TECHNICAL REPORT 4
STREET DESIGN MANUAL EDITS & DESIGN STANDARDS

DALLAS
BIKE PLAN

2025

Introduction

The purpose of this technical report is to recommend edits to the City of Dallas Street Design Manual. Included in this report are the recommended edits to the applicable Sections, including a sub-section dedicated to bike facilities within Section 4, and updates to the Standard Construction Details (251D).

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SECTION 1 INTRODUCTION

1.4 STANDARDS

The following City standards, as currently amended, shall be used with the Street Design Manual in the design of thoroughfare and street pavements and the preparation of construction plans:

City of Dallas Standards:

- City of Dallas Complete Streets Design Manual
- City of Dallas Standard Construction Details, File 251D
- Dallas City Code
    - Chapter 9 - Bicycles
    - Chapter 28 - Motor Vehicles and Traffic
    - Chapter 43 - Street and Sidewalks
    - Chapter 51A - Dallas Development Code
- City of Dallas Street Process Manual
- City of Dallas Addendum to the NCTCOG Public Works Construction Standards
- City of Dallas Thoroughfare Plan
- Dallas Central Business District Streets and Vehicular Circulation Plan
- ~~City of Dallas 2011~~ Dallas Bike Plan
- City of Dallas Pavement Cut and Repair Standards Manual
- City of Dallas Traffic Barricade Manual
- Corridor Planning Documents and Standards (Forward Dallas! Comprehensive Plan)
- City of Dallas Drainage Design Manual
- City of Dallas Water and Wastewater Procedures and Design Manual
- City of Dallas Benchmarks (Vertical Control Manual)

Federal and State Regulations and Design Guides:

- Americans with Disabilities Act (ADA)
- ADA Accessibility Guidelines (ADAAG)
- ADA Standards for Accessible Design -(ADA Standards)
- Public Rights-of-Way Accessibility Guidelines (PROWAG)
- Texas Accessibility Standards (TAS)
- Texas Manual on Uniform Traffic Control Devices (TMUTCD)

- TxDOT Roadway Design Manual
- TxDOT Bridge Design Manual
- Texas Street and Highways Code and Texas Vehicle Code

Industry Standards and Design Guides:

- AASHTO Green Book
- NACTO Urban Street Design Guide
- NACTO Urban Bikeway Design Guide
- NACTO Transit Street Design Guide

Other Local Standards and Design Guides:

- Complete Streets Policy Statement, North Central Texas Council of Government (NCTCOG)
- NCTCOG Public Works Construction Standards
- NCTCOG iSWM Criteria Manual for Site Development and Construction
- DART Design Criteria Manual, Standard Drawings, and Standard Specifications
- Dallas County Fire Code

The *City of Dallas Complete Streets Design Manual* provides an improved method for the way streets are to be designed and built. The purpose of the Complete Streets Design Manual is to build streets that are safe and comfortable for all people using various modes of transportation. In addition, the manual incorporates more than just the travel lanes between the curbs into the design and considers the entire space that resides between buildings on either side of the streets.

The *City of Dallas Standard Construction Details (File 251D)* provides standard detailed paving, drainage, traffic control and related facility drawings showing construction items and features to be used with construction plans provided to the City of Dallas. Construction plan designs prepared for the City shall be consistent with Standard Construction Details, as currently amended. Specific details have specific functions and uses, and this set of standard details must not be considered a catalog from which to choose. Special situations will require the designer to develop special details for the approval of the Director prior to incorporating into the construction plans. The Standard Construction Details is maintained and updated by the Department of Public Works.

The *Dallas Development Code, Article VIII of Chapter 51A* provides the regulations governing plat requirements and their review by the City Departments. Paving infrastructure requirements for developments in the City of Dallas are given in this code. The Dallas Development Code is maintained and updated by the Department of Planning and Development.

The *Dallas Development Code, Article X of Chapter 51A* defines the Landscape and Tree Preservation Regulations, which establish regulations on type of landscape, landscape placement, landscape maintenance, and other factors influencing the landscape in an urban setting.

The *City of Dallas Street Process Manual* is a guide for designers to understand the process of planning and designing a street in the City of Dallas. The Street Process Manual provides information regarding each phase of the public or private development project from community engagement and conceptual design to documentation and approval requirements.

The *City of Dallas Addendum to the NCTCOG Public Works Construction Standards*, set forth exceptions and requirements of the City of Dallas, and are consequently the most current standards to be followed. These specifications take precedence over existing requirements and conditions listed in previous standards.

