5 The Roadway Zone

5.1. Creating the Roadway Zone

The Roadway Zone is the portion of the ROW between the curbs that may contain elements from the Flex Zone, Vehicle Zone, and Median Zone. Its primary function is to promote a safe and enjoyable environment for a variety of users to travel or park. Roadway users primarily entail those driving or riding in personal or shared vehicles, transit riders, micromobility riders, and people on bikes.

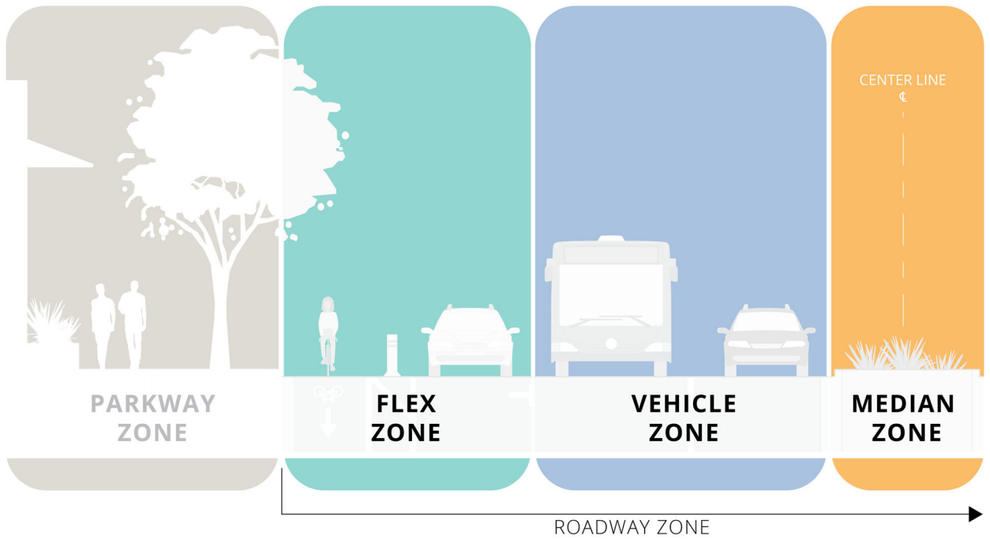

FIGURE 5-1 ROADWAY ZONE

5.2. Roadway Zone Standards and Guidelines

- Streets shall be paved with asphalt concrete over cement-treated base, concrete, or full-depth asphalt concrete in accordance with the City's Standard Drawings or with a comparable structural section approved by the City Engineer or designee.
- The same pavement section is required in shoulders as well as driving lanes, except for rural road classifications.
- PCC pavement is required for streets with grades greater than 12 percent.
- Rolled curbs are not permitted on publicly dedicated streets, except that rolled or mountable curbs may be permitted in situations such as centers of roundabouts. Rolled curb may be used on private drives where the grade does not exceed 5 percent.
- Emergency vehicle access routes and requirements must be adhered to as shown in Figures 5-2, 5-3, and 5-4. Fire apparatus access roadways shall not have less than 20 feet of unobstructed width, shall have an adequate roadway turning radius of 40 feet, and shall have a minimum vertical clearance of 13 feet 6 inches per the Development Services approval process. When adjacent to a fire hydrant or if an adjacent building exceeds 30 feet in height, fire apparatus access roadways shall not have less than 26 feet of unobstructed width. Access should be coordinated with property access routes. See City of San Diego FPB Policy A-14-1 for additional guidance, standards, and exceptions.
- The required width of emergency vehicle access roadways shall not be obstructed in any manner, including the parking of vehicles. Where no space is provided for parking along access roadways, they shall be kept clear by the posting of signs or the painting of curbs. See City of San Diego FPB Policy A-14-1 for additional guidance, standards, and exceptions.
- Most design details, location requirements, pavement structural section computations, and construction methods are included in the latest edition of the City's Standard Drawings, "Greenbook", and "Whitebook".
- Curb-to-curb width is the distance from face-of-curb to face-of-curb, as shown in the San Diego Regional Standard Drawings, and the City's Standard Drawings.
- Drainage Improvements may be required for streets with unique roadway alignments or pre-existing drainage problems. Street drainage is covered in detail in the Drainage Design Manual and Stormwater Standards.
- Engineers are cautioned that use of stamped concrete for pavement surfaces in residential areas may cause adverse community reaction due to noise where the roadway is immediately adjacent to dwelling units.

5.2.1 New Development versus Retrofit

In addition to the guidelines outlined above, these guidelines and standards describe the opportunities for roadway improvements for new and retrofit streets.

The following considerations apply to new or retrofitted ROW:

- Parallel routes serving all forms of traffic should be considered when resulting curb-to-curb width may not accommodate all forms of traffic (e.g., a dedicated bicycle or transit lane, a parking lane, or a travel lane).
- Neighborhoods evolve over time and the public ROW configuration has an influence as to what type of development occurs.
- All impacts to surface drainage should be evaluated and managed accordingly.

The following considerations apply to retrofitted ROW:

- The dimensions of existing roadways can be increased either through the acquisition of additional ROW or increasing setback requirements for new development. If the curb-to-curb width is increased, the existing level of pedestrian accommodation must be maintained or enhanced.
- The dimensions of existing curb-to-curb roadway width can be reduced to create additional pedestrian space, by decreasing the width of travel lanes or other street features, such as medians, where applicable. An alternative to reducing lane width could be to revise the parking from parallel to diagonal or removing a travel lane, which slows speeds and creates opportunities for an improved pedestrian environment.
- Prior to improvements to an existing street, utilities (e.g., lighting, electrical, and storm drains) should be identified and either incorporated into the design or relocated to provide access as required by the ADA and California Title 24 regulations.

The following considerations should be made for new ROW:

- For new road design, all current rules, regulations, standards, and City policies apply.
- New streets must consider the needs of all users in determining ROW width.
- Locate and design new streets to respect the natural environment, scenic character, and community character of the area traversed; and meet safety standards.
- A new street should be a safe system with vulnerable road users separated from high-speed vehicles.

5.2.2 Emergency Vehicles and Access

In the state of California, drivers must yield the right-of-way to any emergency vehicle using a siren and red lights and shall immediately drive to the right-hand edge or curb of the highway, clear of any intersection, and thereupon shall stop and remain stopped until the authorized emergency vehicle has passed. Roadways, in turn, must be equipped to contend with the challenges inherent in emergency situations, such as the need to accommodate emergency vehicles with large turning radii. To complicate this, well-rounded street design often involves interventions that make it more difficult to make space for emergency vehicles to pass. Therefore, special guidelines must be considered when designing roadways that accommodate emergency vehicles while balancing the daily needs of all road users.

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Considerations

- Lane reduction projects with center turn lanes, median bus lanes, and offset bus lanes all provide a lane for emergency vehicles to use in congested conditions.
- The impact of raised crosswalks, raised intersections, corner bulb outs, speed humps, speed tables and raised medians on the operational needs of transit buses and emergency vehicles should be considered.
- Trucks and buses are wider and have longer wheelbases and greater minimum turning radii. These are the principal characteristic dimensions affecting horizontal roadway design.
- Consider emergency vehicle response routes when planning roadway upgrades.
- Large emergency vehicles may be able to traverse higher curbs, medians and truck aprons. Designers should consider traversable heights of standard emergency vehicles when designing safe intersections.
- Road lumps have been developed specifically to accommodate fire vehicles. It should be considered in qualified locations where mobility of fire vehicles is a high priority.

Standards and Guidelines:

- Emergency vehicle access routes, fire access setback distances, and their requirements must be adhered to as shown in Figures 5-2, 5-3, 5-4 and the following:
    - Fire apparatus access roadways shall not have less than 20 feet of unobstructed width, shall have an adequate roadway turning radius, and shall have a minimum vertical clearance of 13 feet 6 inches per the Development Services approval process.
    - When adjacent to a fire hydrant or if an adjacent building exceeds 30 feet in height, fire apparatus access roadways shall not have less than 26 feet of unobstructed width.
    - The fire access setback distance shall be no less than 15 feet and no greater than 30 feet from the building to ensure the ability to position an aerial ladder to one entire side of the building. The setback distance can include the entire Parkway Zone and Flex Zone (if emergency cannot access the Flex Zone). See City of San Diego FPB Policy A-14-1 for additional guidance, standards, and exceptions.

- The required width of emergency vehicle access roadways shall not be obstructed in any manner, including the parking of vehicles. Where no space is provided for parking along access roadways, they shall be kept clear by the posting of signs or the painting of curbs.
- Promenades must accommodate access for emergency vehicles, usually by using street furniture that can be moved to make way for emergency vehicles.
- Design of landscaped medians must account for impacts on emergency vehicle movement and access.
- Diverters may affect access for emergency vehicles; designs that allow emergency vehicle access are required and should be coordinated with emergency responders. Diverters should be designed flexibly with mountable curbs to allow emergency vehicles to traverse them.

- Multi-purpose paths should be designed with sufficient surfacing structural depth for the subgrade soil type to support maintenance and emergency vehicles. Where the path must be constructed over a very poor subgrade (wet and/or poor material), treatment of the subgrade with lime, cement or geotextile fabric should be used.

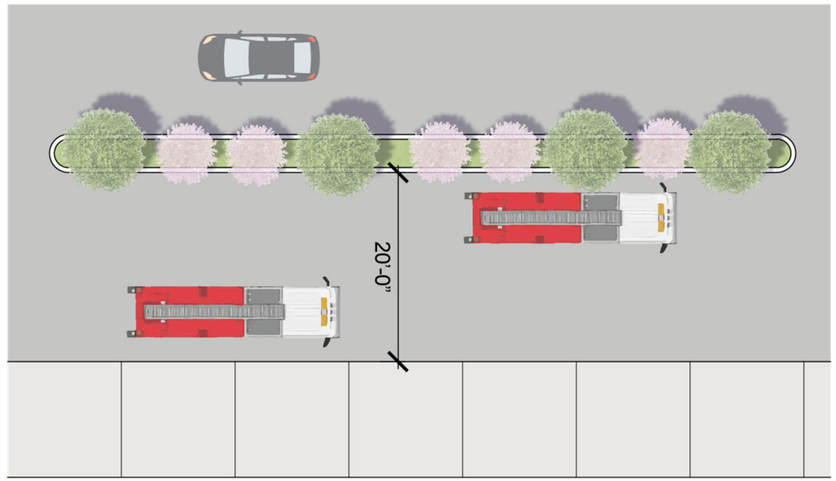

FIGURE 5-2 FIRE ACCESS UNOBSTRUCTED WIDTH OF 20 FT

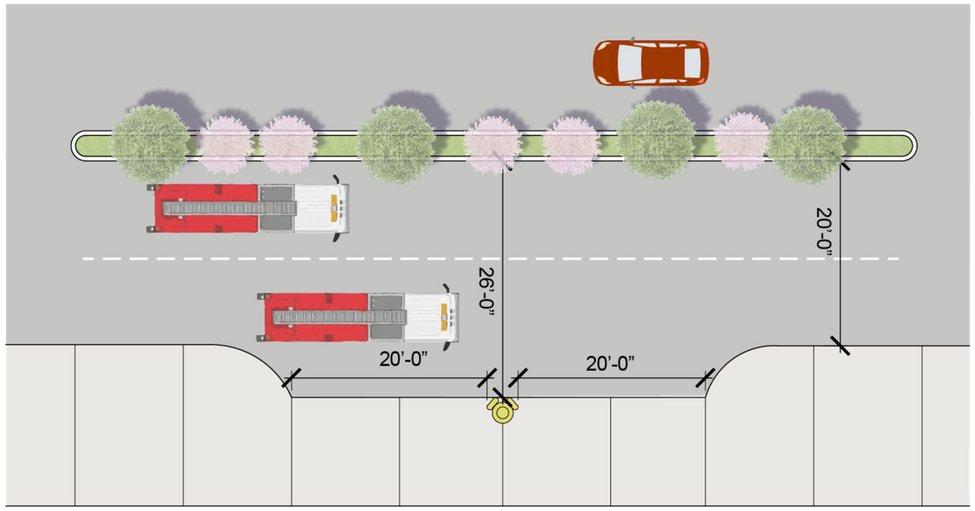

FIGURE 5-3 FIRE ACCESS UNOBSTRUCTED WIDTH OF 26 FT ADJACENT TO FIRE HYDRANT

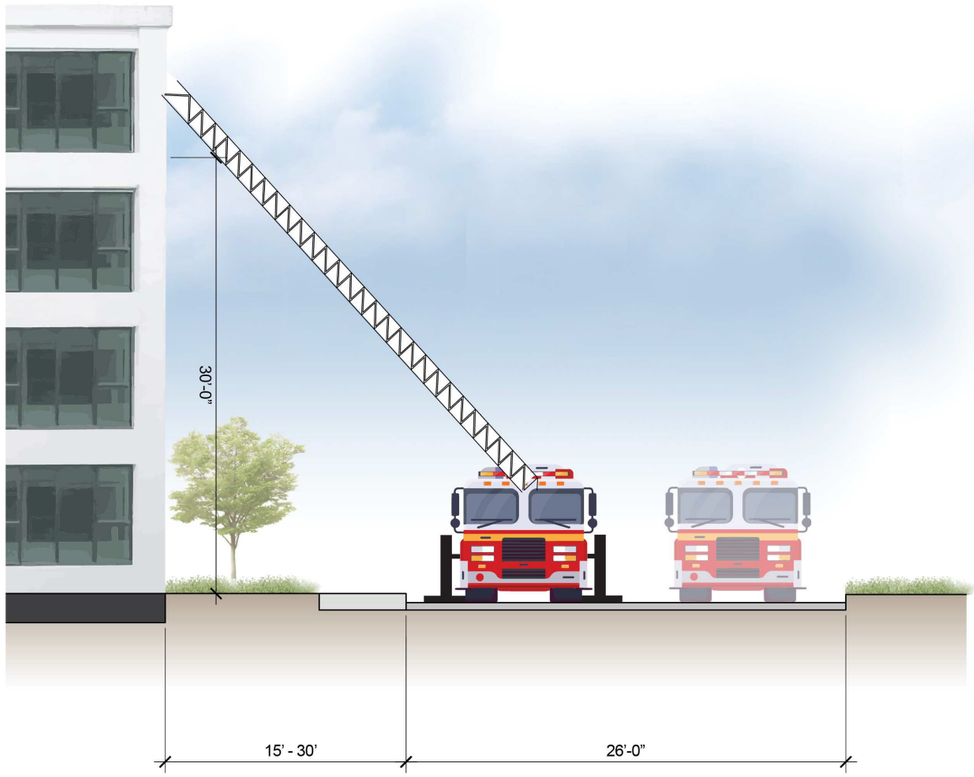

FIGURE 5-4 FIRE ACCESS SETBACK DISTANCE

Note: The area within the Fire Access Setback distance can include various treatments such as cycle tracks and parking.

Standards and Guidelines:

- Emergency vehicle access routes, fire access setback distances, and their requirements must be adhered to as shown in Figures 5-2, 5-3, 5-4 and the following:

    - Fire apparatus access roadways shall not have less than 20 feet of unobstructed width, shall have an adequate roadway turning radius, and shall have a minimum vertical clearance of 13 feet 6 inches per the Development Services approval process.
    - When adjacent to a fire hydrant or if an adjacent building exceeds 30 feet in height, fire apparatus access roadways shall not have less than 26 feet of unobstructed width.
    - The fire access setback distance shall be no less than 15 feet and no greater than 30 feet from the building to ensure the ability to position an aerial ladder to one entire side of the building. The setback distance can include the entire Parkway Zone and Flex Zone (if emergency cannot access the Flex Zone). See City of San Diego FPB Policy A-14-1 for additional guidance, standards, and exceptions.

- The required width of emergency vehicle access roadways shall not be obstructed in any manner, including the parking of vehicles. Where no space is provided for parking along access roadways, they shall be kept clear by the posting of signs or the painting of curbs.
- Promenades must accommodate access for emergency vehicles, usually by using street furniture that can be moved to make way for emergency vehicles.
- Design of landscaped medians must account for impacts on emergency vehicle movement and access.
- Diverters may affect access for emergency vehicles; designs that allow emergency vehicle access are required and should be coordinated with emergency responders. Diverters should be designed flexibly with mountable curbs to allow emergency vehicles to traverse them.
- Multi-purpose paths should be designed with sufficient surfacing structural depth for the subgrade soil type to support maintenance and emergency vehicles. Where the path must be constructed over a very poor subgrade (wet and/or poor material), treatment of the subgrade with lime, cement or geotextile fabric should be used.

References:

- FPB Policy A-14-1 "Fire Access Roadways", City of San Diego Fire-Rescue Dept, 2015
- Traffic Calming ePrimer, Module 5: Effects of Traffic Calming Measures on Non-Personal Passenger Vehicles, FHWA, n.d.

5.3. Flex Zone

The Flex Zone encompasses the region of the right of way (ROW) between the Parkway Zone and the Vehicle Zone. Various features can be placed in the Flex Zone depending on community needs, surrounding land uses, and the roadway classification. These features include parklets, bicycle facilities, transit facilities, on-street parking, passenger and loading zones, and accommodation for emergency vehicles.

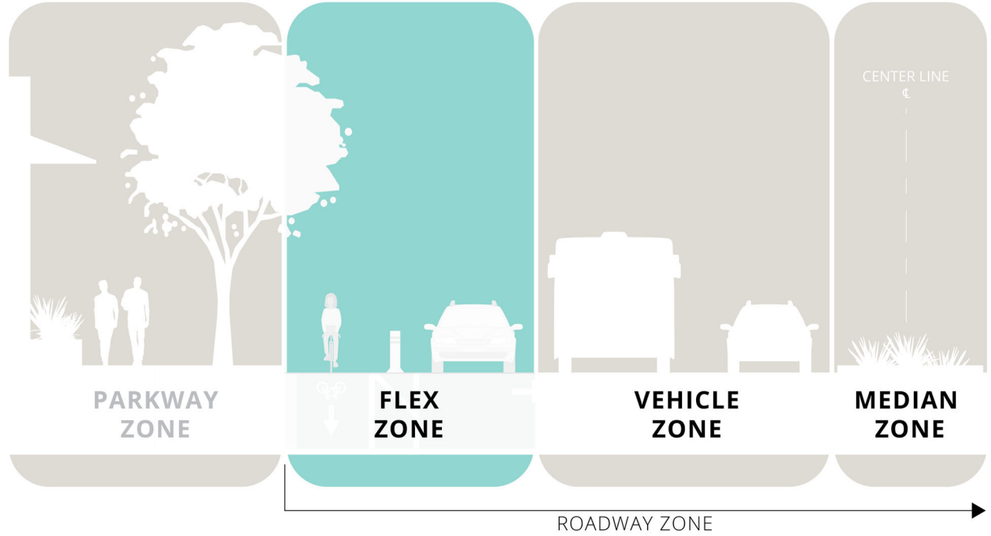

FIGURE 5-5 FLEX ZONE

5.3.1 Pedestrian Plazas, Parklets, and Streetaries

Streetaries are outdoor spaces created in street space formerly dedicated to parking spaces that serve as an extension of a restaurant or other establishment that sells food and drink.

Similarly, Pedestrian Plazas (also known as “parklets”) transform one or two curbside parking spaces into an active, vibrant, and accessible public space. They typically incorporate benches, tables, landscaping, and/or bicycle parking on a platform that is flush with the sidewalk. Parklets are sponsored, installed, and maintained by a community partner such as a neighborhood or business group. See the Spaces as Places Manual for additional information.

Benefits:

- Pedestrian Plazas are publicly accessible to all and are intended to provide a space for enjoyable public interaction.
- Pedestrian Plazas foster a more walkable, pedestrian-friendly environment, and offer additional seating areas for pedestrians and patrons of the surrounding businesses.

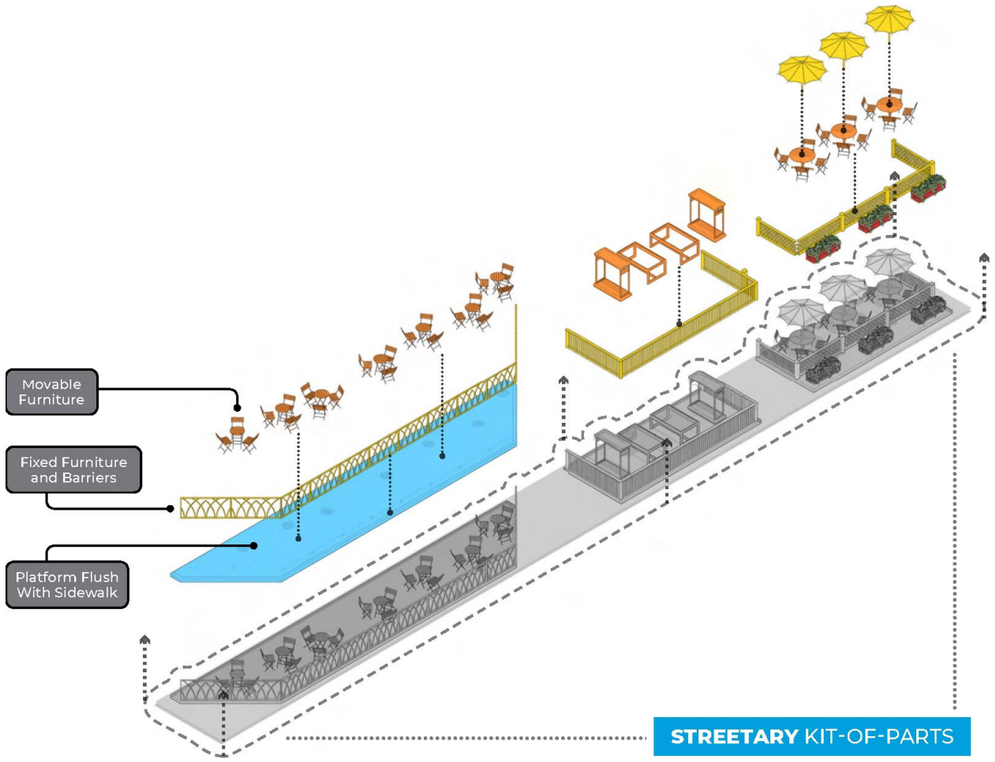

FIGURE 5-6 STREETARY

Source: Spaces as Places Design Manual

Considerations:

- Pedestrian Plazas should not be located on streets where the grade along the street exceeds a maximum running slope of 5% or a maximum cross slope of 2%.
- If a Pedestrian Plaza will be placed where an existing parking meter is located, the applicant will be required to pay the costs for the City to remove the parking meter. When the pedestrian plaza is removed, the applicant will then be required to pay for the reinstallation of the parking meter.
- The City Engineer may require removal of a Pedestrian Plaza if a Pedestrian Plaza is not used or maintained as intended, if it is determined to be a public safety hazard or public nuisance, or if use of the space is needed for another purpose.
- Pedestrian Plazas shall not interfere with the use of designated blue zone parking spaces; curb ramps; Metropolitan Transit System (MTS) stops or other access features of the public right-of-way.
- Pedestrian Plazas, Parklets, and Streetaries shall be designed and constructed to be accessible to all individuals therefore, shall comply with all applicable provisions of the access law for entry, dining, seating, etc.

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- Street trees must be considered, including vacant sites where street trees have previously existed. Trees must be protected in place and no new installations shall be closer than 6 feet from the base of existing street trees. Installations must avoid tree damage, including tree root systems. Vacant sites must be replanted with trees and may not be covered or paved in.
- Standards for streetaries, including location, design, accessibility, stormwater, and fire code requirements can be found in the Spaces as Places Design Manual and in Chapter 14, Article 1, Division 6, Section 141.0612 of the City of San Diego Municipal Code.

References:

- Information Bulletin 565: Pedestrian Plaza, City of San Diego Development Services Dept, 2020
- Municipal Code §141.0612, City of San Diego, n.d.
- Spaces as Places Design Manual, City of San Diego City Planning Dept, 2023

5.3.2 Bikeways

Bikeways are to be provided in accordance with adopted community plans and the City's Bicycle Master Plan and should be continuous, leading to all major activity centers. Bikeway design will reference the Caltrans Highway Design Manual, CA MUTCD, AASHTO Guide for the Development of Bicycle Facilities, NACTO Urban Bikeway Design Guide, and the City of San Diego Bicycle Facility Design Guidelines in order to promote safer and more attractive bikeway facilities.

5.3.3 Bicycle Facilities

Bicycle facilities are typically provided within the Flex Zone and provide space for cyclists and other micromobility users to travel safely separated from pedestrians and motor vehicles. Bicycle facilities do not contribute to minimum parkway widths even if at the same grade as the parkway.

Multi-use or off-street paths, typically designated as Class I facilities can be found in Chapter 4, "Off-street Non-vehicular Treatments".

Incorporating appropriate bicycle facilities is a crucial element in creating a complete street that supports all modes of travel. The selection of the bicycle facility ensures that cyclists are safely and efficiently integrated into the street environment. Prioritizing bike facility selection fosters a more inclusive and sustainable transportation system, which aligns with the goals of a Complete Street.

Caltrans Design Information Bulletin 94 Complete Streets: Contextual Design Guidance (DIB-94) recommends the following bicycle facilities based on the posted speed limit and average daily traffic.

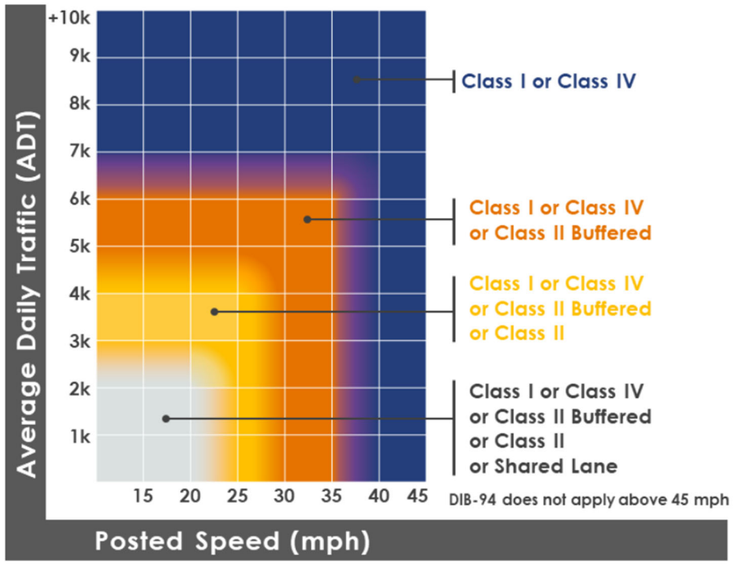

FIGURE 5-7 RECOMMENDED BICYCLE FACILITIES

Source: Caltrans' Design Information Bulletin 94 – Complete Streets

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5.3.3.1 Class II Bike Lane

Bike lanes are defined by pavement striping and signage used to allocate a portion of a roadway for exclusive or preferential bicycle travel. Bike lanes are one-way facilities on either side of a roadway. Whenever possible, Bike Lanes should be enhanced with treatments that improve safety and connectivity by addressing site-specific issues, such as additional warning or wayfinding signage.

Benefits:

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

Considerations:

- On streets with heavy bicycle traffic, wider bike lanes should be considered in order to allow faster moving bicyclists to pass slow moving bicyclists.
- Left-side bike lanes should be considered on one-way arterial streets if significant transit service is present on the right-most travel lane. Contraflow bike lanes can be considered on the left side of one-way streets.

Standards and Guidelines:

- White line separating vehicle lane from bike lane must be 6″; White line separating bike lane from parking lane must be 4″.
- 5 feet shall be the minimum width of bike lane where parking stalls are marked.
- On streets with on-street parking, if parking volume is substantial or turnover high, an additional one to two feet of width is desirable.
- Wider bike lanes are desirable in certain circumstances such as on higher speed arterials (45 mph+) where a wider bike lane can increase separation between passing vehicles, parked vehicles and bicyclists.

References:

- Bicycle Master Plan, City of San Diego, 2013
- Highway Design Manual, 7th ed., Caltrans, 2020

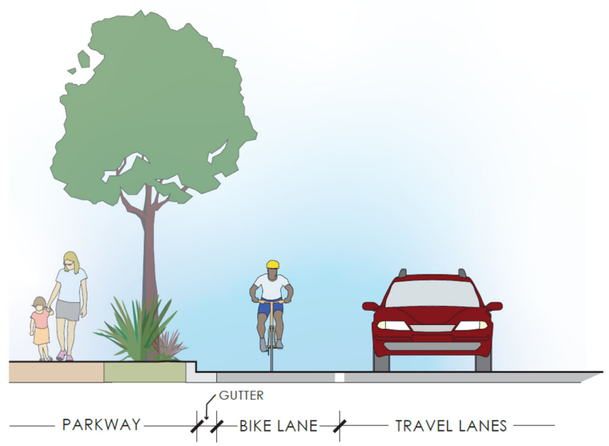

FIGURE 5-8 CLASS II BIKE LANE SECTION VIEW

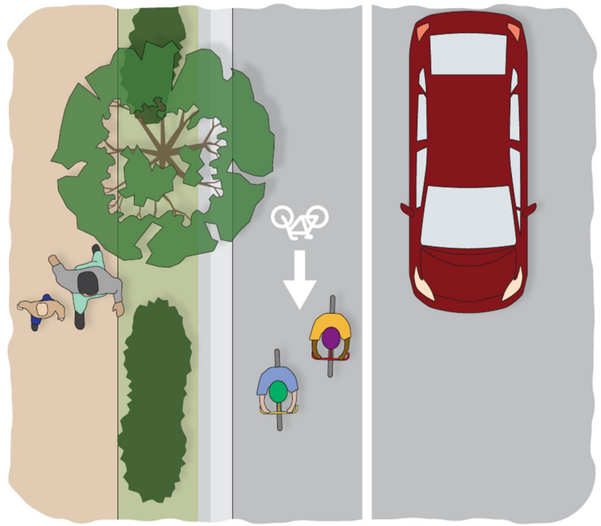

FIGURE 5-9 CLASS II BIKE LANE PLAN VIEW

Facility	Bike Lane [1]
Preferred	7′
Minimum	5′
Maximum	8′

TABLE 5-1 CLASS II BIKE LANE DIMENSIONS

Note:

1. Bike Lane width should exclude the width of the gutter pan, if adjacent.

5.3.3.2 Class II Buffered Bike Lane

Buffered bike lanes are conventional bike lanes paired with a designated buffer space separating the bike lane from the adjacent motor vehicle travel lane and/or parking lane. A buffered bike lane is allowed as per CA MUTCD guidelines for buffered preferential lanes (Section 3D-01).

Benefits:

- Provides greater shy distance between motor vehicles and bicyclists.
- Provides space for bicyclists to pass another bicyclist without encroaching into the adjacent motor vehicle travel lane.
- Encourages bicyclists to ride outside of the door zone when buffer is between parked cars and bike lane.
- Appeals to a wider cross-section of bicycle users.

Considerations:

- Buffer striping may require additional maintenance when compared to a conventional bike lane.
- If trenching is to be done in the bike lane, the entire bike lane should be repaved so that there is not an uneven surface or longitudinal joints.

Standards and Guidelines

- Minimum buffer width is 2 feet and should be tapered at the beginning of the bike lane.
- The buffer area should have diagonal markings or chevron markings if 4 feet or wider. The chevron or diagonal markings may be omitted from bicycle lane buffer areas less than 4 feet wide.
- Bike lane word and/or symbol and arrow markings (CA MUTCD Figure 9C-3) shall be used to define the bike lane and designate that portion of the street for preferential use by bicyclists.
- The combined width of the buffer(s) and bike lane should be considered “bike lane width” with respect to guidance given in other documents that don’t recognize the existence of buffers.

