CITY OF SAN ANTONIO TEXAS

Bike Facilities Guidelines for Future Amendments

Contents

Introduction

Purpose of This Document

Over time, traffic demand has increased, street widths have expanded, and our streets have turned into major thoroughfares primarily designed for driving and with little to no emphasis on accommodating other types of users. As San Antonio continues to grow, a change in the way we think about and utilize our public right-of-way is necessary so all residents can safely and comfortably travel regardless of what mode they choose.

Rather than a “one-size-fits-all” approach, the Bike Facilities Guidelines for Future Amendments serves as a tool to determine the appropriate bicycle facility based on the broader street context, vehicle volumes and speeds, and the modal needs of a street. The planning, designing, and implementation of bicycle facilities still follows the City’s rigorous process that includes engineering assessment and public engagement. These guidelines, however, form the foundation for decision-making and collaboration to better move people.

It is important to note that this is a living document that should be updated with changes to land use plans, future transportation planning efforts, zoning ordinances, and changes in public desires and needs.

Guiding Principles

- Provide comfortable and connected multimodal facilities for users of all ages and abilities;
- Allocate space for vulnerable roadway users in the street design process;
- Recognize the relationship between streets and the adjacent land uses by integrating existing and future land uses to bicycle facility selection and design;
- Ensure that bicyclists are accommodated in future roadway improvement projects;
- Improve safety for all users, regardless of mode; and
- Improve bicycle network connectivity and circulation.

Relationship to Other Standards and Guidance

This Bike Facilities Guidelines for Future Amendments document provides San Antonio-focused guidelines that build off local, state, and national design standards and guidance. The guidance carries forward principles from the San Antonio Bike Network Plan, Tomorrow Sub-Area Plans, Major Thoroughfare Plan, and existing standards and policies that guide the design of San Antonio's built environment. It also integrates best practices in urban design from national research and guidance. The documents listed below provide a start to but not a comprehensive list of the guidance that led to the development of these guidelines and should be referenced as they evolve to keep up with the newest guidance. Resources include those from the Federal Highway Administration (FHWA), the American Association of State Highway and Transportation Officials (AASHTO), and the National Association of City Transportation Officials (NACTO).

- San Antonio Unified Development Code § 35-506 and 35-207
- San Antonio Downtown Design Guide
- Bicycle Accommodation Design Guidance (TxDOT)
- Roadway Design Manual (TxDOT)
- Guide for the Development of Bicycle Facilities (AASHTO)
- Urban Street Design Guide (NACTO)
- Urban Bikeway Design Guide (NACTO)
- Transit Street Design Guide (NACTO)
- Evaluation of Safety, Design, and Operation of Shared-Use Paths (FHWA)
- Separated Bike Lane Planning and Design Guide (FHWA)
- Manual on Uniform Traffic Control Devices (FHWA)

Page Intentionally Left Blank

Bicycle Facility Selection

Page Intentionally Left Blank

LET'S RIDE SA

Building Off the Bike Network Plan

A great bicycle facility alone may not be used if people can't safely and comfortably reach it. Only with a connected and complete bicycle network can people actually get where they need and want to go via riding a bicycle. By building out bicycle facilities that are efficient, seamless, and easy to use, San Antonio can encourage more people to bicycle.

The San Antonio Bike Network Plan developed a vision for a comfortable and interconnected system of bikeways to connect San Antonians to the places they want to go. The network informs facility selection by showing where high-quality bicycle facilities are needed the most. Ultimately, the Bike Network Plan creates a blueprint for investing in and implementing context-sensitive bicycle facilities.

How Do I Use the Bike Network Plan?

If a project is planned on a roadway identified in the Bike Network Plan, integrating recommended bicycle infrastructure should be prioritized during the design phase. It is important to remember that the quality of the bicycle infrastructure matters. Simply adding a bicycle lane on any corridor can be a missed opportunity to build out a low-stress/high-comfort bicycle network that serves all users and all abilities. Because projects are limited, there may not be another chance to build a high-quality bicycle connection for decades.

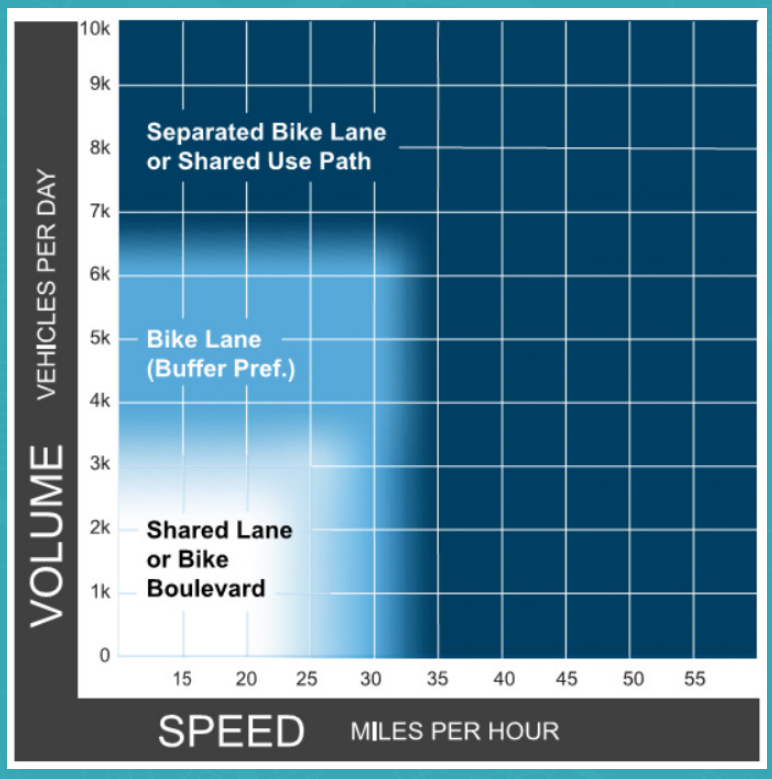
Additionally, if a project is planned on a road that is not identified in the Bike Network Plan, a discussion between Public Works, Transportation, and Planning should occur to determine appropriate bicycle facility needs.

Designing for All Ages and Abilities

Picking the Right Facility for Users

According to national guidance, the appropriate bicycle facility for a corridor is ideally matched to the prevailing traffic volumes and speeds. The chart below provides general guidance from the FHWA's 2019 Bikeway Selection Guide on the appropriate facility to keep people riding bicycles comfortably. In addition, the **NACTO Urban Bikeway Design Guide** provides guidance for choosing a bikeway design to create an All Ages & Abilities bicycling environment.

This document builds off FHWA and NACTO guidance to create context-sensitive bicycle facility guidance specifically for the City of San Antonio. It is important to note that the right bicycle facility design should include a comprehensive viewpoint that looks at the context and roadway characteristics. Simply adding a bike lane on a given road may not provide the proper infrastructure to make the facility comfortable for most.



Designing for people of all ages and abilities requires physical separation at certain vehicle volumes (y-axis) and speeds (x-axis). The FHWA Bikeway Selection Guide provides general guidance for providing the appropriate facility based on the volume and speed of a road.

Notes:
1. Chart assumes operating speeds are similar to posted speeds. If they differ, use operating speed rather than posted speed.
2. Advisory bike lanes may be an option when traffic volume is <3K ADT.
Credit: Bikeway Selection Guide, FHWA, 2019

Understanding the Impact of Speeds and Volumes

Whether or not people will bike on a given corridor is heavily influenced by how comfortable they feel. For bicyclists, two of the biggest factors for comfortability are vehicle speeds and volumes. Even small increases in either of these two factors can greatly decrease a bicyclist's physical safety or perceived comfort.

SPEED

The speed of vehicles along a corridor greatly impacts safety of all roads users by narrowing driver sight, increasing stopping distance, and escalating the likelihood of a crash to include a fatality of serious injury. When designing for an All Ages and Abilities Bicycle Network, it's important to understand how speeds impact the overall design of the bicycle facility.

Design Speed: A tool used to determine the geometric features of a road during road design. Higher design speeds often mandate larger curb radii, wider travel lane widths, on-street parking restrictions, guardrails, and clear zones. Lower design speeds reduce observed speeding behavior, providing a safer place for people to bike.

Target Speed: The highest speed that designers intend drivers to go on a specific road or street.

Posted Speed: The maximum lawful vehicle speed designated for a roadway.

Supporting safe travel speeds is an essential aspect of San Antonio Vision Zero work to eliminate traffic deaths and severe injuries. Therefore, design speeds should align with a safe and reasonable speed for the roadway's context and use. To reduce prevailing speeds, there are a multitude of countermeasures that can be considered, including:

- Narrowing travel lanes to cause motorists to naturally slow their speeds;
- Adding physical elements such as curb extensions, raised elements, and medians;
- Incorporating elements such as on-street parking, trees, and planting areas; and
- Reducing turning radii at intersections and slip lanes.
- Avoiding right-run slip lanes.

VOLUME

Biking with mixed traffic is generally comfortable only when vehicle volumes and speeds are low. As volumes increase it becomes increasingly difficult for motorists and bicyclists to share roadway space. On roadways that have high peak hour volumes, greater separation between bicyclists and vehicles can be beneficial, particularly when the peak hour coincides with peak volumes for bicyclists.

Understanding a Street's Context

San Antonio is formed by different neighborhoods that vary by their mix of uses, density, scale of buildings, block patterns, and amenities. These neighborhood characteristics affect network connectivity and influence how people travel. For example, people living in dense, mixed-use urban areas are more likely to walk or bike for their daily needs, requiring enhanced pedestrian and bicycle amenities. Understanding the challenges and opportunities of each surrounding street context (land use) is key to developing a bicycle network that works for the whole city and all users. As illustrated below, the surrounding street context categories developed for the Bike Network Plan are condensed, generalized variations of the 18 future land use categories developed by the San Antonio Planning Department. These surrounding street contexts are subject to change based on development.

How the Street Context Relates to Adopted Future Land Uses

Low Density Neighborhood
Adopted future land uses: Residential Estate, Low Density Residential, and Urban Low Density Residential

Medium Density Neighborhood
Adopted future land uses: Medium Density Residential, Neighborhood Mixed-Use, and Neighborhood Commercial

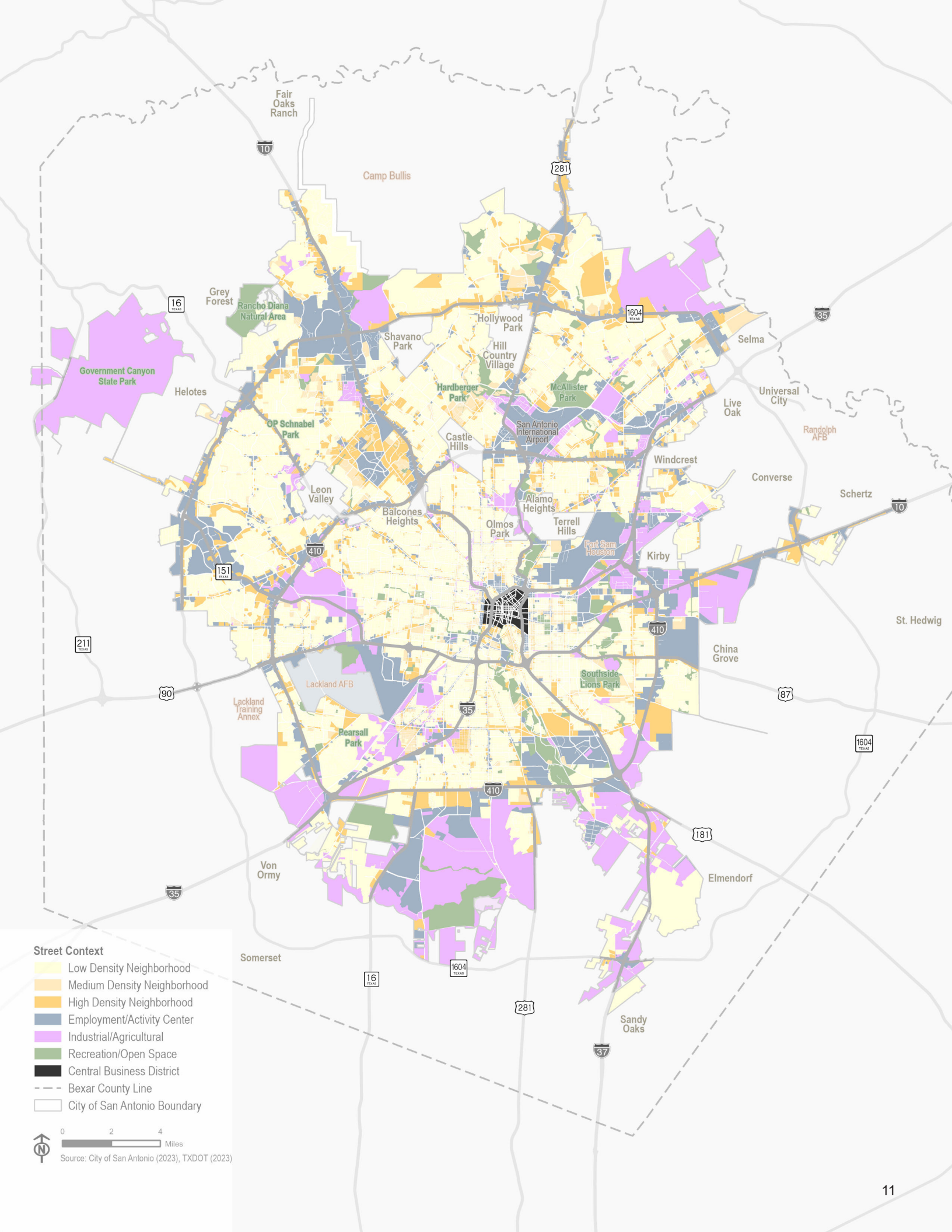
High Density Neighborhood
Adopted future land uses: High Density Residential, Urban Mixed-Use, and Community Commercial

Employment/Activity Center
Adopted future land uses: Employment/Flex Mixed-Use, Business/Innovation Mixed-Use, Regional Mixed-Use, and Regional Commercial

Industrial/Agricultural
Adopted future land uses: Light Industrial, Heavy Industrial, and Agricultural

Recreation/Open Space
Adopted future land uses: Parks/Open Space

Central Business District


Fair Oaks Ranch
Camp Bullis
Grey Forest
Rancho Diana Natural Area
Government Canyon State Park
Helotes
OP Schnabel Park
Shavano Park
Hollywood Park
Hill Country Village
Hardberger Park
McAllister Park
Castle Hills
San Antonio International Airport
Selma
Universal City
Live Oak
Randolph AFB
Windcrest
Converse
Schertz
Leon Valley
Balcones Heights
Alamo Heights
Olmos Park
Terrell Hills
Fort Sam Houston
Kirby
St. Hedwig
China Grove
Lackland AFB
Lackland Training Annex
Pearsall Park
Southside Lions Park
Von Ormy
Elmendorf
Somerset
Sandy Oaks
Street Context
Low Density Neighborhood
Medium Density Neighborhood
High Density Neighborhood
Employment/Activity Center
Industrial/Agricultural
Recreation/Open Space
Central Business District
Bexar County Line
City of San Antonio Boundary
0 2 4
Miles
Source: City of San Antonio (2023), TXDOT (2023)

Recommended Bicycle Facilities*

San Antonio's bicycle facility selection is organized by 1) the City's roadway functional classification, and 2) surrounding land use context. In consultation with the City's Planning Department staff, the SA Tomorrow Comprehensive Plan, and the SA Tomorrow Sub-Area plans, land use categories were consolidated to create seven street contexts based on land uses. In total, there are 42 unique combinations of functional classification and land use-based street contexts.

Functional Classifications

- Primary Arterial
- Secondary Arterial
- Collector A and B
- Collector C
- Local A
- Local B and C

Street Context

- Low Density Neighborhood
- Medium Density Neighborhood
- High Density Neighborhood
- Employment/Activity Center
- Industrial/Agricultural
- Recreation/Open Space
- Central Business District

* Selection of bike facilities on existing or proposed streets for street contexts (classification / land use) not included in the UDC table 506-4, shall be done in coordination with and approval from the Director of Development Services and the Director of Public Works.

How to Use This Document

For each combination of street context and functional classification, a one-page bicycle facility selection sheet describes the expected street land use context, desired key street characteristics, and guidance to choose an appropriate bicycle facility.

Functional classification and street context

Desired right-of-way width, vehicle travel speed, and target shade covering

Collector A/B
High Density Neighborhood

Collectors in high density neighborhoods connect neighborhood streets to the City's broader transportation network. These streets typically carry higher volumes and, with additional design elements, can make walking and biking an attractive option for many short trips.

Desired Characteristics in this Street Context

RIGHT OF WAY	AVERAGE VEHICLE TRAVEL SPEED (Target Speed)	TARGET SHADE COVERING
70' - 80'	0 50	
70-80 feet	25-30 miles per hour	Refer to Table 510-1 and 510-2 in the UDC

Preferred Bicycle Facility Based on Speed, Lanes, and Volumes

The following table outlines preferred and alternative bicycle facility types based on national design guidance to create a comfortable bicycle facility for all ages and abilities.

Number of Lanes	Speed*	Traffic Volumes**	PREFERRED BICYCLE FACILITY		Alternative Options to Consider***
2 Lanes	25 MPH^	<3,000	Bike Boulevard see page 74	Striped Bike Lane see page 76	• Buffered Bike Lane • Protected Bike Lane • Shared Use Path • Alternative Route
2 Lanes	30 MPH	<3,000	Striped Bike Lane see page 76	Buffered Bike Lane see page 78	
2 Lanes	30 MPH	>3,000	Buffered Bike Lane see page 78	Protected Bike Lane see page 80	• Shared Use Path • Alternative Route

* Represents design speed for future roads and posted speed for existing roads.
** Represents projected future year traffic volumes and not Design ADT.
*** Alternative options may be considered if the preferred facility type does not fit within the right of way.
^ UDC recommends a 30/35 MPH design speed for Collectors A/B. A 25 MPH design/posted speed is recommended in this context for a bike boulevard. A traffic engineering study (speed study) is required prior to using 25 MPH design/posted speed. If 25 MPH speed is not justified, a striped bike lane or buffered

Preferred cycling facility types and alternatives based on speed, number of lanes, traffic volumes, and street context. If the preferred facility is not feasible, alternative bicycle facility options are identified.

Page Intentionally Left Blank

Primary Arterial

Primary arterials allow for longer trips across the city. These roads move the largest volumes of vehicles but also have significant right-of-way that can be used to separate people walking and biking from vehicle traffic. Enhanced bicycle facilities are needed along these corridors to increase comfort and safety for people of all ages and abilities. If high-quality dedicated bicycle facilities or shared use paths are not feasible, it is recommended to identify alternative routes for cyclists. Many primary arterials also serve as VIA transit routes, so enabling efficient transit service and access to transit are critical elements when designing streets and accommodating bicyclists.

Existing UDC Standards (Table 506-3)

Total Right-of-Way	120'
Number of Travel Lanes	4 – 6
Design ADT (vpd)	4 Lanes: 30,000-34,000 6 Lanes: > 46,000
Design Speed	45 mph
Pavement Width	48' - 81'
Median Width	16' min
Curb	Yes
Attached Sidewalk Width	6' min
Bicycle Facilities	Required
Landscaped/Sidewalk Buffer Width	5' min
Streetscape Planting	Yes
On-Street Parking	Not Permitted

Note: Refer to UDC Table 506-4 for design standards related to streets in Traditional Neighborhoods and Table 506-4A.1 for enhanced street design standards.

Primary Arterial
Low Density Neighborhood

Because vehicles travel at relatively high speeds and there are multiple travel lanes, providing space between vehicle, pedestrian, and bicycle facilities is a top priority.

Desired Characteristics in this Street Context

RIGHT-OF-WAY

120
feet

AVERAGE VEHICLE TRAVEL SPEED (Target Speed)

40-45
miles per hour

TARGET SHADE COVERING

Refer to Table 510-1 and 510-2 in the UDC

Preferred Bicycle Facility Based on Speed, Lanes, and Volumes

The following table outlines preferred and alternative bicycle facility types based on national design guidance to create a comfortable bicycle facility for all ages and abilities.

Number of Lanes	Speed*	Traffic Volumes**	PREFERRED BICYCLE FACILITY		Alternative Options to Consider***
2–4 Lanes	40 mph	Up to 30,000	**Protected Bike Lane** see page 84	**Shared Use Path** see page 92	• Protected Bike Lane (at-grade not recommended on 6-lane or 45 mph roadways) • Alternative Route
6 Lanes	40 mph	> 30,000	**Protected Bike Lane (Raised)** see page 84	**Shared Use Path** see page 92	
2–6 Lanes	45 mph	Up to 30,000			
		> 30,000			

* Represents design speed for future roads and posted speed for existing roads.

** Represents projected future year traffic volumes and not Design ADT.

*** Alternative options may be considered if the preferred facility type does not fit within the right-of-way. Coordination with the Transportation Department should be performed to ensure connectivity.

Note: Per UDC, primary arterials have 4–6 lanes. Bicycle facility selection guidance is also provided for 2-lane primary arterials as several streets exist today with this configuration. Coordination and approval from the Public Works Director may be needed.

Primary Arterial
Medium Density Neighborhood

Arterials traversing medium density neighborhood land uses often support high traffic volumes with widely spaced intersections and crossings. Because vehicles travel at relatively high speeds, providing space between vehicle, pedestrian, and bicycle facilities is a top priority.

Desired Characteristics in this Street Context

RIGHT-OF-WAY

120 feet

AVERAGE VEHICLE TRAVEL SPEED (Target Speed)

40-45 miles per hour

TARGET SHADE COVERING

Refer to Table 510-1 and 510-2 in the UDC

Preferred Bicycle Facility Based on Speed, Lanes, and Volumes

The following table outlines preferred and alternative bicycle facility types based on national design guidance to create a comfortable bicycle facility for all ages and abilities.

Number of Lanes	Speed*	Traffic Volumes**	PREFERRED BICYCLE FACILITY		Alternative Options to Consider***
2–4 Lanes	40 mph	Up to 30,000	**Protected Bike Lane** see page 84	**Shared Use Path** see page 92	• Protected Bike Lane (at-grade not recommended on 6-lane or 45 mph roadways) • Alternative Route
6 Lanes	40 mph	> 30,000	**Protected Bike Lane (Raised)** see page 84	**Shared Use Path** see page 92	
2–6 Lanes	45 mph	Up to 30,000			
		> 30,000			

* Represents design speed for future roads and posted speed for existing roads.

** Represents projected future year traffic volumes and not Design ADT.

*** Alternative options may be considered if the preferred facility type does not fit within the right-of-way. Coordination with the Transportation Department should be performed to ensure connectivity.

Note: Per UDC, primary arterials have 4–6 lanes. Bicycle facility selection guidance is also provided for 2-lane primary arterials as several streets exist today with this configuration. Coordination and approval from the Public Works Director may be needed.

Primary Arterial
High Density Neighborhood

Arterials in high density neighborhoods provide access to local destinations and services. Many trips from adjacent neighborhoods to access these destinations can be made by walking or biking, so safety and convenience for these users should be balanced with the street's overall efficiency.

Desired Characteristics in this Street Context

RIGHT-OF-WAY

120 feet

AVERAGE VEHICLE TRAVEL SPEED (Target Speed)

35-40 miles per hour

TARGET SHADE COVERING

Refer to Table 510-1 and 510-2 in the UDC

Preferred Bicycle Facility Based on Speed, Lanes, and Volumes

The following table outlines preferred and alternative bicycle facility types based on national design guidance to create a comfortable bicycle facility for all ages and abilities.

Number of Lanes	Speed*	Traffic Volumes**	PREFERRED BICYCLE FACILITY		Alternative Options to Consider***
2–4 Lanes	35 mph	Up to 30,000	 **Protected Bike Lane** see page 84	 **Shared Use Path** see page 92	• Protected Bike Lane (at-grade not recommended on 6-lane or 45 mph roadways) • Alternative Route
6 Lanes	35 mph	> 30,000			
2–6 Lanes	40 mph^	Up to 30,000	 **Protected Bike Lane (Raised)** see page 84	 **Shared Use Path** see page 92	
		> 30,000			

* Represents design speed for future roads and posted speed for existing roads.

** Represents projected future year traffic volumes and not Design ADT.

*** Alternative options may be considered if the preferred facility type does not fit within the right-of-way. Coordination with the Transportation Department should be performed to ensure connectivity.

^ Per UDC, a design speed of 45mph should be used for future roads. However, a posted speed of 40 mph is recommended for this street context.

Note: Per UDC, primary arterials have 4–6 lanes. Bicycle facility selection guidance is also provided for 2-lane primary arterials as several streets exist today with this configuration. Coordination and approval from the Public Works Director may be needed.

Primary Arterial
Employment/Activity Center

Arterials within employment/activity centers are important corridors for moving people and providing access to employment, services, and commercial centers. Employment /activity centers also include higher density housing and should encourage a safe environment for people walking, biking, and accessing transit.

Desired Characteristics in this Street Context

RIGHT-OF-WAY

120 feet

AVERAGE VEHICLE TRAVEL SPEED (Target Speed)

35-40 miles per hour

TARGET SHADE COVERING

Refer to Table 510-1 and 510-2 in the UDC

Preferred Bicycle Facility Based on Speed, Lanes, and Volumes

The following table outlines preferred and alternative bicycle facility types based on national design guidance to create a comfortable bicycle facility for all ages and abilities.

Number of Lanes	Speed*	Traffic Volumes**	PREFERRED BICYCLE FACILITY		Alternative Options to Consider***
2–4 Lanes	35 mph	Up to 30,000	**Protected Bike Lane** see page 84	**Shared Use Path** see page 92	• Protected Bike Lane (at-grade not recommended on 6-lane or 45 mph roadways) • Alternative Route
6 Lanes	35 mph	> 30,000			
2–6 Lanes	40 mph^	Up to 30,000	**Protected Bike Lane (Raised)** see page 84	**Shared Use Path** see page 92	
		> 30,000			

* Represents design speed for future roads and posted speed for existing roads.

** Represents projected future year traffic volumes and not Design ADT.

*** Alternative options may be considered if the preferred facility type does not fit within the right-of-way. Coordination with the Transportation Department should be performed to ensure connectivity.

^ Per UDC, a design speed of 45mph should be used for future roads. However, a posted speed of 40 mph is recommended for this street context.

Note: Per UDC, primary arterials have 4–6 lanes. Bicycle facility selection guidance is also provided for 2-lane primary arterials as several streets exist today with this configuration. Coordination and approval from the Public Works Director may be needed.

Primary Arterial
Industrial/Agricultural

Arterials in industrial areas need to provide direct, convenient, and efficient access between commercial and industrial locations to regional routes and destinations. On these high-volume routes careful attention should be given to ensuring lane widths and turning radii are designed with pedestrian and bicycle safety in mind.

Desired Characteristics in this Street Context

RIGHT-OF-WAY

120
feet

AVERAGE VEHICLE TRAVEL SPEED (Target Speed)

40-45
miles per hour

TARGET SHADE COVERING

Refer to Table 510-1 and 510-2 in the UDC

Preferred Bicycle Facility Based on Speed, Lanes, and Volumes

The following table outlines preferred and alternative bicycle facility types based on national design guidance to create a comfortable bicycle facility for all ages and abilities.

Number of Lanes	Speed*	Traffic Volumes**	PREFERRED BICYCLE FACILITY		Alternative Options to Consider***
2–4 Lanes	40 mph	Up to 30,000	**Protected Bike Lane** see page 84	**Shared Use Path** see page 92	• Protected Bike Lane (at-grade not recommended on 6-lane or 45 mph roadways) • Alternative Route
6 Lanes	40 mph	> 30,000	**Protected Bike Lane (Raised)** see page 84	**Shared Use Path** see page 92	
2–6 Lanes	45 mph	Up to 30,000			
		> 30,000			

* Represents design speed for future roads and posted speed for existing roads.

** Represents projected future year traffic volumes and not Design ADT.

*** Alternative options may be considered if the preferred facility type does not fit within the right-of-way. Coordination with the Transportation Department should be performed to ensure connectivity.

Note: Per UDC, primary arterials have 4–6 lanes. Bicycle facility selection guidance is also provided for 2-lane primary arterials as several streets exist today with this configuration. Coordination and approval from the Public Works Director may be needed.

Primary Arterial
Recreation/Open Space

Recreation and open spaces attract large numbers of visitors, particularly from surrounding neighborhoods. Helping residents access these spaces safely and without needing a vehicle are top priorities. Robust pedestrian and bicycle facilities help provide comfortable and safe connections to trails.

Desired Characteristics in this Street Context

RIGHT-OF-WAY

120 feet

AVERAGE VEHICLE TRAVEL SPEED (Target Speed)

30-45 miles per hour

TARGET SHADE COVERING

Refer to Table 510-1 and 510-2 in the UDC

Preferred Bicycle Facility Based on Speed, Lanes, and Volumes

The following table outlines preferred and alternative bicycle facility types based on national design guidance to create a comfortable bicycle facility for all ages and abilities.

Number of Lanes	Speed*	Traffic Volumes**	PREFERRED BICYCLE FACILITY	Alternative Options to Consider***
2–6 Lanes	<35 mph	Any	**Protected Bike Lane** see page 84 **Shared Use Path** see page 92	• Protected Bike Lane (at-grade not recommended on 6-lane or 45 mph roadways) • Alternative Route
2–6 Lanes	> 40 mph	Any	**Protected Bike Lane (Raised)** see page 84 **Shared Use Path** see page 92	

* Represents design speed for future roads and posted speed for existing roads.

** Represents projected future year traffic volumes and not Design ADT.

*** Alternative options may be considered if the preferred facility type does not fit within the right-of-way. Coordination with the Transportation Department should be performed to ensure connectivity.

Note: Per UDC, primary arterials have 4–6 lanes. Bicycle facility selection guidance is also provided for 2-lane primary arterials as several streets exist today with this configuration. Coordination and approval from the Public Works Director may be needed.

Page Intentionally Left Blank

Primary Arterial
Central Business District

The Central Business District experiences some of the highest amount of street-level activity in San Antonio today. Therefore, arterials should be designed to provide a safe, pleasant environment for people walking and biking, and to create an inviting public realm. Providing access to key destinations for people using all modes is a primary goal, that must be balanced with moving people on these corridors.

Desired Characteristics in this Street Context

RIGHT-OF-WAY

120 feet

AVERAGE VEHICLE TRAVEL SPEED (Target Speed)

30-35 miles per hour

TARGET SHADE COVERING

Refer to Table 510-1 and 510-2 in the UDC

Preferred Bicycle Facility Based on Speed, Lanes, and Volumes

The following table outlines preferred and alternative bicycle facility types based on national design guidance to create a comfortable bicycle facility for all ages and abilities.

Number of Lanes	Speed*	Traffic Volumes**	PREFERRED BICYCLE FACILITY		Alternative Options to Consider***
2–4 Lanes	30 mph	Up to 30,000	**Protected Bike Lane** see page 84	**Shared Use Path** see page 92	• Protected Bike Lane (at-grade not recommended on 6-lane or 45 mph roadways) • Alternative Route
6 Lanes	30 mph	> 30,000	**Protected Bike Lane (Raised)** see page 84	**Shared Use Path** see page 92	
2–6 Lanes	35 mph^	Up to 30,000			
		> 30,000			

* Represents design speed for future roads and posted speed for existing roads.

** Represents projected future year traffic volumes and not Design ADT.

*** Alternative options may be considered if the preferred facility type does not fit within the right-of-way. Coordination with the Transportation Department should be performed to ensure connectivity.

^ Per UDC, a design speed of 45mph should be used for future roads. However, a posted speed of 35 mph is recommended for this street context.

Note: Per UDC, primary arterials have 4–6 lanes. Bicycle facility selection guidance is also provided for 2-lane primary arterials as several streets exist today with this configuration. Coordination and approval from the Public Works Director may be needed.

Page Intentionally Left Blank

Secondary Arterial

Along with primary arterials, secondary arterials form the backbone of San Antonio's street network. These roads move large volumes of vehicles and provide direct regional access to key destinations and activity centers. Enhanced bicycle facilities are needed along these corridors to increase comfort and safety for vulnerable users. If high-quality dedicated bicycle facilities or shared use paths are not feasible, it is recommended to identify alternative routes for cyclists. Many secondary arterials also serve as VIA transit routes, so enabling efficient transit service and access to transit is critical when designing the streets and accommodating bicyclists.

Existing UDC Standards (Table 506-3)

Total Right-of-Way	86'-110'
Number of Travel Lanes	4
Design ADT (vpd)	4 Lanes: 30,000-34,000
Design Speed	40 mph
Pavement Width	48' - 81'
Median Width	16' min
Curb	Yes
Attached Sidewalk Width	6' min
Bicycle Facilities	Required
Landscaped/Sidewalk Buffer Width	5' min
Streetscape Planting	Yes
On-Street Parking	Not Permitted

Note: Refer to UDC Table 506-4 for design standards related to streets in Traditional Neighborhoods and Table 506-4A.1 for enhanced street design standards.

Secondary Arterial
Low Density Neighborhood

Because vehicles travel at relatively high speeds and there are multiple travel lanes, providing space between vehicles and pedestrians and bicycle facilities is a top priority.

Desired Characteristics in this Street Context

RIGHT-OF-WAY

86' - 110'

86–110
feet

AVERAGE VEHICLE TRAVEL SPEED
(Target Speed)

35–40
miles per hour

TARGET SHADE COVERING

Refer to Table 510-1 and 510-2 in the UDC

Preferred Bicycle Facility Based on Speed, Lanes, and Volumes

The following table outlines preferred and alternative bicycle facility types based on national design guidance to create a comfortable bicycle facility for all ages and abilities.

Number of Lanes	Speed*	Traffic Volumes**	PREFERRED BICYCLE FACILITY		Alternative Options to Consider***
2 Lanes	35–40 mph	Any	**Protected Bike Lane** see page 84	**Shared Use Path** see page 92	• Buffered Bike Lane (not recommended on 4-lane or 40 mph roadways) • Alternative Route
2–4 Lanes	40 mph	Any	**Protected Bike Lane (Raised)** see page 84	**Shared Use Path** see page 92	

* Represents design speed for future roads and posted speed for existing roads.

** Represents projected future year traffic volumes and not Design ADT.

*** Alternative options may be considered if the preferred facility type does not fit within the right-of-way. Coordination with the Transportation Department should be performed to ensure connectivity.

Note: Per UDC, secondary arterials have 4 lanes. Bicycle facility selection guidance is also provided for 2-lane secondary arterials as several streets exist today with this configuration. Coordination and approval from Public Works Director may be needed.

Secondary Arterial
Medium Density Neighborhood

Arterials traversing medium density neighborhood land uses often support high traffic volumes with widely spaced intersections and crossings. Because vehicles travel at relatively high speeds, providing space between vehicles and pedestrians and/or bicycle facilities is a top priority.

Desired Characteristics in this Street Context

RIGHT-OF-WAY

86' - 110'

86–110
feet

AVERAGE VEHICLE TRAVEL SPEED (Target Speed)

35–40
miles per hour

TARGET SHADE COVERING

Refer to Table 510-1 and 510-2 in the UDC

Preferred Bicycle Facility Based on Speed, Lanes, and Volumes

The following table outlines preferred and alternative bicycle facility types based on national design guidance to create a comfortable bicycle facility for all ages and abilities.

Number of Lanes	Speed*	Traffic Volumes**	PREFERRED BICYCLE FACILITY		Alternative Options to Consider***
2 Lanes	35–40 mph	Any	**Protected Bike Lane** see page 84	**Shared Use Path** see page 92	• Buffered Bike Lane (not recommended on 4-lane or 40 mph roadways) • Alternative Route
2–4 Lanes	40 mph	Any	**Protected Bike Lane (Raised)** see page 84	**Shared Use Path** see page 92	

* Represents design speed for future roads and posted speed for existing roads.

** Represents projected future year traffic volumes and not Design ADT.

*** Alternative options may be considered if the preferred facility type does not fit within the right-of-way. Coordination with the Transportation Department should be performed to ensure connectivity.

Note: Per UDC, secondary arterials have 4 lanes. Bicycle facility selection guidance is also provided for 2-lane secondary arterials as several streets exist today with this configuration. Coordination and approval from Public Works Director may be needed.

Secondary Arterial
High Density Neighborhood

Arterials in high density neighborhoods provide access to local destinations and services. Many trips from adjacent neighborhoods to access these destinations can be made by walking or biking, so safety and convenience for these users should be balanced with the street's overall efficiency.

Desired Characteristics in this Street Context

RIGHT-OF-WAY

86' - 110'

86–110
feet

AVERAGE VEHICLE TRAVEL SPEED (Target Speed)

35–40
miles per hour

TARGET SHADE COVERING

Refer to Table 510-1 and 510-2 in the UDC

Preferred Bicycle Facility Based on Speed, Lanes, and Volumes

The following table outlines preferred and alternative bicycle facility types based on national design guidance to create a comfortable bicycle facility for all ages and abilities.

Number of Lanes	Speed*	Traffic Volumes**	PREFERRED BICYCLE FACILITY		Alternative Options to Consider***
2 Lanes	35–40 mph	Any	**Protected Bike Lane** see page 84	**Shared Use Path** see page 92	• Buffered Bike Lane (not recommended on 4-lane or 40 mph roadways) • Alternative Route
2–4 Lanes	40 mph	Any	**Protected Bike Lane (Raised)** see page 84	**Shared Use Path** see page 92	

* Represents design speed for future roads and posted speed for existing roads.

** Represents projected future year traffic volumes and not Design ADT.

*** Alternative options may be considered if the preferred facility type does not fit within the right-of-way. Coordination with the Transportation Department should be performed to ensure connectivity.

Note: Per UDC, secondary arterials have 4 lanes. Bicycle facility selection guidance is also provided for 2-lane secondary arterials as several streets exist today with this configuration. Coordination and approval from Public Works Director may be needed.

Secondary Arterial
Employment/Activity Center

Arterials within employment/activity centers are important corridors for moving people and providing access to employment, services, and commercial centers. Employment /activity centers also include higher density housing and must provide a safe environment for people walking, biking, and accessing transit.

Desired Characteristics in this Street Context

RIGHT-OF-WAY

86' - 110'

86–110
feet

AVERAGE VEHICLE TRAVEL SPEED (Target Speed)

35–40
miles per hour

TARGET SHADE COVERING

Refer to Table 510-1 and 510-2 in the UDC

Preferred Bicycle Facility Based on Speed, Lanes, and Volumes

The following table outlines preferred and alternative bicycle facility types based on national design guidance to create a comfortable bicycle facility for all ages and abilities.

Number of Lanes	Speed*	Traffic Volumes**	PREFERRED BICYCLE FACILITY		Alternative Options to Consider***
2 Lanes	35–40 mph	Any	**Protected Bike Lane** see page 84	**Shared Use Path** see page 92	• Buffered Bike Lane (not recommended on 4-lane or 40 mph roadways) • Alternative Route
2–4 Lanes	40 mph	Any	**Protected Bike Lane (Raised)** see page 84	**Shared Use Path** see page 92	

* Represents design speed for future roads and posted speed for existing roads.

** Represents projected future year traffic volumes and not Design ADT.

*** Alternative options may be considered if the preferred facility type does not fit within the right-of-way. Coordination with the Transportation Department should be performed to ensure connectivity.

Note: Per UDC, secondary arterials have 4 lanes. Bicycle facility selection guidance is also provided for 2-lane secondary arterials as several streets exist today with this configuration. Coordination and approval from Public Works Director may be needed.

Secondary Arterial
Industrial/Agricultural

Arterials in industrial areas need to provide direct, convenient, and efficient access between commercial and industrial locations to regional routes and destinations. These high-volume routes should pay careful attention to ensuring lane widths and turning radii are designed with pedestrian and bicycle safety in mind.

Desired Characteristics in this Street Context

RIGHT-OF-WAY

86–110 feet

AVERAGE VEHICLE TRAVEL SPEED (Target Speed)

35–40 miles per hour

TARGET SHADE COVERING

Refer to Table 510-1 and 510-2 in the UDC

Preferred Bicycle Facility Based on Speed, Lanes, and Volumes

The following table outlines preferred and alternative bicycle facility types based on national design guidance to create a comfortable bicycle facility for all ages and abilities.

Number of Lanes	Speed*	Traffic Volumes**	PREFERRED BICYCLE FACILITY	Alternative Options to Consider***
2 Lanes	35 mph	Any	**Protected Bike Lane** see page 84	• Buffered Bike Lane (not recommended on 4-lane or 40 mph roadways) • Shared Use Path • Alternative Route
2–4 Lanes	40 mph	Any	**Shared Use Path** see page 92	

* Represents design speed for future roads and posted speed for existing roads.

** Represents projected future year traffic volumes and not Design ADT.

*** Alternative options may be considered if the preferred facility type does not fit within the right-of-way. Coordination with the Transportation Department should be performed to ensure connectivity.

Note: Per UDC, secondary arterials have 4 lanes. Bicycle facility selection guidance is also provided for 2-lane secondary arterials as several streets exist today with this configuration. Coordination and approval from Public Works Director may be needed.

