DRAFT | OCTOBER 2026

Streets for All

A Slow Streets Manual



The City of SAN DIEGO



30th St, San Diego, CA. Source: Kittelson & Associates, Inc.

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J St, San Diego, CA. Source: City of San Diego

01

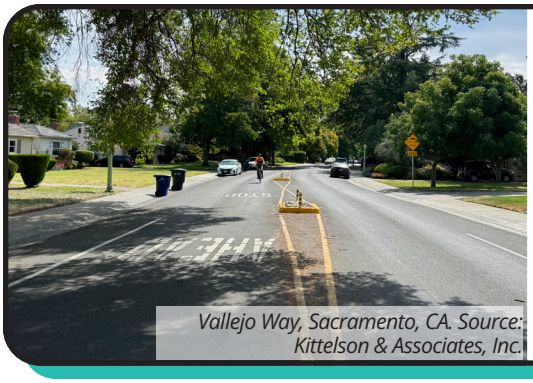
Introduction

San Diego's streets are more than just ways to get from point A to point B; they are the front yards of our neighborhoods, the heart of our business districts, and the stage for everyday life. This Manual is a resource for neighbors to come together to help reimagine these spaces as safer, more vibrant places for people to walk, bike, roll, and connect with each other.

At its core, Streets for All provides a guide to transform local streets into calmer, more livable spaces. Streets for All is grounded in the framework of "Slow Streets" as defined and permitted by California Vehicle Code Section 21101(e), which allows cities to restrict vehicle access on certain streets for the purpose of safety, livability, and public use.

Implementing Streets for All can also help to reduce vehicle travel and associated greenhouse gas emissions in alignment with the City's Climate Action Plan. Transportation accounts for roughly half of citywide emissions, with many daily trips under three miles. By calming traffic and creating safer, more comfortable streets for walking, biking, and rolling, Streets for All helps shift short trips away from driving. Even modest increases in walking, biking, and rolling can result in meaningful emissions reductions while improving public health, safety, and neighborhood quality of life.

Whether the goal is to reduce speeding, create a new public space, or improve access to neighborhood destinations, schools, and transit stops, Streets for All offers neighbors options to reclaim streets as community assets. To achieve those goals, successful Streets for All projects should use three key strategies:



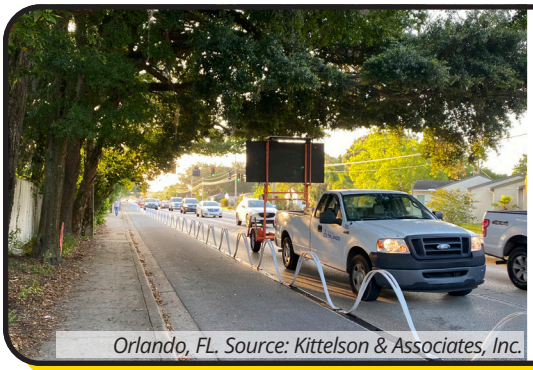
Vallejo Way, Sacramento, CA. Source: Kittelson & Associates, Inc.

TRAFFIC CALMING
Traffic calming uses street design to slow vehicles and support safer, more comfortable movement for people walking, biking, and rolling. Treatments like speed lumps, traffic circles, and curb extensions encourage safer driving and help turn everyday streets into shared community spaces.



Del Sol Blvd, CA. Source: City of San Diego

QUICK-BUILD
Quick-Build techniques use low-cost, modular materials like paint, flex posts, planters, and signage to create visible change quickly. These tools make it easier to try new things and make adjustments at lower costs and quicker timelines.



Orlando, FL. Source: Kittelson & Associates, Inc.

DEMONSTRATION PROJECTS
Demonstration projects are short-term, temporary installations that allow for testing of ideas in real time. Whether it's a one-day pop-up plaza or a longer pilot with planters and signs, these projects help generate feedback, build support, and guide longer-term investments

Together, these strategies can bring safety improvements, social spaces, and creative placemaking to neighborhoods more quickly. This guide outlines how to identify and shape a Streets for All project, what treatments and materials to consider, and how to permit and implement a project.

HOW TO USE THIS MANUAL

The Streets for All Manual is designed as a guide for neighbors to work together on projects that can make San Diego's streets safer and more comfortable for people of all ages and abilities. The treatments and Streets for All street types provide guidance for projects that can help calm traffic, improve safety, or create space to gather and connect on neighborhood streets.

STEP 01

UNDERSTAND THE PROGRAM

Chapter 2: Streets for All outlines the purpose of Streets for All and details the three types of Streets for All projects. This section provides information and guidance on:

- Streets for All applicability and eligibility
- Three types of Streets for All projects and examples of what they might look like
- City Streets eligible for each Streets for All project type

STEP 02

SELECT THE RIGHT TREATMENTS

Chapter 3: Treatments describes treatments that may be used to create Streets for All projects, including design and location guidance.

STEP 03

CHOOSE APPROPRIATE MATERIALS

Chapter 4: Materials provides details on materials that are appropriate for a wide variety of project types found in the Treatments section.

STEP 04

PLAN AND PERMIT

Chapter 5: How to Implement a Streets for All Project outlines the implementation steps for Streets for All projects.

STEP 05

REVIEW DESIGN GUIDANCE

Appendix A: Streets for All Treatment Guide provides detailed guidance on each treatment, including additional information on treatment effectiveness, benefits, and considerations as well as complementary treatments and drawings of potential applications.

TECHNICAL REFERENCES

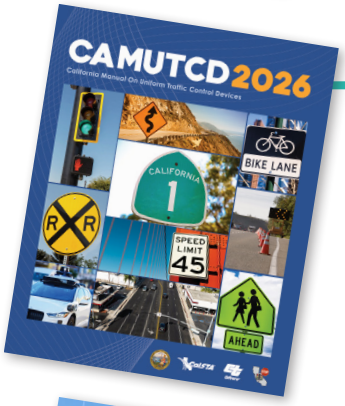
Transportation facilities should be developed using design best practices, engineering judgment, and local, state, and federal best practices. The documents listed below summarize a list of national guidance which led to the development of this guide and should be referenced as they evolve to keep up with the newest guidance. Resources include the Federal Highway Administration (FHWA), the California Department of Transportation (Caltrans), the City of San Diego, the American Association of State Highway and Transportation Officials (AASHTO), and the National Association of City Transportation Officials (NACTO).



Caltrans Design Information Bulletin-94 Complete Streets: Contextual Design Guidance



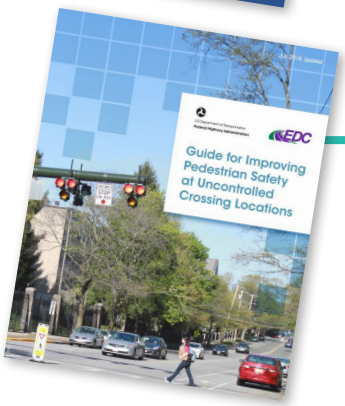
City of San Diego Street Design Manual (Draft)



California Manual on Uniform Traffic Control Devices (MUTCD)



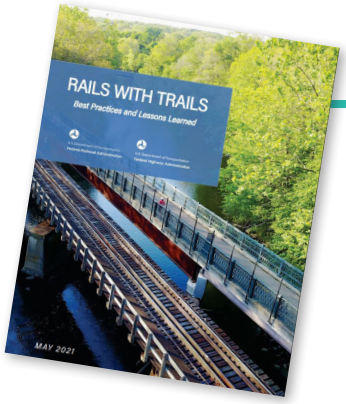
City of San Diego Spaces as Places Design Manual



FHWA Guide for Improving Pedestrian Safety at Uncontrolled Crossing Locations



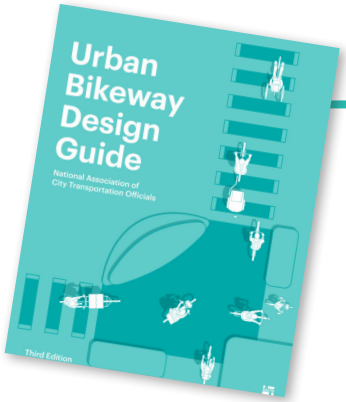
Separated Bike Lane Planning and Design Guide



Federal Railroad Agency Rails With Trails: Best Practices and Lessons Learned



Guide for the Development of Bicycle Facilities (AASHTO)



NACTO Urban Bikeway Design Guide



NACTO Don't Give Up at the Intersection



FHWA Evaluation of Safety, Design, and Operation of Shared-Use Paths



Meade Ave, San Diego, CA. Source: Kittelson & Associates, Inc.

02

Streets for All

The City has a vast network of streets, trails, bicycle routes, and sidewalks that support walking, biking, and rolling by prioritizing safety, comfort, and reduced exposure to traffic and help people navigate throughout the City without a car. However, there are still gaps and challenges in the transportation network that can prevent people from traveling safely and comfortably to and from their destinations. As a solution, this manual presents guidance, treatments, and materials to implement Streets for All projects, which can enhance the City's existing network and address gaps to improve connectivity and access to key destinations throughout San Diego. Streets for All projects can also connect to and enhance projects identified in the Bicycle Master Plan and Mobility Master Plan to further enhance neighborhood safety and access to the transportation system.

Streets for All provides opportunities to build and evaluate projects before committing to long-term capital infrastructure. The following chapters provide guidance for neighbors to work together to implement street safety and community placemaking projects quickly, with low-cost and flexible materials.

There are three types of Streets for All projects, each with its own goals and application criteria. The following pages describe each street type in more detail, including an overview map for each type. An interactive webmap showing which streets in San Diego are eligible for each project type is available.

Refer to Chapter 5: How to Implement a Streets for All Project for more information on the Streets for All process and how to apply after reviewing this section.



Vallejo Way, Sacramento, CA. Source: Kittelson & Associates, Inc.

RESIDENTIAL HEALTHY & CONNECTED STREETS
Allows slow moving vehicle traffic and prioritizes walking, biking, and rolling



Cabrillo St, San Francisco, CA. Source: Kittelson & Associates, Inc.

RESIDENTIAL CALM STREETS
Prioritizes space for social gathering, exercise and walking, biking, and rolling by limiting vehicle traffic during certain times



SW 9th Ave, Portland, OR. Source: Kittelson & Associates, Inc.

BUSINESS HEALTHY & CONNECTED STREETS
Prioritizes business and social activities and allows slow moving vehicle traffic

RESIDENTIAL **COMMERCIAL**

PROJECT TYPE	CLOSURE TYPE	INTENDED USE	APPLICABLE CONTEXT
Residential Healthy and Connected Streets	Open to vehicular traffic with a focus on multi-modal options	• Prioritizes through movement for biking, walking, and rolling • Allows slow, through access for drivers	 **Residential**
Residential Calm Streets	Partial / full closure to vehicular traffic (all day or temporal) focused on slowing/ calming traffic	• Prioritizes space to gather and play • Provides through movement for biking, walking, & rolling • Allows vehicle access only to fronting homes	 **Residential**
Business Healthy & Connected Streets	Open to vehicular traffic with traffic calming	• Prioritizes space for business activity and gathering • Prioritizes through movement for biking, walking, and rolling • Allows slow, through access for drivers • Allows delivery loading / unloading • Vehicular entry points are clearly marked to alert drivers that they are entering a shared, pedestrian zone	 **Commercial**

RESIDENTIAL HEALTHY & CONNECTED STREETS



Vallejo Way, Sacramento, CA. Source: Kittelson & Associates, Inc.

A residential street that allows slow moving vehicle traffic and prioritizes biking, rolling, and walking through significant traffic calming.

- Prioritizes through movement for biking, walking, and rolling
- Allows slow, through access for drivers

PURPOSE

The purpose of a Residential Healthy & Connected Street is to provide a comfortable, shared space where people can walk, roll, and bike to access everyday destinations on the City's low-stress neighborhood network of bikeways and walkways.

CLOSURE TYPE

Open to vehicular traffic with a focus on multi-modal options

IMPROVEMENT EMPHASIS

WALKING / ROLLING	High
BIKING	High
DRIVING	Medium
TRANSIT	Low / None
FREIGHT/ DELIVERIES	Low

CRITERIA

LAND USES	At least 75% of fronting uses are residential
POSTED SPEED LIMIT*	30 miles per hour or less
NUMBER OF LANES	Three lanes or less
PARALLEL ROUTES	One or more for vehicular access (ideally within 0.25 mile but up to 0.5 miles)
EMERGENCY ROUTE	No
TRANSIT ROUTE	No
SLOPE	Relatively flat (less than or equal to 3% grade)
LENGTH & CONNECTIVITY	One or more of the following: • Between 0.25 – 2.0 miles in length • Connects to an existing or future bicycle facility • Provides direct access to an everyday destination (e.g. grocery store, library, recreation center, school)
ADJACENT TO SIGNALIZED INTERSECTION	May or may not be

** While this number represents the maximum posted speed, Streets for All treatments may slow vehicles by creating behavioral changes.*

RESIDENTIAL HEALTHY & CONNECTED STREETS

Residential Healthy & Connected Streets use a mix of quick-build treatments to create a traffic calming effect that discourage vehicular speeding and create a more comfortable environment for people walking, rolling, and biking.

The image below depicts an example Residential Healthy & Connected Street block. Residential Healthy & Connected Streets may be up to two miles long and should contain a mix of treatments, such as speed lumps, curb extensions, chokers and traffic circles, are outlined in the Treatments chapter. Streets that meet the criteria for Residential and Healthy Connected Streets are shown in Figure 3.

Figure 1. Rendering of Residential Healthy & Connected Street

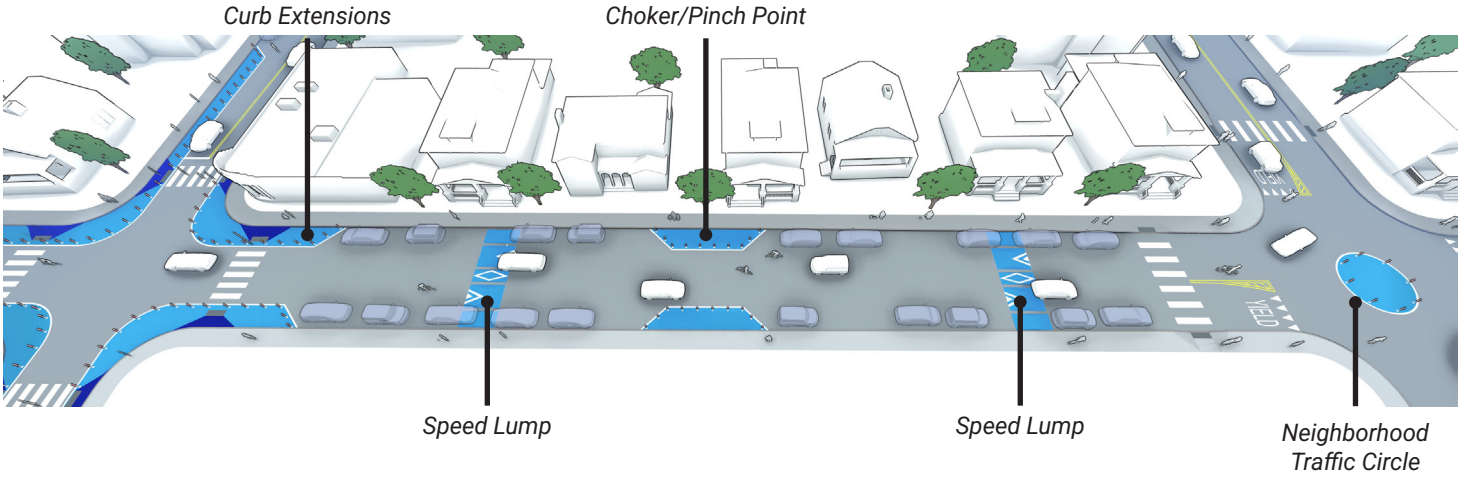
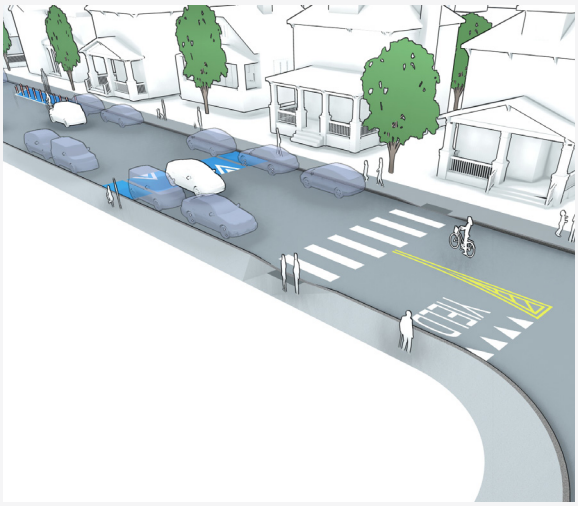


Figure 2. Rendering of Residential Healthy & Connected Streets Intersection

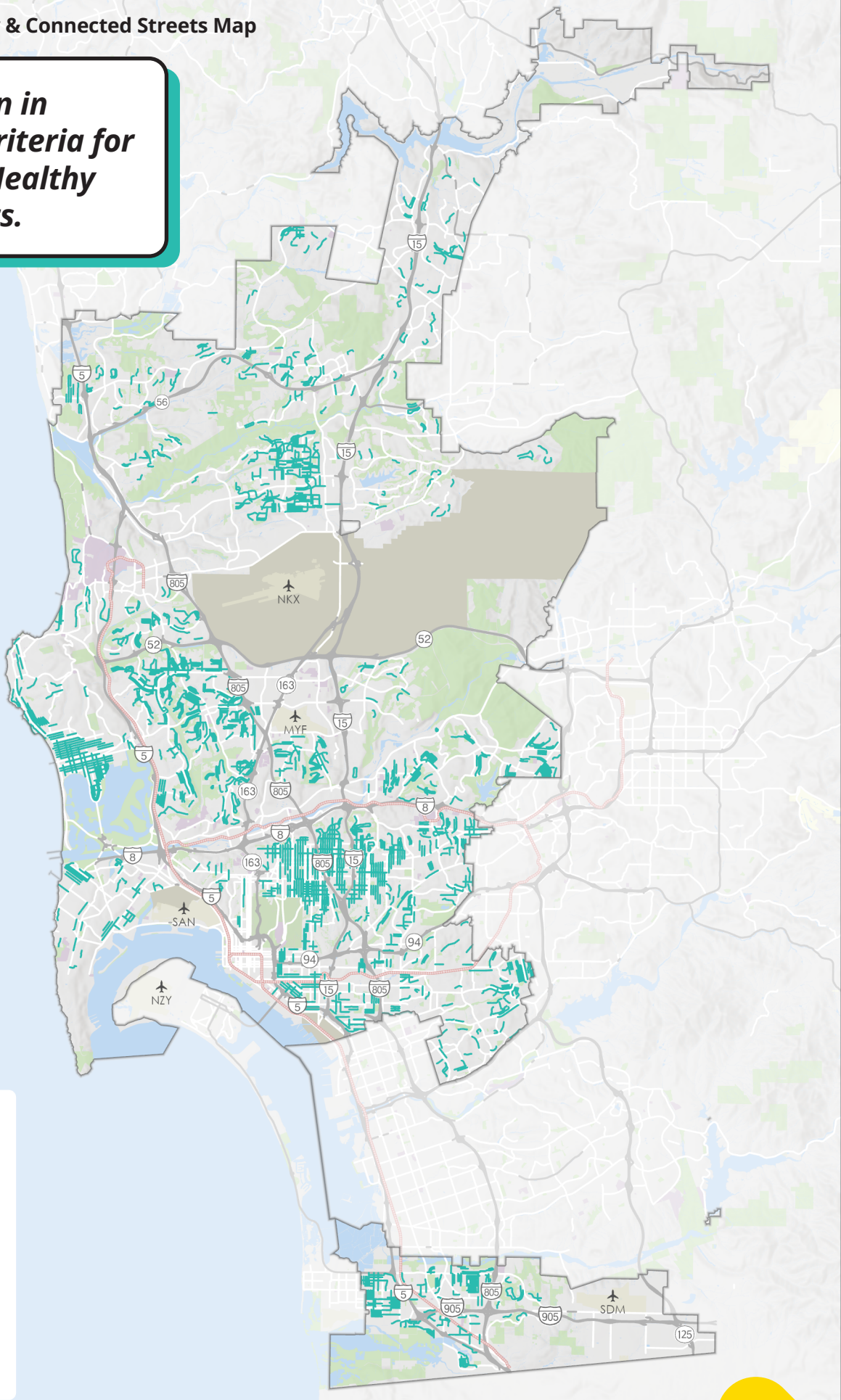


As shown in the example, this street uses a combination of intersection treatments like curb extensions and a neighborhood traffic circle, as well as corridor treatments like speed lumps and chokers/pinch points to facilitate low vehicle speeds. These treatments can create a lower speed, lower volume street that feels more comfortable for people walking, biking, and rolling. The treatments may also discourage vehicle through traffic and reduce the number of vehicles driving on the street. This street prioritizes walking, biking, and rolling while making the street safer for all.

Detailed materials and application guidance for each treatment is provided in the Treatments and Materials chapters. Follow the process in Chapter 5: How to Implement a Streets for All Project and work with City staff to ensure you are selecting appropriate treatments to accommodate the specific needs, users, and context of your street.

Figure 3. Residential Healthy & Connected Streets Map

The streets shown in green meet the criteria for Residential and Healthy Connected Streets.



RESIDENTIAL HEALTHY AND CONNECTED STREETS

- Streets Eligible for Residential Healthy and Connected Streets
- Trolley Lines
- Airports
- Military Facilities
- Parks and Greenspace
- Universities, Hospitals, Civic and Other Institutions
- Bodies of Water
- City of San Diego

N

0 2 4 Miles

RESIDENTIAL CALM STREETS



Cabrillo Ave, San Francisco, CA. Source: Kittelson & Associates, Inc.

Treatments applied on residential streets to limit vehicular traffic and prioritize space for social gathering or exercise in the street as well as allowing through movement for people biking, rolling, and walking. Residential Calm Streets include partial or full vehicular diversions to reduce the number of vehicles on the street.

- Prioritizes space to gather and play
- Provides through movement for biking, rolling, and walking
- Only allows vehicle access to fronting homes

PURPOSE

The purpose of a Residential Calm Street is to provide a new community space for people who live in the area to socialize, walk, roll, bike, and play in the street.

CLOSURE TYPE

Partial / full closure to vehicular traffic (all day or temporal) focused on slowing/ calming traffic

IMPROVEMENT EMPHASIS

WALKING / ROLLING	High
BIKING	High
DRIVING	Low
TRANSIT	None
FREIGHT/ DELIVERIES	None

CRITERIA

LAND USES	At least 75% of fronting uses are residential
POSTED SPEED LIMIT*	25 miles per hour or less
NUMBER OF LANES	Two lanes or less
PARALLEL ROUTES	One or more for vehicular access (within 0.25 miles)
EMERGENCY ROUTE	No
TRANSIT ROUTE	No
SLOPE	Relatively flat (less than or equal to 3% grade)
LENGTH & CONNECTIVITY	0.25 miles or less in length, but at least one block long
ADJACENT TO SIGNALIZED INTERSECTION	No

** While this number represents the maximum posted speed, Streets for All treatments may slow vehicles by creating behavioral changes.*

RESIDENTIAL CALM STREETS

Residential Calm Streets, like Residential Healthy & Connected Streets, are designed in residential areas where walking, rolling, and biking is desired. Residential Calm Streets use traffic diversion treatments to create active spaces for people to enjoy the street as open public space. Traffic diversions discourage non-local vehicles from accessing the street during a set period of time. The street may be closed at all times or just during certain hours, depending on the neighbors' intent and desire. Streets that meet the criteria for Residential and Calm Streets are shown in Figure 6.

Figure 4. Rendering of Residential Calm Street

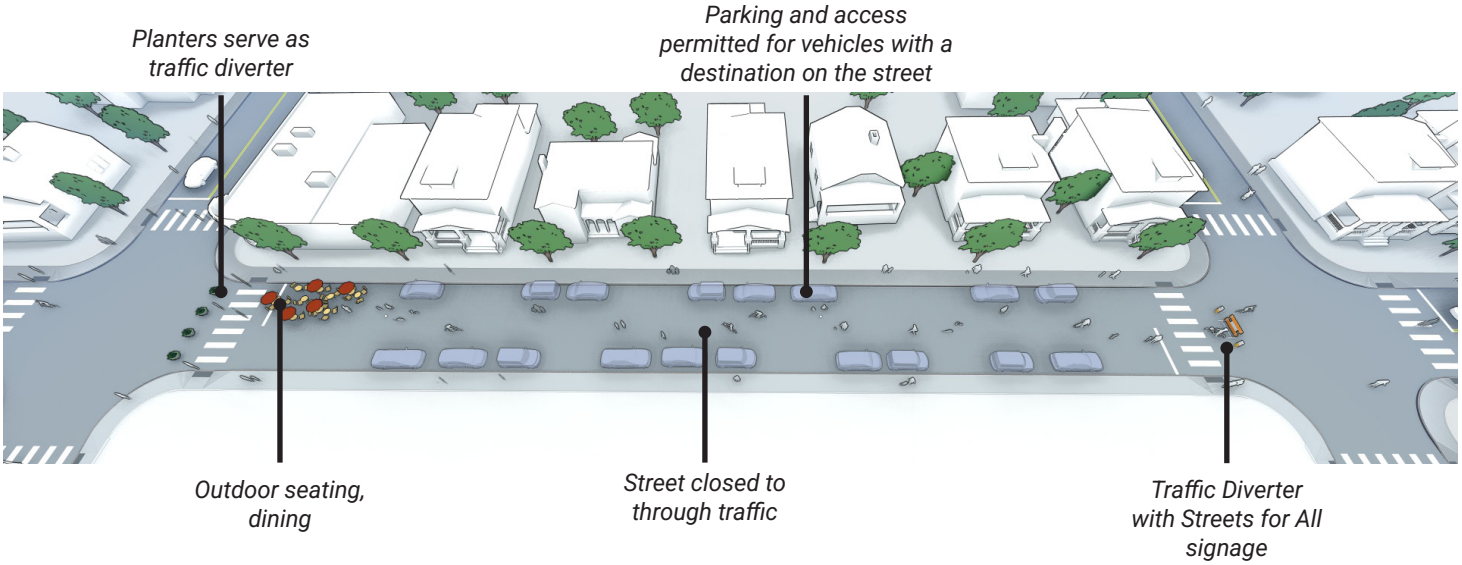


Figure 5. Rendering of Residential Calm Street Intersection

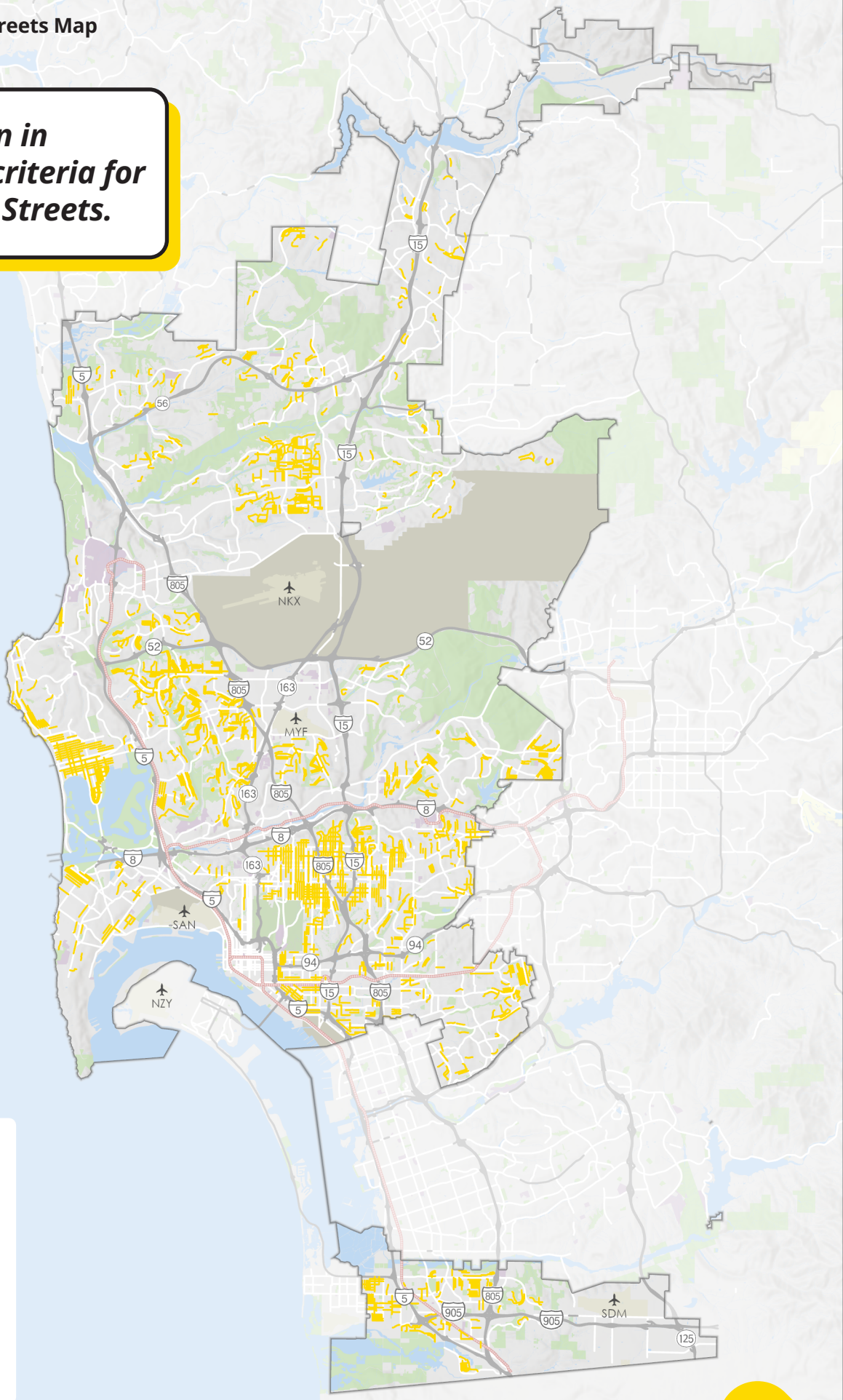


As shown in the example, this street uses a combination of traffic diversion treatments like planters and signage to exclude non-resident vehicle access. These treatments create lower vehicle volumes, making the street feel more comfortable for people walking, rolling, and biking. This street prioritizes these active transportation modes while making the street safer for all.

Detailed materials and application guidance for each treatment is provided in the Treatments and Materials chapters. Follow the process in Chapter 5: How to Implement a Streets for All Project and work with City staff to ensure you are selecting appropriate treatments to accommodate the specific needs, users, and context of your street.

Figure 6. Residential Calm Streets Map

The streets shown in yellow meet the criteria for Residential Calm Streets.



BUSINESS HEALTHY & CONNECTED STREETS



SW 9th Ave, Portland, OR. Source: Kittelson & Associates, Inc.

A street located in a business district that is designed to support placemaking and business activity by providing additional space for activities and beautification while prioritizing people walking, biking, rolling, and gathering, and allowing slow moving traffic.

- Prioritizes space for business activity and gathering
- Prioritizes through movement for walking, biking, and rolling
- Allows slow, through access for drivers
- Allows delivery loading / unloading
- Vehicular entry points are clearly marked to alert drivers that they are entering a shared, pedestrian zone

PURPOSE

The purpose of a Business Healthy & Connected Street is to support business activities and the gathering of people in a commercial district.

CLOSURE TYPE

Open to vehicular traffic with traffic calming

IMPROVEMENT EMPHASIS

WALKING / ROLLING	High
BIKING	High
DRIVING	Medium
TRANSIT	Low
FREIGHT/ DELIVERIES	Medium

CRITERIA

LAND USES	At least 75% of fronting uses are commercial; street does not provide immediate freeway access and does not front land uses with access needs (e.g. cemetery, gas station, drive thru, or hospital)
POSTED SPEED LIMIT*	30 miles per hour or less
NUMBER OF LANES	Four lanes or less
PARALLEL ROUTES	One or more for vehicular access (ideally within 0.25 mile but up to 0.5 mile)
EMERGENCY ROUTE	No**
TRANSIT ROUTE	No**
SLOPE	Relatively flat (less than or equal to 3% grade)
LENGTH & CONNECTIVITY	1 mile or less in length
ADJACENT TO SIGNALIZED INTERSECTION	May or may not be

** While this number represents the maximum posted speed, Streets for All treatments may slow vehicles by creating behavioral changes.*

*** Exceptions may be considered via coordination with the appropriate transit agency and City of San Diego Fire-Rescue Department.*

BUSINESS HEALTHY & CONNECTED STREETS

Business Healthy & Connected Streets may be designed in commercial areas to prioritize people walking, rolling, and biking while maintaining curbside uses like on-street parking and delivery zones. This type of street uses a mix of treatments to create a traffic calming effect that discourages vehicular speeding and can create an environment where people can share the street or that provides more space for gathering, business access, and business operations like outdoor cafes. The image below depicts an example Business Healthy & Connected Streets. Streets that meet the criteria for Business and Healthy Connected Streets are shown in Figure 9.

Figure 7. Rendering of Business Healthy & Connected Street

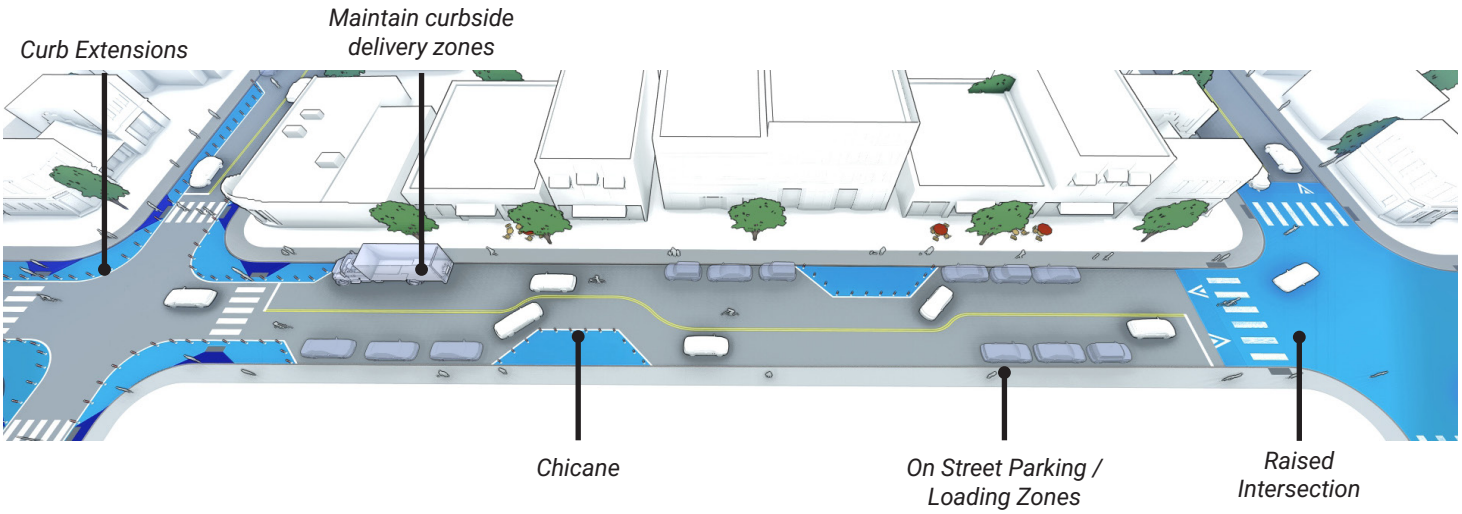
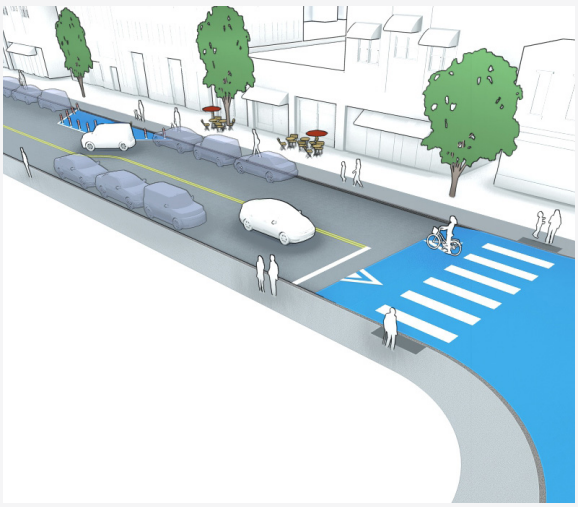


Figure 8. Rendering of Business Healthy & Connected Street Intersection



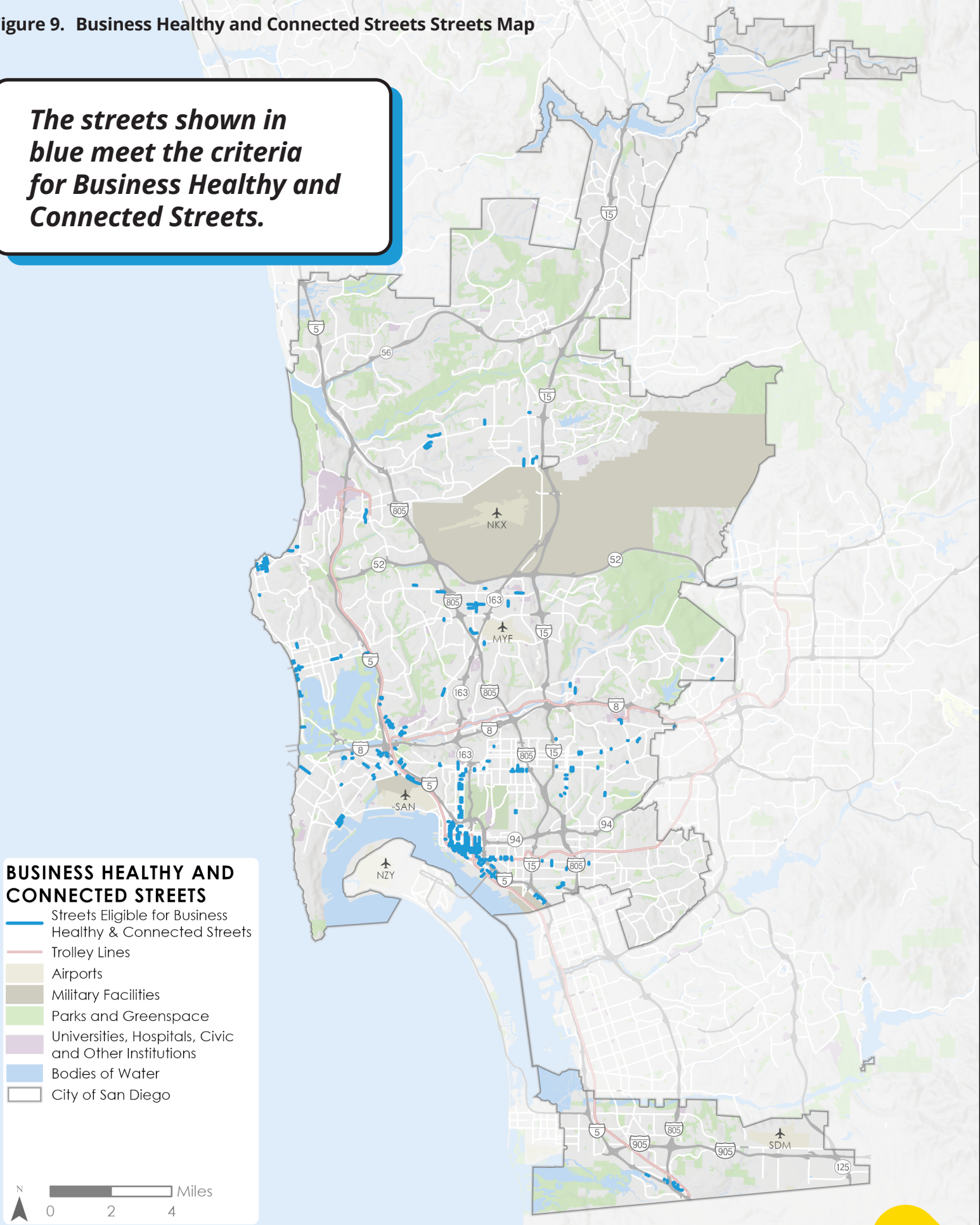
As shown in the example, this Street uses a combination of intersection treatments and corridor treatments to maintain low vehicle speeds. The treatments are complementary to existing on-street parking, loading zones, and other curbside uses.

