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**COMPLETE STREETS DESIGN GUIDE**
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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 and convenience of all transportation users – pedestrians, bicyclists, transit riders, and private 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 attractive. 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. They allow for healthy, recreational activities such as walking, running and bicycling. When designed to be safe and attractive, streets 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 not meant to supersede existing technical standards provided for in other City or national manuals. Rather, it 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 analyses 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, this Guide hopes to indoctrinate 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 everyone.

Mobility Plan 2035 represents the City’s 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 through future editions 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 comprised 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 actual infrastructure to altering signalization or simply reinforcing safety efforts with signage. Funding is also a major determinant of what types of treatments are feasible for certain projects.

The Complete Streets Design Guide is intended to serve a variety of users. For city departments that oversee the implementation of street improvement projects, this 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 manual when advocating for safety treatments in their neighborhoods. The Guide can also serve as an educational tool for students, practitioners, and other municipalities looking to develop their own complete street design guide.

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 (i.e., 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
Chapter 3. Complete Street Cross-Sections
Chapter 4. Sidewalks
Chapter 5. Roadways
Chapter 6. Intersections & Crossings
Chapter 7. Off-Street Non-Vehicular Treatments
Chapter 8. Appendices

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
Council. Los Angeles City Council
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 have different defini-
tions of elements within the street right-of-way. The following are definitions used in this 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 within the City and synchronize it with that of the United States.

Above Ground Infrastructure (AGI). AGI is used in BOE’s Street Design Manual.

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

Amenity Zone. The portion of the Sidewalk Area (Border) between the face of the curb and the Pedestrian Zone, where the primary functions of which is to support street trees and infiltrate stormwater and which may be occupied by street lights, street furniture, and above ground infrastructure. Where landscaping exists, the Amenity Zone is commonly referred to as the “parkway.”

Border. The term used by BOE for the portion of the public right-of-way between the face of curb and property line. In this Guide, this portion 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 agree to collectively fund improvement projects, services, or programs within their designated commercial area.

Complete Street Type. Identifies the street’s function relative to vehicles and all other modes.

Convenience Strip. A walkable strip behind and including the curb for access to parking where there is a non-walkable planted parkway or tree well.

Curb extension. A curb extension (also known as a bumpout or bulbout) extends the curb line and sidewalk out into the curbside portion of 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. Also referred to by DOT and BOE as curb return.

Flex Zone. The space adjacent to an existing curb face that can be utilized for sidewalk or roadway uses.

Frontage Zone. The portion of the Sidewalk Area adjacent to the property line, which typically includes the area for building entries and adjacent outdoor dining facilities.

Functional Classification. Streets are classified into distinct “functional” categories based on the amount of travel they are intended to accommodate and provide for.

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

Level of Service (LOS). A metric for measuring vehicle delay and traffic flow.

Median. The portion of divided highway 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. An auxiliary lane on the roadway utilized primarily for the parking of vehicles.

Parkway. The landscaped portion of a Sidewalk (Border) between the face of curb and walkway.

Pedestrian Zone. Also known as the Pedestrian Access Route (PAR), the Pedestrian Zone is a continuous and unobstructed path of travel provided for individuals traveling on the sidewalk.

Raised Landscaped Median. A raised longitudinal space separating the two main directions of traffic 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, excluding shoulders (per BOE including shoulders) for vehicular use. A divided highway has two or more roadways.

Shoulder. The area between the traveled roadway and the adjacent right of way limit line. It represents the same areas as the sidewalk (“border” per BOE) where there is no curb at the edge of the traveled roadway.

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. The Street Standards Committee consists of representatives from the Department of City Planning, Department of Transportation and Bureau of Engineering and is tasked with the responsibility of establishing street standards and applying them to streets within the city. The committee oversees any 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). Metric for measuring vehicle travel.

Walkway. Also known as the pedestrian access route (PAR), the walkway is the paved surface of the sidewalk located in the Pedestrian Zone.
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 volume of travel. Streets are broadly classified as either an arterial, collector, or local. Arterials can be thought of as the City’s trunk lines that provide access to major commercial destinations, while locals are typically streets in residential areas with low volumes of travel. Collectors serve to link travel on local streets to arterials and vice-versa.

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, Avenue III. The wider range of arterial categories allow streets to be classified more accurately according to their existing physical character and operational function. The previous arterial classifications, due to their preva-

lent 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 impact of land uses and transportation activities 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 number of travel lanes, sidewalk widths, and targeted operating speed.

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, an overlay of Pedestrian Enhanced Districts have been identified to target improvements in areas with high volumes of pedestrian activity.

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. Moderate bicycle enhancements typically include a bicycle lane (that may or may not have a painted buffer)
Pedestrian Enhanced Districts

Pedestrian-Enhanced Districts (PEDs) are typically around intersections or a series of consecutive intersections, where improvements for pedestrians are prioritized relative to improvements for other roadway users. 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, crossing refuge islands), sidewalk widening, and public seating areas. Pedestrian Enhanced Districts are selected based on a comprehensive assessment analysis that takes into consideration population density, job density, retail job concentrations, commercial land-use intensity, transit facility proximity and intensity, concentration of landmark destinations, intersection density, pedestrian collisions, park proximity, and school proximity.

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.

immediately adjacent to vehicular travel lanes (i.e., no on-street parking buffer); these bicycle lanes would not require intersection signalization for bicycles or turning-movement restrictions for motor vehicles. More comprehensive 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, cycle tracks would likely implement signalization for bicycles and 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 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) is 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 composed 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.
ARterial Streets

Arterial streets account for approximately 40% of the City’s streets (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 be located on 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 25 mph 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 Framework Element. A universal targeted operating speed of 15 mph is established for all turning movements at intersections.

Boulevard I (Major Highway Class I)

Roadway Width: 100 ft.

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

Typical Sidewalk/Border Width: 18 ft.
Target Operating Speed: 40 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
**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 local traffic and are not intended for cut-through traffic.

**Industrial Collector**

To accommodate larger vehicles, a typical Industrial Collector has larger curb returns to allow for the wider lane widths and turning radii required of trucks.
**Local (Continuous/Non-Continuous)**

Local streets are intended to accommodate lower volumes of vehicle traffic. Local streets have one lane in each direction and with parking on both sides of the street. They can be split into two types: “Continuous” and “Non-Continuous.” Continuous local streets connect to other streets at both ends, while Non-Continuous streets lead to a dead-end.

Roadway Width: 36/30 ft.
Right-of-Way Width: 60/50 ft.
Typical Number of Lanes: 1 lane in each direction
Typical Sidewalk/Border Width: 12/10 ft.
Target Operating Speed: 20/15 mph

**Industrial Local**

Industrial local streets provide the first and last mile connection 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
NON-ARTERIALS - 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, or Limited. Hillside Collectors are the primary streets leading into a hillside area. Hillside Local streets are narrower residential streets that branch off Hillside Collectors. Hillside Limited streets branch off of 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: 20 ft. min

Right-of-Way Width: 30 ft.

