and/or used onsite at most developments and redevelopments where more than 500 square feet of impervious surface is added. Adopted in November 2011, the LID Ordinance requires stormwater mitigation for a much larger number of development and redevelopment projects than was previously required under the Standard Urban Stormwater Mitigation Plan (SUSMP).

Most single family residences can comply by planting landscaped areas and installing simple BMPs such as rain barrels, permeable pavement and rainwater storage tanks. Larger developments can utilize a wide variety of methods; depending on site conditions, the LID requirements could encourage an aggressive use of BMPs. Although LID-complying facilities are generally located within the parcel and not in the public right-of-way, it is possible that installations by developers of BMPs in the public right-of-way could be a component of LID compliance.

The City of Los Angeles must comply with the Los Angeles Regional Water Quality Control Board's Municipal Separate Storm Sewer System (MS4) Permit, which requires all jurisdictions in Los Angeles County to reduce contaminants in runoff to improve water quality in waterways. These requirements stem from National Pollutant Discharge Elimination System (NPDES) requirements of the Clean Water Act, as promulgated by the U.S. Environmental Protection Agency and delegated to the Los Angeles Regional Water Quality Control Board.

References

The City of Los Angeles Stormwater Program: www.lastormwater.org.

"Development Best Management Practices Handbook: Low Impact Development Guide", Los Angeles Bureau of Sanitation (2011)

"Stormwater Best Management Practice Design and Maintenance Manual for Publicly Maintained Storm Drain Systems", County of Los Angeles Department of Public Works (1999)

Existing Standard Plans: S-480-0 through S-486-0

S-480-0: General Requirements for Green Street

S-481-0: Parkway Swale in Major/Secondary Highways

S-482-0: Parkway Swale in Local/Collector Streets

S-483-0: Parkway Swale with no street parking

S-484-0: Vegetated Stormwater Curb Extension (VSCE)

S-485-0: Interlocking pavers for vehicular alleys

S-486-0: Interlocking pavers for pedestrian alleys

S-485-0 and S-486-0

"Approved products for use in the public right-of-way pavers list." (boe.lacity.org/apm/)

City-approved plant materials list, BSS and BOE

4.9 Bicycle Parking

Secure bicycle parking is an integral part of the bikeway network. Most commonly, the City of Los Angeles Department of Transportation (LADOT) installs curbside inverted-U bicycle racks, usually placed individually or in pairs. As bicycling continues to become an attractive travel option for Angelenos, there are increased opportunities to provide enhanced parking facilities such as bicycle lockers, sheltered bicycle parking, bike corrals, and bike hubs with shower and changing facilities.

The "inverted-U" rack is the City's accepted standard for on-street bicycle parking.

Bicycle racks can be fanciful pieces of public art, while still meeting required specifications.

Benefits

- Encourages bicycling as a viable travel option by adding convenience and security for short-term parking
- Benefits businesses by providing easily-accessible bicycle parking facilities for use by patrons
- Promotes an attractive and fully-accessible sidewalk environment by reducing the need to lock bicycles haphazardly to fences, entry gates, and street poles

Applications

- Bicycle parking facilities should be located frequently and regularly in active commercial districts. In Los Angeles, bicycle parking in the public realm is most commonly placed in the amenity zone utilizing inverted-U Racks placed parallel to the curb.
- Multiple racks should be provided near major destinations including parks, libraries, major transit stops, retail destinations, and college neighborhoods. High-capacity bike parking is encouraged when available space can accommodate clustered racks, parking shelters, and/or bicycle corrals.
- To promote "first-mile last-mile" connections, bicycle parking should be provided near transit stops where applicable. Bike racks should be placed near the back of the transit stop or be placed outside of but adjacent to the transit stop, ensuring unobstructed boarding/alighting at all bus doors.
- On-street bicycle parking (bike corrals) should be considered where there are space constraints on the sidewalk, especially where parking demand is high. (See section 5.5" Bicycle Corral" below).

- Sheltered bicycle parking can accommodate a large number of bicycles while providing the convenience and comfort of sun and rain protection. Shelters are especially encouraged at locations with longer-term parking needs like transit centers and rail stations. They should be placed where sidewalk-area dimensions provide adequate space to ensure ADA compliance.

- Bike lockers are especially useful for bicyclists who prefer to park their bicycles in a highly-secured manner that also protects their bicycle from natural elements. Lockers are encouraged at larger destinations with long-term parking needs, such as bus stops and rail stations. User fees decrease maintenance costs and compensate for the larger initial capital cost.

- Individual and clustered racks can be located in the frontage zone if sufficient sidewalk-area width exists. Long-term bicycle parking for residents, employees, and students should be provided within buildings when possible.

Considerations and Guidance

- Bike rack locations are approved by the Department of Transportation and the City Engineer after they are deemed in compliance with material, clearance, and accessibility requirements presented in the above guidelines and in Standard Plan S-671

- For all clearance and accessibility requirements for bicycle rack placement, refer to BOE Standard Plan S-671-0. ADA accessibility requirements must be met. In order to ensure accessibility and ADA compliance, the placement and spacing of bicycle racks should consider dimensions when occupied by bicycles. The placement of bicycle racks should also consider usage space, so that bicyclists do not impede the pedestrian walkway while maneuvering their bicycles.

- Because racks are typically placed 24”-30” from the curb, cyclists utilizing the streetside side sometimes have little space between the rack and roadway to maneuver their bicycles. When space allows, racks should be placed further away from the curbline.

- Making bicycle parking visible to foot traffic reduces the incidents of theft and vandalism. Bicycle parking should be located in well-lit, secure locations close to the main entrance of a building. Avoid placement in a secluded place or behind screening or tall plantings.

- Install parking devices that support the frame of the bicycle at two points, Racks should support the bicycle well and make it easy to lock a U-shaped lock to the frame of the bike and the rack.

- Poorly-designed bicycle racks made of substandard materials result in higher rates of theft, and design flaws may cause damage to bicycles. Racks with any one of the following characteristics must not be employed:

    - Support the bicycle at one point of contact
    - Support the bicycle by one wheel
    - Have sharp edges that can be hazardous to users and pedestrians

Bicycle lockers provide high security and protection from natural elements.

- Have mounting hardware that can be unscrewed with common tools
- Requires the bicyclist to lift their bicycle onto the rack

- While the inverted-U design is the accepted standard in Los Angeles for bicycle parking in the public right-of-way, other rack designs may be accepted for use at the discretion of LADOT and approval of the Department of Public Works. The installation of creatively-designed racks can provide a public art amenity; these should be encouraged, especially in pedestrian-oriented districts.
- In addition, property owners are encouraged to install bicycle racks in the frontage zone near building entrances (after receiving the required conditional permit from BOE) or on private property near building entrances.
- New development projects must provide a minimum number of bicycle parking spaces per the Los Angeles Bicycle Parking Ordinance, section 12.21.AA16 of the Municipal Code.

Location and Placement of Bicycle Racks

Amenity Zone:

Bicycle racks that are parallel to the curb should be a minimum 24 inches from the curbline to allow for access to parked vehicles and provide adequate space for cyclists to maneuver. To provide added safety for bicyclists, when fronting a curbside vehicular travel lane racks should be set back further, preferably at least 36 inches from the curbline.

- The rack should allow a minimum of 5 feet of clearance when placed parallel to the roadway (along a single line), measured from center of base plate to center of base plate. In areas with curbside vehicular parking, a rack oriented parallel to the curbline must be a minimum of 90 inches from another curbside rack to ensure pedestrians with clear access to and from the curb parking between two parked parallel bicycles (BOE S-671 Standard Plan).
- The rack should maintain 5 feet of clearance from other street furniture. Other street furniture includes but is not limited to: parking meters, trees, tree wells, newspaper racks, light poles, sign poles, telephone poles, utility meters, benches, mailboxes, fire hydrants, and trash cans.

Wide sidewalk areas afford opportunities to consolidate multiple racks in groups.

- A bicycle rack should not be installed in a bus stop zone, taxi zone or loading zone. A rack should not be installed near a fire hydrant or near handicap-accessible parking.

Frontage Zone:

- In the frontage zone, bicycle racks can be placed perpendicular, angled, or parallel to a building or property frontage. Perpendicular or angled parking should be provided if space permits; these orientations allow for better-accessible clustered parking.

- Racks located parallel to the property line should be placed at least 30" from the structure. When racks are placed side by side, each rack should be spaced at least 60" from one another in order to accommodate both rider and bicycle in the aisle.

Flex Zone – Curb Extensions

Bicycle racks located on mid-block curb extensions should comply with all guidelines stated above for racks located in the amenity zone. Bicycle racks should generally not be located on corner bulbouts near intersections because they hinder visibility for pedestrians, bicyclists, and motorists.

Other Discussion

Los Angeles code does not currently allow decommissioned parking meters to be retrofitted to accommodate bicycle parking, although LADOT has completed pilot retrofit projects. This is common tpractice in many other localities and should be considered in Los Angeles.

Bike repair stations are a valuable convenience for cyclists. These should be located in strategic locations with high bicycle traffic, ideally placed adjacent to clustered parking facilities. To ensure security and safety, they should be placed in a secure part of the street that is highly-visible and well-lit.

The current placement of bicycle racks should be checked for compliance with standards. Racks that are not in compliance should be relocated, as designated by LADOT under guidance by the above guidelines as well as those in Standard Plan S-671.

References

APBP Bicycle Parking Guidelines

NACTO Urban Bikeway Design Guide

BOE Standard Plan S-671

2013 Bicycle Parking Ordinance (LAMC Ord. No. 182386)

Bike repair stations are a valuable public convenience for bicycle riders.

4.10 Bikeshare Stations

A bikeshare program provides bicycles for use on a short-term basis. Patrons typically include annual members as well as occasional users. The success of a bikeshare program is largely dependent upon the strategic location of stations, ensuring that patrons are provided with the most convenient locations for checking out and returning bicycles.

Benefits

- Provides a convenient transportation option that can be used for short trips and "first-mile last-mile" connections
- Provides health benefits by encouraging physical activity
- Increases visibility of bicycling as a viable transportation option
- Reduces congestion and increases capacity of transit
- Provides a convenient alternative to owning, maintaining, and storing/parking a personal bicycle

Applications

- A bikeshare program is best utilized in higher-density districts (e.g., downtown or other areas with business, cultural, and tourist destinations) where bicycling is a convenient and safe mode of travel. Because a bikeshare program is designed to attract all users, it is best suited in areas with bicycle lanes and traffic-calming measures.
- Bikeshare stations are especially valuable near major transit stops to provide valuable "first-mile last-mile" connections, near places of interest, and in locations where short trips are commonplace (e.g., high-density mixed use districts and around college campuses).
- Stations are located either in the sidewalk area (typically in the amenity zone) or in the roadway parking lane (flex zone).

Considerations

- By limiting the number of places where bicycles can be accessed or returned, bikeshare service is sometimes less convenient than a privately-owned bicycle capable of point-to-point transport.
- The placement and design of bikeshare stations requires a coordinated effort amongst many city agencies, business/community groups, and the bikeshare operator.

Guidance

- For safety reasons, stations should be well-lit by pedestrian-scaled lighting and located in locations that are highly visible to other users of the street.
- To ensure visibility at intersections, stations that are located in the parking lane should be at least 30 feet from intersection departure and 50 feet from intersection approach, per LADOT bicycle corral standard design.
- Stations can be located in a red curb zone as long as standard clearances are met. There should be at least a 25 foot clearance from a fire hydrant.
- There should be adequate, ADA-compliant clearances from bus stop, utilities, driveways, tree wells, and other street furniture.
- When placed in the roadway, stations should be buffered using wheel stops on both ends and object marker signage, per LADOT bicycle corral standard design.

Other Discussion

- The Los Angeles City bikeshare program is a component of the regional bikeshare program, which is a partnership between the City, LA Metro, and other cities.

4.11 Parking Meters and Pay Stations

Modern-day "smart" parking meters and pay stations give motorists convenient payment options. They also provide the City with an opportunity to expand variable pricing programs. Multi-space pay stations that typically serve 8-10 vehicles can be a beneficial alternative to single-space meters.

Benefits

- Offers motorists the convenience of multiple payment options and the opportunity to add time remotely by cell phone or internet
- When using multi-space pay stations, reduces visual clutter in the urban landscape by allowing for the removal of single-space parking meters. Multi-space pay stations are also less expensive for the City to operate and service than numerous single-space meters.
- Variable pricing programs de-incentivize car usage and increase parking revenue

Considerations

- The conversion of single-space meters to multi-space units reduces visual clutter from the urban landscape. However, conversion decisions should be made based on practical parking management considerations. (For example, shorter curbside zones may not have the length and/or number of spaces to justify a multi-space meter.)
- Parking meters shall be accessible per ADA, so in a landscaping strip a concrete pad connected to the walkway should be provided at the meter's base.

Design Guidance

- Single-space parking meters should be placed in the amenity zone, 18-24" from the curbline. They should be placed at the front end of each parking stall.

- Parking pay stations may be located in the amenity zone, at least 18" from the curbline. They may also be located in the flex zone in a curb extension; this helps to maintain a clear pedestrian walkway in areas with narrow sidewalk widths. Multi-space stations should be placed every 8 to 10 parking spaces and spaced approximately 150 to 200 feet apart. Signs should clearly direct patrons to the pay station and be spaced no more than 100 feet apart.

- Areas with multi-space pay stations often consist of delineated, numbered spacing stalls. When parking stalls are delineated by pavement striping, they also must be clearly numbered at the curb.

- Alternatively, multi-space pay stations could allow for the removal of rigid delineations of parking spaces, potentially allowing a given area to accommodate a higher number of vehicles. Rather than recording a parking stall number, users simply use their license plate number.

- When possible, the design of single- and multi-space meters should reflect the design of other streetscape elements. They should comply with the clearance requirements for all other street features and appurtenances, including tree wells, street lighting, bicycle racks, and news racks.

Other Discussion

In locations where filming is common, conversion of individual meter poles to multi-space pay stations can be especially beneficial because this reduces the number of obstacles in front of parked production trucks.

Decommissioned parking meter poles can be repurposed into bicycle racks. Pole repurposing should only be considered where there is a sufficient clear distance between the rack and the curbline. Los Angeles code does not currently allow decommissioned parking meters to be retrofitted to accommodate bicycle parking, although LADOT has completed pilot retrofit projects. Relatedly, bicyclists often use functioning meter poles as impromptu bicycle racks, blocking curbside access as well as access to the meter itself. To avoid this problem, locations with parking meter poles should contain enough dedicated bicycle racks to meet demand (see section 4.9 "Bicycle Parking").

When an area with single-space parking meters is converted to multi-space pay stations, the decommissioned parking meter poles can be repurposed into bicycle racks.

4.12 Utilities and other infrastructure

Effective management of utility placement on, above, and below the sidewalk area ensures a safer and more enjoyable street environment. The placement of other sidewalk amenities can potentially reduce maintenance access to utilities, highlighting the need for interdepartmental coordination. Utilities that affect sidewalk functionality include surface-mounted facilities (SMFs) such as utility vault and signal boxes; above-ground infrastructure (AGI) such as power and telecommunications wiring; and underground infrastructure serving electricity, storm drainage, sewer and water, gas, telecommunications, street lighting, and traffic signalization. (Note: street lighting is discussed separately in Section 4.13 below.)

Benefits

Well-placed utilities and other infrastructure:

- Reduce clutter on the sidewalk
- Improve pedestrian safety
- Reduce maintenance conflicts with other street amenities
- Allow for more landscaping and trees

Considerations and Guidance

- When practicable, the placement or relocation of new utilities should avoid areas conducive to future placement of street amenities such as seating areas, landscaping, stormwater management treatments, and transit stops. New development should submit utility plans with initial development proposals so that utilities can be placed away from suitable locations for streetscape amenities wherever practicable. Conversely, the placement of street amenities (e.g., street furniture and landscaping) must ensure easy access to utilities for maintenance and emergencies.
- Existing vaults located in a curb ramp should be moved or modified to meet accessibility requirements.
- Tree removal should be avoided and minimized during the routing of large-scale utility undergrounding projects.
- Many projects involving sidewalk widening or curb extensions require the demolition or excavation of an existing walkway, and existing underground utilities may be impacted. Utility companies should be contacted and provided with plans outlining the proposed improvements.

Overhead power lines detract aesthetically from the urban environment, and utility poles take valuable sidewalk space. By relocating utilities underground, valuable above-ground space is made available for other public amenities such as landscaping, street trees, lighting, and street furniture. Without the need to be pruned around power lines, larger shade-providing trees can be planted.

- When adding curb extensions or widening the sidewalk, utilities such as water mains, meters, and sewer vents should remain in place whenever possible, as they can be cost prohibitive to move. Utility vaults and valves should be minimized in curb extensions where planting or street furnishings are planned.

- Utility installation and repair should be coordinated with roadway and streetscape improvement projects to avoid duplication of efforts or making new cuts in new pavement. Roadway and streetscape improvement projects provide the opportunity to incorporate utility retrofits and new utility installations.

- In densely-developed districts, utility vaults and valves may be placed in the frontage zone. To facilitate access, however, the placement of utility structures in the frontage zone is preferred only when it has been determined that incorporating utility vaults into the amenity zone is not feasible.

- Above-grade and surface-mounted utilities should be placed to minimize disruption to pedestrian travel, and to maintain required widths for pedestrian access routes.

- Small utility vaults, such as water and gas meters and street lighting access, should be located to minimize conflicts with existing or potential tree locations and landscaped areas. Vaults should be aligned or clustered wherever possible.

- Catch basins and surface flow lines associated with storm drainage systems should be located away from the crosswalk or between curb ramps. Catch basins should be located upstream of curb ramps to prevent ponding at the bottom of the ramp.

- Utility boxes may be painted as part of a public art program. (See Section 4.6 “Public Art”.)

- Trenchless technologies, such as moling and tunneling, should be used wherever possible to avoid excavation and disruption of streetscape elements.

- In pedestrian-oriented residential and commercial areas, surface-mounted utilities (SMUs) should be screened with landscaping and/or decorative screens whenever practicable.

Other Discussion

On most public rights-of-way in Los Angeles, the only utilities located under the sidewalk are street lighting conduit and lateral lines that extend from utility mains beneath the roadway. However, in some older neighborhood gas and other utility lines are also located under the sidewalk.

Some of the most extensive visual and physical intrusions into the built environment are utility poles and overhead lines for power and communications. In addition to their negative aesthetic effects, they interfere with the placement of amenities such as street trees/landscaping, seating, street lighting, and stormwater management. The relocation of overhead utility lines can provide an enormous aesthetic benefit and allow for better sidewalk accessibility and increased opportunities for sidewalk enhancements and amenities. One of the most effective contributions to Complete Streets is to remove overhead utility lines by undergrounding them or relocating them to alleys or rear yards.

Above-ground electrical lines are typically not insulated and therefore necessitate the regular pruning of street trees to a sub-standard height and prevent the planting of new trees that are appropriately scaled for the street. As a result, the myriad benefits of street trees – aesthetic, cooling effect, air quality, etc. – are often compromised. An alternative, where the lines cannot be undergrounded or relocated, may be to replace the existing electrical lines with insulated, braided lines used in back yard conditions. Tree branches can grow around these electrical lines without concern that a fire will started if the lines break. Trees will still need to be pruned when limbs put pressure on power lines.

4.13 Street Lighting

Street lighting serves a necessary public function by illuminating the roadway and sidewalk area to ensure safety, security, and accessibility for all road users. Through their type, scale, and design, street lighting elements affect the aesthetic qualities and character of a street, especially at night when they play a pivotal role in shaping the nighttime environment. In particular, pedestrian-scale lighting of the sidewalk area creates a safer and more enjoyable pedestrian realm.

A pedestrian-oriented light fixture can share a single pole with a roadway light fixture. In some instances, new pedestrian-oriented lighting fixtures can be affixed to existing roadway light poles.

Benefits

Well-designed, properly-located, and appropriately-scaled street lighting:

- Improves nighttime safety and security by illuminating the roadway and sidewalk area to benefit all users of the public right-of-way including motorists, bicyclists, transit users, and pedestrians
- Improves pedestrian accessibility and mobility by illuminating sidewalks, crosswalks, curb ramps, and signs as well as barriers and potential hazards
- Incorporates pedestrian-scale lighting to create a more comfortable illumination *quality* by using softer light than typical roadway lighting
- Contributes to the identity of a district or neighborhood, and serves as a strong unifying element in the streetscape
- Reduces energy consumption and costs by utilizing energy-efficient bulbs and incorporating sustainable technologies
- Reduces light pollution and light trespass (unwanted light)

Applications

- Most arterial streets in Los Angeles contain street light poles that are 30 feet tall and illuminate both the roadway and the sidewalk. Non-arterial streets typically contain poles 20-30 feet tall. Generally, taller pole heights afford a larger illuminated area, so spacing between lighting fixtures can be wider and the number of fixtures lower. While this is more economical for construction and maintenance, overly-high light fixtures may be out of scale to the street and land use contexts.

- Pedestrian-scale lighting fixtures are typically 12 to 15 feet high. They should be encouraged to provide supplemental light for the sidewalk area, especially in areas with high nighttime pedestrian volumes such as commercial districts and other areas with higher-density land uses. Pedestrian-scale lighting should be installed in all locations where a wide sidewalk is not well-illuminated by the roadway lights. Pedestrian lighting should be installed in all pedestrian pathways under all freeway underpasses.

- Critical locations such as ramps, crosswalks, transit stops and seating areas that are used at night should be highly visible and well lit.

Considerations and Guidance

Location and placement

- The placement of both roadway and pedestrian lighting should consider street dimensions and function as well as land use contexts. Wide arterial streets have different lighting requirements than narrow streets.

- Pedestrian lighting should be installed primarily in the sidewalk amenity zone. In sidewalk areas 24 feet or wider, pedestrian light fixtures may be located within the pedestrian zone as long as a required clear path is maintained. Where a building is set back from the sidewalk area, pedestrian light fixtures may be installed in the frontage zone on poles directly adjacent to the property line. Where a building fronts the sidewalk area, pedestrian light fixtures may be attached directly to the building façade.

- The placement of light poles should be coordinated with the placement of landscaping, street furniture, transit stops and other utilities. Their placement should comply with clearance requirements in relation to other facilities, curbs, intersections, and crossings.

- Roadway lighting fixtures should be placed between trees to facilitate maximum lighting and to ensure that the tree canopy is maintained and that excessive tree pruning is avoided. When the illumination of the sidewalk is provided solely by roadway lighting, trees often create shadowed areas that may not be safely lit (especially when the placement of trees and light fixtures is not well-coordinated). Because they can

be located below the tree canopy, pedestrian-scale lighting offers increased safety and more-uniform illumination along a pathway. In this way the tree canopy can be retained without sacrificing accessibility and safety.

- Retrofits of existing street lights and new installations should include pedestrian-scale lighting, especially in areas with high pedestrian activity. As a cost-saving measure, pedestrian lighting could be added to existing street light poles; in these situations it is often beneficial to provide additional sidewalk area lighting by installing pedestrian light fixtures between roadway light poles.

- The potential for unwanted light trespass onto private property should be investigated before installing roadway and pedestrian light fixtures.

Type and Design

- Fixture design should complement and be coordinated with the design of other streetscape elements. Fixture design should relate to the character of the neighborhood or district. New lighting fixtures should be coordinated with the design of street furniture (e.g., seating, transit shelters, trash receptacles, and kiosks) to provide a more unified streetscape.

- Lighting fixtures of lower height and illumination levels which are spaced at closer intervals along the street are preferred over tall light fixtures with bright illumination levels spaced further apart.

- The use of LEDs, and in some cases, induction technology for roadway light fixtures, is now standard practice in the City of Los Angeles.

- Pedestrian light sources should provide a warm (yellow, not blue) light if using metal halide or high-pressure sodium bulbs; LED pedestrian lights should produce a similar quality of light.

- As appropriate, dark sky-compliant lighting should be selected to minimize light pollution cast into the sky while maximizing light cast onto the ground. A minimum of 95% of emitted light should be directed toward the ground.

- In addition to lower energy and maintenance costs, LEDs can enhance visibility with better color rendering (i.e. colors appear more natural) and a more consistent spread of light. LEDs are also designed to minimize light pollution and light trespass.

- Solar light fixtures should be utilized where possible for new installations or for retrofit projects. Where solar light fixtures are not appropriate or possible, LED or a future more energy-efficient technology should be used.

- Some local streets in older residential neighborhoods contain electrolier lampposts that illuminate the roadway and sidewalk; these are well-scaled to the neighborhood environment. New streetlights in these residential neighborhoods should be chosen to match their design and scale. A balance should be found so that roadways are illuminated sufficiently to meet illumination requirements while also complementing the neighborhood scale and providing a more-comfortable sidewalk environment.

- Historically-significant street light poles and fixtures should be maintained and upgraded to incorporate newer illumination technologies where appropriate.

Other Discussion

Los Angeles has over 200,000 streetlights in more than 400 different styles. According to the Bureau of Street Lighting, "street lights provide illumination of both the roadways and sidewalks to the levels required by the Bureau of Street Lighting (BSL) for safety and security." Additionally, "lighting systems are designed and constructed to conform to nationally accepted standards which are sponsored by the Illuminating Engineering Society and approved by the American National standards Institute."

Street poles can be outfitted with clamp-on brackets for banners, adding to the visual quality of the streetscape. These banners generally consist of placemaking themes pertinent to a particular district (adding to the character and cultural heritage of a place), and informational uses to promote cultural and civic events and amenities including festivals, museum exhibitions, and special events. (Also see Section 4.3 "Streetscape Signage and Wayfinding" and Section 4.6 "Public Art".)

For property owners that request street lighting, currently only lighting for minimal traffic safety (usually at "traffic conflict areas") is provided at no cost for installation or maintenance. For all other lighting installations, property owners share the costs of installation and annual operation/maintenance through a special assessment. Some projects obtain outside funding for the installation cost. In order to provide safe lighting equitably throughout the City, government-funded street lighting and streetscape projects should be a priority in residential areas with higher pedestrian volumes and larger safety concerns.

References

BSL's "DESIGN STANDARDS AND GUIDELINES": illumination standards (roadways and sidewalks,

BSL's "Special Specifications for the Construction of Street Lighting Systems. Which supplement the latest edition of the "Standard Specifications for Public Works Construction (Green Book)" Specs include special provisions, standard drawings, approved equipment, etc.

City of Los Angeles LED Streetlight Replacement Program

Municipal Solid-State Street Lighting Consortium (sponsored by U.S. Dept of Energy)

4.14 Waste and Recycling Receptacles

Well-designed and strategically-located receptacles are an essential component of a clean, enjoyable sidewalk environment. Their effectiveness in keeping litter off the streets is largely dependent on their placement, functional design, and volume capacities.

Benefits

- Contribute to an enjoyable and attractive street environment by reducing litter, especially when placed frequently and in convenient locations
- Provides a more-unified streetscape when coordinated with the design of other street furniture
- In particular, solar compactors increase capacity, decreasing the number of receptacles needed while also decreasing maintenance costs by reducing the required frequency of trash removal

Applications

- Waste receptacles should be located near high activity generators such as major civic and commercial destinations, at transit stops, and near street corners.
- At least one waste/recycling receptacle should be located at all transit stops. At stops with higher usage, multiple receptacles may be necessary to ensure that trash is accommodated; these can be either adjoining or separated, depending on stop layout and function.
- Along streets in retail commercial districts, there should be a maximum of one trash receptacle every 200 feet. Additional trash receptacles should be provided only if a private sponsor provides continued maintenance.