References:

- CA MUTCD Rev. 8, Caltrans, 2024
- Urban Bikeway Design Guide, NACTO, 2014

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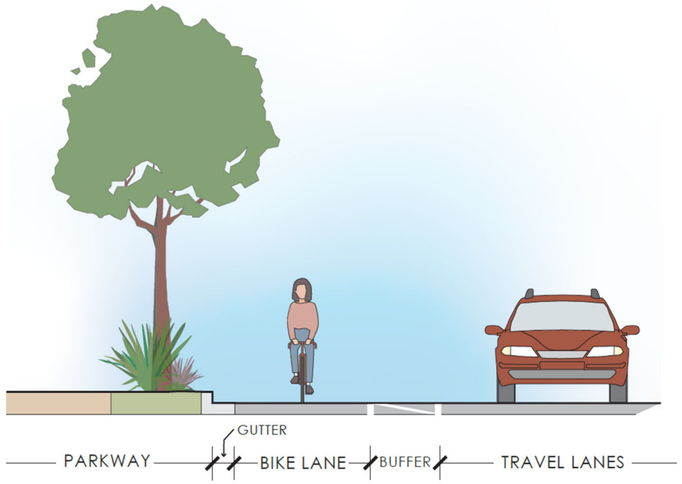

FIGURE 5-10 CLASS II BICYCLE BUFFERED BIKE LANE SECTION VIEW

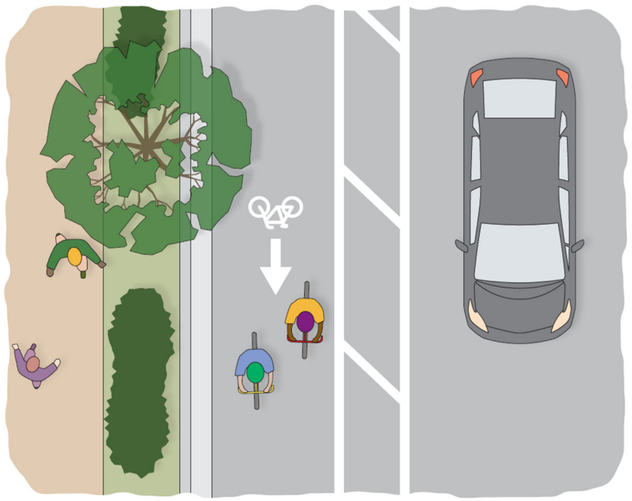

FIGURE 5-11 CLASS II BUFFERED BIKE LANE PLAN VIEW

Facility	Bike Lane [1]	Buffer
Preferred	7′	3′
Minimum	5′	2′
Maximum	8′	4′

TABLE 5-2 CLASS II BUFFERED BIKE LANE DIMENSIONS

Notes:

1. *Bike Lane width should exclude the width of the gutter pan, if adjacent.*

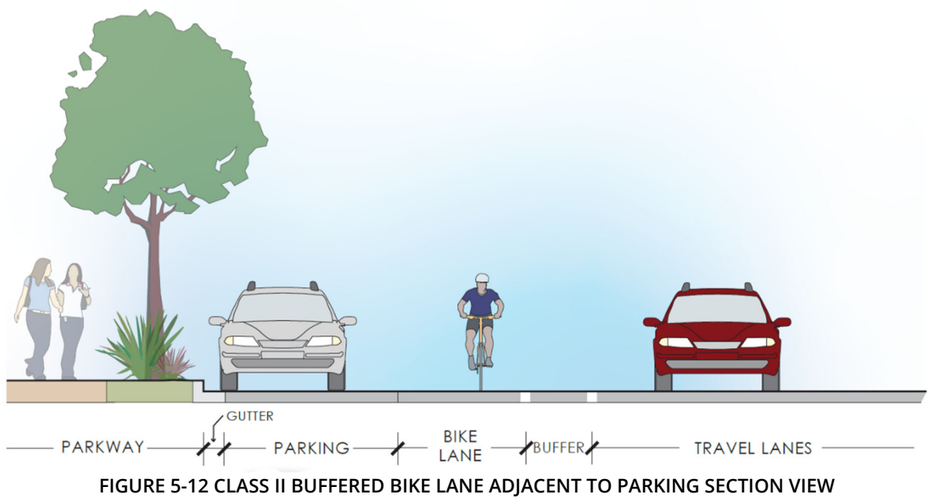

FIGURE 5-12 CLASS II BUFFERED BIKE LANE ADJACENT TO PARKING SECTION VIEW

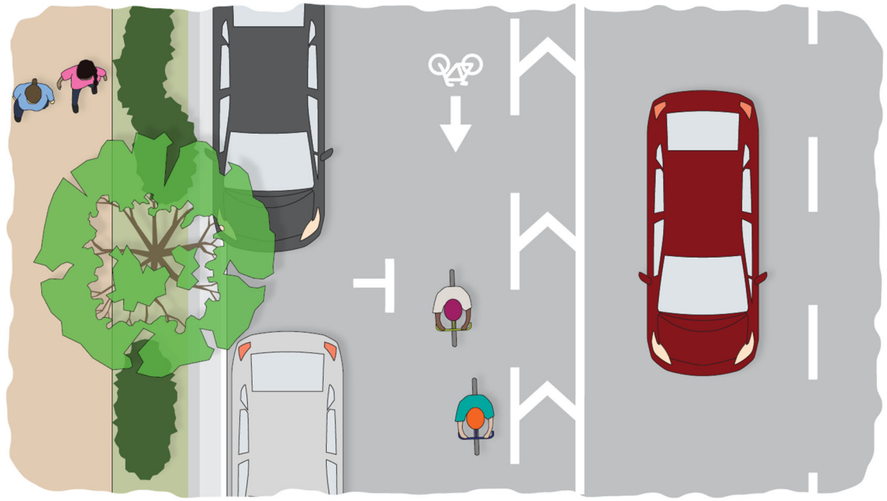

FIGURE 5-13 CLASS II BUFFERED BIKE LANE ADJACENT TO PARKING PLAN VIEW

Facility	Buffer [1]	Bike Lane	Buffer
Preferred	3′	7′	3′
Minimum	-	5′	2′
Maximum	-	8′	4′

TABLE 5-3 CLASS II BUFFERED BIKE LANE ADJACENT TO PARKING DIMENSIONS

Notes:

1. *Optional buffer. If adjacent to angle parking, preferred buffer width between the bike lane and travel lane is 4 ft.*

5.3.3.3 Class III Bike Routes

Class III Bike Routes are shared facilities within travel lanes which either provide continuity to other bicycle facilities or designate networks on low volume/low speed connecting streets.

Benefits:

- May help to raise the visibility of bicyclists on streets.
- May help to encourage bicyclists to use the full lane, which could help prevent injuries that occur when bicyclists collide with open car doors in adjacent on-street parking facilities.

Considerations:

- Sharrows should not be installed on high-speed or high-volume streets.
- Routes should be signed only if any of the following apply:
    - They provide for through and direct travel in bicycle-demand corridors.
    - Connect discontinuous segments of bike lanes.
    - They provide traffic actuated signals for bicycle and appropriate assignment of right of way at intersections to give greater priority to bicyclists, as compared with alternative streets.
    - Street parking has been removed or restricted in areas of critical width to provide improved safety.
    - Surface imperfections or irregularities have been corrected (e.g., utility covers adjusted to grade, potholes filled, etc.).

Guidelines:

- Senate Bill 1216 (2024) prohibits the use of new sharrows on a roadway that has a posted speed limit greater than 30 mph where bicycle travel is permitted.
- Existing sharrows shall not be replaced on repaved roadways with a posted speed limit greater than 30 mph.
- For application and placement of shared roadway markings and bike route signs, see the CA MUTCD Sections 9B and 9C.
- Minimum widths for Class III bikeways are represented in the minimum standards for highway lanes and shoulder in the California MUTCD.
- Bike routes should be installed in concert with traffic calming mechanisms to increase safety. See Chapter 5.8, “Traffic Calming” for more information.

References:

- CA MUTCD Rev. 8, Caltrans, 2024

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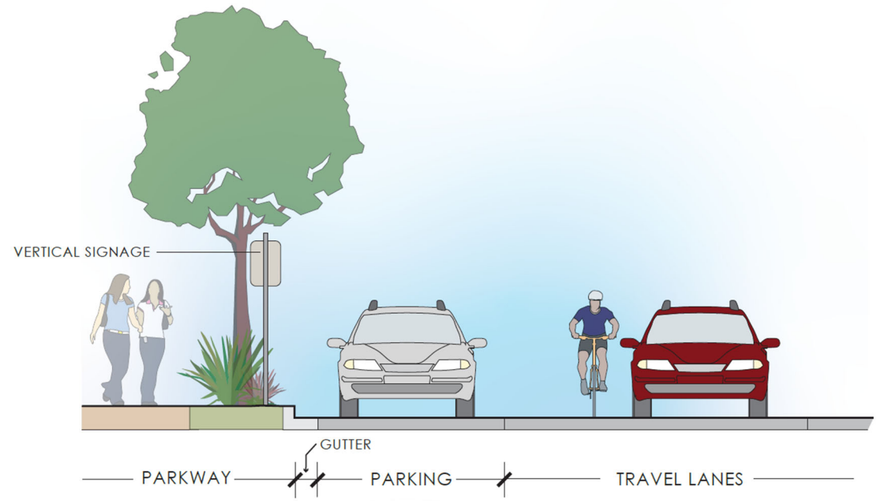

FIGURE 5-14 CLASS III BIKE ROUTE SECTION VIEW

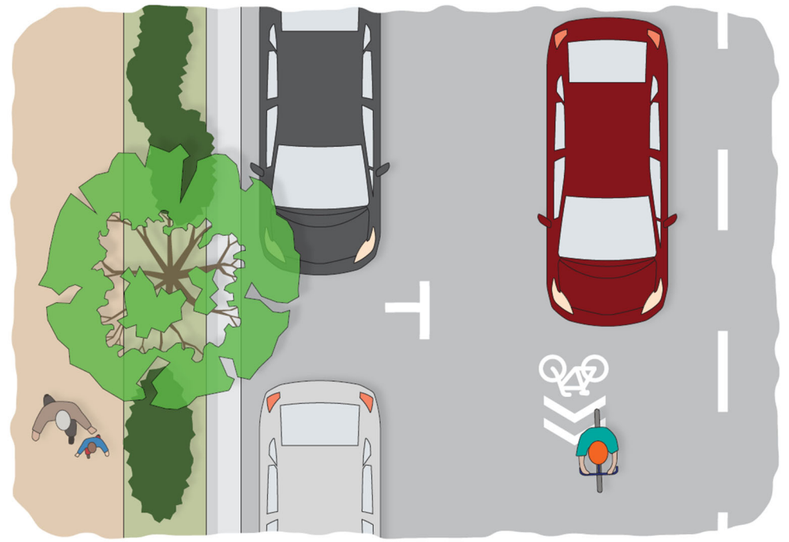

FIGURE 5-15 CLASS BIKE ROUTE PLAN VIEW

5.3.3.4 Bicycle Boulevard

Bicycle Boulevards are bike routes on low volume, low speed local streets that prioritize bicycle movement. Traffic calming is typically used to discourage drivers from using the street as a circulation route. Bike boulevards provide continuous comfortable bicycle routes through the local street network. Directional markings and wayfinding signage provide riders with intuitive, coherent routing.

Benefits:

- Can benefit residents from reduced vehicle speeds and through traffic due to traffic calming measures.
- Provides comfortable route for bicyclists to utilize the full lane.

Considerations:

- With the presence of traffic calming measures, emergency vehicle access should be considered. Refer to Section 5.2.2 "Emergency Vehicles and Access" for more information.

Guidelines:

- Less than 3,000 ADT and an 85th percentile speed of no more than 25 mph, 20 mph preferred.
- Bicycle wayfielding signs and pavement marking shall be included to distinguish a bike boulevard from a bike route.
    - For application and placement of shared roadway markings and bike route signs, see the California MUTCD Sections 9B and 9C.
- Any centerline striping shall be removed, except at controlled intersection approaches.
- Bike routes should be installed in concert with traffic calming mechanisms to increase safety. See Chapter 6.8, "Traffic Calming" for more information.
- Like Class III Bike Routes, minimum widths for bike boulevards are represented in the minimum standards for highway lanes and shoulder in the California MUTCD.

References:

- Bikeway Selection Guide, FHWA, 2019
- Urban Bikeway Design Guide, NACTO, 2014

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5.3.3.5 Class IV Separated Bikeways General Notes

Separation for bicycle facilities can take many forms varying in cost, ease of installation, durability, and aesthetics.

Benefits:

- Provides physical separation for people on bikes.
- Provides increased confidence in personal safety for cyclists, which increases the range of potential users for the bicycle facilities.

Considerations:

- All physical barriers have the potential to impact drainage and emergency vehicle access and should be evaluated accordingly.
- Flexible delineator posts are one of the most popular types of separation elements due to their low cost, visibility, and ease of installation. However, their durability and aesthetic quality can present challenges and agencies may consider converting these types of buffers to a more permanent style when design and budgets allow. Delineators can be placed in the middle of the buffer area or to one side or the other as site conditions dictate (such as street sweeper width or vehicle door opening).
    - Separated bikeways using fixed barriers can make it difficult to provide adequate fire access setbacks distance (15-30') for buildings exceeding 30' in height. Flexible pylons can be driven over in an emergency and allow more flexibility for emergency access as opposed to parking or other immovable barriers.
- Raised median concrete curbs can either be cast in place or precast. This type of buffer element is more expensive to construct and install but provides a continuous raised buffer that is attractive with little long-term maintenance required. Mountable curbs are an option where emergency vehicle access may be required.
- Concrete barriers provide the highest level of crash protection among these separation types. They are less expensive than many of the other treatments and require little maintenance. However, this barrier type may be less attractive and may require additional drainage and service vehicle solutions. A crash cushion must be installed where the barrier end is exposed.
- Bollards are a rigid barrier solution that provides a strong vertical element to the buffer space. Depending on how closely the bollards are placed apart, this form of separation may result in an increased cost compared to others and may not be as appropriate on higher speed streets.
- Planters provide an aesthetic element to the streetscape, a suitable vertical barrier, and are quick to install. However, depending on the placement, this treatment is more expensive than other solutions, requires maintenance of the landscaping, and may not be as appropriate on higher speed streets.
- Parking stops, miniature speed humps, and similar low linear barriers are inexpensive buffer solutions that offer several benefits. These barriers have a high level of durability, can provide

near continuous separation, and are a good solution when minimal buffer width is available. However, using the minimum width will not provide the same level of comfort and protection due to their low height and bicyclists' proximity to traffic. These can be combined with flexible delineator posts to create an enhanced barrier.

- While not a barrier type on its own, parked cars can provide an additional level of protection and comfort for bicyclists. Additional guidance and standards can be found in Section 5.3.5.5, "Floating Parking."
- Separation types can be used in combination to realize the full benefits of several treatments at a lower overall cost. For example, delineator posts can be alternated with parking stops or other low, linear barriers to provide both horizontal and vertical elements. Planters or rigid barriers and bollards may be used at the start of a block to more clearly identify the separated bike lane and provide an aesthetic treatment, with more inexpensive treatments used midblock.
- Raised cycle tracks may be at the level of the adjacent sidewalk or set at a level between the roadway and sidewalk to separate the cycle track from the sidewalk. A raised cycle track may be combined with a parking lane or other barrier between the cycle track and the vehicle travel lane. Refer to DIB 89-02 for more information.

Guidelines:

- Asphalt concrete berms should be included when there is parking allowed on grades where vehicles are required to turn the wheels towards the curb.

References:

- CA MUTCD Rev. 8, Caltrans, 2024
- DIB 89-02 "Class IV Bikeway Guidance", Caltrans, 2022

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5.3.3.6 Class IV One-Way Cycle Track

A Cycle Track is a hybrid type bicycle facility that combines the experience of a separated path with the on-street infrastructure of a conventional Bike Lane.

Cycle tracks are bikeways located in roadway right-of-way but separated from vehicle lanes by physical barriers or buffers. One-way cycle tracks provide for one-way bicycle travel in each direction adjacent to vehicular travel lanes and are exclusively for bicycle use.

Benefits:

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

Considerations:

- May create design challenges at intersections for right-turning vehicles.
- May require creating entry and exit points for driveways and parking lots along the Cycle Track route.
- May require bicyclist-only signal phasing to allow for left turns along the route by installing two-stage left-turn boxes.
- May require the removal of on-street parking.
- Cycle tracks can have channelizers and posts on downhill grades greater than 3% when the BL is equal to or greater than 7′ and the buffer is equal to or greater than 3′.

Standards and Guidelines:

- One-way cycle tracks can be separated by a device or barrier (pavement markings or coloring), bollards, curbs/medians and on-street parking or a combination of these elements from the travel lane or by on-street parking with additional striping provided between the travel lane and the cycle track.
- Bike lane word, symbol, and/or arrow markings (MUTCD Figure 9C-3) shall be placed at the beginning of a cycle track and at periodic intervals along the facility based on engineering judgment.
- The minimum width for a cycle track shall be 5 feet per DIB 89-02. The minimum width should be 6 feet to accommodate street sweeping. In areas with high bicyclist volumes or uphill sections, the minimum width should be 7 feet to allow for bicyclists passing each other.
- In the absence of a raised median or curb, the minimum desired width of the painted buffer is 3 ft. The buffer space should be used to locate bollards, planters, signs or other forms of physical protection.

- Colored pavement may be used to further define the bicycle space.

References:

- DIB 89-02 "Class IV Bikeway Guidance", Caltrans, 2022

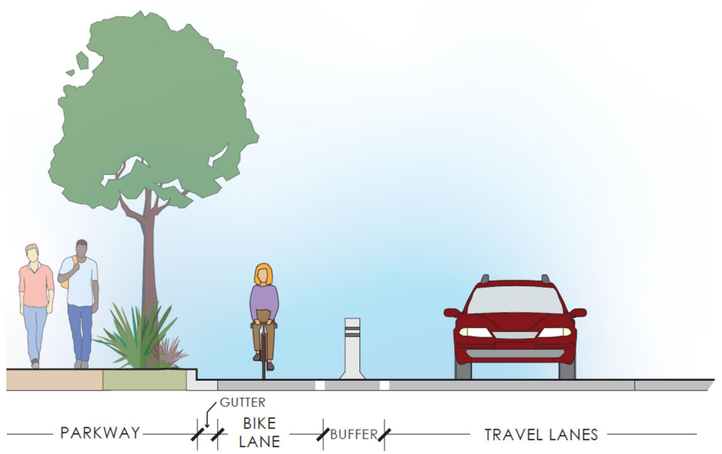

FIGURE 5-16 ONE-WAY CYCLE TRACK SECTION VIEW

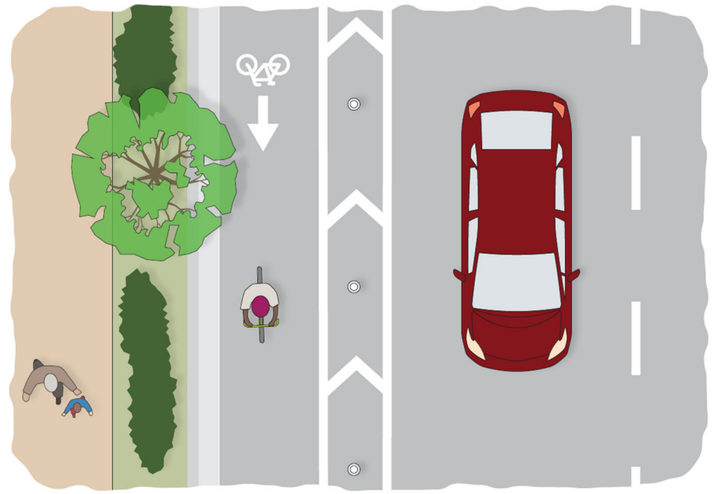

FIGURE 5-17 ONE-WAY CYCLE TRACK PLAN VIEW

Facility	Bike Lane [3]	Buffer with post
Preferred	7′	3′
Minimum	6′ [1,2]	2′ [2]
Maximum	8′	-

TABLE 5-4 ONE-WAY CYCLE TRACK DIMENSIONS

Notes:

1. *Cycle tracks can be narrower than standard minimum if there are agreements or other arrangements for maintenance.*
2. *Standard minimum does not apply on downhill grades steeper than 3%.*
3. *Cycle track lane width should exclude the width of the gutter pan, if adjacent.*

5.3.3.7 Class IV Two-Way Cycle Tracks

Two-way cycle tracks are physically separated bicycle facilities that allow bicycle movement in both directions on one side of the road. Two-cycle tracks share some of the same design elements as one-way cycle tracks, but require additional considerations at driveways.

At street level, two-way cycle tracks can be protected by parking or other physical barrier. A raised cycle track can provide vertical separation from the adjacent vehicle travel lane.

Benefits:

- Decreases injuries and fatalities.
- Encourages cyclists to travel in a protected bikeway as opposed to on the sidewalk.
- More attractive to a wide range of bicyclists at all levels and ages.
- Increases bicycle ridership.

Considerations:

- Trash pickup, transit use, and emergency vehicle access should be accounted for in the planning and design process.
- A yellow flex post or removable bollard with obstruction pavement markings should be considered at the entrance to a two-way cycle track to prevent vehicles from entering, while still allowing for emergency vehicle access and bike lane street sweeping.
- May create design challenges at intersections.
- May require creating entry and exit points for driveways and parking lots.
- May require bicyclist-only signal phasing at intersections.

Guidelines:

- Two-way cycle tracks can be separated by a device or barrier (pavement markings or coloring), bollards, curbs/medians and on-street parking or a combination of these elements from the travel lane or by on-street parking with additional striping provided between the travel lane and the cycle track.
- Preferred two-way cycle track width is 12 feet, with a minimum of 8 feet width in constrained locations for minimum lengths.
- Raised cycle tracks may be at the level of the adjacent sidewalk or set at a level between the roadway and sidewalk to separate the cycle track from the sidewalk. A raised cycle track may be combined with a parking lane or other barrier between the cycle track and the vehicle travel lane.

References:

- DIB 89-02 "Class IV Bikeway Guidance", Caltrans, 2022

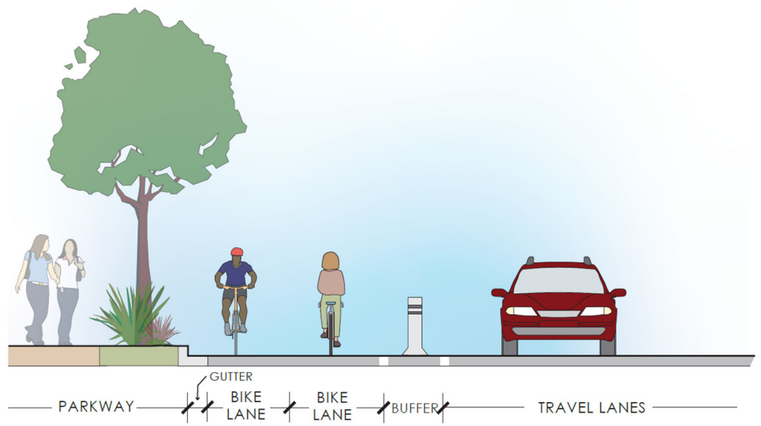

FIGURE 5-18 TWO-WAY CYCLE TRACK SECTION VIEW

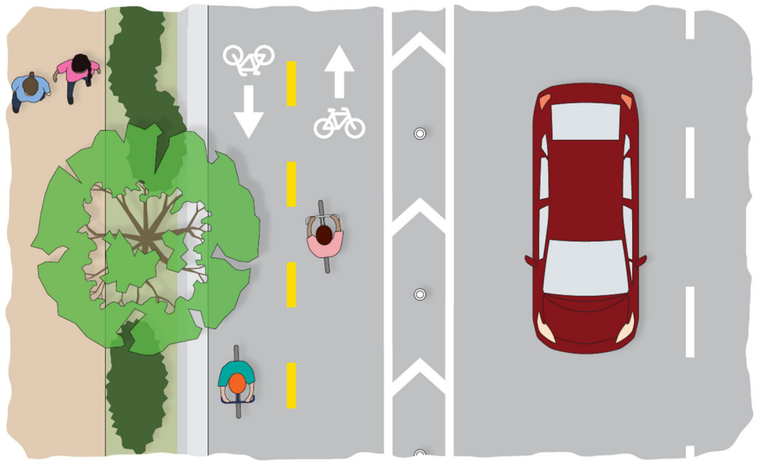

FIGURE 5-19 TWO-WAY CYCLE TRACK PLAN VIEW

Facility	Two-Way Cycle Track [3]	Buffer
Preferred	12′	4′
Minimum	8′ [1,2]	2′ (3′ parking adjacent) [2]
Maximum	14′	-

TABLE 5-5 TWO-WAY CYCLE TRACK DIMENSIONS

Notes:

1. *Cycle tracks can be narrower than standard minimum if there are agreements or other arrangements for maintenance.*
2. *Standard minimum does not apply on downhill grades steeper than 3%.*
3. *Cycle track lane width should exclude the width of the gutter pan, if adjacent.*

5.3.3.8 Bicycle Facilities at Driveways

Where driveways exist, different bicycle infrastructure requires different treatments.

Benefits:

- Installing green conflict paint near driveways may raise the driver's and bicyclist's awareness of these potential conflict areas.

Considerations:

- Alternating from Class IV to Class II infrastructure may be appropriate on roadways with many driveways or turning movements.

FIGURE 5-20 BICYCLE FACILITIES AT DRIVEWAYS

Location: Park Blvd.

Standards and Guidelines:

- At unpaved roadway or driveway crossings, including bike paths or pedestrian walkways, the crossing roadway or driveway shall be paved a minimum of 15 feet to minimize or eliminate gravel intrusion on the path. The pavement structure at the crossing should be adequate to sustain the expected loading at that location.

- Future driveway construction should avoid construction of a vertical lip from the driveway to the gutter, as the lip may create a problem for bicyclists when entering from the edge of the roadway at a flat angle. If a lip is deemed necessary, the height should be limited to ½ inch.
- See Section 3H.06 of the FHWA MUTCD for standards and guidelines for the optional use of green colored pavement for in marked bike lanes and extensions of bike lanes through intersections and other traffic conflict areas.
- CA MUTCD 4D.105 (CA) to require bicyclists to be detected at all traffic-actuated signals on public and private roads and driveways.
- Separated bikeways at alleys and driveways should remain as a separated bikeway facility. However, the physical separation feature, such as flexible posts, planters, etc. will be discontinued at alley or driveway locations. The separation markings may continue at these locations. Note the importance of including traffic control devices for the benefit of sight distance.

5.3.3.9 Micromobility Parking

Micromobility devices, inclusive of scooters, operate and park within public right-of-way. Designating parking locations provides more control over the start and end location of vehicles, increases predictability for users and non-users alike, and reduces encroachment in the public right-of-way.

Standards and Guidelines:

- Refer to the latest City of San Diego Municipal Code for Shared Mobility Devices on the standards and guidelines.
- A minimum 6' clear pedestrian path should be provided required for all sidewalk corral locations.
- Corrals or shared micromobility parking areas should be located outside of the pedestrian path of travel, typically within the Flex Zone.
- Corrals should be marked with neutral, non-branded, or universal-branded signage to best inform customers of where devices should be parked.

References:

- Guidelines for Regulating Shared Micromobility, NACTO, 2019
- Municipal Code Chapter 8, Article 3, Division 3, City of San Diego, n.d.

5.3.4 Transit Facilities

5.3.4.1 Floating Bus Stops

Floating bus stops, like bus islands, are dedicated waiting and boarding areas for passengers that streamline transit service and improve accessibility by enabling in-lane stops.

Floating bus stops are separated from the sidewalk by a bicycle channel, eliminating conflicts between transit vehicles and bicycle at stops. For both streetcars and buses, boarding islands allow the creation of accessible in-lane stops with near-level or level boarding.

Benefits:

- Reduces transit vehicle dwell times; on busy streets, in-lane stops may reduce stop delay between 5 and 20 seconds per location.
- Eliminates bus-bike "leapfrogging" conflict at stops, in which buses merge across the bicycle travel path at stops, causing bicycles to merge into general traffic to pass the stopped bus, only to be passed again as the bus accelerates.
- Provides more space for transit passengers and amenities while maintaining a clear pedestrian path on the sidewalk.

Considerations:

- Floating bus stops usually require less complex drainage modifications than bus bulb outs.
- At high-volume stops, it may be necessary to require bicyclists to yield to people accessing the floating bus stop directly from the sidewalk.
- Bicycle signals can enhance the clarity of intersection movements.
- Consider using bike signals with far-side boarding islands to provide a dedicated bike and pedestrian through phase.
- Refer to Section 5.2.2 "Emergency Vehicles and Access" for minimum clear widths for emergency vehicle access and fire access setback distances.

Standards and Guidelines:

- Boarding islands must be designed to permit accessible boarding.
- An accessible boarding area, typically 8 feet wide by 5 feet long, must be provided to permit boarding maneuvers by a person using a wheelchair (ADA Std. 810.2.2)
- Where the bike lane or cycle track requires bicyclists to yield at a crosswalk from the sidewalk onto the floating bus stop, the BIKES YIELD TO PEDESTRIANS sign (MUTCD R9-6) and yield triangle markings must be installed.
- Detectable warning surfaces must be placed on both sides of every crossing over the bike lane.
- Platform access ramp may have a maximum slope of 1:12 at a crosswalk or other crossing point, at the sidewalk and onto the platform (ADA Std. 405.2)
- Use reflective signage or other visible raised element on the leading (back left) corner of the island.

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- KEEP LEFT or KEEP RIGHT (MUTCD R4-8) or object marker (OM-3) signs may be used.
- An accessible ramp should be placed at the intersection end of the floating bus stop entering the crosswalk.
- Floating bus stops should include shelters, seating, wayfinding, and passenger information when feasible.
- Shelters should be located at least 10 feet from crosswalks over the bike lane to allow visibility between bicyclists and people exiting the bus stops.
- Install leaning rails along the edge of the island along the bike channel on portions of the floating bus stop without a shelter or accessible boarding area.
- A YIELD stencil marking may be marked in the bike channel prior to the crosswalk to reinforce the requirement to yield.
- Higher (14-inch) platforms typically require that all doors be configured for level boarding, and may be incompatible with some buses
- For low-floor vehicles using bridge plates, near-level boarding can usually be achieved with a 9.5- to 12-inch platform.

References:

- Transit Street Design Guide, NACTO, 2016

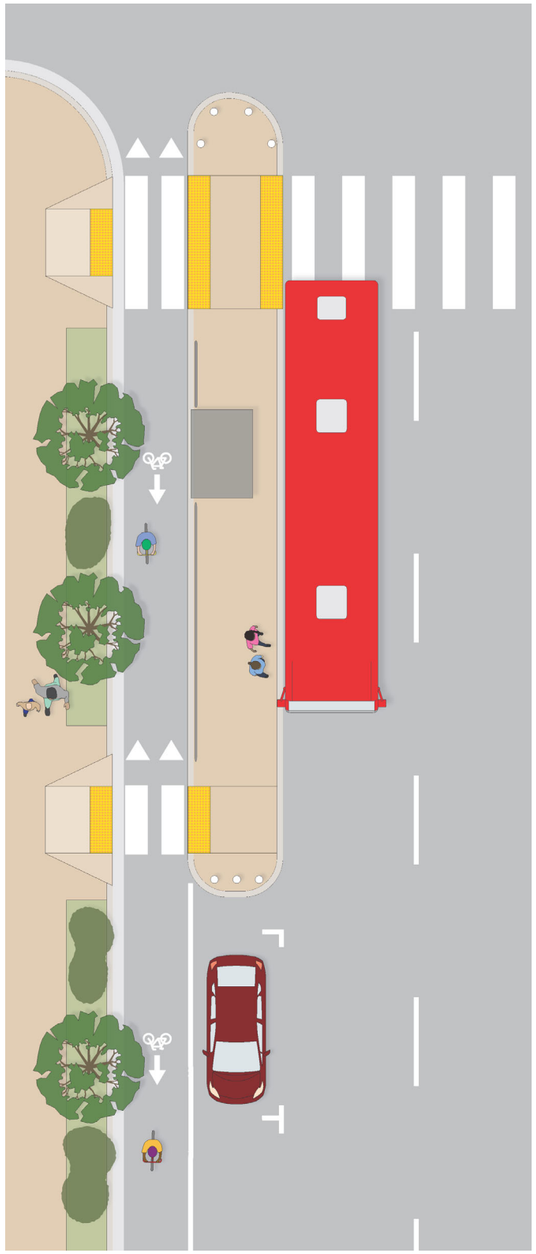

FIGURE 5-21 FLOATING BUS STOPS PLAN VIEW

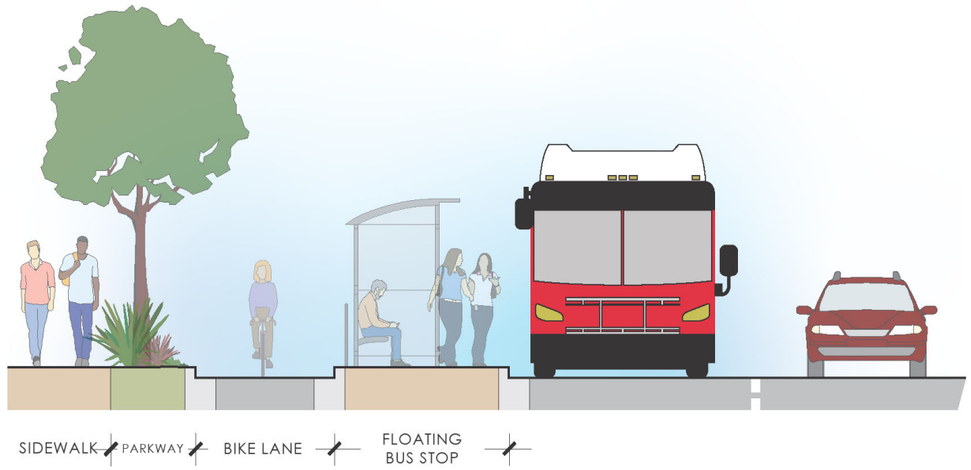

FIGURE 5-22 FLOATING BUS STOPS THROUGH THE LOCATION SECTION VIEW

Facility	Bike Lane	Floating Bus Stop[1,2]
Preferred	7′	10′
Minimum	6′	9′
Maximum	8′	12′

TABLE 5-6 FLOATING BUS STOPS DIMENSIONS

Notes:

1. *Dimensions excludes any rail and curb.*
2. *10 ft minimum with a bus shelter.*

5.3.4.2 Bus Bulb Outs

Bus bulb outs are curb extensions that align the bus stop with the parking lane, allowing buses to stop and board passengers without ever leaving the travel lane.

Bus bulb outs help buses move faster and more reliably by decreasing the amount of time lost when merging in and out of traffic.

Benefits:

- Helps buses move faster and more reliably by decreasing the amount of time lost when merging in and out of traffic.

Considerations:

- Bus bulb outs may be combined with amenities such as wayfinding, landscaping, and trees to enhance the overall transit user experience.
- Refer to Section 5.2.2 "Emergency Vehicles and Access" for minimum clear widths for emergency vehicle access and fire access setback distances.

Standards and Guidelines:

- San Diego should work with MTS to determine the clear width necessary to deploy a wheelchair accessible lift onto the bus bulb.
- A bus bulb out should be roughly equal to the width of the parking lane with a return angle of 45 degrees. To accommodate street sweeping, all curves shall have a min 22' radius.
- Use cut-throughs for curbside bicycle facilities (i.e. bike lane or cycle track) at intersections and midblock bus bulb outs.
- Curbside bike lanes should not be dropped on the approach to an intersection with a curb extension.
- Where a rear side bus bulb out is combined with a turn restriction, design the curb to self-enforce the turn restriction and monitor closely to ensure that transit vehicles are not suffering from delays.
- Bus bulb outs should be equipped with transit shelters whenever possible.
- Bus bulb outs may require right turn on red restrictions where motorists are likely to queue in the right-hand lane.
- See Section 3H.07 of the FHWA MUTCD for standards and guidelines for the optional use of red colored pavement for transit lanes.

