



SAN JOSE COMPLETE STREETS DESIGN STANDARDS & GUIDELINES



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May 2018





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9 AM - 6 PM

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TRANSPORTATION

SAN JOSE MUSEUM OF ART
CARTER MUSEUM

NETSQUITE

SAN JOSE MUSEUM OF ART

SAN JOSE COMPLETE STREETS DESIGN STANDARDS & GUIDELINES

May 2018

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CITY OF SAN JOSE

Department of Transportation

Jim Ortbal, Director

John Ristow, Deputy Director

Laura Wells, Deputy Director

Zahi Khattab, Principal Engineer

Zahir Gulzadah, Division Manager

Lily Lim-Tsao, Division Manager

Jessica Zenk, Division Manager

Colin Heyne, Public Information Manager

Jim Bittner, Senior Engineer

Alisar Aoun, Senior Engineer

Ramses Madou, Senior Transportation Specialist

Devin Gianchandani, Senior Transportation Specialist

Eric Eidlin, Senior Transportation Specialist

Thomas Eddy, Senior Engineering Technician

Doug Moody, Associate Engineer

Florin Lapustea, Associate Engineer

Shu Su, Associate Engineer

Stacey Lu, Associate Engineer

John Brazil, Associate Transportation Specialist

Ryan Smith, Transportation Specialist

Peter Rice, Graduate Intern

DOCUMENT REVIEWERS

San José Department of Transportation

San José Development Services/Public Works

San José Environmental Services Department

San José Fire Department

Valley Transportation Authority

SPUR San Jose

CONSULTANT TEAM

Fehr & Peers

Matthew Ridgway

Matt Haynes

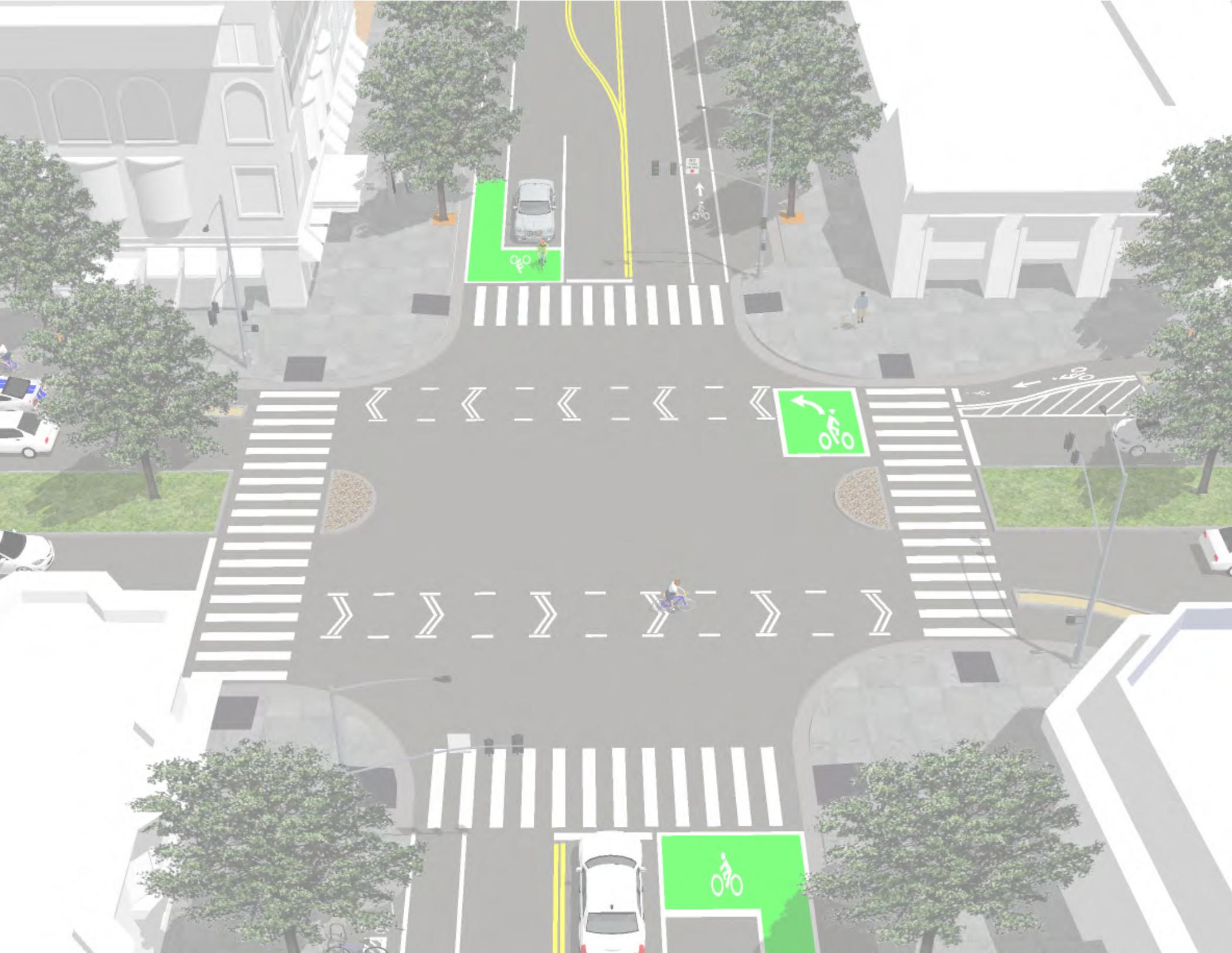
Mollie Pelon

Community Design+Architecture

Phil Erickson

Kevin Saavedra

Zach Dinh



I. VISION

These *Complete Streets Design Standards & Guidelines* have been developed as a comprehensive set of street design standards and guidelines to guide how the City of San José builds and retrofits streets.

In addition to designing complete streets through the use of these standards and guidelines, in 2014 the City of San José joined a coalition of other city transportation departments in the United States as a NACTO (National Association of City Transportation Officials) member city. NACTO is a national leader in promoting safe, multimodal street design to build cities as places for people, with safe, sustainable, accessible and equitable transportation choices that support a strong economy and vibrant quality of life.

These standards and guidelines are intended for use by a variety of audiences, including City staff, staff from other agencies, consultants, designers and residents. Its purpose is to serve as a manual of design options to achieve the City's *Envision 2040 General Plan* vision of being a "walking and bicycling first" city. As such, it seeks to ensure that new and retrofitted streets are enhanced with "Complete Streets" design elements embracing all travel modes and activities appropriate for the facility.

"Complete Streets" describes a comprehensive approach to the practice of mobility planning that recognizes that transportation corridors have multiple users with different abilities and travel mode preferences (such as walking, biking, taking transit, and driving).

Complete Streets principles identified in this document provide standards and guidelines for the design and implementation of streets that are comfortable and

welcoming for all modes of travel. This includes design in accordance with "Vision Zero" principles that support the goal of eliminating traffic related deaths and severe injuries. This manual seeks to provide a unified set of guidelines, consistent with previous planning documents and other community goals in the city's *General Plan*, for practitioners working in the City of San José. Practitioners can use this guide to plan, design and build great streets for pedestrians, bicyclists, transit users and motorists.

These standards and guidelines are intended to be compatible with other City planning documents and various design guidance relating to the use of streets. Additionally, to provide current information on state-of-the-practice design treatments, this document is intended to be updated regularly - typically every three to five years. Overall, these standards and guidelines support the San José Department of Transportation's goals to:

provide a transportation system that is safe, efficient, and convenient for all modes of transportation, and which supports San José's public life, neighborhood livability, economic vitality, and environmental sustainability

These standards and guidelines represent the best practices that are currently being applied in California and nationwide* to meet standards set by the California Complete Streets Act. 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 (see callout on following page). It's important to note that design options shown within this manual do not supercede local, state, or federal regulations governing respective areas.

** includes guidance in NACTO design guides*

Implementing Complete Streets

The City of San José recognizes that the Complete Streets Design Standards and Guidelines, in their current form, may have inconsistencies with some other City documents because in some cases this document proposes substantial changes to the process of designing and retrofitting City streets. This in turn necessitates updates to other City policies, procedures, and codes so that they can be brought in line with the vision and goals provided in these Complete Streets Design Standards and Guidelines.

Specific changes to the City’s Municipal Code that may be in conflict with this document are being addressed as a parallel step in adoption of these standards and guidelines, through a City Council action to amend certain sections in the municipal code.

Work has been done or is underway to update the following standards and manuals to be in conformance with these standards and guidelines at the time this document is published:

Underway

- San José Traffic Impact Analysis Handbook
- City Crosswalk Installation Guidelines

Near term

- San José Bicycle Plan

Future

- San José Transportation Mobility Plan
- Downtown San José Transportation Plan
- Urban Village Plans and Station Area Plans
- San José Downtown Streetscape Master Plan
- San José Standard Details and Specifications

Guiding Street Design Principles

Several design principles serve to define the City’s vision for promoting streets that are safe, efficient, and convenient for multimodal travel while also supporting public life, neighborhood livability, and economic vitality. The three guiding design principles below serve as the foundation for the development of a citywide complete streets network:

- People-oriented
- Connected
- Resilient

Streets in San José should reflect these three characteristics.

People-Oriented



Streets are public spaces and should be designed to make all users feel comfortable when traveling to their destination, be they on foot, on a bike, in a bus, in a car, or in some other travel mode. Streets should support safe, convenient travel and encourage a healthy community, as well as economic and social equity.

Connected



Streets should provide a linked network to the maximum extent possible: streets should be connected to their built and natural context to support neighborhood livability, compact and complementary land uses, economic vitality, public life, and placemaking within the City. They should also be connected to technology to enhance the travel experience and improve reliability.



Resilient

Streets should include “green” or sustainable design features that promote the environment, rather than detract from it: green elements can improve air and water quality, provide shade for comfort, help create great places, and generally support people-oriented transportation objectives. Streets should be adaptable to changing travel needs and land use patterns over time.

These guiding design principles are articulated throughout the document.



Use of This Document

This document is divided into several sections describing key details of street design:

- Chapter II describes street types defined in the Envision San José 2040 General Plan and includes dimensioned cross-sections and the process for designing streets to achieve desired travel speeds
- Chapter III describes specific design elements of Complete Streets
- Chapter IV includes design guidance for “complete” intersections, including strategies to ensure their function for all travel modes
- Chapter V includes guidance for the design of the pedestrian realm, including crosswalks and sidewalks
- Chapter VI includes design guidance for bike facilities and treatments on streets and at intersections

The criteria in these standards and guidelines provide a guide for designers, engineers, and planners to exercise sound judgment in applying standards in the design of projects. This guidance allows for flexibility in applying design standards and approving design exceptions that take the context and project location into consideration, which enables the designer to tailor the design to the specific circumstances while maintaining safety.

This document is intended to replace the City’s Geometric Design Guidelines (2010) which were formerly used as the primary basis for street design and geometric configuration.

These standards and guidelines generally conform to the standards and policies set forth in the 2014 California Manual on Uniform Traffic Control Devices (CA MUTCD). Complete Street standards and guidelines that are in a demonstration phase and have yet to be incorporated into the CA MUTCD will require provisional approval.

Additional Design Emphases

Throughout the document, particular areas of design emphasis are highlighted with the use of the following icons:



Safety - A design element emphasizes safety for one or more modes of travel.



Pedestrians - A design element emphasizes walking as a mode of travel.



Bikes - A design element emphasizes bicycling as a mode of travel.



Transit - A design element that is focused on or applicable to transit. Transit refers to VTA buses and light rail, Caltrain, and BART if not specifically stated.



Automotive - A design element is applicable to automobiles.



New Technology - A design element that may make use of new or emerging technology.

These standards and guidelines also generally conform to the standards and policies set forth in Caltrans Standard Plans 2015, the 2017 California Highway Design Manual (HDM - English Version), American Association of State Highway and Transportation Officials (AASHTO) publication, "A Policy on Geometric Design of Highways and Streets" (2011), and the City of San José Municipal Code. However, AASHTO policies and standards do not always satisfy City of San José conditions. As a result, these standards and guidelines promote consideration of other design guidance, including NACTO, to support people-oriented, connected and resilient streets.

Standards & Guidelines

This document includes standards and guidelines. Definitions used in this document include:

Standard - a statement of required, mandatory, or specifically prohibitive practice.

Guideline - a statement of intended practice in typical situations, with deviations allowed if judgment or study indicates the deviation to be appropriate. The City will consider information included in a request/study and determine if the design variance is reasonable and appropriate prior to making judgment and allowing deviation.

Summaries of the standards and guidelines included in this document are below. **Appendix A - Standards, Guidelines, and Options Summary** includes a full summary of the standards and guidelines included in this document.

Standards

This section summarizes streetscape design standards in this document, including primary guiding principles, compliance with the Americans with Disabilities Act (ADA), minimum widths of streetscape elements, right-of-way widths, and design of sidewalks and walkways.

Primary Guiding Principles

1. Street typologies established in the Envision San José 2040 General Plan shall be used to design streets in San José. (pg. 7)
2. Streets shall be designed to promote safety and convenience for pedestrians, bicyclists, users with disabilities, and/or children. (pg. 23)
3. Streets shall be designed according to target speeds. (pg. 20)
4. Streetscapes shall be designed to support transit operations. (pg. 54)
5. Streets shall be designed to balance safety, delay, carrying capacity, and comfort for people who walk, bike, take transit, and/or drive. (pg. 23)
6. Multimodal factors of person delay, reliability, safety, and comfort shall be analyzed. (pg. 23)

Americans with Disabilities Act (ADA)

7. All streetscape designs shall meet or exceed ADA requirements. (throughout the document)

Widths

8. When a street is developed or redeveloped, the new street shall comply with this document, including widths of right-of-way (pg. 13) and minimum widths of travel lanes (pg. 14, 27, 31), sidewalk zones (pg. 70-71), and bikeways. (pg. 99-106)
9. The Director of Transportation determines if a Collector Street shall be designed to the specifications of an Arterial or Local Street. (pg. 14)
10. Emergency access routes shall accommodate emergency vehicle access. (pg. 37)
11. A 5' minimum clearance must be maintained for on-street disabled parking. (pg. 78)

Sidewalk and Walkway Design

12. Sidewalks shall be people-oriented and comprised of the following zones: Frontage Zone, Through Zone, Furnishing Zone, and Curb Zone. (pg. 66-67)
13. The path of travel between sidewalks and building entries, as well as paths to and from on-street parking for people with disabilities, shall be kept clear. (pg. 72)
14. Street trees and tree basins shall be situated to accommodate opening doors and facilitate passenger entry and exit from parked vehicles. (pg. 77)
15. Café and restaurant tables and seating shall allow for clear access and not interfere with driveways, curb ramps, or emergency access. (pg. 72)
16. Marked crosswalks shall be defined through yellow (in school zones) or white pavement striping. (pg. 83)

Bikeway Design

17. Cycle tracks, bike lanes, and shared use paths shall have bike signal detection and/or actuation. (p. 98)
18. Cycle tracks shall include intersection approaches. (pg. 98, 111)

Guidelines

This document includes guidelines for guiding principles of complete streets and intersections and elements of complete streets.

Guidelines for street designs guiding principles state that context types should be used to design streets in San Jose. (pg. 10)

Guidelines for elements of complete streets cover sidewalks, lanes widths, bike facilities, bus lanes, intersections, bus stops, parking, lighting, traffic calming measures, stormwater management through green street design, trees, landscaping, planters, placemaking, public seating, signage, wayfinding, median design, cul-de-sac design, and additional complete streets elements.

Please see **Appendix A** for a full summary of the guidelines included in this document.

Options

This document also includes options. The definition of options used in this document is:

Option - a statement of practice that, in some instances, is a permissive condition and carries no requirement.

This document includes options for street design guiding principles, crossings, intersections, transit stops, bikeways, traffic calming, street trees, landscaping, planters, larger vehicles turning on narrower streets, sidewalk zones, placemaking signs, public art, seating, and bike racks.

Appendix A is a full summary of the standards, guidelines, and options included in this document.



II. SAN JOSE STREET TYPES

Street Type Principles

Street design principles discussed in this chapter support people oriented, connected, and resilient streets that are safe, comfortable, convenient, and attractive for all.

The *Envision San José 2040 General Plan* organizes streets and other transportation facilities according to “typologies.” Typologies reflect a street’s primary function and adjacent land use context. In doing so, typologies establish the need to accommodate multiple travel modes and promote desired travel speeds.

Street typologies provide direction for a Complete Street network that accommodates all people traveling on it. Adjacent and nearby land uses influence the functionality and character of the street environment. A well-integrated street system complements land uses and meets travel needs. Street typologies apply to all types of streets in the City, from downtown pedestrian-focused streets to Grand Boulevards that prioritize transit, and they consider the broad range of users, including children, the disabled, and seniors.

This chapter further describes street typologies that accommodate all users, superseding previous functional classification diagrams of roadways. Previous functional classifications define streets only according to their vehicular transportation function, such as local, collector, arterial, expressway, and freeway, as opposed to considering all users of the street. While a street’s functional classification may still be used in certain instances, Complete Streets typologies established in the *Envision San José 2040 General Plan* shall be used to design streets in San José.

Street Typologies and Function

The *Envision San José 2040 General Plan* describes eight different street typology classifications. For the purposes of this document, the street typologies have been simplified into four types with the modal and other variations for the General Plan types distinguished by context types. The street types for the Complete Streets Standards and Guidelines are: Grand Boulevards, Main Streets, City Connector Streets, and Local Connector Streets. These typologies represent differing priorities with respect to travel mode and scale and provide an additional hierarchy in terms of mode prioritization beyond the General Plan descriptions.

Grand Boulevard



Transit Priority Streets

Grand Boulevards, as defined in San José’s General Plan, are major transportation corridors that connect City neighborhoods. These streets are intended as primary transit routes and are sized to accommodate Santa Clara Valley Transportation Authority (VTA) light rail, bus rapid transit (BRT), buses, and other forms of public transit. Under the General Plan, Grand Boulevards are designed with transit as the primary mode of transportation, and where conflicts may arise between travel modes, transit has priority.

Pedestrian Accommodation

Given the Grand Boulevards focus on transit, accommodation of pedestrians is also an important goal as transit riders are pedestrians when they are not riding the transit vehicle. Therefore, whenever possible Grand Boulevards should provide wide sidewalks including space for through pedestrian circulation, activity along the building frontage, and space for street furnishings. This presents an opportunity to contribute to City identity using elements such as enhanced landscaping and green infrastructure, pedestrian lighting, street furniture, signage and wayfinding, and restaurant seating and other storefront activity that takes advantage of pedestrian activity along the street and around transit stops. Bicyclists also often ride transit and should be accommodated where space allows.

Multiway Boulevard

Multiway Boulevards are a distinct type of Grand Boulevard that include several unique characteristics. Multiway Boulevards are typically distinguished by separating through traffic and local traffic by a median divider. Local traffic and access takes place on a frontage road area, which also may include angled or parallel parking and bike access.

Multiway Boulevards have the ability to carry high levels of automobile traffic volumes but at lower travel speeds, thus promoting a more attractive street environment for walking and pedestrian activity. They

are also adaptable, permitting a variety of configurations within the available space. In addition to a median separating the frontage lane from the through lanes, a central median can also be included to permit space for turn pockets. An alternate configuration includes a wider side median that could also include pedestrian access or linear park space.

The example shown in this document presents a cross-section option using 130’ of right-of-way, which is consistent with other Grand Boulevard cross sections. Designers should also refer to *The Boulevard Book: History, Evolution and Design of Multiway Boulevards* by Jacobs, MacDonald and Rofe for additional information on the design and operation of Multiway Boulevards.



Grand Boulevard with Dedicated Center Running Bus Rapid Transit (BRT)

Main Street



Main Streets primarily serve commercial and social interests at the local neighborhood scale. As such, they may differ in character from neighborhood to neighborhood. Their level of social activity and unique characteristics can also make them a draw for those from the surrounding city and region. Main Streets differ from Grand Boulevards in that they lack the transit emphasis of Grand Boulevards and may be narrower in width. Nonetheless, special emphasis is given to pedestrian activity so that people can access multiple retail, restaurant, and entertainment uses along Main Streets by walking in a safe and comfortable environment. Main Streets are therefore characterized by appropriately wide pedestrian walkways, landscaping, pedestrian lighting, and street furniture. Building frontages are also pedestrian-oriented with outdoor seating and space.

City Connector Street



City Connector Streets are focused on providing access for mid- and long-range trips across San José. However, this does not mean that more local activities of walking or cycling are not accommodated, because City Connector Streets serve short range trips and the local uses along them as well. In the City Connector Street typology, pedestrians and bicyclists are prioritized, or equally accommodated with automobiles. While transit may be present, it is given limited emphasis.

Local Connector Street



The Local Connector Street type is typically a two-lane street that combines the Local Connector and Residential Street types of the General Plan. Pedestrians and bicyclists are typically given priority over automobiles. Transit is given limited emphasis. This typology accounts for the distinction that streets fronted with primarily residential uses should be designed to control traffic speeds and generally discourage through auto traffic.

On-Street Primary Bikeways



The City's General Plan also calls out streets that will serve as primary bike connections within San José. These connections not only serve as a backbone for accessing destinations within the City via bike, but they also connect the surrounding street network to the City's extensive off-street trail system. On-Street Primary Bikeways generally apply to the City Connector Street and Local Connector Street Typologies.

Primary Bikeways should include enhanced bike facilities to support high bike volumes and bicyclists of all skill and comfort levels. Additional detail on high-quality bikeway facilities is provided in Chapter VI of this document. In some cases, the primary bikeway network may also have an overlapping street typology. In such instances, designers should attempt to integrate the applicable typology classification and dimensions, while also meeting the goals of ensuring high-quality, connected and comfortable bike facilities.

Context Types

In addition to the street types described above, context types give an indication of land use mix, predominant type, intensity, and other factors that further inform the design of the street. Context relates to how the physical form and character of the local surroundings relates to the pedestrian realm of the street. Context types take land use mix and development intensity into consideration to achieve a more tailored approach that is consistent with neighborhood flavor and character. In this document, Complete Street Context Types are derived from the City’s General Plan Land Use classifications.

The context types are shown in the table to the right and are described as follows:

Downtown

The Downtown context type is characterized by intensive office, retail, service, residential, and entertainment uses. Developments in this Context Type should support pedestrian and bicyclist activity. Transit usage and pedestrian activity are encouraged and automobile activity is given secondary emphasis.

Urban Village

The Urban Village context type supports a wide variety of intensive commercial, residential, and other land uses which are each characterized by unique urban forms defined by an Urban Village Plan.

Transit Employment Center

The Transit Employment Center context type emphasizes access between clusters of employment use and major transit, such as BART and VTA light rail, in combination with other facilities and services. This context type is characterized by buildings oriented toward public streets with pedestrian and transit emphasis; bikes can also be important in these areas, both providing circulation throughout the day and as a means to commute between home and work.

General Plan Land Use Designations	Complete Streets Context Types
Downtown	Downtown
Commercial Downtown	
Urban Village	Urban Village
Transit Employment Center	Transit Employment Center
Regional Commercial	Commercial
Mixed Use Commercial	
Neighborhood/Community Commercial	
Combined Industrial/Commercial	Commercial or Industrial, as appropriate
Industrial Park	Industrial
Light Industrial	
Heavy Industrial	
Public/Quasi-Public	Public/Quasi-Public
Transportation and Utilities	N/A (Predominant adjacent Context Type applies)
Urban Residential	Residential Neighborhood
Residential Neighborhood	
Mixed Use Neighborhood	Mixed Use Neighborhood
Transit Residential	Transit Residential
Rural Residential	Rural Residential
Lower Hillside	
Agriculture	Agriculture and Open Space
Open Space, Parklands and Habitat	
Open Hillside	
Private Recreation and Open Space	

Commercial

The Commercial context type accommodates a broad variety of commercial uses, including retail services and commercial and professional office developments. They can range in scale and intensities from the local neighborhood to the regional scale. Street-facing activity and a pedestrian supportive environment are emphasized to allow for clientele to park once and walk to multiple destinations.

Industrial

The Industrial context type can allow for industrial uses ranging from warehousing and light manufacturing to more intensive uses such as extractive and primary processing activities. While pedestrian activity and bicycling are accommodated, they are not given the degree of emphasis as they are in other context types. Owing to more predominant truck activity that may be required for this context type, travel lanes are typically wider.

Public/Quasi-Public

The Public/Quasi-Public context type includes education, civic, and governmental uses, as well as joint development projects which can include public and private activities. Due to the varied nature of the uses within this context type, scale and intensity can vary considerably, though in all applications, pedestrian and bike activity is encouraged.

Residential Neighborhood

The Residential Neighborhood context type broadly encompasses most of the single-family residential neighborhoods found throughout the City. Streets are typically narrower to preserve neighborhood feel and character, and the building frontage zone may be minimal, if present. The furnishing zone may be wider to accommodate landscape and larger street trees. Pedestrians and bicyclists are accommodated and connections to the bikeway network can make these streets bike commute corridors. Because streets are narrower, transit uses may not be applicable for certain street typologies.

Mixed-Use Neighborhood

The Mixed-Use Neighborhood context type is intended for medium density residential uses and can also allow for small stand-alone commercial uses. This Context Type may be situated near urban amenities such as transit stations and therefore pedestrian, bike, and transit uses are encouraged.

Transit Residential

Similar to the Transit Employment Center, the Transit Residential context type emphasizes the clustering of homes for more compact and higher density within walking distance of major transit such as BART and VTA light rail. This context type is characterized by residential buildings oriented toward public streets with some supporting retail and service uses and an emphasis on pedestrian and transit circulation.

Rural Residential

The Rural Residential context type applies to low density residential uses that are predominantly rural in character. While pedestrians are accommodated, walkways may be reduced to their minimum requirements in certain constrained situations given the low intensity of activity and likely focus on recreational walking. Transit activities are typically not found in this context type.

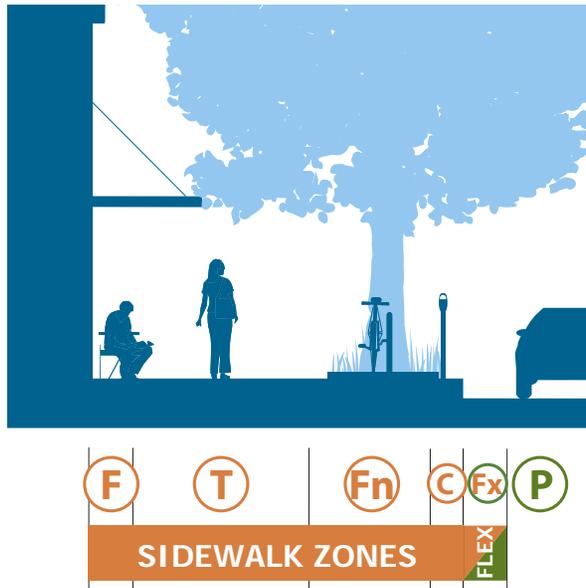
Agriculture and Open Space

The Agriculture and Open Space context type broadly applies to publicly- or privately-owned areas that are low intensity and relatively undeveloped. While pedestrians are accommodated, walkways may be reduced to their minimum requirements in certain constrained situations. Where applicable, bike lanes may also be reduced to minimum dimensions. Transit activities are typically not found in this context type.

Sidewalk Zones



A sidewalk is comprised of several “zones” which serve different functions for pedestrian activity. A table with a detailed list of dimensions is included on pages 70 and 71 of Chapter V. Sidewalk zones are further described in Chapter V.



Frontage Zone (F)

A Frontage Zone is the area between the through way (the main pedestrian walking space) and adjacent property which may accommodate pedestrian-oriented activities and elements, such as street furniture, planting, café seating, and outdoor retail displays. It can act as a buffer between doorways and other entries bridging private and public spaces.

Through Zone (T)

Commonly known as a public walkway or sidewalk, the Through Zone area is primarily reserved for pedestrian movement along the street.

Furnishing Zone (Fn)

The Furnishing Zone can contain landscaping, street furniture, transit stops, and wayfinding signs and is primarily intended as an extended buffer zone between pedestrians and vehicles, and a space for pedestrians to linger in the public open space of the street.

Curb Zone (C)

The Curb Zone primarily acts as a transition for people using bikes or cars to get on/off their bike or in/out of their car and allows space for opening vehicle doors and parking meters. It also adds to the buffering of pedestrians in the Through Zone from traffic in the street. In areas where more frequent change over of parking is expected, the Curb Zone should be wider to accommodate activity and to avoid conflicts with landscaping and more passive activity in the Furnishing Zone.

Flex Zone (Fx)

In some cases, such as when the roadway is restriped to accommodate a more multimodal condition, an excess of roadway width may be present. This is especially true if the curbs are not reconstructed afterward. This “leftover” space can be allocated to bike, pedestrian, or general green infrastructure use. Due to the flexible nature of this area, it is designated as Flex Space. See Chapter V for additional information on possible pedestrian reconfiguration of the Flex Zone, Chapter III for possible green infrastructure configurations, and Chapter VI for bike infrastructure configurations.

Street Dimensions

The following section contains street dimension tables and represents general design parameters that respond to differences in context types and travel mode priorities. They are intended to present a range of options under a variety of conditions in order to flexibly balance street design innovations with technical and engineering constraints.

Constrained and Unconstrained Dimensions

The street dimensions presented in the following pages address Constrained Dimensions, which should be interpreted as minimum widths that are compatible with existing street configurations. These Constrained Dimensions are also intended to be used where space is limited due to previous development patterns or existing physical constraints. These minimum dimensions allow for flexibility while at the same time providing the minimum space required for safety and comfort.

With ideal Unconstrained Dimensions, however, sidewalks should generally be wider than depicted. See Chapter V for more detail on Sidewalk Zones and the configuration of the pedestrian realm. Design criteria for street right-of-way are listed in the table to the right (per Title 13 of the San José Municipal Code). **Right-of-way dimensions can be increased through City Council action (e.g., sidewalk widths specified in adopted Urban Village Plans).**

In San José, street design is predominantly guided by street typologies established in the Envision San José 2040 General Plan and functional classifications. The Director of Transportation defines and maintains the City’s Functional Classification Diagram of roadways (e.g., Local, Collector, or Arterial). Each street in San José has both a typology and a functional classification.

Cross-sections that show right-of-way, travel lane widths, and other streetscape design elements are shown in the figures on pages 15-19 of this document. All street designs submitted on tentative maps and site plans that include City streets shall comply with design criteria specified in this document.

Standard Right-of-way (ROW) Widths			
Functional Classification	Street Designation	ROW Width (ft)	Minimum Centerline Radius (ft)
Local	Narrow Residential	40, 44, 46, or 48	150
	Minor Residential	50, 52, 54, 56, or 60	150
Collector	Neighborhood Collector	56, 60, or 64	300
	Neighborhood Collector	70	600
	Major Collector	80, 84, 86 or 90	600
Arterial	Minor Arterial	106	600
	Major Arterial	120 or 130	1000
Expressway		134 or 220	1000

Lane Width Guidelines		
Typology	Grand Boulevard City Connector Street	Main Street Local Connector Street Residential Street
Functional Class	Arterials	Local Streets
<i>Interior Lane</i>		
Next to centerline/adjacent lane	10-11 ft	10 ft
Next to curb median	10-11 ft	10 ft
Next to painted median	10-11 ft	10 ft
One lane next to median with parking	26 ft - Lane striped at 11 ft; parking, bike lane or flex space in remainder	
One lane next to median without parking	20 ft - Lane striped at 11 ft; bike lane or flex space in remainder	
<i>Curb Lane</i>		
With parking	18 ft (includes parking lane width)	17 ft (includes parking lane width)
No parking w/ bike lane ¹	11 ft (plus bike lane)	10 ft (plus bike lane)
No parking w/out bike lane	10-14 ft	
Part-time parking ²	10-12 ft	
With buses	11-15 ft	
<i>Turn Lane</i>		
Left turn	9-10 ft	
2-way left turn	10-12 ft	10 ft
Left turn adjacent to median island	10 ft	
Double left turn lanes	9-10 ft	
Right turn	10-12 ft	9-10 ft
<i>Bike Facilities³</i>	<i>See Chapter VI "Bike Design"</i>	
<i>Parking</i>	7-8 ft	7 ft

Dimensions shown in this table are considered standard and are typically minimum. Parking dimensions include gutter pan width; otherwise, dimensions do not include gutter pan width. Variations may be proposed for consideration where key design considerations for safety and target speed are maintained.

1. See page 92, Standard Bike Lanes for further guidance.
2. Time of Day Parking or Part-time Parking requires prior SJDOT Approval.
3. See pages 98-106 for specific guidance on bikeways.

The Director of Transportation determines if a Collector Street shall be designed to the specifications of an Arterial or Local Street shown in the table to the left.

Notes on lane widths and cross sections on following pages:

Dimensions shown for pedestrian, flex, bikeway and medians should be considered minimum (i.e. constrained); wider dimensions should be considered where possible.

Pedestrian Realm

New streets, and streets undergoing major streetscape improvements should generally have wider sidewalks than shown, see Chapter V for further guidance on pedestrian realm dimensions.

Flex space is defined as additional right-of-way between curbs that could be used for several purposes to narrow the street and improve adjacent pedestrian realm. Potential uses of flex space include: parklets, green gutter treatments, bikeway enhancements, etc.; see Chapter V for further guidance.

Parking

For angled parking, see Chapter III for guidelines on parking lane width and locations where it may be considered.

Travel Lanes and Medians

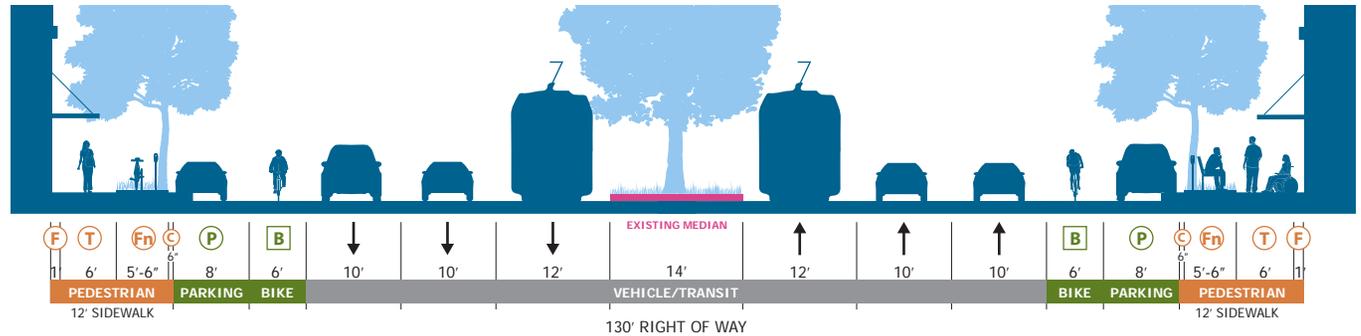
If no transit lane is required, additional space that is available should be reallocated to the bikeway. If transit is added in the future, a lane can be widened to 12' through restriping the roadway.

If no median is provided, additional space within the roadway should be allocated to Flex Space.

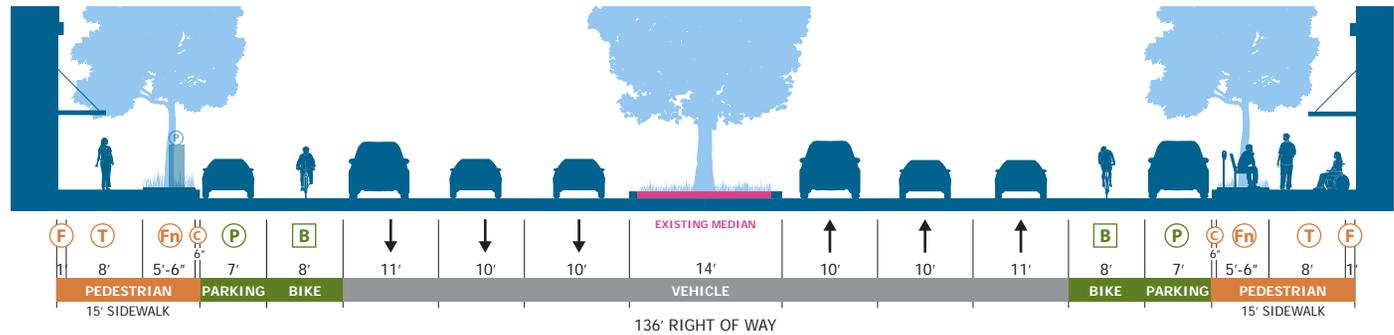
For Multiway Boulevards, a side median should separate travel lanes from frontage roads. A combination of widths may be considered.