The *City of Dallas Thoroughfare Plan and the Dallas Central Business District Streets and Vehicular Circulation Plan* provide detailed discussion of the history, purpose, approach and goals of the thoroughfare system within Dallas and details the current functional and dimensional classifications of the thoroughfares in the City. The *City of Dallas Thoroughfare Plan* provides descriptions of designated routes and provides minimum and standard pavement cross sections. The plan is maintained and updated by the Mobility Planning Division of the Transportation Department.

The ~~*City of Dallas 2011 *~~*Dallas Bike Plan* identifies ~~suggested~~ routes for the bikeway system, and facility type for the routes ~~and provides design standards necessary to accommodate bicycles on the designated bike routes~~. The ~~City of Dallas 2011~~ Dallas Bike Plan is maintained and updated by the ~~Mobility~~ Transportation Planning Division of the Transportation Department.

[…]

The *AASHTO Green Book* provides guidance for designing geometric alignment, street width, lane width, shoulder width, medians, and other street features. AASHTO originated as a design guide for highways, so it does not fully address city street issues and often has recommendations which favor high speed car traffic over other modes. The *NACTO Urban Street Design Guide Urban Bikeway Design Guide*, and *Transit Street Design Guide* should be considered.

SECTION 2 STREET TYPES

2.3 DIMENSIONAL CLASSIFICATION

2.3.2 Maps and Listings

Table 2.3 Street and Thoroughfare Geometric Standards

Functional Classification	Dimensional Classification Category	Section Designation	Pavement Width (ft)[1]	Median Width (ft)	Parkway Width (ft)	Normal Right-of-Way (ft)
Principal Arterial	Standard (divided)	S-8-D	2-48	15	9.5	130
		S-6-D	2-36	15	10	107
	Minimum (divided)	M-6-D (A)	2-33	15	9.5	100
		M-6-D (B)[2]	2-30	15	7.5[3]	90
	Standard (couplet)	S-4-U	44	-	83	60
		S-3-U	36	-	10	56
	Minimum (couplet)	M-4-U [2]	40	-	10	60
		M-3-U	33	-	8.5	50
Minor Arterial	Standard (divided)	S-4-D	2-24	15	8.5	80
	Minimum (divided)	M-4-D (A)	2-22	15	10.5	80
		M-4-D (B)[2]	2-20	15	10	75
	Standard (undivided)	S-4-U	44	-	8[3]	60
	Minimum (undivided)	M-4-U[2]	40	-	10	60
Collector (Community/ Residential)	Standard	M-4-U[4]	40	-	10	60
		S-2-U	36	-	10	56
	Minimum	M-2-U	36	-	7[3]	50
Local Streets	Standard	S-2-U	36	-	10	56
		L-2-U (A)[5]	33	-	10	53
		L-2-U (B)[6]	26	-	12	50
	Minimum	M-2-U	36	-	7[3]	50
Alleys	Standard/Minimum	Alley	10	-	2.5	15

Notes

[1] Minimum and standard street sections are depicted in Figures 2.2 and 2.3.

[2] All pavement dimensions measured from face of curb. Additional pavement width may be~~is~~ required for all thoroughfares on a bike route designated in the ~~2011~~ Dallas Bike Plan. For those thoroughfares, parking widths are adjusted as necessary to stay within the normal right-of-way width listed. See the ~~2011~~ Dallas Bike Plan for further details.

[3] Section designations using ten-feet lanes should not be used for arterial streets carrying significant bus or truck traffic. Changes in thoroughfare sections require Thoroughfare Plan amendments. Use of section designations using ten foot lanes should be specifically approved by the Director.

[4] Use of Section designations with parkways narrower than 8.5' may require special sight distance considerations in curved sections and may require larger than normal comer clips at street intersections.

[5] Striped for 2 lanes

[6] Alleys may be required, depending on zoning

[7] Alleys required

SECTION 4 GEOMETRIC DESIGN

4.6 BIKE FACILITIES

The manuals listed below inform and supplement the bicycle design standards included in Street Design Manual and are used by the City of Dallas when planning and designing bicycle facilities.