Secondary Arterial
Recreation/Open Space

Recreation and open spaces attract large numbers of visitors, particularly from surrounding neighborhoods. Helping residents access these spaces safely and without needing a vehicle are top priorities. Robust pedestrian and bicycle facilities help provide comfortable and safe connections to trails.

Desired Characteristics in this Street Context

RIGHT-OF-WAY

86' - 110'

86–110
feet

AVERAGE VEHICLE TRAVEL SPEED (Target Speed)

40
miles per hour

TARGET SHADE COVERING

Refer to Table 510-1 and 510-2 in the UDC

Preferred Bicycle Facility Based on Speed, Lanes, and Volumes

The following table outlines preferred and alternative bicycle facility types based on national design guidance to create a comfortable bicycle facility for all ages and abilities.

Number of Lanes	Speed*	Traffic Volumes**	PREFERRED BICYCLE FACILITY	Alternative Options to Consider***
2–4 Lanes	40 mph	Any	**Protected Bike Lane** see page 84 **Shared Use Path** see page 92	• Buffered Bike Lane (not recommended on 4-lane or 40 mph road-ways) • Shared Use Path • Alternative Route

* Represents design speed for future roads and posted speed for existing roads.

** Represents projected future year traffic volumes and not Design ADT.

*** Alternative options may be considered if the preferred facility type does not fit within the right-of-way. Coordination with the Transportation Department should be performed to ensure connectivity.

Note: Per UDC, secondary arterials have 4 lanes. Bicycle facility selection guidance is also provided for 2-lane secondary arterials as several streets exist today with this configuration. Coordination and approval from Public Works Director may be needed.

Page Intentionally Left Blank

Secondary Arterial
Central Business District

The Central Business District experiences the most street-level activity in San Antonio today. Therefore, arterials should be designed to provide a safe, pleasant environment for people walking and biking, and to create an inviting public realm. Providing access to key destinations for people using all modes is a primary goal, which must be balanced with moving people on these corridors.

Desired Characteristics in this Street Context

RIGHT-OF-WAY

86' - 110'

86–110
feet

AVERAGE VEHICLE TRAVEL SPEED (Target Speed)

30–35
miles per hour

TARGET SHADE COVERING

Refer to Table 510-1 and 510-2 in the UDC

Preferred Bicycle Facility Based on Speed, Lanes, and Volumes

The following table outlines preferred and alternative bicycle facility types based on national design guidance to create a comfortable bicycle facility for all ages and abilities.

Number of Lanes	Speed*	Traffic Volumes**	PREFERRED BICYCLE FACILITY	Alternative Options to Consider***
2–4 Lanes	30–35 mph	Any	**Protected Bike Lane** see page 84 **Shared Use Path** see page 92	• Buffered Bike Lane (not recommended on 4-lane or 40 mph roadways) • Alternative Route

* Represents design speed for future roads and posted speed for existing roads.

** Represents projected future year traffic volumes and not Design ADT.

*** Alternative options may be considered if the preferred facility type does not fit within the right-of-way. Coordination with the Transportation Department should be performed to ensure connectivity.

Note: Per UDC, secondary arterials have 4 lanes. Bicycle facility selection guidance is also provided for 2-lane secondary arterials as several streets exist today with this configuration. Coordination and approval from Public Works Director may be needed.

Page Intentionally Left Blank

Collector A/B

Collector streets link residents to nearby destinations and adjacent neighborhoods and connects to San Antonio's arterials, enabling longer, cross-town trips. Many trips on collectors are shorter, making walking and biking more feasible. Collectors should be designed for moderate vehicle volumes and lower speeds. Combined with high-quality sidewalks and bicycle facilities, enhanced landscaping, furniture, and shading, collector streets can be attractive corridors for walking and biking. As defined in San Antonio's Unified Development Code, Collector A and Collector B streets vary from Collector C streets based on available right-of-way and traffic volumes.

Existing UDC Standards (Table 506-3)

	Collector A	Collector B
Total Right-of-Way	70'	80'
Design ADT (vpd)	8,000–10,000	8,000–10,000
Design Speed	30 mph	35 mph
Pavement Width	30'	34'
Median Width	Not Required	Not Required
Curb	Yes	Yes
Attached Sidewalk Width	6' min	6' min
Bicycle Facilities*	Required	Required
Landscaped/Sidewalk Buffer Width	5' min	5' min
Streetscape Planting	Yes	Yes
On-Street Parking	Not Permitted	Not Permitted

* Refer to UDC Table 506-3 for minimum widths for shared use paths.

Note: Refer to UDC Table 506-4 for design standards related to streets in Traditional Neighborhoods and Table 506-4A.1 for enhanced street design standards.

Collector A/B
Low Density Neighborhood

Collectors in Low Density Neighborhoods provide direct connections to neighborhood streets. These streets typically carry low volumes of traffic at low speeds and, with additional design elements, can make walking and biking an attractive option for many short trips.

Desired Characteristics in this Street Context

RIGHT-OF-WAY

70' – 80'

70–80
feet

AVERAGE VEHICLE TRAVEL SPEED (Target Speed)

25-30
miles per hour

TARGET SHADE COVERING

Refer to Table 510-1 and 510-2 in the UDC

Preferred Bicycle Facility Based on Speed, Lanes, and Volumes

The following table outlines preferred and alternative bicycle facility types based on national design guidance to create a comfortable bicycle facility for all ages and abilities.

Number of Lanes	Speed*	Traffic Volumes**	PREFERRED BICYCLE FACILITY	Alternative Options to Consider***
2 Lanes	25 mph^	<3,000	**Bike Boulevard** see page 78	• Striped Bike Lane • Buffered Bike Lane • Shared Use Path • Alternative Route
2 Lanes	30 mph	<3,000	**Striped Bike Lane** see page 80; **Buffered Bike Lane** see page 82	
2 Lanes	30 mph	>3,000	**Buffered Bike Lane** see page 82; **Protected Bike Lane** see page 84	• Shared Use Path • Alternative Route

* Represents design speed for future roads and posted speed for existing roads.

** Represents projected future year traffic volumes and not Design ADT.

*** Alternative options may be considered if the preferred facility type does not fit within the right-of-way. Coordination with the Transportation Department should be performed to ensure connectivity.

^ UDC recommends a 30/35 mph design speed for Collectors A/B. A 25 mph design/posted speed is recommended in this context for a bike boulevard. A traffic engineering study (speed study) is required prior to using 25 mph design/posted speed. If 25 mph speed is not justified, a striped bike lane or buffered bike lane should be used instead.

Collector A/B
Medium Density Neighborhood

Collectors in Medium Density Neighborhoods connect neighborhood streets to the city's broader transportation network. These streets typically carry moderate volumes and, with additional design elements, can make walking and biking an attractive option for many short trips.

Desired Characteristics in this Street Context

RIGHT-OF-WAY

70' – 80'

70–80
feet

AVERAGE VEHICLE TRAVEL SPEED (Target Speed)

25–30
miles per hour

TARGET SHADE COVERING

Refer to Table 510-1 and 510-2 in the UDC

Preferred Bicycle Facility Based on Speed, Lanes, and Volumes

The following table outlines preferred and alternative bicycle facility types based on national design guidance to create a comfortable bicycle facility for all ages and abilities.

Number of Lanes	Speed*	Traffic Volumes**	PREFERRED BICYCLE FACILITY	Alternative Options to Consider**
2 Lanes	25 mph^	<3,000	**Bike Boulevard** see page 78	• Striped Bike Lane • Buffered Bike Lane • Shared Use Path • Alternative Route
2 Lanes	30 mph	<3,000	**Striped Bike Lane** see page 80 **Buffered Bike Lane** see page 82	
2 Lanes	30 mph	>3,000	**Buffered Bike Lane** see page 82 **Protected Bike Lane** see page 84	• Shared Use Path • Alternative Route

* Represents design speed for future roads and posted speed for existing roads.

** Represents projected future year traffic volumes and not Design ADT.

*** Alternative options may be considered if the preferred facility type does not fit within the right-of-way. Coordination with the Transportation Department should be performed to ensure connectivity.

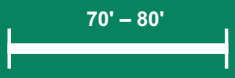
^ UDC recommends a 30/35 mph design speed for Collectors A/B. A 25 mph design/posted speed is recommended in this context for a bike boulevard. A traffic engineering study (speed study) is required prior to using 25 mph design/posted speed. If 25 mph speed is not justified, a striped bike lane or buffered bike lane should be used instead.

Collector A/B
High Density Neighborhood

Collectors in high density neighborhoods connect neighborhood streets to the City's broader transportation network. These streets typically carry higher volumes and, with additional design elements, can make walking and biking an attractive option for many short trips.

Desired Characteristics in this Street Context

RIGHT-OF-WAY



70–80
feet

AVERAGE VEHICLE TRAVEL SPEED (Target Speed)

25–30
miles per hour

TARGET SHADE COVERING

Refer to Table 510-1 and 510-2 in the UDC

Preferred Bicycle Facility Based on Speed, Lanes, and Volumes

The following table outlines preferred and alternative bicycle facility types based on national design guidance to create a comfortable bicycle facility for all ages and abilities.

Number of Lanes	Speed*	Traffic Volumes**	PREFERRED BICYCLE FACILITY		Alternative Options to Consider***
2 Lanes	25 mph^	<3,000	**Bike Boulevard** see page 78	**Striped Bike Lane** see page 80	• Buffered Bike Lane • Protected Bike Lane • Shared Use Path • Alternative Route
2 Lanes	30 mph	<3,000	**Striped Bike Lane** see page 80	**Buffered Bike Lane** see page 82	
2 Lanes	30 mph	>3,000	**Buffered Bike Lane** see page 82	**Protected Bike Lane** see page 84	• Shared Use Path • Alternative Route

* Represents design speed for future roads and posted speed for existing roads.

** Represents projected future year traffic volumes and not Design ADT.

*** Alternative options may be considered if the preferred facility type does not fit within the right-of-way. Coordination with the Transportation Department should be performed to ensure connectivity.

^ UDC recommends a 30/35 mph design speed for Collectors A/B. A 25 mph design/posted speed is recommended in this context for a bike boulevard. A traffic engineering study (speed study) is required prior to using 25 mph design/posted speed. If 25 mph speed is not justified, a striped bike lane or buffered bike lane should be used instead.

Collector A/B
Employment/Activity Center

Collectors in employment and activity centers link people to major employment and commercial centers and services. They should deliver an efficient experience for people using all modes of transportation, and their design should anticipate significant numbers of people walking.

Desired Characteristics in this Street Context

RIGHT-OF-WAY

70–80
feet

AVERAGE VEHICLE TRAVEL SPEED (Target Speed)

25–30
miles per hour

TARGET SHADE COVERING

Refer to Table 510-1 and 510-2 in the UDC

Preferred Bicycle Facility Based on Speed, Lanes, and Volumes

The following table outlines preferred and alternative bicycle facility types based on national design guidance to create a comfortable bicycle facility for all ages and abilities.

Number of Lanes	Speed*	Traffic Volumes**	PREFERRED BICYCLE FACILITY	Alternative Options to Consider***
2 Lanes	25 mph^	<3,000	**Bike Boulevard** see page 78 **Striped Bike Lane** see page 80	• Buffered Bike Lane • Protected Bike Lane • Shared Use Path • Alternative Route
2 Lanes	30 mph	<3,000	**Striped Bike Lane** see page 80 **Buffered Bike Lane** see page 82	
2 Lanes	30 mph	>3,000	**Buffered Bike Lane** see page 82 **Protected Bike Lane** see page 84	• Shared Use Path • Alternative Route

* Represents design speed for future roads and posted speed for existing roads.

** Represents projected future year traffic volumes and not Design ADT.

*** Alternative options may be considered if the preferred facility type does not fit within the right-of-way. Coordination with the Transportation Department should be performed to ensure connectivity.

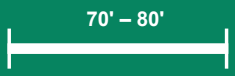
^ UDC recommends a 30/35 mph design speed for Collectors A/B. A 25 mph design/posted speed is recommended in this context for a bike boulevard. A traffic engineering study (speed study) is required prior to using 25 mph design/posted speed. If 25 mph speed is not justified, a striped bike lane or buffered bike lane should be used instead.

Collector A/B
Industrial/Agricultural

Collectors in industrial areas need to provide links from industrial and agricultural sites to regional routes and destinations. Although volumes and speeds are lower, bicycle facilities should still be protected or separated from vehicle traffic.

Desired Characteristics in this Street Context

RIGHT-OF-WAY



70–80
feet

AVERAGE VEHICLE TRAVEL SPEED (Target Speed)

30
miles per hour

TARGET SHADE COVERING

Refer to Table 510-1 and 510-2 in the UDC

Preferred Bicycle Facility Based on Speed, Lanes, and Volumes

The following table outlines preferred and alternative bicycle facility types based on national design guidance to create a comfortable bicycle facility for all ages and abilities.

Number of Lanes	Speed*	Traffic Volumes**	PREFERRED BICYCLE FACILITY		Alternative Options to Consider***
2 Lanes	30 mph	Any	**Buffered Bike Lane** see page 82	**Protected Bike Lane** see page 84	• Buffered Bike Lane • Protected Bike Lane • Shared Use Path • Alternative Route

* Represents design speed for future roads and posted speed for existing roads.

** Represents projected future year traffic volumes and not Design ADT.

*** Alternative options may be considered if the preferred facility type does not fit within the right-of-way. Coordination with the Transportation Department should be performed to ensure connectivity.

Collector A/B
Recreation/Open Space

Collector streets within recreation and open space areas should enable everyone, from our youngest to our oldest residents, to comfortably access San Antonio's parks and open spaces. Low volumes and travel speeds, plentiful trees and vegetation, wide sidewalks and bicycle facilities create a welcoming environment for all.

Desired Characteristics in this Street Context

RIGHT-OF-WAY

70' – 80'

70–80
feet

AVERAGE VEHICLE TRAVEL SPEED (Target Speed)

30
miles per hour

TARGET SHADE COVERING

Refer to Table 510-1 and 510-2 in the UDC

Preferred Bicycle Facility Based on Speed, Lanes, and Volumes

The following table outlines preferred and alternative bicycle facility types based on national design guidance to create a comfortable bicycle facility for all ages and abilities.

Number of Lanes	Speed*	Traffic Volumes**	PREFERRED BICYCLE FACILITY		Alternative Options to Consider***
2 Lanes	30 mph	<3,000	**Striped Bike Lane** see page 80	**Buffered Bike Lane** see page 82	• Protected Bike Lane • Shared Use Path • Alternative Route
2 Lanes	30 mph	>3,000	**Buffered Bike Lane** see page 82	**Protected Bike Lane** see page 84	• Shared Use Path • Alternative Route

* Represents design speed for future roads and posted speed for existing roads.

** Represents projected future year traffic volumes and not Design ADT.

*** Alternative options may be considered if the preferred facility type does not fit within the right-of-way. Coordination with the Transportation Department should be performed to ensure connectivity.

Page Intentionally Left Blank

Collector A/B
Central Business District

The Central Business District experiences the most amount of street-level activity in San Antonio today. Collectors in downtown San Antonio should be designed to maximize space for people walking and to create an inviting public realm.

Desired Characteristics in this Street Context

RIGHT-OF-WAY

70' – 80'

70–80
feet

AVERAGE VEHICLE TRAVEL SPEED (Target Speed)

25–30
miles per hour

TARGET SHADE COVERING

Refer to Table 510-1 and 510-2 in the UDC

Preferred Bicycle Facility Based on Speed, Lanes, and Volumes

The following table outlines preferred and alternative bicycle facility types based on national design guidance to create a comfortable bicycle facility for all ages and abilities.

Number of Lanes	Speed*	Traffic Volumes**	PREFERRED BICYCLE FACILITY		Alternative Options to Consider***
2 Lanes	25 mph^	<3,000	**Bike Boulevard** see page 78	**Striped Bike Lane** see page 80	• Bike Boulevard (only 2 lanes/25 mph) • Striped Bike Lane (only 2 lanes/25 mph) • Buffered Bike Lane • Protected Bike Lane • Shared Use Path • Alternative Route
2 Lanes	25 mph^	>3,000	**Buffered Bike Lane** see page 82	**Protected Bike Lane** see page 84	
2 Lanes	30 mph	<3,000	**Striped Bike Lane** see page 80	**Buffered Bike Lane** see page 82	
2 Lanes	30 mph	>3,000	**Buffered Bike Lane** see page 82	**Protected Bike Lane** see page 84	

* Represents design speed for future roads and posted speed for existing roads.

** Represents projected future year traffic volumes and not Design ADT.

*** Alternative options may be considered if the preferred facility type does not fit within the right-of-way. Coordination with the Transportation Department should be performed to ensure connectivity.

^ UDC recommends a 30/35 mph design speed for Collectors A/B. A 25 mph design/posted speed is recommended in this downtown context. A traffic engineering study (speed study) is required prior to using 25 mph design/posted speed.

Page Intentionally Left Blank

Collector C

Collector streets link residents to nearby destinations and adjacent neighborhoods and connect to San Antonio's arterials, enabling longer, cross-town trips. Many trips on collectors are shorter, making walking and biking more feasible. Collectors should be designed for moderate vehicle volumes and lower speeds. Combined with high-quality sidewalks and bicycle facilities, enhanced landscaping, furniture, and shading, collector streets can be attractive corridors for walking and biking. As defined in San Antonio's Unified Development Code, Collector C streets vary from Collector A and B streets based on available right-of-way and traffic volumes.

Existing UDC Standards (Table 506-3)

Total Right-of-Way	100'
Design ADT (vpd)	10,000 – 30,000
Design Speed	35 mph
Pavement Width	44'
Median Width	16'
Curb	Yes
Attached Sidewalk Width	6' min
Bicycle Facilities	Required
Landscaped/Sidewalk Buffer Width	5' min
Streetscape Planting	Yes
On-Street Parking	Not Permitted

Note: Refer to UDC Table 506-4 for design standards related to streets in Traditional Neighborhoods and Table 506-4A.1 for enhanced street design standards.

Collector C
Low Density Neighborhood

Collectors in Low Density Neighborhoods provide direct connections to neighborhood streets. These streets typically carry low volumes of traffic at low speeds and, with additional design elements, can make walking and biking an attractive option for many short trips.

Desired Characteristics in this Street Context

RIGHT-OF-WAY

100
feet

AVERAGE VEHICLE TRAVEL SPEED (Target Speed)

35
miles per hour

TARGET SHADE COVERING

Refer to Table 510-1 and 510-2 in the UDC

Preferred Bicycle Facility Based on Speed, Lanes, and Volumes

The following table outlines preferred and alternative bicycle facility types based on national design guidance to create a comfortable bicycle facility for all ages and abilities.

Number of Lanes	Speed*	Traffic Volumes**	PREFERRED BICYCLE FACILITY	Alternative Options to Consider**
2 Lanes	35 mph	Any	**Protected Bike Lane (At-Grade)** see page 84	• Protected Bike Lane (Raised) • Shared Use Path • Alternative Route
4 Lanes	35 mph	Any	**Protected Bike Lane (At-Grade)** see page 84 **Shared Use Path** see page 92	

* Represents design speed for future roads and posted speed for existing roads.

** Represents projected future year traffic volumes and not Design ADT.

*** Alternative options may be considered if the preferred facility type does not fit within the right-of-way. Coordination with the Transportation Department should be performed to ensure connectivity.

Collector C
Medium Density Neighborhood

Collectors in Medium Density Neighborhoods connect neighborhood streets to the city's broader transportation network. These streets typically carry moderate volumes and, with additional design elements, can make walking and biking an attractive option for many short trips.

Desired Characteristics in this Street Context

RIGHT-OF-WAY

100 feet

AVERAGE VEHICLE TRAVEL SPEED (Target Speed)

35 miles per hour

TARGET SHADE COVERING

Refer to Table 510-1 and 510-2 in the UDC

Preferred Bicycle Facility Based on Speed, Lanes, and Volumes

The following table outlines preferred and alternative bicycle facility types based on national design guidance to create a comfortable bicycle facility for all ages and abilities.

Number of Lanes	Speed*	Traffic Volumes**	PREFERRED BICYCLE FACILITY	Alternative Options to Consider**
2 Lanes	35 mph	Any	**Protected Bike Lane (At-Grade)** see page 84	• Protected Bike Lane (Raised) • Shared Use Path • Alternative Route
4 Lanes	35 mph	Any	**Protected Bike Lane (At-Grade)** see page 84 **Shared Use Path** see page 92	

* Represents design speed for future roads and posted speed for existing roads.

** Represents projected future year traffic volumes and not Design ADT.

*** Alternative options may be considered if the preferred facility type does not fit within the right-of-way. Coordination with the Transportation Department should be performed to ensure connectivity.

Collector C
High Density Neighborhood

Collectors in high density neighborhoods connect neighborhood streets to the city's broader transportation network. These streets typically carry higher volumes and, with additional design elements, can make walking and biking an attractive option for many short trips.

Desired Characteristics in this Street Context

RIGHT-OF-WAY

100 feet

AVERAGE VEHICLE TRAVEL SPEED (Target Speed)

30–35 miles per hour

TARGET SHADE COVERING

Refer to Table 510-1 and 510-2 in the UDC

Preferred Bicycle Facility Based on Speed, Lanes, and Volumes

The following table outlines preferred and alternative bicycle facility types based on national design guidance to create a comfortable bicycle facility for all ages and abilities.

Number of Lanes	Speed*	Traffic Volumes**	PREFERRED BICYCLE FACILITY	Alternative Options to Consider**
2 Lanes	30 mph	<3,000	**Striped Bike Lane** see page 80 **Buffered Bike Lane** see page 82	• Buffered Bike Lane • Shared Use Path • Alternative Route
2 Lanes	30 mph	>3,000	**Buffered Bike Lane** see page 82 **Protected Bike Lane** see page 84	
2-4 Lanes	35 mph	Any	**Protected Bike Lane (At-Grade)** see page 84 **Shared Use Path** see page 92	• Protected Bike Lane (Raised) • Alternative Route

* Represents design speed for future roads and posted speed for existing roads.

** Represents projected future year traffic volumes and not Design ADT.

*** Alternative options may be considered if the preferred facility type does not fit within the right-of-way. Coordination with the Transportation Department should be performed to ensure connectivity.

Collector C
Employment/Activity Center

Collectors in employment and activity centers link people to major employment and commercial centers and services. They should deliver an efficient experience for people using all modes of transportation, and their design should anticipate significant numbers of people walking.

Desired Characteristics in this Street Context

RIGHT-OF-WAY

100 feet

AVERAGE VEHICLE TRAVEL SPEED (Target Speed)

30–35 miles per hour

TARGET SHADE COVERING

Refer to Table 510-1 and 510-2 in the UDC

Preferred Bicycle Facility Based on Speed, Lanes, and Volumes

The following table outlines preferred and alternative bicycle facility types based on national design guidance to create a comfortable bicycle facility for all ages and abilities.

Number of Lanes	Speed*	Traffic Volumes**	PREFERRED BICYCLE FACILITY		Alternative Options to Consider**
2 Lanes	30 mph	<3,000	**Striped Bike Lane** see page 80	**Buffered Bike Lane** see page 82	• Buffered Bike Lane • Shared Use Path • Alternative Route
2 Lanes	30 mph	>3,000	**Buffered Bike Lane** see page 82	**Protected Bike Lane** see page 84	
2-4 Lanes	35 mph	Any	**Protected Bike Lane (At-Grade)** see page 84	**Shared Use Path** see page 92	• Protected Bike Lane (Raised) • Alternative Route

* Represents design speed for future roads and posted speed for existing roads.

** Represents projected future year traffic volumes and not Design ADT.

*** Alternative options may be considered if the preferred facility type does not fit within the right-of-way. Coordination with the Transportation Department should be performed to ensure connectivity.

Collector C
Industrial/Agricultural

Collectors in industrial areas need to provide links from industrial and agricultural sites to regional routes and destinations. Although volumes and speeds are lower, bicycle facilities should still be protected or separated from vehicle traffic.

Desired Characteristics in this Street Context

RIGHT-OF-WAY

100
feet

AVERAGE VEHICLE TRAVEL SPEED (Target Speed)

35
miles per hour

TARGET SHADE COVERING

Refer to Table 510-1 and 510-2 in the UDC

Preferred Bicycle Facility Based on Speed, Lanes, and Volumes

The following table outlines preferred and alternative bicycle facility types based on national design guidance to create a comfortable bicycle facility for all ages and abilities.

Number of Lanes	Speed*	Traffic Volumes**	PREFERRED BICYCLE FACILITY		Alternative Options to Consider**
2-4 Lanes	35 mph	Any	**Protected Bike Lane (At-Grade)** see page 84	**Shared Use Path** see page 92	• Protected Bike Lane (Raised) • Alternative Route

* Represents design speed for future roads and posted speed for existing roads.

** Represents projected future year traffic volumes and not Design ADT.

*** Alternative options may be considered if the preferred facility type does not fit within the right-of-way. Coordination with the Transportation Department should be performed to ensure connectivity.

Collector C
Recreation/Open Space

Collector streets within recreation and open space areas should enable everyone, from our youngest to our oldest residents, to comfortably access San Antonio's parks and open spaces. Low volumes and travel speeds, plentiful trees and vegetation, wide sidewalks and bicycle facilities create a welcoming environment for all.

Desired Characteristics in this Street Context

RIGHT-OF-WAY

100 feet

AVERAGE VEHICLE TRAVEL SPEED (Target Speed)

35 miles per hour

TARGET SHADE COVERING

Refer to Table 510-1 and 510-2 in the UDC

Preferred Bicycle Facility Based on Speed, Lanes, and Volumes

The following table outlines preferred and alternative bicycle facility types based on national design guidance to create a comfortable bicycle facility for all ages and abilities.

Number of Lanes	Speed*	Traffic Volumes**	PREFERRED BICYCLE FACILITY	Alternative Options to Consider**
2-4 Lanes	35 mph	Any	**Shared Use Path** see page 92	• Protected Bike Lane • Alternative Route

* Represents design speed for future roads and posted speed for existing roads.

** Represents projected future year traffic volumes and not Design ADT.

*** Alternative options may be considered if the preferred facility type does not fit within the right-of-way. Coordination with the Transportation Department should be performed to ensure connectivity.

Page Intentionally Left Blank

Collector C
Central Business District

The Central Business District experiences has the highest amount of street-level activity in San Antonio today. Collectors in Downtown San Antonio should be designed to maximize space for people walking and to create an inviting public realm.

Desired Characteristics in this Street Context

RIGHT-OF-WAY

100 feet

AVERAGE VEHICLE TRAVEL SPEED (Target Speed)

25–30 miles per hour

TARGET SHADE COVERING

Refer to Table 510-1 and 510-2 in the UDC

Preferred Bicycle Facility Based on Speed, Lanes, and Volumes

The following table outlines preferred and alternative bicycle facility types based on national design guidance to create a comfortable bicycle facility for all ages and abilities.

Number of Lanes	Speed*	Traffic Volumes**	PREFERRED BICYCLE FACILITY		Alternative Options to Consider**
2 Lanes	25 mph^	<3,000	**Bike Boulevard** see page 82	**Striped Bike Lane** see page 80	• Bike Boulevard (only 2 lanes/25 mph) • Striped Bike Lane (only 2 lanes/25 mph) • Buffered Bike Lane • Protected Bike Lane • Shared Use Path • Alternative Route
2 Lanes	25 mph^	>3,000	**Buffered Bike Lane** see page 82	**Protected Bike Lane** see page 84	
2 Lanes	30 mph	<3,000	**Striped Bike Lane** see page 80	**Buffered Bike Lane** see page 82	
2 Lanes	30 mph	>3,000	**Buffered Bike Lane** see page 82	**Protected Bike Lane** see page 84	

* Represents design speed for future roads and posted speed for existing roads.

** Represents projected future year traffic volumes and not Design ADT.

*** Alternative options may be considered if the preferred facility type does not fit within the right-of-way. Coordination with the Transportation Department should be performed to ensure connectivity.

^ UDC recommends a 35 mph design speed for Collectors C. A 25 mph design/posted speed is recommended in this downtown context. A traffic engineering study (speed study) is required prior to using 25 mph design/posted speed

Page Intentionally Left Blank

Local A

Local streets connect residents to the city's transportation network and act as places for neighbors to recreate and socialize. Local streets are designed to carry very little traffic and for cars to move slowly; they should be calm, shaded, and kid-friendly. Local streets may include flex zones that can be used for on-street parking and green infrastructure, as well as additional uses in higher density areas. As defined in San Antonio's Unified Development Code, Local A streets vary from Local B and Local C streets based on available right-of-way.

Existing UDC Standards (Table 506-3)

Total Right-of-Way (ROW)	50'
Design ADT (vpd)	<1,000
Design Speed	30 mph
Pavement Width	30'
Median	Not Required
Curb	Yes
Attached Sidewalk Width	4' min
Bicycle Facilities	Not Required
Landscaped/Sidewalk Buffer Width	Not Required
Streetscape Planting	Not Required
On-Street Parking	Allowed

Note: Refer to UDC Table 506-4 for design standards related to streets in Traditional Neighborhoods and Table 506-4A.1 for enhanced street design standards.

Local A
Low Density Neighborhood

Local streets in low density neighborhoods areas enable residents to step out their front door and connect to San Antonio's broader transportation network. They also serve as shared community spaces and extensions of residents' front yards and should encourage drivers to travel at safe speeds.

Desired Characteristics in this Street Context

RIGHT-OF-WAY

50
feet

AVERAGE VEHICLE TRAVEL SPEED (Target Speed)

25
miles per hour

TARGET SHADE COVERING

Refer to Table 510-1 and 510-2 in the UDC

Preferred Bicycle Facility Based on Speed, Lanes, and Volumes

The following table outlines preferred and alternative bicycle facility types based on national design guidance to create a comfortable bicycle facility for all ages and abilities.

Number of Lanes	Speed*	Traffic Volumes**	PREFERRED BICYCLE FACILITY	Alternative Options to Consider***
2 Lanes	25 mph^	<3,000	**Bike Boulevard** see page 78	• Striped Bike Lane • Shared Use Path • Alternative Route

* Represents design speed for future roads and posted speed for existing roads.

** Represents projected future year traffic volumes and not Design ADT.

*** Alternative options may be considered if the preferred facility type does not fit within the right-of-way. Coordination with the Transportation Department should be performed to ensure connectivity.

^ UDC recommends a 30 mph design speed for Local A. A 25 mph design/posted speed is recommended in this context for a bike boulevard. A traffic engineering study (speed study) is required prior to using 25 mph design/posted speed. If 25 mph speed is not justified, a striped bike lane or buffered bike lane should be used instead.

Local A
Medium Density Neighborhood

Local roadways in medium density neighborhoods connect residents to the city's broader transportation network. They also serve as shared community spaces and extensions of residents' front yards and should encourage drivers to travel at safe speeds.

Desired Characteristics in this Street Context

RIGHT-OF-WAY

50
feet

AVERAGE VEHICLE TRAVEL SPEED (Target Speed)

25
miles per hour

TARGET SHADE COVERING

Refer to Table 510-1 and 510-2 in the UDC

Preferred Bicycle Facility Based on Speed, Lanes, and Volumes

The following table outlines preferred and alternative bicycle facility types based on national design guidance to create a comfortable bicycle facility for all ages and abilities.

Number of Lanes	Speed*	Traffic Volumes**	PREFERRED BICYCLE FACILITY	Alternative Options to Consider***
2 Lanes	25 mph^	<3,000	**Bike Boulevard** see page 78	• Striped Bike Lane • Shared Use Path • Alternative Route

* Represents design speed for future roads and posted speed for existing roads.

** Represents projected future year traffic volumes and not Design ADT.

*** Alternative options may be considered if the preferred facility type does not fit within the right-of-way. Coordination with the Transportation Department should be performed to ensure connectivity.

^ UDC recommends a 30 mph design speed for Local A. A 25 mph design/posted speed is recommended in this context for a bike boulevard. A traffic engineering study (speed study) is required prior to using 25 mph design/posted speed. If 25 mph speed is not justified, a striped bike lane or buffered bike lane should be used instead.

Local A
High Density Neighborhood

Local streets in high density neighborhoods connect residents to their homes and their daily needs (i.e., grocery stores, restaurants, shopping centers, etc.). Local streets are often residential, which means that the street's function as a public and social spaces.

Desired Characteristics in this Street Context

RIGHT-OF-WAY

50
feet

AVERAGE VEHICLE TRAVEL SPEED (Target Speed)

25
miles per hour

TARGET SHADE COVERING

Refer to Table 510-1 and 510-2 in the UDC

Preferred Bicycle Facility Based on Speed, Lanes, and Volumes

The following table outlines preferred and alternative bicycle facility types based on national design guidance to create a comfortable bicycle facility for all ages and abilities.

Number of Lanes	Speed*	Traffic Volumes**	PREFERRED BICYCLE FACILITY	Alternative Options to Consider***
2 Lanes	25 mph^	<3,000	**Bike Boulevard** see page 78 **Striped Bike Lane** see page 80	• Buffered Bike Lane • Shared Use Path • Alternative Route

* Represents design speed for future roads and posted speed for existing roads.

** Represents projected future year traffic volumes and not Design ADT.

*** Alternative options may be considered if the preferred facility type does not fit within the right-of-way. Coordination with the Transportation Department should be performed to ensure connectivity.

^ UDC recommends a 30 mph design speed for Local A. A 25 mph design/posted speed is recommended in this context for a bike boulevard. A traffic engineering study (speed study) is required prior to using 25 mph design/posted speed. If 25 mph speed is not justified, a striped bike lane or buffered bike lane should be used instead.

Local A
Employment/Activity Center

Local streets in employment and activity centers link people to major employment and commercial centers and services. They also can provide circulation within these centers and allow for people to move between destinations.

Desired Characteristics in this Street Context

RIGHT-OF-WAY

50
feet

AVERAGE VEHICLE TRAVEL SPEED (Target Speed)

25
miles per hour

TARGET SHADE COVERING

Refer to Table 510-1 and 510-2 in the UDC

Preferred Bicycle Facility Based on Speed, Lanes, and Volumes

The following table outlines preferred and alternative bicycle facility types based on national design guidance to create a comfortable bicycle facility for all ages and abilities.

Number of Lanes	Speed*	Traffic Volumes**	PREFERRED BICYCLE FACILITY	Alternative Options to Consider***
2 Lanes	25 mph^	<3,000	**Bike Boulevard** see page 78 **Striped Bike Lane** see page 80	• Buffered Bike Lane • Shared Use Path • Alternative Route

* Represents design speed for future roads and posted speed for existing roads.

** Represents projected future year traffic volumes and not Design ADT.

*** Alternative options may be considered if the preferred facility type does not fit within the right-of-way. Coordination with the Transportation Department should be performed to ensure connectivity.

^ UDC recommends a 30 mph design speed for Local A. A 25 mph design/posted speed is recommended in this context for a bike boulevard. A traffic engineering study (speed study) is required prior to using 25 mph design/posted speed. If 25 mph speed is not justified, a striped bike lane or buffered bike lane should be used instead.

Local A
Industrial/Agricultural

Local streets in industrial and agriculture areas provide vital, short-distance connections from commercial and industrial buildings to the larger transportation network. Minimizing conflicts between freight traffic and people walking and biking is critical.

Desired Characteristics in this Street Context

RIGHT-OF-WAY

50
feet

AVERAGE VEHICLE TRAVEL SPEED (Target Speed)

25
miles per hour

TARGET SHADE COVERING

Refer to Table 510-1 and 510-2 in the UDC

Preferred Bicycle Facility Based on Speed, Lanes, and Volumes

The following table outlines preferred and alternative bicycle facility types based on national design guidance to create a comfortable bicycle facility for all ages and abilities.

Number of Lanes	Speed*	Traffic Volumes**	PREFERRED BICYCLE FACILITY	Alternative Options to Consider***
2 Lanes	25 mph^	<3,000	**Striped Bike Lane** see page 80	• Buffered Bike Lane • Shared Use Path • Alternative Route

* Represents design speed for future roads and posted speed for existing roads.

** Represents projected future year traffic volumes and not Design ADT.

*** Alternative options may be considered if the preferred facility type does not fit within the right-of-way. Coordination with the Transportation Department should be performed to ensure connectivity.

^ UDC recommends a 30 mph design speed for Local A. A 25 mph design/posted speed is recommended in this industrial context. A traffic engineering study (speed study) is required prior to using 25 mph design/posted speed. If 25 mph speed is not justified, a buffered bike lane or shared used path should be used instead.

Local A
Recreation/Open Space

Local streets within recreation and open space areas should enable everyone, from the youngest to the oldest residents, to comfortably access San Antonio's parks and open spaces. Low volumes and travel speeds, plentiful trees and vegetation, wide sidewalks and bicycle facilities create a welcoming environment for people walking and biking.

Desired Characteristics in this Street Context

RIGHT-OF-WAY

50
feet

AVERAGE VEHICLE TRAVEL SPEED (Target Speed)

25
miles per hour

TARGET SHADE COVERING

Refer to Table 510-1 and 510-2 in the UDC

Preferred Bicycle Facility Based on Speed, Lanes, and Volumes

The following table outlines preferred and alternative bicycle facility types based on national design guidance to create a comfortable bicycle facility for all ages and abilities.

Number of Lanes	Speed*	Traffic Volumes**	PREFERRED BICYCLE FACILITY	Alternative Options to Consider***
2 Lanes	25 mph^	<3,000	**Bike Boulevard** see page 78 **Striped Bike Lane** see page 80	• Buffered Bike Lane • Shared Use Path • Alternative Route

* Represents design speed for future roads and posted speed for existing roads.

** Represents projected future year traffic volumes and not Design ADT.

*** Alternative options may be considered if the preferred facility type does not fit within the right-of-way. Coordination with the Transportation Department should be performed to ensure connectivity.

^ UDC recommends a 30 mph design speed for Local A. A 25 mph design/posted speed is recommended in this context for a bike boulevard. A traffic engineering study (speed study) is required prior to using 25 mph design/posted speed. If 25 mph speed is not justified, a striped bike lane or buffered bike lane should be used instead

Page Intentionally Left Blank

Local A
Central Business District

The Central Business District experiences the most street-level activity in San Antonio; therefore, local streets should be designed to maximize space for people walking and to create an inviting public realm. Local streets typically have low volumes and low speeds and may include on-street parking, bicycle parking, seating, and space for mingling in the shade to create activity and support local businesses.

Desired Characteristics in this Street Context

RIGHT-OF-WAY

50
feet

AVERAGE VEHICLE TRAVEL SPEED (Target Speed)

25
miles per hour

TARGET SHADE COVERING

Refer to Table 510-1 and 510-2 in the UDC

Preferred Bicycle Facility Based on Speed, Lanes, and Volumes

The following table outlines preferred and alternative bicycle facility types based on national design guidance to create a comfortable bicycle facility for all ages and abilities.

Number of Lanes	Speed*	Traffic Volumes**	PREFERRED BICYCLE FACILITY	Alternative Options to Consider***
2 Lanes	25 mph^	<3,000	**Bike Boulevard** see page 78 **Striped Bike Lane** see page 80	• Buffered Bike Lane • Shared Use Path • Alternative Route

* Represents design speed for future roads and posted speed for existing roads.

** Represents projected future year traffic volumes and not Design ADT.

*** Alternative options may be considered if the preferred facility type does not fit within the right-of-way. Coordination with the Transportation Department should be performed to ensure connectivity.

^ UDC recommends a 30 mph design speed for Local A. A 25 mph design/posted speed is recommended in this context for a bike boulevard. A traffic engineering study (speed study) is required prior to using 25 mph design/posted speed. If 25 mph speed is not justified, a striped bike lane or buffered bike lane should be used instead.

Page Intentionally Left Blank

Local B and C

Local streets connect residents to the city's transportation network and act as places for neighbors to recreate and socialize. Local streets are designed to carry very little traffic and for cars to move slowly; they should be calm, shaded, and kid-friendly. Local streets may include flex zones that can be used for on-street parking and green infrastructure, as well as additional uses in higher density areas. As defined in San Antonio's Unified Development Code, Local B and C streets vary from Local A streets based on available right-of-way.

Existing UDC Standards (Table 506-3)

	Local B	Local C
Total Right-of-Way (ROW)	60'	60'
Design ADT (vpd)	1,000 – 4,000 (if houses fronting) 4,000 – 8,000 (if no houses fronting)	4,000 – 10,000
Design Speed (mph)	30 mph	30 mph
Pavement Width (feet)	34'	36'
Median	Not Required	Not Required
Curb	Yes	Yes
Sidewalk Width	4' min houses fronting 6' min no houses fronting	6' min
Bicycle Facilities	Allowed	Allowed
Landscaped/Sidewalk Buffer Width	Not Required: 3' min	Not Required: 3' min
Streetscape Planting	Not Required	Not Required
On-Street Parking	Allowed	Allowed

Note: Refer to UDC Table 506-4 for design standards related to streets in Traditional Neighborhoods and Table 506-4A.1 for enhanced street design standards.

Local B/C
Low Density Neighborhood

Local streets in low density neighborhood areas enable residents to step out of their front door and connect to San Antonio's broader transportation network. They also serve as shared community spaces and extensions of residents' front yards and should encourage drivers to travel at safe speeds.