Example Grand Boulevard Cross Sections

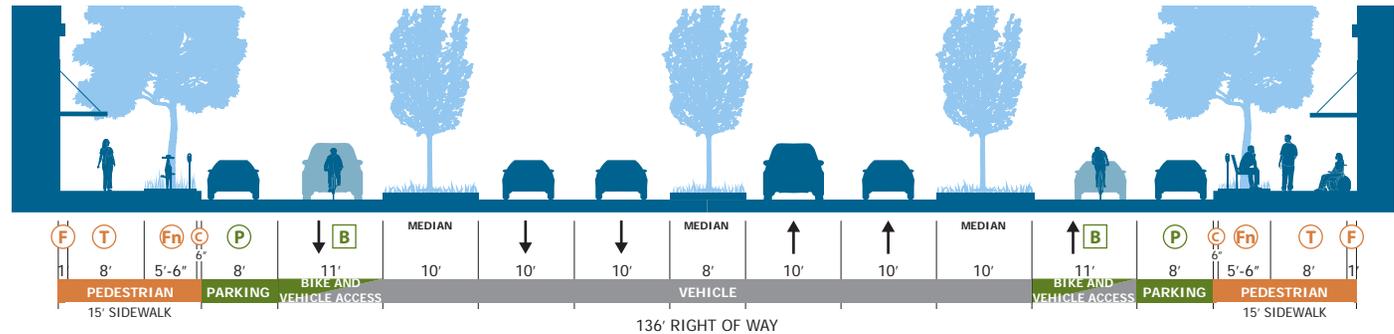
Grand Boulevard (6 Lane) with Dedicated Transit Lane



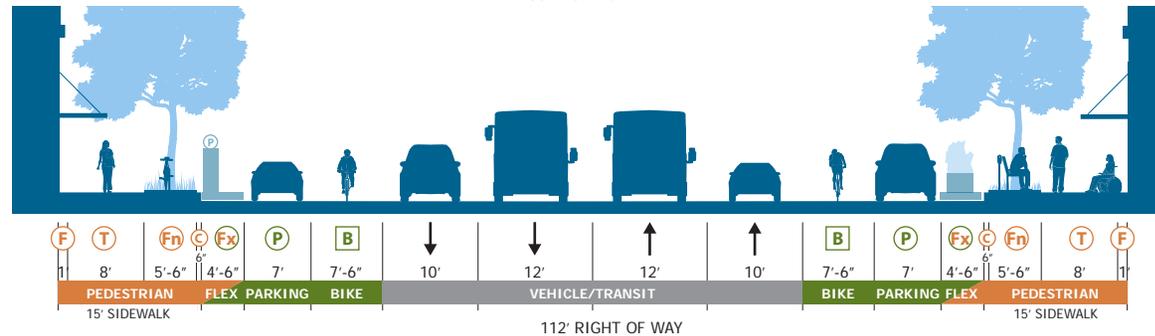
Grand Boulevard (6 Lane) without Dedicated Transit Lane within Urban Village



Grand Boulevard (Multiway 4 Lane) without Dedicated Transit Lane within Urban Village

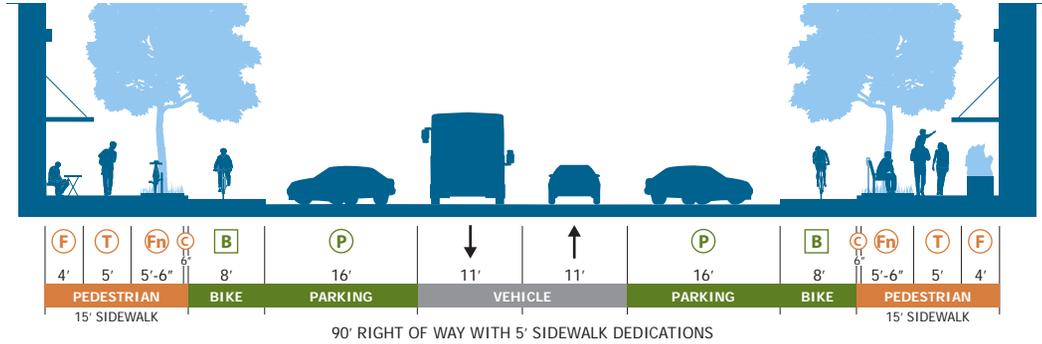


Grand Boulevard (4 Lane) with Dedicated Transit Lane within Urban Village (Additional width required at transit stops)

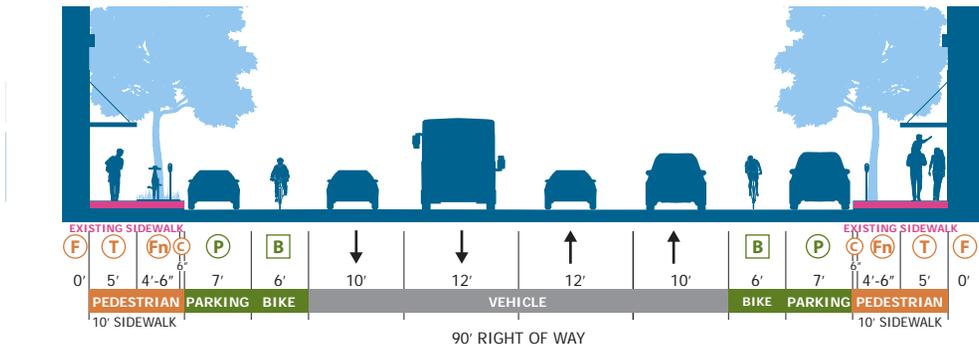


Example Main Street Cross Sections

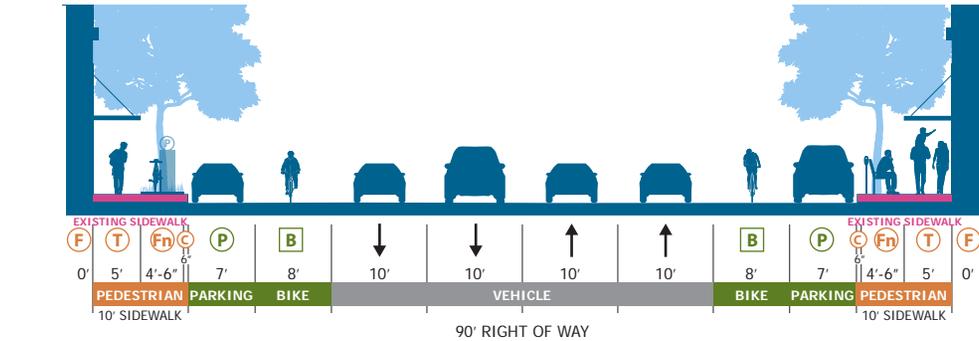
Main Street (2 Lane) with Transit and Angled Parking within Urban Village



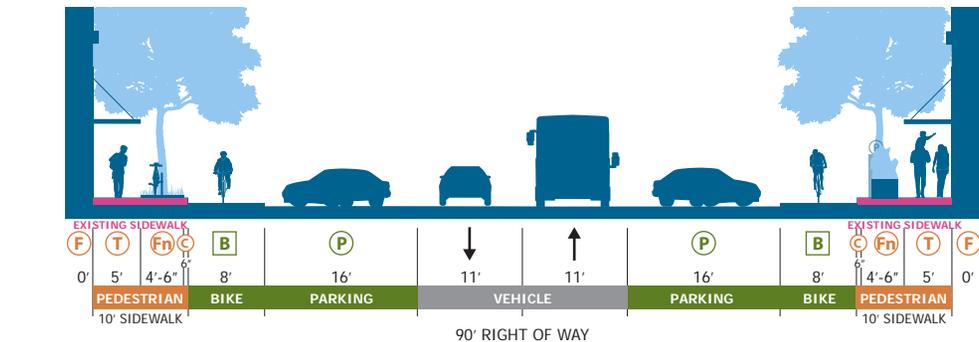
Main Street (4 Lane) with Transit



Main Street (4 Lane) without Transit

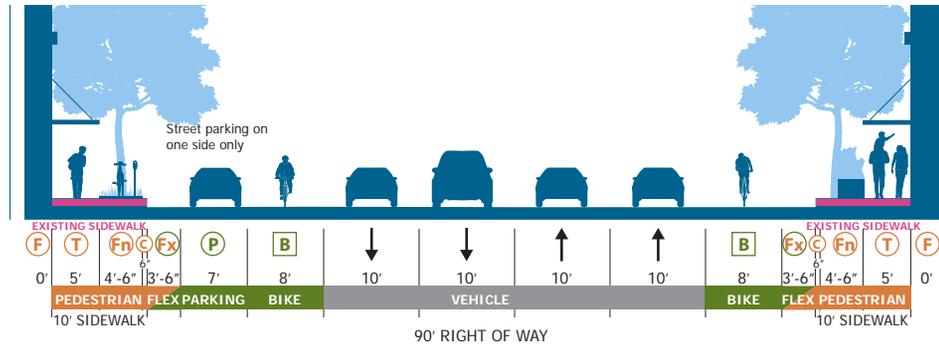


Main Street (2 Lane) with Transit and Angled Parking (Transit Stops would take place of parking zone where needed)

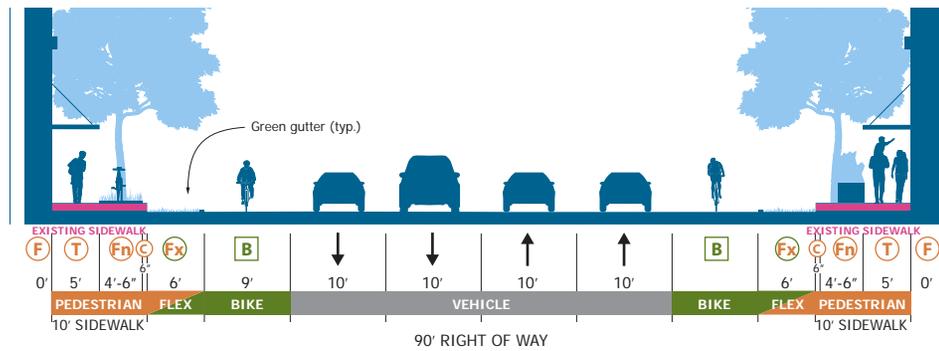


Example City Connector Street Cross Sections

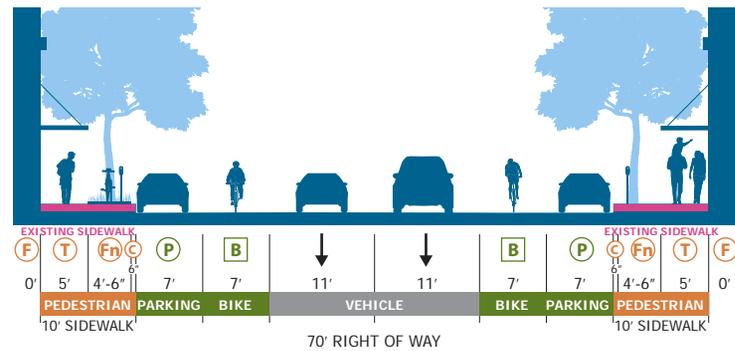
City Connector (4-Lane)



City Connector (4 Lane)

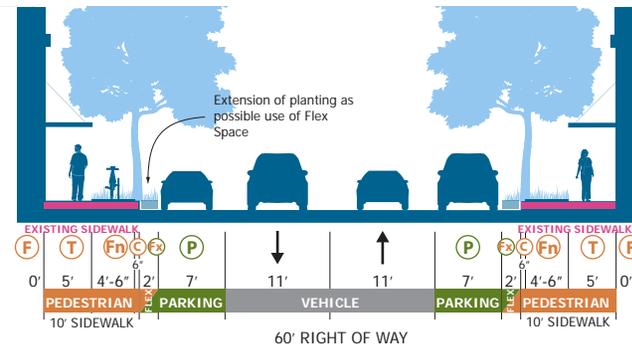


City Connector (2 Lane)

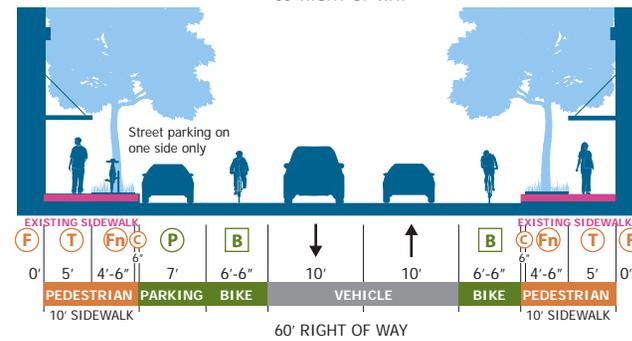


Example Local Connector and Residential Street Cross Sections

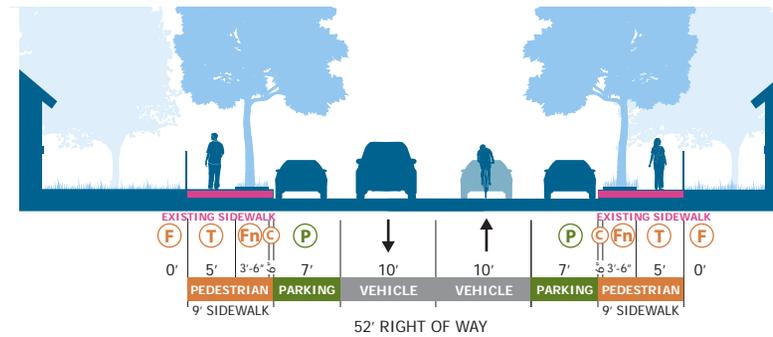
Local Street (parking on both sides)



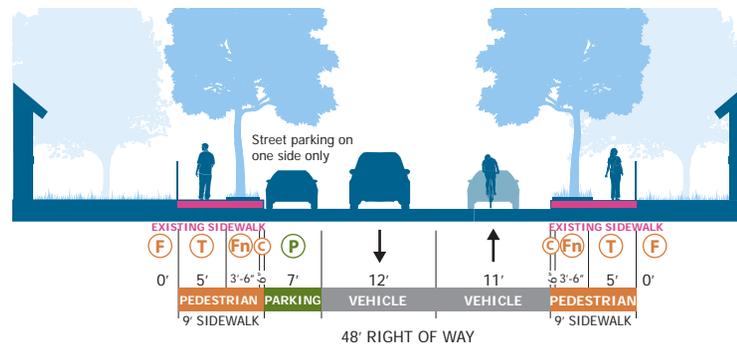
Local Street (with bike facilities and parking on one side)



Local Street (parking on both sides)

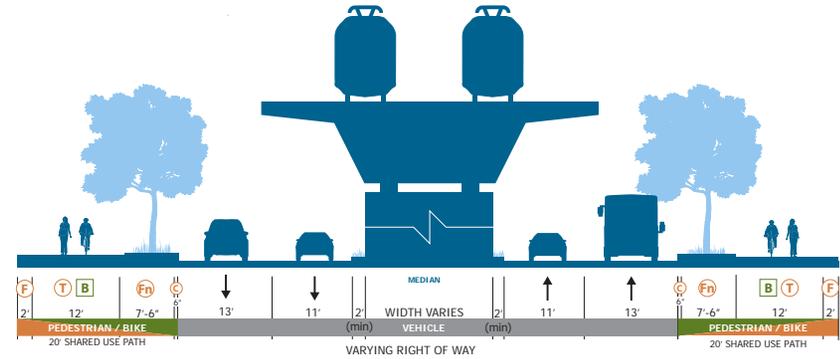


Local Street (sharrow or bike boulevard, parking on one side)

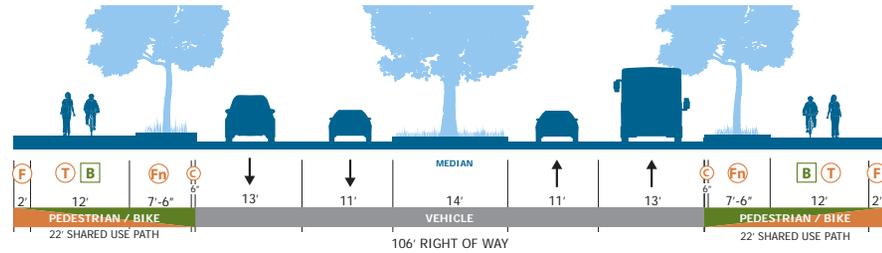


Example Monterey Road with High Speed Rail (HSR) Cross Sections

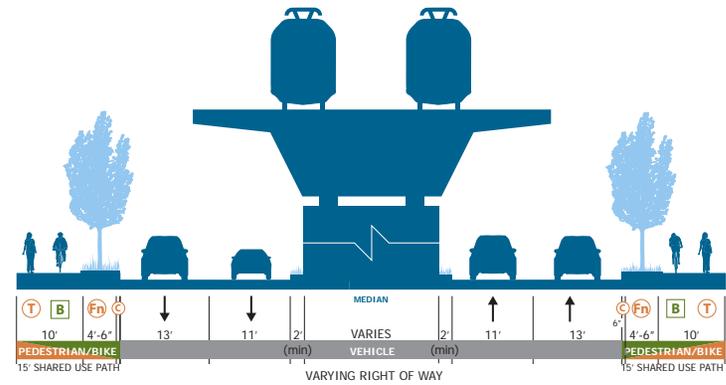
Grand Boulevard (Viaduct HSR Alternative)



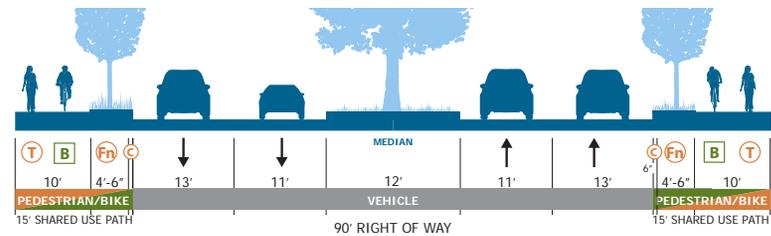
Grand Boulevard (At-Grade HSR Alternative)



City Connector Street (Viaduct HSR Alternative)



City Connector Street (At-Grade HSR Alternative)



Street Design Process



Target Speeds

A “target speed” is defined as a desired vehicle operating speed for a given street. These standards and guidelines support the use of target speeds to proactively manage vehicle speeds on City streets to minimize the negative consequences of excessive speeds. Excessive vehicle speeds can create challenges to achieving Complete Streets, including:

- Decrease overall roadway safety, especially for more vulnerable roadway users, such as pedestrians and bicyclists
- Decrease the comfort of walking and biking on a street
- Make it difficult to cross wide, high speed streets; especially for pedestrians, bicyclists, children, and seniors
- Limit the use of a street for other purposes, as high vehicle speeds result in higher roadway noise levels

“A passive design approach assumes, and strives to account for, the worst case scenario, both in terms of user behavior and traffic congestion. For many years, roadways have been designed with a “passive” approach, allowing drivers to travel unpredictably at high speeds. While a passive approach to system design is sound in parallel fields of engineering, such as stormwater management or seismic engineering for earthquake zones, its consequences on ordinary city streets have been disastrous. Overdesigned buffers, clear zones, and setbacks intended to account for fixed-object crashes have created streets that not only account for, but encourage, unsafe speeds.”

– NACTO

Target Speeds and Current California Practice

The target speed should normally be the same as the posted speed limit on a given street. The California State Legislature sets the regulations for speed limits on California streets. In order to enforce speed limits, the California Vehicle Code (CVC) specifies how these regulations should be used. By following standard procedures, public agencies establish speed limits that are generally uniform throughout the state.

Except for speed limits prescribed by the CVC, speed limits need to be based upon an engineering and traffic survey demonstrating that the speed limit is appropriate, reasonable, and safe to facilitate the orderly movement of traffic.

The target speed concept is a focused approach that can be deployed when designing a street, whether reallocating space through re-striping after pavement maintenance, or through a more complex streetscape modification. The goals of target speeds are to create vehicle speeds consistent with the appropriate street classification and adjacent land uses, in an effort to support safe operations for all street users. Additionally, achieving an appropriate target speed is a key characteristic of people-oriented streets.

The following describes how desired target speeds can be achieved on existing or new streets. When streets are being designed or redesigned, they shall be designed according to target speeds.

Target Speed Application to City Streets

Existing City Streets

On existing city streets subject to upgrades such as pavement maintenance, the reallocation of space through revised roadway marking geometrics is one method of designing to achieve a target speed along a corridor, which may be lower than the existing posted speed. This process is described in more detail in the following section and can be implemented by narrower lane widths, addition of bike lanes and buffers, reducing shoulder widths, and other related techniques for managing speeds.

On existing streets without proposed modifications, minor treatments (such as lane restriping, pedestrian enhancements, traffic calming treatments, or other modifications) can be considered for managing vehicle speeds. However, it may not be possible to fully achieve desired operating speeds with minor treatments alone.

New City Streets

On new City streets, the designer has full control over multiple geometric design criteria that can help achieve desired target vehicle speeds. As a result, a broader range of design treatments described in these standards and guidelines may be appropriate to consider on new streets.

Target Speed Design Process

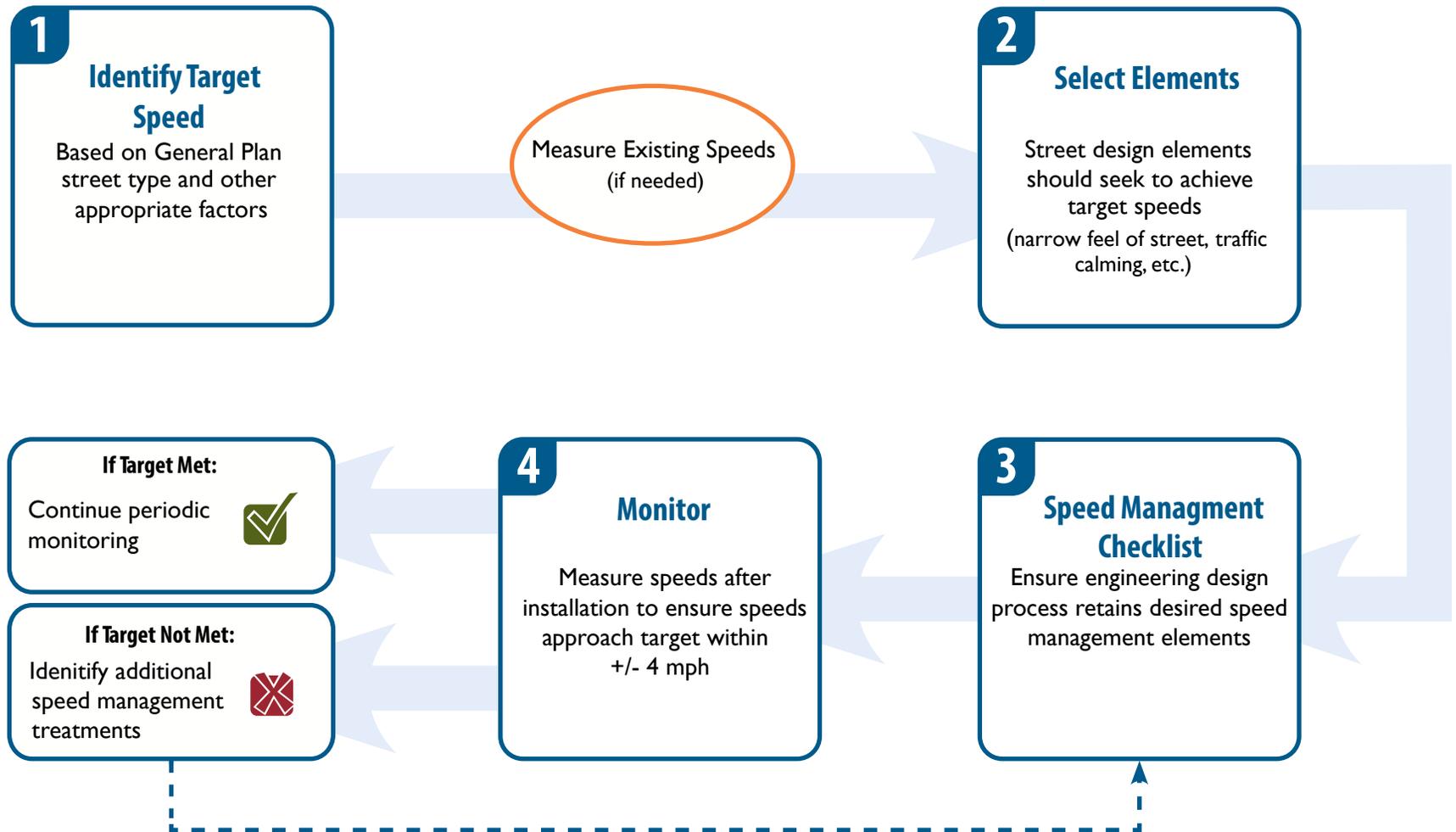
The City’s process for target speed design for new and upgraded streets is described below:

1. Identify appropriate or “target speeds” for a given street or corridor. In general, target speeds should fall in the following ranges:

Street Type	Target Speed (mph)
Grand Boulevards	25-40
Primary Bicycle Facility Streets	20-30
Main Streets	25-30
City Connector Streets	25-35
Local Connector Streets	25-30
Residential Streets	15-25
Commercial	25-30
Expressways	30-45

2. Select elements to integrate into street design to achieve target speeds and limit maximum speeds. Street elements that narrow the perceived feel of the street or provide traffic calming are particularly important in effective target speed management. See Chapter III for additional information on traffic calming elements and Chapter V for additional information on narrowing the feel of the street through an enhanced pedestrian realm.
3. Focus on engineering design process – establish a speed management checklist for review of street design projects to ensure the engineering design process maintains desired elements to achieve target speeds.
4. Monitor speeds over time to ensure speeds are approaching target speeds, especially within 3 to 6 months after construction of new street design elements. If design elements fail to achieve desired speed, install additional traffic calming elements in order to manage speeds to within +/- 4 mph of target speed. Additional traffic calming elements may include traditional horizontal and vertical traffic calming features as well as potential new technology features such as speed feedback signs, speed sensitive signals, or other innovative treatments. The process for testing additional treatments to further manage speeds will be evaluated and refined by the City over time to develop further guidance for using specific design elements to achieve target speeds.
5. Target speed should ideally be the same as the posted speed limit. In some cases the specific attributes or people-oriented goals of a street may justify the installation of additional elements to reduce target speeds. In rare cases, it may be appropriate to modify design elements to increase target speeds, but this process is generally discouraged.

Designing to Achieve Target Speeds



Additional Design Considerations

In addition to target speeds, several other considerations include:

Design Hour and Year

The traditional traffic design process seeks to design to accommodate traffic with minimal delay based on peak hour traffic forecasts for conditions 20-30 years into the future. This process, while perhaps useful for major freeways and other vehicular traffic priority facilities, is generally not appropriate for streets in San José where a balanced network is desired to support all modes of travel.

While traffic carrying capacity and automobile delay play a role in designing many streets and intersections, these criteria shall be balanced, and in some cases not considered, when other criteria such as safety or pedestrian, bicyclist, or transit delay or comfort are considered higher priority. Street capacity may also be a lower priority than other factors such as economic development or historical preservation, thus meaning that higher levels of congestion may be considered acceptable.

Additionally, designing to accommodate only peak hour delay should be used carefully since it can result in intersections being overdesigned for the other non-peak hours of the day and weekends when there are lower levels of traffic and, often, higher levels of walking and biking activity. For delay analysis, peak period (not peak hour) and off-peak period traffic movements should be analyzed. In addition, multimodal factors of person delay, reliability, safety, and comfort shall be analyzed.

Design Vehicle

Design vehicles are the largest vehicle expected to use a particular street and traditionally have governed street geometries such as lane widths and curb radii.

Complete Streets principles emphasize an analytical approach in the selection of an appropriate design vehicle, including evaluation of the negative implications and tradeoffs involved in selecting a design vehicle that will only infrequently use a street versus pedestrians and bicyclists that may be present throughout the day.

In most areas, it is not desirable to choose the largest design vehicle based on highway design policy (e.g. AASHTO). Instead, it is usually more desirable to select a smaller vehicle that will regularly (e.g. several times per day or more) use a given street. On most San José streets that are not major truck routes or used by large emergency vehicles, the design vehicle should be no longer than 40'. Design vehicles are described in more detail in Chapter IV.

Modal Priorities by Street Type

Streets shall be designed based on the modal priorities described in the typologies section above. Design shall promote safety and convenience for the most vulnerable people traveling along a street, which may be pedestrians, bicyclists, users with disabilities, and/or children.

Balanced Transportation System: Complete and maintain a multimodal transportation system that gives priority to the mobility needs of bicyclists, pedestrians, and public transit users while also providing for the safe and efficient movement of automobiles, buses, and trucks.

– General Plan Goal TR-1

Walking and Bicycling: Improve walking and bicycling facilities to be more convenient, comfortable, and safe, so that they become primary transportation modes in San José.

– General Plan Goal TR-2



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III. ELEMENTS OF COMPLETE STREETS

Complete Street Design Principles

This chapter describes the key elements that go into creating complete streets. It is intended to not only be an introductory primer on complete streets but also a comprehensive overview of each key supporting element. References are provided to sections where additional detail is contained in later chapters of this document.

These elements also are described in the context of the City's vision to create streets that are people-oriented, connected and resilient:

Guiding Principles

People-Oriented



People-oriented streets are streets that are designed to make all people comfortable when traveling regardless of which mode they choose. People-oriented streets also go a step further – they can and should be places in and of themselves. Streets designed for people work effectively to function as travel thoroughfares as well as places to linger, wait and spend time.

Connected



Complete streets are those that support an interconnected transportation network: they should be connected to their built and natural context to support neighborhood livability, compact and complementary land uses, economic vitality, public life, and placemaking within the City. The City's guiding principles also support connections to technology to enhance the travel experience, including supporting advanced forms of traveler information and new and emerging travel modes.

Resilient



Resilient complete streets are those that include “green” design features that promote a healthier environment. Resilient streets can be attained by supporting a greater variety of travel options that can achieve better air and water quality. They can also provide higher levels of comfort through smart landscape and urban design, and are able to readily and responsively adapt to changing travel needs.

The following section describes seven key areas where the City of San José is focusing on developing complete streets. Each area supports the overarching vision of the City to provide a safe, efficient, and convenient transportation system that promotes livability and economic vitality.

Key Elements of Complete Streets
▪ Mixed Flow Travel Lanes
▪ Bike Facilities
▪ Sidewalks
▪ Transit Facilities
▪ On-Street Parking
▪ Traffic Calming
▪ Stormwater Management / Green Streets
▪ Other Elements (Striping, Medians, etc.)

Complete Street Elements

Mixed Flow Travel Lane



Effective design of lane widths can govern the flow of traffic and allow for a mixture of various travel modes within a street. In the past, wide lanes from 11-13' were used in order to create a safety buffer for motor vehicles in faster-moving traffic. To foster an environment that is safe for all travel modes including pedestrians and bicyclists, narrower lanes of 10-11' are generally favored to promote slower vehicular speeds and a greater awareness of slower-moving traffic, and to allow for reallocation of space between all the modes on existing streets. However, some exceptions to this general guideline can be found in this document. For example, a 11-12' transit lane width is found in certain configurations of the Grand Boulevard and Main Street context types, as these widths can accommodate typical light rail vehicles. 11-12' widths can accommodate a wide variety of buses in street configurations that are intended to carry transit, but not necessarily light rail. In certain constrained conditions, particularly in residential settings, a lane width of 9' can be utilized for a "yield street," where vehicles traveling in opposite directions can safely pass one another as long as one vehicle stops and yields to the other. Any new yield streets would need to be approved by the Fire Department, as the City of San José Fire Code requires a 20' total clear area for vehicular travel.

The table on the following page lists the minimum widths necessary for the desired travel mode. Parking dimensions include gutter pan width; otherwise, dimensions exclude gutter pan width.

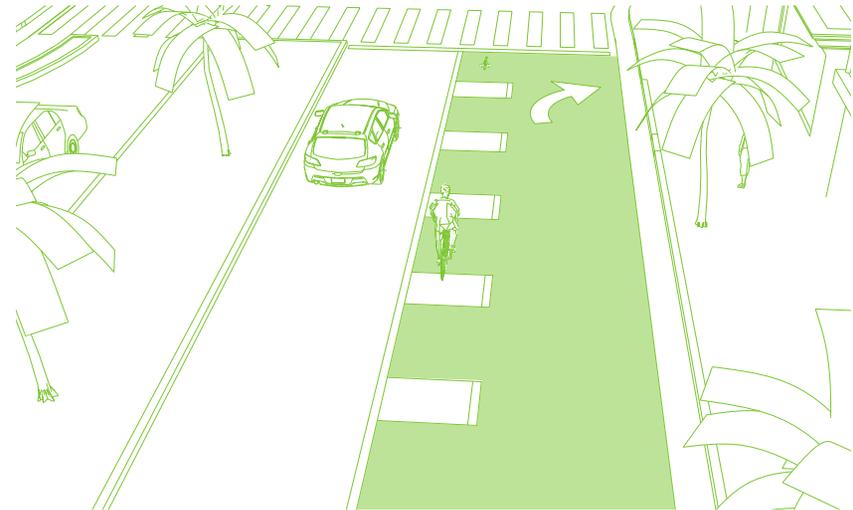
See the detailed street cross-sections in Chapter II for more detailed guidance regarding street width dimensions and surrounding context types. For more detail on the configuration of bike facilities, see Chapter VI.

Automobile Travel Lane Width	Modal Priority
9'	Pedestrians and Bicyclists, Parked Vehicles
10'	Pedestrians and Bicyclists
11'	Buses

Additional Width Availability – Flex Space

Occasionally, with the reallocation of street space as identified in this document, there may be additional right-of-way on City streets that will not be necessary for any specific mode or function. When this occurs, the designer may consider a number of opportunities to use this additional width for additional or enhanced features that improve the overall urban design and streetscape. For example, if a street undergoes a lane reduction and addition of a median, bike lanes, and/or buffers and on-street parking, there may be additional space available for other uses. Potential uses could include a wider median, wider bike lanes, or a wider pedestrian realm. Several examples are described below, though additional creativity and experimentation are encouraged when presented with this type of situation. In general, assigning additional space to create travel lanes wider than 12' is discouraged, except where necessary to accommodate light rail transit or bikes in shared lanes.

Flex Space is an innovative way of creating connected streets in San José. Flex Space should be added in a way that is context-sensitive and requires minimal investment for maintenance. Experimentation should be encouraged to provide design guidance for the planning, design, and implementation of Flex Space at intersections and along key corridors.



Bike Facilities



Bikeway design elements can support complete streets by making them more comfortable and convenient for bike riders of all ages and abilities. Well designed bike facilities contribute to an environment that is more orderly, and also safer for people who walk and drive.

San José’s goal for bicycling, established in the Envision 2040 General Plan, is for bike commute trips to increase to 15 percent of all commute trips by 2040. By incorporating innovative bikeway design elements into its complete streets, the City can work toward its goal of becoming a great bicycling community.

Bike facilities can range from dedicated low-stress facilities entirely separated from vehicle traffic to on-street facilities that share street space with motorized vehicles. Several of the most common bike design elements are presented on the next page, in increasing level of separation from vehicle traffic.