On-Street Parking: both sides of street

Target Operating Speed: 15 mph
OTHER PUBLIC RIGHTS-OF-WAY

The streets and other public rights-of-way in this category offer opportunities to meet unique access conditions. The Shared Street and Stormwater Greenway provide the City with two new street classifications in the S-470 that create lively public spaces for pedestrians, bicyclists and cars to co-exist in a safe, vibrant, slow-speed environment.

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 visually enhance the aesthetics and reinforce the safety aspects of a shared street.

Target Operating Speed: 5 mph

Pedestrian Walkway

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

Public Stairway

Public stairways are located in hillside areas and provide pedestrians with important access to hillside residential areas.

Stormwater Greenway

A stormwater greenway includes an above-ground detention basin for storing temporary runoff in order to capture, infiltrate, and remove pollutants from street-water runoff, as well as paths of travel for pedestrians, bicyclists, and limited vehicular traffic.

Stormwater greenway width: variable
Detention Basin width: variable
Walkway width: 5’ minimum
Planting area width: 3’
Roadway width: 15’
Targeted Operating Speed: 5 mph
NON-ARTERIALS – SERVICE ROADS

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

One-Way Service Road

Right-of-way width: 25-31'
Roadway width: 12-18'
Walkway Width: 5'
Curb separation from arterial street: 3'

Bi-Directional Service Road

Right-of-way width: 33'-41'
Roadway width: 20-28''
Walkway Width: 5'
Curb separation from arterial street: 3'

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.
ALLEYS

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'
Curb return: 20'
Standard Cut-corners: 14.14'
Targeted Operating Speed: 5 mph

Standard Cross-section for 90° Intersection (Plan View)

Minimum Turning Area (Plan View)

Standard Turning Area (Plan View)

Standard Cut-corners (Plan View)
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The illustrations on the following pages show how complete streets may be implemented within different street designations of varying roadway widths.

**Street Classifications and Network Assignments**

The cross section diagrams are numbered according to Street Classification (lettered “A” to “I”) and Network Assignment (numbered 1.0-4.0)

<table>
<thead>
<tr>
<th>Street Classification</th>
<th>Typical Row Width</th>
<th>Typical Roadway Width</th>
</tr>
</thead>
<tbody>
<tr>
<td>A Boulevard I (Major Highway Class I)</td>
<td>136’</td>
<td>100’</td>
</tr>
<tr>
<td>B Boulevard II (Major Highway Class II)</td>
<td>110’</td>
<td>80’</td>
</tr>
<tr>
<td>C Avenue I (Secondary Highway)</td>
<td>100’</td>
<td>70’</td>
</tr>
<tr>
<td>D Avenue II (Secondary Highway)</td>
<td>86’</td>
<td>56’</td>
</tr>
<tr>
<td>E Avenue III (Secondary)</td>
<td>72’</td>
<td>46’</td>
</tr>
<tr>
<td>F Collector Street</td>
<td>66’</td>
<td>40’</td>
</tr>
<tr>
<td>G Industrial Collector Street</td>
<td>68’</td>
<td>48’</td>
</tr>
<tr>
<td>H Local Street</td>
<td>60’</td>
<td>36’</td>
</tr>
<tr>
<td>I Non-Continuous Local Street</td>
<td>60’</td>
<td>30’</td>
</tr>
</tbody>
</table>

**Network Assignments**

1. **Neighborhood Enhanced (NEN)**
   1.1 Shared lane markings and Curbside parking

2. **Bicycle Enhanced (BEN)**
   2.1 Bicycle lane and Curbside parking
   2.2 Cycle Track - without curbside parking
   2.3 Cycle Track - with curbside parking

3. **Transit Enhanced (TEN)**
   3.1 Full-time or peak period transit lane (curbside)
      1. Cycle track
      2. Curbside parking
      3. Bicycle lane
      4. Bicycle lane and Curbside parking
   3.2 Bus Rapid Transit (BRT) (center-running)
      1. Cycle track
      2. Curbside parking
      3. Bicycle lane
      4. Bicycle lane and Curbside parking

4. **Vehicle Enhanced (VEN)**
   4.1 With off-peak curbside parking
   4.2 Without curbside parking
Legend for Complete Street Cross Sections

Symbols:

- **B** Cycle track/Bicycle lane
- **T** Full-time or peak period transit lane
- **BRT** Bus rapid transit
- **P** Curbside parking lane
- **11' (10')** Typical (minimum) dimension

Center Lanes & Raised Medians or Platforms:

- Striped roadway-level left-turn lane
- Raised median and/or roadway-level turn lane (variable depending on location along the street segment)
- Raised median or Platform

* Minimums illustrate the minimum width in which the illustrated cross section could be accommodated.
Complete Street Cross Sections

**A. Boulevard I (MAJOR HIGHWAY CLASS I) -- 136’ ROW, 100’ Roadway (Typical)**

### 2 Bicycle Enhanced (BEN)

#### 2.1 Bicycle lane and Curbside parking

![Diagram of Bicycle lane and Curbside parking]

#### 2.2 Cycle Track - without curbside parking

![Diagram of Cycle Track - without curbside parking]

#### 2.3 Cycle Track - with curbside parking

![Diagram of Cycle Track - with curbside parking]

### 3 Transit Enhanced (TEN)

#### 3.1 Full-time or peak period transit lane (curbside)

![Diagram of Full-time or peak period transit lane (curbside)]

#### 3.1.1 Full-time or peak period transit lane (curbside) + Cycle track

![Diagram of Full-time or peak period transit lane (curbside) + Cycle track]
Legend for Street Cross Sections

A. to I.) and Network Assignment (numbered 1.0-4.0). Streets with BRT and Network Assignments that may be implemented for each. Figure 2-1 provides a legend for all cross sections in this chapter. The following figures and table show the various Street Classifications and Network Assignments that may be implemented ...