Solar-powered waste receptacles allow for "just-in-time" collection by wirelessly communicating fullness levels to service operators. Some also incorporate compactors to effectively increase receptacle capacity and reduce the frequency of servicing.

Waste receptacles can be street design elements that complement the design of surrounding street furniture.

- Receptacles should generally be located in the amenity zone between the curb and the pedestrian walkway. Receptacles may also be located in the frontage zone as long as they do not impede the pedestrian zone, this can work well for businesses who agree to provide continued trash removal.

- Waste and recycling receptacles should be located near street corners but should not inhibit corner visibility.

Design Guidance

- Receptacles should be immovable and bolted to the pavement to ensure that their proper placement is maintained. Receptacles should not merely be chained to light poles, which is common practice today.

- Receptacles should be opaque not mesh or wire baskets and have a top. Attention must be paid to the receptacle's functional design so that there is a large opening to ensure usability while also effectively screening the trash. Trash receptacles should open from the side to allow easy access for removal/ replacement of garbage bags.

- Durable, graffiti-resistant materials such as galvanized or stainless steel should be used.

- Solar receptacles (compactors) should be considered for use in high-volume locations. This means that fewer receptacles are necessary in high volume locations, lessening their negative aesthetic effects on the street environment.

- In some locations, trash receptacles are serviced by waste removal companies that do not practice mixed-waste processing (a process in which recyclables are sorted out). In these locations, waste receptacles should be paired with recycling receptacles, and they should be easily distinguishable from one another. Ideally, a single fixture that incorporates two receptacles – one for trash and one for recycling – should be used.

- Waste receptacles, like all street furniture, should be considered a street design element. Their design should complement the design of surrounding street furnishings (including benches, street lights, bike racks, etc.)

A typical waste receptacle used in Los Angeles.

Wire basket waste receptacles are unattractive and its contents are open to the effects of wind.

Waste recptacles can be a street design element.

Other Discussion

The benefits of waste receptacles are only attained with regular installation, maintenance, and servicing. However, there is no coordinated program in Los Angeles for the installation, maintenance, and servicing of waste and recycling receptacles. Instead, these services are provided by a variety of public agencies, community organizations, and private companies:

- The Bureau of Sanitation services approximately 3,000 receptacles. Other city departments such as the Department of Recreation and Parks provide and service receptacles adjacent to their facilities.
- In their "Adopt-A-Basket" program, BSS provides receptacles to sponsors (e.g., community/business groups or individual property owners) who agree to maintain and service them.
- Many private organizations (e.g. Business Improvement Districts and Homeowners Associations) install and service their own receptacles; these require R-Permits to be placed in the public right-of-way.
- Trash receptacles that are installed during streetscape and/or development projects are supposed to be serviced through sub-agreements with developers, community-based BIDS, HOAs, non-profit organizations, and/or individual property owners.
- The Bureau of Street Services (BSS) oversees two contractors that provide receptacles adjacent to transit furniture. Martin Outdoor Media, LLC installs and services around 2,000 receptacles placed adjacent to bus benches that they also maintain. As part of the City's Coordinated Street Furniture Program, CBS Decaux, LLC services around 1700 trash receptacles that are placed adjacent to their transit shelters.

4.15 Parklets

Parklets transform one or two curbside parking spaces into an active, vibrant, and accessible public space. They typically incorporate benches, tables, landscaping, and/or bicycle parking on a platform that is flush with the sidewalk. Parklets are sponsored, installed, and maintained by a community partner such as a neighborhood or business group.

Benefits

- Activates the public realm and creates a distinctive setting for sitting, dining, socializing, and relaxing
- Promotes and supports local businesses by providing unique public spaces that attract customers
- Adds visual and spatial interest to the streetscape
- Expands the usable width of the sidewalk in constrained conditions

Huntington Drive, El Sereno

Applications

Parklets are especially valuable at locations with high pedestrian activity, especially at locations where narrow or congested sidewalks prevent the full utilization of public space.

Considerations

- Because parklets are located in a parking lane adjacent to vehicular and/or bicycle lanes, safety must be strongly considered. The siting and design of parklets must incorporate substantial buffering elements to protect users from vehicular traffic. (See design guidance.)
- Because they are in the public right-of-way separate from the property line, parklets must be open to the public even when their primary use is affiliated with an adjacent business.
- In areas where production filming is common, the location of parklets should take into consideration the movement of large production equipment between the roadway and the sidewalk area, the length of continuous curb space required to park large production vehicles (typically at least 120'), as well as the ability of production crews to "dress" a location for a time- or place-specific scene.

Spring Street, Downtown Los Angeles

York Boulevard, Highland Park

Spring Street, Downtown Los Angeles

Guidance

Location and Placement

- Parklets should generally be located only along streets with a speed limit of 25 MPH or less.
- Parklets should be at least one parking space away from the street corner. They must provide adequate clearance for automobiles to turn in and out of driveways.
- Parklets should be located between vehicular parking spaces (flanked on either end by an on-street parking space). Parked cars by themselves provide an important protective buffer from vehicular traffic.
- The parking lane of a parklet site should be at least eight feet wide from the curb face to the adjacent travel lane. In order to ensure pedestrian safety, platform areas should generally have a width of two feet less than the width of the parking lane in order to provide a buffer from moving traffic.
- LADOT guidelines must be adhered to for other clearances and access requirements.

Design

- At the time of the completion of this Guide, the Los Angeles Department of Transportation offers pre-approved parklet models to simplify and expedite approval and implementation. Community partners can choose from several models that utilize combinations of standardized components to suit the desired function(s) of the parklet. Common design elements include built-in or standalone seating, bike racks, and greenery.
- Parklets may be further designed in a variety of ways to meet the needs of the local residents. Some additional creative uses include recreational amenities such as exercise equipment, chessboard tables, or interactive play elements.

- Parklets should be buffered using wheel stops on both ends that are 4 feet from the platform. Safety planters should be placed on the traffic-facing end of the parklet to help absorb the impact of vehicular intrusion. Safety planters should typically be made of fiberglass and weigh a minimum of 700 pounds when full with a soil and sand mixture. Planters should be outfitted with reflective tape for added nighttime visibility.

- Parklets must have vertical elements that make them clearly visible to traffic, such as flexible posts.

- Roadbed graphics are an additional visual element that can mark the area between the wheel stops and the side parklet edges as well as the area adjacent to the roadway edge. Striping should consist of broad (approximately one-foot wide) painted stripes using bright colors, at a 45 degree angle from the curbline. This serves to further alert motorists and demarcate the area as a public amenity.

- To enhance accessibility, the entry of the parklet should be flush with the curb and sidewalk.

- Parklets must not inhibit adequate stormwater drainage and should include metal grates at the roadway level to keep debris from accumulating underneath the platform while allowing water to flow freely.

- Signage facing the sidewalk area should clearly communicate to pedestrians that the parklet is available for anyone to use, not just for patrons of a sponsoring business.

- LADOT guidelines must be adhered to for other design requirements and treatments including those for planters, furniture, signage, and bicycle racks. These guidelines also provide guidance for clearances and access.

References

City of Los Angeles Department of Transportation's "People St" program (peoplest.lacity.org)

4.16 Bus Stop Location

Bus stops that are optimally located provide riders with convenient access to jobs, destinations and residences. Bus stops can be placed on the near side or far side of the intersection, or at the midblock.

Benefits

- All bus stop locations offer specific benefits, whether they are located on the far side, near side, or at the midblock.

Far Side

- Reduces delay because buses do not have to wait for a green light after passengers have boarded and alighted
- Helps create gaps in traffic for buses to reenter the travel lane
- Minimizes conflicts between buses and right turning vehicles traveling in the same direction
- Provides additional right-turn capacity by allowing other traffic to use the right lane at intersection approaches
- Improves pedestrian safety when riders have to utilize the crosswalk located behind the bus; Increases visibility of crossing pedestrians for bus drivers waiting at a red light.
- Provides the optimal location for traffic signal priority corridors
- Improves bus drivers' sight distance and maneuverability when approaching intersections
- Gives buses deceleration space in the intersection

Near Side

- Provides convenience for riders when undesirable traffic occurs on the far side of the intersection
- Allows passengers to board and alight if the bus is stopped at a red light
- May minimize the number of red lights that buses encounter when transit signal priority is absent
- Allows riders to utilize the crosswalk closest to the bus' front door

Locating Bus Stops midblock can allow riders to more easily access streetside shops and restaurants..

Midblock

- Less risk of sidewalk congestion or conflict between pedestrian crossings and riders waiting at the stop
- Provides convenience for riders when a major destination is located at the midpoint of a long block
- Allows buses to avoid vehicle queuing that may occur at intersection approaches

Applications

- The ideal bus stop location for riders depends on the physical or operational context of the roadway and transit route/system.
- The following site conditions should inform bus stop location: available curbside space, sidewalk width and pavement quality, travel lane width and quantity, intersection geometry, sight distances, and the presence of major destinations, on-street parking, bicycle facilities, and/or crosswalks.
- The following criteria should also inform bus stop location: ridership demand, bus routing, transfer locations, and traffic volume and turning movement data.
- Far side bus stops are the most common location and are generally preferred, but near side and midblock stop locations should always be considered when evaluating the criteria.

Considerations

Far Side

- Queuing vehicles may block the intersection during peak periods
- Buses may obstruct sight distances for motorists approaching intersections
- Buses may have to stop twice -- once at an intersection approach, and then again at the far side stop

Near Side

- Increases potential for conflict with right-turning vehicles
- Decreases roadway capacity during peak periods due to buses queuing in travel lanes near bus stops
- Causes delays when a bus boarding occurs during the green light phase and finishes boarding during the red light phase
- Poses a pedestrian safety risk when eager passengers dash across a crosswalk in front of the bus

Midblock

- Requires more curbside space
- Decreases on-street parking supply (unless a bus stop bulb exists)
- Requires a midblock crosswalk to conveniently access the bus stop; may encourage jaywalking in location lacking a midblock crosswalk
- Increases walking distance to a transfer location or destination if they are not located at the midblock

Design Guidance

- Bus stops should not obstruct driveways or other pedestrian paths wherever possible.
- Bus stop spacing should balance ridership demand while providing adequate coverage. The spacing between bus stops running local service should be no more than a ¼ mile, while the spacing for rapid stops should be between ½ and 1 mile.
- Where feasible, bus stop bulbs can be installed at bus stop locations to help improve on-time performance while also improving the waiting area for passengers.

4.17 Bus Bulb

A bus bulb is a curb extension that increases transit performance by allowing buses to stop in the travel lane at bus stops. It also adds valuable space that can be dedicated to transit amenities (e.g., shelters, benches, and kiosks) without encroaching on the pedestrian walkway.

Benefits

- Improves transit performance by eliminating the need for buses to maneuver into a curb space to board passengers, then back into the travel lane to continue along its route
- Provides space to install a bus shelter, additional seating, and/or off-board payment collection equipment without conflicting with pedestrian movements in the pedestrian zone
- Reduces the likelihood that other vehicles will be parked at the curbside space designated for bus boardings and alightings
- Facilitates accessibility by allowing for additional space for boarding and alighting.
- Requires removing only two on-street parking spaces while the equivalent of four spaces are required for buses to pull over at a curbside bus stop.

Applications

- Bus bulbs are typically applied on multi-lane arterial corridors (with on-street parking) so that cars are able to pass stopped buses.
- They can be applied at locations where the on-time performance of major high-frequency bus routes (such as Metro Rapid lines) are hindered by having to merge back into the travel lane
- They can also be applied where the existing sidewalk width is too narrow to accommodate a bus shelter.

Considerations

- Vehicle traffic in the travel lane is blocked while buses are stopped at a bus bulb. This may prompt unsafe vehicle maneuvers to pass stopped buses.
- Bus bulbs at near-side stops affect streets that experience heavy right turn vehicle movements.
- Cost estimates, drainage concerns, utility relocation, and street sweeping operations should be analyzed before implementation.

Design Guidance

- Bus stop bulbs should extend a length of at least 60' (excluding the tapers of the curb extension). They should extend a length of 120' (or 140' for articulated buses) to accommodate locations where the frequency of service results in multiple buses arriving at the stop at the same time.
- Longer bus bulbs should accommodate at least a 5' clearance between multiple buses.
- A 10' clearance behind the back of the bus should be provided to prevent the back end of buses from protruding into the intersection
- Bus stop bulbs should preferably be 8' to 10' wide (or minimum 6') to comfortably accommodate a bus shelter.
- Bus bulb tapers should have a return angle of 45 degrees.
- When applied at near-side stops, bus bulbs may require right-turn-on-red restrictions.

4.18 Sidewalk Equestrian Trails

Equestrian trails allow individuals to enjoy a unique form of recreation and travel within the City of Los Angeles. An integrated network of trails promotes horseback riding and provides a safe means for recreational riders to experience scenic parts of the City.

Benefits

- Provides access to scenic open spaces across parts of the City
- Ensures the safety and viability of horseback riding in the City with proper design and facilities
- Provides a means to incorporate more landscaping and native vegetation throughout the city

Applications

Sidewalk equestrian trails are located primarily in the San Fernando Valley and Santa Monica Mountains, where urban trails connect to mountain trail systems.

Design Guidance

- Design trails adjacent to streets to be between 10 and 12 feet in width to accommodate a double-track. Trail widths may be reduced in cases where topography or space is prohibitive. No trail width should be less than 6 feet.
- Maintain a vertical clearance of 10 feet from the ground and any physical barrier such as bridges, underpasses, and maintain vegetation free of protruding branches.
- A minimum height of 4 feet is recommended for all fences and barriers along trails. A greater height may be permitted for trails adjacent to high speed roads where traffic may startle horses. Height should be tapered down as trail approaches intersections or end, to maximize horse/rider view.
- Low walls or fences with railings added for more height are acceptable. Bollards or barrier posts can help separate equestrian from other uses. Barrier posts should be an odd number to prevent confusion, and placed 5 feet apart to allow equestrians to pass through.

- Preferred fence materials include “woodcrete” or other sturdy material that gives the appearance of wood-like finish.
- A second signal actuator push button (equine crossing signal) should be installed 5 to 6 feet above the ground. The post should be placed 6.5 feet from the road edge so that the animal’s head does not encroach into the roadway.
- Use of native plants for landscaping is encouraged. Low walls or fences can include vegetation facing the trail to improve appearance, especially along trails with pipe railing. Vegetation should be trimmed to less than 4 feet high for crime prevention purposes, and trimmed to avoid injury to equines.
- Plants toxic to equines must be removed or identified with signage.
- Urban trails should be designed in accordance with traffic engineering standards. The Metropolitan Transportation Authority Congestion Management Plan (CMP) and the Transportation element of the County of Los Angeles General Plan should be consulted to determine the traffic impacts of a trail.

References

County of Los Angeles Trails Plan (2011)

Major Equestrian and Hiking Trails Plan (1968)

Guide to Existing and Potential Equestrian Trails, Los Angeles Department of City Planning (revised 1991)

Rim of the Valley Trail Corridor Plan, Santa Monica Mountains Conservancy (1990)

4.19 Esplanade

An esplanade integrates an offstreet bicycle path (typically two-way), a pedestrian walkway, trees, and landscaping into a travel corridor alongside a vehicular roadway. An esplanade creates an inviting pathway that is safe and enjoyable for a wide range of users.

Benefits

- Encourages bicycling and walking as an alternative to motorized travel
- Increases comfort and safety by separating pedestrians and bicyclists from the roadway
- May provide additional safety and comfort by providing a parkway strip separating the pedestrian walkway from the bicycle path
- Provides key pedestrian and bicycle linkages

Applications

- An esplanade is an intensive project that is appropriate for large-scale streetscape and roadway projects. It is best located on streets with fewer cross streets so that crossings are kept to a minimum.
- An esplanade is highly beneficial when it provides linkages between popular destinations and/or districts.

Considerations

- An esplanade generally requires greater width than that of a typical sidewalk area, so its development will likely necessitate the relocation of the curb to increase sidewalk width. This will likely require the relocation of utility infrastructure (e.g., drainage infrastructure, streetlights, utility poles, underground wiring, and utility boxes).
- An esplanade should have dedicated signalization at intersections with vehicular roadways. This is desired for a few reasons: 1) pedestrians and bicyclists are less visible to turning traffic because the pathways are set back further from the street, 2) at roadway crossings with two-way bicycle paths, motorists may not expect oncoming bicycle traffic, and 3) dedicated signalization adds convenience and comfort to users.

Design Guidance

- An esplanade is typically 25-35' wide, accommodating a minimum 7'-wide pedestrian walkway, minimum 12' two-way bicycle path, and a parkway with landscaping, trees, and/or streetlights. Ideally there should be two parkway strips – one between the roadway and bicycle path, and another between the bicycle path and pedestrian walkway. Trees with broad canopies should be chosen to help create an attractive environment and protect users from the sun.
- Methods for stormwater treatment and management should be integrated into the landscaping plan. Permeable pavement should be considered for pathway surfaces.
- For further design guidance regarding the bicycle path, see Section 5.3 "Protected Bicycle Lane".
- For design guidance regarding intersections and mid-block crossings with a roadway, as well as instances where pedestrian walkways cross a bicycle path, see Section 5.3 "Protected Bicycle Lane" and Section 6.11 "Bicycle Lanes at Intersections".

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COMPLETE STREETS DESIGN GUIDE

ROADWAYS

5

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5. ROADWAYS

Introduction

This chapter presents several treatments and techniques that provide complete street enhancements in the roadway, which is defined as the area between the curbs. The following interventions represent “tools” in the complete streets design “toolkit”. Their application varies based on many factors including land use context, street configuration, pedestrian and traffic volumes, and vehicle speeds. Used individually or in coordination with other interventions in this guide, they provide safer vehicular speeds, improved goods movement, transit prioritization, and even pedestrian use of the roadway zone.

5.1 Pedestrian Plaza

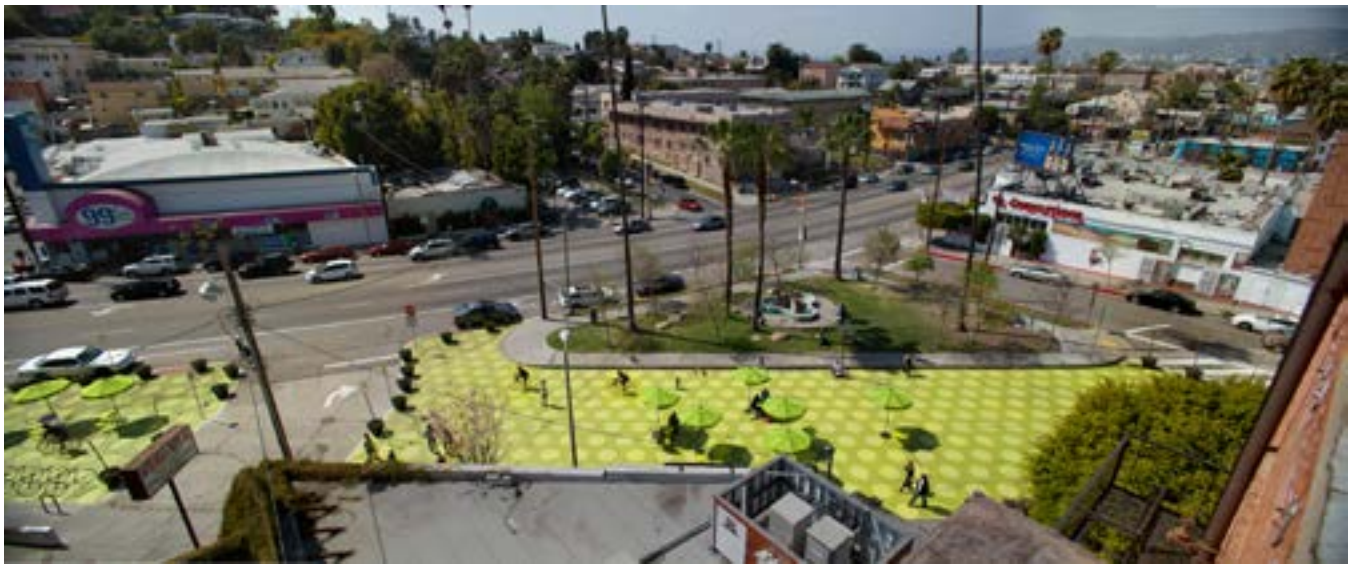
A pedestrian plaza is an outdoor public space with public amenities that contributes to fostering a greater sense of community. Formed by repurposing a portion of existing roadway, these spaces can be used to host community events and draw patrons to local neighborhood businesses.

Benefits

- Provides an opportunity to turn low-volume streets into pedestrian-oriented public spaces
- Creates a sense of place and identity for neighborhoods
- Provides opportunities for community programming, public art displays, and increased neighborhood economic activity
- Slows down street traffic on surrounding streets

Applications

- Pedestrian plazas should be considered on a street segment with low vehicle traffic or on roadways that pose safety or operational issues because of unorthodox geometry.
- They should be applied in locations where a community partner agrees to maintain the plaza's cleanliness and furniture.
- Land uses such as restaurants, cafes, and retail shops, should complement the site of the plaza.



Sunset Triangle Plaza, Silver Lake

Pedestrian Enhancements


Sunset Triangle Plaza, Silver Lake


NoHo Plaza, North Hollywood

Considerations

- While bicycle parking should be installed within the plaza, vehicle parking should be prohibited unless for loading purposes at specific hours when the plaza is not occupied.
- Access for emergency vehicles must be accommodated

Design Guidance

- Pedestrian plazas should be clearly delineated from adjacent roadways using design elements such as a colorful or textured surface treatment, bollards, striping, delineators, and perimeter planters. Additional street lighting should be considered to increase the plaza's visibility and safety.
- The plaza may contain tables, seating, bicycle parking, bicycle repair stations, aesthetic landscaping, stormwater vegetation, public art, recreational amenities, and exercise equipment.

Other Discussion

- LADOT's People St. Program works with local stakeholders to establish plazas in their neighborhoods. After the success of Los Angeles' first pedestrian plaza, Sunset Triangle, in Silver Lake in 2012, LADOT's People St. Program continues to partner with local groups to bring more plazas across the city. The overall goal of the People St program is to catalyze permanent roadway-to-plaza conversions as described above.

References

NACTO Urban Street Design Guide

LADOT People St. Program - http://peoplest.lacity.org/

5.2 Bicycle Lane

Bicycle lanes provide safe, dedicated travel lanes for bicyclists. Classified as Class II facilities by the state, bike lanes serve the mobility needs of riders by providing them with useful connections to destinations.

Benefits

- Provides bicyclists with a safe, dedicated space on the roadway
- Facilitates predictable behavior and movements between motorists and bicyclists
- Allows bicyclists to travel at speeds appropriate to bicyclists rather than moving traffic

Applications

- Bike lanes are valuable on streets where demand is high and/or where connections are needed.
- Bike lanes are typically applied on arterial streets with travelways in both directions.
- Road diet projects present opportunities to install bike lanes and reduce off-peak vehicular speeds.
- Apply on streets designed for one-way travel on one way streets or for two-way travel on both sides of the street.
- Apply on streets/corridors which allow the placement of bike lanes adjacent to the existing curb.
- Apply on streets/corridors where there are parking lanes provided and which allow the provision of bike lanes through the reallocation of existing street space, i.e. the narrowing of travel lanes, the reconfiguration of parking lanes, and/or the removal of travel lanes.

Considerations

- On streets with heavy bicycle traffic, wider bicycle lanes should be considered in order to allow faster-moving bicyclists to pass slow moving bicyclists.
- Left-side bike lanes should be considered on one-way arterial streets if significant transit service is present on the right-most travel lane. Contraflow bike lanes can be considered on the left side of one-way streets.
- Uphill conditions may pose a challenge for some riders. Wider bike lanes should be considered in these instances, along with downhill Shared Lane Markings to allow bicyclists to take the vehicular travel lane on the downhill.
- Streets with frequent parking turnover may increase the risk of conflict and “dooring” collisions with bicyclists. This safety factor can be addressed by increasing parking lane and/or bike lane widths, or by painting a striped buffer between the bike lane and parking lane.
- Parked or moving vehicles should be prohibited in the bike lane. Bike lanes should only be traversed by vehicles when entering or exiting an on-street parking space or driveway; or when entering a right turn lane at the designated merging area near the intersection approach.

In this image, a dashed line seeks to demarcate the so-called “door zone”, which is the space in which a cyclist is in danger of being hit by an open car door. There is currently no standard treatment for providing a door-zone buffer between parked vehicles and bicyclists.

Bicycle Enhancements

Painted striping provides a spatial buffer from passing vehicles, providing protection from fast-moving vehicles. Note that, in this case, there is insufficient space to also incorporate a buffer in the "door zone" next to parked vehicles.

Design Guidance

- The City of Los Angeles Department of Transportation lists the following widths for bike lanes:
- Interior Bike lane:
  - 7' (desirable)
  - 5' (minimum)
  - 4' (absolute minimum and only for short distances)
- Bike Lane w/o Parking:
  - 7' (desirable)
  - 5' (minimum w/ gutter)
  - 4' (minimum w/ no gutter)
- Bike Lane w/ Parking:
  - 15' (desirable)
  - 13' (minimum)
  - 12' (absolute minimum)
- Striping:
  - White line separating vehicle lane from bicycle lane must be 6"
  - White line separating bicycle lane from parking lane must be 4"
  - A buffered space can be added to bike lanes according to the amount of available roadway space.

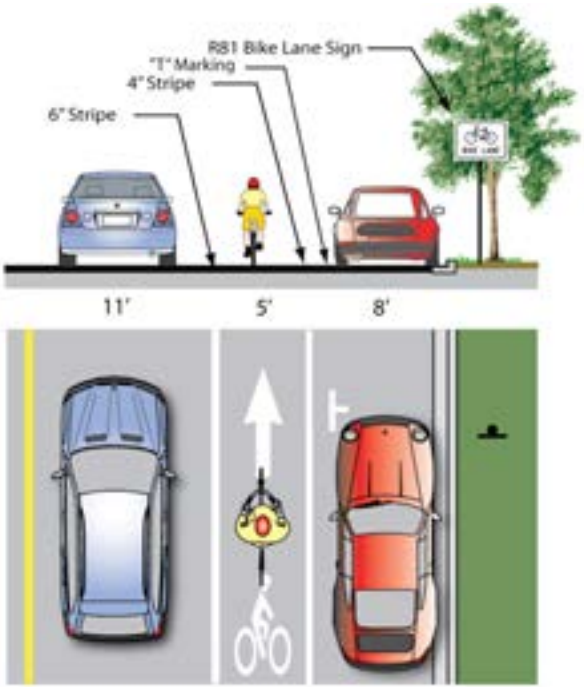
Bicycle Enhancements

- Signage for bicycles lanes (R81-CA MUTCD) must be provided at:
  - Beginning of bike lane
  - Approaches and at far side of all arterial crossings
  - Major changes in direction
  - Intervals not to exceed ½ mile
- Pavement Markings for bicycle lanes shall be the "BIKE LANE" stencil or graphic representation of a bicyclist with directional arrow (preferred) to be used:
  - At the beginning of a bicycle lane:
  - Far side of all bicycle path (Class I) crossings
  - Aproaches and at far side of all arterial crossings
  - Major changes in direction
  - Intervals not to exceed ½ mile
  - Beginning and end of bicycle lane pockets at approach to intersection

Other Design Guidance

Bicycle Lane Next to On-Street Parallel Parking

- Lane Width: 5' minimum, 7' maximum
- Discussion: Bicycle lanes adjacent to on-street parallel parking are the most common type used in the United States. Crashes caused by a suddenly opened vehicle door are a hazard for bicyclists using this type of facility. Providing wider bicycle lanes is one way to mitigate against potential bicyclist collisions with car doors. However, if the outer edge of the bicycle lane abuts the parking stall, bicyclists may still ride too close to parked cars. Bicycle lanes that are too wide may also encourage vehicles to use the bicycle lane as a loading zone in busy areas where on-street parking is typically full or motorists may try to drive in them. Design treatments to encourage bicyclists to ride farther away from parked vehicles will increase the safety of the facility. If sufficient space is available, the preferred design provides a buffer zone between parked cars and the bicycle lane.
- Caltrans Highway Design Manual: The figure below depicts bicycle lanes on an urban type curbed street where parking stalls (or continuous parking stripes) are marked. Bicycle lanes are located between the parking area and the traffic lanes.