Bike Boulevard



Bike Boulevard



Standard Bike Lane



Buffered Bike Lane



Protected Bike Lane / Cycle Track



Protected Bike Lane



Shared-use Path



Shared-use Path
Image Credit: NACTO

- **Bike Boulevards:** Bike Boulevards are streets that are made more comfortable for bicyclists of all ages and abilities because they incorporate traffic calming elements that prioritize bike traffic. This treatment is typically found on residential streets with low traffic speeds and volumes, and tends to serve as an alternative parallel route to streets with higher vehicle speeds and/or volumes.
- **Standard Bike Lanes:** Bike Lanes provide dedicated roadway space for bicyclists. This space is separated from vehicle travel lanes and parking lanes through the use of pavement striping. Bike lanes are normally provided on each side of the street to the right of mixed flow lanes. A variation is a contra-flow lane, which is provided in the opposite direction of motor vehicle traffic - typically on one-way streets to provide two-way bike access.
- **Buffered Bike Lanes:** Buffered Bike Lanes are bike lanes that are separated from vehicle traffic and/or parking lanes by a striped horizontal buffer. This treatment should be used when there is sufficient roadway width.
- **Protected Bike Lanes / Cycle Tracks:** Protected Bike Lanes / Cycle Tracks are bike lanes that are protected from vehicle traffic through the use of horizontal and/or vertical buffers. For streets with on-street parking, cycle tracks are placed between the curb and the parking to eliminate conflicts with parking vehicles. This treatment is essential on routes with high traffic speeds or volumes, heavy truck traffic, or high parking turnover. Cycle tracks can serve one or two-way bike traffic and are applied on routes with high volumes of bike traffic or key routes in a bike network.
- **Shared-Use Paths:** Shared-Use Paths are separated from vehicle traffic and can be used by people walking or riding bikes. These facilities are used for both recreation and transportation.

See Bicycle Facility Selection Facility Chart on page 93 for more information.

Additional detail on bikeway design treatments, including variations such as left-side bike lanes and advisory bike lanes, is also provided in Chapter VI of this document.

Connected streets can be test beds for bike innovation. Bike technology such as electric bikes, bike signal treatments, and other features, is rapidly allowing bikes to travel faster and further than before, which offers the opportunity to significantly expand San José’s bike mode share. The City’s vision for connected streets should encompass planning for bike accommodations, including bike friendly signal timing, additional waiting areas for bicyclists at intersections, and providing flexibility for increasing bike space allocation where demand justifies it.



Sidewalks

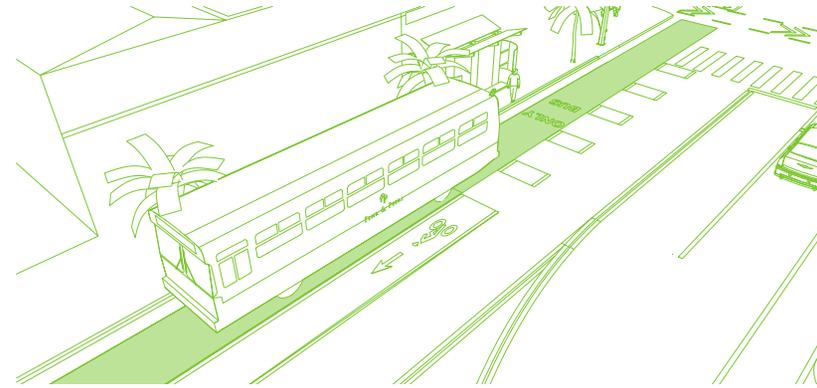


The term “sidewalk” can take a variety of meanings: colloquially, sidewalks can mean any outdoor space alongside streets that can be accessed by pedestrians. The term can have legal implications; for example, a sidewalk can be defined as the area between the curb and the property line, even though pedestrians may be unimpeded from crossing the area behind the property line. For the purposes of this document, the term “sidewalk” is the area between the building face (or property boundary) and the face of curb adjacent to the roadway. To facilitate discussion of design guidance for the different functional areas of the sidewalk, a set of sidewalk “zones” is defined (see the diagram on this page). The space primarily intended for the unimpeded movement of pedestrians is known as the Through Zone. As described in Chapters II and V of this document, Sidewalks Zones are comprised of Frontage Zones (F), or the area between the Through Zone and adjacent property; Through Zones (T), or the primary pedestrian walking area; Furnishing Zones (Fn), which is the primary area for locating street furnishings, landscaping, and other pedestrian-oriented elements; and Curb Zones (C), which form a transition area for drivers and bicyclists exiting their vehicles from the roadside. All of these zones are intended to be easily accessed by pedestrians.



Overall, the sidewalk should foster an attractive pedestrian environment that provides for functional walking, strolling, window shopping, outdoor dining, and stopping to talk with friends, among other pedestrian activities. In addition, street trees and other elements provide benefits such as shade oxygen, buffering from traffic, and other contributions to pedestrian comfort and safety. Enhancing elements such as street trees, pedestrian lighting, awnings, and street furniture should not be located in the Through Zone, as this would intrude into the primary pedestrian path, but instead should be located in the appropriate sidewalk zone. The presence of balanced pedestrian amenities combined with appropriately-sized sidewalks helps create an inviting public realm that can encourage pedestrian activity as well as provide health and economic benefits.

See Chapter II for guidance regarding dimensions for each sidewalk zone as it applies to its relative context type, and Chapter V for a detailed discussion of street elements that can be found in each sidewalk zone.



Street and Pedestrian Scale Lighting



Combination Street and Pedestrian-Scale Lighting

Street lights create a safer and more inviting environment for all users of the street. Pedestrian scale lighting, or lighting that is lower than 20', should be used in combination with roadway lighting in order to better light pedestrian spaces. Street lighting can also be enhanced to work with or define neighborhood aesthetics. Additional detail on pedestrian scale street lighting is provided in Chapter V.

Transit Facilities



Complete streets are designed to accommodate all forms and frequencies of public transit service, and where appropriate, private transit services as well. Transit facilities on complete streets in many areas include accommodation for bus transit, though some corridors may also have light rail, streetcar, or other types of rail transit. Because bus transit service is and will continue to be the main form of transit on many City streets, this document focuses primarily on bus facilities. In corridors with rail service, some elements of bus transit facilities may be adapted for rail service, though additional rail-specific design treatments should also be considered.

Transit-friendly complete streets elements can include the following:

Dedicated Bus Lanes

Bus lanes can be located in several places within a street, though they are typically either adjacent to the curb or in the center median.



Dedicated Curbside Bus Lanes: Dedicated curbside bus lanes are typically located adjacent to the curb or parking lane and are red in color, have “BUS ONLY” marking and use a solid white line to denote their separation from other vehicle traffic. Where there is appropriate passing width, bike traffic may be encouraged to use the bus only lane. When encouraging bike and bus traffic to share the dedicated lane, minimum lane widths should be determined based on engineering judgment, taking into account typical transit vehicle widths and expected bike volumes.

Minimum widths:

Curbside -11', excluding gutter pan width

Offset (i.e. adjacent to parking) -10'



Dedicated Median Bus Lanes: Median separated bus lanes are separated from other vehicle traffic through the use of striping, medians, rumble strips, or other separation devices. These lanes can carry one or two way bus traffic and are typically center-running. Larger median boarding islands and accessible safe crosswalks must be considered with this treatment.

Minimum width: 11 feet, excluding gutter pan width



Contra-Flow Bus Lanes: A contra-flow bus lane enables bus travel opposite the direction of vehicle travel on one-way streets. This treatment should be clearly defined through “BUS ONLY” pavement markings and signing, and/or colorized pavement. Similar to all dedicated transit facilities, barriers such as medians, curbs and rumble strips can be used to deter usage by other traffic. This treatment enables better connectivity in one-way street networks for transit and potentially bikes. In situations where there is appropriate passing width, bike traffic may be encouraged to use the bus only lane. When encouraging bike and bus traffic to share the dedicated lane, minimum lane widths should be determined based on engineering judgment.

Minimum width: 11 feet, excluding gutter pan width

Bus lanes should typically be considered:

- On Grand Boulevard or Main Streets with high levels of transit service (at least 5-10 buses per hour per direction)
- At key locations where buses can bypass congestion or lengthy vehicle queues, such as queue jump lanes
- On select other street types where it is advantageous and supportive of the City’s transit mode share goals to allocate street space expressly for transit service



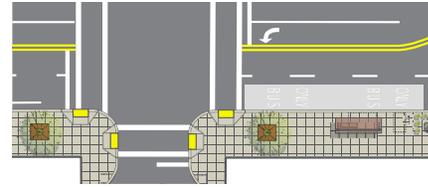
Bus Stops



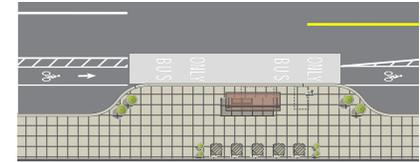
Bus stops should be comfortable, accessible spaces that enhance the passenger experience. Bus stops must be identifiable by both users and transit drivers through signage. Bus stops should be at least 40' long to accommodate standard buses, and longer if it is necessary to accommodate articulated buses or multiple buses at one time. In accordance with VTA Guidelines, bus stops should include amenities such as shelters, benches, lighting, route and schedule information, and arrival time screens. The loading zone, or area nearest the front door at a bus stop should remain clear of all obstructions to allow for safe, quick loading and unloading. Bus stops are placemaking opportunities and locations where the use of innovative technology should be promoted.

Bus bulbs, or curb extensions at bus stops, provide more space for waiting passengers and allow for quicker loading and unloading, shortening bus travel time overall. They are typically slightly narrower than the width of the parking lane, between 6-7'. Considerations for the installation of bus bulbs include transfer service frequency, traffic volumes, and presence or absence of on-street bike facilities. In general bus bulbs can be considered on streets with high service frequencies, lower traffic volumes or where occasional disruption to traffic flow is acceptable, and where there will not be conflicts with bike facilities.

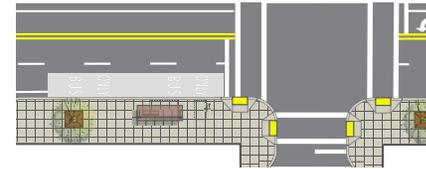
Bus Stop Placement Considerations



- **Far-side bus stops**, those located after an intersection, reduce conflicts with turning vehicles, remove a double stopping scenario and allow for quicker bus re-entry into traffic flow. Far-side bus stops are generally preferable along most transit corridors.



- **Mid-block bus stops** can help decrease traffic congestion but encourage mid-block crossing by pedestrians. Appropriate pedestrian crossing treatments should be considered with mid-block bus stops. The installation of mid-block bus stops may require parking removal.



- **Near-side bus stops**, those located before an intersection, provide pedestrian access to the nearest crosswalk but create blind-spots and conflicts with right turning vehicles and create a double-stopping scenario in which the bus stops to unload passengers as well as for a signalized stop. Near-side bus stops may be appropriate in limited circumstances or where it would locate a bus stop immediately adjacent to a high ridership generating use.

Additional Guidance:

- In most scenarios, far-side bus stops should be used to decrease traffic congestion, bus travel time delay and to effectively accommodate pedestrians. In all placements, bus stops should be located at least 10' from crosswalks.
- Special design consideration should be given for bus stops where bike facilities exist—see Chapter IV for additional guidance.

On-Street Parking



On-street parking can be implemented in a variety of ways on complete streets. The table on the following page describes some of the key dimensions and considerations for on-street parking. All parking dimensions shown below include gutter pan width.



Parallel Parking



Parallel parking lanes should be limited to a maximum of 8' wide, and can usually be designed to be 7' wide. Wider parking lanes may be appropriate in areas where loading and unloading or double parking frequently occur. When parking is placed next to a standard bike lane, a buffer should be considered wherever possible in order to decrease the possibility of dooring incidents.



Angled Parking



Back-in angled parking: Back-in angled parking is typically used where parking borders a bike lane. This treatment provides motorists a better view of bicyclists and other vehicles when exiting the space. This removes visibility issues caused by backing out of front-in angled parking.

Front-in angled parking: Front-in angled parking is traditionally more common than back in angled parking. When considering this treatment, attention should be given to potential visibility issues caused by vehicle backing out of front-in angled parking.



Perpendicular parking



Perpendicular parking, or parking at right angles to the curb, may be considered in locations where additional parking capacity is desirable and where street right-of-way allows. Travel speeds and volumes should be considered as factors where perpendicular parking is considered, as it is generally most appropriate on streets with moderate to low traffic volumes and speeds.



Image Credit: SFMTA

Flexible Use Parking



Flexible use or time of day parking refers to parking lanes with time of day restrictions that allow the parking lane to become a vehicle travel lane during the time of day when it is most needed. This typically restricts parking during the morning or evening peak hours.



Bike Parking



Refer to Chapter VI for additional detail on bike parking.

Parking Dimension Guidelines				
Parking Type	Angle (if Applicable)	Space Width	Space Length	Adjacent Lane Width
Parallel	NA	7'-8'	20' ¹ -22' ²	12'
Back-In Angled	45°	10'	16'	12' ⁵
Front-In Angled	45° ³	9'	16'	12'
Flexible Use	NA	11' ⁴	Refer to parallel parking	Refer to parallel parking

- ¹ This length should only be used if space is adjacent to curb extension/bulb-out and adequate room is available to maneuver in and out of space.
- ² This is the typical length for parallel parking spaces.
- ³ In on-street parking scenarios, angles greater than 45° have reduced visibility and inefficiently use space.
- ⁴ If used as time of day vehicle travel lane or bus lane, 12' min. if gutter is present.
- ⁵ In locations where bike lanes would continue adjacent to back-in angled parking, a conflict zone treatment should be used in order to alert drivers of the presence of bicyclists in this area. Conflict zone pavement markings should be used in the adjacent travel lane at a minimum of 14'-16' width be maintained (10' motor vehicle travel lane, 4' sharrows or 6' bike lane conflict zone treatment). These treatment options can be found in Chapter VI. If no bike treatment is present on the street, the adjacent motor vehicle lane should maintain a minimum 12' width.



Parking Innovation



Connected streets should consider opportunities to enable and expand new technologies. Electric vehicle charging is currently done primarily off-street, but additional on-street connections should be allowed where they can be accommodated with minimal or no public investment.

Traffic Calming Measures



Traffic calming treatments are varied treatments that slow traffic speeds with raised devices, or by visually or physically narrowing the roadway. Traffic calming treatments are essential to creating complete streets and can be used to lower travel speeds to the “target speed” rather than the design speed.

Horizontal Traffic Calming



Traffic calming treatments that use horizontal deflection are those that require horizontal travel (side-to-side) that is not typically required of vehicles.

- **Curb Extensions** refer to treatments that extend the sidewalk, narrow the roadway both visually and physically, and increase the visibility of pedestrians to drivers at intersections. They can be used to slow vehicles by reducing the turning radius, shorten pedestrian crossing distances and create more pedestrian space on sidewalks.
- **Chicanes** are a type of curb extension that slows traffic through offsetting the roadway and necessitating extra turning movements. Chicanes can be used as green spaces, rainwater gardens, bike racks, sidewalk cafes and other pedestrian realm enhancements.
- **Mid-block Neckdowns/Pinchpoints** are mid-block treatments intended to slow traffic by physically narrowing travel lanes. These curb extensions are located directly across from one another and typically extend the width of the parking lane. This treatment can facilitate mid-block crossings for pedestrians.
- **Median Islands** are treatments that slow traffic by introducing a narrowing effect of a median. These treatments can provide a visual amenity and can be used in conjunction with a crosswalk to create a pedestrian refuge when crossing wide streets.
- **Traffic Circles** are raised circular islands, placed in intersections, around which traffic circulates. They are a useful treatment for calming intersections, especially within neighborhoods where a high number of large vehicles are not present but high traffic speeds, volumes, and safety are a concern.

- **Roundabouts** can also be considered as a traffic calming treatment on streets with higher traffic volumes – see Chapter IV for additional design guidance on roundabouts.

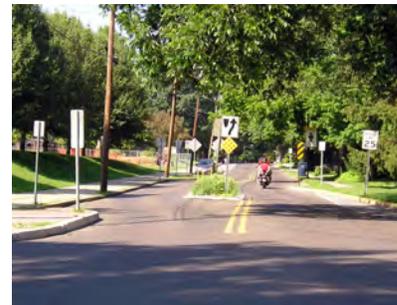
Additional horizontal traffic calming treatments are described in the City's *Traffic Calming Toolkit*. Additionally, application of some of these devices should comply with the City's Traffic Calming Policy.



Curb Extension/Bulb-out



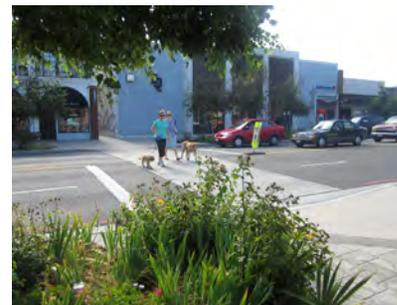
Median Island



Chicane



Traffic Circle



Mid-block Neckdowns/Pinchpoints

Vertical Traffic Calming



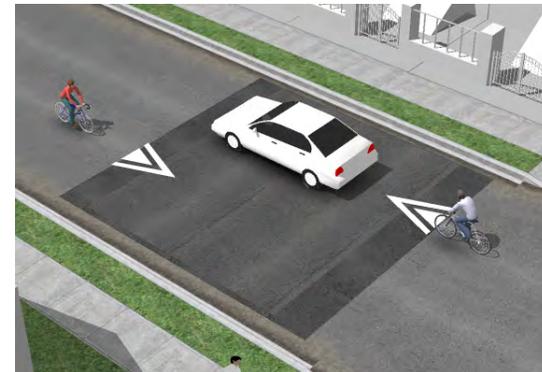
Traffic calming treatments that include vertical deflection require vertical travel of the vehicle outside of that normally required. Vertical traffic calming devices can have a more substantial speed reduction effect than horizontal measures. They include:

- **Road Humps** are rounded, raised areas placed across the roadway. They are generally 10-14' long (in the direction of travel) and 3-4" high. The profile of a road hump can be circular, parabolic, or sinusoidal. They are often tapered as they reach the curb on each end to allow unimpeded drainage. Typical road humps in the city are 12' long and 3" high.
- **Speed Tables** are treatments similar to road humps but are flat on top and raise the entire wheelbase of the vehicle.
- **Raised Crosswalks/Intersections** are similar to speed tables in design and include a crosswalk on the flat portion of the speed table. A raised intersection brings the entire intersection flush with the curb. This treatment is typically yield controlled and requires motor vehicles to enter the intersection at a reduced speed.

Vertical traffic calming devices should be considered on street types in the City, consistent with the current Traffic Calming Policy, where reducing travel speeds to achieve a given target speed is desirable. Design and construction of traffic calming devices must take into account location of the street lights to increase the devices' visibility, the underground utilities to minimize the construction costs, location of driveways, and location of traffic controls, among other factors. Implementation of traffic calming devices typically requires Fire Department coordination, and they should consider the City's current Traffic Calming Policy and the traffic calming toolkit that contains a more comprehensive list and details of traffic calming measures.



Road Hump



Speed Table

Image Credit: NACTO



Raised Crosswalk/Intersection

Image Credit: NACTO



Volume Control

Image Credit: NACTO



Traffic Calming on Emergency Access Routes

Related Traffic Calming Considerations



- Volume control measures, such as full or partial street closures, diagonal diverters and median barriers, have the effect of reducing through traffic on given streets. They can help reduce non-local traffic in neighborhoods while still maintaining local access and connections for bicyclists and pedestrians.
- Traffic calming on emergency access routes shall be designed to accommodate emergency vehicle access, but streets should be designed around the most frequent users. Example traffic calming treatments that accommodate emergency vehicles include:
 - Traffic circles with mountable rolled curbs
 - Speed cushions (or road lumps) offset for emergency vehicle wheelbase may be considered on emergency access routes
 - Mountable curbs
 - Removable and/or collapsible barriers (such as soft-hit posts)

As with vertical traffic calming measures, traffic calming on emergency access routes requires coordination with the Fire Department and should be implemented in accordance with the City's Traffic Calming Policy.

- Traffic calming through perception can also be considered to help reduce traffic speeds. Elements that visually narrow the feel of a street or lane include street trees, street furniture, landscape treatments, pavement texture, and adjacent building heights.
- Detention is the ability of hold water for a period of time to allow the water to infiltrate into soils or more slowly enter the storm drain system. This can allow a watershed to function more effectively and naturally.

Additional Complete Streets Elements

Performance Measurement

Connected streets perform well, and their performance should be measured using innovative technology where appropriate. Technology can be used to efficiently monitor system performance, such as automated bike counters and parking utilization. Travel time and speed data can be used to inform delivery of a transportation network that operates well by strategically identifying and implementing improvements. Experimentation with big data and other performance management strategies should be encouraged to promote public and private investment in mobility in the City.

Street Markings and Striping

In general, the marking and striping of complete streets should conform to guidance contained in the California Manual on Uniform Traffic Control Devices (CA MUTCD) and the California Vehicle Code (CVC). Where design detail is not included in this document, referring to relevant sections of the CA MUTCD is appropriate. Standard markings should be used to convey the intended meaning in the relevant section of the CA MUTCD. Markings that create confusion for drivers, bicyclists, or pedestrians should be removed or redesigned as soon as practicable.

However, in some circumstances, striping and marking design of people oriented complete streets may not be adequately contained within the CA MUTCD. In circumstances where specific guidance is not available from national or state documents, the designer is encouraged to utilize professional engineering judgment in including guidance from other resources such as National Association of City Transportation Officials (NACTO) and CROW (Center for Research and Contract Standardization in Civil and Traffic Engineering, The Netherlands) in order to develop appropriate treatments satisfying the City's safety, mobility, and access goals.



Median Design



The design of new or retrofitted medians is an important aspect of complete streets. Medians are defined as the area in the center part of a street between travel lanes, typically of opposite directions. Medians can be designated by striping, pavement markers, or with raised curbs or other devices.

In general, median design should be based on the following guidance:

- Installation of curbed medians with landscaping is considered the preferred complete streets approach in the City.
- Median curbs should conform to typical curb design standards. Curbs should be fully vertical with no angled tapers.
- Median curbs on most streets may not necessitate the installation of an edge stripe between the adjacent travel lane and the median curb if sufficient contrast between pavement and median curb exists (CA MUTCD guidance indicates use of an edge stripe is optional and can be omitted). Streets with target speeds of over 45 mph should have edge stripes.
- Permanent median islands should be designed to ensure adequate drainage at the crown of the street.
- Median island noses should be clearly marked to avoid vehicle collisions.
- Tapering of median noses as a design practice to accommodate large truck movements is strongly discouraged because it can reduce pedestrian refuge island space.
- Median openings should be provided at periodic intervals where crosswalk installations are appropriate. In general, streets with shorter block lengths and lower



traffic volumes should have a greater frequency of median openings. For median pedestrian crossings, see Chapter V of this document.

Cul-de-sac Design

- While cul-de-sacs are located on many existing San José streets, they are discouraged from being installed on new or reconfigured streets because they limit automobile circulation and hinder walking and biking activity.
- Cul-de-sacs, if necessary to install and where alternate through street connections are not physically possible, should be designed to accommodate fire truck turnarounds if space allows. Fire Department guidance typically states a desired radius of 48 feet. Cul-de-sac radii of less than 48 feet currently require Fire Department coordination and approval.
- Additionally, any new cul-de-sacs should not present a dead-end connection for pedestrians and bicyclists. Instead, they should provide a pedestrian and bike connection from the end of the cul-de-sac to adjacent streets or trails.

Truck Access

The movement of goods through cities is essential to support economic vitality; however, the design of complete streets focuses on the most frequent and most vulnerable users as opposed to the accommodation of the largest vehicle size. Typically, streets with heavy truck use will accommodate larger vehicles through high turn radii and wider lanes, directly affecting pedestrian exposure and crossing distances.

Designated truck routes minimize effects to the pedestrian environment as trucks and heavy vehicles can be rerouted to areas without heavy pedestrian traffic. In areas requiring truck access outside of designated routes, such as Downtown, streets should be designed for the most frequent and vulnerable users, but trucks and other heavy vehicles should be accommodated where doing so would not adversely interfere with pedestrian and bike accommodation.

Freight Loading Zones

Where possible, designated freight loading zones should be included in front of commercial uses. Loading zones minimize double parking, and time restrictions can help to limit heavy truck travel during the peak periods.



Freight Loading Zones



Driveways

Design for driveway locations on major streets (Grand Boulevards, Main Streets and City Connectors) should consider several factors. These include:

- **Pedestrian activity areas and major bike corridors:** Driveways are discouraged in areas with high pedestrian activity or with enhanced bikeway facilities. Access should be promoted via side streets or, in some instances, through shared use agreements with adjacent properties with existing driveways.
- **Limited spacing:** entrance and exit driveways should be limited to two per 300' feet in most locations, or even fewer along corridors with high pedestrian or bicycling activity, or with designated bikeways.
- **Distance from signalized intersections or roundabouts:** Driveways should be located at least 150' from signalized intersections or roundabouts, unless otherwise approved by the Department of Transportation.

Dimensions of driveways on all street types should consider the following factors:

- **Curb radius:** To minimize potential conflicts with pedestrians and bikes, most driveways should not have a curb radius, or if present, should include curbs with a radius of less than 5'.
- **Driveway entry width:** Driveway entry width will vary depending on expected driveway volume, directionality and vehicle types. General factors to be considered include:
 - Typical one-way driveway width is 12-14', though increasing this width to 16' may be appropriate if larger vehicles are expected to use the driveway.
 - Typical two-way driveway width should be 26' for multi-family housing (over 8 units) or 32' for commercial uses. Increasing these widths may be appropriate if substantially larger vehicles are expected to use the driveway.
 - Typical single family or small multi-family (8 units or less) residential driveway width is 10-12'. Wider driveways, or two-car driveways, in residential areas are discouraged due to increased exposure for pedestrians walking along adjacent sidewalks.

Rural Areas

There are some rural or undeveloped areas in the City with 2 lane streets. The following design guidance should be considered when making complete street improvements to these areas:

- As rural areas become developed, typical complete street cross sections as defined in Chapter II of this manual should be used
- Because rural areas oftentimes develop over time, interim measures may also be considered to provide multimodal access in the intervening time period prior to a full street cross section being constructed
- Rural streets and roadways should be designed for all users, including weekday travel patterns but also weekend travel that may include higher levels of recreational bike and pedestrian activity
- Green street treatments for rural areas should be considered where possible
- Shoulders should be included on high volume rural roadways, particularly those that are attractive bike routes

Railroad Crossings

Railroad crossing design should conform to the relevant sections of the CA MUTCD and Federal Railroad Administration guidelines. Where bike routes cross railroads, care should also be taken to reduce potential bike conflicts with rail tracks.



Stormwater Management through Green Street Design

During rain events in urban areas, stormwater runoff can collect pollutants, sediment, and other litter and debris which can accumulate in city drainage systems, creeks, and local aquifers, and eventually flow into the San Francisco Bay. Stormwater management can be implemented through various “green infrastructure” design elements that promote spreading of peak stormwater flows, treating it through various natural processes, and using it to irrigate landscape. Design features can be utilized to catch litter and debris and remove pollutants and sediments prior to stormwater entering the sewer or groundwater systems.

Implementing green infrastructure within the public street for stormwater management can improve water quality by natural means. This is often described as making “green streets”. Green street elements provide an additional purpose for landscape within the street and provide the added benefit of supporting economic vitality, calming traffic, complementing placemaking, and improving public health by promoting pedestrian activity.

The following is a short description of the various functions that green street elements can provide to improve stormwater quality and manage its flow:

- Infiltration is the process or rate at which water percolates into the ground. In order to select and design proper green street elements it is important to understand the ability of underlying soils to allow for infiltration – does the type of soil and the hydrology allow water to percolate and is there contamination or other factors that make infiltration impractical.
- Detention is the ability to hold water for a period of time to allow the water to infiltrate into soils or more slowly enter the storm drain system. This can allow a watershed to function more effectively and naturally.
- Bioretention is the ability of plants and soils to slow and reduce peak stormwater flow through the natural processes. Plants can take up stormwater through their roots and transpire it into the atmosphere while soils have the ability to be saturated and allow the water to evaporate into the atmosphere, infiltrate into the ground water system, or flow through constructed underdrains into the stormwater system.
- Solid (particulate) matter and pollutants can be removed from stormwater by use of rocks, gravel, and the structure of plants or other constructed elements, such as grates. These elements should be design to allow for ease of maintenance. Soluble pollutants may be absorbed by plant roots and, in some cases, be filtered and processed by soil and microbes.

The following pages describe green infrastructure elements that should be considered and incorporated into the complete street design process. These elements can be effective at managing stormwater in accordance with federal and state requirements.

Green infrastructure and stormwater elements shown on the following pages are treatment control measures intended to depict options for treating runoffs within the public right of way. It is important to distinguish maintenance responsibilities for elements that treat runoffs from the roadway surfaces versus enhanced sidewalk surfaces. Enhanced sidewalk surfaces, which do not treat roadway surface runoffs, such as permeable pavers, are required to be maintained by adjacent private property owners per the City’s municipal code.

Green Infrastructure Elements



Rain Gardens



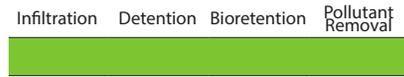
Parkstrip Bioretention



Applicability



Function



Design Implementation

- Typically larger landscaped areas, but can vary widely in size
- Can be vegetated or xeriscaped
- Flexible shape and size allows use of rain gardens in wide range of applications

- Are linear and are well-suited for locations along streets
- Can vary significantly in width but are not as effective when narrower
- Should be landscaped with non-floatable, aged mulch

Considerations

- Mimic natural hydrology by infiltrating and evapotranspiring runoff
- Collect and absorb runoff from sidewalks, parking lots, and streets
- Capable of holding larger volumes of water
- Can have a more “natural” look and feel
- Are more flexible in layout and overall design

- Can slow, infiltrate, and filter stormwater and associated debris, sediment, and pollution
- The most commonly-known and accepted green street element
- Provide treatment and retention while conveying stormwater from one location to another
- Maybe less applicable in more urban areas, such as where space is constrained or in heavily-trafficked sidewalks and plazas
- Where adjacent to active on-street parking, provide hard paved strip in curb zone for passengers to access cars

Combination Options

Corner bulb-outs /curb extensions, parkstrip bioretention, trees and plantings; can be “porkchop” islands at channelized right turns

Rain gardens, bulb-outs /curb extensions, trees and plantings

Alternatives

Parkstrip Bioretention

Implementation Cost

\$

\$

Maintenance Cost

\$

\$

Key: Generally applicable/primary function Sometimes applicable/secondary function Does not apply

Green Infrastructure Elements



Infiltration and Flow-Through Planters



Stormwater Tree Wells



Source: City of Philadelphia

	Travel Lane	Median/Planter	Parking Lane	Curb Extension	Sidewalk Area
Applicability		█	█	█	█
Function		█	█	█	█
Design Implementation		<ul style="list-style-type: none"> Rock-filled element with no outlet that receives stormwater runoff Depending on soil conditions, permeability and other conditions, such as soil or ground water contamination, it may not be appropriate to infiltrate stormwater into surrounding subsoils; in these cases, an underdrain should be used and be connected to a storm sewer. 			
Considerations		<ul style="list-style-type: none"> Can be applied in areas with soils that do not percolate well Primary pollutant-removal mechanism is filtering through the soil 			<ul style="list-style-type: none"> An individual tree planted in a tree well designed for stormwater to drain from the street into the planter Depending upon soil conditions and design water may infiltrate into native soils or an underdrain; alternatively excess water may flow back along curb line to a storm drain If an underdrain is needed and feasible, a stormwater tree may be "linked" to adjacent trees, see Tree Wells – Linked Where street width is constrained Stormwater Trees can be placed intermittently in the parking lane to provide a limited green infrastructure benefit Individual trees do not typically provide enough capacity to meet C3 stormwater treatment requirements (governing stormwater flow and pollutants) without being combined with other green street features
Combination Options		Parkstrip bioretention, trees and plantings			<ul style="list-style-type: none"> Combine individual stormwater trees with an underdrain to create a linked tree well system, see linked tree wells Combine with green gutters in constrained situations
Alternatives		Parkstrip bioretention, green gutter			Green gutter
Implementation Cost		\$ - \$\$			\$
Maintenance Cost		\$			\$

Key: █ Generally applicable/primary function █ Sometimes applicable/secondary function □ Does not apply

Green Infrastructure Elements



Green Gutters



Photo credit: Kevin Robert Perry

Travel Lane Median/Planter Parking Lane Curb Extension Sidewalk Area

Tree Wells - Linked



Travel Lane Median/Planter Parking Lane Curb Extension Sidewalk Area

Applicability



Function



Design Implementation

- Flush and typically flat-bottomed landscaped area between the curb and adjacent travel lane or bike lane
- May or may not have a vertical curb between landscape area and the roadway

- An individual tree planted in a tree well designed for stormwater to drain from the street into the planter
- Depending upon soil conditions and design water may infiltrate into native soils or an underdrain; alternatively excess water may flow back along curb line to a storm drain

Considerations

- Appropriate only in retrofit of a street with existing curbs and no on-street parking
- Most appropriate where excessively wide curbside lanes or excessive space is available and it is not feasible to move the curb or build curb extensions that can provide space of other green infrastructure elements
- Typically do not provide enough capacity to meet C3 stormwater treatment requirements without being combined with other green street features

- If an underdrain is needed and feasible, a stormwater tree may be "linked" to adjacent trees
- Where street width is constrained Stormwater Trees can be placed intermittently in the parking lane to provide a limited green infrastructure benefit
- Individual trees do not typically provide enough capacity to meet C3 stormwater treatment requirements without being combined with other green street features

Combination Options

- Can be combined with most other green street features
- Most appropriate to combine with other lower cost treatments, such as Stormwater Tree Wells

- Combine individual stormwater trees with an underdrain to create a linked tree well system, see linked tree wells
- Combine with green gutters in constrained situations

Alternatives

- Where space is not available between the curbs space and budget is limited, space may be available in the sidewalk area for
 - Stormwater trees
 - Trees
 - Understory landscaping

- Linked tree wells
- Infiltration and flow through planters
- Trees and understory landscaping

Implementation Cost

\$

\$ - \$\$

Maintenance Cost

\$

\$

Key: Generally applicable/primary function Sometimes applicable/secondary function Does not apply

Green Infrastructure Elements



Permeable Paving



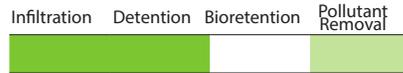
Trees



Applicability



Function



Design Implementation

- Can be constructed from pervious concrete, porous asphalt, permeable interlocking pavers, and other materials

- Where space and soil conditions permit, trees can be incorporated with other green infrastructure elements such as parkstrip bioretention and infiltration trenches/basins/rain gardens
- Careful considerations can be taken to preserve and integrate existing trees to new designs

Considerations

- A relatively cost-effective stormwater management solution
- Infiltrate, treat, and can store stormwater where it falls

- Contribute to slowing, absorbing, and filtering stormwater
- Counteract Heat Island Effect by providing natural cooling benefits
- Contribute to air quality by removing air pollutants and producing oxygen
- Provide economic benefits; mature trees have been shown to increase real estate values and encourage pedestrian activity

Combination Options

On-street parking, infiltration basins/trenches/tree wells

Rain gardens, parkstrip bioretention, bus bulb-outs and curb extensions, infiltration basins/trenches/tree wells

Alternatives

Green gutter

Green gutter

Implementation Cost

\$ - \$\$

\$

Maintenance Cost

\$

\$

Key: Generally applicable/primary function Sometimes applicable/secondary function Does not apply

Green Infrastructure Elements



Understory Planting

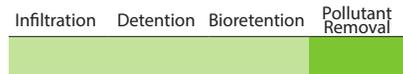


Travel Lane Median/Planter Parking Lane Curb Extension Sidewalk Area

Applicability



Function



Design Implementation

- Can be combined with other green infrastructure elements
- Add to aesthetic and ecological value of streetscapes
- Can contribute to placemaking enhancements
- Should complement tree plantings where applicable

Considerations

- Contribute to the reduction of impervious areas and surface runoff
- Treat stormwater through natural biofiltration processes

Combination Options

Rain gardens, parkstrip bioretention

Alternatives

Xeriscaping (drought tolerant landscaping)

Implementation Cost

\$

Maintenance Cost

\$

Key: Generally applicable/primary function Sometimes applicable/secondary function Does not apply

Asbury St

The Alameda

IV. COMPLETE INTERSECTIONS

Intersection Design Principles

Intersections are where people going different directions cross paths. They are where travel routes may change direction, and they can be centers of activity where street life is most active and vibrant. However, intersections are also oftentimes the least safe location in the transportation system, and they are where travelers are frequently delayed and inconvenienced. As a result, strategies to make intersections people-oriented, connected, and resilient can be profoundly effective in creating complete streets in San José. Designing complete intersections means that they should be:

Guiding Principles

People-Oriented



Complete intersections should be designed first and foremost for people. Traditionally, intersection design has typically focused on only one performance metric – the average delay an automobile experiences waiting at an intersection. This metric is termed Level of Service (LOS). The effect of designing solely for this metric is that many intersections are created to be unnecessarily large and unfriendly toward anyone not in an automobile. Complete intersections recognize that no single metric can adequately describe the way an intersection should function. As a result, these standards and guidelines support designing intersections in a way that recognizes and promotes the needs of all travelers. This means intersections should be multimodal in nature, and they should be evaluated based on metrics such as person delay, safety, and placemaking. This methodology is consistent with recently adopted City policy allowing a new metric, Vehicle Miles Travelled (VMT) to be the methodology used to measure traffic impact versus traditional methods.