These treatments can create a lower speed, lower volume street that feels more comfortable for people walking, biking, and rolling, and can create space for public uses, such as outdoor dining, additional seating, and landscaping opportunities.

Detailed materials and application guidance for each treatment is provided in the Treatments and Materials chapters. Follow the process in Chapter 5: How to Implement a Streets for All Project and work with City staff to ensure you are selecting appropriate treatments to accommodate the specific needs, users, and context of your street.

Figure 9. Business Healthy and Connected Streets Streets Map

The streets shown in blue meet the criteria for Business Healthy and Connected Streets.





Third St and J St intersection, San Diego, CA. Source: Kittelson & Associates, Inc.

03

Treatments

San Diego has implemented numerous quick-build projects to improve safety using low-cost, flexible design tools. This Manual builds on that experience and incorporates national and international best practices to highlight effective, adaptable treatments. It supports both corridor- and intersection-level improvements and is intended to guide the selection and layering of strategies that create safer, more people-focused streets.

The Streets for All Manual supports both corridor- and intersection-level improvements and is intended to guide the selection and layering of strategies that create pedestrian- and cyclist-focused streets for walking, biking, rolling, and gathering. This chapter introduces a toolbox of design strategies that help slow traffic, improve safety, and create public spaces.

These treatments are the building blocks of Streets for All projects, and many use quick-build techniques- lower cost, modular materials like paint, planters, and flex-posts that can be installed quickly and adapted over time. Each treatment addresses a specific challenge. Many can be layered together to create more complete, people-focused streets. The examples shown earlier in this guide highlight how different types of Streets for All projects use these treatment in real world settings.

HOW TO USE THIS CHAPTER

STEP 01

UNDERSTAND THE TYPES OF TREATMENTS

Each treatment in this guide serves a different purpose. Some are intended to slow cars, others make crossings safer, and many aim to do both. Treatments are grouped by complexity and use case:



GROUP A
LOW COMPLEXITY

Treatments that can be deployed with minimal review to achieve quick improvements.

First steps for low-speed streets, or when layering treatments



GROUP B
MODERATE COMPLEXITY

Treatments requiring minor review to address safety or connectivity needs.

Effective for corridors or intersections with defined design needs



GROUP C
HIGH COMPLEXITY

Treatments often requiring signals, reconstruction, or geometric changes.

Best for priority locations, high-injury streets, or placemaking

STEP 02

USE THE TABLES TO IDENTIFY TREATMENTS

Review the tables to identify appropriate / desired treatments on the next two pages, including:

- Treatment Quick Reference to identify where treatments work best and how they can be paired
- Treatment Impacts and Safety Outcomes to see how treatments can address project goals

STEP 03

FLIP THROUGH THE VISUAL GLOSSARY

The Visual Treatment Glossary includes images and short descriptions to for each tool.

STEP 04

DIVE INTO THE DETAILS (APPENDIX)

Once preferred treatments have been selected, turn to the Appendix A: Streets for All Treatment Guide for full design guidance, considerations, and materials.

TREATMENT QUICK REFERENCE

COUNTER-MEASURE	LANES	POSTED SPEED GUIDANCE (MPH)	VOLUME GUIDANCE IN AVERAGE DAILY TRAFFIC	STREET CONTEXT*	OFTEN PAIRED WITH	BENEFITS PEDESTRIANS	BENEFITS BICYCLISTS	BENEFITS DRIVERS (SAFETY/ OPERATIONS)
GROUP A - LOW COMPLEXITY								
Centerline Hardening	Any	Any	Any	Commercial, Community Place	Slow-turn wedges, bend outs, curb extensions	✓		✓
Chicane	<=2	<=35	<=10,000	Any	Stormwater infrastructure, speed lumps	✓	✓	
Choker / Pinch Point	<=2	<=35	<=10,000	Any	Speed lumps, raised crosswalks	✓	✓	
Curb Extension	Any	Any	Any	Any	Bend outs, raised crosswalks, median refuge islands	✓	✓	
Lane Narrowing	Any	Any	Any	Any	Speed lumps	✓	✓	✓
Slow Turn Wedge	Any	Any	Any	Commercial, Community Place	Centerline hardening, raised crosswalks	✓		✓
Speed Lumps	<=2	<=30	<=10,000	Neighborhood, Community Place	Crosswalks, pinch points	✓	✓	✓
GROUP B - MODERATE COMPLEXITY								
Bend Out	Any	Any	Any	Commercial, Community Place	Protected bike lanes, median refuge islands, signal treatments	✓	✓	
Bike Box / Two Stage Left Turn Queue Box	<=4	Any	Any	Any	Centerline hardening, slow turn wedges, signal treatments		✓	
Bike Lane	<=3	<=30	<=6,500	Any	Bike boxes, bend outs, protected intersections, and other intersection treatments		✓	
Buffered Bike Lane	<=4	<=35	<=6,500	Any	Bike boxes, bend outs, protected intersections, and other intersection treatments		✓	
Crossing Enhancements	<=4	<=35	<=12,000	Any	Any intersection treatment	✓		
Median Refuge	Any	Any	Any	Commercial, Community Place	RRFBs, lighting	✓		
Neighborhood Traffic Circle	<=2	<=30	<=3,500	Neighborhood	Curb extensions, raised crosswalks, median refuge islands	✓	✓	✓
Raised Crosswalk / Speed Table	<=4	<=30**	<=9,000**	Commercial, Community Place	Curb extensions, median refuge islands, RRFBs	✓		
Raised Median	Any	Any	Any	Commercial, Community Place	Crosswalks, RRFBs			✓
Separated Bikeway	Any	Any	Any	Any	Bike boxes, bend outs, protected intersections, and other intersection treatments		✓	
GROUP C - HIGH COMPLEXITY								
Diagonal Diverter	<=2	<=25	<=3,500	Neighborhood	Curb extensions, raised crossings	✓		
Protected / Dedicated Intersection	Any	Any	Any	Any	Protected bike lanes, median refuge islands, signal treatments	✓	✓	✓
Raised Intersection	<=4	<=35**	<=9,000**	Any	Curb extensions, slow turn wedges, median refuge islands *(note: no quick build option)*	✓	✓	✓
Rectangular Rapid Flashing Beacon (RRFB)	<=4	<=35	<=15,000	Commercial, Community Place	Median refuges, raised crosswalks, curb extensions	✓		
Roundabout	Any	Any	Any	Any	RRFBs, raised crossings, median refuge islands	✓	✓	✓
Traffic Diverter	<=2	<=25	<=3,500	Neighborhood	Raised crossings, signage, median refuge	✓	✓	

**Street context describes the surrounding land uses and activity patterns. It includes: Neighborhood – primarily residential; Community Place – schools, parks, and civic uses; Commercial – shops, services, and employment*

***May be applicable on higher speed/volume roadways in some cases*

TREATMENT IMPACTS AND SAFETY OUTCOMES

TREATMENT	REDUCE SPEEDS	REDUCE VOLUMES	IMPROVE VISIBILITY	ENHANCE CROSSINGS	REDUCE CONFLICT POINTS
GROUP A - LOW COMPLEXITY					
Centerline Hardening	✓		✓	✓	
Chicane	✓	✓			
Choker / Pinch Point	✓	✓			
Curb Extension	✓		✓	✓	
Lane Narrowing	✓				
Slow Turn Wedge	✓		✓	✓	
Speed Lumps	✓	✓			
GROUP B - MODERATE COMPLEXITY					
Bend Out	✓		✓	✓	
Bike Box / Two Stage Left Turn Queue Box			✓	✓	
Bike Lane			✓		
Buffered Bike Lane			✓		
Crossing Enhancements			✓	✓	
Median Refuge	✓		✓	✓	
Neighborhood Traffic Circle	✓		✓	✓	✓
Raised Crosswalk / Speed Table	✓	✓	✓	✓	
Raised Median	✓		✓	✓	
Separated Bikeway			✓		✓
GROUP C - HIGH COMPLEXITY					
Diagonal Diverter	✓	✓			✓
Protected / Dedicated Intersection	✓		✓	✓	✓
Raised Intersection	✓		✓	✓	
Rectangular Rapid Flashing Beacon (RRFB)			✓	✓	
Roundabout	✓		✓	✓	✓
Traffic Diverter	✓	✓		✓	✓

RELATED CITY POLICIES AND PROCESSES

The Streets for All Manual aims to provide the effective treatments for improving safety, comfort, and livability on neighborhood streets. The treatments aim to address common concerns like speeding, cut-through traffic, and a lack of comfortable walking, biking, and rolling space while being practical to implement.

Some other changes, such as stop signs, traffic signals, and other major traffic control devices, follow separate state and federal processes. These require engineering studies and warrant analyses to ensure they are applied consistently and appropriately. While these tools can play an important role in specific situations, they are addressed through established City policies and processes and are therefore not covered by this manual.

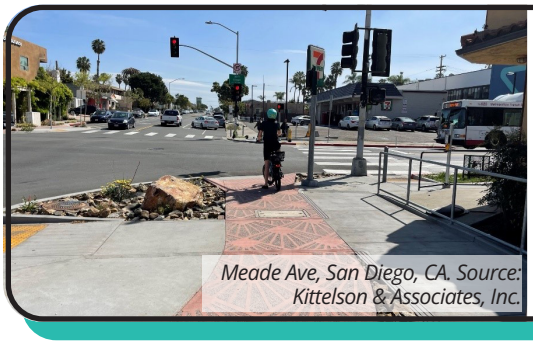
For more information on these processes, see the City's adopted Council Policies:



VISUAL TREATMENT GLOSSARY

This section provides a quick visual reference for each treatment included in the Manual. Each entry includes a photo or illustration and a short description to demonstrate what it does.

For full design details and technical guidance, see Appendix A: Streets for All Treatment Guide.

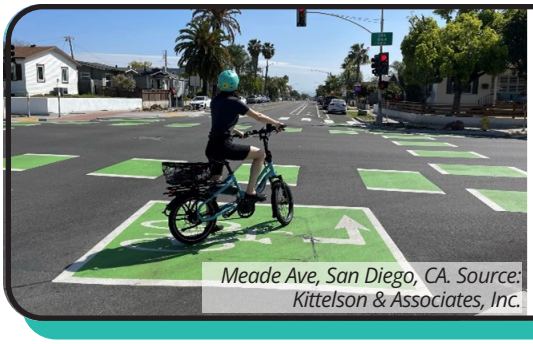


Meade Ave, San Diego, CA. Source: Kittelson & Associates, Inc.

BEND OUTS

Bike lanes shifted away from the vehicle lane and into the curb area at intersections, creating space between people biking and turning vehicles.

For more information, see Bend Out.

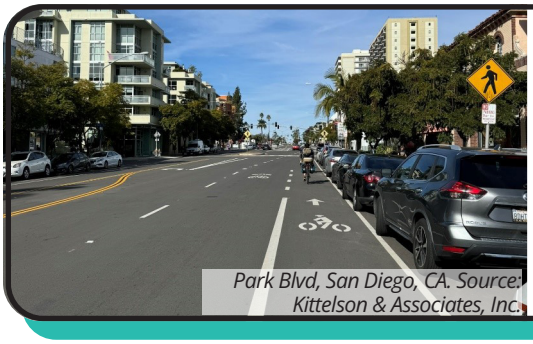


Meade Ave, San Diego, CA. Source: Kittelson & Associates, Inc.

BIKE BOX / TWO STAGE LEFT TURN QUEUE BOX

Designated space for people biking to wait to travel through the intersection ahead of the vehicle stop bar, improving visibility and allowing people biking to get a head start.

For more information, see Bike Box / Two Stage Left Turn Queue Box.



Park Blvd, San Diego, CA. Source: Kittelson & Associates, Inc.

BIKE LANE

Pavement markings used to create exclusive space for people biking.

For more information, see Bike Lane.



Meade Ave, San Diego, CA. Source: Kittelson & Associates, Inc.

BUFFERED BIKE LANE

Painted bike lanes with an additional painted buffer to provide additional horizontal separation between the bike and travel or parking lanes, increasing comfort and separation for people biking.

For more information, see Buffered Bike Lane.



Stockton Blvd, Sacramento, CA. Source: Kittelson & Associates, Inc.

CENTERLINE HARDENING

Elevated features, such as a curb, plastic bollards, or other delineators that are installed in the centerline of the roadway at an intersection and aims to reduce vehicle turning speeds.

For more information, see Centerline Hardening.

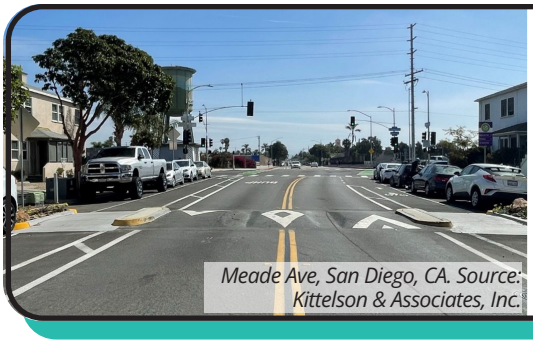


Gateway Rd, Carlsbad, CA. Source: Kittelson & Associates, Inc.

CHICANE

Segments of offset curb, landscaping, or other form of horizontal deflection that can help reduce speeding along streets.

For more information, see Chicane.



Meade Ave, San Diego, CA. Source: Kittelson & Associates, Inc.

CHOKER / PINCH POINT

Curb extension provided mid-block or at intersections to narrow the travel lanes and slow vehicle speeds.

For more information, see Choker / Pinch Point.

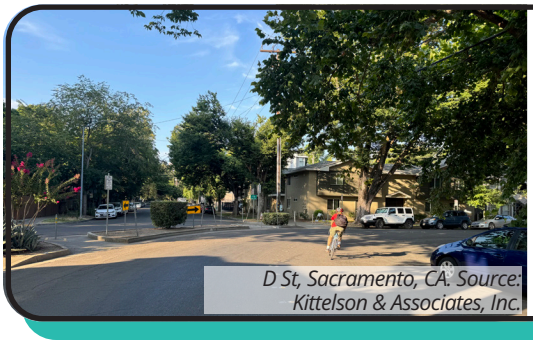


25th Ave, Denver, CO. Source: Kittelson & Associates, Inc.

CURB EXTENSION

An extension of the curb that provides additional pedestrian space in the roadway beyond the existing curb and visually and physically narrows the roadway for people driving.

For more information, see Curb Extension.



D St, Sacramento, CA. Source: Kittelson & Associates, Inc.

DIAGONAL DIVERTER

Vehicle traffic is channelized to take either a right or left turn but people walking, biking, and rolling can proceed through.

For more information, see Diagonal Diverter.



Reynard Way, San Diego, CA. Source: Kittelson & Associates, Inc.

LANE NARROWING

Narrowing lanes to 10 feet or less and reducing the total amount of space for vehicles can provide visual cues for drivers to slow down. This effect may be achieved via striping, adding vertical elements, or moving curb.

For more information, see Lane Narrowing.



Vallejo Way, Sacramento, CA. Source: Kittelson & Associates, Inc.

MEDIAN REFUGE

Protected spaces to facilitate bicycle and pedestrian crossings on streets with two or more lanes, allowing users to cross one direction of travel at a time.

For more information, see Median Refuge.



Arapahoe St, Denver, CO. Source: Kittelson & Associates, Inc.

NEIGHBORHOOD TRAFFIC CIRCLE

Unsignalized, circular intersections where incoming traffic yields to traffic in the intersection. Traffic circles require less space than roundabouts and may be stop controlled but do not include horizontal deflection at the entrance.

For more information, see Neighborhood Traffic Circle.

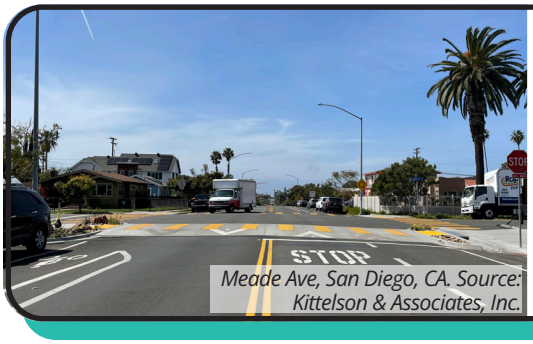


Berkman Dr, Austin, TX. Source: Kittelson & Associates, Inc.

PROTECTED / DEDICATED INTERSECTION

Physical separation at intersections between people walking, biking, and driving using corner islands to tighten vehicular turning radii and provide space for bike circulation and queuing set back from traffic.

For more information, see Protected / Dedicated Intersection.



Meade Ave, San Diego, CA. Source: Kittelson & Associates, Inc.

RAISED CROSSWALK / SPEED TABLE

Elevated crosswalks that act as vertical deflection to slow vehicles and increase visibility of people crossing midblock or at an intersection. Speed tables are designed similarly without the crosswalk and are intended to slow vehicles.

For more information, see Raised Crosswalk / Speed Table.



SE 15th St, Ft. Lauderdale, FL. Source: Kittelson & Associates, Inc.

RAISED INTERSECTION

An intersection that is elevated to sidewalk level to slow vehicles and increase driver awareness at intersections. Raised intersections can be used as a gateway treatment to signify entry into a lower speed environment.

For more information, see Raised Intersection.

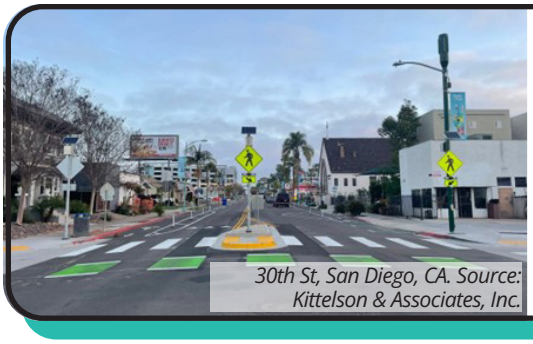


Vallejo Way, Sacramento, CA. Source: Kittelson & Associates, Inc.

RAISED MEDIAN

Raised features in the middle of the road which separate traffic in opposing directions, restrict mid-block turning movements, and can provide formal or informal refuge for pedestrians.

For more information, see Raised Median.



30th St, San Diego, CA. Source: Kittelson & Associates, Inc.

RECTANGULAR RAPID FLASHING BEACON (RRFB)

Flashing signage that enhances the visibility of a pedestrian crossing. Rectangular Rapid Flashing Beacons flash with alternating frequency to increase visibility of people walking and rolling to drivers.

For more information, see Rectangular Rapid Flashing Beacon (RRFB).

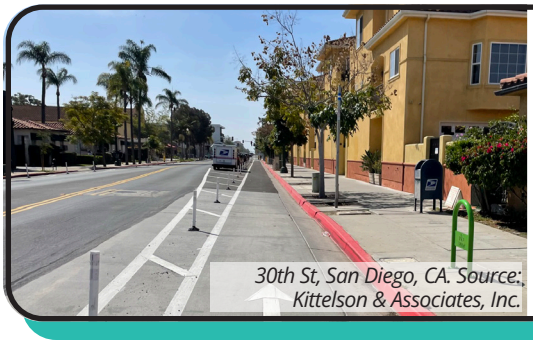


Del Sol Blvd, San Diego, CA. Source: City of San Diego

ROUNDABOUT

Unsignalized, circular intersections where incoming traffic yields to traffic in the intersection.

For more information, see Roundabout.



30th St, San Diego, CA. Source: Kittelson & Associates, Inc.

SEPARATED BIKEWAY

Physically separated and designated space for people biking separated from vehicular lanes via raised features.

For more information, see Separated Bikeway.



Stout St, Denver, CO. Source: Kittelson & Associates, Inc.

SLOW TURN WEDGE

Elevated features, such as curbs or vertical delineators installed at corners to slow turning vehicles and prevent drivers from cutting corners.

For more information, see Slow Turn Wedge.



Georgia St, San Diego, CA Source: Kittelson & Associates, Inc.

SPEED LUMPS

Elevated mounds in the roadway intended to slow vehicles.

For more information, see Speed Lumps.

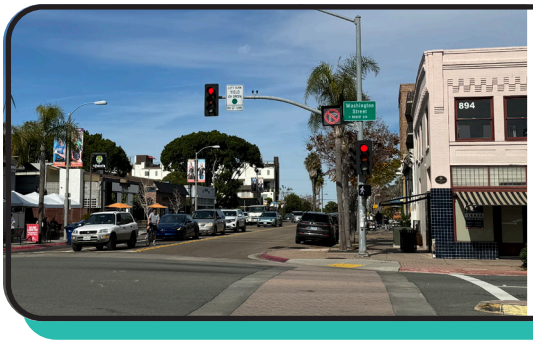


Broadway, Sacramento, CA. Source: Kittelson & Associates, Inc.

TRAFFIC DIVERTER

Full or partial street closure to vehicular traffic while still allowing access for people walking and biking.

For more information, see Traffic Diverter.



CROSSING ENHANCEMENTS

Treatments that increase the visibility of pedestrian and bicycle crossings, manage conflicts at intersections, and minimize delay for people walking and biking. These tools support safety and accessibility goals on both signalized and unsignalized streets.

For more information, see Crossing Enhancements.



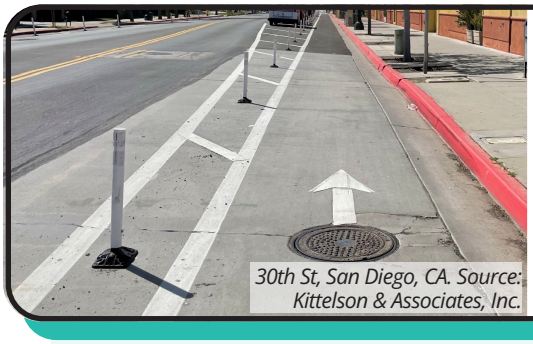
Del Sol Blvd, San Diego, CA. Source: City of San Diego

04

Materials

This section provides guidance on recommended materials for quick-build and demonstration projects, including striping and surface treatments, vertical barriers, and signs. The materials may be applied to one or more project types found in the Treatments chapter. The materials outlined in this section should be used as a starting point, but may be updated or added to as new materials are available. The following materials were selected to optimize safety, durability, and maintenance considerations.

Materials may be sourced and procured in a variety of ways and will depend on the type and scale of the project and the overall material cost. When possible, project materials may be reused or locally-sourced. A low (<$1,000), medium ($1,000-$5,000), and high (>$5,000) cost scale is included to identify associated costs with material options.



30th St, San Diego, CA. Source: Kittelson & Associates, Inc.

FLEX POSTS

Flex posts, or delineator posts, may be installed to separate travel lanes from areas for people walking, biking, or rolling. Flex posts can be installed on their own, or on a modular curb base. For demonstration projects, flex posts can be adhered to the roadway using adhesive butyl pads.

TYPICAL DIMENSIONS: 8 inches wide, 36 inches high
(Modular curb: 40 inches long, 12 inches wide, 3 inches high)

APPLICATIONS

Diagonal diverter, traffic diverter, median refuge, centerline hardening, slow turn wedge, curb extension, protected bike lane, neighborhood traffic circle, raised median, bend out, chicane, choker/pinch point, protected intersection

COST

$$$

LOW



Del Sol Blvd, San Diego, CA. Source: City of San Diego

PLASTIC BOARD

3D printed modular curbs that can be attached to asphalt with adhesive pads for quick build projects and drilled into asphalt for longer-lasting Quick Build projects.

TYPICAL DIMENSIONS: 16 inches wide, 50 inches long, Radius = 8 inches

APPLICATIONS

Roundabouts, median refuges, centerline hardening, slow turn wedges, curb extensions, neighborhood traffic circles, raised medians, bend outs, chicanes, chokers/pinch points, protected intersections

COST

$$$

LOW



Rose Hill St, Boise, ID. Source: Kittelson & Associates, Inc.

LOW-PROFILE TRAFFIC SEPARATOR

Low-profile traffic separators are mountable vertical barriers used to separate travel lanes from areas for people walking, biking, or rolling. These may be used with flex posts to delineate treatments and increase the level of separation.

TYPICAL DIMENSIONS: Varies; 32 inches long, 8.5 inches wide, 5 inches high

APPLICATIONS

Slow turn wedges, buffered bike lanes, protected bike lanes, curb extensions, chokers/pinch points, bend outs, protected intersections, chicanes

COST

$$$

LOW



S. Caroline St, Baltimore, MD. Source: Kittelson & Associates, Inc.

WHITE PAINT (THERMOPLASTIC)
Thermoplastic may be used to delineate the edge of project elements or to fill in smaller project areas, such as stencils. Thermoplastic comes as a liquid application or preformed sheets. Both require professional installation.

TYPICAL DIMENSIONS: Varies

APPLICATIONS
Diagonal diverters, traffic diverters, median refuges, slow turn wedges, curb extensions, buffered bike lanes, protected bike lanes, neighborhood traffic circle, bend outs, chicanes, chokers/pinch points, protected intersections

COST
$$$
LOW



7th St, Washington, DC. Source: Kittelson & Associates, Inc.

PLANTERS
Planters may be used as a vertical separator, similar to flex posts. Planters may also be used to create diverters on Streets for All projects. Planter maintenance should be considered and arranged when opting for this treatment.

TYPICAL DIMENSIONS: Varies

APPLICATIONS
Diagonal diverters, traffic diverters, median refuges, slow turn wedges, curb extensions, buffered bike lanes, protected bike lanes, neighborhood traffic circle, bend outs, chicanes, chokers/pinch points, protected intersections

COST
$$$
LOW



Kenwood Rd, Baltimore, MD. Source: Kittelson & Associates, Inc.

STREETS FOR ALL SIGNAGE
Streets for All signage may be used to temporarily block off space or divert traffic, particularly at access points. Signs may be mounted on gates, jersey barriers, cones, planters, or other desired barrier materials.

TYPICAL DIMENSIONS: Varies

APPLICATIONS
Diagonal diverters, traffic diverters

COST
$$$
LOW



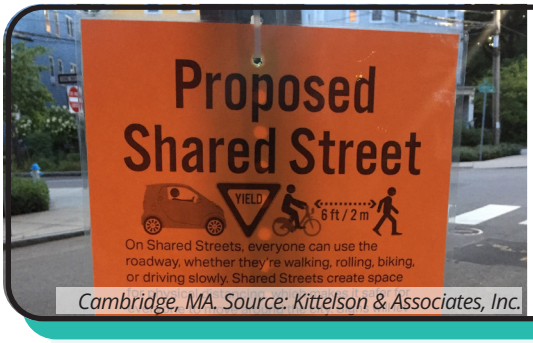
Hyannis, MA. Source: Kittelson & Associates, Inc.

ACCESSIBLE RAMP
Accessible ramps can be used to ensure that treatments and installations meet required ADA accessibility regulations by providing an accessible connection between curbs and project areas.

TYPICAL DIMENSIONS: Varies

APPLICATIONS
Curb extensions, raised crosswalks

COST
$$$
MEDIUM



Cambridge, MA. Source: Kittelson & Associates, Inc.

LAMINATED SIGNS
Laminated signs may be used to communicate information about a Streets for All project. Signs may be used to inform an area or community of a planned Streets for All project. Additionally, laminated signs may remain up for the duration of the project as an informational tool.

TYPICAL DIMENSIONS: Varies

APPLICATIONS
Residential Healthy and Connected Streets Residential Calm Streets, Business Healthy & Connected Streets, Demonstration projects

COST
$$$
LOW



San Diego, CA.Source: Kittelson & Associates, Inc.

COLORED ASPHALT PAINT (STREETBOND)
Colored asphalt paint may be used in a variety of treatments to improve visibility of treatments and beautify a space. Asphalt art may incorporate the work of local artists, encourage community collaboration, and enhance the look and feel of an area. Experimental process documentation may be required for this treatment.

TYPICAL DIMENSIONS: Varies

APPLICATIONS
Median refuges, slow turn wedges, curb extensions, bike lanes, buffered bike lanes, protected bike lanes, neighborhood traffic circles bend outs, chicanes, chokers/pinch points, protected intersections, crossing enhancements

COST
$$$
LOW

DEMONSTRATION PROJECT MATERIALS

Demonstration projects may be used to advance transportation safety, access, connectivity, and comfort. They can be planned, designed, and installed quickly and can last from one day to two weeks. These projects are intended to help educate, inform, and bring awareness to communities and can help build support for longer term projects.

In addition to some of the materials described previously in this chapter, demonstration project materials could include, but are not limited to, the items listed below. Materials for these types of projects are typically less durable than a full infrastructure project, as they are intended to be temporary in nature. Therefore, it is critical to select materials based on the desired project duration. Additionally, for longer demonstration projects, the project should be monitored regularly to ensure all materials are withstanding weather, vandalism, theft, and any other disruptions that may impact the efficacy of the design.

SINGLE DAY MATERIALS

(best for events or very short-term demonstrations)

- Sidewalk chalk
- Cornstarch paint
- Traffic tape
- Tempera paint
- Spray chalk
- Spray paint
- Traffic cones

LONGER-TERM MATERIALS

(durable enough for demonstrations lasting more than a single day)

- Traffic barrels
- Flex posts
- Wave delineators
- Plastic jersey barriers
- Parking stops
- Temporary speed lumps/cushions
- Bus boarding platforms
- Detectable warning surfaces
- Street furniture



Ventura, CA. Source: Kittelson & Associates, Inc.

05

How to Implement a Streets for All Project

This section describes the process for implementing a Streets for All project within the public right-of-way. The potential permits required to install Streets for All projects depend on the proposed Streets for All project type (i.e. demonstration or permanent). The general process for City approval and permit issuance is noted below; however, because Streets for All projects can vary greatly in their location, size, duration, and inclusion of treatments and materials, the City's approval process may differ from the process outlined below on a case-by-case basis in consultation with City staff during the permitting process. Permitting may include multiple City Departments including (but not limited to) the Development Services Department, Transportation Department, and Economic Development Department. All projects will require maintenance agreements from the applicant. In addition, special coordination with outside public agencies or public serving facilities such as schools, libraries, recreation centers, and post offices may be required if the project is located near these facilities.

Refer to the applicable Municipal Code section Information Bulletins and Project Submittal Manual for additional Information, as detailed in Sections 1-3 below. Also, refer to the implementation guidance from the California Vehicle Code Section 1, 21101 (f)(1-6).

1. STREETS FOR ALL DOCUMENTATION AND SUBMITTAL PROCESS:

The steps below are part of a generalized process that could vary depending on the project or location and is subject to change. Please refer to the applicable municipal code requirements, documents listed, and information available from the Development Services Department.

A. NETWORK MAP AND TREATMENT SELECTION

Review the Streets for All Manual and associated Network Map. Determine that the street you are interested in developing a project for is on the Network Map and review the Streets for All Manual to choose proposed treatments and materials for the selected street.

B. PROJECT DESCRIPTION, COMMUNITY CONSENSUS, AND NEXT STEPS

Prepare a project description including street name and extent (beginning and end of project), proposed treatments and their location, and project duration. Inform the Business Improvement District and the Community Parking District of the project where applicable, and the Council District based on where the project is located. Additionally, provide documentation of community consultation and a 75% approval rate of affected property owners. See Step C and D for projects including art in the right-of-way and/or roadway crossing components. All others, skip to Step E.

C. PUBLIC ART IN THE RIGHT-OF-WAY REVIEW (SELECT PROJECTS ONLY)

Streets for All projects that propose Artworks as defined in Municipal Code Chapter 2, Article 2, Division 59 utilizing colored asphalt paint (streetbond) or similar materials must be reviewed by Cultural Affairs before submitting permit applications. Applicants should determine if the project meets the definition of Artwork. Colored asphalt paint that is being used solely as a design element and is not specified by an Artist as defined in the above referenced Municipal Code section is not considered an Artwork . These projects may proceed to Step E. If the project includes an Artwork, please contact the Cultural Affairs team for review.

D. TRAFFIC SERVICE REQUEST (SELECT PROJECTS ONLY)

Streets for All projects that propose new crossings or crossing enhancements must submit a Traffic Service Request to the Transportation Department for an engineering evaluation of the proposed Streets for All project description and location. Transportation Department staff will review the proposed Streets for All installation for safety and traffic flow implications.

E. PERMIT SUBMITTAL

Submit the required permits, maintenance agreements documents and fees to the Development Services Department (DSD), as outlined in Section 2, below. DSD staff will review proposals for Streets for All projects for evaluation as Placemaking treatments per Municipal Code Chapter 12, Article 9, Division 7.

F. INSURANCE

Submit the required issuance documents requested by permit issuance staff. Insurance is required for both demonstration and permanent Streets for All projects. Insurance requirements would be determined in consultation with DSD staff during the permit review process.

G. PERMIT ISSUANCE

Permits are issued once the project application has been reviewed and signed off by all the required review disciplines. During pre-permit issuance, the applicant will receive an e-mail if additional documents and/or fees are required.

H. PROJECT INSTALLATION

The applicant installs treatment(s) per the approved plans and communicates with assigned City staff regarding timing. For treatments approved on Right-of-Way Permit plans, a Traffic Control Permit and a Pre-Construction Meeting with the Transportation Department is required for commencement of work.

2. PERMITS & AGREEMENTS GLOSSARY

A. PERMITS

- Right-of-Way Permit: A right-of-way permit is required for any work or privately owned encroachments in the public right-of-way or for installing public improvements in the right-of-way. Refer to Municipal Code Chapter 12, Article 9, Division 7.
- Coastal Development Permit: A Coastal Development Permit may be required by either the City of San Diego or the California Coastal Commission for projects located within the Coastal Overlay Zone. Refer to Municipal Code Chapter 13, Article 2, Division 4.
- Traffic Control Permit: After obtaining a right-of-way permit, a traffic control permit is required for commencement of work within the public right-of-way or public service easement. Refer to Municipal Code Chapter 12, Article 9, Division 7 and Information Bulletin 177.

B. AGREEMENTS

Public Improvement Maintenance Agreement is required for privately-owned and/or privately-maintained encroachments located in the public right-of-way or in a public service easement. A Public Improvement Maintenance Agreement is a form of Encroachment Maintenance and Removal Agreement. Refer to Municipal Code Chapter 12, Article 9, Division 7.

PERMITS/AGREEMENTS	PROJECT TYPE	
	DEMONSTRATION PROJECTS (2 WEEKS OR LESS)	PERMANENT PROJECTS (UP TO 5 YEARS)
Right-of-Way Permit	Required	Required
Coastal Development Permit	May be required depending on project design or location	May be required depending on project design or location
Traffic Control Permit	Required	Required
Insurance	Required	Required
Public Improvement Maintenance Agreement (PIMA)	--	Required for permanent installations

3. ADDITIONAL RESOURCES & REFERENCES

- Right-of Way Permit, Traffic Control Permit, Placemaking in the Right-of-Way, PIMA: San Diego Municipal Code, Chapter 12, Article 9, Division 7
- Coastal Development Permit: San Diego Municipal Code Chapter 13, Article 2, Division 4
- Public Art: San Diego Municipal Code Chapter 2, Article 2, Division 59
- Land Development Manual: Project Submittal Requirements Section 3 - Construction Permits - Grading and Public Right-of-Way
- Information Bulletin 165: Obtaining a Public Right-of-Way Permit for Standard Public Improvements
- Information Bulletin 177: How to Obtain a Public Right of Way Permit for Traffic Control
- Information Bulletin 353: Grading & Right-of-Way Permit Issuance
- Public Improvement Maintenance Agreement (PIMA)
- City of San Diego Traffic Calming Guidelines
- Assembly Bill 773: Street Closures and Designations
- City of San Diego Art Proposal Process
- City of San Diego Traffic Service Request



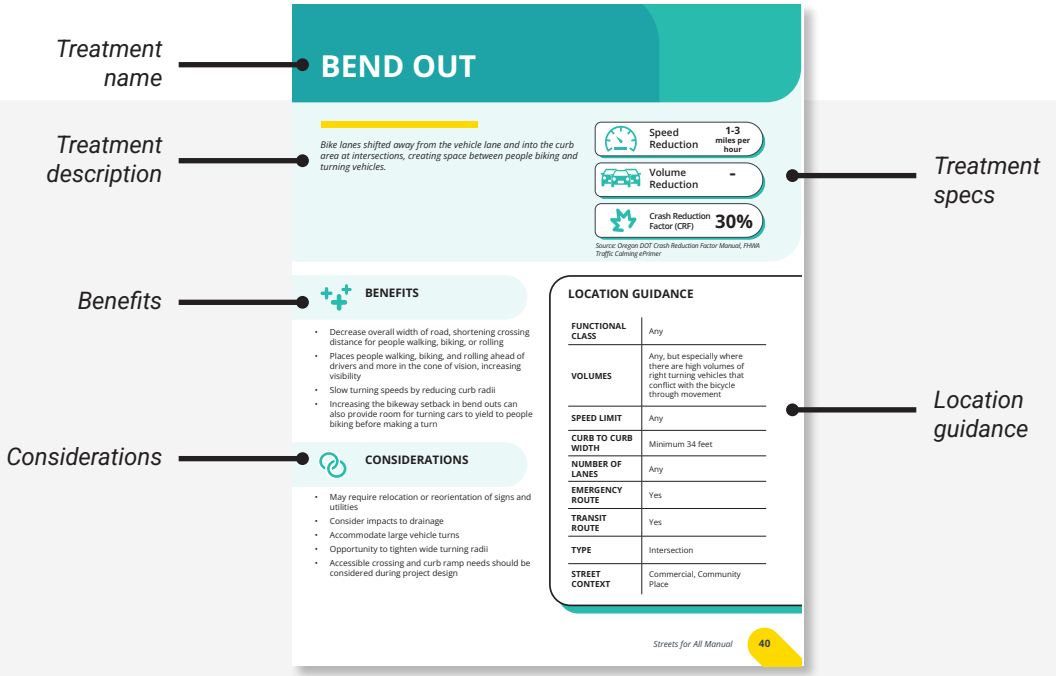
Del Sol Blvd, San Diego, CA. Source: City of San Diego

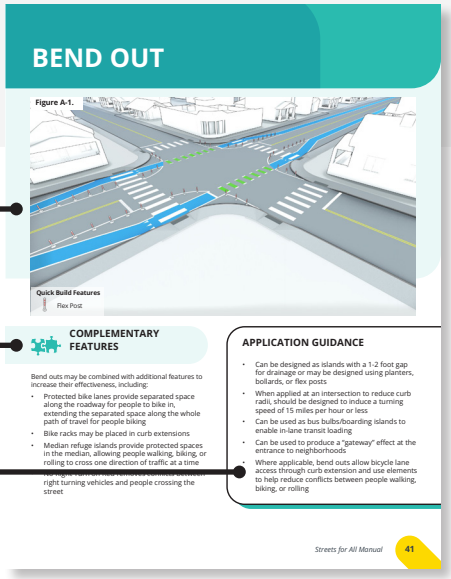
Appendix A: Streets for All Treatment Guide

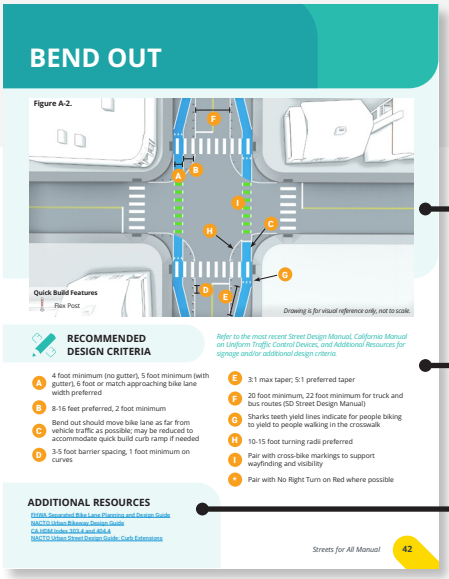
This appendix includes detailed guidance on each of the treatments introduced in the Manual. These treatments may be used as part of a Streets for All project. However, projects are not limited to the treatments in this manual. In some cases, there may be situations where a different treatment is appropriate. Additional treatments may be explored, added, and/or removed based on best engineering practices and these scenarios would require consultation with City staff during the permit review process. Where applicable, treatment design aligns with the California Manual on Uniform Traffic Control Devices.