Standard dimensions for a bicycle lane next to on-street parallel parking

Bicycle Enhancements

As indicated, 5 feet shall be the minimum width of bicycle lane where parking stalls are marked. If parking volume is substantial or turnover high, an additional one to two feet of width is desirable. Bicycle lanes shall not be placed between the parking area and the curb. Such facilities increase the conflict between bicyclists and opening car doors and reduce visibility at intersections. Also, they prevent bicyclists from leaving the bicycle lane to turn left and cannot be effectively maintained. Bicycle lanes are established in conjunction with the parking areas. As indicated, 11 or 12 feet (depending on the type of curb) shall be the minimum width of the bicycle lane where parking is permitted. This type of lane is satisfactory where parking is not extensive and where turnover of parked cars is infrequent. However, if parking is substantial, turnover of parked cars is high, truck traffic is substantial, or if vehicle speeds exceed 55 km/h, additional width is recommended

Standard dimensions for a curbside bicycle lane (no on-street parking).

- AASHTO Guide for the Development of Bicycle Facilities (1999): If parking is permitted, the bicycle lane should be placed between the parking area and the travel lane and have a minimum width of 5 feet. Where parking is permitted but a parking stripe or stalls are not utilized, the shared area should be a minimum of 11 feet without a curb face and 12 feet adjacent to a curb face as shown in figure below. If the parking volume is substantial or turnover is high, an additional 1 to 2 feet of width is desirable

Bicycle Lane with No On-Street Parking

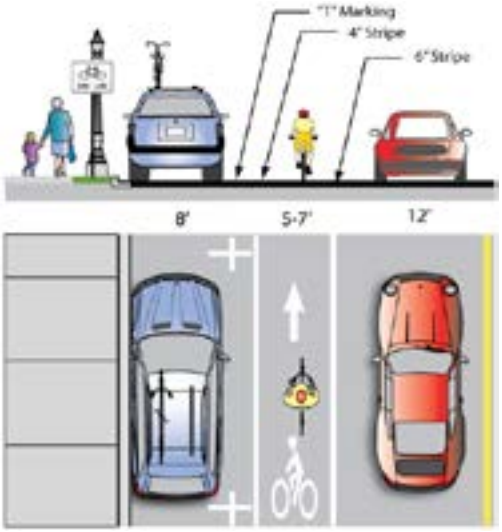
- Lane Width: 5' minimum measured from face of curb when adjacent to curb.
- Preferred Width: 6-7' where right-of-way allows.
- Maximum Width: 7' adjacent to arterials with high travel speeds.
- Discussion: Wider bicycle lanes are desirable in certain circumstances such as on higher speed arterials (45 mph+) where a wider bicycle lane can increase separation between passing vehicles, parked vehicles and bicyclists. Wide bicycle lanes are also appropriate in areas with high bicycle use. A bicycle lane width of 6' or 7' makes it possible for bicyclists to pass each other without leaving the lane, increasing the capacity of the bicycle lane. Frequent signing and pavement markings are important with wide bicycle lanes to ensure motorists do not mistake the lane for a vehicle lane or parking lane.

A typical curbside bicycle lane in Los Angeles

Bicycle Enhancements

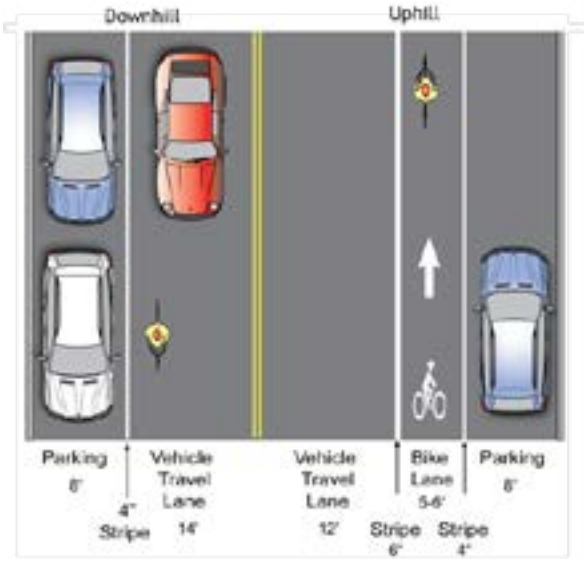
Bicycle Lane on Left Side of One-Way Street

- Lane Width: 5' minimum when adjacent to curb and gutter, 7' maximum.
- Discussion: Bicycle Lanes on the left side of a one-way street are generally discouraged, but they can be useful in certain limited circumstances. Left-side bicycle lanes on one-way streets should only be considered on roadways with either: 1) heavy transit use on the right side of the street, 2) high volumes of right turn movements by vehicles, 3) bicyclists need to make left turns on the one way street.
- Benefits:
  - With the bicycle lane on the left, bicyclists are seen in the motorist's driver's side mirror, which has a smaller blind spot than the passenger side mirror.
  - Most bus stops and loading zones are on the right side of the street.
  - Left-side bicycle lanes reduce the number of conflicts caused by buses or trucks blocking or merging through a bicycle lane.
  - Considerations:
  - There may also be potential for increased conflicts between bicyclists and motorists making left turns. A left turn pocket with the bicycle lane oriented to the right may address these conflicts if space permits.
  - Drivers are not accustomed to looking for bicycles on the left hand side of their vehicles.
  - Car passengers opening doors are less likely to be aware of the presence of bicyclists to their right.
  - Bicycle lanes on the left side of the street may experience higher levels of 'wrong way riding' by bicyclists.
  - Bicyclists may not be accustomed to looking over their right shoulders to monitor traffic, the facilities render helmet and handlebar mounted mirrors useless.
  - Where adjacent to parallel parking, left side bicycle lanes may result in poorer visibility to motorists leaving parking spaces.



Standard dimensions for a bicycle lane on the left side of a one-way street.

Bicycle Enhancements



Uphill climbing bicycle lane with a downhill "sharrowed" multi-modal travel lane

Uphill Climbing Bicycle Lanes

- Lane Width: 5 or 6 feet wide (6' is preferred for extra maneuvering room on steep grades).
- Striping: On the uphill side, use a 6" stripe between the vehicle travel lane and bike lane, and a 4" stripe between the bicycle lane and the parking lane or shoulder. On the downhill side, use a 4" shoulder stripe or edgeline between vehicle travel lane and the parking lane shoulder and/or add sharrows to the travel lane.
- Discussion: Separating vehicle and bicycle traffic, uphill bicycle lanes (also known as "climbing lanes") enable motorists to safely pass slower-speed bicyclists, thereby improving conditions for both travel modes. The right-of-way or curb-to-curb width on some streets may only provide enough space to stripe a bicycle lane on one side. Under these conditions, bicycle lane striping could be added to the uphill side of the street only. This measure often includes delineating on-street parking (if provided), slightly narrowing travel lanes, and/or shifting the centerline if necessary.

Wide Outside Bicycle Lane as a Connection Gap Closure

- Lane Width: The outside lane should be 14' wide minimum.
- Signage: Appropriate signage as recommended by the CA MUTCD applies. The gap area should have "Bicycle Route" (D11-1) signs placed at maximum 400' intervals. Additionally, "Bicycles May Use Full Lane" signage (MUTCD R4-11) may be used on roadways with higher traffic volumes.
- Discussion: For connection gaps with no on-street parking and without adequate right of way for widening or lane width reductions to provide continuous bicycle lanes, a wide outside lane may be used with the appropriate signage. If parking is under-utilized, its removal should be considered to provide for dedicated bicycle facilities.

Bicycle Enhancements

Contra-Flow Bicycle Lane on One-Way Street

- Lane Width: The contra-flow lane should be 5' minimum when adjacent to curb and gutter
- Discussion: Contra-flow bicycle lanes enable bicyclists to ride in the opposite direction of vehicle traffic on one-way streets for local access. The facility is placed on the opposite side of vehicle travel lanes (to the motorists' left), and separated from traffic with a double yellow line or extruded curb. This informs motorists that bicyclists are riding legally in a dedicated lane.

Measures should be taken to signalize all stop-controlled intersections on streets with contra flow bicycle lanes. All left-turn-on-red movements from intersecting one-way streets onto the street with the contra-flow bicycle lane should be prohibited (R-13B).

If driveways exist, exiting left turns should be prohibited if possible by relocating exit movements to other streets. If left turn out of driveways onto the street with the contra-flow bicycle lane must be permitted, special signage should be developed warning motorists to look left for approaching bicyclists before turning left.

Wide Bicycle Lane with Additional Pavement Markings Next to On-Street Parallel Parking (Non Standard)

- Lane Width: 7' maximum
- Discussion: Wide bicycle lanes may encourage less-experienced bicyclists to ride farther to the right (door zone) to maximize distance from passing traffic. Diagonal stripes may be added to encourage bicyclists to ride to the left of the bicycle lane. This treatment is not standard and should be studied before use. Providing a buffer between parking stalls and the outside bicycle lane stripe are preferred (see Preferred Design for Bicycle Lane Next to On-Street Parallel Parking). However, the treatment at right may be used in areas where parking stalls are undesirable or otherwise cannot be used.

Floating Bicycle Lane or Bicycle Accommodatio with Part-Time Parking (Non Standard)

- Lane Width: Standard bicycle lane design as recommended by the CA MUTCD, a minimum of 5' and a maximum of 7' or double row of Shared Lane Markings.
- Design Summary: Standard parking T's where appropriate. Add required signage and tapered pavement markings or striping to lead into the facility.
- Discussion: When parking is allowed, bicyclists use the floating bicycle lane where cars were previously parked between a 4" wide white stripe and the curb. When parking is not allowed, bicyclists move to the right and share a wide travel lane or Shared Lane Marking pavement treatment. On roadways where there is a part time parking prohibition, yet there is a demonstrated need for bicycle travel through the corridor, it may be feasible to install a floating bicycle lane or double row of Shared Lane Markings to provide bicycle accommodation.

References

NACTO Urban Bikeway Design Guide

LADOT Manual of Policies and Procedures – Section 531, Page 8-9

CA MUTCD

Caltrans Highway Design Manual

AASHTO Guide for the Development of Bicycle Facilities

5.3 Protected Bicycle Lane

A protected bicycle lane, or "cycle track," is a type of bicycle facility that provides a physical separation for bicyclists traveling on the roadway.

Benefits

- Decreases injuries and fatalities while providing a safer, more comfortable bicycling experience
- Encourages bicyclists to travel in a protected bicycle lane on the roadway, as opposed to on the sidewalk
- Mitigates conflicts between bicyclists and motorists by providing greater clarity about roadway behavior
- Increases bicycle ridership

Applications

- Protected bicycle lanes are typically applied:
    - one-way on each side of two-way streets
    - one-way on one side of a one-way street, two-way on one side of a one-way street, and are separated from vehicles and pedestrians by pavement markings or coloring, bollards, curbs/medians and on-street parking, or a combination of these elements.
- Protected bicycle lanes should be applied along corridors with adequate right- of-way. Sidewalks or other pedestrian facilities should not be narrowed to accommodate the Cycle Track, as pedestrians will likely walk on the Protected Bicycle Lane if sidewalk capacity is reduced.
- Apply in relation to school routes, dense commercial districts, and arterials heavily traveled by bicyclists.
- Apply along streets with long blocks and few or no driveway or midblock access points for vehicles. Protected Bicycle Lanes located on one-way streets will have fewer potential conflicts than those on two-way streets.

A Complete Street rendering incorporating protected bicycle lanes with on-street parking and bus boarding islands (image courtesy of NACTO)

- Apply along routes where there are more destinations on one side of a street or if the Protected Bicycle Lane will be connecting to a shared use path or other bicycle facility on one side of the street.

Design Guidance

Separation

- Protected Bicycle Lanes can be separated by a device or barrier (pavement markings or coloring, bollards, curbs/medians and on-street parking or a combination of these elements. from the travel lane or by on-street parking with additional striping provided between the lane and the Cycle Track. Protected Bicycle Lanes using barrier separation are typically at-grade. Openings in the barrier or curb are needed at driveways or other access points. The barrier should be dropped at intersections to allow vehicle crossing. When on-street parking is present, it should separate the Protected Bicycle Lane from the roadway, the Protected Bicycle Lane should be placed with a 3-foot (min.) buffer between parking and the Protected Bicycle Lane to minimize the hazard of opening car doors into passing bicyclists.

Painted buffers and soft-hit posts (as seen here in Chicago, Illinois) are inexpensive interim treatments to establish protected bicycle lanes before more-costly permanent facilities can be constructed.

Protected bike lane with a landscaped buffer

Bicycle Enhancements

Protected Bicycle Lane Only

- *Raised buffer without adjacent parking* -- If there is no parking adjacent to the buffer it may be as narrow as 2 feet, although a width of 4 feet is preferable.

The Figueroa Street streetscape plan envisions protected bicycle lanes intermixing with bus boarding islands. (image courtesy of Melendrez)

Protected Bicycle Lane adjacent to Parking Lane

- *Raised buffer with adjacent parking* -- This should be at least 3' wide to ensure an adequate buffer for open vehicle doors. The preferred width is at least 4' to better accommodate pedestrian egress and ingress from parked vehicles.

- *Striped buffer with adjacent parking. --* A standard for this condition would be a preferred width of 4 feet and a minimum width of 3 feet.

Protected Bicycle Lane adjacent to Parking Lane / Peak Hour Bus Lane

- Protected Bicycle Lanes, when designed adjacent to Parking Lanes / Peak-Time Bus Lanes should be placed between the lane and the sidewalk. This treatment prevents the conflict of bicyclists riding between two travel lanes. At intersections where Protected Bicycle Lanes meet bus stops, a bus stop island, 4' – 5' wide, should be provided, between the Protected Bicycle Lane and the Peak-Time Bus Lane, which allows pedestrians to board the bus. Additionally, the Protected Bicycle Lane should have yield signs at such conflict zones, and it should be raised to be at-grade with the sidewalk and bus stop island, before descending to be at-grade with the travel lanes.

This conceptual rendering for 7th Street incorporates a wide buffered area that can accommodate non-car uses such as transit boarding islands, bikeshare stations, and bicycle parking corrals. (Image courtesy of Melendrez)

Considerations

- May create design challenges at intersections for right-turning vehicles.
- May require creating entry and exit points for driveways and parking lots along the Cycle Track route.
- May require bicyclist-only signal phasing to allow for left turns along the route by installing two-stage left-turn boxes.
- May be difficult for existing street maintenance equipment to maintain Protected Bicycle Lane due to maintenance vehicle design widths.
- Raised buffers require additional design consideration, in particular, drainage, street cleaning and treatment at intersection.
- Access to fire hydrants must be accommodated; fire trucks can typically mount a low physical barrier.
- In locations where production filming is common, cycle track design should take into consideration the movement of large production equipment between the roadway and the sidewalk area. At-grade painted buffers and/or movable barriers can be utilized in lieu of a raised buffer.

A conceptual rendering of a protected bicycle lane (cycle track) on Huntington Drive in El Sereno.

Interim Design Strategies

- By re-allocating roadway space (including removing or reallocating parking lanes and/or travel lanes), interim cycle tracks can be physically protected from parking or travel lanes by painted buffers at least 3' in width with flexible delineators.

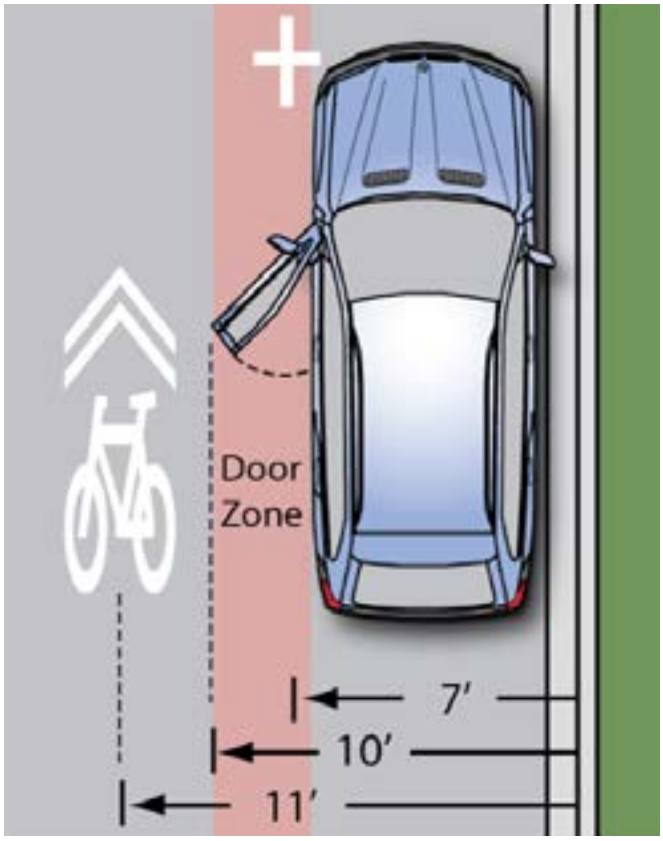
A buffered bicycle lane on 2nd Street in downtown Los Angeles provides separation and protection from vehicular traffic.

References

NACTO Urban Bikeway Design Guide

5.4 Shared Lane Marking (Sharrow)

Shared Lane Markings serve as a visual cue for motorists to be aware of bicyclists traveling on the street. The presence of Shared Lane Markings indicate that that particular street serves as a vital connection for bicyclists, however, physical roadway constraints make it infeasible to implement a bicycle lane.



Shared Lane markings should be placed so as to encourage bicyclists to ride at least 3 feet away from parked cars in order to prevent "dooring" collisions..

Benefits

- Alerts motorists to the lateral location of bicyclists likely to occupy the travel lane
- Reinforces the right of bicyclists to use the entire travel lane
- Guides bicyclists in the correct direction of travel
- Reminds bicyclists to ride 3' away from parked cars to prevent "dooring" collisions

Applications

- Shared Lane Markings should be applied on streets that serve bicycle traffic but that do not have sufficient roadway space to accommodate a bike lane.
- They are recommended on streets that are designated as bike routes (Class III bicycle facilities) and on streets that have travel speeds of 35 mph or less.
- Shared Lane Markings should be provided only after fully considering the feasibility of a bike lane.

Bicycle Enhancements

Design Guidance

- Where on-street parking is present, Shared Lane Markings (sharrows) should be placed (centered) a minimum of **11'** from the face of the curb or from the edge of the pavement where a curb is absent
    - It may be placed **more than 11'** from the face of the curb if adequate roadway width exists.
    - If on-street parking spaces are wider than **7'** the shared lane marking should be moved further out accordingly.
- Where on-street parking is absent and the travel lane is less than 14' wide, the center of the shared lane marking should be at least 4' from the face of the curb or from the edge of the pavement.
- Shared Lane Markings should be placed immediately after an intersection and spaced at intervals not greater than 250' thereafter.
- "Bicycles May Use Full Lane" signage (MUTCD R4-11) should be used to supplement the effect of the shared lane marking.

References

CA MUTCD 9C.07 – Shared Lane Marking

Shared lane markings could be highlighted using a green painted backgroud

5.5 Bicycle Corral

A bicycle corral supplies additional bike parking by replacing a single on-street parking space with a row of bicycle racks or a cycle stall.

Benefits

- Benefits local businesses by increasing the overall supply of on-street parking
- Makes bicycling more convenient (especially for local trips) when users know that bicycle parking is present
- Reduces the likelihood of parked bicycles affixed to railings, private property, or other street furniture

Applications

- A bicycle corral is especially valuable in environments that have a high demand for bicycle parking, such as commercial districts and corridors.
- Bicycle Corrals work well where sidewalks are too narrow to accommodate bicycle racks on the sidewalk, or when demand for bicycle parking (especially short-term) is not met by sidewalk racks alone.

Design Guidance

- Bicycle racks within a corral can be installed in a parallel or diagonal configuration, depending on the orientation of the surrounding on-street parking spaces.
- A typical corral replaces one parking space with up to 14 parked bicycles.
- Spacing between racks should be at least 48” to allow for adequate room to maneuver bicycles into and out of the stalls
- Reflective flexible delineators, wheel stops or planters should serve as buffers for the corral at both ends. Object marker signage can further increase the visibility of bicycle corrals.
- There should be adequate clearances from bus stops, fire hydrants, utilities (including manhole covers), driveways, tree wells, and other street furniture.

Standardized rack for Los Angeles bicycle corrals

Bicycle Enhancements

- Corrals can be located in a red curb zone as long as standard clearances are met. There should be at least a 25 foot clearance from a fire hydrant.
- Bicycle corrals should be located at least 30 feet from intersection departure and 50 feet from intersection approach.

Other Discussion

- LADOT should consider developing a standard plan for the placement and design features of bicycle corrals, including striping, signage, dimensioning and other elements.
- Bicycle corrals are part of LADOT's Bicycle Friendly Business Program, a public-private partnership that serves local stakeholders, business owners, or community partners that are interested in increasing bicycle friendliness in their community by hosting a bicycle corral outside of their establishment. LADOT pays for the corral, site design, and installation in the public right-of-way, while the requesting party agrees to become a maintenance partner that ensures the corral's cleanliness and upkeep.

References

LADOT Bike Blog: ladotbikeblog.wordpress.com/bike-corrals/

LADOT Bicycle Friendly Business Program http://ladotbikeblog.wordpress.com/bicycle-friendly-business-program/

Standard Plan: S-671 Bicycle Rack

York Boulevard, Highland Park

5.6 Shared Bicycle-Bus Lane

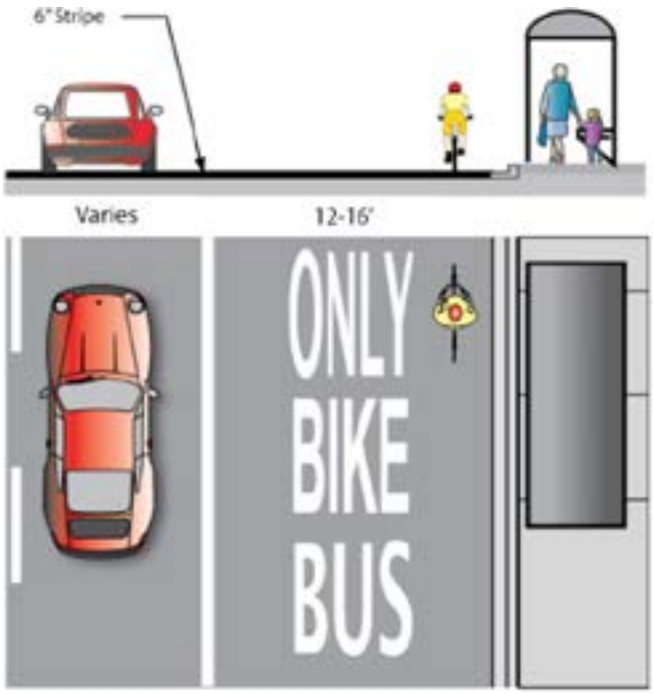
A shared bicycle-bus lane provides bicyclists and buses with an exclusive travel lane on the roadway, especially where constrained roadways cannot accommodate separate facilities for both modes.

Benefits

- Provides a more pleasant bicycle ride or transit trip by minimizing interaction with cars
- Improves travel times for buses
- Reduces risk of collision between cars and bicyclists
- Fosters a safer travel environment when bus drivers and bicyclists are well trained and educated on how to co-exist and interact in the same space.

Applications

- Shared bicycle-bus lanes are applicable where inadequate roadway space exists to accommodate a separate bike lane and bus lane.



- Generally, such shared uses are operationally acceptable unless very high volumes of bus and bicycle traffic exist. By law, California bicyclists must ride as far to the right as practicable. This allows bicyclists lawful use of a right-hand bus lane.

Considerations

- Right turning vehicles can reduce the benefits of the shared lane by creating congestion at intersection approaches.
- Enforcement should ensure that private vehicles do not encroach onto the shared lane.
- Some bicyclists may be uncomfortable with buses passing them within the same travel space.
- Bicyclists traveling along their route may not be comfortable with continually having to “leap frog” buses that are temporarily stopped to board and alight passengers.

Design Guidance

- The minimum width of the shared lane should be **16’** from the curb, which allows space for buses to pass bicyclists.
- A **14’** shared lane may be allowed on roadways with low traffic volumes and/or lower bus frequency, while a **12’** shared lane should only be considered in very constrained areas.
- To minimize delays to transit vehicles and bicyclists, vehicular right turns should be limited or prohibited at locations.
- There is no current standard CA MUTCD signage for a shared bicycle-bus lane. Many cities have developed their own signage.

5.7 Peak-hour Bus Lane

A peak-hour bus lane increases the efficiency of transit during peak hours (7am-9am, 4pm-7pm) by providing a dedicated lane for bus travel. Placed on an arterial street with heavy transit ridership, peak-hour bus lanes typically occupy the curbside travel lane and prohibit on-street parking during peak hours.

Benefits

- Increases reliability and on-time performance of transit during peak travel times
- Prioritizes and promotes transit as an attractive mode of travel

Applications

- Peak-hour bus lanes should be considered on multi-lane arterial corridors where major transit service suffers from poor on-time performance, as a result of peak hour congestion.

Considerations

- Businesses along the street should be notified in advance that implementation of a curbside peak-hour bus lane will result in the restriction of on-street parking during peak hours.
- The appropriate width for a bicycle lane may not be feasible alongside a peak-hour bus lane, in which case the lane can then be designed as a shared bike-bus lane.
- Personnel or video/photo technology should be considered as enforcement tools to ensure the lane is only used by buses during peak hours.

Peak-hour Bus Lanes allow buses to stay on schedule at hours when vehicle lanes tend to get congested..

Design Guidance

- Peak-hour bus lanes should be installed with the appropriate parking signage and pavement markings (See City of Los Angeles' Department of Transportation standard plan S-487 for Exclusive Bus Lane Markings for further detail).
- At intersections, right turning movements by other motorists and bicyclists can be facilitated by marking dashed lines at the intersection approach. If buses traveling in the lane experience significant delays, right turns at select intersections may need to be prohibited.
- Transit signal prioritization should be given to buses operating in these lanes.
- Bus pads should be installed at stops to prevent street warping.
- Alternatively, a peak-hour bus lane can be offset, meaning the bus only lane is located one lane away from the curb (See Section 5.8 "Offset Bus Lane").
- Peak-hour bus lanes may also be designed as shared bike-bus lanes (See Section 5.6 "Shared Bike/ Bus Lane").
- Red paint should be considered as a supplemental treatment used to delineate and reinforce the lane for bus use only.