References:

- Manual on Uniform Traffic Control Devices for Streets and Highways, 11th ed., FHWA, 2023
- Transit Street Design Guide, NACTO, 2016

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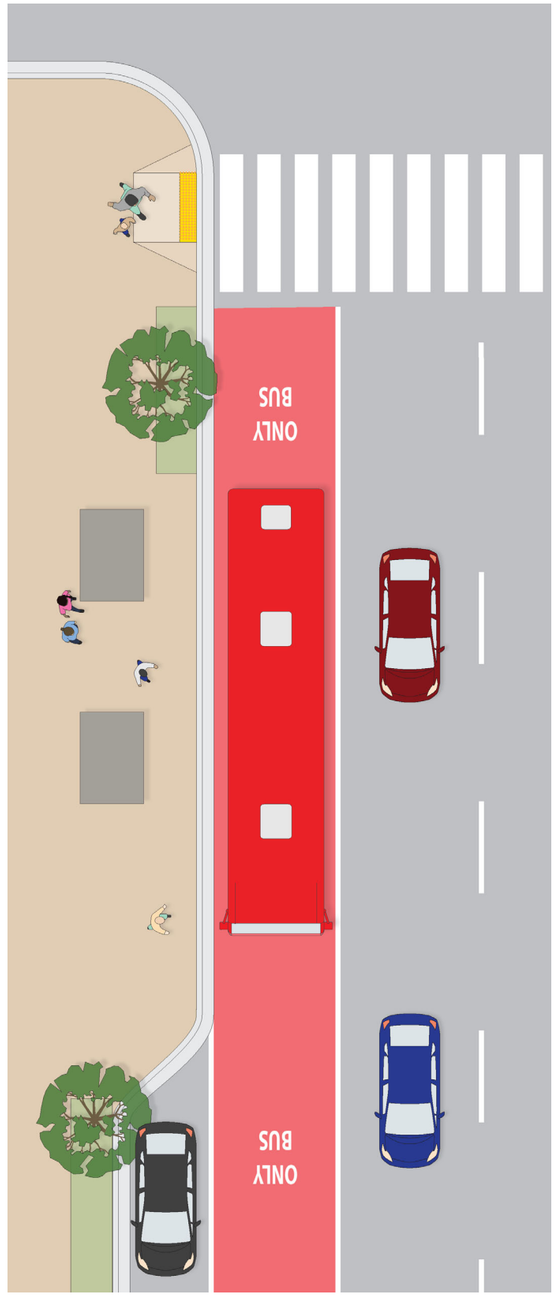

FIGURE 5-23 BUS BULB OUTS PLAN VIEW

Note: Red transit lane paint is optional.

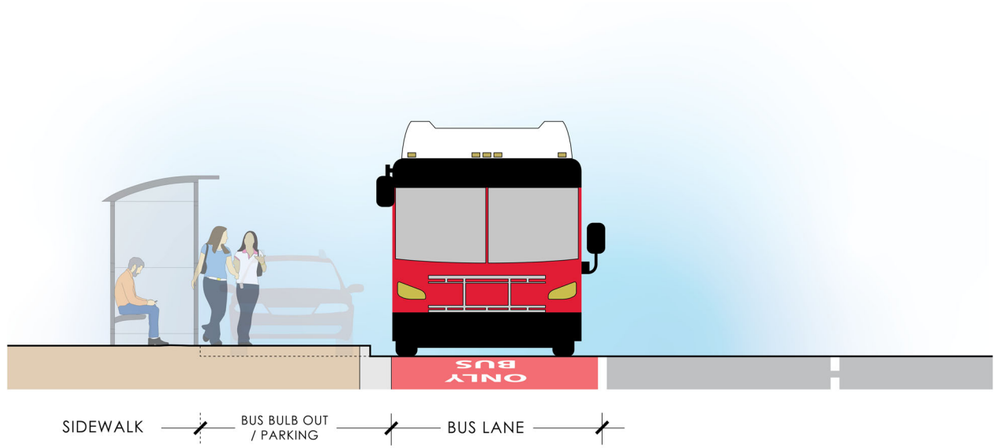

FIGURE 5-24 BUS BULB OUTS THROUGH THE LOCATION SECTION VIEW

Facility	Bus Bulb Outs Length (feet)	Bus Bulb Outs Width (feet)
Preferred	-	8′ - 10′
Minimum	One 40′ Bus	6′
Maximum	Two 60′ Buses	-

TABLE 5-7 BUS BULB OUT DIMENSIONS

5.3.4.3 Bus Pad

Bus pads are highly durable areas of the roadway surface at bus stops, usually constructed in concrete, addressing the common issue of asphalt distortion at bus stops.

Conventional asphalt pavement is flexible and can be moved by the force and heat generated by braking buses and trucks, leading to wave-shaped hills or hummocks along the length of a bus stop. This issue is pronounced at high-volume stops where dwelling buses further heat the roadway surface, as well as near-side stops in mixed-traffic lanes where trucks may be adding to wear.

Benefits:

- Addresses the common issue of asphalt distortion at bus stops.

Considerations:

- Bus pads should be at least 12 feet wide to accommodate both wheels of a bus, but should be wider at locations without precision loading, to provide a consistent surface when the bus does not pull fully to the curb.
- The ideal length of a comparable pull-out stop can be used to determine the length of the bus pad.
- Coordinate with MTS on placement and determining the bus pad length. At in-lane stops, bus pad length should be determined based on the length of the full bus zone.

Standards and Guidelines:

- Pavement at bus stops must be kept smooth at crosswalks to maintain accessibility.
- Along bus stops with through bicycle traffic, such as in-lane stops, smooth pavement must be provided.
- At in-lane stops, the bus pad should extend across the full width of the lane, and end on the lane line.
- At pull-out stops where the bus crosses a bike lane, the concrete bus pad should end at either the right edge of the bike lane or the left edge of the bike lane (including its full width), to prevent the creation of a longitudinal seam within the bike lane.
- Where bicyclists pass stopped buses, as on shared bus-bike lanes, bus pads should be provided across the full width of the lane to provide a level surface to both buses and bikes.
- At curbside pull-out stops, bus pads should be provided for the full length of the clear curb zone, ending before reaching the crosswalk.
- Bus pads should end before the crosswalk to prevent lateral or longitudinal pavement seams in the crosswalk.
- If a bus pad has to extend into the crosswalk, it should extend across the full width of the crosswalk to prevent wheelchairs from encountering seams between concrete and asphalt.

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- Concrete bus pads are required for all bus stops along transit corridors and shall consist of 9 inches of PCC pavement. Refer to the Metropolitan Transit Development Board "Designing for Transit" Guidelines and the City of San Diego Standard Drawing.

References:

- Designing for Transit, MTS, 2018
- Standard Drawings for Public Works Construction (SDG-102), City of San Diego Engineering and Capital Projects Dept, 2021
- Transit Street Design Guide, NACTO, 2016

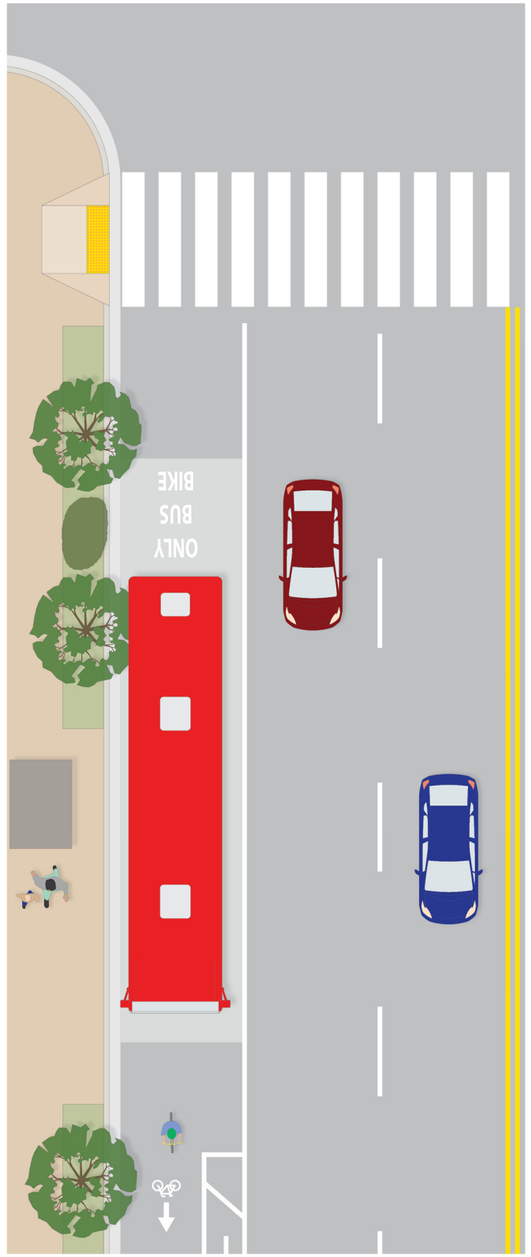

FIGURE 5-25 BUS PAD PLAN VIEW

Note: Sharrows can be used if the posted speed limit is 30 mph or less.

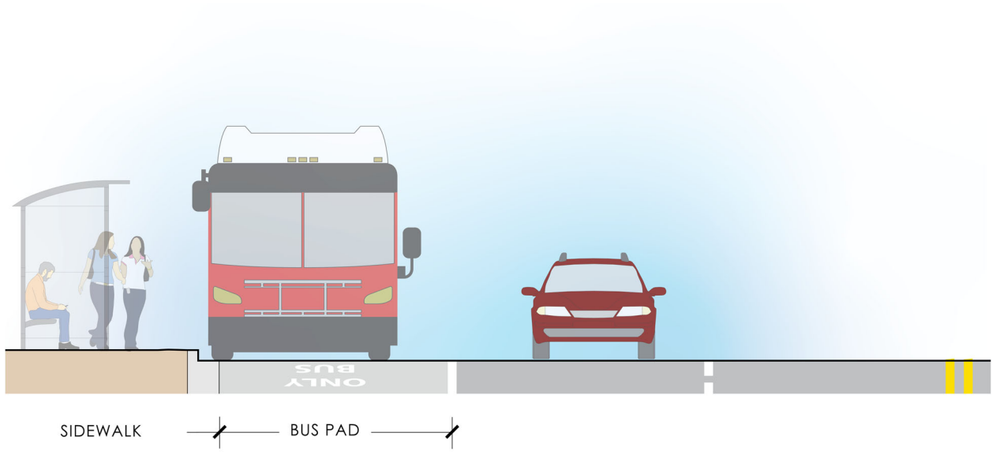

FIGURE 5-26 BUS PAD THROUGH THE LOCATION SECTION VIEW

Facility	Bus Pad Length (feet)	Bus Pad Width (feet)
Minimum	75’	12’
Maximum	100’	-

TABLE 5-8 BUS PAD DIMENSIONS

5.3.5 On-Street Vehicle Parking

On-street parking, typically located within the Flex Zone, provides motorists with parking at their homes or destinations. It can also help separate the parkway or even bicycle facilities from moving traffic.

5.3.5.1 General Guidance

Benefits:

- Parking serves as a barrier for pedestrians and adds a perception of safety while walking within the Parkway Zone between the travel lanes and the Parkway Zone and/or bicycle facilities.
- It can provide accessible parking near destinations.
- It can provide a place to park vehicle near destinations.
- It can provide a space to park vehicles and receive goods from businesses or get to their residence.

Considerations:

- Drivers opening their doors can impede the path of travel for cyclists, sometimes resulting in injury. Parking and bicycle facilities should be planned concurrently to minimize the risk of conflict.
- Parking takes up valuable space within the curb-to-curb width of the Roadway Zone that could be dedicated to users of other travel modes. Careful consideration should be given to nearby off-street parking options and land uses prior to including parking in a street section. Parking in-lieu fees paid by developers instead of providing parking spaces can help finance public or shared parking facilities.
- All taxpayers contribute to the maintenance of on-street parking spaces, regardless of use. Research done throughout the nation suggests that when the real costs of parking are passed on directly to drivers, the demand for parking typically drops, and alternative modes of transportation, where available (such as transit, carpooling, walking, and bicycling) become more attractive and viable for certain trips.
- Parking pricing, time limits, and enforcement may assist with parking management and using parking resources more efficiently. Enforcement of standards, such as using private garages for vehicles not personal storage, can contribute to increased usable supply of parking particularly in residential areas.
- The type of parking provided, outlined in Sections 5.3.5.2 through 5.3.5.5, affects the number of spaces that can fit within a road segment. Parallel parking takes up the least amount of width in the roadway section but provides fewer spaces when compared to angle parking.
- The location of planned driveways should be carefully considered in relation to the parking supply.
- Bicycle parking should be provided in high-use areas to reduce the demand for vehicle parking spaces. See Section 3.7.3.1, "Bike Parking and Corrals."

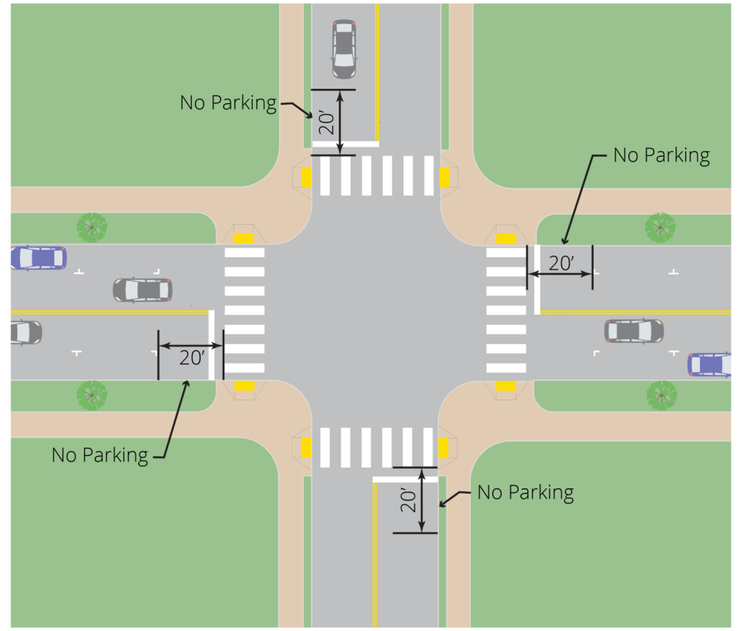

FIGURE 5-27 DAYLIGHTING AT A TYPICAL INTERSECTION

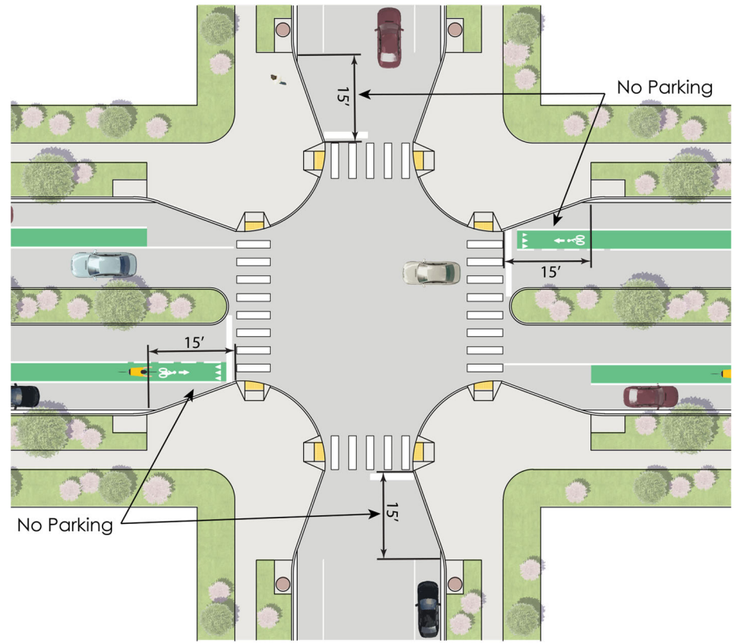

FIGURE 5-28 DAYLIGHTING AT A TYPICAL INTERSECTION WITH BULB-OUTS

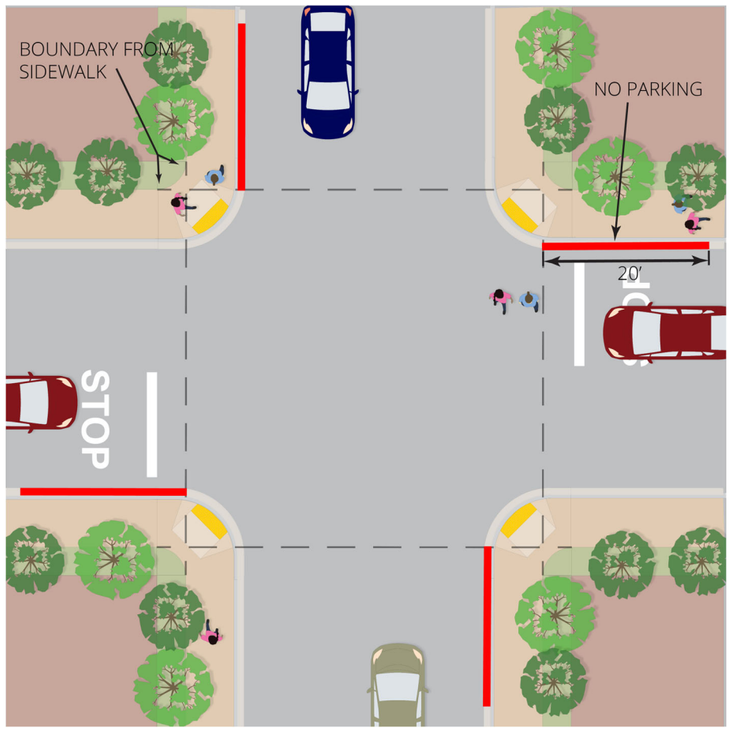

FIGURE 5-29 DAYLIGHTING AT A TYPICAL INTERSECTION WITH UNMARKED CROSSWALKS

Note: Red curbs may not start at the curb return.

Standards and Guidelines:

- Parking, standing, or stopping within 20 feet of the vehicle approach side of any marked or unmarked crosswalk or within 15 feet of any crosswalk where a curb extension is present is prohibited. Refer to Figures 5-27 and 5-28.
- Unmarked crosswalks shall be measured from the boundary line of where two sidewalks intersect at the curb ramp. Refer to Figure 5-29 and Section 105.6 “Pedestrian Crossings” of the HDM.
- Parking for bicycles or motorized scooters within 20 feet of a crosswalk may be permitted to the satisfaction of the City Engineer.
- Existing permitted blue curbs shall be maintained in the same location if streets are reconfigured. Coordinate with the Transportation Department, Community Parking District, or Access Compliance and Accessibility if a blue zone needs to be relocated, other than due to redevelopment of the adjacent property.
- On high-use commercial streets, the parking lane should be demarcated to indicate to drivers how close they are to parked cars. The ratio of accessible parking spaces is required per SDM-117 and Council Policy 500-08.

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- In high-demand areas, parking management strategies should be adopted wherever possible. Strategies include parking pricing, time limits, valet parking, permit parking districts, community parking districts.
- The curb should be striped in locations where parking is restricted, as listed below and outlined in the San Diego Municipal Code.

    - Blue: Accessible parking zones
    - Green: Short term parking zones, typically 15 or 30 minutes
    - Red: No Parking zones
    - White: Passenger loading zones
    - Yellow: Commercial loading zones

- Parking information and wayfinding should be provided in high-demand areas.
- Accessible parking should be provided, per the City’s Standard Drawings and Council Policy 500-08.

References:

- CA Vehicle Code (CVC 22500) (AB 413), Department of Motor Vehicles, n.d.
- Council Policy 500-08 "Disabled Persons Parking Zone on City Streets", City of San Diego, 1996
- Municipal Code Chapter 8, Article 6, Division 01, City of San Diego, n.d.
- The High Cost of Free Parking, Donald Shoup, 2011
- PROWAG, US Access Board, 2023

5.3.5.2 Parallel Parking

Parallel Parking is the most common and simplest form of parking within the public right-of-way that offers the minimum amount of parking spaces within an urban environment. Parallel parking has a traffic calming effect by narrowing the lane width.

Benefits:

- Less curb-to-curb width used when compared to angle or perpendicular parking.
- Easier to exit a parking space when compared to angle or perpendicular parking.

Considerations:

- Entry to parking spaces may impede traffic flow.
- In some instances, parallel parking can create a potential conflict between vehicles and cyclists.

Standards and Guidelines:

- The minimum width of parallel parking spaces is 7’. In high-speed or high-ADT areas, the minimum width should be 8’.

- In high use areas, parallel parking spaces should be striped to indicate where drivers should park and maintain efficient parking patterns.
- Especially in high use areas, parking should be metered with traditional fixed parking fees or variable parking fees.
- Striped buffers (2'-wide) should be provided between parking spaces and Class II bike lanes where space permits.
- See section 5.3.5.5 for standards related to floating parking.

5.3.5.3 Angle Parking

Angle parking is generally used to increase the number of available parking spaces. However, a positive by-product can be a reduction in vehicle speed. Angle Parking also enhances the maneuverability of for both entering and exiting vehicles. Angle parking includes reverse angle parking and perpendicular parking. Additional discussion for perpendicular parking is included in Section 5.3.5.4.

Benefits:

- Speed reduction: Drivers may slow down in anticipation of vehicles leaving parking spaces.
- Maintains emergency response access.
- Can increase parking supply over parallel parking.

Considerations:

- Angle parking creates a potential conflict between vehicles and cyclists. Striped buffers (2'-wide) should be provided between parking spaces and bike lanes where space permits. 6 ft buffer between the parking spaces and bike lanes is preferred.
- Another option for angled parking is to provide back-in parking, also known as Reverse Angle Parking (RAP), which may decrease the accident potential associated with traditional back-out parking.
- Reverse angle parking is a preferred treatment when on-street bike lanes are present.

Standards and Guidelines:

- Refer to Table 5-10 and 5-11 for Standard Angle Parking angles and dimensions.
- Refer to Table 5-12 for Reverse Angle Parking angle and dimensions.
- Back-in Angle Parking sign shall accompany the installation of reverse angle parking stalls.
- Angle parking spaces should be striped to indicate where drivers should park.
- Angle parking is only permitted on streets with existing or planned ADT at or below 10,000 vehicles.
- Angle parking can create potential conflict with existing street trees, as cars may hit the tree backing in or pulling forward. Increased drivers may increase soil compaction on planting strip or tree well.
- Refer to SDM-117 and PROWAG for additional accessible angle parking requirements.

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References:

- Angle Parking Standards, City of San Diego, n.d.
- Municipal Code §86.0104, City of San Diego, n.d.
- On-street Motor Vehicle Parking and the Bikeway Selection Process, FHWA, 2021
- PROWAG, US Access Board, 2023
- Standard Drawings for Public Works Construction (SDM-117), City of San Diego Engineering and Capital Projects Dept, 2021

5.3.5.4 Perpendicular Parking

Perpendicular parking is a type of angle parking. It is generally used to increase the number of available parking spaces over other angle parking alternative. However, a positive by-product can be a reduction in vehicle speed.

Benefits:

- Speed reduction: Drivers may slow down in anticipation of vehicles backing out of parking spaces.
- Increase parking supply over parallel or angle parking.

Considerations:

- Perpendicular parking creates a potential conflict between vehicles and cyclists. Striped buffers (2'-wide) should be provided between parking spaces and bike lanes where space permits. 6 ft buffer between the parking spaces and bike lanes is preferred.
- Another option for perpendicular parking is to provide back-in parking which may decrease the accident potential associated with traditional back-out parking.
- Perpendicular parking can create potential conflict with existing street trees, as cars may hit the tree backing in or pulling forward. Increased drivers may increase soil compaction on planting strip or tree well.

Standards and Guidelines:

- Refer to Table 6-11 for 90º dimensions.
- On-street perpendicular parking is only permitted on local streets and streets where existing or planned ADT is at or below 3,000 vehicles.
- Perpendicular parking spaces should be striped to indicate where drivers should park.
- Refer to SDM-117 and PROWAG for additional accessible angle parking requirements.

The following tables apply to angle parking and perpendicular parking:

Angle	Traffic Flow Configuration (one lane per direction)	Minimum Width of Street Based on Frontage Parking Layout			Lineal Curb Length per Parking Space	Minimum Red Curb/ Clearance from Intersection/ Driveway
		Angle on Both Sides of Street	Angle/ Parallel	Angle/ Parking Prohibited One Side		
39º50'	Two-way	56 feet	48 feet	42 feet	12.5 feet	20 feet
	One-way	52 feet	44 feet	36 feet	12.5 feet	20 feet
45º	Two-way	58 feet	50 feet	43 feet	11.5 feet	18 feet
	One-way	54 feet	46 feet	38 feet	11.5 feet	18 feet
50º	Two-way	60 feet	50 feet	44 feet	10.5 feet	15 feet
	One-way	56 feet	48 feet	40 feet	10.5 feet	15 feet
55º	Two-way	64 feet	52 feet	46 feet	10 feet	13 feet
	One-way	60 feet	50 feet	42 feet	10 feet	13 feet
60º	Two-way	68 feet	54 feet	48 feet	9.5 feet	11 feet
	One-way	62 feet	52 feet	44 feet	9.5 feet	11 feet

TABLE 5-9 ANGLE PARKING GUIDELINES (COLLECTOR STREET, ADT BETWEEN 3,000 AND 10,000)

Angle	Traffic Flow Configuration (one lane per direction)	Minimum Width of Street Based on Frontage Parking Layout			Lineal Curb Length per Parking Space	Minimum Red Curb/ Clearance from Intersection/ Driveway
		Angle on Both Sides of Street	Angle/ Parallel	Angle/ Parking Prohibited One Side		
39º50'	Two-way	52 feet	44 feet	40 feet	12.5 feet	20 feet
	One-way	48 feet	40 feet	32 feet	12.5 feet	20 feet
45º	Two-way	54 feet	46 feet	42 feet	11.5 feet	18 feet
	One-way	50 feet	42 feet	34 feet	11.5 feet	18 feet
50º	Two-way	56 feet	46 feet	44 feet	10.5 feet	15 feet
	One-way	52 feet	44 feet	36 feet	10.5 feet	15 feet
55º	Two-way	58 feet	48 feet	46 feet	10 feet	13 feet
	One-way	56 feet	46 feet	38 feet	10 feet	13 feet
60º	Two-way	62 feet	48 feet	46 feet	9.5 feet	11 feet
	One-way	58 feet	48 feet	40 feet	9.5 feet	11 feet
90º	Two-way	64 feet	52 feet	47 feet	9.5 feet	6-10 feet
	One-way	60 feet	48 feet	40 feet	9.5 feet	6-10 feet

TABLE 5-10 ANGLE PARKING GUIDELINES (LOCAL STREET, ADT BELOW 3,000)

Note:

1. *There is no parking or standing on vehicle approach side within 20 ft in advance of any crosswalk, or within 15 ft in advance of any crosswalk with a curb extension present per CVC 22500 (Assembly Bill 413, 2023).*
2. *Additional accessible requirements for angle parking are listed in SDM-117.*

The following tables apply to reverse angle parking:

Angle	Traffic Flow Configuration (one lane per direction)	Minimum Width of Street Based on Frontage Parking Layout			Lineal Curb Length per Parking Space	Minimum Red Curb/ Clearance from Intersection/ Driveway
		Angle on Both Sides of Street	Angle/ Parallel	Angle/ Parking Prohibited One Side		
40º	Two-way	52 feet	44 feet	40 feet	14.8 feet	20 feet
	One-way	48 feet	40 feet	32 feet	14.8 feet	20 feet

TABLE 5-11 REVERSE ANGLE PARKING GUIDELINES

Note:

1. *There is no parking or standing on vehicle approach side within 20 ft in advance of any crosswalk, or within 15 ft in advance of any crosswalk with a curb extension present per CVC 22500 (Assembly Bill 413, 2023).*
2. *Additional accessible requirements for angle parking are listed in SDM-117.*

References:

- Angle Parking Standards, City of San Diego
- Municipal Code §86.0104, City of San Diego, n.d.
- PROWAG, US Access Board, 2023
- Standard Drawings for Public Works Construction (SDM-117), City of San Diego Engineering and Capital Projects Dept, 2021

5.3.5.5 Floating Parking

Floating parking is located between vehicular travel lanes and a protected bicycle facility.

Benefits:

- Parking provides a buffer for bicycle facilities.
- While not a barrier type on its own, parked cars can provide an additional level of protection and comfort for bicyclists.

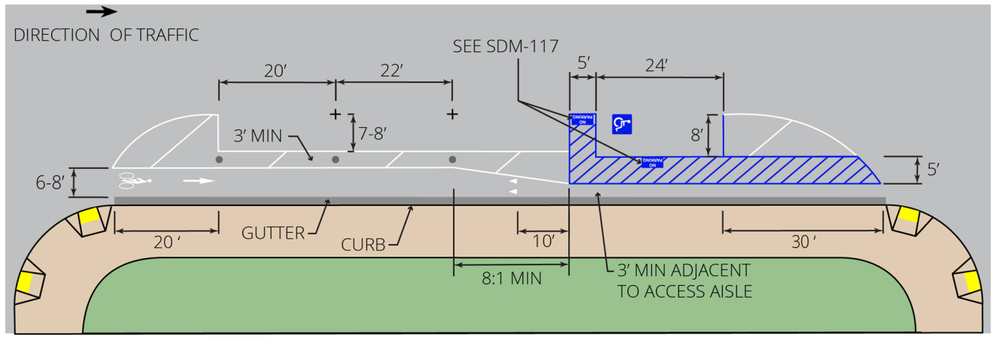
Considerations:

- Floating parking, and the associated bicycle facilities, function best when there are few or no driveways, intersections, or other conflicts along the street.
- Refer to Section 5.2.2 “Emergency Vehicles and Access” for minimum clear widths for emergency vehicle access and fire access setback distances.

Standards and Guidelines:

- Floating parking shall be installed in accordance with accessibility parking requirements. Refer to Section 5.3.5.6.
- “No Parking” pavement marking in the access aisle shall be installed per SDM-117.

- The minimum no parking distances from the curb return are 20′ on the far side of an intersection and 30′ at the near side of an intersection.
- Floating parking is still subject to wheel cramping parking requirement on all grades over 3% (hills) with or without the presence of signs per CA Vehicle Code. A "Type A" AC dike (Caltrans Standard Plans A87B) shall be installed along the entire length of the parking stall for wheel curbing.
- If Class IV cycle tracks (either one-way or two-way) are located between the curb and parking, a minimum 3′-wide buffer must be provided to reduce conflicts between cyclists and car doors and to provide people with a place to disembark from vehicles.
- Sight distance clearance for two-way cycle tracks shall be 30′ in either direction.
- Additional vertical elements such as periodic delineator posts should be paired with this design. Barrier types that obstruct the opening of car doors or create tripping hazards should be avoided.
- In addition, parking shall comply with Figure 5-31 "On-Street Accessible Parking Stall Floating Placement Layout."



NOT TO SCALE

FIGURE 5-30 ON-STREET ACCESSIBLE PARKING STALL FLOATING PLACEMENT LAYOUT

Note: Bicycle facility dimensions exclude the gutter pan width

5.3.5.6 Accessible On-Street Parking

Accessible on-street parking spaces are provided so that those with limited mobility or other accessibility demands with disabilities who have a distinguishing license plate or placard on their vehicles can park near destinations and be connected by an accessible route and curb ramp.

Citizen requested blue curbs as described in Council Policy 500-08 are typically fronting residential properties with limited accessible access to the property, are in a unique circumstance where it is not fully accessible, and do not comply with the following regulations.

Benefits:

- Increased accessibility for persons with disabilities.

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Considerations:

- Accessible paths of travel from the accessible on-street parking space to adjacent land uses must be considered and designed.
- Loading and unloading spaces for accessible vehicles must be considered and designed.

Standards and Guidelines:

- Refer to the requirements in PROWAG, City of San Diego Standard Drawings SDM-117, and CA MUTCD.
- Accessible on-street parking spaces shall be designed in accordance with the City's Standard Drawings, SDM-117 and any other applicable City standards.
- Accessible on-street parking spaces must be identified by signs displaying the International Symbol of Accessibility (ISA).
- Where on-street parking is provided on the block perimeter and the parking is marked or metered, accessible parking spaces shall be provided in accordance with the table below. Where parking pay stations are provided and the parking is not marked, each 20.0 ft of block perimeter where parking is permitted shall be counted as one parking space.
- On-street accessible van parking spaces are not required; however, accessible spaces require access aisles.
- In general, locate the accessible on-street parking spaces closest to the corners with curb ramps.
- If the block does not have priority facilities, then locate the parking close to the most public facilities. Priority facilities include:
    - Government services, parks, libraries, community center
    - Senior facilities
    - Medical services
- Disperse the accessible spaces, when possible, to avoid clusters of accessible on-street parking spaces on the same intersection.
- For perpendicular spaces the first option is preferably on the near side of the block face, so the access aisle of the parking space is closer to the corner. If located on the far side of the block the access aisle shall be installed on the drivers' side.

References:

- DIB 82-06 "Pedestrian Accessibility Guidelines for Highway Projects", Caltrans, 2017
- PROWAG, US Access Board, 2023
- Standard Drawings for Public Works Construction (SDM-117), City of San Diego, 2021

5.3.5.7 Metered Parking

Metered parking is a useful solution to parking congestion, particularly along heavily trafficked and dense areas. This intervention plays an important role in the City's parking management strategy, while producing revenue and incentivizing active transportation and transit use.

Benefits:

- Metered parking can help manage on-street parking congestion.
- It facilitates parking turnover, to ensure that more people can access a high-demand area like business land uses than if parking were unconstrained.
- Metered parking fees can help recover some of the estimated reasonable costs associated with parking infrastructure, enforcement, and maintenance.
- Metered parking can incentivize the use of alternative modes of travel, such as transit, walking or biking.

Considerations:

- Metered Parking should be considered in parking impacted areas.
- A community planning group, City-owned nonprofit, or a nonprofit managing a City-assessment district may submit to the Mayor or City Manager a request to form a Community Parking District when existing City mechanisms for implementing parking management solutions have been insufficient or such mechanisms do not exist within the community. See Council Policy 100-18 for more details.

Standards and Guidelines:

- All metered parking spaces must be delineated with lines or marking (parking T's) to designate the parking space for which a meter applies to.
- Refer to SDMC 86.0125 for the establishment regulations of parking meter zones.
- Signs should clearly indicate time limit for metered parking. Metered parking can be paid via an app or a kiosk where a ticket is provided to the person parking in metered area.
- See the City of San Diego Municipal Code Sections §86.0123 to §86.0130 for additional guidance on parking meters, including time of operation, rates, target utilization, and other regulations.
- The City does not install metered parking at accessible parking spaces.

References:

- Council Policy 100-18 "Community Parking Districts", City of San Diego, 2015
- Municipal Code §86.0123, City of San Diego, n.d.