Desired Characteristics in this Street Context

RIGHT-OF-WAY

60
feet

AVERAGE VEHICLE TRAVEL SPEED (Target Speed)

25–30
miles per hour

TARGET SHADE COVERING

Refer to Table 510-1 and 510-2 in the UDC

Preferred Bicycle Facility Based on Speed, Lanes, and Volumes

The following table outlines preferred and alternative bicycle facility types based on national design guidance to create a comfortable bicycle facility for all ages and abilities.

Number of Lanes	Speed*	Traffic Volumes**	PREFERRED BICYCLE FACILITY	Alternative Options to Consider**
2 Lanes	25 mph^	<3,000	**Bike Boulevard** see page 78 **Striped Bike Lane** see page 80	• Buffered Bike Lane • Shared Use Path • Alternative Route
2 Lanes	25 - 30 mph^	>3,000	**Striped Bike Lane** see page 80	

* Represents design speed for future roads and posted speed for existing roads.

** Represents projected future year traffic volumes and not Design ADT.

*** Alternative options may be considered if the preferred facility type does not fit within the right-of-way. Coordination with the Transportation Department should be performed to ensure connectivity.

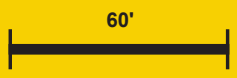
^ UDC recommends a 30 mph design speed for Local B/C. A 25 mph design/posted speed is recommended in this context. A traffic engineering study (speed study) is required prior to using 25 mph design/posted speed. If 25 mph speed is not justified, a buffered bike lane or shared use path should be used instead.

Local B/C
Medium Density Neighborhood

Local roadways in medium density neighborhoods connect residents to the city's broader transportation network. They also serve as shared community spaces and extensions of residents' front yards and should encourage drivers to travel at safe speeds.

Desired Characteristics in this Street Context

RIGHT-OF-WAY



60
feet

AVERAGE VEHICLE TRAVEL SPEED (Target Speed)

25–30
miles per hour

TARGET SHADE COVERING

Refer to Table 510-1 and 510-2 in the UDC

Preferred Bicycle Facility Based on Speed, Lanes, and Volumes

The following table outlines preferred and alternative bicycle facility types based on national design guidance to create a comfortable bicycle facility for all ages and abilities.

Number of Lanes	Speed*	Traffic Volumes**	PREFERRED BICYCLE FACILITY	Alternative Options to Consider**
2 Lanes	25 mph^	<3,000	**Bike Boulevard** see page 78 **Striped Bike Lane** see page 80	• Buffered Bike Lane • Shared Use Path • Alternative Route
2 Lanes	25 - 30 mph^	>3,000	**Striped Bike Lane** see page 80 **Buffered Bike Lane** see page 82	

* Represents design speed for future roads and posted speed for existing roads.

** Represents projected future year traffic volumes and not Design ADT.

*** Alternative options may be considered if the preferred facility type does not fit within the right-of-way. Coordination with the Transportation Department should be performed to ensure connectivity.

^ UDC recommends a 30 mph design speed for Local A. A 25 mph design/posted speed is recommended in this context for a bike boulevard. A traffic engineering study (speed study) is required prior to using 25 mph design/posted speed. If 25 mph speed is not justified, a striped bike lane or buffered bike lane should be used instead

Local B/C
High Density Neighborhood

Local streets in high density neighborhoods connect residents to their homes and their daily needs (i.e., grocery stores, restaurants, shopping centers, etc.). Local streets are often residential, which means that the streets function as a public and social spaces.

Desired Characteristics in this Street Context

RIGHT-OF-WAY

60
feet

AVERAGE VEHICLE TRAVEL SPEED (Target Speed)

25–30
miles per hour

TARGET SHADE COVERING

Refer to Table 510-1 and 510-2 in the UDC

Preferred Bicycle Facility Based on Speed, Lanes, and Volumes

The following table outlines preferred and alternative bicycle facility types based on national design guidance to create a comfortable bicycle facility for all ages and abilities.

Number of Lanes	Speed*	Traffic Volumes**	PREFERRED BICYCLE FACILITY	Alternative Options to Consider**
2 Lanes	25 mph^	<3,000	Striped Bike Lane see page 80	• Buffered Bike Lane • Shared Use Path • Alternative Route
2 Lanes	25 - 30 mph^	>3,000	Striped Bike Lane see page 80 Buffered Bike Lane see page 82	

* Represents design speed for future roads and posted speed for existing roads.

** Represents projected future year traffic volumes and not Design ADT.

*** Alternative options may be considered if the preferred facility type does not fit within the right-of-way. Coordination with the Transportation Department should be performed to ensure connectivity.

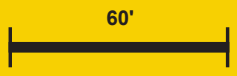
^ UDC recommends a 30 mph design speed for Local B/C. A 25 mph design/posted speed is recommended in this context. A traffic engineering study (speed study) is required prior to using 25 mph design/posted speed. If 25 mph speed is not justified, a buffered bike lane or shared use path should be used instead.

Local B/C
Employment/Activity Center

Local streets in employment and activity centers link people to major employment and commercial centers and services. They also can provide circulation within these centers and allow for people to move between destinations.

Desired Characteristics in this Street Context

RIGHT-OF-WAY



60
feet

AVERAGE VEHICLE TRAVEL SPEED (Target Speed)

25–30
miles per hour

TARGET SHADE COVERING

Refer to Table 510-1 and 510-2 in the UDC

Preferred Bicycle Facility Based on Speed, Lanes, and Volumes

The following table outlines preferred and alternative bicycle facility types based on national design guidance to create a comfortable bicycle facility for all ages and abilities.

Number of Lanes	Speed*	Traffic Volumes**	PREFERRED BICYCLE FACILITY	Alternative Options to Consider**
2 Lanes	25 mph^	<3,000	**Striped Bike Lane** see page 80	• Buffered Bike Lane • Shared Use Path • Alternative Route
2 Lanes	25 - 30 mph^	>3,000	**Striped Bike Lane** see page 80 **Buffered Bike Lane** see page 82	

* Represents design speed for future roads and posted speed for existing roads.

** Represents projected future year traffic volumes and not Design ADT.

*** Alternative options may be considered if the preferred facility type does not fit within the right-of-way. Coordination with the Transportation Department should be performed to ensure connectivity.

^ UDC recommends a 30 mph design speed for Local B/C. A 25 mph design/posted speed is recommended in this context. A traffic engineering study (speed study) is required prior to using 25 mph design/posted speed. If 25 mph speed is not justified, a buffered bike lane or shared use path should be used instead.

Local B/C
Industrial/Agricultural

Local streets in industrial and agriculture areas provide vital, short-distance connections from commercial and industrial buildings to the larger transportation network. Minimizing conflicts between freight traffic and people walking and biking is critical.

Desired Characteristics in this Street Context

RIGHT-OF-WAY

60
feet

AVERAGE VEHICLE TRAVEL SPEED (Target Speed)

25–30
miles per hour

TARGET SHADE COVERING

Refer to Table 510-1 and 510-2 in the UDC

Preferred Bicycle Facility Based on Speed, Lanes, and Volumes

The following table outlines preferred and alternative bicycle facility types based on national design guidance to create a comfortable bicycle facility for all ages and abilities.

Number of Lanes	Speed*	Traffic Volumes**	PREFERRED BICYCLE FACILITY	Alternative Options to Consider***
2 Lanes	25 mph^	<3,000	**Striped Bike Lane** see page 80	• Shared Use Path • Alternative Route
2 Lanes	25 - 30 mph^	>3,000	**Striped Bike Lane** see page 80 **Buffered Bike Lane** see page 82	

* Represents design speed for future roads and posted speed for existing roads.

** Represents projected future year traffic volumes and not Design ADT.

*** Alternative options may be considered if the preferred facility type does not fit within the right-of-way. Coordination with the Transportation Department should be performed to ensure connectivity.

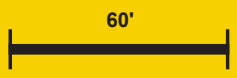
^ UDC recommends a 30 mph design speed for Local B/C. A 25 mph design/posted speed is recommended in this context. A traffic engineering study (speed study) is required prior to using 25 mph design/posted speed. If 25 mph speed is not justified, a buffered bike lane or shared use path should be used instead.

Local B/C
Recreation/Open Space

Local streets within recreation and open space areas should enable everyone, from the youngest to the oldest residents, to comfortably access San Antonio's parks and open spaces. Low volumes and travel speeds, plentiful trees and vegetation, and wide sidewalks and bicycle facilities create a welcoming environment for people walking and biking.

Desired Characteristics in this Street Context

RIGHT-OF-WAY



60
feet

AVERAGE VEHICLE TRAVEL SPEED (Target Speed)

25–30
miles per hour

TARGET SHADE COVERING

Refer to Table 510-1 and 510-2 in the UDC

Preferred Bicycle Facility Based on Speed, Lanes, and Volumes

The following table outlines preferred and alternative bicycle facility types based on national design guidance to create a comfortable bicycle facility for all ages and abilities.

Number of Lanes	Speed*	Traffic Volumes**	PREFERRED BICYCLE FACILITY	Alternative Options to Consider**
2 Lanes	25 mph^	<3,000	**Striped Bike Lane** see page 80	• Buffered Bike Lane • Shared Use Path • Alternative Route
2 Lanes	25 - 30 mph^	>3,000	**Striped Bike Lane** see page 80 **Buffered Bike Lane** see page 82	

* Represents design speed for future roads and posted speed for existing roads.

** Represents projected future year traffic volumes and not Design ADT.

*** Alternative options may be considered if the preferred facility type does not fit within the right-of-way. Coordination with the Transportation Department should be performed to ensure connectivity.

^ UDC recommends a 30 mph design speed for Local B/C. A 25 mph design/posted speed is recommended in this context. A traffic engineering study (speed study) is required prior to using 25 mph design/posted speed. If 25 mph speed is not justified, a buffered bike lane or shared use path should be used instead.

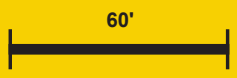
Page Intentionally Left Blank

Local B/C
Central Business District

The Central Business District experiences the most street-level activity in San Antonio; therefore, local streets should be designed to maximize space for people walking and to create an inviting public realm. Local streets typically have lower volumes and slower speeds and may include on-street parking, bicycle parking, seating, and space for mingling in the shade to create activity and support local businesses.

Desired Characteristics in this Street Context

RIGHT-OF-WAY



60
feet

AVERAGE VEHICLE TRAVEL SPEED (Target Speed)

25–30
miles per hour

TARGET SHADE COVERING

Refer to Table 510-1 and 510-2 in the UDC

Preferred Bicycle Facility Based on Speed, Lanes, and Volumes

The following table outlines preferred and alternative bicycle facility types based on national design guidance to create a comfortable bicycle facility for all ages and abilities.

Number of Lanes	Speed*	Traffic Volumes**	PREFERRED BICYCLE FACILITY	Alternative Options to Consider**
2 Lanes	25 mph^	<3,000	**Striped Bike Lane** see page 80	• Buffered Bike Lane • Protected Bike Lane • Shared Use Path • Alternative Route
2 Lanes	25 - 30 mph^	>3,000	**Striped Bike Lane** see page 80 **Buffered Bike Lane** see page 82	

* Represents design speed for future roads and posted speed for existing roads.

** Represents projected future year traffic volumes and not Design ADT.

*** Alternative options may be considered if the preferred facility type does not fit within the right-of-way. Coordination with the Transportation Department should be performed to ensure connectivity.

^ UDC recommends a 30 mph design speed for Local B/C. A 25 mph design/posted speed is recommended in this context. A traffic engineering study (speed study) is required prior to using 25 mph design/posted speed. If 25 mph speed is not justified, a buffered or protected bike lane or shared use path should be used instead.

Page Intentionally Left Blank

Additional Bicycle Facility Guidelines

Page Intentionally Left Blank

Bicycle Facility Types

The following pages outline general guidelines to consider for each bicycle facility type:

Bike Boulevard

Treatment Summary

Bike Boulevards, also known as Bicycle Boulevards, Neighborhood Greenways, or Neighborhood Bike Routes, are typically traffic calmed residential streets with low vehicle volumes and low speeds where motor vehicles and bicycles share the road space. Bike Boulevards use pavement markings, signs, and traffic calming elements to enhance safety and comfort for people on bicycles.

Bike Boulevards are only appropriate on-streets with low speeds (preferably 20-25 MPH) and vehicular volumes (preferably 3,000 vehicles per day or less). If speeds and volumes are higher than that, traffic calming or other treatments should be applied to create the appropriate environment. Bike Boulevards aim to optimize through-travel for people biking and include treatments to create low-stress crossings across busy streets. They should be designed to be as direct as possible and should include connections to nearby destinations that limit out of direction travel.

The following section summarizes general design guidance for bike boulevards. Refer to the most recent MUTCD, AASHTO Guide for the Development of Bicycle Facilities, and NACTO Urban Bikeway Design Guide for additional information as needed.

Recommended Elements

A1 Bicycle wayfinding signage and pavement markings shall be included on Bike Boulevards. Pavement markings should be used to indicate preferred positioning in the road as well as wayfinding at turns.

A2 Bicycle wayfinding signage should be placed anywhere there is a decision point or turn required. The signs should include destinations with arrows and distances.

A3 The orientation of the chevron marking as part of the shared lane marking should indicate the appropriate direction of travel along the Bike Boulevard.

A4 Traffic calming elements should be included at regular intervals (preferably 250-300'), both mid-block and at intersections.

A5 Bike Boulevards should be designed for average travel speeds of 20-25 MPH, although posted speed may differ.

A6 Pavement widths should match the widths noted in the UDC.

A7 The curb should be painted red where parking is not allowed. No parking signs (MUTCD R8-3) may be used to discourage or prohibit parking in the bike lane.

A8 At intersections and crossings, detectable warning surfaces and curb ramps shall be installed.

A9 At offset or complex intersections, shared lane markings may be painted through the intersection.

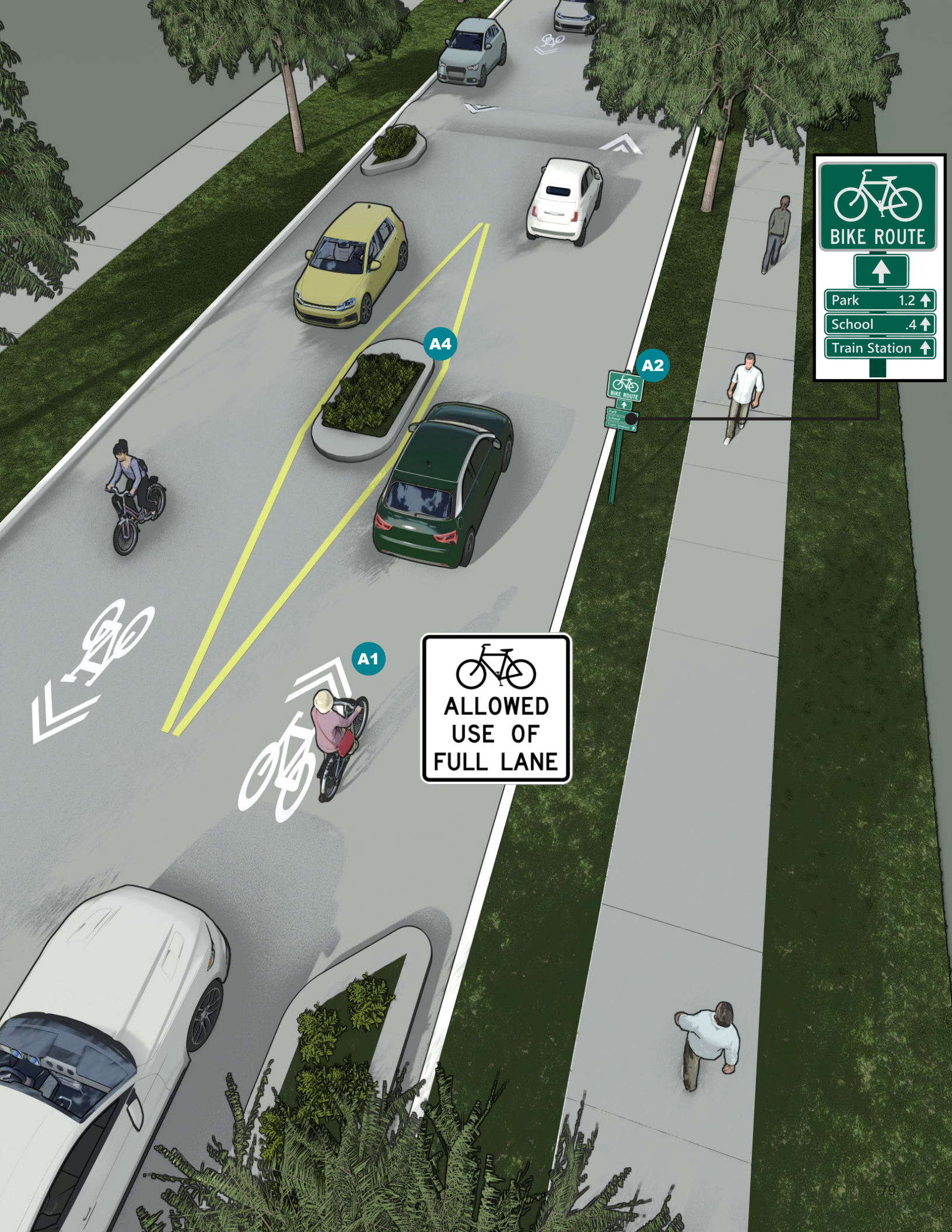
Optional Enhancements

B1 If on-street parking is included, consider marking a 2' to 3' buffer between the travel lane and parking lane if the travel lanes are wider than 11'.

B2 In addition to standard directional wayfinding signage, confirmation signs listing destinations and distances may be included.

B3 On one-way streets, a contraflow bike lane may be included to allow bicycle travel in the opposite direction of traffic. For more information on Bike Lanes, see "Striped Bike Lane" on page 80.

B4 Where there is additional space, Bike Boulevards may include striped bike lanes in addition to traffic calming. For more information on Bike Lanes, see "Striped Bike Lane" on page 80.


A1
A2
A4
ALLOWED USE OF FULL LANE
BIKE ROUTE
Park 1.2
School .4
Train Station

Striped Bike Lane

Treatment Summary

Striped bike lanes designate exclusive space for people biking through the use of pavement markings and are typically appropriate on-streets with speeds of 30 MPH or less. Bike lanes are intended for one-way travel and are typically provided on both sides of two-way streets, and on one side of one-way streets. Conventional bike lanes may vary in width. In some cases, contraflow bike lanes may be provided to support access on one-way streets. Bike lanes are typically on the right side of the street, between the outside travel lane and curb, parking lane, or road edge. While the bike lane distinguishes predictable areas for bicyclist and automobile movement, bicyclists may leave the bikeway to pass other bicyclists or avoid debris and other traffic conflicts.

The following section summarizes general design guidance for bike lanes. Refer to the most recent MUTCD, AASHTO Guide for the Development of Bicycle Facilities, and NACTO Urban Bikeway Design Guide for additional information as needed.

Recommended Elements

A1 Bicycle lane word, symbol, and/or arrow markings shall be placed at the beginning of the bike lane and along periodic intervals based on engineering judgement.

A2 A solid wide white lane line shall be used to identify the edge of the bike lane.

A3 Preferred bike lane width is determined based on facility type, context, and engineering assessment.

A4 The curb may be painted red where parking is not allowed. No parking signs (MUTCD R8-3) may be used to discourage parking in the bike lane.

A5 At intersections and crossings, detectable warning surfaces and curb ramps shall be installed.

A6 At intersections and driveways, conflict striping may be considered to improve visibility for all users.

A7 Manholes, drainage grates, and other obstacles should be set flush with the paved roadway, and grates should be positioned perpendicular to the path of travel so as not to trap bike tires.

Optional Enhancements

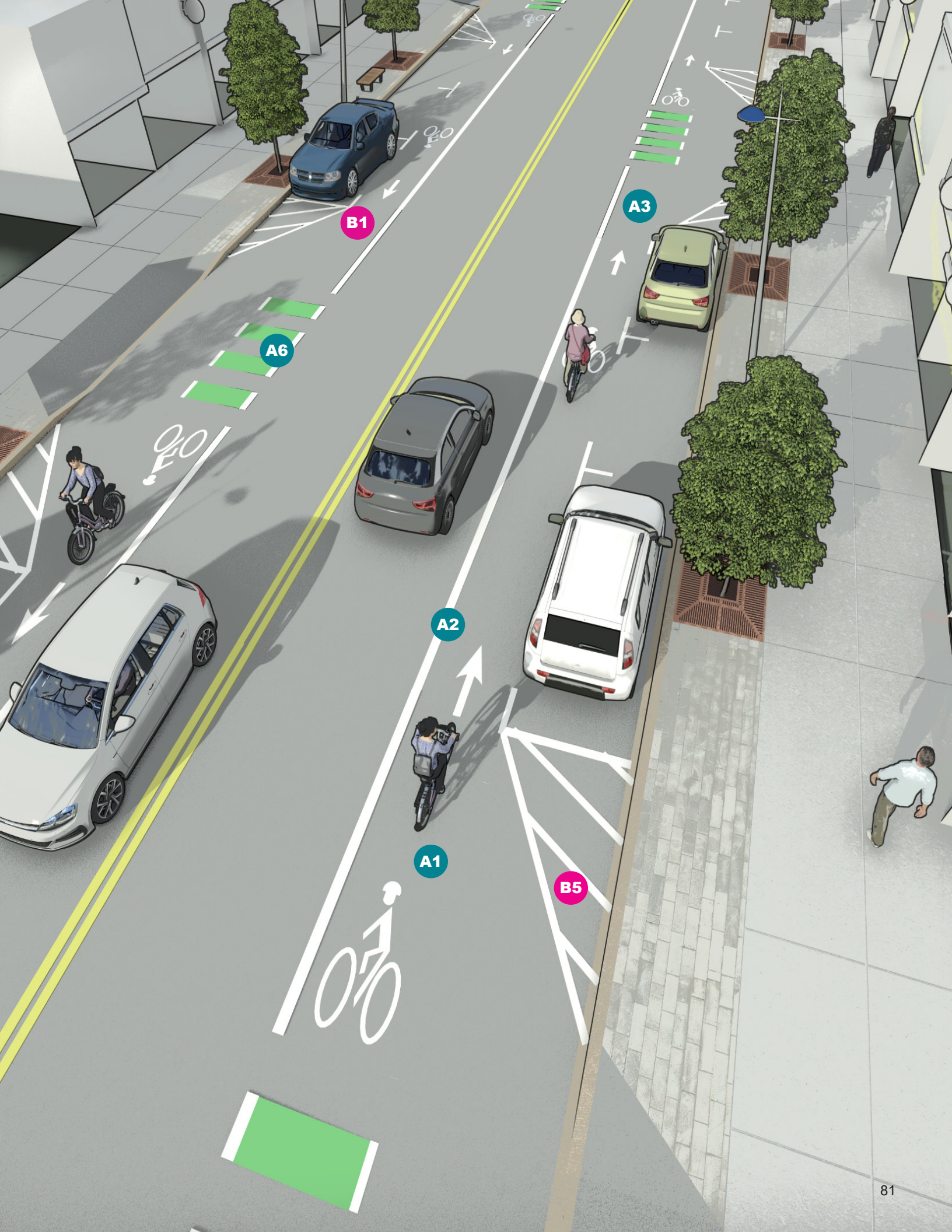
B1 If the bike lane is adjacent to on-street parking, the bikeway should be placed between the travel lane and on-street parking. If there is space to provide a 3’ buffer between the bikeway and parking lane while maintaining the minimum recommended bikeway width, the bikeway should be placed between the curb and the parking lane. Consider making bike lanes as wide as possible to allow people biking to avoid the door zone.

B2 At bus stops, a bus island should be considered. People biking should yield to people walking at these points. If there is not space for a bus island, the bus may pull out to the curb and share the space with people biking.

B3 To further indicate priority users, yield markings and/or raised crossings may be installed where people walking are anticipated to cross the bikeway.

B4 Where drivers are observed parking or driving in a bike lane, protected bike lanes should be considered.

B5 Where on street parking is present, prohibiting parking within 20 feet of driveways and intersections, or "daylighting," may be used to improve visibility for all roadway users.


B1
A3
A6
A2
A1
B5

Buffered Bike Lane

Treatment Summary

Buffered bike lanes provide additional horizontal separation between the bike lanes, travel lanes, or parking lanes, increasing comfort and separation for people biking. Buffered bike lanes are preferred along streets with higher volumes and speeds, where conventional bike lanes may not adequately enhance comfort and safety for people biking. Buffers provide a greater space for bicycling without making the bike lane appear overly wide; overly wide space may attract unintended motor vehicle use for driving or parking.

The following section summarizes general design guidance for buffered bike lanes. Refer to the most recent MUTCD, AASHTO Guide for the Development of Bicycle Facilities, and NACTO Urban Bikeway Design Guide for additional information as needed.

Recommended Elements

A1 Bicycle lane word, symbol, and/or arrow markings shall be placed at the beginning of the bike lane and along periodic intervals based on engineering judgement.

A2 Preferred bike lane width is determined based on facility type, context, and engineering assessment.

A3 The buffer shall be marked with two solid white lines and hatching. Preferred buffer width is determined based on facility type, context, and engineering assessment.

A4 The curb should be painted red where parking is not allowed. No parking signs (MUTCD R8-3) may be used to discourage parking in the bike lane.

A5 At intersections and crossings, detectable warning surfaces and curb ramps shall be installed.

A6 At intersections and driveways, conflict striping may be considered to improve visibility for all users.

A7 Manholes, drainage grates, or other obstacles should be set flush with the paved roadway and grates should be positioned perpendicular to the path of travel so as not to trap bike tires.

Optional Enhancements

B1 If the bike lane is adjacent to on-street parking, the bikeway may be placed between the curb and the parking lane. Consider making bike lanes as wide as possible to allow people biking to avoid the door zone. Where this is infeasible, the bike lane may be placed between the parking lane and vehicle lane. In these cases, buffers should be placed on both sides of the bike lane. If there is not space for a buffer on both sides of the bike lane and the bike lane must be placed between the parking lane and driving lane, the buffer may be placed only on one side. The determination of which side should be made based on engineering judgment and should consider parking turnover, vehicle speed, and volume.

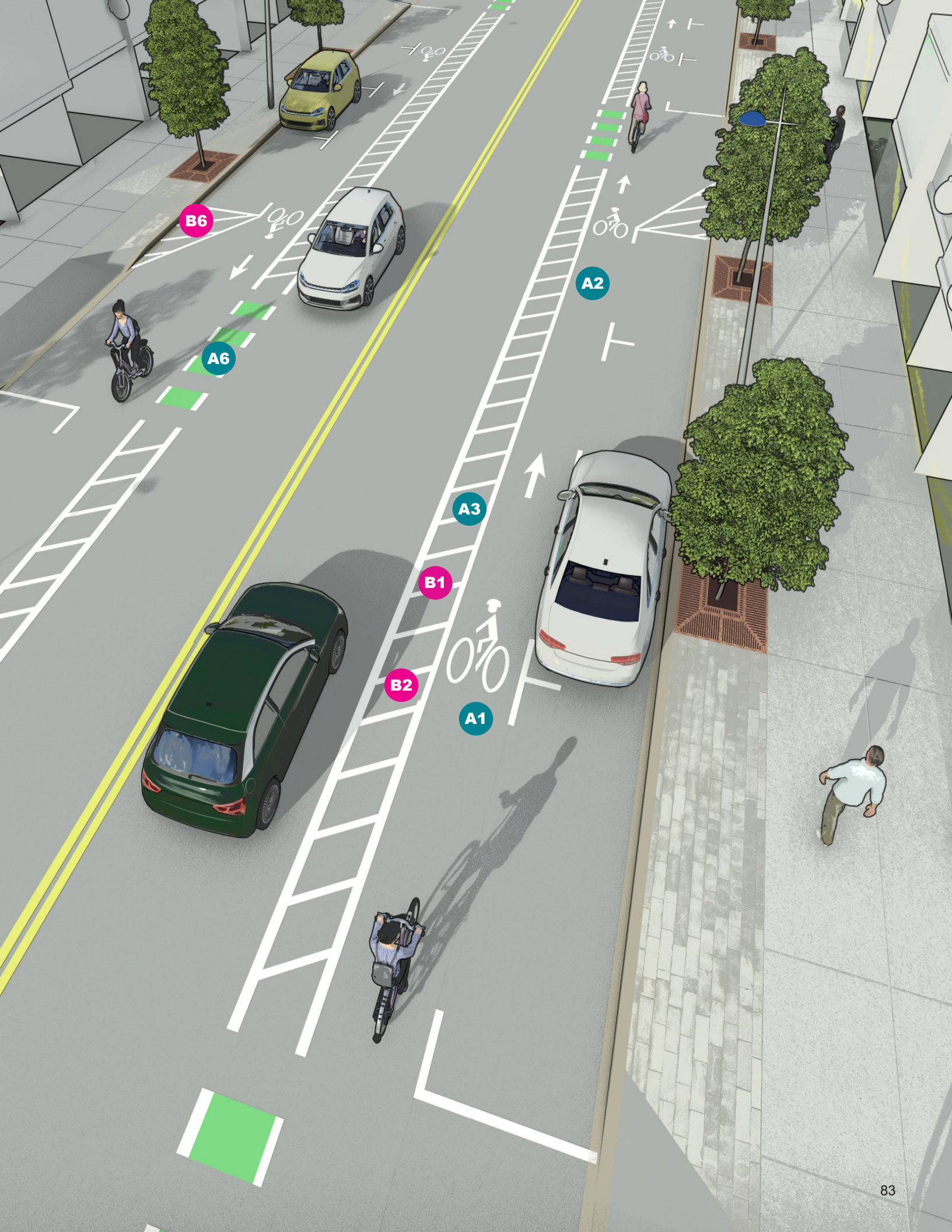
B2 A minimum 3' buffer is suggested when parking is present.

B3 At bus stops, a bus island should be considered. People biking should yield to people walking at these points. If there is not space for a bus island, the bus may pull out to the curb and share the space with people biking.

B4 To further indicate priority users, yield markings and/or raised crossings may be installed where people walking are anticipated to cross the bikeway.

B5 Where drivers are observed parking or driving in a bike lane, protected bike lanes should be considered.

B6 Where on street parking is present, prohibiting parking within 20 feet of driveways and intersections, or "daylighting," may be used to improve visibility for all roadway users.


B6
A6
A2
A3
B1
B2
A1

Protected Bike Lane

Treatment Summary

Protected bike lanes, also known as cycle tracks and separated bikeways, incorporate physical separation from motorized traffic, parking lanes, and adjacent walking facilities. Physical separation varies and includes flexible post delineators, raised medians, landscaping, or another physical object. This vertical element differentiates protected bike lanes from striped and buffered bike lanes. Streets with protected bike lanes should also have sidewalks on both sides to accommodate people walking.

Protected bike lanes can accommodate one-way or two-way travel, be placed on one or both sides of the street, and may be built at street level, sidewalk level, or somewhere in between. One-way protected bike lanes are usually preferred as they reduce potential conflict points at driveways and intersections while providing access to both sides of the street. However, two-way facilities may be preferred along streets with long, uninterrupted blocks with most destinations on one side like parks. Two-way bike lanes require additional considerations at driveways and intersections so drivers know to look for two-way bike traffic.

The following section summarizes general design guidance for protected bike lanes. Refer to the most recent FHWA Separated Bike Lane Planning and Design Guide and/or the NACTO Urban Bikeway Design Guide for additional information as needed.

Recommended Elements

A1 Bicycle lane word, symbol, and/or arrow markings shall be placed at the beginning of the protected bike lane and along periodic intervals based on engineering judgement.

A2 Preferred bike lane width is determined based on facility type, context, and engineering assessment.

A3 Physical separation, which may or may not include painted markings, shall be used. Separation type shall be based on facility type, context, and engineering assessment. Separation type examples can be found in "Separator Types" on page 86.

A4 A curb, detectable edge, or other feature shall be used to provide visual and physical queues to separate the bikeway and walkway.

A5 At intersections and crossings, detectable warning surfaces and curb ramps shall be installed.

A6 At intersections and driveways, conflict striping should be considered to improve visibility for all users. Raised side street crossings may be installed at side streets and driveways, especially if the bikeway is at sidewalk level.

A7 Manholes, drainage grates, and other obstacles should be set flush with the paved roadway, and grates should be positioned perpendicular to the path of travel so as not to trap bike tires.

Optional Enhancements

B1 If the bike lane is parking protected, additional vertical elements should be considered between the parking lane and the bike lane. The buffer shall be at least 3’ when parking is present.

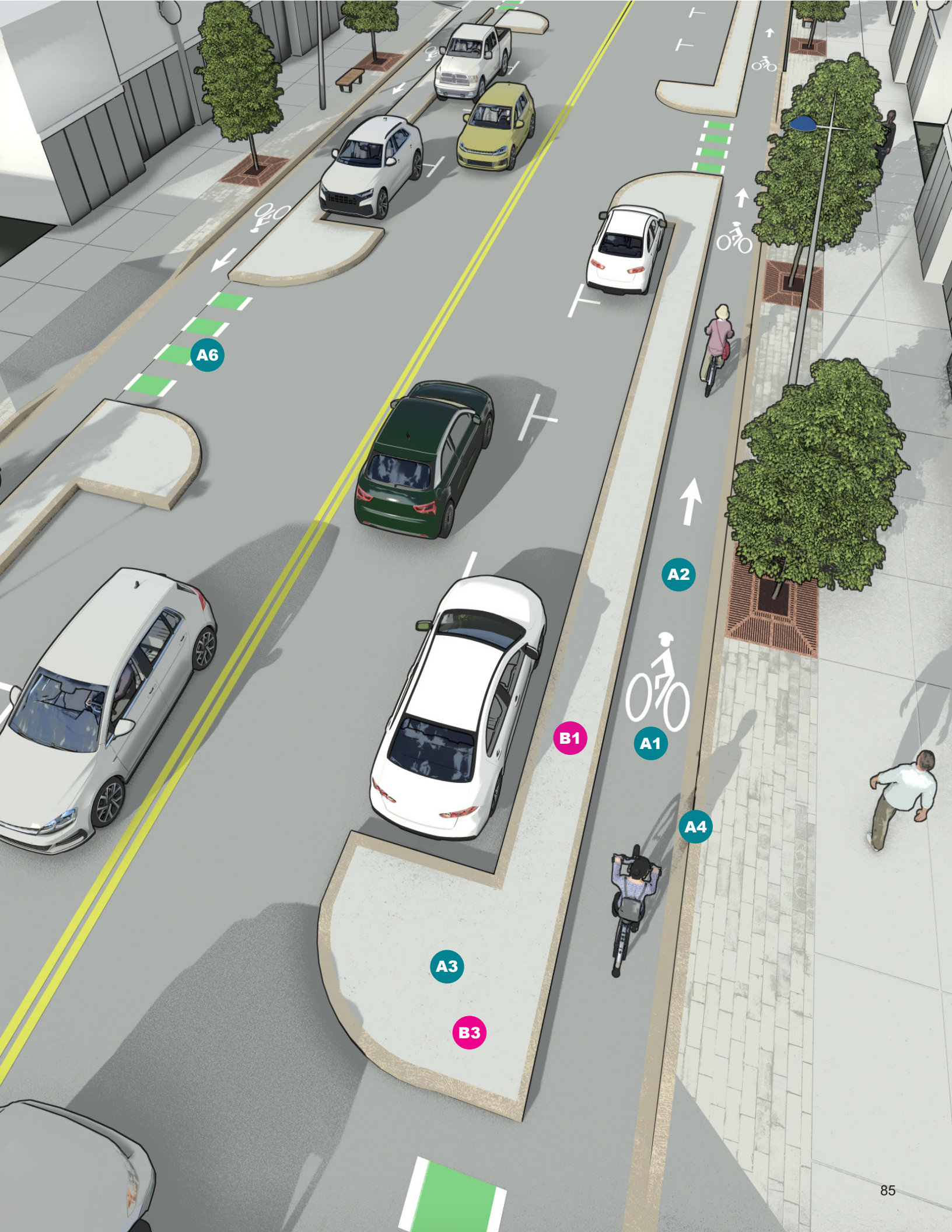
B2 If parking is provided, accessible parking shall also be provided. The bikeway may be narrowed to accommodate the required path of travel, and curb ramps should be installed to provide access to the sidewalk. Where possible, place accessible parking spaces near intersections.

B3 Where on street parking is present, prohibiting parking within 20 feet of driveways and intersections, or "daylighting," may be used to improve visibility for all roadway users.

B4 Where parking protected bike lanes are installed, the curb may be painted red and a colored stripe may be painted in the parking space to indicate parking restrictions similar to what would be painted on the curb (white, green, yellow, or blue curb).

B5 At bus stops, a bus island should be considered. People biking should yield to people walking at these points.

B6 To further indicate priority users, yield markings and/or raised crossings may be installed where people walking are anticipated to cross the bikeway. Additionally, any space where people are anticipated to walk should be designed to meet ADA cross slope standards.

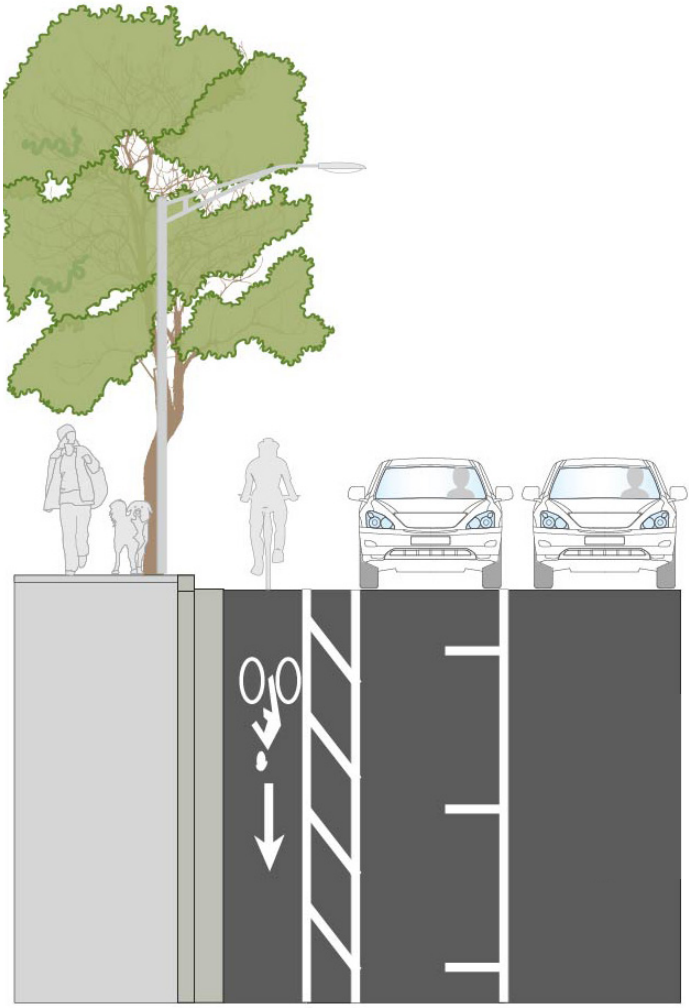

A6
A2
A1
B1
A4
A3
B3

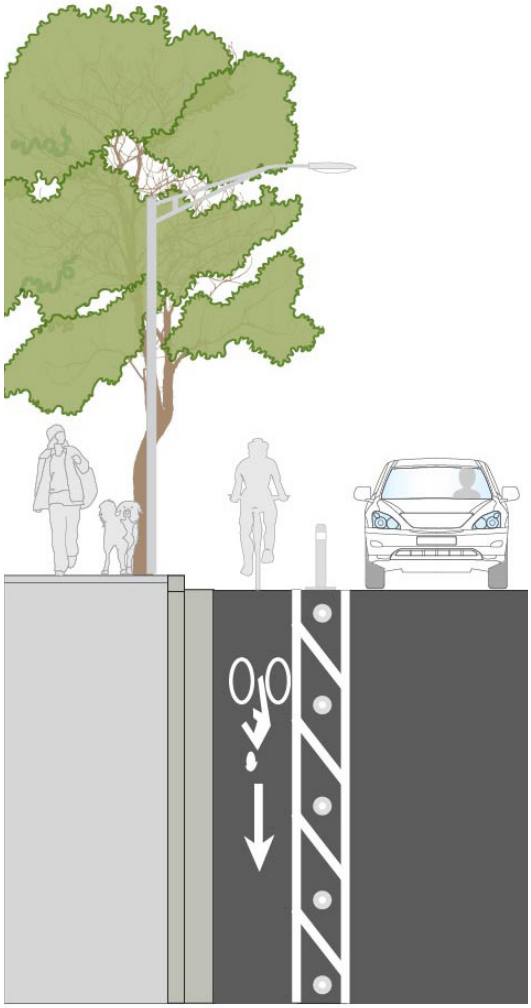
Separator Types

Vertical separation between the bikeway and vehicle lanes is one of the most important design elements to consider when designing a protected bike lane. There are a variety of potential options that can be used to separate bike lanes from vehicular traffic. Many factors influence the design decisions for these buffers, including number of driving lanes, vehicular speeds and volumes, drainage, driveways, available right-of-way, maintenance, aesthetics, durability, cost, and long-term maintenance.