- American Association of State Highway Transportation Officials Guide for the Development of Bicycle Facilities ("AASHTO Bike Guide"): The AASHTO Bike Guide provides guidance for bicycle planning considerations, bicycle parking, and maintenance, as well as geometric design for on-road facilities and shared use paths. Shared use paths, and many on-street bicycle facilities in the City of Dallas are consistent with the design parameters recommended in the AAHSTO Bike Guide. The guide also provides design criteria necessary for calculating stopping sight distance, signal timing clearance intervals, horizontal and vertical curves necessary to safely accommodate bicyclists.
- Texas Manual on Uniform Traffic Control Devices (TMUTCD): The TMUTCD sets guidelines for the selection, installation, and operation of appropriate traffic control devices. Specifically, the TMUTCD provides warrants and considerations for the application of traffic control devices, including markings, signs, and signals (Part 9 includes information on traffic control for bicycle facilities). Through TMUTCD and FHWA, there is a process for experimentation and interim approval of traffic control devices not included in the current version of the TMUTCD.
- National Association of City Transportation Officials (NACTO) Urban Bikeway Design Guide: The NACTO Urban Bikeway Design Guide provides recommendations and information on innovative bicycle facilities and design principles that are appropriate in urban areas such as the City of Dallas. The NACTO guide includes required, recommended, and optional considerations on treatments such as bicycle boxes, bicycle signals, and cycle tracks.
- Federal Highway Administration (FHWA) Bikeway Selection Guide: This FHWA guide presents factors and considerations, drawing on research where available, to help transportation practitioners make informed decisions about tradeoffs relating to the selection of bikeway types.
- Federal Highway Administration (FHWA) Separated Bike Lane Planning and Design Guide: This FHWA guide defines separated bike lanes, discusses context for use in low-stress bicycle networks, provides design guidance for midblock and intersection configurations, and discusses lessons learned from installations throughout the United States. The guide also provides guidance to accommodate driveways, transit stops, accessible parking, and loading zones with separated bike lanes. The guide includes a literature review of research on separated bike lanes within the United States.

~~4.3.7.1~~ 4.6.1 ~~Bikeways and Facilities~~ Bike Facility Types

~~A General~~

Bike ~~lanes~~ facilities in the Dallas Bike Plan are categorized under ~~three~~ four umbrellas: ~~(1) On-Street Shared, (2) On-Street Dedicated, and (3) Off-Street Bikeways~~(1) ~~Bike Boulevards~~Neighborhood Bikeways~~.~~, (2) Visually Separated, (3) Physically Separated, and (4) Trails. In addition, there are existing Bicycle Routes in Dallas—facilities with shared lane markings and signs, but without any further measures to enhance the

safety and comfort of bike riders. It is not recommended for additional Bicycle Routes to be established in Dallas, and the existing Bicycle Routes should be upgraded over time to one of the four categories of facilities listed below.

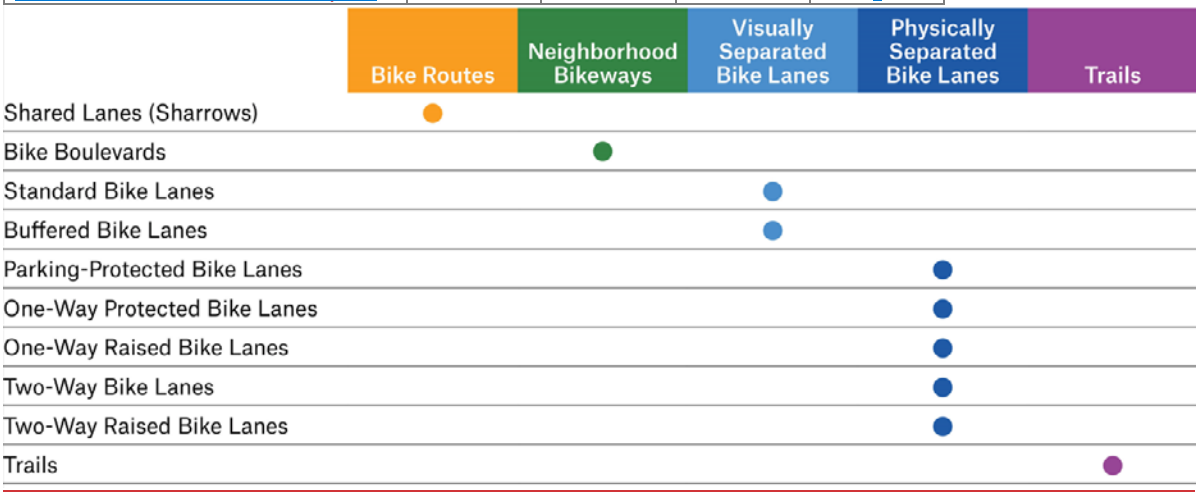
This manual provides general guidelines on design and selection of facility type. Refer to the *NACTO Urban Bikeway Design Guide* ~~and Dallas Bike Plan Addendum~~ for more detailed guidance on ~~cross~~ typical sections and treatments.