Additional Discussion

- Starting in 2013, the Los Angeles County Metropolitan Transportation Authority (Metro), in partnership with the City of Los Angeles, implemented curbside peak-hour bus lanes on a 7.7- mile segment of Wilshire Blvd as part of their Wilshire Bus Rapid Transit (BRT) Project. Overall, the project aims to improve bus passenger travel times, service reliability, and ridership along the corridor. The bus lanes are operational on weekdays from 7 am to 9 am and 4 pm to 7 pm. In addition, bicyclists are also allowed on these lanes during the peak period.

References

FTA Bus Lanes http://www.fta.dot.gov/12351_4358.html

Effective Bus-Only Lanes http://nacto.org/docs/usdg/effective_bus_only_lanes_kiesling.pdf

The City of Los Angeles' Department of Transportation currently has a standard plan (S-487) for Exclusive Bus Lane Markings.

Red paint on the curb emphasizes the lane's exclusive dedication to bus use..

5.8 Offset Bus Lane

Unlike a peak-hour bus lane, an offset bus lane is located away from the curbside, and are separated from the curb by a parking lane. Offset bus lanes provide the greatest benefits when bus bulbs are integrated.

Benefits

- Increases reliability and on-time performance of transit during peak travel times
- Prioritizes and promotes transit as an attractive mode of travel
- Allows existing on-street parking to remain operational
- Provides a lane for emergency vehicles to use in congested conditions
- Allows for the implementation of bus bulbs, which eliminates the need for drivers to pull into and out of bus stop locations

Applications

- Offset bus lanes should be considered on multi-lane arterial corridors where major transit service suffers from poor on-time performance, as a result of peak hour congestion.

Design Guidance

- The minimum width of a dedicated bus lane in an offset position is **10'**.
- Bus bulbs should be implemented in conjunction with offset lanes (See Section 4.17 "Bus Bulb")
- Offset bus lanes should be installed with the appropriate pavement markings (See City of Los Angeles' Department of Transportation standard plan S-487 for Exclusive Bus Lane Markings for further detail)
- At intersections, right turning movements by other motorists and bicyclists can be facilitated by marking dashed lines at the intersection approach. If buses traveling in the lane experience significant delays, right turns at select intersections may need to be prohibited.
- Transit signal prioritization should be given to buses operating in these lanes.
- Bus pads should be installed at stops to prevent street warping.
- Peak-hour bus lanes may also be designed as shared bike-bus lanes (See Section 5.6 "Shared Bicycle-Bus Lane").
- Red pavement paint should be considered as a supplemental treatment used to delineate and reinforce the lane for bus use only.

Considerations

- Personnel or video/photo technology should be considered as enforcement tools to ensure the lane is used appropriately by only buses.

References

The City of Los Angeles' Department of Transportation currently has a standard plan (S-487) for Exclusive Bus Lane Markings.
NACTO Urban Street Design Guide

5.9 Median Bus Lane / Busway

A median bus lanes enhances transit service by providing a dedicated right-of-way for buses to run down the center of corridors. A median busway functions similarly to a median bus lane except that it provides a physical separation from vehicle traffic. For both of these facilities, passengers board and alight at station stops that are located on median boarding islands.

Benefits

- Minimizes conflicts with on-street curbside parking and vehicle turning movements
- Improves speed and reliability of transit by eliminating the need for buses to pull into bus stops and merge back into traffic
- Provides a lane for emergency vehicles to use in congested conditions

Applications

- Median bus lanes should be considered on multi-lane arterial corridors where major transit service suffers from poor on-time performance, as a result of peak hour congestion.

Design Guidance

- The minimum width of a median bus lane should be 11'.
- Median bus lanes should be installed with the appropriate pavement markings (See City of Los Angeles' Department of Transportation standard plan S-487 for Exclusive Bus Lane Markings for further detail)
- Contiguous lanes that run in opposite directions should be separated by a solid single or double white stripe(s).
- Median boarding islands should be placed in close proximity to safe, signalized crosswalks.
- A median busway can be separated from other travel lanes using a curb strip or rumble strips.

Image courtesy of NACTO

Transit Enhancements

- Transit signal prioritization should be given to buses operating in these lanes.
- Bus pads should be installed at stops to prevent street warping.
- Red paint should be considered as a supplemental treatment used to delineate and reinforce the lane for bus use only.

Considerations

- Personnel or video/photo technology should be considered as enforcement tools to ensure the lane is used appropriately by only buses.
- Intersections that require left turning provisions for vehicles should be provided with a protected turn signal.
- Compared to peak-hour bus lanes and offset bus lanes, the additional costs of constructing of median boarding islands should be factored in the project feasibility.

References

NACTO Urban Street Design Guide

5.10 Bus Pad

A concrete bus pad is placed at a bus stop to help mitigate the impacts that frequent bus service and heavy vehicles have on the roadway surface.

A concrete bus pad under construction

Where no bus pad exists, the weight of heavy vehicles causes rippling and cracking of the asphalt surface.s

Benefits

- Helps prevent long-term damage (e.g., gaps, cracks, and ripples) to the roadway surface
- Maintains smooth road surface for bicyclists and vehicles

Applications

- Apply concrete bus pads at bus stops where frequent bus service exists with headways of 15 minutes or less.

Design Guidance

- Bus pads should be designed with a minimum width of 12’ per pad and a minimum length of 90’. See City of Los Angeles Bureau of Engineering standard plan S-433 for further detail.
- Bus pads may warrant a longer length to accommodate multiple bus lines and/or articulated buses.

References

- City of Los Angeles Bureau of Engineering standard plan S-433 - Bus Pad.

Transit Enhancements

5.11 Median Bus Boarding Island

A median boarding island provides a boarding platform for passengers waiting for transit vehicles travelling away from the roadway curbline center-running Bus Rapid Transit, and locations with protected bicycle lanes (Cycle Tracks).

Benefits

- Provides space to accommodate bus shelters and other transit-related amenities that would not be possible on constrained sidewalks
- Supports reliable transit operations that run on an exclusive right-of-way
- Provides some landscaping opportunities as long they do not obstruct boarding and alighting portions of the island
- May function as a refuge island for pedestrian crossings

Applications

- Transit boarding islands are applied where transit runs in center lanes.
- They may also be utilized adjacent to protected bicycle lanes (cycle tracks). See Section 5.3 “Protected Bicycle Lane”.

Design Guidance

- Pedestrian crossings from the sidewalk to the median boarding island should be designed and supplemented with the appropriate signage to reduce the risk of collision.

Image Courtesy of Omnitrans

Transit Enhancements

- Transit boarding islands should be at least as long as the distance between the front of the vehicle and its back door, with an additional **5'** clearance at the rear end.
- If applicable, the boarding island should be long enough to accommodate multiple buses with a **5'** buffer space between each pair of stopped buses.
- Transit boarding islands should facilitate accessible boardings by providing a raised platform with a ramp and a minimum **5' wide by 8' long** loading pad.
- Boarding islands should include an enclosure or barrier separating waiting passengers and moving traffic, unless engineering judgment deems them unnecessary because of low volumes of slow-moving traffic.
- Boarding islands should warrant high visibility crossings connecting the platform to the sidewalk, complete with detectable warning plates, ADA ramps, and Braille signage.
- Platform amenities such as seating and fare machines should not obstruct waiting areas or nudge waiting passengers toward the center lane.

A median boarding island ensures access while allowing a protected cycle track to continue along an existing curbline. In this instance, the boarding island is accessed via a curb ramp (somewhat visible in the foreground) that adjoins the crosswalk.

Transit Enhancements

5.12 Lane Reconfiguration / Road Diet

In a "road diet" project, a street's roadway space is reconfigured to prioritize safer vehicle speeds, fewer collisions, and a pedestrian- and bicycle-friendly environment. A typical road diet project involves restriping the roadway to provide a center turn lane and bicycle lanes by reducing a travel lane in each direction.

Benefits

- Encourages safer vehicle travel speeds
- Increases driver awareness of bicyclists and pedestrians
- Reallocates space for bicycle facilities and potential sidewalk widenings
- Provides a center turn lane for emergency vehicles use lane to bypass congested traffic
- Center turn lane eliminates queuing of vehicles that wish to continue through the intersection

A "traditional 4:3" Road Diet

Applications

- Road diet projects are applied to multi-lane streets that exhibit unsafe vehicle speeds and have a documented history of pedestrian and bicycle safety concerns or that are designated as streets with a Class II bicycle facility.
- Prior to implementation, road diet projects should have a traffic analysis conducted to determine their feasibility.
- According to the FHWA, a four-lane roadway with average traffic daily volumes up to 20,000 vehicles represents a good candidates for a potential road diet project.

Design Guidance

- The nature of the road diet depends on a street's existing configuration, traffic operations, user needs, and safety concerns. For instance, a four-lane street (two travel lanes in each direction) could be modified to include one travel lane in each direction, a center turn lane, and bicycle lanes.

References

FHWA "Road Diet" - http://safety.fhwa.dot.gov/provencountermeasures/fhwa_sa_12_013.pdf

Before road diet

After road diet: *Images courtesy of NACTO*

5.13 Lane Narrowing

Roadway space can be optimized by narrowing the width of travel lanes in order to make room for other beneficial roadway features (such as bicycle lanes) and provide traffic calming benefits.

Benefits

- Encourages slower speeds and reduces the risk of collisions
- Provides space for bicycle lanes and/or wider sidewalks

Applications

- Lane narrowing should be considered on roadways with wider lanes (12 feet or wider), excess traffic capacity, and safety/speeding concerns.
- Lane narrowing can be done in conjunction with a road diet project.

Design Guidance

- See LADOT Manual for Policies and Procedures for detailed information about standard lane widths:
  - Travel lane with speeds **less than or equal to 35 mph** should be a minimum of **10'**, with a **9'** wide lane being the absolute minimum width in scenarios where the safety impacts of operational options have been carefully considered.
  - Travel lane with speeds **greater than or equal to 40 mph** should be a minimum of **11'**, with a **10'** wide lane being the absolute minimum width in scenarios where the safety impacts of operational options have been carefully considered.
  - The minimum lane width for a travel lane that is directly **adjacent to a bike lane** (i.e., without a painted buffer) is **11'** (minimum) or **10.5'** (absolute minimum).
  - On streets that are designated for truck or transit traffic , one travel lane of 11' may be used in each direction.

References

LADOT Manual of Policies and Procedures – Section 531, Page 8-9.

NACTO Urban Street Design Guide – Lane Width http://nacto.org/usdg/lane-width/

5.14 Neckdown

A neckdown, also known as a "choker" or "pinchpoint," consists of curb extensions on both sides of a street at the midblock. The narrower roadway helps calm vehicle speeds, while also decreasing the distance of pedestrian crossings.

Benefits

- When paired with a midblock crosswalk, a neckdown reduces the crossing distance for pedestrians and makes pedestrians more visible for motorists
- Encourages drivers to slow down by providing a physical and visual constraint
- Provides additional sidewalk space for street furniture and green landscaping features
- Delineates direct crosswalk paths and allows more space for smoother grade transitions on the curb ramp
- Produces opportunities for landscaping and stormwater management features

Applications

- A neckdown with or without an associated pedestrian crossing can be applied on any local or non-arterial street that exhibits vehicles traveling at unsafe speeds, especially where pedestrians are present.
- They should be considered around high activity areas, such as schools, commercial destinations, key transit stops, and dense office environments.

Considerations

- Operations for larger vehicles such as buses, delivery/garbage/construction trucks, street sweepers, and emergency vehicles should be addressed before implementation.
- They may require the relocation of existing storm drainage inlets and above ground utilities (e.g., fire hydrants).

Design Guidance

- A neckdown should be narrow enough to discourage drivers from traveling at unsafe speeds.
- At crossings where pedestrian volumes are high, crosswalk markings should be wider than the typical width of 10'.

Interim Design Strategies

- Neckdowns, like other curb extensions, can be installed using low-cost, interim materials such as plastic bollards, planters, or striping. These temporary treatments provide safety benefits until funding becomes available to construct an actual concrete neckdown.

5.15 Chicane

Chicanes are alternating curb extensions on the roadway that encourage motorists to drive at slower, safer speeds. Chicanes form an S-shaped curve, forcing cars to slow down.

Benefits

- Discourages speeding on local streets, reducing the risk of collisions caused by motorists
- Fosters a friendlier bicycling and pedestrian environment
- Provides opportunities for landscaping and stormwater management features

Applications

- Chicanes are typically applied on streets in residential contexts where unsafe vehicle speeds pose a threat to pedestrians and bicyclists.
- They are applied at the midblock on narrower streets where there is a travel lane in each direction, or on one-way roads.

Design Guidance

- Chicanes typically consist of a set of **2 or 3** curb extensions set in an alternating pattern.
- The desired design speed of the street should help inform the degree of horizontal deflection (i.e., the lateral movement of vehicles around the chicane). Some European manuals recommend that chicanes should have a displacement of at least **one lane** and the angle of deflection should be at least **45 degrees**.
- Curb extensions may be designed as edge islands with a **1' to 2'** gap from the curb, as a way to address drainage concerns.
- The installation of a center island can help prevent cars from speeding straight through chicanes.
- Signage and striping should be used to help alert and guide motorists along the curves on the roadway.
- Landscaping and vegetated planted in chicanes should be low growing to maintain clear sight distances.

Interim Design Strategies

- Achieving the traffic calming benefits of chicanes can be achieved by using striping and plastic bollards to demarcate the areas where the curb extensions would be.
- Configuring on-street parking to create a chicane effect another inexpensive design solution.

References

NACTO Urban Street Design Guide

Institute of Transportation Engineers – Traffic Calming Measures: Chicane http://www.ite.org/traffic/chicane.asp

5.16 Landscaped Median

A landscaped median can range from being a tree-lined promenade to an intensively landscaped boulevard median.

Benefits

- Supports trees and other plants where conditions are relatively conducive to their growth and allows for installation of drought-tolerant and native plants
- Contributes to community identity with unique landscaping and other elements
- Channelizes vehicular traffic and limits midblock left-turns where appropriate
- Provides, at times, a pedestrian refuge on a wide street at pedestrian crossings
- Provides an opportunity to provide traffic calming
- Collects and treats or infiltrates stormwater
- Provides a visual separation that makes the roadway appear narrower and thus reduces speeds

Applications

- Apply on two-way streets that have more than two travel lanes in each direction.
- Apply on streets being considered to be pedestrian-friendly areas.
- Apply contextually on streets that are being considered for lane narrowing and/or lane reduction.

Considerations

- Continuous medians may not be the most appropriate treatment in every situation. In some cases, they can increase traffic speeds by decreasing the perceived friction through separating traffic flow directions. They may also take up space that can be better used for wider sidewalks, bicycle lanes, landscaping buffer strips, or on-street parking.

- Design must account for impact of raised median on emergency vehicle movement and access. Landscaping or stormwater source controls require a partner for ongoing maintenance.
- Continuous raised median may prevent left turns into driveways on opposite side of street. On streets that have a limited right of way, other treatments should be considered first before application of this treatment.

Design Guidance

- Minimum width: At least 7 feet wide, including curbs, except the median strip adjacent to left-turn lane may be a minimum of 3 feet wide
- Minimum width to include trees: In order to accommodate trees, both in terms of soil volume and separating from travel lanes, medians should be at least 7 feet wide, including curbs.
- Tree spacing from intersection: In order to provide visibility, trees should be 50 feet from a crosswalk or from the limit line at an intersection where there is no crosswalk.
- Where possible, vegetated gutters and bioswales should be included in the median to expand stormwater drainage efforts along the roadway.
- Stormwater treatment: Minimize runoff from stormwater onto the roadway and, where feasible, infiltrate runoff.
- Planting: Appropriate plant materials will vary depending on local conditions and maintenance. Typically, low growing, low maintenance, low water use plants are appropriate. Refer to BSS for specific requirements.
- Irrigation: Overspray and runoff onto the roadway pavement from irrigation is prohibited. Refer to BSS for specific requirements.
- Other elements: Gateway signs or elements, art, pathways on wide medians, and other elements can also be provided on medians. If a median is particularly wide, seating and recreational elements may be provided.

5.17 Speed Feedback Sign

A speed feedback sign displays an approaching vehicle's speed and prompts drivers to slow down when traveling at unsafe speeds.

Benefits

- Encourages safer vehicle speeds
- Improves safety and reduces the risk of collisions with pedestrians and bicyclists
- Alerts drivers they are traveling on a street where vulnerable users may be present (e.g., school children, senior residents)

Applications

- Speed feedback signs are applied near schools, campuses, local neighborhood streets, and construction sites.
- They can also be applied where high vehicle speeds continually exceed the stated speed limit, or where a history of collisions on a street has been caused by unsafe vehicle speeds.

Considerations

- Speed feedback signs should be considered if more inexpensive options, such as traditional signage, are not as effective.
- Alternatively, physical treatments such as chicanes, neckdowns, or speed tables can be considered instead of speed feedback signs.

Design Guidance

- See MUTCD Chapter 2L Changeable Message Signs for comprehensive design guidance
- Speed feedback signs shall not include advertising, animation, rapid flashing, dissolving, exploding, scrolling, or other dynamic elements.
- They shall automatically adjust their brightness under varying light conditions to maintain legibility.
- They should be located sufficiently upstream of high collision locations to enable road users to slow down.

References

MUTCD Chapter 2L. Changeable Message Signs

5.18 On-Street Carshare Parking

Carsharing is designed to give individuals short-term access to cars when they need it. Typically, a user checks out a vehicle from a designated off-street lot or garage. Access to shared vehicles can be easy or inconvenient depending on where one lives. By assigning a select number of on-street parking spaces for carshare use, shared vehicles will be available in more locations to serve more users.

Benefits

- Provides carshare users with greater access to shared vehicles, especially in residential areas where off-street carshare locations are not close by
- Increases visibility of car sharing as a viable transportation option
- Promotes more walking and bicycling amongst carshare users when they are not driving
- Carsharing in general helps alleviates the financial burden of having to own a personal vehicle because users are only charged for the times they choose to drive
- Carsharing also reduces parking demand, vehicle miles traveled, and auto emissions

Applications

- On-street parking for car share usage should be applied in select locations where the demand for carshare access is high and where off-street carshare parking is not available, such as in residential neighborhoods with low vehicle ownership rates; or in commercial districts that attract high volumes of patrons.

Design Guidance

- Designate no more than two on-street spaces per block for the exclusive use of carshare.
- On-street parking spaces for carshare should not be designated in peak period tow-away zones or on spaces reserved for disabled persons, loading purposes (yellow-painted curb), or short-term parking (green curb).

Other Discussion

- The San Francisco Municipal Transportation Agency (SFMTA) is currently in the middle of their On-Street Car Share Pilot Project where they have converted 150 on-street spaces for carsharing use for a two-year period from 2013 to 2015. The pilot program will help inform where the demand for carshare services is highest and help further establish definitive locations where carshare will continue to thrive and serve communities in the future.
- CA Vehicle Code Section 22507.1. outlines local regulations for parking privileges for car share or ridesharing programs. It states in part 'a' that "A local authority may, by ordinance or resolution, designate certain streets or portions of streets for the exclusive parking privilege of motor vehicles participating in a car share vehicle program or ridesharing program. The ordinance or resolution shall establish the criteria for a public or private company or organization to participate in the program, and may limit the types of motor vehicles that may be included in the program. Under the car share vehicle program a car share vehicle or ridesharing vehicle shall be assigned a permit by the local authority that allows that vehicle to park in the exclusive designated parking areas."

5.19 Back-In Angle Parking

Back-in angle parking requires cars to back into on-street parking spaces, oriented diagonally. When exiting, motorists can more safely maneuver back into the travel lane because they will have a clearer view of oncoming vehicles, bicyclists, and pedestrians.

Benefits

- Expands and increases motorists' field of vision when exiting, reducing the risk of colliding with pedestrians and bicyclists
- May prove easier for some motorists to back-in at an angle as opposed to backing in and parking parallel.
- Makes loading and unloading activities more convenient by orienting the vehicle's trunk toward the sidewalk
- Eliminates the risk of motorists "dooring" bicyclists traveling in the bicycle lane, as evidenced on streets with a parallel parking configuration
- Increases the overall supply of on-street parking spaces when compared to parallel parking
- Encourages safer vehicles speeds when back-in angled parking is part of a road diet project

Applications

- Back-in angle parking should first be considered on non-arterial roadways that can adequately accommodate the necessary design width, especially in areas where parking is scarce, vehicle speeds are unsafe, and bicycle traffic is frequent.
- The back-in configuration should also be considered near schools, in commercial districts, and in conjunction with proposed road diets projects

Considerations

- Motorists must be aware of cyclists as they attempt to back into an angled space.
- Exhaust pipe emissions from parked cars are directed toward pedestrians on the sidewalk.

Design Guidance

- Although not drawn to specifically reflect the design for back-in angled parking, the City of Los Angeles Department of Transportation does currently have a Standard Plan (S-440) for On-Street Angle Parking Stalls.
- Angle parking requires that the curbside parking lane be wider than what is needed to accommodate parallel parking, typically at least 16.9' depending on the angle of the parking stall (refer to Standard Plan S-440 On-Street Angle Parking Stalls).
- Parking stall width should be 8' wide and 16' feet long. A maximum 2' overhang space over the space is provided for longer vehicles that exceed the 16' length.
- On parking spaces angled 45 degrees or more, a 4' minimum buffer space should be provided between moving traffic and the outer edge of the stall marking.
- Bike lanes next to back-in angled stalls should ideally by 6' wide. Striping should delineate the travel lane from the bicycle lane, but a second stripe is not necessary delineating the bike lane and the parking stall.

References

- Pedestrian and Bicycle Information Center – Back-in Angle Parking http://www.pedbikeinfo.org/data/faq_details.cfm?id=3974
- Charlotte Bicycle Master Plan http://charmeck.org/city/charlotte/Transportation/PedBike/Documents/ChapterSeven070708.pdf

5.20 Commercial Loading

Roadway space that is specifically designated for commercial loading activities allows deliveries and goods movement operations to function smoothly and efficiently.

Benefits

- Provides convenient access to storefronts for loading and unloading purposes
- Reduces the likelihood of double parking by delivery vehicles, causing an obstruction for other roadway users

Applications

- Commercial loading zones should be applied in select locations along commercial corridors where an on-street parking is scarce or where high volumes of deliveries currently occur.
- Where feasible, loading zones should be consolidated at midblock locations to minimize conflicts with bicyclists and motorists near intersections. In addition, the location of loading zones at the midblock (rather than near intersections) helps to ensure that large vehicles do not obstruct corner visibility.

Design Guidance

- Designated loading and unloading zones should be delineated by the use of yellow-colored curbs, roadway striping and signage.

Additional Discussion

- LADOT has existing regulations for the placement of commercial loading zones, described as 'yellow curb zones'. The regulations are listed below:
  - Vehicles with a commercial license plate are allowed to park in yellow zones, only if they are actively loading or unloading freight, for a maximum of 30 minutes.
  - Yellow curb zone restrictions are in effect Monday through Saturday from 7:00am to 6:00pm unless otherwise posted on signs; all other parking regulations are in effect outside hours noted.
  - Vehicles without a commercial license plate may load and unload passengers or baggage in these zones, but only for a maximum of 5 minutes.

References

LADOT - Colored Curb Zones http://www.ladot.lacity.org/WhatWeDo/Parking/CanIParkThere/ColoredCurbZones/index.htm

Loading and unloading zones should be designated by both signs and yellow-colored curbs..

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COMPLETE STREETS DESIGN GUIDE

INTERSECTIONS AND CROSSINGS

6

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6. INTERSECTIONS AND CROSSINGS

Introduction

Intersections and crossings are where all travel modes converge and intermix, so their design is especially important to the creation of Complete Streets. Pedestrians and bicyclists are most at risk for injury in the event of a crash with a motor vehicle, so the design of intersections and crossings should prioritize their needs. This chapter presents design components that improve safety and efficiency using a variety of methods, including structural enhancements, surface treatments, signal timing, and signal prioritization.

Physical Enhancements - Pedestrian

6.1 Crosswalk Markings

Crosswalk markings delineate a safe path for pedestrians to crossing while also signaling to motorists to prepare to yield or stop.

Benefits

- Provides a direct, visible, and accessible path for pedestrians to cross the street
- Improves and reinforces the pedestrian environment
- Provides safe access to destinations
- Alerts motorists to stop or yield for pedestrian crossings

An advanced stop line is always paired with the installation of a continental crosswalk. This line keeps waiting vehicles away from the actual crosswalk area.

Applications

- Marked crosswalks should be provided on all intersection legs controlled by traffic signals, unless a pedestrian crossing is specifically prohibited because of an intersection's unique geometry.
- At controlled intersections. Midblock crossings or uncontrolled crossings (crossings where motorists do not have signals or stop signs) areas with high pedestrian traffic volumes, including schools, campuses, commercial districts, parks, public spaces, transit stations, bus stops, hospitals, large offices
- At sites that complement surrounding land uses and/or address a history of collisions
- The following factors should be considered in determining whether a marked crosswalk should be used: vehicular approach speeds from both directions, vehicular volume and density, vehicular turning movements, pedestrian volumes, roadway width, day and night visibility by both pedestrians and motorists, desirable clarity of pedestrian routes for sighted or sight-impaired pedestrians, discouragement of undesirable pedestrian routes, consistency with marking at adjacent intersections or within the same intersection.
- Intersections without traffic signals or STOP signs are considered uncontrolled intersections. The decision to mark a crosswalk at an uncontrolled location should be guided by an engineering study. Factors considered in the study include vehicular volumes and speeds, roadway width and configuration, stopping sight distance, distance to the next controlled crossing, night time visibility, grade, and pedestrian volumes.

Considerations

- Crossings should be provided on all legs of the intersection unless an intersection's unique geometry (with LADOT's engineering judgment) warrants restricting access for safety and visibility reasons.

Physical Enhancements - Pedestrian

Continental crosswalks can be an important component of safe mid-block crossings.

Design Guidance

- Continental striping is now a common crosswalk treatment in Los Angeles (see LADOT standard plan 481.1). Continental striping provides high visibility for both motorists and pedestrians. They consist of **24"** wide bars (placed perpendicular to the path of travel), with bars generally painted in line with lane and centerline striping; in this arrangement vehicle tire paths go between the bars to reduce wear, reducing the frequency of repainting.

- The engineering study should consider the number of lanes, the presence of a median, the distance from adjacent signalized intersections, the pedestrian volumes and delays, the average daily traffic (ADT), the posted or statutory speed limit or 85th-percentile speed, the geometry of the location, the possible consolidation of multiple crossing points, the availability of street lighting, and other appropriate factors.

- Crosswalk markings should be considered in conjunction with other measures (e.g., curb extensions, crossing refuge island, and unidirectional curb ramps) to make crossings safer and more comfortable for pedestrians while increasing motorists' awareness of pedestrians.

- For candidate crosswalk locations on either a multi-lane street (three or more lanes), or on two-lane streets with daily traffic volumes (ADT) greater than 12,000 or with posted speed limit exceeding 30 mph, enhanced treatments beyond striping and signing may be needed. Enhanced treatments may include–but are not limited to–intersection signalization, Overhead Flashing Beacons, Rectangular Rapid Flash Beacon (RRFB) or High-Intensity Activated Crosswalk (HAWK) signals.

- Crosswalks should be at least as wide as the sidewalk, but may be wider in locations with high pedestrian demand or narrow sidewalks. Crosswalks should be no less than **15'** in width but may vary according to site conditions.