This document does not include an exhaustive list of types of separation and is designed to allow flexibility for the City to identify and implement new forms of separation as technology evolves. The following section describes a snapshot of potential separation technologies available to the City today. The table below provides a summary of some considerations for forms of separation. Each form is described in more detail on the following pages.

High = Relatively High Med = Relatively Moderate Low = Relatively Low	Cost	Perceived Safety	Durability and Maintenance	Stormwater Management	Level of Separation from Vehicles	Aesthetics	Construction Impacts	Minimum Width Required
Parked Cars	Low Cost	Med	High	High	Med	Med	High	**11’**
Flexible Delineator Posts	Low Cost	Med	Low	High	Med	Low	Med	**1.5’**
Tuffcurb	Low Cost	High	Low	High	Med	Low	Med	**1.5’**
Armadillos	Low Cost	Med	Med	High	Med	Med	Med	**2’**
Parking Stops	Low Cost	Med	Med	High	Med	Low	Med	**2’**
Planters	Medium Cost	High	Low	Med	High	High	Med	**4'**
Concrete (Jersey) Barriers	High Cost	High	High	Med	High	Med	Med	**3’**
Rigid Bollards	Low Cost	Med	Med	High	Med	Med	High	**1.5'**
Raised Medians	High Cost	High	High	Med	High	High	High	**1.5’**
Sidewalk Level (Raised)	High Cost	High	High	Low	High	High	High	**2’**



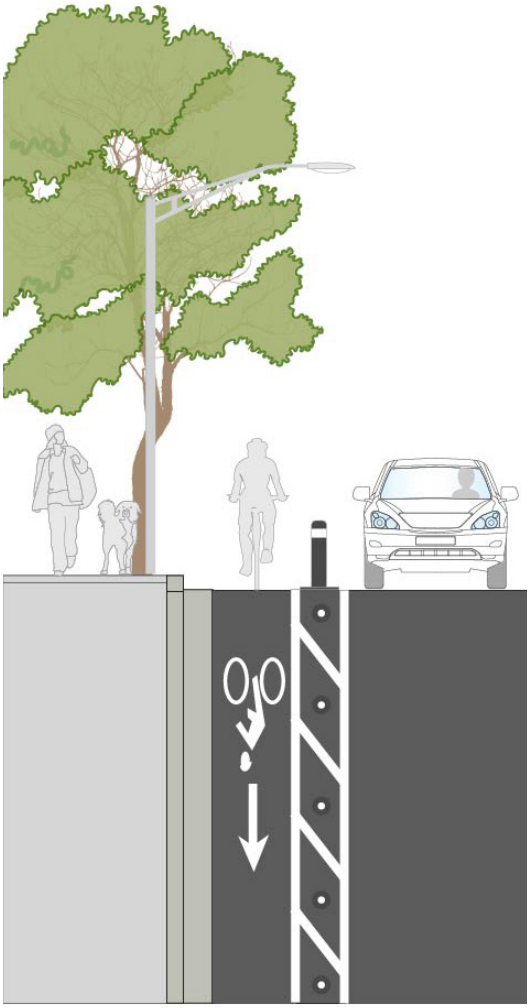


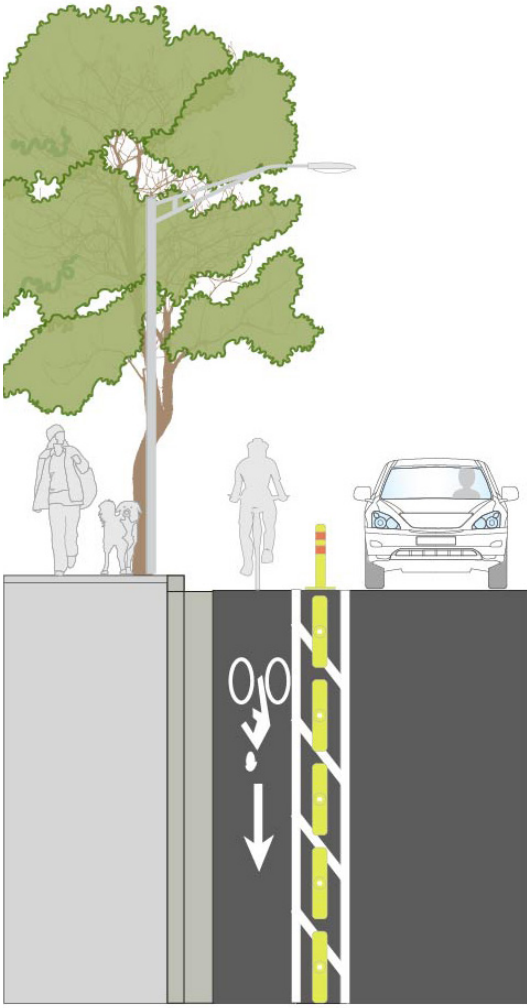
Parked Cars

- Parked vehicles are used to provide visual and physical separation.
- Only effective on its own when parking is fully or almost fully occupied. Otherwise, additional vertical elements may be considered to provide separation.
- A minimum 3' buffer is required to provide space for the opening of car doors.
- If used, additional vertical elements should take into account the need for the opening of car doors.

Flexible Delineator Posts

- Hard but bendable posts.
- Closer spacing and/or additional vertical elements should be used if there are concerns about drivers parking in the bikeway.
- Relatively inexpensive to install.
- May require frequent maintenance.
- May be used for permanent installations.
- Easy to modify and allow flexibility for design changes over time.



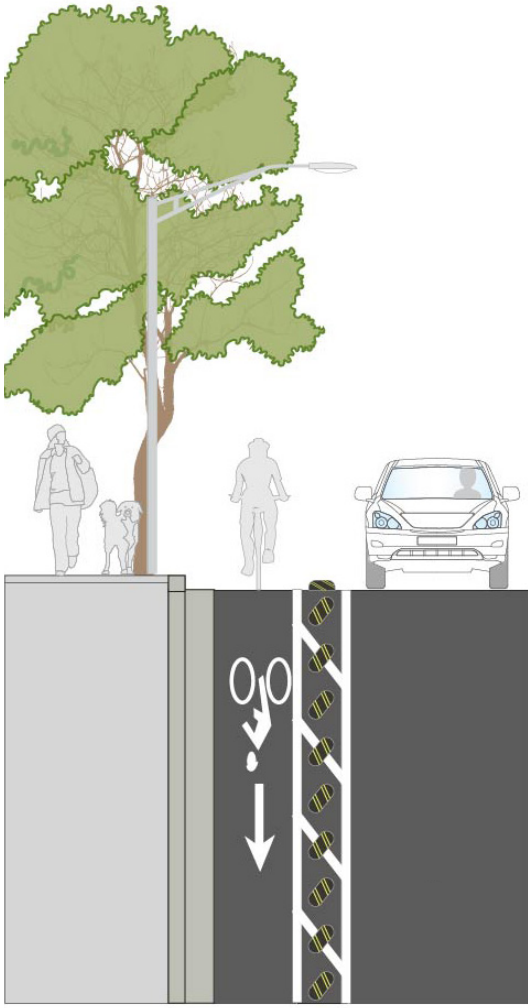


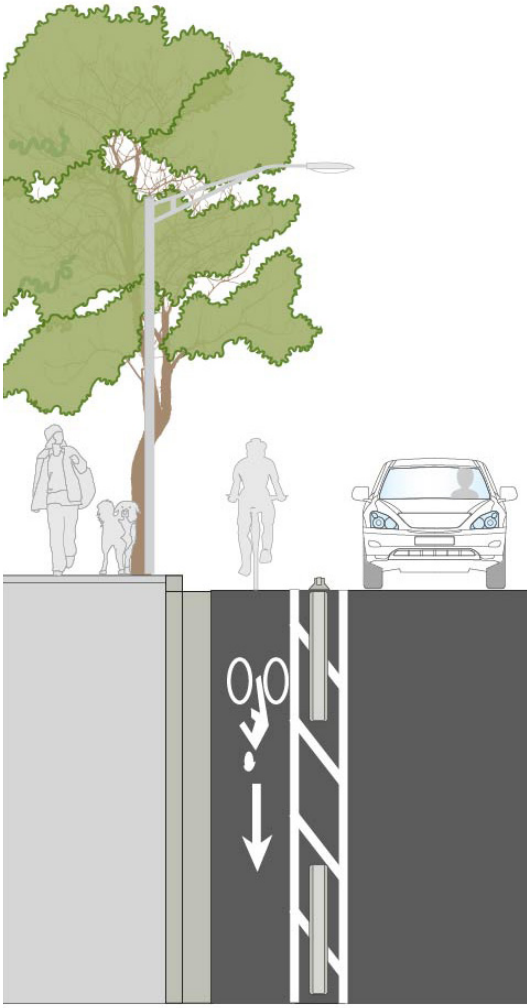
Rigid Bollards

- Operate similar to flexible posts, but are sturdier and have a higher cost.
- Generally considered more attractive than flexible posts.
- As with flexible posts, closer spacing and/or additional vertical elements should be used if there are concerns about drivers parking in the bikeway.

Tuffcurb

- Resembles a curb stop with a flexible post mounted on top of it.
- The combination of vertical and horizontal features provides a greater level of comfort for people walking and biking and also discourages drivers from driving into the bike lane.
- While more expensive than a standard flexible post, this treatment is still relatively inexpensive and can be modified more easily than a curb.



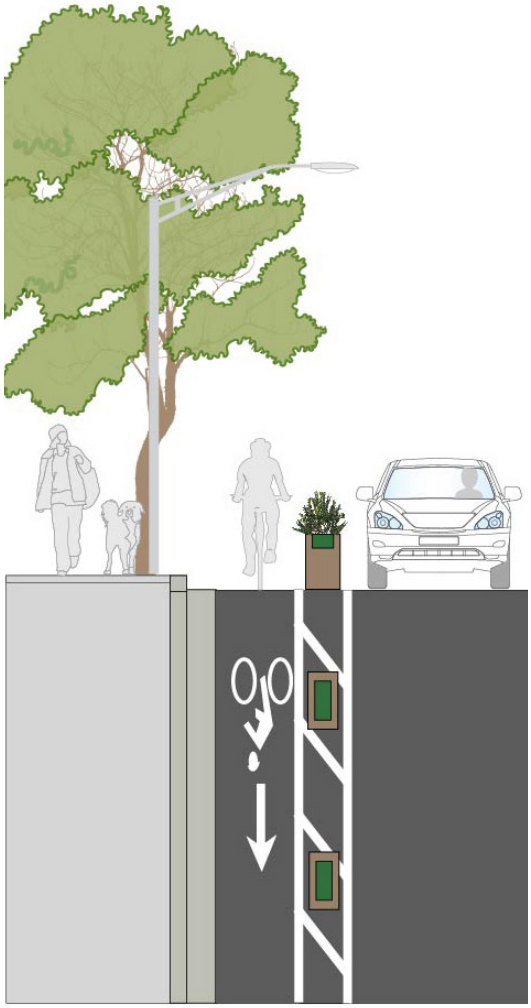


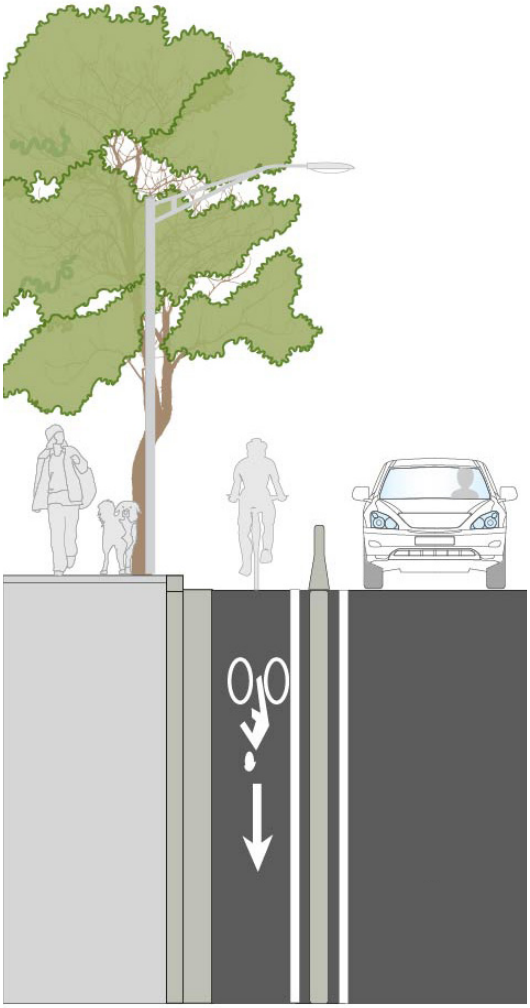
Armadillos

- Small, oblong objects that are generally painted with yellow or white stripes to increase visibility.
- Due to low profile, these provide less visual separation.
- May be used in combination with taller vertical elements to increase visibility.
- May pose a tripping hazard if used next to a parking lane.
- Low cost and easy to modify over time.

Parking Stops

- Inexpensive, low linear barrier.
- High level of durability.
- Provides near-continuous separation.
- The low profile limits visual separation; may be used in combination with taller vertical elements to increase visibility.
- Wider buffers may be preferred with this treatment to offset the lower level of visual separation from vehicles.



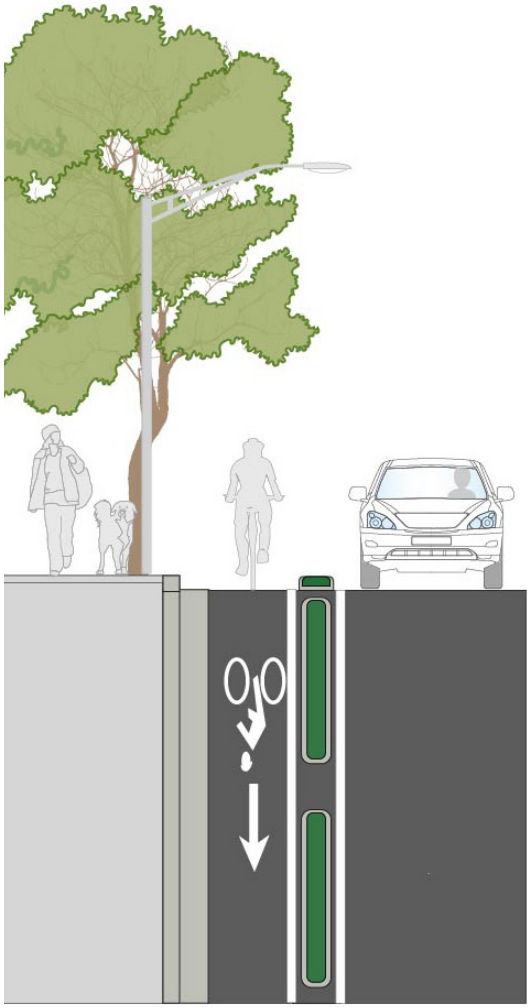


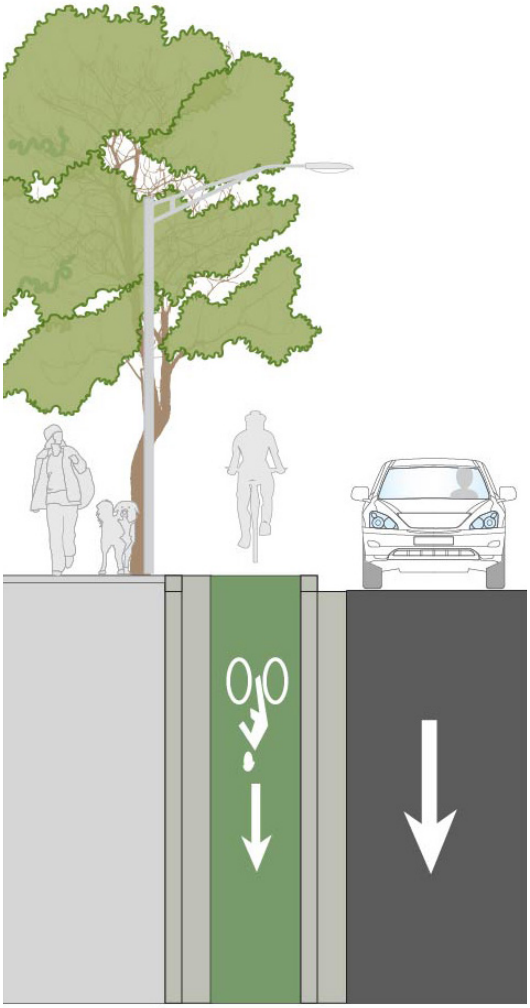
Planters

- Provides a strong visual and physical barrier between people biking and drivers.
- Offers an opportunity for placemaking and beautification.
- May be placed closer together to provide a consistent barrier.
- Generally considered an expensive treatment to install and may require significant maintenance.
- Require a wider buffer space given their width and height.
- Most appropriate on-streets with lower speeds and volumes.

Concrete (Jersey) Barriers

- Lower-cost treatment that provides continuous vertical separation.
- Highly durable treatment appropriate on roads with high vehicular speeds and volumes.
- May be painted to improve visual appeal.
- Not compatible with on-street parking.
- Crash cushion may be needed at barrier ends.
- May have drainage impacts.





Raised Medians

- Concrete curbs that are cast in place or precast.
- More expensive to construct but lower maintenance needs.
- Provide a high level of separation.
- Wider medians may provide space for landscaping, stormwater treatments, and other placemaking elements.
- May be mountable where emergency access is required.
- Gaps should be placed between medians to maintain drainage.

Sidewalk Level (Raised)

- Provides a high level of comfort.
- Expensive to construct, but lower maintenance needs.
- A detectable edge, such as a grass strip or textured pavement, should be installed to provide visual and tactile delineation between the sidewalk and the bikeway.
- In constrained situations, different pavement types and markings may be used to provide separation between the sidewalk and bikeway.

Shared Use Path

Treatment Summary

Shared use paths are bi-directional paths for nonmotorized uses. They may run fully separate from a road or be directly adjacent to streets as a sidepath. These facilities may include separated lanes for people walking and biking or mix modes together, and they may also include an adjacent unpaved path to accommodate equestrian use. These facilities offer network connectivity outside of the roadway network and are usually located in parks, along rivers, beaches, greenbelts, or utility corridors and they may also run alongside streets as sidepaths.

Shared use path design is similar to roadway design. It follows many of the same core design principles but on a different scale and with typically lower design speeds. When considering shared use paths, the competing needs of the corridor should be evaluated to best support adopted City policies and prioritize the most vulnerable users of our roadways. Shared use paths are not appropriate for streets with high pedestrian and bicycle volumes unless separate space can be provided for each mode. Shared use paths require intersection designs that safely accommodate bi-directional bicycle traffic.

The following section summarizes general design guidance for protected Shared Use Paths. Refer to the most recent MUTCD, AASHTO Guide for the Development of Bicycle Facilities, and NACTO Urban Bikeway Design Guide for additional information as needed.

Recommended Elements

A1 Preferred width is determined based on facility type, context, and engineering assessment.

A2 Shared use paths should include a shoulder on either side, and the edge of the path should be separated from the roadway with a landscape buffer.

A3 On wider shared use paths, a centerline stripe may help clarify the direction of travel and organize traffic. On very wide paths, separate walking and biking space may be designated.

A5 At intersections and crossings, detectable warning surfaces and curb ramps shall be installed.

A6 At intersections and driveways, conflict striping should be considered to improve visibility for all users.

A7 Shared use paths are best suited for areas where roadway crossings and driveways can be minimized or where overpasses and underpasses are feasible. Raised side street crossings should be installed at side streets and driveways, especially if the bikeway is at sidewalk level.

Optional Enhancements

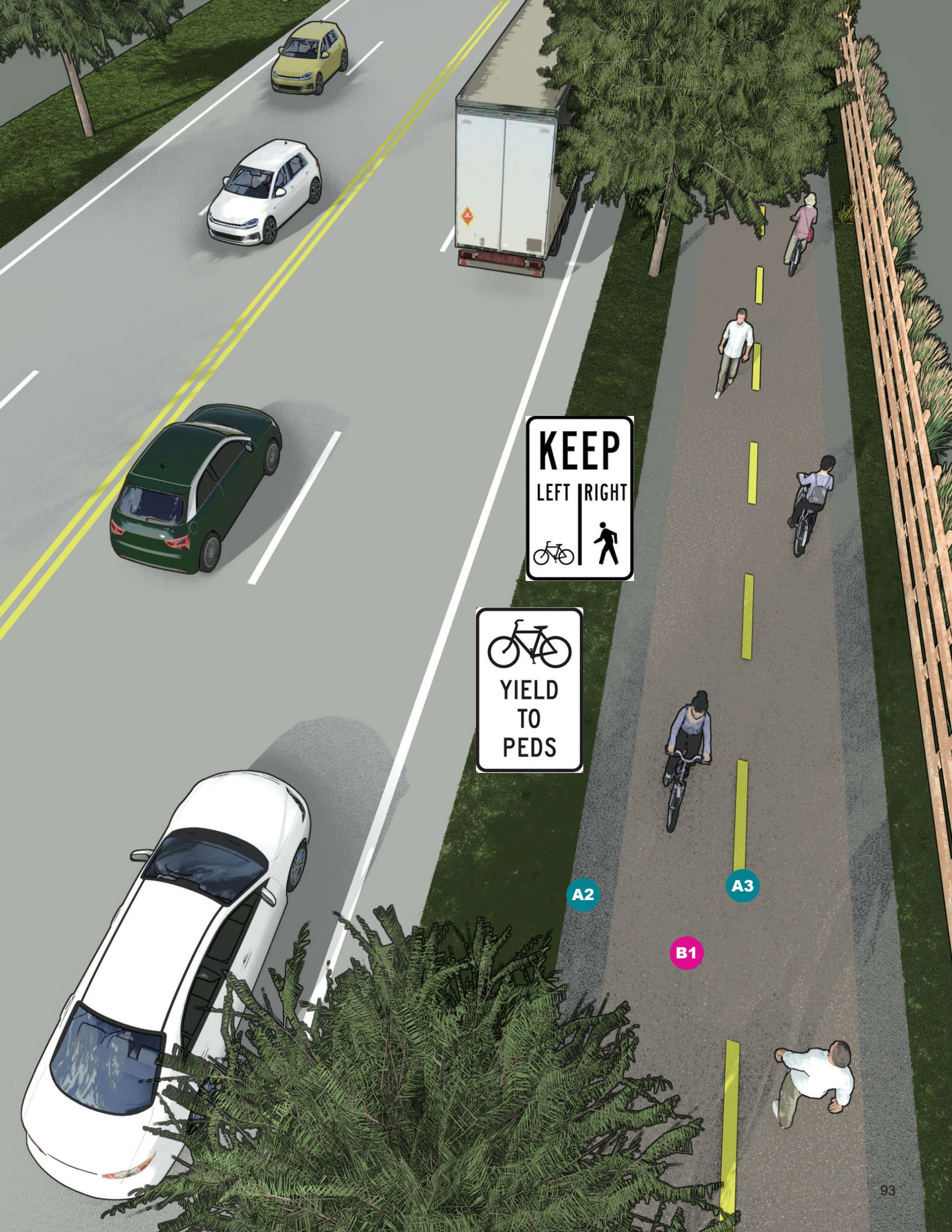
B1 Shared use paths may use materials such as asphalt or colored concrete to visually differentiate the space from a conventional sidewalk.

B2 Shared use paths may be placed on both sides of the road where there are destinations on both sides of the road to increase access.

B3 Short segments of sidepaths or shared use paths may be used to connect other bike facilities.

B4 If drivers are anticipated to encroach on the shared use path, bollards or other preventative features may be placed at the entrance to the path. These should be highly visible, well lit, and designed for someone on using a wheelchair or riding a bike to pass through easily and, for people on bikes, without having to dismount.

B5 If there is space to do so, it is ideal to include a detectable surface such as grass or a small curb where fully separated space is delineated for people walking and biking.


KEEP
LEFT
RIGHT
YIELD
TO
PEDS
A2
A3
B1

Page Intentionally Left Blank

Intersection Treatment Examples

Page Intentionally Left Blank

Intersection Typologies

What are Intersection Typologies?

Intersection Typologies provide intersection design guidelines for the development of future amendments based on the context of San Antonio's streets and the needs of people biking when they intersect. These guidelines are derived from best practices and recommendations from the Texas MUTCD, NACTO Bike Design Guide, and other sources.

Furthermore, the Intersection Typologies offer an approach to determine which intersection treatments and solutions are most appropriate based on existing or planned bike facilities, as well as the project's goals and constraints. This process is designed to present a range of intersection treatments and solutions that can be used for intersection retrofits, new builds, or applied to whole intersections or specific legs of an intersection.

Why Intersection Typologies?

Intersections are critical points of conflict between different road users and represent a particularly challenging and potentially stressful place for people biking to navigate. For those "interested but concerned" in biking—or rather the majority of San Antonians—the presence of bike facilities alone may not be sufficient to encourage biking if intersections are not designed to be comfortable for people biking. These users are more likely to choose biking as a mode of transportation if they feel secure navigating intersections, which are frequently perceived as the most intimidating and hazardous parts of a journey. By ensuring that intersection designs address the specific needs and concerns of these riders, intersection typologies can help create a more comprehensive and inviting bike network, ultimately encouraging more people to choose biking as a viable and safe option.

Intersection Details

Intersection Typology Selection

STEP 1

Determine Bike Path Compatibility

STEP 2

Refine Options Considering Project Goals and Constraints

STEP 3

Review Applicable Intersection Typologies

Step 1 of the Intersection Typology process includes determining which types of bike facilities will be present or are planned for the intersection and selecting Intersection Typologies that are compatible with the bike facilities. In Step 2, consider the goals the project, such as costs, available right of way, among others. Each treatment is rated on a scale from Low to High regarding how well they meet each goal. Select one or more Intersection Typologies as potential candidates based on these ratings. In Step 3, review the selected Intersection Typologies. Each Intersection Typology has a two-page spread with the elements below. Additional information regarding unique intersection types as well as intersection treatment, marking, and signage details are also provided in this chapter to support the design process.

Formal guidance documents for nationally accepted standards which should be referenced when designing the intersections

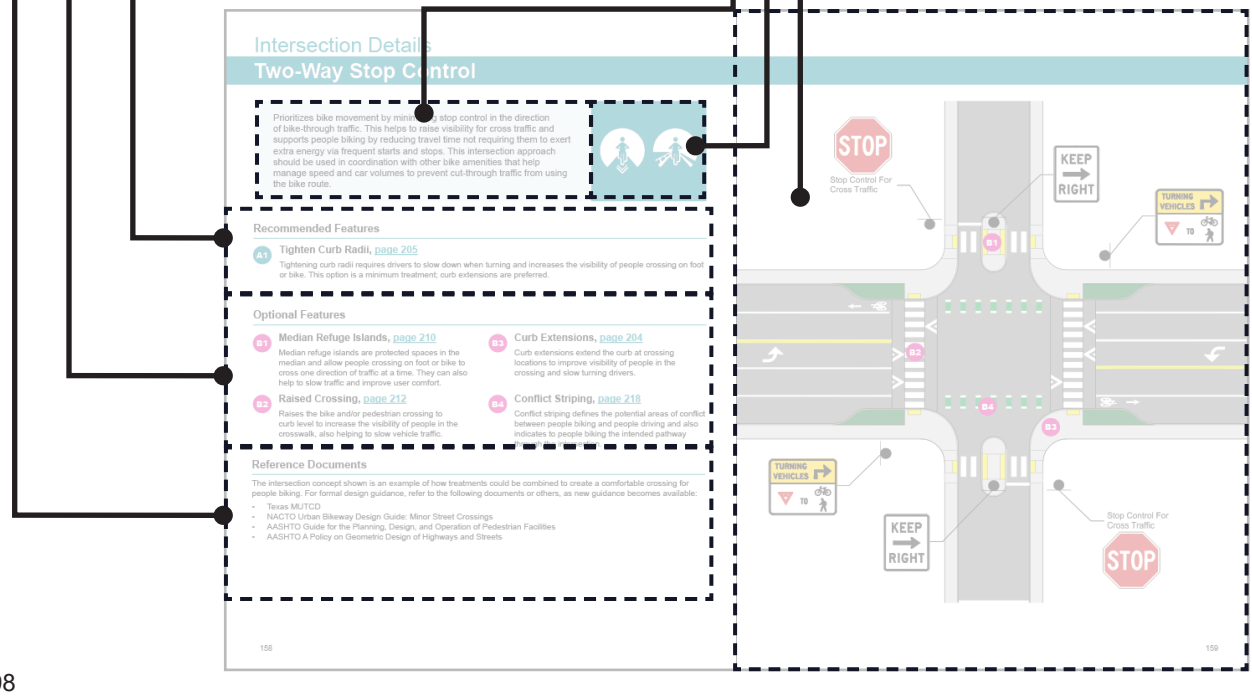
Optional intersection elements that may be used but can be removed from the design if they are determined infeasible or unnecessary in the design process

Recommended intersection elements that may be considered for the intersection, with hyperlinks to pages with further detailed guidance

A brief description of the solution and general application considerations

Icons indicating which bike facilities are compatible with the design recommendations

Intersection design example and callouts for recommended and optional intersection elements



STEP 1

Determine Bike Path Compatibility

Identify intersection types that are compatible with the bike facility.
NOTE: In some cases, different legs of the intersection may have different solutions.

	 Bike Boulevard	 Striped Bike Lane or Buffered Bike Lane	 Protected Bike Lane	 Shared Use Path *
Two-way Stop Control	■	■		
Raised Intersection	■	■	■	■
Neighborhood Traffic Circle	■	■		
One-Way Traffic Diverter	■	■		
Median Diverter	■	■		■
Diagonal Diverter	■	■		
Partial Closure / Half-Closure Diverter	■	■		
Bike Box Intersection	■	■	■	■
Roundabout	■	■	■	■
Dedicated Intersection		■	■	■
Protected Intersection		■	■	■

**NOTE: Most Shared Use Paths crossings will be handled as Midblock Crossings or as a Side Path Crossing.*

STEP 2

Refine Options Considering Project Goals and Constraints

From those options, narrow further based on project goals and constraints:

	Manages Vehicular Volumes	Manages Vehicular Speeds	Reduces Bike Exposure	Increased Comfort of People Biking	Right of Way Impacts	Project Cost
Two-way Stop Control	✗	Low	Med	Low	Low	Low
Raised Intersection	✗	High	Low	Med	Low	Med
Neighborhood Traffic Circle	✗	Med	High	Med	Low	Low
One-Way Traffic Diverter	✓	Low	High	High	Low	Med
Median Diverter	✓	Low	High	High	Low	Med
Partial Closure / Half-Closure Diverter	✓	Low	High	High	Low	Med
Diagonal Diverter	✓	Med	High	High	Low	Med
Bike Box Intersection	✗	Low	Med	Med	Low	Low
Roundabout	✗	High	High	High	High	High
Dedicated Intersection	✗	Med	High	High	Med	Med
Protected Intersection	✗	Med	High	High	High	High

STEP 3

Review Applicable Intersection Typologies and Review Design Details

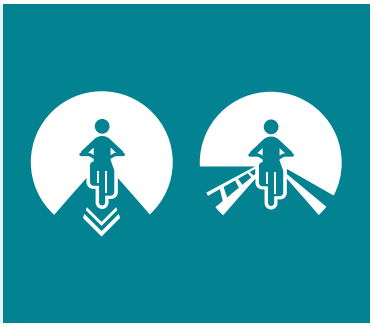
Review the Intersection Typology details as well as the recommended and optional intersection elements, their respective design details, and real-world constraints of the project. Using best engineering judgment, select the intersection treatments appropriate for the project and apply using best engineering practices and the latest design guidance and standards.

The Intersection Typologies provide standard designs that combine a number of treatments and work for many intersections. However, San Antonio has a variety of unique intersection types that may require additional design considerations. When no Intersection Typology fits an intersection, review the following sections for unique intersection designs, intersection details, and markings and signage details that can be combined or applied individually to help meet the needs of all intersection users.

Intersection Details

Two-Way Stop Control

Prioritizes bike movement by minimizing stop control in the direction of bike-through traffic. This helps to raise visibility for cross traffic and supports people biking by reducing travel time by not requiring them to exert extra energy via frequent starts and stops. This intersection approach should be used in coordination with other bike amenities that help manage speed and car volumes to prevent cut-through traffic from using the bike route.



Recommended Features

A1 Tighten Curb Radii

Tightening curb radii requires drivers to slow down when turning and increases the visibility of people crossing on foot or bike. This option is a minimum treatment; curb extensions are preferred.

Optional Features

B1 Median Refuge Islands

Median refuge islands are protected spaces in the median and allow people crossing on foot or bike to cross one direction of traffic at a time. They can also help to slow traffic and improve user comfort.

B2 Raised Crossing

Raises the bike and/or pedestrian crossing to curb level to increase the visibility of people in the crosswalk, and to slow vehicle traffic.

B3 Curb Extensions

Curb extensions extend the curb at crossing locations to improve visibility of people in the crossing and to slow turning drivers.

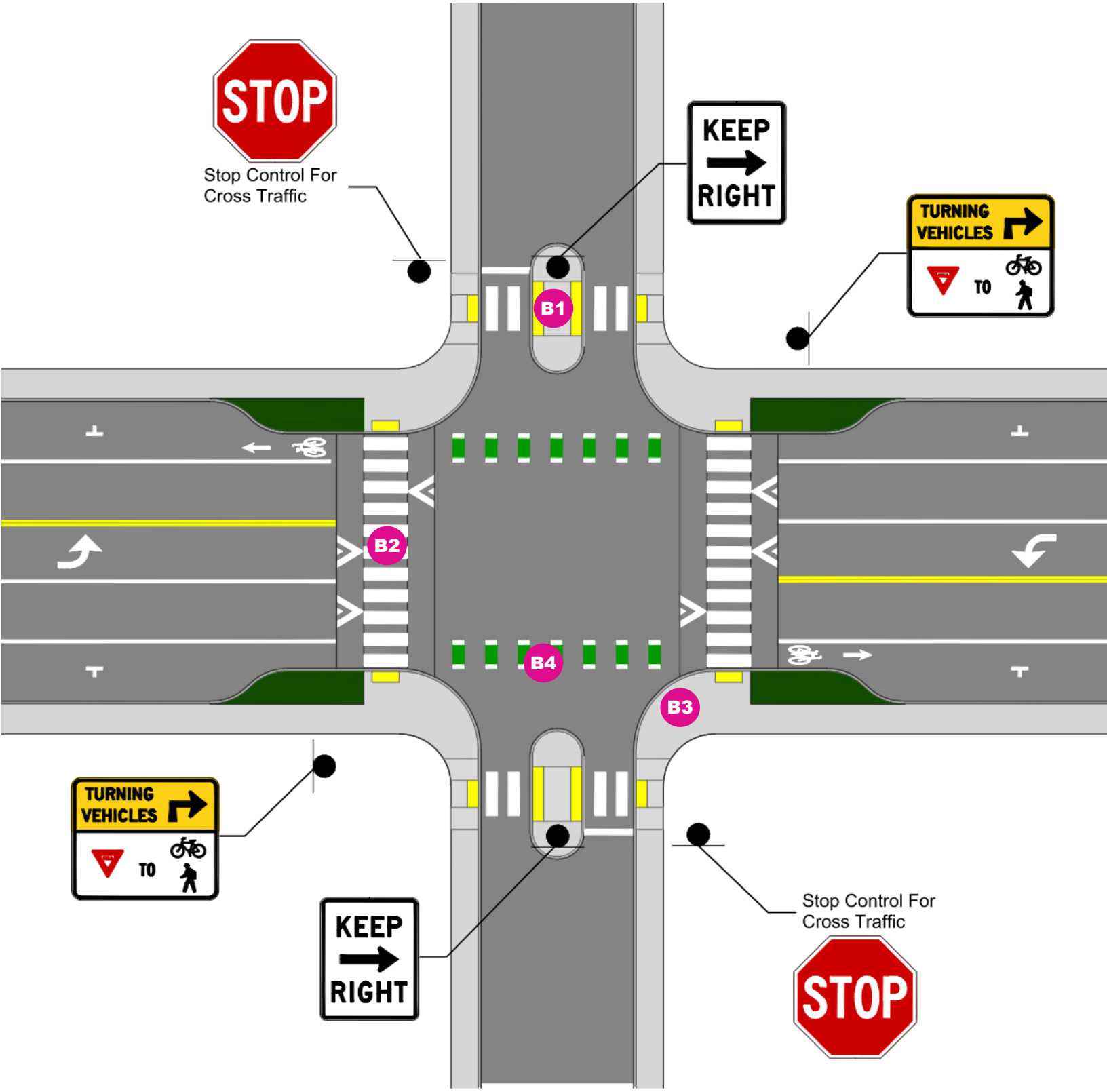
B4 Conflict Striping

Conflict striping defines the potential areas of conflict between people biking and people driving and also indicates to people biking their intended pathway through the intersection.

Reference Documents

The intersection concept shown is an example of how treatments could be combined to create a comfortable crossing for people biking. For formal design guidance, refer to the following documents or others, as new guidance becomes available:

- Texas MUTCD
- NACTO Urban Bikeway Design Guide: Minor Street Crossings
- AASHTO Guide for the Planning, Design, and Operation of Pedestrian Facilities
- AASHTO A Policy on Geometric Design of Highways and Streets


STOP
Stop Control For
Cross Traffic
KEEP
RIGHT
TURNING
VEHICLES
TO
B1
B2
B3
B4
TURNING
VEHICLES
TO
KEEP
RIGHT
Stop Control For
Cross Traffic
STOP

Intersection Details

Raised Intersection

A Raised Intersection is when the full intersection, including the crosswalks, is raised sidewalk level to slow traffic and increase visibility for all users. This solution may be implemented with additional features like pavers to provide an opportunity for placemaking. FHWA recommends that raised intersections only be installed on roadways with speeds of 30 MPH or less. Drainage impacts should be evaluated.

Recommended Features

A1 Raised Crossing

Raises the bike and/or pedestrian crossing to curb level to increase the visibility of people in the crosswalk, which also helping to slow vehicle traffic.

Optional Features

B1 Curb Extensions

Curb extensions extend the curb at crossing locations to improve visibility of people in the crossing and slow turning drivers.

B2 Tighten Curb Radii

Tightening curb radii requires drivers to slow down when turning and increases the visibility of people crossing on foot or bike. This option is a minimum treatment; curb extensions are preferred.

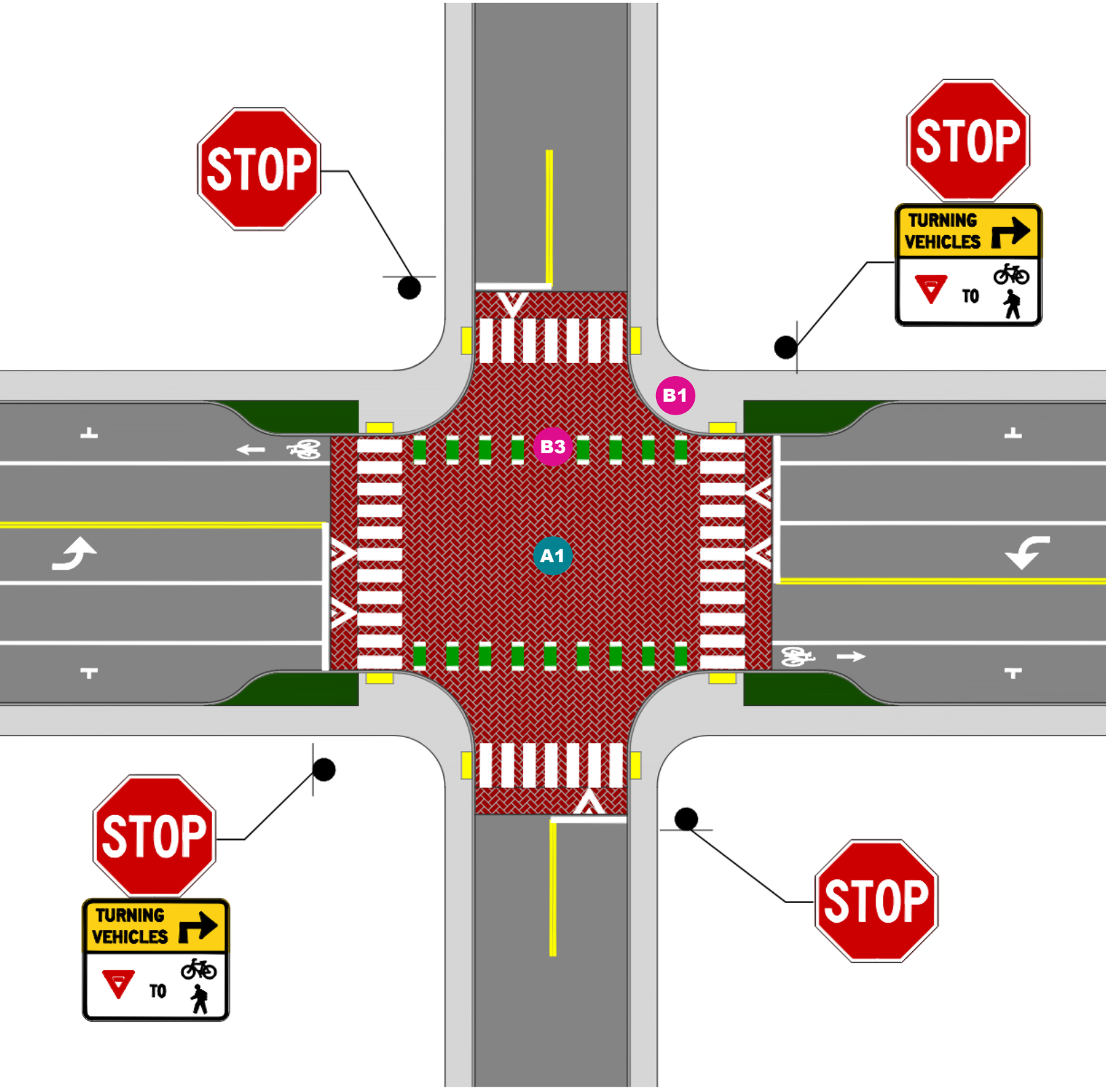
B3 Conflict Striping

Conflict striping defines the potential areas of conflict between people biking and people driving and also indicates to people biking their intended pathway through the intersection.