~~Bicycle facility types recommended by the Dallas Bike Plan can be categorized into these three umbrellas shown in~~ Table 4.1~~80~~ identifies the types of facilities that fall under the ~~four~~five categories of bike facilities:

Table 4.1~~80~~ Bike Facility Categorizations

	~~On-Street Shared~~	~~On-Street Dedicated~~	~~Off-Street Bikeways~~
~~Bicycle Boulevards~~	•		
~~Shared Roadways~~	•		
~~Climbing Lanes~~	•	•	
~~Cycle Tracks~~		•	
~~Paved Shoulder~~		•	
~~Shared Bus/Bike~~		•	
~~Shared Use Paths~~			•
~~Side Paths~~			•
~~Sidewalks~~			•

	~~Bike Boulevard~~	~~Visually Separated~~	~~Physically Separated~~	~~Trail~~
~~Bike Boulevard~~	•			
~~Standard Bike Lanes~~		•		
~~Buffered Bike Lanes~~		•		
~~Parking-Protected Bike Lanes~~			•	
~~One-Way Protected Bike Lane~~			•	
~~One-Way Raised Bike Lane~~			•	
~~Two-Way Protected Bike Lanes~~			•	
~~Two-Way Raised Cycle Tracks~~			•	
~~Trail / Shared Use Path / Sidepath~~				•



~~Where bike lanes are part of the complete street and the existing right-of-way condition provides limited pedestrian zone area for bike parking, some automobile parking spaces can be considered for conversion to "bike corrals" to provide for bike parking. Clearance considerations are required at fire hydrants, bus stops, loading zones, and above ground structures. When the Parking Zone is adjacent to bike lanes, design parallel parking and provide a solid white line separating the bike lane from the parking.~~

4.6.2 Selection of Bike Facility Type

The matrix shown in Figure 4.64~~X~~ should be used to determine the appropriate type of bike facility to install on a given roadway. Engineering judgement should be used~~.~~ given the specific conditions for any given roadway.

Figure 4.64~~X~~ Bike Facility Selection Matrix

FACILITY TYPES	Minimum Width*	Max Posted Speed*	Max Lanes*	Recommended Daily Volume*	Highest Functional Class**	Max Heavy Truck %	Preferred Application	Considerations
Bike Routes	*Facility Type is present in existing network but not recommended for future bike facility implementation.*							
Neighborhood Bikeway	N/A	30	2	<1,000	Local	<3%	Low-speed and low-volume local roads that provide bike facilities	1. May require signalized crossing of higher volume/speed roads 2. Traffic calming measures are necessary
Visually Separated Bike Lane	4 ft (no buffer) 7 ft (with buffer)	35	4	1,000-10,000	Community Collector	<5%	Local residential streets	1. Buffer is preferred 2. Bike lane pavement markings should continue through intersections and across larger driveways
Physically Separated Buffered Bike Lane (one-way)	7 ft (8 ft adjacent to parking lane)	40	6	>5,000	Arterial	N/A	Higher speed, higher volume roads	1. Availability of right-of-way 2. Number of driveways impacts bike safety 3. Bike lane markings should continue through intersections and larger driveways
Physically Separated Bike Lane (two-way)	11 ft	35	4	>5,000	Community Arterial	N/A	Urban core low-speed	1. Bike signalization recommended due to contra-flow movements. 2. Number of driveways impacts bike safety 3. Bike lane marking should continue through intersections and larger driveways
Trail / Shared-Use Path	12 ft (May be 8-10 ft if there are constraints)	N/A	N/A	N/A	N/A	N/A	When off-road bike facilities are advisable to support longer trips and when right-of-way or easements are available	Enhanced crossing treatments including signals (RRFBs, HAWKS, full signalization) for crossing higher volume and speed collector arterial roadways

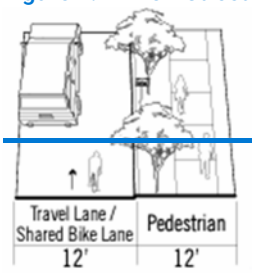
* Target Speed by Street Typology/Functional Classification; Dallas Street Design Manual.
** Typical Characteristics of Functional Classifications; Dallas Street Design Manual.
*** When floating bus stops are not employed.

