Complete Streets Manual

Chapter Nine of the City of Los Angeles Mobility Plan
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Los Angeles Department of City Planning
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Introduction

In the last decade, instead of perpetually requiring that a roadway be widened, the City has begun to “live within its means” by working within existing roadway widths to accommodate a balance of all modes of transportation, and to meet the needs of all users (pedestrians, bicyclists, transit riders, and motorists) within the right-of-way. The Complete Streets concept values the importance of designing and operating streets in order to provide safe and convenient access for all users.

In the City of Los Angeles, the Complete Streets concept is promoted by:

1. Acknowledging that all streets are Complete Streets

2. Implementing a layered network approach to Complete Streets by selecting specific regional streets to be enhanced for a particular prioritized mode (transit, bicycles, pedestrians, or vehicles) while still providing access for all other modes.

While the Complete Streets Standards in this Manual focus primarily on physical changes to the right-of-way and roadway areas, it is important to note that the operation and management of a street also play critical roles in ensuring that it is truly “complete” and meets the needs of all users.

These standards represent the best practices that are currently being applied in both California and nationwide to meet standards set by the California Complete Streets Act. Some of these standards are in conflict with the Bureau of Engineering (BOE) Street Design Manual as well as current Los Angeles Department of Transportation (LADOT) policies and practices. Until these manuals and/or companion standard plans are modified, the Complete Streets Standards presented in this manual shall supersede all related existing city regulations and policies. Complete Street standards that are in a demonstration phase and have yet to be incorporated into the California Manual on Uniform Traffic Control Devices (CA MUTCD) will require provisional approval. This document provides a foundation for Complete Streets standards and is meant to be a launching point for the City’s implementation of a Complete Streets program.
Organization

The Complete Streets Manual is presented in three parts composed of 15 sections:

Section 1: Street Identification

Defines each of the City’s street classifications included in the S-470 Standards and establishes targeted operating speeds for each roadway type as well as other special typologies occurring in the public right-of-way.

Describes the role and characteristics of a Complete Street as well as how it will be implemented through the enhanced network.

Section 2: Sample Cross-Sections

Presents sample complete street cross-sections.

Sections 3-15: Sidewalks, Roadway, Bicycle Facilities, Transit, Intersections, Signalization, Public Space, Paths, Signs

Provides planners, city engineers and urban designers with design standards and guidelines to apply when determining specific street design improvements within the roadway and/or overall right-of-way.
1.1 Street Classifications

To accommodate the new focus on Complete Streets the City has updated its street classifications and Standard Plans to support ample sidewalks, recognize the role and importance of all travel modes, and acknowledge the value of existing roadway widths. The terms “highway” and “collector” – due to their prevalent usage throughout the City’s municipal code and in various manuals – have been retained as arterial street classification categories, but the actual street classifications have been rebranded to reflect the use of our streets as more than just vehicular thoroughfares. For the most part, street classifications and standards have not been modified while three new non-arterial street classifications have been added.

The City’s streets can be partitioned into two broad categories: arterials and non-arterials. Arterials are the City’s trunk lines that serve to connect neighborhoods to major destinations. Non-arterials connect arterials with neighborhoods and are divided into two sub-categories: Non-Arterial-Unique, and Non-Arterial-Hillside.

In the sections that follow a description of each street type is provided that includes the typical number of lanes, typical sidewalk width, and the targeted operating speed. An operating speed limit of 25mph is established for arterials located in areas with high pedestrian volume and areas located within the regional centers, community centers and/or mixed-use boulevards identified in the Framework Element. A universal targeted operating speed of 15 mph is established for all turning movements at intersections.
Arterial Streets

Arterials 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. Exclusive of industrial uses, almost all of the City’s non-residential uses (largely commercial) are located on an arterial street. In more limited situations, single family and multi-family residential uses are also sometimes located on an arterial.

Historically, the City has maintained three functional highway classifications: Major Highway Class I, Major Highway Class II, and Secondary Highway. By and large, they are the workhorses of the City’s street system. From this point on, these functional highway terms will be more popularly referenced as “Boulevard” and “Avenue”. Not all streets designed as boulevards or avenues are named “Boulevard” or “Avenue” and vice versa. For example, Vermont Avenue is designed and functionally classified as a “Boulevard”.

Photo by Flickr: Slices of Light
Boulevard (Major Highway)

Boulevards are the City’s widest streets that provide regional connections and include two categories:

- Boulevard I
- Boulevard II

Avenue (Secondary Highway)

In recognition of the varying street characteristics found among existing Avenue (Secondary Highway) segments, this classification has been sub-divided into three categories:

- Avenue I
- Avenue II
- Avenue III
Boulevard I (Major Highway Class I)

Discussion

A typical Boulevard I has left-turn lanes and has a raised center median included within a 100’-wide roadway. Because of the large roadway width, wider sidewalks are needed to support larger trees and to buffer pedestrians and adjacent uses. Some segments of a Boulevard I may include a median wider than the typical 10’ to 12’ and therefore may have an overall wider roadway.

Roadway Width: 100 ft.
Typical Number of Lanes: 3-4 lanes in each direction
Typical Sidewalk Width: 18 ft.
Target Operating Speed: 40 mph

Boulevard II (Major Highway Class II)

Discussion

Streets in this category make up the majority of all Boulevards. A Boulevard II typically has a center median and other elements intended to increase through traffic. These streets have great opportunities for landscaping and increasing the overall visual quality of the city.

Roadway Width: 80 ft.
Right-of-Way Width: 110 ft.
Typical Number of Lanes: 2-3 lanes in each direction
Typical Sidewalk Width: 15 ft.
Target Operating Speed: 35 mph
Avenue I (Secondary Highway)

Discussion

An Avenue I typically includes streets with a high amount of retail uses and local destinations.

Roadway Width: 70 ft.
Right-of-Way Width: 100 ft.
Typical Number of Lanes: 1-2 lanes in each direction
Typical Sidewalk Width: 15 ft.
Target Operating Speed: 35 mph

Avenue II (Secondary Highway)

Discussion

Typically located in parts of the City with dense active uses, an active pedestrian environment, and a limited demand for new development.

Roadway Width: 56 ft.
Right-of-Way Width: 86 ft.
Typical Number of Lanes: 1-2 lanes in each direction
Typical Sidewalk Width: 15 ft.
Target Operating Speed: 30 mph
Avenue III (Secondary Highway)

Discussion

An Avenue III dimension was developed to maintain the roadway width in some of the older, more historic parts of the City.

Roadway Width: 46 ft.

Right-of-Way Width: 72 ft.

Typical Number of Lanes: 1-2

Typical Sidewalk Width: 15 ft.

Target Operating Speed: 25 mph
Non-Arterial Streets

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

**Included Streets:**

- Collector
- Industrial Collector
- Local (continuous and non-continuous)
- Industrial Local
Collector

Discussion

Collector streets have a community feel to them and are typically a little wider than local streets and are signalized at their intersections with Arterials. Collector streets are not intended to accommodate “through traffic,” that is, vehicle trips that do not start or end in the immediate area.

Roadway Width: 40 ft.
Typical Number of Lanes: 1 lane each direction
Typical Sidewalk Width: 13 ft.
Target Operating Speed: 25 mph

Industrial Collector

Discussion

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.

Roadway Width: 48 ft.
Right-of-Way Width: 68 ft.
Typical Number of Lanes: 1 lane in each direction
Typical Sidewalk Width: 10 ft.
Target Operating Speed: 25 mph
**Local Street (Continuous/Non-Continuous)**

**Discussion**

Local streets are not intended to accommodate “through traffic.” Both street types have one lane in each direction and accommodate parking on both sides of the street. Non-continuous local streets have a narrower (30’) roadway than a continuous local (36’) and typically have less vehicle traffic and therefore slower speeds can be tolerated. Local Continuous streets have an operating design speed of 20mph whereas the Non-Continuous maximum operating design speed is 15 mph.

Roadway Width: 36/30 ft.

Right-of-Way Width: 60/50 ft.

Typical Number of Lanes: 1 lane in each direction

Typical Sidewalk Width: 12/10 ft.

Target Operating Speed: 20/15 mph

---

**Industrial Local**

**Discussion**

Industrial locals provide the first and last mile connection for goods movement. A 64’ right-of-way, one lane in each direction and parking on both sides but with a roadway of 44’ and sidewalks of 10’ to provide more space for trucks.

Roadway Width: 44 ft.

Right-of-Way Width: 64 ft.

Typical Number of Lanes: 1 lane in each direction

Typical Sidewalk Width: 10 ft.

Target Operating Speed: 20 mph
Non-Arterial Hillside Streets

Hillside streets are often narrow, winding roadways that have a residential feel. They provide fine-grain access to hillside neighborhoods such as in the Silver Lake and Echo Park communities of Los Angeles.

Hillside streets are designed as either Collector, Local, or Limited. Typically the primary street leading into a hillside area is a Collector street, streets branching off the Collector are local streets and streets branching off of local streets and typically serving a limited number of homes are referred to as Hillside Limited. The Collector offers the greatest capacity with a 50’ right-of-way and 40’ roadway, one lane of travel in each direction and parking on both sides. The Local right-of-way is narrower at 44’ and a roadway of 36’ while still permitting the same travel and parking capacity of the Collector but with slower speeds due to the narrower roadway. The Limited is narrower still with a 36’ right-of-way and 26’ roadway and parking permitted on only one side of the road.
Non-Arterial Unique

The streets and other public right-of-ways 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 S-470 that further blur the spatial boundaries between pedestrians, bicyclists and cars and allow for interaction between travelers and their surrounding environment.

**Included Streets:**

- Shared Street
- Pedestrian Walkway
- Stormwater Greenway
- Service Road
- Alley
- Public Stairway
Shared Street

Discussion

Shared streets create a comfortable place for any road user to pass through. They typically include green elements and other traffic calming devices that visually elevate the environment. This new classification allows roadway designers with a new option for traffic calming in neighborhoods or other places where the context calls for it. Shared Streets have a right-of-way width of at least 20’ and a targeted operating speed of 5 mph whereby cars, bikes, pedestrians, and scooters all share the same space. A 5’ buffer zone is needed on each side to meet ADA requirements.

Roadway Width: 20 ft. min

Right-of-Way Width: 30 ft.

Typical Buffer Zone Width: 5 ft.

Target Operating Speed: 25 mph

Pedestrian Walkway

Discussion

A Pedestrian Walkway is only for pedestrian use. It is at least 10’ wide and is limited to pedestrians and bicyclists.

Walkway Width: 10-25 ft.
Stormwater Greenway

Discussion

There is no limitation on the width of a stormwater greenway. The only limitations are the minimum widths for the path (5'), planting areas (3'), and roadway (15'). The detention basin can be of variable width. The targeted operating speed is also 5 mph.

Service Road (one way and bi-directional)

Discussion

Usually parallel to a divided highway, Service Roads — or frontage roads as they are often commonly called — offer local access and parking for adjacent uses.
Alleys

Discussion

Alleys have a minimum width of 20’. They increase the accessibility of a network and many green features can be implemented within alleys. (Discussed in Section 6.5)

Public Stairways

Discussion

Public stairways are located in hillside areas and provide pedestrians with important connections. See Section 13.3.
Special Situations

There are a variety of special street types and facilities that exist within the public right of way today.

**Included Streets:**

- Divided
- Downtown One-Way
- Equestrian
- Green Street
- Historic
- Neighborhood Friendly Streets
**Divided**

**Discussion**

A divided roadway includes streets that have a larger than standard median (more than 10-12 ft) within the roadway.

**Downtown One-Way Streets**

**Discussion**

Due to the number of one-way streets in the downtown area, the sample cross-sections in Section 2 include suggestions as to how BEN, TEN and Complete Street features can be accommodated.

**Equestrian**

**Discussion**

Equestrian trails can be incorporated into the right-of-way of any of the street classifications. Detailed information on equestrian trails is included in this manual (Section 14.9).
**Green Streets**

**Discussion**

For the most part, any street can include “green street” enhancements. Detailed information on green street features is included in Section 6 of this Manual.

**Historic Streets**

**Discussion**

Streets in Historic Preservation Areas shall be protected and preserved as specifically called out in each historic preservation plan in order to maintain the historic character of the community.

**Neighborhood Friendly Streets**

**Discussion**

A street that is friendly for kids, dog walkers, the elderly, and anyone else who wants to take a stroll through their neighborhood while feeling safe. This street typology brings in many traffic calming elements to local streets. See Section 5 of this manual.
1.2 Enhanced Network

The enhanced network takes a layered approach to designing complete streets in cities. Using this concept, a subset of streets are selected that prioritize a certain transportation mode within each layer. While each street will still accommodate all modes, layering networks serves to emphasize a particular mode on a particular street as part of a larger system.

Benefits

1. Increases connectivity between modes and accessibility to all road users
2. Alleviates the challenge of accommodating all users on all roadways
3. Ideal for designing bicycle and transit network layouts

The Complete Street Network is comprised of three Enhanced Networks: bicycle enhanced network, transit enhanced network, and vehicle enhanced network, as well as pedestrian enhanced areas.

Classification of Enhancements

Each Enhanced Network is composed of a combination of one or more of enhancement types. The facility enhancement types for each Enhanced Network are described in more detail below.

Pedestrian Enhancements

Improvements to areas identified within a Pedestrian-Enhanced District primarily consist of infrastructure improvements within the sidewalk and street right-of-way as well as pedestrian signal timing infrastructure improvements. Pedestrian Enhancements typically include way-finding, street trees, pedestrian-scaled street lighting, enhanced crosswalks at all legs of the intersection, automatic pedestrian signals, reduced crossing length (e.g., bulb-outs, median pedestrian refuges), wider sidewalks (> than 15’ where feasible), and specialty paving and seating areas where special maintenance funding exists. Streets that make up Pedestrian-Enhanced areas should be 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.

Bicycle Enhancements

Improvements along the Bicycle-Enhanced Network primarily consist of right-of-way infrastructure improvements, signal timing infrastructure improvements, and end of trip facilities. Bicycle enhancements are classified as moderate or comprehensive based on their benefits and intensity of implementation. Moderate enhancements typically include a cycle track immediately adjacent to the vehicular travel lanes (i.e., no on-street parking buffer); these cycle tracks would not require intersection signalization for bicycles or turning-movement restrictions for motor vehicles. Comprehensive enhancements include 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 Enhancements

Transit enhancements are classified as moderate, moderate plus or comprehensive based on their benefits and intensity of implementation. Moderate enhancements typically include stop enhancements and increased service, with transit vehicles continuing to operate in mixed traffic. Moderate plus enhancements include an exclusive lane during the peak period only, while comprehensive enhancements typically include transit vehicles operating in an all-day exclusive lane.

Vehicular Enhancements

Vehicular enhancements are classified as moderate or comprehensive based on their benefits and intensity of implementation. Moderate enhancements typically include technology enhancements and peak hour restrictions for parking and turning movements. Comprehensive enhancements can include access management, all-day lane conversions of parking, and all-day turning movement restrictions or permanent access control.
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Complete Street Sample Cross-Sections

Discussion

The illustrations on the following pages show how complete streets may be implemented within different street designations of varying roadway widths.

Complete Street Concept: In Enhanced Network

Enhanced Arterial Street

An arterial street on the Enhanced Network is distinguished by one of three network designations: Bicycle Enhanced Network (BEN), Transit Enhanced Network (TEN), or Vehicle Enhanced Network (VEN). This street, like its non-network counterpart, also includes sidewalks of 15’ to 18’ in width with trees and other landscape or “green street” enhancements in the parkway area.

A BEN street, in addition to the pedestrian enhancements and a vehicle lane or two for vehicles (cars, trucks, transit), includes a cycle-track for bicycles which abuts the curb and is protected from moving vehicles by either parked cars or a striped buffer and either a low-broken curb or vertical stanchions.

A TEN street typically provides special accommodations for transit by dedicating a full- or part-time vehicle lane for exclusive transit use. Limited situations along streets with narrower roadways and/or less transit may demand that transit shares the vehicle lane. In all three scenarios, transit is further enhanced through preemptive signal timing, next-bus information, transit shelters and pre-payment boarding stations. A TEN street also includes pedestrian enhancements and lanes for vehicles. TEN streets that are also part of the Backbone Network should also include a bicycle lane. A select number of TEN streets are also BEN streets in which case a cycle-track is provided for the bicyclists. State law permits bicyclists to ride within a transit-only lane so even in locations where a bicycle lane or cycle track is not present a bicyclist is still permitted within the street.
A VEN street still provides pedestrian enhancements but does not include TEN or BEN features. A VEN street that is either a Boulevard I or II typically has limited parking during the peak hours.

**Enhanced Non-Arterial Street**

The TEN and VEN are limited to arterial streets but portions of the BEN are on Community or Local streets. In these situations the BEN features include a bicycle lane and/or a variety of Bicycle-Friendly features such as described later in this manual.

The following pages show guidance on how the enhanced network could look like on different street designations.

**Complete Street Concept:**

**Non-Enhanced Network**

**Arterial Street**

An arterial street that is not part of the Enhanced Network includes sidewalks of 15’ to 18’ in width with trees and other “green street” enhancements in the parkway area, and travel lanes that are shared between cars, trucks, and transit. These streets would also typically include full-time on-street parking on both sides of the street; however, in order to expand the “completeness” of the street for all users, opportunities should be identified to convert the occasional parking space to bicycle corrals and/or parklets.

Given the vulnerability of bicycles, it is preferable, even in a complete street, that a bicycle lane is provided. When there is no bicycle lane the bicycle is permitted to share the curb lane with vehicles. The inclusion of bicycle lanes shall be prioritized on street segments included in the Bicycle Backbone Network.

**Non-Arterial Streets**

Due to their narrower roadway configuration, non-arterial streets utilize Complete Street concepts through roadway design that allows for a greater comfort level and improved safety across all modes, rather than relying solely on the physical demarcation of the roadway area by mode. A typical example of this would be the addition of shared lane markings and other Bicycle-Friendly Features presented in the Technical Design Handbook that help calm traffic and improve safety and comfort for bicyclists as well as pedestrians and vehicles. These features should be focused on locations identified in the Neighborhood Network.
The one exception to this is the Community I street (see below) whereby a bicycle lane can be included on street segments where bicycle infrastructure is desired (see Bicycle Backbone or Neighborhood Network maps). Bicycle corrals or parklets are also good features to include on these streets.

Pedestrian access is an important component of all non-arterial streets, which is indicated by typical sidewalk dimensions and/or slower vehicular travel design speeds. Green street infrastructure is particularly well-suited to non-arterial streets (except Hillside Streets) as the continuous parkways and street calming features such as mini round-a-bouts and bump-outs allow for ample stormwater retention and detention opportunities.
The following figures and table show the various Street Classifications and Network Assignments that may be implemented for each. Figure 2-1 includes the different Street Classifications and typical roadway width and Figure 2-2 provides a legend for all cross sections in this chapter. The cross sections are numbered according to the Street Classification (lettered A. to I.) and Network Assignment (numbered 1.0-4.0). Streets with BRT Enhanced Designations include variations (a. to d.). Example: 1.2.3.a indicates a Boulevard I, BRT with center median - separated cycle track.

**Legend for Street Cross Sections**

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>P</strong></td>
<td>Transit</td>
</tr>
<tr>
<td>Raised median or platform</td>
<td></td>
</tr>
<tr>
<td>Travel lane</td>
<td></td>
</tr>
<tr>
<td>Full-time or peak period transit lane</td>
<td></td>
</tr>
<tr>
<td>Curbside parking lane</td>
<td></td>
</tr>
<tr>
<td>Walkable convenience strip and curb within Parkway</td>
<td></td>
</tr>
<tr>
<td>Parkway* (dimension is for entire Parkway, including walkable convenience strip and curb)</td>
<td></td>
</tr>
<tr>
<td>Paved walkway</td>
<td></td>
</tr>
<tr>
<td>Sidewalk width</td>
<td></td>
</tr>
<tr>
<td>Roadway width: typical (minimum**)</td>
<td></td>
</tr>
<tr>
<td>Right-of-way width: typical (minimum**)</td>
<td></td>
</tr>
</tbody>
</table>

**Other Symbols:**

- 2-way left-turn lane
- Cycle track/Bicycle lane
- Bus rapid transit
- Typical (minimum) dimension
- Separation: raised, striped, either raised or striped

*Width of parkway shall vary based upon situational conditions.
**Minimums illustrate the minimum width in which the illustrated cross section could be accommodated.
Figure 2-1
Street Classifications

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

Network Assignments

1 Complete Street

1.1 Bicycle lane and Curbside parking

1.2 Shared lane markings and Curbside parking

1.3 Equestrian Trails

2 Bicycle Enhanced (BEN)

2.1 Cycle Track - without curbside parking

2.2 Cycle Track - with curbside parking

3 Transit Enhanced (TEN)

3.1 Full-time or peak period transit lane (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
A. Boulevard I (MAJOR HIGHWAY CLASS I) -- 136' ROW, 100' Roadway (Typical)

1 Complete Street
1.1 Bicycle lane and Curbside parking

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

2.2 Cycle Track - with curbside parking

3 Transit Enhanced (TEN)
3.1 Full-time or peak period transit lane (curbside)
A. Boulevard I (MAJOR HIGHWAY CLASS I) -- 136’ ROW, 100’ Roadway (Typical)

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

3.1.2 Curbside parking

3.1.3 Bicycle lane

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

At/approaching platform- requires 1’ additional roadway each side (shown) or 1’ wide BRT shoulder
A. Boulevard I (MAJOR HIGHWAY CLASS I) -- 136’ ROW, 100’ Roadway (Typical)

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

3.2.1 Cycle track

Note: For all BRT sections, 2’ separation may narrow to 1’ at platform so platform may be 12’ wide.

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

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)

1 Complete Street

1.1 Bicycle lane and Curbside parking

2 Bicycle Enhanced (BEN)

2.1 Cycle Track - without curbside parking

2.2 Cycle Track - with curbside parking
B. Boulevard II (MAJOR HIGHWAY CLASS II) - 110’ ROW, 80’ Roadway (Typical)

3 Transit Enhanced (TEN)

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

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

3.1.1 a. Cycle track with curbside parking

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

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

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

3.1.2 Curbside parking
B. Boulevard II (MAJOR HIGHWAY CLASS II) - 110’ ROW, 80’ 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)
3.2.1 Cycle track

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

3.2 Bus Rapid Transit (BRT) (center-running) +
3.2.2 Curbside parking
B. Boulevard II (MAJOR HIGHWAY CLASS II) - 110' ROW, 80' Roadway (Typical)

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

3.2.3 Bicycle lane (Buffer)

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 Complete Street
1.1 Bicycle lane and Curbside parking

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

2.2 Cycle Track - with curbside parking

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

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

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

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

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

3.2 Bus Rapid Transit (BRT) (center-running) +
   3.2.2 Curbside parking (Midblock)
C. Avenue I (SECONDARY HIGHWAY) - 100’ ROW, 70’ Roadway (Typical)

4 Vehicle Enhanced (VEN)

4.1 With full-time or off-peak curbside parking

4.2 Without curbside parking

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

1 Complete Street

1.1 Bicycle lane and Curbside parking

1.2 Equestrian Trails

2 Bicycle Enhanced (BEN)

2.1 Cycle Track - without curbside parking
D. **Avenue II (SECONDARY HIGHWAY) - 86’ ROW, 56’ Roadway (Typical)**

2.2 Cycle Track - with curbside parking

3. **Transit Enhanced (TEN)**

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

3.1b. Cycle track with out parking

3.1c. Cycle track (one-way example)

3.1 Full-time or peak period transit lane (curbside) +
3.1b 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. **Complete Street**

   1.1 Bicycle lane and Curbside parking

   ![Diagram](image1)

   1.2 Shared lane markings and Curbside parking

   ![Diagram](image2)

**F. Collector Street - 66’ ROW, 40’ Roadway**

1. **Complete Street**

   1.2 Shared lane markings and Curbside parking

   ![Diagram](image3)
G. Industrial Collector Street - 68' ROW, 48' Roadway

1 Complete Street

1.2 Shared lane markings and Curbside parking

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

1 Complete Street

1.2 Shared lane markings and Curbside parking

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

1 Complete Street

1.2 Shared lane markings and Curbside parking
THIS PAGE IS INTENTIONALLY LEFT BLANK
## 3.1 Right-of-Way and Roadway Widths

**Intent**

Right-of-way width is a combination of roadway and sidewalk widths. The intent of the roadway width standards is to accommodate vehicle and bicycle lanes within existing roadway widths to the extent feasible. It is not helpful to establish roadway widths that are unlikely to be implemented, given that the City is more-or-less built out. Resources are better spent on achieving a functional network now, rather than waiting decades or centuries for the possibility of increased capacity.

### Standards Table

<table>
<thead>
<tr>
<th>Complete Street Type Name</th>
<th>ARTERIAL STREETS</th>
<th>TYPICAL NON-ARTERIAL STREETS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Boulevard I (Major I)</td>
<td>Boulevard II (Major II)</td>
</tr>
<tr>
<td>ROW Width</td>
<td>120-126 feet</td>
<td>110 feet</td>
</tr>
<tr>
<td>Roadway Width</td>
<td>84-102 feet</td>
<td>52-82 feet</td>
</tr>
<tr>
<td>Speed</td>
<td>40 mph</td>
<td>35 mph</td>
</tr>
<tr>
<td>Number of vehicle travel lanes (includes BRT lanes)</td>
<td>6-8</td>
<td>4-6</td>
</tr>
</tbody>
</table>

Footnote:
1. Continuous Local Streets (where a local street is more than 660 feet long)
2. Non-Continuous Local Streets (where a local street is less than 660 feet long)
### 3.2 Sidewalk Widths

#### Intent

The intent of the sidewalk width standards is to accommodate pedestrians, support businesses and buffer residences. Their primary goal is to achieve a complete street network while ensuring that increased sidewalk width does not prevent the redevelopment of private parcels where such redevelopment is desirable.

#### Standards Table

<table>
<thead>
<tr>
<th>Complete Street Type Name</th>
<th>Boulevard I (Major I)</th>
<th>Boulevard II (Major II)</th>
<th>Avenue I (Secondary)</th>
<th>Avenue II (Secondary)</th>
<th>Avenue III (Secondary)</th>
<th>Typical Non-Arterial Streets</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Community Collector</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Industrial Collector</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Local</td>
</tr>
<tr>
<td><strong>Sidewalk and Sidewalk Zone Widths</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total Sidewalk width* (including curb)</td>
<td>18 feet</td>
<td>15 feet</td>
<td>15 feet</td>
<td>15 feet</td>
<td>13 feet</td>
<td>13 feet</td>
</tr>
<tr>
<td>Walkway Zone width:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Where Sidewalk width meets the standard</td>
<td>9 feet</td>
<td>7.5 feet</td>
<td>7.5 feet</td>
<td>7.5 feet</td>
<td>5 feet</td>
<td>5 feet</td>
</tr>
<tr>
<td>Where Sidewalk width is less than standard</td>
<td>6 feet where sidewalk is 10 to 14.5 feet wide; 5 feet where sidewalk is 8 to 9.5 feet wide.</td>
<td>5 feet</td>
<td>4 feet</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Parkway Zone width:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>9 feet</td>
<td>7.5 feet</td>
<td>7.5 feet</td>
<td>7.5 feet</td>
<td>8 feet</td>
<td>4 feet</td>
</tr>
</tbody>
</table>

**Footnote:**

*Sidewalk widths in excess of 12 feet may be provided as easements rather than dedications.
1. Continuous Local Streets (where a local street is more than 660 feet long)
2. Non-Continuous Local Streets (where a local street is less than 660 feet long)
Discussion

The Sidewalk is divided into two primary zones:

**The Walkway Zone,** which is located adjacent to the ROW line/property line and provides a clear path of travel for pedestrians and may also accommodate outdoor dining and other commercial activity if there is adequate width.

**The Parkway Zone,** which is located between the Walkway Zone and the face of curb (and includes the curb).

Figure 3-2

The Sidewalk Zones
## 3.3 Vehicle and Bicycle Lane Widths

### Intent

Establish typical and desired lane widths appropriate to local conditions for use in developing Enhanced cross sections and generally designing streets.

### Standards Table

<table>
<thead>
<tr>
<th>Complete Street Type Name</th>
<th>Boulevard I (Major I)</th>
<th>Boulevard II (Major II)</th>
<th>Avenue I (Secondary)</th>
<th>Avenue II (Secondary)</th>
<th>Avenue III (Secondary)</th>
<th>TYPICAL NON-ARTERIAL STREETS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Community Collector</td>
</tr>
<tr>
<td><strong>Vehicle and Bicycle Lanes Widths: Typical (range)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Curb travel lane with buses</td>
<td>15 feet (10-15 feet)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Curb travel lane without buses</td>
<td>13 feet (10-13 feet)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Left turn lane</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2-way left-turn lane</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Interior bike lane</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Curbside bike + adj. bus lane</td>
<td>20 feet (16-20 feet)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Curb bike lane not separated</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Curb bike lane separated (for cycle-tracks, see Section 7.2)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Curbside parking</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

11 feet (10.5-11 feet) / 12 feet (11-12 feet) / 10 feet (9-11 feet)

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Los Angeles Department of City Planning

Draft February 2014
Discussion/Examples

Number of Lanes. Even as streets are redesigned to accommodate modes other than motor vehicles and better serve their other functions, it is still desirable to maintain vehicle travel lanes appropriate to each Street Type’s function as a conduit for vehicular traffic, including Bus Rapid Transit, other buses, trucks and automobiles. Typically streets will have vehicular travel lanes in the following ranges:
Lane Widths. The following discussion describes and illustrates the lane types listed in the previous table.

Interior travel lane. An interior travel lane is a vehicular travel lane that is not located adjacent to the curb. The typical width of an interior through lane is 10 feet, except when it is adjacent to a bicycle lane or if it carries a high volume of buses or trucks. A through lane adjacent to a bicycle lane should be 10-11 feet wide.

Curb travel lane. Travel lanes located adjacent to a curb should be wider than interior travel lanes if possible to provide additional clearance from the curb, particularly if there are buses in the curb travel lane. Curb travel lanes may be full-time travel lanes or may be used in the non-peak period as curbside parking lanes.
**Left turn lane.** Left-turn lanes at intersections increase the capacity of the travel lanes by eliminating left turns from a travel lane, which would block traffic. Where there is a center lane, the left-turn lane is located in the center lane. Where there is no center turn lane, the left turn lane is created by eliminating curbside parking on one or both sides and shifting travel lanes to the curb.

**2-way left-turn lane.** A two-way left-turn lane refers to a lane in the center of the roadway, set aside for vehicles in the roadway to make left turns in both directions. Two-way left-turn lanes are delineated by parallel double yellow lines, where the interior line may be dashed and the exterior line is solid on each side of the lane. At signalized intersections, this striping is replaced by standard left-turn lane striping. Where there are no driveways or where U-turns cannot be made within one-quarter mile, 2-way left turn lanes may be replaced by raised medians.

**Interior bicycle lane.** Where a bicycle lane is located between the parking lane and travel lane, it is typically 5 feet wide, although an additional one or two feet is desirable to reduce the potential for "dooring."
Curbside bicycle and adjacent bus lane. A curbside bicycle and adjacent bus lane refers to a curbside lane with enough width to accommodate bikes and buses, and where bikes are protected directly adjacent to the curb. These lanes are not designed for curbside parking and are found on bus and bicycle priority streets.

Curbside bicycle lanes. A curbside bicycle lane must be at least 5 feet wide, although 6 or 7 feet is preferable in order to avoid riding in the gutter or across the asphalt-to-gutter joint. In the example cross sections shown below, the most common curbside bicycle lane width is 5 feet. To minimize the joint condition, the entire bicycle lane can sometimes be paved in concrete as an extension of the gutter, or the bicycle lane asphalt can be overlaid to match the gutter more evenly and smoothly.

Curbside parking lane. The curbside parking lane, typically 8 feet wide, is used primarily for parking and loading, but it may also be used for other purposes [such as...].
## 3.4 Bus Rapid Transit (BRT) Design Widths

### Intent

To generally suggest how Bus Rapid Transit (BRT) could be integrated on existing streets in Los Angeles if applying current industry standards, and to identify the key issues to consider when planning for its integration. It's understood that any BRT systems introduced in the future would primarily be done on "constrained corridors" as opposed to "greenfield busways" since the City's street network is established and not typically subject to further widening as proposed by these Street Standards. This section focuses on BRT running in a dedicated busway, and does not address buses in mixed-flow traffic (which is typically handled by express bus, or Metro Rapid service and covered by the standards for Bus Priority Streets). This section does not address BRT on a dedicated right-of-way, like the existing Orange Line, since L.A. County Metro would lead the planning and design based on site specific conditions.

### Standards Table

<table>
<thead>
<tr>
<th>Complete Street Type Name</th>
<th>Boulevard I (Major I)</th>
<th>Boulevard II (Major II)</th>
<th>Avenue I (Secondary)</th>
<th>Avenue II (Secondary)</th>
<th>Avenue III (Secondary)</th>
<th>TYPICAL NON-ARTERIAL STREETS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Community Collector</td>
</tr>
<tr>
<td><strong>Bus Rapid Transit (BRT) Design Widths</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bus lane width</td>
<td></td>
<td>12 feet</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Barrier/curb separator</td>
<td>2 feet; mountable curb or striped separator if &lt; 2 non-BRT vehicle lanes</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Station platform</td>
<td></td>
<td>14 feet</td>
<td></td>
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<td></td>
<td></td>
</tr>
</tbody>
</table>
Bus lanes must be wide enough to accommodate both standard and articulated buses. Some national standards specify overall minimums and preferred widths. Additionally, a curb separator is recommended to physically separate the bus from other travel lanes or other uses when street-running.