Reference Documents

The intersection concept shown is an example of how treatments could be combined to create a comfortable crossing for people biking. For formal design guidance, refer to the following documents or others, as new guidance becomes available:

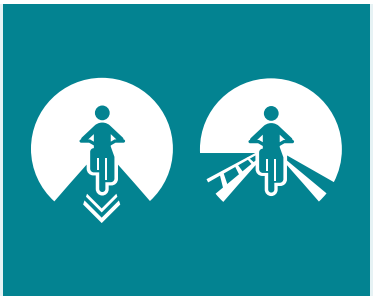
- Texas MUTCD
- NACTO Urban Street Design Guide: Raised Intersections
- AASHTO Guide for the Planning, Design, and Operation of Pedestrian Facilities
- AASHTO A Policy on Geometric Design of Highways and Streets


STOP
STOP
TURNING VEHICLES
TO
B1
B3
A1
STOP
TURNING VEHICLES
TO
STOP

Intersection Details

Neighborhood Traffic Circle

Neighborhood traffic circles are typically raised, circular elements are placed in an intersection to slow drivers. They provide an opportunity for placemaking as the raised elements can be installed with planters or other beautifying elements. This solution is less ideal for locations where there is significant walking expected and may or may not be installed with stop control.



Recommended Features

A1 Tighten Curb Radii

Tightening curb radii requires drivers to slow down when turning and increases the visibility of people crossing on foot or bike. This option is a minimum treatment; curb extensions are preferred.

Optional Features

B1 Raised Crossing

Raises the bike and/or pedestrian crossing to curb level to increase the visibility of people in the crosswalk, which helps slow vehicle traffic.

B2 Curb Extensions

Curb extensions extend the curb at crossing locations to improve visibility of people in the crossing and to slow turning drivers.

B3 Median Refuge Islands

Median refuge islands are protected spaces in the median, and they allow people crossing on foot or bike to cross one direction of traffic at a time. They can also help to slow traffic and improve user comfort.

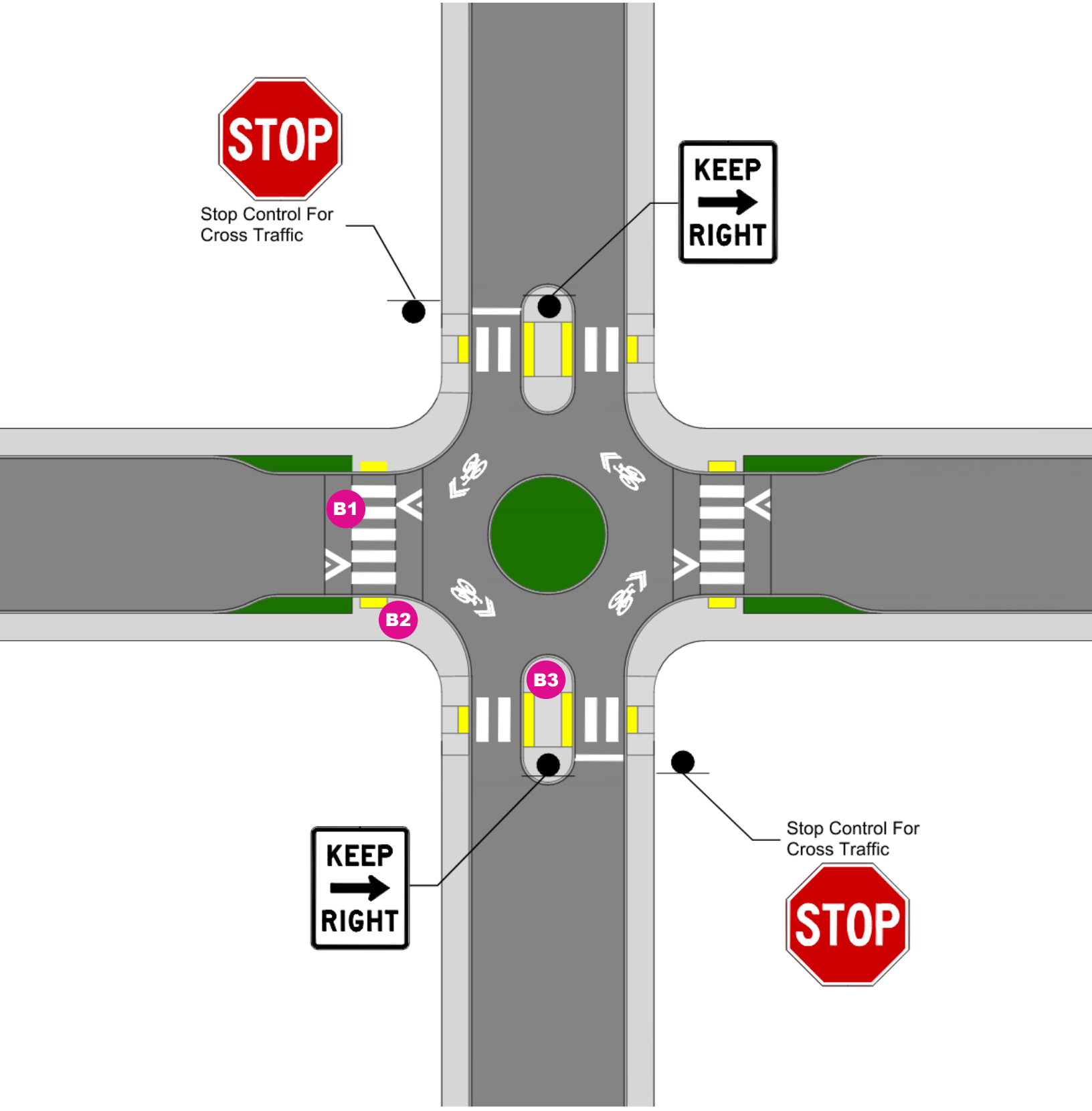
B4 Directional Markers

Directional markers indicate the intended path for biking through the intersection and increase the visibility of people biking to drivers.

Reference Documents

The intersection concept shown is an example of how treatments could be combined to create a comfortable crossing for people biking. For formal design guidance, refer to the following documents or others, as new guidance becomes available:

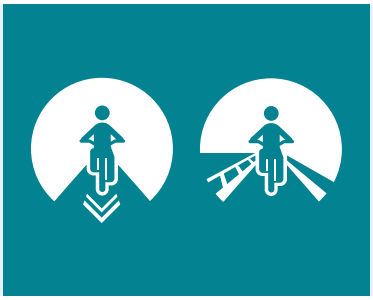
- Texas MUTCD
- NACTO Urban Bikeway Design Guide: Minor Street Crossings
- AASHTO Guide for the Planning, Design, and Operation of Pedestrian Facilities
- AASHTO A Policy on Geometric Design of Highways and Streets
- NCHRP Research Report 1043: Guide for Roundabouts


STOP
Stop Control For
Cross Traffic
KEEP
RIGHT
B1
B2
B3
KEEP
RIGHT
Stop Control For
Cross Traffic
STOP

Intersection Details

Median Diverter

A center island prevents through traffic for vehicles but provides a protected space for people walking and biking to wait for gaps in traffic and cross the road one direction at a time. Median diverters are typically used where a lower stress bike facility such as a bike boulevard intersects with a higher-volume or higher-speed street. The median can be designed to be mountable for emergency access.



Recommended Features

A1 Tighten Curb Radii

Tightening curb radii requires drivers to slow down when turning and increases the visibility of people crossing on foot or bike. This option is a minimum treatment; curb extensions are preferred.

A2 Conflict Striping

Conflict striping defines the potential areas of conflict between people biking and people driving and also indicates the intended path for people biking.

A3 Directional Markers

Directional markers provide guidance to people biking how to proceed through the intersection. Typically used in complex or wide intersections to increase the visibility of people biking to drivers.

A4 Reflective Approach Edge

The approach edge of the refuge island shall be outlined in retroreflective white or yellow material.

Optional Features

B1 Median Refuge Islands

Median refuge islands are protected spaces in the median, and they allow people crossing on foot or bike to cross one direction of traffic at a time. They can also help to slow traffic and improve user comfort.

B2 Raised Crossing

Raises the bike and/or pedestrian crossing to curb level to increase the visibility of people in the crosswalk, which also helps slow vehicle traffic.

B3 Additional Reflective Markers

Reflective markers can be used in place of the KEEP RIGHT sign. For more guidance see Section 31.02 of the MUTCD.

B4 Curb Extensions

Curb extensions extend the curb at crossing locations to improve visibility of people in the crossing and slow turning drivers.

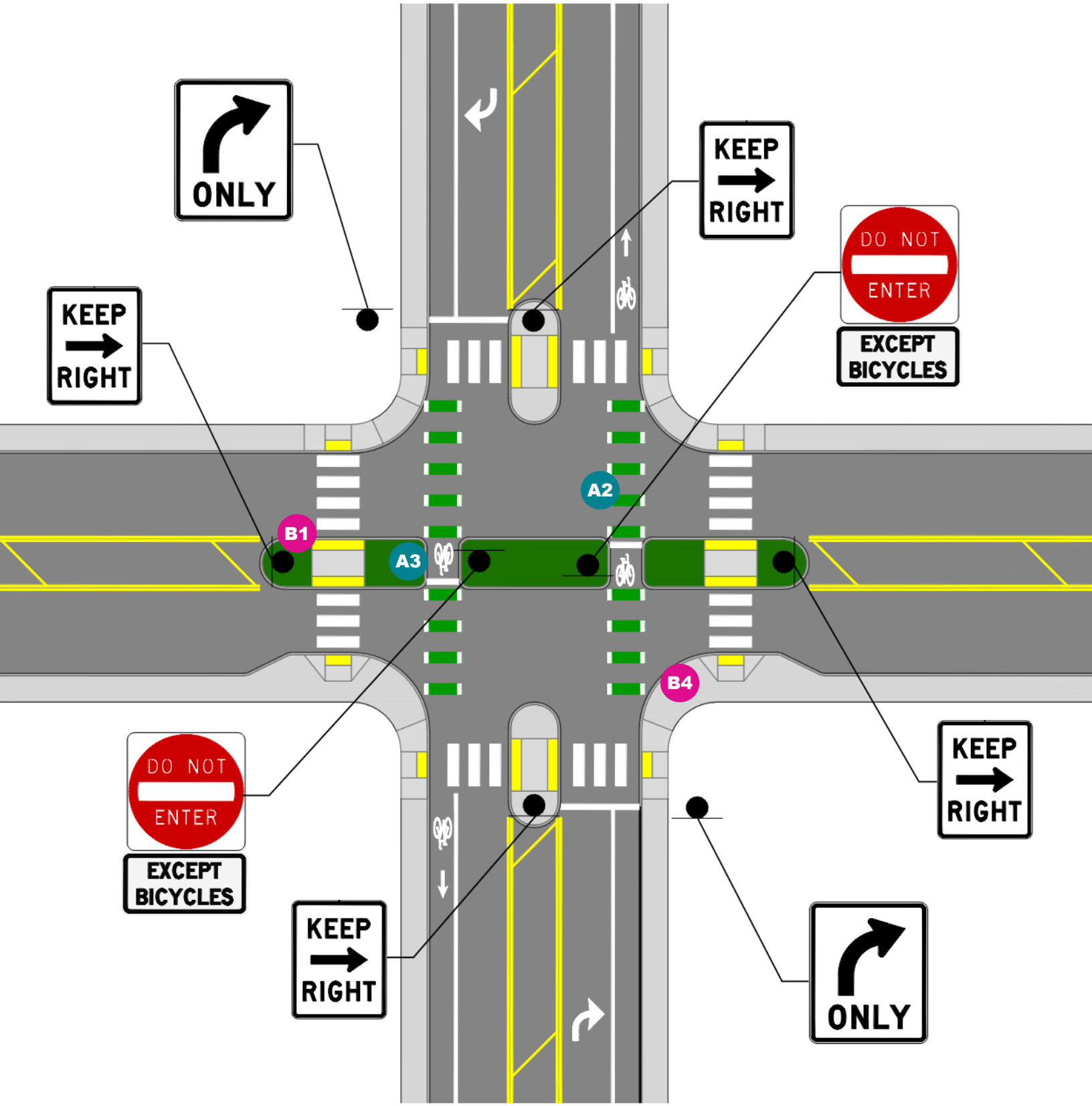
B5 Two-Stage Bicycle-Turn Queue Box or Bike Box

These designated spaces provide space for people biking to stage ahead of traffic or to make left-turns at multi lane intersections in multiple signal stages. These treatments are only MUTCD compliant if the intersection is signalized.

Reference Documents

The intersection concept shown is an example of how treatments could be combined to create a comfortable crossing for people biking. For formal design guidance, refer to the following documents or others, as new guidance becomes available:

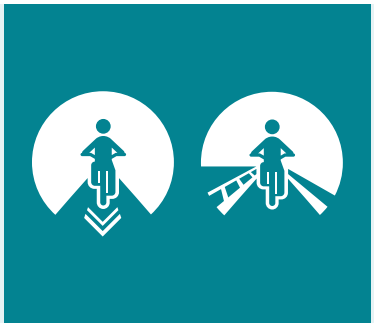
- Texas MUTCD and FHWA MUTCD, 11th Edition, Part 9 (for bicycle treatments not yet in Texas MUTCD)
- NACTO Urban Bikeway Design Guide: Major Street Crossings
- AASHTO Guide for the Planning, Design, and Operation of Pedestrian Facilities
- AASHTO A Policy on Geometric Design of Highways and Streets


ONLY
KEEP
RIGHT
KEEP
RIGHT
DO NOT
ENTER
EXCEPT
BICYCLES
A2
B1
A3
B4
DO NOT
ENTER
EXCEPT
BICYCLES
KEEP
RIGHT
KEEP
RIGHT
ONLY

Intersection Details

Partial Closure / Half-Closure Diverter

In both a partial and half-closure, vehicles are permitted to exit one leg of the intersection, but not enter while people walking and biking can proceed unimpeded in both directions. This can be achieved by either using an island (with an optional pedestrian refuge island) in the case of a Partial Closure, or by using a curb extension in the case of a Half Closure. Volume control measures such as partial/half closures should not be used along primary emergency response routes.



Recommended Features

A1 Bicycle Access

Treatments should provide a contra-flow bike lane or an opening between an island and curb to allow channeled bike access.

A2 Tighten Curb Radii

Tightening curb radii requires drivers to slow down when turning and increases the visibility of people crossing on foot or bike.

A3 Curb Extensions

Curb extensions extend the curb at crossing locations to reduce the crossing distance and slow turning drivers. In a half closure, the curb extension should be long enough to discourage drivers from traveling in the wrong direction.

A4 Median Refuge Islands

Median refuge islands are protected spaces in the median that allow people crossing on foot or bike to cross one direction of traffic at a time. When used with a Partial Closure, the median island should be extended to the centerline.

A5 Reflective Approach Edge

The approach edge of the refuge island shall be outlined in retroreflective white or yellow material.

Optional Features

B1 Raised Crossing

Raises the bike and/or pedestrian crossing to curb level to increase the visibility of people in the crosswalk, also helping to slow vehicle traffic. Alternatively, the whole intersection can be raised.

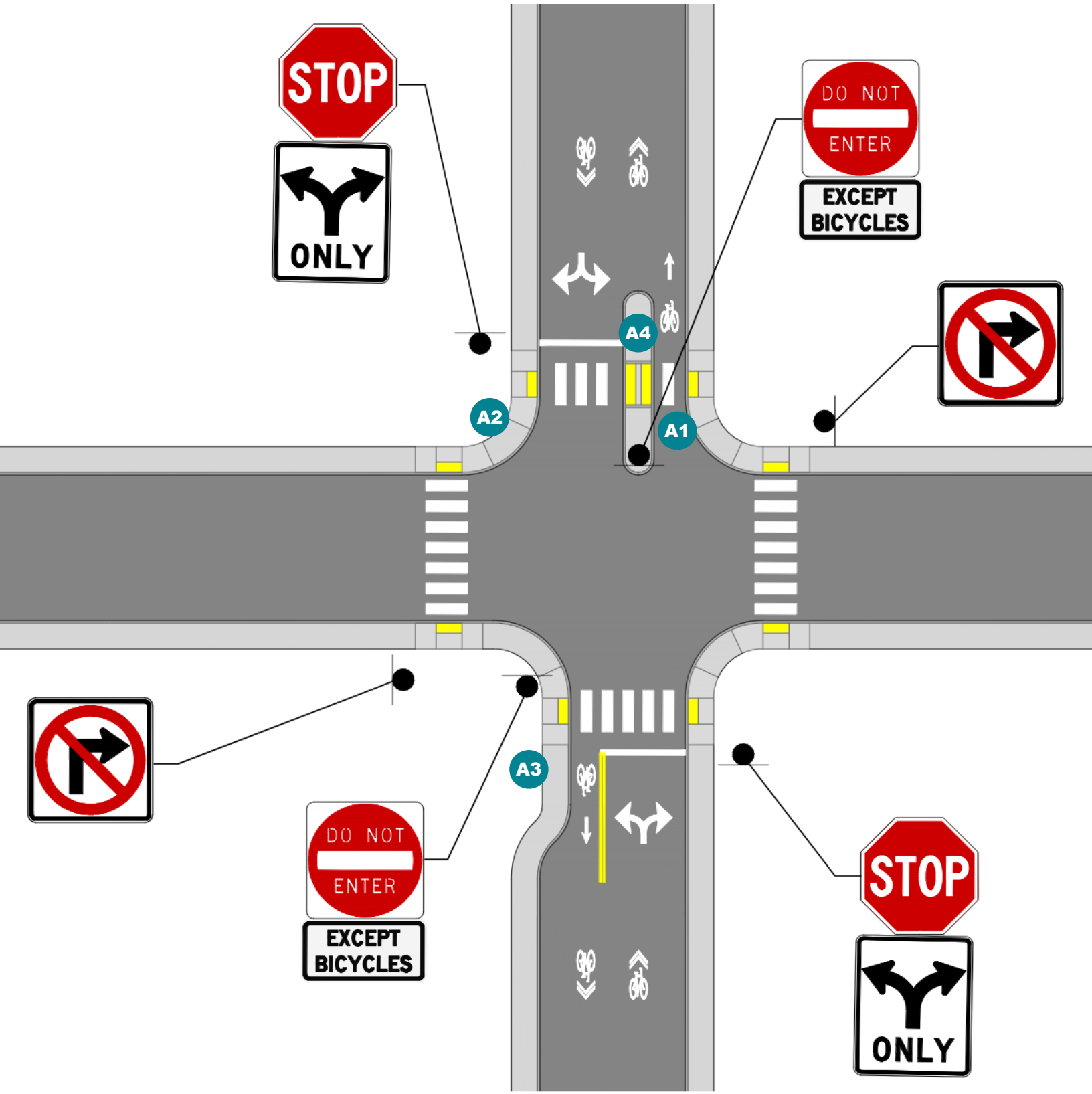
B2 Additional Reflective Markers

Reflective markers can be used in place of the KEEP RIGHT sign. For more guidance see Section 31.02 of the MUTCD.

Reference Documents

The intersection concept shown is an example of how treatments could be combined to create a comfortable crossing for people biking. For formal design guidance, refer to the following documents or others, as new guidance becomes available:

- Texas MUTCD
- NACTO Urban Bikeway Design Guide: Major Street Crossings
- AASHTO Guide for the Planning, Design, and Operation of Pedestrian Facilities
- AASHTO A Policy on Geometric Design of Highways and Streets


STOP
ONLY
DO NOT
ENTER
EXCEPT
BICYCLES
A4
A2
A1
A3
DO NOT
ENTER
EXCEPT
BICYCLES
STOP
ONLY

Intersection Details

Diagonal Diverter

Vehicular traffic is channelized to take either a right or left-turn, but people walking and biking can proceed through. Diverters can be designed with landscaping to support placemaking and stormwater drainage, or with cutouts to maintain existing flowlines.

Recommended Features

A1 Directional Markers

Directional markers indicate the intended path for biking through the intersection and increase the visibility of people biking to drivers.

A2 Median Island or Raised Feature

A median island is placed in the middle of the diverter to prevent vehicles from driving through. It may be mountable for emergency vehicle access.

A3 Tighten Curb Radii

Tightening curb radii requires drivers to slow down when turning and increases the visibility of people crossing on foot or bike. This option is a minimum treatment; curb extensions are preferred.

Optional Features

B1 Curb Extensions

Curb extensions extend the curb at crossing locations to improve visibility of people in the crossing and to slow turning drivers.

B2 Raised Crossing

Raises the bike and/or pedestrian crossing to curb level to increase the visibility of people in the crosswalk, which also helps slow vehicle traffic.

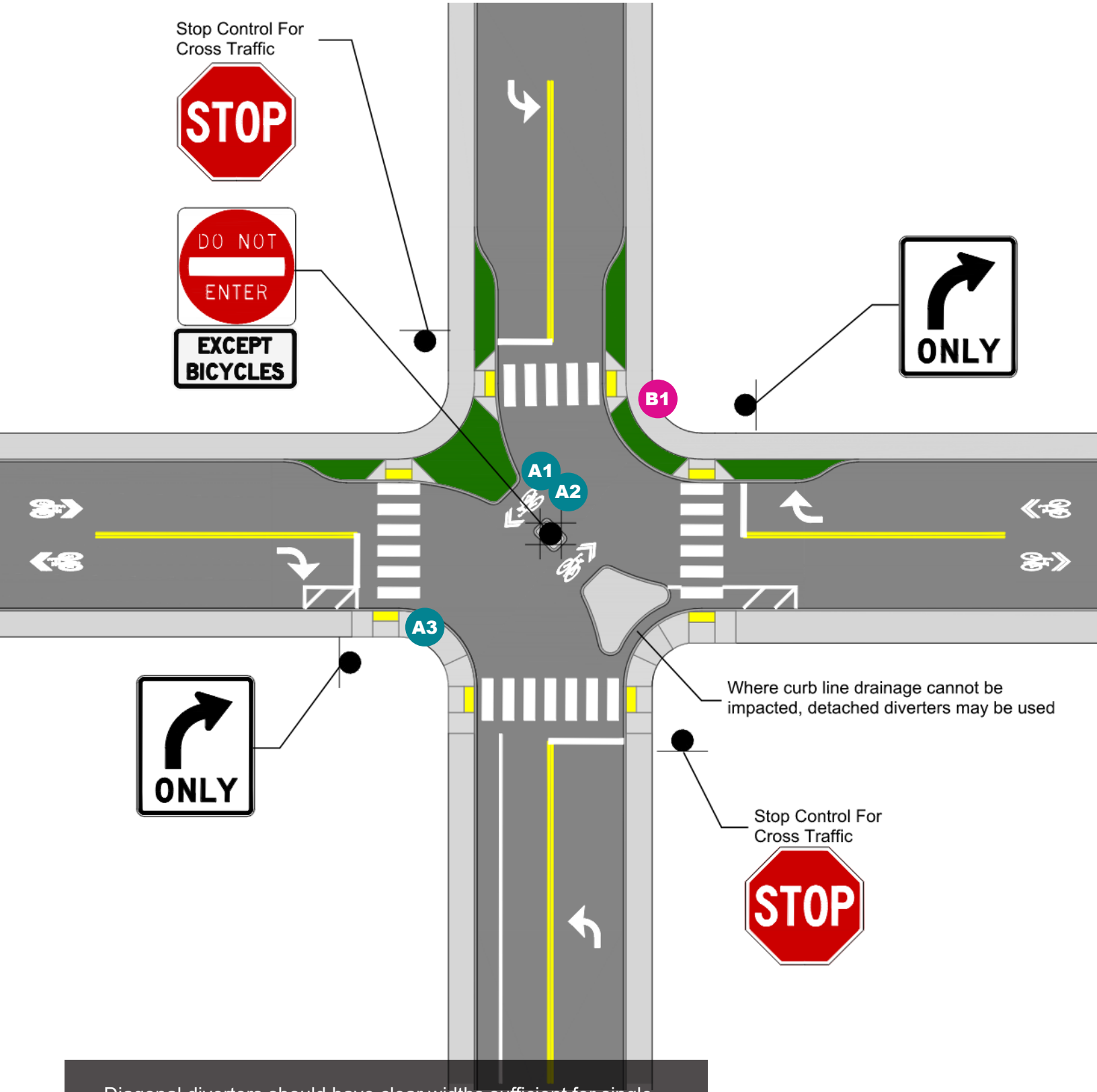
B3 Additional Reflective Markers

Reflective markers can be used in place of the KEEP RIGHT sign. For more guidance see Section 31.02 of the MUTCD.

Reference Documents

The intersection concept shown is an example of how treatments could be combined to create a comfortable crossing for people biking. For formal design guidance, refer to the following documents or others, as new guidance becomes available:

- Texas MUTCD
- NACTO Urban Bikeway Design Guide: Major Street Crossings
- AASHTO Guide for the Planning, Design, and Operation of Pedestrian Facilities
- AASHTO A Policy on Geometric Design of Highways and Streets



Diagonal diverters should have clear widths sufficient for single-unit trucks to make turns without encroaching on opposing lanes

Intersection Details

Bike Box Intersection

Bike boxes and two-stage bicycle-turn queue boxes can be used as elements to enhance other intersection solutions or used alone to make up the Bike Box Intersection. Bike Boxes should only be considered at signalized intersections.

Recommended Features

A1 Bike Box

Bike boxes provide designated spaces for people biking to queue in front of vehicles and/or transition to left-turn lanes at red lights in signalized intersections.

A2 Two-Stage Bicycle-Turn Queue Box

Queue boxes provide designated space for people biking to make left-turns at multi lane intersections in multiple signal stages.

A3 Conflict Striping

Conflict striping defines the potential areas of conflict between people biking and people driving and also indicates the intended path for people biking.

A4 Tighten Curb Radii

Tightening curb radii requires drivers to slow down when turning and increases the visibility of people crossing on foot or bike. This option is a minimum treatment; curb extensions are preferred.

Optional Features

B1 Bend-Outs

Bend-outs allowing people biking to queue closer to the street crossing, improving visibility and providing yield space for right-turning drivers.

B2 Centerline Hardening

A raised treatment is placed along the centerline, requiring drivers to slow down when making left-turns.

B3 Curb Extensions

Curb extensions extend the curb at crossing locations to improve visibility of people in the crossing and to slow turning drivers.

B4 Raised Crossing

Raises the bike and/or pedestrian crossing to curb level to increase the visibility of people in the crosswalk, which also helps slow vehicle traffic.

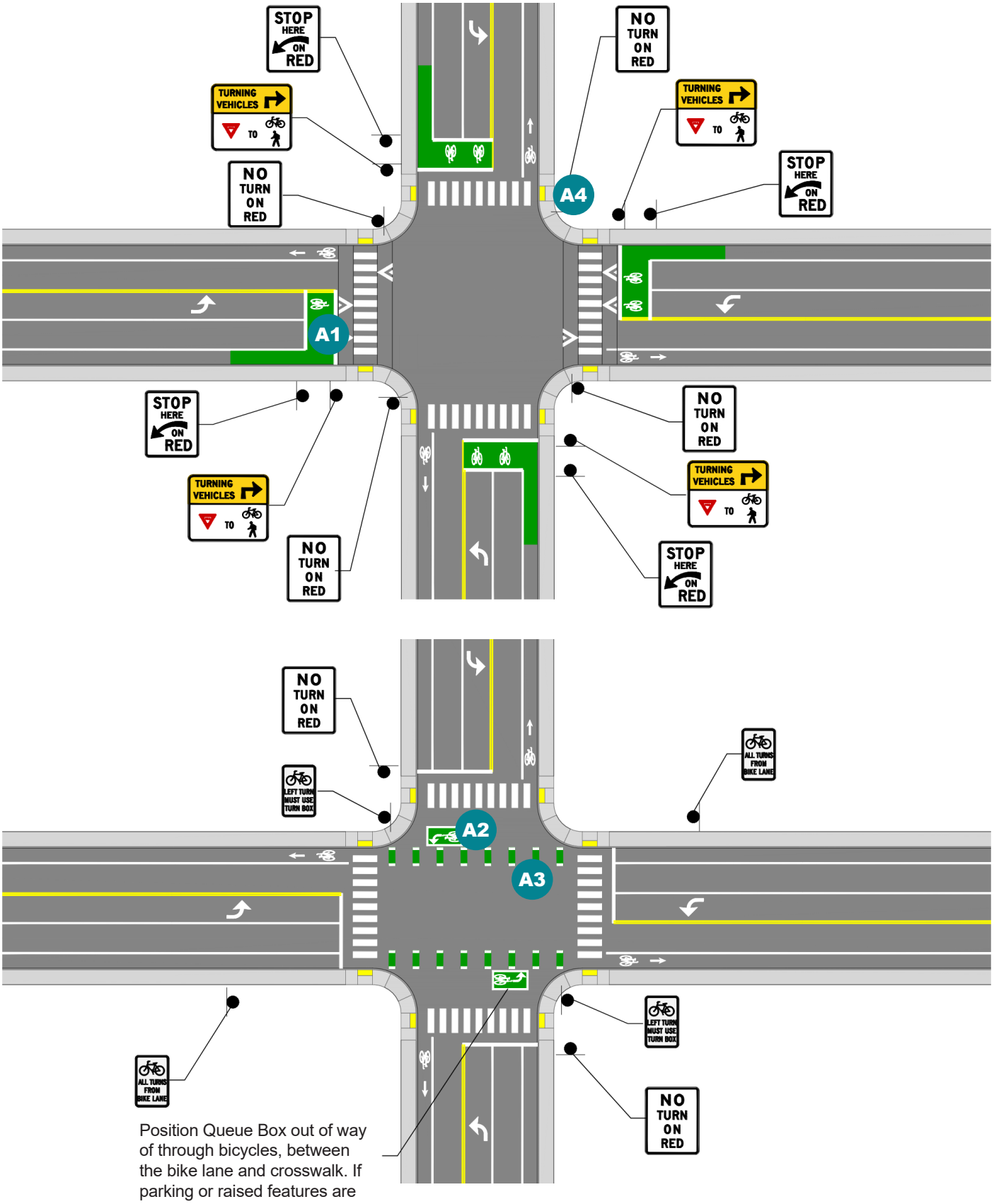
B5 Median Refuge Islands

Median refuge islands are protected spaces in the median that allow people crossing on foot or bike to cross one direction of traffic at a time.

Reference Documents

The intersection concept shown is an example of how treatments could be combined to create a comfortable crossing for people biking. For formal design guidance, refer to the following documents or others, as new guidance becomes available:

- Texas MUTCD and FHWA MUTCD, 11th Edition, Part 9 (for bicycle treatments not yet in Texas MUTCD)
- NACTO Urban Bikeway Design Guide: Major Street Crossings
- AASHTO Guide for the Planning, Design, and Operation of Pedestrian Facilities
- AASHTO A Policy on Geometric Design of Highways and Streets



Position Queue Box out of way of through bicycles, between the bike lane and crosswalk. If parking or raised features are present, Queue Box may be moved to inside of bike lane

Intersection Details

Protected Roundabout

Roundabouts slow traffic while maintaining continuous vehicle flow through an intersection. When paired with a protected bike lane, the roundabout maintains separation between modes through the intersection. They may also be paired with raised crossings to further slow traffic.

Recommended Features

A1 Conflict Striping

Conflict striping defines the potential areas of conflict between people biking and people driving and also indicates to people biking their intended pathway through the intersection.

A2 Splitter Islands

Splitter islands slow vehicular traffic approaching the roundabout and help to guide drivers to the right when they reach the circular part of the intersection.

A3 Median Refuge Islands

Median refuge islands are protected spaces in the median, and they people crossing on foot or bike to cross one direction of traffic at a time. They can also help to slow traffic and improve user comfort.

Optional Features

B1 Raised Crossing

Raises the bike and/or pedestrian crossing to curb level to increase the visibility of people in the crosswalk, and to slow vehicle traffic.

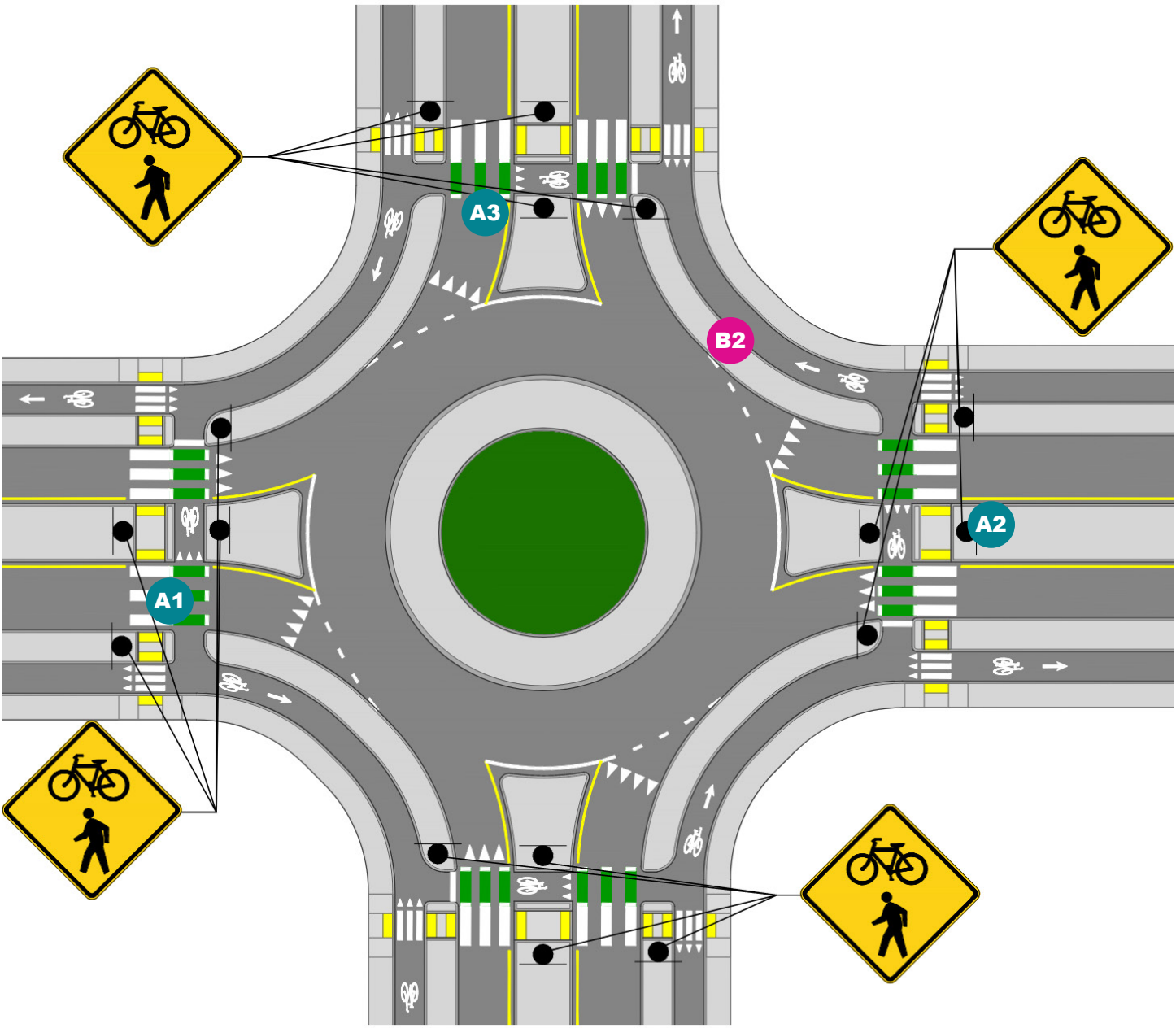
B2 Bikeway Protection

Where a protected bikeway approaches a roundabout, or where additional comfort and separation is desired, medians or other vertical barriers can be used to protect the bikeway through the roundabout. Where this treatment is applied, crosswalks and appropriate ADA ramps and features must be applied, similar to a protected intersection or bend-out. If the bikeway is not protected though the intersection, a ramp may be provided and bicycle traffic may travel along a shared sidepath through the intersection.

Reference Documents

The intersection concept shown is an example of how treatments could be combined to create a comfortable crossing for people biking. For formal design guidance, refer to the following documents or others, as new guidance becomes available:

- Texas MUTCD and FHWA MUTCD, 11th Edition, Part 9 (for bicycle treatments not yet in Texas MUTCD)
- NACTO Urban Bikeway Design Guide: Major Street Crossings
- AASHTO Guide for the Planning, Design, and Operation of Pedestrian Facilities
- AASHTO A Policy on Geometric Design of Highways and Streets
- NCHRP Research Report 1043: Guide for Roundabouts


A3
B2
A2
A1

Intersection Details

Dedicated Intersection

People biking are given a dedicated path to traverse through the intersection, reducing the conflict points between people biking and motorists especially when the treatment is combined with protected-permissive bike signal phasing.

Dedicated intersections are typically recommended in constrained scenarios when there is not enough space for a full protected intersection. They have positive effects on perceived comfort and traffic calming. However, they do not provide as much space for turning drivers to yield to people in the crosswalk or crossbike and the wedge islands are mountable so they provide less protection than a protected intersection.

Recommended Features

A1 Centerline Hardening

A raised treatment is placed along the centerline, requiring drivers to slow down when making left-turns.

A2 Corner Wedge Island

Corner wedge islands are small, raised wedges, that require drivers to slow down when making right turns and provide a small level of physical separation for people biking. They may be mountable to accommodate larger vehicles.

A3 Conflict Striping

Conflict striping defines the potential areas of conflict between people biking and people driving and also indicates to people biking the intended pathway through the intersection.

A4 Bike Signalization

Using a combination of leading bike and pedestrian intervals can be provided if a shared through/turn lane is next to the bikeway. If a dedicated right- or left-turn lane is next to the bikeway, a protected-permissive bike signal phase should be considered.

A5 Bike Lane Yield Markings and Crosswalks

Communicates to people biking to yield to people walking across the bikeway and to wait at the median island. Also indicates where people walking should cross. Detectable warning surfaces shall be placed before and after the crossing of the bikeway.

Optional Features

B1 Median Refuge Islands

Median refuge islands are protected spaces in the median and the allow people crossing on foot or bike to cross one direction of traffic at a time. They can also help to slow traffic and to improve user comfort.