HOW TO USE THE DESIGN SHEETS

Each of the treatments includes a three-page breakdown, as detailed below. Each spread outlines feasibility guidance on where treatments are applicable, given a street's context and characteristics.







Treatment angle view

Complementary features

Application guidance

Treatment overview

Treatment specs

Additional resources

BEND OUT

Bike lanes shifted away from the vehicle lane and into the curb area at intersections, creating space between people biking and turning vehicles.

Speed Reduction	1-3 miles per hour
Volume Reduction	N/A
Crash Reduction Factor (CRF)	30%

Source: Oregon DOT Crash Reduction Factor Manual, FHWA Traffic Calming ePrimer

BENEFITS

- Decrease overall width of road, shortening crossing distance for people walking, biking, or rolling
- Places people walking, biking, and rolling ahead of drivers and more in the cone of vision, increasing visibility
- Slow turning speeds by reducing curb radii
- Increasing the bikeway setback in bend outs can also provide room for turning cars to yield to people biking before making a turn

CONSIDERATIONS

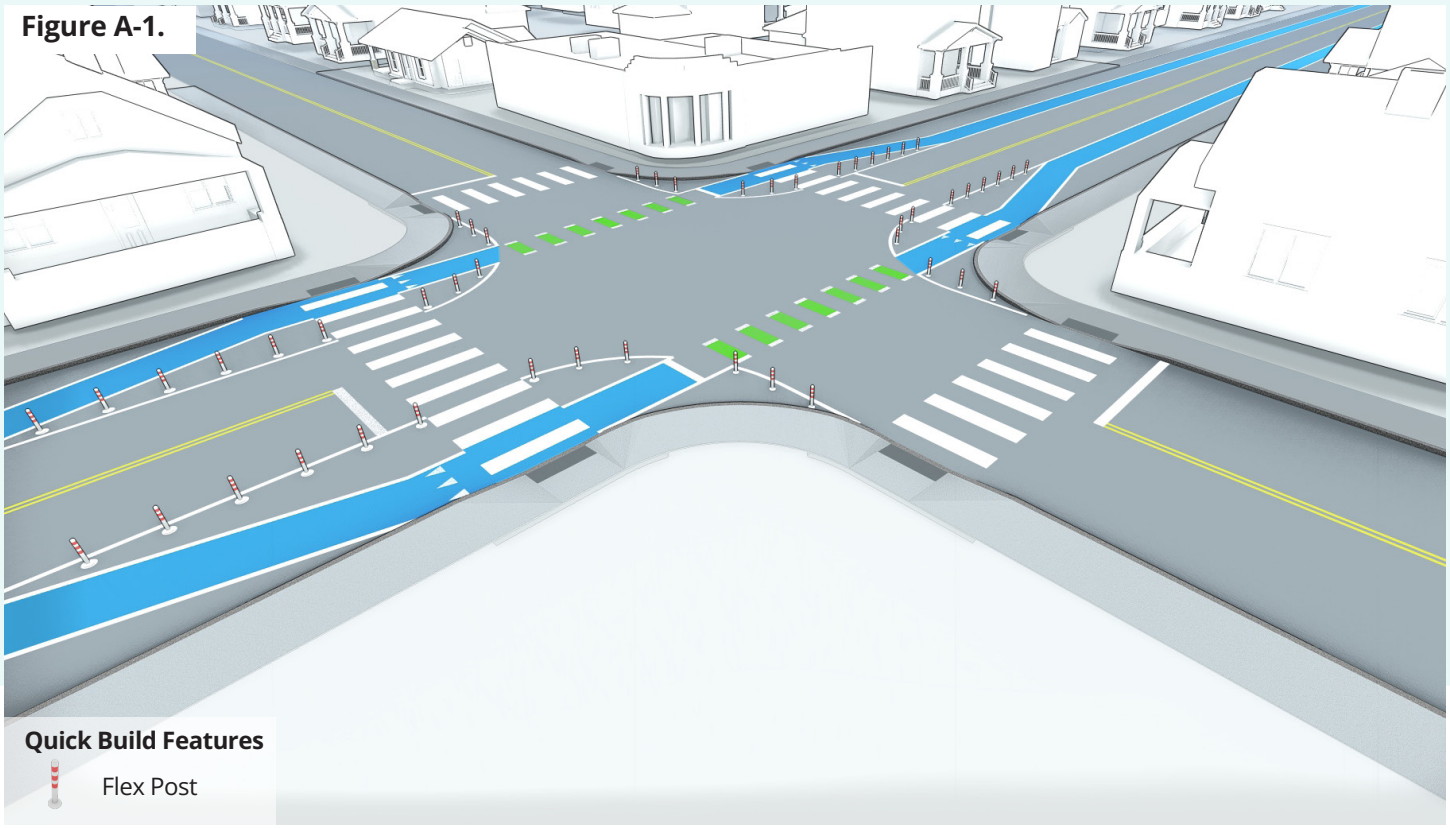
- May require relocation or reorientation of signs and utilities
- Consider impacts to drainage
- Accommodate large vehicle turns
- Opportunity to tighten wide turning radii
- Accessible crossing and curb ramp needs must be included during project design

LOCATION GUIDANCE

FUNCTIONAL CLASS	Any
VOLUMES	Any, but especially where there are high volumes of right turning vehicles that conflict with the bicycle through movement
SPEED LIMIT	Any
CURB TO CURB WIDTH	Minimum 34 feet
NUMBER OF LANES	Any
EMERGENCY ROUTE	Yes
TRANSIT ROUTE	Yes
TYPE	Intersection
STREET CONTEXT	Commercial, Community Place

BEND OUT

Figure A-1.



COMPLEMENTARY FEATURES

Bend outs may be combined with additional features to increase their effectiveness, including:

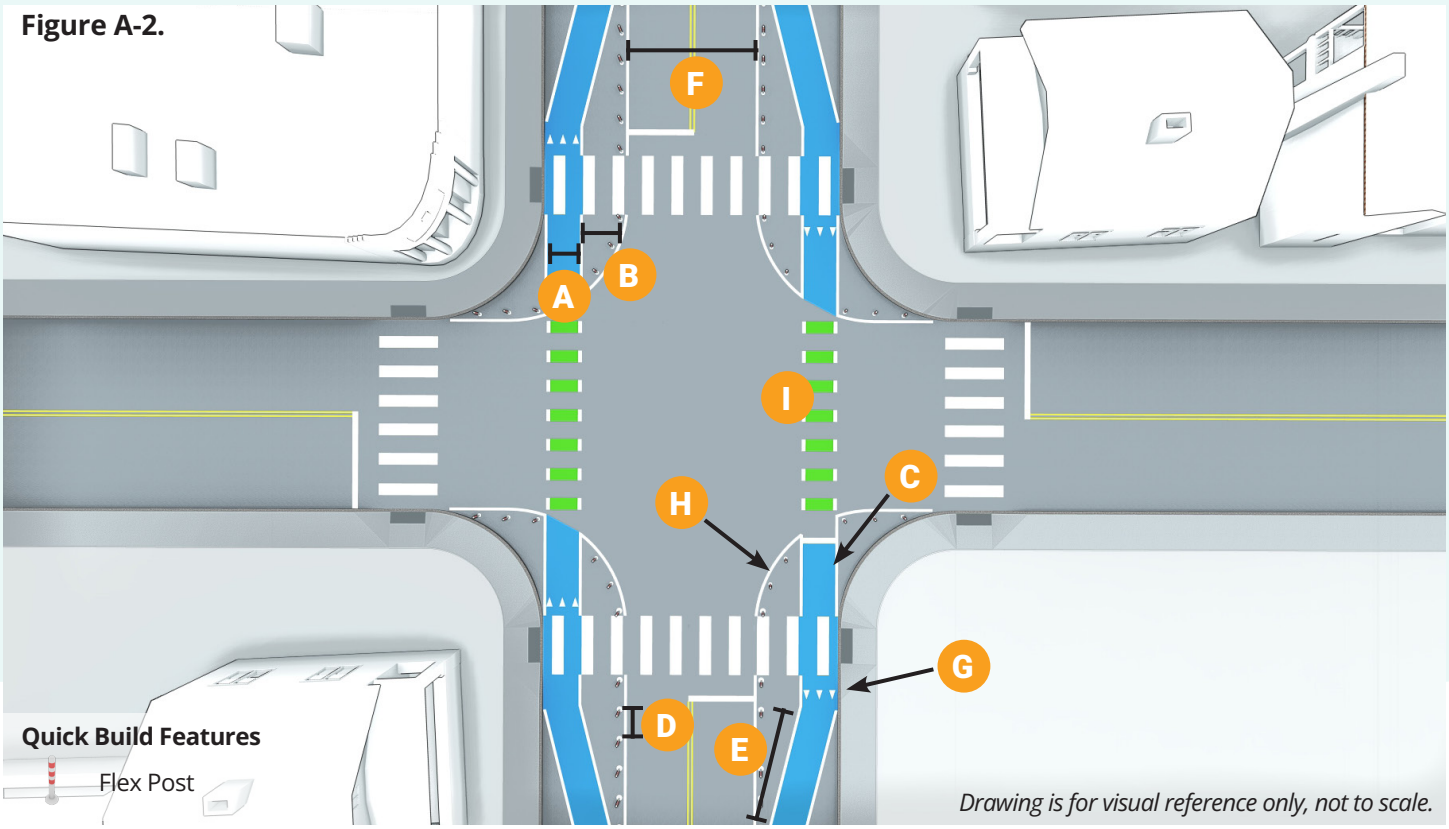
- Protected bike lanes provide separated space along the roadway for people to bike in, extending the separated space along the whole path of travel for people biking
- Bike racks may be placed in curb extensions
- Median refuge islands provide protected spaces in the median, allowing people walking, biking, or rolling to cross one direction of traffic at a time
- No Right Turn on Red removes conflicts between right turning vehicles and people crossing the street

APPLICATION GUIDANCE

- Can be designed as islands with a 1-2 foot gap for drainage or may be designed using planters, bollards, or flex posts
- When applied at an intersection to reduce curb radii, should be designed to induce a turning speed of 15 miles per hour or less
- Can be used as bus bulbs/boarding islands to enable in-lane transit loading
- Can be used to produce a "gateway" effect at the entrance to neighborhoods
- Where applicable, bend outs allow bicycle lane access through curb extension and use elements to help reduce conflicts between people walking, biking, or rolling

BEND OUT

Figure A-2.



RECOMMENDED DESIGN CRITERIA

Refer to the most recent Street Design Manual, California Manual on Uniform Traffic Control Devices, and Additional Resources for signage and/or additional design criteria.

- **A** 4 foot minimum (no gutter), 5 foot minimum (with gutter), 6 foot or match approaching bike lane width preferred
- **B** 8-16 feet preferred, 2 foot minimum
- **C** Bend out should move bike lane as far from vehicle traffic as possible; may be reduced to accommodate quick build curb ramp if needed
- **D** 3-5 foot barrier spacing, 1 foot minimum on curves
- **E** 3:1 max taper; 5:1 preferred taper
- **F** 20 foot minimum, 22 foot minimum for truck and bus routes (SD Street Design Manual)
- **G** Sharks teeth yield lines indicate for people biking to yield to people walking in the crosswalk
- **H** 10-15 foot turning radii preferred
- **I** Pair with cross-bike markings to support wayfinding and visibility
- ***** Pair with No Right Turn on Red where possible

ADDITIONAL RESOURCES

FHWA Separated Bike Lane Planning and Design Guide
NACTO Urban Bikeway Design Guide
CA HDM Index 303.4 and 404.4
NACTO Urban Street Design Guide: Curb Extensions

BIKE BOX / TWO STAGE LEFT TURN QUEUE BOX

Designated space for people biking to wait to travel through the intersection ahead of the vehicle stop bar, improving visibility and allowing people biking to get a head start. Bike boxes are placed across the travel lane behind the crosswalk, and two-stage left-turn queue boxes provide waiting space in front of the stop bar to facilitate left turns for bicyclists.



NO IMPACT ON SPEED OR VOLUME



Crash Reduction Factor **35%**

Source: CALTRANS Report CA19-3180, Development of Crash Reduction Factors for Bicycle-Related Safety Countermeasures

BENEFITS

- Increase the visibility of people biking
- Reduce right turn conflicts between people driving and biking
- Organize and separate multimodal movement at intersections

CONSIDERATIONS

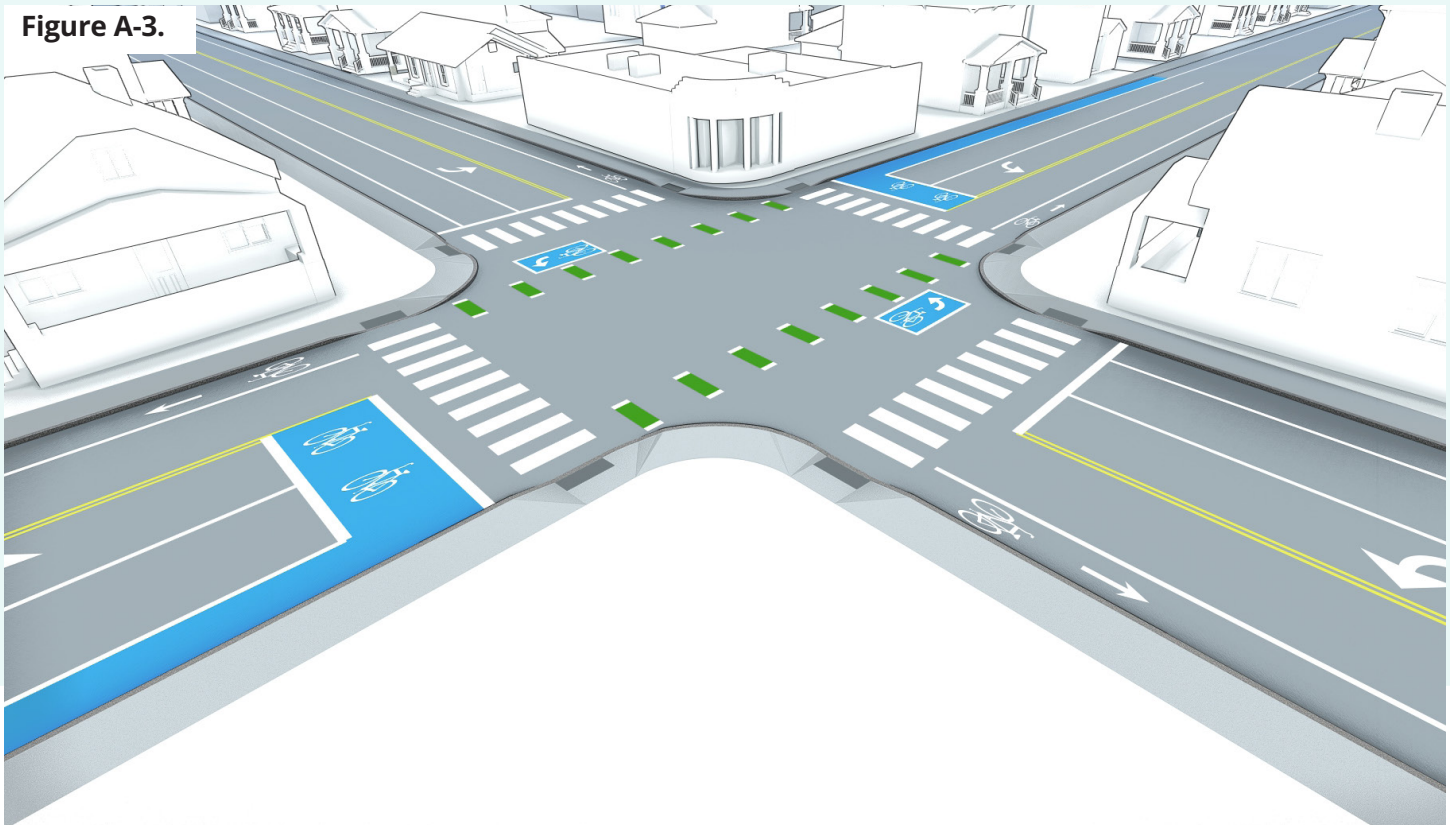
- Can be placed in at one strategic turning point, or can stretch across the intersection
- Driver compliance rates may vary
- Bike boxes require removal of right-on-red turning movements for vehicles

LOCATION GUIDANCE

FUNCTIONAL CLASS	Any
VOLUMES	Any
SPEED LIMIT	Any
CURB TO CURB WIDTH	Any
NUMBER OF LANES	4 or less preferred
EMERGENCY ROUTE	Yes
TRANSIT ROUTE	Yes
TYPE	Segment
STREET CONTEXT	Any

BIKE BOX / TWO STAGE LEFT TURN QUEUE BOX

Figure A-3.



COMPLEMENTARY FEATURES

Bike boxes may be combined with additional features to increase their effectiveness, including:

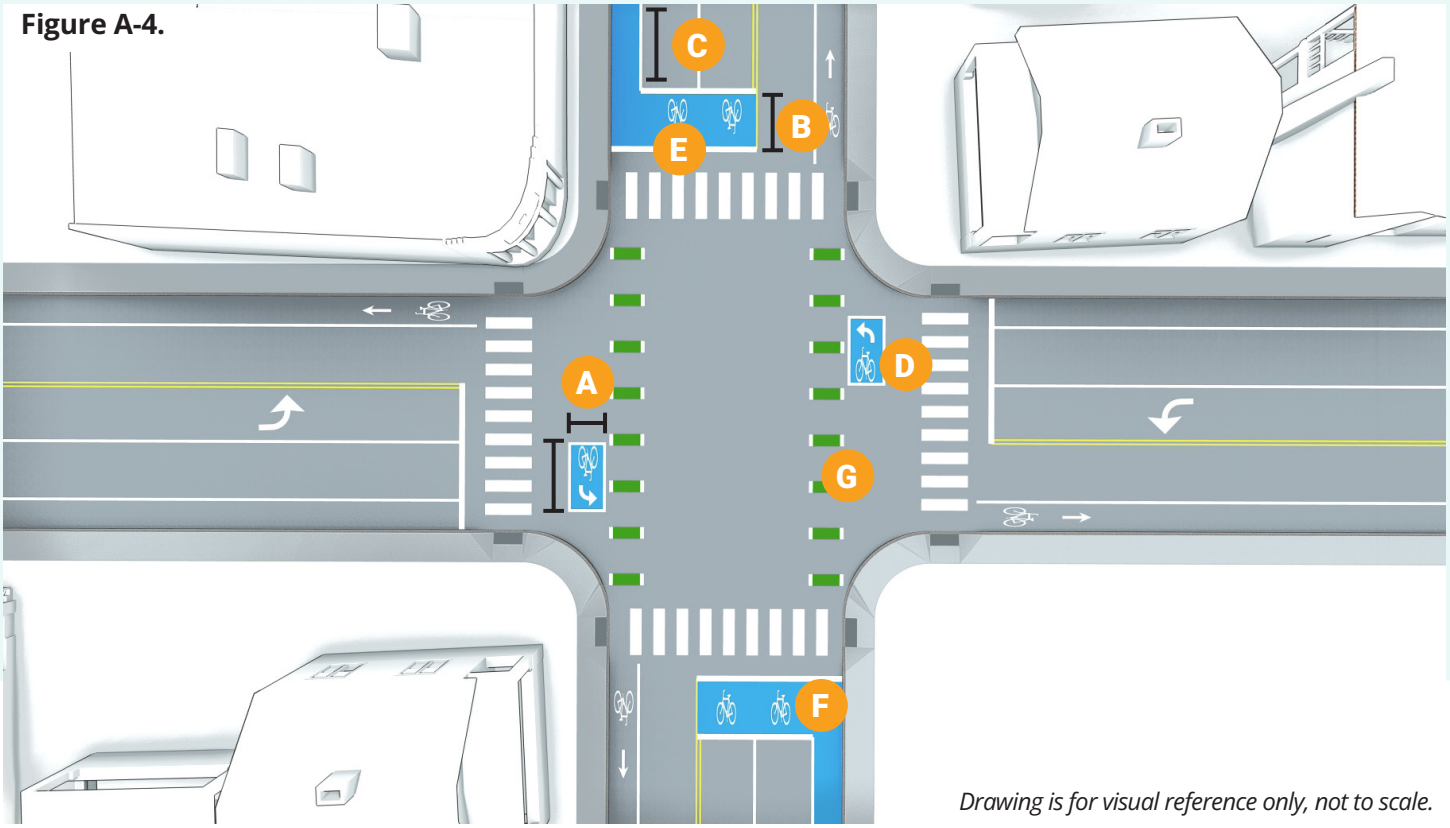
- Centerline hardening places a raised treatment along the centerline, requiring drivers to slow down when making left turns
- Curb extensions or slow-turn wedges extend the curb at crossings to improve visibility of people walking and reduce turning speeds
- Raised crossings elevate the bike and/or pedestrian crossing to curb level, increasing visibility and slowing vehicle traffic
- Median refuge islands provide protected spaces in the median, allowing people walking, biking, or rolling to cross one direction of traffic at a time
- No Right Turn on Red removes conflicts between right turning vehicles and people crossing the street

APPLICATION GUIDANCE

- Bike boxes should be located past the stop bar and before the crosswalk; two stage left turn queue boxes may be located past the crosswalk
- Bike boxes can be used at any intersection, but two stage left turn queue boxes are only intended for use at signalized intersections
- Most effective on roads with 2 to 4 lanes
- Can be added to roads with existing or planned bike facilities
- May be combined with an exclusive bike signal phase or a leading interval using bike signal heads
- At mid-block crossing locations, bicycle-turn queue boxes may be placed in a curb cut-out

BIKE BOX / TWO STAGE LEFT TURN QUEUE BOX

Figure A-4.



Drawing is for visual reference only, not to scale.

RECOMMENDED DESIGN CRITERIA

Refer to the most recent Street Design Manual, California Manual on Uniform Traffic Control Devices, and Additional Resources for signage and/or additional design criteria.

- **A** 10 foot minimum width, 6.5 foot minimum depth
- **B** 10 foot minimum depth; should span travel lanes facing the same direction
- **C** Bike lane should extend at least 25 feet from the queue box; green color may be used in this area
- **D** Two stage left turn queue boxes are positioned in front of the crosswalk; may be positioned in front of on-street parking if present
- **E** Bike boxes are placed prior to the stop bar
- **F** Green colored pavement should be used inside the bike box or queue box to further define the bicycle space
- **G** Pair with cross-bike markings to support wayfinding and visibility
- ***** Pair with No Right Turn on Red where possible

ADDITIONAL RESOURCES

California Manual on Uniform Traffic Control Devices 2026 Chapter 9

BIKE LANE

Pavement markings used to create exclusive space for people biking. While the bike lane distinguishes predictable areas for bicyclist and automobile movement, bicyclists may leave the bikeway to pass other bicyclists or avoid debris and other traffic conflicts.



NO IMPACT ON SPEED OR VOLUME FOR THROUGH TRAFFIC; VEHICLE TURNING SPEEDS MAY BE REDUCED



IMPACTS ON SAFETY INCONCLUSIVE, NOT EFFECTIVE ON HIGH SPEED OR VOLUME ROADS

BENEFITS

- Painted bike lanes help quickly fill gaps in the bike network or expand an existing network with minimal cost

CONSIDERATIONS

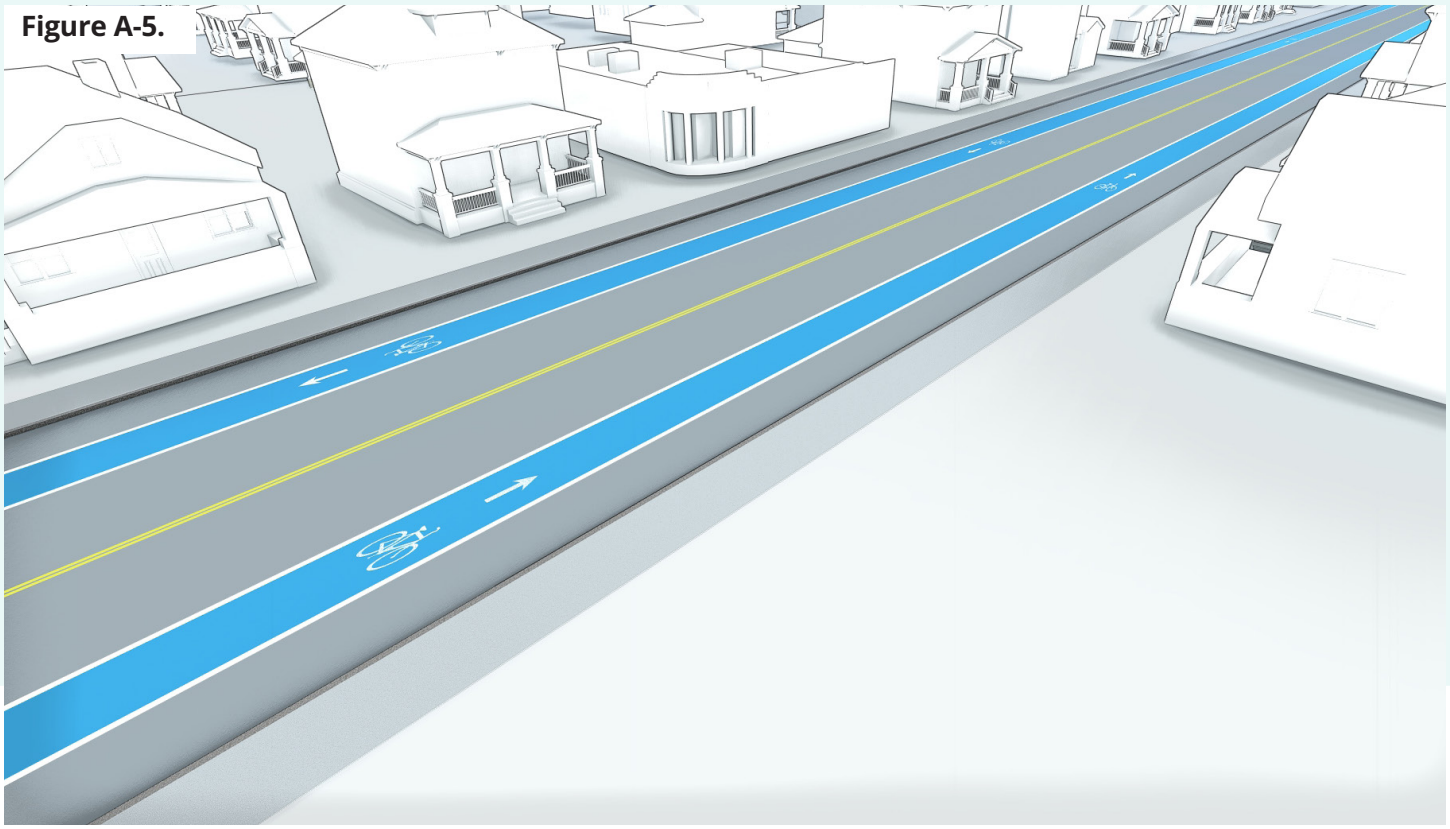
- Overly wide bike lanes may attract unintended motor vehicle use for driving or parking
- Where drivers are observed parking or driving in a bike lane, protected bike lanes should be considered
- Striped bike lanes do not provide any separation or protection from vehicles

LOCATION GUIDANCE

FUNCTIONAL CLASS	Local or Collector
VOLUMES	Less than or equal to 6,500 vehicles per day
SPEED LIMIT	Less than or equal to 30 miles per hour
CURB TO CURB WIDTH	Minimum 30 feet
NUMBER OF LANES	Less than or equal to 3
EMERGENCY ROUTE	Yes
TRANSIT ROUTE	Yes
TYPE	Segment
STREET CONTEXT	Any

BIKE LANE

Figure A-5.



COMPLEMENTARY FEATURES

Bike lanes may be combined with additional features to increase their effectiveness, including:

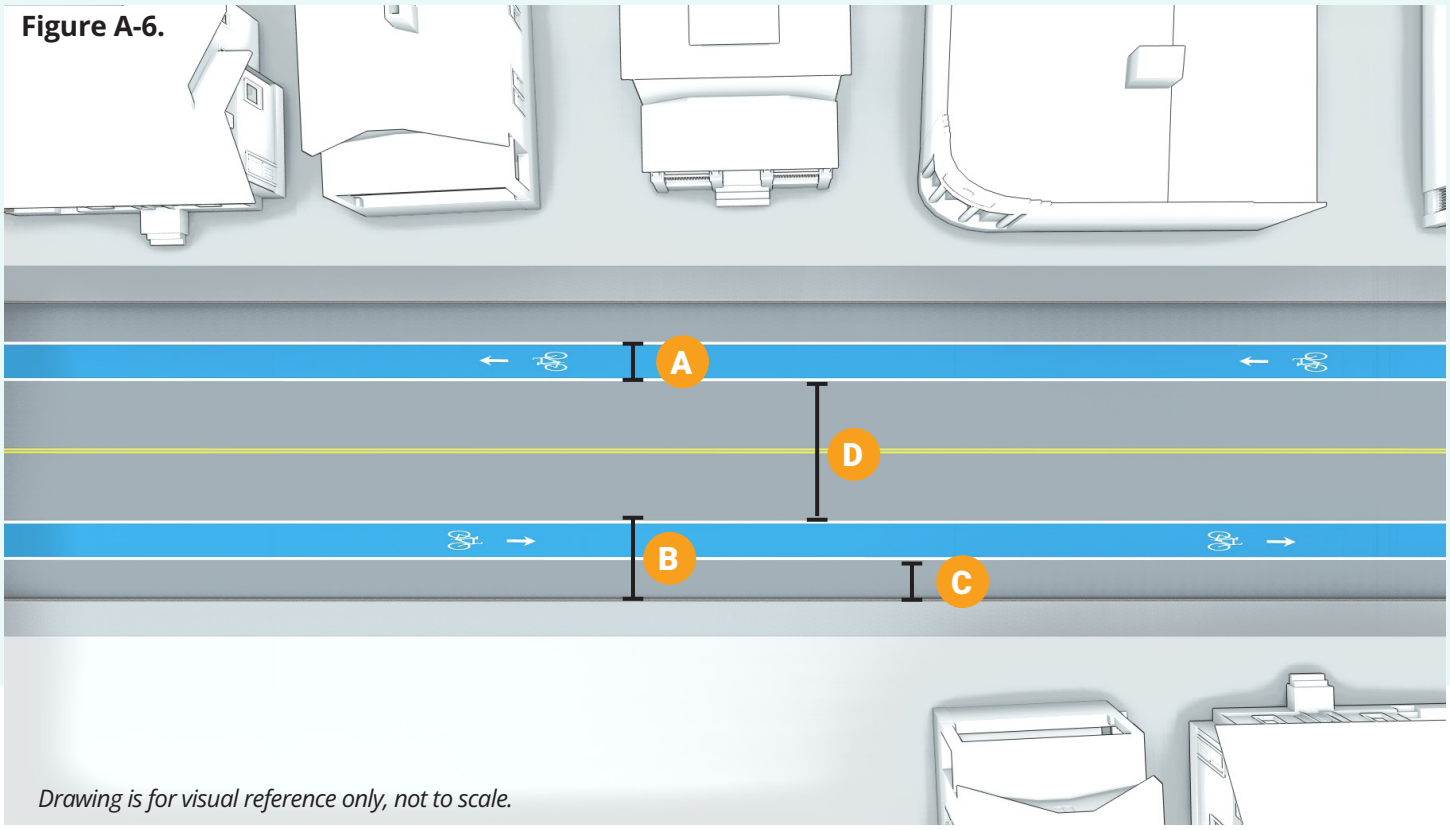
- Intersection treatments along the bike route such as protected intersections, protected roundabouts, dedicated intersections, bend outs, hardened centerlines, bike boxes, and two-stage left-turn queue boxes can help improve crossing comfort
- Slow-turn wedges, tight turn radii, or raised crossings at side streets and high-volume driveways, along with conflict markings to highlight the presence of people biking
- Yield markings and/or raised crossings may be installed where people walking are anticipated to cross the bikeway to further indicate priority users

APPLICATION GUIDANCE

- Intended for one-way travel; typically provided on both sides of two-way streets and on one side of one-way streets
- Contraflow bike lanes may be provided to support access on one-way streets
- The curb should be painted red where parking is not allowed; no parking signs may be used to discourage parking in the bike lane
- Conflict striping at intersections and driveways may be considered to improve visibility for all users
- Detectable warning surfaces should be used to clearly define where people walking will cross the bikeway
- When adjacent to on-street parking, a 3-foot buffer between the bike lane and parking lane should be considered to prevent “door zone” conflicts

BIKE LANE

Figure A-6.



Drawing is for visual reference only, not to scale.

RECOMMENDED DESIGN CRITERIA

Refer to the most recent Street Design Manual, California Manual on Uniform Traffic Control Devices, and Additional Resources for signage and/or additional design criteria.

- **A** 5 foot minimum
- **B** If on-street parking present, 12 foot minimum, 14.5 foot preferred
- **C** 7 foot minimum parking width, 8 foot preferred
- **D** 20 foot minimum travel lane width, 22 foot minimum travel lane width for truck and bus routes (SD Street Design Manual)

ADDITIONAL RESOURCES

FHWA Bikeway Selection Guide
NACTO Designing for All Ages and Abilities
NACTO Urban Bikeway Design Guide
California Manual on Uniform Traffic Control Devices Chapter 9

BUFFERED BIKE LANE

Painted bike lanes with an additional painted buffer to provide additional horizontal separation between the bike and travel or parking lanes, increasing comfort and separation for people biking.



NO IMPACT ON SPEED OR VOLUME FOR THROUGH TRAFFIC; VEHICLE TURNING SPEEDS MAY BE REDUCED



IMPACTS ON SAFETY INCONCLUSIVE, NOT EFFECTIVE ON HIGH SPEED OR VOLUME ROADS

BENEFITS

- Additional buffer space can increase comfort for some people, especially where there are higher volumes of traffic or higher vehicle speeds
- Painted bike lanes help quickly fill gaps in the bike network or expand an existing network with minimal cost
- Can help narrow the roadway and promote reduced driving speeds

CONSIDERATIONS

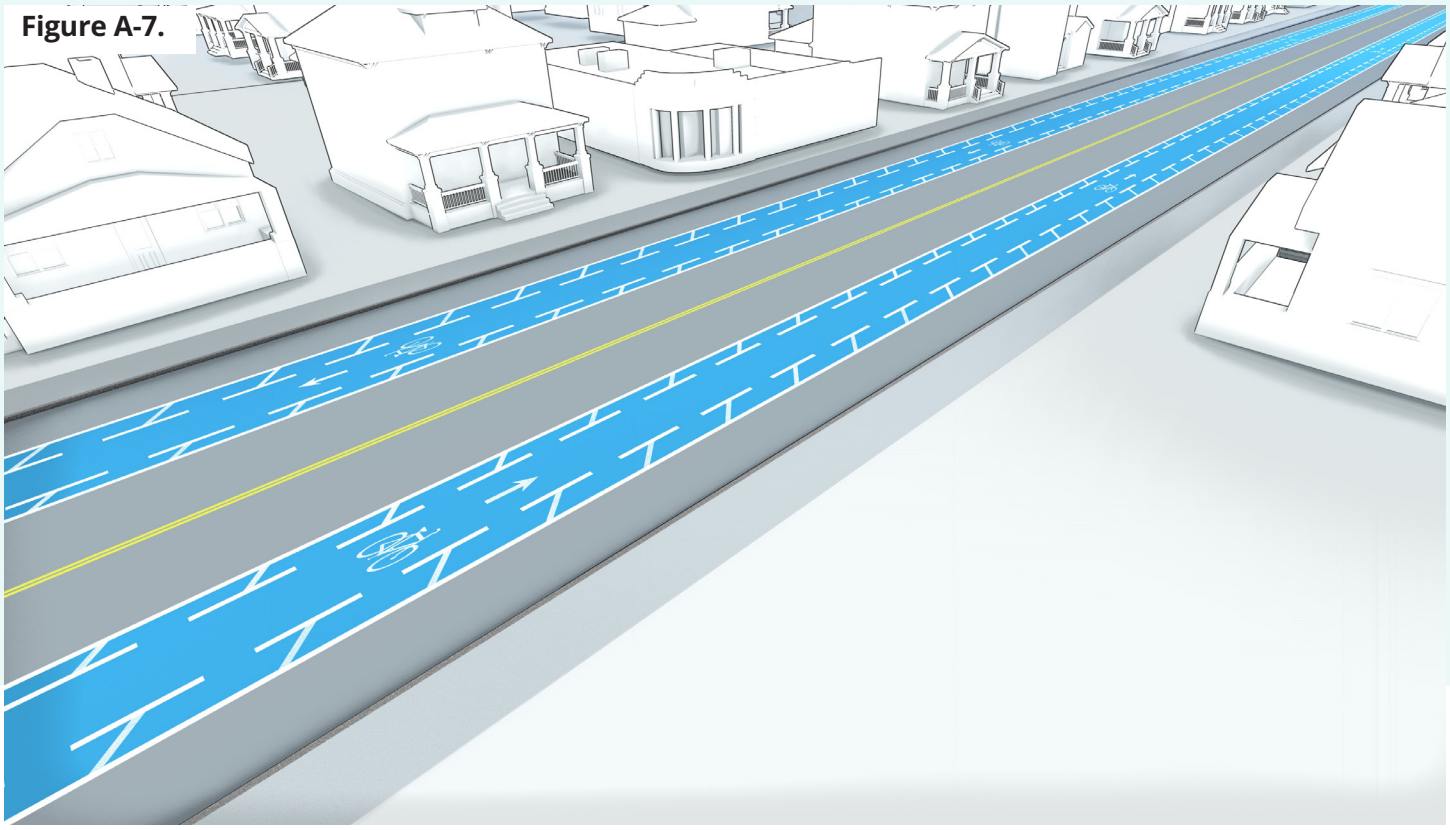
- Overly wide bike lanes and buffer space may attract unintended motor vehicle use for driving or parking
- Where drivers are observed parking or driving in a bike lane, protected bike lanes should be considered

LOCATION GUIDANCE

FUNCTIONAL CLASS	Local or Collector
VOLUMES	Less than or equal to 6,500 vehicles per day
SPEED LIMIT	Less than or equal to 35 miles per hour
CURB TO CURB WIDTH	Minimum 34 feet
NUMBER OF LANES	Less than or equal to 4
EMERGENCY ROUTE	Yes
TRANSIT ROUTE	Yes
TYPE	Segment
STREET CONTEXT	Any

BUFFERED BIKE LANE

Figure A-7.