Busways can be designed to be center running in the street (median busway) where stations and bus lanes are coordinated with left-turn lanes and other intersection requirements. Busways can also be designed alongside the curb, although this configuration is not desirable when it sacrifices curbside parking which is critical in retail and pedestrian oriented districts.

Discussion

The implementation of bus lanes and/or general bus speed improvements such as road surface repaving, selective street widening, and enhanced transit signal priority will significantly improve bus passenger travel times and schedule reliability.
Examples

Plan view showing just one alternative for integrating a busway onto an existing street with 80 feet of roadway without having to move the curbs (or on a street with a 70-foot roadway where there would be several benefits to widening the roadway to accommodate BRT and the desired 15-foot wide sidewalks when considering the current front yard setback, and/or street fronting parcels are going to be redeveloped. Here the BRT is center running in the street on dedicated lanes. There are two travel lanes in each direction and sharrows accommodate bicycles in the curb lane. The excess roadway is striped to discourage cars from driving too close to the sidewalk and pedestrians. This layout would be appropriate where off-street parking is adequate to serve the current land uses and bicycles are a priority.

In older neighborhoods, some streets only have a 70-foot roadway, and it may not be practical or desirable to widen the roadway to 80 feet to accommodate BRT. This plan shows one way to integrate a busway onto an existing street without having to move the curbs. Here the BRT is center running in the street in dedicated lanes. There would be one travel lane in each direction and a buffered bike lane. This configuration would likely result in a loss of one travel lane in each direction as well as on-street parking. This layout would be appropriate where off-street parking is adequate to serve the uses along the BRT street and where bicycles are a priority.

Typical BRT Segment in 70-Foot Roadway (between stations)
In older neighborhoods, some streets only have a 70-foot roadway, and it may not be practical or desirable to widen the roadway to 80 feet at the station area. This plan shows one alternative for integrating BRT onto an existing street without having to move the curbs. There is one travel lane in each direction, and each is adjacent to a “buffer” area with painted stripes to discourage cars from driving near the curb and close to pedestrians. This configuration would likely result in a loss of one travel lane in each direction and some on-street parking. Left turns would be evaluated for appropriateness.
Planning Issues for Consideration

The Benefits of BRT

BRT usually runs at faster operating speeds with more frequent service and fewer stops when compared to local or express bus service running in mixed-flow lanes. This approach results in a faster trip for the transit patron which is what makes it highly attractive. With a branded systemwide identity, thoughtful transit shelter designs at the stations, and state-of-the-art amenities for passengers, BRT in a dedicated lane has similar benefits to light rail. Passenger capacity is higher than local or express buses, as Metro typically specifies 60-foot articulated buses. Other enhancements can include real-time information at bus stops, signal priority at intersections, and queue jump lanes.

Stations

BRT stations are typically about one-half mile to three-quarters of a mile apart, although spacing can vary depending on development densities, places of interest, and transit transfer points. When the busway is in the center of the street, it can be widened to accommodate a station composed of a single central platform between the bus lanes. The center platform is typically located near an intersection for easy pedestrian access and to accommodate system transfers to other routes along cross streets. Stations can also be designed with separate side platforms that are located on opposite sides of the busway. This configuration is especially efficient when left turn lanes are required as they can be accommodated in the shadow of the platform width across the intersection. Additionally, when left turns aren’t required, the zone that aligns with the platforms between stations can be devoted to landscaping that can beautify a transit parkway.
Station Access

Stations located at busways in the center of the street would typically be accessible from the signalized intersection crosswalk for convenience. If the blocks are extremely long and streets are very far apart (requiring the platform to be sited more than 150 feet from the intersection or mid-block), then a signalized pedestrian crossing should be provided to allow for safe and convenient access to the platforms.

Right of Way Uses

When integrating BRT onto an existing street, there are trade-offs between what exists there now (such as the number of travel lanes and the presence of on-street parking), and how the street would be reconfigured in the future (with possibly fewer travel lanes and/or the removal of on-street parking). This is challenging when trying to insert BRT without widening the roadway—which is preferred since street widening often has dramatic impacts on the resulting sidewalk widths in relation to already developed buildings that face onto the street. In high activity retail and pedestrian areas, on-street parking is vital to businesses and helps provide a physical buffer between pedestrians and moving vehicles. If there is ample off-street parking (for example right behind the businesses) on-street parking may not be as critical to maintain. There will be other cases where the addition of bicycle lanes will be highly beneficial in conjunction with BRT. The trade-offs need to be understood and be analyzed in detail during conceptual design, as each community will have different priorities for how the roadway should be reapportioned to best serve its needs.
Accommodating Left Turns

**Existing examples of BRT systems describe how left turns can be accommodated in several ways.** When the busway runs in the center of the street, left turn lanes be located immediately adjacent to the busway, and signalized to prevent conflicts with bus movement. Signalized left turns can be provided in left turn pockets, or directly from travel lanes signed for left turn or through movements depending on the volume of traffic.

If appropriate, left turns can be eliminated 1) if the street grid allows for access to destinations through either a series of right turns (ideal when blocks sizes are small and the extra travel doesn’t adversely impact local conditions), or 2) if left turns can be accommodated frequently enough to remove some while assuring reasonable access. The primary consideration when planning for left turns at intersections, is that often where left turns are most needed at major street crossings, is often the same intersection where stations should be sited; and both require additional space not necessary between stations.

This suggests that if an existing street is constrained in its right-of-way (and assuming it can accommodate the basic busway dimensions between stations) then street widening or dedications may be necessary in some places to accommodate either the station platform, left turn lanes, or both.

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**Development Opportunities**

**Much has been documented on the positive impacts of transit-oriented development at rail stations.** There is also a growing literature on opportunities oriented to bus service, especially for BRT which can have significant passenger capacity to warrant development attention. The opportunity to create more active centers around BRT stations is possible if the system is well designed as a permanent component of a regional rail system, well branded, provides customers with the same level of amenity and service as rail travel, and is planned along corridors with significant destinations, major institutions, employment centers and housing. Incentives could be provided using density bonuses and reduced parking requirements to encourage a range of housing types and commercial uses along future BRT corridors using a transit overlay district.

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*Stations and landscaping can contribute to the branding and placemaking aspects of a BRT system. Examples show left to right: A contemporary station in a median (Bogota, Colombia), continuous median landscaping (Nantes, France), and comprehensive streetscape design with a center platform station & amenities (Las Vegas, Nevada).*
Resources

Transit Cooperative Research Program (TCRP) Report 90 Bus Rapid Transit,
Vol. 2: Implementation Guidelines, Transit Research Board (TRB) of the
National Academies.

BRT Bus Rapid Transit Service Design Guidelines, VTA Transit,

APTA Standards Development Program, Recommended Practice, Designing Bus Rapid Transit Running
Ways, APTA Bus Rail Transit Working Group, approved October 2010.

Characteristics of Bus Rapid Transit for Decision-Making (CBRT), FTA and USDOT, Office of Research,
Demonstration and Innovation, August 2004.

4.1 Walkway Zone

Intent

- Provide adequate walkway width to accommodate pedestrians, including those with disabilities.
- Maintain a clear path of travel with an even walkable surface.

Standards Table

<table>
<thead>
<tr>
<th>Complete Street Type Name</th>
<th>ARTERIAL STREETS</th>
<th>TYPICAL NON-ARTERIAL STREETS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Boulevard I (Major I)</td>
<td>Boulevard II (Major II)</td>
</tr>
<tr>
<td>Sidewalks</td>
<td>Where sidewalk improvements are installed as a requirement of the Zoning Code, a Streetscape Plan, or other regulation or condition of approval, the Property Owner shall maintain and accept liability for them and agree to an on-going assessment to maintain/operate any required lighting.</td>
<td></td>
</tr>
<tr>
<td>Location</td>
<td>The walkway zone shall be placed as close to the property line as possible.</td>
<td></td>
</tr>
<tr>
<td>Walkway paving</td>
<td>Paved with ADA-compliant scored concrete or other material(s) approved by BOE</td>
<td></td>
</tr>
</tbody>
</table>

Discussion/Examples

The Walkway Zone is primarily for pedestrians. Within the Walkway Zone, the Pedestrian Access Route (PAR) is the path that provides continuous connections from the public right-of-way to building and property entry points, parking areas, and public transportation. This pathway is required to comply with ADA guidelines and is intended to be a seamless pathway for wheelchair and white cane users. As such, PAR surfaces should be firm, stable, and slip-resistant, and they should comply with maximum cross-slope requirements (2% grade). The walkway grade should not exceed the general grade of the adjacent street. The PAR should be a minimum of 4 feet, but preferably at least 5 feet in width to provide adequate space for two pedestrians to comfortably pass or walk side by side. All transitions (e.g. from street to ramp or ramp to landing), must be flush and free of changes in level.
Depending on anticipated pedestrian volumes, the Walkway Zone width in excess of the PAR may be occupied by outdoor dining, seating or other elements related to the adjacent businesses.

If the property owner is required to or agrees to maintain the walkway paving, a wider range of material choices is available, including ADA-compliant permeable pavers or other paving, as approved by the Bureau of Engineering (BOE). Materials that are not currently on BOE’s list of approved materials can be tested and added to that list.

Typical Commercial Arterial Street

The sidewalks on a commercial street will be designed to accommodate a range of functions that include: pedestrians walking or strolling (allowing 3-4 people to pass by each other comfortably in the walkway zone), easy access into and out of cars parked curbside, ample room for street trees and tree wells, roadway and pedestrian lighting, seating, trash receptacles, bicycle racks, parking meters, and, where appropriate, public art and/or district wayfinding elements. While there are

**Standard Street Dimensions**

- Columnar shade trees
- Roadway lights
- Pedestrian lights
- 7.5' wide walk zone
- 7' x 12' + tree wells with decomposed granite
- Litter receptacle
- Bike racks
- Benches
many elements that contribute to the design of a successful commercial streetscape, they must be thoughtfully organized within the sidewalk zone to minimize clutter and to not compromise pedestrian access or visibility of the businesses.

**Standard Street Dimensions**

Typical Residential Arterial Street

**The sidewalks on a residential street shall be designed to accommodate pedestrians walking or strolling,** (allowing 1-3 people to pass by each other comfortably in the walkway zone), easy access into and out of cars parked curbside, permeable parkways (that ideally are landscaped), ample room for tree wells and shade-providing street trees, and lighting that is appropriately scaled to the street. Additional amenities like seating and trash receptacles may be accommodated in the furnishings zone where there are small neighborhood businesses at street-level.
4.2 Curb Extensions

Intent

- Improve safety for pedestrians and motorists at intersections; increases visibility and reduce speed of turning vehicles.
- Encourage pedestrians to cross at designated locations.
- Increase usable sidewalk area.

Standards Table

<table>
<thead>
<tr>
<th>Complete Street Type Name</th>
<th>ARTERIAL STREETS</th>
<th>TYPICAL NON-ARTERIAL STREETS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Boulevard I (Major I)</td>
<td>Boulevard II (Major II)</td>
</tr>
<tr>
<td>Curb Extensions</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Curb extension width</td>
<td></td>
<td>Typically 5’ with parallel parking and 15’ with angled parking. May be wider given local conditions.</td>
</tr>
<tr>
<td>Criteria</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bus stop curb extensions</td>
<td>Where feasible, provide on streets with Metro Rapid service or other high frequency bus service with headways of 10 minutes or less. Bus stop curb extensions should be 60’ minimum (excluding tapers). At bus stops where frequency of service is such that two buses regularly would be arriving at the stop at the same time, provide 120’ curb extension (excluding tapers).</td>
<td></td>
</tr>
<tr>
<td>Other corner curb extensions</td>
<td>Permitted where there is curbside parking, a dedicated right-turn lane is not provided, and peak hour right turns are less than 200 during the peak hour.</td>
<td></td>
</tr>
<tr>
<td>Midblock curb extensions</td>
<td>Desirable at midblock crossings where there is a curbside parking lane; optional elsewhere to provide additional paved or planted area or stormwater infiltration.</td>
<td></td>
</tr>
<tr>
<td>Basic design - all types of curb extensions</td>
<td>With parallel parking, 5’ wide with 25’ inside curb return. With angled parking, 15’ wide with 25’ inside curb return. Exception: with Maintenance Agreement to keep curb free of debris, inside radius of less than 25’ may be provided. May be paved or planted and should include stormwater infiltration where feasible.</td>
<td></td>
</tr>
<tr>
<td>General intent</td>
<td>Keep curb extensions clear for the primary use of pedestrian activity and/or landscaping.</td>
<td></td>
</tr>
<tr>
<td>Curb ramps</td>
<td>To the extent feasible, directional ramps shall be installed in corner curb extensions.</td>
<td></td>
</tr>
<tr>
<td>Utilities/infrastructure</td>
<td>See Utilities and Other Infrastructure.</td>
<td></td>
</tr>
<tr>
<td>Drainage</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
**Section 4.2 Curb Extensions**

### Curb Extensions

<table>
<thead>
<tr>
<th>Complete Street Type Name</th>
<th>ARTERIAL STREETS</th>
<th>TYPICAL NON-ARTERIAL STREETS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Boulevard I (Major I)</td>
<td>Boulevard II (Major II)</td>
</tr>
<tr>
<td>Planted curb extensions</td>
<td>Where feasible, design planted area to collect site stormwater and allow streetwater to flow through it with a curb outlet to allow overflow to drain along the curb flow line.</td>
<td></td>
</tr>
<tr>
<td>Permeably paved curb extensions</td>
<td>If soil/sub-surface conditions permit infiltration, provide minimal slope of curb extension surface and design subsurface to maximize infiltration. Allow street drainage to flow into the subsurface infiltration medium. Provide overflow drain connected to storm drain system or curb flow line.</td>
<td></td>
</tr>
<tr>
<td>Non-permeably paved curb extensions</td>
<td>If 2% slope to the curb would result in less than 6” curb, drain to inlet(s) on the curb extension which may flow directly into subsurface infiltration medium if soil/sub-surface conditions permit infiltration, or may be connected to the storm drain system or curb flow line.</td>
<td></td>
</tr>
</tbody>
</table>

### Discussion/Examples

Curb extensions - also known as bulb-outs or neckdowns - extend the curb line and sidewalk out into the parking lane, which reduces the effective street width and increases sidewalk area for pedestrians. Curb extensions significantly improve pedestrian crossings by reducing the pedestrian crossing distance, which improves the ability of pedestrians and motorists to see each other, and reduces the time that pedestrians are in the street.

Curb extensions placed at an intersection also prevent motorists from parking in or to close to a crosswalk or from blocking a curb ramp. Motor vehicles parked at corners present a threat to pedestrian safety, as they block sight lines, obscure visibility of pedestrians and other vehicles, and make turning particularly difficult for emergency vehicles and trucks. Motorists are encouraged to travel more slowly at intersections or midblock locations with curb extensions, as the restricted street width sends a visual cue to motorists. Turning speeds at intersections are reduced with curb extensions (curb radii should be as tight as is practicable).
Curb extensions are only appropriate where there is an on-street parking lane and are typically 5 feet wide where there is parallel parking and up to 15 feet wide where there is diagonal parking. Curb extensions must not extend into travel lanes, bicycle lanes or shoulders. The turning needs of larger vehicles such as school buses need to be considered in curb extension design.

**Bus stop curb extensions.**

See 6.9 for additional discussion of bus stop curb extensions.
Midblock curb extensions at crosswalks (left) are most common and increase the visibility of pedestrians waiting to cross. Midblock curb extensions can also be provided where additional sidewalk area is needed, for example, for seating, bicycle racks, or planting (right).

Corner curb extensions with landscaping (left); midblock curb extension to accommodate street trees where the sidewalk is narrow (right).

The upper plans show planted and paved curb extensions where there is parallel curb side parking. The lower images show planted and paved curb extensions where there is diagonal parking. The curb extensions on the left are paved, those on the right are planted. Paved curb extensions, especially with diagonal parking, should infiltrate and/or treat stormwater.
Figure 4-1

Standard Street Dimensions

To avoid reconstructing the entire roadway in order to surface drain a wide paved curb extension to the street, area drains that flow to the street or to a catch basin can be installed.

A large planted curb extension can be depressed in the center with a slightly elevated surface swale to a curb outlet for overflow.

Curb extensions create a more permanent place to provide a range of pedestrian enhancements and amenities.
4.3 Pedestrian Access Between Curbside Parking and Walkway

Intent

Provide comfortable access from curbside parking to the Walkway Zone.

Standards Table

<table>
<thead>
<tr>
<th>Complete Street Type Name</th>
<th>ARTERIAL STREETS</th>
<th>Non-Arterial Streets</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pedestrian Access Between Curbside Parking and Walkway Zone</td>
<td>Boulevard I (Major I)</td>
<td>Boulevard II (Major II)</td>
</tr>
<tr>
<td>Walkable convenience strip</td>
<td>Required where there is curbside parking and the parkway is not walkable. A walkable convenience strip along the curb and pathways between the convenience strip and walkway zone should be provided every 2 parking spaces (every 40 to 50 feet). Walkable parkway materials include stabilized decomposed granite, fine-to-medium mulch, and walkable grass or groundcover. The walkable convenience strip may be any of the above or, where parking turn-over is high, permeable pavers, concrete or other paving.</td>
<td>Not required, unless there is a raised curb around the planted area.</td>
</tr>
</tbody>
</table>

Width of walkable convenience strip (including curb):

| If raised curb around planted area | 3' | |
| If no raised curb around planted area | 2' | 1.5' | 0.5' (curb) |
Discussion/Examples

On Non-Arterial Streets, curbside parking has been accessed across the planted parkway throughout the history of the City. Often there is a paved walkway across the parkway which is aligned with the walkway to the building entrance. This means of access has not generally caused access problems and should not be changed.

On Arterial Streets, where there is a higher turn-over of curbside parking and higher traffic volumes along the adjacent travel lane, it may be desirable to have more clearly defined access between curbside parking and the paved walkway.

Accessible curbside parking spaces. The Architectural and Transportation Barriers Compliance Board has proposed accessibility guidelines for the design, construction, and alteration of pedestrian facilities in the public right-of-way, which, when adopted, will be mandatory. The proposed guidelines requires one accessible curbside space for every 25 marked or metered curbside spaces or fraction thereof. In addition, every passenger loading zone will be required to provide one accessible space. The diagrams below show how access from the parked vehicle and across the Parkway Zone is to be provided.
Where the sidewalk adjacent to an accessible curbside parking space is at least 14 feet wide, the curb must be inset 5 feet to provide an access aisle at roadway level with a ramp up to the sidewalk (top left).

Where the adjacent sidewalk is less than 14 feet wide, an access aisle is not required, but the space must be at the end of the block (bottom left). Placement will need to be coordinated with bus stop locations.

For angled parking, an 8-foot wide access ramp must be provided at roadway level with a ramp up to the sidewalk. (Source: Architectural and Transportation Barriers Compliance Board, Accessibility Guidelines for Pedestrian Facilities in the Public Right-of-Way, 36 CFR Part 1190, Federal Register / Vol. 76, No. 233 / December 5, 2011.)
4.4 Driveways

Intent

- Minimize conflicts between vehicles and pedestrians.
- Provide a continuous walkable surface in the Walkway Zone.

Standards Table

<table>
<thead>
<tr>
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</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Boulevard I (Major I)</td>
<td>Boulevard II (Major II)</td>
</tr>
<tr>
<td>Driveway slope</td>
<td>Driveway slopes should be located in the Parkway Zone or curb extension and not in the Walkway Zone. Where a driveway crosses the Walkway Zone, it should maintain the walkway level.</td>
<td></td>
</tr>
<tr>
<td>Driveway width</td>
<td>Driveways shall be as narrow as possible to minimize pedestrian conflicts and maximize opportunities for streetscape elements.</td>
<td></td>
</tr>
<tr>
<td>Number of driveways</td>
<td>Only the minimum number of driveways required to accommodate anticipated vehicle volumes shall be provided; shared driveways for adjacent developments should be used where feasible.</td>
<td></td>
</tr>
<tr>
<td>Driveway location</td>
<td>Driveways should be located to minimize pedestrian conflicts.</td>
<td></td>
</tr>
</tbody>
</table>

Discussion

Driveways that do not comply with the slope standard often present significant obstacles to wheelchair users. Driveway aprons that extend into the Walkway Zone can render a sidewalk impassable to users of wheelchairs, walkers, and crutches. They need a flat plane on which to rest all four supports (two in the case of crutches). To provide a continuous Pedestrian Access Route (PAR) across driveways, aprons should be confined to the Parkway Zone.
4.5 Street Lighting

Intent

- Illuminate both the roadway and sidewalk using appropriately scaled light poles and fixtures.

- Contribute to the identity of district or neighborhood and larger community; establish a pattern or rhythm with street trees.

Standards Table

<table>
<thead>
<tr>
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<th>NON-ARTERIAL STREETS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Boulevard I (Major I)</td>
<td>Boulevard II (Major II)</td>
</tr>
<tr>
<td>Street Lighting</td>
<td>Required; typically on 30-foot poles.</td>
<td>Required; typically on 20-foot poles.</td>
</tr>
<tr>
<td>Pedestrian lights</td>
<td>May be on separate poles and/or attached to street light poles, typically at a height of 12 to 15 feet.</td>
<td></td>
</tr>
<tr>
<td>Spill light</td>
<td>All optic systems shall be cut-off with minimal light trespass into windows above the ground floor of buildings.</td>
<td></td>
</tr>
<tr>
<td>Other design criteria</td>
<td>See Bureau of Street Lighting standards.</td>
<td></td>
</tr>
</tbody>
</table>

Discussion

On Arterial Streets, there are two types of street lights: street lights, which are typically 30 feet tall and illuminate both the roadway and the sidewalk, and pedestrian lights, which provide supplemental lighting of sidewalks. 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. Pedestrian lights are ornamental and supplement the street lights. Pedestrian lights contribute to the pedestrian scale of the street and add a warm glow of yellow light on the sidewalk.

All light sources should provide a warm (yellow, not blue) light and shall be LED or a future more energy-efficient technology. All street lighting can contribute to community identity and can serve as a strong unifying element, whether in a retail district or residential neighborhood.
Examples

Standard-height street lights - typically about 30 feet tall, illuminate both roadway and sidewalk.

Pedestrian lights, typically 12 to 15 feet tall, provide supplemental sidewalk lighting on Arterial streets or roadway and roadway and sidewalk lighting on Hillside and Local Streets (20 to 36 feet wide).

Lower-height street lights - typically about 20 feet tall, illuminate both roadway and sidewalk on Collector Streets.
4.6 Street Furniture

**Intent**

- Provide furnishing along streets to:
  - Make walking, bicycling, and public transit more inviting.
  - Improve the street economy and common city prosperity.
  - Enhance public space and create a place for social interaction.

- Avoid excessive quantities of furnishings that result in clutter and potentially reduce access and other sidewalk functions.

### Standards Table

<table>
<thead>
<tr>
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</thead>
<tbody>
<tr>
<td></td>
<td>Boulevard I (Major I)</td>
<td>Boulevard II (Major II)</td>
</tr>
<tr>
<td>Seating</td>
<td>On streets with ground-floor commercial uses and medium to high pedestrian volumes, provide seating for 3, e.g., one 6-foot long bench, every 200 feet. Seating may be adjacent to the building facade or in the Parkway Zone.</td>
<td>---</td>
</tr>
<tr>
<td>Trash receptacles</td>
<td>Provide 4 at each intersection on bus priority and BRT streets and where there are ground-floor commercial uses, 2 on other Arterial Streets. On high pedestrian volume streets, an additional 1 receptacle every 200 feet.</td>
<td>---</td>
</tr>
<tr>
<td>Bicycle racks (see Chapter 4.7)</td>
<td>Provide 1 every 50 feet on bicycle priority streets, 1 every 100 feet on other streets. Racks may be attached to parking meters and may be located in decomposed granite tree wells or parkways at least 6 feet from trees.</td>
<td>---</td>
</tr>
<tr>
<td>Info/advertising kiosks</td>
<td>No more than 1 per block. Locate in curb extension or Parkway Zone at least 20 feet from a street tree.</td>
<td>---</td>
</tr>
<tr>
<td>Placement on Non-Arterial cross street</td>
<td>Furnishings may be placed on Non-Arterial cross street within 50 feet of intersection.</td>
<td>---</td>
</tr>
<tr>
<td>Spacing from other sidewalk elements</td>
<td>18 inches from face of curb, 2 feet from driveways and access ramps, 5 feet from fire hydrants and transit shelters.</td>
<td>---</td>
</tr>
<tr>
<td>Newsracks</td>
<td>See Bureau of Street Services standards LAMC 42.00 (f).</td>
<td>---</td>
</tr>
</tbody>
</table>
Discussion/Examples

Furnishings along the sidewalk add vitality to the pedestrian experience, encourage use of the street by pedestrians, and provide a more comfortable environment for non-motorized travel. They provide a functional service to the user and provide uniformity to the urban design.

Placement of street furnishings should be provided

- At concentrations of pedestrian activity (gathering areas).
- On streets with pedestrian-oriented destinations, where people may gather or linger and enjoy the public space.

While furnishings contribute to the vitality of the street, care must be taken to avoid clutter, placement of furnishings that inhibit access. The placement of furnishings must also be balanced with other sidewalk elements and functions. Street furnishings are secondary to the layout of street trees and lights, since street trees and lights establish the rhythm and pattern of the street.

The Bureau of Street Services is responsible for street furniture. A permit from BSS is required in order to place street furniture on the sidewalk.

Seating. Seating provides a comfortable, utilitarian, and active environment where people can rest, socialize, or read in a public space. The proper placement of a bench is a simple gesture creating a sense of place for the immediate area. Seating may be individual or linear (benches). It can be consistent for the street if there is a Streetscape Plan in place or it can relate to the adjacent use.

Location. Seating arrangements should be located and configured according to the following guidelines:

- Seating should be located in a shaded area under trees.
• Seating should be oriented toward points of interest; this can be the adjacent building, an open space, or the street itself if it’s lively. Where sidewalk width permits, seating can also be oriented perpendicular to the curb.

• Informal seating opportunities, incorporated into the adjacent building architecture, may be used as an alternative to free-standing benches. Low planter walls can be used as informal seating areas.

**Design.** Benches and seating should be made of durable high-quality materials. The seating design should complement and visually reinforce the design of the

**Trash receptacles.** Trash receptacles should be located:

- Near high activity generators such as major civic and commercial destinations
- At transit stops
- Near street corners but outside of the sidewalk pedestrian zone

**Bicycle racks.** Bicycle racks are critical in facilitating bicycling. It should be at least as easy and convenient to park a bike as a car. While the majority of bicycle racks should be provided in off-street parking facilities and in bike corrals in the curbside parking lane, convenient parking should also be provided along the sidewalk.

**Other furnishings.** The City regulates and manages street vendor standards, information/advertising kiosks, and newsracks. Refer to LAMC 42.00 for standards regarding newsracks.

**Sidewalk dining facilities.** Just as sidewalk dining contributes to street life, the physical facilities associated with it should contribute to the quality of the street environment and the project. Outdoor dining may occur on any portion of the sidewalk provided the required Pedestrian Access Route (PAR) is maintained.

All dining facilities located on the sidewalk should be freestanding, that is, not be attached to the sidewalk.

Enclosures of sidewalk dining areas are required only where alcohol is served, but may be provided elsewhere to create a sense of security. Enclosures shall not exceed 42 inches in height and shall be fabricated of durable materials that are in the same family as or compatible with the project’s architectural materials. Wood and square tubular steel (“fake wrought iron”) are not allowed. The use of movable planters to define a sidewalk dining area is encouraged.
Examples

Example of a “family” of street furnishings. (Credit: Landscape Forms)

Examples of other furnishings that could be added to the streetscape in conjunction with development projects to enhance relationship of the development to the adjacent street.
Bike racks can be located adjacent to large tree wells or in a decomposed granite parkway.

Seating and sidewalk dining combine with street trees and lights to create a complete pedestrian environment throughout the day and evening.

Sidewalk dining on both sides of the Pedestrian Access Route (PAR): in the Parkway Zone (right) and adjacent to the building facade in the Walkway Zone (left).

A simple railing enclosure separates dining from PAR.
4.7 Sidewalk Bicycle Parking

Bicycle parking is a support facility that allows bicyclists to store their bicycles when they reach a destination. Bicycle parking can be separated into two categories: short term and long term. Short term bicycle parking is recommended when providing bicycle storage for short periods of time, errands or quick activities. Long term bicycle parking is recommended when providing bicycle storage for long periods of time, overnight or possibly all day for commuters.

General Design Guidance:

Accessibility and Location:

- Bicycle parking should be placed as close as possible to the main entrance of a building/establishment. Racks should be placed no further than 50 feet away from the primary entrance of the establishment. This increases security and makes bicycling a visible travel option to bicyclists and non-bicyclists. Avoid placement around the corner or in an out-of-the-way place or put screening or landscaping around the parking. Hiding bicycle parking increases theft and vandalism.

- Make bicycle parking visible to bicyclists, building security, foot traffic, and anyone approaching the building. Making bicycle parking visible to foot traffic reduces the incidents of theft and vandalism.

- If possible, provide lighting for bicycle parking areas. Bicyclists, just like motorists, prefer to park in clean, well-lit places.

- If possible, provide a rack situated in an area that can cover the bicycle from the elements. Bicyclists don’t want to sit on a wet seat or leave their bicycle out in the rain.

- Install parking devices, which support the frame of the bicycle at two points, not just the wheel. Poorly designed bicycle parking devices bend wheels and damage bicycles.

In relation to the Public Right of Way:

Distance from a Curb: The bicycle rack should be situated 24 to 30 inches from the curb. The rack should align with existing street furniture. The rack should be placed parallel to the street to park bicycles parallel to the street.
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.

Distance from other Bicycle Racks: The rack should allow a minimum of 4 feet of clearance when placed parallel to the roadway measured from center of base plate to center of base plate. The rack should allow sufficient space for any bicycle. A typical bicycle requires a clearance of 6 feet in length and at least two feet in width.

Distance from Building: The rack should be a maximum of 50 feet from the front entrance of establishment. The rack should allow enough room between the rack and the entrance to the establishment. Bicycle racks should not impede access to a building. Bicycle racks should allow at least 5 feet of clearance on the sidewalk for pedestrian traffic.

Other Distances: A bicycle rack shall not be installed in a bus stop zone, taxi zones, or a loading zone. A bicycle rack should be placed at a minimum of 5 feet from a pedestrian crossing, driveways, alley entrances, and street corners/intersections. Bicycle racks shall not be placed on top of gutters/storm drains and utility access vehicles or too close to signal boxes.

**Inverted –U Bicycle Racks**

**Design Summary**

Rack Dimensions: 43” high by 30” long.

Construction: 2 3/8” x 2” x .188” wall single Schedule 40 ASTM A53 Steel pipe, constructed of a single 180 degree bend.

Base Plate will be constructed of ASTM A36 with a thickness of 3/8” and will be welded onto the steel pipe. The base plate should be welded to the steel pipe and be constructed to receive mounting hardware with three 0.50” diameter holes at 120 degrees of each plate.

Mounting Hardware: Mushroom Head, Stainless Steel Spike. 2 3/4” long by 1/2” diameter or equivalent vandal resistant hardware. Unacceptable fasteners include “Threaded Spike” or anything that contains sharp edges or can be vandalized.
Coating Material Finish: Long wearing, mildew and ultraviolet ray resistant coating made of polyester, polyvinyl, thermoplastic or TGIC Powder Coating. Coated in the factory prior to delivery. Any damaged surface area resulted from the Contractor’s operation shall be repaired with approved materials in accordance to the manufacturer’s specifications.

**Discussion**

These racks are a common existing facility found in many areas in Los Angeles. Care should be taken to ensure that they are placed and installed correctly.

**Guidance**

- APBP Bicycle Parking Guidelines

**Alternative Non-Standard Racks (Art Racks, etc.)**

**Design Summary**

Alternate parking devices must meet the following criteria:

- Support the bicycle frame at two points not only by the wheel
- Must accept a variety of bicycle sizes and styles including various types and sizes of frames, wheel sizes, and tire widths.
- Must allow for the use of a cable as well as a U-shaped lock.
- Allow for the frame and at least one wheel of the bicycle to be locked to the rack.
- Must be tall enough to be “seen” by pedestrians and the visually impaired yet not be monumental in scale to the bicycles to be parked to the device.
- Must be maintenance free or fabricated from materials which wear in an aesthetically pleasing manner.
- Must have a simple, rather than complex, design which allows the user to easily figure out and utilize the rack. Moving parts are not acceptable or must be kept at a minimum.
- Must not require the user to lift the bicycle onto the parking device.
**Discussion**

While the Inverted-U design is the accepted standard for bicycle parking in the public right-of-way, other rack designs may be accepted for use at the discretion of LADOT and the Department of Public Works.

**Guidance**

- LADOT/SCIARC
- Artist Designed
- Rack Program

**Additional Discussion - Unacceptable Bicycle Racks**

Examples of inferior bicycle racks abound. The use of unacceptable bicycle parking facilities can discourage bicycling. Racks with the following characteristics should not be employed:

- Support bicycles at one point of contact.
- Support bicycles by one wheel.
- Allow bicycles to fall; bending the wheel and blocking the pedestrian right-of-way.
- Has sharp edges that can be hazardous to users and pedestrians.
- Has mounting hardware that can be unscrewed with common tools.
- Requires the bicyclist to lift their bicycle onto in.

Examples of unacceptable bicycle racks.

**Additional Discussion – Rack Installation**

- Racks will be affixed to City sidewalks or other concrete pad location by the utilization of vandal-resistant hardware provided by the installer and approved by LADOT.
- Racks will be installed in locations as designated by LADOT throughout the City of Los Angeles. In most cases racks will be sited for installation in clusters in business districts in the City.
- Racks will be installed or removed in/from locations as designated by LADOT.
• All bicycle racks shall be installed at locations approved by City Engineer or LADOT staff. All installations shall conform to Americans with Disabilities Act (ADA) requirements.