Section Complete Street Sample Cross-Sections  Mobility  Complete Streets Manual

Legend for Street Cross Sections

### A. Boulevard I (MAJOR HIGHWAY CLASS I) -- 136’ ROW, 100’ Roadway (Typical)

#### 3.1 Curbside parking

- **Symbols:**
  - P: Curb
  - T: Transit lane
  - S: Sidewalk
  - R: Raised median
  - B: Bicycle lane
  - M: Median

#### 3.2 Bus Rapid Transit (BRT) (center-running)

- **Symbols:**
  - BRT: Bus Rapid Transit Travel lane
  - Platform: Platform

#### 3.2 Bus Rapid Transit (BRT) (center-running) + Cycle track

- **Symbols:**
  - BRT: Bus Rapid Transit Travel lane
  - B: Bicycle lane

### Note:
For all BRT sections, 2’ separation may narrow to 1’ at platform so platform may be 12’ wide.
A. Boulevard I (MAJOR HIGHWAY CLASS I) -- 136' ROW, 100' Roadway (Typical)

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

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

2.2 Cycle Track - without curbside parking

2.3 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 (curbside) +

3.1 a. Cycle track with curbside parking
B. Boulevard II (MAJOR HIGHWAY CLASS II) - 110' ROW, 80' Roadway (Typical)

3.1 b. Cycle track with 2-way left turn lane

3.1 c. Cycle track with curbside parking (one-way example)

3.1 Full-time or peak period transit lane (curbside) + Curbside parking

3.1 Full-time or peak period transit lane (curbside) + Bicycle lane
B. Boulevard II (MAJOR HIGHWAY CLASS II) - 110’ ROW, 80’ Roadway (Typical)

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

Midblock

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

3.2 Bus Rapid Transit (BRT) (center-running) +

3.2.1 Cycle track

3.2 Bus Rapid Transit (BRT) (center-running) +

3.2.2 Curbside parking

3.2 Bus Rapid Transit (BRT) (center-running) +

3.2.3 Bicycle lane (Buffer)
B. Boulevard II (MAJOR HIGHWAY CLASS II) - 110’ ROW, 80’ Roadway (Typical)

3.2 Bus Rapid Transit (BRT) (center-running) +
3.2.4 Bicycle lane and Curbside parking

4. Vehicle Enhanced (VEN)

4.1 With full-time or off-peak curbside parking

4.2 Without curbside parking

C. Avenue I (SECONDARY HIGHWAY) - 100’ ROW, 70’ Roadway (Typical)

1 Neighborhood Enhanced (NEN)

2.1 Bicycle lane and Curbside parking
C. Avenue I (SECONDARY HIGHWAY) - 100’ ROW, 70’ Roadway (Typical)

2  Bicycle Enhanced (BEN)
   2.2 Cycle Track - without curbside parking

   - Diagram of cycle track with curbside parking

   - Diagram of cycle track without curbside parking

3  Transit Enhanced (TEN)
   3.1 Full-time or peak period transit lane (curbside) +
      3.1  a. Cycle track (two way example)
      3.1  b. Cycle track (one way example)
      3.1  c. Cycle track (one way example)
      3.1  d. Cycle track (two way example)
C. Avenue I (SECONDARY HIGHWAY) - 100’ ROW, 70’ Roadway (Typical)

3.1 Full-time or peak period transit lane (curbside) + Bicycle lane

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

At platform

3.2 Bus Rapid Transit (BRT) (center-running) + Cycle track (Midblock)

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

4 Vehicle Enhanced (VEN)

4.1 With full-time or off-peak curbside parking
C. Avenue I (SECONDARY HIGHWAY) - 100' ROW, 70' Roadway (Typical)

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 Trails

2 Bicycle Enhanced (BEN)

2.2 Cycle Track - without curbside parking

2.3 Cycle Track - with curbside parking
D. Avenue II (SECONDARY HIGHWAY) - 86' ROW, 56' Roadway (Typical)

3 Transit Enhanced (TEN)

3.1 Full-time or peak period transit lane (curbside) +

3.1.1 a. Cycle track with parking

3.1.1 b. Cycle track with out parking

3.1.1 c. Cycle track (one-way example)

3.1 Full-time or peak period transit lane (curbside) +

3.1.2 Curbside parking
D. Avenue II (SECONDARY HIGHWAY) - 86’ ROW, 56’ Roadway (Typical)

3.1 Full-time or peak period transit lane (curbside) +
3.1.3 Bicycle lane

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

At/approaching platform - widen roadway 3’ on each side

3.2 Bus Rapid Transit (BRT) (center-running) +
3.2.1 Cycle track
E. Avenue III (Secondary) - 72' ROW, 46' Roadway

1 Neighborhood Enhanced (NEN)
   1.1 Shared lane markings and Curbside parking

2 Bicycle Enhanced (BEN)
   2.1 Bicycle lane and Curbside parking

F. Collector Street - 66' ROW, 40' Roadway

1 Neighborhood Enhanced (NEN)
   1.1 Shared lane markings and Curbside parking
### G. Industrial Collector Street - 68' ROW, 48' Roadway

**1 Neighborhood Enhanced (NEN)**

**1.1 Shared lane markings and Curbside parking**

![Diagram of Industrial Collector Street]

### H. Continuous Local Street - 60' ROW, 36' Roadway

**1 Neighborhood Enhanced (NEN)**

**1.1 Shared lane markings and Curbside parking**

![Diagram of Continuous Local Street]

### I. Non-Continuous Local Street - 60' ROW, 30' Roadway

**1 Neighborhood Enhanced (NEN)**

**1.1 Shared lane markings and Curbside parking**

![Diagram of Non-Continuous Local Street]
SIDEWALK ZONES

Components of the Public Right-of-Way

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”)

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.”

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.

Pedestrian Zone, Also known as the Pedestrian Access Route (PAR), the Pedestrian Zone is a continuous and unobstructed path of travel provided for individuals traveling on the sidewalk.

Amenity Zone. The portion of the Sidewalk Area (Border) between the face of the curb and the Pedestrian Zone, where the primary functions of which is to support street trees and infiltrate stormwater and which may be occupied by street lights, street furniture, and above ground infrastructure. Where landscaping exists, the Amenity Zone is commonly referred to as the “parkway.”

Flex Zone, The space – usually the width of a parking lane – adjacent to an existing curb face that can be utilized for roadway uses or extensions of the sidewalk (curb extensions).

Roadway, The portion of the right-of-way, excluding shoulders (per BOE including shoulders) for vehicular use. A divided highway has two or more roadways.

Sidewalk Area and Roadway Zones

- 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
- 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
- Bicycle corrals
- Bike share 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

MORE COMMON PEDESTRIAN & BIKE
LESS COMMON VEHICULAR
4.1 BUILDING ENTRIES

Building entries can be enhanced by resourceful 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 light columns) can also be enhanced in similar fashions.
- 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.

Design Guidance

- 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 must meet ADA standards for accessible surfaces.
- 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.

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, metal gate/screen roll-up doors 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.

References

BOE/BSS R-Permit procedure
BOE Entrance Canopy Permit procedure
S-601-3
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.
- The utilization of the sidewalk area for 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.

Design Guidance

- 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 including intersections. 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.
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, can provide a coherent image of a neighborhood or district, mark entry points, and give 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 must 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.

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. See design guidance (below) for guidelines and approaches that address these concerns.