COMPLEMENTARY FEATURES

Buffered bike lanes may be combined with additional features to increase their effectiveness, including:

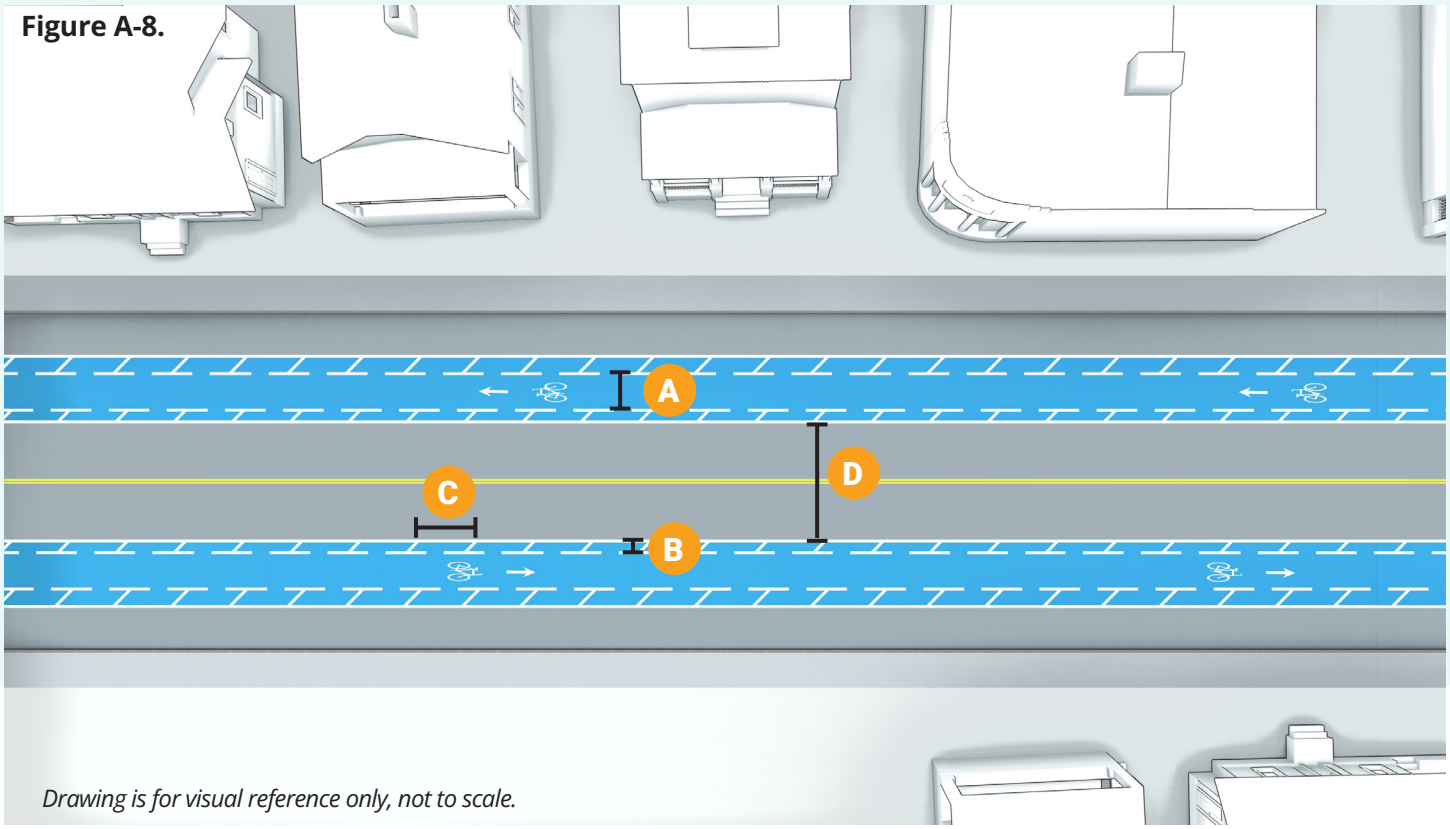
- Intersection treatments along the bike route such as protected intersections, protected roundabouts, dedicated intersections, bend outs, hardened centerlines, bike boxes, and two-stage left-turn queue boxes can help improve crossing comfort
- Slow-turn wedges, tight turn radii, or raised crossings at side streets and high-volume driveways, along with conflict markings to highlight the presence of people biking
- Yield markings and/or raised crossings may be installed where people walking are anticipated to cross the bikeway to further indicate priority users

APPLICATION GUIDANCE

- Buffered bike lanes are preferred on streets with higher volumes and speeds where conventional bike lanes may not provide adequate comfort and safety for people biking
- The curb should be painted red where parking is not allowed; no parking signs may be used to discourage parking in the bike lane
- Conflict striping at intersections and driveways may be considered to improve visibility for all users
- Detectable warning surfaces should be used to clearly define where people walking will cross the bikeway
- The minimum buffer is 2 feet and 3 feet when on-street parking is present

BUFFERED BIKE LANE

Figure A-8.



Drawing is for visual reference only, not to scale.

RECOMMENDED DESIGN CRITERIA

Refer to the most recent Street Design Manual, California Manual on Uniform Traffic Control Devices, and Additional Resources for signage and/or additional design criteria.

- **A** 5 foot minimum
- **B** 2 foot minimum (3 foot preferred) between driving lane and bike lane
  3 foot minimum if placed between bike lane and on street parking
  (note: buffer may be painted on both sides of bike lane where space permits only on one side where space is constrained)
- **C** Inside line for buffer should be dashed where parking is present
- **D** 10 foot diagonal line at 45 degrees preferred, 20 foot maximum
- **E** 20 foot minimum travel lane width, 22 foot minimum travel lane width for truck and bus routes (SD Street Design Manual)

ADDITIONAL RESOURCES

FHWA Bikeway Selection Guide
NACTO Designing for All Ages and Abilities
NACTO Urban Bikeway Design Guide
California Manual on Uniform Traffic Control Devices Chapter 9

CENTERLINE HARDENING

Elevated features, such as a curb, plastic bollards, or other delineators that are installed in the centerline of the roadway at an intersection and aims to reduce vehicle turning speeds.

Speed Reduction	2 miles per hour
Volume Reduction	N/A
Crash Reduction Factor (CRF)	46%

Source: Portland Bureau of Transportation Evaluation Report: Left Turn Calming Project, 2020

BENEFITS

- Guides drivers to make tight turns at lower speeds and limits the potential for crossing the centerline
- Does not reduce traffic capacity
- Improves vehicle reaction time to respond and yield to people walking, biking, or rolling across an intersection
- Can improve crossing comfort by providing a vertical barrier between the crosswalk and through vehicle traffic

CONSIDERATIONS

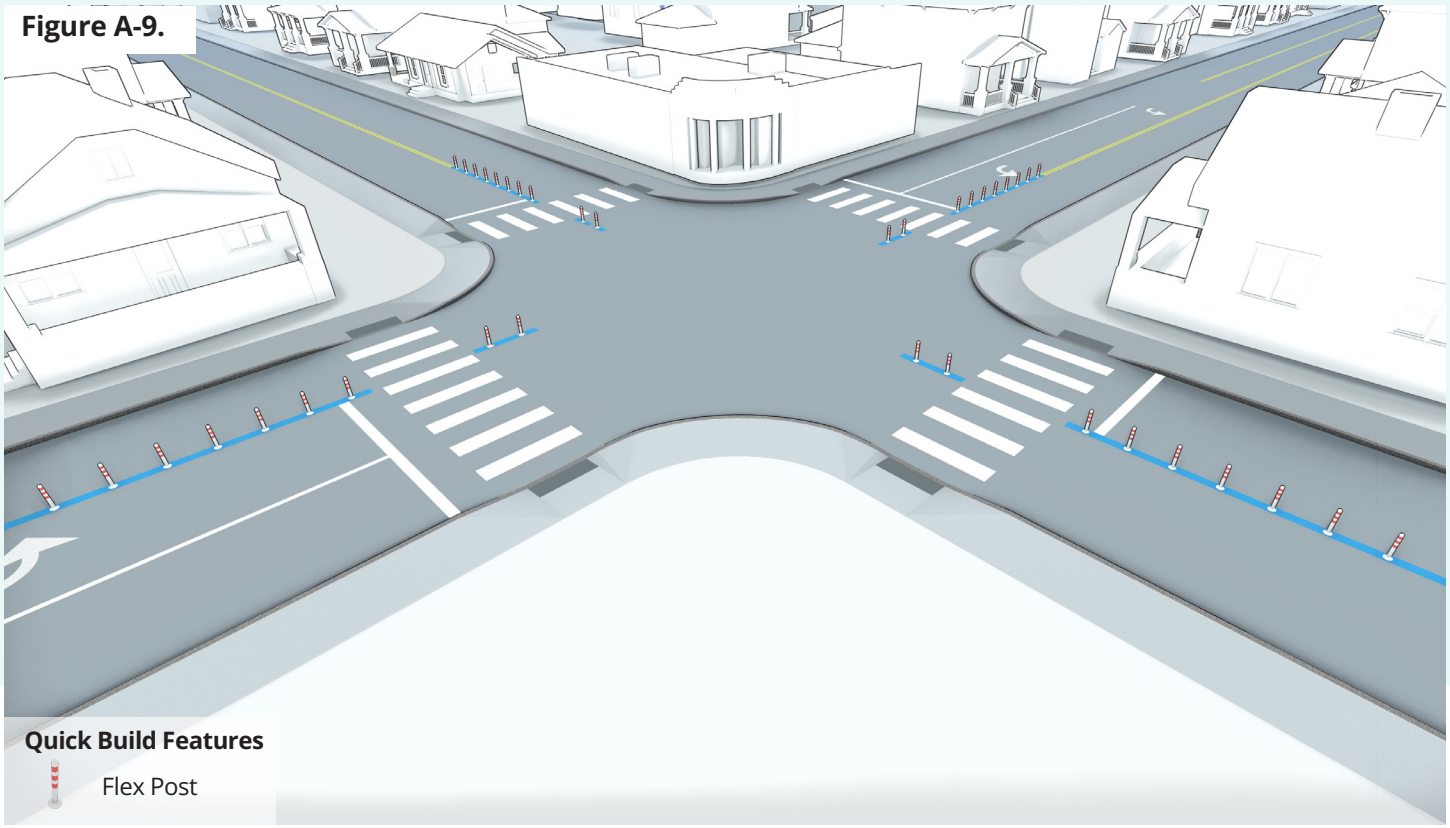
- Flexible materials can be used to accommodate larger turning radii for trucks and buses

LOCATION GUIDANCE

FUNCTIONAL CLASS	Major, Collector
VOLUMES	Any
SPEED LIMIT	Any
CURB TO CURB WIDTH	Any
NUMBER OF LANES	2+
EMERGENCY ROUTE	Yes
TRANSIT ROUTE	Yes
TYPE	Intersection
STREET CONTEXT	Commercial, Community Place

CENTERLINE HARDENING

Figure A-9.



COMPLEMENTARY FEATURES

Centerline hardening may be combined with additional features to increase their effectiveness, including:

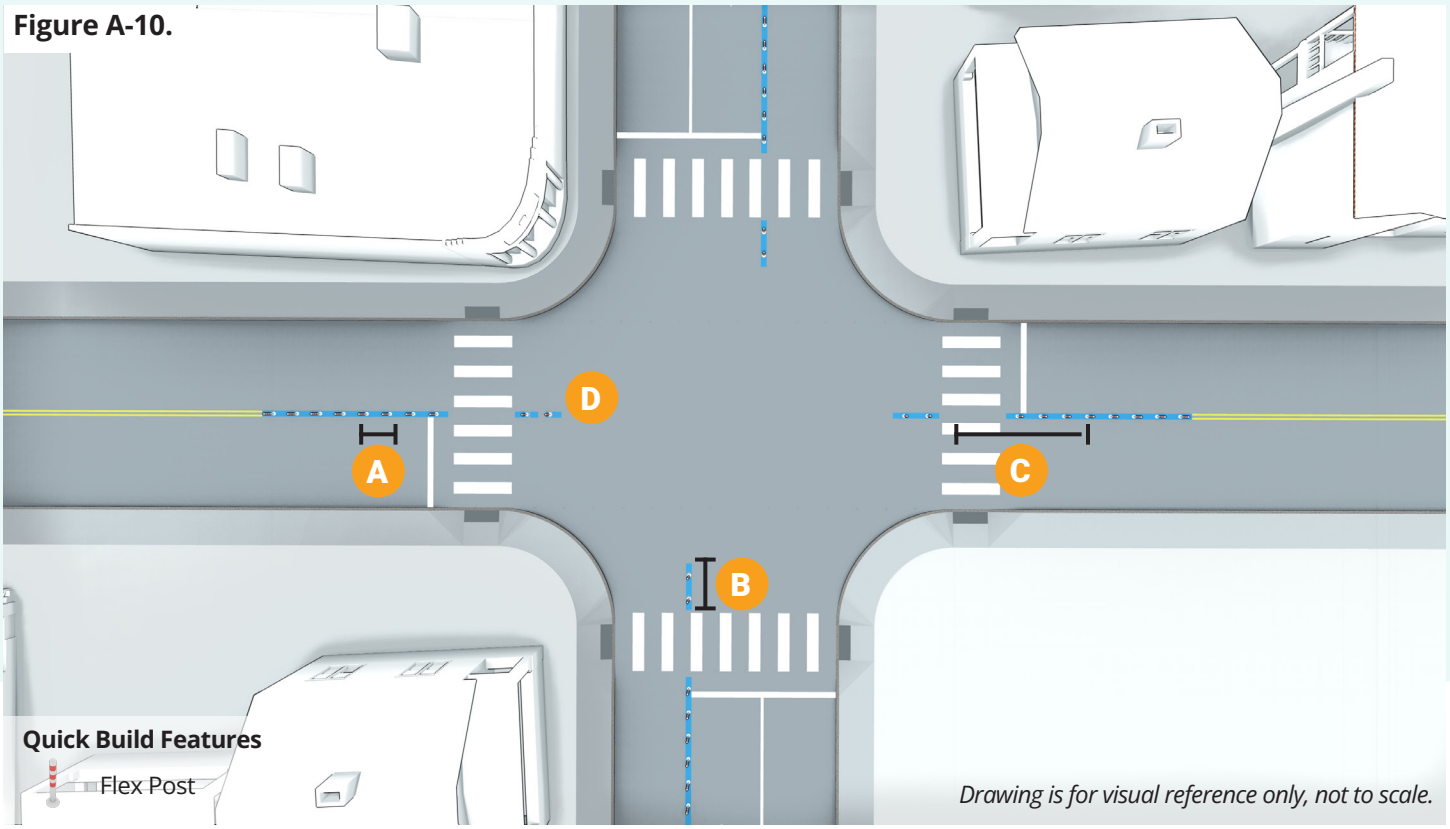
- Bend outs allow people biking to queue closer to the street crossing, improving visibility and providing yield space for right-turning drivers
- Curb extensions or slow-turn wedges extend the curb at crossings to improve visibility of people walking and reduce turning speeds
- Raised crossings elevate the bike and/or pedestrian crossing to curb level, increasing visibility and slowing vehicle traffic
- Bike boxes are designated spaces at intersections that allow people biking to queue in front of motor vehicles at red lights

APPLICATION GUIDANCE

- Often installed at intersections where a minor street intersects with a major street
- Especially useful at intersections with high volumes of pedestrians and/or where speeds of left turning vehicles are an issue
- Typically installed next to crosswalks and applied at intersections to increase driver yielding to people crossing the street
- Application may include vertical elements and may be designed to be mountable
- Treatment typically includes a raised element before the crosswalk and a separate raised element after the crosswalk, extending into the intersection

CENTERLINE HARDENING

Figure A-10.



RECOMMENDED DESIGN CRITERIA

Refer to the most recent Street Design Manual, California Manual on Uniform Traffic Control Devices, and Additional Resources for signage and/or additional design criteria.

- **A** 5-8 foot barrier spacing
- **B** 25 foot preferred, 10 foot minimum depending on design vehicle
- **C** 25 foot minimum, 100 foot typical
- **D** Plastic board may be used instead of flex post to create a mountable median nose

ADDITIONAL RESOURCES

Caltrans Pedestrian Safety Countermeasures Toolbox
NACTO Don't Give Up at the Intersection

CHICANE

Segments of offset curb, landscaping, or other form of horizontal deflection that can help reduce speeding along streets.

Speed Reduction **5 - 13 miles per hour**

Volume Reduction **20%**

IMPACTS ON CRASHES, YIELDING, AND SAFETY HAVE NOT YET BEEN MEASURED IN THE UNITED STATES

Source: Caltrans Traffic Calming Guide

BENEFITS

- Slows drivers
- Increases available public space on corridor which can be used for neighborhood amenities

CONSIDERATIONS

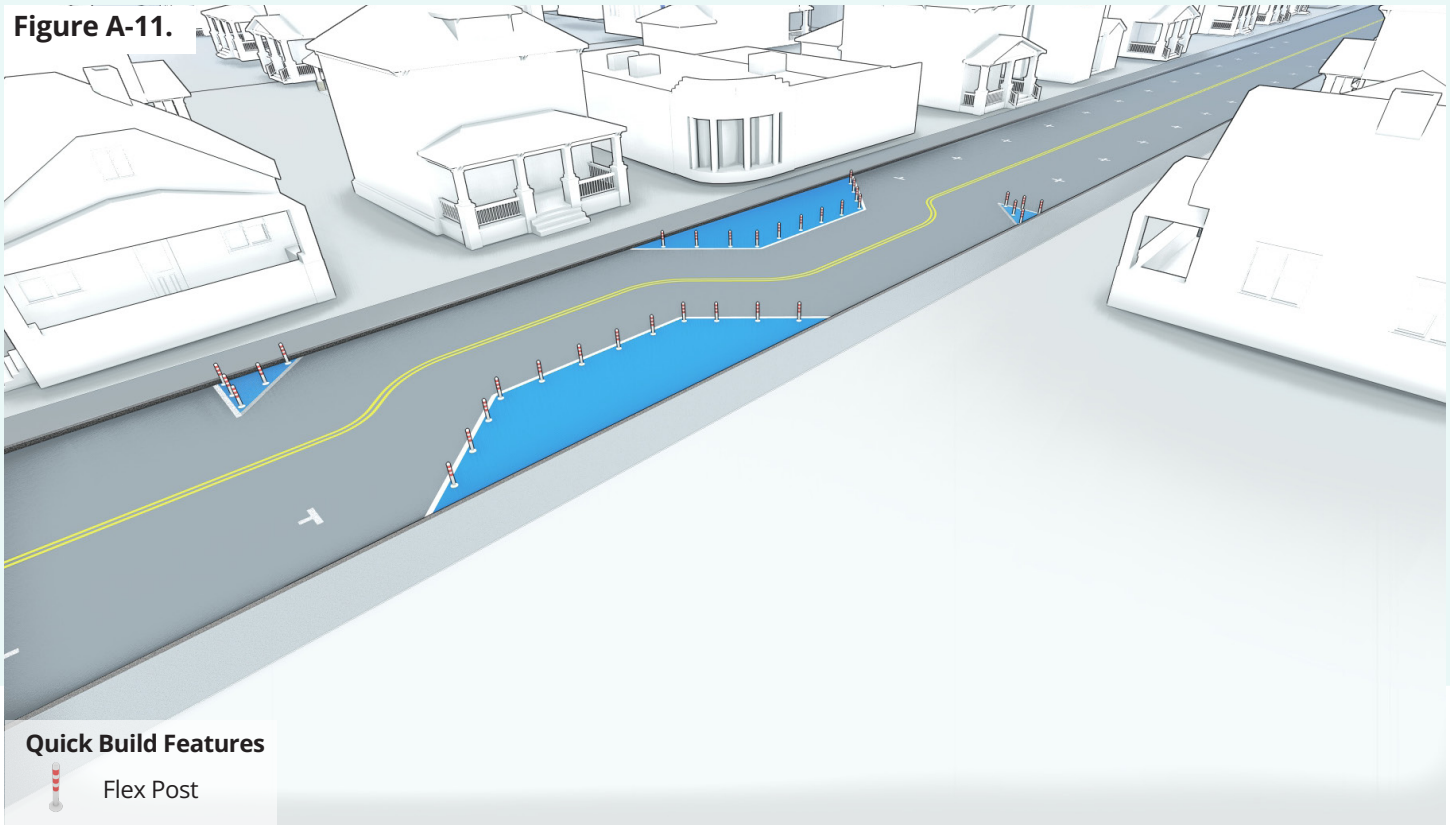
- Consider impacts to drainage, street sweeping, and trash pick-up
- Landscaping or other amenities added to the curb extensions of the chicane should not interfere with driver view

LOCATION GUIDANCE

FUNCTIONAL CLASS	Collector, Local
VOLUMES	Less than or equal to 10,000 vehicles per day
SPEED LIMIT	Less than or equal to 35 miles per hour
CURB TO CURB WIDTH	Minimum 27 feet
NUMBER OF LANES	Any
EMERGENCY ROUTE	Yes
TRANSIT ROUTE	Yes
TYPE	Mid-Block
STREET CONTEXT	Any

CHICANE

Figure A-11.



COMPLEMENTARY FEATURES

Chicanes may be combined with additional features to increase their effectiveness, including:

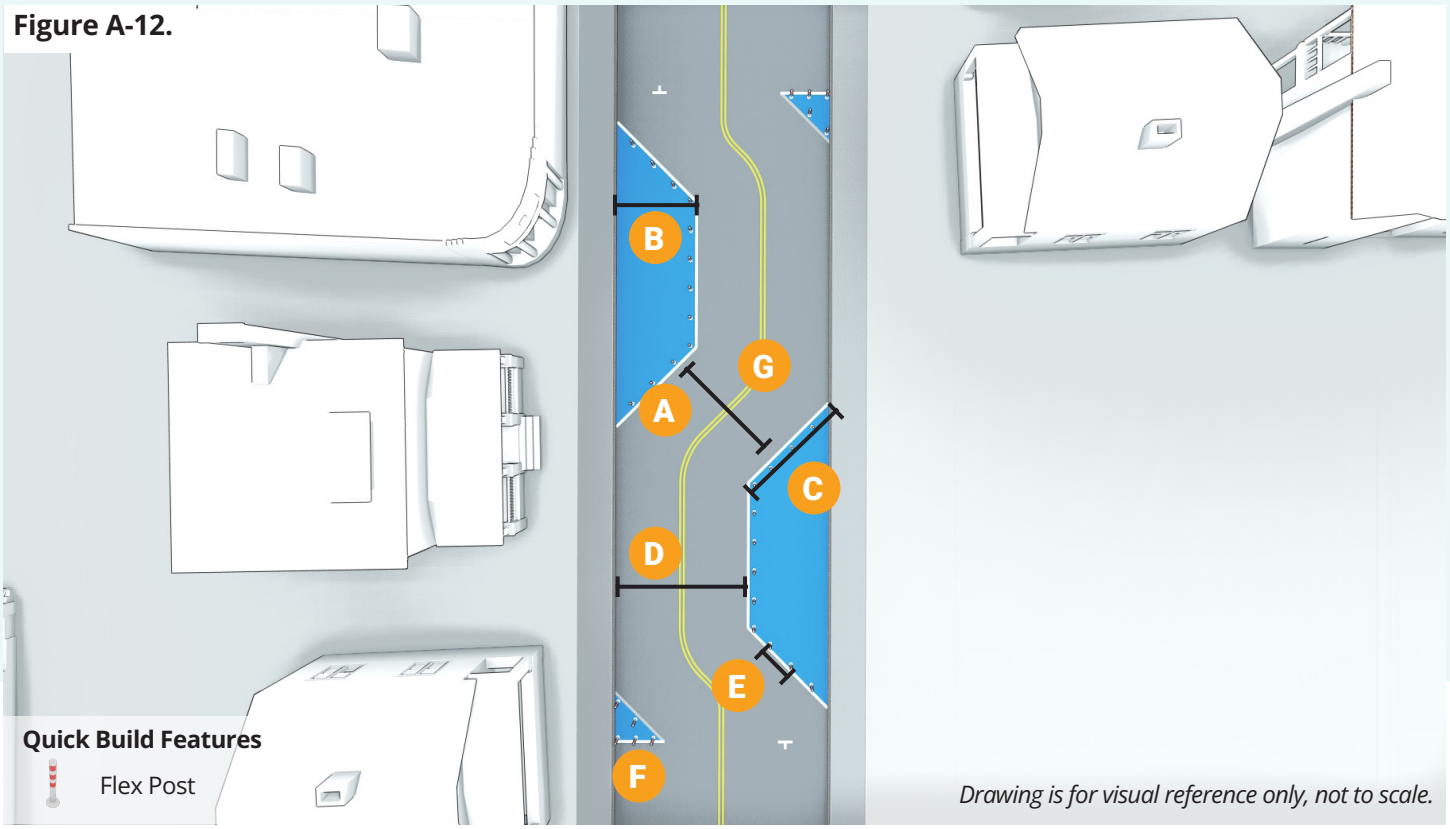
- Neighborhood amenities such as bike racks, street art, landscaping, or potted plants may be placed in curb extensions of the chicane
- For hardscape projects, green stormwater infrastructure may also be integrated
- Can be applied in conjunction with speed lumps, or tables to enhance speed reduction

APPLICATION GUIDANCE

- May be designed to allow one-way or two-way traffic to pass through
- Generally feasible for streets with on-street parking
- Additional signage and striping should be considered to alert drivers to changes in roadway conditions
- The length, width, and spacing of deflections determine effectiveness in slowing vehicles
- Mountable truck aprons can help accommodate turning movements for larger vehicles, such as delivery trucks or buses
- May be designed to allow space for public art

CHICANE

Figure A-12.



Drawing is for visual reference only, not to scale.

RECOMMENDED DESIGN CRITERIA

Refer to the most recent Street Design Manual, California Manual on Uniform Traffic Control Devices, and Additional Resources for signage and/or additional design criteria.

- **A** Maintain existing road clearance at a minimum
- **B** 4 foot minimum, 8 foot or greater typical
- **C** 45 degree angle
- **D** 20 foot minimum, 22 foot minimum for truck and bus routes (SD Street Design Manual)
- **E** 5-8 foot barrier spacing
- **F** Additional raised elements can help guide and slow drivers at the exit of the chicane
- **G** Where space allows, a third island or raised element may be placed in the median / centerline between chicanes or a speed lump may be applied; if this is done the Chicanes should be spaced further apart

ADDITIONAL RESOURCES

Caltrans Traffic Calming Guide
CA HDM Topic 404
CA HDM Index 303.4
NACTO Urban Street Design Guide: Chicane
FHWA Traffic Calming

CHOKER / PINCH POINT

Curb extension provided mid-block or at intersections to narrow the travel lanes and slow vehicle speeds. These features may be designed to allow only one vehicle through at a time on one way or two way streets.

Speed Reduction **1-4 miles per hour**

Volume Reduction **20%**

IMPACTS ON CRASHES, YIELDING, AND SAFETY HAVE NOT YET BEEN MEASURED IN THE UNITED STATES

Source: City of San Diego Traffic Calming Guidelines

BENEFITS

- Reduces vehicle speeds without diverting traffic to nearby streets
- Provides opportunity to enhance public space and/or introduce green infrastructure

CONSIDERATIONS

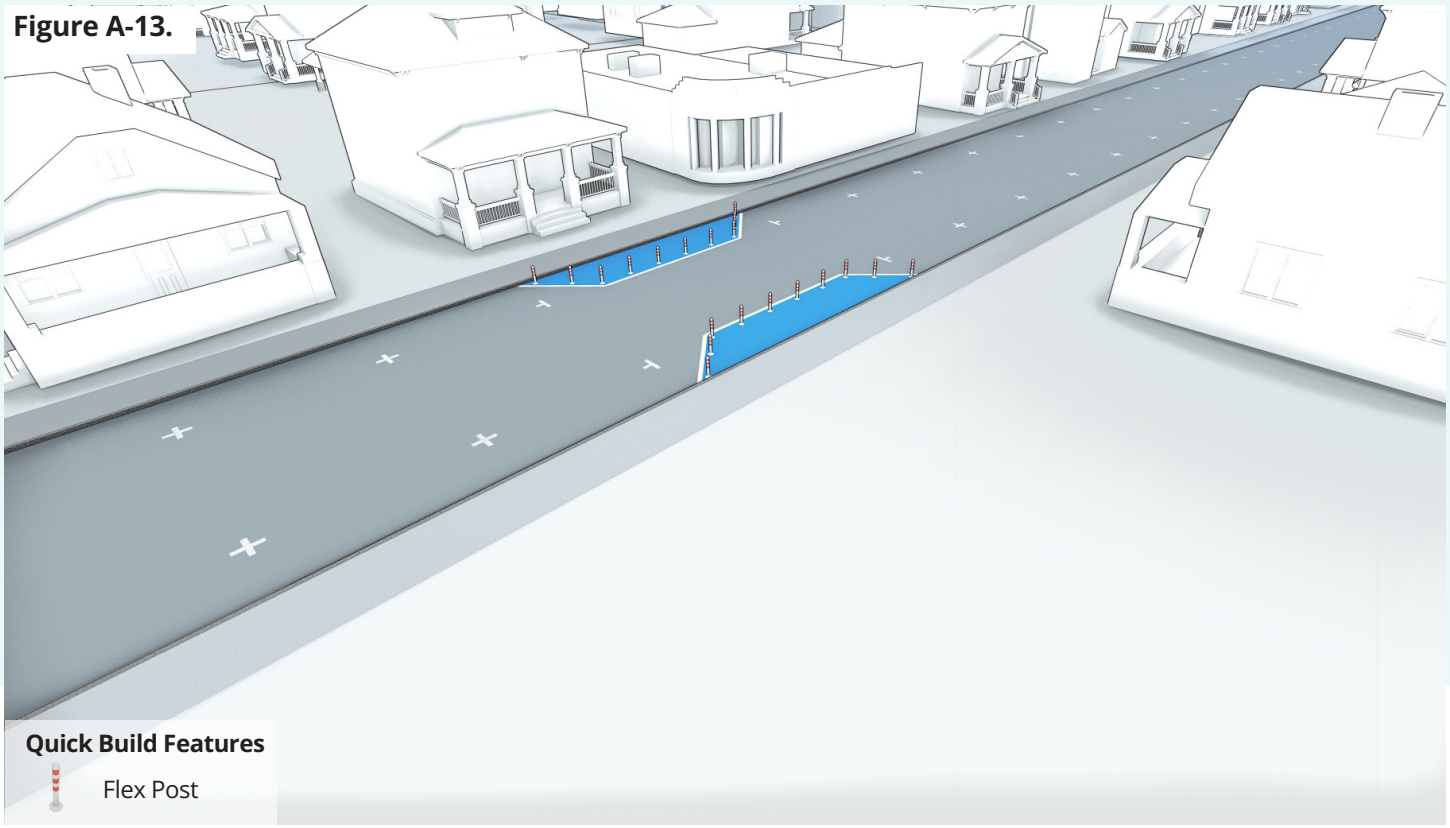
- Consider impacts to drainage and access for people biking

LOCATION GUIDANCE

FUNCTIONAL CLASS	Collector, Local
VOLUMES	Less than or equal to 10,000 vehicles per day
SPEED LIMIT	Less than or equal to 35 miles per hour
CURB TO CURB WIDTH	Minimum 27 feet
NUMBER OF LANES	Any
EMERGENCY ROUTE	Yes
TRANSIT ROUTE	No
TYPE	Mid-Block
STREET CONTEXT	Any

CHOKER / PINCH POINT

Figure A-13.



Quick Build Features

Flex Post

COMPLEMENTARY FEATURES

Pinch points may be combined with additional features to increase their effectiveness, including:

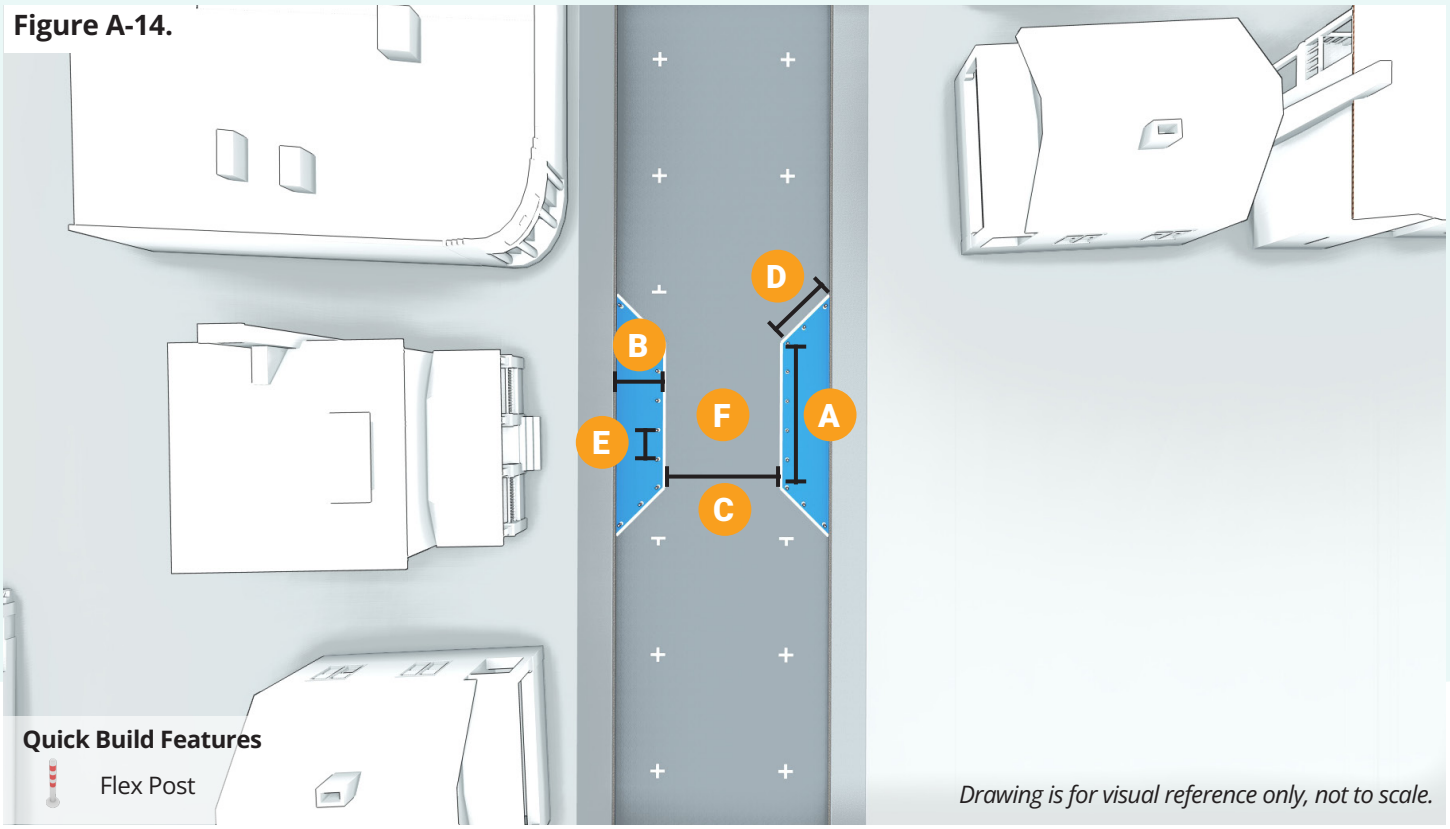
- Can be applied in conjunction with speed lumps, or tables to enhance speed reduction
- Neighborhood amenities such as bike racks, street art, landscaping, or potted plants may be placed in curb extensions at the pinch point
- For hardscape projects, green stormwater infrastructure may also be integrated
- If the pinch point is used to enhance a mid-block crossing, adding a raised crosswalk or median refuge may further improve the effectiveness of the crossing

APPLICATION GUIDANCE

- Typically installed on low volume streets
- Where bicycle volumes are high or a bike lane is present, a separate pathway should be considered to enable people biking to bypass the pinch point
- Stop or yield signage should be provided if the street is narrowed to one lane
- May be paired with mid-block crossings to reduce crossing distances for people walking
- May narrow traffic down to one lane to require yielding, but this should only be considered on local streets which are not emergency or transit routes
- Should not be placed adjacent to hydrants or Fire Department Connections where emergency apparatus are likely to stage

CHOKER / PINCH POINT

Figure A-14.



Quick Build Features

Flex Post

Drawing is for visual reference only, not to scale.

RECOMMENDED DESIGN CRITERIA

Refer to the most recent Street Design Manual, California Manual on Uniform Traffic Control Devices, and Additional Resources for signage and/or additional design criteria.

- **A** 20 foot minimum, 50 foot preferred
- **B** 4 foot minimum, 8+ foot typical
- **C** 20 foot minimum for two-way travel, 10 foot minimum for one way travel
- **D** 45 degree angle
- **E** 5-8 foot barrier spacing
- **F** A speed lump or raised crosswalk may be placed in the pinch point

ADDITIONAL RESOURCES

Caltrans Traffic Calming Guide
CA HDM Index 303.4 and 404.4
NACTO Urban Street Design Guide: Curb Extensions
FHWA Countermeasures

CURB EXTENSION

An extension of the curb that provides additional pedestrian space in the roadway beyond the existing curb and visually and physically narrows the roadway for people driving. Bend outs may be applied to curb extensions where bike lanes are present to provide protection and separation between people biking and driving.