• All bolt holes shall be clean of dust or any debris. The anchoring bolts should be driven vertically through the support plate into the bolt holes until the bolt head is firmly seated against the support plate.

• For pavement surfaces that are not level, use washers to level the rack and support plate. Fill with non-shrinking grout after the bicycle rack is mounted to the concrete.

• Do not place bicycle rack over any pavement expansion or control joint. Bicycle rack shall be placed at least 3 inches away from any expansion and or control joints in the cement.

Requirements for Multiple Bicycle Parking Installation:

• Bicycle racks can be placed perpendicular, parallel or angled to a building.

• Allow ample room between bicycle rack and structure.

• Bicycle racks should be placed at least 30 inches from the structure. When racks are placed side by side each rack should be spaced at least 48 inches from one another. Measured from the center of the rack.

• There should be sufficient room for a rider and a bicycle to fit in the aisle, the total width between bicycle racks should be at least 5 feet wide.
4.8 Utilities and Other Infrastructure

Intent

- Manage the placement of utilities and other infrastructure on sidewalks to:
  - Reduced clutter on the sidewalk.
  - Increased opportunity for planting areas and for soil volume to support tree growth and stormwater infiltration.
  - Reduced maintenance conflicts.
  - Improved pedestrian safety and visual quality.

Standards Table

<table>
<thead>
<tr>
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<td></td>
<td>Boulevard I (Major I)</td>
<td>Boulevard II (Major II)</td>
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<tr>
<td>Utilities and Other Infrastructure</td>
<td>Underground electrical, telephone, cable and other utility lines or relocate them to alleys or rear yards in conjunction with new construction projects.</td>
<td>—</td>
</tr>
<tr>
<td>Above-ground utility lines</td>
<td>Underground utility vaults and other related infrastructure where feasible.</td>
<td>—</td>
</tr>
<tr>
<td>Above-ground utility vaults</td>
<td>Locate street lighting conduit along the back of curb within the Parkway Zone. All other underground utility lines shall be located beneath the roadway.</td>
<td>—</td>
</tr>
<tr>
<td>Underground lines</td>
<td>Locate water, gas, electrical and other meter boxes either 1) in the Walkway Zone or 2) in the Parkway Zone as close to the back of curb as feasible and/or in the paved access strip as the back of curb where there is one.</td>
<td>—</td>
</tr>
<tr>
<td>Meter boxes</td>
<td>AGI near intersections, e.g., traffic control boxes, shall be located in the parkway zone of the street with less pedestrian activity. AGI shall be located at least 18 inches from back of curb. AGI shall be placed to avoid disrupting the pattern of street trees/street lights, stormwater management and other sidewalk functions. To the extent feasible, AGI shall not be relocated into sidewalk extensions. Where signals are pedestrian-activated, provide automatic pedestrian detection, pre-timed pedestrian phases, or install a separate pole at the required distance from the curb consistent with ADA guidelines.</td>
<td>—</td>
</tr>
</tbody>
</table>
Parking meters may be located in tree wells or parkways, as well as paved areas. Double meters are encouraged as they direct people to the walkway between two parking spaces.

Below-ground utilities previously located below the roadway need not be relocated when the roadway is replaced by a curb extension, widened sidewalk or median.

Only modifications to traffic signals, related conduit/wiring and other utilities directly required to accommodate curb extensions or other sidewalk improvements in 6.0 are required in conjunction with the installation of those improvements.

The most detrimental elements to creating walkable, livable, attractive streets in the City of Los Angeles are above-ground electrical, telephone and cable lines. The poles interfere with street tree and street light spacing and with stormwater management in the Parkway Zone. Electrical lines running directly over the Parkway Zone, which are typically not insulated, braided lines which are found in back yards, necessitate the regular pruning of existing 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, including cannot be achieved.

Thus, the single most effective contribution to Complete Living Streets is to remove overhead utility lines by either underground them or relocate them to alleys or rear yards. An alternative, where utility lines cannot be undergrounded or relocated, may be to replace the existing electrical lines with insulated, braided lines used in back yard conditions. Tree branches can grow around these electrical lines without concern that a fire will started if the lines break. Trees will still need to be pruned when limbs put pressure on power lines, and power poles still interfere with consistent street tree and street light spacing, but at least appropriately sized trees could be planted.

The location of underground utilities and other infrastructure must be considered when planning and designing sidewalks to contribute to Complete Living Streets. The majority of underground utilities, including sanitary sewers and storm drains, and water, gas, and electrical mains, are typically located under the roadway. In the City of Los Angeles, telecommunications, traffic signal conduit and fiber optic conduit are typically also located under the roadway. Sanitary sewers are often in the center of the street directly under the potential location of a landscaped median. They are usually relatively deep. In general, if they have at least 4 or 5 feet of cover, they should not
be affected by the introduction of a landscaped median. The other utilities within the roadway are typically located closer to the curbs.

In the City of Los Angeles, only street lighting conduit is typically located under the sidewalk, along with lateral lines that extend from utility mains in the roadway to serve adjacent properties run across the sidewalk.

The following suggestions provide additional guidance regarding underground utilities:

- Utilities should be placed to minimize disruption to pedestrian travel and to avoid ideal locations for directing stormwater, planting trees and other vegetation, and siting street furniture, while maintaining necessary access to the utilities for maintenance and emergencies.

- Large utility vaults should be located in the roadway or parking lane where possible to avoid competition for limited sidewalk space. Vaults in the parking lane may be located in short-term parking zones or in front of driveways to facilitate access. They can also be placed in midblock curb extensions.

- 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.

- Utility mains located in the parking lane and laterals accessing properties may pass under curb extensions. With curb extensions or sidewalk widening, utilities such as water mains, meters, and sewer vents may remain in place as they can be cost prohibitive to move.

- New utility vaults should not be placed within street crossing and curb ramp areas.

- Existing vaults located in the center accessible portion of a ramp should be moved or modified to meet accessibility requirements, as feasible, as part of utility upgrades.

- 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.
A typical Los Angeles Arterial Street has overhead utility lines (top). Utility undergrounding or relocation to the alley or rear yard alone can dramatically change the appearance of a street (middle). When combined with other improvements, including consistently spaced appropriately scaled street trees, it contributes to a more complete living street.
Other design considerations.

- Street design and new developments should consider the overall pattern of plantings, lighting, and furnishings when placing new utilities in the street, and locate utility lines so as to minimize disruption to the prevailing streetscape rhythms.

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

- 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.

- Tree removal should be avoided and minimized during the routing of large-scale utility undergrounding projects.

Process.

- Utility installation and repair should be coordinated with planned street reconstruction or major streetscape improvements.

- New development should submit utility plans with initial development proposals so that utilities may be sited to minimize interference with potential locations for streetscape elements.

- Utility work also offers opportunities to make other changes to the street after the work is completed and should be coordinated with planned improvements to avoid duplication of efforts or making new cuts in new pavement. Examples of improvements to streets that can be done at low cost after utility work include restriping for bike lanes if utility work requires total street repaving, as well as building sidewalks in conjunction with utility work occurring outside the traveled way.
Traffic Calming

Section 5
5.1 Neighborhood Friendly Streets (NFS)

Design Summary

Neighborhood Friendly Streets (NFS) generally are installed on minor or local roadways. No design standard exists. See following pages for additional guidance.

Discussion

On Neighborhood Friendly Streets, or Bicycle Routes, it is important to provide a benefit to the users who chooses the route. Frequently this benefit is composed of reduced travel time, lower motor vehicle traffic volumes and/or reduced motor vehicle speeds. Ideally, bicyclists should not be required to make frequent stops, and pedestrians can walk in a stress-free environment. The Neighborhood Friendly Street, or bicycle route, should be watched closely following treatment to determine if there is an increase in vehicle trips along the route as many motorists may take advantage of fewer stops.

Design Elements of a Neighborhood Friendly Street

- Median Opening Allows Bicyclists to Cross Roadway
- Raised Median Prevents Motorists from Cutting Through
- Diagonal diverter allows through movement for bicyclist while preventing motorists from cutting through. Opening preserves emergency vehicle access.
- Mini Traffic Circles and Speed Bumps Serve as Traffic Calming Devices
- 4 Way stop sign on cross streets favors through bicycle movement
thereby reducing the effectiveness of the facility for other more-vulnerable users. If motor vehicle ADT increases, treatments may be considered such as diagonal diverters, one-way closures, chicanes, chokers and other applicable treatments to preserve bicycle permeability and limit through vehicle access.

See following pages for additional discussion.

Guidance

- No explicit guidance in State or Federal manuals

Additional Discussion - Bicycle Friendly Streets (BFS)

This section describes various treatments commonly used for developing Neighborhood Friendly Streets. The treatments fall within five main “application levels” based on their level of physical intensity, with Level 1 representing the least physically-intensive treatments that could be implemented at relatively low impact on roadways that already function well for pedestrians and bicyclists. Identifying appropriate application levels for individual Neighborhood Friendly Street corridors provides a starting point for selecting appropriate site-specific improvements. The five Neighborhood Friendly Street application levels will be discussed in the next sections, including:

- Level 1: Signage
- Level 2: Pavement markings
- Level 3: Intersection treatments
- Level 4: Traffic calming
- Level 5: Traffic diversion

It should be noted that corridors targeted for higher-level applications would also receive relevant lower-level treatments (as illustrated next). For instance, a street targeted for Level 3 applications should also include Level 1 and 2 applications as necessary. It should also be noted that some applications may be appropriate on some streets while inappropriate on others. In other words, it may not be appropriate or necessary to implement all “Level 2” applications on a Level 2 street. Furthermore, several treatments could fall within multiple categories as they achieve multiple goals. To identify and develop specific treatments for each Neighborhood Friendly Street, the City should involve the bicycling community and neighborhood groups. Further analysis and engineering design work may also be necessary to determine the feasibility of some applications.
<table>
<thead>
<tr>
<th>Level 1</th>
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<th>Level 3</th>
<th>Level 4</th>
<th>Level 5</th>
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<tr>
<td>Marked Crosswalks</td>
<td>Bicycle Left Turn Lanes</td>
<td>Loop Director Symbols</td>
<td>Mini Traffic Circles</td>
<td>Choker Entrances</td>
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<td>Route &amp; Intersection</td>
<td>Intersection</td>
<td>Traffic Caliming</td>
<td>Traffic Diverters</td>
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<td>Intensity of Treatments</td>
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<td>Shared Bikeway</td>
<td>Bicycle Priority Street</td>
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Higher levels may contain all treatments from lower levels. Design varies based on roadway conditions and area characteristics.
5.2 Signage & Pavement Markings

Design Summary

Design varies; see following page for additional discussion.

Discussion

Signage is a cost-effective yet highly-visible treatment that can calm the environment on a Neighborhood Friendly Street network. Described in this section, signage can serve both wayfinding and safety purposes.

See following page for additional discussion:

Potential Signage/Wayfinding Options

![Diagram of signage options]

Los Angeles Department of City Planning
Guidance

- California MUTCD
- Caltrans Highway Design Manual

Additional Discussion - Bicycle Route/NFS Signage & Pavement Markings

Signage

Wayfinding Signs: Shown on previous page, wayfinding signs are typically placed at key locations leading to and along Neighborhood Friendly Streets, including where multiple routes intersect and at key bicyclist “decision points.” Wayfinding signs displaying destinations and distances can dispel common misperceptions about time and distance while increasing user ease and accessibility to the NFS network. Wayfinding signs also visually cue motorists that they are driving along a bicycle route and should correspondingly use caution. Note that too many road signs tend to clutter the right-of-way and become invisible to regular users.

Warning Signs: Warning signs advising motorists to “Share the Road” may also improve bicycling conditions on a Neighborhood Friendly Street network. These signs may be useful near major trip generators such as schools, parks and other activity centers. Warning signs should also be placed on major streets approaching Neighborhood Friendly Streets to alert motorists of crossings.

Pavement Markings: Pavement marking techniques may also improve bicycling conditions along a Neighborhood Friendly Street network which may include Shared Lane Markings and Loop Detector Markings.

Shared Lane Markings: Shared Lane Marking (SLM) – see Section 8.4) are often used on streets where dedicated bicycle lanes are desirable but not possible due to physical or other constraints. They also may be used as Neighborhood Friendly Street markings where on street parking is present.

On-Street Parking Delineation: Delineating on-street parking spaces with parking Ts clearly indicate where a vehicle should be parked, and can discourage motorists from parking their vehicles too far into the adjacent travel lane. This helps bicyclists by maintaining a wide enough space to safely share a travel lane.
with moving vehicles while minimizing the need to swerve farther into the travel lane to maneuver around parked cars and opening doors. In addition to benefiting bicyclists, delineated parking spaces also promote the efficient use of on-street parking by maximizing the number of spaces in high-demand areas.

**Loop Detector Stencils:** At signalized intersections with in-pavement detection, the CA MUTCD Bicycle Detector Symbol may be used to indicate where bicyclists should wait to activate a green light. (See Section 5.7.2)
5.3 Stop Signs on Cross-Streets

Design Summary
Design varies; see below and following pages for additional discussion.

Discussion
The installation of a stop sign on cross streets along the Neighborhood Friendly Street or Bicycle Route maximizes through bicycle connectivity and speed and requires motorists crossing the facility to stop and proceed when safe. The addition of stop signs will typically not meet the warrants for additional stop sign installation and should be considered a traffic calming tool rather than a traffic control device.

Advantages:
- Inexpensive installation.
- Effective at reducing though bicycle and cross vehicle conflicts.

Disadvantages:
- May be unwarranted as traffic control device.

Guidance
- California MUTCD
- Caltrans Highway Design Manual
5.4 Curb Bulbouts and High-Visibility Crosswalks

Design Summary

Design varies; see below and following pages for additional discussion.

Discussion

This treatment is appropriate for Neighborhood Friendly Streets or Bicycle Routes near activity centers that may generate large amounts of pedestrian activity such as schools or commercial areas. The bulbouts should only extend across the parking lane and should not obstruct bicyclists’ path of travel or the travel lane. This treatment may be combined with a stop sign on the cross street if necessary.

Advantages:

• Traffic calming device.

Disadvantages:

• May impact on-street parking.
• Moderate cost (approx $5,000-$15,000 per intersection).
• May impact bus/truck turning movements.
• May impact emergency vehicles.
• Issues with storm water drains and runoff.

Guidance

• AASHTO Guide for the Development of Pedestrian Facilities
• Berkeley Bicycle Boulevard Design Tools and Guidelines http://webserver.ci.berkeley.ca.us/uploadedFiles/Public_Works/Level_3_-_General/ch4_.pdf
5.5 Diagonal Diverter

Design Summary

Design varies; see below and previous pages for additional discussion.

Discussion

This treatment prevents through vehicle traffic and is appropriate for Neighborhood Friendly Streets or Bicycle Routes where through vehicle traffic may be high or is not desired. The diverter should be designed so that emergency vehicles may still permeate the diverter with a minimum of delay, potentially using flexible bollards. The diverter may landscaped with drought tolerant plants that do not impact sight lines to enhance the greenspace of the neighborhood.

Advantages:

• Traffic calming device.
• Reduces through vehicle movements along BFS.

Disadvantages:

• May slightly slow emergency responders.
• Moderate cost (approx $4,000-$10,000 per intersection).
• May impact street maintenance and, if landscaped, should be adopted by neighborhood for landscape maintenance.

Guidance

• Berkeley Bicycle Boulevard Design Tools and Guidelines http://webserver.ci.berkeley.ca.us/uploadedFiles/Public_Works/Level_3_-_General/ch4_.pdf
5.6 Major Signalized Intersections

Design Summary

Design varies; see following page for additional discussion.

Discussion

Bicyclists must be detected at signalized intersections for the Neighborhood Friendly Street to be effective.

The photo below depicts an intersection of a Neighborhood Friendly Street with a major street. Through motor vehicle traffic is prohibited while bicycle through traffic is controlled with a dedicated through lane with embedded loop detection.

See below for special considerations:

Guidance

- CA MUTCD
- Caltrans Highway Design Manual
- AASHTO Guide for the Development of Bicycle Facilities

Special Considerations for Bicyclists at Local/ Major Signalized Intersections

For a signalized intersection to function properly for a bicyclist crossing a major roadway at a signalized intersection, the following considerations must be addressed:

- Easy and accurate detection by the traffic signal controller by one of the methods listed in the column.

- Safe location to wait for green signal – Bicyclists awaiting a green light should not block vehicle right turns (if allowed). Sufficient lane width or stenciling can help with lane positioning and traffic flow.

- Signal timing providing adequate time for bicyclists to safely cross the intersection.

Design Example

1. An embedded loop with placement and sensitivity to detect a bicycle. Identify loop with the standard “Bicycle Detector Symbol” shown in Figure 9C-7(CA) in the California MUTCD.

2. Video detection technology.

3. Use of a bicyclist-activated push button, as long as they do not require bicyclists to dismount or make unsafe leaning movements. These devices should be placed as close to the street as possible in a location that is unobstructed by parked vehicles or motorists making right-hand turns.
In situations where there are few crossable gaps and where vehicles on the major street do not stop for pedestrians and bicyclists waiting to cross, “half signals,” that stop traffic only along one of the streets could be installed to improve the crossing environment. Half signals include bicycle activation buttons and may also include bicycle loop detectors on the Neighborhood Friendly Street approach. Many of these models have been used successfully for years in Europe, and their use in the U.S. has increased dramatically over the last decade.
5.7 Crossing Islands

Design Summary

Various designs are applicable for crossing islands. Designs vary: see following page for additional discussion.

Discussion

Crossing islands enable crossing for bicyclists where traffic signals or other designs may not be feasible.

Guidance

- Caltrans Highway Design Manual
- California MUTCD
- AASHTO Guide for the Development of Bicycle Facilities

Recommended Design
Additional Discussion - Bicycle Route/BFS at Local/Major Unsignalized Intersections – Crossing Islands

Special Considerations for Bicyclists at Local/Major Unsignalized Intersections:

At intersections of Neighborhood Friendly Streets/Bicycle Routes and major unsignalized intersections, a crossing island should be provided to allow crossing one direction of traffic at a time when gaps in traffic allow. The crossing island should be at least 8 feet wide (measured perpendicular to the centerline of the major road) to be used as a bicycle refuge. Narrower medians can accommodate bikes if the holding area is at an acute angle to the major roadway, which allows stopped bicyclists to face oncoming motorists. Crossing islands should be in the middle of the intersection, thus prohibiting left and through vehicle movements in conjunction with a high-visibility crosswalk (left turn prohibition is required).

Advantages of bicycle crossing islands:

- Provides safe refuge in the median of the major street so that bicyclists and pedestrians only have to cross one direction of traffic at a time – works well with signal controlled traffic platoons coming from opposite directions.

- Provides traffic calming and safety benefits by preventing left turns and/or through traffic from using the intersection.

Disadvantages / potential hazards:

- Potential impacts to major roadway, including lane narrowing, loss of some on-street parking and restricted turning movements.

- Crossing island may collect debris and may be difficult to maintain.
5.8 Traffic Mini-Circle

Intent

- Manage traffic at intersections where volumes do not warrant a signal.
- Reduce crash problems at the intersection of two Non-Arterial streets.
- Reduce vehicle speeds at the intersection.
- Treat a series of intersections along a Non-Arterial Street as part of a neighborhood traffic improvement program, such as a Neighborhood Friendly Street.

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</table>

**4.4 Mini Traffic Circles**

- Buffer: Provide 4 feet between maximum vehicle displacement around circle and pedestrian crossing zone (striped or unstriped).
- Directional curb ramps: If feasible.
- Stop signs: Traffic circles on Bicycle Friendly Streets should have stop sign control on the approaches of intersecting cross streets, but not on the Bicycle Friendly Street.

Elements in traffic circle shall meet Intersection Visibility standards, LAMC 62.20.

Discussion/Examples

Traffic mini-circles are typically used on two-lane Collector Streets with ADT of less than 5,000 and bus/heavy vehicle volumes of less than 2% of total ADT and on Local Streets as a means of slowing vehicular traffic and allowing bicycles to move through the intersection on the Collector Street without stopping.
According to the FHWA Pedestrian Safety Guide:

“Mini-circles are raised circular islands constructed in the center of residential street intersections. They reduce vehicle speeds by forcing motorists to maneuver around them and are sometimes used instead of stop signs. Mini-circles have been found to reduce motor vehicle crashes up to 93% in some locations, such as Seattle, WA. Drivers making left turns are directed to go on the far side of the circle (see diagram at right) prior to making the turn. Signs may be installed within the circle to direct motorists to proceed around the right side of the circle before passing through or making a left turn. Mini-circles are commonly landscaped (bushes, flowers, or grass), most often at locations where the neighborhood has agreed to maintain the plants. In locations where landscaping is not feasible, traffic circles can be enhanced through pavement materials.

“Mini-circles are an intersection improvement as well as a traffic calming device and can take the place of a signal or four-way stop (many un-warranted signals are installed because of the demand for action by the community.

“Mini-circles must be properly designed to benefit pedestrians and cyclists. Right-turning vehicles are not controlled at an intersection with a mini-circle, potentially putting pedestrians and cyclists at risk. [Therefore] curb radii should not be reduced to what would be otherwise desirable...The occasional larger vehicle going through an intersection with a traffic circle (e.g., a fire truck or moving van) can be accommodated by created a mountable curb in the outer portion of the circle.... Larger vehicles that need access to streets (e.g. school buses and fire engines) may need to make left hand turns in front of the circle.”

A traffic mini-circle differs from a mini-roundabout (see Section 5.9) in that it typically does not include splitter islands on the approach and has a smaller footprint.

Examples of other places in Southern California where mini-traffic circles have been installed:

- Long Beach
- Pasadena
- Santa Barbara
- West Hollywood
- Santa Monica
Figure 5-1
Standard Street Dimensions

Example plan of a traffic mini-circle with striping and Botts dots to guide motorists around the circle. In the City of Los Angeles, a 4-foot buffer between maximum vehicle displacement around circle and pedestrian crossing zone, typically resulting in 15 feet from the circle to the corner, is required to ensure that vehicles do not enter the crosswalk.

Examples of traffic mini-circles include Seattle, Santa Monica, Long Beach, and Sydney.
Auto-Turn diagrams show how passenger vehicles can maneuver around the mini-circle (upper diagram), while buses and emergency vehicles can turn left in front of it (lower diagram).
5.9 Mini-Roundabout

Design Summary

Design varies; see below and following pages for additional discussion.

Discussion

Roundabouts can be effective in several scenarios when used along a Neighborhood Friendly Street and cross-streets. Typically mini-roundabouts are implemented where the Neighborhood Friendly Street intersects a local street or even a collector if the ADT is less than 2,000. Signage and striping treatments should be implemented based on traffic volumes and may be appropriate for local/local intersections with very low ADT, while increased signage and splitter striping may be appropriate for larger ADTs and intersections with collector streets. Mini-roundabouts can be landscaped with drought tolerant plants that do not impact sight lines for added visual impact and traffic calming effect. Treatment should be designed with the input of LAPD and LAFD for emergency vehicle access.

Advantages:

• Very effective at reducing through bicycle and cross vehicle conflicts.

• Adds overall traffic calming in all directions.

• Use where unwarranted stop signs exist.

Disadvantages:

• Moderate to high cost (approx $20,000 per intersection).

• Required approval of neighborhood for installation.

• Required neighborhood support and adoption for maintenance of landscaping if installed.

Guidance

• California MUTCD

• Caltrans Highway Design Manual
Mini Roundabout

- FHWA Roundabouts: An Informational Guide
- AASHTO Guide for the Development of Bicycle Facilities
- Berkeley Bicycle Boulevard Design Tools and Guidelines
5.10 Bicycle Only Left Turn Pocket (Non Standard)

Design Summary

Bicycle Lane Width:

Bicycle Lane pocket should be 4’ minimum in width, with 5’ preferred.

Discussion

A left-turn pocket allows only bicycles left turn access to a Neighborhood Friendly Street or designated bikeway. If the intersection is controlled the left-turn pocket may have a left arrow signal, depending on bicycle and vehicle volumes. Signs and raised median design restrictions should be provided that prohibit motorists from turning, while allowing access to bicyclists. Bicycle 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. This treatment typically should be applied on lower volume arterials and collectors.

Guidance

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

• This treatment is currently used in Portland, Oregon.

Recommended Design

Design Example

Portland, Oregon
5.11 Bicycle Pockets at Local Streets (Non Standard)

Design Summary

Bicycle Turn Pocket Width:

The Bicycle Turn Pockets should be 5 feet wide, with a total of 11 feet required for both turn pockets and center striping. Roadway treatments should also prohibit motor vehicle left turn movements.

Discussion

Bicycle Routes or Neighborhood Friendly Streets crossing major streets at offset intersections can incorporate “bicycle left-turn lanes” to facilitate easier bicyclist crossings. Similar to medians/refuge islands, bicycle left-turn lanes allow the crossing to be completed in two phases. A bicyclist on the Neighborhood Friendly Street could execute a right-hand turn onto the cross-street, and then wait in a delineated left-turn lane if necessary to wait for a gap in oncoming traffic. If traffic volumes are moderate, the prohibition of vehicular left turns may reduce conflicts between bicyclists and vehicles.

Guidance

• This treatment is not currently covered in any established standards.
5.12 Bicycle Pockets at Major Streets

Design Summary

Design varies: Bicycle Pockets should be 5’ wide minimum. Openings in median/bicycle pocket should be wide enough to accommodate two bicyclists waiting for a traffic gap. Bicycle Pockets should be only delineated with paint.

Discussion

Misaligned intersections of local and major streets can cause discontinuity in the bicycle network and make Bicycle Routes/Neighborhood Friendly Streets difficult to fully implement. The concepts below are suggestions for providing bicycle facilities to close similar gaps in Los Angeles. In examples ‘A’ and ‘B’ below, a longer offset is represented. Road space can be taken from a median, center turn lane, or on-street parking to create a two-way bicycle pocket to better facilitate a connection for bicyclists. In example ‘C’ a shorter offset allows for a narrower facility consisting of two left turn pockets.

Guidance

• This treatment is not currently covered in any established standards.
Recommended Design
(not to scale)
6.1 Stormwater Treatment

Intent

Infiltrate or treat stormwater runoff from the sidewalk at a minimum and from the roadway where feasible and affordable.

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<td></td>
<td>Avenue (Secondary)</td>
<td>Collector Street</td>
</tr>
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<td></td>
<td></td>
<td>Industrial Collector</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Local</td>
</tr>
<tr>
<td>Stormwater/Streetwater Treatment</td>
<td>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.</td>
<td></td>
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<tr>
<td>Sidewalk runoff</td>
<td></td>
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<tr>
<td>Roadway runoff</td>
<td></td>
<td>See BOE standards for infiltration/treatment of roadway runoff (&quot;streetwater&quot;).</td>
</tr>
</tbody>
</table>

Discussion

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.

BOE has developed extremely complex and costly standards that make it difficult to manage stormwater and other runoff ("streetwater") in the public ROW cost effectively. To facilitate the goals and benefits of managing streetwater, it is suggested that the City develop less complex, less costly standards for smaller projects, similar to those used by other jurisdictions.

Goals and Benefits of Streetwater Management. While conventional stormwater controls aim to move water off-site and into storm drains...
as quickly as possible, streetwater management seeks to use and store water on-site for absorption and infiltration in order to clean it naturally and use it as a resource. The storm drain system, therefore, is an overflow support system rather than a primary conveyance system. Streetwater management deals with water as an amenity rather than a liability.

The primary goals of streetwater management are as follows:

- **Reduce** – limit the amount of impervious surfaces that generate additional runoff
- **Sink** – keep water on site
- **Store** – contain water for direct non-potable/potable indoor/outdoor purposes
- **Use** – to irrigate and replace imported potable water
- **Slow** – friction slows flow
- **Spread** – allow water to be slowed enough to infiltrate

These goals can be expressed succinctly: slow it, spread it, store it, and sink it, but use it.

Streetwater management provides the following ecological, economic, and aesthetic benefits:

- Reduced use of potable water for irrigation;
- Reduced surface water pollution;
- Support for the urban ecosystem and wildlife habitat;
- Enhanced flood control;
- Biological filtration and bio-remediation;
- Groundwater recharge;
- Reduced heat island effect;
- Education through best management practices (BMP) visibility;
- Aeration of root zone;
- Potential reductions in stormwater infrastructure and treatment costs; and
- Improved aesthetics and public space within neighborhoods.
Examples

Figure 6-1
Standard Street Dimensions

Parkway swale during storm event

(Parkway swale during storm event
(Credit: Edward Belden, Los Angeles and San Gabriel Rivers Watershed Council in Model Design Manual for Living Streets))

Parking lot swales collect, treat and infiltrate stormwater before it reaches the street and is mixed with other contaminants.

Parking lot swales collect, treat and infiltrate stormwater before it reaches the street and is mixed with other contaminants.
Principles of Stormwater Management

• Use the conventional storm drain system as the overflow approach, not the primary system to manage streetwater. Wherever possible, natural drainages should be the primary overflow.

• Harvest, use, and/or store stormwater as close to its source as possible. Wet weather rainfall and its by product, stormwater, can offset or eliminate imported potable irrigation water needs when harvested and used on-site. Harvesting and storing stormwater transforms a flooding liability into an on-site irrigation resource. This ensures natural waterways and their plant communities have local sources of water, thereby reducing the need for imported water. Harvesting and storing rainwater also reduces the need for costly drainage conveyance infrastructure for stormwater management.

• Select tools that mimic natural processes. Minimize the cost of the installation and maintenance by using gravity flow rather than pumped flow, living filtration over synthetic/mechanical filtration, and living surface infiltration instead of piped drainage. Priority should also be given to pervious versus impervious surfaces. The primary purpose is to harvest and utilize rain as part of a healthy vegetated watershed. For example, vegetation can reduce runoff water volume and pollutant load, provide summer shade and cooling, and enhance wildlife habitat and sense of place with native vegetation rooted to the local ecosystem.

• 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 streetwater management are ecological, economic, and social. Make the functions described in this section visible for street users to see, understand, appreciate, and replicate. Public right-of-way streetwater installations can inspire private property installations and serve as model installations for neighborhoods. Visible water flow systems are also easier to maintain. Blockages are easier to notice and easier to access for regular maintenance.
6.2 Raised Landscaped Medians

Intent

- Channelize vehicular traffic and limit midblock left-turns where appropriate.
- Provide a pedestrian refuge on a wide street.
- Collect and treat or infiltrate stormwater.
- Provide a visual separation that makes the roadway appear narrower.
- Support trees and other plants where conditions are relatively conducive to their growth and where irrigation can be provided for long stretches.
- Contribute to community identity with unique landscaping and other elements.

Standards Table

<table>
<thead>
<tr>
<th>Complete Street Type Name</th>
<th>ARTERIAL STREETS</th>
<th>NON-ARTERIAL STREETS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Boulevard I (Major I)</td>
<td>Boulevard II (Major II)</td>
</tr>
<tr>
<td>Criteria for Raised Landscaped Medians</td>
<td>20 feet of roadway width, excluding curbside parking or loading zones, provided on each side of the median (typically two travel lanes on each side).</td>
<td>Medians may be used where the Fire Chief determines that access and staging can be accommodated without a 20-foot clear zone in the roadway (i.e. using adjacent setbacks).</td>
</tr>
<tr>
<td></td>
<td>If counts are not available, the following storage lengths are suggested minimums: 40 feet if non-signalized; 60 feet at signalized collector; 100 feet at signalized Arterial Street.</td>
<td>If counts are not available, the following storage lengths are suggested: 40 feet if non-signalized; 60 feet if signalized.</td>
</tr>
<tr>
<td>Minimum width</td>
<td>At least 7 feet wide, including curbs, except the median strip adjacent to left-turn lane may be a minimum of 3 feet wide.</td>
<td></td>
</tr>
<tr>
<td>Minimum width to include trees</td>
<td>In order to accommodate trees, both in terms of soil volume and separating from travel lanes, medians should be at least 7 feet wide, including curbs.</td>
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</tr>
</tbody>
</table>
**Criteria for Raised Landscaped Medians**

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<thead>
<tr>
<th>Complete Street Type Name</th>
<th>ARTERIAL STREETS</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Boulevard I (Major I)</td>
<td>Boulevard II (Major II)</td>
</tr>
<tr>
<td>Tree spacing from intersection</td>
<td>In order to provide visibility, trees should be 50 feet from a crosswalk or from the limit line at an intersection where there is no crosswalk.</td>
<td>Not required</td>
</tr>
<tr>
<td>18 inch wide walkable edge strip</td>
<td>An edge strip with a walkable surface should be provided on Arterial Streets for maintenance access.</td>
<td>Not required</td>
</tr>
<tr>
<td>Stormwater treatment</td>
<td>Minimize runoff from stormwater onto the roadway and, where feasible, infiltrate runoff.</td>
<td>Not required</td>
</tr>
<tr>
<td>Planting</td>
<td>Appropriate plant materials will vary depending on local conditions and maintenance. Typically, low growing, low maintenance, low water use plants are appropriately. Refer to BSS for specific requirements.</td>
<td>Not required</td>
</tr>
<tr>
<td>Irrigation</td>
<td>Overspray and runoff onto the roadway pavement from irrigation is prohibited. Refer to BSS for specific requirements.</td>
<td>Not required</td>
</tr>
<tr>
<td>Other elements</td>
<td>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.</td>
<td>Not required</td>
</tr>
</tbody>
</table>

**Discussion**

Raised medians are most useful on high volume, high speed roads. Raised medians are most often installed on Boulevards (Majors) with continuous center lanes. However, medians are sometimes installed on Avenues (Secondary Streets), Collectors and Local Streets, where buildings are set back from the ROW and there is sufficient area for the fire department to stage within the setback.