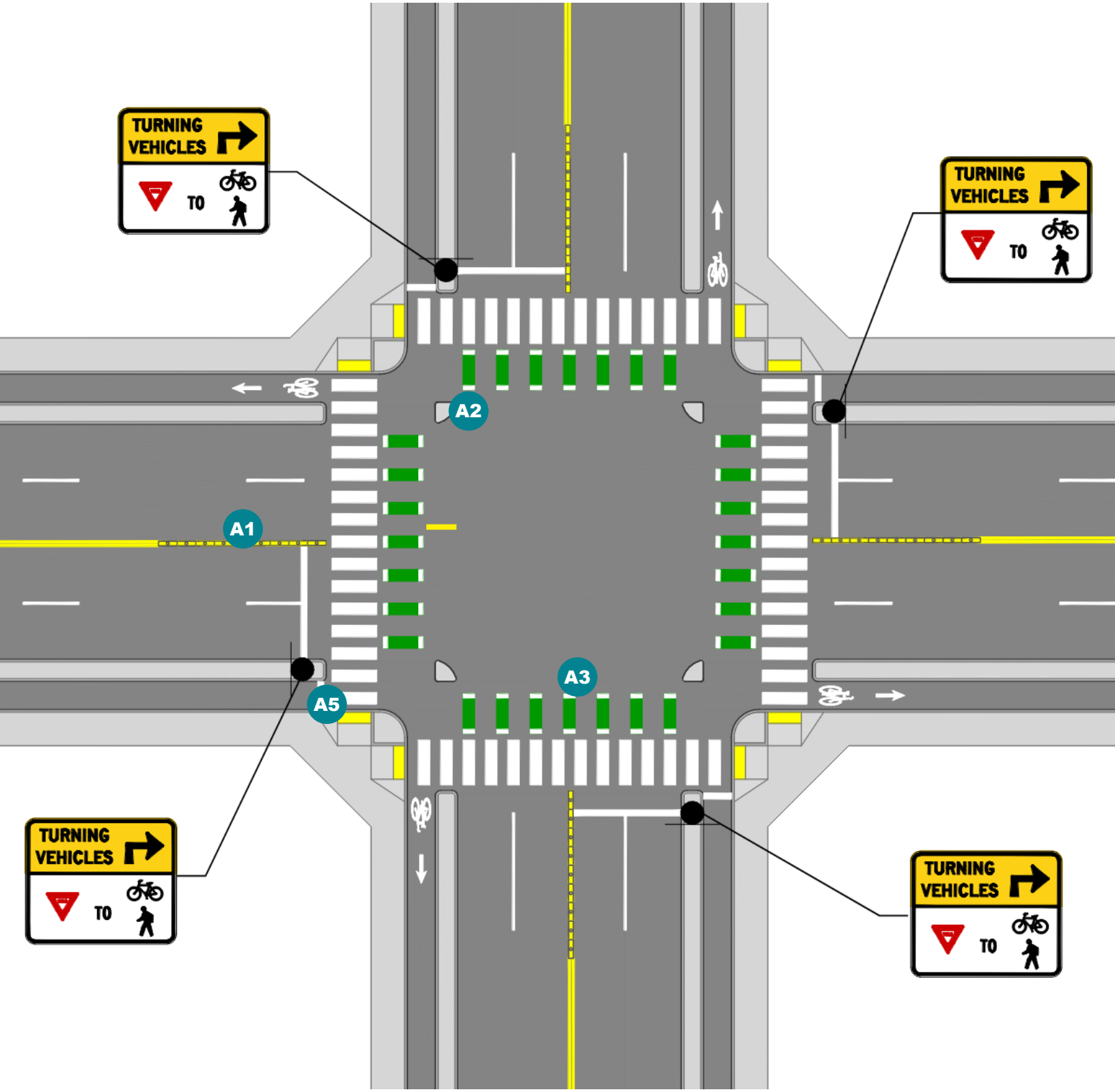
B2 Crosswalk Separator

Crosswalk separators are small raised elements between the crosswalk and crossbike to help provide guidance for people with visual impairments.

Reference Documents

The intersection concept shown is an example of how treatments could be combined to create a comfortable crossing for people biking. For formal design guidance, refer to the following documents or others, as new guidance becomes available:

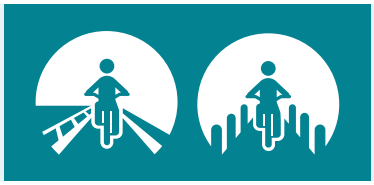
- Texas MUTCD and FHWA MUTCD, 11th Edition, Part 9 (for bicycle treatments not yet in Texas MUTCD)
- NACTO Urban Bikeway Design Guide: Major Street Crossings
- AASHTO Guide for the Planning, Design, and Operation of Pedestrian Facilities
- AASHTO A Policy on Geometric Design of Highways and Streets


TURNING VEHICLES
TO
TURNING VEHICLES
TO
A2
A1
A3
A5
TURNING VEHICLES
TO
TURNING VEHICLES
TO

Intersection Details

Protected Intersection

People biking are given a dedicated path to traverse through the intersection, providing physical separation throughout the intersection that exposes people biking when they cross vehicle travel lanes.



Recommended Features

A1 Driver Yield Zone

The driver yield zone provides space for turning vehicles to yield to people crossing. The preferred offset distance between the crossing and adjacent street is enough allow for one full vehicle to queue, but may reduced in constrained situations or lengthened where higher vehicle speeds are anticipated.

A2 Corner Islands

Corner islands provide physical separation between the bikeway and moving vehicles. The curb radius of the corner island should be designed to slow turning vehicle speeds to 15 mph or less. The corner island may include a mountable truck apron where needed.

A3 Forward Bike Queue Area

This area provides space for people biking to queue prior to crossing the intersection. The bike queue area should, at a minimum, allow two people on bikes to queue, but larger queue areas can accommodate higher bike volumes and longer bikes.

A4 Bike Lane Taper

If a lateral shift is required to position the bikeway, a gentle shift is preferred. The preferred taper is 1:4 or 1:5.

A5 Conflict Striping

Conflict striping defines the potential areas of conflict between people biking and people driving and also indicates to people biking the intended pathway through the intersection.

A6 Signal Treatments

A leading pedestrian interval with a concurrent bike signal phase may be used to provide people walking and biking with a head start, although a dedicated bike phase is preferred. In either event, right turns on red should be prohibited.

A7 Detectable Edge

Where the bikeway is at sidewalk level, a detectable edge should be placed between the bikeway and sidewalk.

A8 Bike Lane Yield Markings and Crosswalks

Communicates to people biking to yield to people walking across the bikeway and to wait at the median island. Detectable warning surfaces shall be placed before and after the crossing of the bikeway.

Optional Features

B1 Median Refuge Islands,

Median refuge islands are protected spaces in the median, and they allow people crossing on foot or bike to cross one direction of traffic at a time. They can also help to slow traffic and improve user comfort.

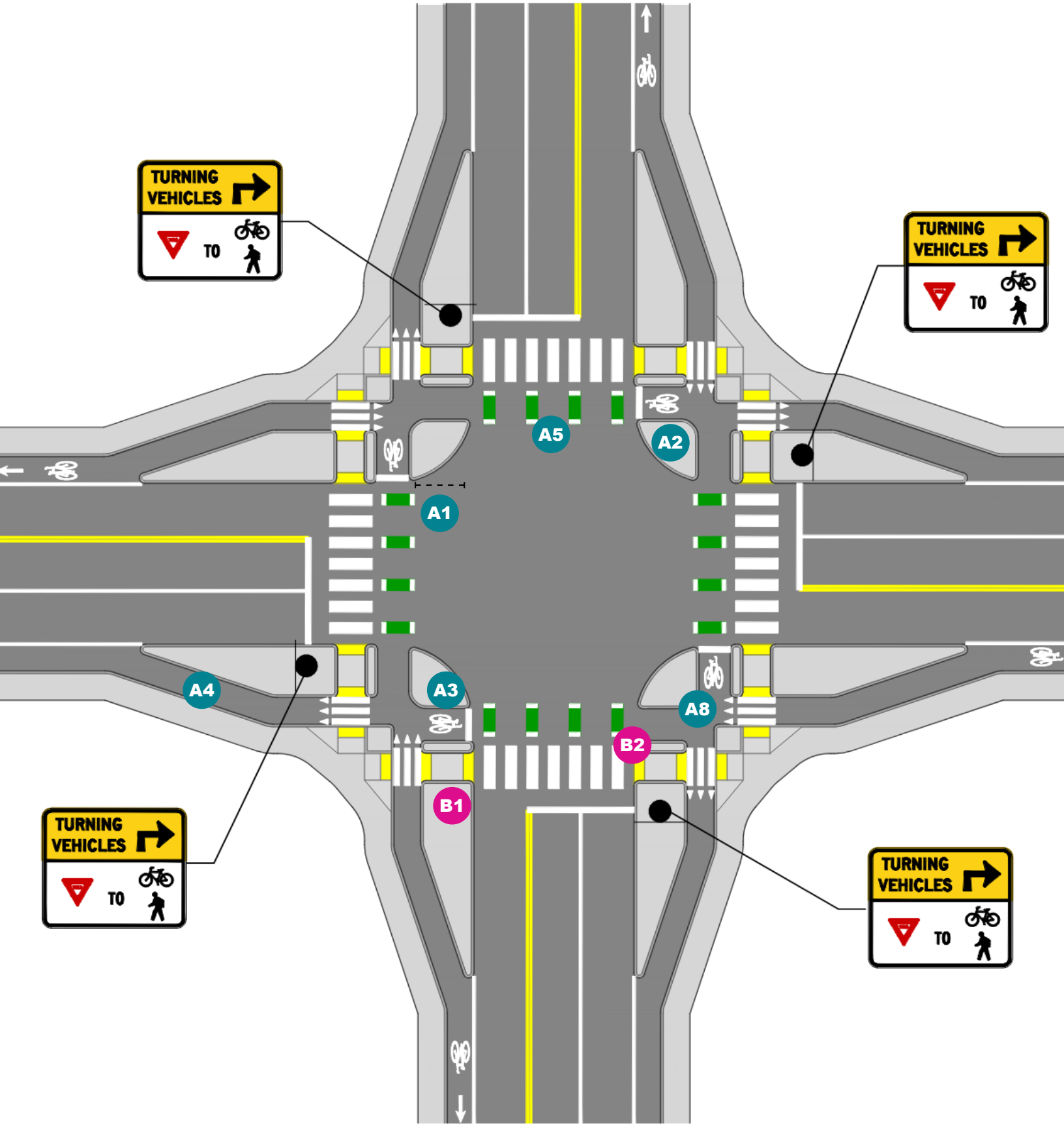
B2 Crosswalk Separator

Crosswalk separators are small raised elements between the crosswalk and crossbike to help provide guidance for people with visual impairments..

Reference Documents

The intersection concept shown is an example of how treatments could be combined to create a comfortable crossing for people biking. For formal design guidance, refer to the following documents or others, as new guidance becomes available:

- Texas MUTCD and FHWA MUTCD, 11th Edition, Part 9 (for bicycle treatments not yet in Texas MUTCD)
- NACTO Urban Bikeway Design Guide: Major Street Crossings
- AASHTO Guide for the Planning, Design, and Operation of Pedestrian Facilities
- AASHTO A Policy on Geometric Design of Highways and Streets


TURNING VEHICLES
TO
TURNING VEHICLES
TO
TURNING VEHICLES
TO
TURNING VEHICLES
TO
A1
A2
A3
A4
A5
A8
B1
B2

Page Intentionally Left Blank

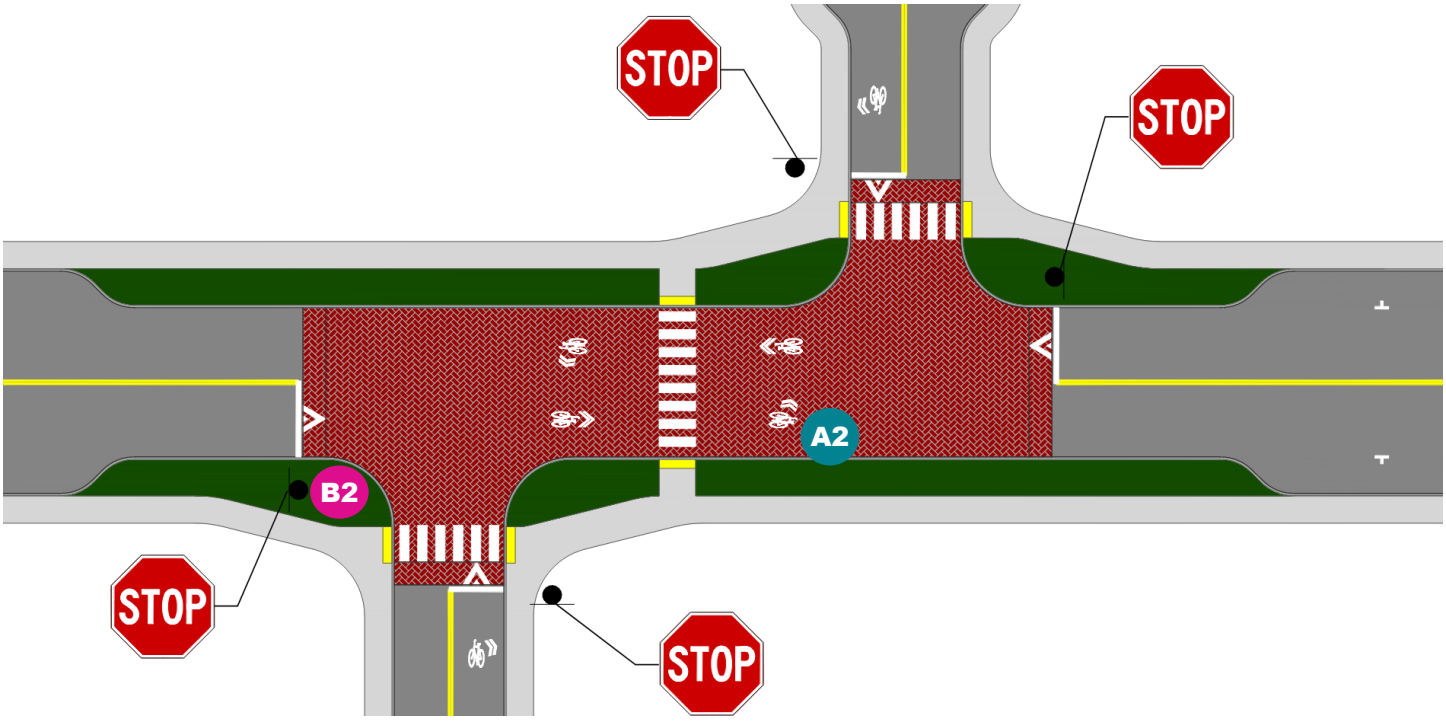
Offset Intersections

An offset intersection, also known as a “staggered intersection”, occurs when two opposing legs of a minor road are not aligned, requiring those traveling along the minor road to utilize the major road for a short distance in order to proceed through. While offset intersections can be challenging for all road users, they are particularly challenging for people biking, as lack of infrastructure can encourage them to make multiple, complex maneuvers at two back-to-back intersections while navigating space with potentially fast-moving and high volumes of cars along the major road. The following design guidance is intended to provide design options that can help people biking navigate offset intersections with greater comfort.

Offset Intersections

Raised Offset Intersection

Raised offset intersections elevate the entire major roadway and intersections between the minor roads to the level of the sidewalk, creating a slow zone for motorists throughout the offset intersection. Raised intersections also improve the visibility and comfort of people walking and biking and create a continuous surface for people walking to cross. Raised intersections should only be use on roads with lower speeds and volumes.



Recommended Features

A1 Wayfinding Signs

Wayfinding signs indicates to people biking how to turn and proceed through the intersection in order to remain on the desired bikeway.

A2 Directional Markers

Directional markers indicate the intended path for biking through the intersection and increase the visibility of people biking to drivers.

Optional Features

B1 Rectangular Rapid Flashing Beacon

This treatment may be paired with rectangular rapid flashing beacons (RRFBs) at each marked crossing to further indicate to drivers the need to yield to people walking and biking.

B2 Curb Extensions

Curb extensions extend the curb at crossing locations to improve visibility of people in the crossing and to slow turning drivers.

Reference Documents

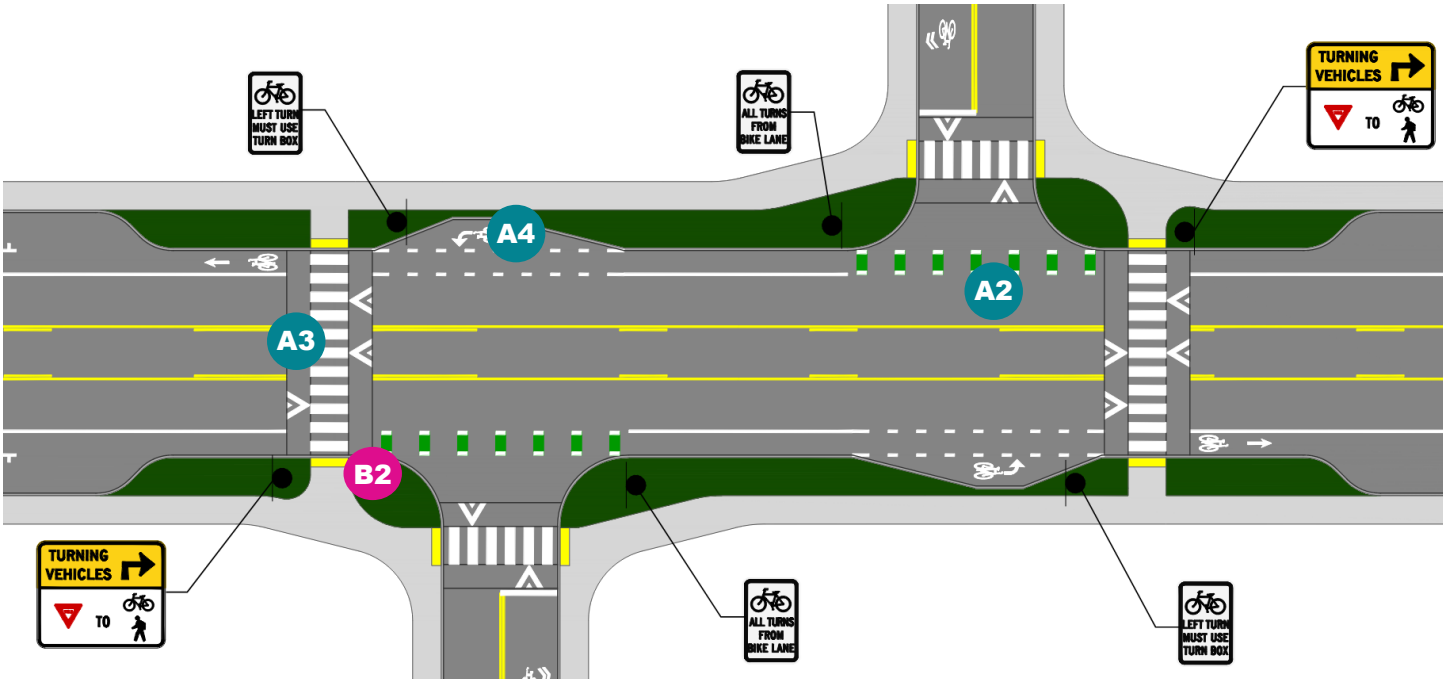
The intersection concept shown is an example of how treatments could be combined to create a comfortable crossing for people biking. For formal design guidance, refer to the following documents or others, as new guidance becomes available:

- Texas MUTCD
- NACTO Urban Bikeway Design Guide: Minor Street Crossings
- AASHTO Guide for the Planning, Design, and Operation of Pedestrian Facilities
- AASHTO A Policy on Geometric Design of Highways and Streets

Offset Intersections

Slow Zone Offset Intersection

Slow zone intersections utilize raised crosswalks across the major roadway on either end of the intersection to create a slow zone for motorists throughout the offset intersection. Raised crossings improve the visibility and comfort of people walking and biking, and should only be use on roads with lower speeds and volumes. Two-stage bicycle-turn queue boxes are used to provide people biking with a spot to wait for a gap in traffic to cross.



Recommended Features

A1 Wayfinding Signs

Wayfinding signs shall be used to indicate to people biking how to turn and proceed through the intersection in order to remain on the desired bikeway.

A2 Conflict Striping

Conflict striping defines the potential areas of conflict between people biking and people driving and also indicates to people biking their intended pathway through the intersection.

A3 Raised Crossing

Raises the bike and/or pedestrian crossing to curb level to increase the visibility of people in the crosswalk, which also helps slow vehicle traffic.

A4 Two-Stage Bicycle-Turn Queue Box,

Queue boxes provide designated space for people biking to make left-turns at multi lane intersections in multiple signal stages.

Optional Features

B1 Rectangular Rapid Flashing Beacon

Pedestrian activated flashing beacons at crosswalks which indicate to drivers the need to yield.

B2 Curb Extensions

Curb extensions extend the curb at crossing locations to improve visibility of people in the crossing and slow turning drivers.

Reference Documents

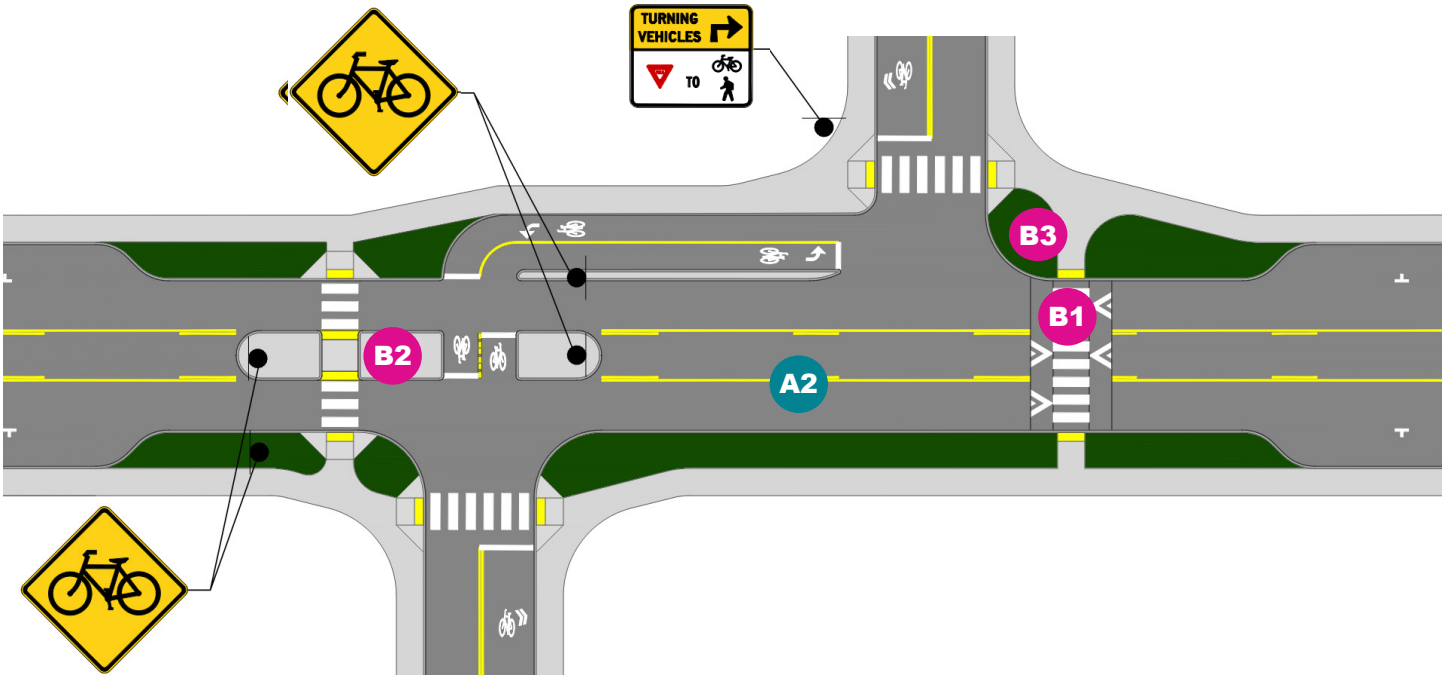
The intersection concept shown is an example of how treatments could be combined to create a comfortable crossing for people biking. For formal design guidance, refer to the following documents or others, as new guidance becomes available:

- Texas MUTCD and FHWA MUTCD, 11th Edition, Part 9 (for bicycle treatments not yet in Texas MUTCD)
- NACTO Urban Bikeway Design Guide: Major Street Crossings
- AASHTO Guide for the Planning, Design, and Operation of Pedestrian Facilities
- AASHTO A Policy on Geometric Design of Highways and Streets

Offset Intersections

Cycle Track Connection

A two-way cycle track diverts people biking from either side of the minor street to a single crossing location. This minimizes the cost of crossing treatments and can enable the use of beacons and other crossing signals and treatments that cannot be used in close proximity to each other.



Recommended Features

A1 Wayfinding Signs

Wayfinding signs shall be used to indicate to people biking how to turn and proceed through the intersection in order to remain on the desired bikeway.

A2 Directional Markers

Directional markers are turn arrows that help indicate the intended path of travel for people biking.

Optional Features

B1 Raised Crossing

Raises the bike and/or pedestrian crossing to curb level to increase the visibility of people in the crosswalk and slows drivers as they pass the raised element.

B2 Median Refuge Islands

Median refuge islands are protected spaces in the median that allow people crossing on foot or bike to cross one direction of traffic at a time. They can help slow traffic and are useful on multi-lane roads.

B3 Curb Extensions

Curb extensions extend the curb at crossing locations to improve visibility of people in the crossing and to slow turning drivers.

Reference Documents

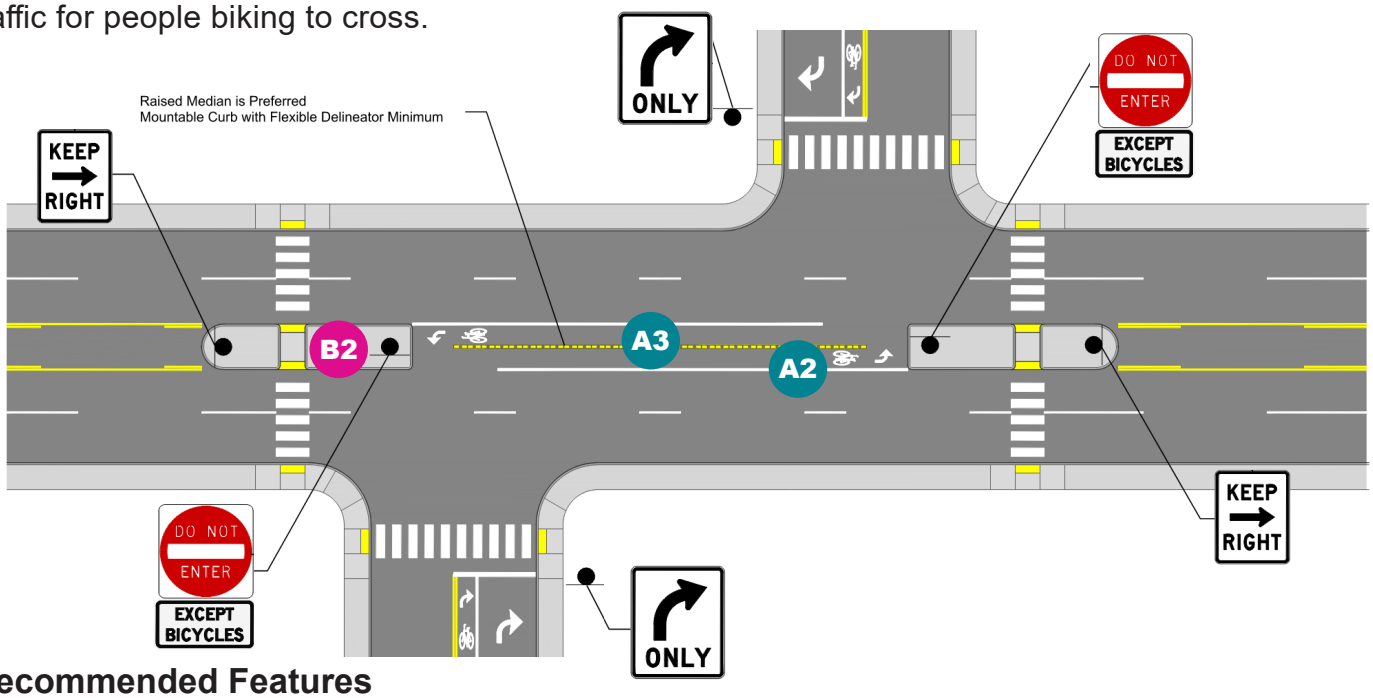
The intersection concept shown is an example of how treatments could be combined to create a comfortable crossing for people biking. For formal design guidance, refer to the following documents or others, as new guidance becomes available:

- Texas MUTCD
- NACTO Urban Bikeway Design Guide: Major Street Crossings; Offset Intersections
- AASHTO Guide for the Planning, Design, and Operation of Pedestrian Facilities
- AASHTO A Policy on Geometric Design of Highways and Streets

Offset Intersections

Median Refuge Turn Pocket

Center-turn lanes are provided and designed specifically for people biking and are protected with median islands. The center-turn lanes allow people biking to cross from the minor street into the center turn lane, bike along the center turn lane, and then have a protected space to wait for a gap in traffic to cross to the opposing leg of the minor street. This solution is most appropriate where there vehicle speeds and volumes are low enough on the major street to provide sufficient gaps in traffic for people biking to cross.



Recommended Features

A1 Wayfinding Signs

Wayfinding signs shall be used to indicate to people biking how to turn and proceed through the intersection in order to remain on the desired bikeway.

A2 Directional Markers

Conflict striping defines the potential areas of conflict between people biking and people driving and also indicates to people biking their intended pathway through the intersection.

A3 Centerline Hardening

A raised treatment is placed along the centerline, preventing drivers from turning left and separating the bike lane by direction of travel. Alternatively, the lane lines between the bike lanes and driving lanes can be hardened to provide a similar effect while increasing comfort for people biking.

Optional Features

B1 Rectangular Rapid Flashing Beacon

Pedestrian activated flashing beacons at crosswalks that indicate to drivers the need to yield.

B2 Median Refuge Islands

Median refuge islands are protected spaces in the median that allow people crossing on foot or bike to cross one direction of traffic at a time. They can help slow traffic and are useful on multi-lane roads.

Reference Documents

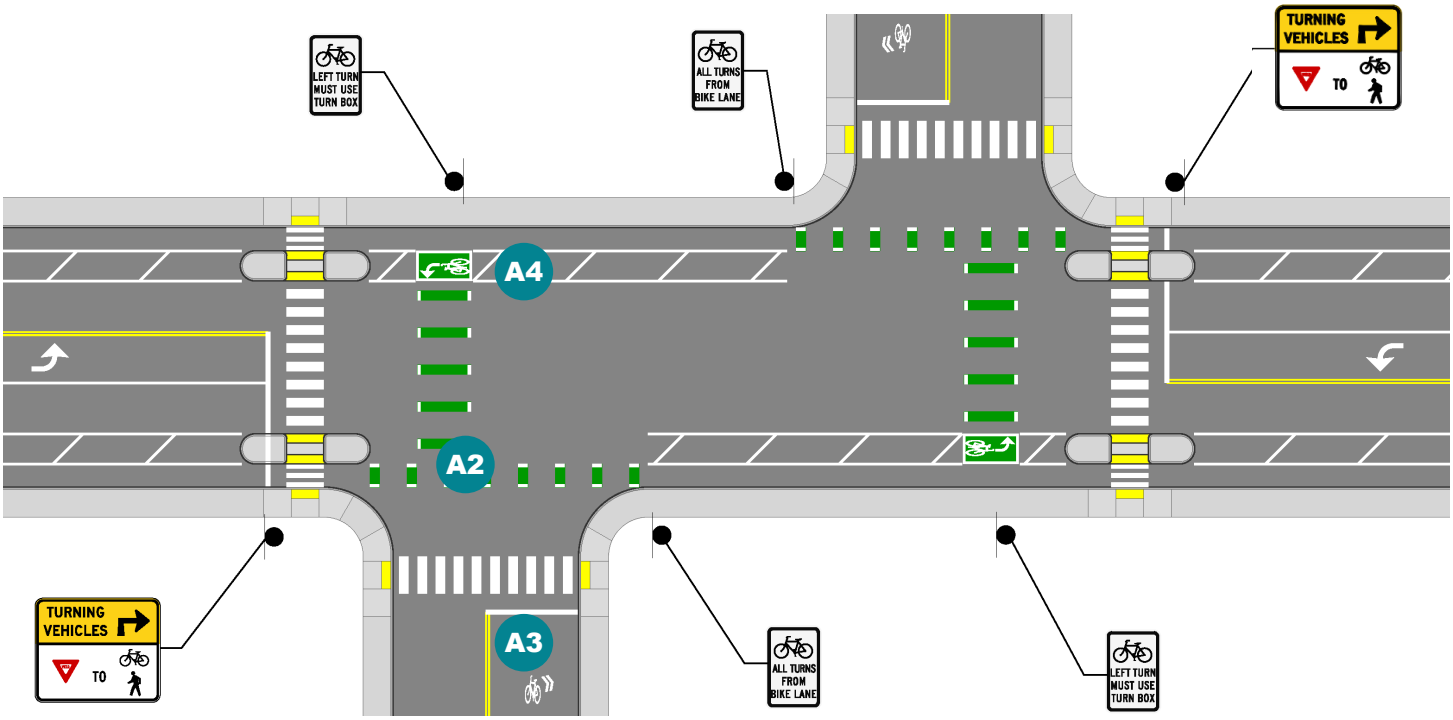
The intersection concept shown is an example of how treatments could be combined to create a comfortable crossing for people biking. For formal design guidance, refer to the following documents or others, as new guidance becomes available:

- Texas MUTCD
- NACTO Urban Bikeway Design Guide: Major Street Crossings; Offset Intersections
- AASHTO Guide for the Planning, Design, and Operation of Pedestrian Facilities
- AASHTO A Policy on Geometric Design of Highways and Streets

Offset Intersections

Two-Stage Turn Queue Boxes

Two-stage Turn Queue Boxes callow people biking to position themselves and wait for a crossing opportunity. This solution provides a pathway that limits conflicts between people biking and drivers.



Recommended Features

A1 Wayfinding Signs

Wayfinding signs shall be used to indicate to people biking how to turn and proceed through the intersection in order to remain on the desired bikeway.

A2 Conflict Striping

Conflict striping defines the potential areas of conflict between people biking and people driving and also indicates to people biking the intended pathway through the intersection.

A3 Directional Markers

Directional markers are turn arrows that help indicate the intended path of travel for people biking.

A4 Two-Stage Bicycle-Turn Queue Box

Queue boxes provide designated space for people biking to make left-turns at multi lane intersections in multiple signal stages.

Optional Features

B1 Rectangular Rapid Flashing Beacon

Pedestrian activated flashing beacons at crosswalks that indicate to drivers the need to yield.

B2 Median Refuge Islands

Median refuge islands are protected spaces in the median that allow people crossing on foot or bike to cross one direction of traffic at a time. They can help slow traffic and are useful on multi-lane roads.

Reference Documents

The intersection concept shown is an example of how treatments could be combined to create a comfortable crossing for people biking. For formal design guidance, refer to the following documents or others, as new guidance becomes available:

- Texas MUTCD and FHWA MUTCD, 11th Edition, Part 9 (for bicycle treatments not yet in Texas MUTCD)
- NACTO Urban Bikeway Design Guide: Major Street Crossings; Offset Intersections
- AASHTO Guide for the Planning, Design, and Operation of Pedestrian Facilities
- AASHTO A Policy on Geometric Design of Highways and Streets

Page Intentionally Left Blank

Page Intentionally Left Blank

Midblock, Side Street, and Driveway Crossings

Active transportation facilities require special considerations for midblock, side street, and driveway crossings.

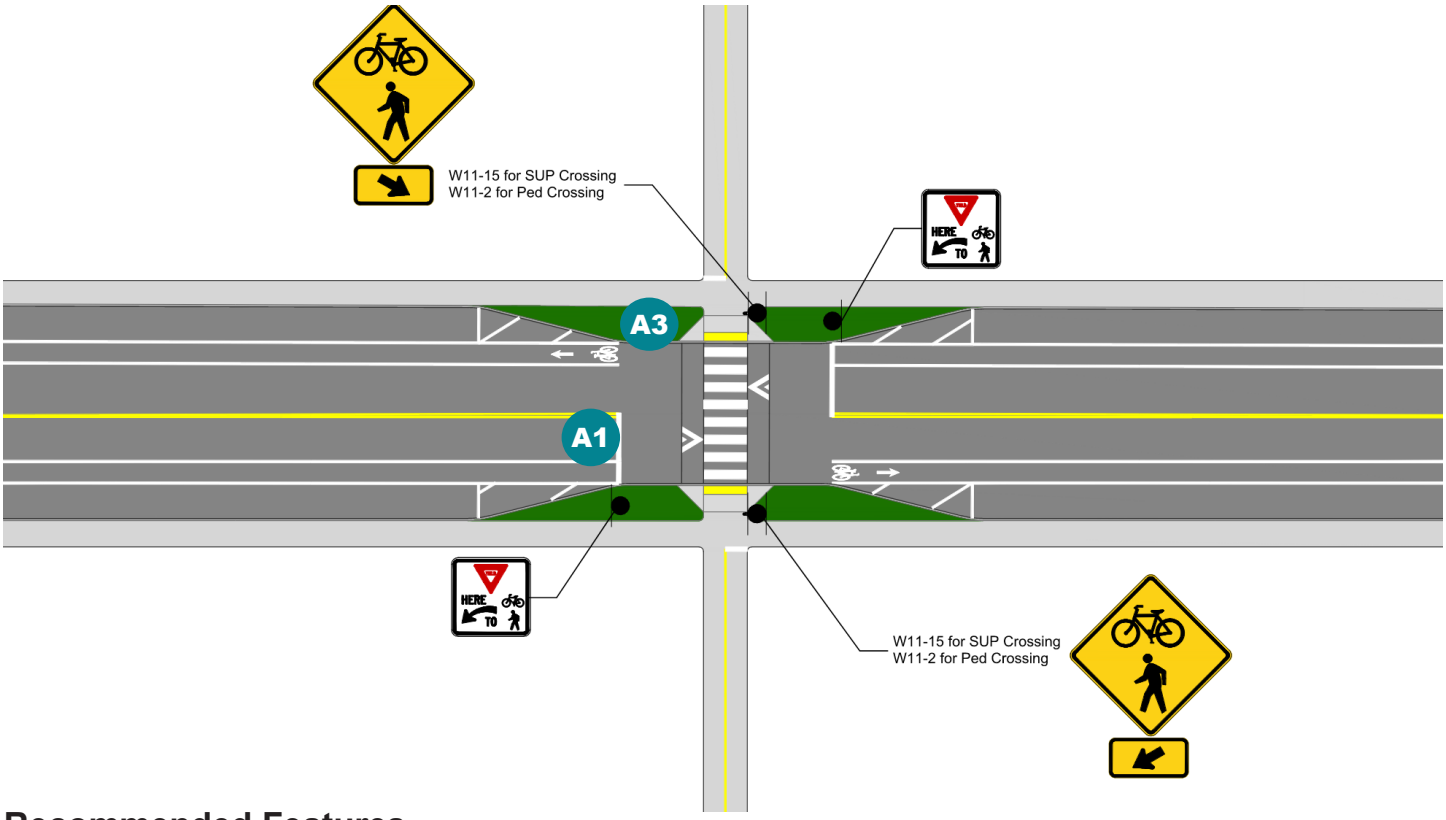
Midblock crossings occur outside of an intersection, and they are often installed to support shared use path crossings. These crossings require additional consideration to alert drivers of the potential for people crossing, as drivers may not expect the crossing outside of a signalized intersections.

Bikeways and shared use paths also require additional consideration when crossing side streets or driveways. In these locations, the bikeway or shared use path should be designed to minimize conflict between people crossing on foot or bike and drivers turning into or out of the side street or driveway. While conflict markings and crosswalks alone may be sufficient in many places, side streets and driveways that are heavily utilized, those that have experienced crashes between turning vehicles and people walking and biking, in places where additional comfort is desired, additional treatments may be considered.

Midblock Crossings

Raised Shared Use Path Crossing

Where shared use paths cross streets, the crossing may be elevated to the same height as the sidewalk. A raised crossing helps increase the visibility of people using the path to people driving. The raised crossing also helps to slow down drivers when they travel over the raised portion, which helps increase driver reaction time and increase yielding to people in the crossing.



Recommended Features

A1 **Stop Lines**

Stop lines at midblock crossings should be set back to ensure that a person crossing is visible.

A2 **Median Refuge Islands**

Median refuge islands are protected spaces in the median, and they allow people crossing on foot or bike to cross one direction of traffic at a time. They can also help to slow traffic and to improve user comfort.

A3 **Curb Extensions**

Curb extensions extend the curb at crossing locations to improve visibility of people in the crossing and to slow turning drivers.

A4 **Bike Lane Yield Markings and Crosswalks**

Communicates to people biking to yield to people walking across the bikeway to wait at the median island. Also indicates where people walking should cross. Detectable warning surfaces shall be placed before and after the crossing of the bikeway.