Speed Reduction	1-3 miles per hour
Volume Reduction	N/A
Crash Reduction Factor (CRF)	30%

Source: Oregon DOT Crash Reduction Factor Manual, FHWA Traffic Calming ePrimer

BENEFITS

- Decrease overall width of road, shortening crossing distance for people walking
- Increase visibility of pedestrians at an intersection by aligning people walking with the parking lane
- Slow turning speeds by reducing curb radii
- Increase the bikeway setback in bend outs which can also provide room for turning cars to yield to people biking before making a turn

CONSIDERATIONS

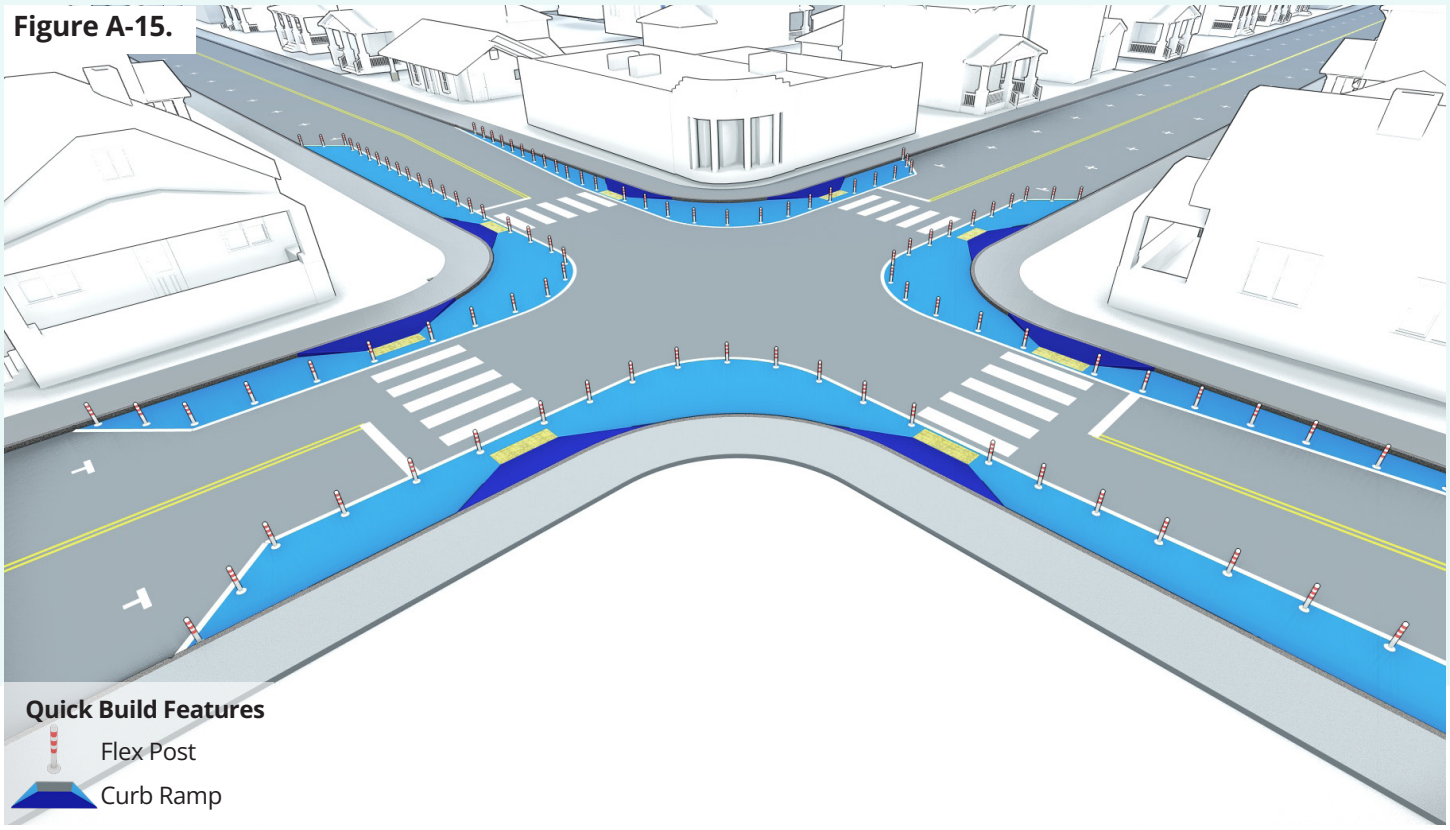
- May require relocation or reorientation of signs and utilities
- Consider impacts to drainage
- Accommodate large vehicle turns
- Opportunity to tighten wide turning radii
- Accessible crossing and curb ramp needs must be included during project design

LOCATION GUIDANCE

FUNCTIONAL CLASS	Any
VOLUMES	Any Average Daily Traffic, but may require additional consideration greater than or equal to 15,000 vehicles per day
SPEED LIMIT	Any, but may require additional consideration greater than or equal to 40 miles per hour
CURB TO CURB WIDTH	Minimum 27 feet
NUMBER OF LANES	Any
EMERGENCY ROUTE	Yes; may require additional turn radius
TRANSIT ROUTE	Yes
TYPE	Intersection
STREET CONTEXT	Any

CURB EXTENSION

Figure A-15.



COMPLEMENTARY FEATURES

Curb extensions may be combined with additional features to increase their effectiveness, including:

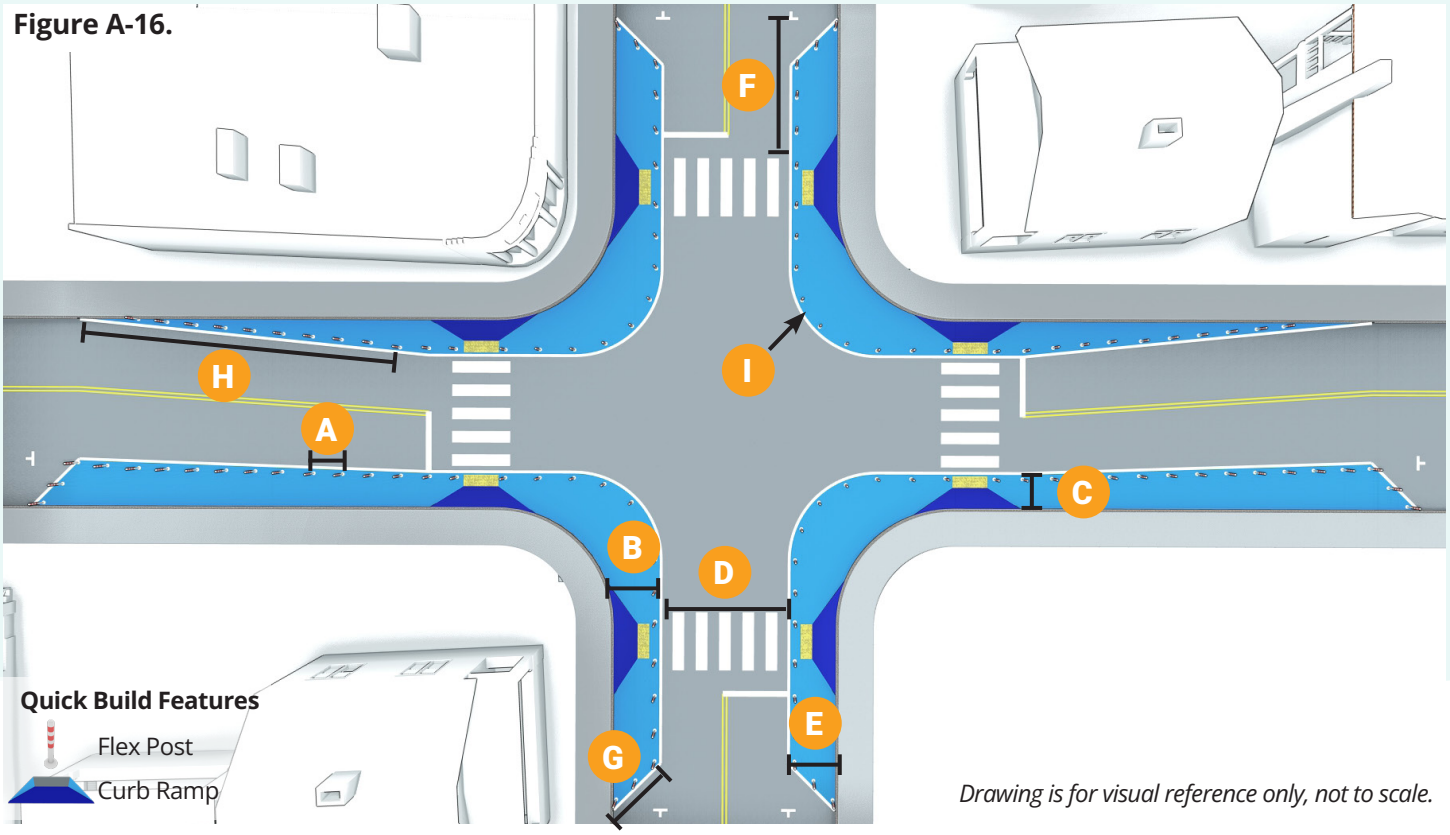
- Bend outs can facilitate bike turning movements where bike facilities are present
- Bike racks may be placed in curb extensions
- Mountable truck aprons can accommodate turning movements for larger vehicles, such as delivery trucks, buses or fire apparatus
- Street art can be incorporated through painting or installations in the curb extension
- Landscaping or potted plants can be added; for permanent projects, green stormwater infrastructure may be integrated
- Raised crosswalks can enhance the effectiveness of the curb extension
- Median refuge islands or in-street pedestrian crossing signs can slow drivers and increase the comfort of people walking

APPLICATION GUIDANCE

- Can be designed as islands with a 1-2 foot gap for drainage or may be designed using planters, bollards, or flex posts
- May include public art and can be painted
- When applied at an intersection to reduce curb radii, should be designed to induce a turning speed of 15 miles per hour or less
- Can be used as bus bulbs/boarding islands to enable in-lane transit loading
- When applied midblock, curb extensions may be used to create pinch points or chicanes
- Can be used to produce a "gateway" effect at the entrance to neighborhoods
- Where applicable, bend outs allow bicycle lane access through curb extension and use elements to help reduce conflicts between people walking, biking, and rolling

CURB EXTENSION

Figure A-16.



Drawing is for visual reference only, not to scale.

RECOMMENDED DESIGN CRITERIA

Refer to the most recent Street Design Manual, California Manual on Uniform Traffic Control Devices, and Additional Resources for signage and/or additional design criteria.

- **A** 5-8 foot barrier spacing
- **B** Ramp length (minimum)
- **C** 1/2 parking width where on street parking exists on one side of the street (typical)
- **D** 20 foot minimum, 22 foot minimum for truck and bus routes (SD Street Design Manual)
- **E** Parking width (typical)
- **F** 15 foot minimum
- **G** 45 Degree Angle
- **H** Taper per equations:
  - 40 miles per hour or less: L = WS2 / 60
  - 45 miles per hour or more: L = WS

  L = taper length in feet

  W = width of offset in feet

  S = posted speed limit, or off-peak 85th-percentile speed prior to work starting, or the anticipated operating speed in miles per hour
- **I** Curb radius varies per street type (If traffic calming 10-15 feet in urban areas) (SD Street Design Manual)

ADDITIONAL RESOURCES

Caltrans Traffic Calming Guide
CA HDM Index 303.4 and 404.4
NACTO Urban Street Design Guide: Curb Extensions
FHWA Proven Safety Countermeasures

DIAGONAL DIVERTER

Vehicle traffic is channelized to take either a right or left turn but people walking, biking, and rolling can proceed through.

Speed Reduction	1 mile per hour
Volume Reduction	35%
IMPACTS ON CRASHES, HAVE NOT YET BEEN MEASURED IN THE UNITED STATES	

Source: Caltrans Traffic Calming Guide

BENEFITS

- Prevents cut-through traffic
- Reduces vehicle volumes on neighborhood streets and thereby improves safety of people walking, biking, and rolling by reducing their exposure
- Maintains bicycle and pedestrian access
- Removes some intersection conflict points

CONSIDERATIONS

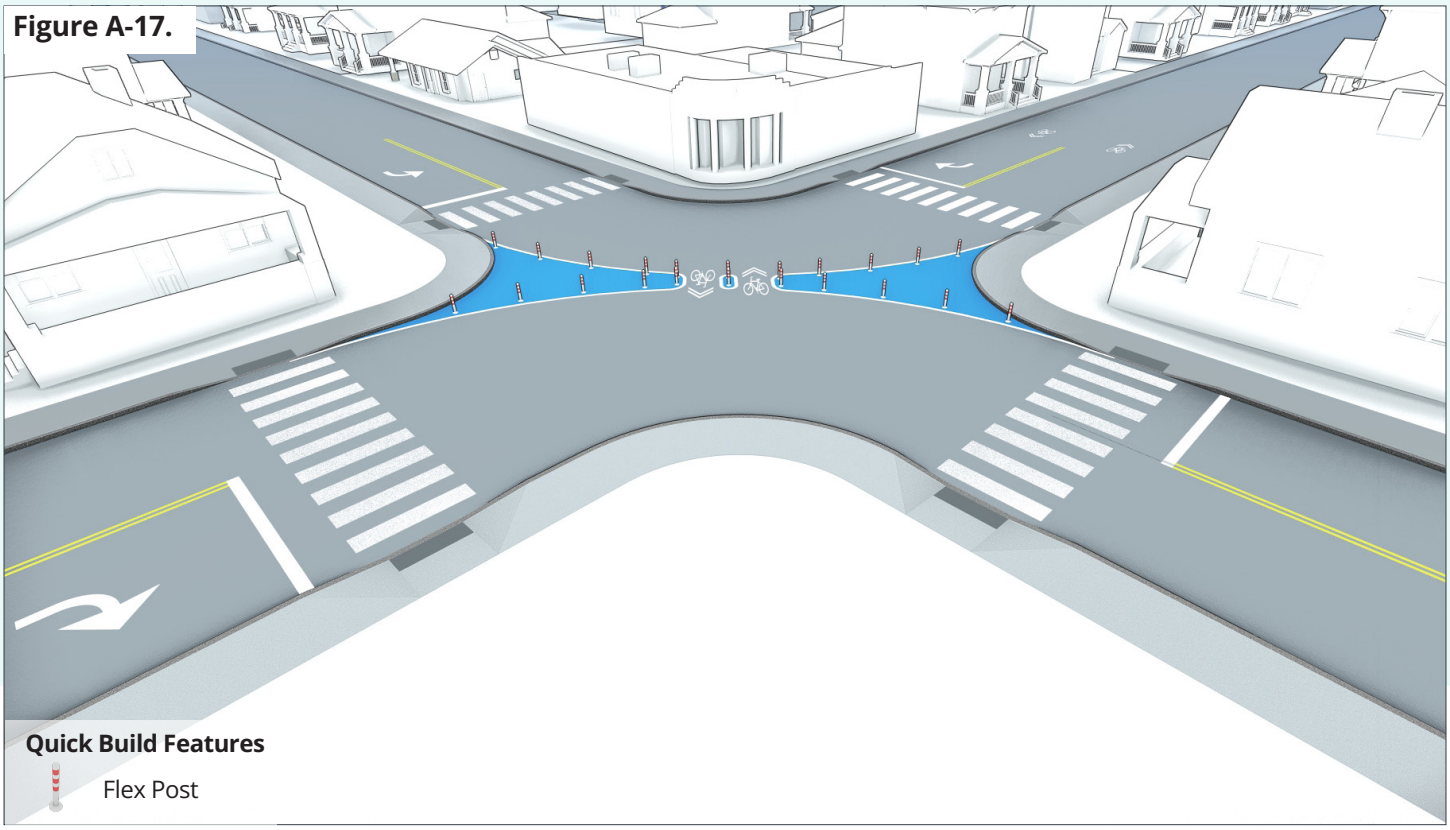
- Should consider turning radius and access for emergency vehicles, USPS, box-trucks, trash trucks, and school buses (if applicable)
- Gaps in the median can accommodate bike through-travel
- Reduces network connectivity for vehicles

LOCATION GUIDANCE

FUNCTIONAL CLASS	Local
VOLUMES	Less than or equal to 3,500 vehicles per day
SPEED LIMIT	Less than or equal to 25 miles per hour on minor / closed leg
CURB TO CURB WIDTH	No Minimum
NUMBER OF LANES	2
EMERGENCY ROUTE	No unless designed to be mountable
TRANSIT ROUTE	No
TYPE	Intersection
STREET CONTEXT	Neighborhood

DIAGONAL DIVERTER

Figure A-17.



COMPLEMENTARY FEATURES

Diagonal Diverters may be combined with additional features to increase their effectiveness, including:

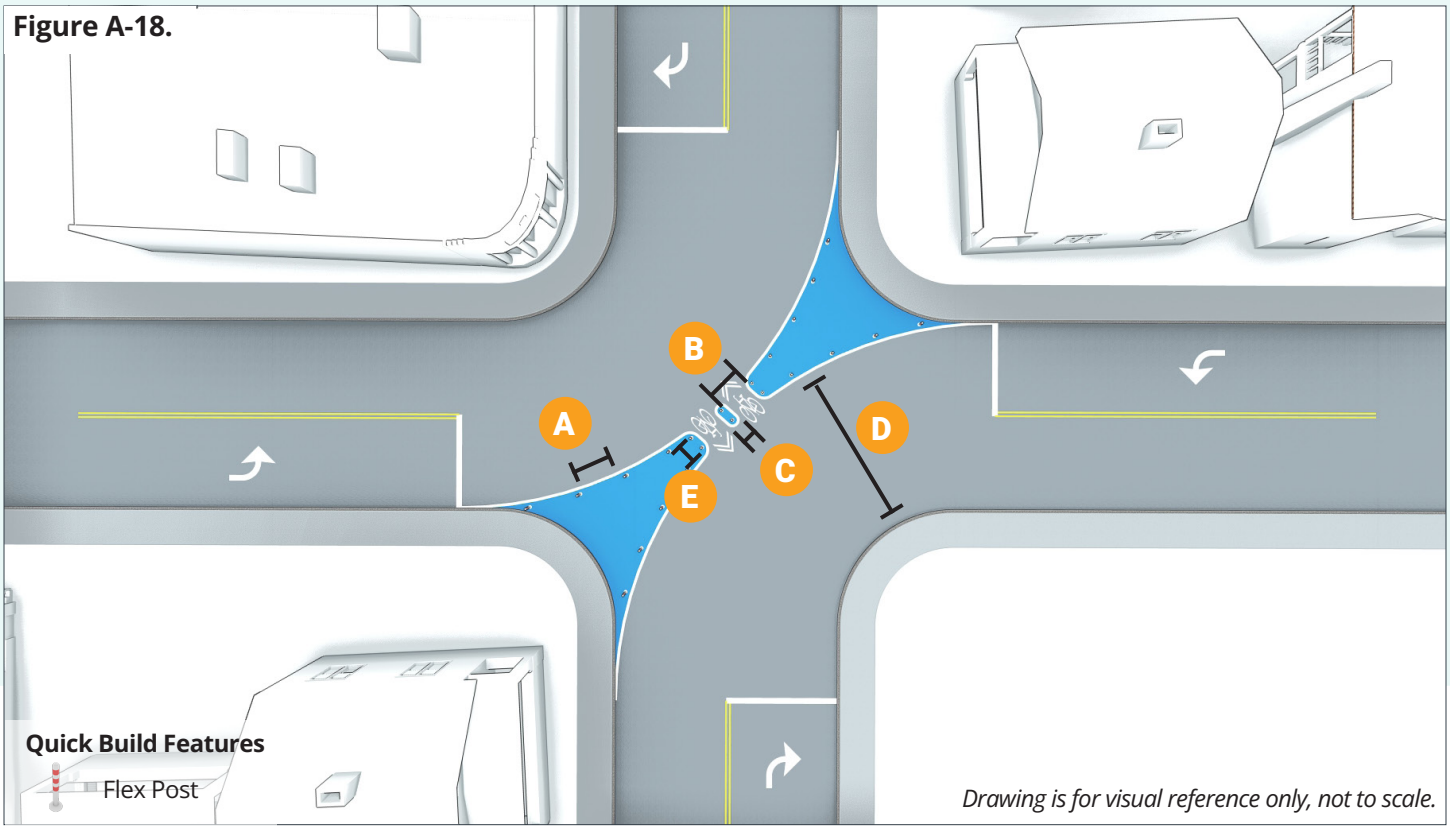
- Curb extensions or slow-turn wedges extend the curb at crossings to improve visibility of people walking and reduce turning speeds
- Raised crossings elevate the crosswalk to curb level, improving visibility of people walking and slowing vehicle traffic

APPLICATION GUIDANCE

- Typically applied at the intersection of two unsignalized local streets with low volumes
- Can be used on both one-way and two-way streets
- Appropriate signage is recommended to warn drivers of the closure
- Should provide a 6 – 10 foot refuge area for crossing bicyclists to wait for a gap in traffic (NACTO)
- Can be applied on roadway with on-street parking and/or a bicycle facility
- Should be designed to allow emergency vehicles to pass over or through

DIAGONAL DIVERTER

Figure A-18.



RECOMMENDED DESIGN CRITERIA

Refer to the most recent Street Design Manual, California Manual on Uniform Traffic Control Devices, and Additional Resources for signage and/or additional design criteria.

- **A** 3-5 foot barrier spacing, 1 foot minimum on curves
- **B** 4 foot minimum, 6 foot preferred
- **C** If vertical, 2 foot minimum; if striped, N/A
- **D** 20 foot minimum, 22 foot minimum for truck and bus routes (SD Street Design Manual)
- **E** 6 foot minimum

ADDITIONAL RESOURCES

Caltrans Traffic Calming Guide
Caltrans HDM Topic 404
FHWA Traffic Calming ePrimer
NACTO Urban Street Design Guide: Temporary Street Closures

LANE NARROWING

Narrowing lanes to 10 feet or less and reducing the total amount of space for vehicles can provide visual cues for drivers to slow down. This effect may be achieved via striping, adding vertical elements, or moving curb.

Speed Reduction	1-3 miles per hour/foot
Volume Reduction	N/A
IMPACTS ON CRASHES, HAVE NOT YET BEEN MEASURED IN THE UNITED STATES	

Source: FHWA Speed Management: A Manual for Local Rural Road Owners

BENEFITS

- Slows drivers
- Reduces crossing distances for people walking
- May provide more space for public amenities, including landscaping
- May allow reallocation of roadway space to other modes such as bikes

CONSIDERATIONS

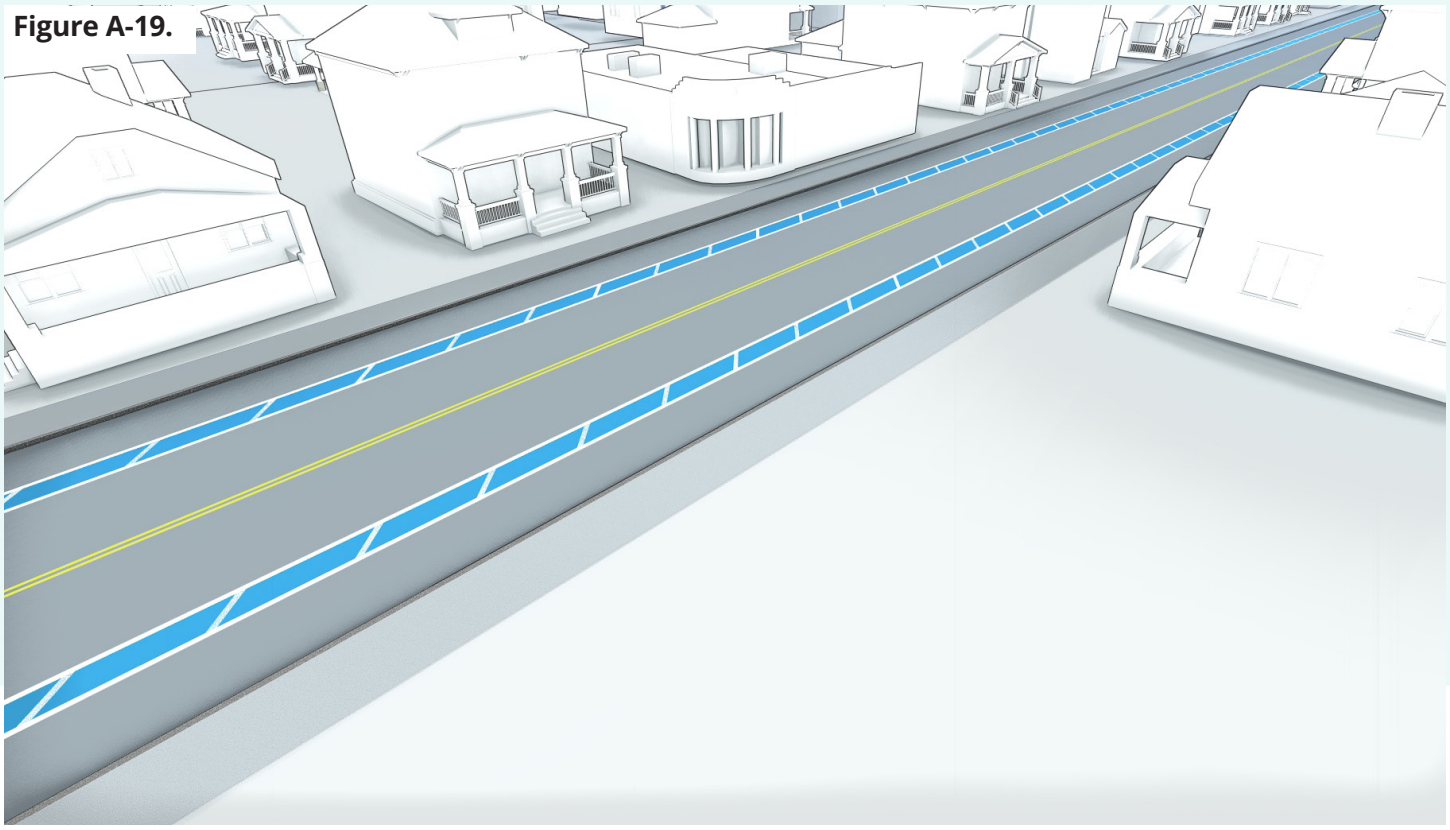
- Consider impacts to emergency vehicles, buses, transit, trash-pickup, or other large vehicles that may frequently access the street; these concerns can be mitigated if the lane narrowing is conducted using striping as opposed to vertical treatments

LOCATION GUIDANCE

FUNCTIONAL CLASS	Any
VOLUMES	Any
SPEED LIMIT	Any
CURB TO CURB WIDTH	Any
NUMBER OF LANES	Any
EMERGENCY ROUTE	Yes, but at least one 11 foot lane should be maintained in each direction
TRANSIT ROUTE	Yes, but at least one 11 foot lane should be maintained in each direction
TYPE	Segment
STREET CONTEXT	Any

LANE NARROWING

Figure A-19.



COMPLEMENTARY FEATURES

Lane narrowing may be combined with additional features to increase their effectiveness, including:

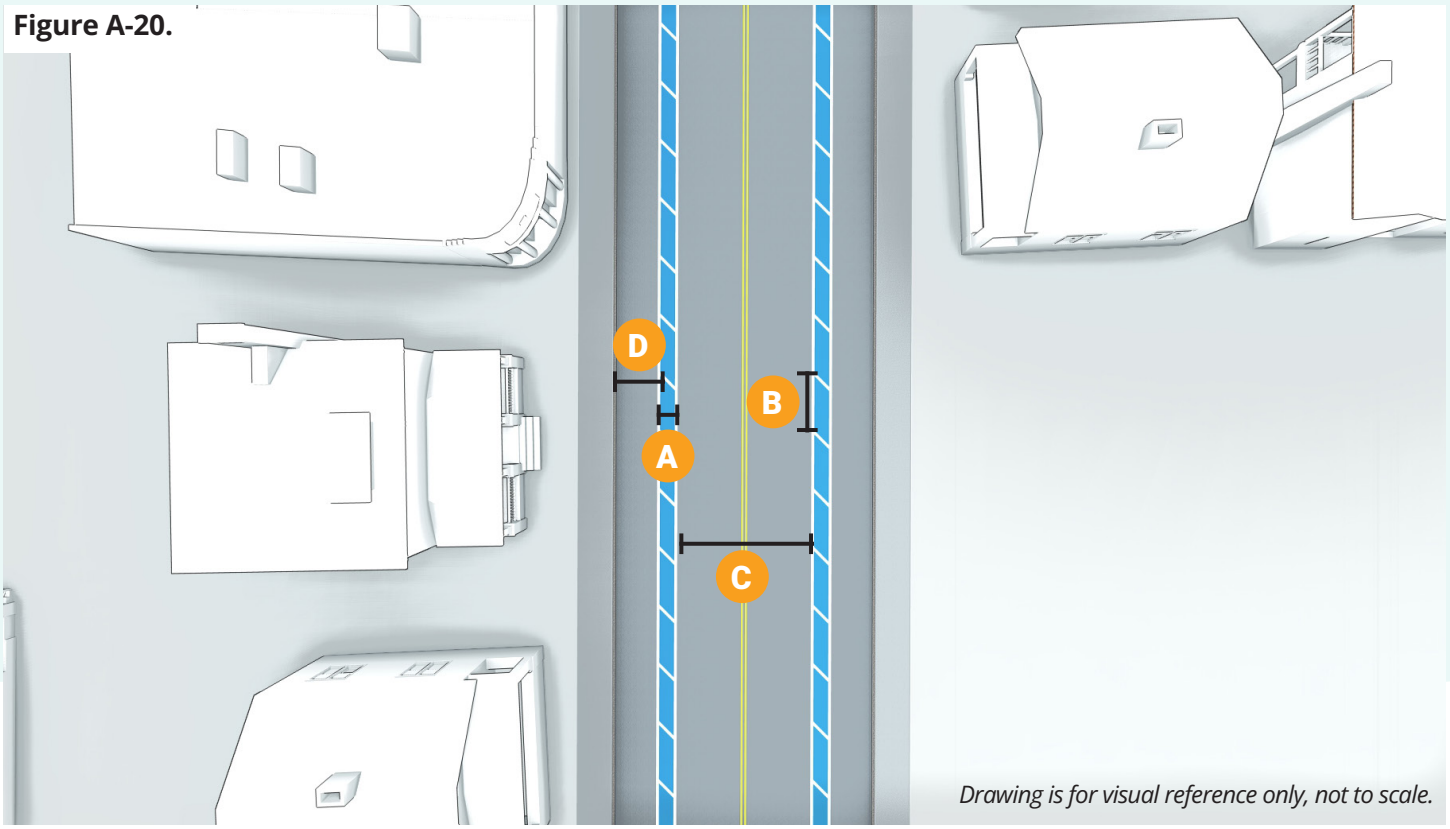
- Can be applied in conjunction with speed lumps, or tables to enhance speed reduction
- Neighborhood amenities such as bike racks, street art, landscaping, or potted plants may be placed where the roadway has been narrowed
- For hardscape projects, green stormwater infrastructure may also be integrated
- Space may be re allocated to bike lanes, buffered bike lanes, or protected bike lanes

APPLICATION GUIDANCE

- Narrowing lanes can reduce vehicle speeds while freeing up right-of-way for other modes (e.g., bike lanes, transit stops) or placemaking amenities (e.g., parklets, landscaping)
- On multi-lane roadways with large vehicles such as transit or freight, curbside lanes should be wider, while inside lanes can be narrowed

LANE NARROWING

Figure A-20.



Drawing is for visual reference only, not to scale.

RECOMMENDED DESIGN CRITERIA

Refer to the most recent Street Design Manual, California Manual on Uniform Traffic Control Devices, and Additional Resources for signage and/or additional design criteria.

- **A** 2 foot minimum
- **B** 10 foot diagonal line at 45 degrees preferred, 20 foot maximum
- **C** 20 foot minimum, 22 foot minimum for truck and bus routes (SD Street Design Manual)
- **D** Parking lane width City standard

ADDITIONAL RESOURCES

Caltrans DIB 94
Caltrans Traffic Calming Guide
FHWA Traffic Calming e-Primer
NACTO Lane Widths

MEDIAN REFUGE

Protected spaces to facilitate bicycle and pedestrian crossings on streets with two or more lanes, allowing users to cross one direction of travel at a time.

Speed Reduction	1-5 miles per hour
Volume Reduction	N/A
Crash Reduction Factor (CRF)	56%

Source: FHWA Traffic Calming ePrimer, FHWA Guide to Improving Pedestrian Safety

BENEFITS

- May slow traffic by creating a pinch point
- Improves visibility of people walking, biking, and rolling
- Reduces the overall crossing length and exposure to traffic

CONSIDERATIONS

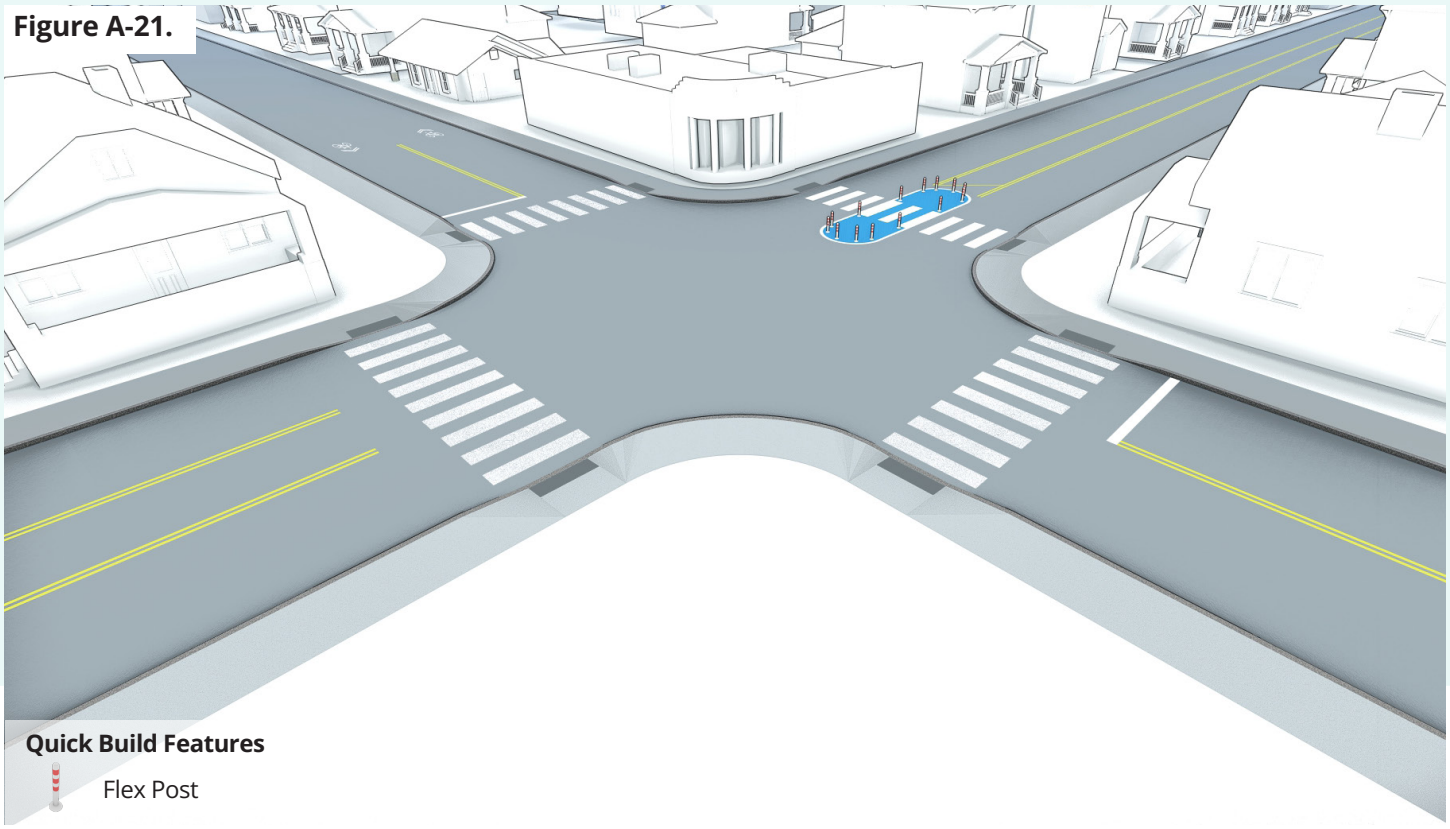
- Opportunity to include landscaping, green infrastructure, or artistic elements
- Benefits streets with high bicycle and pedestrian volumes
- Accessible crossing and curb ramp needs must be included during project design

LOCATION GUIDANCE

FUNCTIONAL CLASS	Any
VOLUMES	Any, especially greater than or equal to 9,000 vehicles per day
SPEED LIMIT	Any, especially greater than or equal to 35 miles per hour
CURB TO CURB WIDTH	26 feet
NUMBER OF LANES	Any, especially 3+ lanes
EMERGENCY ROUTE	Yes
TRANSIT ROUTE	Yes
TYPE	Intersection or Mid Block
STREET CONTEXT	Commercial, Community Place

MEDIAN REFUGE

Figure A-21.



COMPLEMENTARY FEATURES

Median refuge islands may be combined with additional features to increase their effectiveness, including:

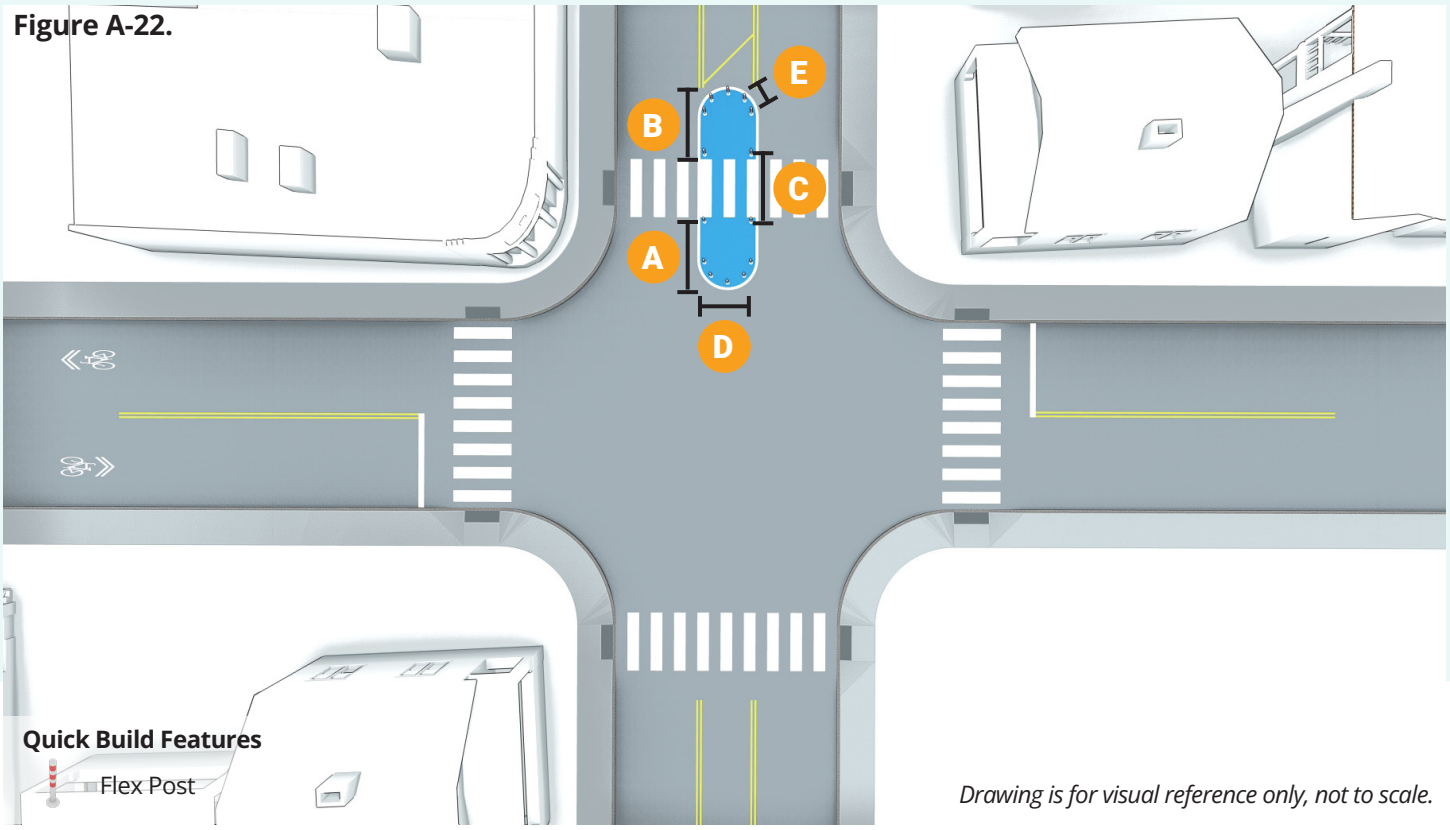
- May be designed with an angled cut-through to position people walking, biking, or rolling to face oncoming traffic; if shared with people walking, biking, and rolling the angle should transition back to perpendicular at crossing points to aid people with visual impairments
- If a median is extended beyond the crosswalk or through the intersection, separated refuge spaces may be provided for people walking, biking, and rolling within their respective paths of travel
- Rectangular Rapid Flashing Beacons (RRFBs) can help improve visibility of people walking and increase driver yield rates at unsignalized locations
- Landscaping may be added in the median but should not obstruct visibility
- Additional lighting may be added to improve visibility

APPLICATION GUIDANCE

- Median should be wide enough to meet ADA requirements (10 foot preferred, 6 foot minimum)
- Consider including signals or hybrid beacons on higher volume or multi-lane streets
- Consider on streets with higher speeds and volumes and/or wide crossing distances
- Median islands can be applied midblock or at signalized or unsignalized intersections and can double as a diverter to prevent cut-through traffic

MEDIAN REFUGE

Figure A-22.



Drawing is for visual reference only, not to scale.