Raised medians can serve as a place of refuge for pedestrians who cross a street midblock or at intersections. They provide space for street trees and other landscaping which, in turn, can help reduce speeds by changing the character of a street. They also have benefits for motorist safety when they replace center turn lanes. Desired turning movements need to be carefully provided so that motorists are not forced to travel on inappropriate routes such as residential streets or an unsafe U-turn condition is not created. Continuous medians may not be the most appropriate treatment in every situation. In some cases, they can increase traffic speeds by decreasing the perceived friction through separating traffic flow directions. They may also take up space that can be better used for wider sidewalks, bicycle lanes, landscaping buffer strips, or on-street parking.

**Examples**

If center lane is at least 12 feet wide, a “nose” along the turn lane can be included to provide a small pedestrian refuge adjacent at the crosswalk and additional visual relief from the expanse of roadway. If the center lane is at least 14 feet wide, the nose can be planted with low groundcover.
below, the center lane is 14 feet wide, so, where there is no left-turn lane, the raised median is 12 feet wide with 1 foot clear between lane striping and the face of the median curbs, 6-inch curbs and a 10 foot wide planted area. Adjacent to the 9-foot wide left-turn lane, there is a 4-foot wide raised median with 6-inch curbs and a 3-foot planted area with 1 foot clear between the face of the median curb and the travel lane in the opposite direction.

**Center Turn Lane less than 12 Feet Wide (Without Median Nose)***

- Median "nose" adjacent to left-turn lane can provide pedestrian refuge if needed.
- Median nose at least 4 feet wide, including curbs, can be planted.
- Median reduces the expanse of asphalt.
If center lane is less than 12 feet wide, a “nose” along the turn lane cannot be provided. In the example below, the center lane is 10 feet wide, so, where there is no left-turn lane, the raised median is 8 feet wide with 1 foot clear between lane striping and the face of the median curbs, 6-inch curbs and a 7-foot wide planted area.
The 7-foot wide median on Wilshire Boulevard, Westlake accommodates small trees and improves the visual character of the street, reducing the expanse of asphalt.

The median on Orange Grove Avenue, South Pasadena contributes to traffic calming and enhances community identity, with the addition of river rock and native plants.

The medians on Sepulveda Boulevard in Westchester contribute to community identity and provide a pedestrian refuge for a midblock crosswalk.

The medians on Santa Monica Boulevard, West Hollywood include pedestrian refuges at staggered midblock crosswalks, noses at intersections, locations for public art and access paths.
6.3 Parkway Zone Surface and Treatment

Intent

- Provide optimal conditions for tree health.
- Reduce stormwater runoff by increasing permeable surface area.
- Provide a buffer between vehicles in the street and pedestrians on the sidewalk.
- Encourage continuous parkway planting to enhance the visual quality of the street and contribute to traffic calming by reducing the perceived width of the roadway.

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<tr>
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<td>Boulevard I (Major I)</td>
<td>Boulevard II (Major II)</td>
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</tr>
<tr>
<td>Collector Street</td>
<td>Industrial Collector</td>
<td>Local</td>
</tr>
</tbody>
</table>

**Parkway Zone Surface and Treatment**

<table>
<thead>
<tr>
<th></th>
<th>ARTERIAL STREETS</th>
<th>NON-ARTERIAL STREETS</th>
<th></th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Provide a continuous parkway with 12-foot long tree wells</td>
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<td></td>
<td>1) at bus stops and 2) adjacent to ground floor retail where the sidewalk is less than 15 feet wide. Smaller tree wells may be provided where uncompacted soil is provided under the entire parkway zone to a depth of 3 feet and the parkway zone surface is permeable or the sidewalk runoff is otherwise drained into the uncompacted soil volume.</td>
<td>Provide a continuous parkway.</td>
<td></td>
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<tr>
<td></td>
<td>If Section 4.1(Walkway Zone) applies (sidewalk improvements are installed as a requirement)</td>
<td></td>
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<tr>
<td></td>
<td>Provide a continuous parkway.</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>If Section 4.1 does not apply</td>
<td>12-foot long tree wells.</td>
<td>Provide a continuous parkway.</td>
</tr>
<tr>
<td></td>
<td>Parkways/tree well surface treatment</td>
<td></td>
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<tr>
<td></td>
<td>Within 4 feet of trees</td>
<td>No paving or planting; mulch (preferred) or stabilized decomposed granite only.</td>
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</tbody>
</table>
**Discussion**

The Parkway Zone surface is critical to the health of street trees and to stormwater collection. A well-designed parkway also contributes to the character of the street, adjacent land uses and community. The preferred surface is a continuous planted parkway, as it maximizes these benefits.

**Benefits of Parkway Planting.** Parkway planting:

- Complements and supports street trees, in particular by providing uncompacted, permeable areas that accommodate roots and provide air, water, and nutrients
- Reduces impervious area and surface runoff
- Treats stormwater, improving water quality and provides infiltration and groundwater recharge
- Provides habitat
- Reduces the perceived width of the street by breaking up wide expanses of paving, particularly when the understory is in medians and sidewalk furniture zones
- Contributes to traffic calming
• Provides a buffer between the walkway zone and the street, contributing to pedestrian comfort

• Improves the curb appeal of properties along the street, potentially increasing their value

• Enhances the visual quality of the community

**Principles.** The following principles guide the standards in this section.

• Trees take precedence: other parkway planting should support and not compete with them.

• Only pave where necessary: keep as much of the Parkway Zone unpaved and planted as possible.

• Design the parkway to infiltrate water.

• The entire parkway does not have to be covered with plants—composted mulch is a good groundcover (top of mulch should be below adjoining hardscape so that runoff will flow into planning areas).

• Make the understory sustainable: use drought-tolerant plants.

• Replenish the soil with compost.

• Design the understory to contribute to the sense of place

**Soil.** Provide good quality, uncompacted, permeable soil. 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.

**Design.** Generally, the 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.

Plant the parkway with species that:

• Do not require mowing more frequently than once every few months

• Are drought tolerant and can survive with minimal irrigation upon establishment
• 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
• Do not have thorns or sharp edges adjacent to any walkway or curb

Examples

Left: Traditional landscaping, requiring irrigation, along a residential parkway in Southern California.
Right: More sustainable landscaping.

Landscaped parkways along a commercial streets. Landscaped parkways provide more soil volume for street trees and collect storm water runoff from the sidewalk. In addition, they can be designed to infiltrate or filter stormwater.

Left: Large tree wells can provide similar benefits to continuous parkways.
Right: Stabilized decomposed granite parkways can accommodate furniture and overflow pedestrians.
6.4 Street Trees

Intent

The goal of adding street trees is to increase the canopy cover of the street, not simply to increase the overall number of trees. Therefore, facilitating the growth of street trees to a mature size and protecting mature trees is critical. Healthy, mature trees:

- Shade streets so they are more pleasant places to walk and spend time.
- Shade adjacent buildings to lower temperatures and reduce energy use.
- Slow and capture rainwater, helping it soak into the ground to restore local hydrologic functions and aquifers.
- Improve air quality by cooling air, producing oxygen, and absorbing and storing carbon in woody plant tissues.
- Make streets and adjacent land uses more attractive.
- Increase property values and sales revenues for residences and businesses along the streets.
- Enhance local neighborhood and cultural identity through specific plant forms and materials, the act of planting and sharing food crops, or by creating sheltering spaces for social interaction.
- Enhance safety and personal security on a street by calming traffic and by fostering a denser and more consistent human presence.
- Provide cover, food, and nesting sites for indigenous wildlife.
### Standards Table

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<tbody>
<tr>
<td></td>
<td>Boulevard I (Major I)</td>
<td>Boulevard II (Major II)</td>
</tr>
<tr>
<td><strong>Street Trees</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mature height under power lines</td>
<td>5 feet lower than electrical power line (excludes phone, cable, other non-electrical lines, which need not clear the tree canopy).</td>
<td></td>
</tr>
<tr>
<td>Mature height-other</td>
<td>50 feet+</td>
<td>40-50 feet</td>
</tr>
<tr>
<td>Clearance under canopy</td>
<td>Trees must be species/cultivar that can be pruned up above 14 feet at mature height.</td>
<td></td>
</tr>
<tr>
<td>Spacing from tree/palm</td>
<td>Average 30 feet for trees 40 feet or greater canopy spread/height; 25 feet for smaller trees; 10 feet from palms.</td>
<td></td>
</tr>
<tr>
<td>Spacing from other elements</td>
<td>As specified by UFD except: Trees with mature canopy diameter of 30 feet or less may be 15 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.</td>
<td></td>
</tr>
<tr>
<td><strong>Tree size at planting</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Box size</td>
<td>36-inch box</td>
<td>24-inch box</td>
</tr>
<tr>
<td>Trunk dia. 4-foot high</td>
<td>2 - 2.5 inches</td>
<td>1 - 1.5 inches</td>
</tr>
<tr>
<td>Height</td>
<td>14 feet</td>
<td>10 feet</td>
</tr>
<tr>
<td>Canopy clearance</td>
<td>6 feet above sidewalk elevation.</td>
<td></td>
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<tr>
<td><strong>Form</strong></td>
<td></td>
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<tr>
<td>Adjacent to curb travel lane</td>
<td>Single central leader (trunk) with canopy that can be pruned up above bus/truck height (16 feet) within 5 years.</td>
<td></td>
</tr>
<tr>
<td>Adjacent to ground floor commercial uses</td>
<td>Single central leader with open canopy that can be pruned up above business signs (14 feet) within 5 years.</td>
<td></td>
</tr>
<tr>
<td>On sidewalks less than 15 feet wide with 0 to 5-foot building setback</td>
<td>Columnar (typically less than 40-foot diameter), open canopy where multi-story buildings are anticipated. Canopy may be wider/denser where single-story buildings are anticipated.</td>
<td></td>
</tr>
<tr>
<td><strong>Other Standards</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adequate root volume to support street trees</td>
<td>Roots of trees planted in the Parkway Zone shall not be restricted by concrete curbs, root barriers or other means, except linear root barriers up to 12 inches deep may be used along the edge of walkway or back of curb for a length of 8 feet centered on the tree trunk.</td>
<td></td>
</tr>
<tr>
<td><strong>Irrigation</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>If Section 4.1 (Walkway Zone) applies</td>
<td>In-line drip or bubblers; no spray; see BSS standards for design.</td>
<td></td>
</tr>
<tr>
<td>If Section 4.1 does not apply</td>
<td>To be watered weekly from July - September for 3 years after planting by installer or other individual or entity.</td>
<td></td>
</tr>
<tr>
<td>Time of planting</td>
<td>Plant trees in conjunction with each project; in-lieu fees are not allowed.</td>
<td></td>
</tr>
<tr>
<td>Other standards</td>
<td>Refer to adopted Streetscape Plan, BSS and UFD for all other standards, including species selection in conformance with the above standards.</td>
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</tbody>
</table>
Street trees are essential to both walkability/livability and the environmental benefits of the City’s urban forest. Trees contribute to the comfort and safety of people who live or travel along the street. Trees provide shade for pedestrians, which is critical during most of the year in non-coastal areas of Southern California. A street lined with trees and other planting looks and feels narrower and more enclosed, which encourages drivers to slow down and to pay more attention to their surroundings. Trees provide a physical and a psychological barrier between pedestrians and motorized traffic, increasing safety as well as making walking more enjoyable. In his book Great Streets, Allan Jacobs says: “Given a limited budget, the most effective expenditure of funds to improve a street would probably be on trees...assuming someone will take care of them.”

As a critical part of the urban forest, which includes all trees, shrubs, and other
into the ground. The plants themselves take up and store large quantities of water that would otherwise contribute to surface runoff. Part of this moisture is then returned to the air through evaporation to further cool the city.

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

**Guiding Principles for Street Trees.** The following principles guide the standards in this section:

- Create optimum conditions for growth. Space for roots and above ground growth is the main constraint to the urban forest achieving its highest potential. Typically a 6 to 8-foot wide, continuous Parkway Zone with uncompacted soil to a minimum depth of three feet is necessary for tree growth and longevity. If space for trees is constrained, these smaller areas should be connected below the surface to form larger effective areas for the movement of air, root systems, and water through the soil.
Select the right tree for the space. In choosing a street tree, consider what canopy, form, and height will maximize benefits over the course of its life. Provide necessary clearances below overhead high-intensity electrical transmission lines and prevent limbs from overhanging potentially sensitive structures such as flat roofs. In commercial areas where the visibility of façade-mounted signs is a concern, choose species whose mature canopy allows for visibility, with the lowest branches at a height of 12 to 14 feet or more above the ground. Select trees with non-aggressive root systems to avoid damaging paving and sidewalks.

Start with good nursery stock and train it well. When installing plant material, choose plants that have complete single leaders and are in good “form,” and check that boxed trees are not root bound. Proper watering and pruning every three to four years will allow trees to mature and thrive for many years of service.

Do not subject plants to concentrated levels of pollutants. Trees and other plants should be integrated within streetwater management practices whenever possible, but filtering of pollutants from “first flush” rain falls and street runoff will extend the life of trees and prevent toxic buildup of street pollutants in tree wells.

The following explain the rationale for the standards in this section:

Climate and Soil. Selecting trees that are adapted to a site’s climate and local rain cycles can create a more sustainable urban forest. The urban environment is harsh for many plants. Often plants native to an area are best adapted to that area’s climate. Select plants that can tolerate the environmental elements, such as radiant heat from the sidewalk or street surface or wind from passing traffic.

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. Plants need healthy soil, air, and water to thrive.

Covering the soil surface with mulch can help improve soil quality, as the added shade, cooling, and retained moisture help support the biological activities close to the soil’s surface. These activities open and help keep open the pore
structure of the soil and cushion the impact of foot traffic. The process works better if the mulch material is organic rather than stone. Those with limited resources for soil preparation should invest in an extensive covering of mulch.

**Planting Conditions.** Traditionally, trees have been squeezed into whatever limited space is easily found, but this does not work well for either the tree or the street.

The following guidelines provide recommended planting areas:

Where possible, establish and maintain 6 to 8-foot wide Parkway Zones that are unpaved and planted and surfaced with low groundcover, mulch, or stabilized decomposed granite. Note that many large trees need up to 12 feet in width, and are not suitable for placement in narrower Parkway Zones.

Where 6 to 8-foot wide Parkway Zones are not feasible, 12-foot long tree wells with permeable pavers (standard interlocking pavers are not permeable) and uncompacted soil to a depth of 3 feet between the trees (using Silva Cells, structural or gap-graded soil (angular rock with soil-filled gaps), or other means.

Spacing between trees will vary with species and site conditions. The spacing should be 10 percent less than the mature canopy spread. 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.

Parkways and tree wells should be graded, so that the soil surface slopes downward toward the center, forming a shallow swale to collect water. The crown of the tree should remain 2 inches above finished grade and not be in the center of a swale, but off to the side. The finished soil elevation after planting is held below that of the surrounding paving so 2 to 3 inches of mulch can be added. The mulch layer must be replenished as needed to maintain a nearly continuous level surface adjacent to paving.

**Species/Cultivar Selection**

- 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.

- Where there are overhead power lines that are less than 50 feet above grade, braided insulated electrical wire should be used so that trees do
not have to be pruned to avoid the electrical lines. If braided insulated electrical wire cannot be provided, appropriate trees that will not grow tall enough to reach the power lines should be specified and planted.

- Trees that are part of streetwater management practices must be species that respond well to the extremes of periodic inundation and dry conditions found in water catchment areas. Design of all planting areas should include provisions for improved streetwater detention and infiltration.

- 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. New plantings added to streets with existing trees should be selected with the aim of creating visual harmony with existing trees. Native species should be considered for inclusion whenever possible, but consideration should be first given to a species’ adaptability to urban conditions.

- Consider evergreen species where it is desirable to maintain foliage through the winter months, such as to slow storm water through the rainy season.

- Consider deciduous species where their ability to allow sunlight to penetrate into otherwise shaded areas (such as south facing windows of adjoining buildings) during the winter months will be beneficial.

**Tree Spacing and Other Considerations**

- Most jurisdictions have spacing requirements between trees and street lights (typically about 30 feet high), which typically vary from 10 to 20 feet. The smaller setback provides greater flexibility in tree spacing and allows for a more complete tree canopy.

- Pedestrian lights, which are about 12 feet tall, generally do not conflict with the tree canopy, so spacing is less rigid. Some jurisdictions still require wide clearance for their convenience in maintaining the lights, but this wide spacing greatly reduces tree canopy and is therefore discouraged. Spacing of 10 feet away from trees is generally adequate.

- 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.
Examples

Left: Sweetsade
Right: Southern Magnolia

Left: Australian Flame
Right: Ginkgo

Left: London Plane
Right: Mexican Sycamore

Examples of trees with strong central leaders and relatively narrow canopies, which are well suited to both wide and narrow streets with narrow sidewalks and/or buildings that are not set back from the sidewalk.
Examples of smaller trees with more spreading canopies, which are suitable under power lines.
6.5 Alleys

Intent

- Promote safe pedestrian and bike-oriented travel
- Increase connectivity to the larger street network
- Increase accessibility to nearby uses
- Allow for outdoor commercial activities
- Serve as pleasant public spaces for non-motorized travel
- Promote use of sustainable building materials and landscaping aesthetics
- Increase value of housing and commercial properties
- Induce traffic calming and emphasize slow automobile speeds

Design Example
Discussion

Although they primarily function to provide access to residential and commercial properties, alleys can also serve as a versatile public space. Alleys can function as “shared streets,” emphasizing low-intensity multi-modal travel, green landscaping, and recreational and commercial activities.

Typically narrower than traditional streets, residential alleys do not emphasize automobile throughput. Therefore, as a way to complement their slow, safe non-motorized nature, residential alleys present an opportunity to incorporate sustainable green features into their design. For example, permeable pavement with reflective properties can help reduce urban runoff and limit the heat island effect. Moreover, planters and bioswales can also absorb stormwater runoff while providing attractive landscaping elements.

Commercial alleys are usually used as loading and unloading zones for delivery trucks. However, during non-delivery hours, they can function as vibrant outdoor spaces for pedestrians and bicyclists. For example, commercial alleys can be enhanced with public art, movable street furniture, and charming facade designs to complement activities such as outdoor dining and social gatherings.

Because they lack of sidewalks and accommodate all modes of travel, alleys should be strategically designed with public safety measures in mind. For example, adequate light fixtures enhance the pedestrian experience at night while reducing the incidence of collisions between different travel modes. In addition, bollards and tactile strips prioritize non-motorized travel, while rumble strips, different pavement textures, and painted street markings can induce slower car speeds.

The narrower width of alleys may require unique maintenance requirements, especially if retrofitted with specific green design features. Street cleaning and sanitation-related vehicles may be affected and should be considered when incorporating new design features into alleys. As an alternative, neighborhood groups and commercial tenants can help play a collective role in ensuring the upkeep and maintenance of alley space abutting their properties.
7.1 Design Needs

The purpose of this chapter is to provide the facility designer with an understanding of how bicyclists operate and how their bicycle influences that operation. Bicyclists, by nature, are much more sensitive to poor facility design, construction and maintenance than motor vehicle drivers because they are physically exposed and lack the protection provided by a vehicle’s structure and numerous other safety features. By understanding the unique characteristics and needs of bicyclists, the facility designer can provide the highest quality facilities and minimize risk to the bicyclists who use them.

The Bicycle as a Design Consideration

Similar to motor vehicles, bicyclists and their bicycles come in a variety of sizes and configurations. This variation can take the form of a conventional bicycle, a recumbent bicycle, a tricycle, or the behavioral characteristics and comfort level of the bicyclist riding the device. Any bikeway undergoing design should consider the various types of bicycles that may be expected on the facility and design with that set of critical dimensions in mind.

The operating space and physical dimensions of a typical adult bicyclist are shown in the following figure. Clear space is required for the bicyclist to operate within a facility; this is why the minimum operating width is greater than the physical dimensions of the bicyclist. Although four feet is the minimum acceptable operating width, five feet or more is preferred especially if high volumes of bicyclists are anticipated in future use or if the bikeway is situated near high speed traffic, a large volume of parked lanes or on a grade. Other pertinent dimensions are included in the graphic on page 6.

Outside of the design dimensions of a typical bicycle, there are many commonly used pedal driven cycles and accessories that should be considered when planning and designing bicycle facilities. The most common types including tandem bicycles, recumbent bicycles, and trailer accessories are depicted in the following page.
By CA law, the bicycle is a “device”, not a vehicle, this distinction is intended to include all pedal cycles, including tricycles, bicycles with trailers, recumbent cycles, etc. However, bicyclists are responsible for following the rules of the road subject to motor vehicle law.
The table below summarizes the typical dimensions for most commonly encountered bicycle designs:

### BICYCLE AS DESIGN VEHICLE - TYPICAL DIMENSIONS

<table>
<thead>
<tr>
<th>Bicyclist Type</th>
<th>Feature</th>
<th>Typical Dimensions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Upright Adult Bicyclist</td>
<td>Physical width</td>
<td>2 ft 6 in</td>
</tr>
<tr>
<td></td>
<td>Operating width (Minimum)</td>
<td>4 ft</td>
</tr>
<tr>
<td></td>
<td>Operating width (Preferred)</td>
<td>5 ft</td>
</tr>
<tr>
<td></td>
<td>Physical length</td>
<td>5 ft 10 in</td>
</tr>
<tr>
<td></td>
<td>Physical height of handlebars</td>
<td>3 ft 8 in</td>
</tr>
<tr>
<td></td>
<td>Operating height</td>
<td>8 ft 4 in</td>
</tr>
<tr>
<td></td>
<td>Eye height</td>
<td>5 ft</td>
</tr>
<tr>
<td></td>
<td>Vertical clearance to obstructions (tunnel height, lighting, etc.)</td>
<td>10 ft</td>
</tr>
<tr>
<td></td>
<td>Approximate center of gravity</td>
<td>3 ft 6 in to 3 ft 10 in*</td>
</tr>
<tr>
<td>Recumbent Bicyclist</td>
<td>Physical length</td>
<td>8 ft</td>
</tr>
<tr>
<td>Tandem Bicyclist</td>
<td>Eye height</td>
<td>3 ft 10 in</td>
</tr>
<tr>
<td>Bicyclist with child trailer</td>
<td>Physical length</td>
<td>10 ft</td>
</tr>
<tr>
<td></td>
<td>Physical width</td>
<td>2 ft 6 in</td>
</tr>
</tbody>
</table>

* Approximate center of gravity is expressed in a range based on the 50th and 95th percentile measurements reported in the NCHRP Project 20-7 (168), Determination of Appropriate Railing Heights for Bicyclists (2004).

The speed that various types of bicyclists can be expected to maintain under various conditions can also influence the design of facilities such as shared use paths. The table below provides typical bicyclist speeds for a variety of conditions.

### DESIGN SPEED EXPECTATIONS

<table>
<thead>
<tr>
<th>Bicyclist Type</th>
<th>Feature</th>
<th>Typical Speed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Upright Adult Bicyclist</td>
<td>Paved level surfacing</td>
<td>10 - 15 mph</td>
</tr>
<tr>
<td></td>
<td>Crossing Intersections</td>
<td>10 mph</td>
</tr>
<tr>
<td></td>
<td>Downhill</td>
<td>30 mph</td>
</tr>
<tr>
<td></td>
<td>Uphill</td>
<td>5-12 mph</td>
</tr>
<tr>
<td>Recumbent Bicyclist</td>
<td>Paved level surfacing</td>
<td>18 mph</td>
</tr>
</tbody>
</table>
7.2 Cycle Tracks

Intent

Separating bicycle lanes from the adjacent vehicular lanes with either striping or a raised zone, can make an Arterial Street more comfortable for the majority of cyclists who may be hesitant to ride on a busy street.

Discussion

A Cycle Track is a hybrid type bicycle facility that combines the experience of a separated path with the on-street infrastructure of a conventional bicycle lane. Cycle Tracks have different forms, but all share common elements. Cycle Tracks provide space that is intended to be exclusively or primarily for bicycles, and is separated from vehicle travel lanes, parking lanes and sidewalks. Cycle Tracks can be either one-way or two-way, on one or both sides of a street, and are separated from vehicles and pedestrians by pavement markings or coloring, bollards, curbs/medians and on-street parking or a combination of these elements.

Standards Table

<table>
<thead>
<tr>
<th>Complete Street Type Name</th>
<th>ARTERIAL STREETS</th>
<th>NON-ARTERIAL STREETS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Boulevard I (Major I)</td>
<td>Boulevard II (Major II)</td>
</tr>
<tr>
<td>Cycle Tracks - Desired Dimensions</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Curbside - with parking</td>
<td>5 feet (3 feet)</td>
<td></td>
</tr>
<tr>
<td>Curbside - without parking</td>
<td>5 feet (3 feet)</td>
<td></td>
</tr>
<tr>
<td>Raised Cycle Track</td>
<td>6.5 feet (3 feet)</td>
<td></td>
</tr>
<tr>
<td>Two-Way Cycle Track</td>
<td>8-12 feet (3 feet)</td>
<td></td>
</tr>
</tbody>
</table>

Left: Photo by Seattle Department of Transportation

Los Angeles Department of City Planning

Draft February 2014 7-7
Discussion/Examples

The illustrations that follow show the following four conditions:

Raised buffer with adjacent parking. This condition requires a minimum 3-foot and preferable 4-foot wide raised buffer to protect bicycles from opening door. Raised buffers have additional design considerations, in particular, drainage, street cleaning and treatment at intersection.

Raised buffer without adjacent parking. If there is no parking adjacent to the buffer it may be as narrow as 2 feet, although a width of 4 feet is preferable.
Striped buffer with adjacent parking. California’s MUTCD currently does not allow a striped buffer with a parking lane between it and the travel lane, so a curbside bike lane with a striped buffer between it and the curbside parking lane cannot currently be implemented as it has been in other cities in the United States and abroad. Therefore, a standard for this condition, which would be a preferred width of 4 feet and a minimum width of 3 feet, is not included in Table 1 but will be added once the MUTCD is updated.

Striped buffer without adjacent parking. California’s MUTCD currently does not allow a striped buffer with a parking lane between it and the travel lane, so a curbside bike lane with a striped buffer between it and the curbside parking lane cannot currently be implemented as it has been in other cities in the United States and abroad. Therefore, a standard for this condition, which would be a preferred width of 4 feet and a minimum width of 3 feet, is not included in Table 1 but will be added once the MUTCD is updated.
Guidance

- This treatment is not currently present in any U.S. State or Federal design manuals 9th Avenue – New York City

- CROW Design Manual for Bicycle Traffic - Chapter 5

Recommended Design

No Parking
Additional Discussion - Cycle Tracks - Protected Bicycle Lanes

Separation:

Cycle Tracks can be separated by a barrier or by on-street parking. Cycle Tracks 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.

Recommended Design
On-Street Parking
When on-street parking is present, it should separate the Cycle Track from the roadway, the Cycle Track should be placed with a 2-foot (min.) buffer between parking and the cycle track to minimize the hazard of opening car doors into passing bicyclists.

**Placement:**

Cycle Tracks should be placed along slower speed urban/suburban streets with long blocks and few or no driveway or midblock access points for vehicles. Cycle Tracks located on one-way streets will have fewer potential conflicts than those on two-way streets. A two-way Cycle Track is desirable when there are more destinations on one side of a street or if the Cycle Track will be connecting to a shared use path or other bicycle facility on one side of the street.

Cycle Tracks should only be constructed 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 Cycle Track if sidewalk capacity is reduced. Visual and physical cues should be present that make it easy to understand where bicyclists and pedestrians should be moving.

**Intersections:**

Cycle Tracks separate bicyclists and motor vehicles to a greater degree than bicycle lanes. This produces added comfort for low speed bicyclists on the Cycle Track, but it creates additional considerations at intersections that must be addressed. Right and left turning motorists conflicting with cycle track users are the most common conflict. Both roadway users have to expand their visual scanning to see potential conflicts. To mitigate for conflicts, several treatments can be applied at intersections:

- **Protected Phases at Signals:** This treatment MUST have separate signal phases for bicyclists and will potentially increase delay for motor vehicles. With this treatment, left and right turning movements are separated from conflicting through movements. The use of a bicycle signal head is required in this treatment to ensure all users know which signals to follow. “Demand only” bicycle signals can be implemented to reduce vehicle delay to prevent an empty signal phase from regularly occurring. With this scenario, a push button, auto detection, or imbedded loop within the Cycle Track should be available to actuate the signal. If frequent bicyclist left turns are expected, a bicycle box should be incorporated. Bicyclists movements should be given their own signal phase and signal activation.

- **Advanced Signal Phases:** Signalization utilizing a bicycle signal head can also be set to provide Cycle Track users a green phase in advance of vehicle phases. The amount of time will depend on the width of the intersection.
Access Management: The reduction in the number of potential conflict points can also benefit a Cycle Track corridor. Medians, driveway consolidations, or restricted movements reduce the potential for conflict.

Advantages:

- Well designed facilities have been proven to increase bicycle ridership where implemented (e.g. Portland, Oregon, Minneapolis, Minnesota).
- Cycle Tracks provide increased comfort for bicyclists and greater clarity about expected behavior on the part of both bicyclists and motorists.
- Properly designed Cycle Tracks eliminate conflicts between bicyclists and parking motorists by placing the Cycle Track on the inside of the parking lane.
- Barriers used along Cycle Tracks to separate parking and motor vehicle travel lanes from bicyclists must provide adequate space to mitigate or remove the danger of passenger car “dooring.”

Disadvantages:

- Can create unusual situations at intersections for vehicles.
- Can be expensive to correctly implement.
- Can require closures/restrict vehicle access from driveways, alleys, and parking lots through access management planning.
- Left turns can be complicated for bicyclists and may cause delay due to bicyclist only signal phasing.
- May be difficult for existing street maintenance equipment to maintain Cycle Track (sweepers etc.)
7.3 Design of Bicycle Lanes

Bicycle lanes or Class II bicycle facilities (Caltrans designation) are defined as a portion of the roadway that has been designated by striping, signage, and pavement markings for the preferential or exclusive use of bicyclists. Bicycle lanes are generally found on major arterial and collector roadways in Los Angeles and are 5-7 feet wide. Bicycle lanes can be found in a large variety of configurations.

Bicycle lanes provide bicyclists with their own space on the roadway and enable them to ride at their preferred speed without interference from prevailing traffic conditions. Bicycle lanes facilitate predictable behavior and movements between bicyclists and motorists. Bicyclists may leave the bicycle lane to pass other bicyclists, make left turns, avoid obstacles or debris, merge with traffic at intersections, and to avoid conflicts with other roadway users.

General Design Guidance:

Width:

Varies depending on roadway configuration; see following pages for design examples.

Striping:

Line separating vehicle lane from bicycle lane: 6 inches

Line separating bicycle lane from parking lane: 4 inches

Dashed white stripe when:

- Vehicle merging area (approximately 50 feet to 200 feet).
- Delineate conflict area in intersections (optional).
- Length of conflict area.
**Signage:**

Use R81 (CA) Bicycle Lane Sign at:

Beginning of Bicycle 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:

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 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.

Approved Bike Lane Stencils

[Images of bike lane stencils for Option 1 and Option 2]
7.4 Bicycle Lane Next to On-Street Parallel Parking

Design Summary

Bicycle Lane Width: 5’ minimum, 7’ maximum recommended when parking stalls are marked.

12’ minimum (14’ preferred) for a shared bicycle/parking lane adjacent to a curb face, or 11’ minimum where parking is permitted but not marked on streets without curbs.

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 to mitigate against potential bicyclist collisions with car doors. However, if the

Preferred Design
(if space is available)

Preferred Minimum Design
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. Encouraging 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. This could be accomplished by using parking “T’s” to increase separation; in Los Angeles, parking ‘T’s are typically installed adjacent to metered parking.

Guidance

• California MUTCD

• Caltrans Highway Design Manual

• AASHTO Guide for the Development of Bicycle Facilities

Additional Discussion - Bicycle Lane Next to On-Street Parallel Parking

From the 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.

The figure above depicts bicycle lanes on an urban-type curbed street, where parking is permitted, but without parking stripe or stall marking. 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.
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.


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

**Design Summary**

Bicycle Lane Width: 7’ maximum (may encourage vehicle loading in bicycle lane).

**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 common hazard for bicyclists using this type of facility. Wide bicycle lanes may encourage un-experienced bicyclist to ride farther to the right (door zone) to maximize distance from passing traffic. Wide bicycle lanes may also encourage vehicles to use the bicycle lane as a loading zone in busy areas where on-street parking is typically full. Encouraging bicyclists to ride farther away from parked vehicles increases the safety of the facility. Installing smaller bicycle lane stencils placed to the left of are another method to increase separation. 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 in used in areas where parking stalls are undesirable or otherwise cannot be used.

**Guidance**

- This treatment is not currently present in any State or Federal design standards
- This treatment is currently included in the San Francisco Bicycle Design Guidelines.
7.6 Bicycle Lane with No On-Street Parking

Design Summary

Bicycle 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 to 7 feet 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.

Guidance

- California MUTCD
- Caltrans Highway Design Manual
- AASHTO Guide for the Development of Bicycle Facilities
7.7 Bicycle Lane on Left Side of One-Way Street

Design Summary

Bicycle Lane Width:

5’ minimum when adjacent to curb and gutter, 7’ maximum.

See 3.1 - guidance on Bicycle Lanes Next to On-Street Parallel Parking.

Discussion

Bicycle Lanes on the left side of a one-way street are generally discouraged, but they can be useful in certain limited circumstances.