5.3.5.8 Motorcycle Parking

Motorcycle Parking means a parking space designed for any motor vehicle designed to travel on not more than three wheels in contact with the ground. This includes mopeds and motor scooters. Daylighting does not apply to motorcycle parking.

Benefits:

- Provides closer and convenient parking for motorcycle users closer to their destination.

- Providing dedicated motorcycle parking spaces can minimize the risk of larger vehicles accidently hitting the motorcycle.
- Makes efficient use of limited available curb space for parking.
- Motorcycles are generally more fuel-efficient and less polluting than their motor vehicle counterpart, which can reduce traffic congestion.

Considerations:

- Consider the location of motorcycle parking spots in convenient, visible, and accessible areas near popular destinations.

Standards and Guidelines:

- Motorcycle spaces shall be at least 3 ft wide and 8 ft long for motorcycle parking.
- Preferred motorcycle spaces should be at least 4 ft wide at a 45-degree angle. Parking depth to face of curb shall be 8 ft. Minimum red curb distance shall be 8 ft.

References:

- Municipal Code §142.0560, City of San Diego, n.d.
- Motorcycle Stall Dimensions, City of San Diego Transportation Dept, n.d.

5.4. Vehicle Zone

The Vehicle Zone is the portion of the ROW between the Flex Zone and the Median Zone. Its primary function is to define the intended path of travel for vehicles, transit, and other road users along a corridor.

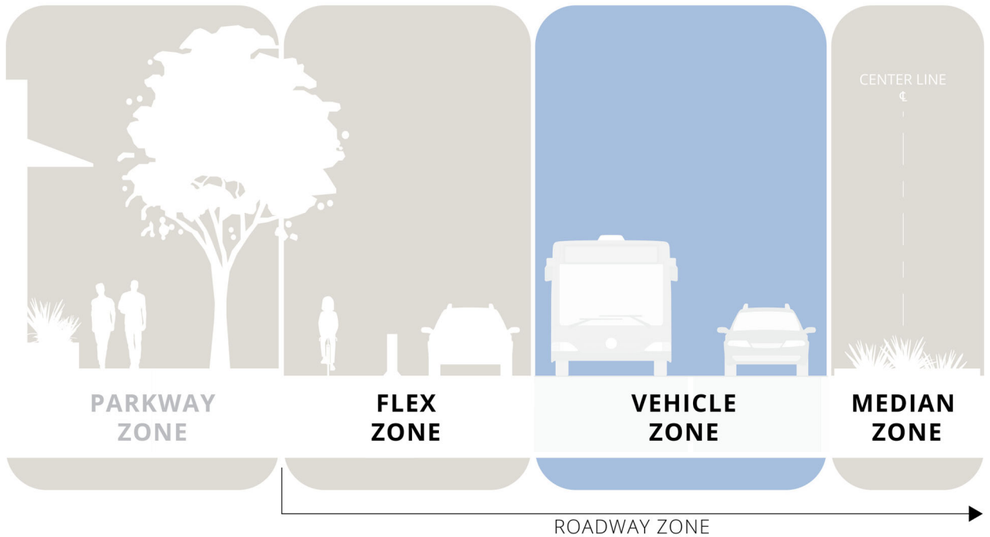

FIGURE 5-31 VEHICLE ZONE

5.4.1 Travel Lanes

Travel lanes are the portion of the roadway for the movement of vehicles, exclusive of the shoulders, berms, sidewalks, and parking areas.

5.4.1.1 Travel Lane Widths

Lane widths should be considered within the assemblage of a given street delineating space to serve all needs, including travel lanes, safety islands, bike lanes, and sidewalks. Each lane width discussion should be informed by an understanding of the goals for traffic calming as well as making adequate space for larger vehicles, such as trucks and buses. Additional information on travel lane narrowing or reduction can be found in Section 5.8.7.

Benefits:

- Narrower streets help promote slower driving speeds.
- Narrower streets create reduced crossing distances, shorter signal cycles, less stormwater, and less construction material to build.

Considerations:

- For multi-lane roadways where transit or freight vehicles are present and require a wider travel lane, the wider lane should be the outside lane (curbside or next to parking), except where center running transit lanes are present. Major truck or transit routes through urban areas may require the use of wider lane widths.
- Wide lanes encourage higher speeds on streets that can then divide a community.

Guidelines:

- Lane widths of 10 feet are appropriate in urban areas and have a positive impact on a street's safety without impacting traffic operations. Travel lane widths of 10 feet generally provide adequate safety in urban settings while discouraging speeding. In select cases, narrower travel lanes (9–9.5 feet) can be effective as through lanes in conjunction with a turn lane.
- 11-foot lanes should be used for designated truck and bus routes (one 11-foot lane per direction) or adjacent to lanes in the opposing direction.
- Lanes greater than 11 feet should not be used on streets with collector street classifications or lower, as they may cause unintended speeding and assume valuable right of way at the expense of other modes.

5.4.1.2 Transitions

Where the number of travel lanes in a roadway increase or decrease, transitions are incorporated to indicate this change and to facilitate proper road user actions at these points.

The following design standards should be used for transitions:

- No pavement widening transition is required to increase the number of travel lanes beyond that needed for drainage flow.
- When reducing the number of through travel lanes, the paved section shall undergo a transition as follows:
    - For $V \geq 45$ mph, $L = W \times V$
    - For $V \leq 40$ mph, $L = (W \times V^2)/60$
      (where V = design speed, in miles per hour; W = width of roadway transition, in feet; L = transition length, in feet)

5.4.1.3 Design Speeds

On city streets, designers should select a design speed to use in geometric decisions based on safe operating speeds in a complex environment. Speed plays a critical role in the cause and severity of crashes. There is a direct correlation between higher speeds, crash risk, and the severity of injuries.

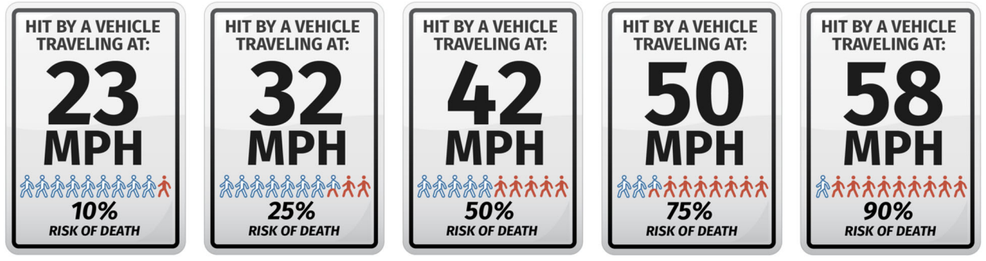

FIGURE 5-32 DESIGN SPEEDS PEDESTRIAN FATALITY RISK

Source: FHWA (2022)

Benefits:

- Embracing a proactive design approach on new and existing streets with the goal of reducing speeds is one of the most consequential interventions in reducing pedestrian injuries and fatalities.

Considerations:

- Higher design speeds often include larger curb radii, wider travel lane widths, on-street parking restrictions, guardrails, and clear zones.
- Lower design speeds may reduce observed speeding behavior and provide a safer place for people to walk, park, and drive.
- In collisions between two street users of different masses, the lighter street user typically experiences more severe injuries compared to those of the heavier street user.

Guidelines:

- Streets should be designed for retrofit using target speed, the speed intended for drivers, rather than operating speed.
- Use design criteria that are at or below the target speed of a given street. The use of higher speeds should be reserved for limited access freeways and highways and is inappropriate on urban streets, including urban arterials.
- Bring the design speed in line with the target speed on roadway retrofits by implementing measures to reduce and stabilize operating speeds as appropriate. Narrower lane widths, roadside landscaping, speed humps, and curb extensions reduce traffic speeds and improve the quality of the bicycle and pedestrian realm.
- Use short signal cycle lengths in downtown areas and networks with closely spaced signals.
- In neighborhoods, designers should consider 20 mph zones to reduce speeds for interaction with children at play and other unpredictable behavior.

- On local roads or in areas with above average pedestrian volumes, retrofit designers may choose to select a design speed below the posted speed limit.
- Alleys may be assigned target speeds as low as 5–10 mph.

References:

- A Policy on Geometric Design of Highway and Streets (Greenbook, 7th ed.), AASHTO, 2018
- Urban Street Design Guide, NACTO, 2013

5.4.1.4 Horizontal Curves

Standards and Guidelines:

- Minimum curve radii with and without superelevation are shown in Chapter 2, "Street Types," for the various classifications of streets. These radii are derived from the Caltrans Highway Design Manual's Maximum Comfortable Speed on Horizontal Curves chart.
- Superelevation:
    - Local streets and two-lane residential collectors generally should not be superelevated at curves.
    - Superelevation is allowed on other street classifications as required to maintain the design speed along curves and adhere to maximum comfortable speed criteria.
    - When superelevation is required, the minimum amount permitted is plus 2 percent. The maximum superelevation permitted, regardless of circumstances, is 4 percent for design speeds of 30 mph and lower, 6 percent for urban classifications with design speeds between 35 mph and 45 mph, and 10 percent for rural classifications and for design speeds of 50 mph and higher.
    - Superelevation must be designed to show length, transition, and crown runoff. Design must follow Caltrans standards as provided in its Highway Design Manual, Chapter 200.
    - Superelevation shall extend uniformly from the flow line of the gutter on the high side of the street to the lip of the gutter on the low side of the street, keeping the standard slope of the gutter on the low side unchanged. This shall also include the slope of median gutters, if any, as shown in City of San Diego Standard Drawing SDG-154.
    - All streets not superelevated shall be crowned at 2 percent.
- Sight distance on horizontal curves shall be determined from Caltrans Highway Design Manual Figure 201.6, "Stopping Sight Distance on Horizontal Curves."
- Compound curves are prohibited.
- Reversing Curves:
    - Reversing curves are permitted; however, for all streets other than local streets, they must be separated by a tangent length adequate to provide safety of travel.

- For non-superelevated reversing curves, the tangent length provided shall be compatible with probable driving speed, type of vehicle use, and individual curve radius and length.
- Superelevated reversing curves shall be separated by tangents sufficient to contain all of the superelevation runoff required.

- Knuckles may be approved on a deviation basis for residential cul-de-sacs with 200 ADT or under, intersecting at right angles plus or minus 5 degrees. Knuckles should not be used in lieu of providing a 100-foot minimum curve radius required on residential streets.
- Sharp horizontal curves must not begin near the top of pronounced crest vertical curves or near the low point of pronounced sag vertical curves.

5.4.1.5 Vertical Curves

Standards and Guidelines:

- Vertical curves shall be designed to the current Caltrans Highway Design Manual Stopping Sight Distance based on design speed.
- For local streets, the minimum acceptable vertical curve is 10 feet of curve for each 1 percent difference in grade.
- Vertical curves leading into intersections shall be designed such that the grade immediately approaching a cross gutter is no greater than 4 percent.
- Sight distance on vertical curves shall be determined from Caltrans Highway Design Manual 201.4, "Stopping Sight Distance on Crest Vertical Curves" and Figure 201.5, "Stopping Sight Distance on Sag Vertical Curves."

5.4.1.6 Guardrails and other Safety Devices

Standards and Guidelines:

- All guardrail installations must be done in conformance with the latest edition of Caltrans Standard Plans, the AASHTO Roadside Design Guide, the City's Standard Drawings.
- Guardrails may be required at certain locations for safety purposes in accordance with guidelines in the Caltrans Traffic Safety Systems Guidance (2019).
- Reflectors and other safety structures may be required when necessary for public safety.
- When guardrails are warranted at fire hydrant locations, guardrails shall be installed in a manner not to interfere with the operation of the fire hydrant.

5.4.1.7 Roadway Striping

Roadway striping can change the appearance of the roadway, encouraging drivers to remain in designated lanes or drawing their attention to bike lanes. Adding lane striping to a residential road without lane markings or a bike lane may change the behavior of some drivers. By adding striping, the vehicle travel

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lanes are visually narrowed which will encourage slower speeds. In general, vehicles will not travel in a designated bike lane. This can have a positive impact on both driver and bicycle safety.

Benefits:

- Speed reduction
- Increase the visibility of bicyclists to drivers.

Considerations:

- Possible loss of on-street parking.

Guidelines:

- Two-way streets with low or medium volumes of traffic may benefit from the use of a dashed center line with narrow lane widths or no center line at all. In such instances, it may be possible to allocate additional right-of-way to bicyclists or pedestrians, while permitting motorists to cross the center of the roadway when passing.
- Raised pavement markers are required for all streets of collector or greater classification. Installation and criteria must be according to the latest edition of the California Manual on Uniform Traffic Control Devices (CA MUTCD).
- See Part 5 "Traffic Control Device Considerations for Automated Vehicles" of FHWA's MUTCD for autonomous vehicle striping guidance.
- Stamped concrete or other types of decorative paving will be permitted in the traveled roadway of a public and/or private street, provided all of the following conditions are met:
  - At signalized intersections to designate pedestrian crosswalks (brick pavers, but not stamped concrete, may be used);
  - The street grade is 8 percent or less; and
  - Maintenance is assured by either an encroachment maintenance removal agreement or by inclusion in an assessment district.

References:

- CA MUTCD Rev. 8, Caltrans, 2024
- Manual on Uniform Traffic Control Devices for Streets and Highways, 11th ed., FHWA, 2023
- Roadside Design Guide, AASHTO, 2011
- Standard Plans, 7th Ed., Caltrans, 2024
- Traffic Calming Guidelines, City of San Diego, 2010
- Traffic Safety Systems Guidance, Caltrans, 2019

5.4.2 Transitways

A transitway is a dedicated route or corridor designed exclusively for public transportation vehicles. It aims to provide a more efficient and reliable transit experience. Transitways can include features like exclusive lanes, priority signals, and enhanced passenger facilities.

Table 5–14, 5-15 and Figure 5-34 illustrate the design specifications for transitways.

Description	Specifications	Units
Width, Right-of-Way	56 – 68	ft
Design Speed	20	mph
Width, Curb to Curb	28	ft
Maximum Grade	8	%
Minimum Curve Radius	65	ft
Street Lights	Pedestrian scale, both sides	-

TABLE 5-12 SHARED TRANSITWAY SPECIFICATIONS

Land Use	Parkway Configurations
Residential: *Medium-to-Very High Density Multiple Dwelling Residential – no front yards, Commercial Office – no front yards*	UP-6T
Non-residential: Pedestrian-Oriented Commercial Retail, Urban Village Commercial Retail	UP-7T

TABLE 5-13 PARKWAYS FOR SHARED TRANSITWAY

Note: Refer to the MTS publication, Designing for Transit, for more information.

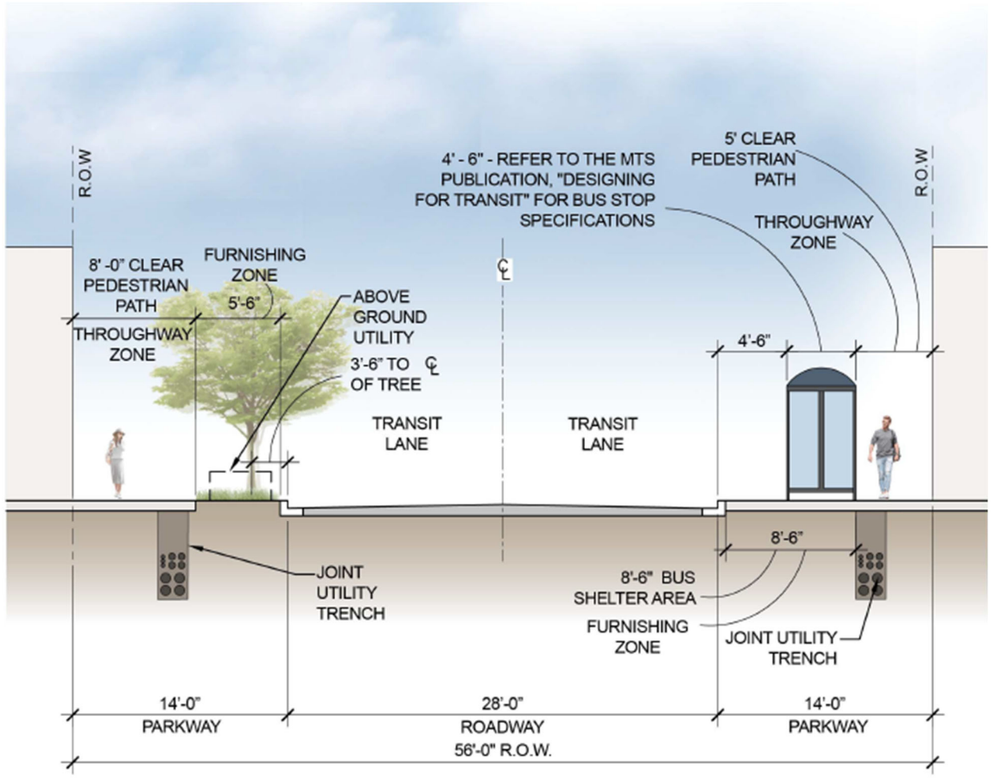

FIGURE 5-33 TRANSITWAY SECTION A-A

5.4.3 Transit Lanes

Transit lanes are dedicated space within the roadway reserved exclusively for public transportation vehicles. By prioritizing transit vehicles, transit lanes can help alleviate traffic congestion, provide traffic calming benefits, enhance transit reliability, and support broader climate action goals.

5.4.3.1 Shared Bus/Bike Lane

Shared bus-bike lanes are not high-comfort bike facilities. However, buses and bicyclists often compete for the same space near the curb. On streets without dedicated bicycle facilities, curbside bus lanes attract bicycle traffic, which in turn leads to permitting bicycles in bus lanes.

Shared bus-bike lanes are most commonly applied on two-way streets with curbside or offset bus lanes, and no existing or planned bicycle facilities.

Benefits:

- Provides bicycle access on transit streets where no space is available for dedicated bike facilities.
- Provides increased space and visibility for active street users while improving transit service reliability.

Considerations:

- Dedicated bus and bicycle facilities are preferred over shared bus-bike lanes.
- Bus-bike lanes are not high-comfort bicycle facilities.
- At peak periods and high-volume bus routes, in particular, bus-bike lanes are not intended to substitute for dedicated bike facilities.
- At high speeds, special care must be taken not to require bicycle and bus traffic mixing.

Standards and Guidelines:

- Senate Bill 1216 (2024) prohibits the use of new sharrows on a roadway that has a posted speed limit greater than 30 mph where bicycle travel is permitted.
- Pavement markings must indicate that the lane is dedicated to transit, including a solid white line and BUS BIKE ONLY or similar marking.
- Install signs permitting buses and bicycles and excluding other traffic. BUS-BIKE ONLY signs may be used.
- If permitted, sharrows should be placed in the center or left side of the lane. At bus stops, place sharrow markings at the left side of the lane.
- The width of bus-bike lane is 11 feet for offset lanes, and up to 12 feet for curbside lanes.
- Lanes that are 13-15 feet wide should be avoided to limit unsafe passing movements.
- If 13-14 feet of width is available, a marked buffer can be added on the left side of the bus-bike lane so that buses are guided to the right, allowing any passing bicycle traffic to use the buffer area at bus stops.
- Additional considerations should be made at bus stops: a bus-bike lane may be wider to allow bikes to pass stopped buses on the left. In these cases, a dashed line should be marked 9 feet from the curb to indicate to bicyclists where to pass. It may appropriate to narrow adjacent general traffic lanes at bus stops to accommodate a bike passing zone.
- No vertical separation should be installed between bus-bike lanes and mixed-traffic lanes.
- See Section 3H.07 of the FHWA MUTCD for standards and guidelines for the optional use of red colored pavement for transit lanes.

References:

- Manual on Uniform Traffic Control Devices for Streets and Highways, 11th ed., FHWA, 2023
- Transit Street Design Guide, NACTO, 2016

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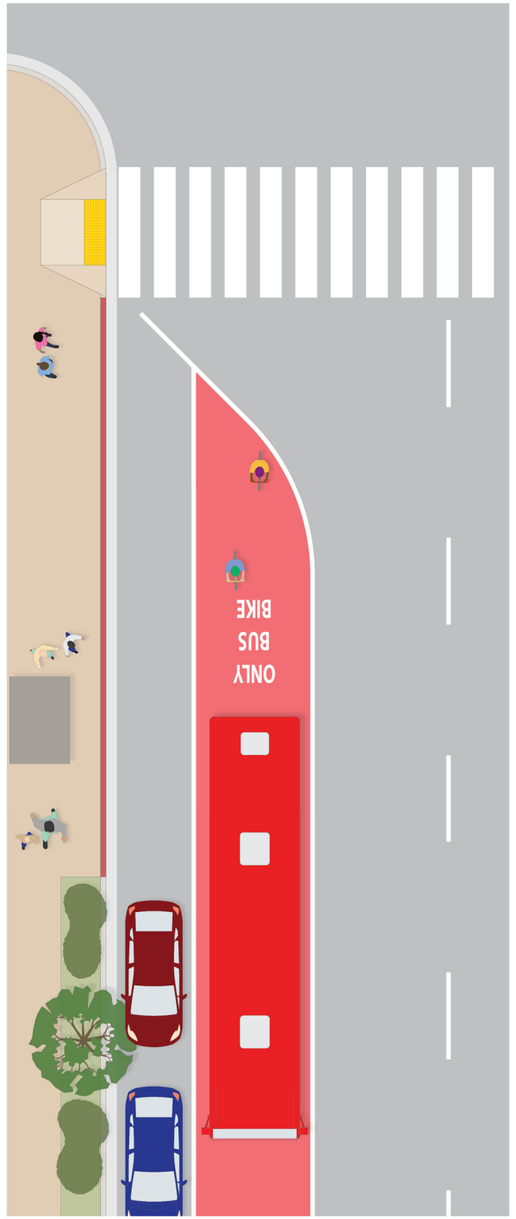

FIGURE 5-34 SHARED BUS/BIKE LANES PLAN VIEW

Note:

1. *Red transit lane paint is optional*
2. *Sharrows can be used if the posted speed limit is 30 mph or less.*

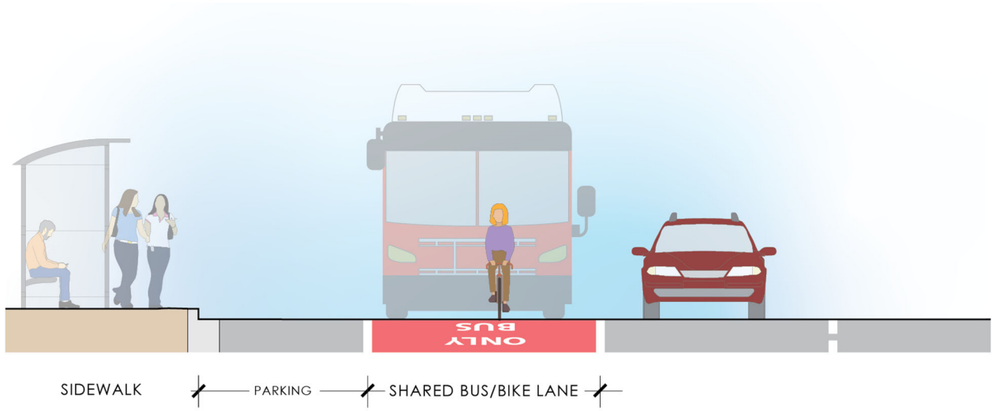

FIGURE 5-35 SHARED BUS/BIKE LANE THROUGH THE LOCATION SECTION VIEW

Facility	Shared Bus/Bike Lane[1]	Buffer
Preferred	11′	n/a
Minimum	11′	n/a
Maximum	12′	3-4′

TABLE 5-14 SHARED BUS/BIKE LANE DIMENSIONS

Notes:

1. *Lane width should exclude the width of the gutter pan.*

5.4.3.2 Peak-Hour Bus Lane

Peak-hour bus lanes allow transit to take precedence over parking and curbside access at peak hours when it most benefits bus operations. Peak-hour bus lanes provide dedicated bus lane operations during peak travel periods and provide general curbside uses at other times.

Benefits:

- Provides a large boost to transit capacity at critical times, improving reliability and transit times.
- Conducive to active transit signal priority treatments.

Considerations:

- Curbside peak-only bus lanes involve a trade-off between faster peak travel times and slower off-peak bus travel times, with slower pull-out stops during off-peak times.
- Because bus stops are typically located directly on the adjacent sidewalk, enough room must be available for waiting passengers, stop amenities, and passing pedestrian traffic.

Standards and Guidelines:

- Pavement markings must indicate that the lane is dedicated to transit, including a solid white line and "BUS ONLY" marking. Skip-lines may be applied where vehicles are permitted to cross, such as at intersections and turn pockets.
- Signage must clearly indicate the lane restriction, as well as hours of enforcement and any turn allocations.
- If the lane permits parking during non-operational hours, signage should clearly communicate parking restriction times (i.e. "No Parking, 7–9 AM") as well as any other parking regulations (e.g. "2 Hour Parking, 9 AM–6 PM").
- Camera enforcement and/or towing services are usually needed to operate successful peak-hour bus lanes.
- A 12- or 13-foot wide lane can accommodate curbside parking with a bike lane during non-peak hours, and operate as a shared bus-bike lane during peak hours. However, signage must communicate that bicycling is permitted at all times.

References:

- Transit Street Design Guide, NACTO, 2016

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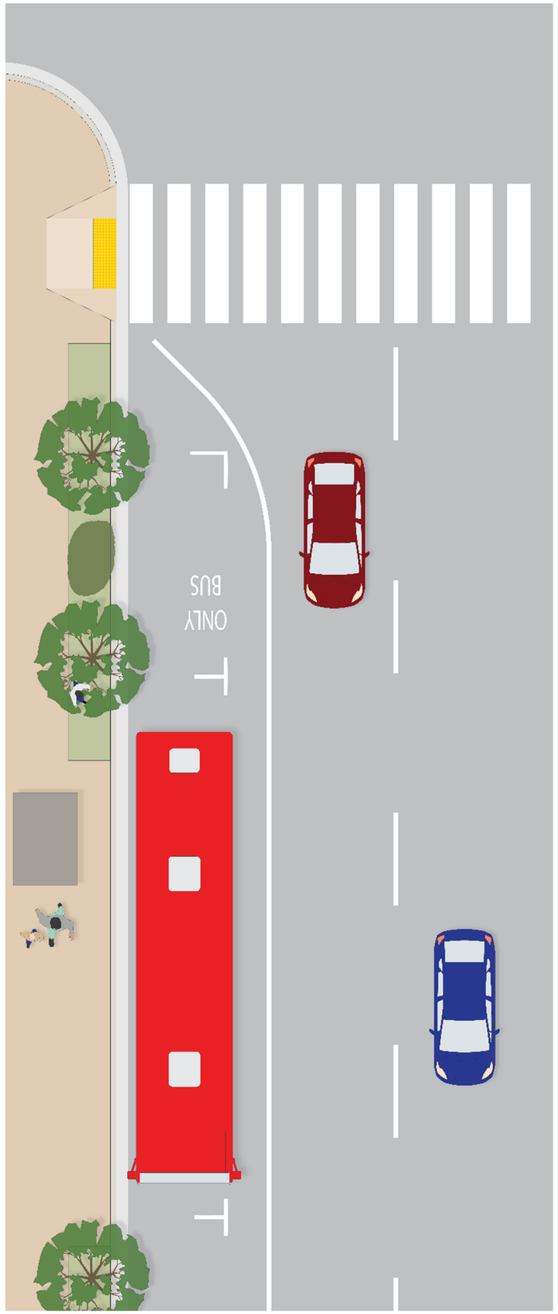

FIGURE 5-36 PEAK-HOUR BUS LANE PLAN VIEW

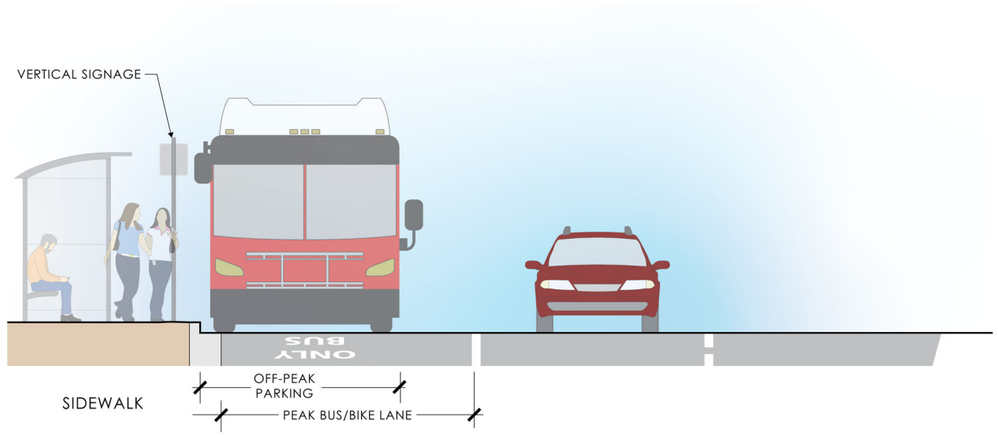

FIGURE 5-37 PEAK-HOUR BUS LANE THROUGH THE LOCATION SECTION VIEW

Facility	Off-Peak Parking	Peak-Hour Bus Lane[1]	Off-Peak Bike Lane (Optional)
Preferred	8′	11-13′	5′
Minimum	8′	11′	n/a
Maximum	n/a	n/a	n/a

TABLE 5-15 PEAK-HOUR BUS LANE DIMENSIONS

Notes:

1. *Lane width should not include the width of the gutter pan.*

5.4.3.3 Offset Bus Lane

Offset bus lanes, also known as “floating” or “parking-adjacent” lanes, place transit vehicles in the right-most travel lane, but are offset from the curb by street parking, curb extensions, or raised cycle tracks.

Offset bus lanes are typically applied on multi-lane streets with on-street parking, loading, and other curbside uses, especially streets with retail.

Benefits

- Offset bus lanes accommodate high transit volumes and improve reliability and travel times on streets operating near or beyond their motor vehicle traffic capacity.
- Offset bus lanes raise visibility of high-quality services, especially rapid bus services.
- Offset bus lanes reduce delays for transit riders.
- Offset bus lanes maintain space for other curbside uses, such as parking, loading, bulb-outs, and parklets.

Considerations

- Implementation is easy; reconstruction of curbs is usually not necessary.
- In commercial areas, lanes are prone to encroachment due to double-parking, deliveries, and taxis; enforcement is critical.
- Vertical separation elements between bus and mixed-traffic lane are usually not feasible because parking is preserved.
- Right-turning conflicts should be considered when implementing offset bus lanes.

Standards and Guidelines

- Designate lanes using BUS ONLY markings and signs (CA MUTCD 3D-01 or similar markings)
- Dedicated transit lanes must be separated from other traffic using solid single stripes or double white stripes.
- Red color treatments are effective in reinforcing lane designation, which should be applied along the entire lane if used.
- Transit bulbs should be installed at stops to enable in-lane stops, and provide space for other stop and sidewalk amenities
- Provide shared right-turn lanes or right-turn pockets at intersections with moderate to high turn volumes.
- See Section 3H.07 of the FHWA MUTCD for standards and guidelines for the optional use of red colored pavement for transit lanes.

References

- Manual on Uniform Traffic Control Devices on Streets and Highways, 11th ed., FHWA, 2023
- Transit Street Design Guide, NACTO, 2016

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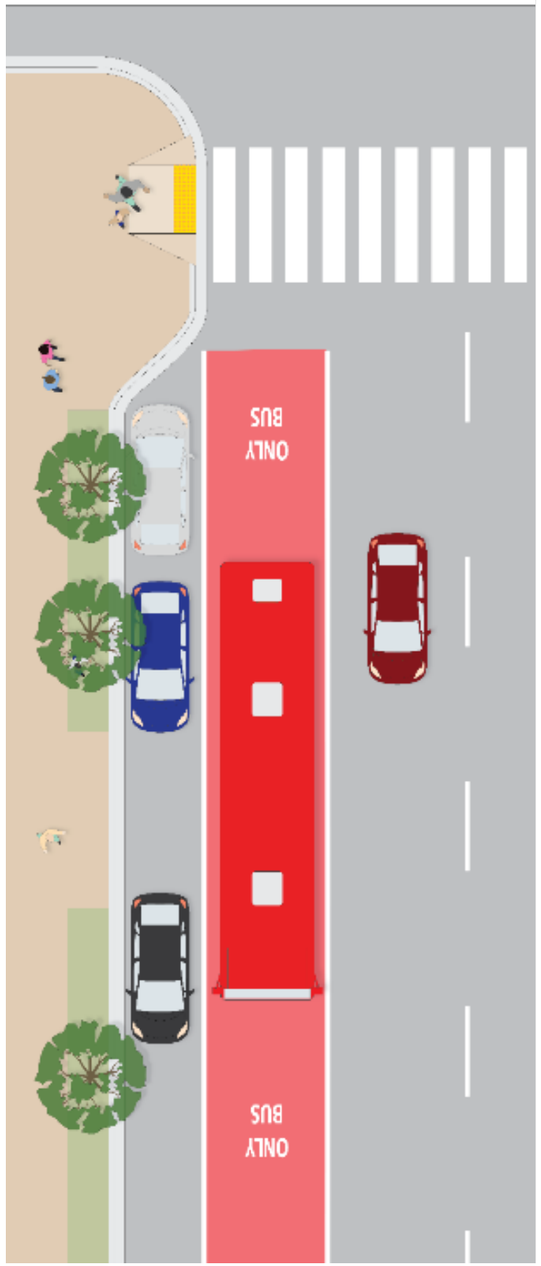

FIGURE 5-38 OFFSET BUS LANE PLAN VIEW

Note: Red transit lane paint is optional.