RECOMMENDED DESIGN CRITERIA

Refer to the most recent Street Design Manual, California Manual on Uniform Traffic Control Devices, and Additional Resources for signage and/or additional design criteria.

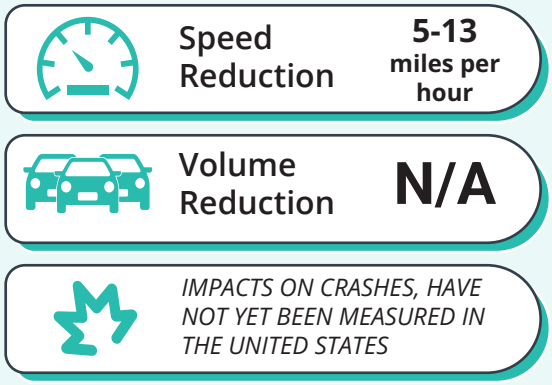
- **A** 6 foot minimum
- **B** 6 foot minimum
- **C** 10 foot typical
- **D** 6 foot minimum, 10 foot typical
- **E** 3-5 foot barrier spacing, 1 foot minimum on curves

ADDITIONAL RESOURCES

Caltrans Traffic Calming Guide
Caltrans HDM Index 405.4
Caltrans HDM Topic 904
NACTO Urban Bikeway Design Guide

NEIGHBORHOOD TRAFFIC CIRCLE

Unsignalized, circular intersections where incoming traffic yields to traffic in the intersection. Traffic circles require less space than roundabouts and may be stop controlled, but have less impact on traffic speed than a full roundabout because they do not include horizontal deflection at the entrance.



Source: FHWA Traffic Calming ePrimer

BENEFITS

- Slows drivers
- Removes conflict points
- Can improve traffic flow and reduce severity of crashes
- Provides opportunity for landscaping or placemaking
- Designed to fit within smaller footprint compared to roundabout

CONSIDERATIONS

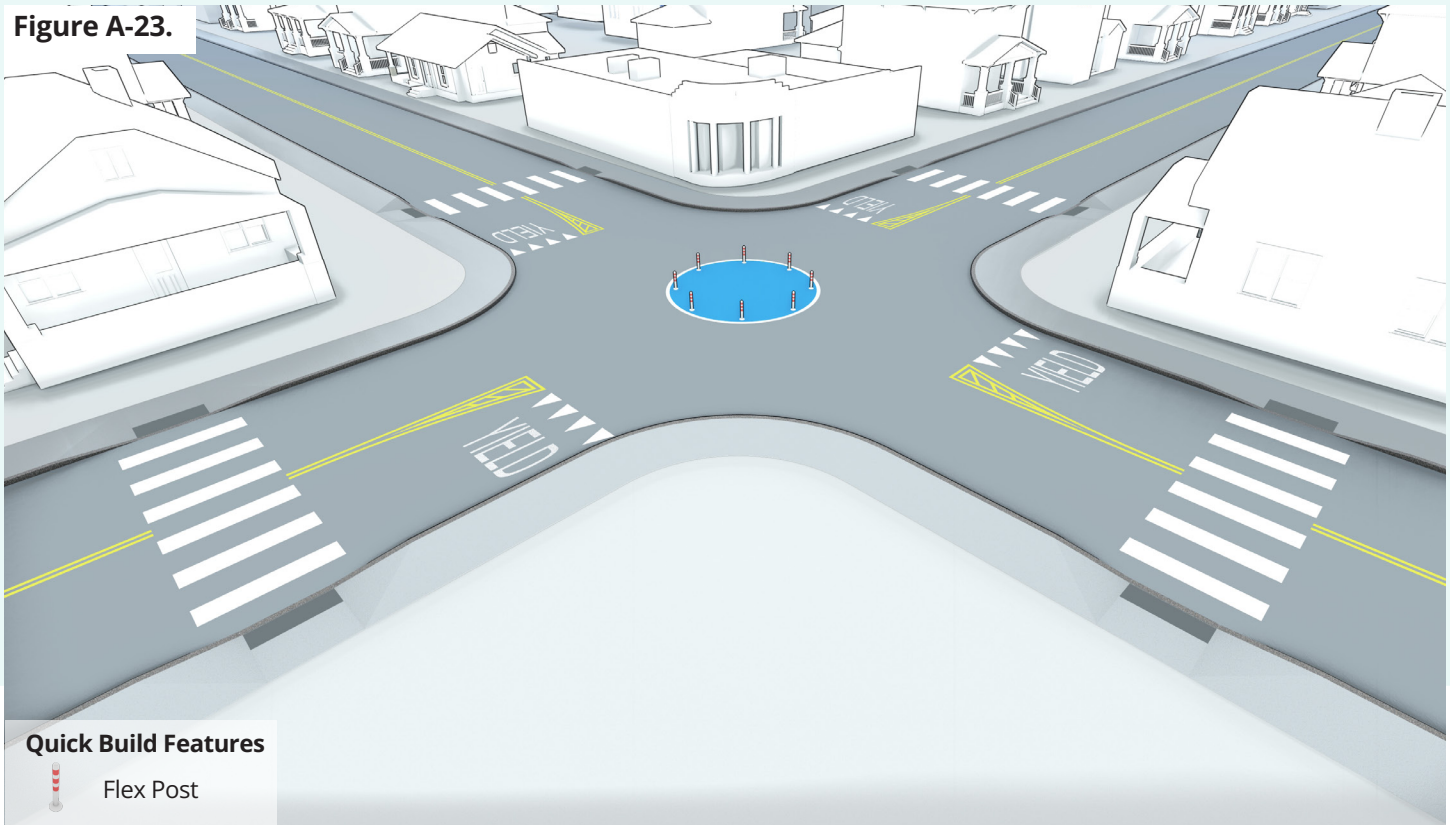
- May require additional treatments for people walking, biking, and rolling
- May require additional space for large vehicles such as transit, freight, emergency services, and trash pickup
- Consider impacts to drainage
- Does not provide large deflection and may not as effectively lower vehicle speeds when compared to roundabouts
- Consider access to large diameter and/or deep utilities that are located under the traffic circle

LOCATION GUIDANCE

FUNCTIONAL CLASS	Local
VOLUMES	Less than or equal to 3,500 vehicles per day
SPEED LIMIT	Less than or equal to 30 miles per hour
CURB TO CURB WIDTH	Any
NUMBER OF LANES	2
EMERGENCY ROUTE	Yes, if mountable
TRANSIT ROUTE	No
TYPE	Intersection
STREET CONTEXT	Neighborhood

NEIGHBORHOOD TRAFFIC CIRCLE

Figure A-23.



COMPLEMENTARY FEATURES

Curb extensions may be combined with additional features to increase their effectiveness, including:

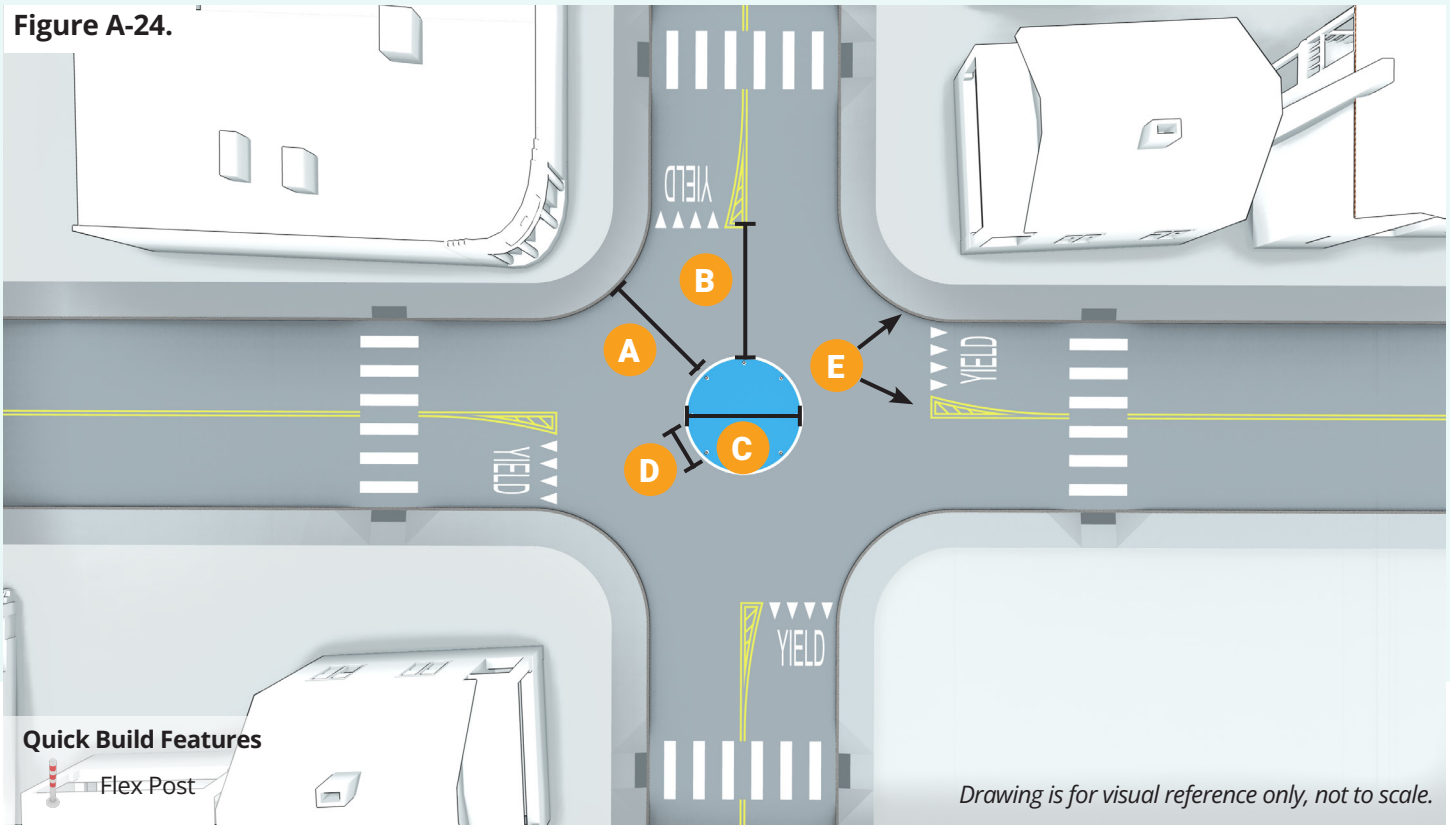
- Directional markers indicate the intended path for people biking through the intersection and improve their visibility to drivers
- Curb extensions or slow-turn wedges extend the curb at crossings to improve visibility of people walking and reduce turning speeds
- Raised crossings elevate the pedestrian crossing to curb level, increasing visibility and slowing vehicle traffic
- Median refuge islands provide protected spaces in the median, allowing people walking to cross one direction of traffic at a time

APPLICATION GUIDANCE

- Typically do not have channelized (splitter) islands
- Typically applied on lower speed, 2 lane local roadways at intersections with 3 to 4 legs
- May have yield or stop signs at approaches
- Can be implemented using raised islands or other relatively inexpensive materials
- Landscaping or other materials used in center of treatment should be maintained or designed to not hinder visibility
- May be designed to be mountable to provide access for trucks or other large vehicles

NEIGHBORHOOD TRAFFIC CIRCLE

Figure A-24.



RECOMMENDED DESIGN CRITERIA

Refer to the most recent Street Design Manual, California Manual on Uniform Traffic Control Devices, and Additional Resources for signage and/or additional design criteria.

- **A** 14 foot minimum
- **B** 10 foot minimum; this should include any unmarked crosswalk or assumed path of pedestrian travel
- **C** 10 foot minimum
- **D** 2-5 foot barrier spacing
- **E** Consider entry islands or curb extensions if center circle does not provide significant deflection, especially where on-street parking is present

ADDITIONAL RESOURCES

Caltrans Traffic Calming Guide
CA HDM Chapter 400
California Manual on Uniform Traffic Control Devices
FHWA Traffic Calming ePrimer
NACTO Urban Street Design Guide: Mini-roundabout

PROTECTED / DEDICATED INTERSECTION

Physical separation at intersections between people walking, biking, or rolling, and vehicles using concrete, landscaping, and /or vertical delineators using corner islands to tighten vehicular turning radii and provide space for bike circulation and queuing set back from traffic. Dedicated intersections are a variation of protected intersections which use smaller wedges or islands to provide space for people biking which may be used in constrained spaces.



NO IMPACT ON SPEED OR VOLUME



IMPACTS ON CRASHES, YIELDING, AND SAFETY HAVE NOT YET BEEN MEASURED IN THE UNITED STATES

BENEFITS

- Slows vehicle turning speeds
- Places people walking, biking, and rolling ahead of drivers improving visibility for all and reducing right turn conflicts for all users
- Shortens crossing distances for people walking, biking, and rolling
- Provides space for turning vehicles to yield to people walking, biking, and rolling

CONSIDERATIONS

- In areas with limited space, a dedicated intersection may be considered, following the same principles but using smaller channelizing islands with flex posts, plastic boards, and/or low profile separators
- Accessible crossing and curb ramp needs must be included during project design

LOCATION GUIDANCE

FUNCTIONAL CLASS	Any
VOLUMES	Any, but more critical as volumes increase
SPEED LIMIT	Any
CURB TO CURB WIDTH	Minimum 36 feet
NUMBER OF LANES	Any
EMERGENCY ROUTE	Yes
TRANSIT ROUTE	Yes
TYPE	Intersection
STREET CONTEXT	Any

PROTECTED / DEDICATED INTERSECTION

Figure A-25.



COMPLEMENTARY FEATURES

Protected intersections may be combined with additional features to increase their effectiveness, including:

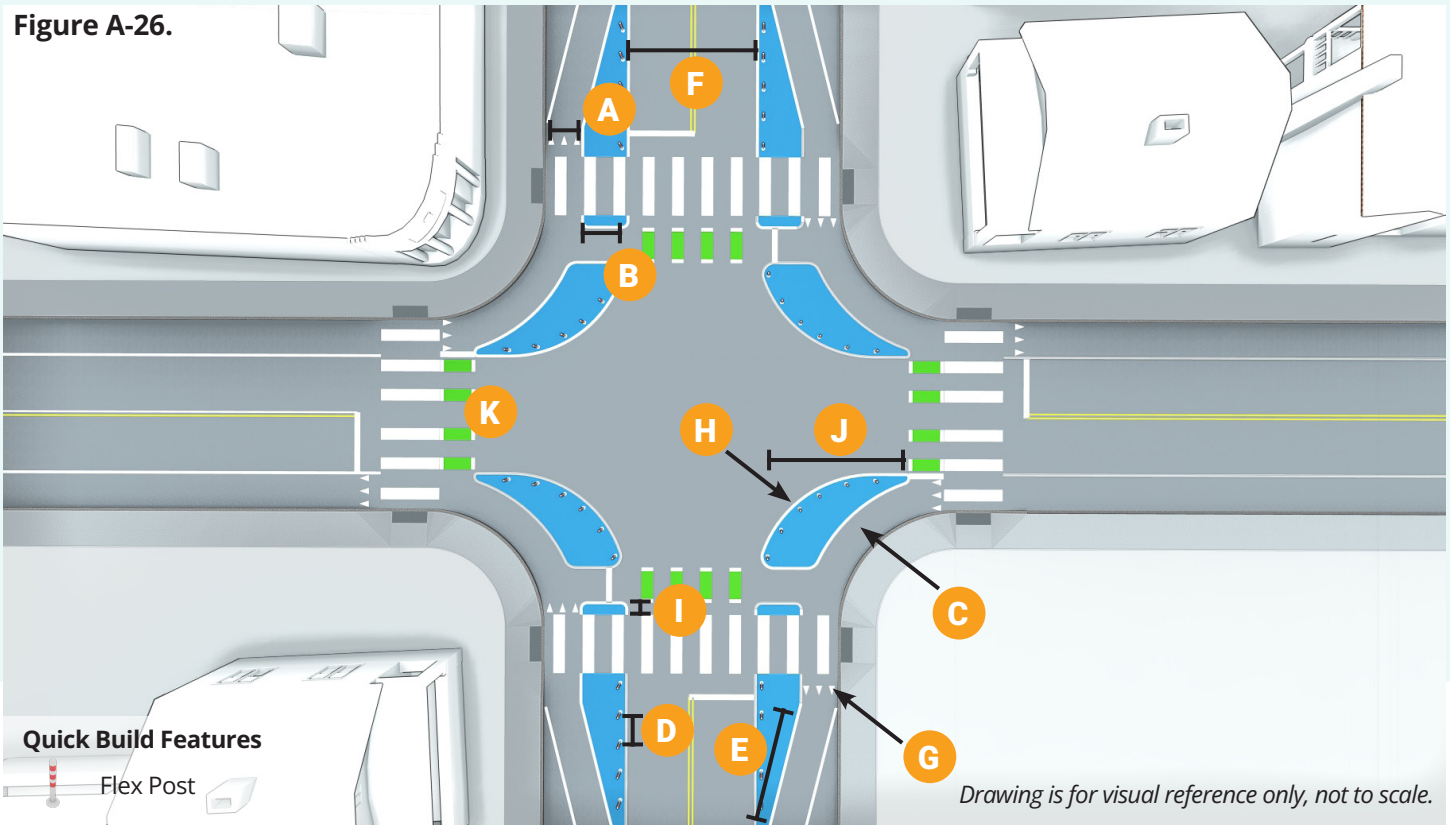
- Street art can be incorporated through painting or installations in locations where the curb is extended
- Landscaping or potted plants can be added; for permanent projects, green stormwater infrastructure may be integrated
- Raised crossings can further enhance the effectiveness of the protected intersection
- Median refuge islands can help provide additional protection through the crossing
- No Right Turn on Red removes conflicts between right turning vehicles and people crossing the street

APPLICATION GUIDANCE

- Stop bar and crossing location should provide space for vehicles to yield (6–16 feet); NA for dedicated intersections
- Can be built at street level or sidewalk level
- May require additional signal heads and timing for cyclist control, but can also direct people biking to use pedestrian crossing signals
- If built at sidewalk height, consider including a buffer to separate the bikeway from the sidewalk
- Conflict striping at intersections and driveways may be considered to improve visibility for all users
- Median refuge islands should be considered for wider crossings (4+ lanes)
- Dedicated intersections should be combined with hardened centerlines

PROTECTED / DEDICATED INTERSECTION

Figure A-26.



RECOMMENDED DESIGN CRITERIA

Refer to the most recent Street Design Manual, California Manual on Uniform Traffic Control Devices, and Additional Resources for signage and/or additional design criteria.

- **A** 4 foot minimum (no gutter), 5 foot minimum (with gutter), 6 foot or match approaching bike lane width preferred
- **B** 6 foot minimum for protected intersection; NA for dedicated intersection
- **C** Bike lane should be placed as close to the curb as possible; may be reduced to accommodate quick build curb ramp if needed
- **D** 3-5 foot barrier spacing, 1 foot minimum on curves
- **E** 3:1 max taper; 5:1 preferred taper
- **F** 20 foot minimum, 22 foot minimum for truck and bus routes (SD Street Design Manual)
- **G** Sharks teeth yield lines indicate for people biking to yield to people walking in the crosswalk
- **H** 10-15 foot turning radii preferred
- **I** 2 foot minimum splitter island between walkway and bikeway where feasible
- **J** 6 foot minimum setback for fully protected intersection, 16 foot preferred; N/A for dedicated intersection
- **K** Pair with cross-bike markings to support wayfinding and visibility
- ***** Pair with No Right Turn on Red and bike signals where possible

ADDITIONAL RESOURCES

Caltrans DIB 89-02
FHWA Bikeway Selection Guide
NACTO Designing for All Ages and Abilities
NACTO Urban Bikeway Design Guide
FHWA Separated Bike Lane Planning and Design Guide
California Manual on Uniform Traffic Control Devices Chapter 9

RAISED CROSSWALK / SPEED TABLE

Elevated crosswalks that act as vertical deflection to slow vehicles and increase visibility of people crossing midblock or at an intersection. Raised crosswalks can be used as a gateway treatment to signify entry into a lower speed environment or can be used across side streets and driveways to provide level crossing for people on foot or bike. A speed table is designed similar to a raised crosswalk but does not include the crossing and solely slows down drivers.

Speed Reduction	7-8 miles per hour
Volume Reduction	20%
Crash Reduction Factor (CRF)	45%

Source: FHWA Proven Safety Countermeasures, Caltrans Traffic Calming Guide, FHWA Traffic Calming ePrimer

BENEFITS

- Increases visibility of people crossing
- Slows drivers
- Easier to cross for people with mobility challenges

CONSIDERATIONS

- Consider impacts to drainage and emergency vehicle access
- Meet ADA requirements for crossings
- May use special pavers / murals to create visual placemaking
- May be implemented in conjunction with other elements that increase crosswalk visibility such as striping and advanced warning signage
- Consider application near pedestrian and bicycle generators, such as parks, schools, and recreation facilities

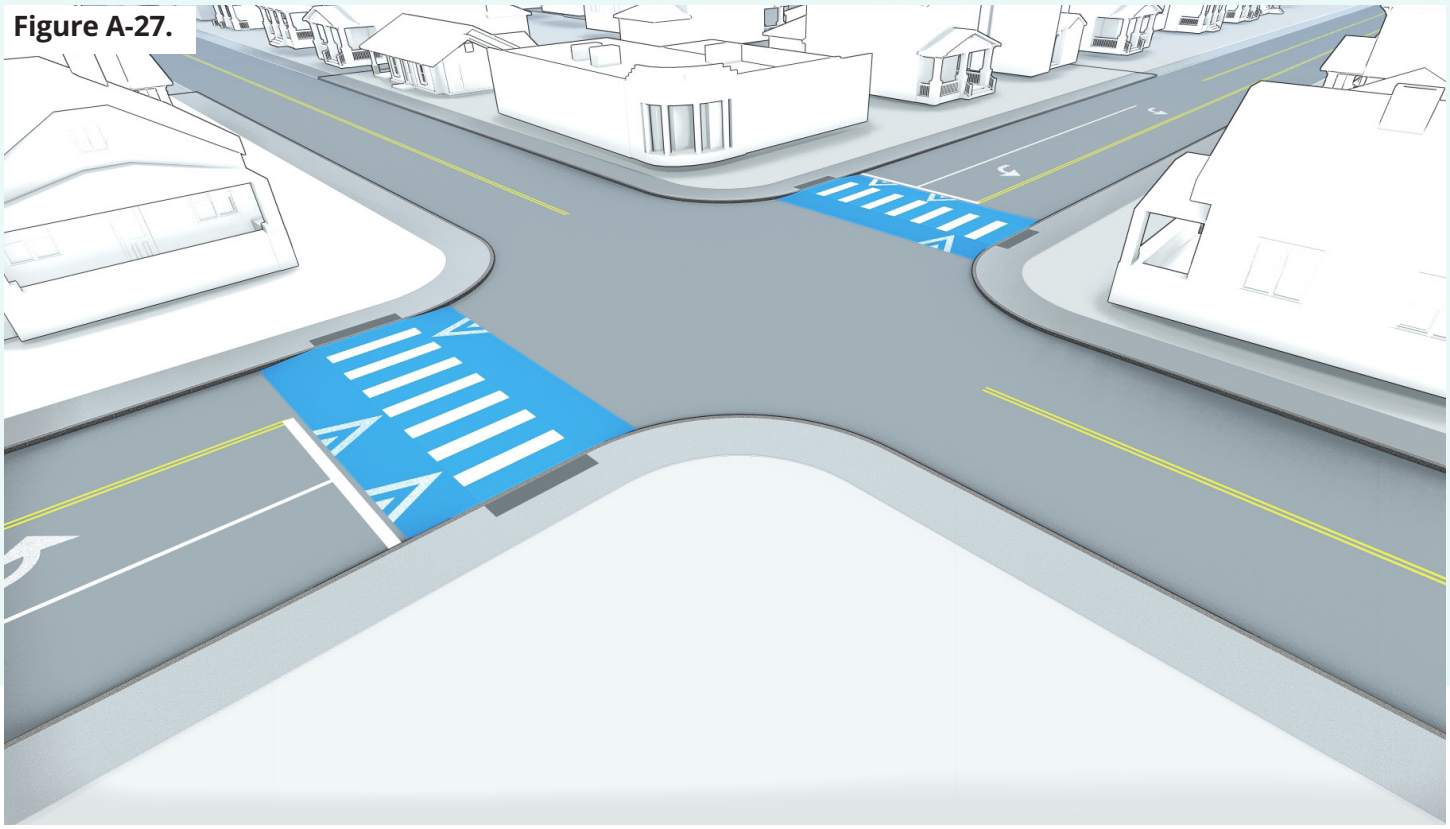
LOCATION GUIDANCE

FUNCTIONAL CLASS	Local, Collector, Major with significant Pedestrian Activity
VOLUMES	Less than or equal to 9,000 vehicles per day*
SPEED LIMIT	Less than or equal to 35 miles per hour*
CURB TO CURB WIDTH	Any
NUMBER OF LANES	Less than or equal to 4
EMERGENCY ROUTE	Generally not appropriate without special consideration
TRANSIT ROUTE	Yes; coordinate with transit agency
TYPE	Intersection, Mid Block, or Driveway
STREET CONTEXT	Commercial, Community Place

**May be applicable on higher speed/volume roadways in some cases*

RAISED CROSSWALK / SPEED TABLE

Figure A-27.



COMPLEMENTARY FEATURES

Raised crosswalks may be combined with additional features to increase their effectiveness, including:

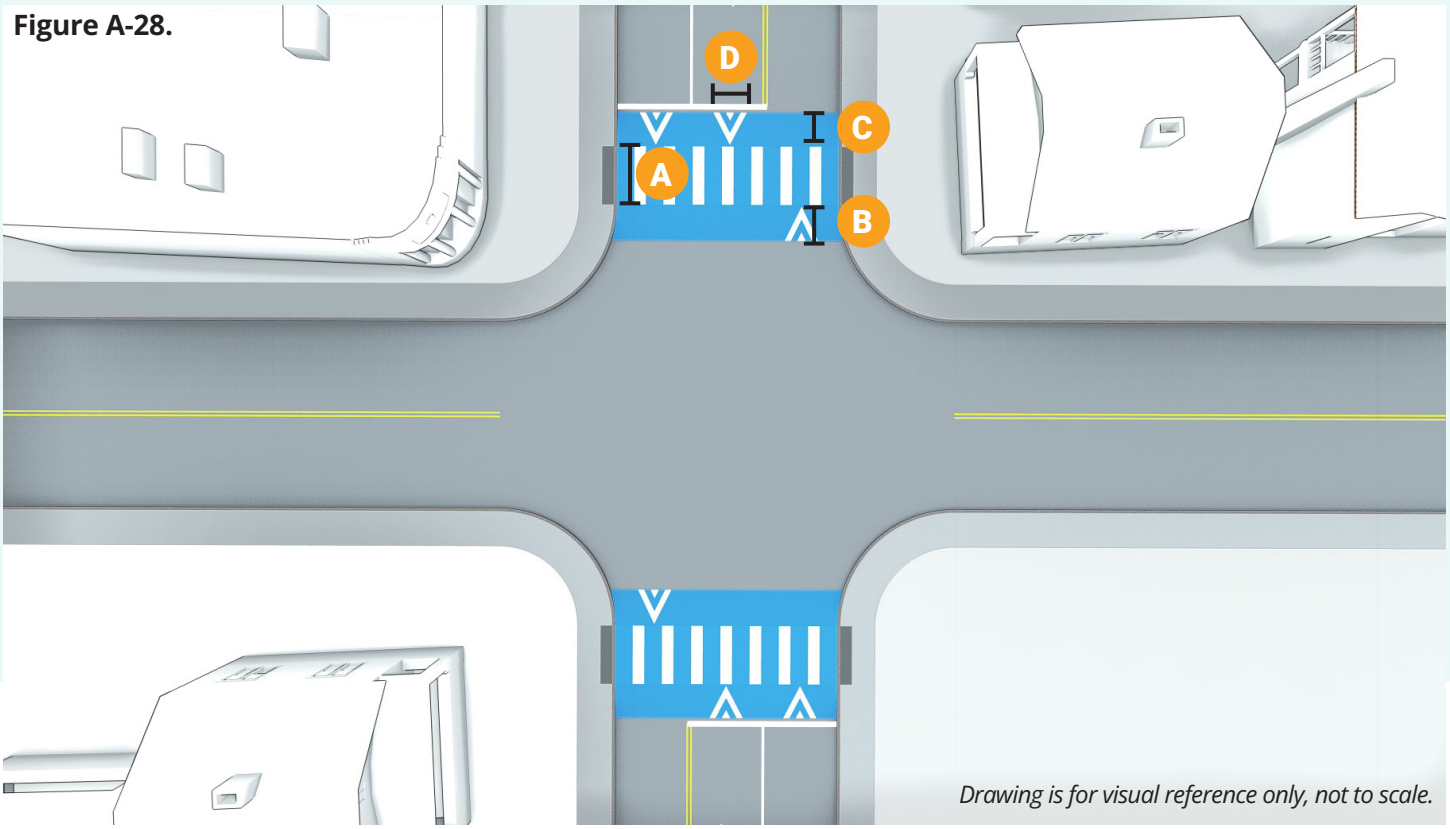
- Curb extensions or slow-turn wedges extend the curb at crossings to improve visibility of people walking and reduce turning speeds
- Median refuge islands or in-street pedestrian crossing signs can slow drivers and increase the comfort of people walking
- Rectangular Rapid Flashing Beacons (RRFBs) can help improve visibility of people walking and increase driver yield rates

APPLICATION GUIDANCE

- May be used to facilitate sidewalk, shared use path, or raised separated bikeway crossings at driveways, intersections, or mid block
- May be appropriate on arterials on a case by case basis
- Crosswalk table should be at least 10 feet wide, allowing the front and rear tires of a vehicle to be on the table at the same time
- If applied at intersection, typically applied at the entrance of a minor street. (See: Raised Intersection if full intersection receives this treatment)
- Stop lines at midblock crossings should be set back 20 – 50 feet to ensure that a person crossing is visible

RAISED CROSSWALK / SPEED TABLE

Figure A-28.



Drawing is for visual reference only, not to scale.

RECOMMENDED DESIGN CRITERIA

Refer to the most recent Street Design Manual, California Manual on Uniform Traffic Control Devices, and Additional Resources for signage and/or additional design criteria.

- **A** 10 foot minimum
- **B** 6 foot typical
- **C** 6 foot typical
- **D** 6 foot typical
- * Match curb height, 6 inch (typical)

ADDITIONAL RESOURCES

Caltrans Traffic Calming Guide
Caltrans DIB 82
FHWA Traffic Calming e-Primer

RAISED INTERSECTION

An intersection that is elevated to sidewalk level to slow vehicles and increase driver awareness at intersections. Raised intersections can be used as a gateway treatment to signify entry into a lower speed environment.

Speed Reduction	1-5 miles per hour
Volume Reduction	N/A
IMPACTS ON CRASHES, HAVE NOT YET BEEN MEASURED IN THE UNITED STATES	

Source: FHWA Traffic Calming ePrimer

BENEFITS

- Increases visibility of people crossing
- Slows drivers
- Gateway treatment
- At-grade facility is easier to cross for people with mobility impairments
- Visual indicator of a pedestrian zone and provides opportunity for placemaking

CONSIDERATIONS

- Consider impacts to drainage and emergency vehicles
- Consider use of detectable warnings and tactile edges for pedestrians with low visibility
- Consider grade and sight distance before implementation

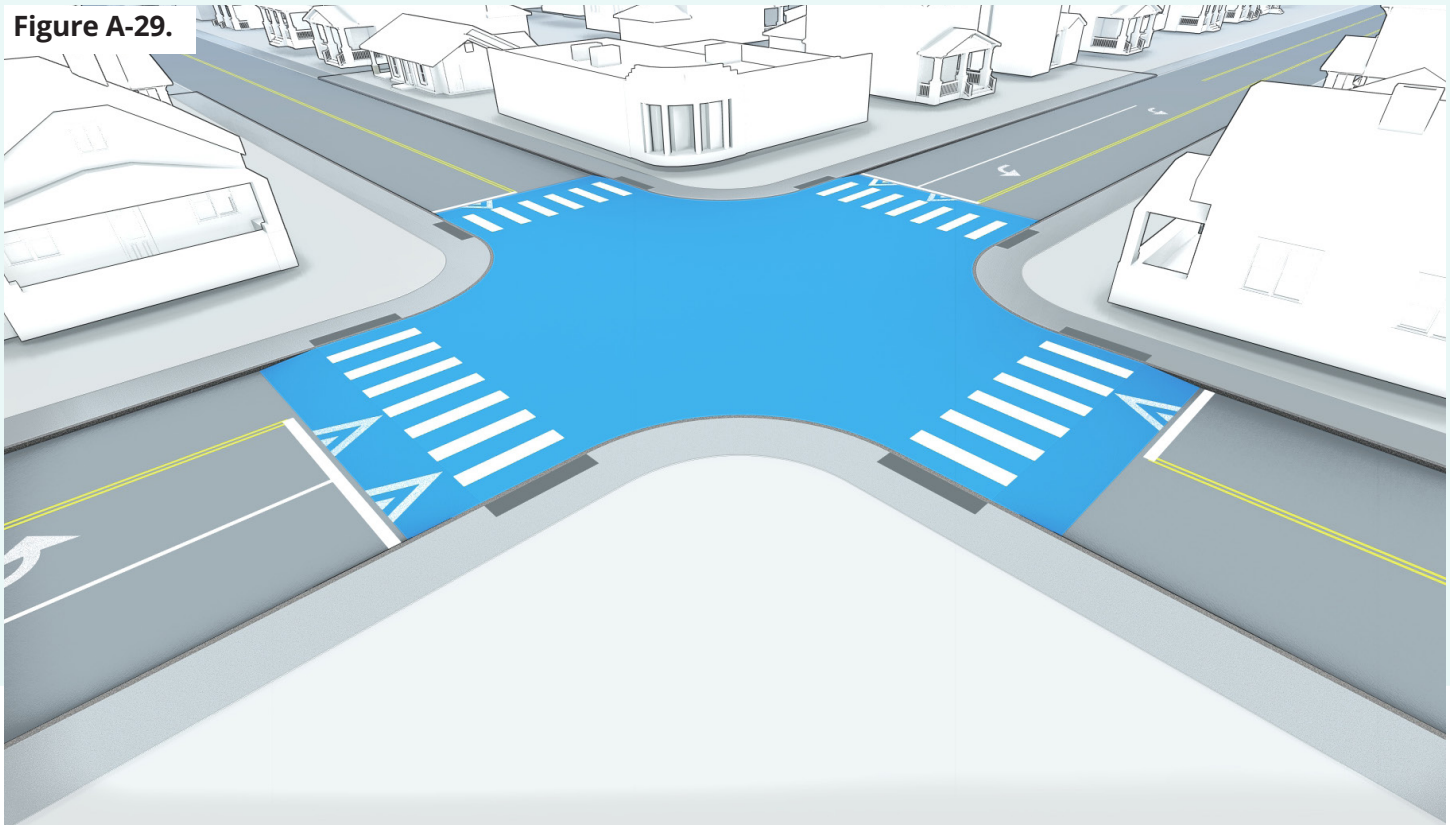
LOCATION GUIDANCE

FUNCTIONAL CLASS	Local, Collector, Major with significant Pedestrian Activity
VOLUMES	Less than or equal to 9,000 vehicles per day*
SPEED LIMIT	Less than or equal to 35 miles per hour*
CURB TO CURB WIDTH	Any
NUMBER OF LANES	Any
EMERGENCY ROUTE	No
TRANSIT ROUTE	Yes
TYPE	Intersection
STREET CONTEXT	Any

**May be applicable on higher speed/volume roadways in some cases*

RAISED INTERSECTION

Figure A-29.



COMPLEMENTARY FEATURES

Raised intersections may be combined with additional features to increase their effectiveness, including:

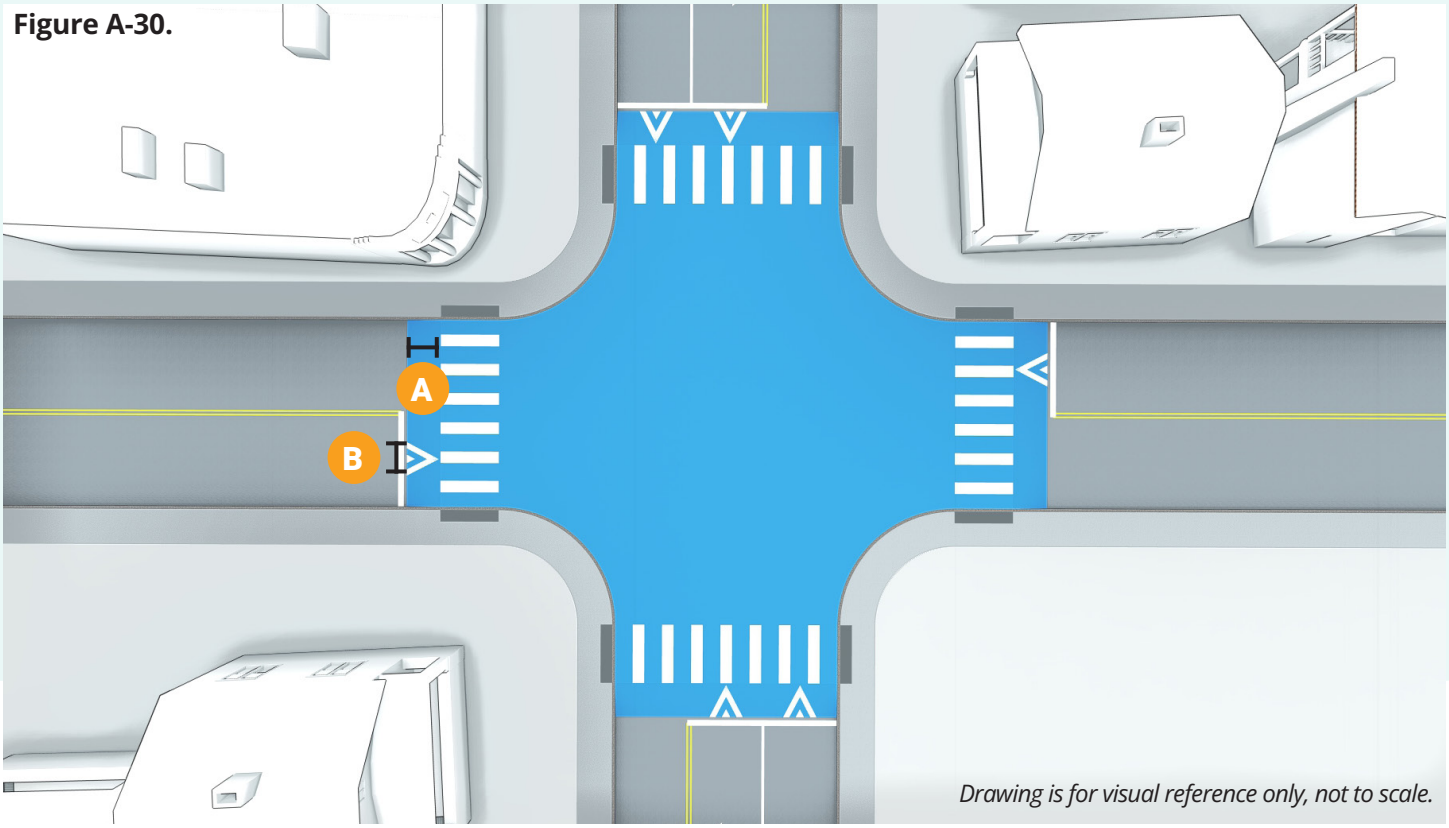
- Curb extensions or slow-turn wedges extend the curb at crossings to improve visibility of people walking and reduce turning speeds
- Median refuge islands provide protected spaces in the median, allowing people walking, biking, or rolling to cross one direction of traffic at a time

APPLICATION GUIDANCE

- May use special pavers / murals to create visual placemaking
- May be implemented in conjunction with other elements that increase crosswalk visibility such as striping and advanced warning signage
- While ADA compliance is required, crosswalks do not need to be marked if the intersection is flush with the sidewalk
- Supports areas with high pedestrian or bicycle volumes at the intersection including areas with trip generators like transit stops, schools, and parks

RAISED INTERSECTION

Figure A-30.