See following page for further discussion:

Guidance

• Caltrans Highway Design Manual
• Expanded coverage in the draft 2009 AASHTO Guide For the Development of Bicycle Facilities
• AASHTO Guide for the Development of Bicycle Facilities
Additional Discussion - Bicycle Lane on Left Side of One-Way Street

Left-side bicycle lanes on one-way streets should only be considered on roadways with either:

- Heavy transit use on the right side of the street (either in a dedicated lane or with traffic).
- High volumes of right turn movements by vehicles.
- Bicyclists need to make left turns on the one way street.
Advantages of a left side bicycle lane on a one-way street:

- Increased driver visibility – 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.

- Fewer bus and truck conflicts – 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.

Disadvantages / potential hazards:

- 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. See section 5.5.9 for example, configuration would be reversed in this case.

- 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.
7.8 Uphill Climbing Bicycle Lanes

Design Summary

Bicycle Lane Width: Uphill bicycle lane should be 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.

Discussion

While descending, bicyclists are often able to maintain vehicular travel speeds; bicyclists ascending hills tend to lose momentum, especially on longer street segments with continuous uphill grades. This speed reduction creates greater speed differentials between bicyclists and motorists, creating uncomfortable and potentially unsafe riding conditions. 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. This measure often includes delineating on-street parking (if provided), slightly narrowing travel lanes, and/or shifting the centerline if necessary. The measure is currently used in Portland, Oregon; San Francisco, Seattle, Washington, and Madison, Wisconsin.

Guidance

- California MUTCD
- Caltrans Highway Design Manual
- Facility combines guidance for Shared Lane Marking and Class II bicycle lane.
Preferred Design

<table>
<thead>
<tr>
<th>Downhill</th>
<th>Uphill</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parking 8'</td>
<td>4&quot; Stripe</td>
</tr>
<tr>
<td>Vehicle Travel Lane 14'</td>
<td>Vehicle Travel Lane 12'</td>
</tr>
<tr>
<td>4&quot; Stripe</td>
<td>6&quot; Stripe</td>
</tr>
<tr>
<td>Bike Lane 5-6'</td>
<td>Parking 8'</td>
</tr>
</tbody>
</table>
7.9 Bicycle Lanes at Channelized Intersection with Right Turn Pocket

Design Summary

Bicycle Lane Width: Bicycle Lane pocket, next to a vehicular right turn pocket, should be 4’ minimum in width; 5’ preferred.

Striping: Use a 6” stripe between the vehicle through lane and bike lane, and a 4” stripe between the bicycle lane and the right turn lane.

Discussion

According to the CA MUTCD and contains Highway Design Manual, the appropriate treatment for right-turn only lanes is to place a bicycle lane pocket between the right-turn lane and the right-most through lane or, where right-of-way is insufficient, to drop the bicycle lane entirely approaching the right-turn lane. The design (right) illustrates a bicycle lane pocket, with signage indicating that motorists should yield to bicyclists through the merge area. While the CA MUTCD states that the dashed lines in the merging area are optional, it is recommended that they be an integral part of any intersection with this treatment in Los Angeles. The merge area (dashed lines) should begin no less than 50’ before the stop line on the near side of the intersection.

- Dropping the bicycle lane should only be done when a bicycle lane pocket cannot be accommodated.
- Travel lane reductions may be required to achieve this design.

Guidance

- California MUTCD
- Caltrans Highway Design Manual
- AASHTO Guide for the Development of Bicycle Facilities
7.10 Bicycle Lanes at Double Right Turn Intersections

Design Summary

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.

Guidance

California MUTCD

Preferred Design
Additional Discussion - Bicycle Lanes at Double Right Turn Intersections

The use of double-turn lanes should be discouraged because of the difficulties they present for pedestrians and bicyclists. Existing double-turn lanes should be studied and converted to single-turn lanes, unless found to be absolutely necessary for traffic operations. In situations where the double-turn lane cannot be avoided, the options on the previous page can be used to better accommodate bicyclists.

Advantages of Bicycle Treatments at Double Right Turn Lanes:

- Aids in correct positioning of bicyclists at intersections with double right turn lanes. Bicyclists should be able to travel straight through an intersection without vehicles turning through their path.
- Encourages motorists to yield to bicyclists when using the outside right turn lane.
- Reduces motor vehicle speed within the right turn lanes.

Disadvantages / potential hazards:

- Many bicyclists may be uncomfortable with double right turn lanes regardless of the treatment.
- Not suitable for intersections with high bicycle volumes – the second right turn lane should be eliminated in such cases.
- Failure to yield to bicyclists when using the outside right turn lane.
- Reduces motor vehicle speed within the right turn lanes.
7.11 Bicycle Lane Next to Back-in On-Street Diagonal Parking (Non Standard)

Design Summary

Bicycle Lane Width: 5’ minimum

White 4-inch stripe separates bicycle lane from parking stalls.

Parking stalls are sufficiently long to accommodate most vehicles (vehicles do not block bicycle lane).

Discussion

In certain areas with high parking demand such as urban commercial areas, diagonal parking may be used to increase parking supply. Conventional diagonal parking is not compatible or recommended in conjunction with high levels of bicycle traffic. Drivers backing out of conventional diagonal parking have poor visibility of approaching bicyclists.

The use of ‘back-in diagonal parking’ or ‘reverse angled parking’ is recommended over head-in diagonal parking. This design addresses issues with diagonal parking and bicycle travel by improving sight distance between drivers and bicyclists and has other benefits to vehicles including: loading and unloading of the trunk occurs at the curb rather than in the street, passengers (including children) are directed by open doors towards the curb, vehicle headlights are not directed into homes and businesses, and there is no door conflict with bicyclists. While there may be a learning curve for some drivers, using back-in diagonal parking is typically an easier maneuver than conventional parallel parking.
Guidance

- This treatment is not currently present in any State or Federal design standards but is now a standard configuration for angled parking in Seattle, WA.
7.12 Contra-Flow Bicycle Lane on One-Way Street

Design Summary

Bicycle Lane Width: 5’ minimum when adjacent to curb and gutter.

5’ minimum recommended if next to on-street parallel parking (if applicable – non-contra-flow direction only).

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.

Recommended Design

Left: Photo by Zane Selvans
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.

See following page for additional discussion.

**Guidance**

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

- Contra-flow bicycle lanes exist in several U.S. cities, including Boise, Idaho; Boulder, Colorado; Minneapolis, Minnesota; Cambridge, Massachusetts; and Eugene and Portland, Oregon.

**Additional Discussion - Contra-Flow Bicycle Lane on One-Way Street**

Contra-flow lanes may be considered where the following conditions exist:

- When alternate routes require excessive out-of-direction travel.

- When alternate routes include unsafe or uncomfortable streets with high traffic volumes and/or no bicycle facilities.

- When the contra-flow lane provides direct access to bicyclist destinations on the street under consideration.

- When few intersecting streets, alleys or driveways exist on the side of the contra-flow lane.

- When bicyclists can safely and conveniently re-enter the traffic stream where the contra-flow lane ends.

To ensure bicyclist safety on streets with contra-flow lanes:

- Signs should be posted at intersecting streets, alleys and driveways informing motorists to expect two-way traffic. Example signs include a ‘Do Not Enter’ or ‘One-Way’ sign with an ‘Except Bicycles’ sign below.
• Intersection traffic controls along the street (e.g., stop signs and traffic signals) should also be installed and oriented toward bicyclists in the contra-flow lane.

• On-street parking should be prohibited between the contra-flow lane and the curb to prevent motorists from crossing the bicycle lane in the wrong direction.

**Advantages of a left handed bicycle lane on a one-way street:**

• Decreases trip distance, the number of intersections encountered, and travel times for bicyclists by eliminating out-of-direction travel.

• Provides separate facility for bicycles traveling against motor vehicle traffic.

**Disadvantages / potential hazards:**

• Motorists turning left onto one way street may not expect contra-flow bicyclists (may require prohibition of left turns on red from intersecting streets onto one-way street).

• Some motorists may use the bicycle lane for left-turn movements.

• Contra-flow bicycle lane may require the reduction in parking or vehicle through lane capacity.

• Conflicts of vehicles at driveways.

• Conflicts at crossings.
7.13 Colored Bicycle Lanes in Conflict Areas (Non Standard)

Design Summary

Bicycle Lane Width:

See section 5.4.

Discussion

Some cities in the United States are using colored bicycle lane segment to guide bicyclists through major vehicle/bicycle conflict points.

Color Considerations:

There are three colors being used in bicycle lanes: blue, green, and red. All help the bicycle lane stand out in merging areas. The City of Portland began using blue lanes and changed to green in April 2008. Green is the color being recommended for use at the Federal level for including the MUTCD.

See following page for additional discussion:

Guidance

- This treatment is not currently present in any State or Federal design standards
- Portland’s Blue Bicycle Lanes http://www.portlandonline.com/shared/cfm/image.cfm?id=58842
- City of Chicago - Green Pavement Markings for Bicycle Lanes (Ongoing) - FHWA Experiment No. 9-77(E)
**Additional Discussion - Colored Bicycle Lanes in Conflict Areas**

**Guidance:**

Colored bicycle lane segments can be used in conflict areas or locations where motorists and bicyclists must cross each other’s path (e.g., at intersections, freeway ramps or merge areas). Bicyclists are especially vulnerable at locations where the volume of conflicting vehicle traffic is high, and where the vehicle/bicycle conflict...
area is long. Colored bicycle lanes typically extend through the entire bicycle/vehicle conflict zone (e.g., through the entire intersection, or through the transition zone where motorists cross a bicycle lane to enter a dedicated right-turn lane. Although colored bicycle lanes are not an official standard in California at this time, they continue to be successfully used around the country. Portland, Oregon; Chicago, Illinois; Philadelphia, Pennsylvania; Cambridge, Massachusetts; Mammoth Lakes, California; and Tempe, Arizona, have all used colored bicycle lanes in select locations. This treatment typically includes accompanying signage alerting motorists of vehicle/bicycle conflict points. Portland’s ‘Blue Bicycle Lane’ report found that significantly more motorists yielded to bicyclists and slowed or stopped before entering the conflict area after the application of the colored pavement.

In areas of high vehicle traffic, thermoplastic application with proper friction coefficient for ongoing bicycle use (as opposed to paint) is recommended. At high volume intersections, the thermoplastic treatment has shown to significantly prolong the life of the marking, thus off-setting the additional cost for the treatment by lowering the frequency of required maintenance.

Advantages of colored bicycle lanes at conflict points:

- Draws attention to conflict areas.
- Results in more consistent yielding behavior by motorists.
- Emphasizes expectation of bicycles in the roadway.

Disadvantages / potential hazards:

- Currently non-standard treatment with increased agency liability.
- Maintenance to repair or replace treatment.
- Potential slipping hazard in wet conditions.
7.14 Colored Bicycle Lanes at Interchanges

Design Summary

Bicycle Lane Width:

The bicycle lane width through the interchange should be the same width as the approaching bicycle lane (minimum five feet). Additionally, the bicycle lane should follow guidance in sections 5.4.2. through 5.4.4.

Discussion

On high traffic bicycle corridors non-standard treatments may be desirable over current practices outlined in Figure 9C-104 in the CA MUTCD. Dashed bicycle lane lines with or without colored bicycle lanes may be applied to provide increased visibility for bicycles in the merging area. See 9.6 Colored bicycle lanes in conflict areas.

Guidance

- This treatment is not currently present in any State or Federal design standards.
- City of Chicago - Green Pavement Markings for Bicycle Lanes (Ongoing) - FHWA Experiment No. 9-77(E)
- Portland’s Blue Bicycle Lanes http://www.portlandonline.com/shared/cfm/image.cfm?id=58842
7.15 Bicycle Box – Single Lane (Non Standard)

Design Summary

No right turns.

Bicycle Box Dimensions: The Bicycle Box should be 14’ deep to allow for bicycle positioning.

Signage:

Appropriate signage as recommended by the CA MUTCD applies. Signage should be present to prevent ‘right turn on red’ and to indicate where the motorist must stop.

Recommended Design
Discussion

Bicycle boxes provide additional space for bicyclists to move to the front of the vehicular queue while waiting for a green light. On a two-lane roadway, the bicycle box can also facilitate left turning movements for bicyclists as well as through bicycle traffic. Motor vehicles must stop behind the white limit line at the rear of the bicycle box and may not turn right on red.

Guidance

- This treatment is not currently present in any U.S. State or Federal design manuals.

- Examples of this treatment can be found in Cambridge, Massachusetts; Portland, Oregon; and Vancouver, Washington.
7.16 Bicycle Box – Multi Lane

Design Summary

Right turns allowed.

Bicycle Box Dimensions:
The Bicycle Box should be 14’ deep to allow for bicycle positioning.

Signage:
Appropriate signage as recommended by the CA MUTCD applies.

Discussion

In some areas there may be a situation where a freeway ramp exists where bicycles are prohibited or areas where bicycles may not need to access such as parking garages and vehicular right turn movements are required. In these cases a vehicular right turn only lane may be provided to the right of the bicycle box. Right turns on red are permitted in these instances.

Recommended Design
Guidance

• This treatment is not currently present in any U.S. or Federal design manuals.

Bicycle Box – General Discussion

Guidance:

A Bicycle Box is generally a right angle extension to a bicycle lane at the head of a signalized intersection. Bicycle Boxes should be used with a separate signal phase and at intersections where left-turning bicyclists face high volumes of traffic.

Bicycle Boxes should be located at signalized intersections only, and right turns on red should be prohibited unless a separate right turn pocket is provided to the right of the bicycle box. Bicycle Boxes can exist in several configurations illustrated on the following pages.

Design Summary:

Bicycle Boxes typically include the following features:

• A striped bicycle lane: Allows bicyclists to safely maneuver to the “head of the line” of stopped vehicles.

• An advanced vehicle stop bar or limit line located several feet upstream from the intersection: Provides a space for bicyclists to move directly in front of the vehicle at the head of the line, increasing motorists’ visibility of bicyclists.

• Bicycle pavement markings in the bicycle box: Advises motorists that the box of for bicycles.

• Signage: Advising motorists to stop behind the Bicycle Box (R10-6a) and, that there are no right turns on red (R10-11).
Bicycle Boxes offer several advantages:

• Bicyclists making left turns can safely position themselves in the Bicycle Box in front of motor vehicle traffic, as opposed to merging with vehicle traffic as they approach the intersection.

• Enables bicyclists to move to the head of the line, bicycle boxes reduce bicyclist waiting time and increase the likelihood that a bicyclist can clear an intersection during the signal phase.

• Bicyclists at the head of the line can avoid breathing exhaust fumes from vehicles idling at the intersection.

Bicycle Boxes have been installed in the United States with striping only or with colored treatments to increase visibility. Bicycle Boxes are a common treatment in European cities, though their use has increased throughout North American cities, including Cambridge, Massachusetts; Eugene and Portland, Oregon; and Vancouver, British Columbia.
7.17 Raised Bicycle Lanes (Non Standard)

Design Summary

Bicycle Lane Width: 5 feet minimum. Bicycle lane should drain to street. Drainage grates should be placed in motor vehicle travel lanes.

Mountable Curb Design: Mountable curb should have a 4:1 or flatter slope and have no lip that could catch bicycle tires.

Signage and Striping: Same as traditional Class II bicycle lanes. See section 5.4.

Recommended Design

Design Example
Discussion

Raised bicycle lanes are bicycle lanes that have a mountable curb separating them from the adjacent travel lanes. Raised bicycle lanes provide an element of physical separation from faster moving vehicular traffic. For drivers, the mountable curb provides a visual and tactile reminder of where the bicycle lane is. For bicyclists the mountable curb makes it easy to leave the bicycle lane if necessary, such as when passing another bicyclist, or to merge to the left for turning movements. The raised bicycle lane should return to level grade at intersections.

Raised bicycle lanes cost more than traditional bicycle lanes and typically require a separate paving operation. Maintenance costs are lower as they may be accessed by sweeper vehicles and the bicycle lane receives no vehicle wear and resists debris accumulation.

Raised bicycle lanes work well adjacent to higher speed roadways with few driveways.

Guidance

- This treatment is not currently present in any U.S State or Federal design manuals.
- CROW Design Manual for Bicycle Traffic.
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Bicycle Routes (Class III)

Section 8
8.1 Design of Bicycle Routes

Class III bicycle facilities — (Caltrans designation) are defined as facilities shared with motor vehicles. They are typically used on roads with low speeds and traffic volumes, however they can be used on higher volume roads with wide outside lanes or with shoulders. A motor vehicle driver will usually have to cross over into the adjacent travel lane to pass a bicyclist, unless a wide outside lane or shoulder is provided.

**From the Caltrans Highway Design Manual:**

“Class III bikeways (bicycle routes) are intended to provide continuity to the bikeway system. Bicycle routes are established along through routes not served by Class I or II bikeways, or to connect discontinuous segments of bikeway (normally bicycle lanes). Class III facilities are shared facilities, either with motor vehicles on the street, or with pedestrians on sidewalks, and in either case bicycle usage is secondary. Class III facilities are established by placing Bicycle Route signs along roadways.”

Bicycle Routes can employ a large variety of treatments from simple signage to complex treatments including various types of traffic calming and/or pavement stenciling. The level of treatment to be provided for a specific location or corridor depends on several factors.

**General Design Guidance:**

**Width:** Varies depending on roadway configuration; see following pages for design examples.

**Striping:** If shoulder is present, a 4-inch edge line separating vehicle lane from shoulder for bicycle use should be used.

**Signage:** Use D11-1 “Bicycle Route” Sign at:

- Beginning or end of Bicycle Route (with applicable M4 series sign below).
- Entrance to bicycle path (Class I) - optional.
- At major changes in direction or at intersections with other bicycle routes (with applicable M7 series sign below).
- At intervals along bicycle routes not to exceed ½ mile.
Pavement Markings: Shared Lane Markings (SLM) may be applied to Bicycle Routes per the CA MUTCD requirements.
8.2 Bicycle Route with Wide Outside Lane

Design Summary

Bicycle Lane Width: Fourteen feet (14’) minimum shared travel lane is preferred. Fifteen feet (15’) should be considered if heavy truck or bus traffic is present. Bicycle lanes should be considered on roadways with outside lanes wider than 15 feet. This treatment is found on residential streets, collectors, and minor arterials.

Discussion

This is a common existing facility found in many areas in Los Angeles. The wide outside lane provides adequate on-street space for the vehicle and bicycle to share the lane without requiring the vehicle to leave its lane to pass the bicyclist. This facility is frequently found with and without on-street parking.

Guidance

- California MUTCD
- Caltrans Highway Design Manual
- AASHTO Guide for the Development of Bicycle Facilities

Preferred Design
8.3 Bicycle Route on Collector/Residential Street

Design Summary

Sign Placement: Bicycle Route signage should be applied at intervals frequent enough to keep bicyclists informed of changes in route direction and to remind motorists of the presence of bicyclists.

Discussion

Bicycle routes on local streets should have vehicle traffic volumes under 1,000 vehicles per day. Traffic calming may be appropriate on streets that exceed this limit.

Bicycle routes may be equipped with directional signage, traffic diverters, chicanes, chokers, and/or other traffic calming devices to reduce vehicle speeds or volumes. Such treatments often are associated with ‘Bicycle Friendly Streets’ (see Section 5.5.5 for discussion of Bicycle Friendly Streets).

Guidance

- California MUTCD
- Caltrans Highway Design Manual
- AASHTO Guide for the Development of Bicycle Facilities
8.4 Shared Lane Marking

**Design Summary**

Door Zone Width: The width of the door zone is generally assumed to be 2.5 feet from the edge of the parking lane.

Recommended SLM placement: Minimum of 11 feet from edge of curb where on-street parking is present but may be placed more than 11 feet as conditions support. If parking lane is wider than 7′ the SLM should be moved further out accordingly.

**Discussion**

Shared Lane Marking stencils (commonly called “Sharrows”) have been introduced for use in California and may be used as an additional treatment for Class III facilities but are currently only allowed for use in conjunction with on-street parking.

The stencil can serve a number of purposes, such as reminding bicyclists to ride further from parked cars to prevent “dooring” collisions, making motorists aware of bicycles potentially in the travel lane, and showing bicyclists the correct direction of travel. The pavement marking was adopted for official use by Caltrans in the 2003 California MUTCD.

The 11′ minimum distance from curb shown in the CA MUTCD is based on a 7′ parking stall. Shared lane markings adjacent to an 8′ parking stall may be installed at a minimum of 12′ from centerline to curb. Placing the SLM between vehicle tire tracks (meeting CA MUTCD guidance) may also be considered as it will increase the life of the markings and the long-term cost of maintenance to the treatment.

**Guidance**

- California MUTCD
8.5 Shared Lane Marking with Colored Pavement (Non Standard)

Design Summary

A standard “Shared Roadway Bicycle Marking” per CA MUTCD, is used in conjunction with colored pavement to indicate optimal lane position for bicyclists on an urban, multilane roadway with parallel on-street parking.

Discussion

Cities such as Salt Lake City, Utah and Long Beach, California have used colored pavement in conjunction with Shared Lane Markings to further indicate the appropriate position for bicyclists using the roadway. Increasing the distance from the curb face to the center of the Shared Lane Marking to 13 feet at center and adding a green stripe provides the following benefits:

- Reduces the probability that bicyclists riding over the marking could be impacted by opening car doors.
- Brings the marking more directly and continuously into the line of sight of drivers.
- Reduces wear on the markings by placing them in a location where they will typically track between car tires.

Guidance

- For shared lane markings only, see CA MUTCD.
- The combination of shared lane markings with colored pavement is not currently present in any State or Federal design standards.
- See the CTCDC website for a “Progress report for green and shared lane marking and bikes in lane symbol sign on 2nd Street in Long Beach.”

8.6 Shared Lane Markings on Streets without Parking (Non Standard)

Design Summary

Recommended SLM placement without parking: Center of the SLM should be placed a minimum of 4’ from the face of the curb (or from the edge of the pavement where there is no curb) on streets without parking where the outside travel lane is less than 14’ wide on roadways where the posted speed is less than 40 miles per hour.

Discussion

Shared Lane Markings (also called “Sharrows”) were adopted for official use by Caltrans in the 2003 CA MUTCD but are only currently allowed in conjunction with on-street parking.

The Federal 2009 MUTCD provides guidance for Shared Lane Markings on streets without parking. The Marking can serve a number of purposes, such as making motorists aware of bicycles in the lane, and demonstrating the correct direction of travel of bicyclists.

Guidance

- MUTCD 2009 (Federal)
8.7 Floating Bicycle Lane or Shared Lane Marking with Part-Time Parking

Design Summary

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. Standard parking T’s where appropriate. Add required signage and tapered pavement markings or striping to lead into the facility.

Discussion

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.

Recommended Design

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.
Section 8.7 Floating Bicycle Lane or Shared Lane Marking with Part-Time Parking

Third Lane for Motorists

Shoulder for Cyclists

"Floating Bike Lane" when no parking is allowed on The Embarcadero, Harrison to Howard Streets.

Tow Away, No Stopping
7am–9am, 3pm–7pm

4" Stripe 6" Stripe
Transit Streets

Section 9
9.1 Lane Construction

Because of the impacts of buses that result from repetitive turning movements in a limited area around the stop, reinforced concrete bus pads are required at bus stops with frequent bus service.

- Minimum width of pad (12 feet)
- Minimum length (90 feet), but may need to be longer for higher-level of service, multiple bus lines and/or articulated bus vehicles

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<tr>
<th>Complete Street Type Name</th>
<th>ARTERIAL STREETS</th>
<th>NON-ARTERIAL STREETS</th>
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<tbody>
<tr>
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<td>Boulevard I (Major I)</td>
<td>Boulevard II (Major II)</td>
</tr>
<tr>
<td>Lane Construction</td>
<td>Bus Pad</td>
<td>90-foot concrete bus pad where headways are more frequent than 15 minutes.</td>
</tr>
</tbody>
</table>
9.2 Shared Bus-Bicycle Lane

Design Summary

Bicycle Lane Width: Preferred width from curb to outside edge of lane is 16 feet. This width allows comfortable passing of bicyclists. Fourteen feet (14’) may be allowed on roadways with low traffic volumes and/or lower bus frequency. Twelve feet (12’) should only be considered in very constrained areas.

Signage: There is no current standard CA MUTCD or 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.

Discussion

Typically situated adjacent to the curb, combined bicycle-bus lanes are used where sufficient width exists for a bus lane, but not for separated bus and bicycle lanes. By law, California bicyclists must ride as far to the right as practicable. This allows bicyclists lawful use of a right-hand bus lane. Generally, such multiple uses are operationally acceptable unless very high volumes of bus and bicycle traffic exist.

See following page for additional discussion:

Guidance

- No explicit guidance in existing State or Federal manuals.
Additional Discussion - Shared Bicycle-Bus Lane

Shared bicycle-bus lanes should be considered when:

- High frequency bus routes overlap highly used bicycle routes.
- Adequate right-of-way exists to accommodate the facility; travel lane narrowing may be an option.
- Vehicular right turns are limited or prohibited.

Advantages of shared bicycle-bus lanes:

- Professional bus drivers should be well trained to operate conservatively around bicyclists.
- Minimizes interaction between bicyclists and non-bus motor vehicles.

Disadvantages / potential hazards:

- Right turning vehicles can reduce benefits of facility.
- If bus lane is not well utilized, private vehicles may use the lane or be encouraged to speed.
- Some bicyclists may be uncomfortable with buses passing closely.
- Bicyclists may experience “leap frog” effect between bicycles and buses where buses pass bicycles between stops and bicycles pass buses at stops.
Preferred Design

6” Stripe

11’ 13’ 6” Stripe

11’ 13’

ONLY BIKE BUS
9.3 Dedicated Bicycle Lane with Bus Lane

Design Summary

Bicycle Lane width:

5’ minimum, 7’ maximum.

Combined facility width:

Minimum width from curb to outside edge of bicycle lane is 18 feet.

Preferred Design
**Discussion**

Typically situated adjacent to the curb, dedicated bicycle lane/bus lanes are used where sufficient width exists for a bus lane, and a separated bicycle lane. On one-way streets with bus lanes, a bicycle lane on the left side of the street may also be considered.

See following page for additional discussion:

**Guidance**

- No explicit guidance in existing State or Federal guidance.
Additional Discussion - Dedicated Bicycle Lane with Bus Lane

Dedicated bicycle lane with bus lane should be considered when:

- Adequate right-of-way exists to accommodate the facility. Travel lane narrowing may be an option.
- High frequency bus routes overlap high use bicycle routes.
- Vehicular right turns can be limited or prohibited.

Advantages of dedicated bicycle lane with bus lane

- Provides an improved location for a bicycle lane as bicyclists must pass a bus on the left even if a bicycle lane is not present.
- Decreases bicycle and bus conflict.
- Avoids leap frog effect between bicycles and buses where buses pass bicycles between stops and bicycles pass buses at stops.

Disadvantages / potential hazards

- Right turning vehicles can reduce benefits of facility.
- If bus lane is not well utilized, private vehicles may use the lane or be encouraged to speed.
- Some bicyclists may be uncomfortable with traffic passing them on two sides if installed between bus lane and parallel travel lanes.
9.4 Transit Stop Curb Location

Transit turn out criteria. Transit turnouts are not desired by most operators providing service in an urban setting, because it requires more time for the transit driver to merge back into traffic, adversely affecting their operating times. Transit turnouts are appropriate if it is unsafe to stop or merge in and out of a fast-moving curb lane.

Transit stop curb extensions. Curb extensions shall be provided at transit stops where feasible because they provide more space to accommodate transit patrons boarding and alighting the vehicle, passersby walking beside or behind the stop, and transit stop furnishings. The additional space provided through a curb extension results in more circulation space along the curb, as street trees and lights will remain in line with the standard curb zone immediately adjacent to the curb extension. Curb extensions can also contribute to traffic calming, which is beneficial in areas with higher pedestrian activity and transit use.

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<th>Complete Street Type Name</th>
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<tr>
<td></td>
<td>Boulevard I (Major I)</td>
<td>Boulevard II (Major II)</td>
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Bus Stop Curb Location

<table>
<thead>
<tr>
<th>Bus turn out criteria</th>
<th>Allowable only where the operating speed exceeds 40 mph and traffic in curb lane exceed ____/peak hour.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Curb extension criteria</td>
<td>See Sidewalk - Curb Extensions (Section 4.2).</td>
</tr>
</tbody>
</table>

Example of bus turnout along higher-speed curb lane (Source: Omnitrans, Bus Stop Guidelines by Darnell & Associates)

Example of bus stop at curb extension with extra room for boarding and alighting at curb edge.
9.5 Access at Transit Stops

As a rule, transit stops should be located on the far side of intersections whenever possible. Transit stop amenities shall be located to allow people to circulate easily around them, and transit stop waiting areas and adjacent walkways must comply with Americans with Disabilities Act (ADA) and current local, state and federal regulations.

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<th>Complete Street Type Name</th>
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<td>Boulevard I (Major I)</td>
<td>Boulevard II (Major II)</td>
</tr>
<tr>
<td>Access at Transit Stops</td>
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</tr>
<tr>
<td>Waiting Area</td>
<td>Transit stops shall be located at least 5 feet from a crosswalk, comply with ADA, have a clear landing area at the front door that is a minimum of 5 feet wide (perpendicular to curb) and 8 feet long (parallel to curb). Tree well surfaces shall be accessible, e.g., tree grate or stabilized decomposed granite (not planted or mulched). All elements shall be set back at least 2 feet from the face of curb. Tree canopies shall be pruned up above bus shelter height on the sidewalk and above bus height over the street.</td>
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<tr>
<td>Walkway adjacent to bus stop</td>
<td>Minimum 4-foot clear path of travel shall be provided in the walkway zone behind the transit stop.</td>
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</tr>
<tr>
<td>Transit shelter location</td>
<td>A transit shelter’s posts/walls shall be set back from the back of sidewalk: 5 feet on a 12-foot sidewalk, 6 feet on a 12-foot sidewalk with sidewalk extension, 8 feet on a 15-foot sidewalk, 9 feet on a 15-foot sidewalk with sidewalk extension.</td>
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</tr>
<tr>
<td>Transit bench location</td>
<td>A transit bench shall be set back from the back of sidewalk: 6 feet on a 12-foot sidewalk, 9 feet on a 15-foot sidewalk. On 8-foot sidewalks, a transit bench shall be located at the back of sidewalk.</td>
<td></td>
</tr>
<tr>
<td>Lean bar location</td>
<td>A lean bar shall be set back from the back of sidewalk: 6 feet on a 12-foot sidewalk and 9 feet on a 15-foot sidewalk, 4 feet on an 8-foot sidewalk.</td>
<td></td>
</tr>
</tbody>
</table>
Examples

Figure 9-1
Standard Street Dimensions

Access at Bus Stops - Typical

Access at Bus Stops - with Sidewalk Extensions

1. Dual Curb Ramps
2. Bus Shelter
3. Clear Zone for Wheelchair Entry
4. Required Bus Signage Per Operator
5. New Bench
6. Optional Bench
7. Optional Bench
8. Tree Wells with Decomposed Granite
9. Pedestrian Lighting
10. Utility Boxes Located on Streetside
11. Optional Lean Bar
9.6 Furnishings/Amenities Design

Transit stop furnishings and amenities include route signage and transit info, trash receptacles, seating, shelters, trees, and lighting. Ideally, all furnishings and amenities would be visually clean and modern in their design. All furnishings and amenities at the transit stop must comply with Americans with Disabilities Act (ADA) and any other current local, state and federal regulations.

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<td>Boulevard I (Major I)</td>
<td>Boulevard II (Major II)</td>
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<tr>
<td>Furnishings/Amenities Design</td>
<td>Transit stop furnishings for each Community Plan or Specific Plan area shall be: derived from a single “design family” (either a single system from a manufacturer or a collection of compatible furnishings), made of durable materials and finishes, able to weather exposure to the elements, and readily maintained.</td>
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</tr>
<tr>
<td>Route signage and transit information</td>
<td>Signage shall be located so that the information is clear/visible and as to not clutter the sidewalk. Metro static route signs range from 18 inches wide by 15-36 inches high, typically pole-mounted 18 inches from the curb face. Metro static information cube is 23 inches high by 7 inches wide at all Metro rapid bus stops and where the route intersects Metro Rapid routes. Newer technologies should be used whenever feasible, like variable message signs and real-time information.</td>
<td></td>
</tr>
<tr>
<td>Trash receptacles</td>
<td>Trash receptacles should be attractive, easy to maintain, and not directly adjacent to any seating. Trash receptacles shall have small openings, be easily removable liner/bags, be located 3 feet from seating and in the shade where feasible. If the bus stop is within a business improvement district that has a recycling program, recycling containers shall also be provided within 50 feet of the bus stop.</td>
<td></td>
</tr>
<tr>
<td>Seating</td>
<td>Seating should be attractive, accessible, and easy to maintain. Benches and lean bars shall be located facing the street and in the shade to the extent feasible.</td>
<td></td>
</tr>
<tr>
<td>Shelters</td>
<td>Shelters should be attractive, accessible, easy to maintain, located facing the street with a open back or fairly transparent back panel. Elements such as benches, lighting, signage, and where possible variable message systems or real-time information, shall be well integrated into the design of the shelter.</td>
<td></td>
</tr>
<tr>
<td>Trees</td>
<td>The back of tree wells shall be aligned with the back of bus shelter. Tree canopies shall be pruned up above bus shelter height on the sidewalk and above bus height where they extend over the street.</td>
<td></td>
</tr>
<tr>
<td>Lighting</td>
<td>Pedestrian lights at transit stops shall be consistent with existing or planned pedestrian street lights. Where multiple pedestrian lights are provided, they shall be spaced 30-40 o.c. When feasible provide in-shelter lighting systems and integrated solar photovoltaics.</td>
<td></td>
</tr>
<tr>
<td>Private Development Amenities (upon redevelopment)</td>
<td>Where feasible new development should integrate seating, that could be used as part of a transit stop, into the public edge of the development.</td>
<td></td>
</tr>
</tbody>
</table>
### ARTERIAL STREETS

<table>
<thead>
<tr>
<th>Complete Street Type Name</th>
<th>Boulevard I (Major I)</th>
<th>Boulevard II (Major II)</th>
<th>Avenue (Secondary)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minimum Transit Stop Furnishings/Amenities</td>
<td>1 sign, 1 trash receptacle, 1 shade tree; lean bar where feasible.</td>
<td>1 sign, 1 bench, 1 trash receptacle, 2 shade trees, 1 pedestrian light; lean bar and second pedestrian light where feasible.</td>
<td>1 sign, 1 shelter w/bench, 1 bench or lean bar, 2 trash receptacles, 3 shade tree, 3 pedestrian light; another bench or lean bar where feasible.</td>
</tr>
</tbody>
</table>

**Graphically clear signage for transit stops.**

**Distinct bus shelter designs, photovoltaic roof panel, and transit stop garden.**
9.7 Other Opportunities

Transit stops in themselves can be public art opportunities. If special programs and funding are available, shelters can be designed as unique structures with innovative lighting and interactive play elements. Unique bus shelters and amenities help reinforce community identity and serve as a source for local information and the creative application of newer technologies meant to serve the transit rider and to improve their experience.
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Roadway Parking

Section 10
10.1 Angled Parking

Intent

Where there is excess roadway, not needed for vehicles or bicycles, and where additional parking is needed, angled parking may be considered.