- Crosswalks must be outfitted with curb ramps and tactile warning strips per federal accessibility guidelines.

- Crosswalk markings near schools shall be yellow per CVC 21368.

Physical Enhancements - Pedestrian

Other Discussion

- The City of Los Angeles' Department of Transportation currently has standard plans for crosswalks (S-481.0 "Traffic Controls for Marked Crosswalks on Uncontrolled Approaches" and S-481.1 "Continental Crosswalks on Controlled Approaches").
- The City of Los Angeles' Department of Transportation also has an applicable standard plan (S-490.0 – "Crosswalk Alignment") which specifies where crosswalks align with curb ramps.
- Long blocks, high vehicle speeds/volumes, and long signal cycles make the pedestrian experience more arduous. Proper crosswalk spacing optimizes pedestrians' desired walking routes and helps build a pedestrian network that provides more direct access to destinations, minimizes travel times, and encourages safe crossing behavior.
- The Federal Highway Administration (FHWA) concluded that high visibility pedestrian crosswalks increase driver yielding compliance, better delineate pedestrian space, and increase driver awareness of pedestrians.

References

CA MUTCD (3B.18)*

NACTO Urban Street Design Guide**

CA Vehicle Code (21368)***

6.2 Decorative Pavement Materials

Decorative pavement materials can utilize different colors, textures, and patterns to distinguish crosswalk markings and/or intersections in certain environments. However, use is discouraged with priority given to LADOT's standard plans for high-visibility continental crosswalks.

Benefits

- Adds a supplemental placemaking component to neighborhoods and destinations
- Signifies to the pedestrian that they are in a specific neighborhood or district

Applications

- Decorative pavement materials can be applied on crosswalks and intersections in distinct locations such as cultural and civic destinations. They can enhance district identity or physically/visually connect public spaces.

Considerations

- Decorative colors, patterns, and textures should not be seen as a safety measure and should therefore be considered secondarily to high-visibility continental crosswalks (LADOT Standard Plans S-481.0 and S-481.1).
- They must be maintained periodically to prevent colored visibility from deteriorating or uneven textured pavement from forming.

Design Guidance

- Decorative crosswalks should use stable, durable, and slip-resistant materials that create a smooth surface and provide a high color contrast with the surrounding asphalt.
- Pavement materials should not pose tripping hazards or cause excessive vibration for wheelchair users

Other Discussion

- The City of Los Angeles' Bureau of Engineering currently has a standard plan (S-601-3) for Brick, Concrete, or Other Decorative Pavers

References

ADA and Title 24 standards for more information.

Decorative crosswalks can be a placemaking tool, but they should generally be limited to smaller crossings. Continental crosswalks are the preferred treatment for most pedestrian crossings.

Physical Enhancements - Pedestrian

6.3 Advance Yield Markings

Advance yield markings consist of a row of white triangles placed across each approach to alert motorists to yield for pedestrians at unsignalized or uncontrolled crosswalks.

Benefits

- Notifies motorists that pedestrians may be crossing and indicates where drivers should stop as a pedestrian crosses
- Discourages motor vehicles from speeding through unsignalized or uncontrolled crosswalks
- Helps prevent multiple threat collisions (i.e., when a yielding vehicle in one lane obscures the vision of motorist in an adjacent lane, resulting in the latter continuing through an unsignalized or uncontrolled crosswalk and potentially colliding with crossing pedestrians).

Applications

- Advance yield markings are applied in conjunction with unsignalized or uncontrolled crosswalks, which are typically located at midblock locations.
- They should not be used at locations where drivers are required to stop in compliance with a STOP sign or a signal on multi-lane roadways.

Design Guidance

- Advance yield markings should be placed **20'** to **50'** in advance of crosswalks
- Typically, the preferred setback for effectiveness in advance of crosswalks is **30'**. This setback provides a driver sufficient sight lines to see a crossing pedestrian when vehicles are present or stopped in adjacent lanes.
- Engineering judgment should determine the exact placement of advance yield markings by considering context-specific variables such as vehicle speeds, traffic controls, roadway width, on-street parking, nearby land uses with vulnerable populations, the demand for vehicle-queuing space, and the potential for visual confusion.

References

Section 3B.16 of the MUTCD

LA County Model Design Manual for Living Streets

FHWA PedSafe -- http://www.pedbikesafe.org/PEDSAFE/countermeasures_detail.cfm?CM_NUM=13

6.4 Raised Crosswalk

A raised crosswalk is a pedestrian walkway that is at the same level of the sidewalk. In addition, a raised crosswalk also serves as a speed table that slows approaching traffic.

Benefits

- Provides accessible and convenient crossings for pedestrians, especially those with mobile and visual impairments, because they do not require vertically transitioning up and down a curb ramp.
- Improves motorists' visibility of pedestrians, especially at midblock crosswalks
- Discourages motorists from speeding through crossings and intersections and signals the presence of pedestrians
- Eliminates water ponding and debris collection at the base of typical curb ramps

Applications

- Raised crosswalks can be applied on local or narrower collector streets at midblock locations.
- They are useful in situations where unsafe vehicle speeds pose a threat to pedestrians, particularly around schools, parks, retail districts, and other pedestrian-heavy destinations.
- They should also be considered at crossings where there are issues of poor pedestrian visibility and motorist yielding, or where there is a pattern of collisions indicating points of conflicts between pedestrians and motorists.

Image courtesy of NACTO

Physical Enhancements - Pedestrian

Considerations

- Raised crosswalks should be avoided on wide multi-lane arterial roadways and on streets with steep grade changes and sharp curves.
- The impact of raised crosswalks on the operational needs of transit buses and emergency vehicles should be considered.
- The impact to drainage patterns should be examined to ensure that raised crossings properly accommodate the flow of water.

Design Guidance

- Raised crosswalks (or speed tables) should be **15'** to **20'** wide, paved with smooth materials, and be flush with the sidewalk in height.
- They should be wide enough (**10'** minimum) that both the front and rear wheels of a passenger vehicle can sit atop the speed table at the same time when traveling over it.
- In order to maximize their benefits, raised crosswalks can be implemented in conjunction with curb extensions (on streets with curbside parking) in order to decrease crossing distances and make pedestrians more visible to motorists.
- Detectable warning strips should be installed at both ends of the crosswalk for pedestrians with visual impairments.
- The ramp slopes should be designed to help achieve target operating speeds for the given street.
- Aesthetic enhancements, such as decorative colors and/or textured materials, can be applied. Textured or special pavements can also be placed on the beveled slopes of the raised crosswalk so that they will be made visible to approaching motorists.

References

ITE/FHWA document Traffic Calming: State of the Practice

Image courtesy of NACTO

6.5 Corner Bulbout

A corner bulbout is a curb extension at intersection corners, making vehicular turning movements safer and pedestrian crossings shorter.

Image courtesy of Cityworks Design

Image courtesy of Cityworks Design

Benefits

- Reduces the distance pedestrians have to cross and increases their queuing space
- Encourages drivers to slow down when turning at intersections (because of tighter curb radii)
- Provides additional sidewalk space for street furniture, landscaping, or stormwater management features
- Allows pedestrians and motorists to see each other more clearly
- Delineates direct crosswalk paths and allows more space for smoother grade transitions on the curb ramp

Applications

- Bulbouts can be applied at corners where on-street parking exists, but not where a curbside peak period travel lane exists.
- They should be applied where high volumes of pedestrians are present, especially around schools, parks, senior housing, and retail destinations.
- Bulbouts should be considered on streets at locations where collisions occur between turning vehicles and pedestrian crossings.

Considerations

- Bulbouts should be sufficiently wide enough to maximize their benefit given their costs.
- They may have an impact on the turning movements of larger vehicles such as buses, delivery/garbage/construction trucks, street sweepers, and emergency vehicles.
- They may require the relocation of existing storm drainage inlets and above ground utilities (e.g., fire hydrants, light poles, signal poles, etc).

Physical Enhancements - Pedestrian

Design Guidance

- Bulbouts should usually extend the full width of a parking lane, typically **8'** from the curb. If a bike lane is present, however, the bulbout should be designed to accommodate drainage flows without affecting bicycle travel.
- When bulbouts conflict with the turning movements of trucks and transit vehicles, the width and/or length should be reduced rather than eliminating the bulbout.
- Street furniture, landscaping elements, and other sidewalk amenities located on curb bulbouts must not impede pedestrian flows, emergency access, or affect the sightlines of roadway users.
- Stormwater drainage should be accommodated to prevent ponding at the base of curb ramps, which may include designing catch basins or utilizing trench drains to channel water.

Other Discussion

A curb bulbout is one of many types of curb extensions. In addition, this guide discusses other types of curb extensions such as chokers (or pinchpoints), neckdowns, chicanes, and bus bulbs.

Interim Design Strategies

Curb bulbouts at intersections can be installed using low-cost, interim materials such as delineators, planters, surface treatments or striping. Temporary bulbout treatments provide safety benefits until funding becomes available to construct a more permanent bulbout.

References

AASHTO Guide for the Planning, Design and Operation of Pedestrian Facilities

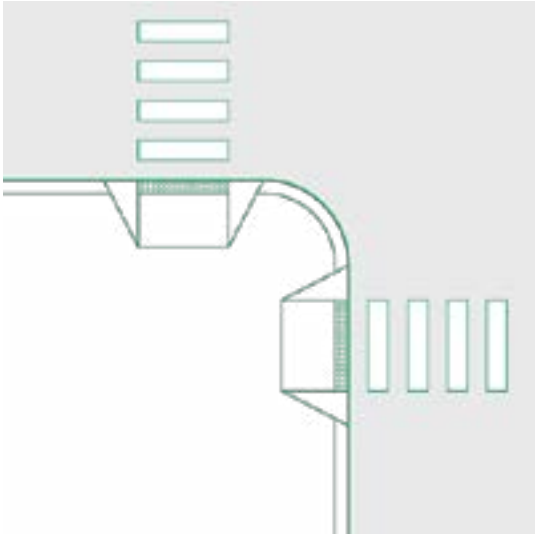
6.6 Curb Radius

The curb radius determines the shape of the curb at street corners. A corner curb with a large radius has a broad arc, while a curb with a smaller radius has a sharper curve. Smaller radii generally encourage slower, safer vehicular turning movements. The curb radius is a primary factor in determining the *effective* turning radius, which is the actual radius available for a vehicle to make a turn at an intersection.

Benefits

A smaller curb radius:

- Reduces the risk of pedestrian-vehicle collisions by encouraging slower turning movements
- Shortens the crossing distance for pedestrians
- Increases pedestrian visibility, especially when corner bulbouts are installed



A smaller curb radius also makes it possible for unidirectional curb ramps to lead directly to crosswalks.

Applications

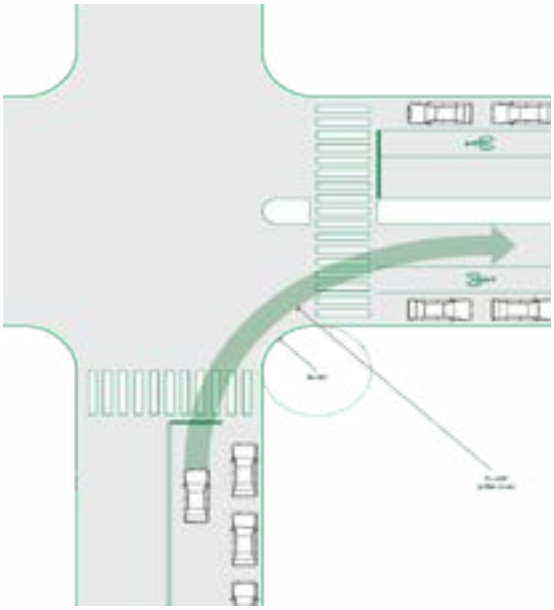
A smaller curb radius can be considered on any street. Smaller curb radii are especially beneficial in areas with high pedestrian volumes such as commercial districts, school zones, and intersections with high pedestrian-vehicle collision rates.

Considerations

Large vehicles (e.g., buses, delivery/garbage/construction trucks, street sweepers, and emergency vehicles) typically make wider turns and may have trouble negotiating a corner with a smaller curb radius.

At corners with smaller curb radii, drivers that underestimate their turning speed may inadvertently mount the curb, endangering pedestrians waiting on the sidewalk.

In addition to corner curb radius, the *effective turning* radius is influenced by other factors including the presence of on-street parking and bike lanes, as well as the width of travel lanes. Typically, these two factors create larger effective turning radii and, therefore, allow for faster turning movements.



The effective turning radius is a property of both the actual curb radius and the placement of turning lanes.

Physical Enhancements - Pedestrian

Design Guidance

- Curb radii should be minimized as much as possible. A larger curb radius may be necessary for some roadways with high truck volumes (such as truck routes).

- A curb designed with a smaller curb radius should incorporate unidirectional curb ramps, where applicable: unidirectional ramps direct pedestrians – especially the visually impaired – in line with the crosswalk. Unidirectional curb ramps have a distinct advantage over bidirectional curb ramps; in the latter, pedestrians waiting at the base of the corner ramp may be vulnerable to injury by motorists that inadvertently mount the curb. (For further discussion, see Section 6.7 “Curb Ramp”.)

- A corner bulbout is a valuable design tool to decrease the curb radius (and effective turning radius). It also can shorten pedestrian crossing distances. (Also see section 6.5 “Corner Bulbout”.)

- Several types of vehicular uses should be considered when determining smaller curb radii that enhance pedestrian safety while also accommodating larger vehicles. These include:

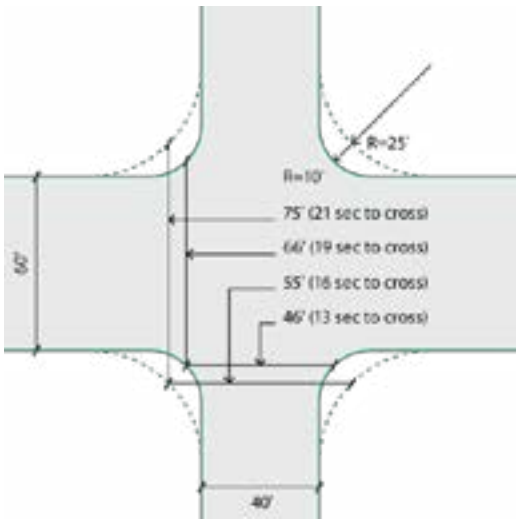
    - Emergency vehicles: Emergency vehicles are generally able to use the full right-of-way (including opposing travel lanes) when motorists pull over to the curbside. However, the ability to swing widely into opposing lanes may be hindered by queued traffic unable to pull over to the curbside. In some locations, this can be mitigated by setting back the limit line of the opposing interior lane.

    - Commercial and package delivery trucks: These include trucks with up to a 40-foot (WB-40) wheelbase.

    - Trailer trucks: Freight Routes should be designed for trailer trucks with a wheelbase of 50 feet or greater.

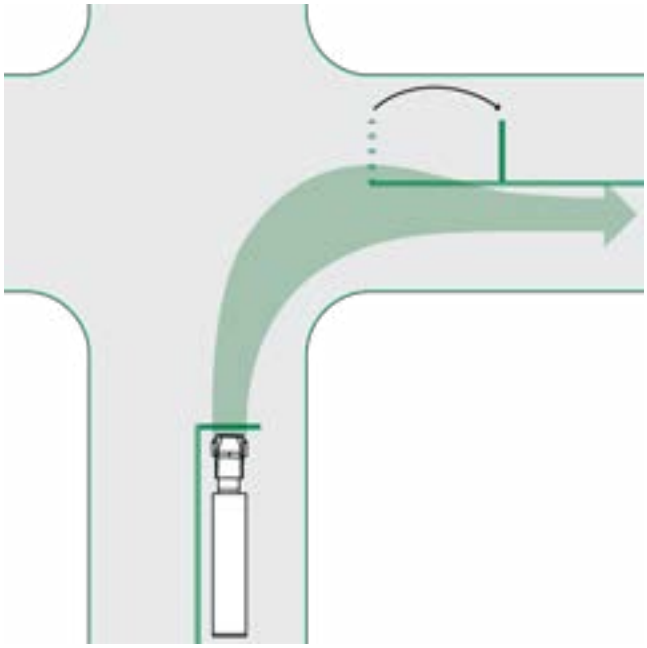
    - Maintenance vehicles: Ideally, trash sweepers should be able to negotiate a turn while being able to sweep around the curb. However, at locations where a small radius may make this unfeasible, other methods for street cleaning at the intersection could be utilized; for example, sidewalk sweeper machines used by some business improvement districts are able to maneuver tight corners.

    - Transit buses: At intersections along transit routes, curb and/or effective radii should be designed for a bus with a wheelbase of 40 feet (BU-40) or greater.



Examples of different curb radii

Physical Enhancements - Pedestrian



Turning movements for long vehicles can be accomodated by setting the stop line further back from the intersection

General guidelines for curb radii:

- 15' for new construction
- 15' for intersections without corner bulbouts or curbside parking
- 20' for intersections without corner bulbouts or curbside parking, when the roadway which the truck is turning into is less than 28 feet wide
- 20' for intersections with bulbouts
- 25' on arterial streets with high volumes of turning buses and/or trucks
- 20'-25' on streets designated as part of the Transit Enhanced or Vehicle Enhanced Networks
- 40' on narrow streets in industrial areas with high truck volumes

Interim Design Strategies

Interim treatments such as striping, alternative pavement surfaces, and/or plastic delineators can be used to demarcate a smaller curb radius and/or a temporary corner bulbout.

Physical Enhancements - Pedestrian

6.7 Curb Ramp

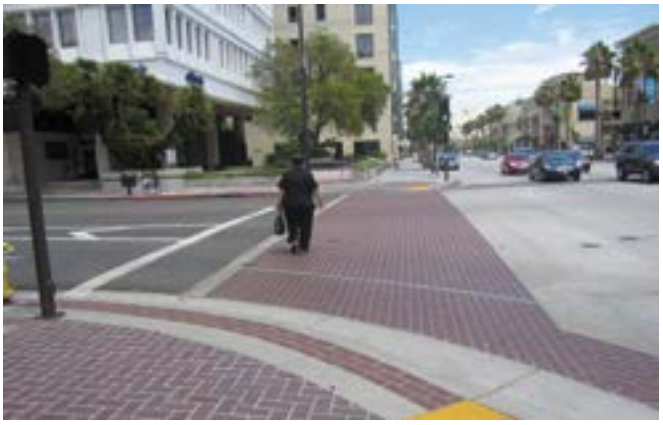
A curb ramp facilitates access between the sidewalk and the roadway for pedestrians. Unidirectional ramps are two curb ramps placed at a corner, while a bidirectional ramp places a single ramp diagonally at the corner of an intersection.

Benefits

- Provides access across intersections at midblock locations for all individuals.
- Provides a smooth slope for pedestrians pushing bicycles, strollers, and other wheeled devices
- Detectable warning surfaces placed at the base of the curb ramp make crosswalk destinations visible while also providing a tactile vibration for sight-impaired pedestrians.

Applications

- Curb ramps must be installed at all intersections and midblock crossings.
- Unidirectional ramp installation (two ramps per corner) should be prioritized at intersections around schools, senior housing communities, major transit hubs, and other pedestrian-heavy destinations.
- Curb ramp design should analyze sidewalk widths, crossing distances, curb height, street slope, proximity to traffic, drainage concerns; distance to signal poles, street lights, trees or other obstructions.



A bidirectional curb ramp (in yellow at the base of the image) orients users to the center of the intersection, requiring users to re-orient themselves toward the actual desired direction of travel.

Considerations

- A single, bidirectional ramp (one ramp diagonally placed at the corner) forces users to undertake a longer, more circuitous path of travel to the other side of the crossing. Bidirectional ramps orient users to the center of the intersection where they risk greater exposure to turning vehicles.
- Feasibility and cost considerations may favor not installing unidirectional ramps because of existing utilities and physical site-specific conditions.
- The accumulation of water or debris at the base of curb ramps should be avoided.

Physical Enhancements - Pedestrian

A unidirectional ramp leads directly to the crosswalk in the desired direction of travel.

Design Guidance

- A level landing pad, no greater than 2% slope in any direction and a minimum of 4' wide perpendicular to the curb, must be provided on the sidewalk.
- Curb ramps should be accompanied by detectable warning strips that meet ADA standards.
- Unidirectional ramps can be installed in conjunction with a corner bulbout at intersections.
- Utility poles or other street furniture should not obstruct the path of pedestrians on the curb ramp. Existing street amenities should be relocated when feasible.
- Reducing the curb radius makes ramp placement easier to design.
- Curb ramps must comply with the Americans with Disabilities Act (ADA) and any other current local, state, and federal regulations.

Other Discussion

- The City of Los Angeles' Bureau of Engineering currently has a standard plan (S-442-3) for Curb Ramps and (S-601-3; Sheet 35) for Detectable Warning Surface.

References

- ADA Best Practices Tool Kit for State and Local Governments: Chapter 6 - Curb Ramps and Pedestrian Crossings Under Title II of the ADA.

Physical Enhancements - Pedestrian

6.8 Crossing Refuge Island

A crossing refuge island provides a waiting area on the street median to help pedestrians complete long crossings.

Benefits

- Allows pedestrians to cross wide streets in two stages, which benefits slower-walking pedestrians, seniors, children, or those with disabilities.
- Allows pedestrians to focus on oncoming traffic in one direction at a time when crossing.
- Allows pedestrians to find gaps in traffic in order to cross at unsignalized crossings.
- Slows vehicle speeds when drivers are conscious of pedestrians waiting on the refuge island.
- Reduces risk of left turn collisions (at intersections) and vehicle head-on collisions (at the midblock).
- Provides landscaping opportunities on the median next to the refuge island.

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Applications

- A crossing refuge island can be applied at signalized or unsignalized crossings at the intersection or at the midblock.
- They can be installed at the midblock when blocks are longer and vehicle speeds are high.
- They can be applied on wider multi-lane roadways (at least four total lanes) at the midblock or intersection, when crossing distances cannot be conveniently traversed with one stage.
- They should be located in places where pedestrians commonly cross, such as schools, large offices, retail destinations, senior housing, transit stations, and major midblock bus stops.

Considerations

- Pedestrian safety islands may be enhanced using plantings or street trees. Plantings may require additional maintenance responsibilities and need to be maintained to ensure visibility.
- May impact underground utilities.
- Design must account for impact of raised median on emergency vehicle movement and access.

Design Guidance

- In addition, a neckdown should be added in conjunction with median refuge islands, where feasible, to provide more space on the sidewalk at the crossing.
- Crossing islands perform best with both tall trees and low ground cover. This greatly increases their visibility, reduces surprise, and lowers the need for a plethora of signs. When curves or hill crests complicate crossing locations, median islands are often extended over a crest or around a curve to where motorists have a clear (six second or longer) sight line of the downstream change in condition.
- Crossing refuge islands should be considered where crossing distances are greater than **50'**.
- They should have proper lighting, signage, reflectors, and drainage accommodations.
- On narrower medians, the refuge island should be as wide as the crosswalk (at least **6'** wide but preferably **8'-10'**) and be level with the roadway.
- On wider medians, the refuge island should be raised to provide more visibility for waiting pedestrians. Raised refuge islands should include curb ramp access, detectable warning strips on the curb ramps, and at least a **5'** wide level waiting area.
- At intersection crossings, median "noses" should be provided perpendicular to the crosswalk, at the tip of the median, pointed toward the intersection.
- Drainage concerns should be addressed in the design of crossing refuge islands.
- At midblock locations, crossing refuge islands can incorporate a slanted design that orients pedestrians to look for oncoming traffic before they continue on to the second stage of the crossing.

Crossing Refuge Islands should be marked by signs.

6.9 Driveways

While driveways provide vehicular access to off-street destinations, they also pose a potential conflict for pedestrians and bicyclists when drivers cross the sidewalk or enter the roadway. Too many driveways can disrupt pedestrian flows and degrade the pedestrian environment.

Benefits

- Fewer driveways reduce the risk of collision between vehicles and other modes
- Fewer driveways result in additional space for street furniture and landscaping opportunities.
- Ideal driveway design (that incorporates signage, mirrors, and surface treatments) encourages vehicles to yield to pedestrians on the sidewalk, while also helping pedestrians anticipate cars that are exiting and entering.

Applications

- In urban settings, driveway installation should be selective and minimal, so as to limit potential conflicts with heavy pedestrian and bicycle movements.

Considerations

- On-street parking can make it difficult for drivers to see bicyclists when they are exiting a driveway.

Design Guidance

- Where a driveway crosses the sidewalk, it should maintain a level walkway. Driveway aprons that encroach onto the pedestrian zone can render a sidewalk impassable to users of wheelchairs, walkers, and crutches.
- Whenever possible, driveways should be equipped with the proper signage, blind spot mirrors, and tactile surface treatments to alert drivers that pedestrians may be crossing the sidewalk.

Physical Enhancements - Pedestrian

- Commercial, industrial, and large residential properties should consolidate driveways. Where possible, parking should be shared amongst multiple uses, including loading areas for trucks.
- Where applicable, site access should be designed from the alley.
- Corner lots should locate driveways on the minor street to avoid conflicts on the major arterial.
- Driveways should be avoided at points close to the intersection.
- Driveways with entry gates should ensure that the gate is appropriately placed (at least 20' from property line) so that vehicles do not obstruct the path of travel for pedestrians on the sidewalk.

Other Discussion

- The City of Los Angeles' Bureau of Engineering currently has a standard plan (S-440-4) for Driveways.
- The City of Los Angeles' Department of Transportation discusses driveway design in their Manual for Policies and Procedures (Section 321).
- The Los Angeles Municipal Code discusses driveway location in Sections 62.105.1, 62.105.2, 62.105.3 and 62.105.4

Physical Enhancements - Pedestrian

6.10 Bicycle Pavement Markings approaching an Intersection

Bicycle pavement markings alert bicyclists and motorists of each other's presence as they approach intersections.

Benefits

- Maintains continuity of the bicycle facility
- Guides bicyclist movements when approaching intersections
- Alerts motorists to expect and yield to merging bicycle traffic
- Signifies an appropriate location for motorists to safely merge across the bike lane into the right-turn lane
- Reduces potential for conflicts between bicyclists and automobiles

Applications

- Markings in the conflict area are applied on streets with right-side bike lanes and right-turn-only lanes at intersection.
- When approaching intersections, the appropriate treatment for right-turn only lanes is to place a bike lane pocket between the right-turn lane and the right-most through lane.
- They can be applied on streets with left-side bike lanes and left-turn only lanes at intersections.
- They can also be applied on streets with bike lanes and a parking lane that transition into a turn lane at intersection.

Considerations

- If a full bike lane pocket cannot be accommodated, a shared bicycle/right turn lane can be installed that places a standard-width bike lane on the left side of a dedicated right-turn lane. This treatment may include signs advising motorists and bicyclists of proper positioning within the lane.

Physical Enhancements - Bicycle

- In cases where there is insufficient roadway space to accommodate a bike lane pocket, the bicycle lane may have to be dropped altogether. However, sharrows provide an alternative option for marking a bikeway through an intersection where a bike lane pocket cannot be accommodated.

Design Guidance

- Consider the use of green paint or thermoplastic treatments to increase the visibility of conflict areas (e.g., intersection approaches, driveways, and transitional zones).
- Apply dashed white lines (**4"** wide, **2'** long) in the merging area at least 50' before the intersection or **100'** if along a high speed/volume roadway.
- Bicycle lane pocket and through lane (next to a vehicular right turn pocket) should be **4'** minimum but **6'** preferred.
- Include signage (MUTCD R4-4) signifying merging of bike lane and vehicle.
- Include signage (MUTCD R3.7R) to force vehicle in right-turn lane to turn right.