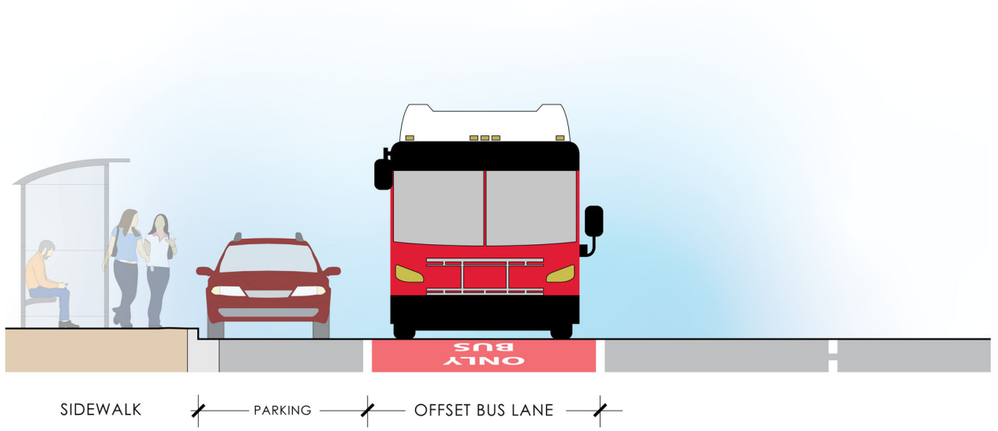

FIGURE 5-29 OFFSET BUS LANE THROUGH THE LOCATION SECTION VIEW

Facility	Parking	Off-Set Bus Lane
Preferred	8-9′	12′
Minimum	7′	11′
Maximum	10′	n/a

TABLE 5-16 OFFSET BUS LANE DIMENSIONS

Notes:

1. *The minimum required dimensions for parking and offset bus lane should not be used in the same location.*

5.4.3.4 Curbside Bus Lane

The lane adjacent to the curb can be dedicated to transit vehicles, especially on through corridors where parking is either not provided or not well utilized. Curbside bus lanes can be implemented with varying levels of separation, increasing service capacity and allowing riders to board directly from the curb.

Benefits:

- Transit vehicles are not delayed by interactions with parking or loading vehicles if well enforced.
- A curbside transit lane can have differing, flexible uses throughout the day, such as parking or a shared bus-bike use. However, full-time lane dedication typically improves integrity.

Considerations:

- Special design attention must be given to right turns from streets with curbside transit lanes.
- Lanes are prone to encroachment by loading, deliveries, and taxicabs. Enforcement is needed.
- Where rain pooling is an issue, gutters and drainage in bus lanes next to the curb must be kept clear to avoid splashing onto the sidewalk. Concrete gutters or lanes may be preferable for curbside bus lanes.
- Because bus stops are typically located directly on the adjacent sidewalk, stops must leave enough room for the alighting, boarding area and passing pedestrian traffic.
- Right-turning conflicts and storm drain inlets should be considered when implementing curbside bus lanes.
- Street trees could be damaged with curbside bus lanes either from oncoming bus or required pruning of the tree for bus clearance which can damage the tree and affect tree health.

Standards and Guidelines:

- Designate lanes using a single or double solid white line, as well as a stenciled "BUS ONLY" marking (refer to MUTCD 3D.01). In some jurisdictions, markings may be required for each permitted user (e.g. "TAXI, LRT, BUS ONLY").
- Signage must designate the transit lane as restricted. Place signs either on the curbside or overhead (MUTCD 2B.20).
- Mark the transit lane with red color. Red color treatments are effective in reinforcing lane designation.
- The desired width of a curbside bus lane next to a mixed-traffic lane is 11–12 feet, excluding a gutter pan if present. Bus-only lanes should not typically exceed 12 feet in width. If target operating speeds between stops are low, typically below 25 mph, 11-foot lanes are preferable to 12-foot lanes. If buses operate in an adjacent lane, a 12-foot curbside lane is desired.
- At intersections with a high volume of turning movements, the curbside lane may need to drop to maintain traffic flow.
- See Section 3H.07 of the FHWA MUTCD for standards and guidelines for the optional use of red colored pavement for transit lanes.

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References:

- Manual on Uniform Traffic Control Devices for Streets and Highways, 11th ed., FHWA, 2023
- Transit Street Design Guide, NACTO, 2016

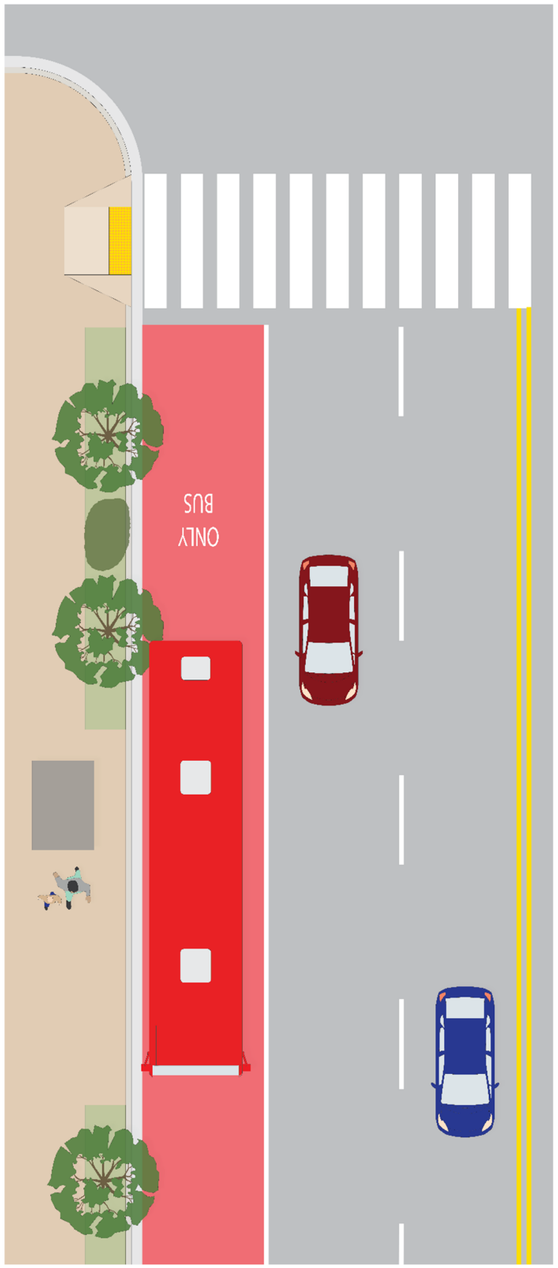

FIGURE 5-40 CURBSIDE BUS LANE PLAN VIEW

Note: Red transit lane paint is optional.

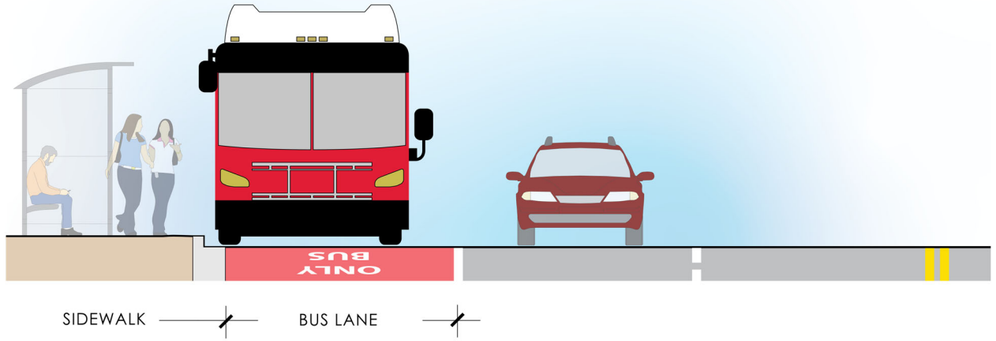

FIGURE 5-41 CURBSIDE BUS LANE THROUGH THE LOCATION SECTION VIEW

Facility	Curbside Bus Lane [1]
Preferred	11-12’
Minimum	11’
Maximum	n/a

TABLE 5-17 CURBSIDE BUS LANE DIMENSIONS

Notes:

1. *Lane width should not include gutter pan.*

5.5. Median Zone

The Median zone encompasses the region of the right of way (ROW) that is often in the center of the roadway between two vehicle zones. A raised median's primary function is to separate opposing directions of travel, but it can also calm or divert traffic, give pedestrians a comfortable place to wait when crossing the street or boarding transit, or beautify the street (see Section 5.8 for traffic calming strategies). Where the median is at-grade with the vehicle zone, it can provide a turning lane for vehicle traffic.

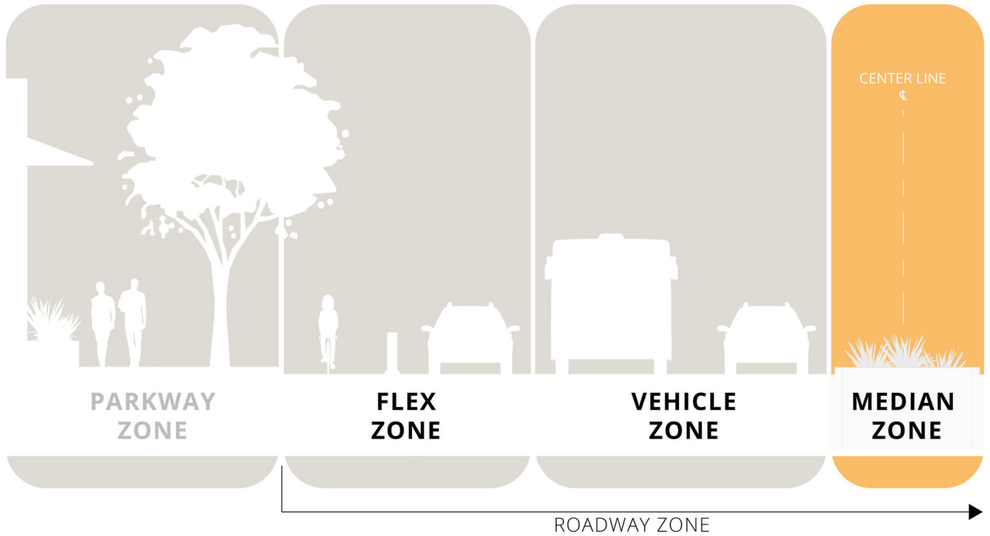

FIGURE 5-32 MEDIAN ZONE

5.5.1 Medians

5.5.1.1 Raised Medians

Raised medians are raised barriers in the center portion of the street or roadway. They come in a variety of forms, such as raised landscaped medians, stamped concrete medians, and concrete barriers (see the City's Standard Drawings SDG-112).

Benefits:

- Raised medians are for access control and may be erected for traffic calming purposes, such as in the case of roundabouts, median slow points, and traffic diverters (see Section 6.7.2 and 5.8).
- Raised islands or medians of sufficient width that are placed in the center area of a street or highway can serve as a place of refuge for pedestrians who are attempting to cross at a midblock or intersection location.

- Raised medians can improve efficiency of transit through dedicated transit lanes or boarding islands.
- Raised medians can enhance placemaking efforts and add character to the public realm when sculptures or gateway signs are incorporated in the design.
- Medians can provide additional space for trees and landscaping.

Considerations:

- Continuous medians may not be the most appropriate treatment in every situation. In some cases, they can increase traffic speeds by decreasing the perceived friction through separating traffic flow directions.
- They may take up space that can be better used for wider sidewalks, bike lanes, landscaping buffer strips, or on-street parking.
- Consider crossing islands if cost is an issue or space is limited.
- Landscaping in medians should not obstruct the visibility between pedestrians and approaching motorists.
- Refer to Standard Drawing SDG-139 for pedestrian islands and cut-throughs.
- Midblock pedestrian crossings must be fully wheelchair accessible. (See Council Policy 200-07).
- Concave medians may not support trees as tree root structures can be affected by pooling water or bioswale infrastructure that does not allow for tree roots or tree root growth.
- All impacts to surface drainage should be evaluated and managed accordingly.

FIGURE 5-43 TYPICAL LANDSCAPE MEDIAN

Location: University Avenue and 29th Street

Standards and Guidelines:

- All raised medians shall be bounded by 6-inch B-2 concrete curbs and surfaced with stamped concrete or concrete as called for in the City's Standard Drawings (SDG-154, SDG-112). See SDG-109 and G-10 for joint details.
- Landscaped medians shall conform to the City's Standard Drawings. The planting, irrigation, brush management, and landscape-related improvements must comply with the regulations in SDMC §142.0403 and with the Landscape Standards in the Land Development Manual.
- Maintenance for landscaped medians shall be provided for through a maintenance assessment district or by other agreement with the City of San Diego.
- Street trees shall be located no closer than 30 inches to the edge of median islands (SDMC §142.0409).
- For landscaped medians, all required plant material shall be irrigated with a permanent, below-grade irrigation system unless specified otherwise in this division. All required irrigation systems shall be automatic, electrically controlled, and designed to provide water to all required plantings to maintain them in a healthy, disease-resistant condition (SDMC §142.0403).
- All pruning shall comply with the standards of the American National Standards Institute (ANSI) for free care operations and the International Society of Arboriculture (ISA) best management practices for free pruning (SDMC §142.0403).
- All median noses shall be painted yellow.
- To accommodate street sweeping, all curves requiring sweeping shall have a min 22' radius.

References:

- Standard Drawings for Public Works Construction, City of San Diego, 2021

5.5.1.2 Green Infrastructure for Concave Medians

Conventional medians are normally designed as a convex surface to shed water onto adjacent pavement and into a curb and gutter system. Concave medians reverse this relationship by designing the median to receive runoff. A diagram and section of a typical concave median is shown in Figure 5-43.

The landscaped median can be designed as a landscaped swale or biofilter to treat runoff. Catch basin and underground storm drain systems may be required for overflows depending on the infiltration conditions and the duration that water is retained (see BASMAA, 1999).

References:

- Proven Safety Countermeasures, FHWA, n.d.
- Start at the Source: Design Guidance Manual for Stormwater Quality Protection, BASMAA, 1999
- Standard Drawings for Public Works Construction, City of San Diego, 2021

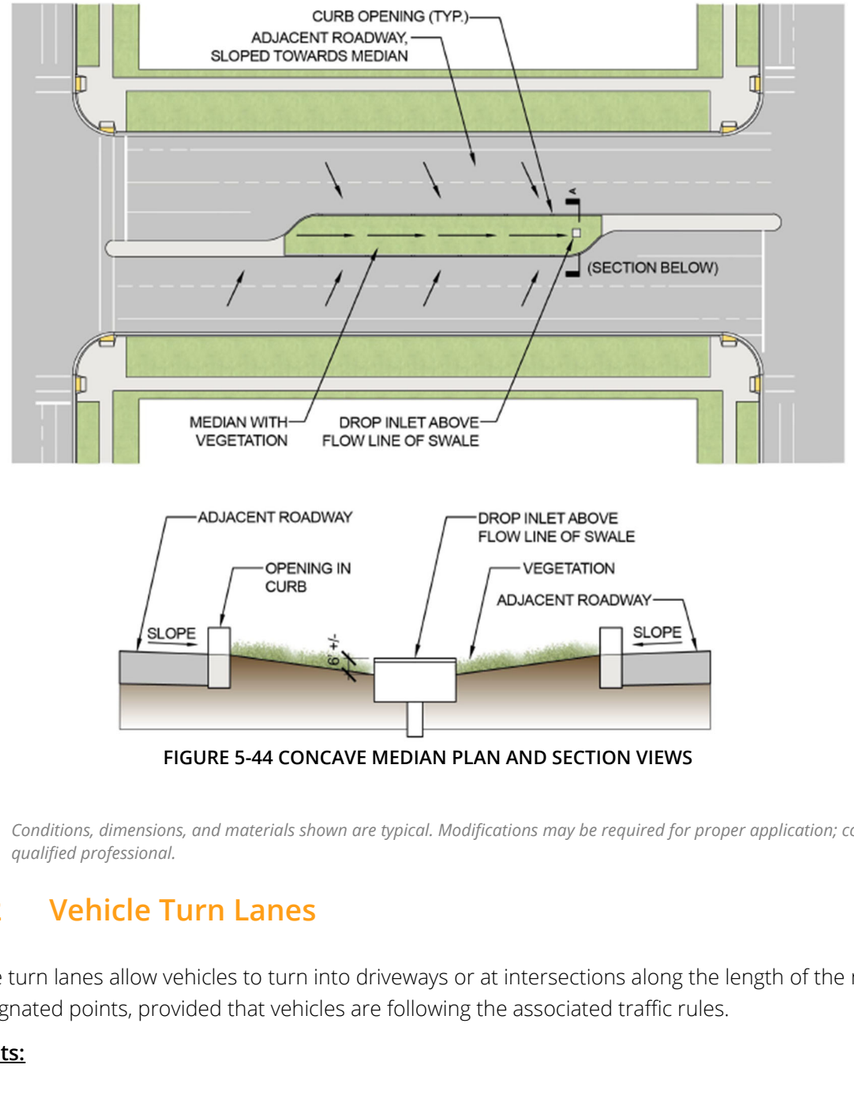

FIGURE 5-44 CONCAVE MEDIAN PLAN AND SECTION VIEWS

Notes:

1. *Conditions, dimensions, and materials shown are typical. Modifications may be required for proper application; consult qualified professional.*

5.5.2 Vehicle Turn Lanes

Vehicle turn lanes allow vehicles to turn into driveways or at intersections along the length of the road or at designated points, provided that vehicles are following the associated traffic rules.

Benefits:

- Exclusive turning lanes for vehicles remove stopped vehicles from through traffic.
- Left-turn lanes at intersections substantially reduce rear-end crashes.
- Left-turn lanes also substantially increase the capacity of many roadways.

Considerations:

- Left-turning vehicles encounter several sources of conflict: pedestrians; bicyclists; opposing through traffic; through traffic in the same direction; and crossing traffic. These conflict types often

lead to angle, sideswipe same direction, and rear-end crashes. Left-turn-related crashes typically account for a high percentage of total crashes at an intersection.

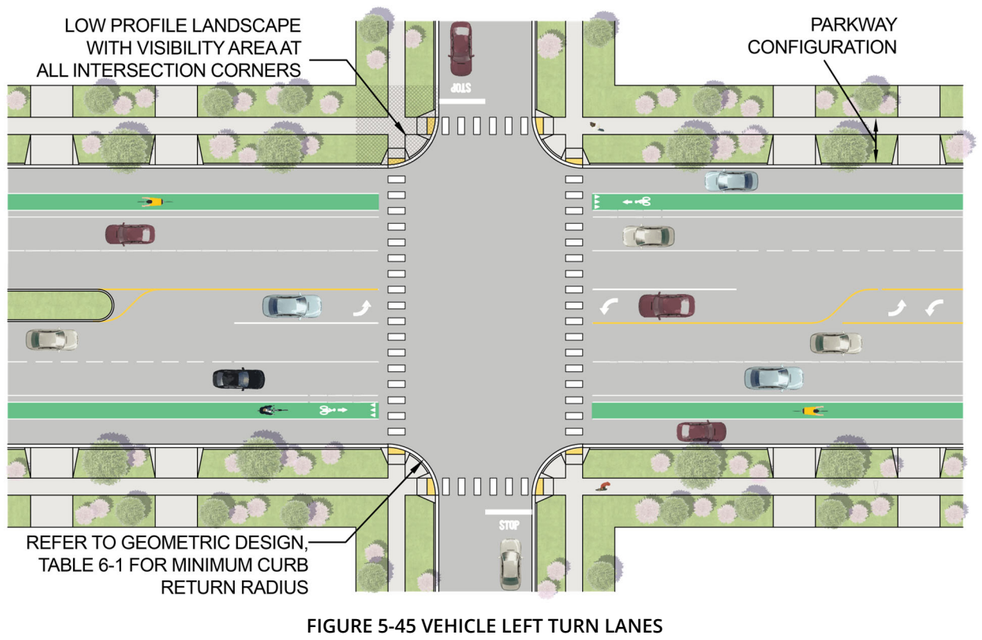

FIGURE 5-45 VEHICLE LEFT TURN LANES

Standards and Guidelines:

- When used, yellow markings for longitudinal lines shall delineate the separation of two-way left-turn lanes and reversible lanes from other lanes.
- If a two-way left-turn lane that is never operated as a reversible lane is used, the lane line pavement markings on each side of the two-way left-turn lane shall consist of a normal broken yellow line and a normal solid yellow line to delineate the edges of a lane that can be used by traffic in either direction as part of a left-turn maneuver. These markings shall be placed with the broken line toward the two-way left turn lane and the solid line toward the adjacent traffic lane.
- White two-way left-turn lane arrows may be used in conjunction with the longitudinal two-way left-turn markings at the locations described in Section 3B.20 of the CA MUTCD. Signs may be used in conjunction with the two-way left turn markings (see Section 2B.24 of the CA MUTCD).
- Channelized left-turn lanes in combination with continuous raised-curb medians are used instead of two-way left-turn lanes if one or more of the following conditions exist:

    - Average daily traffic volumes exceed 20,000 vehicles per day,
    - For remediation where there is a demonstrated crash problem,
    - Wherever a need is demonstrated through engineering study.

- Left-turn or right-turn lanes shall be separated from the through lanes by a single solid 8 inch wide white line.
- Consult the California MUTCD Part 3, “Markings” for additional guidance on turning lane markings.
- The minimum width for a two-way left-turn lane shall be 12 feet. The preferred width is 14 feet.
- Consult the Highway Design Manual Index 301.1 for right-turn lane width requirements.

References:

- CA MUTCD Rev. 8, Caltrans, 2024
- Highway Design Manual, 7th ed., Caltrans, 2020
- Benefits of Access Management, FHWA, 2003
- Signalized Intersections: Informational Guide, FHWA, 2013

5.5.3 Transit Lanes

5.5.3.1 Center Running Transit Lanes

Median bus lanes are typically used on major routes with shorter headways, and where traffic congestion may significantly affect reliability. Median bus lanes reduce conflicts with parked vehicles. Therefore, these lanes create high-quality transit services.

Benefits:

- Median bus lanes serve buses at potentially very high capacity and volume, while improving the pedestrian and passenger experience.
- Eliminates conflicts with drop-offs, deliveries, illegal parking, bicyclists, and some turning movements.

Considerations:

- A combination of self-enforcing design and enforcement, ideally automated, is necessary to ensure the effectiveness of dedicated median bus lanes.
- Coordinate with MTS on station platform design. Platform configuration must be compatible with transit vehicle characteristics—left-side boarding buses may be more expensive.
- Median platforms may reduce overall space occupied by stations, though side-boarding islands can have space benefits when stations are split across an intersection.

Standards and Guidelines:

- Solid white lines or double white lines must be striped along the right side of the transit lane, along with BUS ONLY or LRT ONLY pavement markings (MUTCD 3D-01).
- Center-running lanes should be designated using red/terra cotta color to emphasize the lane and deter drivers from entering it.
- Left turns should be prohibited or accommodated using left-turn lanes and dedicated signal phase.
- Left turns from the median bus lane add significant safety and operational issues for high-frequency bus service but left turns may be permitted at times of day with longer headways.
- Separation with soft (e.g. rumble strips) or hard (e.g. concrete curbs) barriers may be used to reduce encroachment from general traffic.
- The mixed-traffic lane may transition to the right before a stop and to the left after a stop, creating room for parking and a turn lane.
- Complement median bus lanes with all-door boarding and related fare collection strategies, as well as transit signal strategies.
- Designs should anticipate transit vehicles operating at 25 mph, with higher design speeds only if local speed limits permit them.
- Curves may be regulated for much lower speeds, typically 10–15 mph, permitting vehicles to proceed safely within the same lane width as provided on straight sections of the bus lane.

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References:

- Transit Street Design Guide, NACTO, 2016

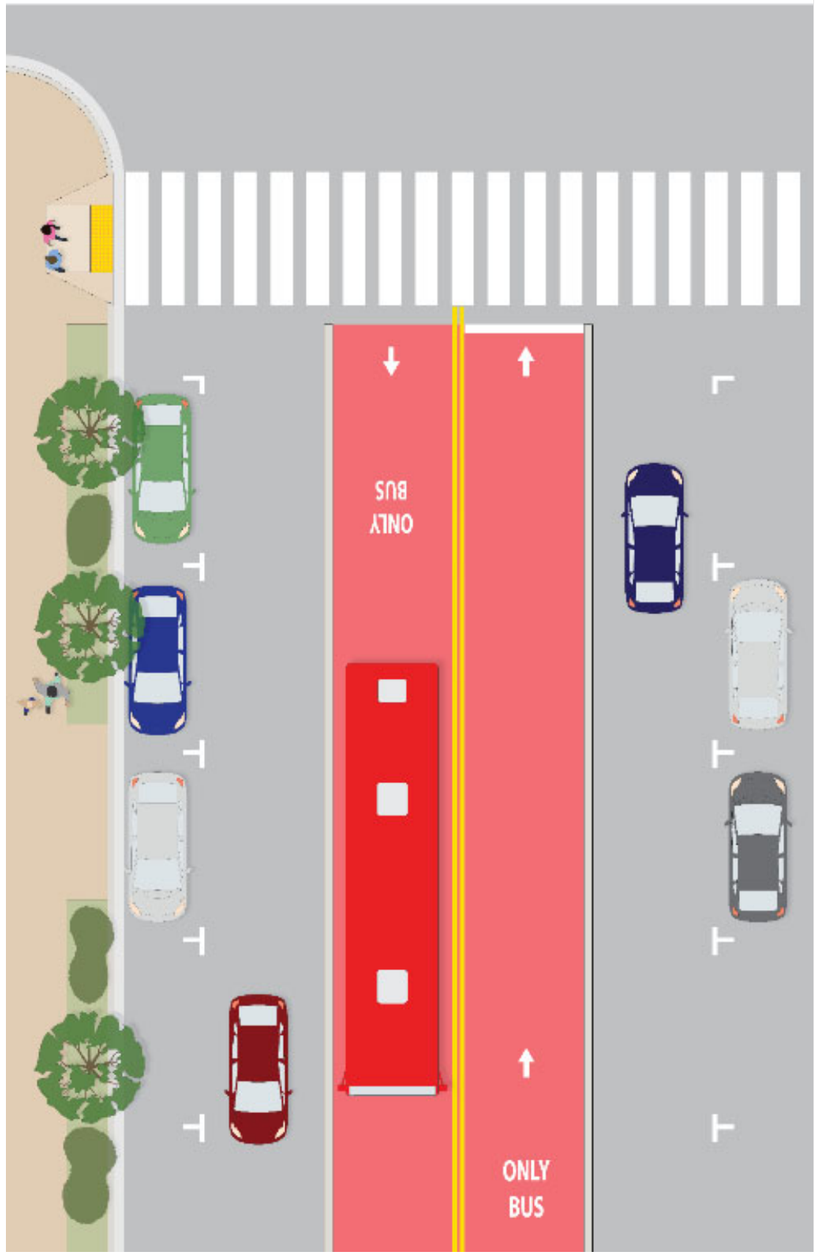

FIGURE 5-4 CENTER RUNNING TRANSIT LANES PLAN VIEW

Note: Red transit lane paint is optional.

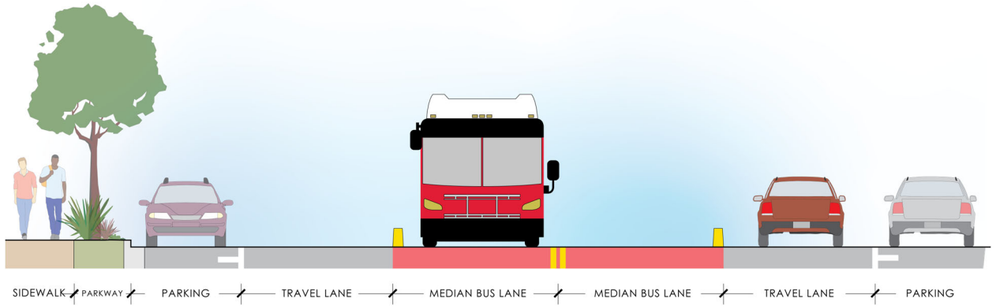

FIGURE 5-5 CENTER RUNNING TRANSIT LANES THROUGH THE LOCATION SECTION VIEW

Facility	Travel Lane #1	Median Bus Lane #1	Median Bus Lane #2	Travel Lane #2
Preferred	11′	12′-13′	12′-13′	11′
Minimum	10′	11′	11′	10′
Maximum	n/a	14′	14′	n/a

TABLE 5-18 CENTER RUNNING TRANSIT LANES DIMENSIONS

5.5.3.2 Median Bus Boarding Island

Located between center-running transit lanes and general traffic lanes to the right, median bus boarding islands create in-lane stops, giving buses priority within the street while allocating space for through-moving vehicles. Median bus boarding islands call for careful management of pedestrian interactions to access the boarding platform.

Benefits:

- Reduces conflicts with curb activity by moving bus stop away from the curb.
- Reduces conflicts with bikes by physically separating bus stop from path of bikes.
- Avoids need to relocate existing catch basins.
- When utilized at a bus stop under an elevated train line, where the bus does not pull over to the sidewalk and passengers regularly stand in the roadway, provides a safer waiting space.

Considerations:

- Designs should provide adequate pedestrian crossing opportunities to and from the island, accounting for potentially high pedestrian volumes. Insufficient crossing width and long pedestrian wait times may increase the incentive for pedestrians to cross traffic lanes unsafely.
- When applied to near-side stops, consider turn management strategies. Near-side applications may be most effective at intersections without the conflicts presented by left-turn movements.

Standards and Guidelines:

- All center medians shall be raised, bounded by 6-inch B-2 concrete curbs and surfaced with stamped concrete or concrete as called for in the City's Standard Drawings.
- Island platforms must be either level or near-level boarding. 24-inch wide detectable warning surfaces should be placed along the boarding edges of the platform to indicate vehicle position.
- Detectable warning surfaces must be placed on both sides of every flush pedestrian crossing.
- Curb ramps shall be provided at the medians to provide access to the crosswalks on the street.
- Platform access ramp may have a maximum slope of 1:12 at a crosswalk or other crossing point, at the sidewalk and onto the platform (ADA Std. 405.2, 810.2.2).
- An accessible boarding area, typically 8 feet wide by 5 feet long, must be provided to permit boarding maneuvers by a person using a wheelchair (ADA Std. 810.2.2), generally requiring islands to be at minimum 8 feet wide. Islands with railings along the rear side will require an extra foot of space, making the total width 9 feet.
- To accommodate street sweeping, all curves requiring sweeping shall have a min 22' radius.
- Reflective signage or other visible raised element on the leading corner (back left corner) of the island. KEEP LEFT or KEEP RIGHT (MUTCD R4-8) or object marker (OM-3) signs may be used.
- Ensure that pedestrian refuge islands crossing transitways are wide enough to allow groups of people to wait, particularly near stations. Discourage pedestrians from waiting in unsafe locations in the roadway, especially near railways.

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- At intersections, install refuge island tips at least 6 feet wide to provide pedestrians protection in the crosswalk.

References:

- 2010 ADA Standards for Accessible Design, Department of Justice, 2010
- Manual on Uniform Traffic Control Devices for Streets and Highways, 11th ed., FHWA, 2023
- Transit Street Design Guide, NACTO, 2016

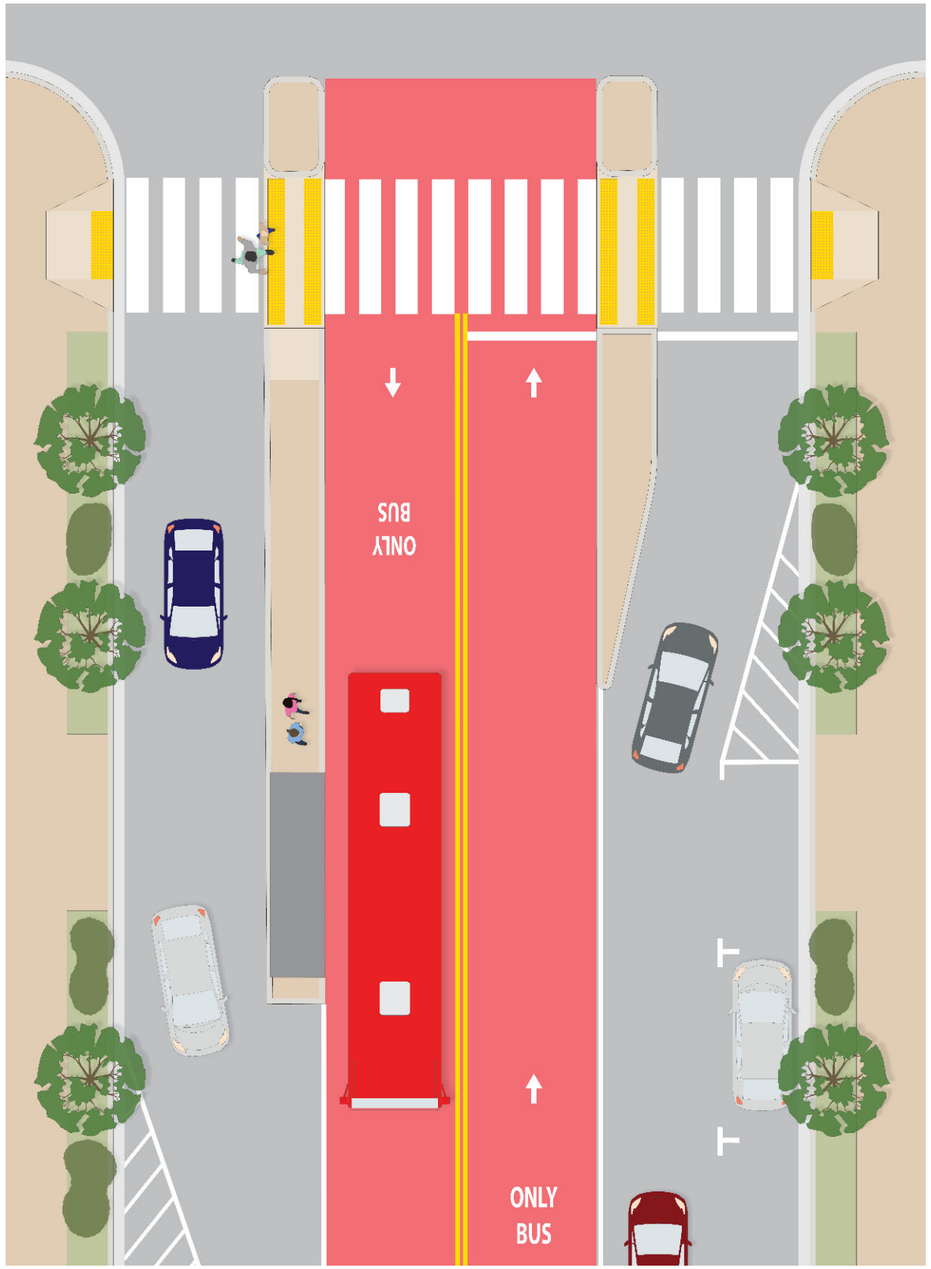

FIGURE 5-48 MEDIAN BUS BOARDING ISLAND PLAN VIEW

Note: Red transit lane paint is optional.