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 accessibility 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 on single poles (or a maximum of two, if necessary) to minimize the number of poles at shared bus stops.

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 adopted for use in the City. These designs communicate parking hours and restrictions in a clear manner for all road users including non-English speakers.

**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:
  • The amenity or frontage zones
  • Curb extensions in the flex zone
  • Public plazas
» 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**

» 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 relaxed 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 outside dining areas is discussed in “Dining Facilities”, section 4.5 below.

Considerations and Guidance

» Seating shall 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).
Other Discussion

In Los Angeles, a property owner is granted condition-al 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.

» 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 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.

» Curbside seating should be avoided where there is a curbside vehicular travel lane, although it is acceptable at transit stops. 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.
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 café, or it can be as substantial as a semi-enclosed dining patio.

Benefits

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

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). In addition, 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 must 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 may 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 extension 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 stimu-
late 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.

**References**

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 place-making 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.
- 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.
- Maintenance should be coordinated with sponsoring agencies or groups.
- The siting of public art should maintain all clearances and applicable Americans with Disabilities Act (ADA) requirements.
- 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-commer-
cial 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
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 streets.
- 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.

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 many arterial and non-arterial streets in Los Angeles, landscaping and trees are interspersed along the sidewalk area, typically within tree wells. Generally, adjacent property owners and/or community/business groups are responsible to care for plantings. 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. Landscaping and trees are also planted in center medians within the roadway; generally, the city is responsible for planting and maintaining a landscape median.
- Landscaping and trees can also be planted in the frontage zone in 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.

Guidance

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. Select plants that can tolerate the environmental elements, such as radiant heat from the sidewalk or street surface or wind from passing traffic.

» 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 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.

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.

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).
  
  • Mature height: no limits/maximaums, 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 current); Non-arterials: 24-inch box
- Trunk diameter, 4' high: 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 even 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

Applications

» The choice of 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 transit bulbs, 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.

- 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.

- 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.

- 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.

- Stormwater facilities in the sidewalk area can potentially impair pedestrian circulation and accessibility. Unlike traditional parkway strips with grass as a primary component, stormwater facilities do not provide an adequate surface for walking. Where street parking exists, design solutions should ensure pedestrian access between the sidewalk area and the parking lane.

- 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.

» 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.

» 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.

» 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.

**Guidance**

» The selection of the best method for a given site is made by considering a combination of factors, presented in Table 4.5 of the Bureau of Sanitation’s LID Handbook. [Biofiltration BMP Design Criteria* (p. 52)]

» 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 stand-alone facility is lessened.

» The siting of stormwater management facilities must be coordinated with existing siting of utilities including water mains, power, fire hydrants, etc.

» In general, facilities that allow infiltration should be setback at least 10 feet from building foundations. This minimizes the chance that saturated soils could damage the foundation.

» Design sidewalks to infiltrate stormwater that falls directly on the sidewalks: either 1) design planted areas to infiltrate runoff from both paved and unpaved portions of the sidewalk with an overflow to the street or storm drainage system when volume exceeds the infiltration rate, or 2) otherwise design paving and subsurface media to infiltrate stormwater.

» 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.

» When developed in the amenity zone and where there is curbside parking, 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 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 that have been found to work well in existing BMPs. 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).

» Maximize streetwater management by integrating it into the myriad design elements in the public right-of-way. The water system is part of a larger, interconnected system. Maximize the benefits of stormwater strategies. For example, traffic calming and road diets can double as streetwater harvesting strategies. In addition, use vegetation to make streets better places and use streetwater management as an integral element of the urban forest.

» Show the water flow. The benefits of stormwater management are ecological, economic, and social.
Blockages are easier to notice and easier to access for regular maintenance.

**Common Treatments in the Public R-O-W**

**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 they 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 suit-
Permeable paving surfaces come 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 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.

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.
posed granite, “structural soil” or natural paths that achieve similar effect to permeable paving.

» 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, sub-drainage 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 walkway 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-resistant” surfaces. However, poured-in-place porous paving is usually ADA compliant and can sometimes be used in active pedestrian areas.

» 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 R-O-W

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**

The City’s Low Impact Development (LID) Ordinance (2011), ensure 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 redevelopment projects 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**


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

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

City-approved plant materials list, Bureau of Street Services

Existing BOE Standard Plans:
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
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.

Benefits

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

Applications

iscrim 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.
iscrim 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.
iscrim 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.
iscrim 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 5.17 below).
iscrim 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.

iscrim 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.

iscrim 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

iscrim 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.

iscrim 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.
  • 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 “art 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 ve-
hicular 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 through two parked parallel bicycles (BOE S-671 Standard Plan).

» Distance from other Street Furniture: 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, trash cans, other street furniture, and other sidewalk obstructions.

» Other Distances: 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.

Poorly designed bike racks that do not meet standards (above) and a bicycle repair station (below)

Frontage Zone:

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

» 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.

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

Parking meter poles traditionally serve as quasi bicycle racks, affording bicyclists convenient places to lock their bicycles. Bicycles locked to parking meter poles often impair access to the vehicular parking lane, and they can intrude into the pedestrian access route. The use of meter poles for bicycle parking is a good measure of a need for bicycle racks.

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 practice 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
- LADOT Sidewalk Parking Program http://Ww.bicyclela.org/Parking.htm
- 2013 Bicycle Parking Ordinance (LAMC Ord. No. 182386)
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 options 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
- 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.

**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, community groups, and the bikeshare operator.

**Design 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.
- 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.
- 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, and they can also support 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
- Supports variable pricing programs that de-incentivize car usage and increase parking revenue
- 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

Applications

- 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.

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 should be accessible per ADA requirements. When placed in a parkway strip, a concrete pad connected to the walkway should be provided at the meter’s base; alternatively, the meters may be placed adjacent to a concrete convenience/access strip (minimum 18” clear width).

Design Guidance

- Areas with multi-space pay stations often consist of delineated, numbered spacing stalls. They must be clearly numbered at the curb either by paint or, preferably, by a longer-lasting method such as numbered tiles.
- Alternatively, multi-space meters 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 must comply with the clearance requirements for all other street features and appurtenances, including tree wells, street lighting, bicycle racks, and news racks.

Other Discussion

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. Because meter poles are often used by bicyclists to secure their bicycles, the removal of meter poles should be accompanied by the installation of bike racks.
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 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 appropriate for 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.
- 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 demolition or excavation of existing walkway, and existing underground utilities may be impacted. Utility companies should be contacted and provided with plans outlining the proposed improvements.
- 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 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. Trenchless technologies, such as moling and tunneling, should be used wherever possible to avoid excavation and disruption of streetscape elements.
- 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.
- Utility vaults and valves should be minimized in...
curb extensions where planting or street furnishings are planned. Existing vaults located in a curb ramp should be moved or modified to meet accessibility requirements.