Reference Documents

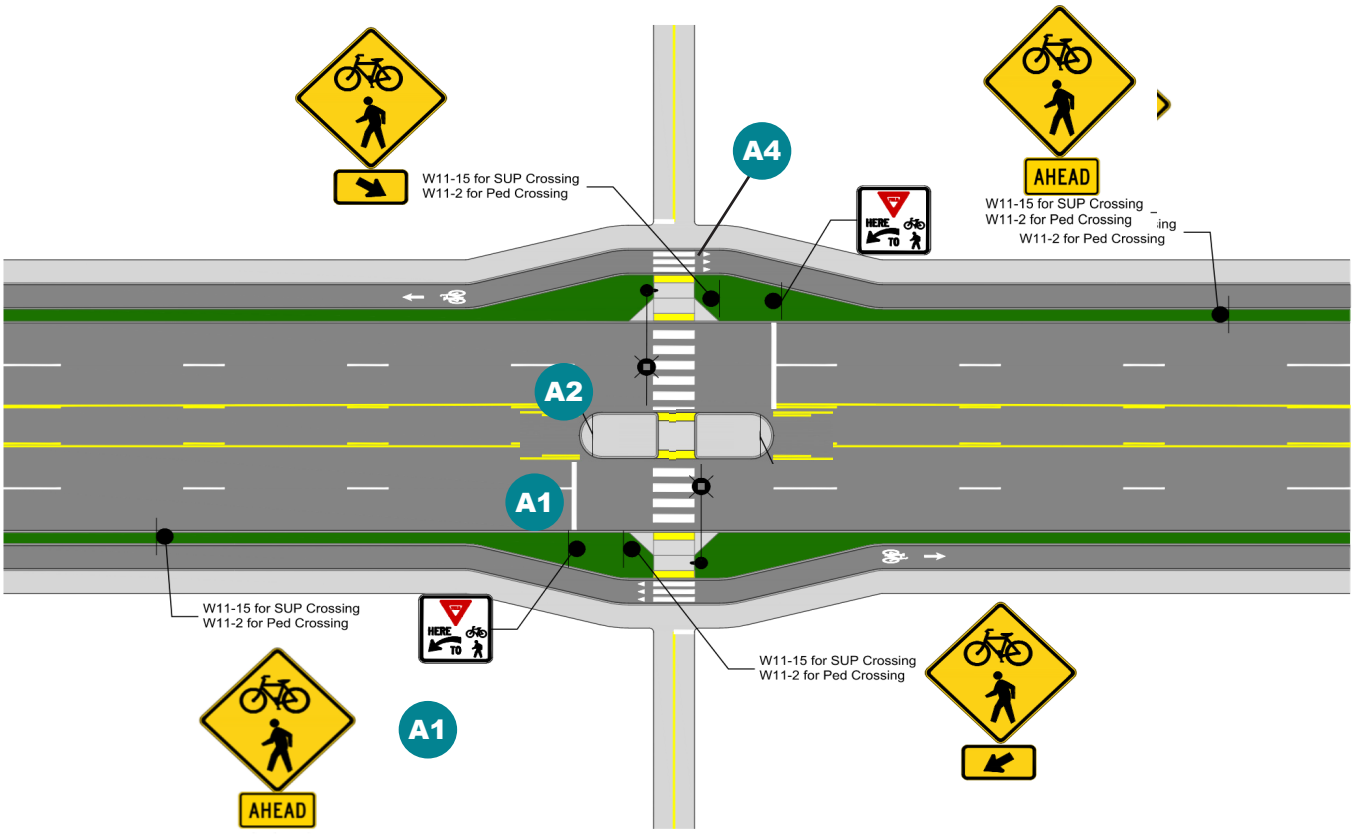
The intersection concept shown is an example of how treatments could be combined to create a comfortable crossing for people biking. For formal design guidance, refer to the following documents or others, as new guidance becomes available:

- Texas MUTCD
- NACTO Urban Bikeway Design Guide: Mid Block Crosswalks
- AASHTO Guide for the Planning, Design, and Operation of Pedestrian Facilities
- AASHTO A Policy on Geometric Design of Highways and Streets

Midblock Crossings

Shared Use Path with Midblock Signal

A midblock signal is a traffic control device intended to facilitate safe crossings for people walking or biking particularly across higher-stress roadways. The signal is activated by push button by a person walking or biking. The signal can also be automated through detection systems.



Recommended Features

A1 Stop Lines

Stop lines at midblock crossings should be set back to ensure that a person crossing is visible.

A2 Median Refuge Islands

Median refuge islands are protected spaces in the median, and they allow people crossing on foot or bike to cross one direction of traffic at a time. They can also help to slow traffic and to improve user comfort.

A3 Curb Extensions

Curb extensions extend the curb at crossing locations to improve visibility of people in the crossing and to slow turning drivers.

A4 Bike Lane Yield Markings and Crosswalks

Communicates to people biking to yield to people walking across the bikeway to wait at the median island. Also indicates where people walking should cross. Detectable warning surfaces shall be placed before and after the crossing of the bikeway.

Reference Documents

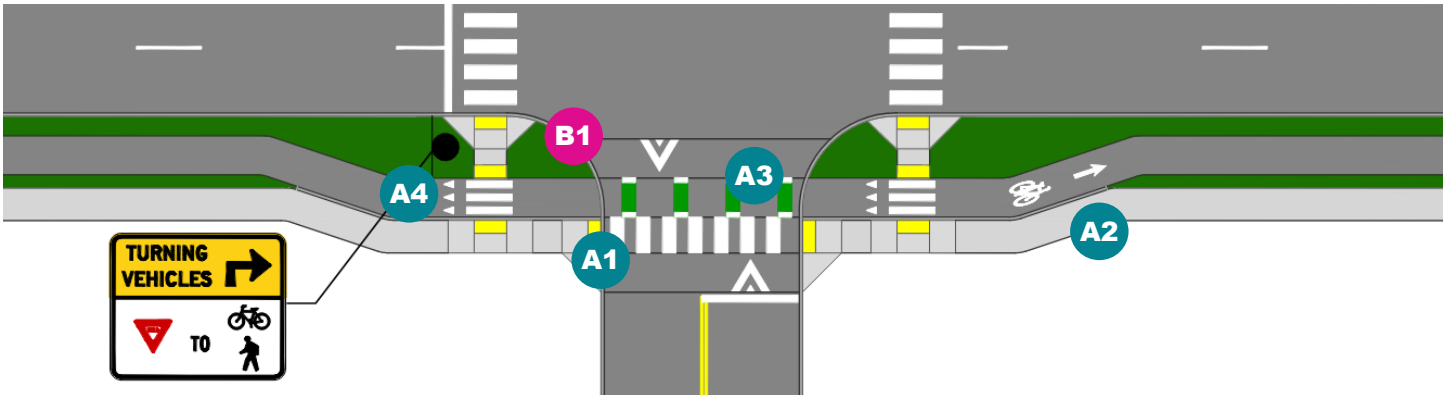
The intersection concept shown is an example of how treatments could be combined to create a comfortable crossing for people biking. For formal design guidance, refer to the following documents or others, as new guidance becomes available:

- Texas MUTCD
- NACTO Urban Bikeway Design Guide: Mid Block Crosswalks
- AASHTO Guide for the Planning, Design, and Operation of Pedestrian Facilities
- AASHTO A Policy on Geometric Design of Highways and Streets

Side Street & Driveway Crossings

Protected Bike Lane Crossing

When protected bike lanes are provided at sidewalk level, it is often more comfortable to provide raised crossings across side streets and driveways to avoid frequent elevation changes. Additionally, raised crossing can help to slow turning vehicles and to improve visibility of people walking and biking. This solution is most effective when applied consistently across a corridor, especially along multi-lane or higher-volume roads.



Recommended Features

A1 Raised Crossing

Raises the bike and/or pedestrian crossing to curb level which increases the visibility of people in the crosswalk and slows drivers as they pass the raised element.

A2 Bend-Outs

Bend-outs allowing people biking to queue closer to the street crossing, which improves visibility and provides yield space for right-turning drivers.

A3 Conflict Striping

Conflict striping defines the potential areas of conflict between people biking and people driving and also indicates to people biking their intended pathway through the intersection.

A4 Bike Lane Yield Markings and Crosswalks

Communicates to people biking to yield to people walking across the bikeway to wait at the median island. Also indicates where people walking should cross. Detectable warning surfaces shall be placed before and after the crossing of the bikeway.

Optional Features

B1 Curb Extensions

Curb extensions extend the curb at crossing locations to improve visibility of people in the crossing and to slow turning drivers.

B2 Median Refuge Islands

Median refuge islands are protected spaces in the median, and they allow people crossing on foot or bike to cross one direction of traffic at a time. They can also help to slow traffic and to improve user comfort.

Reference Documents

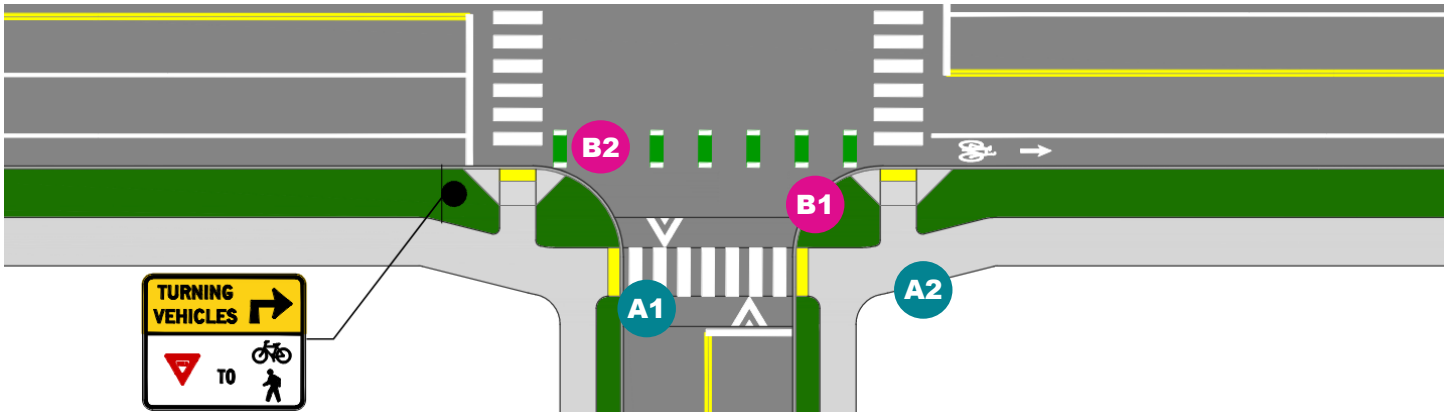
The intersection concept shown is an example of how treatments could be combined to create a comfortable crossing for people biking. For formal design guidance, refer to the following documents or others, as new guidance becomes available:

- Texas MUTCD and FHWA MUTCD, 11th Edition, Part 9 (for bicycle treatments not yet in Texas MUTCD)
- NACTO Urban Bikeway Design Guide: Mid Block Crosswalks
- AASHTO Guide for the Planning, Design, and Operation of Pedestrian Facilities
- AASHTO A Policy on Geometric Design of Highways and Streets

Side Street & Driveway Crossings

Shared Use Path or Sidepath Crossing

When shared use paths and sidepath cross driveways and side streets, it is often more comfortable to provide raised crossings across side streets and driveways to avoid frequent elevation changes. Additionally, raised crossing can help to slow turning vehicles and improve visibility of people walking and biking. This solution is most effective when utilized consistently across a corridor, especially along multi-lane or higher volume roads.



Recommended Features

A1 Raised Crossing

Raises the bike and/or pedestrian crossing to curb level, which increases the visibility of people in the crosswalk and slows drivers as they pass the raised element.

A2 Bend-Outs

Bend-outs allowing people biking to queue closer to the street crossing, which improves visibility and provides yield space for right-turning drivers.

Optional Features

B1 Curb Extensions

Curb extensions extend the curb at crossing locations to improve visibility of people in the crossing and to slow turning drivers.

B2 Bike Lane and Conflict Striping

While most people may be more comfortable biking shared use paths, some may prefer to travel on street in bike lanes to avoid interacting with people walking. If bike lanes are provided adjacent to a shared use path, conflict striping may be painted at intersections and driveways..

Reference Documents

The intersection concept shown is an example of how treatments could be combined to create a comfortable crossing for people biking. For formal design guidance, refer to the following documents or others, as new guidance becomes available:

- Texas MUTCD and FHWA MUTCD, 11th Edition, Part 9 (for bicycle treatments not yet in Texas MUTCD)
- NACTO Urban Bikeway Design Guide: Mid Block Crosswalks
- AASHTO Guide for the Planning, Design, and Operation of Pedestrian Facilities
- AASHTO A Policy on Geometric Design of Highways and Streets

Page Intentionally Left Blank

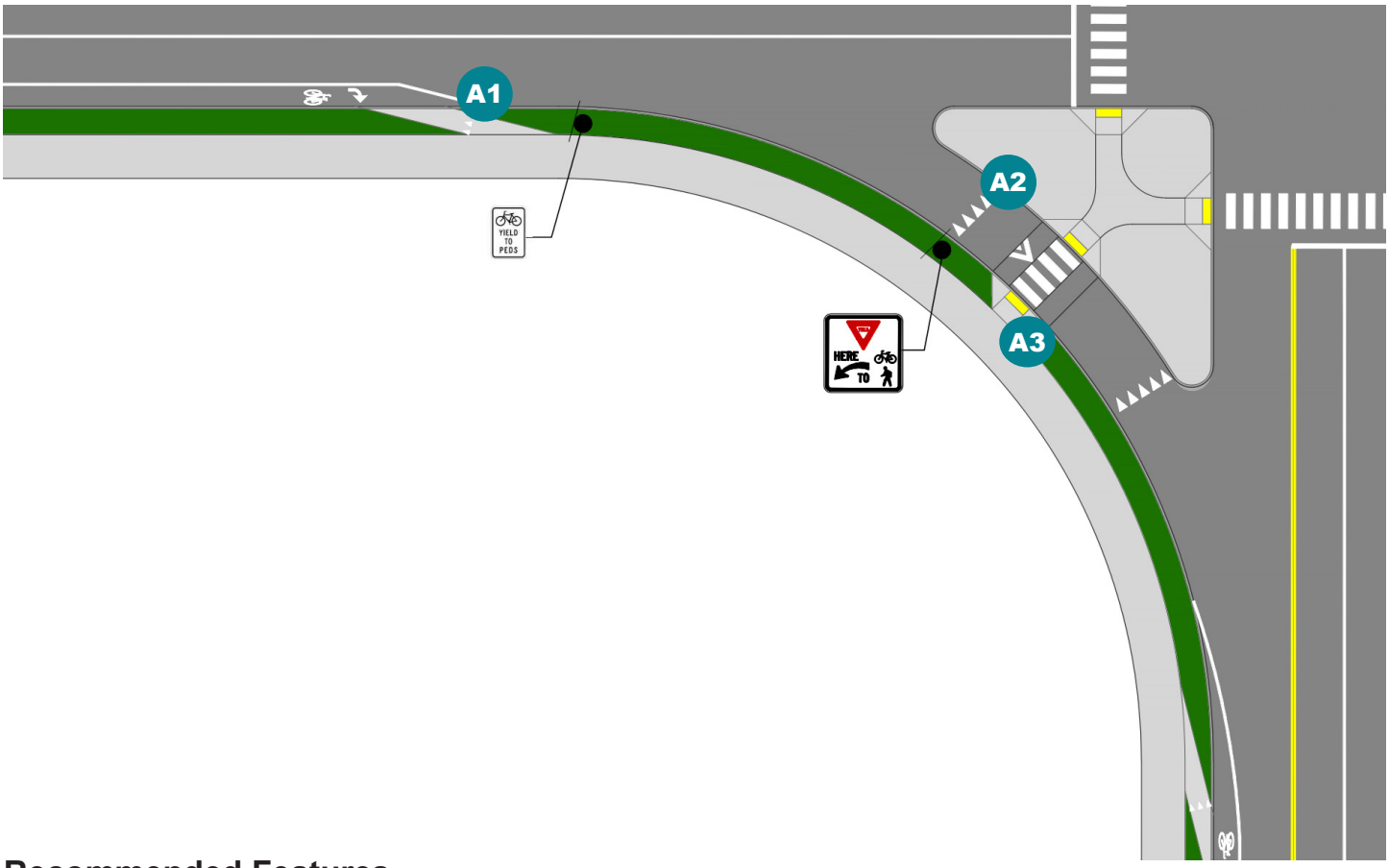
Slip Lane Retrofits

Slip lanes, or channelized right-turn lanes, present challenges for people biking and other roadway users. Slip lanes may encourage higher right-turning speeds, which can reduce driver reaction time in the same area that people walking and biking must cross the intersection. Further, drivers using a slip lane must also split their attention between the pathway in front of them where people may be crossing. The following guidelines are recommended for existing intersections that are to be retrofitted to be more comfortable for people biking.

Slip Lane Retrofits

Raised Crossing in Slip Lane

A raised crossing in the slip lane slows right-turning traffic through the slip lane, especially on the approach of the crossing for people walking and biking. In this example, the bikeway transitions to sidewalk level into a shared use path to facilitate the crossing.



Recommended Features

A1 Bike Lane Transition to Sidepath

People biking transition out of the bike lane onto a sidepath and use the raised crossing to traverse the intersection.

A2 Yield Lines

Communicates to people driving to yield to people walking in the crosswalk and to yield to through traffic as they exit the slip lane.

A3 Raised Crossing

Raises the bike and/or pedestrian crossing to curb level, which increases the visibility of people in the crosswalk and slows drivers as they pass the raised element.

Reference Documents

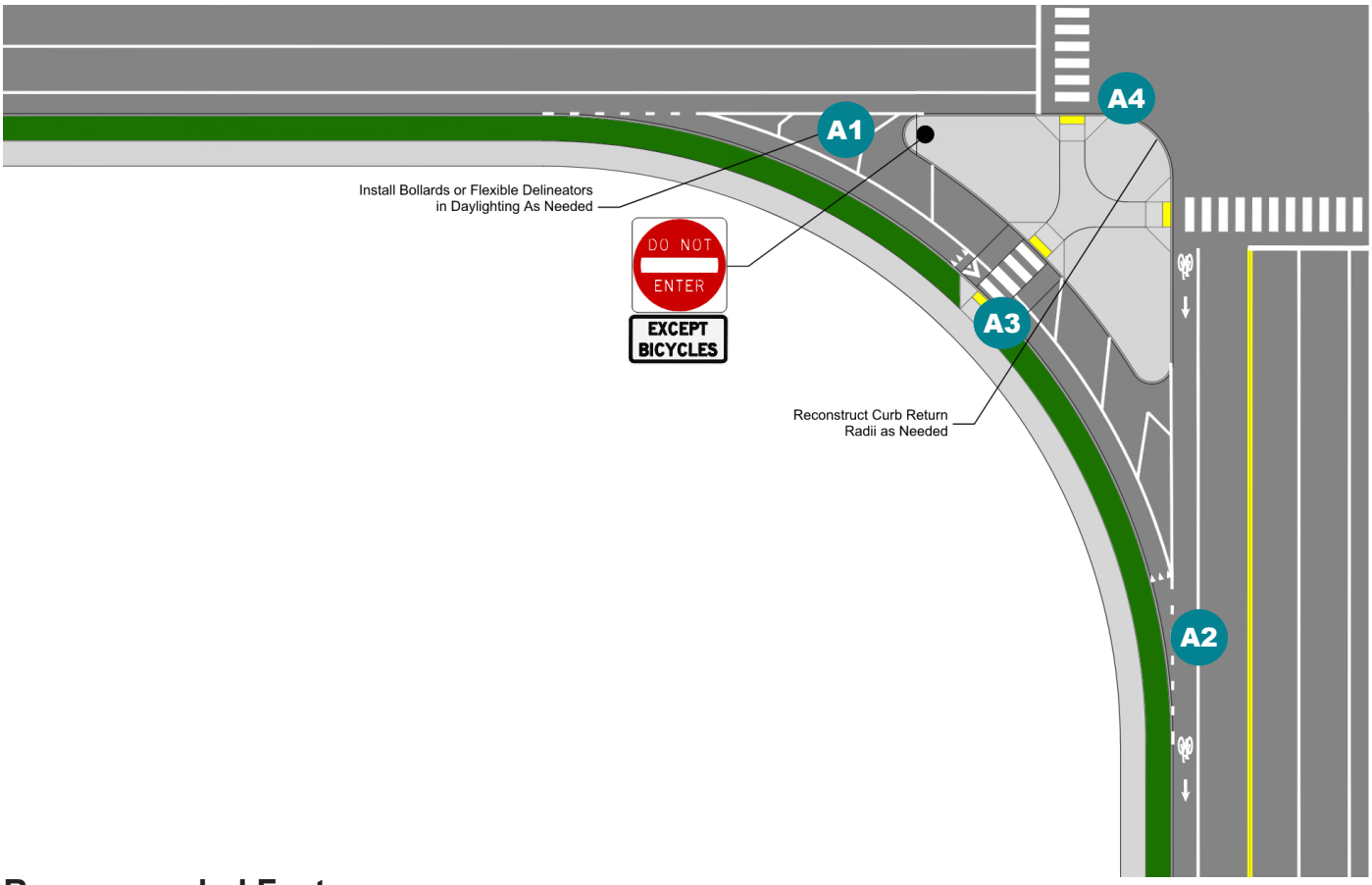
The intersection concept shown is an example of how treatments could be combined to create a comfortable crossing for people biking. For formal design guidance, refer to the following documents or others, as new guidance becomes available:

- Texas MUTCD and FHWA MUTCD, 11th Edition, Part 9 (for bicycle treatments not yet in Texas MUTCD)
- NACTO Urban Bikeway Design Guide: Mid Block Crosswalks
- AASHTO Guide for the Planning, Design, and Operation of Pedestrian Facilities
- AASHTO A Policy on Geometric Design of Highways and Streets

Slip Lane Retrofits

Slip Lane Closure

Closes the slip lane to vehicular traffic but permits people biking. Drivers may turn right at the stop bar, but at slower speeds due to the tighter turning radii. In addition, closing the slip lane reduces the total number of potential conflicts between drivers and people walking and biking.



Recommended Features

A1 Lane Closure

Hatched paint or other quick-build materials such as flex posts can be used to help reinforce that the slip lane is closed to motorist and is only intended for smaller vehicles, or rather, people biking.

A2 Bike Lane Yield Lines

Communicates to people biking to yield to people walking in the crosswalk and also to yield to through-bike traffic as they exit the slip lane.

A3 Raised Crossing

Raises the bike and/or pedestrian crossing to curb level, which increases the visibility of people in the crosswalk and slows drivers as they pass the raised element.

A4 Through Bike Lane

Allows people biking to travel through the intersection along their original path of travel if they do not wish to transition off of the street.

Reference Documents

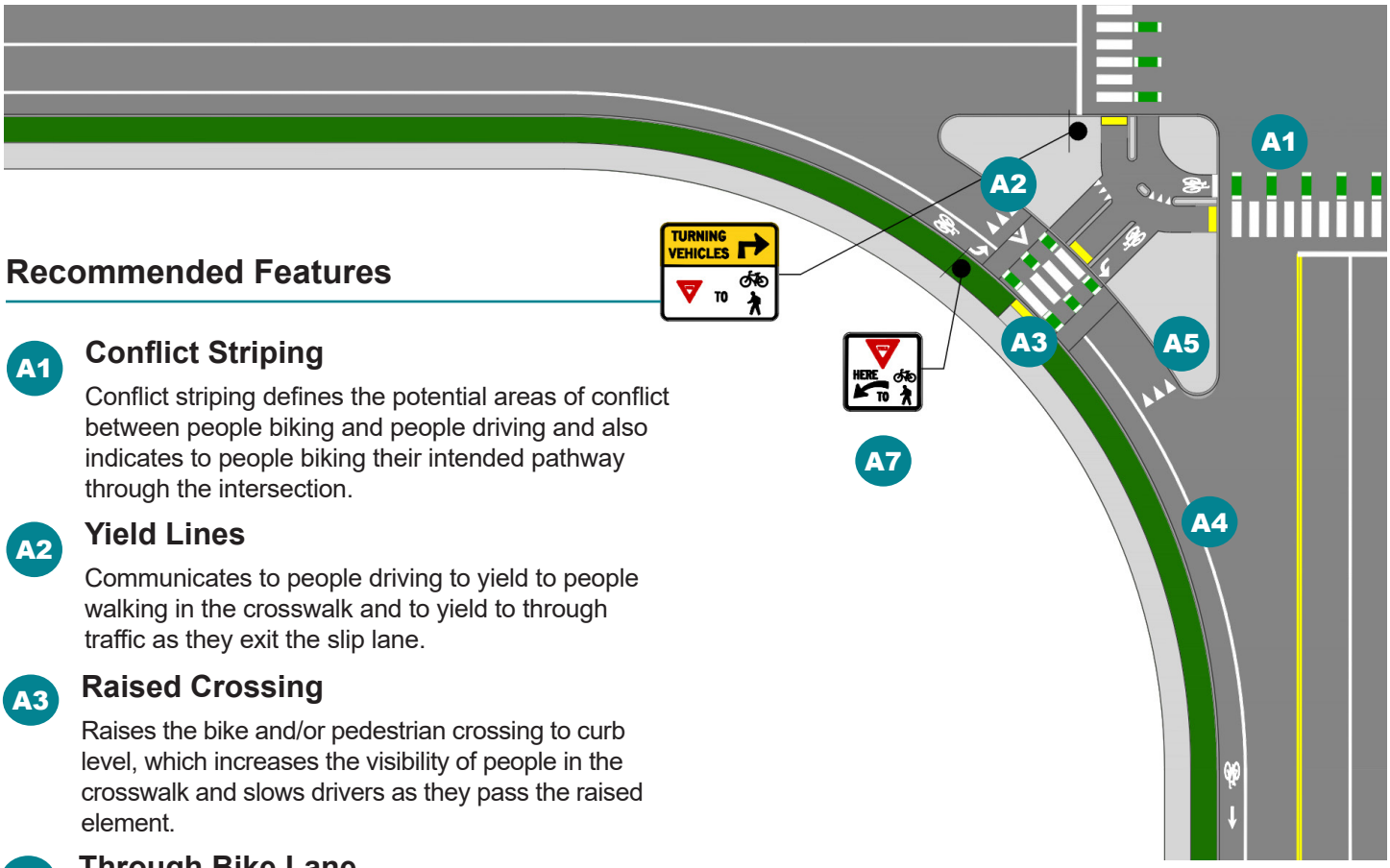
The intersection concept shown is an example of how treatments could be combined to create a comfortable crossing for people biking. For formal design guidance, refer to the following documents or others, as new guidance becomes available:

- Texas MUTCD and FHWA MUTCD, 11th Edition, Part 9 (for bicycle treatments not yet in Texas MUTCD)
- NACTO Urban Bikeway Design Guide: Mid Block Crosswalks
- AASHTO Guide for the Planning, Design, and Operation of Pedestrian Facilities
- AASHTO A Policy on Geometric Design of Highways and Streets

Slip Lane Retrofits

Partially Protected Intersection

The bike lane is transitioned to a protected intersection treatment in the island next to the slip lane. The bike lane utilizes the raised crossing, which slows down drivers and increases the visibility of people crossing the slip lane.



Recommended Features

A1 Conflict Striping

Conflict striping defines the potential areas of conflict between people biking and people driving and also indicates to people biking their intended pathway through the intersection.

A2 Yield Lines

Communicates to people driving to yield to people walking in the crosswalk and to yield to through traffic as they exit the slip lane.

A3 Raised Crossing

Raises the bike and/or pedestrian crossing to curb level, which increases the visibility of people in the crosswalk and slows drivers as they pass the raised element.

A4 Through Bike Lane

Allows people biking to travel through the intersection along their original path of travel if they do not wish to transition off of the street.

A5 Bike Lane Yield Lines and Crosswalks

Communicates to people biking to yield to people walking across the bikeway to wait at the median island. Also indicates where people walking should cross. Detectable warning surfaces shall be placed before and after the crossing of the bikeway.

A6 Detectable Edge

Where the bikeway is at sidewalk level, a detectable edge should be placed between the bikeway and sidewalk.

A7 Forward Bike Queue Area

This area provides space for people biking to queue prior to crossing the intersection. The bike queue area should, at a minimum, allow two people on bikes to queue. Larger queue areas can accommodate higher bike volumes and longer bikes.

Reference Documents

The intersection concept shown is an example of how treatments could be combined to create a comfortable crossing for people biking. For formal design guidance, refer to the following documents or others, as new guidance becomes available:

- Texas MUTCD and FHWA MUTCD, 11th Edition, Part 9 (for bicycle treatments not yet in Texas MUTCD)
- NACTO Urban Bikeway Design Guide: Mid Block Crosswalks
- AASHTO Guide for the Planning, Design, and Operation of Pedestrian Facilities
- AASHTO A Policy on Geometric Design of Highways and Streets

Page Intentionally Left Blank

Page Intentionally Left Blank

Additional Guidance

Page Intentionally Left Blank

Parking and Loading

Bike facilities and parking and loading facilities may both occupy a similar space between the driving lanes and the curb. Both types of facilities are an important role for vulnerable road users: people who are on bikes and people who are exiting vehicles – especially those with disabilities who require access to level walkways on the curb. With some planning, the needs of these groups can be met through thoughtful designs, as described on the following pages:

Parking and Loading

Accessible On Street Parking

Generally, on-street parking should be designed following city standards. Where a buffered or protected bikeway is placed next to On-Street parking, the buffer space shall be at least 3 feet. Accessible parking spaces shall be provided where other designated On-Street parking is provided. Parallel on-street parking spaces may be located at the end of a block with access to existing curb ramps, although they may also be located mid-block where a curb ramp is provided. Sample configurations for accessible on-street parking at block end and mid-block locations are shown below.

Recommended Features

A1 Provide an access aisle of at least 5-feet in width for vehicle lift deployment and accessing the designated crossing. The aisle must connect to a pedestrian access route via a curb ramp or blended transition.

A2 If a pedestrian aisle is not provided, a signed accessible space must be located at the end of a block face and the adjacent sidewalk must be free of obstructions for vehicle lift deployment.

A3 Detectable warning surfaces should be placed at the transition between the sidewalk and the crossing.

A4 Rear access aisles should be painted for driver side access to the sidewalk.

A5 Bike yield lines and a crosswalk across the bikeway indicates to people biking and they need to yield to people walking.

Optional Features

B1 The bikeway may be narrowed to 4-feet at accessible parking spaces in constrained areas.

B2 When the accessible parking space is at the end of the block, median refuge islands are recommended to prevent parking encroachment on the accessible space and path.

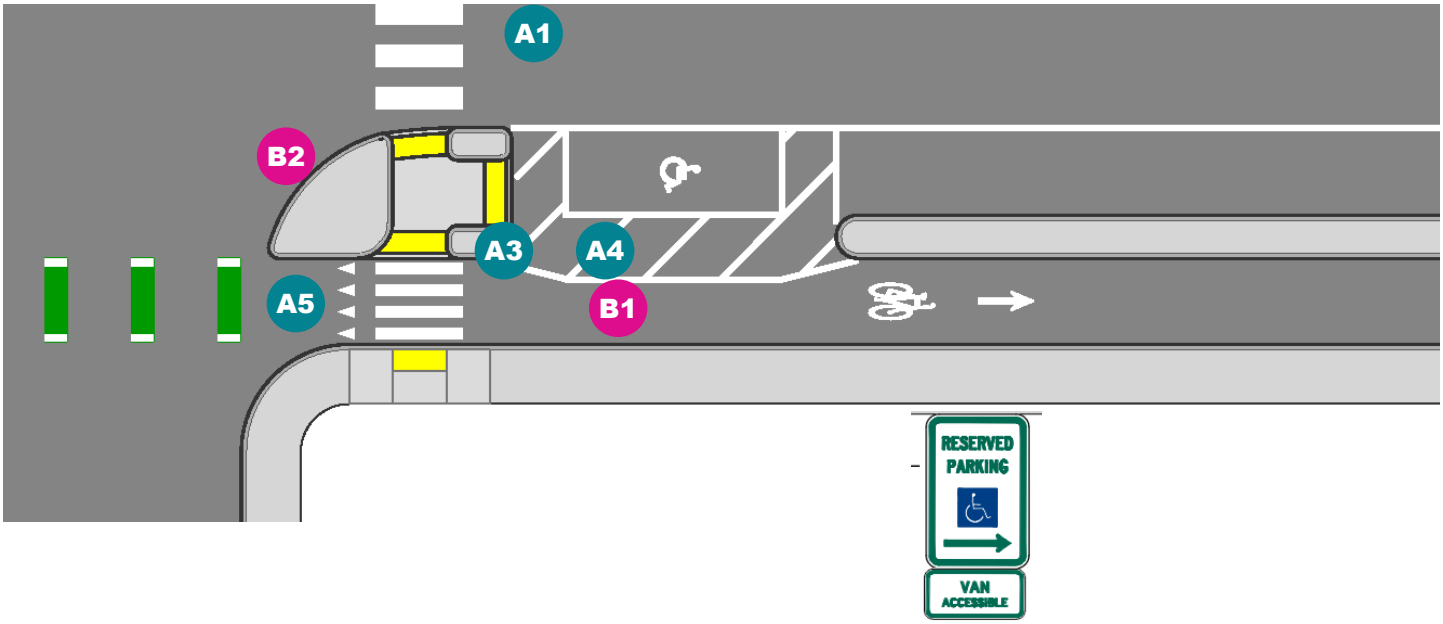
Reference Documents

The accessible parking concepts shown are an example of how treatments could be combined to maintain a comfortable place for people walking and biking while also supporting people with disabilities. For formal design guidance, refer to the following documents or others, as new guidance becomes available:

- Texas MUTCD
- NACTO Urban Bikeway Design Guide
- AASHTO Guide for the Planning, Design, and Operation of Pedestrian Facilities
- AASHTO A Policy on Geometric Design of Highways and Streets
- PROWAG technical requirement R310.2, Table R211 for frequency and availability of ADA parking spaces.

Mid-Block Accessible Space Configuration

End of Block Accessible Space Configuration



Parking and Loading

Loading Zones

Loading zones may be strategically placed to accommodate passenger and/or commercial loading and unloading in front of businesses, schools, hotels, or other key locations. Where possible, the bikeway should be maintained through the loading zone. Where passenger loading is expected, a curb ramp, crosswalk, and detectable warning surfaces should be present. Yield markings should be placed in the bikeway to indicate to people biking to slow down. Bollards or other vertical elements should be used to ensure people do not park vehicles in the bikeway. Green conflict markings may also be striped in the bikeway through the loading zone to indicate the shared space for all users.

Recommended Features

A1 Provide an access aisle of at least 5-feet in width for the entire length of the loading zone for vehicle lift deployment and accessing the designated crossing. The aisle must connect to a pedestrian access route via a curb ramp or blended transition.

A2 The length of the loading zone should be at least 20-feet but may be longer to accommodate the length and number of vehicles expected to use the space.

A3 Detectable warning surfaces should be placed at the transitions between the sidewalk and the crossing.

A4 Bike yield lines and a crosswalk across the bikeway indicates to people biking and they need to yield to people walking.

Optional Features

B1 The bikeway may be narrowed to 4-feet at loading zones in constrained areas.

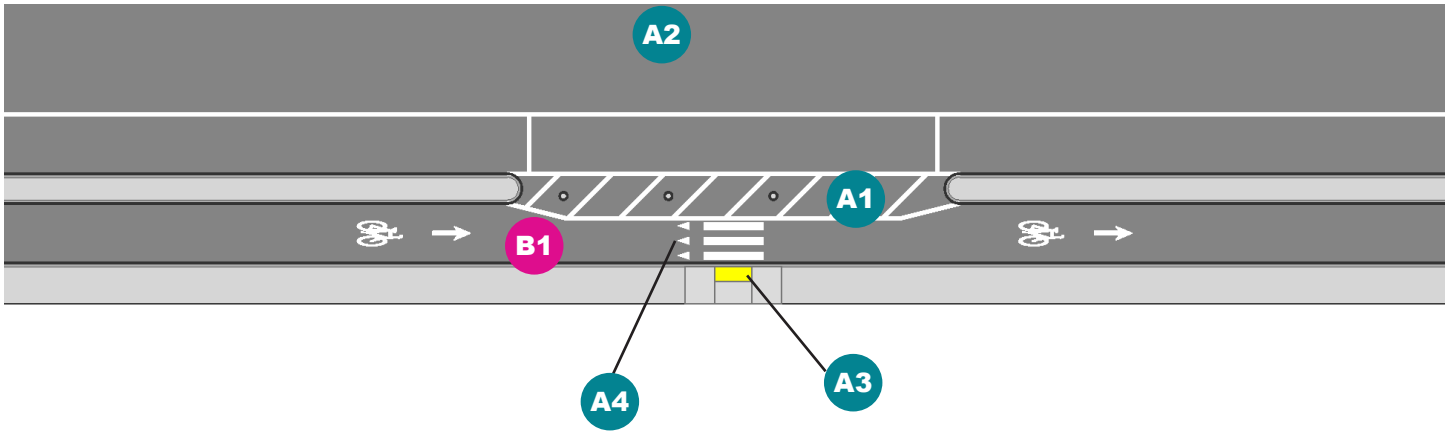
B2 Curb ramps should be wide enough to accommodate dollies/hand trucks, or other delivery devices that may be used.

Reference Documents

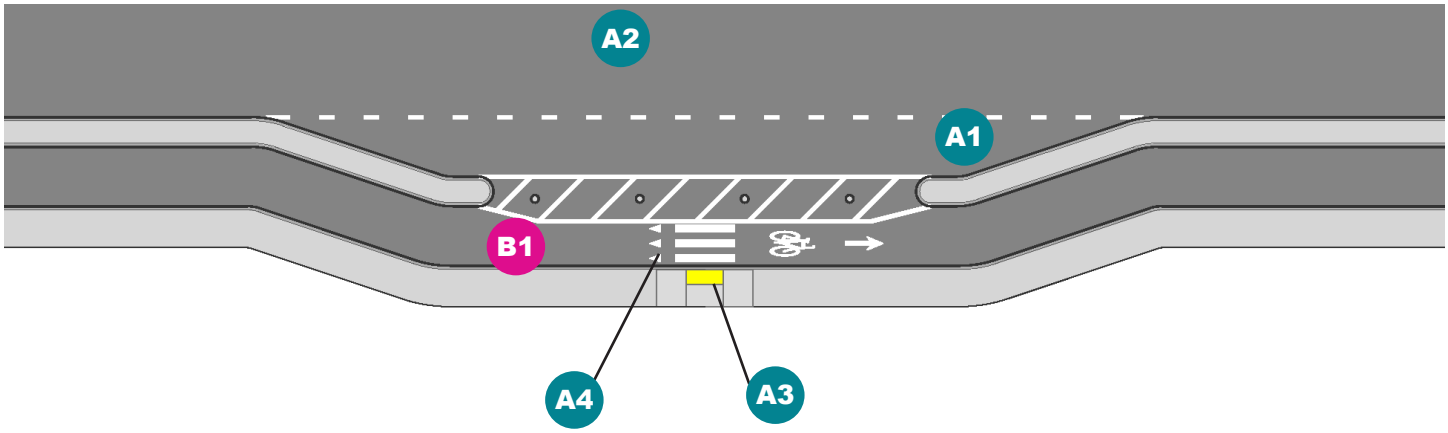
The loading zone concepts shown are an example of how treatments could be combined to maintain a comfortable place for people walking and biking while also supporting people with disabilities. For formal design guidance, refer to the following documents or others, as new guidance becomes available:

- Texas MUTCD
- NACTO Urban Bikeway Design Guide
- AASHTO Guide for the Planning, Design, and Operation of Pedestrian Facilities
- AASHTO A Policy on Geometric Design of Highways and Streets
- PROWAG technical requirement R310 for accessible passenger loading guidance and PROWAG R302.7 for surface guidance

Loading Zone Where On-Street Parking is Present



Loading Zone Where On-Street Parking is Not Present



Page Intentionally Left Blank

Bus Stops

Transit and bikeways are complimentary modes of transportation, as biking can provide a great option to cover the "last mile" connection between a transit stop and a final destination. However, without consideration, buses and bikes may compete for curb space. This section presents options for bus stop designs that are compatible with bike facilities:

Bus Stops

Bus Islands

When bike facilities run along bus routes, especially those with protected bike lanes, shared use paths, or those that see four or more buses per hour, the bike facility should be routed behind the bus stops to create a bus island. This treatment limits potential conflicts between people biking and buses. If a shared use path is present, the shared use path is subject to the same design criteria a sidewalk would be behind a bus stop. It is preferred, however, to separate the bikeway and walkway near bus islands to limit potential conflicts and indicate the need to slow down for people biking.

Protected / separated bikeways require some additional considerations near bus islands. Because people riding the bus must cross the bike lane to get to the bus island, intended crossing locations should be clearly marked using crosswalks and detectable warning surfaces. Yield markings should be used to indicate drivers' need to slow down for people biking. The bikeway may be raised to sidewalk level behind the bus stop to create a level path of travel for people walking and further indicating the need to slow down to people biking. Alternatively, keeping the bikeway at street level provides additional separation between people walking and biking.

Recommended Features

A1 Bus boarding areas must have a 5 x 8-feet clearance space where boarding and alighting occurs for ramp deployment and have a 4-feet clear pedestrian path.

A2 Detectable warning surfaces should be placed at transitions between sidewalks and the crossings.

A3 Bike yield lines and a crosswalk across the bikeway indicates to people biking to yield to people walking.

Optional Features

B1 Two pedestrian crossings from the sidewalk to the bus island help provide additional crossing locations for people walking.

B2 The bikeway may be raised the entire length of the boarding island or only at the pedestrian crossings to indicate to people biking to slow down and provide level crossings for people on foot.

B3 If raised to sidewalk level, a separate bike path may be narrowed to 4-feet at bus islands in constrained areas.

B4 If the bikeway is raised through the bus island or a shared use path is present at an end of block configuration, a raised crosswalk may also be installed.