Standards Table

<table>
<thead>
<tr>
<th>Complete Street Type Name</th>
<th>ARTERIAL STREETS</th>
<th>NON-ARTERIAL STREETS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Boulevard I (Major I)</td>
<td>Boulevard II (Major II)</td>
</tr>
</tbody>
</table>

3.2 Angled Parking

<table>
<thead>
<tr>
<th>Parking lane width</th>
<th>Varies with angle of parking - refer to LADOT Standard Plan Angle Parking Standards for widths.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Back-up lane width</td>
<td>4 feet on streets with one through lane each way or less than 10,000 ADT. On other streets, 11 - 19.7 feet depending on angle of parking (refer to LADOT MPP).</td>
</tr>
</tbody>
</table>

Discussion

Angled parking refers to parking in the curbside lane that is arranged at an angle, rather than parallel to the curb. Angled parking requires that the curbside parking lane be wider than what is needed to accommodate parallel parking and, therefore, can only be implemented where roadway widths allow. The examples below show the narrow back-up lane required on low-volume streets (left) and the wider back-up lane required on higher-volume streets.

Examples

Left: Angled parking with a 4-foot back-up lane on a low-volume street.

Right: Less than 45 degree angled parking with an 11-foot back-up lane on a higher volume arterial street with 4 travel lanes.
10.2 Parking/Loading Uses in the Curbside Parking Lane

Intent

While parking and loading are the primary uses of curbside parking lanes, they may be used for other functions that contribute to a complete street network. Other uses are encouraged as appropriate to local conditions.

Standards Table

<table>
<thead>
<tr>
<th>Complete Street Type Name</th>
<th>ARTERIAL STREETS</th>
<th>NON-ARTERIAL STREETS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Boulevard I (Major I)</td>
<td>Boulevard II (Major II)</td>
</tr>
<tr>
<td>Full-time curbside parking/loading</td>
<td>Primary use, except where the curb lane is needed as a transit and/or bicycle priority facility or vehicular lane either full-time or during the peak-period, provided the impact of the parking loss on local businesses and/or residences has been evaluated.</td>
<td>Primary use</td>
</tr>
<tr>
<td>Full-time vehicle travel lane (10-13 feet wide lane)</td>
<td>Allowed, where it is required to accommodate the vehicle travel and bicycle lanes specified for its Street Type and Priority, including left-turn lanes at intersections where there is not a center lane.</td>
<td>Generally not allowed directly adjacent to the curb, but may be necessary where a street is too narrow to accommodate parking on both sides.</td>
</tr>
<tr>
<td>Peak-period vehicle travel lane (10-13 feet wide lane)</td>
<td>Allowed, provided the street segment 1) is on the Vehicle Priority network and 2) exceeds the vehicular LOS standard in the existing condition.</td>
<td>Generally not allowed.</td>
</tr>
</tbody>
</table>

Other uses in the curb lane where there is full-time parking/loading:

<p>| Sidewalk extensions/ Curb extensions (see Sidewalk section for design criteria) | Allowed, except 1) where the parking lane approaching the intersection is a through lane, e.g., to accommodate a left-turn lane where there is no center lane, or 2) where right-turns exceed 200/hour and a dedicated right-turn lane is present. |</p>
<table>
<thead>
<tr>
<th>Complete Street Type Name</th>
<th>ARTERIAL STREETS</th>
<th>NON-ARTERIAL STREETS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Boulevard I (Major I)</td>
<td>Boulevard II (Major II)</td>
</tr>
<tr>
<td></td>
<td>Collector Street</td>
<td>Industrial Collector</td>
</tr>
</tbody>
</table>

**Uses in the Curbside Parking Lane**

- **Permanent mobility support infrastructure**: Infrastructure that supports and is secondary to travel modes used on the street are permitted; such as bike parking, bike corrals, EV charging facilities.

- **Temporary uses, including parklets and dining**: Allowed, provided: design speed does not exceed 25 mph or 35 mph with a 10-foot buffer; a Maintenance Agreement/Revocable Permit is in place; and (add other criteria developed by DOT et al).

- **Intermittent parkways (with trees and other planting, including stormwater treatment/ infiltration)**: Allowed, provided MA/RP or Assessment District is in place and raised curbs, which do not interrupt drainage to and along the gutter flow line, face the adjacent travel lane and parking space(s). Parking lane tree wells may be designed to infiltrate or collect/treat stormwater runoff per BOE standards. Parking lane tree wells are required where sidewalk is less than 8 feet wide to achieve required street tree spacing.

- **Peak-period parking/loading restrictions**: Not allowed, except where the curb lane is a travel lane. Should only be used after careful consideration.

- **Red curb where the curb lane is not a travel lane**: Minimize use of red curb. To the extent feasible, allow for the use of the curb lane where it is safe to do so.

**Discussion/Examples**

Particularly in older parts of the City, curbside parking and loading are critical, since off-street parking is limited. Pedestrian improvements and amenities can be created in segments of a full-time curbside parking/loading lane where parking is under-utilized and amenities are needed. These amenities enhance the pedestrian environment by extending the sidewalk zone with a sidewalk extension or with more temporary elements to designate the area, to create gathering spaces, seating for cafés/restaurants, and bicycle parking. Intermittent parkways with trees and other planting can also be added in segments of a full-time curbside parking/loading lane to enhance the pedestrian realm with unique and sustainable streetscape improvements.

Uses in the curbside parking lane that eliminate full-time curbside parking/loading tend to be less compatible with pedestrian oriented streets. These types of uses require greater limitations, or in some cases, are not permitted.

**Full-time curbside parking/loading**: Full-time curbside parking/loading refers to the 24-hour use of the curbside parking lane for vehicle parking (parallel to the curb), with loading for businesses in designated locations. Curbside parking provides benefits to both businesses and residents and pedestrians by providing:

- A more vibrant environment with convenient access to storefronts,
- Additional parking for businesses and residences,
• A buffer between pedestrians on the sidewalk and moving motor vehicles in the roadway,

• Positive friction to calm traffic along the street, which is especially important in areas with high pedestrian volumes or on residential through streets, and

• An area of the roadway that can have permeable paving to infiltrate stormwater, making the street more sustainable and giving it a unique look.

Full-time curbside parking/loading also gives a street more flexibility, since it allows for segments of the lane, where parking is under-utilized and/or amenities are needed, to take on other uses that can benefit the businesses and community. On streets where the removal of full-time curbside parking/loading is being considered, it must be confirmed, through consultation with businesses, that this change would not compromise the businesses using that parking.

Peak period vehicular lane. Peak period vehicular lanes refer to the use of the curbside parking lane for vehicular traffic during peak periods to increase the capacity for vehicles in the roadway. With parking/loading only provided in the non-peak periods and moving traffic in the peak, these lanes must be wider than the typical 8-foot wide full-time curbside parking/loading lane. Peak period vehicular lanes should be a desirable 10 feet wide (and a desirable 12-13 feet wide if they are to accommodate buses), making them more difficult to implement without widening an existing roadway. Furthermore, moving traffic in the curbside lane is undesirable for businesses and pedestrians, since it eliminates parking, which also acts as a buffer between the sidewalk and vehicular lane, and does not provide the flexibility to provide pedestrian improvements and amenities that can only occur where there is full-time parking (such as curb extensions, temporary spaces, bike parking, intermittent parkways with trees, and permeable paving). Therefore, peak period vehicular lanes are more limited in their applications, and where applicable require greater design consideration, to improve the quality and safety of the pedestrian environment.

Peak period vehicular lanes are undesirable in areas with high pedestrian volumes, and require greater design considerations to buffer pedestrians from moving traffic directly adjacent to the sidewalk.
**Sidewalk extensions.** Sidewalk extensions, also known as curb extensions or bulb-outs, extend the sidewalk into the curbside parking lane, providing additional pedestrian space at intersections and other appropriate locations within a block. Curb extensions at intersections and pedestrian crossings improve safety by increasing visibility, shorten crossing distances, and slow turning vehicles at corners. Curb extensions create an area to provide gathering spaces, seating for cafés/restaurants, landscaping, stormwater infiltration, and bike facilities. Sidewalk extensions can not be used where the curb lane is used as a full-time or peak-period travel lane along the entire length of the street or approaching an intersection to accommodate a left-turn lane where there is no center lane. For a complete discussion of sidewalk extensions, see Section 6.3 Driveways.

**Bicycle Parking.** To provide better access to bicycle facilities, especially on streets with bike lanes or sharrows, and to prevent congestion within the sidewalk zone, designated curbside parking spaces can be used to provide bicycle parking. Within a curbside bicycle parking area, bike racks should be located so that, when parked, bikes are perpendicular to the curb. Ideally, bicycle parking should be designed within a curb extension. However, when implemented at the street level for greater flexibility, it is desirable that bicycle parking areas be protected from vehicles at the edge of the parking lane with a curb, bollards, moveable planters, or other measures. In districts where curbside parking is in high demand, bicycle parking should first be provided in areas where there is not enough room to park a car.
Temporary uses, including parklets. When curb extensions are too expensive, or flexibility within the curbside parking lane must be maintained, temporary or semi-temporary uses might be appropriate. Temporary uses within the curbside parking lane should be visually and physically distinguished from the roadway. A change in elevation (e.g. a low platform), materiality, or color, is needed on the ground surface to create a temporary space. Additional design elements, such as moveable planters, bollards, curbs, or other components, should be provided at the curbside parking lane edge, to provide a barrier between pedestrians and moving traffic. However, elements used to define the temporary space should not obstruct visibility and should allow people to see above or around them. Temporary uses in the curbside parking lane must comply with Americans with Disabilities Act (ADA) and any other current local, state, and federal regulations.

Temporary uses in the curbside parking lane should be prioritized in commercial areas with high pedestrian volumes, at cafés/restaurants, schools, libraries and other local destinations. In addition, streets with narrower roadways and light/slow-moving traffic provide safer locations for these spaces. Temporary uses should not conflict with other uses, including accessible parking and the safe travel of bicyclists when adjacent to lanes or sharrows.

Typically temporary uses will be initiated by the business owner or property owner and he or she will be responsible for constructing and maintaining the improvements.

Temporary (or semi-temporary) uses in the curbside parking lane require community commitment and involvement. Specifically, a Maintenance Agreement and Revocable Permit must be in place, and they must have the support of adjacent business owners. Uses should be developed by the community to serve local needs and aspirations and could include parklets.

Intermittent parkways with trees and other planting. Intermittent parkways with trees and other planting in the curbside parking lane is desirable in segments where the sidewalk is less than 8 feet wide, but should also be considered where gathering spaces or bicycle facilities in the curbside parking lane are not appropriate. Parkways with trees and other planting in the curbside parking lane benefits the pedestrian by increasing the buffer between the sidewalk and vehicular lane in the roadway, creating a greater sense of protection for the pedestrian. Parkways with trees and other planting in the curbside parking lane adds character to the streetscape and provides an opportunity to infiltrate or collect/treat stormwater runoff. Parkways and planters in the curbside parking lane should be designed with raised curbs that face the street and adjacent parking, do not interrupt the curb flow line, and take up one parking space per tree well or planter.

Peak period parking/loading restrictions where the curb lane is not a travel lane. In the past, when moving vehicles was the only function considered for street, LADOT implemented extensive curbside parking prohibitions on arterial...
streets during the peak period to “reduce friction” and allow the adjacent travel lane to move faster.

The lack of positive friction provided by curbside parking and/or other uses in the curbside parking lane, encourages increased speeds by motor vehicles in the adjacent vehicular lanes.

Bicycle parking in the curbside lane provides the opportunity to make more parking available with better access, can provide a location for bicycle shares, and helps to prevent congestion and clutter on the sidewalk.
Temporary uses in the curbside parking lane, including parklets, can accommodate a range of activities, and are a unique way to enhance the pedestrian environment when a community or district is committed to them.

Angled parking can typically accommodate more parking spaces than curbside parking (parallel to the curb) can and provides the opportunity to create more generous curb extensions.
Intermittent parkways with trees and other planting in the curbside parking lane provides space for trees on narrow sidewalks and the opportunity to add unique elements, like rain gardens, to the street.
10.3 Bicycle Corrals (Non Standard)

Design Summary

Bicycle Corrals utilize on-street space for bicycle parking in areas otherwise used for vehicular loading or parking. Bicycle Corrals typically provide space for 4 to 10 bicycle racks and can park between 8 to 20 bicycles. They are best located in areas with high demand for bicycle parking and can be installed in parallel, perpendicular or diagonal configurations.

Discussion

On-street bicycle parking is typically installed at the request of the adjacent business who agree to on-going maintenance the facility. In Portland, the City enters into a maintenance agreement with the business owner to ensure the bicycle parking area is maintained. On-Street bicycle parking provides a number of benefits in areas where bicycle parking demand is high or increasing:

- Bicycle Corrals increase overall parking supply for local businesses.
- Reduces the number of bicycles parked to railings and other street furniture, improving conditions for pedestrians.
- Can improve visibility at intersections by eliminating large vehicles parking at street corners.

The best-suited locations provide setback from travel lanes and easy access for bicyclists on surrounding streets.

Guidance

- For general bicycle parking guidance see the APBP Bicycle Parking Guidelines.

At first, Portland’s Bike Corrals were completely enclosed by rubber curbs with flexible bollards at either end, but this design made it difficult for bicyclists to enter from the street.

Portland is moving toward a simplified design with a single rubber curb, a pavement marking, and stripes to delineate the space. At each end, bicycle symbols with arrows direct traffic flow entering and exiting the corral. Photo: Greg Raisman

Berkeley installed architectural bollards on a concrete pad.
Additional Discussion – On-Street Bicycle Parking ("Bike Corrals")

On-Street parking in a diagonal parking space in Berkeley, CA.

San Luis Obispo, CA uses a combined approach with the bicycle parking sharing sidewalk and onstreet space. This design provides a solution where sidewalk and roadway space is limited.

Bicycle Racks parallel to curb in Palo Alto, CA.

Portland has also built curb extensions putting the parking at sidewalk level. This design, with covered bicycle parking, is called a “Bike Oasis.”
11.1 Curb Radius

Intent

Provide curb radii that are as small as possible to accommodate typical truck and bus turn movements and to facilitate safe pedestrian crossing and discourage speeding around corners.

Standards Table

<table>
<thead>
<tr>
<th>Complete Street Type Name</th>
<th>ARTERIAL STREETS</th>
<th>NON-ARTERIAL STREETS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Boulevard I (Major I)</td>
<td>Boulevard II (Major II)</td>
</tr>
<tr>
<td>Curb Radius</td>
<td>15 feet</td>
<td>10 feet</td>
</tr>
<tr>
<td>Without curb extensions (desirable)</td>
<td>15 feet</td>
<td>10 feet</td>
</tr>
<tr>
<td>With curb extensions (desirable)</td>
<td>20 feet</td>
<td>15 feet</td>
</tr>
</tbody>
</table>

Exceptions. At an Arterial-to-Arterial intersection without curb extensions, where a right turn is onto an Arterial that is less than 28 feet wide in the direction of the turn, a 20-foot curb radius may be required.

On Bus or Vehicle Priority Streets, where truck and/or bus right turn volumes represent a minimum of 10% of total peak hour right turn volumes, 20 - 25-foot curb radii may be required.

In areas zoned for heavy industry where trailer trucks (wheel base 40 feet or greater) represent a minimum of 10% of total peak hour traffic volumes, 40-foot curb radii may be required.

Discussion/Examples

According to the FHWA Pedestrian Safety Guide:

“One of the common pedestrian crash types involves a pedestrian who is struck by a right-turning vehicle at an intersection. A wide curb radius typically results
in high-speed turning movements by motorists. Reconstructing the turning radius to a tighter turn will reduce turning speeds, shorten the crossing distance for pedestrians, and also improve sight distance between pedestrians and motorists.

“If a curb radius is made to small large trucks or buses may ride over the curb placing pedestrians in danger. Development type and types of road users should be considered when designing an intersection so that curb radii are appropriately designed.

“Where there are no curb extensions and there is a parking and/or bicycle lane, curb radii can be even tighter, because the vehicles will have more room to negotiate the turn. Curb radii can in fact be tighter than any modern guide would allow: older cities in the Northeast frequently have radii of 2-5 feet without suffering any detrimental effects.

“More typically, in new construction, the appropriate turning radius is about 15 feet and about 25 feet for arterial streets with a substantial volume of turning buses and/or trucks. Tighter turning radii are particularly important where streets intersect at a skew. While the corner characterized by an acute angle may require a slightly larger radius to accommodate the turn moves, the corner with an obtuse angle should be kept very tight, to prevent high speed turns.”

For this manual, Los Angeles Fire Trucks and trucks with 40-foot wheel bases (WB-40), typical of semi-trucks (and which have as similar turning radius to 30-foot long single unit trucks, typical of common delivery trucks), were tested using AutoTurn software, on typical roadway and lane widths, to identify conditions under which the standard 15-foot curb radius would be problematic. As summarized in the following table, Los Angeles Fire Trucks and WB-40 trucks typically can turn around corners with either 20-foot curb radii with curb extensions or 15-foot curb radii with no curb extensions and curbside parking except when the Arterial Street lane width in one direction into which the truck is turning is less than 28 feet, in which case a 20-foot curb radius is needed.

The following table illustrates the results of Auto-Turn analyses for one set of conditions in the table. All conditions listed in the table were tested.
### MINIMUM CURB RADII REQUIRED TO ACCOMMODATE LAFD
Fire Trucks and W-B40 Trailer Trucks Based on Auto-Turn Analysis

<table>
<thead>
<tr>
<th>Curb Extension</th>
<th>ARTERIAL CURB LANE WIDTH</th>
<th>MINIMUM CURB RADIUS</th>
</tr>
</thead>
<tbody>
<tr>
<td>No Curb Extensions</td>
<td>13 feet</td>
<td>Arterial to Arterial: 15 feet</td>
</tr>
<tr>
<td></td>
<td>18 feet</td>
<td>Arterial to Arterial: 15 or 20 feet</td>
</tr>
<tr>
<td></td>
<td>23 feet</td>
<td>Non-Arterial to Arterial: 15 feet</td>
</tr>
<tr>
<td>Curb Extension on one of the two streets (Arterial)</td>
<td>18 feet</td>
<td>20 feet</td>
</tr>
<tr>
<td></td>
<td>23 feet</td>
<td>15 feet</td>
</tr>
<tr>
<td>Curb Extensions on both streets</td>
<td>18 feet</td>
<td>20 feet</td>
</tr>
<tr>
<td></td>
<td>23 feet</td>
<td>15 feet</td>
</tr>
</tbody>
</table>

1. 15 feet if turning into at least 28-foot width in one direction, e.g., no left turn lane on a 56-foot arterial; 20 feet if turning into less than 28-foot width in one direction.

### Assumptions
Curb extensions are 5 feet wide.
Minimum arterial curb-to-curb width is 56 feet.
Minimum non-arterial curb-to-curb width is 36 feet.
Acceptable to cross over center line on Non-Arterials
Acceptable to use all lanes in one direction (excludes left-turning lane or the 2-way left turn to this lane) on Arterials.
Arterial curb lane widths correspond to typical conditions: 13-foot travel lane; 18 feet parking + travel lane; 23 feet parking + bicycle lane + travel lane.
13-foot curb lane assumes trucks occupy both curb and second lane per California Department of Motor Vehicle guidance.

### Note
Per the results of the turn template analysis, both a fire truck and a WB40 trailer truck will have to cross over the center line on a non-Arterial street depending on the presence of curb-extensions along the streets as follows: Fire Truck approximately 3 - 5 feet; WB-40 Truck approximately 2 - 10 feet.
Figure 11-1
City of Los Angeles Fire Truck Turn Movements (56-foot Arterial, 40-foot Collector, and 36-foot Local Street)
11.2 Intersection Visibility

Intent

Provide both adequate visibility for motorists at intersections and shade and streetscape continuity along sidewalks, particularly at bus stops, making sidewalks more walkable and usable for pedestrians and transit riders, consistent with the goal of providing Complete Living Streets.

To achieve this intent, it is critical to continue street trees along as much of the sidewalk length as possible and to keep sidewalks at intersections relatively free of obstructions that obstruct visibility and reduce the capacity of the street corner to accommodate pedestrians.

Standards Table

<table>
<thead>
<tr>
<th>Complete Street Type Name</th>
<th>ARTERIAL STREETS</th>
<th>NON-ARTERIAL STREETS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Boulevard I (Major I)</td>
<td>Boulevard II (Major II)</td>
</tr>
<tr>
<td>Intersection Visibility</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Trees</td>
<td>Per LAMC 62.20, trees are allowed in the 45 feet visibility triangle at 1) controlled intersections and 2) at uncontrolled intersections provided their canopies are pruned up above 8 feet. In addition, palms and trees with trunk diameters greater than 24 inches should not be planted in the visibility triangle and trees within the visibility triangle at controlled intersections should be pruned up above 8 feet.</td>
<td></td>
</tr>
<tr>
<td>Other elements within ROW</td>
<td>Per LAMC 62.00, maximum 3 feet high, except utility poles. Utility cabinets, trash receptacles, and similar elements should be located outside the 45-foot visibility triangle.</td>
<td></td>
</tr>
</tbody>
</table>
Discussion/Examples

LAMC 62.20 lists only obstructions that are prohibited within the 45-foot visibility triangle at each corner of an intersection; it then lists exceptions to the those prohibitions. In addition to the exceptions, anything not listed as prohibited is permitted. LAMC 62.20 states that, at uncontrolled intersections, any obstruction to the view necessary for the safe operations of motor vehicles taller than three feet is prohibited, and then specifically excludes utility poles and trees that are pruned up above 8 feet. LAMC 62.20 does prohibit obstructions at controlled intersections. However, BOE has enforced an unwritten policy of prohibiting trees that are pruned up above 8 feet, but not other elements that are prohibited by LAMC 62.20, within the visibility triangle of every intersection, whether controlled or uncontrolled. LADOT has a written policy in its MPP prohibiting trees within 50 feet approaching an intersection and 25 feet departing.

The informal policies of both BOE and LADOT are in conflict with LAMC 62.20 and the goal of creating Complete Living Streets. Their policies have singled out only trees, and not other elements that may block visibility. The conflicting policies should be revisited and brought into conformance with the Municipal Code and the Complete Living Streets goal. A survey of other jurisdictions in California reveal typical set backs for street trees of 30 to 35 feet from intersections, although there are few written policies establishing those dimensions. In practical terms, if the curb return is 15 feet and there is a signal or street light pole at the beginning of the curb return, then to maintain a distance of 20 feet between the street light and street tree, as desired by BSL, the street tree would be 35 feet from the point of intersection of the extended curb lines.

The complete language of LAMC 62.20 is as follows:

“(a) Obstructions Prohibited. (Amended by Ord. No. 163,509, Eff. 5/23/88.) On property at any corner of any intersection not controlled by official traffic control signals or by stop signs at or near the entrances to one or more intersecting streets it shall be unlawful to install, set out or maintain, or to allow the installation, setting out or maintenance of any sign, hedge, shrubbery, natural growth or other obstruction to the view necessary for the safe operation of motor vehicles at such intersections, higher than three feet above the level of the center of the adjacent intersection within any visibility triangle.

“The terms ‘visibility triangle’, as illustrated in the next figure, shall be deemed to be that portion of both public and private property located at any corner and bounded by the curb line or edge of roadway of the intersecting streets and a line joining points on the curb or edge of roadway 45 feet from the point of intersection of the extended curb lines or edges of roadway.
"The term 'intersection' as used in this section is defined in Section 365 of the Vehicle Code of the State of California.

"(b) Exceptions: (Amended by Ord. No. 127,787, Eff. 8/1/64.) The foregoing provision shall not apply to permanent buildings; public utility poles; trees trimmed (to the trunk) to a line at least eight feet above the level of the intersection; saplings or plant species of open growth habits and not planted in the form of a hedge, which are so planted and trimmed as to leave at all seasons a clear and unobstructed cross-view; supporting members of appurtenances to permanent buildings existing on the date this ordinance becomes effective; official warning signs or signals; post signs as defined in Article 7, Chapter 6 of this Code; or to places where the contour of the ground is such that there can be no cross-visibility at the intersection.

Street trees located in 45-foot corner visibility triangle per LAMC 62.20 without sidewalk extensions from viewpoint of driver in right turn lane. Street trees pruned up 8 feet above roadway do not interfere with visibility.

Street trees located in 45-foot corner visibility triangle per LAMC 62.20 with sidewalk extensions. Street trees are set back even farther and again do not affect visibility.
11.3 Modern Roundabout

Intent

- Provide traffic management where the existing intersection is large, complex, and/or has more than 4 approach legs.
- Replace a signalized intersection that is experiencing heavy traffic backup and congestion.
- Slows speeds at an intersection.
- Creates a gateway into an area.

Standards Table

<table>
<thead>
<tr>
<th>Complete Street Type Name</th>
<th>ARTERIAL STREETS</th>
<th>NON-ARTERIAL STREETS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Boulevard I (Major I)</td>
<td>Boulevard II (Major II)</td>
</tr>
<tr>
<td>Modern Roundabouts</td>
<td>Typically allowed at intersections with no more than two lanes on each approach and an intersection ADT of 40,000 or less, if right-of-way permits. For roadways with one lane on each approach, allowed when intersection ADT is 20,000 or less.</td>
<td>Typically allowed if one lane on each approach and ADT of 15,000 or less, if right-of-way permits.</td>
</tr>
</tbody>
</table>

Criteria

Design standards

Design per FHWA Roundabout Design guidance.
Discussion

As described in the FHWA Pedestrian Safety Guide:

“A modern roundabout is built with a large, circular, raised island located at the intersection of an arterial street with one or more crossing roadways and may take the place of a traffic signal. As with a traffic mini-circle, traffic maneuvers around the circle in a counter clockwise direction, and then turns right onto the desired street. All traffic yields to motorists in the circle and left-turning movements are eliminated. Unlike a signalized intersection, vehicles generally flow and merge through the roundabout from each approaching street without having to stop. Splitter islands at the approaches slow vehicles and allow pedestrians to cross one lane at a time.

“The roundabout needs to be constructed to accommodate the needs of pedestrians and bicyclists. Pedestrians may need to travel out of their way to cross the intersection, but generally have a shorter wait than with a signal and have only one direction of approaching traffic to watch for. Unfortunately, visually impaired people have difficulty crossing at roundabouts. This issue needs to be adequately addressed in the design of roundabouts.

“Bicyclists usually suffer the most from roundabout design. Unless the road is very narrow (one lane in each direction), speeds very slow, and traffic very light, bicyclists may not be able to share the road comfortably. Marking bicycle lanes through the roundabout has not always been shown to be safer. In larger roundabouts, an off-road bicycle path should be created to direct cyclists to follow the pedestrian route; while this is usually inconvenient and takes longer, it is generally safer.”
11.4 Crosswalks – All Locations

Intent

To provide the most direct, easily accessible and visible path for pedestrians to cross the street. To meet this intent the following standards can be provided in combination.

Standards Table

<table>
<thead>
<tr>
<th>Complete Street Type Name</th>
<th>ARTERIAL STREETS</th>
<th>NON-ARTERIAL STREETS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Boulevard I (Major I)</td>
<td>Boulevard II (Major II)</td>
</tr>
<tr>
<td>All Locations</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Preferred ramp type</td>
<td>Directional ramps where feasible.</td>
<td>Parkway edged ramps, either directional or single.</td>
</tr>
<tr>
<td>Median refuge island</td>
<td>Where feasible, median refuge may be provided when there are four or more travel lanes, the roadway’s speed limit is 35 mph or greater, and the roadway ADT is in excess of 12,000. Refuge median should be 6-foot minimum width.</td>
<td>Typically not needed.</td>
</tr>
<tr>
<td>Raised crosswalks</td>
<td>Typically not provided.</td>
<td>Allowed where pedestrian volume exceeds 60 (or 40 elderly and/or children) during the peak hour, or 120 during any four hour period.</td>
</tr>
<tr>
<td>Raised intersections</td>
<td>Typically not provided.</td>
<td>Allowed where pedestrian volume exceeds 80 (or 60 elderly and/or children) during the peak hour, or 160 during any four-hour period.</td>
</tr>
<tr>
<td>Crosswalk twice standard width</td>
<td>Where pedestrian crossing volume calls for. DOT to determine.</td>
<td>Typically not needed.</td>
</tr>
<tr>
<td>Restricted crossings at intersections</td>
<td>Pedestrian crossing is allowed at all intersections, whether marked or unmarked. Pedestrian crossing may be restricted on one or two legs of an intersection only in the following circumstances: [requires discussion with DOT re: current criteria].</td>
<td></td>
</tr>
</tbody>
</table>

Discussion/Examples

Pedestrian crossings refer to all intersections and designated mid-block crossings. They should be designed to improve safety and enhance the pedestrian realm, using elements to highlight the crossing. Combining multiple design elements is preferable, when appropriate and feasible. For example, the
use of marked crosswalks at a pedestrian crossing in conjunction with curb extensions and directional curb ramps, help make the crossing safer and more comfortable for pedestrians than marked crosswalks would on their own.

**Curb ramps.** Curb ramps are always required for access from the sidewalk level to the street level and must be installed at all intersections and midblock crossings. Directional curb ramps, or separate curb ramps for each crosswalk, help to orient the visually impaired and those in a wheelchair. Although directional ramps are only required for Arterial Streets, they should be considered on other streets where the sidewalk is wide enough, especially where the adjacent uses include schools, multi-family residential, mixed-use, and institutional. Curb ramps must comply with Americans with Disabilities Act (ADA) and any other current local, state, and federal regulations. In addition, since parkways are required on Collector, Industrial Collectors, and Local streets, curb ramps (directional or otherwise) are required to be edged by the parkway, which creates a more integrated look and allows the parkways to be longer.

**Median refuge islands.** The purpose of a median refuge island is to enhance the pedestrian crossing by highlighting it, while providing a protected area (partway across the street) for pedestrians to look for traffic, so that they are able to focus on one direction of traffic at a time. Median refuge islands should be implemented when the roadway is wide and at pedestrian crossings that cannot be completed in available time. In addition, curb extensions should be added in conjunction with median refuge islands, where feasible, to provide more space on the sidewalk at the crossing. Median refuge islands must comply with Americans with Disabilities Act (ADA) and any other current local, state, and federal regulations, which should include providing a detectable warning surface at the edge of the cut-through to identify the pedestrian refuge area. Ideally, crosswalks through the median refuge island should be angled, so that pedestrians face oncoming traffic. Finally, median refuge islands should be well lit and emphasized with streetlights, signs, and reflectors, to ensure motorists see them.

**Raised crosswalks and intersections.** A raised intersection is a speed table that encompasses the entire intersection. A raised crosswalk is a speed table that is the width of the crosswalk. Speed tables and raised intersections provide a continuous walkway for a pedestrian as they cross the street at the same level as the sidewalk. The purpose of a speed table and raised intersection is to slow traffic
and enhance the pedestrian crossing. Speed tables and raised intersections should be provided when pedestrian volumes and traffic speeds are high, and are typically not required on Collector or Local streets. Speed tables can be used in conjunction with curb extensions on streets with curbside parking and provide the opportunity to highlight the intersection through color or special paving. Detectable warning strips at the edges, and the boundary between the sidewalk and the street, should be installed for pedestrians with visual impairments.

Drainage must be carefully considered in the design of raised crosswalks and intersections to ensure that raised elements do not interfere with the flow of water.

Median refuge islands give pedestrians a protected area within a wide roadway to help them safely complete a crossing. They can be designed many different ways to highlight the refuge (i.e. landscape or hardscape) and can be an opportunity to add character to the streetscape.
11.5 Signalized Intersections and Midblock Crossings

Intent

To provide safe and highly visible crossings at signalized intersections and midblock locations, while allowing enhanced paving and scramble crossings at very high volume pedestrian crossings.

Standards Table

<table>
<thead>
<tr>
<th>Complete Street Type Name</th>
<th>ARTERIAL STREETS</th>
<th>NON-ARTERIAL STREETS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Boulevard I (Major I)</td>
<td>Boulevard II (Major II)</td>
</tr>
<tr>
<td>Criteria for signalization</td>
<td>[DOT: needed to provide additional flexibility relative to MUCTD?]</td>
<td></td>
</tr>
<tr>
<td>Crosswalk marking</td>
<td>White edge striping is standard. Continental striping or enhanced paving may be permitted with DOT approval.</td>
<td></td>
</tr>
<tr>
<td>All-cross intersection (scramble crossing)</td>
<td>Allowed where high pedestrian volumes in the intersection would be served by the crossing.</td>
<td></td>
</tr>
</tbody>
</table>
Discussion/Examples

Signals at intersections provide opportunities for pedestrians to cross the street by holding back traffic and warning motorists of pedestrians. Crosswalks are always striped at signalized intersections.