Drawing is for visual reference only, not to scale.

RECOMMENDED DESIGN CRITERIA

Refer to the most recent Street Design Manual, California Manual on Uniform Traffic Control Devices, and Additional Resources for signage and/or additional design criteria.

- **A** 6 foot
- **B** 6 foot
- ***** 3 inch minimum height, 6 inch typical

ADDITIONAL RESOURCES

Caltrans Traffic Calming Guide
Caltrans DIB 82
NACTO Raised Intersections
FHWA Traffic Calming e-Primer

RAISED MEDIAN

Raised features in the middle of the road which separate traffic in opposing directions, restrict mid-block turning movements, and can provide formal or informal refuge for pedestrians.

Speed Reduction	1-5 miles per hour
Volume Reduction	N/A
Crash Reduction Factor (CRF)	25%

Source: FHWA Traffic Calming ePrimer, Local Roadway Safety Manual: A Manual for California's Local Road Owners

BENEFITS

- May create a lane narrowing effect
- May include trees and/or landscaping
- Limit turning movements to reduce conflicts
- May provide crossing refuge for pedestrians at mid-block crossings

CONSIDERATIONS

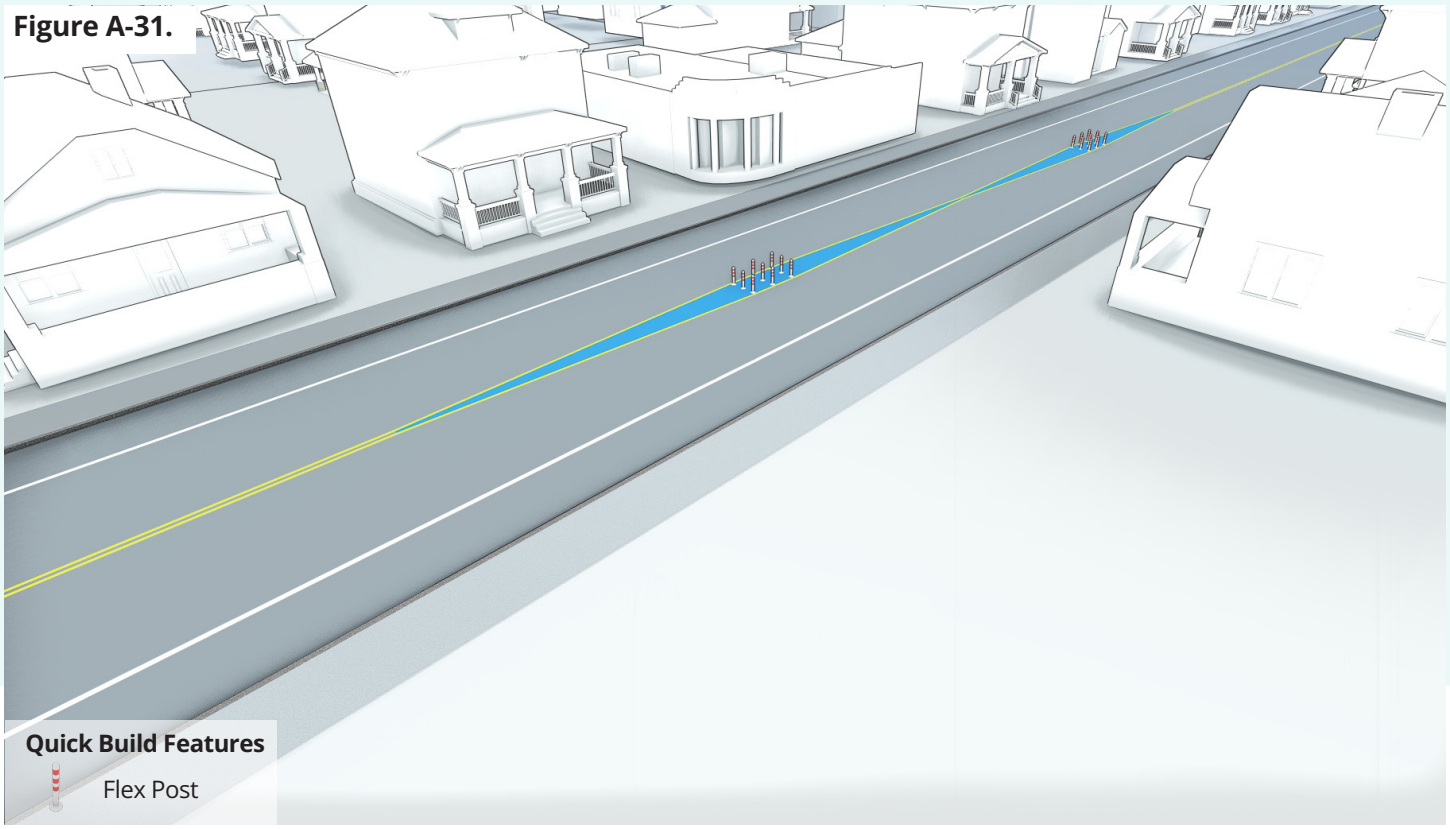
- Require median space in roadways
- Raised median can experience high rates of vehicles collision where introduced
- Width and use of raised median can impact sightlines of drivers as they approach intersections
- Consider on multi-lane streets

LOCATION GUIDANCE

FUNCTIONAL CLASS	Any
VOLUMES	Any, especially on higher volume roads
SPEED LIMIT	Any
CURB TO CURB WIDTH	Minimum 30 feet
NUMBER OF LANES	Any
EMERGENCY ROUTE	Yes, but may include mountable areas or breaks at strategic locations
TRANSIT ROUTE	Yes
TYPE	Intersection or Midblock
STREET CONTEXT	Commercial, Community Place

RAISED MEDIAN

Figure A-31.



COMPLEMENTARY FEATURES

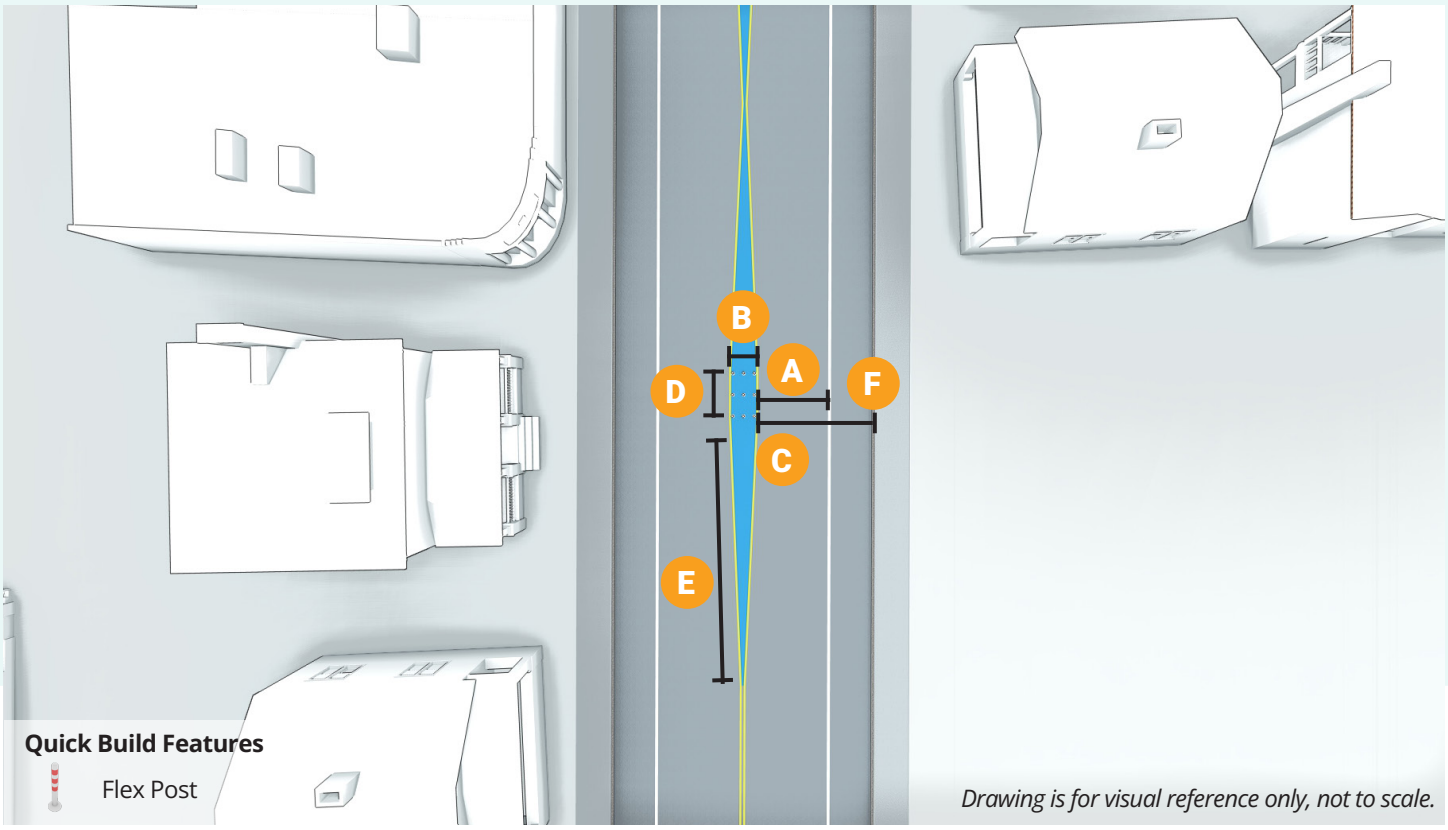
Raised medians may be combined with additional features to increase their effectiveness, including:

- Medians can serve as refuge areas, providing protected spaces for people walking, biking, or rolling to cross one direction of traffic at a time; refuge islands can be further enhanced with curb extensions or raised crossings to slow vehicles and improve visibility
- Reflective markers can be used on the approach in place of KEEP RIGHT signs; see Section 31.02 of the California Manual on Uniform Traffic Control Devices for guidance

APPLICATION GUIDANCE

- 20 feet of clear width is required on both sides of any fixed median unless signification opportunities are provided for vehicles to yield to the side of the road or for emergency vehicles to cross over and drive opposing traffic.
- The height and width of the median should be scaled to roadway speed and traffic volumes
- Medians should be at least 4 feet wide; if a pedestrian refuge is included, it should be wide enough to meet ADA requirements (10 feet preferred, 6 feet minimum)
- The median can be designed to be mountable for emergency access
- If less than 4 lanes, additional considerations may apply to facilitate emergency vehicle access
- May also be designed as short "islands" to achieve a similar effect

RAISED MEDIAN



Drawing is for visual reference only, not to scale.

RECOMMENDED DESIGN CRITERIA

Refer to the most recent Street Design Manual, California Manual on Uniform Traffic Control Devices, and Additional Resources for signage and/or additional design criteria.

- **A** 10 foot travel lane minimum
- **B** 2 foot minimum, 6 foot preferred
- **C** 4 foot minimum
- **D** 3-5 foot barrier spacing, 1 foot minimum on curves
- **E** Taper per equations:
  - 40 miles per hour or less: L = WS2 / 60
  - 45 miles per hour or more: L = WS

  L = taper length in feet

  W = width of offset in feet

  S = posted speed limit, or off-peak 85th-percentile speed prior to work starting, or the anticipated operating speed in miles per hour
- **F** 20 foot minimum from edge of median to curb

ADDITIONAL RESOURCES

Caltrans Traffic Calming Guide
Caltrans HDM Index 405.4
Caltrans HDM Topic 904
NACTO Urban Bikeway Design Guide

RECTANGULAR RAPID FLASHING BEACON (RRFB)

Flashing signage that enhances the visibility of a pedestrian crossing. RRFBs flash with alternating frequency to increase visibility of people walking and rolling to drivers.

Yield Rate Increase **98%**

Crash Reduction Factor (CRF) **47%**

Source: FHWA Proven Safety Countermeasures

BENEFITS

- Increases visibility of people crossing the street
- Increases driver stop compliance

CONSIDERATIONS

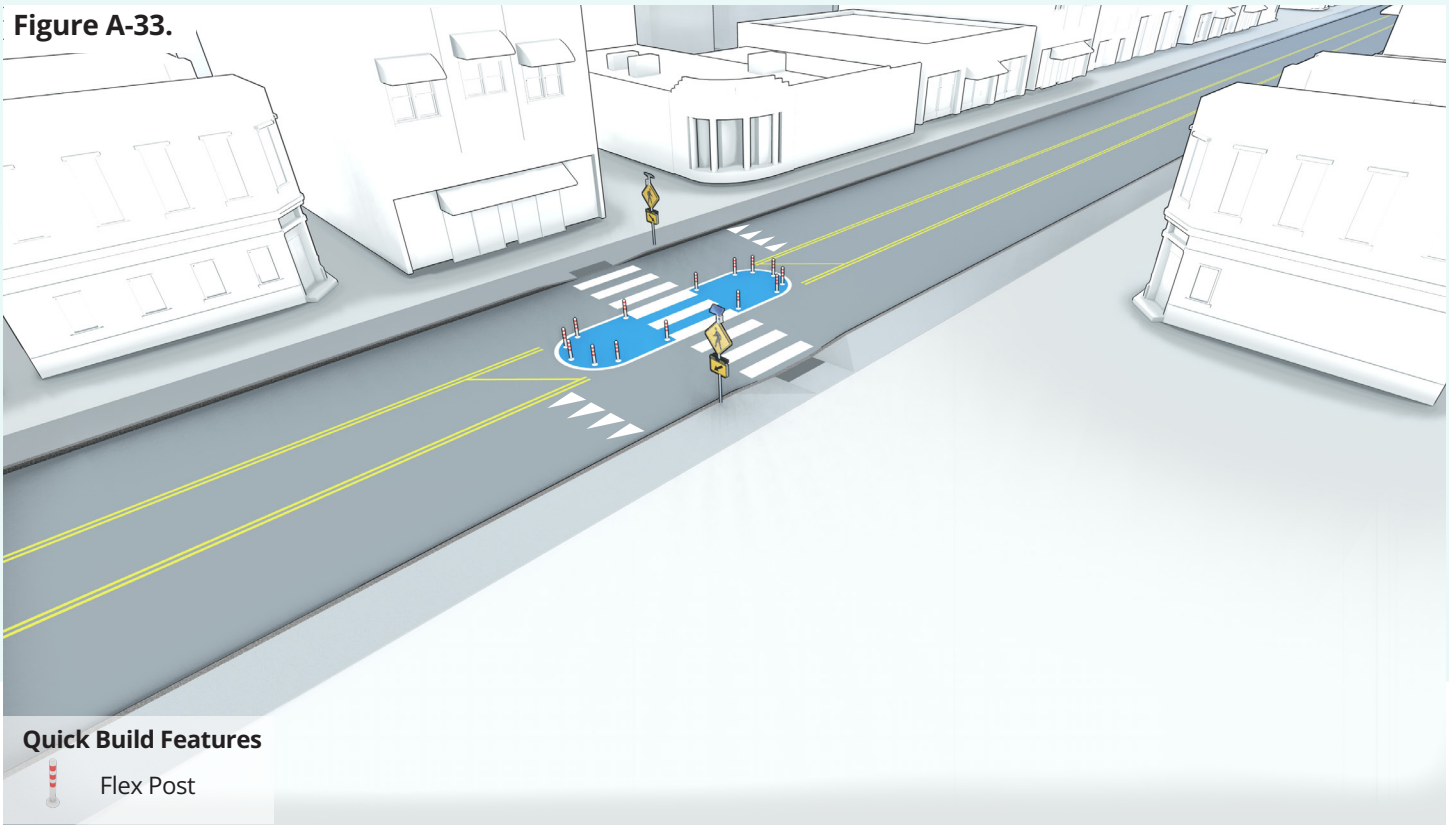
- Hard-wired or solar powered
- May not be effective on high volume, wide multi-lane roadways
- Should not be installed at intersections that are stop controlled, yield controlled, or signalized (FHWA)
- Accessible crossing and curb ramp needs must be included during project design

LOCATION GUIDANCE

FUNCTIONAL CLASS	Majors, Collectors, Local
VOLUMES	< 15,000 vehicles per day
SPEED LIMIT	Less than or equal to 40 miles per hour
CURB TO CURB WIDTH	Any; less effective for wider crossings
NUMBER OF LANES	4, but should be paired with a median refuge island where feasible when >2 lanes
EMERGENCY ROUTE	Yes
TRANSIT ROUTE	Yes
TYPE	Intersection or Midblock
STREET CONTEXT	Commercial, Community Place

RECTANGULAR RAPID FLASHING BEACON (RRFB)

Figure A-33.



Quick Build Features

Flex Post

COMPLEMENTARY FEATURES

RRFBs may be combined with additional features to increase their effectiveness, including:

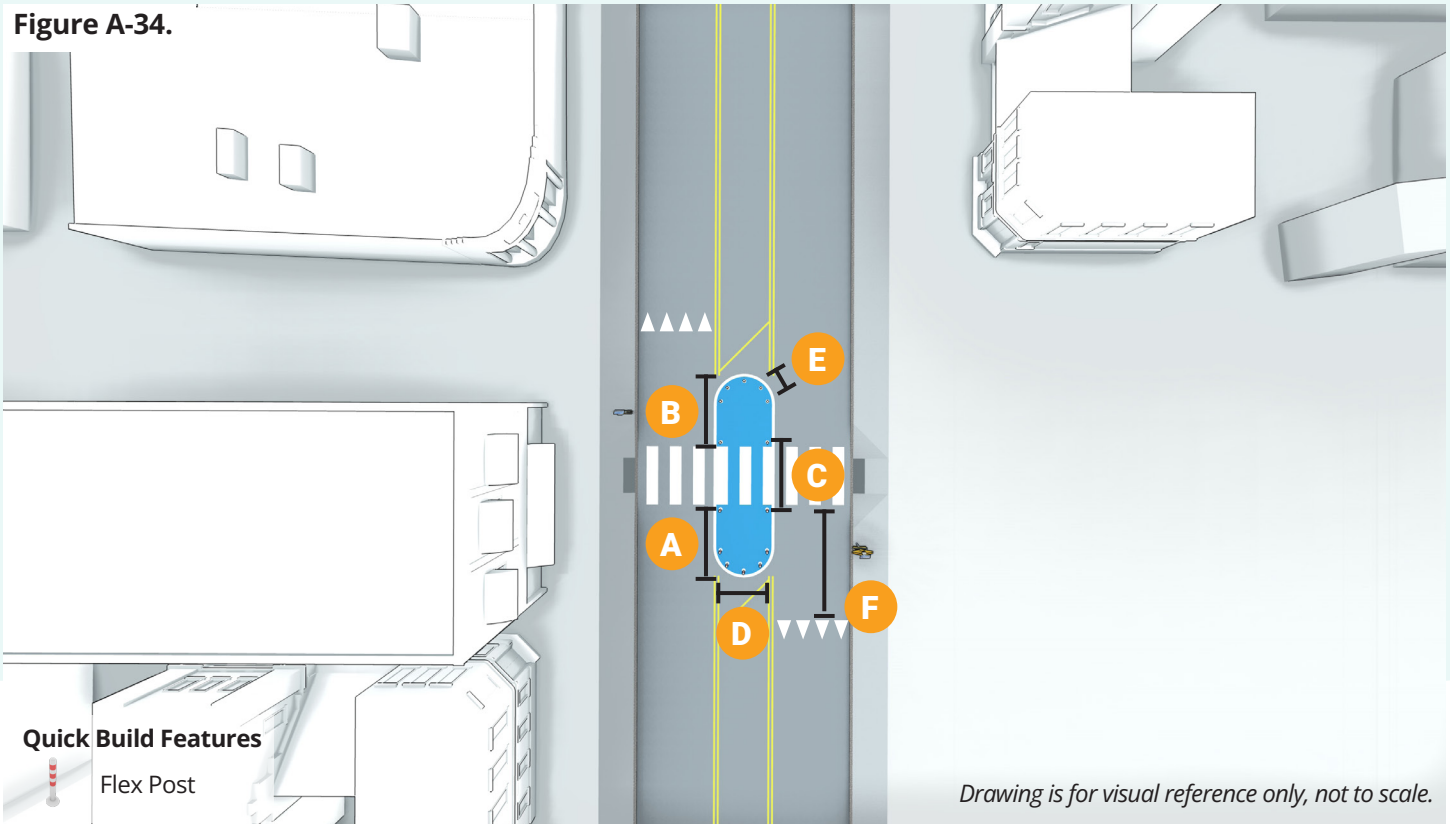
- Curb extensions or slow-turn wedges extend the curb at crossings to improve visibility of people walking and reduce turning speeds
- Raised crossings elevate the bike and/or pedestrian crossing to curb level, increasing visibility and slowing vehicle traffic
- Median refuge islands provide protected spaces in the median, allowing people walking, biking, or rolling to cross one direction of traffic at a time

APPLICATION GUIDANCE

- Typically installed at unsignalized, midblock crossings with speed limits less than 40 miles per hour (FHWA)
- May accompany shared use paths / trail or school crossings
- RRFBs are placed on both sides of the crosswalk as well as in a median if there is a pedestrian refuge and are activated via a push button or passive pedestrian detection
- May be used at the approach / egress of a roundabout
- May be installed along with other high visibility crossing treatments such as high visibility striping and a raised crosswalk

RECTANGULAR RAPID FLASHING BEACON (RRFB)

Figure A-34.



RECOMMENDED DESIGN CRITERIA

Refer to Council Policy 200-07, the most recent Street Design Manual, California Manual on Uniform Traffic Control Devices, and Additional Resources for signage and/or additional design criteria.

- **A** 6 foot minimum
- **B** 6 foot minimum
- **C** 10 foot typical
- **D** 6 foot minimum, 10 foot typical
- **E** 3-5 foot barrier spacing, 1 foot minimum on curves
- **F** 20-50 feet

ADDITIONAL RESOURCES

California Manual on Uniform Traffic Control Devices Chapter 4
Council Policy 200-07
Caltrans Traffic Calming Guide
FHWA Proven Safety Countermeasures

ROUNDABOUT

Unsignalized, circular intersections where incoming traffic yields to traffic in the intersection.

Speed Reduction	15-20 miles per hour
Volume Reduction	N/A
Crash Reduction Factor (CRF)	80%

Source: FHWA Proven Safety Countermeasures

BENEFITS

- Slows vehicles
- Removes conflict points
- Allows for continuous traffic flow
- Provides opportunity for landscaping or placemaking

CONSIDERATIONS

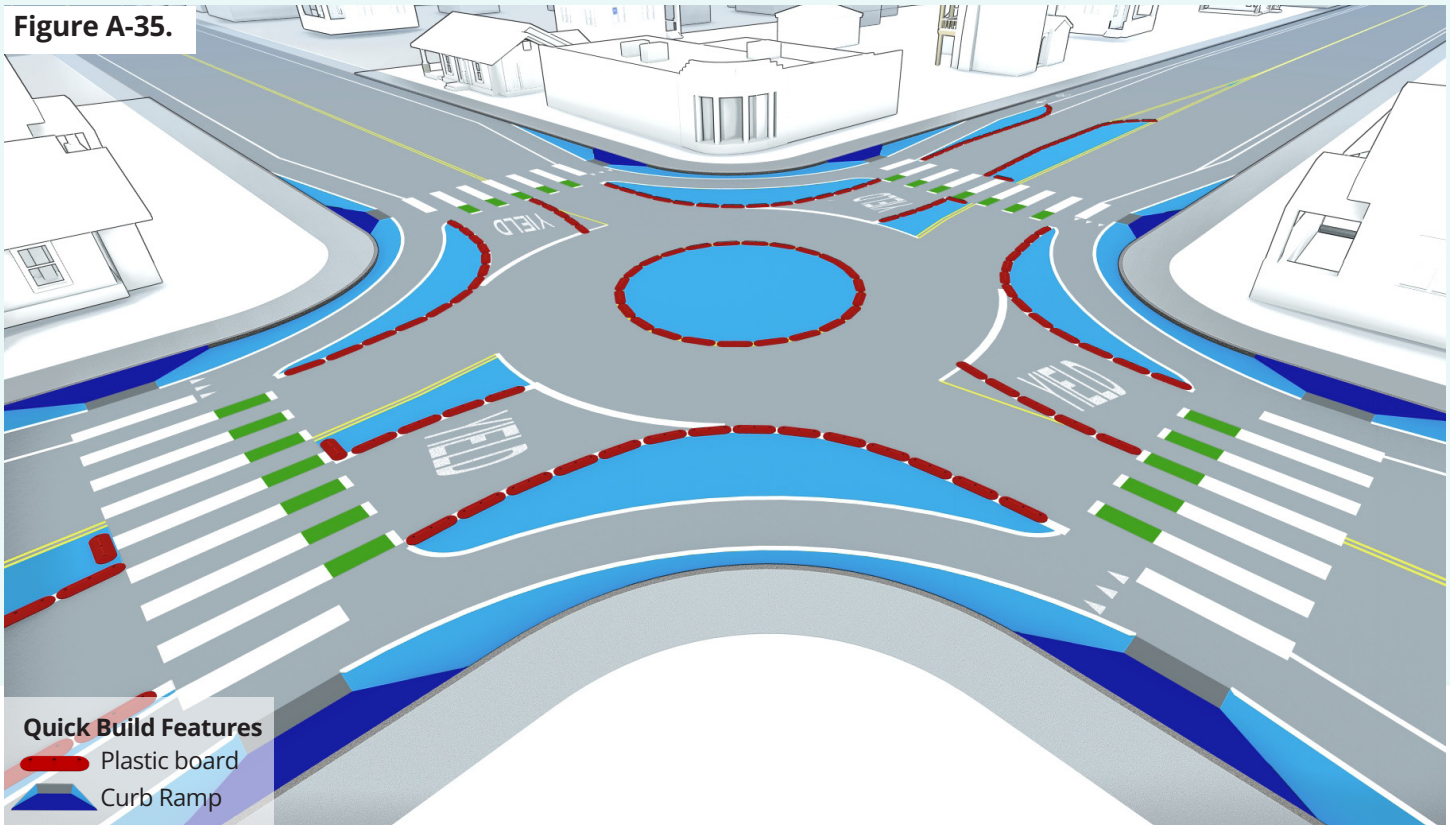
- May require additional treatments for people walking, biking and rolling
- May require additional space for large vehicles such as transit, freight, emergency services, and trash pickup
- Consider impacts to drainage
- May include separated bike lanes or shared lanes to accommodate people biking
- Accessible crossing and curb ramp needs must be included during project design
- Consider access to large diameter and/or deep utilities that are located under the roundabout

LOCATION GUIDANCE

FUNCTIONAL CLASS	Any
VOLUMES	Any
SPEED LIMIT	Any
CURB TO CURB WIDTH	Minimum 70 foot diameter
NUMBER OF LANES	Any
EMERGENCY ROUTE	Yes, may be designed to be mountable
TRANSIT ROUTE	Yes
TYPE	Intersection
STREET CONTEXT	All

ROUNDABOUT

Figure A-35.



COMPLEMENTARY FEATURES

Roundabouts may be combined with additional features to increase their effectiveness, including:

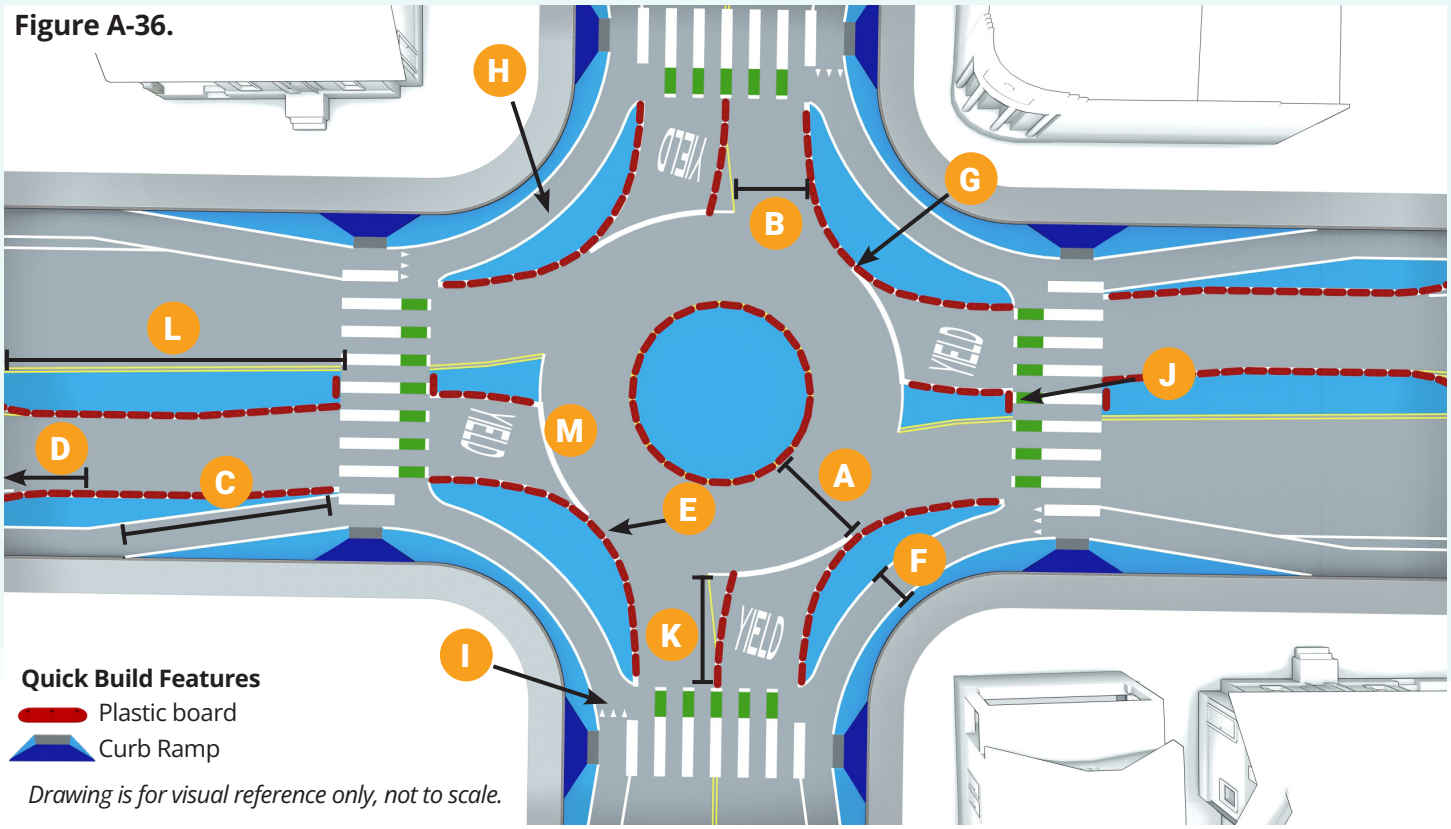
- Street art can be painted or placed in the curb extension
- Landscaping, decorative signs, or potted plants can be added to the roundabout; for hardscape projects, green stormwater infrastructure may also be integrated
- Raised crosswalks can enhance the effectiveness of the roundabout
- Median refuge islands or in-street pedestrian crossing signs can slow drivers and increase the comfort of people walking
- Rectangular Rapid Flashing Beacons (RRFBs) can help improve visibility of people walking and increase driver yield rates

APPLICATION GUIDANCE

- Typically applied on 2-4 lane roads at intersections with 3 to 4 legs with enough space to provide a lateral shift to slow traffic
- Treatment designs may include improvements for people walking, biking, and rolling including separated bike lanes, shared lanes, or refuge islands
- Landscaping or other materials used in center of treatment should be maintained or designed to not hinder visibility
- Splitter islands direct traffic entering intersection and slow vehicles approaching
- May include mountable features to accommodate large vehicles, emergency vehicles, and buses

ROUNDABOUT

Figure A-36.



Drawing is for visual reference only, not to scale.

RECOMMENDED DESIGN CRITERIA

Refer to the most recent Street Design Manual, California Manual on Uniform Traffic Control Devices, and Additional Resources for signage and/or additional design criteria.

- **A** 16 foot typical
- **B** 14 foot typical
- **C** 60 foot typical; 1:10 slope
- **D** 100 foot minimum taper length
- **E** 25 foot radius
- **F** 5 foot minimum, 6 foot preferred; N/A if no bike lane
- **G** Continuous barrier spacing
- **H** Bike lane should be placed as close to the curb as possible; may be reduced to accommodate quick build curb ramp
- **I** Sharks teeth yield lines indicate for people biking to yield to people walking in the crosswalk
- **J** Pair with cross-bike markings to support wayfinding and visibility
- **K** 20 foot minimum
- **L** 100 foot minimum
- **M** Yield marking optional
- ***** Inscribed circle, center island, and splitter islands (major street and minor street) vary based on intersection width; minimum 65 foot, 33 foot, 10 foot (major), and 5 foot (minor), respectively

ADDITIONAL RESOURCES

Caltrans Traffic Calming Guide
CA HDM Chapter 400
California Manual on Uniform Traffic Control Devices
NCHRP 1043 Guide for Roundabouts
FHWA Traffic Calming ePrimer

SEPARATED BIKEWAY

Physically separated and designated space for people biking separated from vehicular lanes via raised features. Physical separation varies and includes flexible post delineators, raised medians, landscaping, or another physical object.



NO IMPACT ON SPEED OR VOLUME FOR THROUGH TRAFFIC; VEHICLE TURNING SPEEDS MAY BE REDUCED



Crash Reduction Factor (CRF) **53%**

Source: FHWA Proven Safety Countermeasures

BENEFITS

- Provide physical barriers between people driving and vehicles, reducing the potential for crashes and interactions
- Comfortable for people of all ages and abilities
- Can provide additional space for landscaping and stormwater features in the separator space

CONSIDERATIONS

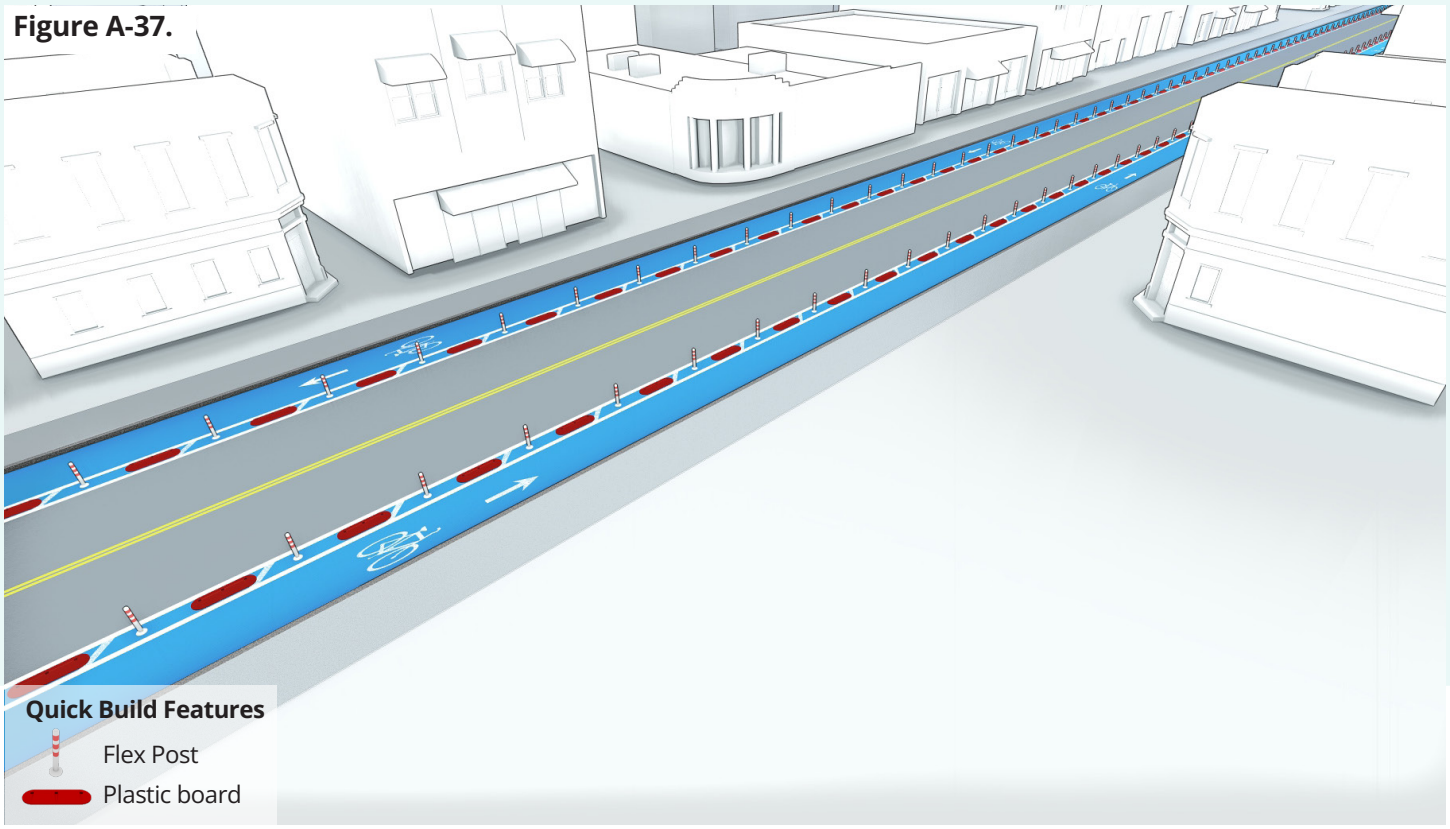
- May require relocation or reorientation of signs and utilities
- Consider impacts to drainage
- Accommodate large vehicle turns
- Opportunity to tighten wide turning radii
- Should include additional intersection and driveway treatments where vehicles cross the bikeway

LOCATION GUIDANCE

FUNCTIONAL CLASS	Any
VOLUMES	Any
SPEED LIMIT	Any, but consider a shared use path for speeds over 45 miles per hour
CURB TO CURB WIDTH	Minimum 36 feet (for one-way bikeways) or 30 feet (for two-way bikeways)
NUMBER OF LANES	Any
EMERGENCY ROUTE	Yes
TRANSIT ROUTE	Yes
TYPE	Segment
STREET CONTEXT	Any

SEPARATED BIKEWAY

Figure A-37.