Connected



Complete intersections are connected intersections. This means they are connected to many other nearby places in the transportation network, and it means that access to and from surrounding land uses is easy and convenient. The use of innovative technology can be particularly effective at intersections as well, from providing information to travelers to designing innovative treatments to promote pedestrian and bicyclist safety.

Resilient



Complete intersections are resilient. They are developed with sustainable green streets measures, and they are designed to achieve the best air quality and healthiest environment possible. They are also designed to be flexible to accommodate ever-changing travel patterns, by promoting shared space and allowing for the installation of non-permanent uses such as parklets and plazas, where appropriate.

Multimodal Intersections

Intersections represent the confluence of various travel modes: pedestrians, bicyclists, automobiles, commercial vehicles, and transit vehicles. As the travel speeds and visibility of these modes can vary significantly, design towards safety is of the utmost importance at intersections.

Complete intersections are intersections that have a multimodal function and design. Elements such as median refuges and curb ramps are specifically tailored to prioritize pedestrian safety, while elements such as curb radii and corner bulb-outs have safety benefits for pedestrians, vehicles, transit vehicles, and bicyclists.

Refer to Chapter VI, Bike Design, for more detailed information about bike facilities at intersections.

In addition to design treatments, multimodal intersections also can have specialized performance measures that prioritize the movement of people. As noted above, complete intersections should not focus on a single metric to describe the way an intersection should function. Instead, in order to design intersections to promote the needs of all travelers, they should be evaluated using metrics such as:

- Person delay, during peak and off-peak travel periods
- Reduction in vehicle miles traveled (VMT)
- Safety, or minimizing exposure to high risk conditions
- Placemaking, or promoting a higher quality street environment
- Transportation network capacity and efficiency

Placemaking at Intersections

Placemaking is essential to complete intersections. The following key intersection features should be considered as a way to promote placemaking at intersections. In addition to those features described below, additional pilot treatments should also be considered throughout the City as innovative ways to improve the quality of the street environment.

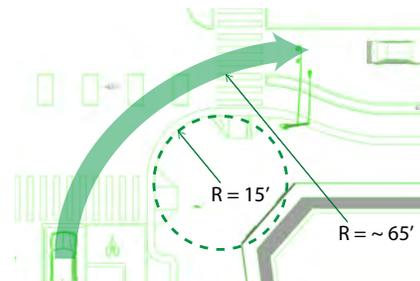
Intersection Corner Treatments

Curb Radii

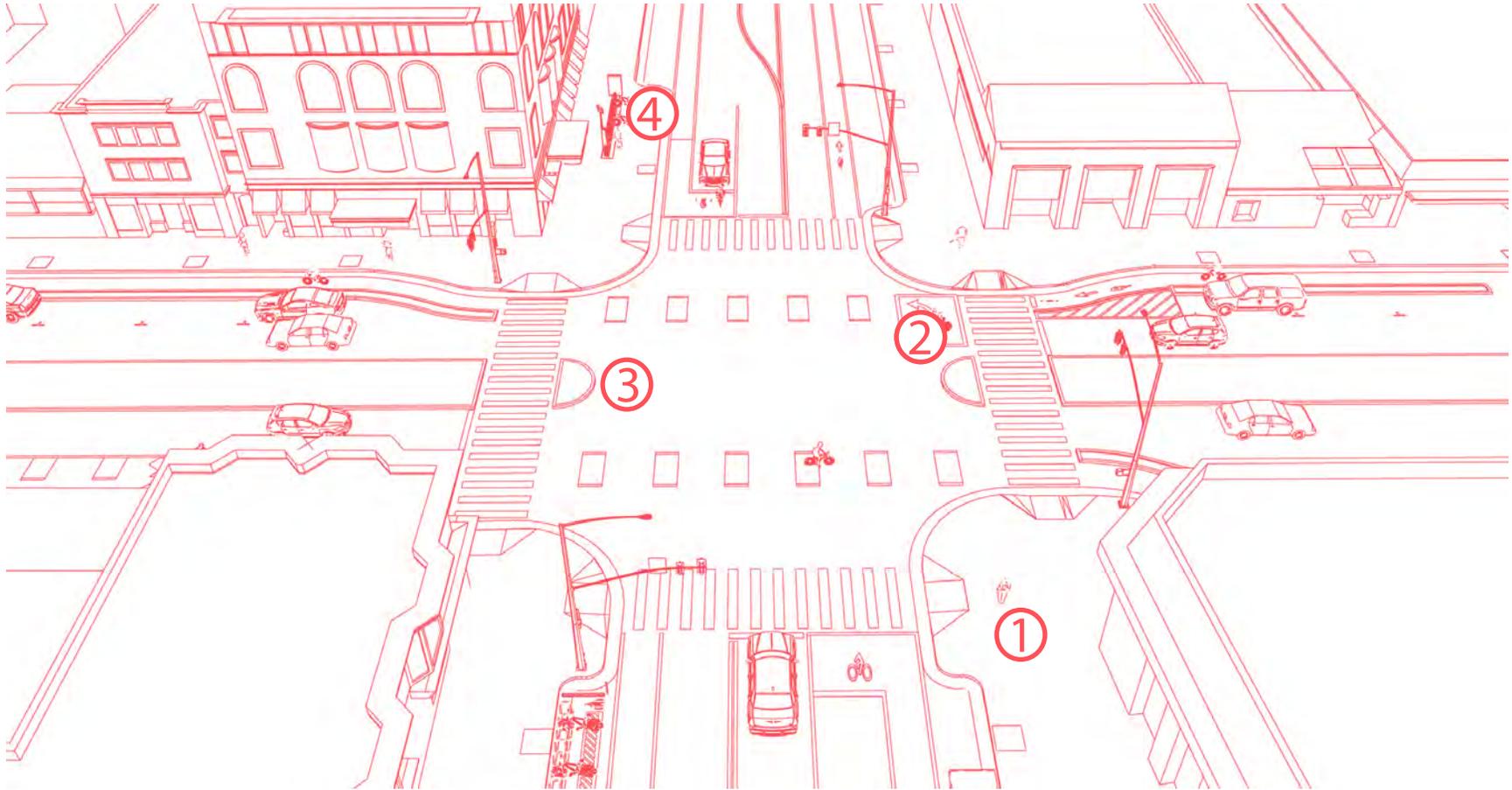


The design of curb radii can directly impact the visibility of pedestrians, the speed of turning vehicles, and the length of pedestrian crossing distances. Larger curb radii increase vehicle speeds, increase crossing distances and limit visibility; smaller curb radii are therefore preferred in urban settings and typically should not exceed 15', however careful attention should be given by the designer to allow for fire apparatus and large trucks to maneuver safely. It should be noted that an additional "effective" curb radius must be considered. The existence of parking and bike lanes leads drivers to take a wider radius during turns than the actual curb-return radius.¹

The following guidelines should be used for considering the appropriate curb return radii at intersections:



¹ For further guidance on curb radii, see the Institute of Transportation Engineers' *Designing Walkable Urban Thoroughfares: A Context Sensitive Approach*.



- ① Corner Bulb-outs
- ② Curb Ramps
- ③ Median Refuges
- ④ Transit Stops

Curb Radius of 5 to 15 Feet Should be Used Where:	Curb Radii May be Larger Where:
<ul style="list-style-type: none"> • High pedestrian volumes are present or reasonably anticipated • The width of the receiving intersection approach can accommodate a turning passenger vehicle without substantial encroachment into the opposing lane (some encroachment may be acceptable on moderate to low volume streets) • Large vehicles constitute a very low proportion of the turning vehicles • Bike and parking lanes create additional space to accommodate the “effective” turning radius of vehicles • Low turning speeds are required or desired 	<ul style="list-style-type: none"> • Occasional encroachment of a turning bus, school bus, moving van, fire truck, or oversized delivery truck into the opposing lane is not acceptable • Curb extensions are proposed to be added in the future • Receiving street does not have parking or bike lanes and the receiving lane is less than 11’ wide, excluding gutter pan width.

Source: Adapted from ITE/CNU Designing Walkable Urban Thoroughfares Manual



Corner Bulb-outs ①

Bulb-outs, also known as curb extensions, extend the sidewalk space into the area of the roadway that is occupied by the parking lane away from the corner. This shortens pedestrian crossing distances at intersections. Bulb-outs therefore increase pedestrian visibility and slow down turning vehicular traffic. Corner bulb-outs, when combined with smaller curb radii, provide additional space to facilitate use of directional curb ramps that are aligned with the crosswalk.

Stormwater infrastructure can be included in the bulb-out design in many cases. Existing street drainage patterns often bring stormwater to a drain inlet near a corner, and this helps facilitate the effectiveness of a rain garden within a bulb-out. Landscape planters, tree wells, French drains, and other elements can be installed where appropriate to help resolve storm drain relocation.

See the following discussion of transit stops for more information about bulb-outs and integration of transit facilities.



Curb Ramps ②

Curb ramps should be present at all intersections, excluding raised crosswalks, and be designed to minimize conflicts with vehicles. Paired directional ramps rather than a single diagonal ramp are preferred at each corner of an intersection. Space does not always exist to provide directional ramps or they may result in the crosswalk shifting back along the throat of the intersecting street too far and adversely impacting sight lines at the intersection. Truncated domes are required and serve to alert the visually impaired of the approach of the adjacent crosswalk and traffic in the roadway.

Sidewalks

Sidewalks approaching intersections and at intersection corners should be designed to avoid pooling water during rain events. Designs should avoid conflicts with obstacles in the Through Zone described in Chapters II and V. Street furniture, traffic control devices, retail displays, and stormwater management features must be located outside of the Through Zone. Tripping hazards such as uneven sidewalks and low planters should be addressed during sidewalk redesign and construction. The Through Zone should be continuous across driveways and meet all of the standards and guidelines above.

Accessibility

To increase the usability of streets for all users, including people with disabilities, seniors, and parents with strollers or young children, a clear and accessible path of travel free of barriers and obstructions is encouraged.

The Federal Americans with Disabilities Act (ADA) provides guidelines for accessibility of elements, such as sidewalks and curb ramps.

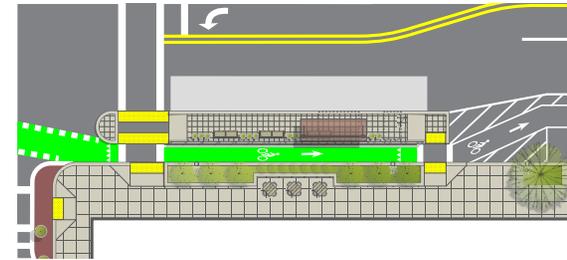
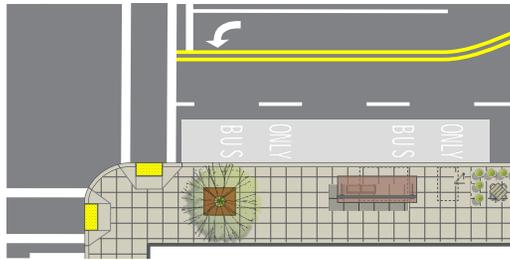
Median Refuges ③



For wider street types that can accommodate center medians, median refuges can be placed to allow pedestrian crossings to occur in two stages if necessary (typically at uncontrolled crossings). This allows pedestrians to concentrate on one direction of moving traffic at a time. Curb ramps can be positioned as appropriate in order to facilitate movement for pedestrians who might need use of those facilities.

Median refuge islands can be used at crossings to reduce pedestrian exposure. Refuge islands should include vertical curbs and can include bollards, plantings, and other protective treatments. A cut through area should be provided for pedestrian access through the island and should be as wide as the crosswalk where possible. The typical minimum width for an island is 6' in order to accommodate strollers and wheelchairs.





Transit Stops ④



Transit stops are integral to the “last mile” concept of transit service—street designs shall consider a transit rider’s total trip from start to finish, including the portion that is completed by other modes. Overall, the design of transit stops shall enhance the environment for pedestrians waiting to board. Additionally, transit stops shall be integrated with the local pedestrian and bike network to provide connections to residences, workplaces, and other destinations. Other streetscape elements and pedestrian facilities shall be designed to support transit operations where available.

Wherever possible, transit stops should be located at the far side of intersections in order to ensure efficient transit operation. Pedestrian boardings and alightings can also be made with greater efficiency and with a higher degree of pedestrian visibility because the crosswalk is located behind the bus.

Transit Bulb-Outs



Transit bulb-outs are a variation of corner bulb-outs that are extended in length along the curb to accommodate a clear curb space for buses to stop and allow riders to board and alight. The length of the bulb-out depends upon the number and length of buses that would typically serve a stop at one time. Transit bulb-outs reduce the time required to serve a bus stop and provide more room for transit rider amenities such as shelters, benches, and trash receptacles while creating more space in the Through Zone. As with typical corner bulb-outs, transit bulb-outs reduce pedestrian crossing distance where they are aligned with crosswalks. Transit bulb-outs result in the bus stopping in a traffic lane which makes it easier for the bus to re-enter traffic flow. This improves transit travel time and can help achieve schedule adherence. Buses stopped at bulb-outs can calm vehicle speeds but also restrict traffic flow. Care should be taken if considering bus bulb-outs on streets with peak traffic volumes of 400 or more vehicles per hour in the outside lane.

Transit Islands



Transit islands are similar to transit bulb-outs as they place the bus stop adjacent to or within the travel lane at a roughly 9-foot wide “platform” or island similar to a bulb-out, but separated from the sidewalk. The length depends upon the number and length of buses that would typically serve a stop at the same time. The separation of the island from the sidewalk provides space along the existing curb to allow bikes to continue in a dedicated lane behind the bus stop, eliminating the bus-bike conflicts that often occur at bus stop locations on busy bus and/or cycling streets. See the section at the end of this chapter for additional detail on bus-bike conflicts.

Transit islands provide room for more amenities at bus stops such as shelters, planters, benches, leaning bars, and a protective railing adjacent to the bike lane. Separating the bus facility from the sidewalk in turn frees up space on the sidewalk for landscaping, including stormwater planters and café seating or other streetscape elements. These facilities can be implemented on a pilot basis using temporary treatments, such as painted bulb-outs and temporary rubber curbs.

Parklets ⑥

A parklet is a publicly-accessible open space intended to add vitality to the public realm. It repurposes part of the street, commonly a parking stall or lane, into a public space. The City of San José was one of the first cities in the United States to install parklets. Parklets repurpose parking spaces to create a hub of vitality along the street.

While a parking spaces are between 7-10' wide, the number of parking stalls reclaimed can create a significant area for a variety of activities. For example, Powell Street Promenade in San Francisco, incorporates benches and cafe tables as part of its design. Other parklets have provided space for public art and local community interactions.

Like paint and planter bulb-outs, parklets can be temporary solutions before more permanent street reconfiguration.

Some transit agencies have been studying the potential for adapting the parklet concept for use in creating lower-cost and interim transit bulb-outs or transit islands.

San José's Parklet Program is administered by the Department of Public Works.



Intersection Geometry

Intersection geometry, as discussed in this section, includes treatments for utilizing poorly used spaces in existing intersections to safely and efficiently accommodate all users. Unused or unnecessary space within intersections, such as wide lane widths and “porkchop” pedestrian islands, should be minimized. Compact intersections reduce driver speeds, increase visibility between drivers and other users, and minimize intersection crossing times for pedestrians and bicyclists. Overall, intersections should be designed as part of an entire network to provide flexibility when considering changes in signal timing, traffic volumes and capacity.

Intersections are crucial locations to reinforce appropriate speeds established along street corridors. Historically, emphasis on efficient vehicle travel encouraged speeding since street design has been traditionally based on the 85th percentile speed of a vehicle on a street and not a roadway target speed methodology.

These standards and guidelines change the past methodologies of considering street design: complete streets and intersections should be designed according to the target speed – the speed at which engineers determine vehicles should operate to ensure the safety of all users. Target speeds should become the operating speed once design measures to reduce speed have been put in place.

Because prevailing automobile traffic speeds are directly related to the severity of crashes, the target speed should be set to decrease the risk of fatality or injury along streets as well as at intersections.



20-25 mph



30-35 mph



40+ mph

Retrofitting Intersections

Intersections in San José can also be retrofitted to create or improve their sense of place. Many intersections today have expansive footprints, including wide lanes, “porkchop” islands and large curb radii that encourage high speeds. These intersections are missed placemaking opportunities, and several strategies should be considered when nearby land use development occurs or when streetscapes are being designed. Compact intersections can be created even when it may not be possible to retrofit an entire corridor. Strategies to promote placemaking through retrofits should primarily seek to make intersections attractive places to spend time. This can be done by:

- Removing porkchop islands and replacing intersection corners with small radius curbs or pedestrian bulb-outs
- Where additional space is no longer needed for large porkchop islands or excessive curb radii, space should not remain unused – possibilities include selling the additional space to adjacent landowners or turning it into public plaza or parklet space
- Where it is not desirable or feasible to move curbs and reconfigure drainage, interim compact intersection treatments should be employed, as described earlier in this chapter
- Adding landscaping or green streets treatments

Target Design Speeds and Design Vehicles

Target design speeds at intersections should generally be determined based on the most vulnerable user of the street. Higher vehicle speeds necessitate wider lanes and larger corner radii, which can degrade the pedestrian environment. Intersection corners should be designed to accommodate slow speed turns – generally 5-8 mph turns for design vehicles and 3-5 mph turns for control vehicles.

Design Vehicle

Design vehicles are historically selected based on the largest vehicle likely to use a given facility. Because large vehicles make wide turns, larger design vehicles increase curb radii, extending crossing distances for pedestrians.

Instead, the design vehicle should be determined by the most frequent larger vehicle, and vulnerable users of the space should be considered.

Control Vehicle

Options for making narrower streets accommodate turning movements of control vehicles include:

- Advanced stop bars on receiving street to allow for turning traffic to partially and temporarily use opposite lane
- Removal of parking close to corner

Street Context	Design Vehicle Length
Downtown	30' (small truck) or 40' (bus) at intersections with turning buses
Urban Village	30' (small truck) or 40' (bus) at intersections with turning buses
Transit Employment Center	30' (small truck) or 40' (bus) at intersections with turning buses
Transit Residential	30' (small truck) or 40' (bus) at intersections with turning buses
Commercial	30' (small truck) or 40' (bus) at intersections with turning buses
Industrial	50' (Semi-Truck)
Primary Truck Routes	50' (Semi-Truck) except on Grand Boulevard Corridors where 30- 40' design vehicle length should be used

Notes: In certain circumstances, such as narrow streets or where safety will not be compromised, buses may be permitted use of the full intersection when turning, which assumes bus would turn across center line. Design vehicle selection should also consider emergency access routes and accommodation of fire trucks as either a design vehicle or control vehicle, as appropriate.



Corner and Ramp Geometry



Corners are key points of intersections that affect both vehicle speed and pedestrian crossing distances. Corners should be extended where feasible to reduce turning radii, therefore slowing vehicle speeds and decreasing pedestrian crossing distances. Extended corners also improve sight lines between pedestrians and vehicles. Corner bulb-outs or curb extensions should be employed in areas where pedestrian travel is encouraged while still balancing the needs of vehicles. Curb extensions are typically the width of a parked car (about 6-7'). All curb extensions should include ADA-accessible curb ramps.

Curb ramps should be used at all intersections to ensure a smooth transition for pedestrians from the sidewalk into the intersection and to comply with ADA. Directional curb ramps (typically two ramps at each corner) should be used to provide a direct path of travel from the sidewalk to/from the crosswalk and provide a clear guidance for visually impaired pedestrians. All places of transition from a pedestrian zone to a street crossing, including curb ramps, must include ADA compliant warning devices and should be a minimum of 4' wide. Additional guidance on curb ramps is included in Chapter V.

Marked Crosswalk Design and Placement



The primary use of marked crosswalks is to promote the safety of pedestrians crossing a street. Well-designed crosswalks are key to creating a city with a vibrant, connected pedestrian realm. This section discusses marked crosswalk design and placement within intersections; more specific striping information can be found in Chapter V.

Crosswalks legally exist at every corner of an intersection as the extension of sidewalks, regardless of whether they are marked or unmarked. Unmarked crosswalks follow the pedestrian path from one side of the street to the other. Markings should be used to identify and enhance crosswalks within intersections. Crosswalks should be aligned with pedestrian paths of travel to denote desired pedestrian crossing locations to pedestrians and drivers. The entry to all crosswalks should have directional, ADA accessible curb ramps, and crosswalks should be approximately double the width of the pedestrian through zone, with a minimum width of 12' between outer edges of striping.

- Crosswalks at intersections should be marked at all legs of signal-control and, if deemed appropriate, at stop-controlled and uncontrolled intersections. All crosswalks should be designed to reduce pedestrian exposure or the distance pedestrians must travel across the street. Specific direction on striping and complementary treatments can be found in Chapter V.
- Midblock crossings may be considered at locations with pedestrian demand, such as transit stops, schools, and other popular destinations. Midblock crossings should be considered where the nearest pedestrian crossing is more than 300 feet away from other marked crosswalks.
- Enhanced crosswalk striping such as ladder or continental striping should be combined with advanced yield lines on multi-lane streets at least 20' in advance of the crosswalk and include appropriate signage. Specific direction on striping and complementary treatments can be found in Chapter V. Pedestrian safety measures to improve visibility, such as striping, stencils, street prints, and color should also be considered to improve street crossings in high pedestrian demand or safety priority areas.

Intersection Controls

Intersections are controlled in a variety of ways – through signals, by stop signs, and by roundabouts. Each type of control presents unique challenges and opportunities for creating complete intersections.

Signalized Intersections



Signal Timing at Complete Intersections

Traffic signals must serve both operational efficiency and safety. They should be proactively operated and maintained to reduce congestion and fuel consumption, which ultimately improves quality life and the air we breathe. A good signal timing plan allocates time appropriately based on the demand at the intersection and keeps cycle lengths to a minimum. It also provides adequate or comfortable pedestrian and bicyclist crossing time to promote non-vehicle travel.

A properly designed signal also contributes to the orderly and efficient movement of people. Signalizing turning movements where a high turning volume or multiple turning lanes exist can eliminate pedestrian-vehicle conflict. A leading pedestrian interval, or LPI, give pedestrians a walk signal 3-5 seconds before the corresponding green signal occurs. LPIs can be used at intersections with heavy turning and pedestrian volumes to increase visibility of pedestrians in an intersection by allowing them to enter the crosswalk before the turning traffic receives a green.



Bike Corridors: Signalized intersections should include detection for bicyclists to facilitate safe, comfortable, and convenient crossings at intersections for bicyclists while also minimizing delay. Signal timing should consider strategies such as a leading bike interval to maximize visibility and reduce conflicts between modes, or coordination for vehicle progression that also supports efficient bike travel. Signal timing would also need to consider unique operating characteristics of bikes, transit, and pedestrian travels within the corridor, as well as cross-corridor operational strategies.

Pedestrian Travel: Pedestrian signal timing should consider generators and destinations. Where the signalized intersection is near a school or a senior center, a slower walking rate should be considered. Automated pedestrian detection technology can be used to extend walking time as needed at wider crossings to accommodate slower travelers.



Roundabouts



To reduce speeds as well as delay for all modes, roundabouts should be considered where appropriate. Roundabouts improve intersection safety by separating pedestrian-vehicle conflict points from vehicle-vehicle conflict points, reduce the total number of conflict points, and reduce vehicle speeds through the intersection. Splitter islands leading into the roundabout allow pedestrians to cross a single lane of traffic at a time. At intersections where roundabouts are employed, crosswalks should be marked and sharrows should be used to denote a shared vehicle and bike space (See Chapter VI for additional details).

Because roundabouts require pedestrians to divert from their path of travel to reach the crosswalks, pedestrian desire lines should be considered when determining if a roundabout is appropriate. Additionally, while single-lane roundabouts have many advantages, multi-lane roundabouts present additional challenges for bicyclists and pedestrians and should only be considered where bike and pedestrian movements can be effectively accommodated.

Additional design detail on roundabouts is provided in *Roundabouts: An Informational Guide, Second Edition (2010)*.²

² Found at: http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp_rpt_672.pdf

Bike and Transit



Intersection Accommodations

Intersections are critical locations for the convergence of bike and transit traffic. While additional detail on bike accommodations is included in Chapter VI, the following treatments may be considered at intersections (and along street corridors where appropriate) to support a well-integrated bike and transit network.

- Cycle Tracks and Bus Stops:** This treatment includes a cycle track treatment adjacent to the bus loading island at an intersection. This would then transition to a buffered or standard bike lane after the intersection. This treatment separates bike traffic from bus traffic and accommodates pedestrian traffic across the bike lane to the bus island. The cycle track behind the stop can be colored green to differentiate the bikeway from the sidewalk and transit island, while railing, benches, shelter and planters can be used on the island and adjacent sidewalk to facilitate safe and convenient pedestrian access to transit islands. The stops are typically provided with two ADA-accessible curb ramps. One of the access points is typically aligned with a crosswalk and protected with a median nose, which effectively creates a bulb-out and significantly shortens the roadway crossing distance for pedestrians. A second access point is provided at the far end of the transit island. Yield markings in the path of bicyclists and crosswalk striping, as well as posted "Bikes Yield to Pedestrians" signs, indicate to bicyclists that pedestrians have right-of-way.
- Bike Lanes and Bus Lanes:** This treatment includes a separate standard bike lane and bus only lane. A mixing zone is indicated with dashed green striping through the area where buses will cross through the bike lane to access the dedicated bus lane and bus stop.
- Bike Lane and Bus Stop – Separate Bike Lane:** This treatment includes a separate standard bike lane. A mixing zone is indicated through dashed green striping through the area where buses will cross through the bike lane to access the dedicated bus lane and bus stop.



Cycle Track and Bus Stop



Bike Lane and Bus Stop - Separate Bike Lane

- Bike Lane and Bus Stop – Shared Bike Lane:** This treatment is a shared bus and bike only lane indicated through pavement markings. Based on existing shared lanes of this nature, the lane should be between 10-14' wide.³

³ A Summary of Design, Policies and Operational Characteristics for Shared Bike/Bus Lanes, prepared by: The University of South Florida Center for Urban Transportation Research; Prepared for the Florida Department of Transportation Research Center

1 HOUR
PARKING
9 A.M. - 6 P.M.

Post St

DOWNTOWN PARKING

Convention Center

4th / San Fernando

San Antonio Parking Info C

1 HOUR
PARKING
9 A.M. - 6 P.M.

LEGADO
COURT

Handicap Accessible



V. SIDEWALKS AND WALKING



Sidewalk Design Principles

Historically, streets have served a multimodal purpose, with walking being the primary mode of travel. The introduction of motor vehicles in the Twentieth Century shifted the primary emphasis to the automobile. The guiding principles of this document encourage a return to a multimodal street emphasis. The City of San José has identified the design of streetscapes for people as a major strategy and has committed to additional design strategies that promote increased walking.

This chapter focuses on the design of the pedestrian realm, commonly referred to as sidewalks. Street crossings, or crosswalks, are also discussed.

All users of streets, including automobile drivers and transit users, are pedestrians at some point in their journey, and origin points and final destinations are commonly accessed using sidewalks. The ubiquity of, and familiarity with, these public spaces warrants careful design and attention, especially as sidewalks are a key element of Complete Streets design.

Sidewalk design principles support the City's Complete Streets Vision in the following ways:



Sidewalk in front of the SoFA Market

Guiding Principles

People-Oriented



All people are pedestrians, and no matter what transportation mode type is utilized, people will use sidewalks at some portion of their journey. Sidewalks shall be people-oriented and, to the extent possible, promote walking. Inviting elements such as seating and street trees, and safety elements such as crosswalks and appropriately-scaled lighting, all encourage sidewalk use and bring a sense of vibrancy to the pedestrian realm.

Connected



Pedestrian travel naturally lends itself to a connected network of accessible spaces, and people tend to prefer the path of least resistance. Pedestrians will even form their own paths where none exist: the “desire lines” through vacant lots, or shortcuts through parking lots and private spaces, demonstrate the need for a continuous, connected pedestrian realm. Well-designed public sidewalks should therefore take connectivity and ease of travel into account in their design. Sidewalks should be connected to other modes of travel as well: a well-designed sidewalk should serve as a comfortable waiting environment for transit vehicles and should serve as a conduit to bike or automobile parking spaces.

Resilient



The width of the sidewalk should allow for “green” design features that promote the environment and actively incorporate natural elements to serve a stormwater management function. These green infrastructure elements can remove pollutants from stormwater runoff, improve air quality through oxygen generation and the removal of airborne particulate matter, and provide shade for comfort while helping to alleviate the heat-island effect from paved urban areas. The presence of these environmentally-oriented and pedestrian-serving elements encourage walking and can contribute to a healthier and more sustainable and resilient population and environment.

Pedestrian Routes & Networks

A continuous pedestrian network is comprised of a series of walkways with minimal barriers and interruptions along the path of travel, is intuitive and easy to navigate, and feels safe and comfortable to walk along.

Pedestrian networks can be characterized by a formal network of streets that are delineated using signs and wayfinding maps, but they can also be less formal, for example, as in a pedestrian’s path to and from places of work, shopping, or leisure activities that do not always fit within prescribed paths. In order to maximize connectivity, and to ensure seamless transitions between travel modes, pedestrian networks should fit within the larger transportation network.

Developing pedestrian networks can involve identifying and prioritizing areas of high population densities and job densities, commercial or retail densities, and proximity to transit and public spaces. Visual elements such as pedestrian and transit signs can inform pedestrians of the presence of these networks and promote their usage. Additional placemaking elements such as kiosks, gateway markers, or even unique lighting elements (discussed later in this chapter) can also contribute to the development of these networks.

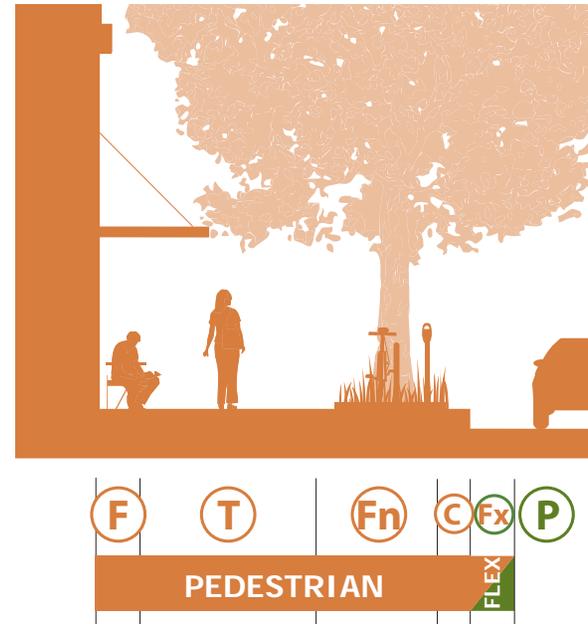
At intersections, elements that shorten crossing distances and enhance pedestrian safety help ensure the continuous nature of these networks. See Chapter IV for more detail on the design of Complete Intersections.

The City of San José’s *Downtown Streetscape Master Plan* provides additional guidance on identified pedestrian networks in the downtown area.

Sidewalk Zones and Placemaking



As described in Chapter III, the term “sidewalk” can have a variety of meanings. For the purposes of these standards and guidelines, a sidewalk is comprised of several zones which serve different functions for pedestrian activity. Places where people shift between being pedestrians and using another mode also occur within or adjacent to the sidewalk, such as loading zones, transit stops, bike parking, and on-street parking. As introduced in Chapter II, sidewalk zones include the Frontage Zone (F), Through Zone (T), Furnishing Zone (Fn), Curb Zone (C). As also introduced in Chapter II, the Flex Zone (Fx) may be reallocated to become part of the sidewalk. This section focuses on the details of design in these zones, including elements that can be found within the zones and their contributions to an “activated” pedestrian realm and general placemaking in San José. A detailed table of minimum dimension guidelines for the sidewalk zones can be found on pages 70 and 71.



Note that the dimensions depicted on the following tables represent a constrained condition. These represent minimum desired dimensions that shall be applied where space is limited due to previous development patterns or existing physical constraints, but still provide space required for safety and comfort. In some context types, sidewalk zones should be wider to support higher levels of pedestrian activity.

A growing body of evidence suggests that well-programmed sidewalks with a wide range of pedestrian streetscape elements can encourage economic activity,^{1,2} and well-traveled and well-lit sidewalks contribute to pedestrian safety, especially in the evening hours.



¹ Joe Cortright, “Walking the Walk: How Walkability Raises Housing Values in U.S. Cities,” (Chicago: CEOs for Cities, 2009).
² Bill Ryan, “Let’s Talk Business: Ideas for Expanding Retailers and Services in Your Community,” (UW Extension, July 2003).



Through Zone T

The Through Zone serves the primary function of the sidewalk: pedestrian movement along the street. Generally, to comply with ADA regulations, the through zone must be 4-5' wide, and it should be wider to encourage walking in a safe, comfortable, and vibrant environment. Narrowing down to 3' is possible in areas that are constrained by a combination of total feasible sidewalk width and other constraints like utility or signal poles, or other infrastructure.

The Through Zone should be as straight as possible, although allowances can be made for periodic weaving due to unavoidable physical or topographical constraints, especially in more suburban areas or contexts. The Through Zone should cross driveways at a level grade for pedestrian convenience and the comfort of those in wheelchairs, as well as to minimize vehicular conflicts and maximize visibility.

Differences in paving materials or colors can help distinguish the Through Zone from surrounding areas and allow for unique placemaking opportunities. Different paving materials and colors can further reinforce the pedestrian "clear" area in the Frontage Zone. Paving materials should be slip resistant.