**Criteria for signalization.** For specific criteria for signalization, refer to LADOT Manual of Policies and Procedures (MPP), Section 353.

**Crosswalk Marking.** At signalized intersections edge striping, to mark the crosswalk, is standard and required. However, enhanced crosswalks may be provided, with special paving for example, which would help to further emphasize the pedestrian crossing.

The purpose of a crosswalk marking is to designate preferred crossing locations for pedestrians that are safe, convenient, and to warn drivers to watch for pedestrians. Criteria for standard crosswalk treatments depend on pedestrian volumes and on whether the intersection, or mid-block crossing, is signalized. For example, at non-signalized intersections and mid-block pedestrian crossings it is more important to highlight the crosswalk than at signalized intersections. In addition, at crossings where pedestrian volumes are high, crosswalk markings are required to be wider than the typical.

Generally continental (zebra) or ladder striping is the most visible. However, enhanced paving materials can be used create a design unique to the community, provided they are as visible as continental or ladder striping, and are long-lived and safe, e.g. non-slippery surface.

**All-cross intersection (aka scramble crossing).** The purpose of an all-cross intersection is to improve the safety and flow of people in street segments with high pedestrian volumes. At all-cross intersections all vehicular traffic is stopped to allow pedestrians to cross the street in every direction at the same time, including diagonally.
Continental (zebra) or ladder striping is typically the most visible.

A crosswalk with a unique color, design, and material clearly designates the pedestrian zone and helps to reinforce the character of a district. Using the same material in the crosswalk and on the sidewalk reinforces the pedestrian zone continuing from the sidewalk through the intersection.

All-cross intersections prioritize the pedestrian and should be considered in street segments with high pedestrian volumes.
# 11.6 Unsignalized Intersections and Midblock Crossings

## Intent

Provide a safe and highly visible crosswalk when warranted at unsignalized intersections and at midblock crossings, based on demand and/or community benefit.

## Standards Table

<table>
<thead>
<tr>
<th>Complete Street Type Name</th>
<th>ARTERIAL STREETS</th>
<th>NON-ARTERIAL STREETS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Boulevard I (Major I)</td>
<td>Boulevard II (Major II)</td>
</tr>
</tbody>
</table>

### Unsinalized Intersections and Midblock Crossings

- 1) Sufficient demand exists or is expected to exist in the future to justify the installation of a crosswalk.
- 2) The location has sufficient sight distance (sight distance in feet should be greater than 10 times the speed limit) and/or sight distance will be improved prior to crosswalk marking.
- 3) Safety considerations do not preclude a crosswalk.
- 4) The distance from the intersection and the nearest marked crosswalk is 300 feet or greater. However, at the discretion of the Director of Planning, the General Manager of DOT and the City Engineer, marked crosswalks may be installed at unsignalized intersections or midblock locations less than 300 feet from the nearest marked crossing if the determination is made that crosswalk installation would be beneficial.

### Continental striping or ladder striping

Typically used at unsignalized marked crosswalks to increase visibility.
Discussion/Examples

Unsignalized intersections provide locations for pedestrians to cross the street when they are too far from a signalized intersection. However, in areas with high pedestrian or traffic volumes, it is critical to implement measures that highlight the crossing and slow traffic, warning motorists of the potential for a pedestrian to cross the street.

Midblock crossings provide locations for pedestrians to cross the street when it is more convenient than walking to an intersection. These crossings are required to have a crosswalk marking. However, additional measures are preferred, such as a pedestrian signal and/or curb extensions, to highlight the crossing, slow traffic, and warn motorists of the potential for a pedestrian to cross the street.

Demand Considerations. Uncontrolled and mid-block crossings should be identified as a candidate for marking if there is a demonstrated need for a crosswalk at present or if one is anticipated in the future. Need can be demonstrated by any of the following:

- Location near existing or proposed pedestrian generators, such as a transit station or bus stop, school, park, multi-family housing, offices, retail destinations.
- Existing pedestrian crossing volumes exceed 20 pedestrians crossing during the peak hour on roadways with a speed limit of 35 mph or less, or 14 pedestrians crossing during the peak hour on roadways with a speed limit greater than 35 mph (source: Appendix A page 65 of NCHRP 562). The above referenced pedestrian volume criteria would be considered met if the sum of pedestrian crossing volumes crossing the roadway under consideration at the nearest adjacent marked or controlled crosswalks and the pedestrian crossing volumes at all locations in between the nearest marked or controlled crosswalks, exceed the volume thresholds.
- Pedestrian-vehicle collisions at this location (over several years).
- Distance to nearest (adequately) marked or controlled crosswalk.
- Citizen surveys, requests, walking audits, etc.
- The discretion of the Director of Planning, the General Manager of DOT and the City Engineer.

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, or HAWK signals.

Determination that enhanced treatments are warranted should follow FHWA guidance in report FHWA-RD-01-075, as well as the discretion of the Director of Planning, the General Manager of DOT and the City Engineer. Determination of the appropriate enhanced treatments would vary based on the characteristics of a particular location, and include roadway width, traffic volumes, pedestrian volumes, driver compliance, and other characteristics. Failing to provide an enhanced crosswalk and/or removing a crosswalk because it cannot be enhanced should be an option of last resort.

**Crosswalk marking.** Continental (zebra) or ladder striping [to be determined by LADOT] is used at unsignalized marked crosswalks to increase visibility.

**Criteria for crosswalk marking.** For specific crosswalk marking criteria at unsignalized intersections, refer to LADOT Manual of Policies and Procedures (MPP), Section 353, except that required pedestrian volume shall include all pedestrians crossing the street segment that would be served by the crosswalk, for example between the two adjacent marked crosswalks.
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12.1 Pedestrian Signalization

Intent

- Facilitate safe crossings in all environments
- Allow for sufficient crossing times through signalization
- Minimize risk-taking behavior such as jaywalking

Discussion

Signalization plays a major role in how pedestrians interact with their streets. Good signalization promotes safer walking behavior, fewer travel delays, and an overall better pedestrian experience. There are several signalization techniques that can prioritize greater pedestrian safety in auto-oriented environments.

For example, a **Leading Pedestrian Interval** (LPI) enables pedestrians to enter the crosswalk a couple of seconds before cars can begin their turn through an intersection. In essence, an LPI prioritizes pedestrian movement and reduces collisions by making pedestrians more visible to turning vehicles. In addition, a split-phase signal can also reduce collisions in the intersection by separating left-turning traffic from pedestrian crossings. Also, balancing signal cycle lengths reduces waiting times and the temptation to jaywalk.

Pedestrian signals can also be calibrated to fit different contexts. For example, incorporating fixed time signals in pedestrian-heavy downtown areas makes crossings more predictable and keeps vehicles from speeding along stretches. On the other hand, actuated signals (i.e., triggered by pressing a button) may work better in suburban contexts with less pedestrian activity. In addition, if pedestrians are not present, actuation benefits transit service, especially in the peak-hour, by not needlessly disrupting their on-time performance.
12.2 Bicycle Signalization

Intent

As the needs and characteristics of bicycles and motor vehicles vary greatly, adequately accommodating bicyclists at traffic signals can be challenging for traffic engineers. This section contains guidance on the detection of bicycles at signals, bicycle pavement markings at signals, and bicycle signals.

Bicycle Considerations at Traffic Signals:

Bicycles typically travel at speeds much slower than motor vehicles and can find themselves without an adequate time to clear an intersection. The duration of the amber phase of signals is typically sufficient to allow motor vehicles to clear an intersection at the prevailing speed; however, bicyclists typically average only 10-15 mph through intersections. Methods for accommodating bicyclists include:

- Lengthening the amber phase of the intersection slightly to allow for the slower speed of bicyclists; this should only be part of the solution as longer amber phases may also encourage motor vehicles to enter intersections under this phase.

- Lengthening the ‘all red’ phase of the intersection: this allows any vehicles or bicycles still in the intersection to clear before a green phase is given to opposing traffic. The maximum length of the ‘all red’ phase should not generally be greater than 3 seconds. Under no circumstances should this time be extended beyond 6 seconds as this may also encourage motor vehicles to illegally enter the intersection.

- Coordinating signals to allow for the 10-15 mph speed of bicyclists: Sometimes it is possible to alter signal timing to provide ‘green waves’ for bicyclists without significantly impeding motor vehicle flow or in specific circumstances, such as business districts with pedestrian volumes, to discourage motor vehicle speeds.

- Increasing the minimum green phase: Bicyclists have slower speeds and accelerations than motor vehicles and even if they are at the stop line when a green light is given, the bicyclist may still lack sufficient time to clear the intersection before a conflicting green phase.

- Using signal detection to detect moving bicyclists: video detection technology may be programmed to detect the presence of bicyclists and alter the minimum green phase, or the clearance interval based on their presence.
Design Summary

Part 4 of the California MUTCD covers bicycle signals.

Support:

A bicycle signal is an electrically powered traffic control device that may only be used in combination with an existing traffic signal. Bicycle signals shall direct bicyclists to take specific actions and may be used to improve an identified safety or operational problem involving bicycles.

Standard:

Only green, yellow and red lighted bicycle symbols shall be used to implement bicycle movement at a signalized intersection.

A separate signal phase for bicycle movement shall be used.

Guidance:

Alternative means of handling conflicts between bicycles and motor vehicles should be considered first. The application of bicycle signals shall be implemented only at locations that meet Caltrans Signal Warrants.

Two alternatives that should be considered are:

1. Striping to direct a bicyclist to a lane adjacent to a traffic lane such as a bicycle lane to left of a right-turn-only lane.

2. Redesigning the intersection to direct a bicyclist from an off-street path to a bicycle lane at a point removed from the signalized intersection.

A bicycle signal phase should be considered only after these and other less restrictive remedies have been tested over time with adequate law enforcement and a reduction in collisions is demonstrated.

Discussion

Bicycle signals are an approved traffic control device in the State of California following an experiment in the City of Davis.

Bicycle signals can be actuated with bicycle sensitive loop detectors, video detection, or push buttons.
Instructional and regulatory signage should be considered with installation of new bicycle signals. This signage is not standard and will have to be created for the application.

See images for examples and see the following page for additional discussion.

**Guidance**

- Caltrans Highway Design Manual
- California MUTCD
- City of Davis Signage

**Additional Discussion – Bicycle Signals Use:**

Bicycle signals are typically considered in locations with heavy bicycle traffic combined with significant conflicts with motor vehicles at intersections with unique geometry; or at the interface between busy roads and off-street bicycle facilities. Specific situations where bicycle signals have had a demonstrated positive effect include:

- High volume of bicyclists at peak hours.
- High numbers of bicycle/motor vehicle collisions, especially those caused by crossing paths.
- At T-intersections with major bicycle movement along the top of the T.
- At the confluence of an off-street bicycle path and a roadway intersection.
- Where separated bicycle paths run parallel to arterial streets.
Legal Clarification:

While bicycle signals are approved for use in California, local municipal code should be checked or modified to clarify if bicycles should only obey the bicycle signal heads at intersections with conflicting vehicular signalization.

Advantages:

• Separates conflicting movements.

• Provides bicyclists priority movement at intersections.

• Protects bicyclist movements in an intersection, which may improve real and perceived safety at high conflict areas.

• Alternates right-of-way between different road users.

Disadvantages:

• May result in additional delay for motorists and loss of vehicular capacity, particularly where a scramble phase is employed.

• May create a false sense of security for bicyclists because they believe the bicycle signal phase will protect them.

• Unfamiliar drivers may be confused or uncertain about intended purpose of signals.
12.3 Loop Detectors

Design Summary

In order to minimize delay to bicyclists, it is recommended to install one loop about 100 ft from the stop bar within the bicycle lane, with a second loop located at the stop bar.

Details of saw cuts and winding patterns for inductive detector loop types appear on Caltrans Standard Detail ES-5B.

Discussion

The Type E loop is the standard for use in the City of Los Angeles.

Guidance

- California MUTCD
- Caltrans Highway Design Manual
- Caltrans Standard Plans (1999) ES-5B
- AASHTO Guide for the Development of Bicycle Facilities

Additional Discussion – Loop Detectors


Section 4A.02 Definitions Relating to Highway Traffic Signals

15. Detector – a device used for determining the presence or passage of vehicles (including motorcycles), bicycles or pedestrians.

29A. Limit Line Detection Zone – a Referenced Bicycle Rider must be detected in a 6ft x 6 ft area immediately behind the limit line, centered either in a normal width lane or if the lane is more than 12 ft wide, centered 6 ft from the left lane line. For a lane of 20 ft or greater, two minimum 6 ft x 6 ft areas shall constitute the Limit Line Detection Zone.
50A. Reference Bicycle Rider — a minimum 4 ft tall person, weighing minimum 90 lb, riding on an unmodified minimum 16-inch wheel bicycle with non-ferromagnetic frame, non-ferromagnetic fork and cranks, aluminum rims, stainless steel spokes, and headlight.

Section 4D.105(CA) Bicycle/Motorcycle Detection:

**Standard:**

All new limit line detector installations and modifications to the existing limit line detection on a public or private road or driveway intersecting a public road (see Section 1A.13 for definitions) shall either provide a Limit Line Detection Zone in which the Reference Bicycle-Rider is detected or be placed on permanent recall or fixed time operation. Refer to CVC 21450.5.

All new and modified bike path approaches to a signalized intersection shall be equipped with either a Limit Line Detection Zone or a bicyclist pushbutton, or else the phase serving the bike path shall be placed on permanent recall or fixed time operation. A bicyclist pushbutton, if used shall be located on the right side of the bike path and where it can be reached from the bike path. See Section 9B.10 for bicycle regulatory signs.

At new signalized intersections or when the advance detection is being replaced at existing signalized intersections, phases with advance detection only shall be placed on permanent recall.

**Support:**

The requirement to detect the Reference Bicycle-Rider in the limit line detection Zone is technology-neutral.

**Option:**

The detection zone in a bike lane may be narrower than 6 ft. See Figure 4D-111(CA).

A Bicycle Detector Symbol may be used. See Sections (B.12 and 9C.05).

A bicyclist pushbutton may be used to supplement the required limit line detection.

Support: See Section 9B.10 for bicycle regulatory signs.
Guidance:

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.

The Reference Bicycle-Rider or the equivalent should be used to confirm bicycle detection under the following situations:

A. A new detection system has been installed; or

B. The detection configuration has been modified.

Support:

CVC Section 21202(a) requires bicyclists traveling “at a speed less than the normal speed of traffic” to ride “as close as practicable to the right-hand curb or edge of roadway” with exceptions, including when the bicyclist is “approaching a place where a right turn is authorized.” This exception was intended to provide the bicyclist the flexibility to avoid having to ride against the right hand curb or edge of road where a potential conflict would be created with a right-turning motorist.

A Limit Line Detection Zone provides for the detection of both bicycles and vehicles, including motorcycles.

Guidance:

Where a Limit Line Detection Zone that detects the Reference Bicycle-Rider has been provided, minimum bicycle timing should be provided as follows:

For all phases, the sum of the minimum green, plus the yellow change interval, plus any red clearance interval should be sufficient to allow a bicyclist riding a bicycle 6 ft long to clear the last conflicting lane at a speed of 14.7 ft/sec, where additional effective start-up time of 6 seconds, according to the formula $G_{min} + Y + R_{clear} \geq 6 \text{ sec} + (W+6 \text{ ft})/14.7 \text{ ft/sec}$, where

$G_{min}$ = Length of minimum green interval (sec)

$Y$ = Length of yellow interval (sec)

$R_{clear}$ = Length of red clearance interval (sec)

$W$ = Distance from limit line to far side of last conflicting lane (ft)
Support:

Bicyclist crossing times are shown in Table 4D-109(CA). The speed of 14.7 ft/sec represents the final crossing speed and the effective start up time of 6 seconds represents the time lost in reacting to the green light and then accelerating to full speed.

Option:

A limit line detection system that can discriminate between bicyclists and vehicles may be used to extend the length of the minimum green.
12.4 Loop Detector Pavement Markings

Design Summary

Locate a Bicycle Detector Pavement Marking where a bicycle can be detected in a shared travel lane by a loop detector or other detection technology.

Discussion

Bicycle Detector Pavement Markings guide bicyclists to position themselves at an intersection to trigger signal actuation. Efforts need to be made to ensure that signal detection devices are capable of detecting a bicycle. Detectors for traffic-actuated signals need to be located in the bicyclist’s expected path, including left-turn lanes and shoulders. Marking the road surface to indicate the optimum location for bicycle detection is helpful to the bicyclist.

Guidance

- California MUTCD
- AASHTO Guide for the Development of Bicycle Facilities

Design Example

Accompanying Signage (R10-22)
Figure 9C-7
CA MUTCD

Los Angeles Department of City Planning
Draft February 2014

Mobility Complete Streets Manual

Section 12.4 Loop Detector Pavement Markings
12.5 Vehicle Signalization

Intent

- Continue to utilize and improve the Automated Traffic Surveillance and Control System (ATSAC) to manage traffic on our highways.

- Continue to develop ways to use ATSAC data to inform our understanding of local and citywide traffic patterns and travel behavior.

Discussion

The Automated Traffic Surveillance and Control System (ATSAC) is the City of Los Angeles’ computer-based traffic signal control system. Implemented in nearly 4,400 signalized intersections across the city today, ATSAC monitors traffic conditions and system performance in order to effectively manage real-time traffic flows.

Information pertaining to vehicle throughput, speeds, and level of congestion is collected and received by the system every second. Then, the system analyzes the data by the minute to determine and trigger the signal timing alterations that result in better traffic flows. In addition, ATSAC also measures traffic volumes and congestion over longer-term periods, enabling trend analyses for future transportation planning purposes. Overall, ATSAC has proven to be an invaluable asset, as evidenced by the evaluative studies that indicate reductions in travel times, traffic signal delay, and air emissions for the City of Los Angeles.
Other Public Space Treatments

Section 13
13.1 Public Space Treatments Overview

Public space elements can reinforce a community’s identity by reflecting the local culture, history and attitudes. When integrated as part of a streetscape project, placemaking elements can serve a dual purpose: beautiful amenity combined with a meaningful function. Other examples of placemaking elements include:

- Public art
- Special lighting - pedestrian or ornamental
- Banners
- Decorative medallions for light poles or street furnishings
- Special furnishings
- Unique bicycle racks
- Sidewalk insets or placards
- Special manhole covers
- Special crosswalk designs
- Wayfinding
Examples

The following examples are intended to provide the community-based reader some ideas for integrating art, gateways, banners and wayfinding into the public realm.

Bicycle racks can be modified versions of off-the-shelf products, or custom fabricated by an artist to reflect the culture and history of the community. (Source: archieexpo.com website images) Art can be integrated directly into the sidewalk, but needs to be long-lived materials that are maintainable by an entity with a secure funding source. (Sources: Poetry plaque in San Francisco)

Artist-designed medallions added to existing street light fixtures to reinforce community identity. (Source: Chinatown medallions by artist Michael Amescua, photo courtesy of CRA/LA website) Freestanding sculpture on San Francisco sidewalk and median in West Hollywood.

Art can enhance utilitarian streetscape elements such as utility boxes and manhole covers. (Source for artist-designed manhole cover in Japan: 3.bp.blogspot.com)
Gateways can extend over the street, like the North Hollywood gateway designed by artist Peter Shire, or over the sidewalk.

Monument gateway signs work best on raised center medians.

Pole gateway signs can be accommodated on sidewalks as well as on medians.

Wayfinding to parking

Wayfinding to destinations
Directional wayfinding

Maps

Interpretive wayfinding
Section 13.1 Public Space Treatments Overview

Interpretive wayfinding

Lights across the street

Tree lights

Special locations

Gobo sidewalk graphics

Seasonal light exhibits

Mobility Complete Streets Manual
Standards Table

**Definition.** These standards would apply to any placemaking element that has been developed by an Artist or Designer, through final design documentation using a site-specific contextual approach that integrates community input.

**Location.** Generally, a placemaking element can be located in a median within the street, or on the sidewalk (embedded in paving, or freestanding in the parkway zone), or within a traffic circle (see Section 4.4) if it meets the parameters in the following table.

<table>
<thead>
<tr>
<th>Complete Street Type Name</th>
<th>ARTERIAL STREETS</th>
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</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Boulevard I (Major I)</td>
<td>Boulevard II (Major II)</td>
</tr>
<tr>
<td>8 Other Placemaking Elements - Design Parameters</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Height clearances</td>
<td>Placemaking elements that cantilever in whole or part over the sidewalk should have a minimum 8-foot vertical head clearance. Placemaking elements that cantilever in whole or part over the roadway should maintain a minimum 16-foot vertical head clearance.</td>
<td></td>
</tr>
<tr>
<td>Horizontal clearances</td>
<td>Placemaking elements over 36 inches in height should be clear of the 45-foot visibility triangle at intersection corners, and shall not interfere with ADA required path of travel. Elements in the parkway zone should maintain the 18 inches clear zone from the face of curb to any portion below 8 feet in height.</td>
<td></td>
</tr>
<tr>
<td>Maintenance</td>
<td>The mechanism for how placemaking elements will be maintained over time must be identified prior to City approval and installation.</td>
<td></td>
</tr>
</tbody>
</table>
13.2 Parklets, Plazas & Open Street Events

Intent

Consider opportunities for public gathering spaces on City roadways, ranging from temporary installations to more permanent.

Discussion

Parklets

Parklets are an important interim design that can provide necessary public space for pedestrian, bicycle and other non-vehicular uses. Parklets are valuable at locations where narrow or congested sidewalks prevent the full utilization of public space. They can be installed at the request of local businesses and residents to expand seating capacity in a certain area. In return for the approval to construct a parklet, local property owners are often responsible for initial capital and maintenance costs. Parklets provide a unique opportunity to increase non-vehicular public space while also promoting and supporting local businesses.

General Design Practices

Parklets should have a minimum width of 6 feet, or the width of the designed parking lane. Typically a parklet will require 1-2 parallel parking spaces or 3-4 angled parking spaces. It is important to ensure pedestrian safety, and in doing so it is recommended that parklets be buffered using a wheel stop that is 4 feet from the parklet. To avoid any tripping hazards the entry of the parklet should be level with the curb and sidewalk. To accomplish this “Bison Pedestals” or a steel substructure with angled beams may be used. Parklets may be designed in a variety of ways to meet the needs of the local residents. Common design elements include built-in or standalone seating, bike racks, and greenery.
Public Plazas

Public plazas provide an opportunity to turn low-volume streets into a pedestrian destination. Plazas are also useful at locations where pedestrian foot traffic overwhelms the capacity of the sidewalk. Public plazas have the potential to increase pedestrian safety while slowing down street traffic. Plazas can either be maintained through private sponsorship or through city funds.

General Design Practices

While bicycle parking can be installed within the plaza, it is vital that vehicle parking not be allowed within the plaza. It is recommended to design the plaza with a strong cutoff. This may be achieved by using a striping, bollards, or large fixed objects. This design technique is important around the corners of the plaza, where oncoming vehicles may encroach on the plaza. Plazas should be designed with ADA-compliant warning strips around the crosswalks. A variety of street furniture may be used, tailored to local needs.

Open Street Events

Temporary street closures are one technique that municipalities can apply to take advantage of the public right of way during off-peak traffic hours. Street closures can encourage residents to walk, bike, and participate in other physical activities. Street closures can also be a useful tool to highlight local amenities businesses. The timing and duration of a street closure varies depending on the type of event and activity. Street closures are often popular if they are connected to reoccurring or one-time events.

Examples

• Play Street

These are often local streets that are closed for a short duration of time to provide additional play or exercise space.

• Pedestrian Street

This type of street closure can be used to help promote local cultural events.

• Market

In this scenario a street closure can be used to promote a local farmers market.

• Open Streets
CicLAvia is a single-day open streets event that began in 2009. For half a day, several of Los Angeles’ busiest streets close down to vehicular traffic, as pedestrians and bicyclists are free to travel down centerline streets. CicLAvia has grown in both popularity and size, as the event is now held multiple times a year and has expanded to several Los Angeles neighborhoods. The event was modeled after the Ciclovías of Bogota, Colombia.
13.3 Public Stairways

Intent

To acknowledge the importance of stairways in the City and consider new opportunities.

Discussion

Public stairways are an important asset to the City. They increase the mobility of pedestrians trying to maneuver through hillside areas. Historically, they were built during a time when quick connections to trolleys and streetcars were necessary for pedestrians living in communities developed in the 1920’s, such as, Mt. Washington, Silver Lake, and Echo Park. Today, they still increase access for residents getting around their neighborhood and should be considered as part of the menu of options when rethinking the public right of way.
13.4 Bicycle Track for Stairways

Design Summary

Retrofit stairwells for bicycles by adding channels or ramps to the stairs. A channel can be fabricated of stock steel and has one or two sides to guide the bike’s wheels and keep them from straying. Some channels are made of “U” shaped stock or “L” shaped steel angles. The upright of the “L” goes next to the outside and the bike leans against the bicyclist for stability. It is always best to provide a track for bicycles by integrating the concept into the design prior to construction of bicycle tire width. Add grit or grip tape to the steel surface to provide ease of use with rubber bicycle tires.

Discussion

Include in the design of new stairways or retrofit existing structures where bicycles are expected such as transit stations, under and over passes, and bicycle accessible tunnels. Should include the provision of a wheel track in order to accommodate bicycle wheels to allow bicyclists to access the location.

Guidance

- U.S. examples can be found in Denver, Chicago, San Francisco, and Los Angeles.

Recommended Design

Cycling England’s Design Portfolio, Wheeling Ramps.
13.5 Bicycle Rails at Roadway Intersections (Non Standard)

Design Example
Copenhagen

Design Summary
Steel or stainless steel rail placed on urban bicycle paths where the paths intersect with roadways.

Discussion
Bicycle friendly nations with extensive off-street bikeway networks have added to the convenience of bicyclist by adding lean rails for bicyclists who wait for clearance at the intersection.

Guidance
- Copenhagen
Paths
Section 14
14.1 Design of Multi-Purpose Paths (Class I)

A multi-purpose path (Caltrans designation Class I) allows for two-way, off-street bicycle use. If a parallel pedestrian path is not provided, other non-motorized users are legally allowed to use the path in California. 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. Class I facilities can also include amenities such as lighting, signage, and fencing. In California, design of Class I facilities is dictated by the Caltrans Highway Design Manual (HDM).

General Design Practices

Multi-purpose 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. Multi-purpose paths should generally provide directional travel opportunities not provided by existing roadways. 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.

Both the Caltrans (HDM) Highway Design Manual and the AASHTO Guide for the Development of Bicycle Facilities generally recommend against the development of bicycle paths directly adjacent to roadways. Also known as “sidepaths”, these facilities may create a situation where a portion of the bicycle traffic rides against the normal flow of motor vehicle traffic and can result in wrong-way riding when either entering or exiting the path. This can also result in unsafe situations where motorists entering or crossing the roadway at intersections and driveways do not notice bicyclists coming from their right, as they are not expecting traffic from that direction. In addition, stopped cross-street motor vehicle traffic or vehicles exiting side streets or driveways may frequently block paths or pull out unexpectedly. Bicyclists traveling from an unexpected direction may go unnoticed by motorists, especially when sight distances are poor.

Multi-purpose 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.

California Vehicle Code 21208 requires bicyclists to ride along on-road designated bicycle lanes with exceptions but does not require bicyclists to ride on paths. Parallel roadway design should still support bicyclists’ use of the road as provided by law.
Design Standards

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 multi-purpose 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.

**Striping:**

The City of Los Angeles requires a 4-inch dashed yellow centerline stripe with 4-inch solid white edge lines to delineate bi-directional bicycle travel and the shoulder needs 2’ white stripped shoulder for pedestrian use.

**Separation from Roadway:**

Multi-purpose 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 multi-purpose 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 Multi-Purpose Paths</th>
<th>Design Speed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Multi-Purpose Paths with Mopeds Prohibited</td>
<td>25 mph</td>
</tr>
<tr>
<td>Multi-Purpose Paths on Long Downgrades (steeper than 4%, longer than 500 feet)</td>
<td>30 mph</td>
</tr>
</tbody>
</table>

Source: Adapted from Caltrans Highway Design Manual (design speed converted from kph to mph)

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 curve radii is smaller than those shown below must be used on bicycle paths because of right of way, topographical or other considerations, 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.

**CURVE RADIi AND SUPERELEVATION**

<table>
<thead>
<tr>
<th>Design Speed (mph)</th>
<th>Minimum Radius (feet)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2% Superelevation</td>
</tr>
<tr>
<td>25</td>
<td>154</td>
</tr>
<tr>
<td>30</td>
<td>282</td>
</tr>
</tbody>
</table>

Source: Adapted from Caltrans Highway Design Manual (metric units converted to English)

**Stopping Sight Distance:**

To provide bicyclists with an opportunity to see and react to the unexpected, a bicycle path should be designed with adequate stopping sight distances. The distance required to bring a bicycle to a full controlled stop is a function of the bicyclist’s perception and brake reaction time, the initial speed of the bicycle, the coefficient of friction between the tires and the pavement, and the braking ability of the bicycle.

The table below indicates the minimum stopping sight distances for the common design speeds and grades on two-way paths. For two-way bicycle paths, the descending direction, that is, where grade is negative, will control the design. The higher design speed should be used on segments with five percent grade and higher.
### 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>507</td>
</tr>
<tr>
<td>30</td>
<td>246</td>
<td>279</td>
<td>332</td>
<td>440</td>
<td>763</td>
</tr>
</tbody>
</table>

Source: Adapted from Caltrans Highway Design Manual (metric units converted to English)

### Grades:

Multi-purpose paths typically attract less skilled bicyclists, so it is important to avoid steep grades in their design. Bicyclists not physically conditioned will be unable to negotiate long, steep uphill grades. Since novice bicyclists often ride poorly maintained bicycles, long downgrades may also cause problems. For these reasons, bicycle paths with long, steep grades will 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.
14.2 Multi-Purpose Paths in River and Utility Corridors

Design Summary

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.

Discussion

Several utility and waterway corridors in Los Angeles offer excellent path development opportunities. Utility corridors typically include powerline and sewer corridors, while waterway corridors include flood control channels, drainage ditches, rivers, and beaches. Path development along these corridors already exist in Los Angeles (e.g., along the Los Angeles River and Ballona Creek). These corridors offer excellent transportation and recreation opportunities for bicyclists of all ages and skills.

See following page for additional discussion.

Guidance

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
Additional Discussion – Multi-Purpose Path in River & Utility Corridor

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. Gates that can prevent all access to the facility should be present pursuant to the following conditions:

Path Closure:

Public access to the path in flood control channels is prohibited during:

- Flood control channel utility maintenance or other activities.
- Inclement weather or the prediction of storm conditions.
Fencing:

Similar to railroads, public access to flood control channels or canals is undesirable by all parties. Hazardous materials, deep water or swift current, steep, slippery slopes, and debris all constitute risks for public access. 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 feet 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.
14.3 Multi-Purpose Paths in Existing Active Rail Corridor

Design Summary

Path Width:

12’ minimum (8’ paved area + 2’ shoulders on each side + 1’ clearance for signage).

17’ when 5’ parallel pedestrian path is included.

Discussion

Rail-with-trail projects typically consist of paths adjacent to active railroads. Offering the same benefits as Rail-to-trail projects, these facilities have been proposed and developed within active rail corridors throughout the Los Angeles (e.g., the San Fernando Road Bicycle Path and the Expo Light Rail Bicycle Path). 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.

Guidance

- Caltrans Highway Design Manual
- CA MUTCD
- AASHTO
- “Rails-with-trails”: Lessons Learned, FHWA, 2002
- SCRRRA Rail-With-trail Design Guidelines
- Additional Discussion – Bicycle Path in Existing Active Rail Corridor
- Existing Guidance:
- From “Rails-with-Trails”: Lessons Learned, FHWA, 2002”
Additional Discussion – Bicycle Path in River & Utility Corridor

Existing Guidance:

“No national standards or guidelines dictate rail-with-trail facility design. Guidance must be pieced together from standards related to bicycle paths, pedestrian facilities, railroad facilities, and/or roadway crossings of railroad rights-of-way. Bicycle path designers should work closely with railroad operations and maintenance staff to achieve a suitable RWT design. Whenever possible, path development should reflect standards set by adjacent railroads for crossings and other design elements. Ultimately, RWTs must be designed to meet both the operational needs of railroads and the safety of bicycle path users. The challenge is to find ways of accommodating both types of uses without compromising safety or function.”

Design Considerations for Rails with Trails:

Setback:

The setback is the distance from the centerline of the railroad to the edge of the bicycle path facility. Each railroad generally has its own policies on bicycle paths adjacent to active rail lines. For example, the BNSF’s policy on “Trails with Rails” states,

“Where train speeds are greater than 90 mph, trails are not acceptable. No trail will be constructed within 100 ft of any mainline track where train speeds are between 70 mph and (90 mph. Trails may be constructed between 50 ft and 100 ft where mainline train speed is 50 mph to 70 mph. Trails may be
constructed 50 ft from centerline of track where train speeds are 25 mph to 50 mph, and 30 ft from any branchline track with speeds of 25 mph or less. No trails less than 30 ft from centerline of track for any reason.“

The Southern California Regional Rail Authority (SCRRA) has published guidelines for rail-with-trail projects and identifies its minimum recommended setback requirements:

- 45 feet for main line track where train speeds exceed 90mph
- 40 feet for main line track where train speeds is between 90 and 78 mph
- 35 feet where main line speed is between 78 and 60 mph
- 30 feet where main line speeds is between 59 and 40 mph; and
- 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 five (54) feet within 150 feet of at-grade crossings and six (6) feet in other areas.