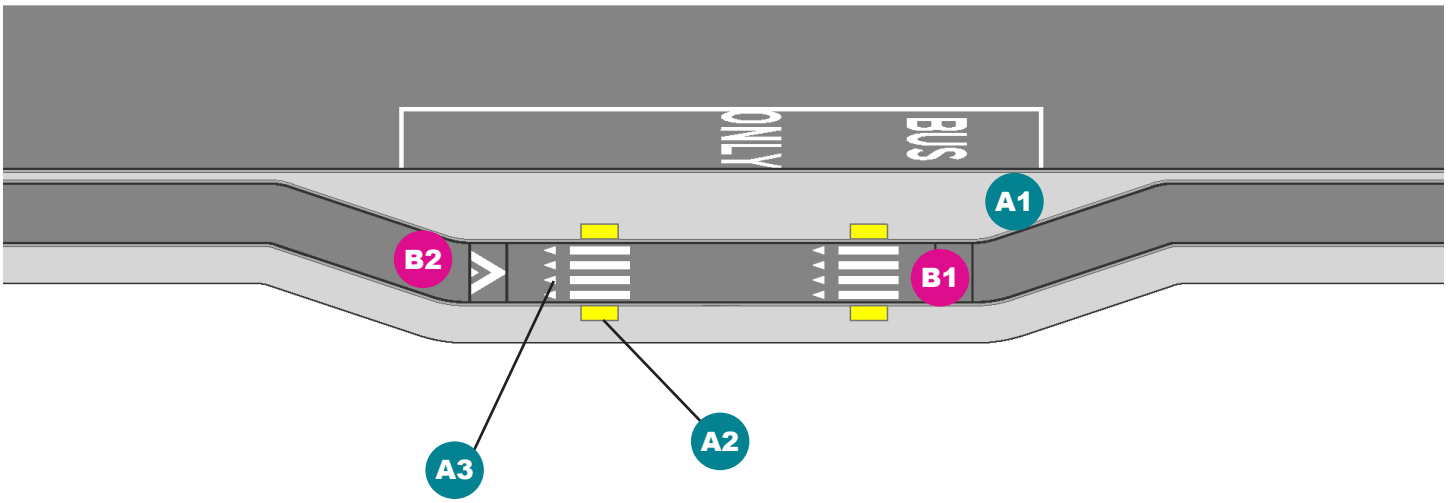
B5 Leaning rails may be installed along the edge of the bus island to provide further separation between the bikeway and bus island. These should only be installed where the bikeway is wide enough so that people biking do not get handlebars caught in the railing (generally, 6-feet or wider is preferred).

Reference Documents

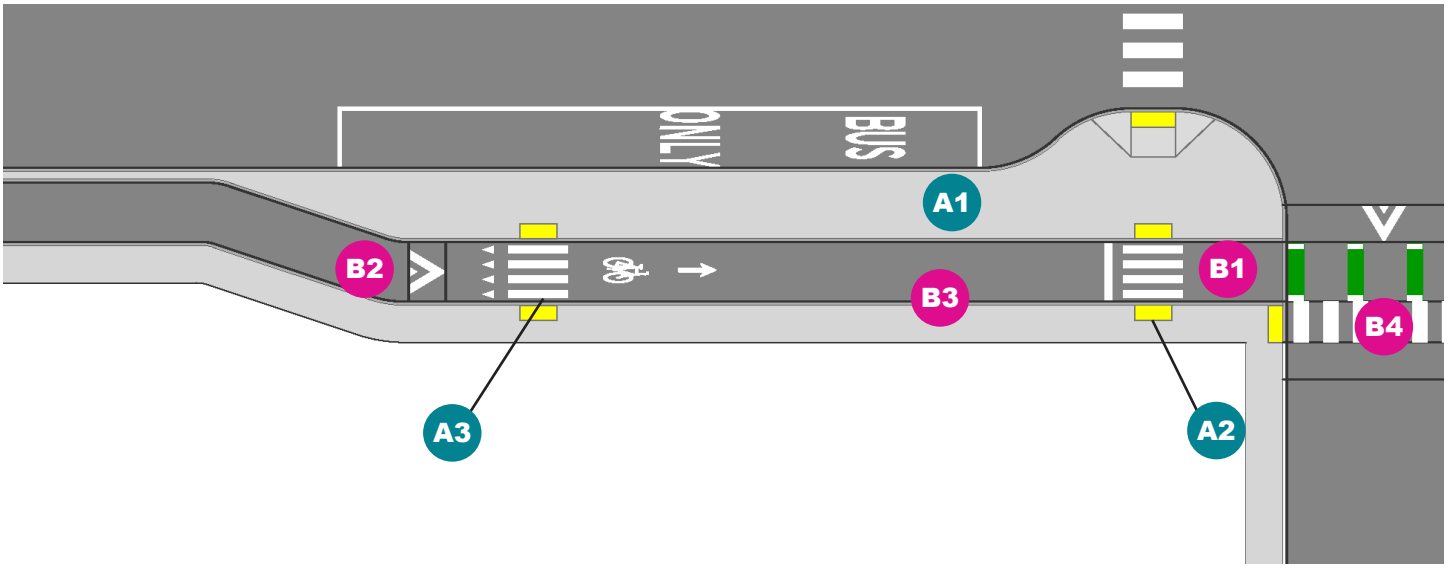
The bus island concepts shown are an examples of how treatments could be combined to maintain a comfortable place for people walking and biking while also supporting people with disabilities. For formal design guidance, refer to the following documents or others, as new guidance becomes available:

- Texas MUTCD
- NACTO Urban Bikeway Design Guide, Transit Street Design Guide
- AASHTO Guide for the Planning, Design, and Operation of Pedestrian Facilities
- AASHTO A Policy on Geometric Design of Highways and Streets
- Accessibility requirements ADA Std. 810.2.2

Mid-Block Bus Island Configuration*



End of Block Bus Island Configuration*

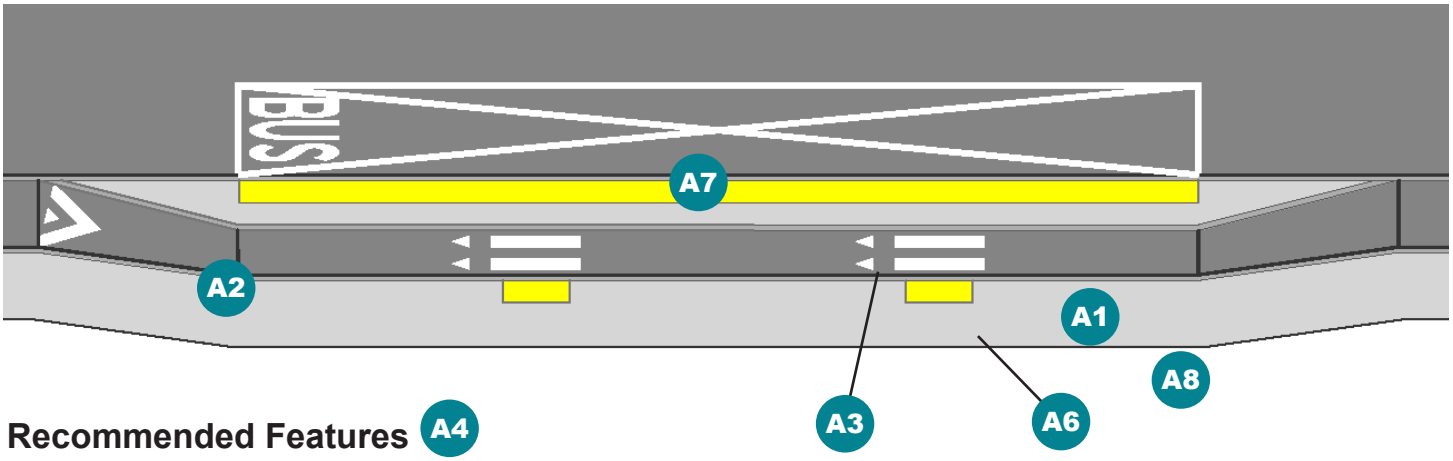


*Shared use paths and separate bike facilites are recommended to include bus islands. Where feasible, bikeways and walkways should be separated to eliminate bus-bike “leapfrogging” conflict at stops.

Bus Stops

Constrained Bus Stops

Where a full bus island cannot be provided due to right of way or other space constraints, it is still desirable to maintain separation between the bike lane and bus stop. In these cases, the bike lane may be raised to sidewalk level and should run along the bus boarding area. When no buses are present, people can bike through the boarding area and people waiting for the bus wait on the sidewalk out of the bikeway. People biking yield during bus loading and unloading. Detectable warning strips may be placed along the edge of the sidewalk where passengers step into the raised boarding area and along the curb where passengers board the bus. The whole width of the separated bicycle lane can be used as the accessible boarding area for wheelchair lifts from the bus. However, stops must provide wheelchair users an accessible waiting area outside of the bike lane.



Recommended Features A4

A1 Bus boarding areas must have a 5 x 8-feet clearance space where boarding and alighting occurs for ramp deployment and have a 4-feet clear pedestrian path.

A2 Raise the bike lane to sidewalk level throughout the length of the intended bus stop.

A3 Bike yield lines and a crosswalk across the bikeway indicate to people biking to yield to people walking.

A4 The bikeway may be narrowed to 4-feet at bus islands in constrained areas.

A5 The accessible waiting area is on the sidewalk. Any transit amenities should be placed on the sidewalk.

A6 Detectable warning surfaces should be placed at transitions between sidewalks and the crossings.

A7 Detectable warning surfaces should be placed along the entire length of the edge of the boarding platform.

A8 A minimum 4-feet wide buffer should be placed between the curb and the bikeway.

Reference Documents

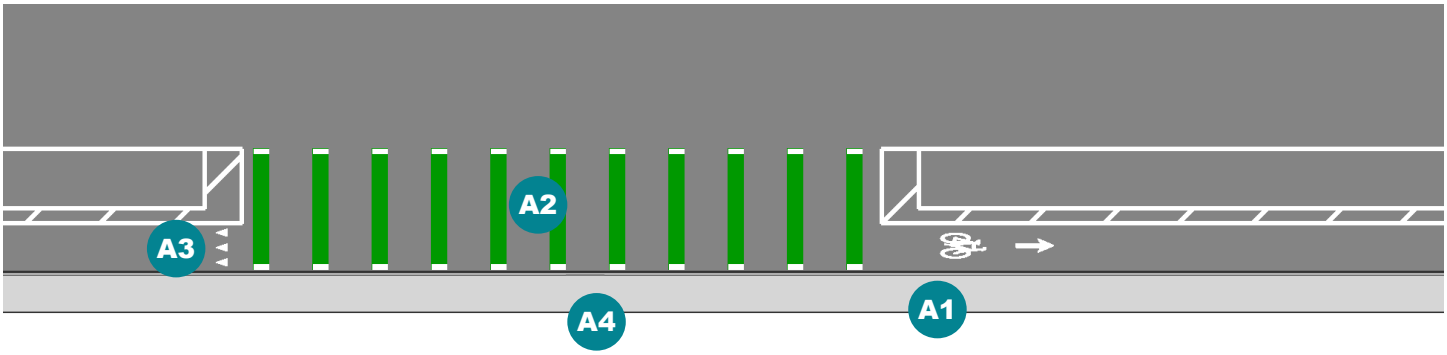
The concept shown is an example of how treatments could be combined to maintain a comfortable place for people walking and biking while also supporting people with disabilities. For formal design guidance, refer to the following documents or others, as new guidance becomes available:

- Texas MUTCD
- NACTO Urban Bikeway Design Guide, Transit Street Design Guide
- AASHTO Guide for the Planning, Design, and Operation of Pedestrian Facilities
- AASHTO A Policy on Geometric Design of Highways and Streets
- Accessibility requirements ADA Std. 810.2.2

Bus Stops

Curbside Bus Stops

Where bus volumes are low (less than four buses per hour) and/or other constraints prevent the construction of stops that separate the bus from the bike lane, curbside bus stops are a low-cost option. In these stops, the bus merges into the bike lane, and people biking must either merge into traffic to bypass the bus or wait for the bus to move. Where on street parking is present, a curbside pullout may be used and the bike lane can be routed around the bus stop. This configuration may be more comfortable than the traditional curbside bus stop. In all cases, green conflict markings should be used to indicate the shared area for all users.



Recommended Features

A1 Bus boarding areas must have a 5 x 8-feet clearance space where boarding and alighting occurs for ramp deployment and have a 4-feet clear pedestrian path.

A2 Paint conflict markings through the entire width of the bus stop to indicate to people biking buses may stop there.

A3 Bike yield lines indicate to people biking they should yield to the bus.

A4 The accessible waiting area is on the sidewalk. Any transit amenities should be placed on the sidewalk.

Reference Documents

The concept shown is an example of how treatments could be combined to maintain a comfortable place for people walking and biking while also supporting people with disabilities. For formal design guidance, refer to the following documents or others, as new guidance becomes available:

- Texas MUTCD
- NACTO Urban Bikeway Design Guide, Transit Street Design Guide
- AASHTO Guide for the Planning, Design, and Operation of Pedestrian Facilities
- AASHTO A Policy on Geometric Design of Highways and Streets
- Accessibility requirements ADA Std. 810.2.2

Page Intentionally Left Blank

Wayfinding

Wayfinding helps people navigate from one location to another, using visual cues and information systems. Clear signage and markers help people biking avoid getting lost, minimize travel time, and enhance their overall experience. Good way finding systems can also increase the comfort of people biking by directing riders to lower-stress routes or to locations where bike facilities are present. This section presents some options for wayfinding signage. The City may wish to develop a comprehensive, branded wayfinding program.

Wayfinding Signage

MUTCD Section 9b.20 Bicycle Guide Signs presents comprehensive guidance on signs, and Section 9B.01 of the MUTCD gives specific design details on the placement of signs including mounting height and lateral placement from the roadway. The information in the following section provides information on key signage that can help to guide people biking through San Antonio.

Confirmation Signs

Indicates to people biking that they are riding along a designated bikeway and alerts people driving to expect higher volumes of bike riders along the roadway. Confirmation signs can be as simple as a BIKE ROUTE (MUTCD D11-1) or can be a community-branded sign with additional details such as distances to major destinations along the route.

Confirmation signs should be placed every 2-3 blocks along a bike boulevard, and especially after turns to confirm to riders they are taking the correct route. For shared use paths, confirmation signs should be placed every quarter to half mile.

D11-1

D11-1bP

M1-8b

M1-8

Turn Signs

Indicates to people biking that the intended bike path turns from one street to another. Arrows are used with these signs to indicate the direction people biking should follow in order to remain on the bikeway.

Turn signs should be placed on the near side of intersections where the bike route turns.

D1-2b

D1-3a

D1-1b


M5-2P M6-1P M6-2P M6-3P M6-4P M6-5P M6-6P M6-7P

Decision Signs

Decision signs indicate to people biking that there are two or more bikeways that converge or diverge and inform the rider of which route leads where. These signs often include information such as directional arrows and distances to key destinations.

Decision signs should be placed on the near side of intersections where two or more bikeways meet.

D1-3c

D1-3a

Page Intentionally Left Blank

Page Intentionally Left Blank

Bike Parking

Safe, convenient, and accessible bike parking is an important component of the bike network. People may decide whether or not to bike based on if there is parking at their destination and if they feel confident their bike will not be damaged or stolen. In order to ensure this, bike parking should be reliably available throughout the city, especially where there are concentrations of businesses or other destinations. The following section provides guidance on where to install bike parking and the potential options that could be provided.

Bike Parking

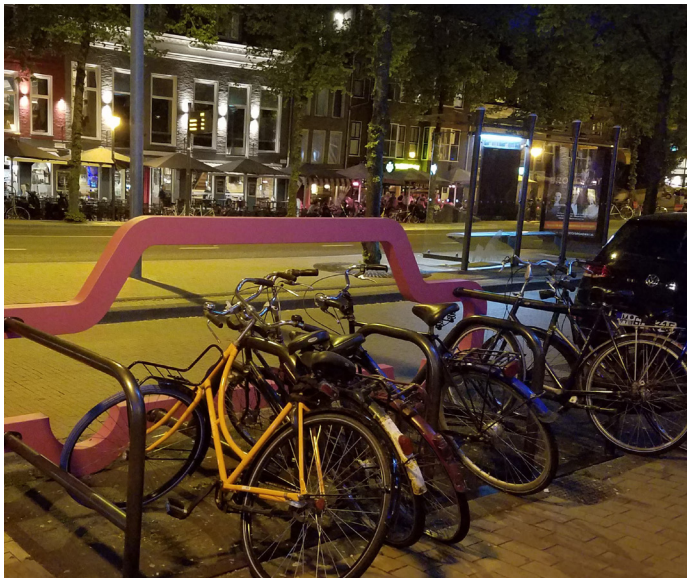
The City of San Antonio requires that bike parking be built in certain areas based on the Unified Development Code (UDC) Section 35-525 - Parking and Loading Standards. The number of bike parking spaces required is based on a percentage of required vehicle spaces. The UDC generally leaves it up to the discretion of the developer whether these spaces are short- or long-term spaces in most areas. In the Downtown and Infill Development Districts, a larger minimum rate of bike parking is required. In the UDC, bike parking is required to be provided within 50-feet of a primary building entrance and every 150-feet along the facade of a building with multiple tenants. As the City implements the Bike Network Plan, the following additional considerations and guidance should be considered.

Location and Siting of Bike Parking

Bike parking should be located at all destinations where people may choose to bike, including:

- Commercial districts, grocery stores, and convenience stores
- Parks and recreation sites
- Schools and universities
- Libraries, community centers, churches, post offices museums, and other community serving destinations
- Employment centers
- Transit centers
- High density residential areas

Bike parking may be located within the public right-of-way on sidewalks or within on-street parking spaces. It may also be located on private property especially in secured garages or bike cages, if built by developers.



Types of Bike Parking

The type of bike parking selected should be based on factors such as the anticipated duration of a stay, type of destination, security needs, and proximity to a destination. Based on this, the designer can determine whether long- or short-term bike parking is preferable.

Short-Term Bike Parking

Short-term bike parking accommodates people who are visiting a destination for approximately two hours or less, such as a grocery store, healthcare office, restaurant, or gym. Short-term visitors may be less familiar with the area and prioritize visibility and access to their bike, and so short-term bike parking spaces should be placed within eyesight of a building entrance. Short-term bike parking in other locations, such as alleys or unsecured locations in parking garages, may be less secure and should be avoided. The following considerations are relevant for short-term bike parking:

- Placed in visible locations close to entrances (50-feet or less)
- Racks should be securely fastened to the ground, accommodate U-locks, and support the bicycle at two points to allow the frame and both wheels to be locked
- Consider adding a weather-protected cover
- Should be well lit
- Location should be visible to the public or seen from within the destination
- May be co-located with amenities such as bike repair stations
- May be designed with creative shapes or colors

Examples of Short-Term Bike Parking Options

U-Rack

Source: Kittelson & Associates

Bike Corral

Source: Kittelson & Associates

Creative Bike Racks

Source: Kittelson & Associates

Long-Term Bike Parking

Long-term bike parking is intended to store bike for several hours or more. This type of parking accommodates regular visitors, like employees, students, residents, or public transit users. Because users leave their bike for long periods unattended, security is critical, as is weather protection. That said, location convenience is less important for long-term users. People may choose to leave their bike long term in a secure space in a building lobby or parking garage, as opposed to prioritizing highly visible locations in front of main entrances. The following considerations are relevant for long term bike parking:

- Signage should be present for first-time users
- Locations may vary, but secure facilities are most important
- Should be directly accessible without stairs
- Should be designed to fit larger bikes like cargo bikes
- May include outlets for e-bike charging
- May be co-located with other amenities like a bike shop or repair station
- Security may include individual user locks, keys, smart cards, mobile applications, or other technologies

Examples of Long-Term Bike Parking Options

Bike Hangar

Source: Transport for London

Bike Locker

Source: King County Metro

Bike Storage Room

Source: Kittelson & Associates

Page Intentionally Left Blank

Bike Signals

Bicyclist movements can often be controlled by vehicle or pedestrian signals. However, where protected bike lanes are used, at complex crossings, where there is a desire to let people biking get a head start, or in other unique situations, a bike signal may be used. Bike signals are signals specifically designed to facilitate crossings for people on bikes. They operate similarly to vehicle signals, but may include a special bike symbol in the signal head. These signals should only be used in conjunction with a conventional traffic signal, and can help address safety or operational challenges. This section provides high-level guidance on when and how to use bike signals. The decision of if and when to install a bicycle signal and how to design phasing should be made based on engineering judgment and consider the needs of everyone crossing through the intersection.

When to Consider a Bike Signal

MUTCD Chapter 4H Bicycle Signals presents comprehensive guidance on the installation and other elements of bicycle signals. The information in the following section provides guidance on when bicycle signals may be appropriate.

When Bicycle Signals May Be Considered

Bike signals may be appropriate in many scenarios, and the determination to use them should be based on an holistic evaluation of the study area, warrant considerations, and engineering judgement. The Federal MUTCD provides warrants for the installation of bike signals where a new traffic control signal is being installed in Chapter 4C; however, it is noted that the installation of bike signals at existing traffic control signals should be made based on engineering judgement.

Locations where it may be appropriate to install bike signals include, but are not limited to:

- Providing a protected bicycle signal phase;
- Providing a leading or lagging bicycle interval or to make it legal for a person biking to enter the intersection; during an all-pedestrian phase;
- Controlling a bicycle through movement for a bicycle lane running on the right-hand side of a right-turn lane, such as for protected bike lanes or through bike lanes;
- At protected intersections, dedicated intersections, or bend outs;
- At intersections with unique bicycle movements, such as a diagonal transition
- To provide for a bike through movement across a T intersection where no concurrent vehicle movement exists;
- Where there are high volumes of right turning vehicles (greater than 150 vehicles per hour for a one-way separated bikeway or 100 vehicles per hour for a two-way separated bikeway or sidepath);
- Controlling a bicycle through movement for contraflow bike lanes or two-way bikeways; and
- Locations where existing traffic signal heads are not visible to people biking.

In general, bike signals should be consistently installed along a corridor if they are used. Otherwise, it can be confusing for people biking if they must look for a combination of vehicle, pedestrian, and/or bike signals.

Bike Signals

Bike Signal Equipment and Faces

The MUTCD establishes requirements for where bike signal displaces can be placed at an intersection. Generally, they may be placed on the near- and far-side at an intersection and are co-located with vehicle traffic signals. The following guidance supplements what is noted in the MUTCD.

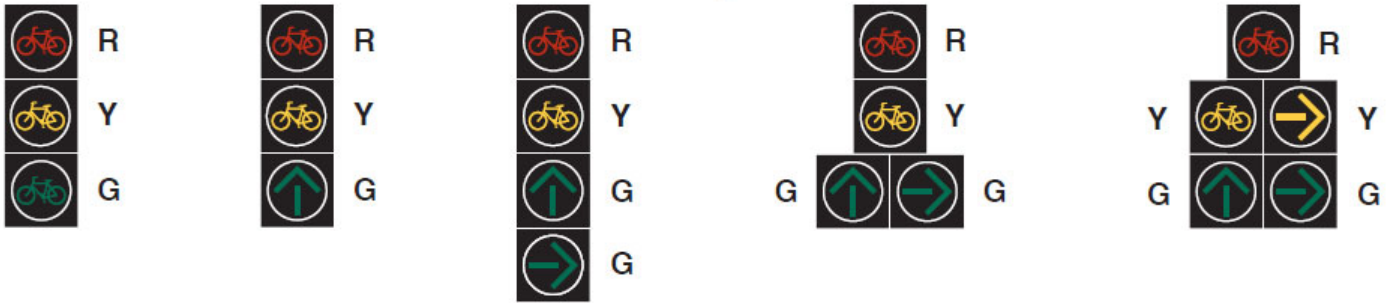
Bicycle Signal Equipment and Faces

Bicycle signal faces may be designed as standard signal faces or may include a bike stencil. The following elements should be considered in bike signal design:

- If designed as a standard signal face, a “BICYCLE SIGNAL” plaque (R10-10b) is required. The sign is optional if a bike stencil is used.
- Bike signal faces may be designed using an 8- or 12-inch circular indicators. If a secondary, near-side signal is installed, 4-inch circular indicators may be utilized on the nearside signal.
- One bike signal face is sufficient, but a second face may be provided to provide additional clarification and guidance for people biking.
- Bike signal heads to should be designed to be visible by people biking. This is especially important in locations with contraflow or two-way bikeways.
- Bike signals may be designed with shielded louvres to prevent confusion for vehicle drivers.
- Bike signals shall be placed a minimum of 7-feet above sidewalk or the ground. If a 4-inch nearside signal is used, the signal face shall be a minimum of 4-feet and a maximum of 8 feet above the ground.

Typical Arrangements of Bike Signal Faces

Vertical Faces



Horizontal Faces

Source: FHWA MUTCD Attachment IA-16-1

Bicycle Detection

The bike signal phase may or may not occur every phase. If actuation is required, passive actuation is preferred using bike loop detectors over requiring people biking to use push buttons. If push buttons are used, they should be mounted in a way that does not require people biking to dismount.

If a push button is used, it shall be accompanied by appropriate regulatory signs (MUTCD R10-4, R10-24, or R10-26) explaining the purpose and operation of the push button. If the push button is intended to be used by both people walking and biking, the button must be designed to meet all accessibility needs.

Bike Signal Phasing

There are a variety of types of phasing that may be used to reduce potential conflicts between people biking and other roadway users or to increase convenience for people biking. Overall waiting time, among other elements, should be considered when determining a signal phasing plan. The following section presents a non-exhaustive discussion of potential phasing options. For more information, please see the NACTO Urban Bikeway Design Guide and/or the FHWA Separated Bikeway Planning and Design Guide.

Clearance Intervals

There are no national standards for determining the appropriate clearance intervals for bike signals. People biking typically require longer minimum green times than drivers because people biking move slower than drivers. Therefore bicycle minimum clearance times should be determined using the time it would take an average person to cross the width of the intersection on a bike. The NACTO Urban Bikeway Design Guide recommends utilizing 14-feet per second, or 9.5 mph, as an average intersection crossing speed. Additional time may be provided for start-up time. Yellow and all-red intervals may be incorporated into the vehicle phases as long as the minimum clearance time is met.

Phasing Options

The following phasing options may be considered at bike signals:

Phasing Option	Description	Benefits	Constraints
Leading Bike Interval	People biking are provided a 3- to 5- second head start in front of all vehicles. This treatment may also provide a head start for people walking.	• People walking and biking enter the intersection before drivers • Improved visibility and reduced conflict potential between all users	• Increased delay for drivers • May be less appropriate in areas with high volumes of right-turning drivers
Protected	Vehicular right turns on red are prohibited during the bike through movement. Then, through bike movements are halted and drivers are permitted to turn across the bike path.	• People biking and walking are fully separated from right-turning vehicles • Drivers are not required to yield when turning	• Longer cycle lengths may be required • Requires a right-turn lane
Protected - Permissive	Through-moving vehicles start at the same time as people biking and walking. A flashing yellow turn phase is then provided for right-turning vehicles.	• People walking and biking can enter the intersection before right-turning vehicles • Improved visibility and reduced conflict potential between all users	• May be less appropriate in areas with high volumes of right-turning drivers
Bike Only Phase	All vehicle traffic is stopped and people biking may move through the intersection. The current MUTCD does not allow bike scrambles.	• People biking and walking are fully separated from drivers • Drivers are not required to yield to other users	• Increases delay for all users, which may result in reduced compliance

Page Intentionally Left Blank

Page Intentionally Left Blank

Appendix

What are the Right Bike Facility Types for San Antonio?

Building off national guidance, San Antonio's bicycle facility selection is a context-sensitive approach that involves a planning- and engineering-based process. As motor vehicle speeds and volumes increase and as the urban form changes, more separation between bicyclists and motor vehicle traffic may be necessary. The following table outlines recommended and allowable bicycle facility types for San Antonio's unique streets and their surrounding contexts .

Primary Arterials

■ **Preferred Facility** ● Alternative Options to Consider***

Number of Lanes	Speed*	Traffic Volumes**	Bike Boulevard	Striped Bike Lane	Buffered Bike Lane	Protected Bike Lane (At-Grade)	Protected Bike Lane (Raised)	Shared Use Path	Alternative Route
Low Density Neighborhood									
2-4 Lanes	40 MPH	Up to 30,000				■	■	■	●
6 Lanes	40 MPH	> 30,000				■	■	■	●
2-6 Lanes	45 MPH	Up to 30,000				● (Not on 6 lanes/45 MPH)	■	■	●
		> 30,000				● (Not on 6 lanes/45 MPH)	■	■	●
Medium Density Neighborhood									
2-4 Lanes	40 MPH	Up to 30,000				■	■	■	●
6 Lanes	40 MPH	> 30,000				■	■	■	●
2-6 Lanes	45 MPH	Up to 30,000				● (Not on 6 lanes/45 MPH)	■	■	●
		> 30,000				● (Not on 6 lanes/45 MPH)	■	■	●
High Density Neighborhood									
2-4 Lanes	40 MPH	Up to 30,000				■	■	■	●
6 Lanes	40 MPH	> 30,000				■	■	■	●
2-6 Lanes	45 MPH	Up to 30,000				● (Not on 6 lanes/45 MPH)	■	■	●
		> 30,000				● (Not on 6 lanes/45 MPH)	■	■	●
Employment/Activity Center									
2-4 Lanes	40 MPH	Up to 30,000				■	■	■	●
6 Lanes	40 MPH	> 30,000				■	■	■	●
2-6 Lanes	45 MPH	Up to 30,000				● (Not on 6 lanes/45 MPH)	■	■	●
		> 30,000				● (Not on 6 lanes/45 MPH)	■	■	●
Industrial/Agicultural									
2-4 Lanes	40 MPH	Up to 30,000				■	■	■	●
6 Lanes	40 MPH	> 30,000				■	■	■	●
2-6 Lanes	45 MPH	Up to 30,000				● (Not on 6 lanes/45 MPH)	■	■	●
		> 30,000				● (Not on 6 lanes/45 MPH)	■	■	●
Recreation/Open Space									
2-6 Lanes	<35 MPH	Any				■	■	■	●
2-6 Lanes	> 40 MPH	Any				● (Not on 6 lanes/45 MPH)	■	■	●
Central Business District									
2-4 Lanes	30 MPH	Up to 30,000				■	■	■	●
6 Lanes	30 MPH	> 30,000				■	■	■	●
2-6 Lanes	35 MPH	Up to 30,000				● (Not on 6 lanes/45 MPH)	■	■	●
		> 30,000				● (Not on 6 lanes/45 MPH)	■	■	●

* Represents design speed for future roads and posted speed for existing roads.
** Represents projected future year traffic volumes and not Design ADT.

*** Alternative options may be considered if the preferred facility type does not fit within the right-of-way. Coordination with the Transportation Department should be performed to ensure connectivity.

Note: Please refer to the individual bicycle selection context sheets for detailed footnotes.

What are the Right Bike Facility Types for San Antonio?

Building off national guidance, San Antonio's bicycle facility selection is a context-sensitive approach that involves a planning- and engineering-based process. As motor vehicle speeds and volumes increase and as the urban form changes, more separation between bicyclists and motor vehicle traffic may be necessary. The following table outlines recommended and allowable bicycle facility types for San Antonio's unique streets and their surrounding contexts .

Secondary Arterials

■ **Preferred Facility** ● Alternative Options to Consider***

Number of Lanes	Speed*	Traffic Volumes**	Bike Boulevard	Striped Bike Lane	Buffered Bike Lane	Protected Bike Lane (At-Grade)	Protected Bike Lane (Raised)	Shared Use Path	Alternative Route
Low Density Neighborhood									
2 Lanes	35-40 MPH	Any			●	■	■	■	●
2-4 Lanes	40 MPH	Any			● (Not on 4 lanes/40 MPH)	●	■	■	●
Medium Density Neighborhood									
2 Lanes	35-40 MPH	Any			●	■	■	■	●
2-4 Lanes	40 MPH	Any			● (Not on 4 lanes/40 MPH)	●	■	■	●
High Density Neighborhood									
2 Lanes	35-40 MPH	Any			●	■	■	■	●
2-4 Lanes	40 MPH	Any			● (Not on 4 lanes/40 MPH)	●	■	■	●
Employment/Activity Center									
2 Lanes	35-40 MPH	Any			●	■	■	■	●
2-4 Lanes	40 MPH	Any			● (Not on 4 lanes/40 MPH)	●	■	■	●
Industrial/Agicultural									
2 Lanes	35-40 MPH	Any			●	■	■	■	●
2-4 Lanes	40 MPH	Any			● (Not on 4 lanes/40 MPH)	●	■	■	●
Recreation/Open Space									
2-4 Lanes	40 MPH	Any			● (Not on 4 lanes/40 MPH)	■	■	■	●
Central Business District									
2-4 Lanes	30-35 MPH	Any			● (Only on 2 lanes/30 MPH)	■	■	■	●

* Represents design speed for future roads and posted speed for existing roads.

** Represents projected future year traffic volumes and not Design ADT.

*** Alternative options may be considered if the preferred facility type does not fit within the right-of-way. Coordination with the Transportation Department should be performed to ensure connectivity.

Note: Please refer to the individual bicycle selection context sheets for detailed footnotes.

What are the Right Bike Facility Types for San Antonio?

Building off national guidance, San Antonio's bicycle facility selection is a context-sensitive approach that involves a planning- and engineering-based process. As motor vehicle speeds and volumes increase and as the urban form changes, more separation between bicyclists and motor vehicle traffic may be necessary. The following table outlines recommended and allowable bicycle facility types for San Antonio's unique streets and their surrounding contexts .

Collector A/B

■ **Preferred Facility** ● Alternative Options to Consider***

Number of Lanes	Speed*	Traffic Volumes**	Bike Boulevard	Striped Bike Lane	Buffered Bike Lane	Protected Bike Lane (At-Grade)	Protected Bike Lane (Raised)	Shared Use Path	Alternative Route
Low Density Neighborhood									
2 Lanes	25 MPH	<3,000	■	●	●			●	●
2 Lanes	30 MPH	<3,000		■	■			●	●
2 Lanes	30 MPH	>3,000			■	■	■	●	●
Medium Density Neighborhood									
2 Lanes	25 MPH	<3,000	■	●	●			●	●
2 Lanes	30 MPH	<3,000		■	■			●	●
2 Lanes	30 MPH	>3,000			■	■	■	●	●
High Density Neighborhood									
2 Lanes	25 MPH	<3,000	■	■	●	●	●	●	●
2 Lanes	30 MPH	<3,000		■	■	●	●	●	●
2 Lanes	30 MPH	>3,000			■	■	■	●	●
Employment/Activity Center									
2 Lanes	25 MPH	<3,000	■	■	●	●	●	●	●
2 Lanes	30 MPH	<3,000		■	■	●	●	●	●
2 Lanes	30 MPH	>3,000			■	■	■	●	●
Industrial/Agicultural									
2 Lanes	30 MPH	Any			■	■	■	●	●
Recreation/Open Space									
2 Lanes	30 MPH	<3,000		■	■	●	●	●	●
2 Lanes	30 MPH	>3,000			■	■	■	●	●
Central Business District									
2 Lanes	25 MPH	<3,000	■	■	●	●	●	●	●
2 Lanes	25 MPH	>3,000	●	●	■	■	■	●	●
2 Lanes	30 MPH	<3,000		■	■	●	●	●	●
2 Lanes	30 MPH	>3,000			■	■	■	●	●

* Represents design speed for future roads and posted speed for existing roads.

** Represents projected future year traffic volumes and not Design ADT.

*** Alternative options may be considered if the preferred facility type does not fit within the right-of-way. Coordination with the Transportation Department should be performed to ensure connectivity.

Note: Please refer to the individual bicycle selection context sheets for detailed footnotes.

What are the Right Bike Facility Types for San Antonio?

Building off national guidance, San Antonio's bicycle facility selection is a context-sensitive approach that involves a planning- and engineering-based process. As motor vehicle speeds and volumes increase and as the urban form changes, more separation between bicyclists and motor vehicle traffic may be necessary. The following table outlines recommended and allowable bicycle facility types for San Antonio's unique streets and their surrounding contexts .

Collector C

■ **Preferred Facility** ● Alternative Options to Consider***

Number of Lanes	Speed*	Traffic Volumes**	Bike Boulevard	Striped Bike Lane	Buffered Bike Lane	Protected Bike Lane (At-Grade)	Protected Bike Lane (Raised)	Shared Use Path	Alternative Route
Low Density Neighborhood									
2 Lanes	35 MPH	Any				■	●	●	●
4 Lanes	35 MPH	Any				■	●	■	●
Medium Density Neighborhood									
2 Lanes	35 MPH	Any				■	●	●	●
4 Lanes	35 MPH	Any				■	●	■	●
High Density Neighborhood									
2 Lanes	30 MPH	<3,000		■	■			●	●
2 Lanes	30 MPH	>3,000			■	■	■	●	●
2-4 Lanes	35 MPH	Any				■	●	■	●
Employment/Activity Center									
2 Lanes	30 MPH	<3,000		■	■			●	●
2 Lanes	30 MPH	>3,000			■	■	■	●	●
2-4 Lanes	35 MPH	Any				■	●	■	●
Industrial/Agicultural									
2-4 Lanes	35 MPH	Any				■	●	■	●
Recreation/Open Space									
2-4 Lanes	35 MPH	Any				●	●	■	●
Central Business District									
2 Lanes	25 MPH	<3,000	■	■	●	●	●	●	●
2 Lanes	25 MPH	>3,000	●	●	■	■	■	●	●
2 Lanes	30 MPH	<3,000		■	■	●	●	●	●
2 Lanes	30 MPH	>3,000			■	■	■	●	●

* Represents design speed for future roads and posted speed for existing roads.

** Represents projected future year traffic volumes and not Design ADT.

*** Alternative options may be considered if the preferred facility type does not fit within the right-of-way. Coordination with the Transportation Department should be performed to ensure connectivity.

Note: Please refer to the individual bicycle selection context sheets for detailed footnotes.

What are the Right Bike Facility Types for San Antonio?

Building off national guidance, San Antonio's bicycle facility selection is a context-sensitive approach that involves a planning- and engineering-based process. As motor vehicle speeds and volumes increase and as the urban form changes, more separation between bicyclists and motor vehicle traffic may be necessary. The following table outlines recommended and allowable bicycle facility types for San Antonio's unique streets and their surrounding contexts .

Local A

■ **Preferred Facility** ● Alternative Options to Consider***

Number of Lanes	Speed*	Traffic Volumes**	Bike Boulevard	Striped Bike Lane	Buffered Bike Lane	Protected Bike Lane (At-Grade)	Protected Bike Lane (Raised)	Shared Use Path	Alternative Route
Low Density Neighborhood									
2 Lanes	25 MPH^	<3,000	■	●				●	●
Medium Density Neighborhood									
2 Lanes	25 MPH^	<3,000	■	●				●	●
High Density Neighborhood									
2 Lanes	25 MPH^	<3,000	■	■	●			●	●
Employment/Activity Center									
2 Lanes	25 MPH^	<3,000	■	■	●			●	●
Industrial/Agicultural									
2 Lanes	25 MPH^	<3,000		■	●			●	●
Recreation/Open Space									
2 Lanes	25 MPH^	<3,000	■	■	●			●	●
Central Business District									
2 Lanes	25 MPH^	<3,000	■	■	●			●	●

* Represents design speed for future roads and posted speed for existing roads.

** Represents projected future year traffic volumes and not Design ADT.

*** Alternative options may be considered if the preferred facility type does not fit within the right-of-way. Coordination with the Transportation Department should be performed to ensure connectivity.

Note: Please refer to the individual bicycle selection context sheets for detailed footnotes.

What are the Right Bike Facility Types for San Antonio?

Building off national guidance, San Antonio's bicycle facility selection is a context-sensitive approach that involves a planning- and engineering-based process. As motor vehicle speeds and volumes increase and as the urban form changes, more separation between bicyclists and motor vehicle traffic may be necessary. The following table outlines recommended and allowable bicycle facility types for San Antonio's unique streets and their surrounding contexts .

Local B/C

■ **Preferred Facility** ● Alternative Options to Consider***

Number of Lanes	Speed*	Traffic Volumes**	Bike Boulevard	Striped Bike Lane	Buffered Bike Lane	Protected Bike Lane (At-Grade)	Protected Bike Lane (Raised)	Shared Use Path	Alternative Route
Low Density Neighborhood									
2 Lanes	25 MPH^	<3,000	■	■	●			●	●
2 Lanes	25 - 30 MPH^	>3,000		■	●			●	●
Medium Density Neighborhood									
2 Lanes	25 MPH^	<3,000	■	■	●			●	●
2 Lanes	25 - 30 MPH^	>3,000		■	■			●	●
High Density Neighborhood									
2 Lanes	25 MPH^	<3,000		■	●				
2 Lanes	25 - 30 MPH^	>3,000		■	■				
Employment/Activity Center									
2 Lanes	25 MPH^	<3,000		■	●			●	●
2 Lanes	25 - 30 MPH^	>3,000		■	■			●	●
Industrial/Agicultural									
2 Lanes	25 MPH^	<3,000		■				●	●
2 Lanes	25 - 30 MPH^	>3,000		■	■			●	●
Recreation/Open Space									
2 Lanes	25 MPH^	<3,000		■	●			●	●
2 Lanes	25 - 30 MPH^	>3,000		■	■			●	●
Central Business District									
2 Lanes	25 MPH^	<3,000		■	●	●		●	●
2 Lanes	25 - 30 MPH^	>3,000		■	■	●	●	●	●

* Represents design speed for future roads and posted speed for existing roads.

** Represents projected future year traffic volumes and not Design ADT.

*** Alternative options may be considered if the preferred facility type does not fit within the right-of-way. Coordination with the Transportation Department should be performed to ensure connectivity.

Note: Please refer to the individual bicycle selection context sheets for detailed footnotes.


CITY OF
SAN ANTONIO
TEXAS