Physical Enhancements - Bicycle

Other Discussion

Bicycle Lanes at Double Right Turn Intersections

- Lane Width: Bicycle Lane pocket should have a minimum width of 4' with 5' preferred.

- Discussion: Merging across two lanes exceeds the comfort zone of most bicyclists. Double right turn lanes or an inside through/right combination lane should be avoided on routes with heavy bicycle use. To prevent vehicles in the outside right turn lane from turning into a bicyclist it is important to encourage proper lane positioning for the bicyclist. This can be accomplished by providing either a bicycle lane to the left of the outside turn lane with a bicycle lane (Option A). This design positions bicyclists using a bicycle lane to the outside of a double right-turn lane. This treatment should only be considered at locations where the right most turn lane is a pocket at the intersection. In this instance, the bicyclist would only have to merge across one lane of traffic to reach the bicycle lane. While non-standard colored bicycle lanes may also help distinguish the bicycle lane in the merging area. Bicyclists should not be expected to merge across two lanes of traffic to continue straight though an intersection.

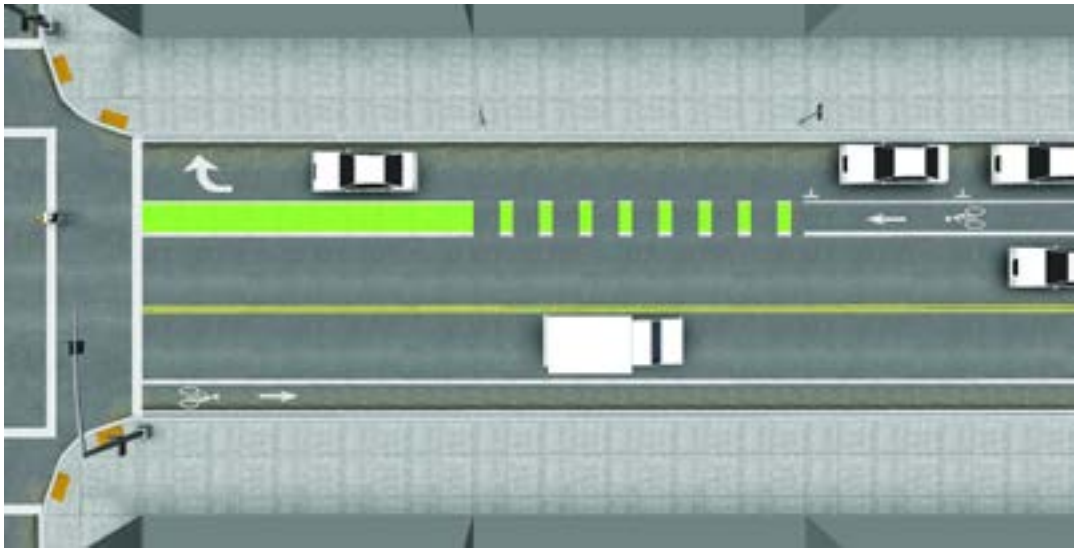
References

CA MUTCD

Caltrans Highway Design Manual

AASHTO Guide for the Development of Bicycle Facilities

NACTO Urban Bikeway Design Guide



6.11 Bicycle Pavement Markings through an Intersection

Bicycle pavement markings provide a clear boundary to help guide bicyclists safely through intersections.

Benefits

- Raises awareness for both bicyclists and motorists to potential conflict areas within the intersection.
- Guides bicyclists through an intersection in a straight and direct path.
- Alerts motorists to not veer into the path of bicyclists also passing through the intersection.
- Relieves bicyclist stress by delineating clear travel paths.
- Reduces conflicts between bicyclists and motorists.

Applications

- Markings through an intersection are applied across signalized intersections, especially in large or complex intersections where the path of travel for bicyclists is unclear.
- Apply across yield-controlled cross streets.

Considerations

- Striping may not be required for every signalized intersection, and should be evaluated and implemented on a case-by-case basis.

Bicycle Pavement Markings guide bicyclists through an intersection on a straight and direct path.

Physical Enhancements - Bicycle

Design Guidance

- Dashed lines shall bind the path of travel (MUTCD 3B.08)
- Striping width should be a minimum of **6”** adjacent to motor vehicle travel lanes and / or should otherwise match the striping dimensions and lateral positioning of the leading bike lane.
- Instead of dashed white lines, alternative striping can be applied, such as shared lane markings in between dashed white lines, green colored paint between dashed white lines, or white **14’** to **20’** squares (“elephant tracks”).

References

MUTCD 3B.08 – Extensions Through Intersections or Interchanges

AASHTO Guide for the Development of Bicycle Facilities.

NACTO Urban Bikeway Design Guide.

6.12 Bicycle Box

A bicycle box is generally a right angle extension to a bicycle lane at the head of a signalized intersection. Bicycle boxes give bicyclists a clear, designated space in front of queued vehicles while waiting for a green light at intersections. Motorists must stop behind the white limit line at the back-end of the bicycle box and are restricted from making a right turn on a red light at the intersection. Bicycle boxes allow bicyclists to safely position themselves before shifting into their desired travel lane.

Bicycle Boxes enable bicyclists to position themselves to safely make left turns at an intersection.

Benefits

- Improves visibility of bicyclists
- Allows bicyclists to safely position themselves at the front of the queue and establish position in the intersection when the light turns green
- Reduces signal delay for bicyclists
- Allows bicyclists to avoid breathing in exhaust fumes from queued vehicles
- Facilitates ideal positioning for bicyclist left turns on a two-lane roadway with traffic in each direction, or at offset/jogged intersections
- Reduces conflicts between bicyclists and motorists, especially where collisions occur when vehicles turn right

Applications

- Bicycle boxes should be applied at signalized intersections with high volumes of left-turning movements.
- They should be applied where right or left-turning conflicts exist between bicyclists and motorists.
- They should be applied where a bicyclist's left turn is required to follow a designated bike facility.
- They should be applied when the majority of motor vehicle traffic on the street turns right but bicycle traffic continues through the intersection.

Physical Enhancements - Bicycle

Design Guidance

- The bicycle box should be **14'** deep to allow for bicycle positioning with a pronounced stop line (MUTCD 3B.16) at the back edge as a buffer from vehicles.
- Signage should be present to prevent 'right turn on red' and to indicate where the motorist must stop (MUTCD R10-6A).
- A "Wait Here" marking can also be used to supplement the intent of the stop line.
- In the United States, bicycle boxes have been installed with white striping or with white accompanied with a colored treatment (e.g. green paint) to increase visibility.
- Where right-turn-only lanes for motor vehicles exist, bicycle lanes should be designed to the left of the turn lane. If a right-turn-on-red is desired, consider ending the bicycle box at the edge of the bicycle lane to allow motor vehicles to make this turning movement.

Other Discussion

This treatment is not currently present in any U.S. State or Federal design manuals but is currently being recommended as of June 2014 by the National Committee for Uniform Traffic Control Devices (NCUTCD) to the FHWA for inclusion into a new edition of the MUTCD.

References

NACTO Urban Bikeway Guide

Coloring a Bicycle Box increases the box's visibility.

6.13 Two-Stage Turn Queue Box

A two-stage turn queue box, or a "Copenhagen left turn," helps facilitate bicyclist left turns at multi-lane signalized intersections. When bicyclists enter the intersection from a right-side bicycle lane, they can wait in a queue box that allows them to reposition their bike and complete their original left turn at the next green light.

Benefits

- Improves bicyclist ability to safely and comfortably make left turns
- Provides a formal queuing space for bicyclists making a two-stage turn
- Reduces turning conflicts between bicyclists and motor vehicles
- Prevents conflicts arising from bicyclists queuing in a bike lane or crosswalk
- Separates turning bicyclists from through bicyclists

A Two-Stage Turn Queue Box separates turning bicyclists from through bicyclists.

Physical Enhancements - Bicycle

Applications

- Two-stage turn queue boxes are applied along right-side bicycle lanes at signalized intersections.
- They should be considered on multi-lane roadways with high traffic speeds and/or traffic volumes that make left turns for bicyclists difficult.
- They should be considered at intersections where a significant number of bicyclists turn left from a right side bicycle lane.
- They may also be used at unsignalized intersections to simplify turns from a bicycle lane onto a neighborhood street.
- They may also be used at midblock crossings so that bicyclists can properly orient themselves for safe crossings.

Design Guidance

- A queue box shall be designated to hold queuing bicyclists and formalize two-stage turn maneuvers.
- Pavement markings shall include a bicycle stencil and a turn arrow to clearly indicate proper bicycle direction and positioning.
- The queue box shall be placed in a safe, designated area that does not conflict with the path of motor vehicle travel. Typically this is between the bicycle lane and the pedestrian crosswalk within the intersection. Colored paving inside of the queuing area should be used to further define the bicycle space.
- Markings across intersections should be used to define through bicyclist positioning.
- In cities that permit right turns on red signal indications, a “No Turn on Red” sign shall be installed overhead to prevent vehicles from entering the queuing area (MUTCD Section 2b.54).
- In cases where a constrained roadway geometry or right of way prevents the creation of a dedicated two stage turn queue box in a protected location:
    - The pedestrian crosswalk may be adjusted or realigned to enable space for a queue box.
    - A bike box may be provided behind the pedestrian crossing to serve the same purpose. This configuration should only be considered if pedestrian volumes are low, as bicyclists must yield to pedestrians in the crosswalk before entering the queue.

References

NACTO Urban Bikeway Design Guide

The pedestrian crosswalk can be realigned to create space for a Queue Box.

6.14 Bicycle-Only Left Turn Pocket

A bicycle-only left turn pocket grants exclusive left turn access to bicyclists from the center turn lane. At locations with jogged and T-intersections, bicyclists can enter a left turn pocket in the center turn lane and wait for a gap in traffic before continuing left onto the intersecting local street.

Benefits

- Provides route continuity for bicycle travel along local streets that have jogged or offset intersections

Applications

- Bicycle-only left turn pockets are ideal where bicycle travel on local streets becomes disrupted by the presence of jogged and T intersections.
- This treatment typically should be applied on lower volume arterials and collectors that intersect with local streets that are prioritized for bicycle travel.
- If the intersection is controlled, the left-turn pocket may have a left arrow signal, depending on bicycle and vehicle volumes.

Considerations

- If traffic volumes are moderate to high, restricting vehicular left turns (at offset intersections where bicycle left turn pockets are present) may reduce conflicts between bicyclists and vehicles.

Design Guidance

- The bicycle left turn pocket should be **4'** minimum in width, with **5'** preferred.
- Signs and raised median design restrictions should be provided that prohibit motorists from turning, while allowing access to bicyclists.
- Bicycle only signal heads may also be used at busy or complex intersections (although not possible under current guidelines).
- Ideally, the left turn pocket should be protected by a raised curb, but the pocket may also be defined by striping if necessary (not possible under current guidelines).

References

There is no currently adopted Federal or State guidance for this treatment.

A bicycle-only Left Turn Pocket grants bicyclists exclusive left-turn access from the center turn lane.

Bicycle-Only Left Turn Pockets can be defined by striping if necessary.

Physical Enhancements - Bicycle

6.15 Diverter

A diverter redirects vehicular traffic by restricting specific turn movements, while at the same time, providing cut-through openings for bicycle traffic.

Benefits

- Provides traffic calming in residential neighborhoods
- Increases the comfort and accessibility of local streets for pedestrians and bicyclists
- Increases safety by reducing the potential for collisions between cars and other modes of travel
- Helps to reduce cut through traffic in neighborhoods

Applications

- Diverters are appropriate for select local streets where through high volume vehicle traffic is not desirable.
- They are applicable to local streets that experience high volumes of spillover traffic from nearby streets or freeways.

Diverters increase accessibility of local streets for bicyclists.

Physical Enhancements - Bicycle

Considerations

- Diverters may affect access for emergency vehicles; Designs that allow emergency vehicle access are required and should be coordinated with emergency responders.
- Street maintenance operations should be coordinated with diverter installation.
- If applicable, maintenance needs for landscaping should be determined and provided for before installation.
- They should only be considered when other measures, such as signage, are not as effective; and as part of an overall traffic calming strategy in conjunction with other treatments.

Design Guidance

- Diverters should be designed flexibly with mountable curbs to allow emergency vehicles to traverse them.
- Cut-through access for bicycles should be accommodated for in the design.
- Accompanying signage should be provided to guide motorists' turning movements and indicate restricted cut-through access.
- Any landscaping on diverters should maintain clear sight lines and capitalize on potential stormwater management practices.

Interim Design Strategies

- Temporary diverters can be installed and piloted to test how a permanent diverter might affect neighborhood traffic.

References

There is no currently adopted Federal or State guidance for this treatment.

Physical Enhancements - Other Traffic Calming Treatments

6.16 Traffic Mini-Circle

A traffic mini-circle is a small circular, raised island placed in the center of a residential intersection to mitigate unsafe vehicle speeds. Unlike roundabouts, traffic mini-circles focus more on controlling vehicle speeds and are not designed to handle higher traffic volumes.

Benefits

- Improves the pedestrian and bicycling environment
- Facilitates safer bicycle movements through residential intersections
- Reduces vehicular speeds and potential for crashes
- Eliminates possibility of vehicles head-on collisions
- Provides opportunities for aesthetic landscaping and stormwater infiltration

Applications

- Traffic mini-circles are applied on local or collector streets (with or without four-way stop signs) that experience unsafe vehicle speeds and/or a history of collisions.
- On two-lane collector streets, traffic mini-circles are typically applied when average daily traffic (ADT) is **less than 5,000** and bus/heavy vehicle volumes are **less than 2% of total ADT**.
- They can be implemented along a stretch of blocks, prioritizing bicycle travel along local streets.
- Traffic mini-circles can also serve as an alternative for signalization or stop signs in a low volume, neighborhood context.

Considerations

- Traffic mini-circles should not be installed on transit routes that make bus turning movements difficult and burdensome.
- Larger vehicles may have difficulty navigating around the mini-circle, while drivers of emergency vehicles may be concerned with the treatment's impact on response times.

Physical Enhancements - Other Traffic Calming Treatments

- Traffic mini-circles should have "Keep Right" signage to safely guide drivers.

- Proper design should ensure that traffic mini-circles do not create confusion or an inconvenience for pedestrians with visual impairments.
- Landscaping and vegetation on the mini-circle should be maintained so that it does not obstruct a driver or pedestrian's visibility.
- High volume streets and intersections should consider mini roundabouts as a more appropriate treatment
- Underground utility access should be factored into the design.
- Neighborhoods should be educated and notified about traffic-mini circles before implementation.

Design Guidance

- Traffic mini-circles should have "Keep Right" signage in the center island to safely guide drivers around the circle.
- Reflective paint on the circle's curb should be used to improve the visibility of the center island.
- A mountable curb should be provided so that large trucks or emergency vehicles can negotiate constrained spaces.
- The design speed around the circle should be **10 to 15 mph**.
- Curb radii at intersection corners should be small to encourage slower right turns.
- The size of the circle should be determined based on the width of the intersecting streets, and should be at least large enough so that they properly encourage vehicles to slow down.
- A **4'** buffer should be provided between the maximum vehicle displacement around the circle and pedestrian crossing zone (i.e., the offset distance). Typically, this results in a width of **15'** from the circle to the corner, safely ensuring that vehicles do not encroach onto the crosswalk.
- Landscaping and stormwater elements can be planted in the center island, so long as an agreement is in place that a party will maintain them.

Physical Enhancements - Other Traffic Calming Treatments

Other Discussion

- Examples of other places in Southern California where traffic mini-circles have been installed include Long Beach, Pasadena, Santa Barbara, West Hollywood, and Santa Monica
- Traffic Mini-Circle Design Dimensions in Seattle, WA
    - The distance between a traffic circle and the curb (off-set distance) should be a maximum of 5.5'.
    - The width between a traffic circle and a curb return (opening width) should be a minimum of 16' and a maximum of 20'.
    - As the off-set distance decreases from the maximum 5' feet, the opening width should increase from the minimum of 16'.
    - The outside 2 feet of the traffic circle should be constructed with a mountable monolithic cement concrete curb and pavement surface doweled to the existing pavement.

References

FHWA Pedestrian Safety Guide

6.17 Mini-Roundabout

A mini-roundabout is a larger, raised island placed in an intersection to control higher traffic speeds and reduce delay. Unlike mini traffic-circles, they come equipped with splitter islands on all approaches and utilize yielding signage and markings to facilitate traffic flow.

Benefits

- Reduces vehicle speeds at intersections while facilitating simultaneous vehicle movements from all intersection approaches
- Eliminates possibility of head-on collisions from vehicle left turns or through traffic
- Reduces need to widen streets approaching intersection to store vehicles under signalized operation
- Provides opportunities for landscaping and stormwater capture
- Facilitates continuous bicycle movements by not forcing them to stop and then rebuild momentum.
- Allows pedestrians to cross frequently when vehicular volumes are low

Applications

- Mini-roundabouts can be used at existing intersections to replace two-way stop control, all-way stop control, or a traffic signal.
- They should be considered at locations with heavy vehicle-turning movements, low pedestrian crossing compliance, poor safety records, or where signalization has led or may lead to operational issues for pedestrians or bicyclists
- They are most effective in lower speed environments in which all approaching roadways have a posted speed of 30 mph or less and an 85th-percentile speed of less than 35 mph near the proposed yield and/or entrance line

Roundabouts ease movement at intersections for bicyclists.

Physical Enhancements - Other Traffic Calming Treatments

Considerations

- Mini-roundabouts require a larger spatial footprint for the intersection.
- They may require modification to street drainage infrastructure and underground utilities.
- Landscaping maintenance must be arranged prior to installation.
- Pedestrians, especially those with visual and mobility impairments, must be aware of free flowing traffic when crossing.

Design Guidance

- A mini-roundabout inscribed circle diameter generally should not exceed **90'**.
- The central island should be domed using **5 to 6%** cross slope, with a maximum height of **5"**.
- The advanced entrance line into the circulatory roadway should be placed at least **2'** outside of the vehicle paths
- Splitter islands at least **6'** in width should be provided as deflection and as refuge island for pedestrian crossings.
- Reflective signage should be placed within the center island and reflective paint should be used on the curb
- Sidewalks should be set back from the edge of the circulatory roadway by at least **5'** so that pedestrians with visual impairments can clearly follow designated crossing paths.
- Signage and detectable warning plates should be provided to delineate pedestrian crossing paths and signal drivers to yield.

Signs at a Roundabout entrance instruct incoming traffic to yield.

Signalization Enhancements - Pedestrian

- Clear sight lines between crosswalks and approaching traffic should be provided.
- At single lane roundabouts, the pedestrian crossing should be at least one vehicle length (25 feet) from the yield line at the intersection with the roundabout to allow one car to queue beyond the crossing.
- Landscaping within the center island should be less than 3' tall within 4' of the edge of the curb

References

FHWA Roundabout Design Guidance

http://safety.fhwa.dot.gov/intersection/roundabouts/fhwasa10007/#s4

Caption goes here

Signalization Enhancements - Pedestrian

6.18 Exclusive Pedestrian Phase

An exclusive pedestrian phase, or pedestrian scramble, allows intersection crossings in all directions (including diagonally) while vehicles are stopped.

Benefits

- Allows pedestrians to cross in any direction, negating the need to cross twice to reach destinations diagonally across the intersection (when diagonal crossings are employed).
- Reduces conflicts between motorists and pedestrians by isolating movements for each to occur in separate signal cycles.

Applications

- Exclusive pedestrian phases are applicable at intersections where a high frequency of turning vehicles with high pedestrian volumes (e.g., **1,200** pedestrian crossings per day)
- They are ideally suited to intersections that have shorter crossings, and where sight distances and unique roadway geometries are problematic.
- They are applicable in high-volume pedestrian areas such as schools, senior housing communities, parks, hospitals, and major transit stops.

Signalization Enhancements - Pedestrian

Considerations

- Although an exclusive pedestrian phase enables crossings in all directions, pedestrians must wait a little longer for their next walk signal while vehicles traveling through the intersection complete their signal phase.
- The tradeoff to safer, multi-directional crossings afforded by an exclusive pedestrian phase is increased wait times for all intersection users.
- This treatment may potentially confuse visually impaired pedestrians who rely on traffic sounds to decide when and where to cross
- This treatment may affect the ability to synchronize timing at adjacent traffic signals.

Design Guidance

- Pedestrian and vehicular traffic volume data should be used to analyze whether the amount of cars and pedestrians traveling through an intersection warrant an exclusive pedestrian phase.
- "No Turn on Red" signs should be installed at intersections with exclusive pedestrian phases.

Reference

LADOT Signal Treatment Toolbox adapted from ***Steps to a Walkable Community: A Guide for Citizens, Planners, and Engineers*** and ***FHWA's Proven Countermeasures*** list.

An intersection utilizing an exclusive pedestrian phase, located near the UCLA campus in Westwood. s

Signalization Enhancements - Pedestrian

6.19 Pedestrian Beacon

A pedestrian beacon is used to help pedestrians safely cross by flashing a blinking light to approaching motorists, warning them that a pedestrian is crossing. The beacons are actuated by a pedestrian call button and come in multiple forms including, Rectangular Rapid-Flashing Beacons (RRFB) and High-Intensity Activated Crosswalks (HAWK).

Benefits

- Makes pedestrian crossings more visible to drivers, especially outside of daylight hours.
- Provides safety benefits and achieves high rates of compliance by motorists.

Applications

- A pedestrian beacon should be applied at unsignalized crossings, and not at intersections with signals or stop signs.
- They should be applied at locations that experience significant pedestrian volumes, do not meet traffic signal criteria, or have a high incidence of collisions.
- They can offer an upgraded safety treatment when normal signage or other milder design treatments are ineffective or insufficient.
- They should not be installed in locations with critical sight distance constraints that limit a motorist's ability to recognize pedestrians waiting to cross.

Design Guidance

- A flashing beacon, such as a RFFBs, are placed curbside below the pedestrian crossing sign and above the arrow indication pointing at the crossing. They should always be accompanied by the appropriate pedestrian crossing signage. The installation should include an audible message confirming that the device is activated and instructing pedestrians to wait until cars have stopped before crossing. Another LED panel should be placed facing the pedestrian to indicate that the beacon has been activated (See MUTCD Chapter 4K, "Flashing Beacons").

A flashing light accompanies the pedestrian crossing sign.

Signalization Enhancements - Pedestrian

Lincoln Blvd., Los Angeles

- A pedestrian hybrid beacon, such as HAWKs, should only be installed at a marked crosswalk, in conjunction with signage and advanced yield markings (See MUTCD Chapter 4F, "Pedestrian Hybrid Beacons")
- The pushbutton and other components of the crosswalk must abide by all other accessibility requirements.
- Pedestrian beacons can also be fitted with solar panels to able to generate and sustain their own energy needs.

References

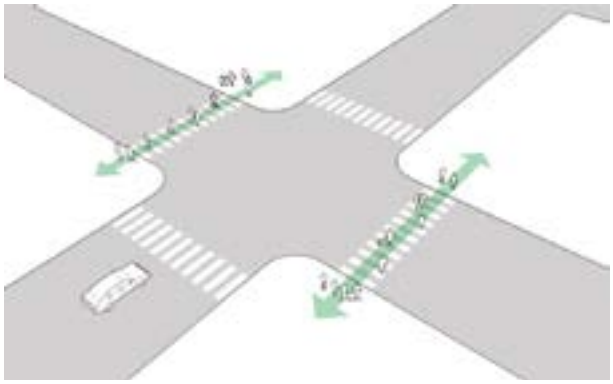
- The City of Los Angeles' Department of Transportation currently has a standard plan (S-55) entitled Typical Layout for Activated Pedestrian Warning Device
- Chapter 4K of the CA MUTCD provides guidance for the use of flashing beacons.
- Chapter 4F of the CA MUTCD provides guidance for the use of pedestrian hybrid beacons.
- FHWA study, the "Effects of Yellow Rectangular Rapid flashing Beacons on Yielding at Multilane Uncontrolled Crosswalks."

6.20 Leading Pedestrian Interval

A Leading Pedestrian Interval (LPI) gives pedestrians a head start when entering the crosswalk, affording extra time to cross before vehicles can begin their turn through an intersection.

Benefits

- Prioritizes pedestrian movements at intersections
- Reduces risk of collision by making pedestrians more visible to turning vehicles
- Reinforces the pedestrian's right-of-way over turning vehicles
- Helps reduces conflicts at sites with a history of collisions and jaywalking



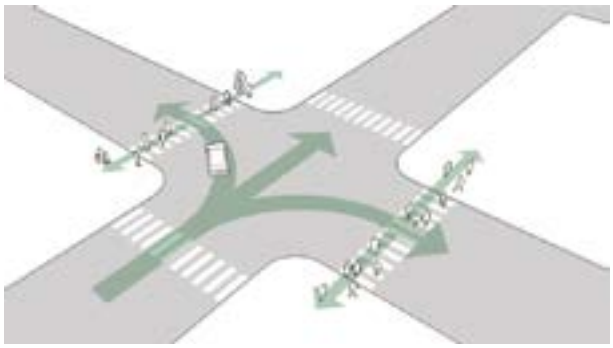
Stage 1: Pedestrian only

Applications

- Leading pedestrian intervals are applied at signalized intersections with a high volumes of pedestrian crossings and turning vehicles.
- They are applicable in dominant vehicle and pedestrian environments, such as a downtown or other major destinations.

Design Guidance

- Leading pedestrian intervals grant pedestrians a walk signal 3 to 7 seconds before a green light is given to vehicles traveling in the same direction, or turning left at the intersection.
- In addition to an LPI, a lagging protected left green arrow should be provided for vehicles
- To increase the effectiveness of an LPI and improve the visibility of pedestrians, a curb extension should be installed at the intersection corners.
- "NO TURN ON RED" signs should be considered with LPIs.



Stage 2: Pedestrian and vehicular

Signalization Enhancements - Pedestrian

Other Discussion

- At intersections where bicycle through movements conflicts with turning traffic, a leading bicycle interval can be implemented along with a leading pedestrian interval. A leading bicycle interval facilitates bicycle through-travel more quickly through the intersection and can help prevent right hook collisions by vehicles.

References

NACTO Urban Street Design Guid

6.21 Accessible Pedestrian Signal

An accessible pedestrian signal (APS) provides audible or vibrotactile information (such as audible tones, speech messages, and/or vibrating surfaces) to facilitate safer pedestrian crossings.

Benefits

- Enhances recognition and understanding of the information by all pedestrians, particularly individuals with vision or cognitive impairments and young children.

Applications

- Accessible pedestrian signals can be applied where a particular signalized location presents difficulties for pedestrians who have visual disabilities to cross the roadway.
- They can be applied at new signalized intersections and planned upgrades to signalized intersections that are equipped with pedestrian crosswalks.

Design Guidance

- See LADOT Standard Plan S-73.2 for Accessible Pedestrian Signals.
- Accessible pedestrian signal detectors may be pushbuttons or passive detection devices.
- The accessible pedestrian signal is typically integrated into the pedestrian detector (push button), so that the audible tones and/or messages come directly from the pushbutton housing.
- They should have a pushbutton locator tone and tactile arrow, and can include audible beaconing and other special features.
- The tone of the walk signal should distinct from the push button locator tone.
- When accessible pedestrian signals are located as close as possible to where pedestrians are waiting to cross the street, they provide the clearest and least ambiguous indication of which pedestrian crossing is served by a device.