COMPLEMENTARY FEATURES

Protected bike lanes may be combined with additional features to increase their effectiveness, including:

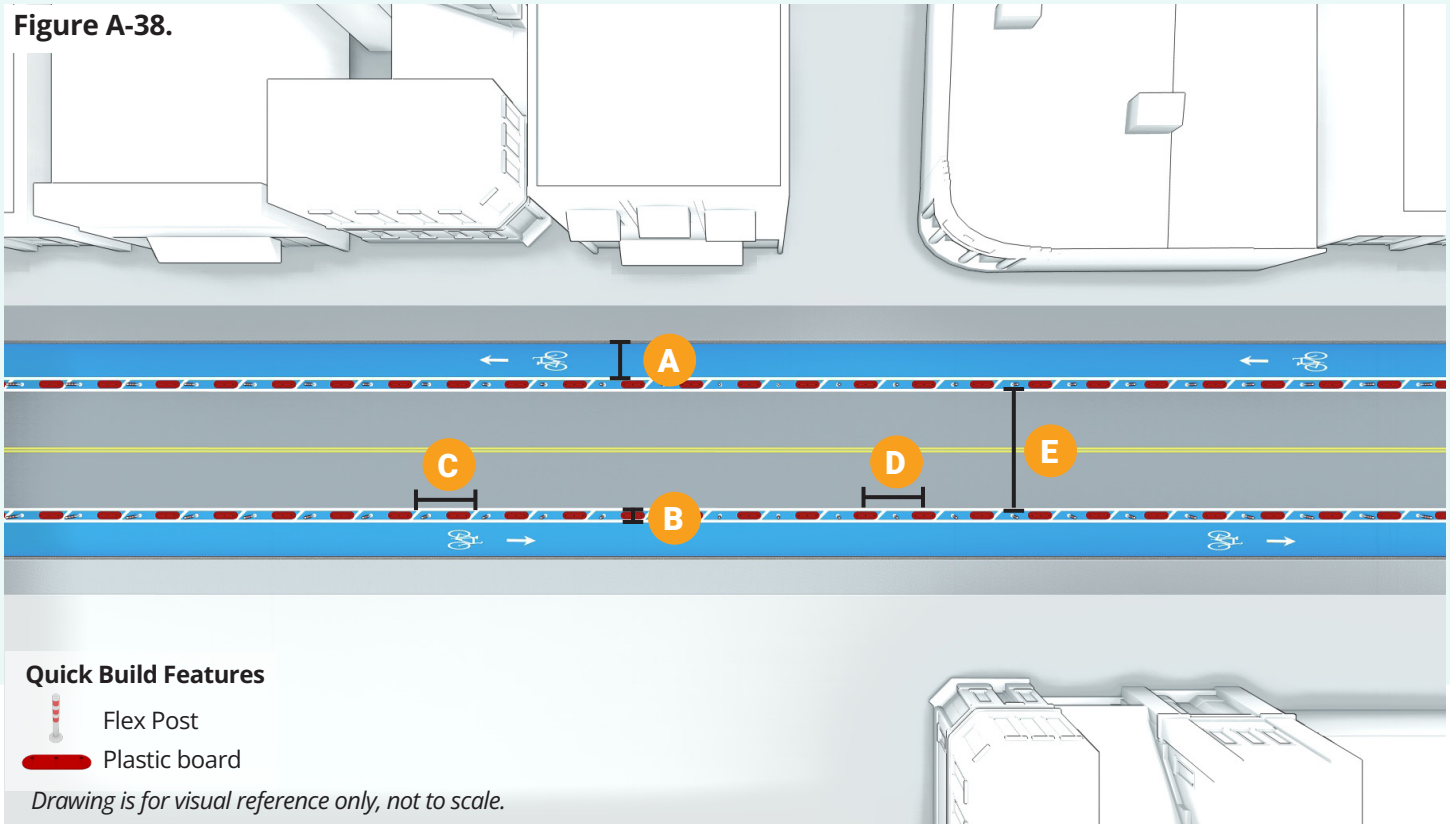
- Intersection treatments along the bike route such as protected intersections, protected roundabouts, dedicated intersections, bend outs, hardened centerlines, bike boxes, and two-stage left-turn queue boxes can help improve crossing comfort
- Slow-turn wedges, tight turn radii, or raised crossings at side streets and high-volume driveways, along with conflict markings to highlight the presence of people biking
- Yield markings and/or raised crossings may be installed where people walking are anticipated to cross the bikeway to further indicate priority users

APPLICATION GUIDANCE

- Protected bike lanes can accommodate one-way or two-way travel on one or both sides of the street and may be at street level, sidewalk level, or an intermediate level
- Conflict striping at intersections and driveways may be considered to improve visibility for all users
- A curb, detectable edge, or other feature should be used to provide visual and physical cues to separate the bikeway from the walkway
- Detectable warning surfaces should be used to clearly define where people walking will cross the bikeway
- Other accessibility features, such as accessible parking and transit stops, must be included where applicable in the design of the bikeway

SEPARATED BIKEWAY

Figure A-38.



Quick Build Features

Flex Post

Plastic board

Drawing is for visual reference only, not to scale.

RECOMMENDED DESIGN CRITERIA

Refer to the most recent Street Design Manual, California Manual on Uniform Traffic Control Devices, and Additional Resources for signage and/or additional design criteria.

- **A** 6 foot minimum, 7 foot preferred when adjacent to curb
- **B** 2 foot minimum, 3 foot minimum when adjacent to parking
- **C** 10 foot diagonal line at 45 degrees preferred, 20 foot maximum
- **D** 5 foot preferred, 8 foot maximum spacing between vertical elements; may alternate between flex posts and other vertical elements like plastic boards
- **E** 20 foot minimum, 22 foot minimum for truck and bus routes (SD Street Design Manual)

ADDITIONAL RESOURCES

Caltrans DIB 89-02
FHWA Bikeway Selection Guide
NACTO Designing for All Ages and Abilities
NACTO Urban Bikeway Design Guide
FHWA Separated Bike Lane Planning and Design Guide
California Manual on Uniform Traffic Control Devices Chapter 9

SLOW TURN WEDGE

Elevated features, such as curbs or vertical delineators installed at corners to slow turning vehicles and prevent drivers from cutting corners.

Speed Reduction	2 miles per hour
Volume Reduction	N/A
Crash Reduction Factor (CRF)	46%

Source: Portland Bureau of Transportation Evaluation Report: Left Turn Calming Project, 2020

BENEFITS

- Guides drivers to make turns at lower speeds
- Does not reduce traffic capacity
- Improves vehicle reaction time to respond / yield to people walking, biking, or rolling across an intersection

CONSIDERATIONS

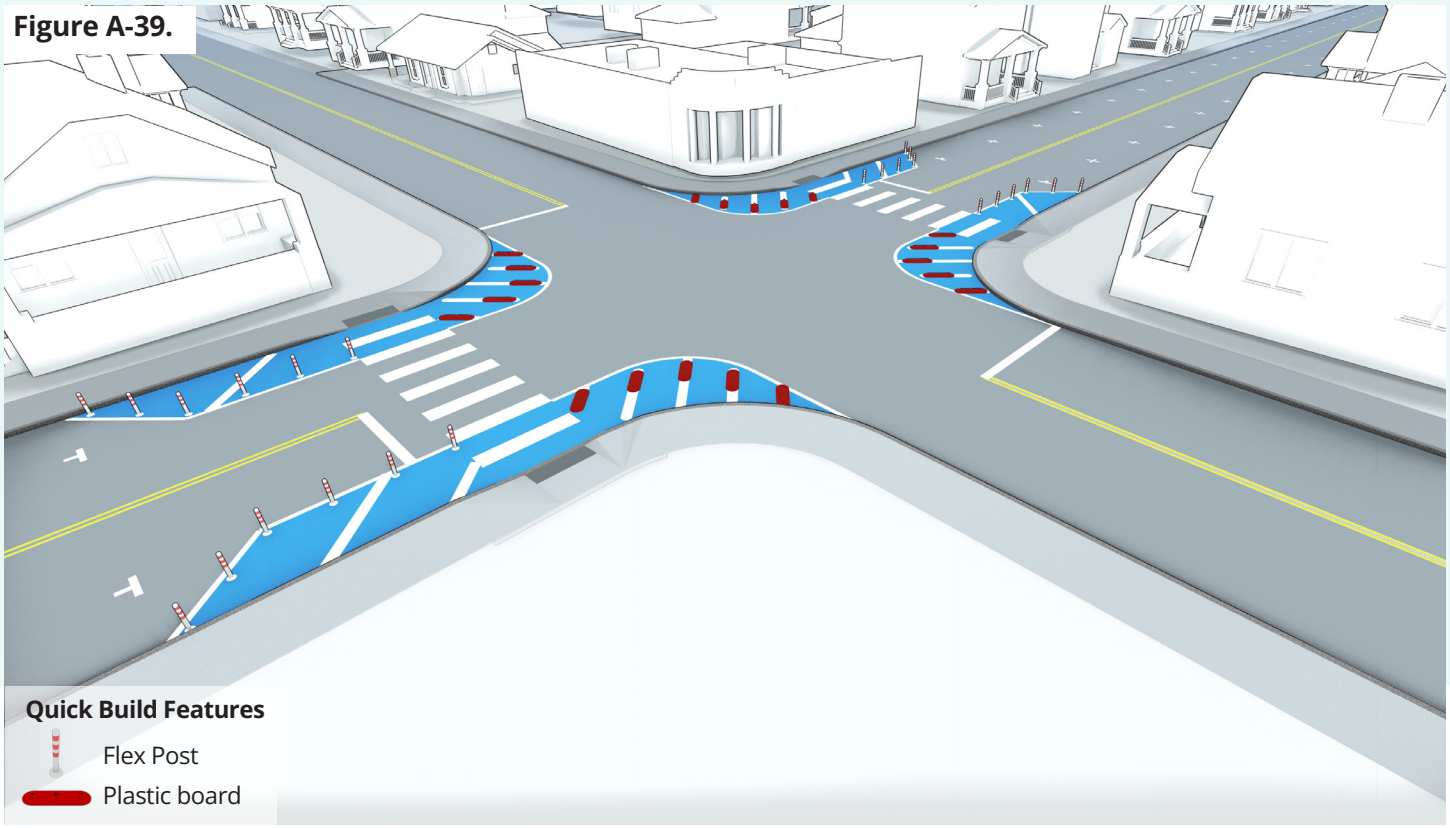
- Can be designed with mountable truck aprons to accommodate turning movements for larger vehicles, such as delivery trucks or buses
- Accessible crossing and curb ramp needs must be included during project design

LOCATION GUIDANCE

FUNCTIONAL CLASS	Any
VOLUMES	Any
SPEED LIMIT	Any
CURB TO CURB WIDTH	Any
NUMBER OF LANES	Any
EMERGENCY ROUTE	Yes
TRANSIT ROUTE	Yes
TYPE	Intersection
STREET CONTEXT	Commercial, Community Place

SLOW TURN WEDGE

Figure A-39.



COMPLEMENTARY FEATURES

Slow turn wedges may be combined with additional features to increase their effectiveness, including:

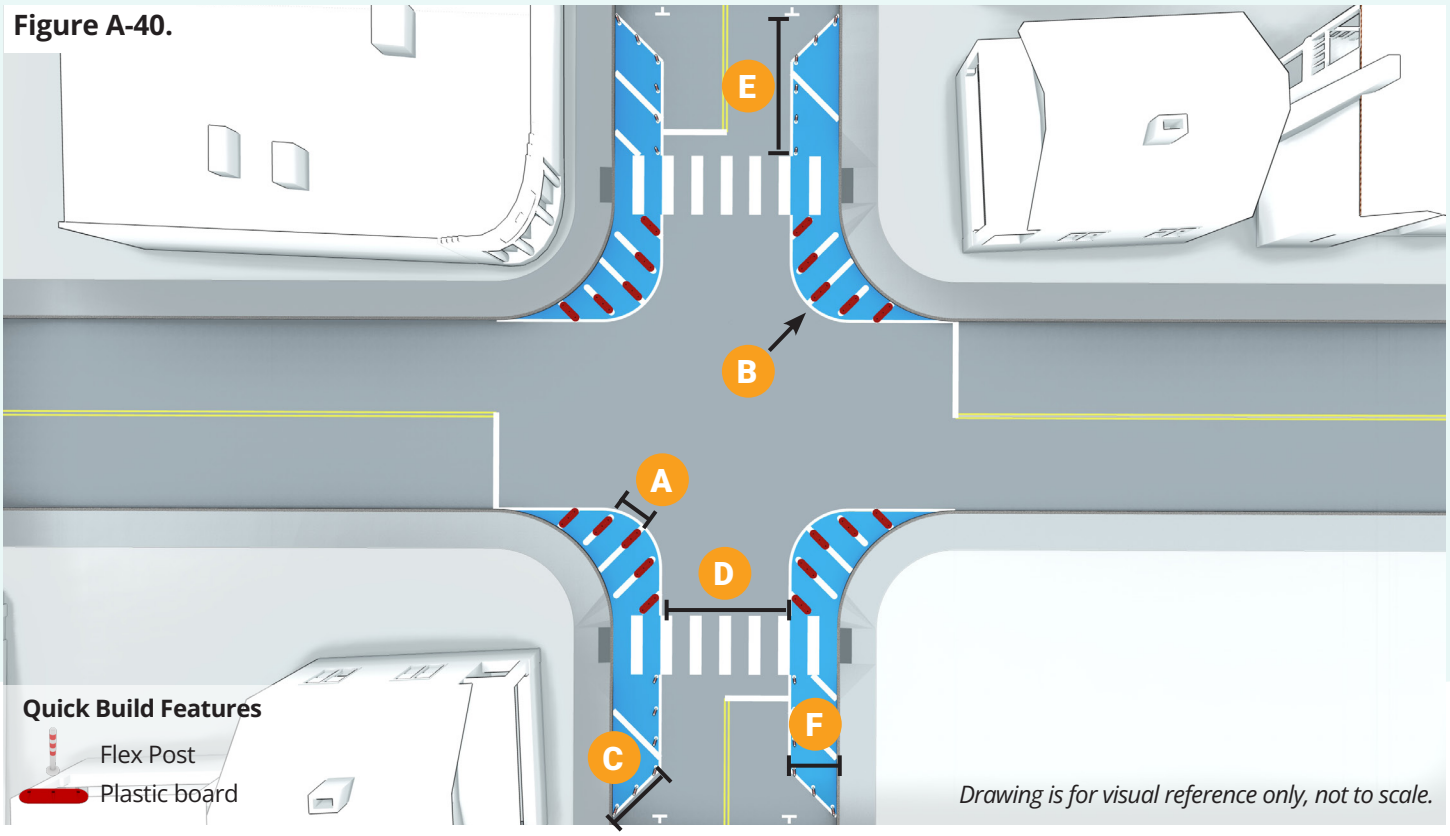
- Centerline hardening places a raised treatment along the centerline, which can help create a pinch point and requires drivers to slow down when making left turns
- Raised crossings elevate the bike and/or pedestrian crossing to curb level, increasing visibility and slowing vehicle traffic
- Median refuge islands provide protected spaces in the median, allowing people walking, biking, or rolling to cross one direction of traffic at a time
- Bike boxes are designated spaces at intersections that allow people biking to queue in front of motor vehicles at red lights
- No Right Turn on Red removes conflicts between right turning vehicles and people crossing the street

APPLICATION GUIDANCE

- Often installed at the minor street at intersections with a major street
- Especially useful at intersections with high volumes of pedestrians and/or where speeds of turning vehicles are an issue
- Typically installed next to crosswalks and applied at intersections to increase driver yielding to people crossing the street
- Application may include vertical elements and may be designed to be mountable
- Street art or potted plants may be incorporated into the slow-turn wedge

SLOW TURN WEDGE

Figure A-40.



RECOMMENDED DESIGN CRITERIA

Refer to the most recent Street Design Manual, California Manual on Uniform Traffic Control Devices, and Additional Resources for signage and/or additional design criteria.

- **A** 5 foot stripe spacing; 2-5 foot barrier spacing
- **B** 10-15 foot radius
- **C** 45 degree angle
- **D** 20 foot minimum, 22 foot minimum for truck and bus routes (SD Street Design Manual)
- **E** 15 foot minimum
- **F** Parking width (Typical)

ADDITIONAL RESOURCES

Caltrans Pedestrian Safety Countermeasures Toolbox
NACTO Don't Give Up at the Intersection

SPEED LUMPS

Elevated mounds in the roadway intended to slow vehicles. When placed near pedestrian crossings, they can significantly enhance safety and comfort for those crossing.

Speed Reduction	6-13 miles per hour
Volume Reduction	20%
Crash Reduction Factor (CRF)	50%

Source: FHWA Traffic Calming ePrimer, FHWA CMF Clearinghouse

BENEFITS

- Slows drivers
- Low cost
- Minimal drainage impact

CONSIDERATIONS

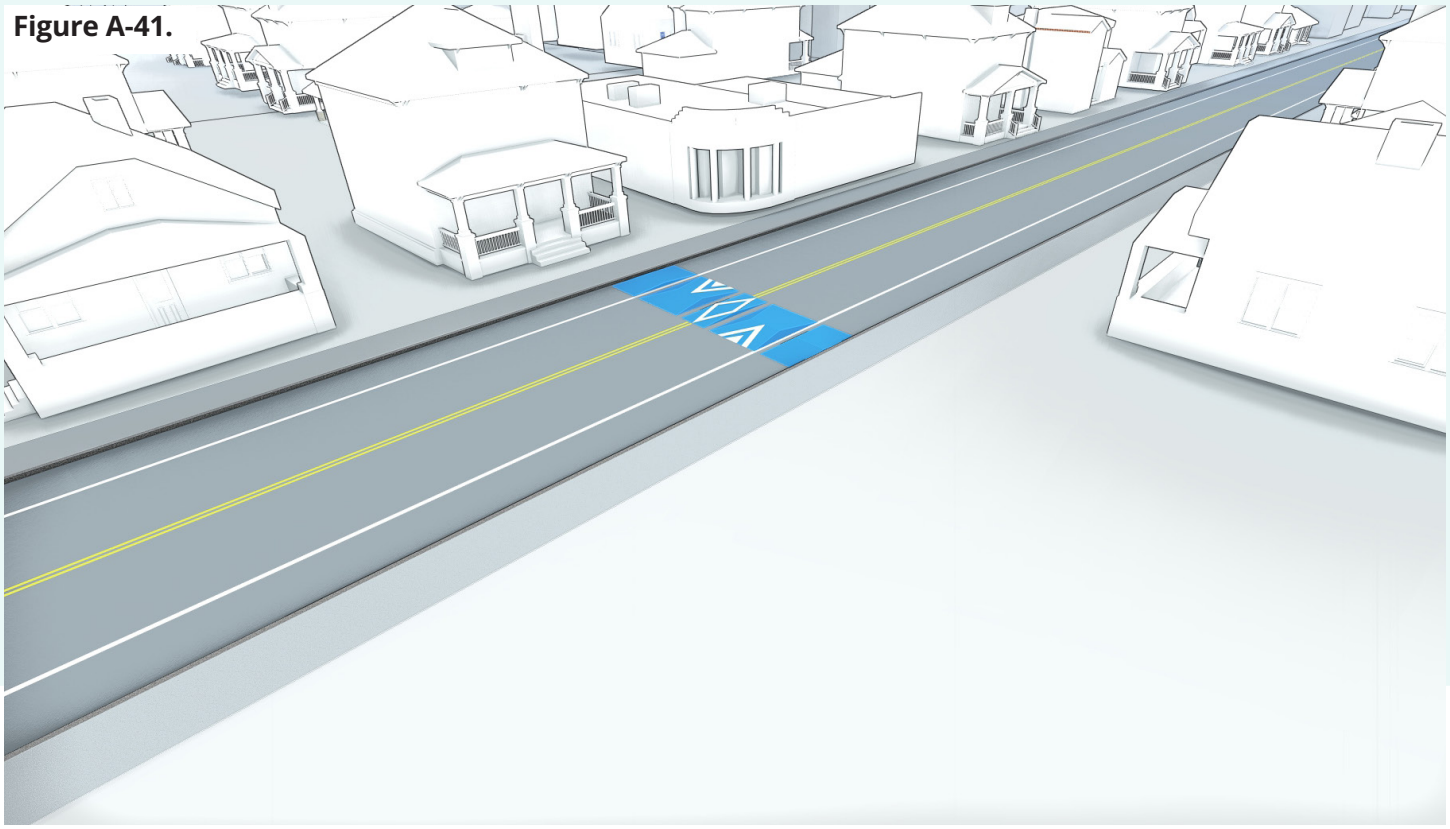
- Warning pavement markings and signage placed in advance of treatment
- May increase noise to adjacent parcels
- Roads with steeper grades may be less effective or not recommended
- Drivers need sufficient visibility to see the speed lump in advance

LOCATION GUIDANCE

FUNCTIONAL CLASS	Local, Collector
VOLUMES	Less than or equal to 10,000 vehicles per day
SPEED LIMIT	Less than or equal to 30 miles per hour
CURB TO CURB WIDTH	Any
NUMBER OF LANES	2
EMERGENCY ROUTE	Yes, require cut outs
TRANSIT ROUTE	Yes, require cut outs
TYPE	Mid Block
STREET CONTEXT	Neighborhood, Community Place

SPEED LUMPS

Figure A-41.



COMPLEMENTARY FEATURES

Curb extensions may be combined with additional features to increase their effectiveness, including:

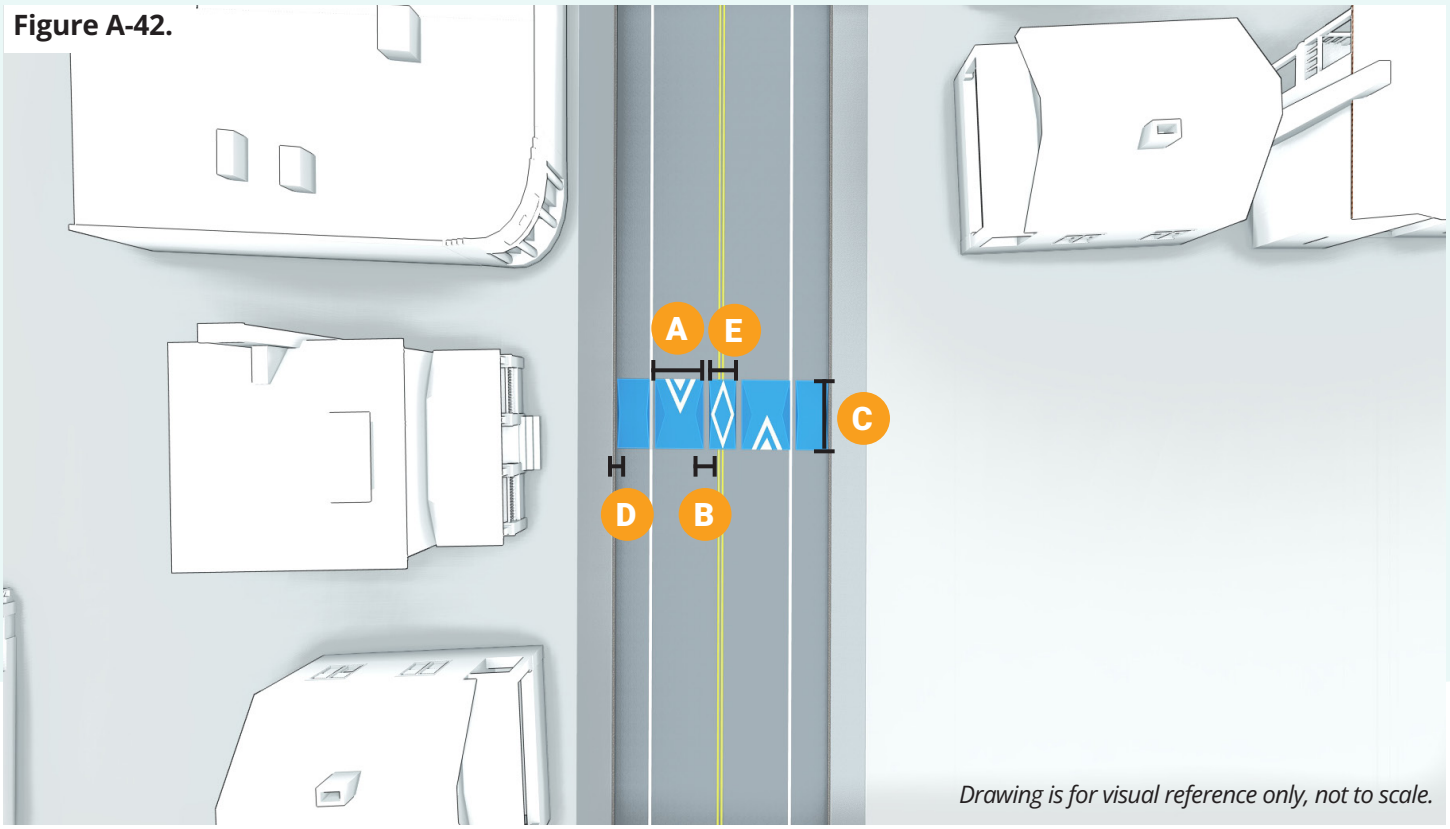
- Can be paired with a crosswalk to create a raised bike or pedestrian crossing
- May be installed in line with a curb extension, especially where on-street parking is present, to prevent drivers from maneuvering around the speed lump, or table
- Can be installed at the entrances and exits of a slow zone, such as a school pick-up or drop-off zone, or near a gateway to provide drivers with physical context on changing land use and potential shifts in street users
- May be placed near an intersection to slow traffic entering the intersection

APPLICATION GUIDANCE

- Should be spaced 250 to 500 feet apart to achieve desired result
- Typically applied mid-block on low volume, low speed, one- or two-way local streets and minor collectors, avoiding driveways and intersections
- Placing speed lumps on either side of a pedestrian crossing can help to create a slow zone, lowering speeds and improving pedestrian comfort
- Require cut outs to allow emergency and transit vehicles to pass through unimpeded

SPEED LUMPS

Figure A-42.



Drawing is for visual reference only, not to scale.

RECOMMENDED DESIGN CRITERIA

Refer to the most recent Street Design Manual, California Manual on Uniform Traffic Control Devices, and Additional Resources for signage and/or additional design criteria.

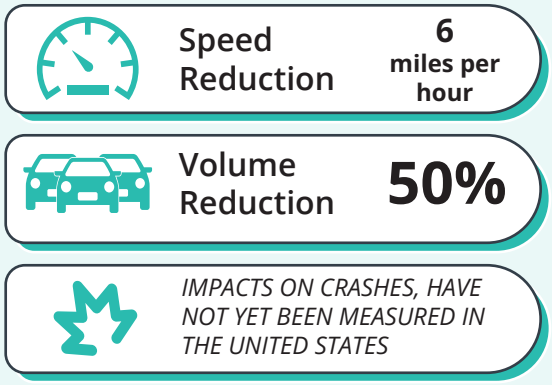
- **A** 8 foot typical, 6 foot minimum
- **B** 3 foot typical between cushions
- **C** 12 foot typical, 6 foot minimum
- **D** 2.5 foot minimum from curb
- **E** 6 foot typical, 3 foot minimum
- ***** 3.5 inch height (typical)

ADDITIONAL RESOURCES

Caltrans Traffic Calming Guide
California Manual on Uniform Traffic Control Devices
FHWA Traffic Calming ePrimer
NACTO Urban Street Guide: Speed Lump

TRAFFIC DIVERTER

Full or partial street closure to vehicular traffic while still allowing access for people walking and biking, and rolling. Diverters may use curb, bollards, or medians to limit vehicle through traffic. Partial diverters, a subset of traffic diverters, allow vehicles to exit the side street but not enter, restricting access without creating a one-way street.



Source: Caltrans Traffic Calming Guide

BENEFITS

- Reduces vehicle volumes on neighborhood streets and thereby improves safety of people walking, biking, and rolling by reducing their exposure
- Maintains bicycle and pedestrian access
- Removes some intersection conflicts

CONSIDERATIONS

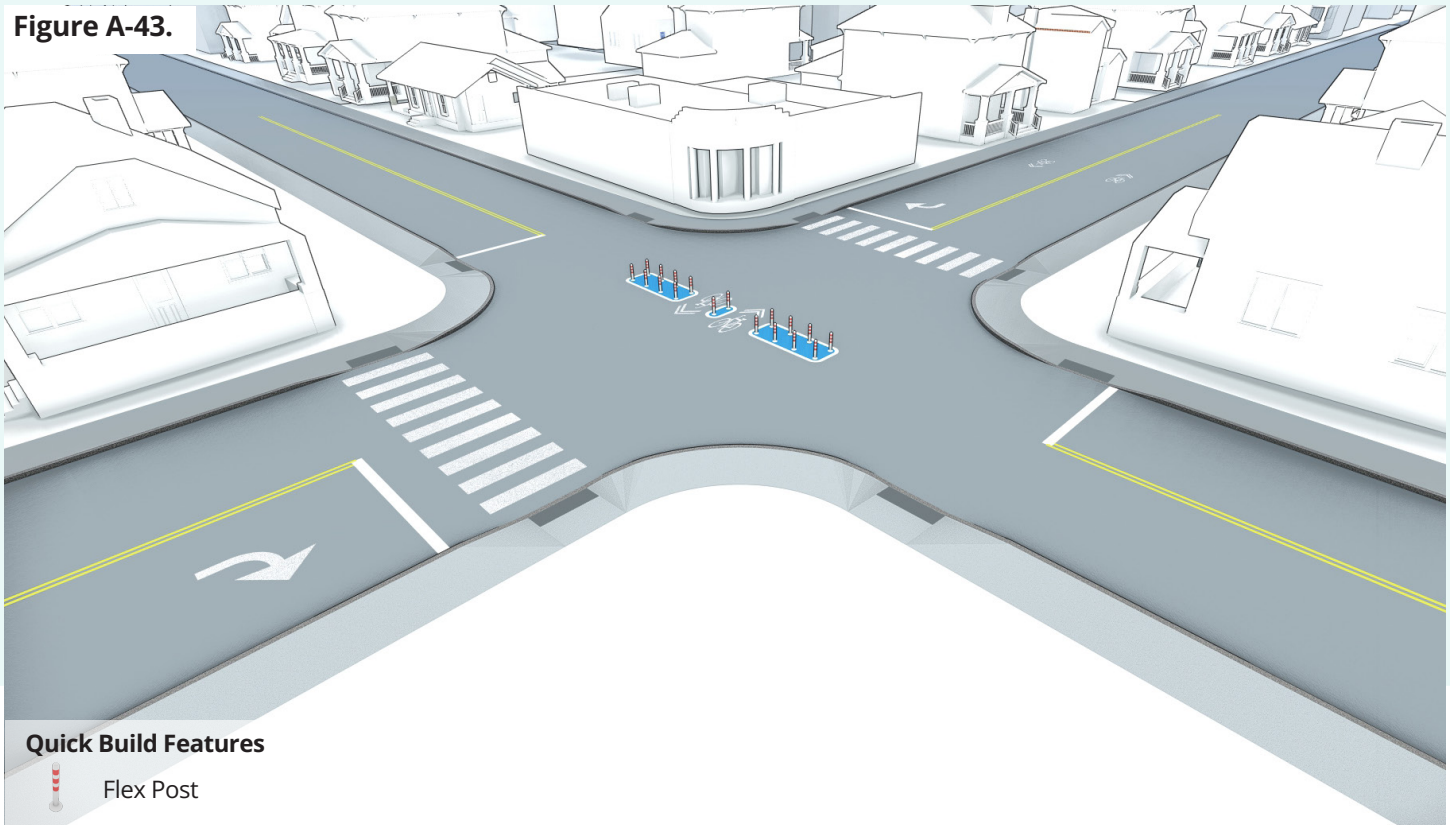
- May increase demand on neighboring streets
- Gaps in the median can accommodate bike through-travel
- Median barriers may be used to selectively force turns at both or only one minor approach, but prevent through-travel
- Consider impacts to school bus, transit, and trash pick-up operations

LOCATION GUIDANCE

FUNCTIONAL CLASS	Local (for closed leg)
VOLUMES	Less than or equal to 3,500 vehicles per day on minor / closed leg
SPEED LIMIT	Less than or equal to 25 miles per hour on minor / closed leg
CURB TO CURB WIDTH	No Minimum
NUMBER OF LANES	2 on minor / closed leg
EMERGENCY ROUTE	Not on minor / closed leg unless mountable median
TRANSIT ROUTE	Not on minor / closed leg
TYPE	Intersection
STREET CONTEXT	Neighborhood

TRAFFIC DIVERTER

Figure A-43.



COMPLEMENTARY FEATURES

Traffic diverters may be combined with additional features to increase their effectiveness, including:

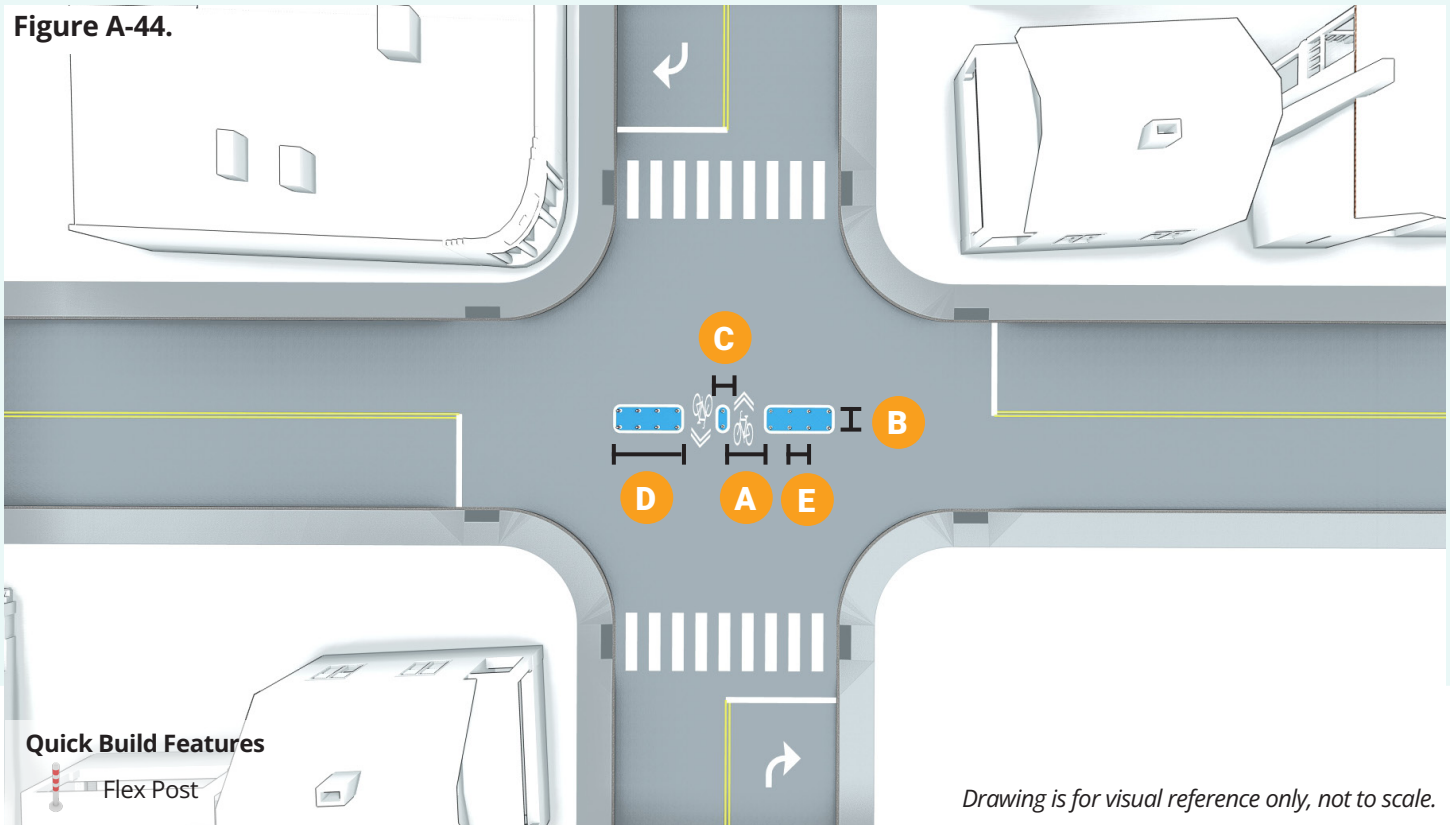
- Raising the bike and/or pedestrian crossing to curb level to improve visibility of people walking, biking, and rolling while slowing vehicle traffic; the entire intersection may also be raised
- Reflective markers can be used on the approach in place of KEEP RIGHT signs for additional guidance; see Section 31.02 of the California Manual on Uniform Traffic Control Devices

APPLICATION GUIDANCE

- Often implemented in conjunction with a bicycle boulevard where the corridor crosses a major arterial
- Applicable at signalized or unsignalized locations
- Appropriate signage including Right Turn Only is recommended to warn drivers of the closure
- Can be applied on roadway with on-street parking and/or a bicycle facility
- Should be designed to allow emergency vehicles to pass over or through
- Median diverters should provide a 6-10 foot refuge area for crossing bicyclists to wait for a gap in traffic (NACTO)
- Partial closure island may have a gap of 4-6 feet to allow access for bikes and for drainage to pass through the closed direction

TRAFFIC DIVERTER

Figure A-44.



Drawing is for visual reference only, not to scale.

RECOMMENDED DESIGN CRITERIA

Refer to the most recent Street Design Manual, California Manual on Uniform Traffic Control Devices, and Additional Resources for signage and/or additional design criteria.

- **A** 4 foot minimum, 6 foot preferred
- **B** 6 foot minimum, 10 foot preferred
- **C** If vertical, 2 foot minimum; If striped, N/A
- **D** 6 foot minimum, should be wide enough to block through traffic
- **E** 3-5 foot barrier spacing, 1 foot minimum on curves

ADDITIONAL RESOURCES

Caltrans Traffic Calming Guide
Caltrans HDM Topic 404
FHWA Traffic Calming ePrimer
NACTO Urban Street Design Guide: Temporary Street Closures

CROSSING ENHANCEMENTS

Crossing enhancements are treatments that increase the visibility of pedestrian and bicycle crossings, manage conflicts at intersections, and minimize delay for people walking and biking. These tools support safety and accessibility goals and requirements on both signalized and unsignalized streets.

UNSIGNALIZED CROSSING TREATMENTS



IN-STREET PEDESTRIAN CROSSING SIGNS

Installed at uncontrolled crossings to alert drivers to pedestrian right-of-way. These signs are placed on the centerline and are more noticeable than roadside signs. Yield rates can increase by 13–46% when used on streets with less than or equal to 30 miles per hour speed limits and three or fewer lanes.



GREEN-COLORED PAVEMENT OR CONFLICT MARKINGS

Used at intersections, driveways, or conflict zones to highlight where people biking cross paths with vehicles. These markings improve visibility and reinforce priority.

LOCATION GUIDANCE

These strategies are applied to signalized intersections to manage turning conflicts, prioritize nonmotorized users, and improve overall safety.



FOR RIGHT TURN CONFLICTS

LEADING PEDESTRIAN INTERVAL (LPI)

Gives people walking or biking a 3–7 second head start before parallel vehicle movements receive a green signal.

NO TURN ON RED

Restricts right turns during red signals to reduce conflicts with crossing pedestrians and bicyclists. Often paired with LPIs or exclusive pedestrian phases.

DELAYED TURN / LEADING THROUGH INTERVAL (LTI)

Holds right-turning drivers for 7–13 seconds while through vehicles proceed, allowing pedestrians and bicyclists to begin crossing. Requires an exclusive right-turn lane.



FOR LEFT TURN CONFLICTS

PROTECTED-ONLY LEFT TURNS

Prohibits unprotected left turns across pedestrian and bicycle crossings. Especially important on wide streets with multilane approaches.



FOR ALL CONFLICTS

EXCLUSIVE PEDESTRIAN AND BICYCLE PHASES

All vehicle traffic is stopped to allow people walking, biking, and rolling to cross in all directions. Useful in high-activity pedestrian or transit areas but may increase signal delay for all users.

REST IN RED

Keeps the signal in red for vehicle movements between cycles, holding vehicles until pedestrian or bicycle demand is detected or until the next scheduled phase. Useful for low-volume side streets and minor movements.



MINIMIZING DELAY FOR PEOPLE WALKING AND BIKING

PEDESTRIAN RECALL

Automatically provides a walk signal each cycle without requiring a push button.

REST IN WALK

Extends the walk interval during green phases to maximize crossing time and reduce pedestrian delay.