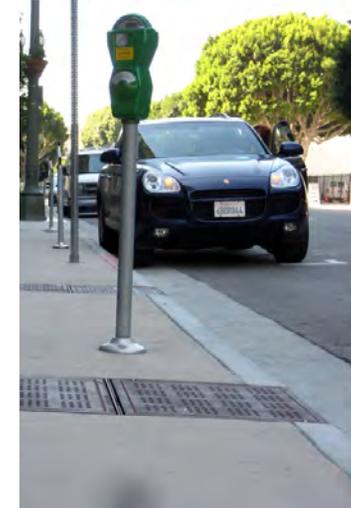
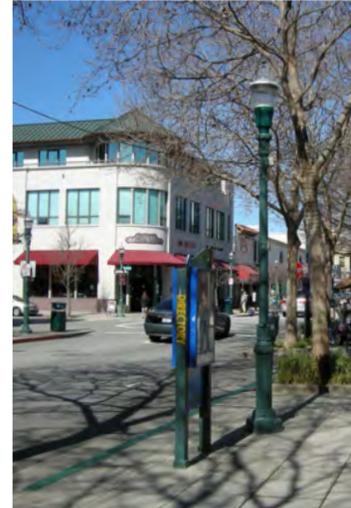


Frontage Zone F

The Frontage Zone is the area between the Through Zone and the front of the adjacent property, which may accommodate pedestrian-oriented activities. The width of this zone can vary depending on context and the activity it is designed to accommodate. In more urban areas, the façade of the building may abut the Through Zone; in more suburban areas and contexts, the Frontage Zone may be completely absent, as occurs when a yard, wall, or fence lies along the property line adjacent to the Through Zone.

Generally, Frontage Zones should be larger in more urban areas, as this allows for activation of the pedestrian realm through elements such as street furniture, and café and restaurant seating. Also, where pedestrian activity is high and sidewalks are crowded, a minimal Frontage Zone provides space for pedestrians to pause outside the flow of pedestrian traffic as well as for a setback from adjacent buildings or landscaping.





Furnishing Zone (Fn)



The Furnishing Zone is the primary space for the range of public streetscape amenities that provide an important placemaking function for streets and make a sidewalk engaging for pedestrians. It also serves as an extended buffer zone between pedestrians and vehicles and as a space for people to linger in the public open space of the street. Many landscaping, green infrastructure, street furniture elements and utilities are located in this zone, hence its greater width than the other zones.

Urban areas tend to have more pedestrian activity, and there should be a greater emphasis on pedestrian-oriented amenities such as seating and appropriately-scaled lighting. In more suburban areas, the Furnishing Zone may see a greater emphasis on pedestrian buffering with landscaping and larger green infrastructure elements.

Curb Zone (C)



The Curb Zone is the edge that typically defines the boundary between the pedestrian realm and the roadway. It acts as a transition for passengers accessing to or from stopped or parked vehicles and allows space for opening vehicle doors and parking meters. In areas where more frequent changeover of parking is expected, the curb zone should be wider to accommodate activity and to avoid conflicts with landscaping and more passive activity in the Furnishing Zone. While curb widths are variable depending on the adjacent land use context type, Curb Zones should always be free of vertical obstructions in order to facilitate access to and from stopped or parked vehicles.

Minimum Sidewalk Zone Widths

GRAND BOULEVARD	Frontage Zone	Through Zone	Furnishing Zone	Curb Zone	Total Sidewalk Width
	F	T	F _n	C	F T F _n C
Downtown	2'	8'	5'	1'	16'
Urban Village ¹	1'	8'	5'-6"	6"	15'
Transit Employment Center	1'	8'	5'-6"	6"	15'
Transit Residential	1'	5'	5'-6"	6"	12'
Commercial	1'	5'	5'-6"	6"	12'
Industrial	1'	5'	5'-6"	6"	12'
Public/Quasi-Public	1'	5'	5'-6"	6"	12'
Mixed-Use Neighborhood	N/A				
Residential Neighborhood	1'	5'	5'-6"	6"	12'
Rural Residential	N/A				
Agriculture and Open Space	N/A				
MAIN STREET	Frontage Zone	Through Zone	Furnishing Zone	Curb Zone	Total Sidewalk Width
	F	T	F _n	C	F T F _n C
Downtown	4'	5'	5'-6"	6"	15'
Urban Village ¹	0'	5'	4'-6"	6"	10' or 15' ²
Transit Employment Center	0'	5'	4'-6"	6"	10'
Transit Residential	0'	5'	4'-6"	6"	10'
Commercial	0'	5'	4'-6"	6"	10'
Industrial	N/A				
Public/Quasi-Public	0'	5'	4'-6"	6"	10'
Mixed-Use Neighborhood	0'	5'	4'-6"	6"	10'
Residential Neighborhood	N/A				
Rural Residential	N/A				
Agriculture and Open Space	N/A				

¹ Sidewalk widths specified in an Urban Village Plan adopted by City Council supercede the values shown in this table within the corresponding Urban Village.

² Potential for a 5' dedication with it creating a 4' frontage zone and 5'-6" furnishing zone, given the purpose of main streets as more pedestrian retail streets.

Minimum Sidewalk Zone Widths (continued)

CITY CONNECTOR	Frontage Zone	Through Zone	Furnishing Zone	Curb Zone	Total Sidewalk Width
	F	T	F _n	C	F T F _n C
Downtown	3'	6'	5'-6"	6"	15'
Urban Village ¹	0'	5'	4'-6"	6"	10'
Transit Employment Center	0'	5'	4'-6"	6"	10'
Transit Residential	0'	5'	4'-6"	6"	10'
Commercial	0'	5'	4'-6"	6"	10'
Industrial	0'	5'	4'-6"	6"	10'
Public/Quasi-Public	0'	5'	4'-6"	6"	10'
Mixed-Use Neighborhood	0'	5'	4'-6"	6"	10'
Residential Neighborhood	0'	5'	4'-6"	6"	10'
Rural Residential	0'	5'	4'-6"	6"	10'
Agriculture and Open Space	0'	5'	4'-6"	6"	10'
LOCAL STREET	Frontage Zone	Through Zone	Furnishing Zone	Curb Zone	Total Sidewalk Width
	F	T	F _n	C	F T F _n C
Downtown	0'	5'-6"	4'	6"	10'
Urban Village ¹	0'	5'-6"	4'	6"	10'
Transit Employment Center	0'	5'	4'-6"	6"	10'
Transit Residential	0'	5'	4'-6"	6"	10'
Commercial	0'	5'	4'-6"	6"	10'
Industrial	0'	5'	4'-6"	6"	10'
Public/Quasi-Public	0'	5'	4'-6"	6"	10'
Mixed-Use Neighborhood	0'	5'	4'-6"	6"	10'
Residential Neighborhood	0'	5'	3'-6"	6"	9'
Rural Residential	0'	5'	5'	0'	10'
Agriculture and Open Space	0'	5'	5'	0'	10'

¹ Sidewalk widths specified in an Urban Village Plan adopted by City Council supercede the values shown in this table within the corresponding Urban Village.

Street Furnishings



This section describes elements that can populate the pedestrian realm. Many, such as seating and public art, are intended for direct interaction with pedestrians. Other items such as fire hydrants and parking meters serve more utilitarian functions but are still a part of the Sidewalk Zone. The following is not meant to be a comprehensive list of elements, but is an introduction to some of the more common applications of these elements with the Sidewalk Zone.

Wherever street furnishing elements are provided, they must be located to maintain an ADA-minimum 4-5' of clear space in the Through Zone. The path of travel between sidewalks and building entries, as well as paths to and from on-street parking for people with disabilities, must be kept clear.

Public Seating

Public seating in the Frontage Zone or Furnishing Zone invites pedestrians to rest, wait, eat, socialize, people watch, or read. Seating can take on many different configurations, be made of a variety of natural and synthetic materials, and be moveable or fixed in place. Seating should be designed with all users in mind and should include a mix of seating with and without armrests for users of varying needs.

Fixed benches in the Frontage Zone should be a minimum of 1' away from the building edge. Seating may be integrated into the design of buildings with seating walls, sills, or other building or landscape elements.



Café and Restaurant Tables and Seating

The presence of café and restaurant tables and seating activates pedestrian activity and helps generate a vibrant atmosphere while providing economic benefits to businesses. Furniture such as tables and chairs is most often placed in the Frontage Zone, provided there is enough space to allow for their placement and use. These elements shall still allow for clear access and not interfere with driveways, curb ramps, or emergency access. Café and restaurant tables and seating in the Furnishing Zone may be possible if space permits and their location does not interfere with the Through Zone. Other opportunities for café seating include bulb-outs, flexible parking areas, and parklets. City ordinances define details of public or private use for these tables and chairs, and other factors. See sections 20.100.1400-1490 of the Municipal Code for more details about café and restaurant tables and seating.



News Racks

State and Federal law allow the placement of news racks in public sidewalks. As with other elements, news racks should not encroach upon the Through Zone. To avoid visual clutter, news racks should be consolidated wherever possible into a single multi-compartment cabinet that should be located to avoid blocking visibility between drivers and pedestrians and access to other street furnishings, building entries/exits, transit stops, parking, etc. See section 13.18.045 of the Municipal Code for additional information for the regulation and siting of these elements.



Parking Meters

Single and Double Space Meters: should be immediately visible to drivers and should be located in the Curb Zone, or within the Furnishing Zone as close as feasible to the Curb Zone, or at the front or rear end of angled and parallel parking stalls.

Multi-Space Meters: allow for the consolidation of roughly 8-10 individual meters into a single device. This reduces street clutter and can reduce maintenance costs. Multi-space meters also allow for flexibility in siting the devices in the Curb or Furnishing zones.



Transit Stops

At transit stop locations, transit rider amenities should be given priority over all other amenities in the Furnishing Zone. Transit stop amenities like signage, benches, trash cans, and shelters should not interfere with mandatory elements like access routes and a minimum 5x8' ADA landing zone clear of obstructions where passengers board and alight. In addition, for safety and commercial visibility reasons, transit stop designs should minimize reductions to visibility between the roadway, the Through Zone, and adjacent properties.

Transit stop siting and design should be coordinated with VTA. The clear area along the curb will vary depending on transit service provider needs. Depending on physical constraints, length of transit vehicles and service frequency, these dimensions can range from 40' to over 100' in length.

Well-designed transit stops should include the following design elements:

- **Passenger Pads/Waiting Areas:** can vary in length from 15-80' depending on passenger volume and available space, and typically have an 8-10' minimum depth.
- **Universal Design Features:** utilize 5'x8' minimum clear area for bus ramp and feature a 4' minimum accessible route to the waiting area. Braille bands for route signs should be present.
- **Pedestrian Areas:** are clear of obstructions and connected to an unobstructed sidewalk in front of and/or behind the stop area.
- **Security:** in addition to pedestrian-scale lights, the siting of bus stops in well-traveled areas with transparent building frontages can add to a sense of security.
- **Signs and Transit Information:** route signs with transit route and agency information, schedules, and other pertinent information should be provided - including in electronic real-time formats.
- **Seating:** where applicable, provide leaning bars and/or benches. Opportunities for informal seating, such as nearby planters, can also be considered.



- **Shelter and Shade:** where applicable, bus shelters should be provided. When bus shelters are unavailable, building frontages, street trees, or awnings may provide these amenities. Typically, the bus shelter should be sited in the Furnishing Zones and adjacent Curb Zones. However, in constrained conditions, the shelter could be sited in the Frontage Zone.
- **Lighting:** pedestrian-scale lights or integrated with the bus shelter or lighting from adjacent buildings and storefronts can provide a secure waiting environment.



Bike Racks

The presence of bike racks encourages people to cycle, secures personal property, and helps bolster economic activity for area businesses. The presence of bike racks also discourages use of street trees, sign posts, and other streetscape elements for bike parking.

Generally, bike racks should be located in the Furnishing Zone, accommodate different bike frame types and sizes, and allow for easy locking of the frame and wheel/wheels to the rack. Where there is high demand for bike parking, bike racks can be installed in a bike “corral” – an on-street parking space converted to bike parking.



Utilities

While not directly related to pedestrian activity, utility-related elements such as traffic signal control boxes, utility poles, and fire hydrants require placement within the sidewalk. Generally these utilities should be located within the Furnishing Zone. The standard considerations for the 4' ADA minimum Through Zone width should be observed, and the design of the pedestrian realm should take these utility items into account to the greatest degree possible. Care should be given to provide clearance around utility boxes and fire hydrants to allow for their maintenance and use.



Public Art

Public art can foster a sense of neighborhood identity, function as gateway elements, or enhance everyday utilitarian objects such as sign posts or utility boxes. Public art should be a source of enjoyment and can serve a function in the pedestrian realm, such as decorative seat walls or planters.

As with other elements, public art should not cross into the Through Zone or impede access to parked vehicles in the Curb Zone.





Landscaping



Landscaping within the street right-of-way can include trees, shrubs, and ground cover plants. It can be located within the Furnishing Zone of the sidewalk as well as within medians. Landscaping serves a broad range of purposes and can be a prime factor in shaping the design character of a street. Landscaping can act as a buffer between pedestrians and the roadway, it can be incorporated into green infrastructure elements to provide stormwater benefits, provide for a cooler environment, and provide habitat for urban wildlife. Trees in particular can provide shade to benefit pedestrians, bicyclists, and the general public by reducing urban temperatures and improving air quality. Studies have shown that the presence of street trees and landscaping can provide economic benefits.³ As much as possible, plant and tree palettes should be selected from the City's Plant List, as these have been officially screened or used in landscapes where recycled water is currently in use.⁴

³ Wolf, K.L. 2003. "Public Response to the Urban Forest in Inner-City Business Districts." *Journal of Arboriculture* 29, 3:117-126.

⁴ City of San José Plant List, found at: <https://www.sanjoseca.gov/index.aspx?NID=1613>

Street Trees

Street trees are the largest and most visible elements of the landscape and overall streetscape. Trees should be carefully placed so as not to interfere with other elements. Street trees should be placed in the Furnishing Zone, where natural shading elements can be utilized for benches and other seating elements. In areas where sidewalks are too narrow to accommodate trees, it may be possible to plant trees within planters or curb extensions in the parking lane.

Street trees and tree basins shall be situated so as to maintain the minimum ADA-required Through Zone, and to accommodate opening doors and facilitate passenger entry and exit from parked vehicles. In more constrained locations and where there are higher levels of pedestrian activity, ADA-compliant tree grates may be used to extend the accessible Through Zone up to the tree trunk.

Care should be taken in selecting tree species and location near intersections and midblock crosswalks in order to maintain sight lines, especially for pedestrian visibility. The visual barrier that trees can create should not be a major concern in more urban areas with slower moving traffic where parked cars, utility poles, and even the corners of buildings affect sight lines as much or even more than tree trunks.

While tree basin dimensions will vary depending on site conditions and desired species of tree, the general desired minimum basin size should provide about 20 square feet; for example a 5'x4' planter or tree grate. Narrower sidewalks may accommodate a 3'x6' planting area for trees.

Consideration should also be given to the space for trees above and below ground. Tree branches should not be below 7' in pedestrian areas and 14' in parking or travel lanes. Below ground there should be adequate space and soil conditions for tree roots. Clearance from underground utilities, basements, and other elements that could be damaged by tree roots should be maintained. Soil conditions can be improved through soil amendments, structural soils, and modular structural systems that help avoid over-compaction of soils. These types of soil improvements can also benefit green infrastructure.



Understory Planting

The understory is a broad category encompassing planting of shrubs, ground cover, and other low plantings in tree basins, landscape parking strips, curb extensions, and medians. Understory plantings can be used to provide a linear buffer between pedestrians and the roadway and can contribute to green infrastructure designs by performing bioretention and pollutant removal functions.

Planters should be at least 3' wide for the healthy growth of plants in the Furnishing Zone. Wider planters may accommodate a larger variety of plants. Narrower plantings from 6"-1' can also be considered for the Frontage Zone.

Understory plantings must maintain the minimum ADA-required Through Zone width. In areas where there is higher turnover of on-street parking, a wider Curb Zone should be provided to ensure that planters do not interfere with pedestrian access to parking. A 5' minimum clearance must be maintained for on-street disabled parking.



Planters

In areas where underground utilities or other physical restraints preclude the placement of tree basins or understory plantings into the ground, above-ground planters can be considered.

Above-ground planters can include pots, above-ground planter beds, and raised planters. Depending on the size and placement of planter walls, planters can also serve as pedestrian seating.

Street Lighting



During the evening hours, street lighting is the most prominent characteristic of the pedestrian environment. The placement and design of pedestrian-scale lighting contributes to comfort and can promote transit usage at all hours of the day. During daylight hours, street lighting can contribute to a neighborhood's look and feel depending on the design and color of the pole and fixture. Please refer to the City of San José's **Public Streetlight Design Guide** for more detailed guidance. The placement of pedestrian lights should carefully consider the location of underground utilities, tree canopies, and other potential obstructions, such as awnings, in areas where sidewalk width is limited. Lighting design should also minimize avoidable light pollution.

Roadway Lighting

Roadway lighting is the most visible type of street light, as the fixtures are the tallest (20-30' typical height) and are usually the brightest street lighting element. Historically, low-pressure sodium (yellow colored) and high pressure sodium (orange/pink colored) have been used for this purpose. Recent guidance in the City of San José's **Public Streetlight Design Guide** states that broad-spectrum (white colored) light should be used for equal or better visibility, particularly in combination with Light-Emitting Diode (LED) technology for higher efficiency.

Pedestrian Lighting

Pedestrian lights are more appropriately scaled for pedestrians (12-15' typical height) and are focused on illuminating the sidewalk. Placement of pedestrian lights can further draw attention to both controlled and uncontrolled pedestrian crossings and should be a priority at transit stops and other locations where pedestrians may congregate at night. The use of dimmers or shut-off controls should be considered in locations where the energy savings can cover the additional cost of the equipment. If used, dimmers and shut-off controls should be programmed appropriately according to context.

Building-Mounted Lighting

Building-mounted lights provide an opportunity for public/private property owners and developers to install lights for the pedestrian realm. These lights can serve the dual purpose of highlighting the building's presence, while at the same time illuminating the sidewalk.



Roadway Lighting



Pedestrian Lighting



Wayfinding and Signs



Signs are a means of providing information to all modes of travel and facilitating mobility. Just as there are multiple modes that travel at different speeds and require different types of information, signs that convey information should be sized, designed, and placed appropriately for the intended users. Related signs should have a consistent design and feel, and incorporate a hierarchy of sizes for ease of interpretation. For example, gateway markers and neighborhood-oriented signs could be larger than pedestrian wayfinding signs. Refer to the City's Community Identification and Wayfinding Policy for more information.

Care should be taken to prevent visual clutter, which can reduce the efficacy of the provided signs, as well as make it difficult to provide streetscape and other design elements within the street right-of-way. This section focuses on signs and wayfinding specifically for vehicles and pedestrians; please refer to Chapter VI for guidance on signs for bicyclists.

Motor Vehicle Signage

The California Manual on Uniform Traffic Control Devices (CA MUTCD) governs the placement and regulation of signs primarily for vehicles, and provides detailed regulations and guidance for these signs. Relevant signs pertaining to pedestrians include, but are not restricted to, crosswalk and yield to pedestrian signs, parking restrictions or payment zone information, and pedestrian drop-off zones.

Pedestrian Signs and Wayfinding

Pedestrian signs can convey a wide range of information, including the location of transit stops, directions to landmarks and places of interest, and historic information.

Pedestrian wayfinding signs are intended to convey directional information to pedestrians. As pedestrians may be of varying age, English proficiency, and physical ability, the signs should be clear to read and easily understood. As appropriate, they should include intuitive, widely-understood symbology. Accommodations should be made

for wheelchair users and to those who may be visually-impaired, for example through the use of locational and directional information in Braille.

Signs can be placed in the Curb Zone, Furnishing Zone, or Frontage Zone. The Through Zone must remain clear for the unimpeded movement of pedestrians; signs should maintain a 7' vertical clear area and the ADA minimum clear width of the walkway.

At transit stops, wayfinding signs should show street layout, popular destinations, and connecting transportation networks.

Transit Signs

Transit information signs communicate which buses stop at particular stops, when or how frequently they will arrive, information about the network of routes, nearby transit stops, and other information about how the stop fits into the overall transit system. Several different amenities provide transit information functions, including basic schedules, route maps, electronic real-time signs, and audible announcement systems.⁵ Design and placement of transit signs should be coordinated with VTA.

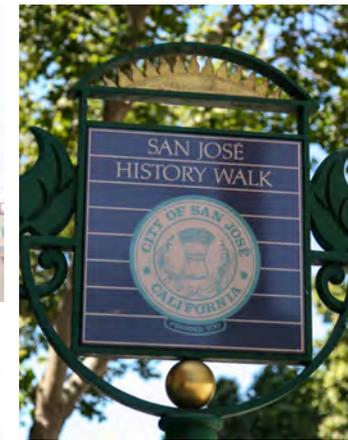
Placemaking Signs

Placemaking signs reinforce neighborhood or community identity by announcing the entrance into that particular neighborhood or community. These signs can have artistic or sculptural details and can incorporate iconic elements. Depending on the location and placement of the sign, placemaking signs may be designed to be visible to multiple modes of travel. Placemaking signs can include banners hung from poles or street/pedestrian lights and historical markers or placards. Public art can also be considered for integration into placemaking signs. Installations should remain consistent with existing City Policy.

⁵ For further guidance on sign types and placement specifically for transit, refer to Metropolitan Transportation Commission's *Regional Transit Wayfinding Guidelines & Standards*. VTA also has a draft Transit Passenger Environment Plan under development, which includes station layout and element guidelines.

Kiosks

A kiosk is a booth or other upright architectural element that can provide wayfinding or placemaking information. Kiosks can be artistic structures and contain artful elements. Due to their larger footprint, kiosks should be located at intersections and in curb bulb-outs, or in Curb Zones, Furnishing Zones, or Frontage Zones that have sufficient vertical and horizontal clearance to accommodate them while still providing an unimpeded Through Zone.



Interim Treatments and Flex Space Configurations

Many of the street configurations described in this document, including restriping in constrained conditions that do not involve moving or reconstructing curbs, can result in “leftover” space that is not immediately usable as a pedestrian accessible area (See Chapter II for sample street sections and tables of roadway configurations). These “leftover” areas have been defined as “Flex Space” in order to emphasize their flexibility of use towards the vehicular, bike, and even pedestrian realm depending on their specific configuration. The following section presents strategies for repurposing these spaces as interim or permanent conditions for reconfiguring existing street cross-sections.



Bike Facilities

Flex space can be allocated as additional space for on- and off-street bike facilities. See Chapter II for a range of possible dimensions and Chapter VI for configuration and additional design details.



Green Infrastructure

Flex space can be allocated to green infrastructure elements in the roadway adjacent to curbs (see “Green Gutters” in Chapter III). If feasible, curbs can be extended to accommodate other types of green infrastructure elements such as rain gardens, parkstrip bioretention, infiltration and flow-through planters and stormwater tree wells. See Chapter III for additional guidance and design details of these elements.

Paint and Planter Bulb-out

As described in Chapter IV, flex space can be used for the creation of an interim paint and planter bulb-out. The painted area serves to reduce turning vehicle pavement envelope areas available for vehicles, hence allowing for a lower speed turn operation, better perception of pedestrians waiting to cross, and reduction in effective crossing distance for pedestrians.



Image Credit: SF Streets Blog

Parklets

Where space allows, flex space can be allocated to parklets (see Chapter IV for more detail). Wider spaces can allow for cafe or sidewalk seating and planters.



Crosswalks



Crosswalks are the portion of a roadway at an intersection, which is an extension of the curb and property lines of the intersecting street, or is any other portion of a roadway which is marked as a pedestrian crossing location by painted lines. Crosswalks at intersections can be either marked or unmarked. A marked crosswalk shall be defined through yellow (in school zones) or white pavement striping.

Marked crosswalks can be striped in various ways depending on surrounding land uses, roadway geometry, vehicle volume and speeds, and collision history. While marked crosswalks are typically at intersections, they can be located midblock. Midblock crosswalks are locations where a crossing is appropriate due to pedestrian desire lines outside of crossings provided at intersections. These crossings can occur where pedestrian generators are located across the street from one another, on long blocks, or where other midblock crossing activity is occurring.

A controlled crosswalk uses a signal or stop sign requiring motorists to stop, regardless of the presence of pedestrians. Uncontrolled crosswalks are locations that do not use a traffic signal or stop sign for approaching traffic.

In accordance with ADA guidance, crosswalks should provide adequate clear space at the bottom of curb ramps. Ramps should also be oriented in the direction of travel for the associated crosswalk.

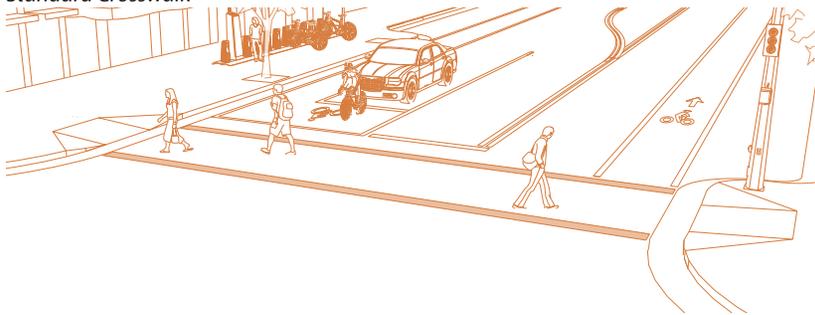
The guidance in this section should be considered to determine if a crosswalk should be marked and the appropriate crosswalk design treatments. For additional information, refer to the City of San José Installation and Removal of Marked Crosswalk guidelines.

Crosswalk Striping

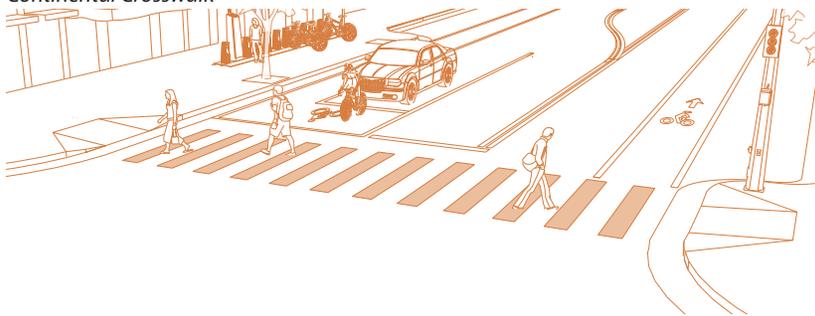


Marked crosswalks provide a designated crossing, which may improve walkability by demarcating a clear “channel” for pedestrian travel to both pedestrians and motorists. Marked crosswalks at uncontrolled locations should be installed at major pedestrian generators with notable pedestrian volumes (at least 15 per peak hour, or 25 for two consecutive hours), and where there are inadequate gaps in traffic for pedestrians to safely cross the street. Marked crosswalks should also be considered at uncontrolled locations with a history of vehicle-pedestrian collisions.

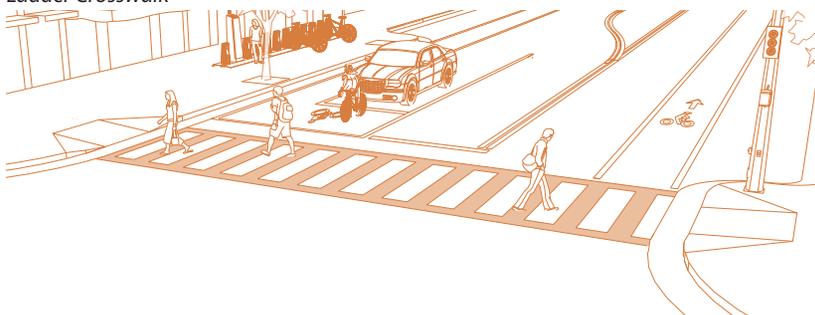
Standard Crosswalk



Continental Crosswalk



Ladder Crosswalk



Types of Crosswalk Markings

- **Standard:** Traditional parallel line crosswalks are the most widely used type of crosswalk marking and are the basic crosswalk striping. This treatment should be used in residential areas or at signalized or stop controlled intersections with moderate to low pedestrian volumes.
- **Continental:** These crosswalks are typically more visible to drivers. Continental crosswalks can be considered at controlled locations with high pedestrian demand, such as downtown, Vision Zero Priority Safety Corridors, and Planned Growth Areas.
- **Ladder:** Ladder crosswalks, and variations known as zebra crosswalks, are also highly visible to drivers and should be considered at uncontrolled locations that require high-visibility markings.
- **Crosswalk Dimension:** Marked crosswalks should be designed in accordance with striping guidance in the CA MUTCD. Crosswalk edge stripes are typically 12” wide for standard crosswalks. Continental and ladder crosswalk dimensions are described in the ITE/CNU *Designing Walkable Urban Thoroughfares: A Context Sensitive Approach* report. Crosswalk widths may vary depending on expected pedestrian demand, though typical widths range from 12-15’ between outer edges of striping.
- **Yield Lines:** Yield lines should be placed 20-50’ in advance of marked, uncontrolled crosswalks on multi-lane roads. Yield lines increase the pedestrian’s visibility to motorists around stopped vehicles in adjacent travel lanes and reduce the incidence of vehicles encroaching on the crosswalk. See following section for additional guidance.
- **Stop Lines:** Stop lines should be placed 5-10’ in advance of continental crosswalks and controlled school crossings.

Crosswalk Treatments

In addition to marked crosswalks, the following treatments can be used to provide greater levels of pedestrian comfort when crossing streets.



Pedestrian Bulb-outs

See Chapter IV for additional details on pedestrian bulb-outs (also described as curb extensions).

Median Refuge Islands

See Chapter IV for additional details on refuge islands.

Raised Crosswalks and Intersections

Raised crosswalks are crosswalks or entire intersections that are raised above the roadway, typically to curb level, with ramps for approaching vehicles. Raised crosswalks function similarly to a speed table to slow approaching vehicles and raise the crossing pedestrian into view.

Flashing Beacons

Flashing beacons can be placed overhead, on poles adjacent to the roadway and, on wide roadways, in a median refuge island. Flashing beacons are installed with signs at the crosswalk, and are activated using a push button or via pedestrian detection. Flashing beacons increase driver yielding behavior at uncontrolled crossings.

Pedestrian Hybrid Beacon/HAWK

HAWKs (High Intensity Activated Crosswalks) are pedestrian-actuated signals that are a combination of a beacon flasher and a traffic control signal. When actuated, the HAWK displays a yellow (warning) indication followed by a solid red light. During the pedestrian clearance, the driver sees a flashing red “wig-wag” pattern until the clearance interval has ended and the signal goes dark. HAWKs reduce pedestrian-vehicle conflicts on multi-lane roadways where it is difficult for pedestrians to find gaps in automobile traffic to cross safely, and where normal signal warrants are not satisfied. The CA MUTCD provides additional guidance on when HAWKs should be considered.



Crosswalk Treatments at Uncontrolled Crossings

Marked crosswalks alone at uncontrolled locations may not be sufficient, and enhancements may be needed if any of the factors in the following table are present. Enhancements may include: higher visibility crosswalk markings, curb extensions, pedestrian refuge islands, flashing beacons, and enhanced street lighting.

- Two-lane road with 5,000 vehicles per day or higher
- One-direction road with 3 or more travel lanes
- Two-direction road, with 2 or more travel lanes per direction
- History of pedestrian collisions
- Crossing distance exceeds 60'
- Posted speed limit of 35 mph or higher
- Sight distance of pedestrians by drivers is less than 10 times the posted speed limit

Crosswalk Treatments at Controlled Crossings

Enhancements, such as higher visibility crosswalk markings, curb extensions, pedestrian refuge islands, and enhanced street lighting, may be desirable and should be considered at the following locations:

- Vision Zero Priority Safety Corridor crossings with high pedestrian activity, fatal and/or severe injury crashes involving pedestrians, visibility, or other roadway constraints.
- Downtown crossings with high pedestrian activity
- Planned Growth Areas, such as urban villages and transit corridors
- Free-right turns of major roads with a posted speed limit of 35 mph or higher and with high pedestrian activity

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VI. BIKE FACILITY DESIGN

Bikeway Design Principles

Bikeway design elements discussed in this chapter are intended to create streets that are safe, comfortable, and convenient for bike riders of all ages and abilities while considering other roadway users and local land use context. The treatments presented are meant to serve as typical guidelines, though thoughtful innovation and flexibility may be appropriate in certain circumstances to achieve a truly low-stress and connected system suitable for all ages and abilities. The following sections provide both conceptual and technical guidelines for the implementation of a wide range of on-street bike treatments.

By incorporating bike-friendly amenities in street design, San José can continue to encourage bicycling as a means of everyday transportation. According to American Community Survey estimates, about one percent of all commute trips in San José are by bike, ranking San José 34th of the 70 largest US cities for bike commuting. However, bike use in San José increased by 33 percent from 2000-2016, placing it among the fastest growing bike commuting populations in the country.

San José's Bike Plan 2020 established a vision for 500 miles of bikeways citywide (adding to the 200 miles of existing bikeways at the time of adoption). The City has invested in many recent bikeway network expansion efforts, while successful open-street events such as Viva Callé have demonstrated and spurred popular interest in bicycling.

San José's goal for bicycling, established in the *Envision 2040 General Plan*, is for bike commute trips to increase to 15 percent of all commute trips by 2040. In its General Plan, the City asserts San José is "a great bicycling community, highlighting its weather, topography, and fitness-oriented culture as significant assets for biking in order to attract businesses which support or can benefit from bicycling activity." In keeping with the goals of the General Plan, the San José Bike Plan 2020 aims to complete 500 miles of bikeways, reduce bike collisions by 50 percent, add 5,000 bike parking spaces and achieve League of American Bicyclist's "gold-level" bike friendly community status. By incorporating innovative bikeway design elements into its complete streets, the City can work toward achieving its goals for becoming a great bicycling community.

To encourage more people to bike, innovative treatments should be integrated into the City's Primary Bikeway Network and other priority locations. Innovative treatments could also be used to enhance existing bike facilities in other locations around the City.

Guiding Principles

People-Oriented



This document supports creation of an on and off-street bike network for bicyclists of all ages and abilities. The City of Portland first developed the “four types,” a categorization for transportation professionals to help understand whom bike facilities should be designed for to reach the greatest number of people. The “Strong and Fearless” are a small subset of people who would bike if there are no designated bike facilities. The “Enthusied and Confident” are a slightly larger group of the population who are interested in bicycling and would do so with a sparse bike network. The largest group of the population are those who are “Interested but Concerned.” These are people who would use bike transportation if it felt safe and made sense. Lastly is the “No Way No How” group. This portion of the population is not interested in using a bike for transportation due to lack of experience, knowledge or interest. These typologies help relate facility type to demand and hypothesize that if a safe and sensible bike network is built, people will use it.

Connected



Well-used bike facilities are those that are continuous, convenient, and connected. In order to increase cycling as a mode of transportation, a network of bikeways that are safe, inviting, and comfortable for bicycling and connect to key destinations and everyday necessities throughout San José is essential. A direct, connected network allows bicyclists to travel to and from activities in a timely and energy efficient manner.

Not only is it important for the City of San José to continue building more miles of bike facilities, they must be accessible and continuous “low stress” facilities that emphasize comfort and safety. The traffic stress of any given corridor is based on the most stressful portion of a route. Therefore, a route with largely low-stress accommodations for the majority of the network and only a small portion of high-stress facilities is considered a high-stress corridor, as the high-stress portion of the corridor is a barrier for bicyclists.

Resilient



A resilient bike network is one that assists San José in facing the physical, social, and economic challenges of the 21st century. Achieving bike mode choice goals will help take the burden off an already congested street network, reduce pavement maintenance costs, and result in cleaner air for the people of San José. Better bike facilities have the potential to stimulate economic development by bringing people closer to shops and restaurants in their city. Encouraging active transportation can lead to better overall health and happiness of the City’s population. Bike transportation is essential in the creation of a growing and adaptable 21st century city.

Types of Bikeways

Protected Bike Lanes / Cycle Tracks¹



Cycle tracks allow continuous unimpeded bike travel that is separated from vehicle travel lanes. Cycle tracks can be raised or level with travel lanes. As opposed to bike lanes, cycle tracks are unique in that the bike lane is placed adjacent to the curb, and parking lanes are adjacent to travel lanes. Cycle tracks must be separated from the adjacent parking lane, travel lane or pedestrian traffic through the use of landscape buffers, street plantings, lighting features, and/or other design elements highlighted below.