References

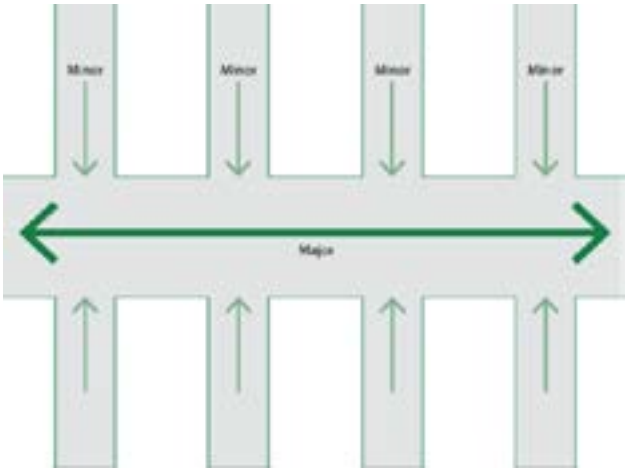
The City of Los Angeles' Department of Transportation currently has a standard plan (S-73.2) for Accessible Pedestrian Signals

CA MUTCD's Sections 4E.09, 4E.10, 4E.11, 4E.12, and 4E.13 for Accessible Pedestrian Signals and Detectors

FHWA: Designing Sidewalks and Trails for Access Part II of II: Best Practices Design Guide

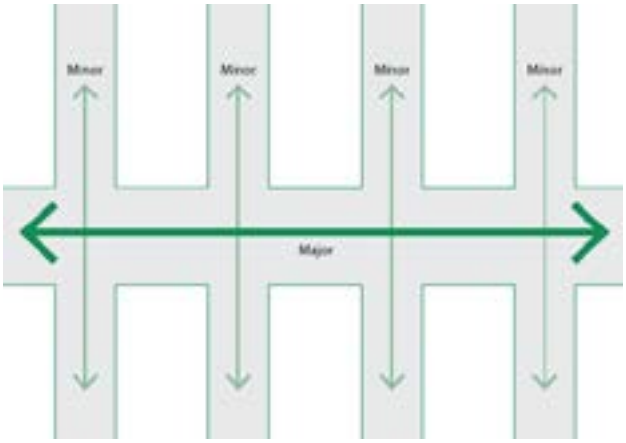
6.22 Shorter Signal Cycle Length

A shorter signal cycle length at intersections prioritizes pedestrian convenience by decreasing wait times to cross the street.



Corridor-based signal timing with longer cycles

Corridor-based cycle lengths (sec)



Balanced signal timing with shorter cycles

Balanced cycle lengths (sec)

Benefits

- Prioritizes pedestrian activity over high vehicle speeds on arterial streets
- Encourages safer pedestrian behavior by providing shorter wait times to cross
- Provides more consistent crossing opportunities
- Facilitates a more fluid network of flows for all travel modes
- Minimizes delays for all users

Applications

- The overall goal of signal design is to minimize cycle lengths to reduce delay for all users. Long cycle lengths make walking less convenient and may encourage unsafe behavior such as pedestrians jay walking and bicyclists running red lights. Signal coordination should be optimized to balance the needs of all users and to minimize the delay for pedestrians, bicyclist, and transit vehicles.
- Shorter signal lengths should be used in conjunction with other treatments and strategies to prevent vehicles from speeding in between signals.
- Cycle lengths should account for the time of day to account for fluctuating vehicle or pedestrian volumes. Cycle length adjustments should be minimal and consider both pedestrian and vehicle volumes at peak and off-peak times.

Signalization Enhancements - Pedestrian

Considerations

- Shorter signal lengths may come at the expense of the time that a pedestrian has to cross the street, potentially necessitating a crossing refuge island or curb bulbouts on wider multi-lane arterial streets.
- They may also make it more burdensome for bicyclists, forcing them to brake and accelerate more often.

Design Guidance

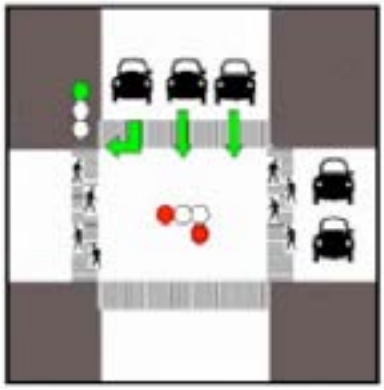
- Shorter cycle lengths of **60 to 90 seconds** should be used for high-pedestrian urban environments.
- Other pedestrian-oriented treatments should complement shorter signal timing lengths (e.g., corner bulbouts, neckdowns, crossing refuge islands, and road diets).
- Shorter cycle lengths should always consider the pedestrian crossing distance (and the correlated minimum crossing time needed) before implementation.
- Signal lengths should be set so that bicyclists do not experience more delay than vehicles.

References

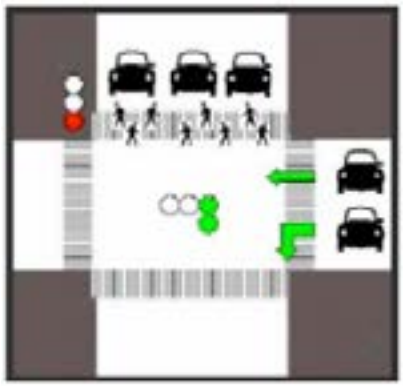
NACTO Urban Street Design Guide

6.23 Split Phasing

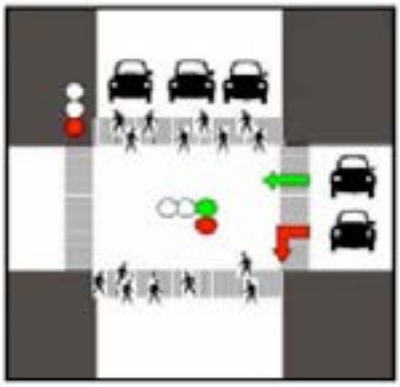
Split phasing provides turns at intersections to mitigate potential conflicts between pedestrian crossings, bicycle crossings, and turning vehicular traffic.



Phase 1



Phase 2



Phase 3

Benefits

- Reduces the risk of conflict between pedestrians and vehicles
- Decreases the potential for head-on vehicle collisions.
- Reduces delay for vehicles that, when a left turn arrow is absent at the intersection, have to wait for left-turning traffic to yield to opposing through traffic.

Applications

- Split phasing is applied at intersections that have a history of collisions between left-turning vehicles and pedestrian crossings.
- It can be applied when unique intersection geometry impedes a driver's visibility and makes turning movements difficult and dangerous to conduct alongside pedestrian crossings.
- It can be applied at locations where high volume/high speed intersections or unconventional intersection geometry makes pedestrian crossings feel unsafe.
- It can be applied when left-turn lane volumes on two opposing approaches are roughly equal to the volume of through traffic.
- It can be applied for right-turn vehicular movements when the turn lane is adjacent to a cycle track. In this case, split phasing separates right-turn movements from bicyclists continuing through the intersection. A dedicated bicycle signals could be utilized in addition to the vehicular signal.

Considerations

- Split phasing can be limited to specific times in the day when the likelihood of collision is at its highest
- Split phasing increases the overall signal cycle length, which results in longer wait times for pedestrians

Signalization Enhancements - Bicycle

Design Guidance

- Split phasing can separate movements using the following phase intervals as an example:
    - Phase 1: For **5 to 10** seconds, pedestrians and through traffic are given a green signal while turning vehicles are restricted at the intersection. This affords pedestrians a leading interval.
    - Phase 2: For **20 to 40 seconds**, right-turning traffic is given a green light but must yield to pedestrians already in the crosswalk.
    - Phase 3: For **5 to 10 seconds**, left turning vehicles are granted a protected left arrow while pedestrian crossings and through traffic are restricted to prevent potential collisions.

Other Discussion

- See CA MUTCD Sections 4D.107 (Selection of Left-Turn Phasing), 4D.108 (Dual Left-Turn Phasing), and 4D.109 (Lead-Lag Left-Turn Phasing)

References

NACTO Urban Street Design Guide

FHWA**-HRT-04-091** Signalized Intersections: Informational Guide

6.24 Bicycle-Only Signal

A bicycle signal head is a traffic control device at intersections that facilitates bicycle movements separately from cars.

Benefits

- Separates bicycle movements from conflicting motor vehicle, streetcar, light rail, or pedestrian movements
- Provides priority and protection to bicycle movements at intersections with a leading or lagging bicycle interval
- Helps address real and perceived bicycle safety issues at intersections
- Simplifies bicycle movements through complex intersections
- Potentially improves operations and reduces conflicts for all modes

Applications

- Bicycle signal heads are applied at complex intersections that are difficult for bicyclists to navigate.
- They should be applied at intersections that experience heavy bicycle traffic, high volumes of bicycle turning movements, and/or have a noticeable collision history.
- They should be applied where predominant bicycle movements conflict with predominant motor vehicle movements during the same green light phase.

Signalization Enhancements - Bicycle

Design Guidance

- See FHWA's "Interim Approval for Optional Use of a Bicycle Signal Face (IA-16)" for comprehensive design recommendations.
- Bicycle signal heads typically use standard three-lens signal heads in green, yellow, and red with a stencil of a bicycle.
- A Bicycle Signal (R10-10b) sign shall be installed immediately adjacent to every bicycle signal face that is intended to control only bicyclists, including signal faces that are comprised of all bicycle symbol signal indications, all arrow signal indications, and every combination thereof.
- The purpose of the sign is to inform any motor vehicle drivers who can also see the signal face that these signal indications are intended only for bicyclists.

References

See CA MUTCD Sections 4C.102 (Bicycle Signal Warrant) and 4D.104 (Bicycle Signals)

6.25 Bicycle Loop Detector

A bicycle loop detector notifies traffic signals to change when bicyclists are waiting at a red light. When a bike is positioned squarely on top of the designated pavement marking (where the loop detector lies underneath), it will be picked up and trigger a green light at the next available signal phase for the bicyclist.

Benefits

- Improves efficiency and flow of bicycle traffic
- Reduces delay for bicyclists
- Increases convenience and safety of bicycling
- Affords bicyclists the same technology given to motorized vehicles
- Provides more time for bicyclists to clear the intersection by prolonging the green light phase
- Discourages red light running by bicyclists, which reduces the risk of collisions with motorized vehicles

Applications

- Bicycle loop detectors are applied underneath the roadway at intersection approaches that are actuated, typically where bicycle lanes, bicycle boxes, left-turn queue boxes, or bicycle signal heads exist.

Considerations

- Loop detector sensitivity settings need to be monitored and adjusted over time.
- Higher car speeds and longer intersections may warrant specific signal timing consideration for bicyclists

Design Guidance

- One loop detector should be installed within the bicycle lane, about **100'** from the intersection approach, while a second loop is placed right behind the intersection's limit line.

Signalization Enhancements - Bicycle

- A bicyclist must be detected in a **6' x 6'** area (i.e., the "limit line detection zone") immediately behind the limit line, centered either in a normal width lane; or, if the lane is more than **12'** wide, centered **6'** from the left lane line.
- For a lane of **20'** or greater, two minimum **6' x 6' areas** shall constitute the limit line detection zone.
- If more than 50% of the limit line detectors need to be replaced at a signalized intersection, then the entire intersection should be upgraded so that every lane has a limit line detection zone.

Other Discussion

- The City of Los Angeles' Department of Transportation currently has a standard plan (S-70) entitled Limit Line Inductive Loop Detector Placement.

References

NACTO Urban Bikeway Design Guide

CA Vehicle Code Section 21450.5 – Traffic Actuated Signals: Detection of Motorcycles and Bicycles

CA MUTCD Section 4D.105(CA) - Bicycle/Motorcycle Detection

MUTCD Figure 9C-7. Bicycle Detector Pavement Marking http://mutcd.fhwa.dot.gov/htm/2009/part9/fig9c_07_longdesc.htm

Caltrans Standard Plans (1999) ES-5B

6.26 Bicycle Green Wave

A green wave is when traffic signals are deliberately timed to coordinate successive green lights along a corridor. Therefore, bicyclists that travel along a green wave street at moderate speeds benefit from not having to intermittently stop at intersections.

Bicycle Green Waves facilitate movement for bicycles while encouraging cars to travel at slower speeds..

Benefits

- Reduce the amount of stops along a corridor
- Provides for a continuous flow of bicycle traffic at the target speed
- Lessens the physical demands of bicycling, especially for younger, older, and/or newer riders
- May encourage drivers decrease their speeds in order to reap the benefits of the green wave
- Slower car speeds improves safety conditions for both pedestrians and bicyclists

Applications

- Bicycle green waves are applicable along corridors that currently carry or show potential for high volumes of daily bicycle riders.
- They can be applied on corridors that warrant traffic calming measures to mitigate high vehicle speeds.
- They are typically applied on corridors with closely spaced intersections (**1/4 mile or less**)

Considerations

- Before making traffic signal timing modifications, the presence of major transit routes and their ability to meet on-time performance goals should be evaluated on potential green wave streets.

Design Guidance

- The appropriate signage should be posted to let bicyclists know they are traveling on a street with a green wave.

Signalization Enhancements - Bicycle

Other Discussion

The San Francisco Municipal Transportation Authority (SFMTA) has implemented green wave along select streets in the city of San Francisco. Currently, the city of San Francisco has green waves on specific segments of Valencia St, 11th St, and 14th St. Internationally, European cities such as Copenhagen have fitted many of their arterial streets with a green wave treatment.

References

NACTO Urban Street Design Guide

6.27 Transit Signal Prioritization

Transit signal prioritization allows transit vehicles to shorten red lights or extend green lights at signalized intersections without disrupting the overall signal timing system.

Benefits

- Reduces delay for transit vehicles
- Improves transit reliability and travel times

Applications

- Transit signal prioritization is applied along corridors with frequent bus service and high ridership demand.
- It can be applied on bus routes and at-grade rail routes that are consistently bogged down by congestion and cross-traffic.
- It can also be used with or without the presence of a dedicated bus only lane.

Considerations

- Signal coordination should not increase delay for all modes (including transit itself), and should take into consideration the acceleration rates and speeds of bicyclists.

Design Guidance

- Transit signal prioritization requires the installation of specialized equipment at an intersection's traffic signal controller and on the transit vehicle.
- Transit signal priority projects are more effective when bus stops are placed at the far side of a signalized intersections.
- A corridor's traffic signals can also be programmed to achieve a green wave for transit vehicles by timing the signals to match a bus's average operating speed instead of an automobile's average speed.

Other Discussion

- Signal priority differs from signal preemption in that the former merely modifies normal signal operations (e.g., transit vehicles) by shortening or lengthening the current phase, while the latter abruptly interrupts the current phase to trigger a green light (e.g., police/emergency vehicles).
- A queue jump lane is another traffic signal concept that prioritizes transit operations. At an intersection, an early green signal is granted to buses waiting at the front of a designated queue jump lane. Meanwhile, other vehicles traveling in the same direction must wait at a red light while the bus gets a jumpstart. Queue jump lanes can be can be used at intersections that either have or do not have a bus stop.

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COMPLETE STREETS DESIGN GUIDE

OFF-STREET NON-VEHICULAR TREATMENTS AND STRATEGIES

7

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7. OFF-STREET NON-VEHICULAR TREATMENTS AND STRATEGIES

Introduction

This chapter presents design guidance for several features often located outside of the public right-of-way. In addition to physical elements such as bicycle ramps and paths, this chapter also presents programmatic interventions that provide vitality to Complete Streets, such as farmers markets and “Pop-Up Retail” events.

7.1 Bicycle Channel Ramps for Stairways

Bicycle Channels provide a ramped surface which cyclists can use to guide bicycles up and down a stairway. Existing stairways can typically be retrofitted with metal rails, and new stairways can integrate a metal rail or concrete channel into their design.

Benefits

- Provides users a safe and convenient alternative to carrying a bicycle up and down a stairway
- Encourages bicycle use by removing a major physical obstacle

Applications

- Bicycle channels should be included in the design of all new public stairways.
- Existing stairways should be retrofitted to accommodate bicycle tracks, especially in areas with higher bicycle traffic such as transit stations, underpasses, and overpasses.

Considerations

- Accessibility guidelines that limit the distance from stair tread to handrail usually require side bicycle rails or channels to be placed very close to the handrail. As a result, users must angle their bicycle significantly to keep handlebars and bike pedals from catching on the handrail.
- One alternative used in other countries is to incorporate center-running concrete ramps or channels into stairway design. Unfortunately, this treatment is problematic because it creates a hazard especially for the visually-impaired.
- Bicycle channels are easier to use on stairways with slopes which are smaller than standard. Bicycle channels on steep stairways are often underutilized because it is easier for most cyclists to lift their bicycles. A steep slope makes it more difficult to gain sufficient leverage to push a bicycle up the stairway, and it also makes it less convenient for guiding a bicycle down the stairway.

Bicycle Channel Ramps can allow bicyclists to travel more easily up and down stairways.

Design Guidance

- A metal channel is fabricated of “U” or “L” shaped stock steel and has one or two sides to guide the bicycle’s wheels and keep them from straying.
- For “L”-shaped channels, the upright of the “L” goes next to the outside (handrail-side) and the bike leans against the bicyclist for stability.
- The channel surface should be textured with grit or grip tape to provide a less-slippery surface.
- All channel designs should be able to accommodate a wide variety of common bicycle wheel widths.
- In new and redesigned stairways, bicycle channels can be integrated into the overall design. Metal channels are the simplest and least costly method, while concrete channels or ramps can also be integrated into the stairway design.
- Stair handrails can be placed in the center of the stairway to allow for easier use of the side bicycle channels, as long as all ADA requirements are met.
- New stairways can be designed with slopes that are slightly more gradual than standard; this ensures full usability of the bicycle channels.

7.2 Multi-Purpose Paths (Class I)

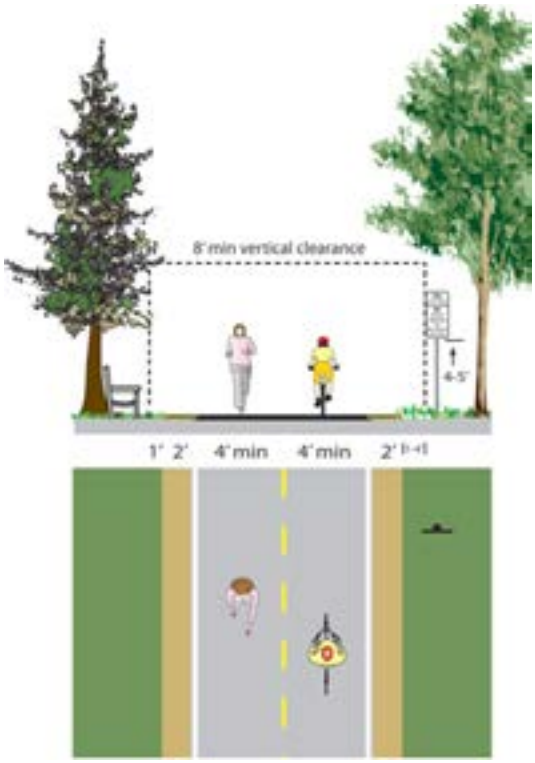
A bicycle path (Caltrans designation Class I) allows for two-way, off-street bicycle use. Class I facilities can also include amenities such as lighting, signage, and fencing. If a parallel pedestrian path is not provided, other non-motorized users are legally allowed to use a bicycle path in California. In California, design of Class I facilities is dictated by the Caltrans Highway Design Manual (HDM).

Benefits

- Bicycle paths can provide a desirable facility, particularly for novice riders and children, recreational trips, and long distance commuter bicyclists of all skill levels who prefer separation from traffic.

Applications

- These facilities are frequently found in parks, along rivers beaches, in rail rights-of-way , and in utility corridors with sufficient right-of-way width.
- Bicycle paths may be considered along roadways under the following conditions:
    - The path will generally be separated from all motor vehicle traffic with few intersections with motor vehicles.
    - Bicycle use is anticipated to be high or a need for facilities for novice-bicyclists is demonstrated.
    - In order to provide continuity with an existing path through a roadway corridor.
    - The path can be terminated at each end onto streets with good bicycle facilities, or onto another well-designed path.
    - There is adequate access to local cross-streets and other facilities along the route.
    - Grade separated structures do not add substantial out-of-direction travel.



Separating pedestrians from bicycle traffic on bicycle paths avoids pedestrian-bicycle conflicts.

Considerations

- Both the Caltrans Highway Design Manual (HDM) and the AASHTO Guide for the Development of Bicycle Facilities generally recommend against the development of bicycle paths directly adjacent to roadways. Also known as "sidepaths", these facilities may create a situation where a portion of the bicycle traffic rides against the normal flow of motor vehicle traffic and can result in wrong-way riding when either entering or exiting the path. This can also result in unsafe situations where motorists entering or crossing the roadway at intersections and driveways do not notice bicyclists coming from their right, as they are not expecting traffic from that direction. In addition, stopped cross-street motor vehicle traffic or vehicles exiting side streets or driveways may frequently block paths or pull out unexpectedly. Bicyclists traveling from an unexpected direction may go unnoticed by motorists, especially when sight distances are poor.

Design Guidance

Some of the elements that enhance off-street path design include:

- Frequent access points from the local road network. If access points are spaced too far apart, users will have to travel out of the way to enter or exit the path, which can discourage use.
- Grade-separated crossings (bridges or underpasses) at intersections.
- Placing wayfinding signs to direct users to and from the path at major roadway crossings.
- Building to a construction standard high enough to allow heavy maintenance and emergency equipment to access the path without causing deterioration.
- Proper design of intersections with on-street roadways, to alert motorists to the presence of bicyclists and to alert bicyclists to the presence of motor vehicles for all crossing movements.


A bicycle path next to a roadway should include physical barriers to prevent bicyclists from encroaching on highway traffic.

- Identifying and addressing potential security problems.
- Provision of separate pedestrian ways to reduce conflicts.
- Landscape designs that encourage bicyclist use and safety, but discourage loitering.
- The following design standards are derived from the Caltrans Highway Design Manual, the California MUTCD, and existing City of Los Angeles design practice.

- **Width:** The minimum paved width for a two-way bicycle path shall be 12 feet. 4' for two-way bicycle travel lane with 2' shoulders. 17' is preferred with 2' shoulders, 4' each way for two-way bicycle travel lane and 5' for pedestrians. A minimum 2-foot wide graded area shall be provided adjacent to the pavement on each side. Additional clearance of 1 foot must be added for signage.
- **Clearance to Obstructions:** A 2-foot minimum shoulder on both sides of the path is required by Caltrans' HDM. The City of Los Angeles paves the 2-foot shoulder. An additional foot of lateral clearance (total of 3 feet) is required by the CA MUTCD for the installation of signage or other furnishings. Grading is not required beyond the 2-foot shoulder.
- The clear width between structures and railings should be not less than 12 feet.
- The vertical clearance to obstructions across the clear width of the path shall be a minimum of 12 feet.
- **Striping:** The City of Los Angeles requires a 4-inch dashed yellow centerline stripe with 4-inch solid white edge lines to delineate bi-directional bicycle travel, and the shoulder needs a 2' white stripped shoulder for pedestrian use.
- **Separation from Roadway:** Bicycle paths closer than 5 feet from the edge of the shoulder shall include a physical barrier to prevent bicyclists from encroaching onto the highway. Bicycle paths within the clear recovery zone of freeways shall include a physical

barrier separation. Suitable barriers may include chain link fences.

- **Noise and dust:** Bicycle path corridors adjacent to busy roadways, freeways or rail lines may be subject to noise, dust, vibration or vandalism, which may discourage use of the path. Methods of reducing this impact include the addition of vegetation or baffles to fencing barriers. This can increase the initial cost and ongoing maintenance cost.

- **Surfacing:** The use of asphalt surfacing is the most common surface used for new bicycle paths in Los Angeles and has proven to be the most suitable for long-term use. However, the material composition and construction methods used can have a significant determination on the longevity of the pathway. Thicker asphalt sections (min. 4") and a well-prepared subgrade will reduce deformation over time and reduce long-term maintenance costs. If asphalt is to be used for surface material, redwood headers must be used to form the pathway. Using modern construction practices, asphalt provides a smooth ride with low maintenance costs and provides for easy repair of surface anomalies.

- Concrete is also a common surface for bicycle paths. The surface must be cross-broomed and the crack-control joints should be saw-cut, not troweled. Concrete paths cost more to build than asphalt paths, and can be highly durable, but concrete is subject to frequent cracking, and repairs to concrete path are more costly and time consuming than repairs to asphalt paths.

- Off-street paths should be designed with sufficient surfacing structural depth for the subgrade soil type to support maintenance and emergency vehicles. Where the path must be constructed over a very poor subgrade (wet and/or poor material), treatment of the subgrade with lime, cement or geotextile fabric should be used.

- Design Speed: The minimum design speed for bicycle paths is 25 miles per hour except on long downgrades as described in the table below, where a 30 mph design speed should be used. Installation of "speed bumps" or other similar surface obstructions, intended to cause bicyclists to slow down in advance of intersections or other geometric constraints, should generally not be used.

- **Horizontal Alignment and Superelevation:** The minimum radius of curvature negotiable by a bicycle is a function of the superelevation rate of the bicycle path surface, the coefficient of friction between the bicycle tires and the bicycle path surface, and the speed of the bicycle.

- For most bicycle path applications the superelevation rate will vary from a minimum of 2 percent (the minimum necessary to encourage adequate drainage) to a maximum of approximately 5 percent (beyond which maneuvering difficulties by slow bicyclists and adult tricyclists might be expected). A straight 2 percent cross slope is recommended on tangent sections. The minimum superelevation rate of 2 percent will be adequate for most conditions and will simplify construction. Superelevation rates steeper than 5 percent should be avoided on bicycle paths expected to have adult tricycle traffic.

Design Speed of Bicycle Paths

Type of Facility	Design Speed
Bicycle Paths with Mopeds Prohibited	25 mph
Bicycle Paths on Long Downgrades (steeper than 4%, longer than 50 feet)	30 mph

- The minimum radius of curvature can be selected from the table below. When smaller curve radii (i.e., smaller than the minimum radii shown below) must be used on bicycle paths because of right of way and/or topographical considerations, then standard curve warning signs and supplemental pavement markings should be installed. The negative effects of nonstandard curves can also be partially offset by widening the pavement through the curves.

- **Stopping Sight Distance:** To provide bicyclists with an opportunity to see and react to the unexpected, a bicycle path should be designed with adequate stopping sight distances. The distance required to bring a bicycle to a full controlled stop is a function of the bicyclist's perception and brake reaction time, the initial speed of the bicycle, the coefficient of friction between the tires and the pavement, and the braking ability of the bicycle.

- The table below indicates the minimum stopping sight distances for the common design speeds and grades on two-way paths. For two-way bicycle paths, the descending direction, that is, where grade is negative, will control the design. The higher design speed should be used on segments with five percent grade and higher.