» 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.

» New infrastructure projects should use resource-efficient utility materials. Re-used or recyclable materials should be incorporated wherever possible.

» Utility boxes may be painted as part of a public art program. (See Section 4.6 above.)

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

Other Discussion

On most public right-of-ways 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 start 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.

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 (which are generally oriented to the roadway and provide less light to the sidewalk area.) 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 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 from 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.

» 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 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.

» 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 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 electrolite 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 (e.g. festivals, museum exhibitions, and special events).

These are discussed further in Section 4.6 “Public Art”.

Currently in Los Angeles, 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” (Bureau of Street Lighting). 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. Well-designed receptacles can be both highly functional and harmonize with other streetscape elements.

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 lessening the 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.
➤ Receptacles should generally be located in the amenity zone between the curb and the pedestrian walkway. This makes trash removal easier for maintenance crews stopping their vehicles in the roadway. Receptacles may also be located in the frontage zone; this can work well for businesses who agree to provide continued trash removal.
➤ 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.
➤ Waste and recycling receptacles should be located near street corners but at least 20’ feet from the intersection so that they do not inhibit visibility area.
➤ 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.

Design Guidance

➤ Trash receptacles should be paired with recycling receptacles at all locations; 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.
➤ They must 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.
➤ Receptacles should be opaque – not metal wire mesh – 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.
➤ 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.)
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

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.

Design 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. 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 Manual, the Los Angeles Department of Transportation offers preapproved parklet models to simplify and expedite approval and implementation. Community partners can choose from several models that utilize combinations...
of standardized components that 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 should 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 or 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

» 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 may that 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 mid-block stop locations should always be considered when evaluating the myriad of criteria.

Considerations

Far Side

» Queuing vehicles may block the intersection during peak periods

» Buses may obstruct sight distances for car drivers 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

Guidance
» All bus stop locations must be ADA compliant, and should be supplemented with visible signage and adequate street lighting.
» 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 accommodate 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
- Increases the overall waiting area for pedestrians, while also increasing the visibility of oncoming buses
- Increases the space to install a bus shelter 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 accessible boardings because pedestrians on the bus bulb will know where to expect the boarding door to be.
- Requires removing only two on-street parking spaces while the equivalent of four spaces are required for buses to pull over.

Applications

- Bus stop bulbs are applied on wide, multi-lane arterial corridors with on-street parking so that cars are able to pass stopped buses.
- They are applied at locations where the on-time performance of major high-frequency bus routes (e.g., Metro Rapid lines) are severely 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

- Bus stop bulbs temporarily block vehicle traffic while buses are boarding passengers, which may prompt unsafe vehicle maneuvers to pass stopped buses.
- Bus stop bulbs at near side stops affect streets that experience heavy right turn vehicle movements.
- Like other types of curb extensions, cost estimates, drainage concerns, utility relocation, and street sweeping operations should be analyzed before implementation.
- Although they produce traffic calming benefits, vertical deflection (e.g. speed tables, raised crosswalks) and horizontal deflection treatments (e.g. chicanes, neckdowns) should not be considered on major bus routes because they may degrade transit performance.

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.
- When located on the far side of the intersection, 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.
- Cities should work with transit providers to determine the clear width necessary to deploy a wheelchair accessible lift onto the bus bulb.
- 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 where motorists are likely to queue.
- Bus bulbs can provide opportunities for more seating, off-board payment collection equipment, and Metro tap card machines
- The effective corner radii of bus bulbs should balance the necessity to accommodate wider bus turns with the need for safe pedestrian crossings.
4.18 SIDEWALK EQUESTRIAN TRAIL

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 more horseback riding and provides a safe means for recreational riders to experience scenic parts of the City.

Benefits

» Provide access to scenic open spaces across parts of the City
» Ensure the safety and viability of horseback riding in the City with proper design and facilities
» Provide 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)
An esplanade integrates an offstreet bicycle path (typically two-way), a pedestrian walkway, trees, and landscaping into a wide 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
- Adds 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 6.3 “Protected Bicycle Lanes” in the Roadways Chapter
- 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 Lanes” in the Roadways Chapter and Section 6.9 “Bicycle Lanes at Intersections” in the Intersections and Crossings Chapter.

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5.1 PEDESTRIAN PLAZA

A pedestrian plaza is an outdoor public space 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, draw patrons to local neighborhood businesses, and feature pedestrian and bicycle-related amenities.

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(s) 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.

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 appropriately 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. Currently, the communities slated to receive plazas next are Pacoima, North Hollywood, and Leimert Park. 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 are designed to provide users with a safe, dedicated space 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 that provide 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.

Considerations
- On streets with heavy bicycle traffic, wider bicycle lanes should be considered in order to allow faster-moving bicyclists to pass one another.
- 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.

Design Guidance
- 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.
- 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 (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).

» Stripping:
  • 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.

» Signage for bicycles lanes (R81-CA MUTCD) must be provided at:
  • Beginning of bike lane
  • At approaches and at far side of all arterial crossings
  • At major changes in direction
  • At 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
  • At approaches and at far side of all arterial crossings
  • At major changes in direction
  • At intervals not to exceed ½ mile
  • At beginning and end of bicycle lane pockets at approach to intersection.

» Lean railings should be considered at intersection approaches to give bicyclists balance and support while they wait for the light to change.
  • Popular within the city of Copenhagen, this treatment consists of both a high railing for bicyclists to hold on to and a low railing to place their feet upon when waiting at the 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 common 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 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. 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.

» 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.

**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.

**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.
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.

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 ACCOMMODATION 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.

* Guidance: * San Francisco, CA; Vancouver, B.C.

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 where implemented (e.g., Portland, Oregon, Minneapolis, Minnesota).

Applications

» Protected bicycle lanes are typical 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 streets, 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 dense commercial districts and on arterials heavily traveled by bicyclists, and where connections to schools might best be served.
  » 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.
  » 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.
  » Visual and physical cues should be present that make it easy to understand where bicyclists and pedestrians should be moving.

Design Guidance

» Separation
  • Protected Bicycle Lanes can be separated from the travel lane by a device or barrier (e.g., pavement markings or coloring, flexible delineators, curbs/medians, on-street parking or a combination of these elements). 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.
  • Barriers used along Protected Bicycle Lanes to separate parking and motor vehicle travel lanes from bicyclists must provide adequate space to mitigate or remove the danger of passenger car “dooring.”

» Protected Bicycle Lane Only
  • Raised buffer without adjacent parking – If there is no parking adjacent to the buffer, the buffer may be as narrow as 2’; although a width of 4’ is preferable.
» 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' and a minimum width of 3'.