Cycle tracks are preferred for streets with high bike volumes and high vehicle speeds. Cycle tracks are particularly useful on key connectors to city destinations such as transit stations, sports arenas, universities, and colleges, which have high bike demand and offer important “last mile” connection to key destinations. They are critical to creating a network of “low-stress” bike facilities.

One-Way Cycle Tracks

Carry directional bike traffic and are typically located on both sides of the roadway.

Application

Useful on streets with parking lanes, heavy parking turnover, high vehicle speeds, high bike volumes or auto volumes and with few bisecting driveways.

Two-Way Cycle Tracks

Carry bike traffic in both directions and are located on one side of the roadway only. These may require additional crossing considerations at intersections, such as bike signals.

Application

Similar to one-way cycle tracks; however, two-way facilities may be most useful on one-way streets, streets with existing wrong way riding, and/or streets with an “edge” condition (railroad tracks, bodies of water, or other features limiting crossing points across the cycle track).



Raised Cycle Tracks

These spaces can be separated from vehicles through use of a mountable or vertical curb and are applicable to both one-way and two-way treatments. Raised cycle tracks are designated bike travel lanes distinguishable by their grade separation from both pedestrians and autos. Raised cycle tracks are typically at an intermediate elevation (half of the curb height) or at sidewalk level.

Application

Raised cycle tracks should be considered when extra separation from adjacent auto traffic is desired, typically due to high speeds or high volumes. Raising a cycle track discourages sidewalk riding and minimizes maintenance costs as a result of motor vehicles. This treatment can be helpful in attracting a wide range of bicyclists and creating the perception of safety.

In-Street Cycle Tracks

As opposed to raised cycle tracks, in-street cycle tracks are typically separated by a painted buffer plus a vertical element such as soft-hit posts, landscape planters, or parked cars. They can also be separated by a raised median with raised curb and/or landscaping. In-street cycle tracks provide a protected bike space separated from vehicle and pedestrian traffic. As with raised cycle tracks, the protected bike space is placed adjacent to the curb, with parking located between the travel lane and cycle track. In-street cycle tracks are typically less costly to implement than raised cycle tracks.

Application

Similar to raised cycle tracks, the primary differences are time and cost considerations. Though these facilities may involve low-cost materials, the possibility of signal control at intersections should be weighed when considering cost.

¹Class IV.

Buffered Bike Lanes²



Buffered bike lanes are standard bike lanes that are also separated horizontally from parking and/or travel lanes with a painted buffer. The buffer can be placed between the bike lane and parking lane, bike lane and travel lane, or in both locations. Where heavy truck traffic, bus routes, high-speed traffic, or high traffic volumes operate in the outside lane, the buffer between the bike lane and travel lane may be desirable. Where parking turnover is high and there may be conflicts between bicyclists and drivers in the “door zone,” a parking-side buffer may be desirable. In either location, this treatment improves comfort for bicyclists and is ideal for bicyclists that may not be comfortable with riding in such close proximity to automobiles or to the door zone. This facility treatment typically provides a greater perception of safety than standard bike lanes without the higher cost and limitations of constructability of a cycle track.

Application

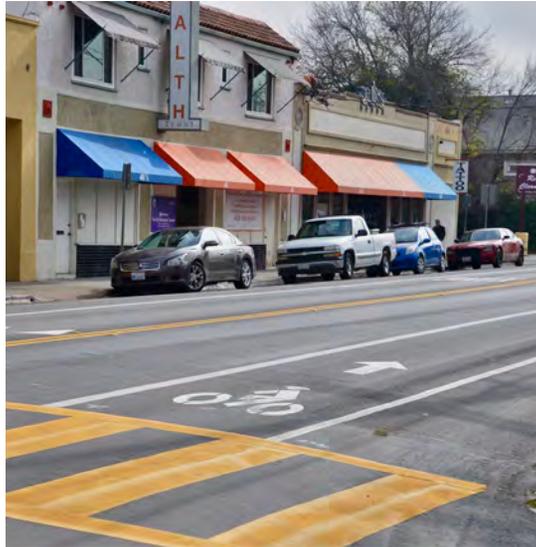
This treatment is preferential to bike lanes where space is available. These treatments should be used where right-of-way allows and where comfortable bike facilities are important, such as near transit, around school sites, and in business districts. Buffered bike lanes are particularly desirable alternatives to standard bike lanes on routes with transit, heavy vehicle traffic, or high speeds.

² Class II.

Standard Bike Lanes³



Standard bike lanes provide bicyclists dedicated roadway space, separate from motor vehicle travel lanes and parking lanes.



Application

This treatment is preferential to shared lanes where space is available. Standard bike lanes may be appropriate on lower auto volumes roadways that are not key links in the bike network. Protected bikeways, such as cycle tracks and buffered bike lanes, are desirable on key bike routes and as space allows. Bike lanes typically provide a higher level of traffic stress than protected facilities.

³ Class II.

Shared Lanes⁴



Shared lanes are mixed-flow travel lanes that require bicyclists to share the roadway with autos. They can provide visual queues to motorists that they are in a space that is shared with bicyclists with “sharrow” pavement markings. Sharrows indicate the preferred bicyclist positioning and signal that drivers should expect bicyclists in this space. These lanes are often used on residential streets, streets with low vehicle volumes and streets with low vehicle speeds, and where no dedicated bike facility is necessary. They can also be used in locations where space is substantially constrained where a standard bike lane or other enhanced treatment cannot be provided.



Application

This facility treatment should only be used on roadways that are not wide enough to accommodate bike lanes but have existing bike traffic or are expected to have future bike traffic. Generally, this treatment should be used in residential areas and low-speed streets; however, it may be considered on higher volume and speed streets where no dedicated bike facility can be provided. While the CA MUTCD allows use on streets with speed limits up to 35 MPH, these guidelines generally discourage their use on streets with speed limits greater than 30 MPH.

⁴ Class III.

Bike Boulevards⁵



Bike Boulevards are typically residential streets with low traffic speeds and volumes. Bike Boulevards are shared lanes that are made more comfortable for bike traffic of all ages and abilities through traffic calming elements that prioritize bicylists. Traffic calming treatments include bike roundabouts, extended green time at signals, speed humps and speed bumps, wayfinding signs, enhanced crosswalks, and curb bulb-outs to reduce motor vehicle speeds and volumes. Special pavement markings and signage may be used to help create identity and provide wayfinding on the corridor.

Application

This treatment should be used in residential areas with existing demand or latent demand for bicycling. Bike Boulevards can provide more approachable connections to city destinations, including schools, transit, and commercial areas, using proximate low speed neighborhood streets. They often serve as a parallel route to dedicated bike space (bike lanes, buffered bike lanes, and cycle tracks) on arterials or collectors.

Shared-Use Paths⁶



The City of San José's *Trail Design Guidelines* (December 2011) address the design and use of shared-use paths. Refer to that document for guidelines for detailed design guidance on trails and shared-use paths.

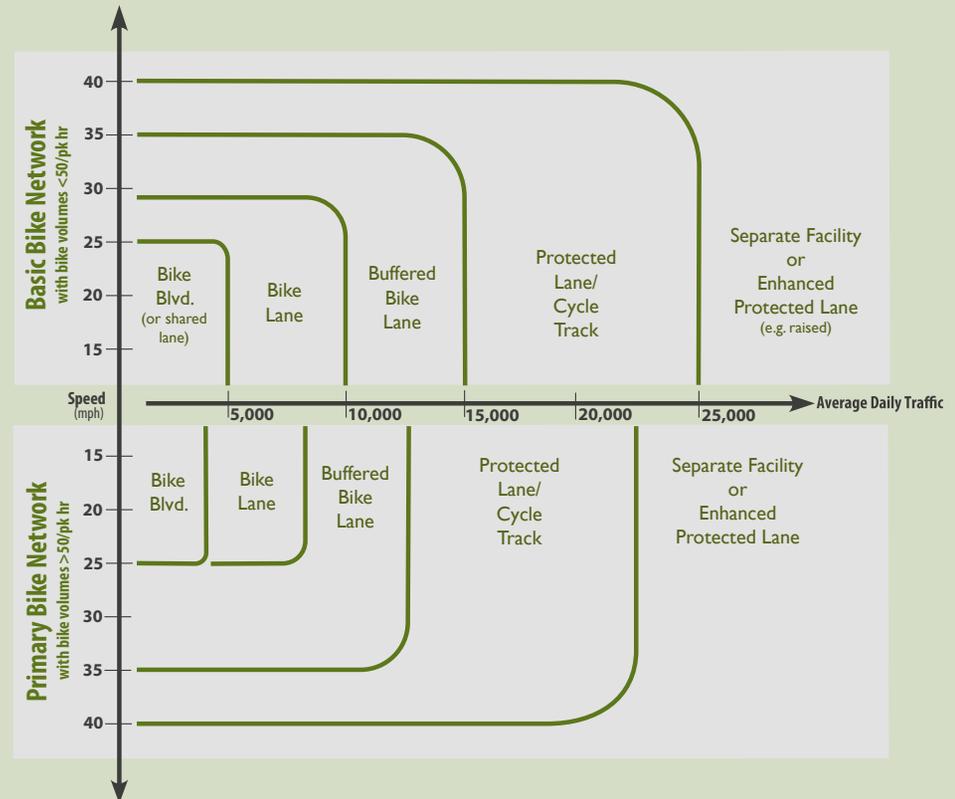
For design guidance on locations where trails and shared-use paths cross streets, refer to page 112 of this document.

Please refer to the *AASHTO Guide for the Development of Bicycle Facilities* for information on shared use path design.

⁵ Class III.

⁶ Class I.

Bike Facility Selection Chart



The above bike facility selection chart should be considered a general guideline for identifying and selecting appropriate bikeway facilities. Additional factors, including space constraints, facility demand, system connectivity, expected user characteristics, cost and other factors should also be considered when identifying appropriate bike treatments for a given facility.

Bikeway Design Variations



Contra-Flow Bike Lanes



Contra-flow bike lanes are bike lanes that operate in the opposite direction of vehicle traffic. They are separated from oncoming vehicle traffic with a double yellow center line and can be further enhanced with vertical separators.

Application

Contra-flow bike lanes are typically installed on one-way streets. This treatment can be used to correct wrong-way bike riding issues and address route connectivity issues associated with one-way streets. In San José, contra-flow facilities may be most useful in Downtown and surrounding neighborhoods, which typically have more one-way streets than other areas of the City. Contra-flow facilities are particularly effective in decreasing bicyclist travel distance by providing for reverse-directional bike travel on one-way streets connecting to key destinations. They can also promote on-street bike riding rather than sidewalk riding. Due to the nature and design of contra-flow lanes, bike treatments at intersections and buffers between vehicle traffic should be considered to ensure additional uncontrolled bike/vehicle conflicts are not being created.



Bike Lanes on One-Way Streets



Bike lanes on one-way streets can be placed on either the left or right side of a street. In some cases, bike lanes may be used on both sides of a street if space permits and bike demand supports the installation of multiple facilities.

Application

One-way streets where parking, transit stops, high turning movement volumes, or other conflicts are more prevalent on the right-hand side are scenarios in which left-side lanes could be considered. Additionally, a left-side bike lane should also be considered based on bikeway network connectivity, including high left-turn movements for bicyclists. Left-side lanes follow all design standards of regular bike lanes but generally should be avoided in places where the street changes from one- to two-way traffic.



Climbing Lanes



A climbing lane is a bike lane used on roadways with considerable inclines where there is not enough space to install a standard sized bike lane in both directions. The climbing lane is provided where the bicyclist is traveling uphill and a shared lane marking is provided in the downhill direction. The climbing lane is essential in the uphill direction as bicyclists travel much slower than motor vehicles uphill and may require more space to operate the bike but can generally keep pace travelling downhill.

Application

This treatment should be used on streets with substantial grades in the uphill direction and on roadways where bike lanes cannot be provided in both directions.



Bike Route Wayfinding



Wayfinding signage is divided into the following types:

Confirmation Signs are intended to inform people that they are traveling on a designated bikeway, provide distance or time to key destinations, and notify motorists that they are traveling on a bike route.

- Location: At the beginning of bikeway facility and before major changes of direction.

Turn Signs are intended to indicate where a bikeway turns onto another street or provide navigation guidance through an area where route guidance may be needed.

- Location: Near side of intersection where bikeway changes direction.

Decision Signs are intended to show connections at a bikeway junction. These signs should show connections and inform users of the preferred route to their destination through the use of time or distance to key destinations.

- Location: Near side of decision making point, about 50-150' in advance of an intersection with another bikeway or the point of divergence to a key destination.



Green Pavement



Green bike facilities are used to better define street space designated for bikes. These facilities are typically green in color and, when used in a bikeway, help to visibly define an area exclusively for bikes. Green bikeways can consist of green paint along the entire bike lane, in key areas (for example, the beginning of a bike lane), and in conflict zones. Conflict zones are areas where bike facilities intersect with other traffic, and often include weave or merge areas where bicyclists and autos should expect to encounter one another. In these areas, green bike facilities are dashed and serve to warn motorized and non-motorized street users of intersecting pathways. Currently, there is interim FHWA approval for the use of green bike lane pavement enhancement. San José has already moved forward with the use of green, and will follow the experimentation process outlined in the CA MUTCD for the use of green with sharrows or other pilot uses of color.¹

¹ http://www.fhwa.dot.gov/environment/bike_pedestrian/guidance/design_guidance/mutcd/



Green Bike Facilities



Green bike facilities can be used in the following locations (locations that are experimental and may require additional documentation are noted with an *):

▪ Cycle Tracks	▪ Conflict Zones
▪ Bike Lanes	▪ Intersections
▪ Turn Boxes*	▪ Bus Stops
▪ Bike Boxes*	▪ Right -Turn Pockets
▪ Green-Backed Sharrows*	▪ Driveways

In addition to making conflict areas more visually defined, the number of conflict areas should be reduced to lessen the risk of bike-auto conflicts. The following guidance is for driveways located along any type of bikeway:

- Driveways should be appropriately spaced from each other and signalized intersections.
- Left turns out of driveways should be discouraged.
- Visual barriers, such as parking, should be removed or restricted within 10-30' (depending on type of bike treatment) of major driveways.

Vertical Separation Devices



Vertical Separation Devices are used to separate motor vehicles (moving or parked) from a bike lane or, more commonly, a cycle track. By definition, vertical separators are placed in a buffer zone and are perpendicular to the plane of travel. These devices should make it difficult for a vehicle to enter the bike lane. The following are suggested vertical separation devices:

- Planter boxes or other landscaping elements
- Raised median or curb
- Zebra Bump/Half Wheel/modular curbs
- Soft hit posts
- Fences or bollards
- Cigar islands

Intersection Treatments

This section describes typical bike treatments at intersections. While they can apply to all facility types described previously, they are typically used at intersections with moderate to high bike volumes, safety concerns or other special considerations warranting focused, bike-specific intersection treatments.

Bike Lanes through Intersections



Marking bike lanes through intersections provides a designated and direct path for bicyclists while indicating to drivers a possible conflict area. This treatment raises awareness of bike presence and priority and is useful in places with high right-turning volumes or in complex intersections where the continuation of the bike route is unclear.

Treatments can include:

- Dashed Bike Lane Lines
- Green skip-striping with dashed bike lane lines

Bike Boxes

Bike boxes are used at signalized intersections to provide a designated area for bikes ahead of motor vehicles. This treatment gives bicyclists a safe and visible advance of vehicle queues and is useful in places where the bike lane is shifting from the right side to the left side of the lane and where there are high right-turn vehicle volumes. Bike boxes are typically placed between the crosswalk and the vehicle stop line and are green in color. They can be limited to one lane or extend across all lanes. The use of green in these areas is experimental under the CA MUTCD and may require additional documentation. Typical features and dimensions include:

- With a no-right-turn-on-red restriction
- Bike pavement legend centered in the bike box
- Advanced stop bar at the back of the box
- Box typically covers the outside travel lane (typically 11') and is approximately 10-16' in length and is colored green
- Optional green bike lane feeding into bike box

Bikeway Design Application Guide for Signalized Intersections

	Bike Lanes through Intersections	Bike Boxes	Two-Stage Turn Queue Boxes	Combined Bike Lane/Turn Lane	Cycle Track Intersection Approach	Median Refuge	Extended Green Time	Bike Signal Heads*	Signal Detection and/or Actuation	Advanced Bike Stop Bar
Protected Lanes: Raised/In-Street One-Way Cycle Tracks	P	O	O	O	M	P	P	P	M	O
Protected Lanes: Raised/In-Street Two-Way Cycle Tracks	P	O	O	O	M	P	P	P	M	O
Buffered Bike Lanes	P	O	O	O	X	P	P	O	M	O
Bike Lanes	P	O	O	O	X	P	P	O	M	O
Shared Lanes	O	O	O	O	X	P	P	X	O	O
Bike Boulevards	O	O	O	O	X	P	P	X	O	O
Shared Use Paths	P	X	O	X	X	P	X	P	M	X

M Mandatory **P** Preferred **O** Optional **X** Not Applicable

*Bike signal heads should only be used when there is a discrete bike phase separate from the vehicle phase. This is unlikely to occur with bike lanes except in a few places.

Detail Pages: Types of Bikeways

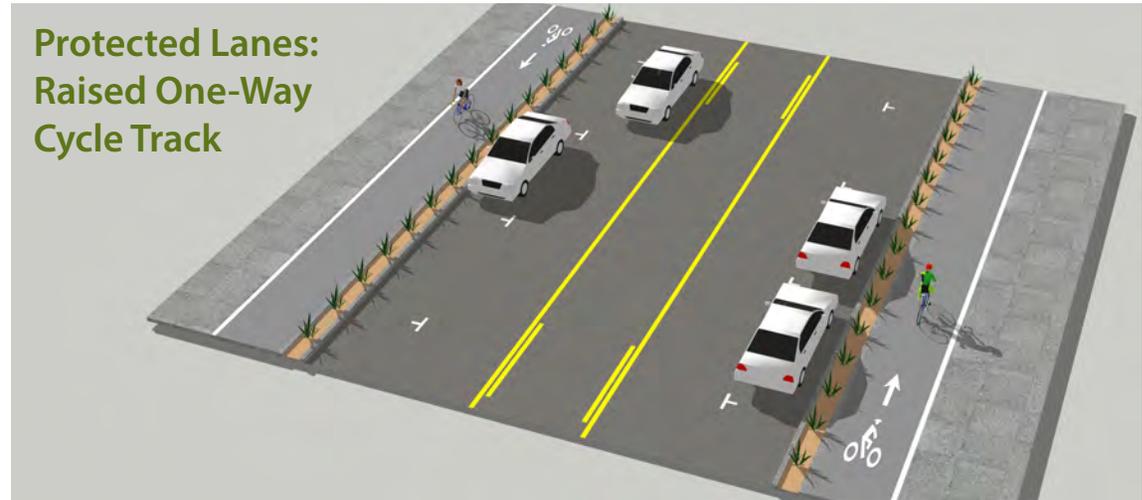


Photo: NACTO

Function	Provides a protected connection for bikes with vertical (and potentially horizontal) separation from vehicles and pedestrians.				
Design Implementation (Optional Items Denoted with *)	<ul style="list-style-type: none"> Asphalt or concrete bike space either at sidewalk height or mid-level between sidewalk and roadway. Curb may be rolled or vertical. Separation between bicyclist and pedestrian should be provided if the sidewalk is at sidewalk height, which may include light fixtures, landscaping, special paving, or other design elements. Parking buffer between cycle track and travel lane* Protected turns across cycle tracks or dedicated bike phase. Use mixing zones where signal modifications cannot be made. (Refer to Page 111, Cycle track intersection approach, for more information) Green skip-stripe conflict zone markings through signalized and non-signalized intersections* Solid or skip-stripe green conflict zone markings through driveways* Bike pavement legends at least one per block and after major transitions or conflict points Bike wayfinding Bus islands/bus bulbs where transit is provided, with cycle track running behind the bus stop and pedestrian crossing points 				
Dimensions	Maximum Width	Minimum Width	Minimum Height	Minimum Rolled or Vertical Curb Width	Minimum Buffer Width Adjacent to Parking
	8', including gutter pan	5'	Typically 3" or 1/2 Curb Height	1'	3
Considerations	<ul style="list-style-type: none"> Maximizes comfort for bicyclists Provides safe separation on streets with high traffic volumes/speeds Could be inappropriately used by pedestrians if the adjacent sidewalk is not comfortable for pedestrians or no separation is provided between sidewalk and cycle track Special maintenance equipment may be required to clean the cycle track 				
Combination Options	Landscaping in buffer area, green pavement treatments, adjacent bike parking, adjacent footpath				
Alternatives	In-Roadway Cycle Track, Buffered Bike Lane, Shared-Use Path				

Cost:
Implementation: \$\$\$
Maintenance: +++

* Denotes an optional treatment

Protected Lanes: Raised Two-Way Cycle Track

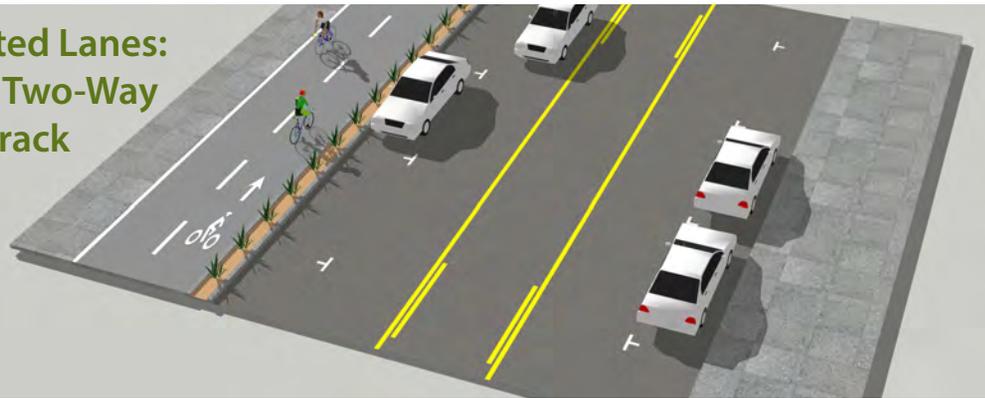


Photo: NACTO

Function Provides a connection for bikes with vertical separation from vehicles where both directions of bike traffic should be consolidated to one side of the roadway, such as along an edge condition, wrong-way riding, or special design considerations.

- Design Implementation (Optional Items Denoted with *)**
- Asphalt or concrete bike space either at sidewalk height on mid-level between sidewalk and roadway. Curb should be rolled. Separation between bicyclist and pedestrian should be provided if the cycle track is at sidewalk height, which may include light fixtures, landscaping, special paving, or other design elements
 - Parking buffer between cycle track and travel lane*
 - Protected turns across cycle tracks or dedicated bike phases are strongly recommended
 - Green skip-stripe conflict zone markings through signalized and non-signalized intersections*
 - Solid or skip-stripe green conflict zone markings through driveways*
 - Bike pavement legends at least one per block and after major transitions or conflict points
 - Bike wayfinding
 - Bus islands/bus bulbs where transit is provided, with cycle track running behind the bus stop
 - Turn boxes or bikes boxes at key intersections in the citywide bike network

Cost:
Implementation: \$\$\$
Maintenance: +++

Dimensions	Minimum Width	Minimum Height	Maximum Height	Minimum Rolled or Vertical Curb Width	Minimum Buffer Width Adjacent to Parking
	8', including gutter pan	Typically 3" or 1/2 Curb Height	Typically 6" or Flush with Sidewalk	1'	3'

- Considerations**
- Two-way cycle tracks should only be considered with special design considerations, which may include an "edge" condition of large infrastructure or natural features (body of water, railroad tracks, etc that decrease intersection conflicts), where wrong-way riding is prevalent, and "last mile" connection to key destinations through complex areas
 - Provide a two-way travel option on one-way streets
 - Maximizes comfort for bicyclists
 - Provides safe separation on streets with high traffic volumes/speeds; could be inappropriately used by pedestrians if the adjacent sidewalk is not comfortable for pedestrians or no separation is provided between sidewalk and cycle track
 - Special maintenance equipment may be required to clean the cycle track, driveway conflicts and intersection considerations should be heavily weighed prior to selection of this facility

Combination Options Landscaping in buffer area, green pavement treatments, adjacent bike parking, adjacent footpath

Alternatives In-Roadway Cycle Track, Buffered Bike Lane, Shared-Use Path

* Denotes an optional treatment

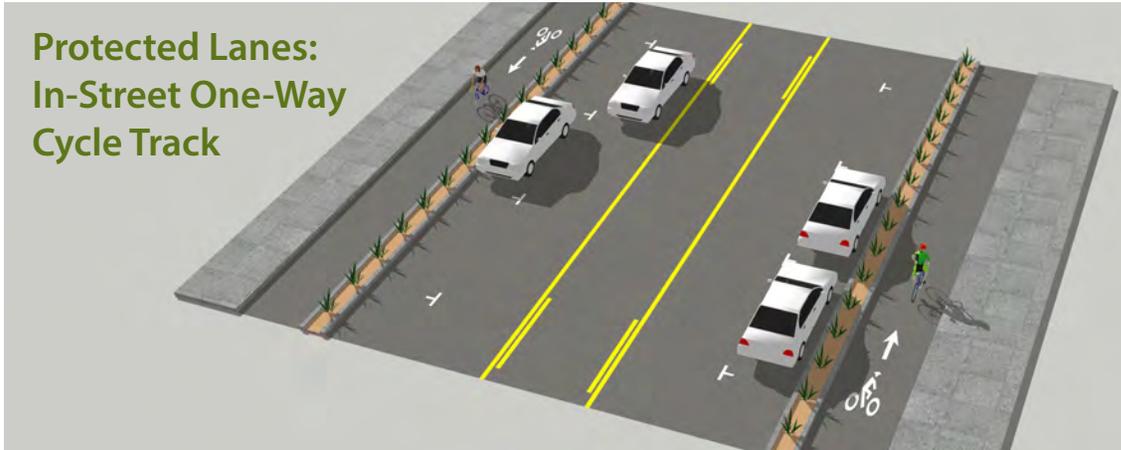
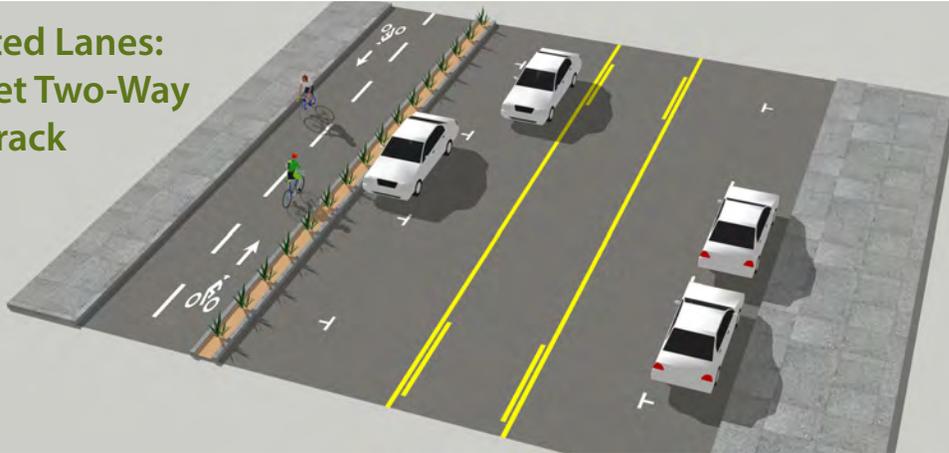


Photo: NACTO

Function	Provides a connection for bicyclists with horizontal and vertical separation from vehicles and pedestrians.			
Design Implementation (Optional Items Denoted with *)	<ul style="list-style-type: none"> • Typically asphalt bike space located at-grade with roadway. • Buffer space may be provided through raised curb, landscaping, landscape planters, bollards or soft-hit posts, parked cars, or similar vertical and horizontal design elements. • Protected turns across cycle tracks or dedicated bike phase. Use mixing zones where signal modifications cannot be made (Refer to Page 111, Cycle track intersection approach, for more information) • Green skip-stripe conflict zone markings through signalized and non-signalized intersections* • Solid or skip-stripe green conflict zone markings through driveways* • Bike pavement legends at least one per block and after major transitions or conflict points • Bike wayfinding • Bus islands/bus bulbs where transit is provided, with cycle track running behind the bus stop • Turn boxes or bikes boxes at key intersections in the citywide bike network 			
	<p style="text-align: right;">Cost: Implementation: \$\$\$ Maintenance: +++</p>			
	Maximum Width	Minimum Width	Minimum Buffer Width	Minimum Parking Buffer Width
Dimensions	8', including gutter pan. If providing 8', ensure vehicle entrance barrier	5', including gutter pan	2'	10' (Combined Buffer + Parking)
Considerations	<ul style="list-style-type: none"> • Maximizes comfort for bicyclists • Provides safe separation from motor vehicle traffic on streets with high traffic volumes/speeds and heavy truck traffic • Where sidewalk is not comfortable for pedestrians, pedestrian-bike conflicts may occur • Consideration should be given to the number and spacing of driveways along the cycle track and opportunities to consolidate and/or reduce driveway size should be considered with the design • When implementing, be sure to discourage pedestrian conflict issues by providing barriers or signs • Additional maintenance may be required where street sweeping vehicles cannot enter the cycle track space 			
Combination Options	Landscaping in buffer area, green pavement treatments, adjacent bike parking			
Alternatives	Protected Raised Cycle Track, Buffered Bike Lanes, Shared-Use Path			

* Denotes an optional treatment

Protected Lanes: In-Street Two-Way Cycle Track



Function Provides a connection for bikes with horizontal separation from vehicles where both directions of bike traffic are consolidated to one side of the roadway, such as along an edge condition, wrong-way riding, or special design considerations.

Design Implementation
(Optional Items Denoted with *)

- Typically asphalt bike space located at-grade with roadway
- Buffer space travel lane may be provided through raised curb, landscaping, landscape planters, bollards or soft-hit posts, parked cars, or similar vertical and horizontal design elements
- Protected turns across cycle tracks or dedicated bike phases are strongly recommended.
- Green skip-stripe conflict zone markings through signalized and non-signalized intersections*
- Solid or skip-stripe green conflict zone markings through driveways*
- Bike pavement legends at least one per block and after major transitions or conflict points
- Bike wayfinding
- Bus islands/bus bulbs where transit is provided, with cycle track running behind the bus stop
- Turn boxes or bikes boxes at key intersections in the citywide bike network
- Consider centerline, especially where bike traffic is heavy in both directions

Cost:
Implementation: \$\$\$
Maintenance: +++

Dimensions	Minimum Width	Minimum Buffer Width	Minimum Parking Buffer Width
	8' - 12', including gutter pan	3'	10' (Minimum 7' Parking + 3' Buffer for Door Zone)

- Considerations**
- Two-way cycle tracks should only be considered with special design considerations, which may include an "edge" condition of large infrastructure or natural features (body of water, railroad tracks, etc that decrease intersection conflicts), where wrong-way riding is prevalent, and "last mile" connection to key destinations through complex areas
 - Maximizes comfort for bicyclists
 - Provides safe separation from motor vehicle traffic on streets with high traffic volumes/speeds and heavy truck traffic
 - Where sidewalk is not comfortable for pedestrians, pedestrian-bike conflicts may occur
 - Consideration should be given to the number and spacing of driveways along the cycle track and opportunities to consolidate and/or reduce driveway size should be considered with the design
 - When implementing, be sure to discourage pedestrian conflict issues by providing barriers or signs
 - Additional maintenance may be required where street sweeping vehicles cannot enter the cycle track space

Alternatives Protected Raised Cycle Track, Shared Use Path

* Denotes an optional treatment

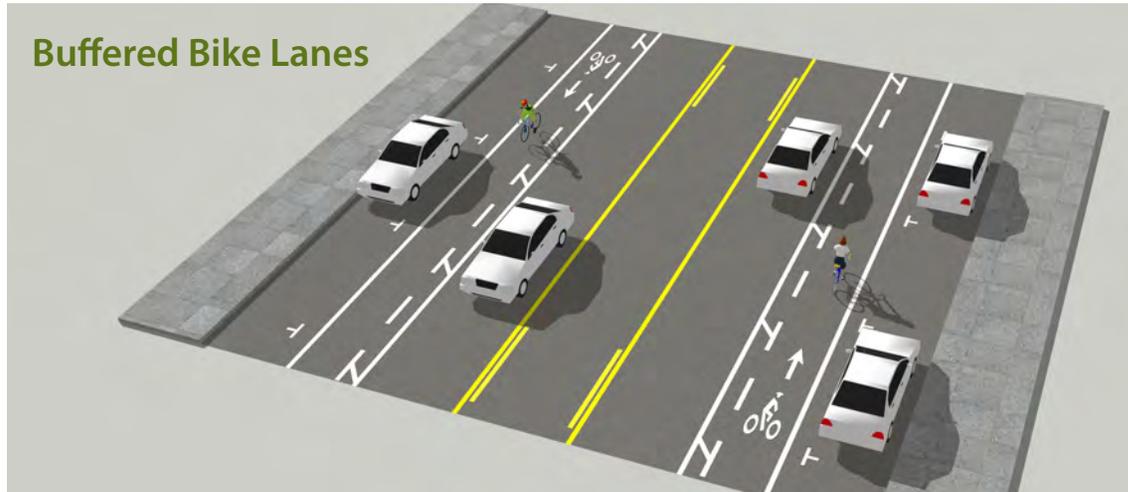


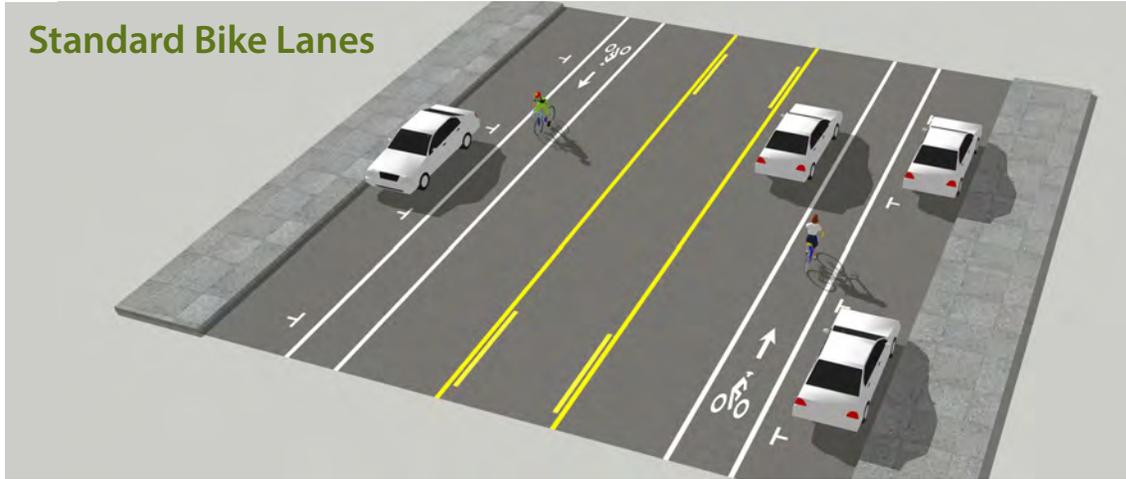
Photo: NACTO

Buffered Bike Lanes

Function	Provides a comfortable connection for bicyclists with a horizontal separation from vehicle traffic and/or parking.		
Design Implementation (Optional Items Denoted with *)	<ul style="list-style-type: none"> • Painted buffer space between travel lane and bike lane, bike lane and parking lane, or on both sides of the bike lane • Green skip-stripe conflict zone markings through signalized intersections* • Skip-stripe green conflict zone markings through major driveways and through bus stops* • Bike pavement legends at least one per block and after major transitions or conflict points • Bike wayfinding • Bike detection at signalized intersections • Turn boxes or bikes boxes at key intersections in the citywide bike network • Buffer should begin immediately following an intersection, using a straight taper rather than a curved, large-radius taper 		Cost: Implementation: \$\$ Maintenance: ++
	Dimensions	Minimum Bike Lane Width 5'	Minimum Buffer Width from Travel Lane 2'
Considerations	<ul style="list-style-type: none"> • Comfortable for bicyclists • Provides separation from motor vehicle traffic on streets with high traffic volumes/speeds, heavy truck traffic, and/or high-turn over parking, where risk of dooring is high • Provides comfortable facility where full vertical separation, as with cycle track, is not feasible • Can be maintained with typical street sweeping vehicles 		
Alternatives	Protected In-Street One Way Cycle Tracks, Bike Lanes		

* Denotes an optional treatment

Standard Bike Lanes



Function Provides a comfortable connection for bicyclists with a horizontal separation from motor vehicle traffic and/or parking.