Full SCRRA guidelines can be found at http://www.metrolinktrains.com/documents/Public_Projects/Rail_with_Trail_Guidelines_021204.pdf
14.4 Multi-Purpose Paths Constructed within New Transit Corridor

**Design Summary**

Path Width:

12’ minimum; 17’ with parallel 5’ pedestrian path; 1’ for signage clearance.

Pavement Markings: Standard pavement markings should be used per the California MUTCD. In order to reinforce the need for separation of bicyclists and pedestrians, graphic markings may be used (as shown below).

**Preferred Design**
Stripping: 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.

Discussion

High profile bikeways such as the Orange Line Bikeway require special design to meet high use by pedestrians and bicyclists allowing for separation and other amenities.

Guidance

• California MUTCD

• Caltrans Highway Design Manual

• AASHTO Guide for the Development of Bicycle Facilities
14.5 Coastal Path

Design Summary

Path Width: Bicycle Path: 12’ minimum; 17’ with parallel 5’ pedestrian path, with 1’ clearance for signage.

Pavement Markings: Standard pavement markings should be used per the California 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.

Discussion

Coastal Paths attract many types of pathway users and conveyances. Bicyclists, pedestrians, rollerbladers, strollers, and pedicabs typically compete for space. To provide an adequate and pleasant facility, adequate widths and separation are needed to maintain a good 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. For example, the bicycle path should not be placed adjacent to large numbers of destinations. Site analysis of each project is required to determine expected pedestrian behavior.

Guidance

- California MUTCD
- Caltrans Highway Design Manual
- AASHTO Guide for the Development of Bicycle Facilities
Preferred Design
with separation

Preferred Design
no separation
14.6 Grade Separated Undercrossing

Design Summary

Width: 14’ minimum to allow for access by maintenance vehicles if necessary.

Height: 10’ minimum.

Pavement Markings: Standard pavement markings should be used per the California 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%.

Discussion

See following page for discussion.

Design Example

Guidance

• CA MUTCD
• Caltrans Highway Design Manual
• AASHTO Guide for the Development of Bicycle Facilities
Additional Discussion – Grade Separated Undercrossing

**General Notes on Grade-Separated Crossings:**

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. For instance, an overcrossing or undercrossing 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. Overcrossings and undercrossings also respond to bicyclist needs where existing at-grade crossing opportunities exist but are undesirable for any number of reasons. In some cases, high vehicle speeds and heavy traffic volumes might warrant a grade-separated crossing. 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.

**Undercrossing Use:**

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.
Advantages of Grade Separated Undercrossing:

- Improves bicycle safety while reducing delay for all users.
- Eliminates barriers to bicyclists.
- Undercrossings require 10 feet of overhead clearance from the path surface. Undercrossings often require less ramping and elevation change for the user versus an overcrossing, particularly for railroad crossings.

Disadvantages/potential hazards:

- If the crossing is not convenient or does not serve a direct connection, it may not be well utilized.
- Potential issues with vandalism, 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.
- High cost.
14.7 Grade Separated Overcrossing

Design Summary

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.

Discussion

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.

See following page for additional discussion.

Guidance

- Caltrans Highway Design Manual
- Caltrans Bridge Design Specifications
- California MUTCD
- AASHTO Guide for the Development of Bicycle Facilities
- AASHTO Guide Specifications for Design of Pedestrian Bridges
Additional Discussion – Grade Separated Overcrossing

**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.

**Overcrossing Use:**

- Overcrossings should be considered when high volumes of bicycles are expected along a corridor.
- 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.

**Advantages of Grade Separated Overcrossing:**

- Improves bicycle safety while reducing delay for all users.
-Eliminates barriers to bicyclists.
Disadvantages / Potential Hazards:

- If the crossing is not convenient or does not serve a direct connection, it may not be well utilized.

- 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.

- Potential issues with vandalism, maintenance.

- High cost.
14.8 Fencing

Design Summary

Height: 5’ minimum.

Discussion

Fencing can serve multiple purposes along bicycle path facilities, including access control, visual screening, channeling of path users, and safety.

See right column and following page for discussion.

Guidance

• Caltrans Highway Design Manual
• AASHTO Guide for the Development of Bicycle Facilities

General Notes on Fencing:

Some factors to consider when deciding on fencing necessity and styles include:

Cost: Fencing and other barriers, depending on the type of materials used and the length, can be costly, so options should be considered carefully.

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.

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.

Fence types: The following page illustrates common types of fencing typically used with bicycle paths.
The City of Los Angeles standard steel pipe fence is a sturdy low maintenance option for bicycle path fencing.

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.

Often used as vandal-resistant fencing, and is used in locations that have a history of trespassing. It is difficult to cut and difficult to scale. Because of its cost and visual impact, it is typically used at specific locations rather than along an entire corridor.

Post and cable fencing is an inexpensive option which serves primarily to demarcate right-of-way boundary but can be cut by vandals. The fence does not provide any screening or anti-trespassing features.
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.

Sometimes referred to as Israeli-style fencing for its use in Israel to protect kibbutz, 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.

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.
14.9 Equestrian Trails

Intent

- To provide design guidelines in the design of equine trails.
- 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
- Investigate future opportunities to create a network of equine trails

Discussion

Equine trails are an asset to communities and residents because they provide for another form of recreation. While walking and bicycling are a viable means of transportation, horseback riding also provides a similar, yet different experience. Horseback riding on designated equine trails allows individuals to enjoy a relaxing ride through some of the City’s scenic, natural sites. An integrated network of trails not only promotes more horseback riding, but it also provides a safe means for riders to experience different parts of the City in a recreational fashion.
Design Guidelines

The design of horsekeeping trails should meet the following:

G1 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.

G2 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.

G3 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.

G4 Low walls or fences with railings added for more height are acceptable. Bollards, barrier posts or rail tie “stopovers” at forest/mountain trail head, 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.

G5 Preferred fence materials include “woodcrete” or other sturdy material that gives the appearance of wood-like finish.

G6 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.
G7 Trails adjacent to or within 6 feet of ditches or steep slopes that rise more than one foot in 3 feet and have drop off of over 2.5 feet should begin at least 8 feet before and extend 8 feet beyond the vertical hazard. A minimum 3 foot shoulder from the rail edge to the trail should be provided with an 8-inch maximum spacing between rails.

G8 Trail treads should be a fine aggregate material such as decomposed granite or other non-slip, porous surface.

G9 Locate trail easements/improvements that are adjacent to commercial and industrial sites away from vehicular traffic, such as along the rear of the site, for safety.

G10 Equine parking or hitching areas separate from vehicle parking should be a minimum of 20x24 feet,

G11 The hitching rail(s) should accommodate small riding groups, be of durable material, finished with rounded edges and no overhanging ends, to avoid injuries, with welded loops or braces in the corners to confine lead ropes and prevent slippage. Length should be a minimum of 4 feet with a height of 42 inches.

G12 Solid metal hitching loops may be set into brick or concrete wall surrounding vehicle parking lot to accommodate equestrian parking in existing or new lots. A soft surface is preferable, with a minimum 24-foot distance to the nearest vehicle parking space. See Design Guideline 4-4.

G13 Install a second signal actuator push button, equine crossing signal, 5 to 6 feet above the ground and set the post 6.5 feet from the road edge so that the animal’s head does not encroach into the roadway. The equestrian waiting area at the signalized crossing should be 25 feet x 15 feet.
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15.1 Pedestrian Wayfinding

Intent

Provide pedestrians with clear language and graphic information to enhance their mobility.

Discussion

Wayfinding programs can be used to provide pedestrian-scale signage to enhance pedestrian mobility throughout the city. Signs can be used to convey spatial information through the use of maps and written directions. Wayfinding signs can be used to convey popular pedestrian routes, local destinations, and difficult to navigate areas of specific neighborhoods. Wayfinding signs can also be used to deliver multi-modal information, such as the locations of nearby Metro stations. It is important that the information on the signs be clear, concise, and consistent.
15.2 Bikeway Signage

Bikeways have unique signage requirements and are included in chapter 9 of the California Manual of Uniform Traffic Control Devices. This chapter summarizes the signs approved for use on all types of bikeway facilities in Los Angeles. It is recommended that the California Manual of Uniform Traffic Control Devices (CA MUTCD) be consulted during the design of any facility.

The CA MUTCD provides the following standard and guidance for the application and placement of signs:

**Standard:**

**Bicycle signs shall be standard in shape,** legend, and color.

All signs shall be retroreflectorized for use on bikeways, including shared-use paths and bicycle lane facilities.

Where signs serve bicyclists as well as other road users, vertical mounting height and lateral placement shall be as specified in Part 2 (Signs).

On shared-use paths, lateral sign clearance shall be a minimum of 3 ft and a maximum of 6 ft from the near edge of the sign to the near edge of the path.

Mounting height for ground-mounted signs on shared-use paths shall be a minimum of 4 ft and a maximum of 5 ft, measured from the bottom edge of the sign to the near edge of the path surface (see Figure 9B-1).

**Figure 5 12**

**Signage Placement**

![Signage Placement Diagram](image)
When overhead signs are used on shared-use paths, the clearance from the bottom edge of the sign to the path surface directly under the sign shall be a minimum of 8 ft.

**Guidance:**

Signs for the exclusive use of bicyclists should be located so that other road users are not confused by them.

The clearance for overhead signs on shared-use paths should be adjusted when appropriate to accommodate typical maintenance vehicles.
## Bikeway Signage

<table>
<thead>
<tr>
<th>Description</th>
<th>Facility Type</th>
<th>CA MUTCD CODE</th>
<th>Graphic</th>
</tr>
</thead>
<tbody>
<tr>
<td>STOP signs shall be installed on shared-use paths at points where bicyclists are required to stop.</td>
<td>Bicycle Path Class I</td>
<td>R1-1</td>
<td><img src="image" alt="Stop Sign" /></td>
</tr>
<tr>
<td>YIELD signs shall be installed on shared-use paths at points where bicyclists have an adequate view of conflicting traffic as they approach the sign, and where bicyclists are required to yield the right-of-way to that conflicting traffic.</td>
<td>Bicycle Path Class I</td>
<td>R1-2</td>
<td><img src="image" alt="Yield Sign" /></td>
</tr>
<tr>
<td>Where motor vehicles entering an exclusive right-turn lane must weave across bicycle traffic in bicycle lanes, the BEGIN RIGHT TURN LANE YIELD TO BIKES sign may be used to inform both the motorist and the bicyclist of this weaving maneuver.</td>
<td>Bicycle Lane Class II</td>
<td>R4-4</td>
<td><img src="image" alt="Begin Right Turn Lane Yield to Bikes Sign" /></td>
</tr>
<tr>
<td>The NO MOTOR VEHICLES sign may be installed at the entrance to a shared-use path.</td>
<td>Bicycle Path Class I</td>
<td>R5-3</td>
<td><img src="image" alt="No Motor Vehicles Sign" /></td>
</tr>
<tr>
<td>The Bicycle WRONG WAY sign and RIDE WITH TRAFFIC plaque may be placed facing wrong-way bicycle traffic, such as on the left side of a roadway.</td>
<td>Bicycle Lane Class II</td>
<td>R5-1b R9-3c</td>
<td><img src="image" alt="Bicycle Wrong Way Sign" /> <img src="image" alt="Ride With Traffic Plaque" /></td>
</tr>
<tr>
<td>This sign and plaque may be mounted back-to-back with other signs to minimize visibility to other traffic.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>If the installation of signs is necessary to restrict parking, standing, or stopping in a bicycle lane.</td>
<td>Bicycle Lane Class II</td>
<td>R26</td>
<td><img src="image" alt="No Parking Any Time Sign" /> <img src="image" alt="No Parking Any Time Sign" /></td>
</tr>
<tr>
<td>Where pedestrians are prohibited, the No Pedestrians sign may be installed at the entrance to the facility.</td>
<td>Bicycle Path Class I</td>
<td>R9-3a</td>
<td><img src="image" alt="No Pedestrians Sign" /></td>
</tr>
</tbody>
</table>
The **R9-5** sign may be used where the crossing of a street by bicyclists is controlled by pedestrian signal indications.

The **R9-6** sign may be used where a bicyclist is required to cross or share a facility used by pedestrians and is required to yield to the pedestrians.

The **Shared-Use Path Restriction (R9-7)** sign may be installed on facilities that are to be shared by pedestrians and bicyclists. The symbols may be switched as appropriate.

Where it is not intended for bicyclists to be controlled by pedestrian signal indications, the **R10-3** sign may be used.
<table>
<thead>
<tr>
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</tr>
</thead>
<tbody>
<tr>
<td>The Bicycle Signal Actuation sign may be installed at signalized intersections where markings are used to indicate the location where a bicyclist is to be positioned to actuate the signal.</td>
<td>Signal</td>
<td>R10-22</td>
<td><img src="image" alt="Signal Graphic" /></td>
</tr>
<tr>
<td>The Bicycle Path Exclusion sign may be used to identify a bicycle path and prohibit motor vehicles and motorized bicycles from entering the bicycle path. If motorized bicycles are permitted, the &quot;Motorized Bicycles&quot; portion may be replaced with &quot;Motorized Bicycles Permitted&quot;.</td>
<td>Bicycle Path Class I</td>
<td>R44A</td>
<td><img src="image" alt="Path Exclusion Graphic" /></td>
</tr>
<tr>
<td>Where it is not intended for bicyclists to be controlled by pedestrian signal indications, the BICYCLE PUSH BUTTON FOR GREEN LIGHT sign may be used.</td>
<td>Signal</td>
<td>R62C</td>
<td><img src="image" alt="Push Button Graphic" /></td>
</tr>
<tr>
<td>The BICYCLE LANE sign shall be placed at the beginning of each designated Bicycle Lane and along each bicycle lane at all major changes in direction.</td>
<td>Bicycle Lane Class II</td>
<td>R81 R81A R81C</td>
<td><img src="image" alt="Bicycle Lane Graphic" /></td>
</tr>
</tbody>
</table>
### Section 15.2 Bikeway Signage

<table>
<thead>
<tr>
<th>Description</th>
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<th>CA MUTCD CODE</th>
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<tbody>
<tr>
<td>If used, Bicycle Route Guide signs should be placed at the beginning and end of bicycle routes and repeated at regular intervals so that bicyclists entering from side streets will have an opportunity to know that they are on a bicycle route. Similar guide signing should be used for shared roadways with intermediate signs placed for bicyclist guidance. The M1-8 sign may be used on numbered routes.</td>
<td>Bicycle Route Class III</td>
<td>D11-1 M4-11 M4-12 M4-13 M1-8</td>
<td><img src="image1" alt="Bicycle Route Guide Signs" /></td>
</tr>
<tr>
<td>If used, Bicycle Route Guide (D11-1) signs should be provided at decision points along designated bicycle routes, including supplemental signs to inform bicyclists of bicycle route direction changes and confirmation signs for route direction, distance, and destination. Option: The M4-11 through M4-13 supplemental plaques may be mounted above the appropriate Bicycle Route Guide signs, Bicycle Route signs, or Interstate Bicycle Route signs. Destination (D1-1b and D1-1c) signs may be mounted below Bicycle Route Guide signs, Bicycle Route signs, or Interstate Bicycle Route signs to furnish additional information, such as directional changes in the route, or intermittent distance and destination information. Guidance: If used, the appropriate arrow (M7-1 through M7-7) sign (see Figure 9B-4) should be placed below the Bicycle Route Guide sign.</td>
<td></td>
<td>M7-1 M7-2 M7-3 M7-4 M7-5 M7-6 M7-7 D1-1b (R) D1-1b (L) D1-1 (c)</td>
<td><img src="image2" alt="Directional Signs" /></td>
</tr>
<tr>
<td>The BICYCLE PARKING AREA (D4-3) sign or BICYCLE PARKING (G93C(CA)) sign may be installed where it is desirable to show the direction to a designated bicycle parking area. The arrow may be reversed as appropriate.</td>
<td>Bicycle Parking</td>
<td>D4-3 G93C (CA)</td>
<td><img src="image3" alt="Parking Signs" /></td>
</tr>
<tr>
<td>Directional sign for Los Angeles River bikeway access. This sign may be used on all City of Los Angeles Streets that permit bicycle access to the Los Angeles River Bicycle Path.</td>
<td>Bicycle Path Class I</td>
<td>S17 (CA) D11-1 M7-1</td>
<td><img src="image4" alt="Los Angeles River Bike Route Sign" /></td>
</tr>
</tbody>
</table>
The Bicycle Warning sign alerts the road user to unexpected entries into the roadway by bicyclists, and other crossing activities that might cause conflicts. These conflicts might be relatively confined, or might occur randomly over a segment of roadway. This sign may use supplemental signs below the sign.

<table>
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<tbody>
<tr>
<td>Other bicycle warning signs such as SLIPPERY WHEN WET may be installed on bicycle facilities to warn bicyclists of conditions not readily apparent.</td>
<td>All Bikeways</td>
<td>W8-10 W8-10p</td>
<td></td>
</tr>
<tr>
<td>Other bicycle warning signs such as Hill may be installed on bicycle facilities to warn bicyclists of conditions not readily apparent.</td>
<td>All Bikeways</td>
<td>W7-5</td>
<td></td>
</tr>
<tr>
<td>Other bicycle warning signs such as BIKEWAY NARROWS may be installed on bicycle facilities to warn bicyclists of conditions not readily apparent.</td>
<td>Bicycle Path Class I</td>
<td>W5-4a</td>
<td></td>
</tr>
<tr>
<td>Other bicycle warning signs such as NARROW BRIDGE may be installed on bicycle facilities to warn bicyclists of conditions not readily apparent.</td>
<td>All Bikeways</td>
<td>W5-2</td>
<td></td>
</tr>
<tr>
<td>May be used to warn bicycle path users of pedestrian activity.</td>
<td>Bicycle Path Class I</td>
<td>W11-2</td>
<td></td>
</tr>
</tbody>
</table>
### Section 15.2 Bikeway Signage

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<tbody>
<tr>
<td>May be used to warn bikeway users of a traffic signal ahead.</td>
<td>All Bikeways</td>
<td>W3-3</td>
<td><img src="image" alt="Traffic Signal Sign" /></td>
</tr>
<tr>
<td>Other bicycle warning signs such as BUMP may be installed on bicycle</td>
<td>All Bikeways</td>
<td>W8-1</td>
<td><img src="image" alt="Bump Sign" /></td>
</tr>
<tr>
<td>facilities to warn bicyclists of conditions not readily apparent.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other bicycle warning signs such as DIP may be installed on bicycle</td>
<td>All Bikeways</td>
<td>W8-2</td>
<td><img src="image" alt="Dip Sign" /></td>
</tr>
<tr>
<td>facilities to warn bicyclists of conditions not readily apparent.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>May warn bicycle path users of a playground ahead that may be adjacent to</td>
<td>Bicycle Path</td>
<td>W15-1</td>
<td><img src="image" alt="Playground Sign" /></td>
</tr>
<tr>
<td>the path.</td>
<td>Class I</td>
<td></td>
<td></td>
</tr>
<tr>
<td>In situations where there is a need to warn motorists to watch for</td>
<td>Bicycle Route</td>
<td>W16-1</td>
<td><img src="image" alt="Share the Road Sign" /></td>
</tr>
<tr>
<td>bicyclists traveling along the highway, the SHARE THE ROAD plaque may be</td>
<td>Class III</td>
<td></td>
<td></td>
</tr>
<tr>
<td>used in conjunction with the W11-1 sign.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Description</td>
<td>Facility Type</td>
<td>CA MUTCD CODE</td>
<td>Graphic</td>
</tr>
<tr>
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</tr>
<tr>
<td>The PEDESTRIAN / BICYCLE DETOUR (M4-9a) should be used where a pedestrian/bicycle detour route has been established because of the closing of a pedestrian/bicycle facility to through traffic. Standard: If used, the Pedestrian/Bicycle Detour sign shall have an arrow pointing in the appropriate direction.</td>
<td>Bicycle Path Class I</td>
<td>M4-9a</td>
<td><img src="image1.png" alt="Image" /></td>
</tr>
<tr>
<td>The BICYCLE DETOUR (M4-9c) may be used where a pedestrian or bicycle detour route (not both) has been established because of the closing of a bicycle facility to through traffic.</td>
<td>Bicycle Lane Class II; or Bicycle Route Class III</td>
<td>M4-9c</td>
<td><img src="image2.png" alt="Image" /></td>
</tr>
<tr>
<td>Several standard signs [W21-5, W21-5a, W21-5b, C24 (CA), C30A (CA), C31A (CA)] may be used to warn bicyclists of changes in conditions regarding the roadway shoulder.</td>
<td>Bicycle Route Class III or other Shared Roadway</td>
<td>W21-5a, C24 (CA)</td>
<td><img src="image3.png" alt="Image" /></td>
</tr>
<tr>
<td>Description</td>
<td>Facility Type</td>
<td>CA MUTCD CODE</td>
<td>Graphic</td>
</tr>
<tr>
<td>---------------------------------------------------------------------------</td>
<td>------------------------------------------------------------------------------</td>
<td>--------------------------</td>
<td>----------------------------------------------</td>
</tr>
<tr>
<td>An alternative to &quot;Share the Road,&quot; this regulatory sign instructs vehicles that bicyclists are permitted full use of the lane travel lane when necessary.</td>
<td>Bicycle Route Class III or other Shared Roadway</td>
<td>R4-11 (under consideration)</td>
<td><img src="image" alt="MAY USE FULL LANE" /></td>
</tr>
<tr>
<td>Another alternative to &quot;Share the Road,&quot; this warning sign instructs vehicles that bicyclists are to be expected in the lane.</td>
<td>Bicycle Route Class III or other Shared Roadway</td>
<td>N/A</td>
<td><img src="image" alt="WATCH FOR USING LANE" /></td>
</tr>
<tr>
<td>This alternative warning sign has been used in Los Angeles.</td>
<td>Bicycle Route Class III or other Shared Roadway</td>
<td>N/A</td>
<td><img src="image" alt="WATCH FOR BICYCLESTERS" /></td>
</tr>
<tr>
<td>Description</td>
<td>Facility Type</td>
<td>CA MUTCD CODE</td>
<td>Graphic</td>
</tr>
<tr>
<td>-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
<td>----------------------</td>
<td>---------------</td>
<td>---------</td>
</tr>
<tr>
<td>This sign may be used where bicycle lanes are interrupted by a double right turn lane, and is currently in use in the City of Los Angeles.</td>
<td>Bicycle Lane Class II</td>
<td>N/A</td>
<td><img src="image1.png" alt="Sign" /></td>
</tr>
<tr>
<td>This sign may be used with a Shared Bicycle / Right Turn Lane.</td>
<td>Bicycle Lane Class II</td>
<td>N/A</td>
<td><img src="image2.png" alt="Sign" /></td>
</tr>
<tr>
<td>This sign instructs motorists to yield to bicyclists in a bicycle lane. The colored lane alerts motorists to the potential conflict area where motorists may merge across a bicycle lane.</td>
<td>Bicycle Lane Class II</td>
<td>N/A</td>
<td><img src="image3.png" alt="Sign" /></td>
</tr>
</tbody>
</table>
### Section 15.2 Bikeway Signage

<table>
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<tr>
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<tbody>
<tr>
<td>Mileage wayfinding signage specifically targeting bicyclists can be extremely helpful, helping people anticipate both distance and direction to their next destination.</td>
<td>Wayfinding Mileage Sign</td>
<td>D1-3c</td>
<td><img src="image" alt="Wayfinding Mileage Sign" /></td>
</tr>
<tr>
<td>Instructional signage similar to the image at right may be used in conjunction with Bicycle Signals where movements from a bicycle path onto a roadway intersection are made during an exclusive phase.</td>
<td>Intersections Bicycle Path Class I</td>
<td>N/A</td>
<td><img src="image" alt="Instructional signage" /></td>
</tr>
<tr>
<td>Directional Sign for River Access — these signs are used where bikeway access is currently non-existent.*</td>
<td>Bicycle Path Class I</td>
<td>N/A</td>
<td><img src="image" alt="Directional Sign for River Access" /></td>
</tr>
<tr>
<td>Park Entry Signs — These signs provide directional wayfinding to parks or other bikeway facilities connecting to the Los Angeles River bikeway.*</td>
<td>Bicycle Path Class I</td>
<td>N/A</td>
<td><img src="image" alt="Park Entry Signs" /></td>
</tr>
<tr>
<td>Los Angeles River Bikeway Mileage Signs — These signs are posted throughout the Los Angeles River bikeway and alert users of distances to popular destinations.*</td>
<td>Bicycle Path Class I</td>
<td>N/A</td>
<td><img src="image" alt="Los Angeles River Bikeway Mileage Signs" /></td>
</tr>
</tbody>
</table>

* Additional information and images related to the descriptions can be found in the text and graphics associated with the table entries. The images depict various signage types and their corresponding CA MUTCD codes. 
## 15.3 Temporary Traffic Control

<table>
<thead>
<tr>
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<th>CA MUTCD Code</th>
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<tbody>
<tr>
<td>The PEDESTRIAN / BICYCLE DETOUR (M4-9a) should be used where a pedestrian/bicycle detour route has been established because of the closing of a pedestrian/bicycle facility to through traffic. Standard: If used, the Pedestrian/Bicycle Detour sign shall have an arrow pointing in the appropriate direction.</td>
<td>Bicycle Path Class I</td>
<td>M4-9a</td>
<td><img src="image1" alt="DETOUR" /></td>
</tr>
<tr>
<td>The BICYCLE DETOUR (M4-9c) may be used where a pedestrian or bicycle detour route (not both) has been established because of the closing of a bicycle facility to through traffic.</td>
<td>Bicycle Lane Class II; or Bicycle Route Class III</td>
<td>M4-9c</td>
<td><img src="image2" alt="DETOUR" /></td>
</tr>
<tr>
<td>Several standard signs [W21-5, W21-5a, W21-5b, C24 (CA), C30A (CA), C31A (CA)] may be used to warn bicyclists of changes in conditions regarding the roadway shoulder.</td>
<td>Bicycle Route Class III or other Shared Roadway</td>
<td>W21-5a / C24 (CA)</td>
<td><img src="image3" alt="RIGHT SHOULDER CLOSED" /></td>
</tr>
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General Bicycle Considerations in Temporary Traffic Control Zones (from CA MUTCD Section 6D.101)

Support:

There are several considerations in planning for bicyclists in Temporary Traffic Control zones on highways and streets:

- A travel route that replicates the most desirable characteristics of a wide paved shoulder or bikeway through or around the traffic control zone is desirable for bicyclists.

- If the traffic control zone interrupts the continuity of an existing bikeway system, signs directing bicyclists through or around the zone and back to the bikeway is desirable.

- Unless a separate bicycle path through or around the traffic control zone is provided, adequate roadway lane width to allow bicyclists and motor vehicles to travel side by side through or around the zone is desirable.

- Bicyclists should not be led into direct conflicts with mainline traffic, work site vehicles, or equipment moving through or around the traffic control zone.

Work Affecting Bicycle Facilities (from CA MUTCD Section 6G.05)

Support:

It is not uncommon, particularly in urban areas, that road work and the associated TTC will affect existing pedestrian or bicycle facilities. It is essential that the needs of all road users, including pedestrians with disabilities, are considered in TTC zones.

In addition to specific provisions identified in Sections 6G.06, 6G.07, 6G.08, 6G.10, 6G.11, 6G.12, and 6G.13, there are a number of provisions that might be applicable for all of the types of activities identified in this Chapter.

Guidance:

Where pedestrian or bicycle usage is high, the typical applications should be modified by giving particular attention to the provisions set forth in Chapters 6D and 6G, Section 6F.68, and in other Sections of Part 6 related to accessibility and detectability provisions in TTC zones.

Bicyclists and pedestrians should not be exposed to unprotected excavations, open utility access, overhanging equipment, or other such conditions.
Except for short duration and mobile operations, when a highway shoulder is occupied, a SHOULDER WORK sign should be placed in advance of the activity area. When work is performed on a paved shoulder 8 ft or more in width, channelizing devices should be placed on a taper having a length that conforms to the requirements of a shoulder taper.

**Work Within the Traveled Way of Urban Streets (from CA MUTCD Section 6G.11)**

**Support:**

In urban TTC zones, decisions are needed on how to control vehicular traffic, such as how many lanes are required, whether any turns need to be prohibited at intersections, and how to maintain access to business, industrial, and residential areas.

**Standard:**

If the TTC zone affects the movement of bicyclists, adequate access to the roadway or shared-use paths shall be provided.

**Guidance:**

If a designated Bicycle Route is closed because of the work being done, a signed alternate route should be provided. Bicyclists should not be directed onto a sidewalk used by pedestrians.
A. Adopting Non-Standard Treatments

Standard facility treatments do not always provide enough options when retrofitting the existing built environment. Narrow rights-of-way, off angled intersections, limited opportunities, and unique roadway geometry may warrant the use of context sensitive, non-standard treatments. This chapter discusses unique treatments and signage that are gaining acceptance across the nation.

Non-standard treatments are not contained within the standards set forth by the California MUTCD or Caltrans HDM. Any application of these treatments should follow the processes outlined on the following pages through the California Traffic Control Devices Committee (CTCDC) and the Federal Highway Administration (FHWA) for pilot project experimentation. Installations of non-standard treatments without going through CTCDC or FHWA process could result in additional liability for the City of Los Angeles. It is not recommended to proceed on a non-standard project without conducting an official experiment through the CTCDC and FHWA.

The following is a summary of the FHWA experimentation procedure:

“All requests for experimentation should originate with the State/ local highway agency or toll operator responsible for managing the roadway or controlled setting where experiment will take place. That organization forwards the request to the FHWA - with a courtesy copy to the FHWA Division Office. The FHWA must approve the experiment before it begins. Requests may also be forwarded directly to the FHWA Division Office, and the Division Office can submit the request to the FHWA Headquarters Office. All requests must include:

1. A statement of the nature of the problem, including data that justifies the need for a new device or application.

2. Describe the proposed change, how it was developed, how it deviates from the current MUTCD.

3. Any illustration(s) that enhance understanding of the device or its use.

4. Supporting data that explains how the experimental device was developed, if it has been tried, the adequacy of its performance, and the process by which the device was chosen or applied.
5. A legally binding statement certifying that the concept of the traffic control device is not protected by a patent or copyright (see MUTCD Section IA.10 for additional details.)

6. The proposed time period and location(s) of the experiment.

7. A detailed research or evaluation plan providing for close monitoring of the experimentation, especially in the early stages of field

Example of Process for Requesting and Conducting Caltrans Experimentations for New Traffic Control Devices in California
implementation. The evaluation plan should include before and after studies as well as quantitative data enabling a scientifically-sound evaluation of the performance of the device.

8. An agreement to restore the experimental site to a condition that complies with the provisions of the MUTCD within 3 months following completion of the experiment. The agreement must also provide that the sponsoring agency will terminate the experiment at any time if it determines that the experiment directly or indirectly causes significant safety hazards. If the experiment demonstrates an improvement, the device or application may remain in place as a request is made to update the MUTCD and an official rulemaking action occurs.

9. An agreement to provide semiannual progress reports for the duration of the experimentation and to provide a copy of the final results to the Office of Transportation Operations (HOTO) within three months of the conclusion of the experiment. HOTO may terminate approval of the experimentation if these reports are not provided on schedule.

Example of Process for Requesting and Conducting Caltrans Experimentations for New Traffic Control Devices in California
B. Terminology

Definitions

City departments and bureaus have different definitions of elements within the street right-of-way. The following are definitions used in this manual. 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.

Border. The term used by BOE for that portion of the ROW commonly known as “sidewalk.”

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. Also known as a bulb-out, a curb extension extends the curb line and sidewalk out into the parking lane, which reduces the effective street width and increase sidewalk area for pedestrians.

Curb radius. Also referred to by DOT and BOE as curb return.

Functional Classification. Identifies only the street’s function relative to vehicles (see Complete Street Type for a definition that address all modes).

Green Streets. Streets that incorporate sustainable elements including stormwater infiltration, 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 manual, except to reference current BOE/DOT Functional Arterial Street Classifications.

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 primarily for the parking of vehicles.

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

Parkway Zone. The portion of the Sidewalk (Border) between the face of curb and the Walkway Zone, 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.

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. The portion of the ROW between the face of curb and property line. (Not as defined by BOE “the portion of the roadway primarily for the use of pedestrians.”)

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.

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

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.

Walkway. The paved surface of the sidewalk located in the Walkway Zone.

Walkway Zone. The portion of the Sidewalk (“Border”) used primarily for walking and, where there are no bicycle lanes, for bicycling.
Acronyms

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

**ADT.** Average Daily Traffic.

**BOE.** Bureau of Engineering in the Department of Public Works.

**BSL.** Bureau of Street Lighting in the Department of Public Works.

**BSS.** Bureau of Street Services in the Department of Public Works.

**DCP.** Department of City Planning.

**DPW.** Department of Public Works.

**LADOT.** Department of Transportation.

**LADOT MPP.** The Department of Transportation’s Manual of Policies and Procedures.

**PAR.** Pedestrian Access Route.

**ROW.** Right of way area between property lines.

**UFD.** Urban Forestry Division of the Bureau of Street Services.
Terminology Illustrated

The basic segments of a typical street cross section are shown below the illustration. Elements that occur within the right-of-way are numbered.

Figure XVI-1
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Walkway Zone

1. Raised landscaped median with left-turn lane at intersection
2. Convenience strip
3. Street trees and street lights

Walkway

4. Curb extension
5. Directional access ramps
6. Marked crosswalk - ladder striping typically used by LADOT is shown
Sources