» 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, as well as, raised to be at-grade with the sidewalk and bus stop island, before descending to be at-grade with the travel lanes.

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 vehicle design widths.
» Raised buffers require additional design considerations, in particular, drainage, street cleaning and treatment at intersection.
» Access to fire hydrants must be accommodated by allowing fire trucks to mount the physical barrier.

Interim Design Strategies
» Remove parking spots temporarily and add painted
5.4 SHARED LANE MARKING (SHARROW)

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

Benefits

- Alerts motorists to the lateral location that bicyclists are likely to occupy within the travel lane
- Encourages the safe passing of bicyclists by motorists
- 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 should be applied on streets that are designated as bike routes (Class III bicycle facilities) and on streets that have travel speeds of 35 mph or less.

Design Guidance

» Where on-street parking is present, Shared Lane Markings (sharrows) should be placed a minimum of 12’ from the face of the curb or from the edge of the pavement where a curb is absent
  • It may be placed more than 12’ 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 when there is no curb.
  • 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

Considerations

» Shared Lane Markings should be provided only after fully considering the feasibility of a bike lane.

» In San Francisco, the San Francisco Municipal Transportation Agency added a green backing to increase the visibility of some of their shared lane markings. The SFMTA even placed a series of these green-backed shared lane markings in intersections to help guide left turning bicyclists.

References

CA MUTCD 9C.07 – Shared Lane Marking
5.5 SHARED BICYCLE-BUS LANE

Shared bicycle-bus lanes provide 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 coexist 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.

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. The City of Los Angeles uses the signage and stencils shown in the photographs.

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.

References
No explicit guidance in existing State or Federal manuals.
A 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.

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 Offset Bus Lane section).
- Peak-hour bus lanes may also be designed as shared bike-bus lanes (See Shared Bike/Bus Lane section for further information).
- Red paint should be considered as a supplemental treatment used to delineate and reinforce the lane for bus use only.

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.

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

The City of Los Angeles’ Department of Transportation currently has a standard plan (S-487) for Exclusive Bus Lane Markings.
5.7 OFFSET BUS LANE

Unlike peak hour bus lanes, offset bus lanes are located away from the curbside. These dedicated bus lanes do not have to replace on-street parking.

Unlike curbside bus lanes, offset bus lanes 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 Bus Bulb section).
- 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.

Considerations

- 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 Shared Bike/Bus Lane section for further information).
- Red paint should be considered as a supplemental treatment used to delineate and reinforce the lane for bus use only.

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
5.8 MEDIAN BUS LANE / BUSWAY

Median bus lanes enhance 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 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 (See Median Boarding Islands section).
- A median busway can be separated from other travel lanes using a curb strip or rumble strips.
- Setback guidelines and other land use regulations should be tailored to create a more inviting pedestrian realm.
- 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
5.9 BUS PAD

Reinforced concrete bus pads are placed at bus stops to help mitigate the impacts that frequent bus service and heavy vehicles have on the roadway.

**Benefits**
- Helps prevent long-term damage (i.e., gaps, cracks, 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.

**Considerations**
- Bus pads may require a longer length to be able to accommodate multiple bus lines and/or articulated buses at major boarding locations.

**References**
City of Los Angeles Bureau of Engineering standard plan S-433 - Bus Pad.
A median boarding island providing a boarding platform for passengers waiting for vehicles running exclusively in the center zone (e.g., center-running Bus Rapid Transit).

**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 only applied where transit runs in center lanes.

**Considerations**
- Unlike traditional transit stops, median boarding islands are physically separated from land uses and transfer points located on the sidewalk.
- 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.

**Design Guidance**
- 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.

**References**
ITDP BRT Guide 2007
5.11 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, bicycle lanes, and wider sidewalks by reducing a travel lane in each direction.

**Benefits**
- Increases driver awareness of bicyclists and pedestrians
- Discourages aggressive speeding and weavings that may result in collisions
- Reallocation of space for wider pedestrian-friendly sidewalks and bicycle facilities
- 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

**Applications**
- Road diet projects are applied to multi-lane streets with unsafe vehicle speeds and have a documented history of pedestrian and bicycle safety concerns
- Road diets can also be applied on streets designated for a bicycle lane improvement.
- 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.

**Considerations**
- Outreach should be conducted to inform communities and businesses about the safety, mobility, and potential economic benefits of a road diet project.
- By not forcing bus drivers to pull into and out of bus stops, the inclusion of bus bulbs can mitigate the impacts that road diets have on the reliability of transit operations in congested conditions.

**References**
5.12 LANE NARROWING

Roadway space can be optimized by narrowing the width of wider 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’ or wider), excess traffic capacity, and safety/speeding concerns.
- Lane narrowing can be done in conjunction with a road diet project.

**Design Guidance**

- Target operating speeds for each street classification should help guide street design decisions about lane widths.
- Streets with frequent volumes of larger vehicles, such as trucks and buses, should have one 11’ wide travel lane in each direction.

**References**

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

A neckdown, also known as a “choker” or “pinchpoint,” are curb extensions on both sides of a street at a midblock location. The narrower roadway helps calm vehicle speeds, while also providing opportunities for 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

Applications

» A neckdown (with or without a midblock pedestrian crosswalk) can be applied on streets where unsafe vehicle speeds pose a danger to pedestrians and/or midblock crossings.
» 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 sufficiently wide and long enough to maximize the benefit of shorter pedestrian crossings, while also narrowing the roadway 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 flexible delineators, striping, and planters and surface treatments. These temporary treatments provide safety benefits until funding becomes available to construct a concrete neckdown.
5.14 CHICANES

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 as they maneuver past the chicanes.

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 practices

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 midblock locations on narrower streets where there is a travel lane in each direction, or on one-way roads.

Considerations

» Motorists should not attempt to pass bicyclists while navigating past chicanes.

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 flexible delineators to demarcate the areas where the curb extensions would be.
» Configuring on-street parking spaces to create a chicane effect is another interim design solution.

References

NACTO Urban Street Design Guide
Institute of Transportation Engineers – Traffic Calming Measures: Chicane http://www.ite.org/traffic/chicane.asp
5.15 LANDSCAPED MEDIAN

A landscaped median can range from being a tree-lined promenade to an intensively landscaped boulevard median. It is a raised area separating traffic directions, or roadways within a street.