Grades: Bicycle paths typically attract less-skilled bicyclists, so it is important to avoid steep grades in their design. Bicyclists not physically conditioned will be unable to negotiate long, steep uphill grades. Since novice bicyclists often ride poorly maintained bicycles, long downgrades may also cause problems. For these reasons, bicycle paths with long, steep grades will

Curve Radii and Superelevation

Minimum Radius (feet)				
Design Speed (mph)	2% Superelevation	3% Superelevation	4% Superelevation	5% Superelavation
25	154	147	141	137
30	282	269	259	249

Stopping Distance

Stopping Distance (feet)					
Design Speed (mph)	0% Grade	5% Grade	10% Grade	15% Grade	20% Grade
25	176	197	232	300	507
30	246	279	332	440	763

generally receive very little use. The maximum grade rate recommended for bicycle paths is 5 percent. It is desirable that sustained grades be limited to 2 percent if a wide range of riders is to be accommodated. Steeper grades can be tolerated for short segments (e.g., up to about 500 feet). Where steeper grades are necessitated, the design speed should be increased and additional width provided.

Lighting: Fixed-source lighting reduces conflicts along paths and at intersections. In addition, lighting allows the bicyclist to see the bicycle path direction, surface conditions, and obstacles. Lighting for bicycle paths is important and should be considered where riding at night is expected, such as bicycle paths serving college students or commuters, and at highway intersections. Lighting should be installed through underpasses or tunnels, and where nighttime security may be a problem.

Depending on the location, average maintained horizontal illumination levels of 5 lux to 22 lux should be considered. Where special security problems exist, higher illumination levels may be considered. Light standards (poles) should meet the recommended horizontal and vertical clearances. Luminaries and standards should be at a scale appropriate for a bicycle path. In the City of Los Angeles, the Department of Public Works Bureau of Street Lighting works with the Department of Transportation to establish lighting standards for equipment and lighting levels.

References

Caltrans Highway Design Manual

California MUTCD

7.3 Multi-Purpose Paths in River and Utility Corridors

Multi-Purpose Paths in river and utility corridors provide unique bicycling and pedestrian opportunities. Utility corridors typically include powerline and sewer corridors, while waterway corridors include flood control channels, drainage ditches, rivers, and beaches.

Benefits

Provide excellent transportation and recreation opportunities for bicyclists of all ages and skills.

Applications

Path development along these corridors already exist in Los Angeles (e.g., along the Los Angeles River and Ballona Creek).

Design Guidance

Path Width

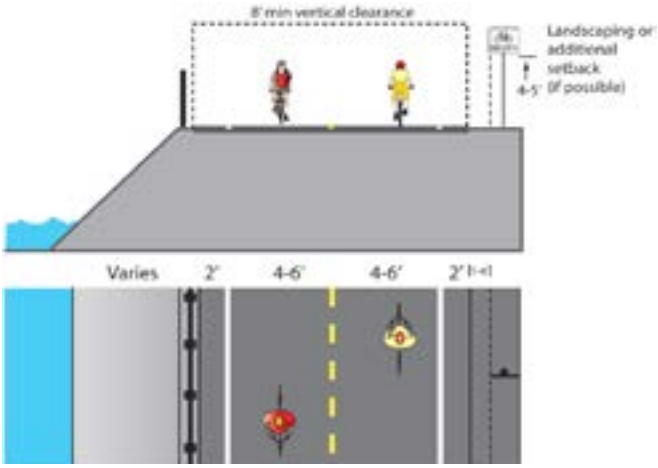
- 12' minimum (8' paved area + 2' shoulders on each side) + 1' clearance for signage
- 17' when 5' parallel pedestrian path is included
- Paths in utility corridors should meet or exceed Caltrans Highway Design Manual standards. If additional width allows wider paths and landscaping are desirable

Access Points: Any access point to the path should be well-defined with lighting and appropriate signage designating the pathway as a bicycle facility and prohibiting motor vehicles. Path access should be facilitated by gates.

Path Closure: Public access to a path in a flood control channel is prohibited during:

- Flood control channel utility maintenance or other activities
- Inclement weather or the prediction of storm conditions

Fencing: Public access to flood control channels or canals is undesirable during storm events when hazardous materials, deep waters, swift currents, debris, and steep, slippery slopes may pose a public safety threat. Appropriate fencing may be required to keep path users within the designated travel way and away from hazards. The City of Los Angeles requires 5' as a minimum height for fences or railings along the bicycle paths. Such fences or railings should be present on the channel side of the path. Typical fencing on the channel side may be constructed out of metal such as galvanized pipe to allow for views down into the channel.



Fencing along the edge of a path can protext bicyclists from hazards.

References

Flood control channels are not discussed specifically, but general bicycle path guidance is available in the following documents:

California MUTCD

Caltrans Highway Design Manual

AASHTO Guide for the Development of Bicycle Facilities

7.4 Multi-Purpose Paths in Existing Active Rail Corridor

Existing active rail corridors can provide bicycling and pedestrian facilities ("rail-with-trail") if the necessary right-of-way can be accommodated.

Benefits

These corridors offer excellent transportation and recreation opportunities for bicyclists of all ages and skills.

Applications

These facilities have been proposed and developed within active rail corridors throughout the City of Los Angeles (e.g., the San Fernando Road Bicycle Path and the Expo Light Rail Bicycle Path).

Considerations

It should be noted that some constraints may impact the feasibility of rail-with-trail projects. In some cases, space may need to be preserved for future planned freight, transit or commuter rail service. In other cases, limited right-of-way width, inadequate setbacks, concerns about safety/trespassing, and numerous mid-block crossings may affect a project's feasibility.

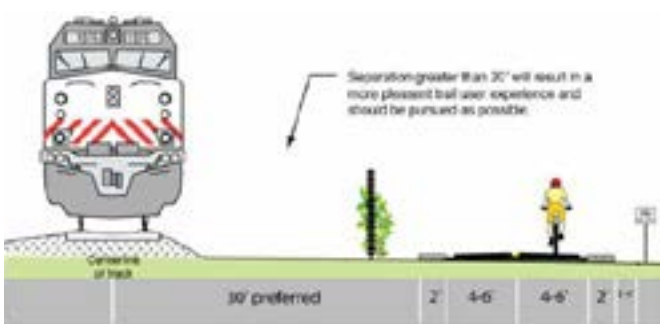
Design Guidance

Bicycle Path Width:

- 12' minimum (8' paved area + 2' shoulders on each side) + 1' clearance for signage.
- 17' when 5' parallel pedestrian path is included.

Setback:

- The setback is the distance from the centerline of the railroad to the edge of the bicycle path facility. Each railroad generally has its own policies on bicycle paths adjacent to active rail lines. For example, the BNSF's policy on "Trails with Rails" states, "Where train speeds are greater than 90 mph, trails are not acceptable. No trail will be constructed within 100 ft. of any mainline track



where train speeds are between 70 mph and 90 mph. Trails may be constructed between 50 ft. and 100 ft. where mainline train speed is 50 mph to 70 mph. Trails may be constructed 50 ft. from centerline of track where train speeds are 25 mph to 50 mph, and 30 ft. from any branchline track with speeds of 25 mph or less. No trails less than 30 ft. from centerline of track for any reason."

- The Southern California Regional Rail Authority (SCRRA) has published guidelines for rail-with-trail projects and identifies its minimum recommended setback requirements:
    - 45 feet for main line track where train speeds exceed 90mph
    - 40 feet for main line track where train speeds is between 90 and 78 mph
    - 35 feet where main line speed is between 78 and 60 mph
    - 30 feet where main line speeds is between 59 and 40 mph;
    - 25 feet where main line speed is below 40 mph.
- Additionally, the SCRRA acknowledges that it may not be possible to provide recommended minimum setbacks at certain points. "Additional barriers, vertical separation or other methods will be employed.
- **Separation:** Separation is any physical barrier that keeps bicycle path users from accessing railroad operations. Separation can take the form of fencing, walls, vegetation, vertical grade, and ditches or swales. Fencing is the most common form of separation and can vary from chain link to wire, wrought iron, vinyl, steel picket, galvanized pipe, and wooden rail. Fencing should be a minimum of 5 feet in height with higher fencing usually next to sensitive areas such as switching yards.
- **Fencing:** Railroads typically require fencing with all rail-with-trail projects. Concerns with trespassing and safety can vary with the amount and type of train traffic on the adjacent rail line and the setting of the bicycle path, i.e. whether the section of track is in an urban or rural setting. The SCRRA typically requires tubular steel or welded wire mesh fencing. Exceptions may be granted that include 'best practices to ensure safe trail use and rail operations'. In rural or environmentally sensitive areas, fencing options may include a three rail split-rail fence in combination with landscaping. Fence height should be four to five (4-5) feet within 150 feet of at-grade crossings and six (6) feet in other areas.

Other Discussion

Existing Guidance:

From Rails-with-Trails: Lessons Learned, FHWA, 2002: "No national standards or guidelines dictate rail-with-trail facility design. Guidance must be pieced together from standards related to bicycle paths, pedestrian facilities, railroad facilities, and/or roadway crossings of railroad rights-of-way. Bicycle path designers should work closely with railroad operations and maintenance staff to achieve a suitable RWT design. Whenever possible, path development should reflect standards set by adjacent railroads for crossings and other design elements. Ultimately, RWTs must be designed to meet both the operational needs of railroads and the safety of bicycle path users. The challenge is to find ways of accommodating both types of uses without compromising safety or function."

References

Caltrans Highway Design Manual

CA MUTCD

AASHTO

"Rails-with-Trails": Lessons Learned, FHWA, 2002

SCRRA Rail-with-Trail Design Guidelines

7.5 Multi-Purpose Path Constructed within New Transit Corridor

New transit corridors can provide bicycling and pedestrian facilities if the necessary right-of-way can be accommodated.

Benefits

- Offers excellent transportation and recreation opportunities for bicyclists of all ages and skills
- Provides “first-mile last-mile” linkages to/from transit stations
- Provides a safe, protected bicycle route with a reduced number of street crossings

Considerations

High profile bikeways such as the Orange Line Bikeway require special design treatments to meet high use by pedestrians and bicyclists allowing for separation and other amenities.

Design Guidance

- **Path width:** 12’ minimum; 17’ with parallel 5’ pedestrian path; 1’ for signage clearance.
- **Pavement markings:** Standard pavement markings should be used per the CA MUTCD. In order to reinforce the need for separation of bicyclists and pedestrians, graphic markings may be used.
- **Striping:** 4” dashed yellow centerline, 4” solid white shoulder stripe, hash marks to separate bicyclists from pedestrians, where pedestrian facilities are provided.
- **Surfacing:** Paved surface thickness adequate to support maintenance vehicles (4” min). Redwood headers if asphalt surface.

The Orange Line Bikeway has separate lanes for bicycles and pedestrians.

References

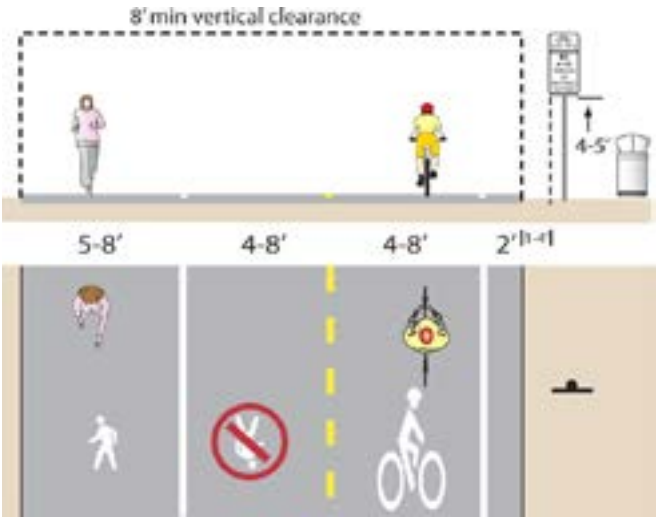
California MUTCD

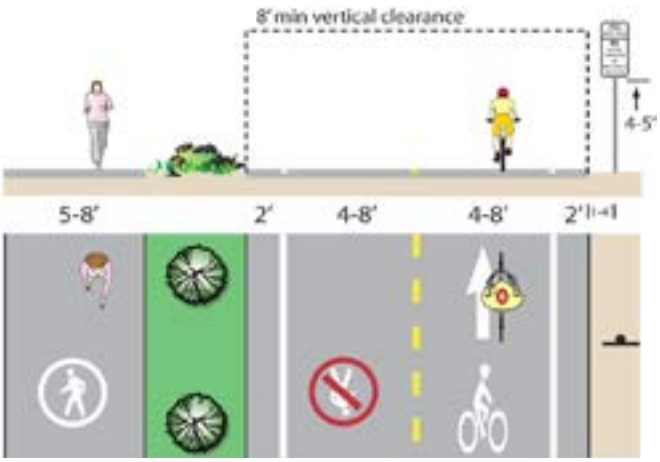
Caltrans Highway Design Manual

AASHTO Guide for the Development of Bicycle Facilities.

7.6 Coastal Paths

Coastal paths attract many types of pathway users and conveyances, including bicyclists, pedestrians, rollerbladers, and pedicabs.





Landscaping can be used to physically separate pedestrian and bicyclist right-of-ways.

Benefits

- Provides a pleasant recreational facility for many types of users to enjoy
- Provides a safe way to enjoy scenic rides and walks

Applications

- Coastal paths are applied along stretches of recreational beach sites.

Considerations

- The bicycle path should not be placed adjacent to large numbers of destinations.

Design Guidance

- **Path Width:**
  - Bicycle Path: 12' minimum;
  - 17' with parallel 5' pedestrian path
  - 1' clearance for signage.
- **Pavement Markings:** Standard pavement markings should be used per the CA MUTCD. In order to reinforce the need for separation of bicyclists and pedestrians, graphic markings may be used.
- **Surfacing:** Paved surface thickness 4", adequate to support maintenance vehicles. Redwood headers if asphalt surface.

- To provide an adequate and pleasant facility, adequate widths and separation are needed to maintain an enjoyable pathway environment.
- Offsetting of the pedestrian path should be provided if possible. Otherwise, separation should be provided in the form of striping or landscaping.
- The bicycle path should be located on whichever side of the path will result in the fewest number of anticipated pedestrian crossings. Site analysis of each project is required to determine expected pedestrian behavior.

References

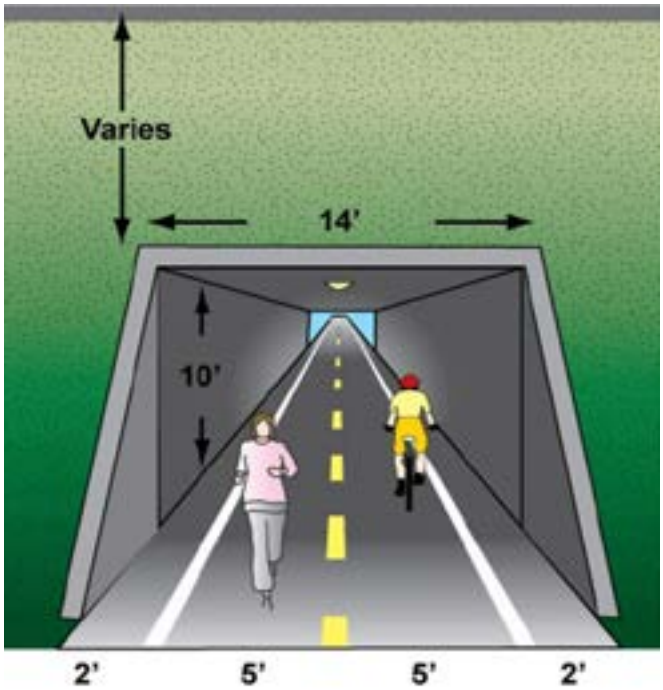
California MUTCD

Caltrans Highway Design Manual

AASHTO Guide for the Development of Bicycle Facilities

7.7 Grade-Separated Undercrossings and Overcrossings

Bicycle/pedestrian undercrossings and overcrossings provide critical bicycle path links by separating the path from conflicts with motor vehicles. These structures are designed to provide safe crossings for bicyclists where they previously did not exist.



Benefits

- Improves bicycle safety while reducing delay for all users.
- Eliminates barriers to bicyclists.
- Require less ramping and elevation change for the user versus an overcrossing, particularly for railroad crossings

Applications

- Undercrossings should be considered when high volumes of bicyclists and pedestrians are expected along a corridor and:
    - Vehicle volumes/speeds are high.
    - The roadway is wide.
    - An at-grade crossing is not feasible.
    - Crossing is needed under another grade-separated facility such as a freeway or rail line.
- Overcrossings should be considered when:
    - Vehicle volumes/speeds are high.
    - The roadway to be crossed consists of multiple travel lanes.
    - An at-grade crossing is not feasible.
    - Crossing is needed over a grade-separated facility such as a freeway or rail line

- An undercrossing or overcrossing may be appropriate where bicycle demand exists to cross a freeway in a specific location, or where a flood control channel (e.g., the Los Angeles River) separates a neighborhood from a nearby bicyclist destination.

- These facilities may also overcome barriers posed by railroads, and are appropriate in areas where frequent or high-speed trains would create at-grade crossing safety issues, and in areas where trains frequently stop and block a desired bicycle crossing point.

- They may also be required by the California Public Utilities Commission (PUC) which often prohibits new at-grade railroad crossings for bicyclists, or to replace existing at-grade crossings for efficiency, safety, and liability reasons.

- Hazardous bicycle crossing conditions (e.g., few or no gaps in the traffic stream, conflicts between motorists and bicyclists at intersections, etc.) could also create the need for an overcrossing or undercrossing.

Considerations

- If the crossing is not convenient or does not serve a direct connection, it may not be well utilized.

- Potential issues with vandalism and maintenance.

- Security may be an issue if sight lines through undercrossing and approaches are inadequate. Undercrossing width greater than 14 feet, vandal resistant lighting and/or skylights are desirable for longer crossings to enhance users' sense of security.

- Overcrossings require at least 17 feet of clearance to the roadway below involving up to 400 feet or greater of approach ramps at each end. Long ramps must meet ADA requirements.

Design Guidance

Undercrossings

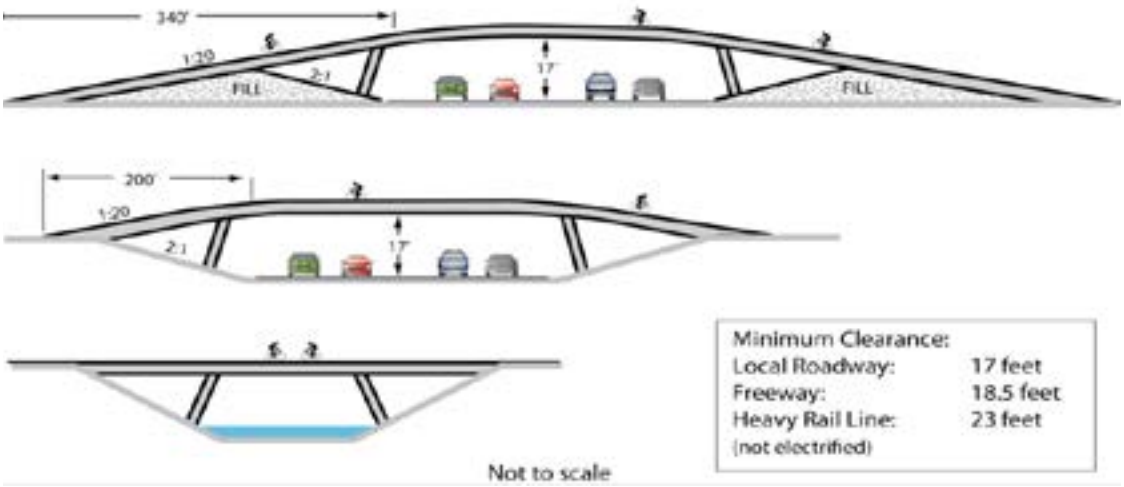
- Width: 14' minimum to allow for access by maintenance vehicles if necessary.

- Height: 10' minimum overhead clearance from the path surface.

- Pavement Markings: Standard pavement markings should be used per the CA MUTCD. In order to reinforce the need for separation of bicyclists and pedestrians, graphic markings may be used.

- Lighting: Vandal-resistant lighting should be installed with all undercrossings in culverts or tunnels.

- Grade Requirements: As with other path sections, grade should not exceed 5%.



When a bicycle path follows a low-lying flood control channel, an undercrossing is often necessary.

- **Overcrossings**

- Width: 12' minimum width. 14' preferred. If overcrossing has any scenic vistas additional width or belvederes should be provided to allow for stopped path users. A separate 5' pedestrian area be provided for facilities anticipated to have high bicycle and pedestrian use.

- Height: 10' vertical clearance.

- Signage & Striping: 4" dashed yellow centerline, 4" solid white shoulder stripe, hash marks to separate bicyclists from pedestrians, where pedestrian facilities are provided.

- Grade: Ramps should not exceed 5% grade.

- Overcrossings require a minimum of 17' of vertical clearance to the roadway below versus a minimum elevation differential of around 12' for an undercrossing. This results in potentially greater elevation differences and longer ramps.

- Ramp Considerations: Overcrossings for bicycles typically fall under the Americans with Disabilities Act (ADA), and guidance is included in the Caltrans HDM which strictly limits ramp slopes to 5% (1:20) with landings at 400 foot intervals, or 8.33% (1:12) with landings every 30 feet.

References

CA MUTCD

Caltrans Highway Design Manual

Caltrans Bridge Design Specifications

AASHTO Guide for the Development of Bicycle Facilities

AASHTO Guide Specifications for Design of Pedestrian Bridges

7.8 Fencing for Bike Paths

Fencing can serve multiple purposes along path facilities, including access control, visual screening, channeling of path users, and safety.

Benefits

- Provides safety for bicyclists and pedestrians
- Channels users accordingly along a path

Applications

- Fencing should be provided where exposure to hazards or safety risks are present along a path

Considerations

- **Cost:** Fencing and other barriers, depending on the type of materials used and the length, can be costly, so options should be considered carefully.
- **Fencing height:** The height and design of a fence influences whether lateral movement will be inhibited. Few fences are successful at preventing people from continuing to cross at historic illegal crossing locations. Fencing that cannot be climbed will typically be cut or otherwise vandalized. Heavy-duty fencing such as wrought iron or steel mesh security fencing that are difficult to climb or cut are often much more expensive.
- **Noise and dust:** Bicycle path corridors adjacent to busy roadways, freeways or rail lines may be subject to noise, dust, vibration or vandalism, which may discourage use of the path. Methods of reducing this impact include the addition of vegetation or baffles to fencing barriers. This can increase the initial cost and ongoing maintenance cost.

Design Guidance

- **Height:** 5' minimum

- **Security:** Fencing between the path and adjacent land uses can protect the privacy and security of the property owners. While crime or vandalism has not been proven to be a common problem along most bicycle paths, fencing is still considered a prudent feature. The type, height, and responsibility of the fencing is often dependent on local conditions.

- **Fence types:** Below are examples of common types of fencing typically used with bicycle paths.

  - *Type-I Steel Pipe Fence:* The City of Los Angeles standard steel pipe fence is a sturdy low maintenance option for bicycle path fencing.

  - *Type-III Chain-Link:* Chain-link fences are popular due to their effectiveness in keeping path users within the public right-of-way, relative low cost, and ease of maintenance but are often discouraged as "handle bar catchers." Most chain-link fences are visually unappealing and tend to project an image of an urban industrial environment. Chain-link is very easy to cut and vandalize and may not be useful in areas with a high history of trespassing. For these reasons, designers should be sensitive to the land-use context when considering the use of chain link fencing. Privacy slats, plastic woven fabric or wood battens can be installed within the chain link material to provide a solid-type barrier to help catch debris, prevent handle bar grabbing and provide wind and visual buffering.

  - *Type-V Wrought-Iron Picket Fence:* Often used as vandal-resistant fencing, and is used in locations that have a history of trespassing. It is difficult to cut and difficult to scale. Because of its cost and visual impact, it is typically used at specific locations rather than along an entire corridor.

  - *Type-II Post and Cable*: Post and cable fencing is an expensive option which serves primarily to demarcate right-of-way boundary but can be cut by vandals. The fence does not provide any screening or anti-trespassing features.

  - *Type-IV Vinyl-Coated Chain-Link:* Vinyl-coated chain-link offers the same level of security, low cost and maintenance with a more passive and polished appearance than galvanized chain link. Privacy slats, plastic woven fabric or wood battens can be installed within the chain link material to provide a solid-type of barrier to help catch debris, prevent handle bar grabbing and provide wind and visual buffering.

  - *Type-VI Steel Mesh Security Fence:* Sometimes referred to as Israeli-style fencing for its use in Israel to protect kibbutzs, this product is more expensive than chain-link, difficult to vandalize, difficult to scale and relatively easy to repair if cut. The fine grade of the mesh helps to prevent grabbing of handle bars. It would be inappropriate for areas requiring aesthetic treatment, and provides limited screening or buffering benefits.

  - *Type-VII Sound Wall:* Sound walls have high costs and visual impacts. Solid concrete block walls are virtually indestructible and offer complete buffering and screening. Walls are most commonly used in areas where a grade separation requires a retaining wall adjacent to the path. These structures can become targets for graffiti artists and can create visually isolated stretches of bicycle path.

References

Caltrans Highway Design Manual

AASHTO Guide for the Development of Bicycle Facilities

7.9 Programming and Temporary Treatments

Pop-Up Retail

Also known as a pop-up shop or flash retailing, pop-up retail (pop-up) is a temporary transformation of a vacant commercial space by a local entrepreneur or small-business owner. Pop-up businesses typically sell clothing, food, seasonal items, art, and other merchandise. Pop-ups activate streets and can help reduce commercial vacancies by demonstrating the business potential for these spaces.

A Farmers Market

Pop-Up Library

A pop-up library is a temporary installation offering free books to read, borrow, and donate. In addition to encouraging reading and learning, pop-up libraries can help to activate public spaces. There are examples of transforming underutilized street infrastructure, such as payphones and phone booths, into pop-up libraries.

Farmers Market

Farmers Markets are retail markets featuring food sold directly by farmers to consumers. Vendors sell products such as fruits, vegetables, meats, and other prepared dishes typically from booths or stands. Beyond offering the local community a source to fresh foods, farmers markets help to activate often large, underutilized spaces.

Pop-Up Plazas

Pop-Up Plazas are underutilized spaces, sometimes roadways, which are transformed into temporary pedestrian spaces. Delineated using temporary materials, such as paint or planters, these public spaces can have community and economic benefits by allowing for such things as outdoor seating, live music, or public art.
Like pop-up retail, pop-up plazas can demonstrate the potential for a permanent pedestrian plaza.

Pallet Furniture

Wooden pallets are a low cost material to build street furniture. Pallet furniture is often placed in strategic locations to enliven spaces such as alleys and street corners. Furniture is often designed to be moveable and for public use. The furniture can be painted, stained, or treated with a water seal to enhance its appeal and longevity.

Community Clean Up

Encouraging volunteers to help in a community cleanup is an affordable way to beautify a neighborhood while giving local residents and businesses a stronger sense of ownership to the community.

Mural Pavement Treatments

Pavement murals enhance pedestrian safety by encouraging drivers to slow down as they enter an intersection. These murals are an effective and low-cost alternative to traffic calming while enhancing the street.

Other Interventions

Public EV Charging Stations

Electric Vehicles (EVs) are a sustainable mobility alternative and are increasing in consumer demand. According to a study by the UCLA Luskin Center for Innovation, the adoption of EVs has the potential to help reduce carbon emissions and traffic noise. The study's market analysis found that Los Angeles has a strong market potential for EVs. Similar to meter parking, The City of Los Angeles can price EV charging stations to fund for its maintenance and other improvement projects. Installing EV charging stations in strategized locations can help to prepare and accommodate for future EV demand.

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