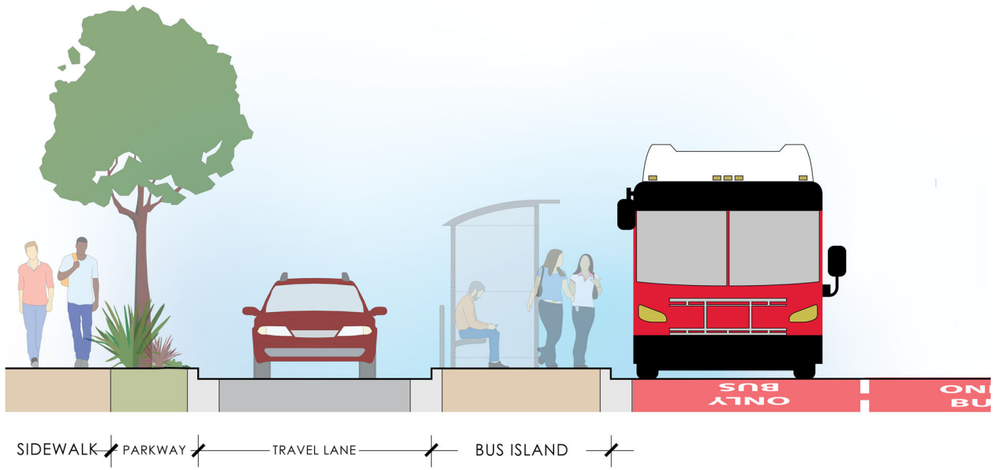

FIGURE 5-49 MEDIAN BUS BOARDING ISLAND SECTION VIEW

Facility	Bus Island
Preferred	9′
Minimum	8′
Maximum	n/a

TABLE 5-19 MEDIAN BUS BOARDING ISLAND DIMENSIONS

5.6. Mid-block Crossing Treatments

Mid-block pedestrian crossings are designated areas for pedestrians to cross the street between where vehicular intersections occur. These crossings should be installed where it is convenient for pedestrians to cross the road, to incentivize greater and safer pedestrian mobility. Frequently, this will mean installation in areas where pedestrians cross mid-block, outside of marked intersections. Midblock crossing treatments may include raised medians/pedestrian cut-throughs, raised crossings, Rectangular Rapid Flash Beacons, or Pedestrian Hybrid Beacons.

5.6.1 General Guidelines

- Refer to Section 5.6.2 Mid-block Crosswalks for additional guidance.
- Refer to CA MUTCD for appropriate pavement markings and signage.
- Drainage requirements must be evaluated and addressed.
- "No Parking" shall be determined based on visibility requirements.
- Placement of landscaping shall be consistent with the Landscape Standards and shall allow for sight distance requirements.
- Curb extensions as shown may be installed to improve pedestrian visibility and reduce crossing distance.

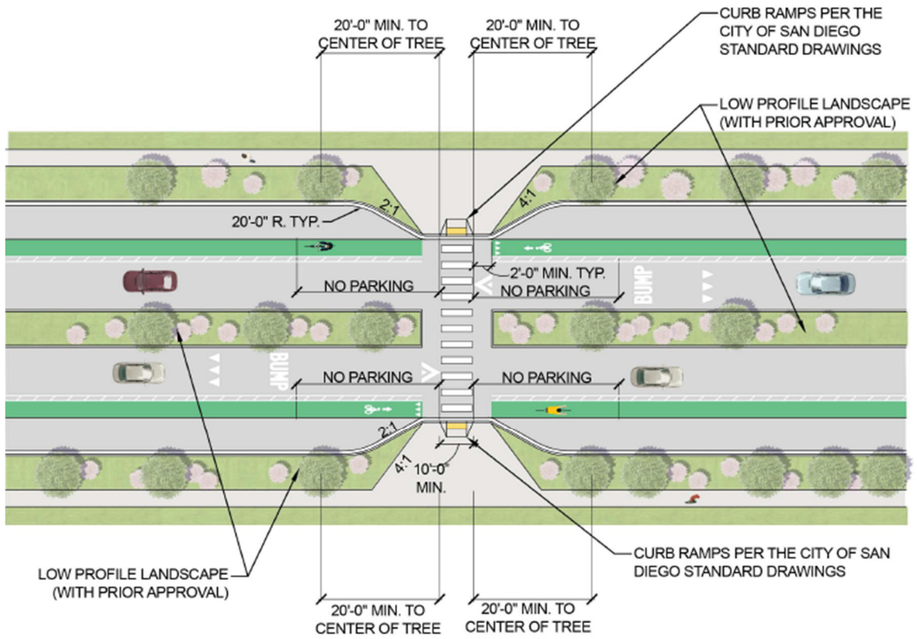

FIGURE 5-50 MID-BLOCK CROSSING PLAN VIEW

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5.6.2 Mid-block Crosswalks

Mid-block crossings provide convenient and safe places where people can cross the street in the middle of a long block. Crossings should use clear markings and signs that alert drivers to yield for pedestrians. Accessible rectangular rapid flash beacons (RRFB) and pedestrian hybrid beacons (PHB, HAWKs) activated by a pedestrian push button are other ways to alert drivers to people using a mid-block crossing.

Benefits:

- Mid-block crosswalks provide convenient crossing locations for pedestrians when other crossing opportunities are distant or where there is a presence of concentrated mid-block pedestrian crossing demand.

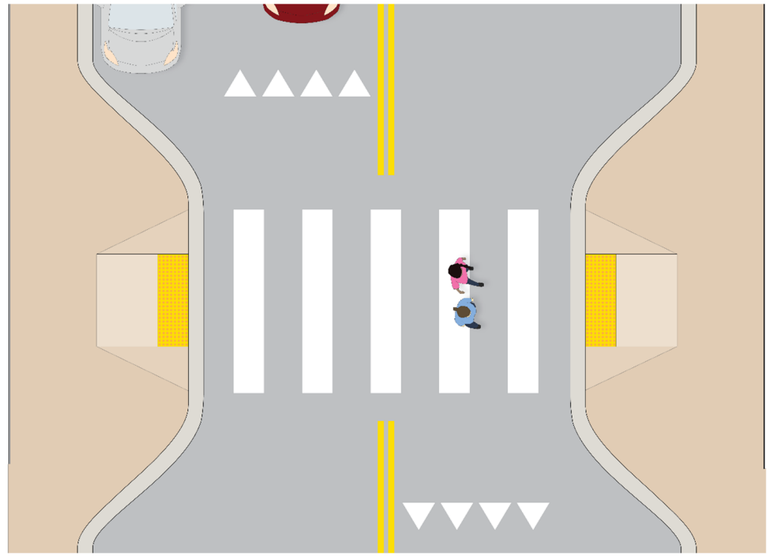

FIGURE 5-51 MID-BLOCK CROSSWALK PLAN VIEW

Considerations:

- Mid-block crosswalk can be an effective part of the overall pedestrian network.
- Requirements for installation of mid-block crossings are contained in the Council Policy 200-07, "Marked Crosswalk Criteria at Uncontrolled Locations."

Standards and Guidelines:

- Crosswalks at uncontrolled intersections and mid-block crosswalks shall be installed in accordance with Council Policy 200-07.

- Parking, standing, or stopping within 20 feet of the vehicle approach side of any marked or unmarked crosswalk or within 15 feet of any crosswalk where a curb extension is present is prohibited.
- Unmarked crosswalks shall be measured from the boundary line of where two sidewalks intersect at the curb ramp. Refer to Figure 5-28 and Section 105.6 “Pedestrian Crossings” of the HDM.
- Parking for bicycles or motorized scooters within 20 feet of a crosswalk may be permitted to the satisfaction of the City Engineer.
- Mid-block crosswalks shall be well illuminated (refer to Chapter 3.6.1, “Mid-Block Street Lighting”).
- A curb ramp shall be provided at each end of the crosswalk.
- Crosswalk marking should be continental crosswalks as per City Standard SDM-116.
- Curb extensions may be considered at the crosswalk to enhance pedestrian crossing visibility and reduce crossing distance.
- If mid-block crosswalks are signalized, accessible pedestrian signals and devices shall be installed.
- On streets that experience excessive vehicle speeds, enhanced pedestrian crossings should be combined with traffic calming measures such as raised crosswalks or curb extensions.

References:

- Council Policy 200-07 "Marked Crosswalk Criteria at Uncontrolled Locations", City of San Diego, 2015

5.6.3 Rectangular Rapid Flashing Beacons (RRFBs)

Rectangular Rapid Flash Beacons (RRFBs) feature amber LED lights that are activated by pushing a button or through technology that automatically detects a pedestrian’s presence. RRFBs may provide a lower cost alternative to traditional traffic signals and pedestrian hybrid beacons. The irregular LED flash pattern is similar to emergency flashers on police vehicles, capturing the attention of drivers more readily than conventional traffic signals. See Council Policy 200-07 for when RRFBs can be used.

Benefits:

- RRFBs can reduce crashes up to 47% for pedestrian crashes. (FHWA)
- RRFBs can increase motorist yielding rates up to 98% (FHWA)

Considerations:

- Install RRFBs in the median rather than the far-side of the roadway if there is a pedestrian refuge or other type of median.
- Reserve the use of RRFBs for locations with significant pedestrian safety issues, as over-use of RRFB treatments may diminish their effectiveness.
- Using solar-power panels eliminates the need for an external power source.

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FIGURE 5-52 RECTANGULAR RAPID FLASHING BEACONS

Location: 30th Street and Landis Street

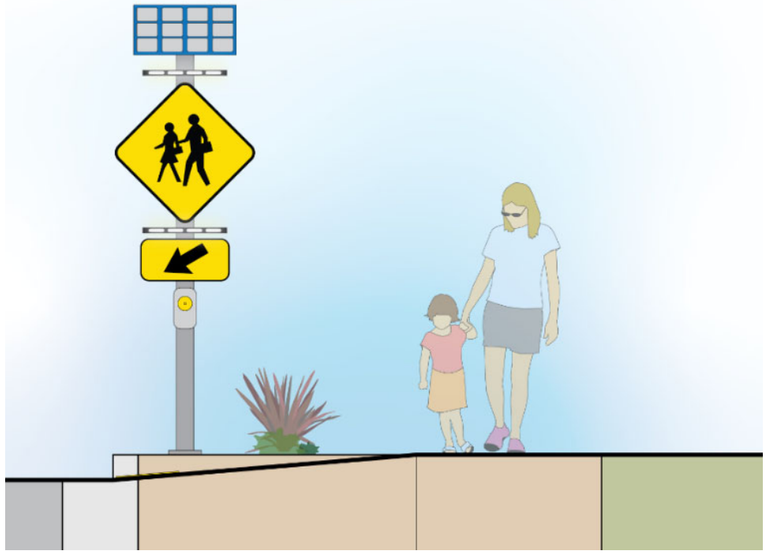

FIGURE 5-53 RECTANGULAR RAPID FLASHING BEACON SECTION VIEW

Guidelines:

- Accessible Pedestrian Signals shall be provided to be accessible to people who are blind or have low vision.

- RRFBs shall have a locator tone and speech notification that the "Lights are Flashing", but no vibration.
- Each RRFB shall consist of two rectangular-shaped yellow indications, each with an LED-array-based light source. The size of each RRFB indication shall be at least 5 inches wide by at least 2 inches high.
- The two RRFB indications for each RRFB unit shall be aligned horizontally, with the longer dimension horizontal and with a minimum space between the two indications of at least 7 inches, measured from the nearest edge of one indication to the nearest edge of the other indication.
- For any approach on which RRFBs are used to supplement post-mounted signs, at least two W11-2, S1-1, or W11-15 crossing warning signs (each with an RRFB unit and a W16-7P plaque) shall be installed at the crosswalk, one on the right-hand side of the roadway and one on the left-hand side of the roadway. On a divided highway, the left-hand side assembly should be installed on the median, if practical, rather than on the far left-hand side of the highway.
- An RRFB unit shall not be installed independent of the crossing warning signs for the approach that the RRFB faces. If the RRFB unit is supplementing a post-mounted sign, the RRFB unit shall be installed on the same support as the associated W11-2, S1-1, or W11-15 crossing warning sign and plaque. If the RRFB unit is supplementing an overhead-mounted sign, the RRFB unit shall be mounted directly below the bottom of the sign. Additional Design Guidance can be found in IA-21.

References:

- CA MUTCD Rev. 8, Caltrans, 2024
- PROWAG, US Access Board, 2023

5.6.4 Pedestrian Hybrid Beacon

A pedestrian hybrid beacon, also known as High-Intensity Activated Crosswalk (HAWKs), is a special type of hybrid beacon used to warn and control traffic at an unsignalized location to assist pedestrians in crossing a street or highway at a marked crosswalk.

Benefits:

- Improves mobility and crossing safety for pedestrians and bicyclists.
- Causes fewer delays than a full traffic signal.
- Encourage drivers to yield to fellow community members walking and biking at street crossing.

Considerations:

- In general, PHBs are used where it is difficult for pedestrians to cross a roadway, such as when gaps in traffic are not sufficient or speeds exceed 35 miles per hour.
- They are very effective at locations where three or more lanes will be crossed, or traffic volumes are above 9,000 annual average daily traffic.
- Installation of a PHB must also include a marked crosswalk and pedestrian countdown signal.

- If PHBs are not already familiar to a community, agencies should conduct appropriate education and outreach as part of implementation.

FIGURE 5-54 PEDESTRIAN HYBRID BEACON

Location: C St

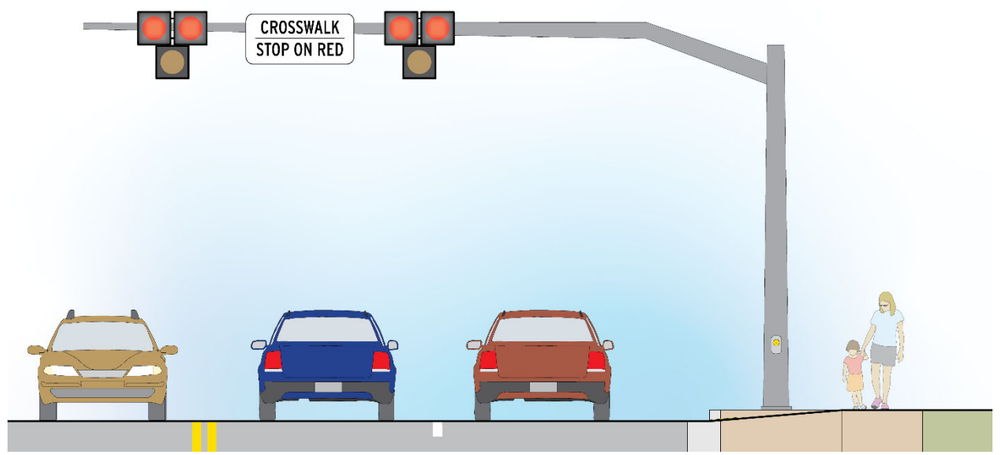

FIGURE 5-55 PEDESTRIAN HYBRID BEACON SECTION VIEW

Guidelines:

- A pedestrian hybrid beacon face shall consist of three signal sections, with a CIRCULAR YELLOW signal indication centered below two horizontally aligned CIRCULAR RED signal indications.
- Accessible Pedestrian Signals shall be provided to be accessible to people who are blind or have low vision.

- The pedestrian push button shall have locator tones, and percussive tone or speech with vibration with the Walk, and the "Wait" when the button is pushed.
- When an engineering study finds that installation of a pedestrian hybrid beacon is justified, then:
    - At least two pedestrian hybrid beacon faces shall be installed for each approach of the major street,
    - A stop line shall be installed for each approach to the crosswalk,
    - A pedestrian signal head conforming to the provisions set forth in Chapter 4E of the CA MUTCD shall be installed at each end of the marked crosswalk, and
    - The pedestrian hybrid beacon shall be pedestrian actuated.
- Additional design guidance can be found in CA MUTCD Chapter 4F. Pedestrian Hybrid Beacons and FHWA MUTCD Chapter 4J. Pedestrian Hybrid Beacons.

References:

- CA MUTCD Rev. 8, Caltrans, 2024
- Manual on Uniform Traffic Control Devices for Streets and Highways, 11th ed., FHWA, 2023
- PROWAG, US Access Board, 2023
- Traffic Calming Guide, Caltrans, 2023

5.7. Private Streets and Private Drives

5.7.1 Private Streets

Standards and Guidelines:

- Private streets shall be designed and constructed to the same structural, geometric, lighting, and drainage standards as dedicated streets. Private streets with parking on both sides of the street shall have a minimum curb-to-curb width of 34 feet.
- The entrance to private streets shall advise the public of the non-dedicated status of the street system and shall have an entrance design that visibly reinforces the private access. At a minimum, absent other design features, this design shall consist of signage designating the street as private. Such entrances must be provided with adequate visitor parking and turnaround facilities.
- The private street name sign shall be in accordance with the City's Standard Drawings.
- Private streets may be utilized where there is a homeowners association established that will maintain the street system.
- General utility easements will be required over private streets. Width of easement should be consistent with street ROW. The minimum width shall be 20' and 28' where the road serves more than one lot.

5.7.2 Private Drives

Standards and Guidelines:

- Private drives, where permitted in lieu of either dedicated or private streets, must be designed to allow direct access to all developed areas of the project.
- Private drives serving as fire lanes shall be designed with a turning radius of 50 feet.
- Minimum private drive width shall be consistent with the Land Development Code.
- Private drives shall be designed and constructed per the City's Standard Drawings.

5.7.3 Walkways

A system of improved all-weather walkways must be provided connecting each dwelling unit to private and public street sidewalks within and adjacent to the development and to major points of pedestrian attraction within the development.

5.7.4 Parking on Private Streets and Drives

Standards and Guidelines:

- Parking shall meet the requirements established by the applicable zone as contained in the Land Development Code, the ADA, and California Title 24 accessibility regulations.
- An unobstructed minimum distance of 25 feet from the circulation drive curb to the structure or carport area and not less than 20 feet from the back of sidewalk shall be provided.
- Parking bays, both parallel and perpendicular, may be utilized on low-volume residential streets. Such facilities would normally be included within the ROW or private street easement and would be maintained as part of the street. Where a sidewalk is located on the same side of the roadway as the parking bay, a continuous walkway must be maintained either by restricting parking within five feet of the extended curb line or by providing an improved walkway around the parking bay. All parking bays shall accommodate full-size vehicles.

5.8. Traffic Calming

This section is intended to provide design options for traffic calming on new streets and streets being considered for retrofit. Some general design specifications are provided to assist designers in developing comprehensive streetscape plans for proposed development and redevelopment projects. Traffic calming is the process of minimizing negative impacts associated with neighborhood traffic on residents, pedestrians, bicyclists and school children. Traffic calming measures can reduce neighborhood speeding, cut-through traffic, and reckless driver behavior on city streets. While roadways ensure both vehicle and pedestrian connectivity, excessive traffic volumes or speeding can cause adverse neighborhood impacts resulting from their original design and placement. To avoid these negative impacts, city streets can be retrofitted to encourage safer driver behavior. The guidelines and traffic calming measures presented in this section can be implemented on residential streets, and many

of these measures can be successfully applied to major and collector roadways as well. New roadways can also be planned and designed with traffic calming in mind for residents, pedestrians, bicyclists, and drivers.

Traffic calming involves the use of various geometric features designed to reduce vehicle speeds or discourage shortcutting traffic. This has the benefit of making streets safer for all users and more comfortable for those outside of a motor vehicle. To achieve the desired effect of traffic calming, the effectiveness of such measures and their impacts should be evaluated on an area-wide basis.
Some measures can be combined to increase the effect on traffic volumes and speeds. For example, a raised crosswalk may be combined with bulb outs, the effect being a crosswalk that is both shortened and raised above the level of the roadway. Motorists must then react to both a vertical deflection and a narrowing. The suitability of a combined measure needs to be assessed.

Landscaping, street trees, street lighting, and street furniture are other methods of traffic calming that also create distinctive and pleasing streetscapes that encourage sidewalk activity. These improvements, outlined in Chapter 3, section 3.4.3, "Furnishings Zone," may involve consideration of irrigation and long-term maintenance to be provided by maintenance assessment districts or other agreements with the City. Having safe and walkable neighborhoods has been shown to improve a healthy quality of life.

5.8.1 Traffic Calming Techniques

Traffic calming strategies generally fall into the following categories:

- Horizontal deflections (e.g., chicanes, traffic circles, median slow points/chokers)
- Vertical deflections (e.g., road lumps, speed tables, and raised crosswalks)
- Intersection improvements
- Traffic diverters
- Channelization

Enhancing the streetscape environment should have the same level of priority in the design scheme as traffic calming impacts. A general discussion of these categories follows along with more specific details and design guidelines for various traffic calming techniques.

Traffic calming features such as median slow points or chokers, chicanes, traffic circles, and intersection pop-outs may be provided in accordance with this design manual. Road lumps or speed tables may be installed by the City on existing streets under some circumstances. For other tools and detailed information on traffic calming features, refer to the City of San Diego Traffic Calming Guidelines, maintained by the Transportation Department. Designers are required to review such guidelines for additional detailed information regarding traffic calming devices.

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5.8.2 Traffic Calming Considerations and Guidelines

Considerations:

- Weigh the undesired effects of traffic calming devices (increased travel times, emergency response times, noise, and traffic diversion) against their prescribed benefits.
- Proposed developments can benefit from neighborhood traffic management strategies. Traffic concerns related to speeding and traffic volumes can often be anticipated and prevented through proper street design. New development and infill (redevelopment) projects can be designed to either incorporate traffic calming devices or avoid the need for traffic calming devices altogether.
- During the development review process the following factors are most crucial in determining the need for traffic calming devices or layout redesign:
    - Traffic volumes: The average daily traffic (ADT) on local residential streets should be minimal, not exceeding 1,500 vehicles. High traffic volumes on local residential streets would be a reason to include traffic calming measures or redesign street layout. During development review, if a residential street were estimated to carry more than 1,500 vehicles then the street layout would require redesign. This would help to reduce speeds on higher volume residential streets.
    - Traffic speeds
    - Street layout
    - Vehicle/pedestrian conflict areas
- Through the City's development review process, if staff determines that the proposed layout is problematic based on the above factors, then staff can request a redesign of the layout to reduce or avoid future traffic-related problems.
- Potential indicators of speeding issues may include:
    - Where there is a distance of greater than 600 feet between traffic control or traffic calming devices
    - Where roadway grades may increase the potential for speeding.
    - Where the effective travel width is large due to a lack of on-street parking or lightly used bike lanes.

Guidelines:

- Traffic calming measures are not typically installed at roadway classifications higher than local streets, per community plan roadway network classifications, except in limited instances (such as use of V-Calm signs).
- Use traffic calming techniques in appropriate locations to reduce vehicle speeds or discourage shortcutting traffic.
- Traffic calming should not impair the mobility of non-motorized users on the street.
- Choose traffic calming devices to best fit the situation for which it is intended. If a pedestrian-oriented land use is located in an area where high speed or high traffic volumes are unavoidable,

then neighborhood traffic management measures should be selected that benefit pedestrians. For example, at an intersection or at mid-block locations, bulb outs, raised crosswalks or center island narrowing should be given some preference over other measures, such as intersection realignment or road lumps.

- Design traffic calming devices appropriately, including consideration for accessibility, drainage, underground utilities, adequate visibility, the needs of emergency, sanitation, and transit vehicles, and landscaping.
- Traffic calming installations must meet State and Federal accessibility requirements including PROWAG and Title 24.
- Delays to emergency vehicles should be minimized by the appropriate placement and design of traffic calming devices. In some cases, certain traffic calming devices may not be appropriate.
- Traffic calming installations should not divert traffic to other local residential streets. The potential impacts of traffic diversion should be evaluated for all traffic calming installations.
- Traffic calming devices on designated transit routes should be limited to those that permit the efficient movement of transit vehicles.
- All traffic calming installations are encouraged to have a landscape element that includes trees and shrubs consistent with the Landscape Standards.
- Maintenance responsibilities must be identified prior to implementation.
- If traffic calming devices include decorative pavement, it shall comply with the standards and guidelines in Section 6.5.1 of this Manual.
- Traffic calming devices will be clearly marked and visible during the day and night. Where appropriate, they should include warning signs on all approaches of traffic affected by the device. All physical devices will be designed with aesthetics in mind to provide for landscaping and visual contrast in the roadway.
- Traffic calming measures should conform to the Traffic Calming Guidelines and the Landscape Standards where applicable.

5.8.3 Horizontal Deflections

Horizontal deflections are used to achieve speed reductions by breaking up the linear path of vehicle travel. Traffic calming designs that involve horizontal shifts in the travel way are inappropriate for multilane collector streets, major streets, and arterials. Horizontal deflections include chicanes (mid-block), traffic circles (intersections), and median slow points (mid-block and intersections).

Curb extensions can be implemented using low-cost, interim materials. In such cases, curb extensions should be demarcated from the existing road- bed using temporary curbs, bollards, planters, or striping.

5.8.3.1 Chicanes

A chicane is a channelization that causes a series of tight turns in opposite directions in an otherwise straight stretch or road (see Figure 5–51). The combination of narrowed street width and the serpentine path of travel slows traffic.

Benefits:

- Slows traffic.
- Potential opportunity for landscaping.
- Tendency not to divert traffic to nearby streets.

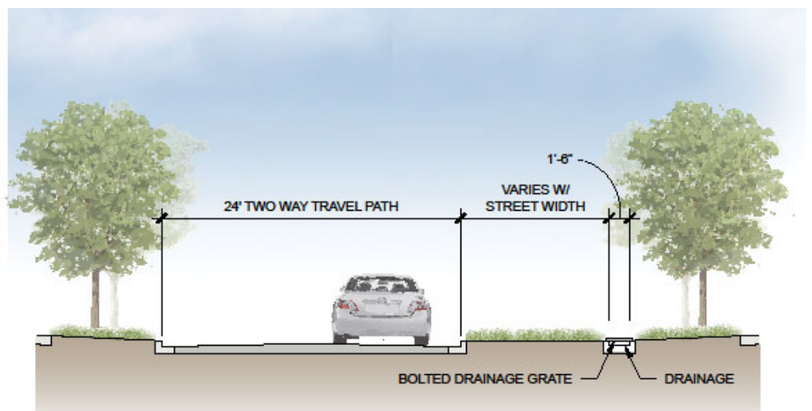


FIGURE 5-56 CHICANE SECTION A-A

Note:

1. *Spacing of chicane segments depend on site considerations, e.g. driveway locations.*
2. *Island plantings should not obscure driver's view of chicane traffic (24" maximum height).*
3. *Stamped concrete may be used in the chicane island.*
4. *Bicycles are to use the same path as motor vehicles, not the drainage channel.*

Considerations:

- On new streets, chicanes narrow the street by widening the sidewalk or landscaped parkway.
- On streets considered for retrofit, raised islands are installed to narrow the street.
- Chicanes are inappropriate for use on streets classified as collector or higher, bus routes or emergency response routes, where there is a grade that exceeds 5 percent, or where there is limited stopping sight distance such as at the crest of a hill.
- Chicanes may cause some loss of on-street parking, may impact driveways, may increase emergency response time, or may affect drainage and street sweeping.
- Careful consideration must go into the design to make sure that drivers are not able to drive directly down the center without any horizontal deflection. This tool should be avoided on roads that have significant horizontal and/or vertical curves.

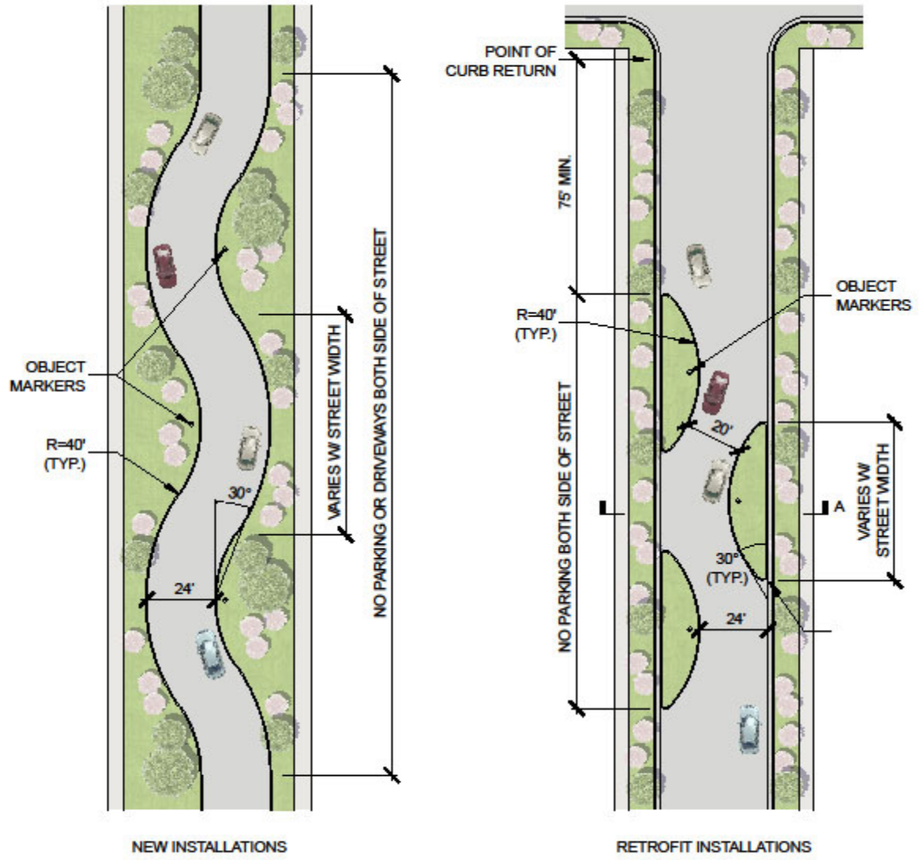


FIGURE 5-6 CHICANE PLAN VIEW

Guidelines:

- Chicanes are created by installing a series of two or more curb extensions, alternating from one side of the roadway to the other. This creates an S-shaped path for vehicles.
- Chicanes can be either one or two lanes. One lane chicanes should only be used on roads with low traffic volumes. This tool is best used on long, straight streets with low volumes due to the single lane of travel through the chicane.

References:

- Traffic Calming Guide, Caltrans, 2023
- Traffic Calming Guidelines, City of San Diego Transportation Dept, 2010

5.8.3.2 Chokers/Pinch points

Chokers are created by installing one set of curb extensions at opposing locations on a roadway. This narrows the travelway but maintains two-way traffic. Curb extensions visually and physically narrow the roadway, creating safer and shorter crossings for pedestrians while increasing the available space for street furniture, benches, plantings, and street trees. They may be implemented on downtown, neighborhood, and residential streets, large and small.

Benefits:

- A set of curb extensions decrease the overall width of the roadway and can serve as a visual cue to drivers that they are entering a neighborhood street or area.

Considerations:

- Creates opportunity to install landscaping.
- May cause a reduction of on-street parking.
- May increase maintenance and emergency response time.
- May impact drainage and street sweeping.
- More difficult access for larger vehicles.
- Requires bicyclists to merge with vehicles.
- Bicycle racks can be combined with curb extensions.
- Crossings do not need to be marked unless volumes exceed 2000–3000 vehicles per day or midblock destinations warrant an enhanced treatment.
- Potential location if combined with pedestrian crossing features.
- This device works best at mid-block locations that have sufficient volumes so that opposing traffic would be approaching or passing through the choker at the same time. This discourages drivers from traveling down the center of the roadway to avoid any impacts of the chokers.

Guidelines:

- Narrowing measures, such as bulb outs or chokers, should not be constructed wider than the approximate width of a parked vehicle. Extension of these devices any further than the width of a parked vehicle (or the length of a vehicle in the case of diagonal parking) could present potential safety issues to other drivers.
- Consider including cut-throughs for bicyclists.
- There should be enough roadway width maintained between the chokers to accommodate bicycle and vehicle traffic.

References:

- Traffic Calming Guide, Caltrans, 2023
- Traffic Calming Guidelines, City of San Diego Transportation Dept, 2010

5.8.3.3 Median Slow Point

A median slow point is a small median or island placed in the center of a roadway that causes traffic to shift its path to the right in order to travel around it (see Figure 5-53). It may be on an approach to an intersection or mid-block. If median slow points are installed across an intersection, the street should have alternative access points.

Benefits:

- Slows traffic
- Creates a pedestrian refuge area.
- Creates a landscaping opportunity.
- Tends not to divert traffic to nearby streets.