Benefits

- Channelizes vehicular traffic and limits midblock left-turns where appropriate
- Provides, at times, a pedestrian refuge on a wide street at pedestrian crossings
- Collects and treats or infiltrates stormwater
- Provides a visual separation that makes the roadway appear narrower and thus reduces speeds
- 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

Applications

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

Design Guidance

- Minimum width: At least 7' wide, including curbs. The median strip adjacent to a left-turn lane may be a minimum of 3' wide
- Minimum width to include trees: In order to accommodate trees, both in terms of soil volume and separation from travel lanes, medians should be at least 7' wide, including curbs.
- Tree spacing from intersection: In order to provide visibility, trees should be 50' from a crosswalk or from the limit line at an intersection where there is no crosswalk.
- Stormwater treatment: Where feasible, landscaped medians should be designed to prevent runoff onto roadways.
- 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.
- Where possible, vegetated gutters and bioswales should be included in the median to expand stormwater drainage efforts along the roadway.

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 as a result of separating traffic flow directions. They may also take up space that can be used for wider sidewalks, bicycle lanes, sidewalk landscaping, or on-street parking.
- The design of raised medians should not conflict with emergency vehicle operations and access.
- Landscaping or stormwater management treatments may require a partner for ongoing maintenance.
- Continuous raised median may prevent left turns into driveways on the opposite side of street. On streets that have a limited right of way, other treatments should be considered first before application of this treatment.

References

Bureau of Street Services - Urban Forestry Division http://bss.lacity.org/UrbanForestry/index_medianislands.htm
5.16 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
- Enhances the surround pedestrian and bicycling environment
- Alerts drivers they are traveling on a street where vulnerable users may be present (e.g., school children, senior residents)

**Applications**

» Speed feedback speed 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 crash locations to enable road users to slow down.

**References**

MUTCD Chapter 2L. Changeable Message Signs
5.17 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.
- Improves visibility at intersections by eliminating large vehicles parked at street corners.
- Makes bicycling more convenient (especially for local trips) when users know that bicycle parking is present.
- Serves as buffer between moving cars and pedestrians on the sidewalk.
- 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 by taking up one parking space.
- 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 can serve as buffers for the corral at both ends. Object marker signage can further increase the visibility of bicycle corrals.
- A 2' setback width the edge of the travel lane should be provided as a buffer between moving traffic and the corral.

- There should be adequate clearances from bus stops, fire hydrants, utilities (including manhole covers), driveways, tree wells, and other street furniture.
- Corrals can be located in a red curb zone as long as standard clearances are met. There should be at least a 25' clearance from a fire hydrant.
- Bicycle corrals should be located at least 30' from the intersection departure and 50' from the 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 – Bike Corrals http://ladotbikeblog.wordpress.com/bike-corrals/
Standard Plan: S-671 Bicycle Rack
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).

**Considerations**

» Outreach should be done to educate businesses and communities on how the conversion of on-street parking will benefit them.

**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.”

**References**

CA Vehicle Code Section 22507.1.
5.19 Back-in Angle Parking

Back-in angle parking requires cars to back into on-street parking space, which is typically oriented diagonally. When exiting the space, 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
- 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
- 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
- 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

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.
- Angled 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 be 6'. Striping should delineate the travel lane from the bicycle lane, but a second stripe is not necessary to delineate the bike lane and the parking stall.

Considerations

- Motorists should 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.

References

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 midblock locations (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.

Considerations

» Commercial vehicles should be discouraged from double parking in bike lanes during loading/unloading periods.

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.

References

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

Vehicles without a commercial license plate may load and unload passengers or baggage in these zones, but only for a maximum of 5 minutes.
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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

Applications

- At 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.

Considerations

- It may not be desirable or cost-effective to provide marked crosswalks at certain intersections when alternate treatments may achieve the same safety and visibility results.
- 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.

Design Guidance

- Continental striping provides high visibility for both motorists and pedestrians. They consist of 24" wide bars (placed perpendicular to the path of travel).
- 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.
- New marked crosswalks alone, without other measures designed to reduce traffic speeds, shorten crossing distances, enhance driver awareness of the crossing, and/or provide active warning of pedestrian presence, should not be installed across uncontrolled roadways where the speed limit exceeds 40 mph and either:
  - The roadway has four or more lanes of travel without a raised median or pedestrian refuge.
island and an ADT of 12,000 vehicles per day or greater; or
  - The roadway has four or more lanes of travel with a raised median or pedestrian refuge island and an ADT of 15,000 vehicles per day or greater. 

» On streets with low volume (<3,000 ADT), low speeds (<20 mph), and few lanes (1–2), marked crosswalks are not always necessary at the intersections.

» 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.¹

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

» 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.

» 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.

» Crosswalk markings near schools shall be yellow per CVC 21368

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.

**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.

**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.
Advanced 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 a motorist in an adjacent lane, resulting in the latter continuing through an unsignalized or uncontrolled crosswalk and potentially colliding with crossing pedestrians).

**Applications**

- Advanced 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**

- Advanced 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.
- Advance yield markings may be staggered, so that yield lines in one lane are closer to the crosswalk than the yield lines in an adjacent lane. Staggered yield lines can improve drivers’ view of pedestrians and provide better sight distances for turning vehicles.
- Engineering judgment should determine the exact placement of advanced 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
6.4 RAISED CROSSWALK

At midblock locations, 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 where on local or narrower collector streets at midblock locations
» They are useful in situations where unsafe vehicles 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

**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 targeted 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
6.5 CORNER BULBOUT

Corner bulbouts are curb extensions at intersection corners, making vehicular turning movements safer and pedestrian crossings shorter.

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 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 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).

Design Guidance
- Bulbouts should extend the full width of a parking lane, typically 8' from the curb. If a bike lane is present, then 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.
» Longer curb extensions along a block afford more room for streetscape furnishings and other design features while still providing some space for parking and loading areas.

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.

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

References
- AASHTO Guide for the Development of Pedestrian Facilities
- Berkeley Bicycle Blvd Design Tools and Guidelines
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

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.

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 Ramps”)
- 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.

» 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.
6.7 CURB RAMPS

Curb ramps facilitate access between the sidewalk and the roadway for pedestrians and motorists. 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.

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 gravitate 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.

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.
- Landscaping can replace the space occupied by flares (i.e., the walkable space adjacent to the sides of the ramp that slopes perpendicular to the ramp).
- 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 for Detectable Warning Surface (S-601-3; Sheet 35).

References

ADA Best Practices Tool Kit for State and Local Governments: Chapter 6 - Curb Ramps and Pedestrian Crossings Under Title II of the ADA
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)
- Lower installation and maintenance costs than a full signal installation.
- Provides landscaping opportunities on the median next to the refuge island

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
- 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 conditions.
- 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
- 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.
6.9 DRIVEWAYS

Although 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
» While fewer driveways in urban environments will reduce vehicular access to off-street lots, garages, and structures, their absence will improve safety for pedestrians on the sidewalk and bicyclists on the roadway.

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.
» 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).

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 rightmost 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.
- 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

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.

**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
- NACTO Urban Bikeway Design Guide.
6.12 BICYCLE BOX

A bicycle box is 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.