Design Implementation
(Optional Items Denoted with *)

- Striping designates a uniform bike travel lane adjacent to on-street parking or curb
- Bike pavement legends at least one per block and after major transitions or conflict points
- Green skip-stripe conflict zone markings through conflict zones at right-turn pockets and bus stops*
- Bike wayfinding and bike lane signage at the beginning of the facility
- Bike detection at intersections
- Turn boxes or bikes boxes at key intersections in the citywide bike network*

Cost:
Implementation: \$
Maintenance: +

Dimensions

Minimum Bike Travel Lane Width

5' (including at least 4' of rideable surface, such as outside of curb gutter pan)¹; 6' preferred

Minimum Parking + Bike Lane Width

14' (8' Parking + 6' Bicycle Lane)

Considerations

- Comfortable for experienced bicyclists but may not provide adequate level of comfort for all ages and ability types, especially on streets with higher traffic speeds and volumes
- Provides dedicated space separate from motor vehicle traffic
- Provides facility where horizontal separation is not feasible
- Can be maintained with typical street sweeping vehicles
- Can be uncomfortable on high speed roadways, roadways with heavy truck traffic and adjacent to parking lanes and transit lanes as bicyclists can be forced into vehicle travel lanes

Alternatives In-Roadway Cycle Tracks, Buffered Bike Lanes, Shared Lanes

¹ Four-foot bike lanes, even where permitted by other state and national guidance, are strongly discouraged

* Denotes an optional treatment

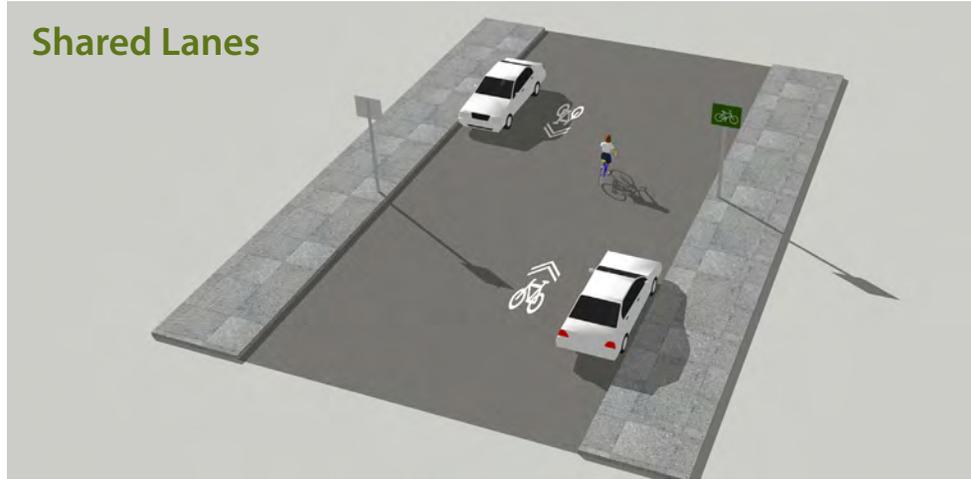


Photo: NACTO

Function	Provides a connection for both bike and vehicle traffic	
Design Implementation (Optional Items Denoted with *)	<ul style="list-style-type: none"> • Sharrows placed typically every 150' and at the beginning of each block, typically centered on the outside travel lane • Install "Bicycles May Use Full Lane" sign (R4-11) at the beginning of each block • Consider "green-backed sharrows," with an approximately 9.5' x 3.5' rectangular of green behind the sharrow on priority routes for bicyclists* • Bike wayfinding and bike route signage at the beginning of the facility • Bike detection at intersections • At major intersections, consider staccato green-backed sharrow or sharrow markings through intersections to denote bicyclist positioning* • Consider alternative direction of arrow to indicate turning movements and jogs in the bike route* 	
Dimensions	Minimum Sharrow Frequency	Maximum Sharrow Frequency
	150' Preferred	250'
Considerations	<ul style="list-style-type: none"> • Comfortable for only most experienced bicyclists on streets with moderate to high traffic volumes (>2,000 ADT) and speeds; generally acceptable for all cyclist types on traffic-calmed, low volume (<2,000 ADT) residential streets with speed limits of 25 MPH or less • Ensure placement of shared lane marking is outside of the "door zone" for rider safety and striping durability • Should generally not be used on streets with high vehicle traffic volumes, high bike traffic volumes, heavy transit use or heavy truck use 	
Alternatives	Bike Lane, Bike Boulevards	

Cost:
Implementation: \$
Maintenance: +

* Denotes an optional treatment



Photo: NACTO

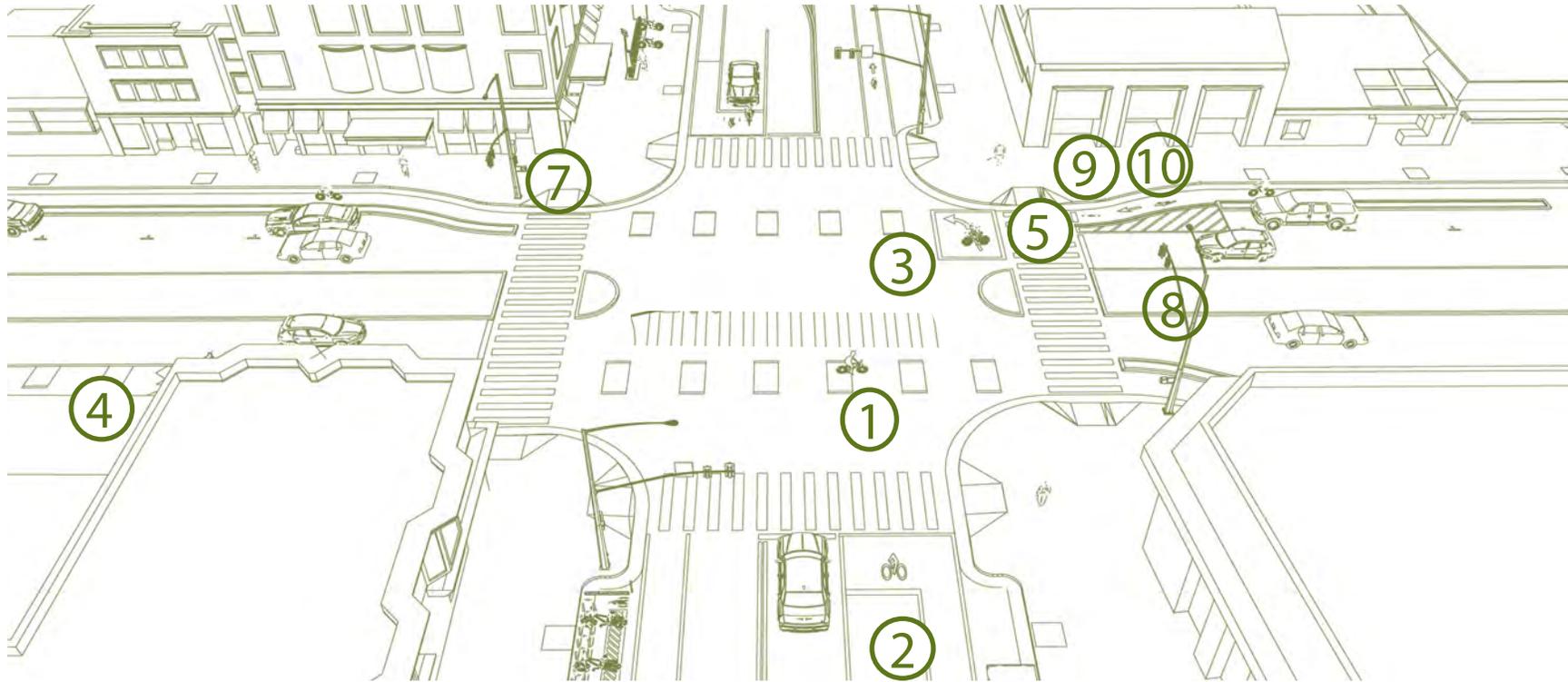
Function	Provides a connection for both bike and vehicle traffic	
Design Implementation (Optional Items Denoted with *)	<ul style="list-style-type: none"> • Oversized “Bike Boulevard” legends, green-backed sharrows, or typical sharrows placed typically every 150-200’ and at the beginning of each block, centered on the outside travel lane • Install “Bicycles May Use Full Lane” sign (R4-11) at the beginning of each block • Traffic calming features are recommended to control volumes if ADT is over 3,000, including partial or full-diverters or closures should be used to maintain low vehicle volumes.* • Traffic calming features to control speeds if the 85th percentile speed is above 25 mph, such as speed tables, raised intersections, speed feedback signs, and speed humps.* • Consider edgelines to define the roadway edge and narrow the perception of the travel way • Consider removing the centerline from the roadway to reduce speeds and narrow the feel of the travel way. • Bike boulevard wayfinding • Bike detection at signalized intersections • Consider enhancing crossings at uncontrolled intersections • At major intersections, consider staccato green-backed sharrow or sharrow markings through intersections to denote bicyclist positioning* • Consider alternative direction of arrow to indicate turning movements and jogs in the bike route* 	
Dimensions	Minimum Pavement Legend Spacing	Maximum Pavement Legend Spacing
	150’ Preferred	250’
Considerations	<ul style="list-style-type: none"> • Ensure placement of sharrows is outside of the door zone • Edgelines should be placed with appropriate room for parking if necessary • Should not be used on streets with speed limits over 25 MPH, high vehicle traffic volumes, high bike traffic volumes, heavy transit use or heavy truck use 	
Alternatives	Shared Lanes	

Cost:
Implementation: \$\$\$
Maintenance: +++

* Denotes an optional treatment

Detail Pages: Intersection Treatments

This section describes typical bike treatments at intersections. While they can apply to all facility types described previously, these treatments are typically used at intersections with moderate to high bike volumes, safety concerns, or other special considerations warranting focused, bike-specific intersection treatments.



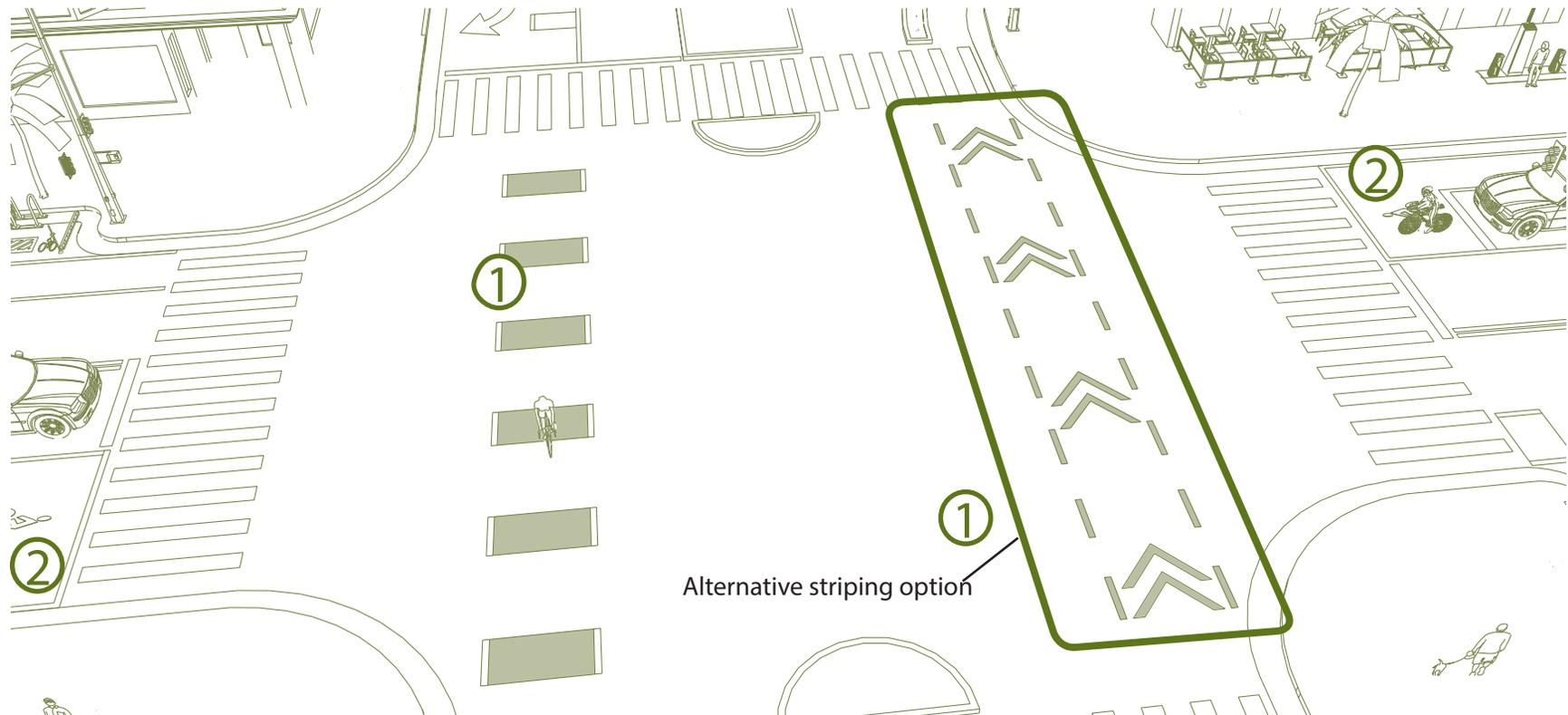
- | | |
|-------------------------------------|---|
| ① Bike Lanes through Intersections | ⑥ Trail and Bike Boulevard Crossings (not pictured) |
| ② Bike Boxes | ⑦ Bike Signal Heads and Bike Signal Phases |
| ③ Two-Stage Turn Queue Boxes | ⑧ Signal Detection and Actuation |
| ④ Combined Bike Lane / Turn Lane | ⑨ Green Wave Signal Priority |
| ⑤ Cycle Track Intersection Approach | ⑩ Advanced Bike Stop Bar |

Bike Lanes through Intersections ①



Marking bike lanes through intersections provides a designated and direct path for bicyclists while indicating to drivers a possible conflict area. This treatment raises awareness of bicyclist presence and priority and is useful in places with high right-turning volumes or in complex intersections where the continuation of the bike route is unclear, or off-set. Treatments can include:

- Dashed Bike Lane Lines
- Green skip-striping with dashed bike lane lines

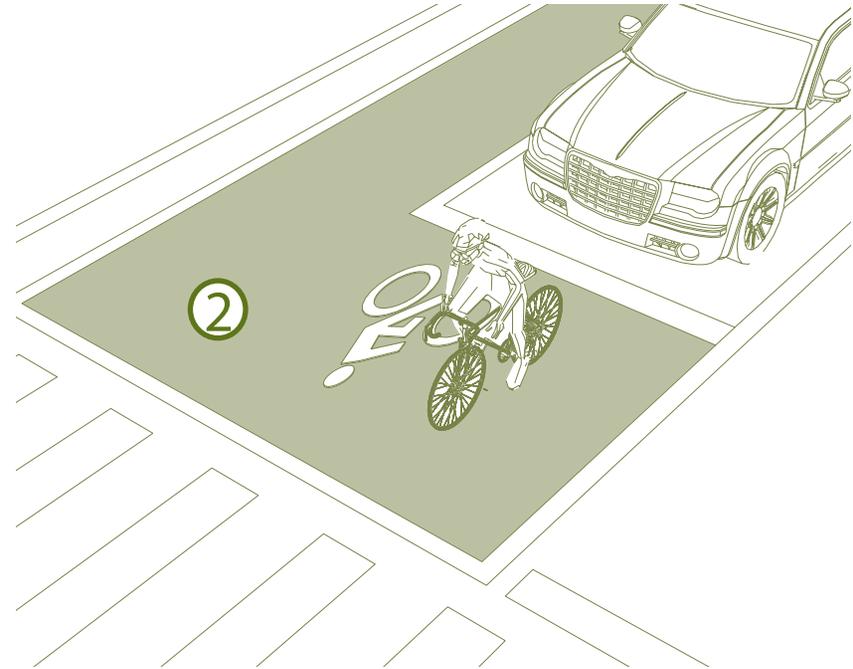
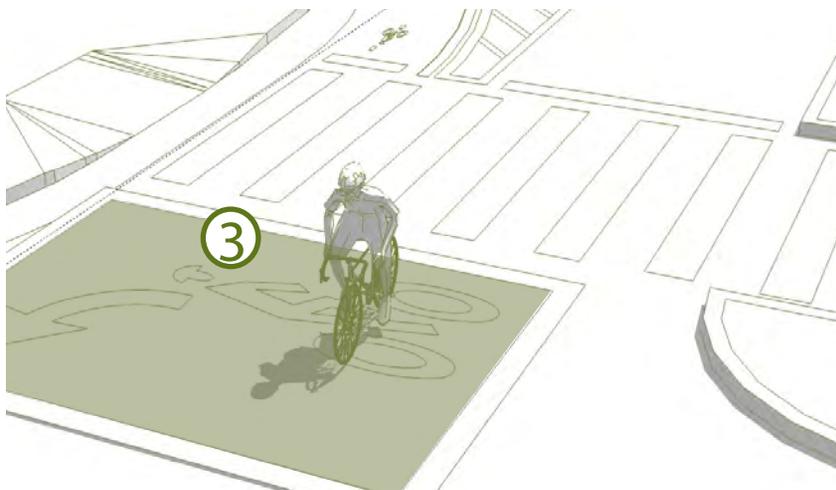


Bike Boxes ②



Bike boxes are used at signalized intersections to provide a designated area for bikes ahead of vehicles. This treatment gives bicyclists a safe and visible area in advance of motor vehicle queues and is useful in places where the queuing area in the bike lane is shifting from the right side to the left side of the lane or where there are high right-turn vehicle volumes. Bike boxes are typically placed between the crosswalk and the vehicle stop line and are green in color. They are generally one lane. The use of green in these areas is experimental under the CA MUTCD and may require additional documentation. Typical features and dimensions include:

- With a no-right-turn-on-red restriction
- Bike pavement legend centered in the bike box
- Advanced stop bar at the back of the box
- Box generally covers the outside travel lane (typically 11') and is approximately 10-16' in length between inner edges of striping and is colored green
- Optional green bike lane feeding into bike box

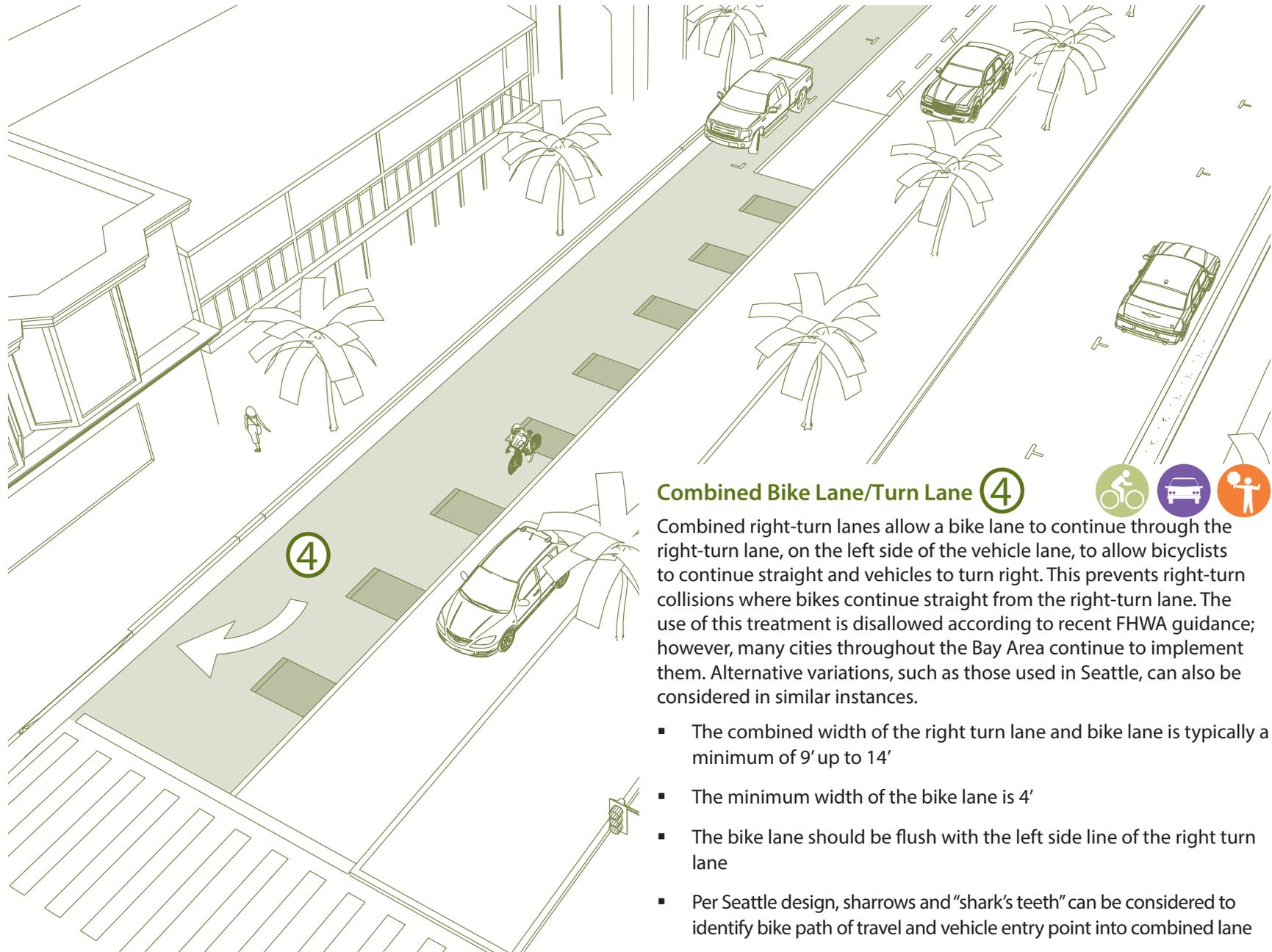


Two-Stage Turn Queue Boxes ③



Two-stage turn boxes allow a cyclist to make a left-hand turn in two movements at multi-lane intersections. This prevents bicyclists from having to merge with traffic to make a left turn and is useful in situations where there are multiple lanes of traffic, high vehicle speeds or where there is a large volume of left-turning bicyclists from a right-side facility. The use of green in these areas is experimental under the CA MUTCD and may require additional documentation. Typical features and dimensions include:

- With a no-right-turn-on-red restriction
- Bike pavement legend with turn arrow
- Typical box dimensions are 15'x10'-16' between inner edges of striping. Boxes are typically colored green.



Combined Bike Lane/Turn Lane ④



Combined right-turn lanes allow a bike lane to continue through the right-turn lane, on the left side of the vehicle lane, to allow bicyclists to continue straight and vehicles to turn right. This prevents right-turn collisions where bikes continue straight from the right-turn lane. The use of this treatment is disallowed according to recent FHWA guidance; however, many cities throughout the Bay Area continue to implement them. Alternative variations, such as those used in Seattle, can also be considered in similar instances.

- The combined width of the right turn lane and bike lane is typically a minimum of 9' up to 14'
- The minimum width of the bike lane is 4'
- The bike lane should be flush with the left side line of the right turn lane
- Per Seattle design, sharrows and "shark's teeth" can be considered to identify bike path of travel and vehicle entry point into combined lane

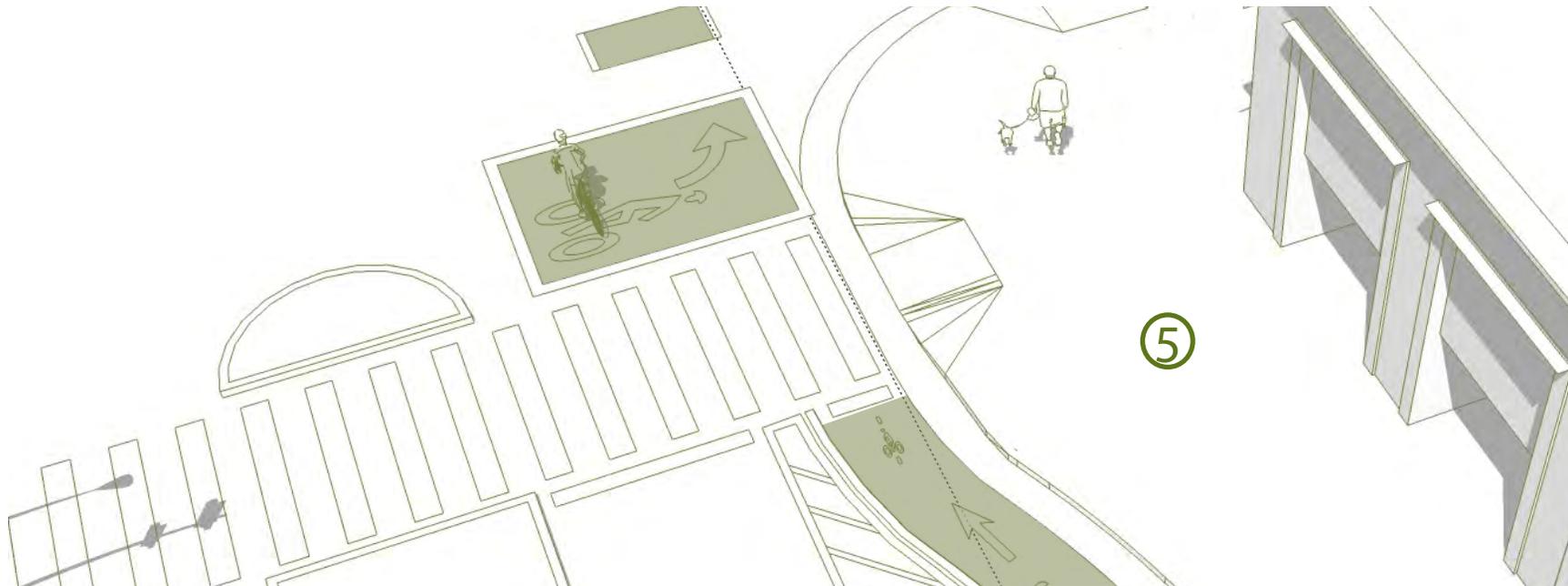
Cycle Track Intersection Approach ⑤

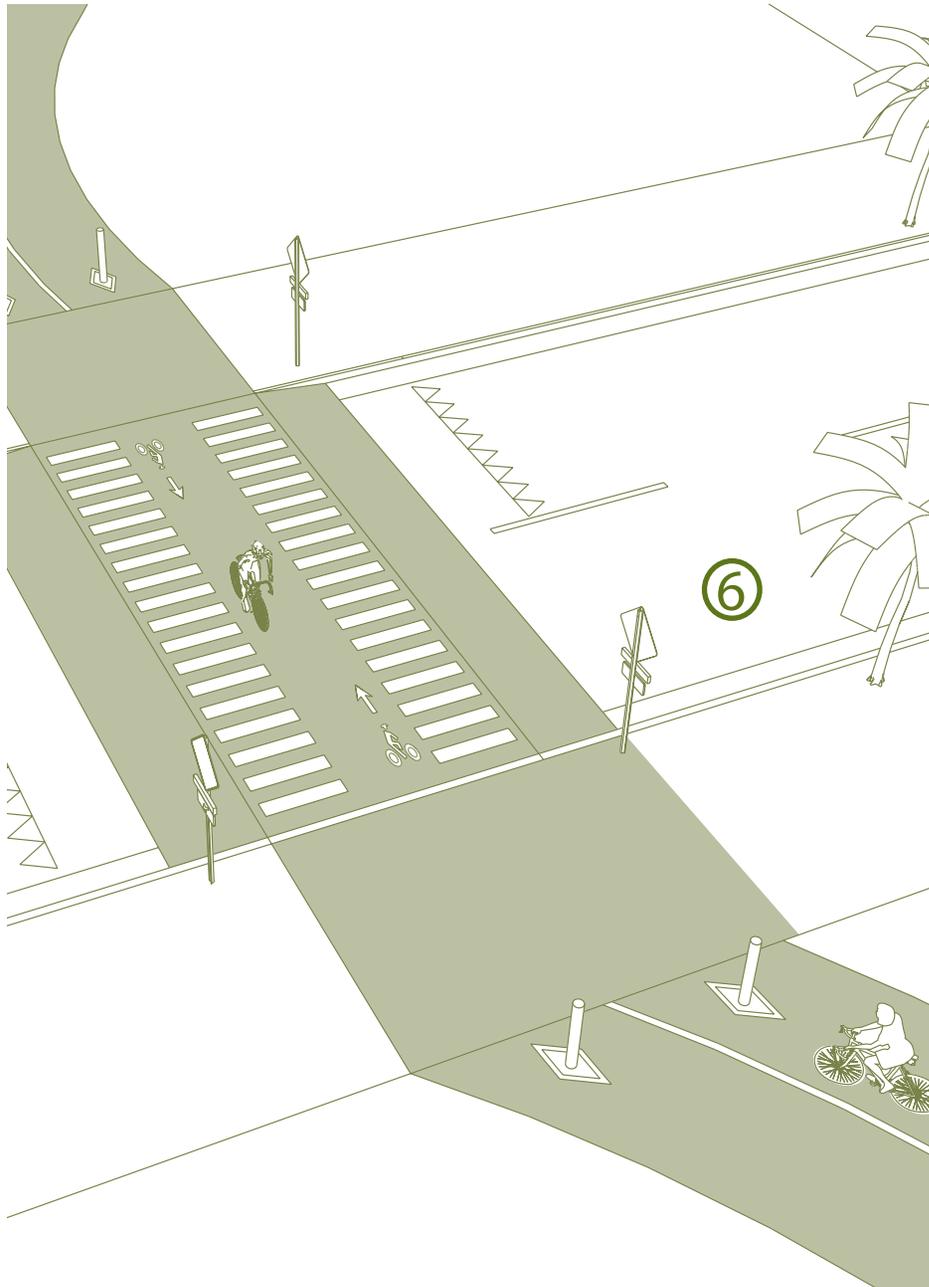


It is desirable to drop a cycle track to street-level, disallow parking and remove any visual barriers in advance of an intersection in order to increase visibility of bicyclists. After returning the cycle track to street level, intersection approaches for cycle tracks can be treated similar to typical bike lane approaches. As the bike lane approaches the intersection, options include (in order of preference):

1. A bike signal phase and/or protected right turn phasing to allow bicyclists to safely progress through the intersection without conflicting turning movements.
2. A combined bike lane/turn lane with a green conflict zone where vehicle and bike paths intersect. A variation on this treatment is a bike lane that runs immediately adjacent to the vehicle lane for the length of the intersection approach, in order to improve cyclist visibility.
3. A bike box allows bikes to position themselves ahead of vehicle traffic if they are stopped at the traffic signal. This should typically only be used in scenarios where there is not a dedicated right-turn lane.

Where new bulb-outs are being constructed, consideration should be given to designing a “protected” intersection that maintains a straight bike path of travel between the sidewalk and the edge of the bulb-out. An alternative to physical intersection approach treatments include configuration of a bike signal phase that separates bike time from vehicle time in the intersection.



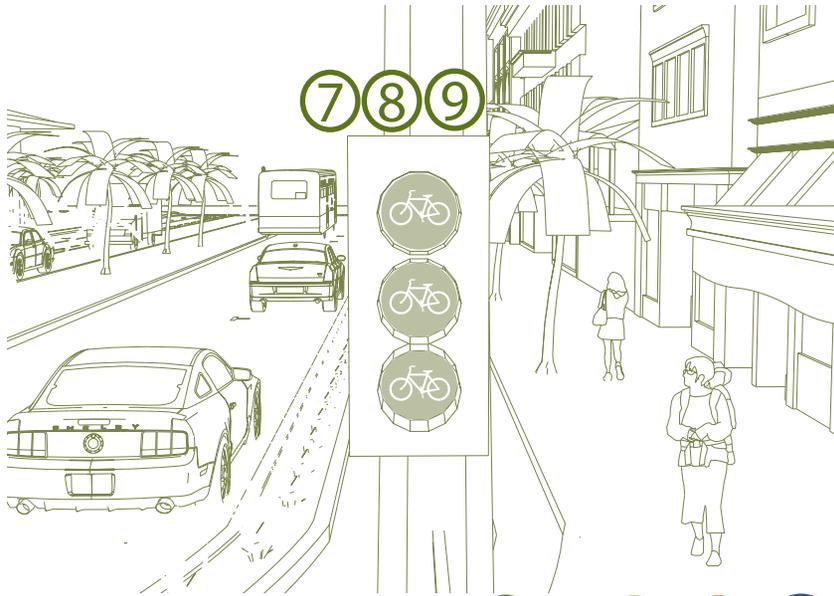


Trail and Bike Boulevard 6



Where trails and bike boulevards cross streets, designers can prioritize safe and convenient bike crossings by incorporating design elements that facilitate bike travel.

- **Bike Signal:** See section on following page.
- **Pedestrian Hybrid Beacons:** Pedestrian Hybrid Beacons (PHBs) or High-intensity Activated Crosswalk (HAWK) signals are signal heads that resemble a typical traffic signal but are triggered by bike or pedestrian push buttons. When the cyclist and/or pedestrian are given 'walk' or green bike signals, the motorist sees a double red light. When the bicyclists and pedestrians are not crossing the street, there is no light.
- **Flashing Beacons:** Flashing beacons are devices used to alert motorists of pedestrians or bicyclists crossing the street. Motorists are alerted that pedestrians and bicyclists have the right-of-way through the use of flashing LED lights and signs. These are typically activated by using a push button in order to decrease the speed of the cyclist before entering oncoming traffic.
- **Refuges:** Median refuge islands are curbed islands placed in the middle of a street in order to aid cyclist and pedestrian crossing of multi-lane, unsignalized and/or high-speed streets. This treatment may or may not be accompanied by a bike signal or other vertical delineation.
- **Extended Green Time:** At signalized intersections on movements with bike traffic, the amount of green time should be extended to allow for the safe passage of bicyclists.
- **Bicyclist and Pedestrian Separation:** Where high bicyclist and/or pedestrian volumes are expected, consideration should be given to delineating separate travel paths for bicyclists through the crossing (see example in figure on this page; alternate delineations can be done where bicyclists should remain to left or right of pedestrians).



Bike Signal Heads and Bike Signal Phases ⑦



Bike signals resemble traffic signals but can be differentiated by the shape of the light display. Bike signals should be used with traffic signals in areas with high bike volumes or high collision rates. These signals typically give bicyclists a 'lead' in front of turning traffic to prevent collisions, and in scenarios with contra-flow bike lanes or two-way cycle tracks, they can provide bike-only signal phases. Signals should be placed in locations where they are clearly visible to bicyclists and a "Bike Signal" sign should accompany them to increase knowledge of their function to both bicyclists and motorists.