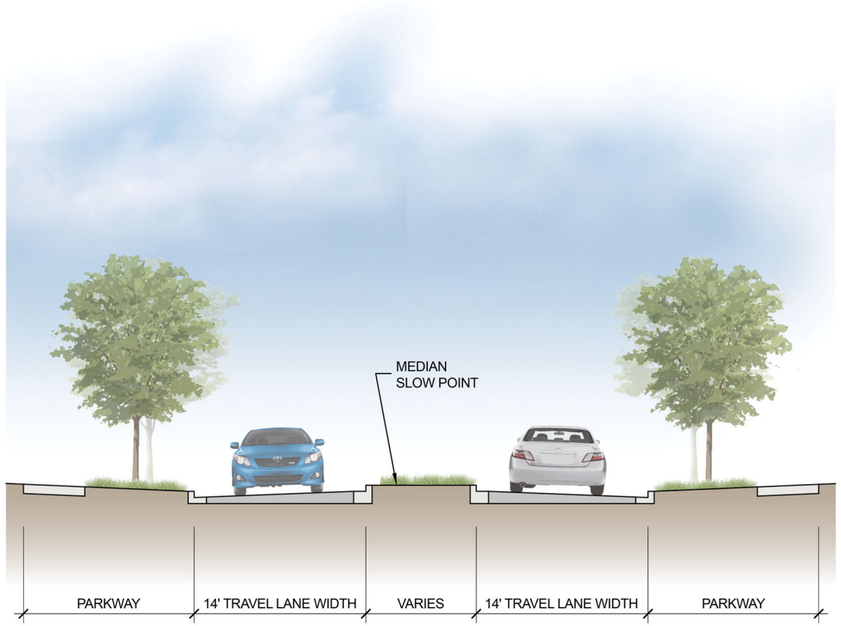
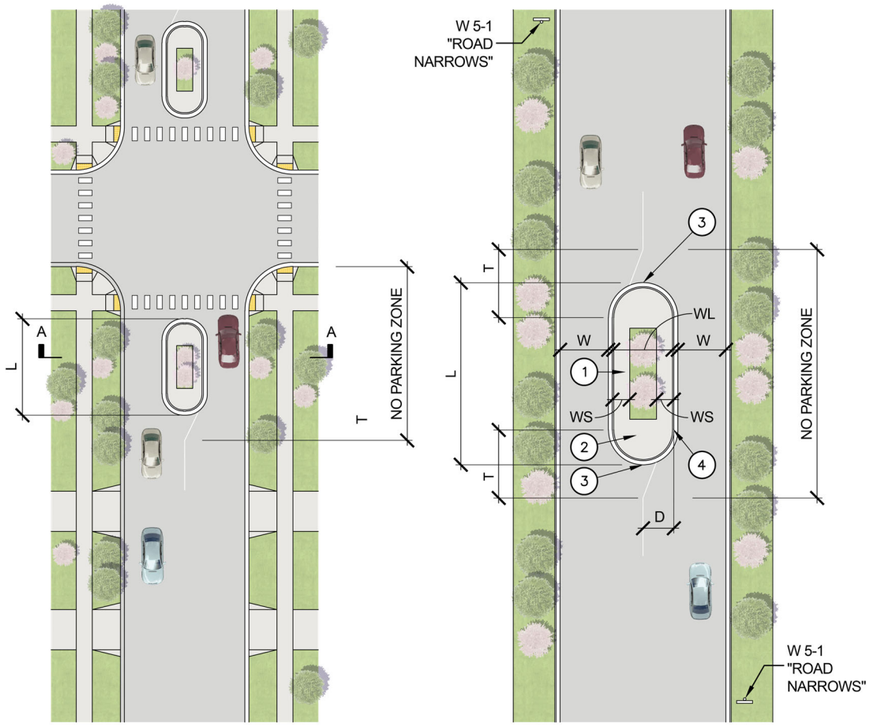


FIGURE 5-58 MEDIAN SLOW POINT SECTION VIEW



1. AREA THAT MAY BE LANDSCAPED (LANDSCAPE, IRRIGATION, AND LONG TERM MAINTENANCE MUST BE CONSIDERED BY A MAINTENANCE ASSESSMENT DISTRICT OR OTHER AGREEMENTS WITH THE CITY OF SAN DIEGO)
2. STAMPED CONCRETE
3. YELLOW PAINTED ISLAND NOSE
4. 6" CURB

W - TRAVEL LANE WIDTH - 14'
WL - WIDTH OF SLOW POINT (VARIES DEPENDING ON STREET WIDTH)
WS - FOR LANDSCAPED SLOW POINT, 2' TYPICAL
L - LENGTH OF SLOW POINT, VARIES DEPENDING ON PARKING AND DRIVEWAYS
D - HORIZONTAL DEFLECTION

$T = \frac{(DXS^2)}{60}$ WHERE:
D = DEFLECTION IN FEET
S = 85TH PERCENTILE SPEED IN MPH

FIGURE 5-7 MEDIAN SLOW POINT PLAN VIEW

Consideration:

- Potential loss of parking.
- May impact large vehicles' turns when installed at intersections.
- May be used on two-lane streets.
- If installed across an intersection, street should have alternative access.
- Inappropriate for use on streets classified as major or higher or where there is limited stopping sight distance.

Guidelines:

- Median slow points may be used on two-lane streets. They should not be used on streets classified as major or higher or where there is limited stopping sight distance.

References:

- Traffic Calming Guidelines, City of San Diego Transportation Dept, 2010

5.8.3.4 Treatment on Curves

Curve Treatments such as raised median or raised pavement markers placed along the centerline of a sharp curve will prevent or discourage vehicles from cutting across the centerline and into the opposing travel lane.

Benefits:

- Speed reduction: Vehicle speeds are generally reduced due to the shorter radius of the vehicle path around the curve.
- Channelizes vehicular traffic and limits midblock left turns where appropriate.
- Provides, at times, a pedestrian refuge on a wide street at pedestrian crossings.
- Collision reduction.

Considerations:

- Potential loss of parking.
- May restrict access to driveways in vicinity of device.

Guidelines:

- Raised pavement markers (Botts dots) can be installed.
- Medians can be installed if there is sufficient roadway width. However, median installation has the potential to block driveway access. Openings may be cut in the median to accommodate this situation.

References:

- Traffic Calming Guidelines, City of San Diego Transportation Dept, 2010

5.8.4 Vertical Deflections

Vertical deflections are an effective traffic calming technique for speed reductions and discouraging shortcutting on local streets. Traffic calming designs that involve vertical shifts are inappropriate for collectors, major streets, and arterials. Vertical deflections include road humps and speed tables/raised crosswalks.

Vertical speed control elements should be applied where the target speed of the roadway cannot be achieved through the use of conventional traffic calming elements, such as medians, narrower roadways or lanes, curb extensions, enforcement or lower speed limits.

Streets with speed limits of 25 mph and under are good candidates for vertical speed control, especially where those streets have higher than desired operating speeds or are used by cut-through traffic on a regular basis.

Vertical speed control elements are most effectively implemented at a neighborhood level, rather than by request on a single street. Designate “Slow Zones” where traffic calming treatments should be targeted or coordinated in a comprehensive way.

Unless otherwise desired, vertical traffic calming should reduce a street’s target speed to 20 mph or less.

5.8.4.1 Road Lumps

Road lumps are rounded, raised areas placed across the road. Road lumps are approximately 12 feet long (in the direction of travel), 3.5 inches high, and parabolic in shape. They are usually constructed with a taper on each side within 1 or 2 feet of the gutter line to allow unimpeded drainage between the hump and curb. Road lumps have cut-outs placed in them so that an emergency vehicle can pass through lumps instead of going over them (see Figure 5-55 and 5-57).

Benefits:

- Speed reduction: reduce speeds to 15–20 mph
- Volume reduction
- Collision reduction
- May discourage cut-through traffic

Considerations:

- Uncomfortable for bicyclists and vehicle passengers.
- Creates noise when vehicles brake and accelerate.
- EMS/Fire vehicles forced to almost stop at ramp.
- Road lumps will not impede EMS/ Fire response as much as traditional road humps.
- Will have less of an effect on larger vehicles.
- The disadvantages of road lumps may include diverting traffic to other low-volume local streets, increasing emergency response time, and increasing noise.
- The height causes the driver to be jolted if traveling at too high of a speed. However, due to the advance in vehicle suspension systems, this device may not affect all drivers. It must be cautioned that these devices do have a severe impact on emergency response services and can create an uncomfortable situation for all passengers including those in ambulances.

Guidelines:

- Road lumps should not be used on streets classified as collector or higher, bus routes or emergency response routes, where there is a grade that exceeds 5 percent, or where there is limited stopping sight distance.
- Ramp profile describes the angle or approach of the vertical measure that a vehicle would traverse. Vertical measures (e.g., speed lumps) should use parabolic profiles on the approach and departure ramps to the device. Parabolic profiles have consistently been used in other programs around the nation and are a recommended design according to Institute of Transportation Engineers: Guidelines for the Design & Application of Speed Humps (ITE 1993).
    - Sinusoidal profiles have slightly less reduction effects on speed than circular and parabolic profiles but higher comfort levels for vehicles and bicyclists and are typically more difficult and expensive to construct due to the slope of the profile.
    - Circular profiles have moderate reduction effects on speeds (compared to the two other profiles) and comfort levels for vehicles and bicyclists.
    - Parabolic profiles have the greatest reduction effects on speeds but have the lowest comfort levels for vehicles and bicyclists due to the greater rise in the slope of the profile.
- Edge taper refers to the transition area between a vertical measure at its full height and the edge of the device. Edge tapers on vertical measures (e.g., speed lumps and excluding raised crosswalks) should extend to the edge of the pavement (i.e., not into the gutter) to prevent blocking the gutter drainage.
- On streets without vertical curbs, the edge taper should extend the full length of the pavement width to discourage drivers from straddling or driving around the vertical measure. In addition, an advisory sign (or other barrier) should be placed on either approach of the vertical device to prevent drivers from driving around the device.
- Vertical devices should extend across any parking or bike lane to prevent drivers from veering into the bike lane. Consequently, bicyclists will traverse the even section (as opposed to the tapered portion) of the device. In addition, vehicles parking on the street will have the option to park on a portion of the device or avoid the device entirely.
- Road humps should be designed to the following criteria:
    - Slopes should not exceed 1:10 or be less steep than 1:25.
    - Side slopes on tapers should be no greater than 1:6.
    - The vertical lip should be no more than a quarter-inch high.
    - Road humps should be approximately 3 ½ inches tall and span the width of the road.
    - The ramp length should span 3–6 feet.
    - Vertical speed control elements should be located where there is sufficient visibility and available lighting.
    - Road humps shall not be placed in front of driveways or other significant access areas. Where frequent driveways make the application of a speed hump difficult, reduce the overall size of the speed hump, or work with local residents to find a workable solution.

    - Road humps may be applied on 1-way or 2-way roads.
    - Spacing for vertical speed controls should be determined based on the target speed of the roadway. Speed humps should be spaced no more than a maximum of 500 feet apart to achieve an 85th percentile speed of 25–35 mph. To achieve greater speed reductions, space speed humps closer together.
- Bus routes may have speed cushions installed on certain routes. Work with local transit providers and bus companies to ensure that drivers are aware of traffic calming devices and can effectively use wheel cut-outs provided.

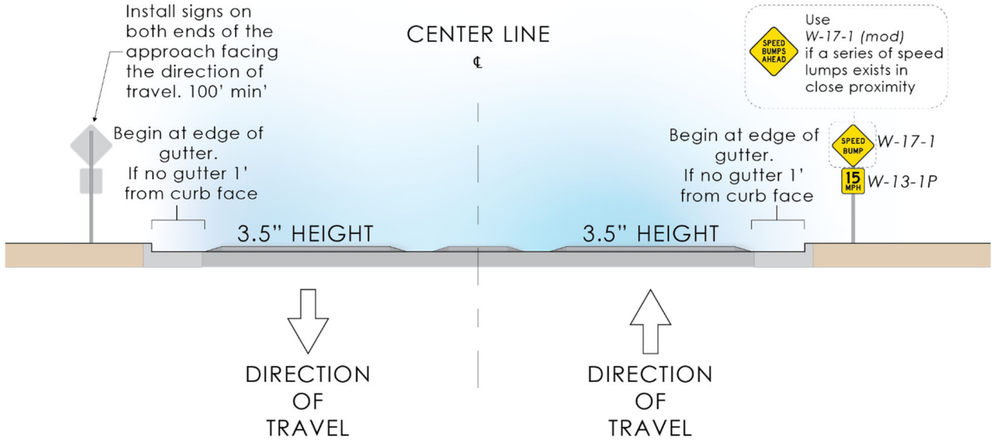


FIGURE 5-60 ROAD LUMPS SECTION A-A

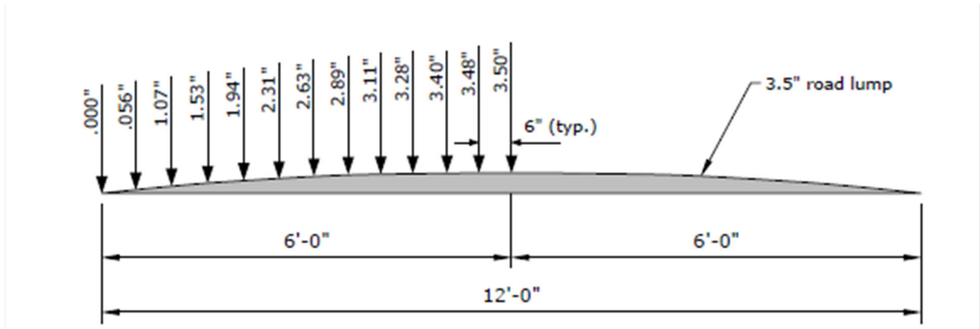


FIGURE 5-61 ROAD LUMP SECTION B-B

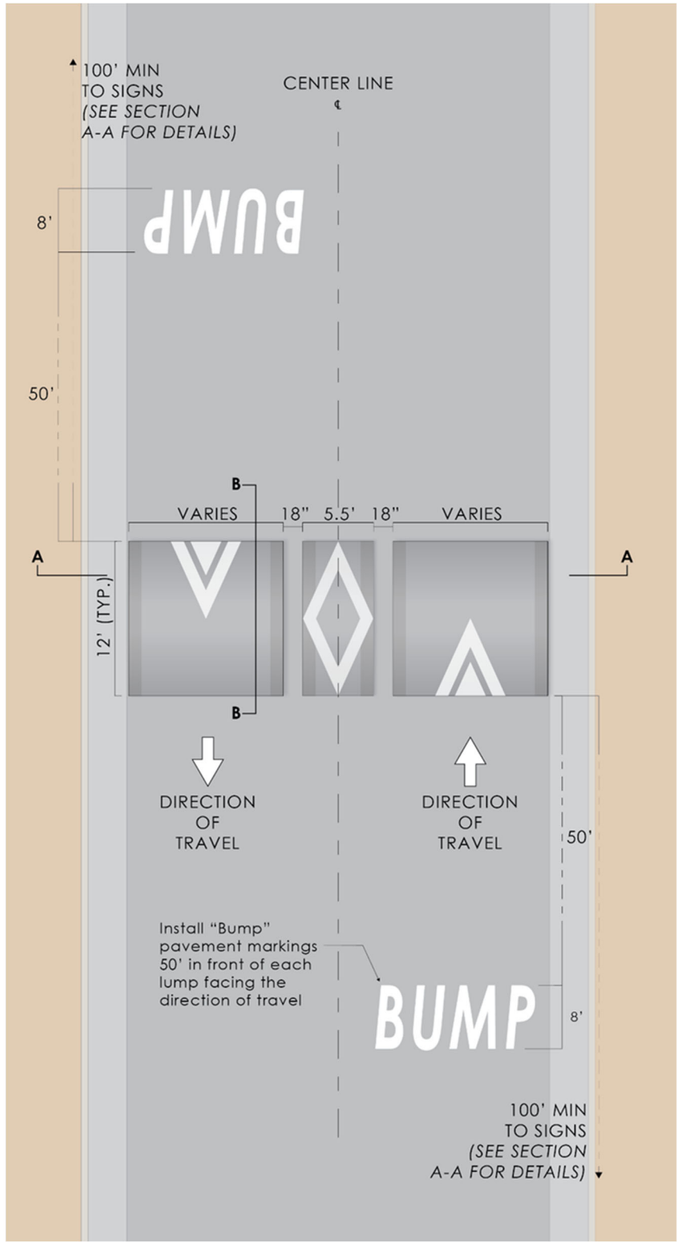


FIGURE 5-62 ROAD LUMPS PLAN VIEW

References:

- Traffic Calming Guide, Caltrans, 2023
- Traffic Calming Guidelines, City of San Diego Transportation Dept, 2010

5.8.4.2 Speed Tables/Raised Crosswalks

Speed Tables are vertical deflection devices that have ramps on both sides of a flat surface. The vertical deflection encourages traffic to slow down.

Essentially, speed tables are flat-topped speed humps, often constructed with concrete, brick, or other textured materials on the flat section.

Benefits:

- Speed tables and raised crosswalks reduce vehicle speeds.
- Raised crosswalks enhance pedestrian safety.
- Slows traffic
- Discourages short-cutting

Considerations:

- EMS/Fire vehicles forced to almost stop at ramp.
- Creates more noise from decelerating and accelerating.
- May cause bicycle safety issues if non-standard pavement treatments are used.
- Speed tables are often designed using unit pavers or other distinctive materials. Distinctive materials may require additional maintenance responsibilities, but help to highlight and define the speed table for both bicyclists and pedestrians.
- They are most effective when installed in groups of two or more, about 300 feet apart.
- The effectiveness of the speed table can be varied by changing the shape of the ramps and/or texture of the table. Steeper ramps will cause a greater reduction in vehicular speeds. Similarly, texturing the table will also cause a greater reduction in speeds. Textured pavement may affect bicyclists but can be designed to take bicycle safety into account.
- The disadvantages of speed tables/raised crosswalks may include diverting traffic to nearby low-volume local streets, increasing noise, and increasing emergency response times. Speed tables/raised crosswalks should not be installed on streets classified as collector or higher, bus routes or emergency response routes, where there is a grade that exceeds 5 percent, or where there is limited stopping sight distance.
- Inappropriate for use on:
    - Streets classified as collector or higher
    - Emergency response routes
    - Where there is limited stopping sight distance
    - Where there is a grade that exceeds 5%

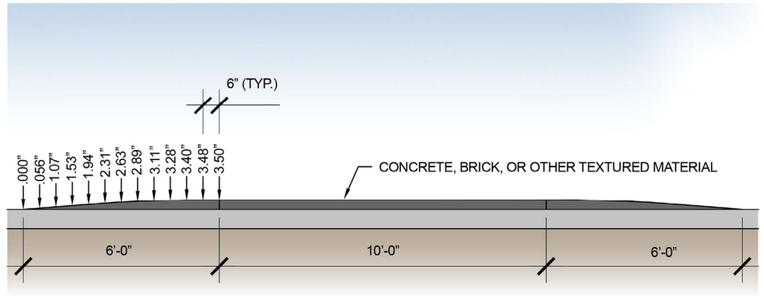


FIGURE 5-63 SPEED TABLE PITCH SECTION A-A

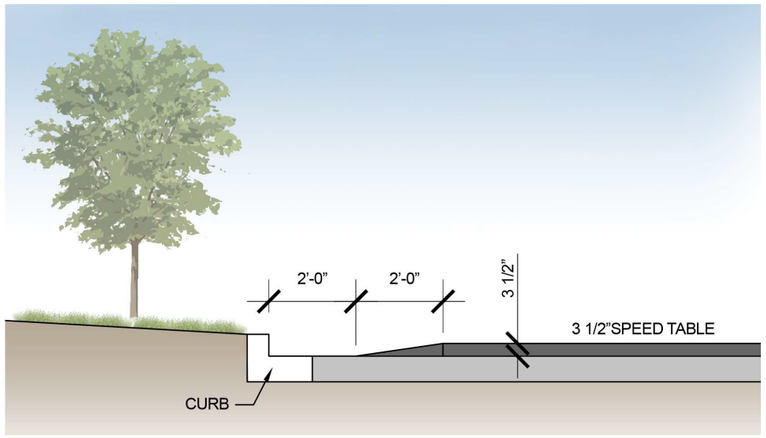


FIGURE 5-64 SPEED TABLE SECTION B-B

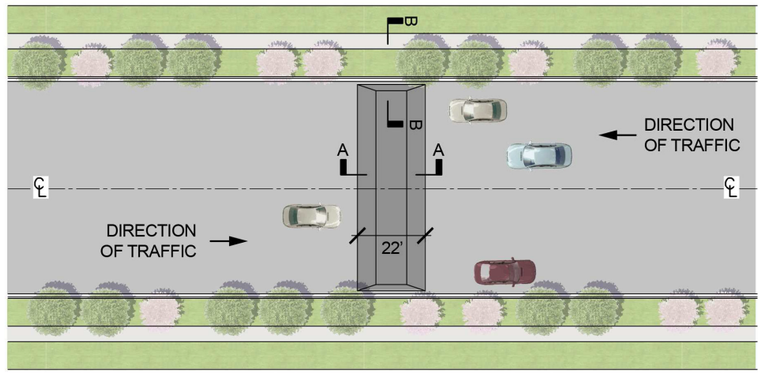


FIGURE 5-65 SPEED TABLE PLAN VIEW

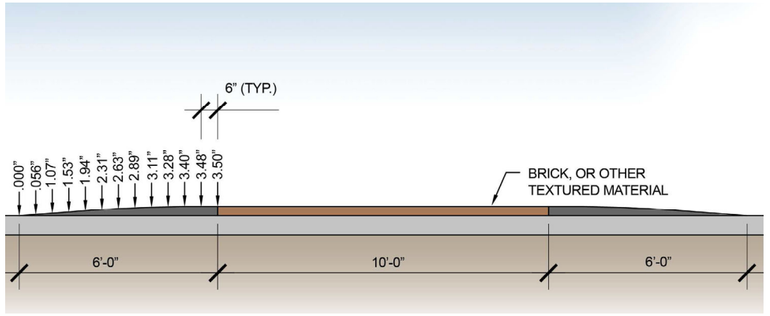


FIGURE 5-66 RAISED CROSSWALK SECTION A-A

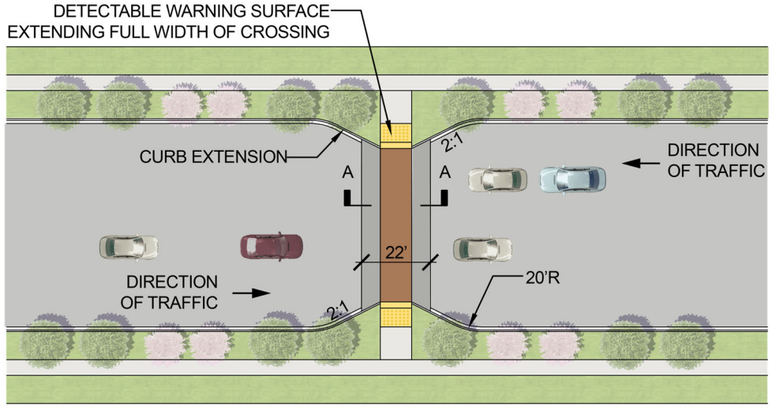


FIGURE 5-67 RAISED CROSSWALK PLAN VIEW

Notes:

1. *Drainage requirements must be evaluated and addressed.*
2. *Crosswalk should meet traffic engineering requirements approved by the City Council. Refer to Council Policy 200-07.*
3. *Refer to CA MUTCD for appropriate signs and markings.*

Guidelines:

- Vehicle operating speeds for streets with speed tables range from 25–45 mph, depending on the spacing.
- Where extended from curb-to-curb and appropriately marked, speed tables serve as raised crosswalks. Drainage requirements must be evaluated and addressed where raised crosswalks are installed (see Figures 5-63 through 5-67).
- Speed tables may be used on collector streets and/or transit and emergency response routes. Where applied, speed tables may be designed as raised midblock crossings, often in conjunction with curb extensions.
- Speed tables should not be applied on streets with curb-to-curb width wider than 50 feet. On 2-way streets, speed tables should be applied in both directions.
- Slopes should not exceed 1:10 or be less steep than 1:25.

- Side slopes on tapers should be no greater than 1:6.
- The vertical lip should be no more than a quarter-inch high.
- Locate vertical speed control elements where there is sufficient visibility and available lighting.
- Speed tables and raised crosswalks are 3.5 inches high and 22 feet long in the direction of travel, with 6-foot ramps at the ends and a 10-foot flat area on top. Concrete, brick, or other textured materials improve the appearance of speed tables/raised crosswalks and draw attention to them. Speed tables are less jarring than the standard 12-foot road lumps.
- Where a speed table coincides with a crossing or crosswalk, it should be designed as a raised crosswalk. See Section 6.4.4. for additional guidance on integrating raised crosswalks with speed tables.
- Speed tables can be used in conjunction with a mid-block pedestrian crossing. The speed table may increase the visibility of pedestrians at mid-block locations (see raised crosswalk).
- May only be used on low ADT two-lane collectors that do not have two-way left-turn lanes or dedicated left-turn pockets.

References:

- Traffic Calming Guide, Caltrans, 2023
- Traffic Calming Guidelines, City of San Diego Transportation Dept 2010

5.8.5 Improvements at Intersections

Traffic calming improvements at intersections discussed in other sections of this Manual include:

- Raised intersections and crosswalks (Section 6.4.4)
- Roundabouts and traffic circles (Sections 6.7.2 to 6.7.4)
- Pedestrian islands (Section 6.4.5)

5.8.5.1 Gateway and Entrances

Gateway/Entrance features are used on local streets at the intersection with a collector or major arterial. The purpose of a gateway/ entrance feature is to alert the driver that they have left the arterial roadway and have entered a residential neighborhood. An example of a gateway treatment is a median with a specimen tree or neighborhood sign and textured roadway pavement.

Benefits:

- Speed reduction
- Increases visibility
- Reduces pedestrian crossing distance
- Allows for enhancements such as greenery
- Improved pedestrian safety
- May discourage cut-through traffic
- May provide a pedestrian crossing refuge

- Strengthens neighborhood identity
- Changes driving environment (e.g. major to residential)

Considerations:

- May cause difficulty for large vehicles to make right turns.
- The use of textured pavement may affect bicyclists, but can be designed in order to take bicycle safety into account.
- Similar to Median Slow Points (6.4.3.5), Gateway/Entrance Features may be used on local streets at their intersections with collector, major, or arterial streets. They alert the driver that they are entering a residential neighborhood. A typical gateway treatment may include a center median with a specimen tree or neighborhood sign and textured roadway pavement.
- Combine stormwater management features, such as bioswales or rain gardens, with curb extensions to absorb rainwater and reduce the impervious surface area of a street.
- In advance of a full reconstruction, gateways can be designed using striping or signage that communicates the entrance into a slow zone.

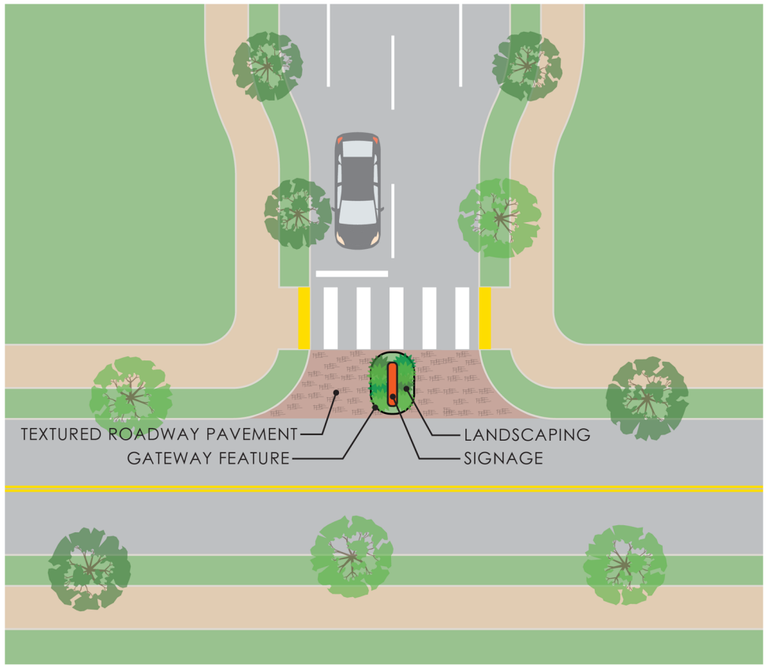


FIGURE 5-68 GATEWAY TREATMENT

Guidelines:

- The length of a curb extension should at least be equal to the width of the crosswalk but is recommended to extend to the advanced stop bar.

- A curb extension should generally be 1–2 feet narrower than the parking lane, except where the parking lane is treated with materials that integrate it into the structure of the sidewalk.
- Curb extensions should be installed whenever on-street parking is present.
- Neighborhood Signs may be placed at the entrances to the neighborhood raising driver awareness about the type of area they are entering.

References:

- Traffic Calming Guidelines, City of San Diego Transportation Dept, 2010

5.8.5.2 Short Intersection Medians/Median Slow Points

Short Intersection Medians/Median Slow Points can be installed on any leg of an intersection to slow fast-turning vehicles. The median forces vehicles to make a turn along a smaller radius, rather than making a higher speed turn on a larger radius, thereby slowing traffic.

Benefits:

- Speed reduction
- Collision reduction
- Pedestrian safety and refuge
- Potential for reduction of left-turn speeds
- Possible opportunity for landscaping

Considerations:

- Potential loss of parking
- May restrict access to driveways in vicinity of device.
- The medians may restrict some larger vehicles, such as fire trucks, buses or moving vans, from making left turns at the intersection.

Guidelines:

- This device may be installed at mid-block locations to achieve the same effect by forcing traffic to shift its path to travel safely around the median. However, this tool may block access to some driveways. Also, it may require removing some parking.

References:

- Traffic Calming Guidelines, City of San Diego Transportation Dept, 2010

5.8.5.3 Intersection Bulbouts/Pop-Outs

Intersection bulbouts, also known as pop-outs, are curb extensions that narrow the street at intersections by widening the sidewalks at the point of crossing.

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Benefits:

- Speed reduction
- Shorten pedestrian crossings and reduce the visual width of long, straight streets.
- Where intersection pop-outs are constructed by widening the landscaped planting strip, they can have a positive effect on the visual appearance of the neighborhood.
- Pop-outs can be used at intersections to create a street gateway effect, visually announcing an entrance to a neighborhood. Intersection pop-outs must accommodate bicyclists, transit vehicles, and emergency response vehicles (see Figure 5-64).
- Volume reduction
- Improved pedestrian safety
- Collision reduction
- Increase the visibility of pedestrians to drivers.
- Speed reduction for through traffic
- Speed reduction for right turning vehicles as curb extensions tighten intersection curb radii and encourage slower turning speeds.

Considerations:

- Difficult for emergency vehicles and larger vehicles to turn.
- May force bicyclists into travel lanes.
- Should be coordinated with bicycle and pedestrian crossing features (see Chapter 6)
- May require parking removal.
- Intersection pop-outs may be installed on local streets, collector streets, and urban major streets.
- Minimal geometric features are included in this manual because intersection pop-outs are site-specific and should be designed on a case-by-case basis.
- Drainage requirements must be evaluated and addressed.
- Additional curb ramps may be required in order to serve accessible parking spaces.

Guidelines:

- Narrowing measures, such as bulbouts, should not be constructed wider than the approximate width of a parked vehicle. Extension of these devices any further than the width of a parked vehicle (or the length of a vehicle in the case of diagonal parking) could present potential safety issues to other drivers.
- Bulbouts are best used in locations with high pedestrian volumes, such as downtown areas and near schools.

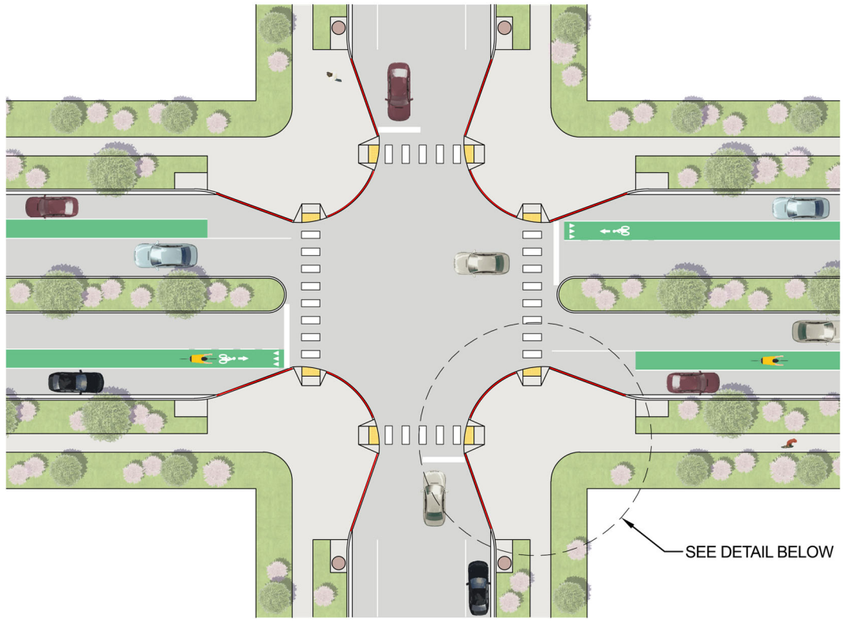

FIGURE 5-69 INTERSECTION POP-OUTS PLAN VIEW

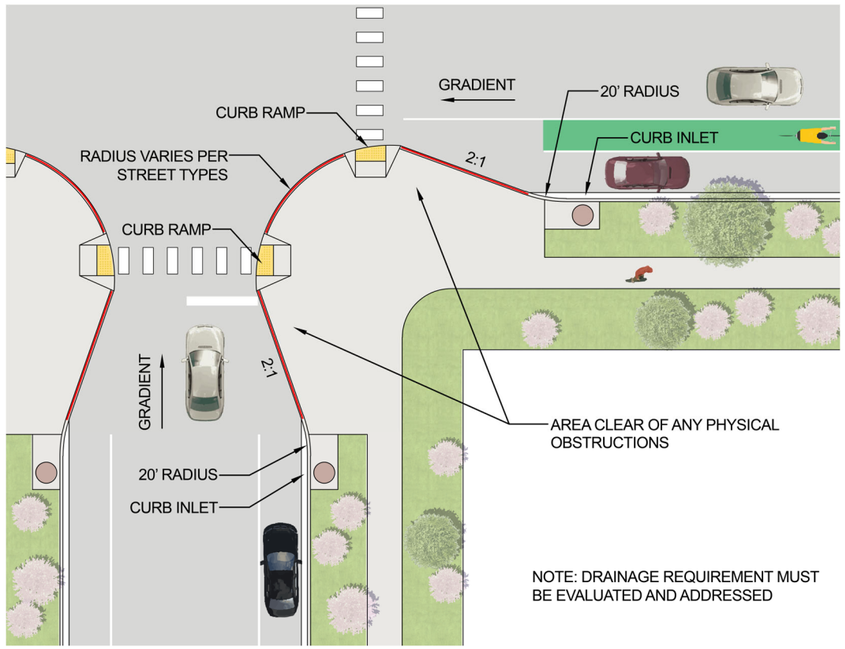

FIGURE 5-70 INTERSECTION POP-OUT DETAIL VIEW

References:

- General Plan, City of San Diego, 2024
- Traffic Calming Guide, Caltrans, 2023
- Traffic Calming Guidelines, City of San Diego Transportation Dept, 2010

5.8.5.4 Curb Radius Reduction

Curb Radius Reductions provide tighter corner radii at intersections.