~~B. On-Street Shared~~ 4.6.3 ~~Bike Boulevards~~Neighborhood Bikeways

~~On-Street Shared bicycle facilities allow bicycles and cars to share the same lanes as shown in Figure 4.19. For the safety and comfort of bicyclists, these are only recommended on streets with 1 lane in each direction or 2 lanes one-way, less than 30 mph target speeds, and an average daily traffic of less than 1,500. General design guidelines are provided here.~~

- ~~Streets may have parking on one or both sides.~~
- ~~Lanes shall be marked with shared bike lane signs. Refer to TMUTCD.~~
- ~~Roadside signage shall be employed to indicate shared lanes.~~

~~Figure 4.19 On-Street Shared Bike Route~~



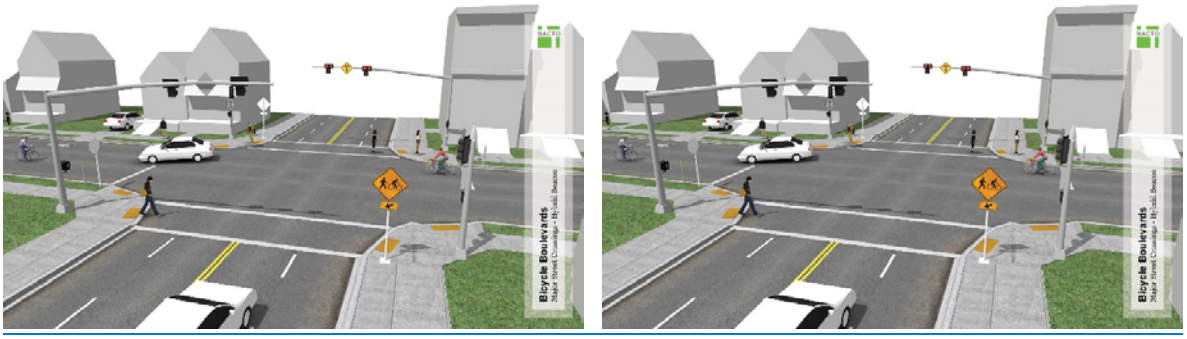
Neighborhood Bikeways ~~Bike Boulevards~~ are low-stress bikeways primarily located on low-volume, low-speed local residential streets. Similar to Bicycle Routes (also known as Shared Lanes or Sharrows) in that bicyclists ride with mixed traffic, treatments such as shared lane markings, wayfinding signs, and traffic calming and traffic diversion features are implemented to prioritize bicycle travel and minimize through motor vehicle traffic. A key aspect of Neighborhood Bikeways ~~Bike Boulevard~~ design is to ensure comfortable and safe crossings of intersecting arterials so that travel along the Neighborhood Bikeways ~~Bike Boulevard~~ can be maintained. Other design considerations include avoiding making bicyclists stop frequently, and still offering convenient access to land use destinations. Traffic calming and traffic diversion treatments that should be considered for Neighborhood Bikeways~~Bike Boulevards~~:

- Neighborhood Bikeways ~~Bike Boulevard~~ Signs and Pavement Markings
- Speed Management
- Volume Management
- Minor Street Crossings: stop signs on local cross streets, allowing the bicyclists on the Neighborhood Bikeways~~Bike Boulevard~~ to proceed without stopping.
- Major Street Crossings: at locations where the Neighborhood Bikeways ~~Bike Boulevard~~ crosses a major street with right-of-way priority, a variety of measure may improve visibility and reduce delay for bicyclists.
    - At unsignalized crossings of major streets, treatments that would be used to improve pedestrian crossing safety based on the conditions should be utilized. Treatments may include the following elements: advance warning signs, crosswalks and crossing warning signs for bicycles or bicycles and pedestrians (TMUTCD W11-1 or W11-15), median refuge island, Rectangular Rapid Flashing Beacons (RRFB) or Hybrid Beacons, or full traffic signals. On streets with few crossing gaps and high motor vehicle speeds and volumes, a bicycle/pedestrian-actuated hybrid beacon should be considered. This will reduce delay at non-peak times when bicyclists do not otherwise need to wait for a gap in traffic on the cross street as well as for users on the cross street, who are not delayed with a full signal. It also reduces the likelihood of generating cut-through traffic on the Neighborhood Bikeways ~~bicycle boulevard~~ route.
    - At signalized intersections, bicycle signal detection and actuation should be provided. Other elements that may be provided include a separate bicycle signal head can provide a leading bicycle signal phase, which allows bicyclists to begin crossing the street in advance of other traffic; or bike boxes to allow bicyclists to get to the head of the queue at signalized intersections. This allows them to take advantage of the typically short green time provided to the minor roadway at an intersection with a major roadway.
- Green Infrastructure