Signal Detection and Actuation ⑧



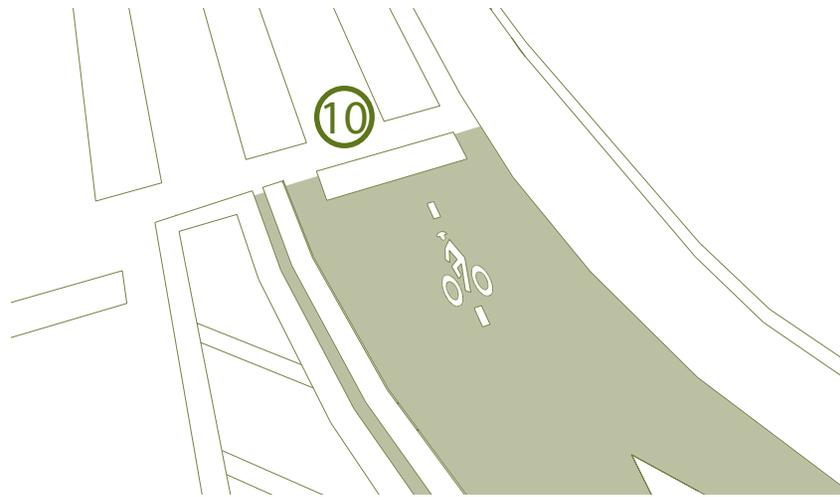
Bike detection is used at signalized intersections to determine the presence of a cyclist and trigger signal timing accordingly. A cyclist's presence can be detected by: video detection, loop detection, push-button, or microwave detection. Video detection is used to detect bicyclists at or in advance of the signal. Once detected, the signal timing is adjusted accordingly. Similarly, loop detection is used to detect bikes at or in advance of a signal but is triggered by the presence of the bicyclist on a certain area of pavement typically denoted by a bike detection marking and sign (CA MUTCD sign R10-22). Push-buttons for bicyclists are located adjacent to the bike lane facing the street and are activated by the user. Microwave detectors are similar to video detectors but are able to monitor multiple detection areas for bicyclists. Passive detection methods are preferred, so bicyclists can maintain momentum.

At all intersections along bike routes, extended bike green time should be programmed into signal controllers to allow adequate bike clearance. This is particularly important for large intersections where it may be difficult for bicyclists to fully cross an intersection in the typically programmed minimum automobile green time phase.

Green Wave Signal Priority ⑨



Green wave signal timing refers to the optimization of signals to bike speeds aimed at prioritizing bike traffic. This signal timing allows bikes to travel comfortably, conveniently, and quickly through corridors where stop-and-go movements may cause bicyclists significant delay. Signals are typically set to allow bicyclists to maintain an average speed of 12-13 miles per hour without being stopped at a red signal.



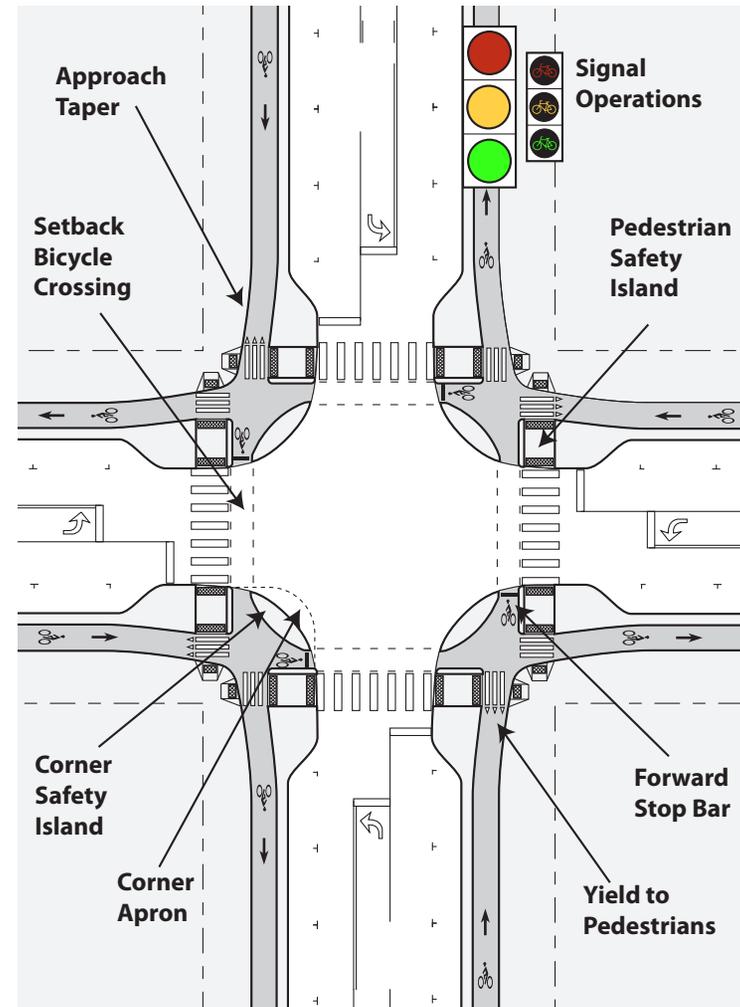
Advanced Bike Stop Bar 10  

Advanced bike stop bars are placed 2-10' in front of vehicle stop bars at intersections. These stop bars place bikes ahead of motor vehicles in order to increase visibility and decrease the incidence of collisions from turning vehicles.

Protected Intersections



Protected intersections use a variety of design elements to create safe, comfortable conditions for bicyclists. A protected intersection is illustrated in the graphic below. While not all of these elements are appropriate in all situations, they make up the typical protected intersection experience.



Source: Alta Planning + Design

Other Bike Facilities

Bike Parking

Bike parking on a Complete Street is defined as the placement of an unused bike while shopping, dining, working, or another short-term activity, distinct from storing a bike at home or elsewhere for long periods of time. Typically, on-street or on-sidewalk bike parking incorporates a rack or series of racks providing support and a place to lock standing bikes.

Bike parking is beneficial to multiple parties. For bicyclists, it allows easy access to local destinations and reduced risk of theft while dismounted. With a bike theft occurring every 24 seconds in the United States, having a secure, visible, and easily-accessible place to store bikes on the street can help bicyclists feel more comfortable leaving their bike while engaging in other activity.²

Ample bike parking can facilitate access, thereby making it easy for customers to patronize businesses. Bike parking can be especially beneficial as a complement to automobile parking; in constrained conditions, bike parking can mean more local parking capacity.

Bike parking enhances and defines the public realm. Streets with no formal place to put locked bikes can feel cluttered when bikes are locked to fences, poles, trees, or other objects. Additionally, bikes locked to solid objects can sometimes block sidewalks. Bike parking remedies both situations by providing a place for organized storage out of existing paths of travel. By uncluttering and unblocking the public realm, bike parking can enhance the viability of bicycling as a mode of transportation.

Bike parking configurations are flexible and can be designed to meet streetscape constraints and opportunities. Single racks can be used, as well as larger assemblages of multiple racks.

² http://www.bikeleague.org/sites/default/files/bikeleague/bikeleague.org/programs/bikefriendlyamerica/communities/pdfs/cops_bikettheft_2008.pdf

Where automobile parking is ample, a single parking space can be converted to parking for multiple bikes.

Bike parking can be defined as short-term or long-term parking based on the facility type. Long-term bike parking provides higher security than short-term parking by providing controlled access via key, smartcard, or code access and is typically protected from weather. These facilities can be bike racks located in cages or rooms as well as bike lockers, and sometimes provide showers and lockers. Long-term storage is intended for parking that is used for more than two hours while short-term parking is intended for users requiring parking for less than two hours. Short-term bike parking typically consists of bike racks secured to the ground in well-lit central areas near commercial or retail areas.

Bike Sharing

Bike sharing is an on-street amenity that has been growing in popularity in recent years. The concept involves a network of bike stations that dock bikes for shared use. Users can check out a bike at a station, ride the bike to their destination, and return the bike to a station elsewhere when done. The Bay Area currently has a bike sharing system, which was implemented in 2013. The City of San José currently hosts 42 stations with the system scheduled to expand to 41 or more stations and 200 dockless bikes by 2019.

Bike sharing provides many of the same benefits as bike parking, since bike sharing stations provide convenient places for users to park their shared bikes. Bike sharing also has the benefit of flexibility: the user does not need to have a bike with them to get to their destination. Additionally, bike sharing systems have been shown to boost local economic activity, can attract newcomers, and can spur business for local bike shops.

Physically, bike sharing stations typically consist of an electronic payment kiosk connected to a line of bike docks. The number of docks can vary by system demand, physical space, or other factors, and bikes can dock from one or two sides. Other elements may include signage or solar panels to power the electronics on the station. Stations can range in size from roughly 6-8' wide by 10' to 40' long. A 4' back-up zone is required where bikes load into docks.

Appendix A

Standards, Guidelines, and Options Summary

This appendix is a summary of the standards, guidelines, and options included in this document. Definitions of standards, guidelines, and options included in this document are:

Standard - a statement of required, mandatory, or specifically prohibitive practice.

Guideline - a statement of intended practice in typical situations, with deviations allowed if judgment or study indicates the deviation to be appropriate. The City will consider information included in a request/study and determine if the design variance is reasonable and appropriate prior to making judgment and allowing deviation.

Option - a statement of practice that, in some instances, is a permissive condition and carries no requirement.

Standards

This section summarizes streetscape design standards in this document, including primary guiding principles, compliance with the Americans with Disabilities Act (ADA), minimum widths of streetscape elements, right-of-way widths, and design of sidewalks, walkways, and bikeways.

Primary Guiding Principles

1. Street typologies established in the Envision San José 2040 General Plan shall be used to design streets in San José. (pg. 7, 10)
2. Streets shall be designed to promote safety and convenience for pedestrians, bicyclists, users with disabilities, and/or children. (pg. 23)
3. Streets shall be designed according to target speeds. (pg. 20)
4. Streetscapes shall be designed to support transit operations. (pg. 54)
5. Streets shall be designed to balance safety, delay, carrying capacity, and comfort for people who walk, bike, take transit, and/or drive. (pg. 23)
6. Multimodal factors of person delay, reliability, safety, and comfort shall be analyzed. (pg. 23)

Americans with Disabilities Act (ADA)

7. All streetscape designs shall meet or exceed ADA requirements. (throughout the document)

Widths

8. When a street is developed or redeveloped, the new street shall comply with this document, including widths of right-of-way (pg. 13) and minimum widths of travel lanes (pg. 14, 27, 31), sidewalk zones (pg. 70-71), and bikeways (pg. 99-106).
9. The Director of Transportation determines if a Collector Street shall be designed to the specifications of an Arterial or Local Street. (pg. 14)
10. Emergency access routes shall accommodate emergency vehicle access. (pg. 37)
11. A 5' minimum clearance must be maintained for on-street disabled parking. (pg. 78)

Sidewalk and Walkway Design

12. Sidewalks shall be people-oriented and comprised of the following zones: Frontage Zone, Through Zone, Furnishing Zone, and Curb Zone. (pg. 66-67)
13. The path of travel between sidewalks and building entries, as well as paths to and from on-street parking for people with disabilities, shall be kept clear. (pg. 72)
14. Street trees and tree basins shall be situated to accommodate opening doors and facilitate passenger entry and exit from parked vehicles. (pg. 77)
15. Café and restaurant tables and seating shall allow for clear access and not interfere with driveways, curb ramps, or emergency access. (pg. 72)
16. Marked crosswalks shall be defined through yellow (in school zones) or white pavement striping. (pg. 83)

Bikeways Design

17. Cycle tracks, bike lanes, and shared use paths shall have bike signal detection and/or actuation. (p. 98)
18. Cycle tracks shall include intersection approaches. (pg. 98, 111)

Guidelines

This section summarizes guidelines for guiding principles of complete streets and intersections and elements of complete streets. Guidelines for elements of complete streets cover sidewalks, lanes widths, bike facilities, bus lanes, intersections, bus stops, parking, lighting, traffic calming measures, stormwater management through green street design, trees, landscaping, planters, placemaking, public seating, signage, wayfinding, median design, cul-de-sac design, and additional complete streets elements.

Guiding Principles

Complete Streets

1. Context types should be used to design streets in San Jose. (pg. 10, 68-71)

Complete Intersections

2. Intersections should be designed first and foremost for people, be multimodal in nature, and evaluated based on metrics such as person delay, safety, reduction in VMT, transportation network capacity and efficiency, and placemaking (rather than solely level of service). (pg. 49, 50)
3. Intersections should be designed as part of an entire network. (pg. 57)
4. Placemaking features should be incorporated into intersections. (pg. 50)
5. Innovative pilot treatments should be considered. (pg. 50)
6. Retrofitting strategies should be considered when nearby land use development occurs. (pg. 58)

Walkways and Sidewalks

7. Pedestrian networks should be integrated within the larger transportation network. (pg. 66)
8. Sidewalks should connect to other modes of travel and provide connectivity, ease of travel, and a comfortable environment to wait for transit. (pg. 66)
9. Sidewalk width should allow for “green” design features. (pg. 66)

Sidewalks and Sidewalk Zones

10. Sidewalks and sidewalk zones (i.e., Through Zone, Frontage Zone, Furnishing Zone, and Curb Zone), should comply with minimum widths. (pg. 70-71)

Through Zone

11. Through Zones should be wider than 4-5', as straight as possible, continuous across driveways, and cross driveways at a level grade. (pg. 68)
12. Enhancing elements such as street trees, pedestrian lighting, awnings, street furniture, and news racks should be located in the appropriate sidewalk zone (not in the Through Zone). (pg. 30 and 73)
13. Paving materials used in the Through Zone should be slip resistant (pg. 53 and 68)

Frontage Zone

14. Frontage Zones in urban areas should be larger to provide space for elements like street furniture, and café and restaurant seating. (pg. 68)
15. Fixed benches in the Frontage Zone should be at least 1' away from the building edge. (pg. 72)

Furnishing Zone

16. Street trees should be placed in the Furnishing Zone. (pg. 77)
17. Utilities should be located within the Furnishing Zone and have enough clearance around them to allow for their maintenance and use. (pg. 76)
18. Furnishing Zones in urban areas should have greater emphasis on pedestrian-oriented amenities such as seating and appropriately-scaled lighting. (pg. 69)
19. Planters should be at least 3' wide in the Furnishing Zone. (pg. 78)
20. Bike racks should be located in the Furnishing Zone, accommodate different bike frame types and sizes, and allow for easy locking of the frame and wheel/wheels to the rack. (pg. 75)

Curb Zone

21. Curb Zones should be wider in areas where more frequent changeover of parking is expected to avoid conflicts with landscaping and more passive activity in the Furnishing Zone (pg. 69, 78)
22. Curb Zones should always be free of vertical obstructions. (pg. 69)
23. Single and double space meters should be immediately visible to drivers and located in the Curb Zone, or within the Furnishing Zone as close as feasible to the Curb Zone, and at the front or rear end of angled and parallel parking stalls (pg. 73)

Truck Access

24. Trucks and other heavy vehicles should be accommodated in areas requiring truck access where doing so would not adversely interfere with pedestrian and bike accommodation. (pg. 40)

Driveways

25. Driveways should be minimized in areas with high pedestrian activity or enhanced bikeway facilities. (pg. 41)
26. Entrance/exit driveways should be limited to 2 per 300 hundred feet in most locations, or even fewer along corridors with high pedestrian or bicycling activity, or with designated bikeways. (pg. 41)
27. Driveways should be located at least 150' from signalized intersections or roundabouts. (pg. 41)
28. Most driveways should not have a curb radius, or if present, should include curbs with a radius of less than 5'. (pg. 41)

Lane Widths

29. Travel lanes should not be wider than 12', except where necessary to accommodate bikes in shared lanes or light rail transit. (pg. 27)

Bikeways

This section summarizes design guidance for bikeways and bike intersection treatments. Bikeway types include protected bike lanes / cycle tracks, buffered bike lanes, standard bike lanes, shared lanes, bike boulevards and bikeway variations.

30. Bikeways should have median refuges. (pg. 98)
31. Cycle tracks, bike lanes, and shared use paths should have bike lanes through intersections. (pg. 98)
32. Cycle tracks, bike lanes, shared lanes, and bike boulevards should have extended green time at signalized intersections. (pg. 98)
33. Cycle tracks and shared use paths should have bike signal heads. (pg. 98)

Protected Bike Lanes / Cycle Tracks

34. Cycle tracks should be installed on streets with high bike volumes and high vehicle speeds, especially on routes with heavy truck traffic or high parking turnover. (pg. 28, 91)
35. Raised cycle tracks should be considered when extra separation from adjacent auto traffic is desired. (pg. 91)

Buffered Bike Lanes

36. Buffered bike lanes should be used whenever there is sufficient roadway width, where right-of-way allows, and/or where comfortable bike facilities are important. (pg. 28, 92)

Shared Lanes

- 37. Shared lanes should generally be used in residential areas and on low-speed streets. (pg. 92)
- 38. Shared lanes should not be used on streets with speed limits greater than 30 MPH. (pg. 92)
- 39. Shared lanes should only be used on roadways that are not wide enough to accommodate bike lanes but have existing bike traffic or are expected to have future bike traffic. (pg. 92)

Bike Boulevards

- 40. Bike boulevards should be used in residential areas with existing or latent demand for bicycling. (pg. 93)

Bikeway Design Variations

- 41. **Contra-flow Bike Lanes:** With contra-flow bike lanes, bike treatments at intersections and buffers between vehicle traffic should be considered to ensure additional uncontrolled bike/vehicle conflicts are not being created. (pg. 94)
- 42. **Left-side bike lanes** should be considered based on bikeway network connectivity, including high left-turn movements for bikes, and should be avoided in places where the street changes from one- to two-way traffic (pg. 94)
- 43. **Climbing lanes** should be used on streets with substantial grades in the uphill direction and on roadways where bike lanes cannot be provided in both directions (pg. 94)
- 44. **Bike route signs** should be located at the beginning of bikeway facility and before major changes of direction. (pg. 95)
- 45. **Driveways along bikeways** should be appropriately spaced from each other and signalized intersections, discourage left turns out, and not have visual barriers within 10-30 feet. (pg. 96)
- 46. **Separation devices** should be used to make it difficult vehicles to enter bike lanes. (pg. 96)

Bike Lanes and Parking

- 47. There should be a buffer between parking and a standard bike lane to limit the possibility of dooring incidents. (pg. 33)
- 48. Where bike lanes continue adjacent to back-in angled parking, conflict zone treatments should be used. (pg. 34)

Parking

- 49. Parking dimensions should be based on parking type. (p. 33-34)

Bus Lanes

50. Bus lanes should be considered (pg. 31):

- on Grand Boulevards or Main Streets with high levels of transit service,
- at key locations where buses can bypass congestion or lengthy vehicle queues, such as queue jump lanes, and
- on other select street types where it is advantageous and supportive of the City's transit mode share goals to allocate street space expressly for transit service.

Transit Stops

51. Transit stops should (pg. 54):

- be integrated with the local pedestrian and bike network , and
- enhance the environment for pedestrians waiting to board.

52. Transit stop siting and design should be coordinated with VTA. (pg. 74)

53. Transit stop design should minimize reductions to visibility between the roadway, the Through Zone, and adjacent properties. (pg. 74)

54. Transit stops should incorporate universal design features, including pedestrian areas (e.g., passenger pads, waiting areas), signs and transit information, seating, shelter, shade, and lighting (pg. 74)

55. At transit stops, transit rider amenities should be given priority over all other amenities in the Furnishing Zone, but transit stop amenities should not interfere with mandatory elements like access routes and a minimum 5'x8' ADA landing zone clear of obstructions where passengers board and alight. (pg. 74)

56. Far-side bus stops are typically preferred. (pg. 32)

57. Mid-block bus stops should be accompanied by appropriate pedestrian crossing treatments. (pg. 32)

58. Bus stops should (pg. 32):

- be located at least 10' from crosswalks,
- be at least 40' long to accommodate standard buses, and longer if necessary to accommodate articulated buses or multiple buses at one time,
- include amenities such as shelters, benches, lighting, route and schedule information, and arrival time screens, and
- incorporate innovative technology.

59. Bus shelters should be sited in the Furnishing Zone and/or Curb Zone (pg. 75)

Traffic Calming Measures

60. Traffic calming devices should be considered where reducing travel speeds is desirable, and traffic calming devices should be consistent with the City's traffic calming policy. (pg. 35-37)

Intersection Design

This section summarizes design guidance for complete intersections including curb ramps, median refuges, cycle tracks, controls, and crosswalk design, placement, and markings.

61. Intersections should be attractive places designed according to the target speed. (pg. 57)
62. Curb radii of 5-15' should be used where: (pg. 52)
- high pedestrian volumes are present or reasonably anticipated,
 - the width of the receiving intersection approach can accommodate a turning passenger vehicle without substantial encroachment into the opposing lane (some encroachment may be acceptable on moderate to low volume streets),
 - large vehicles constitute a very low proportion of the turning vehicles,
 - bike and parking lanes create additional space to accommodate the "effective" turning radius of vehicles, and/or
 - low turning speeds are required or desired.
63. Design vehicles should be the most frequent larger vehicle (not the largest vehicle), and vulnerable users of the space should be considered. (pg. 59)
64. Corners should be extended to reduce turning radii, vehicle speeds, pedestrian crossing distances. (pg. 60)
65. Unused or unnecessary space within intersections, such as wide lane widths and "porkchop" pedestrian islands, should be minimized. (pg. 57)
66. Corner bulb-outs or curb extensions should be employed in areas where pedestrian travel is encouraged while still balancing the needs of vehicles. (pg. 60)
67. Intersections and sidewalks approaching intersections should be designed to avoid pooling water during rain events. (pg. 53)

Curb Ramps

68. Curb ramps should be present at all intersections, excluding raised crosswalks, and be designed to minimize conflicts with motor vehicles. (pg. 53)
69. Curb ramps that provide a smooth transition from the sidewalk should be used at all intersections. (pg. 60)
70. Curb ramps should be oriented in the direction of travel for the associated crosswalk. (pg. 60, 83)
71. All places of transition from a pedestrian zone to a street crossing should be at least 4' feet wide. (pg. 60)

Crosswalk Design, Placement, and Marking

72. Crosswalks should align with pedestrian paths of travel, reduce pedestrians crossing distances, be marked, and have directional curb ramps. (pg. 60, 62)
73. Midblock crossings should be considered where the nearest pedestrian crossing is more than 300 feet away from other marked crosswalks. (pg. 60)
74. Crosswalks should be approximately double the width of the pedestrian through zone, with a minimum width of 12 feet. (pg. 60)
75. Separate paths of travel for pedestrian and bicyclists should be considered where high bicyclist and/or pedestrian volumes are expected. (pg. 112)
76. Crosswalk enhancements, such as higher visibility crosswalk markings, curb extensions, pedestrian refuge islands, and enhanced street lighting, should be considered at the following locations: (pg. 86)
 - Vision Zero Priority Safety Corridor crossings with high pedestrian activity, fatal and/or severe injury crashes involving pedestrians, visibility, or other roadway constraints,
 - Downtown crossings with high pedestrian activity,
 - Planned Growth Areas, such as Urban Villages and transit corridors, and/or
 - Free-right turns of major roads with a posted speed limit of 35 mph or higher and high pedestrian activity.
77. At uncontrolled crossings, marked crosswalks should be considered at locations with histories of vehicle-pedestrian collisions and installed at major pedestrian generators with notable pedestrian volumes where there are inadequate gaps in traffic for pedestrians to safely cross the street. (pg. 84)

Crosswalk Striping

78. Marked crosswalks should be designed in accordance with striping guidance in the CA MUTCD. (pg. 84)
79. Traditional parallel line crosswalks should be used in residential areas or at signalized or stop controlled intersections with moderate to low pedestrian volumes. (pg. 84)
80. Ladder/zebra crosswalks should be considered at uncontrolled locations that require high-visibility markings. (pg. 84)
81. Yield lines w/ appropriate signage should be used:
 - 20-50' in advance of marked, uncontrolled crosswalks on multi-lane roads (pg. 84), or
 - 20' in advance of enhanced crosswalk striping (e.g., ladder or continental) on multi-lane streets. (pg. 60).
82. Stop lines should be placed 5-10' in advance of continental crosswalks and controlled school crossings. (pg. 84)
83. Pedestrian safety measures to improve visibility, such as striping, stencils, street prints, and color also should be considered to improve street crossings in high pedestrian demand or safety priority areas. (pg. 60)

Median Refuges

84. Median noses should (pg. 39):

- not be tapered to accommodate large truck movements, and
- be clearly marked.

85. Median refuge islands should include vertical curbs. (pg. 53)

86. A cut-through area should be provided for pedestrian access through the island, and the cut through area should be as wide as the crosswalk, where possible. (pg. 53)

Cycle Tracks at Intersections

87. Cycle tracks should cross intersections at street-level. (pg. 111)

88. Parking and other visual barriers should not be allowed where cycle tracks approach intersections. (pg. 111)

Signalized Intersections

89. Traffic signals should be proactively operated and maintained. (pg. 61)

90. Signal timing should consider unique operating characteristics of bikes, transit, and pedestrian within the corridor, as well as cross-corridor operational strategies. (pg. 61)

91. Signal timing should consider walking and biking routes and strategies to give people who walk and bike advantages. (pg. 61)

92. Slower walking rates should be considered near schools and senior centers. (pg. 61)

93. Signalized intersections should include detection for bicyclists. (pg. 61)

94. Bike boxes should be accompanied by no-right-turn-on-red restrictions. (pg. 97)

95. Extended green time should be provided at signalized intersections on movements with bike traffic. (pg. 112, 113)

96. Bike signal heads should be (pg. 98, 113):

- used with traffic signals in areas with high bike volumes or high collision rates,
- accompanied by a discrete bike phase separate from the vehicle phase,
- placed in locations where they are clearly visible to bicyclists and motorists, and
- accompanied by “Bike Signal” signs.

Roundabouts

- 97. Roundabouts should be considered to reduce speeds as well as delay for all modes. (pg. 62)
- 98. Multi-lane roundabouts should only be considered where bike and pedestrian movements can be effectively accommodated. (pg. 62)
- 99. Pedestrian desire lines should be considered when determining if a roundabout is appropriate. (pg. 62)
- 100. Where roundabouts are employed, sharrows should be used to denote a shared vehicle and bike space. (pg. 62)

Railroad Crossings

- 101. Railroad crossing designs should conform to the relevant sections of the CA MUTCD and Federal Railroad Administration guidelines. (pg. 41)
- 102. Where bike routes cross railroads, bike conflicts with rail tracks should be minimized. (pg. 41)

Street Lighting

- 103. In areas where sidewalk width is limited, location of underground utilities, tree canopies, and other potential obstructions should be taken into consideration when placing pedestrian lights. (pg. 79)
- 104. Lighting design should minimize avoidable light pollution. (pg. 79)
- 105. Pedestrian scale lighting (lower than 20') should be incorporated into pedestrian spaces. (pg. 30)
- 106. Pedestrian lights should be a priority at transit stops and other locations where pedestrians may congregate at night. (pg. 79)
- 107. Dimmers or shut-off controls should be considered in locations where the energy savings can cover additional cost of equipment. If used, dimmers and shut-off controls should be programmed appropriately. (pg. 79)

Stormwater Management through Green Street Design

- 108. Green infrastructure elements should be incorporated into street design. (pg. 42)

Trees, Landscaping, and Planters

- 109. There should be adequate space and soil conditions below ground for tree roots. (pg. 77)
- 110. Trees should be placed and selected in ways that don't endanger underground utilities, basements, and other elements that could be damaged by tree roots. (pg. 77)
- 111. Plant and tree palettes should be selected from the City's Plant List, and trees be should be carefully placed so as not to interfere with other elements (pg. 77)

- 112. Trees near intersections and midblock crosswalks should maintain sight lines, especially for pedestrian visibility (pg. 77)
- 113. Tree branches should not be below 7' in pedestrian areas and 14' in parking or travel lanes (pg. 77)

Median Design

- 114. Median curbs should conform to typical curb design standards. (pg. 39)
- 115. Streets with target speeds of over 45 mph should have edge stripes. (pg. 39)
- 116. Median openings should be provided at periodic intervals where crosswalk installations are appropriate. (pg. 39)
- 117. Permanent median islands should be designed to ensure adequate drainage at the crown of the street. (pg. 39)

Signage, Wayfinding, Kiosks, Signs, Public Art, and Placemaking

- 118. Public art should not impede access in the Through Zone or to parked vehicles in the Curb Zone. (pg. 76)
- 119. Care should be taken to prevent signage from becoming visual clutter. (pg. 80)
- 120. Related signs should have a consistent design and feel, and incorporate a hierarchy of sizes for ease of interpretation. (pg. 80)
- 121. Signs that convey information should be sized, designed, and placed appropriately for the intended users. (pg. 80)
- 122. Signs should maintain a 7' vertical clear area. (pg. 80)
- 123. Pedestrian wayfinding signs should include intuitive, widely-understood symbology. (pg. 81)
- 124. Pedestrian wayfinding signs should accommodate wheelchair users and to those who may be visually-impaired (e.g., locational and directional information in Braille). (pg. 81)
- 125. Wayfinding signs at transit stops should show street layout, popular destinations, and connecting transportation networks. (pg. 80)

Cul-de-Sac Design

- 126. Cul-de-sacs should typically not be installed on new or reconfigured streets. (pg. 40)
- 127. If installed, cul-de-sacs should (pg. 40):
 - not present a dead end connection for pedestrians and bicyclists, and
 - be designed to accommodate fire truck turnarounds.

Public Seating

128. Seating should be designed with all users in mind and include a mix of seating with and without armrests. (pg. 72)

News Racks

129. News racks should be consolidated into a single multi-compartment cabinet that minimizes visual clutter and maintains visibility between drivers and pedestrians and access to other street furnishings, building entries/exits, transit stops, parking, etc. (pg. 73)

Rural Areas

130. Rural streets and roadways should be designed for all users, including weekday travel patterns but also weekend travel that may include higher levels of recreational bike and pedestrian activity. (pg. 41)

131. Green street treatments for rural areas should be considered. (pg. 41)

132. Shoulders should be included on high volume rural roadways, particularly those that are attractive bike routes. (pg. 41)

Options

This section summarizes options for street design guiding principles, crossings, intersections, transit stops, bikeways, traffic calming, street trees, landscaping, planters, larger vehicles turning on narrower streets, sidewalk zones, placemaking signs, public art, seating, and bike racks.

Guiding Principles

1. Street capacity may be a lower priority than other factors such as economic development or historical preservation, thus meaning that higher levels of congestion may be considered acceptable. (p. 23)

These Complete Streets Design Standards & Guidelines allow, in some instances:

Sidewalks and Sidewalk Zones

2. Flex Zones reallocated to become part of the sidewalk. (pg. 67)

Crossings

3. Median refuge islands that include bollards, plantings, and other protective treatments. (pg. 53)
4. Marked midblock crosswalks at locations with pedestrian demand, such as transit stops, schools, and other popular destinations. (pg. 60, 83)
5. Continental crosswalks at controlled locations with high pedestrian demand, such as downtown, Vision Zero Priority Safety Corridors, and Planned Growth Areas. (pg. 84)
6. Varying crosswalk widths. (pg. 84)
7. The following crosswalk treatments: pedestrian bulb-outs, median refuge islands, raised crosswalks and intersections, flashing beacons, pedestrian hybrid beacon/HAWK. (pg. 85)
8. The following design elements where trails and bike boulevards cross streets: bike signals, PHB, Hybrid Beacons or High-Intensity Activated Crosswalk (HAWK) signals, beacons, refuges, extended green time, bicyclist and pedestrian separation. (pg. 112)

Intersections

9. The following options for retrofitting intersections: (pg. 58)
 - Removing porkchop islands and replacing intersection corners with small radius curbs or pedestrian bulb-outs

- Selling the additional space to adjacent landowners or turning it into public plaza or parklet space
- Interim compact intersections where it is not desirable or feasible to move curbs and reconfigure drainage
- Adding landscaping or green streets treatments

10. Curb radii larger than 5-15' where (pg. 52):

- Occasional encroachment of a turning bus, school bus, moving van, fire truck, or oversized delivery truck into the opposing lane is not acceptable,
- Curb extensions are proposed to be added in the future, and/or
- Receiving street does not have parking or bike lanes and the receiving lane is less than 11 feet in width.

11. Automated pedestrian detection technology that extends walking time as needed at wider crossings to accommodate slower travelers. (pg. 61)

12. Leading pedestrian intervals at intersections with heavy turning and pedestrian volumes that increase visibility of pedestrians in an intersection by allowing them to enter the crosswalk before the turning traffic receives a green. (pg. 61)

Transit Stops

13. Transit service adjacent to curbs that makes use of transit bulb-outs. (pg. 54)

14. Transit islands that use temporary treatments, such as painted bulb outs and temporary rubber curbs. (pg. 54)

Bike Lanes and Transit Stops

15. Innovative designs that integrate bike lanes and bus stops. (pg. 63)

Bikeways

16. Contra-flow bikeways that correct wrong-way bike riding issues and address route connectivity issues associated with one-way streets. (pg. 94)

17. Bike lanes on both sides of one-way streets. (pg. 94)

18. Green paint along bikeways in key areas and in conflict zones, including (experimental locations are noted with an *): cycle tracks, bike lanes, turn boxes*, bike boxes*, green-backed sharrows*, conflict zones, intersections, bus stops, right-turn pockets, and driveways. (pg. 95-96)

19. Two-stage turn-queue boxes on bikeways. (pg. 98)

20. Signal detection and/or actuation along shared lanes and bike boulevards. (pg. 98)

21. Bike signal heads along bike lanes. (pg. 98)

22. Bike lanes through intersections (dashed lines and green skip-striping), bike boxes, advanced bike stop bars, and/or combined bike lanes / turn lanes on cycle tracks, bike lanes, shared lanes, and bike boulevards. (pg. 97-98)
23. Standard bike lanes on lower auto volumes roadways that are not key links in the bike network. (pg. 92)
24. Shared bike lanes on higher volume and speed streets where no dedicated bike facility can be provided. (pg. 92)

Traffic Calming

25. Traffic calming through perception. (p. 37)

Street Trees, Landscaping, and Planters

26. Trees within planters or curb extensions in the parking lane. (pg. 77)
27. Above-ground planters in areas where underground utilities or other physical restraints preclude the placement of tree basins or understory plantings into the ground. (pg. 78)

Larger Vehicles Turning on Narrower Streets

28. Accommodating control vehicles turning movements on narrower streets by removing parking close to the corner and installing advanced stop bars on the receiving street that allow for turning traffic to partially and temporarily use opposite lane. (pg. 59)
29. Busses to turn across center line on narrow streets or where safety will not be compromised. (pg. 59)

Sidewalk Zones

30. Narrowing of Through Zones down to 3' in areas constrained by things like utility or signal poles, or other infrastructure. (pg. 68)
31. In more constrained locations, ADA-compliant tree grates. (pg. 77)
32. In flex space, additional on- and off-street bike facilities, green infrastructure elements, paint and planter bulb-outs, or parklets. (pg. 82-83)
33. Different paving materials or colors used to help distinguish the Through Zone from surrounding areas and allow for unique placemaking opportunities. (pg. 68)

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34. In more suburban areas, a greater emphasis on pedestrian buffering with landscaping and larger green infrastructure elements in the Furnishing Zone. (pg. 69)
 35. Bus shelters sited in the Frontage Zone. (pg. 75)
 36. Signs in the Curb Zone, Furnishing Zone, or Frontage Zone. (pg. 80)

Placemaking Signs and Public Art

37. Placemaking signs with artistic or sculptural details that incorporate iconic elements. (pg. 81)
38. Placemaking signs hung from poles or street/pedestrian lights and historical markers or placards. (pg. 81)
39. Public art integrated into placemaking signs. (pg. 81)
40. Public art in the pedestrian realm, such as decorative seat walls or planters. (pg. 76)

Seating

41. Seating integrated into the design of buildings with seating walls, sills, or other building or landscape elements. (pg. 72)

Bike Racks

42. Seating integrated into the design of buildings with seating walls, sills, or other building or landscape elements. (pg. 72)