Benefits:

- Speed reduction
- Improved pedestrian safety
- Collision reduction
- Slows right turn speeds.
- May discourage cut-through traffic.
- Increases the visibility of pedestrian to drivers.
- Shortens pedestrian crossing distance.

Consideration:

- Difficult for large vehicles to make right turns.
- The size of the corner relates directly to the length of the crosswalk. Longer crosswalks take more time to cross, increasing pedestrian exposure risk and diminishing safety.
- A smaller curb radius expands the pedestrian area, allowing for better pedestrian ramp alignment.
- This treatment may not be appropriate in areas that experience high volumes of large vehicles.

Guidelines:

- Table 6-1 refers to the City's standard curb return radii based on intersecting street classification types.
- Additional lane width may be necessary for receiving lanes at turning locations with reduced curb radius.
- In urban settings, smaller corner radii are preferred and actual corner radii exceeding 15feet should be the exception.
- Reduced curb radii should be 10–15 feet in urban areas. These radii lengths could pose issues with street sweeping.
- Minimize effective turning radius where possible by employing one or more of the following techniques:

    - Accommodate trucks and buses on designated truck and bus routes.

- Restrict right turns on red so there is no expectation of turning into the nearest receiving lane.
- Design so that emergency vehicles may utilize the full area of the intersection for making turns.
- Various techniques that accommodate large vehicles, while restricting the turning speed of smaller vehicles, such as truck aprons, may be used to avoid unnecessary widening of the intersection.
-

- In cases where the curb radius of a given intersection has resulted in an unwieldy crossing distance, but where funding is not available to reconstruct the curb immediately, the appropriate curb radius may be delineated using interim materials such as epoxied gravel, planters, and bollards. This should be a temporary option until funding becomes available for more permanent treatment.
- The effective turn radii must be taken into account when determining the design speed for turning vehicles. The effective turn radius measures the curve of vehicle movement from travel lane to travel lane.

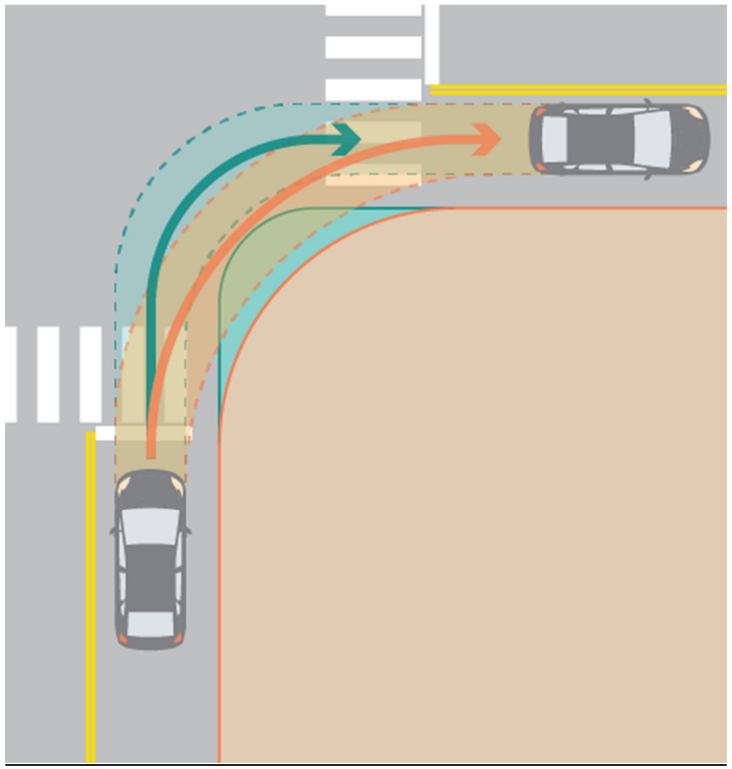

FIGURE 5-71 CURB RADIUS REDUCTION

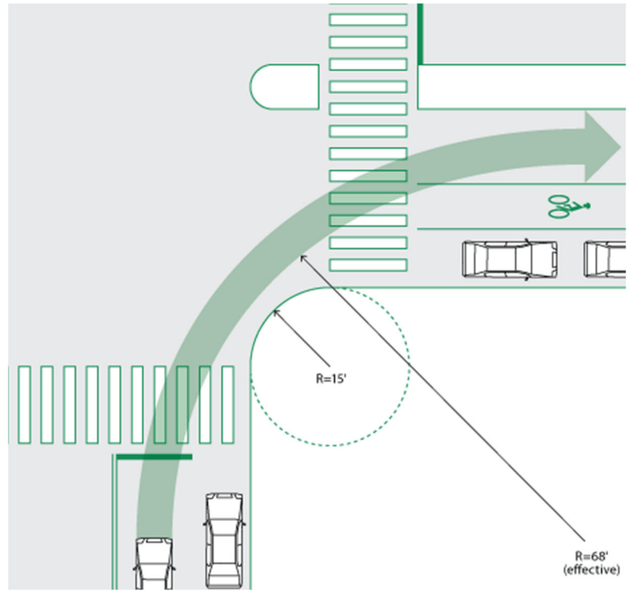

FIGURE 5-72 CURB RADIUS

Source: NACTO Urban Street Design Guide

References:

- General Plan, City of San Diego, 2024
- Traffic Calming Guide, Caltrans, 2023
- Traffic Calming Guidelines, City of San Diego Transportation Dept, 2010

5.8.5.5 Realigned T-intersection

Realigned T-Intersections have a bulb-out in the intersection to deflect the through movements so they will follow a curvilinear path. Medians may also be installed on the through street approaches to guide traffic through the intersection.

Realigned T-intersections modify the existing alignment, forcing the once straight through movement to follow a slower, curvilinear travel route. A bulbout is constructed on the major road in the intersection.

Benefits:

- Speed reduction
- Volume reduction
- Collision reduction
- Improves safety
- Reduce overall intersection speeds.
- Provides an opportunity for additional landscaping.

Considerations:

- May be more difficult for large vehicles to make right turn.
- May reduce available parking.
- Need to ensure intersection has adequate lighting.
- Additional right-of-way may be required.

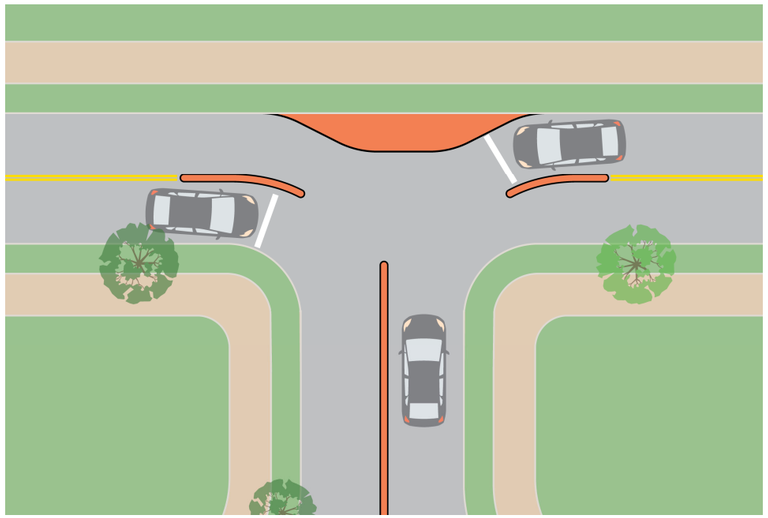

FIGURE 5-73 REALIGNED T-INTERSECTION

Guidelines:

- Stop signs should be installed on the through street rather than the side street. This would allow the side street movement the right-of-way while stopping the through street.
- Medians should also be installed on the major approach legs to guide the traffic through the intersection.

References:

- General Plan, City of San Diego, 2024
- Traffic Calming Guidelines, City of San Diego Transportation Dept, 2010

5.8.6 Traffic Diverters

Traffic diversion devices eliminate through trips on streets on which they are installed and divert those trips to other streets. There are several available traffic diversion designs that may be used to calm traffic.

Traffic diverters are not primarily installed for the purpose of speed control. Diverters are best suited on long, straight, low-volume, local residential streets.

Wherever traffic diversion techniques are employed, provision should be made for continuation of pedestrian and bicycle routing around or through the diversion. Care must be taken in design of diversion installations to allow for emergency vehicles.

5.8.6.1 Semi-Diverters

A semi diverter is a barrier to traffic in one direction of a street that permits traffic in the opposite direction to pass through. It is an alternative to one-way street operation for a block and it allows residents on the block limited two-way travel opportunity. A semi diverter may be used on low-volume, local residential streets and it is best located at the end of a block to prevent entrance and allow exit.

Benefits:

- Speed reduction
- Reduces pedestrian crossing widths.
- Volume reduction
- Collision reduction
- Increases pedestrian safety.
- Elimination of cut-through traffic in one direction.
- Potential landscaping opportunity.
- Maintains emergency response access.

Considerations:

- Will change neighborhood traffic patterns.
- Will increase trip length for many residents.
- Will increase traffic on adjacent roadways.
- Drivers can bypass device by traveling on the wrong side of the road.
- Semi diverters may divert traffic to other low-volume streets, may increase trip lengths, may cause loss of parking, and may increase emergency response time.
- Semi diverters are inappropriate for use on bus or emergency response routes or on streets classified as collector or higher.

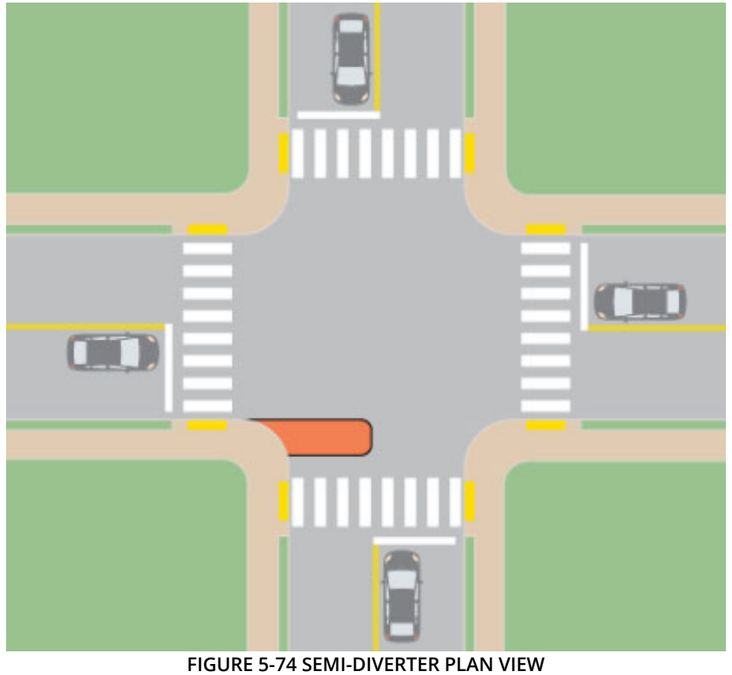

FIGURE 5-74 SEMI-DIVERTER PLAN VIEW

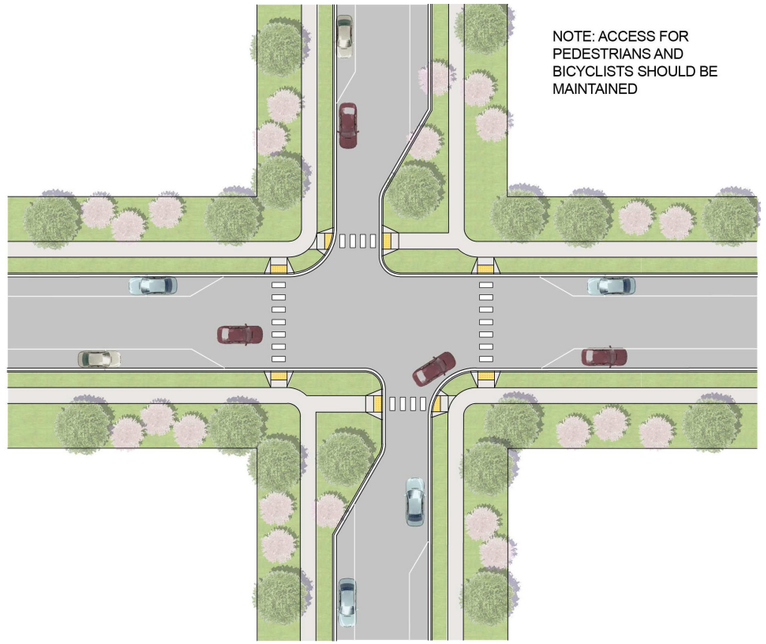

FIGURE 5-75 POP-OUT SEMI-DIVERTER PLAN VIEW

Guidelines:

- No specific geometric features are included in this manual because semi diverters are site-specific and should be designed on a case-by-case basis.

References:

- Traffic Calming Guide, Caltrans, 2023
- Traffic Calming Guidelines, City of San Diego Transportation Dept, 2010

5.8.6.2 Diagonal Diverters

Diagonal diverters are barriers constructed diagonally across a four-legged intersection blocking the through movements.

Benefits:

- Speed reduction
- Volume reduction
- Collision reduction
- Eliminate cut-through traffic.
- Potential landscaping opportunity.

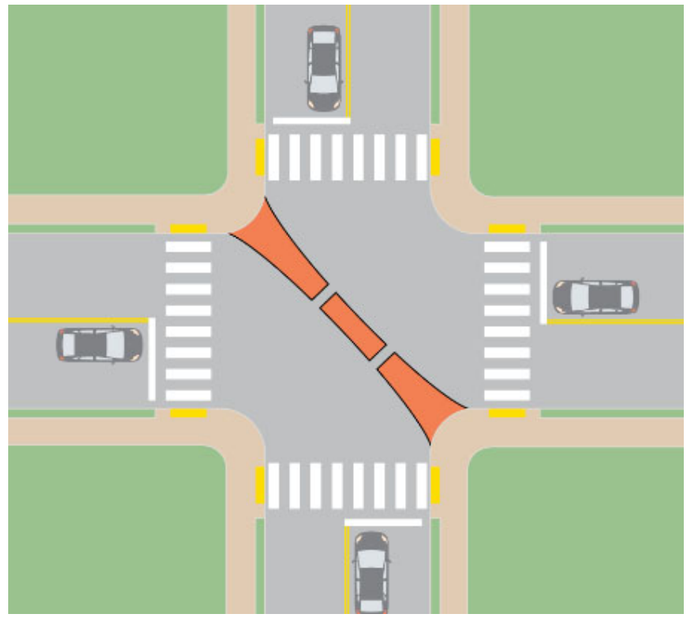

FIGURE 5-76 DIAGONAL DIVERTER

Considerations:

- Will change neighborhood traffic patterns.
- Will increase trip length for some residents.
- Will increase traffic on adjacent roadways.
- Emergency response routes may lengthen.

Guidelines:

- Where applicable, the design of the diverter should consider access for pedestrians, bicyclists, and EMS/ Fire services.

References:

- Traffic Calming Guidelines, City of San Diego Transportation Dept, 2010

5.8.6.3 Full Street Closure/Cul-De-Sac

A Full Street Closure/Cul-de-Sac is created by constructing a barrier across an entire street, closing the street to all through vehicular traffic with considerations to maintain pedestrian, bicycle, and emergency vehicle access.

Benefits:

- Speed reduction
- Volume reduction
- Collision reduction
- Eliminates cut-through traffic.
- Potential for landscaping opportunity.

Considerations:

- Will change neighborhood traffic patterns.
- Will increase trip length for many residents.
- Will increase traffic on adjacent roadways.
- Emergency response routes may lengthen.
- Cul-de-sac bulb radius must be large enough to allow turnarounds.

Guidelines:

- Where applicable, the design of the barrier should consider access for pedestrians, bicyclists, and EMS/Fire services.
- See Section 2.3.1 for more information on cul-de-sacs.

FIGURE 5-77 FULL STREET CLOSURE

Location: Armour Street and Ruffner Street

References:

- Traffic Calming Guide, Caltrans, 2023
- Traffic Calming Guidelines, City of San Diego Transportation Dept, 2010

5.8.6.4 Median Barriers and Channelization

Channelization may be used on arterial streets to prevent cut-through traffic onto local streets or to control turning traffic in or out of a neighborhood. Channelization can be achieved through regulatory signs and pavement markings, landscaping, or raised channelization islands aimed at motorized, non-motorized, or pedestrian traffic.

Benefits:

- Speed reduction
- Collision reduction
- Prevents cut-through traffic in residential neighborhoods.
- Increased pedestrian safety.
- Provides potential for a safer pedestrian crossing.
- Possible opportunity for landscaping.
- Can reduce traffic volumes on residential streets.
- Stacking caused by vehicles waiting for a gap to make a left turn will be eliminated.

Considerations:

- May shift traffic volumes to neighboring roads.
- Restricts access to neighborhood.
- Restricts EMS/Fire access.
- May cause difficulty in mapping routes to a location due to roadway change.
- The raised median is used on the major street, restricting traffic from continuing from one residential neighborhood to the next. The median barrier also restricts left-turns to and from the major street.
- Typically, right-in and right-out are the only turn movements allowed to and from the minor street. However, a variation on the median barrier is an "S" Median which allows for left turn movements from the major street onto the minor street but still prevents through traffic from crossing.
- In addition to preventing cut-through traffic, channelization may be designed to reduce speed, create opportunities for landscaping, control turning traffic in and out of a neighborhood, and to physically guide pedestrians.
- Pedestrians may also use the median barrier as a refuge while crossing the major street, given a minimum median width of 6'.
- These medians can be landscaped to break up the sight line of the driver and enhance the aesthetics of the neighborhood. Landscaping also increases the visibility of the tool.
- The disadvantages of channelization may include creating out-of-direction travel, increasing trip lengths, increasing emergency response time, and impacting accessibility.

Standards and Guidelines:

- At signalized intersections, pedestrian push buttons are required.
- No specific geometric features are included in this manual because channelization devices are site-specific and should be designed on a case-by-case basis.
- Where applicable, the design of the median barrier should consider access for pedestrians, bicyclists, and EMS/ Fire services.
- At signalized intersection, pedestrian push buttons are required.

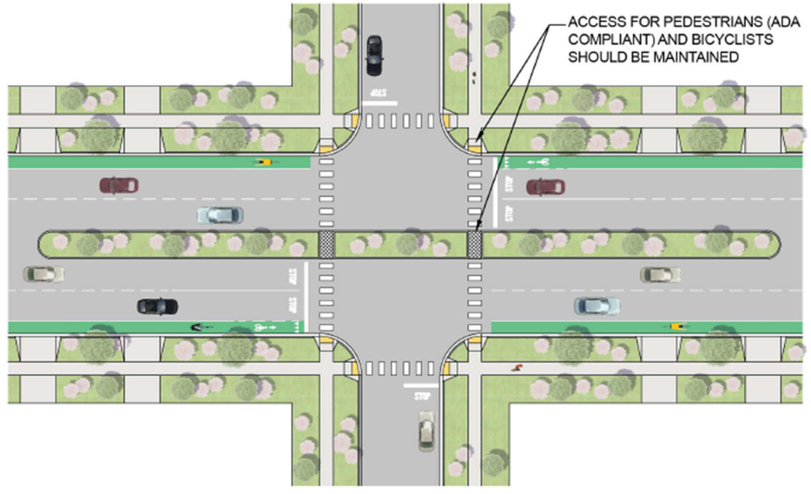

FIGURE 5-78 CHANNELIZATION PLAN VIEW

References:

- Traffic Calming Guide, Caltrans, 2023
- Traffic Calming Guidelines, City of San Diego Transportation Dept, 2010

5.8.6.5 Right-in/Right-out Islands

Right-In/Right-Out Islands restrict left-turns into and out of a particular street. Rather than relying on a sign to discourage drivers from turning left, right-in/right-out islands force drivers to make the desired movement using a raised island.

Benefits:

- Speed reduction
- Volume reduction
- Collision reduction
- Slows right turn speeds.
- May discourage cut-through traffic.
- May provide pedestrian refuge.

Considerations:

- Difficult for large vehicles to make right turn.
- May shift traffic to adjacent streets.
- This device may be particularly effective at locations where local streets intersect with uncontrolled collector streets. If a left turn in or out of a particular street is difficult due to speed

and/or sight distance, the installation of a right-in/right-out island may be very beneficial. However, on low volume roadways, the device may be ineffective as drivers may still be able to make left turns, thereby bypassing the device.

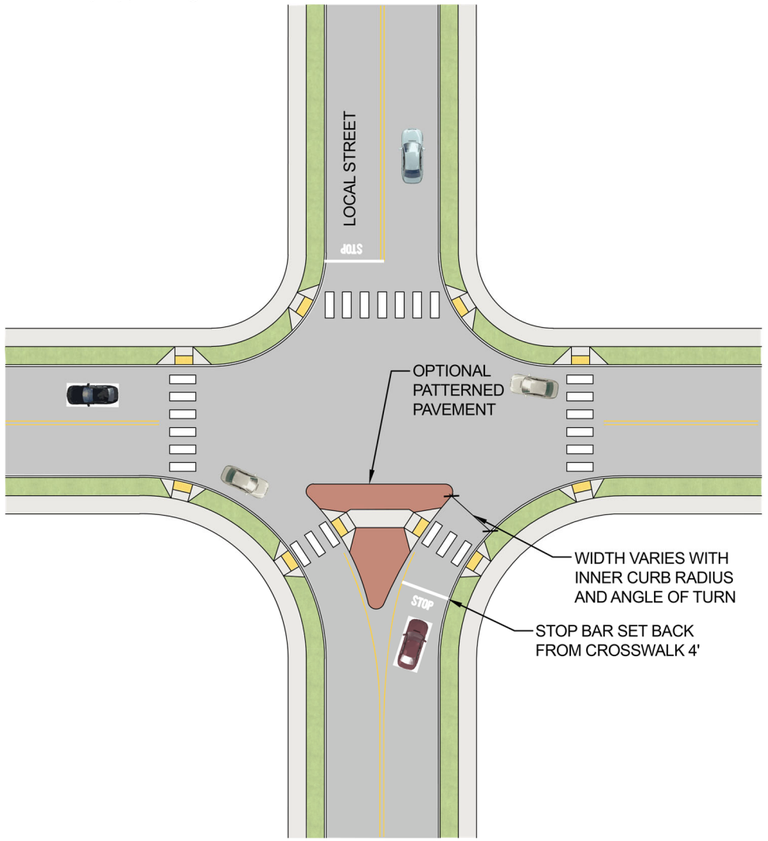

FIGURE 5-89 RIGHT IN/RIGHT-OUT ISLAND PLAN VIEW

Guidelines:

- The right-in/right-out island can be constructed to restrict a single left-turn. For example, the left-turn out may be restricted, but the left-turn in may be maintained.

References:

- Traffic Calming Guide, Caltrans, 2023
- Traffic Calming Guidelines, City of San Diego Transportation Dept, 2010

5.8.7 Travel Lane Narrowing or Reduction

5.8.7.1 Travel Lane Narrowing

On-street parking can provide a buffer between pedestrians on the sidewalk and moving vehicles and narrow travel lane width. On-street parking guidelines are in Section 5.3.5, "On-Street Vehicle Parking." Angle Parking and Perpendicular Parking are generally used to increase the number of on-street parking spaces. However, a positive by-product can be a reduction in vehicle speeds due to narrowing of the traveled way and driver anticipation of vehicles backing out of parking spaces.

5.8.7.2 Travel Lane Reduction

Roadway Reconfiguration through lane reduction can improve safety, calm traffic, provide better mobility and access for all road users, and enhance overall quality of life. This can be a low-cost safety solution when planned in conjunction with a simple pavement overlay, and the reconfiguration can be accomplished at no additional cost.

Benefits:

- Can decrease lane crossing distances and exposure for pedestrians.
- Can reduce vehicle speeds.
- Left-turning drivers can exit the traffic stream while waiting for a gap to complete their turn.

Considerations:

- Lane reductions may be uncommon in a community. Consider conducting an outreach effort to educate the public on the purpose and potential benefits.
- Determine if and how alternative routes will be impacted by a lane reduction.
- Consider the importance a particular street plays in the pedestrian or bicycle network and the relationship between creating more livable streets and supporting economic development.
- The common four-to-three-lane lane reduction is very compatible with single-lane roundabouts.
- Strongly consider conducting before-and-after studies of the conversion for safety and traffic flow conditions

Guidelines:

- Four to three lane conversions should be considered for roadways with documented safety concerns, moderate volumes (less than 15,000 ADT, up to 25,000 ADT in special cases), and along priority bicycling and walking routes.
- Incorporating raised medians and left-turn bays can help eliminate the potential for TWLTL to be used as acceleration lanes by some motorists.

References:

- Pedestrian Safety Guide and Countermeasure Selection System, FHWA, n.d.

5.8.8 Landscaping and Surfaces

Landscaping Improvements may be desirable by communities wishing to beautify their neighborhood and the surrounding street system.

Benefits:

- Adds an aesthetic touch to the project.
- Landscaping strengthens impact if speeding is a primary neighborhood concern.

Considerations:

- Landscaping can also aid in visual narrowing of the roadway which can further help to reduce travel speeds.
- Decorative Pavement Treatments such as brick pavers, interesting or unusual color patterns, or concrete stamping can also add an aesthetic touch to a traffic calming device.
- The additional price of decorative pavement treatments is due to the cost of the material, additional installation time and ongoing required maintenance.

Standards and Guidelines:

- All traffic calming measures that include landscaping improvements must be consistent with the City of San Diego Landscape Standards. This manual includes standards, guidelines, and criteria for all landscaping in the public right-of-way, such as location, plant selection, maintenance, median landscaping, irrigation, and electrical services.
- Also, it is important that landscape improvements not impair sight distances at intersection approaches or on curved roadway segments.
- These improvements should also not block traffic signal indicators, traffic signs, pavement markings or streetlights.
- The additional costs for landscaping improvements are potentially significant. These costs stem from the purchase and installation of the landscaping feature in addition to the required on-going maintenance. Typically, the maintenance costs are much greater than the installation costs since traffic calming features are designed to be permanent improvements to the neighborhood.
- Watering and maintenance will need to be assured through an agreement with the City for all street trees and landscape plantings through street tree permits, encroachment removal and maintenance agreements, or through maintenance assessment districts.

References:

- Drainage Design Manual, City of San Diego Stormwater Dept, 2017
- Landscape Standards, City of San Diego, 2016
- Traffic Calming Guide, Caltrans, 2023

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5.8.9 Signage and Feedback

5.8.9.1 Turn Restrictions

Turn Restrictions can help reduce cut-through traffic, eliminate turn movements, or prohibit turn movements during pedestrian crossing.

Benefits:

- Speed reduction
- Volume reduction
- Can prohibit pedestrian-vehicle conflict when implemented with LPIs.
- May discourage cut-through traffic.
- Maintains emergency response access.

Considerations:

- May increase trip length for many residents.
- May increase traffic on adjacent roadways.
- Drivers can bypass device.

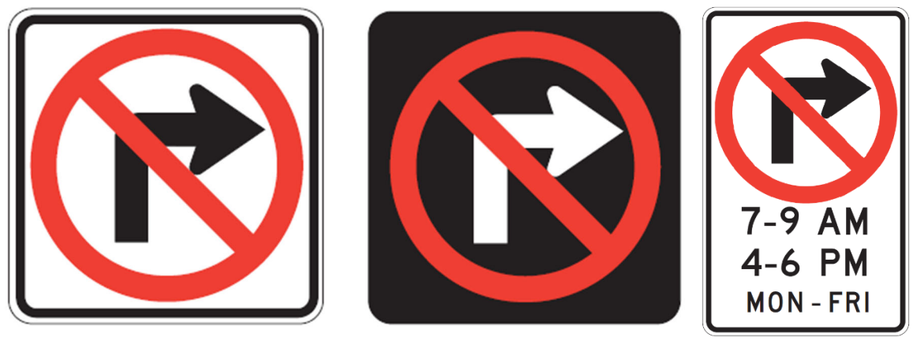

FIGURE 5-80 TURN RESTRICTION SIGNAGE

Guidelines:

- Turn restrictions, such as "No Right-Turns 6AM-9AM" may help reduce traffic from cutting through a residential neighborhood to avoid a congested arterial. This type of treatment, however, relies on enforcement to make sure drivers are abiding by the restriction.

References:

- Traffic Calming Guidelines, City of San Diego Transportation Dept, 2010

5.8.9.2 Vehicle-oriented Signage related to Traffic Calming

Benefits:

- Speed reduction
- Pedestrian safety
- May discourage cut-through traffic.
- Raise driver awareness.

Considerations:

- Effect is often temporary.
- Drivers may not obey the device without enforcement.

Guidelines:

- Concurrent with the installation of neighborhood traffic management devices, device-specific symbol-based signs should be installed next to each device. Roundabout center islands will include signage symbolically indicating the permitted travel paths around the center island.
- Vertical traffic calming measures shall include advanced warning markings on the approach ramps.
- Raised crosswalks and raised intersections with crosswalks should always have pavement markings due to concerns about visibility of pedestrians to drivers.
- Special signing for bicyclists may sometimes be appropriate. For example, the approaches to narrowing devices that do not include a bypass lane for bicyclists could include signage warning motorists to watch for merging bicyclists.
- "School Zone" signs are installed at appropriate locations to remind drivers that there is a school and there are children in the vicinity.

5.8.9.3 Electronic Speed Feedback (V-Calm) Sign

Permanent Electronic Speed Feedback Signs are used to make drivers aware of their speeds.

Temporary Speed Feedback Signs are used to educate drivers of their speed, especially as they travel on residential streets. Radar speed trailers are mobile and can be used as a temporary warning device. This type of tool can be a first attempt at getting drivers to reduce their speeds. The driver's behavior may change when the radar speed trailer is first introduced; it will not necessarily modify driving behavior permanently.

Benefits:

- Speed reduction
- Volume reduction
- Inexpensive measure for traffic calming.

- No increase in EMS/ Fire response time.
- Raises driver awareness.

Considerations:

- Changes in driver behavior may only be temporary.

FIGURE 5-819 ELECTRONIC SPEED FEEDBACK SIGN (V-CALM)

Guidelines:

- Most effective if dynamic feedback sign is installed with a Speed Limit sign.
- Need to determine the operating speed that will activate the sign. May be used with an LED flash that is activated if the motorist is traveling above a threshold speed.
- If solar-powered, the batteries must be checked on regular intervals. Used batteries represent a hazard waste stream for an agency.

References:

- Traffic Calming Guide, Caltrans, 2023
- Traffic Calming Guidelines, City of San Diego Transportation Dept, 2010

5.8.10 Shared Streets

Shared Streets are typically streets without curbs and sidewalks, and vehicles are slowed by placing trees, planters, parking areas, and other obstacles in the street. Motorists become secondary to pedestrians and cyclists and must travel at very low speeds below 10 mph. This makes a street available for public use that is essentially only intended for local access. A shared street identification sign is placed at each street entrance.

Benefits:

- Limiting vehicular speed not only improves residents' feelings of safety, but also promotes greater use of the public space.
- Shared streets allow more room for new features in the street such as street furniture (e.g., planters, street trees, benches) and areas for social interaction, bringing more people out on the streets to walk, bike, play, and interact with each other.

Considerations:

- Designed for low volume streets, limited use, and primarily local access streets.
- A shared street is generally not appropriate where there is a need to provide for nonresident motorists to access services or circulation element roadways.
- The design needs to keep vehicle speeds very low in order to make the streets safe for people of all ages and abilities.

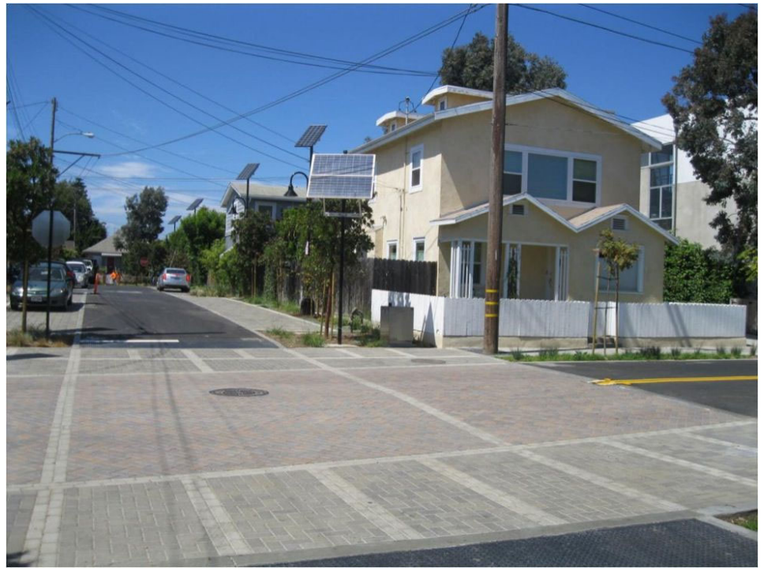

FIGURE 5-102 SHARED STREET

Location: Longfellow Street and Navy St, Santa Monica
Source: NACTO

Guidelines:

- A shared street should be marked by some kind of entrance and exit. This can be achieved by incorporating gateway features such as trees and planters, curbs extensions to make the roadway narrow, and a ramp up to the shared surface. Any of these approaches should also be accompanied by a sign indicating the shared street status.
- Pedestrian and auto space should be on the same level. Shared surfacing encourages drivers to travel more slowly and carefully since the travel way is not specifically dedicated to vehicles. Using different colors or textures in pavement material is also important for guiding the users of the street within the roadway (e.g., pedestrian vs. auto lanes).
- The design of the street should add slight curves to break up the sightlines of a driver and also introduce physical and visual features that will encourage people to drive slowly and with greater caution, though these traffic calming measures cannot be an obstacle for emergency responders.
- If available, parking should be provided intermittently rather than continuously so the car is not the predominant element in the street.
- Research suggests that streets need to be used by fewer than 100 vehicles per hour at peak times to be good candidates for shared street conversion.
- Directional indicators are often used internationally to help pedestrians navigate through large open spaces, avoid obstacles, follow an accessible pathway, and find crosswalks, transit stops, and other amenities, when other cues in the built environment do not provide enough guidance.

References:

- Accessible Shared Streets: Notable Practices and Considerations for Accommodating Pedestrians with Vision Disabilities, FHWA, 2017
- University Course on Bicycle and Pedestrian Transportation Lesson 20: Traffic Calming, FHWA, 2006
- Urban Street Design Guide, NACTO, 2013