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.

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.

In Los Angeles, a bicycle box exists at the intersection of Strathmore Dr and Westwood Blvd on the UCLA campus. Examples of this treatment can also be found in Cambridge, Massachusetts; Portland, Oregon; and Vancouver, Washington.
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.

**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
6.14 BICYCLE-ONLY 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.

» Ideally, the left turn pocket should be protected by a raised curb, but the pocket may also be defined by striping if necessary.

References

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

**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.
- Public outreach should be conducted to garner support and educate the local community on the impacts of diagonal diverters

**References**

Berkeley Bicycle Boulevard Design Tools and Guidelines
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 vehicles 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
- 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.
Use small curb radii where right turns are made. 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.

**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

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.
» 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
**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. 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.

**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 trade off 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.
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: Rectangular Rapid-Flash
ing Beacons (RRFB), 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 unsignal-
ized 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 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 cross-
walk must abide by all other accessibility require-
ments.
- Pedestrian beacons can also be fitted with solar panels to able to generate and sustain their own energy needs.

Other Discussion

- The City of Los Angeles’ Department of Transporta-
tion currently has a standard plan (S-55) entitled Typical Layout for Activated Pedestrian Warning Device

References

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.”
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

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 LPDs.

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 vehicle.

References
NACTO Urban Street Design Guide
Accessible pedestrian signals (APS) provide 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.
- An engineering study should be conducted that considers the following factors: potential demand and requests for APS; traffic volumes and pedestrian presence, including periods of low traffic volumes or high turn-on-red volumes; the complexity of traffic signal phasing (such as split phases, protected turn phases, leading pedestrian intervals, and exclusive pedestrian phases); and the complexity of intersection geometry (e.g., T-type, skewed, and wide intersections).

Design Guidance

- See LADOT Standard Plan S-73.2 for Accessible Pedestrian Signals.
- Accessible pedestrian signal detectors may be push-buttons 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.

Other Discussion

- The City of Los Angeles’ Department of Transportation currently has a standard plan (S-73.2) for Accessible Pedestrian Signals.

References

- CA MUTCD’s Sections 4E.09, 4E.10, 4E.11, 4E.12, and 4E.13 for Accessible Pedestrian Signals and Detectors.
### 6.22 SHORTER SIGNAL LENGTHS

Shorter signal lengths on a street enhance pedestrian flows and control vehicle speeds. They ensure that pedestrians

#### 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

- Shorter signal lengths should be used in conjunction with other treatments and strategies to prevent vehicles from speeding in between signals.
- 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.
- 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.

#### 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.
- Certain populations, such as the elderly and children, may struggle to complete their crossings in one stage.
- They may also make it more burdensome for bicyclists, forcing them to brake and accelerate more often.

#### Design Guidance

- Shorter signal 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 before implementation.
- Signal lengths should be set so that bicyclists do not experience more delay than vehicles.

#### References

NACTO Urban Street Design Guide
Split phasing provides protected left turns at intersections to mitigate potential conflicts between pedestrian crossings and left-turning traffic.

**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.

**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.

**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
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.

**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.

**Other Discussion**

See CA MUTCD Sections 4C.102 (Bicycle Signal Warrant) and 4D.104 (Bicycle Signals)

**References**

Interim Approval for Optional Use of a Bicycle Signal Face (IA-16) http://mutcd.fhwa.dot.gov/resources/interim_approval/ia16/
6.25 BICYCLE LOOP DETECTOR

Bicycle loop detectors help notify 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.
- 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
- 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.

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 to decrease their cars to 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.

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. Interna-

References
NACTO Urban Street Design Guide
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
- Increases an intersection’s person throughput by moving more passengers than cars

**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.
- Transit agencies must address and train employees on how to handle bus and bicycle interactions in bus only lanes.

**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.
CHAPTER 7
OFF-STREET NON-VEHICULAR STRATEGIES

COMPLETE STREETS DESIGN GUIDE
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 smaller than standard slopes. 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 is also makes it less convenient for guiding a bicycle down the stairway.
- 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 DESIGN OF 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.

» Bicycle paths should generally provide directional travel opportunities not provided by existing roadways.

Applications

» These facilities are frequently found in parks, along rivers, beaches, and in rail rights-of-way greenbelts or utility corridors where right-of-way exists and there are few intersections to create conflicts with motorized vehicles.

» 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.

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 “sidewalks”, 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.
  » 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 on structures between railings shall 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.
- Stripping: 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 2' white striped 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.
- 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.

<table>
<thead>
<tr>
<th>Type of Facility</th>
<th>Design Speed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bicycle Paths with Mopeds Prohibited</td>
<td>25 mph</td>
</tr>
<tr>
<td>Bicycle Paths on Long Downgrades</td>
<td>30 mph</td>
</tr>
</tbody>
</table>

Table 2-1. Design Speed of Bicycle Paths

- Installation of “speed bumps” or other similar surface obstructions, intended to cause bicyclists to slow down in advance of intersections or other geometric constraints, shall 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.
- 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.

Table 2-2. Curve Radii and Superelevation

<table>
<thead>
<tr>
<th>Design Speed (mph)</th>
<th>2% Superelevation</th>
<th>3% Superelevation</th>
<th>4% Superelevation</th>
<th>5% Superelevation</th>
</tr>
</thead>
<tbody>
<tr>
<td>25</td>
<td>154</td>
<td>147</td>
<td>141</td>
<td>137</td>
</tr>
<tr>
<td>30</td>
<td>282</td>
<td>209</td>
<td>259</td>
<td>249</td>
</tr>
</tbody>
</table>

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.

Table 2-3. Stopping Distance

<table>
<thead>
<tr>
<th>Design Speed (mph)</th>
<th>0% Grade</th>
<th>5% Grade</th>
<th>10% Grade</th>
<th>15% Grade</th>
<th>20% Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>25</td>
<td>176</td>
<td>197</td>
<td>232</td>
<td>300</td>
<td>537</td>
</tr>
<tr>
<td>30</td>
<td>246</td>
<td>279</td>
<td>332</td>
<td>410</td>
<td>783</td>
</tr>
</tbody>
</table>

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 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
City of Los Angeles design practice.
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**

» These corridors offer 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.

**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
Design Guidance

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 branch-line 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 90 mph
      - 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

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 PATHS IN NEW TRANSIT CORRIDOR

New transit corridors can provide bicycling and pedestrian facilities (“rail-with-trail”) 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.

References

California MUTCD
Caltrans Highway Design Manual
Coastal paths attract many types of pathway users and conveyances, including bicyclists, pedestrians, rollerbladers, and pedicabs.

**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
Bicycle/pedestrian overcrossings and undercrossings 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%.
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 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

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 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-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.

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.

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.

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.

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.