Figure 4.65~~X Bike Boulevard~~Neighborhood Bikeways Treatment Examples


SPEED LIMIT 20
Bicycle Boulevard


STOP



Source: NACTO

~~C. On-Street Dedicated~~ 4.6.4 Visually and Physically Separated Bike Lanes

4.6.4.1 General

Visually or physically separated bike lanes are exclusive lanes for bicycle travel, either separated from adjacent travel lanes with paint in the case of visually separated bike lanes, or a form of physical separation in the case of physically separated bike lanes. Visually separated bike lanes are always at street level. Physically separated bike lanes may be at street-level or sidewalk-level and may be one-way or two-way.

Design guidelines that apply to both on-street and off-street visually and physically separated facilities:

A. Placement:

1. Bike lanes are recommended on the right side of the travelway, in the same direction of car travel. However, where desired for connectivity or other purposes, two-way bike lanes on a one-way street may be permissible. Left-side bike lanes may also be used on one-way streets. Special treatment at intersection crossings must be verified.

B. Width:

1. Dedicated bike lanes in a given direction must be a minimum of 5 feet and a preferred width of 6 feet, which may include the gutter pan. This does not include space for buffers or physical separation, where provided. The minimum ridable width of bike lanes is 4 feet.

2. The recommended width of a two-way physically separated bike lane is 12 feet. The minimum width is 8 feet (4-foot lanes in each direction) with an additional 2 feet minimum for a concrete barrier, or a 3-foot buffer in a parking-protected configuration to safely accommodate opening vehicle doors.

C. Design Speed:

1. Bikeway Design Speeds:

   - Preferred: 18 mph
   - Minimum: 15 mph
   - Constrained: 10 mph

2. Context, such as elevation changes, shall be considered when choosing a bicycle design speed, as recommended by AASHTO. The presence of continuous downhill grades in the direction of travel allows for the consideration of bicycle design speeds in excess of 20 mph.

3. Bicycle facility design shall always treat a bicycle as a design vehicle, as defined by AASHTO. Turning simulation software can be helpful in determining if a bikeway or shared use path meets the requirements for design vehicle and design speed. Due to the design speed of bicycles, ramps between the raised bikeway level and Street Level should not be too abrupt, as this can lead to safety and comfort issues. Ramps that are for use on bikeways and shared use paths shall have a maximum slope of 4%. Increasing this to the maximum ADA slope of 8.33% shall only be allowed where constraints make this the only available option.

D. Horizontal Clearance:

1. Sign placement must meet minimum horizontal clearance distance requirements in Table 4.19~~—~~. Horizontal clearance is defined as the distance from the outside edge of sign to the edge of the bicycle facility or Urban Trail.

   Table 4.19~~———~~

Horizontal Clearance	Object height < 36 in.	Object height 36 in.—96 in.	Object height > 96 in.
Preferred	12 in.	18 in.	24 in.
Minimum	6 in.	12 in.	18 in.

2. A ~~-~~Horizontal clearances from vertical obstructions such as handrails and poles shall be 1 ft. from operating clear width. In highly constrained conditions, 6 in. setbacks may be permitted with approval from applicable staff. A curb is not considered on obstruction.

3. The object height is measured from the top of the sign to the ground elevation.

E. Cross Slope: Bicycle lanes are not required to maintain ADA cross slopes though 2% is the preferred cross slope. Up to 4% cross slope is permitted which can be helpful in making grades when cross sections have elevation change.

F. Pavement Markings and Signage: Bike lane markings and signs shall be placed at the beginning of the bike lane or cycle track, and at periodic intervals along the facility based on engineering judgement and in conformance with the TMUTCD.

G. Bike Lane Surface: A smooth surface is important for bicycle comfort and it is important for the surface to be durable and maintainable.

1. Joints shall be designed to ensure a smooth riding surface. Expansion or construction joints shall be minimized, and control joints shall be saw cut or achieved through use of zip strips or comparable method. Tooled control joints are prohibited due to the bumpy finish.
2. In retrofit situations, longitudinal seams shall be removed within the bike lane clear width by patching the surface material. Existing utility lids shall be adjusted to finished grade and examined on a case-by-case basis to determine if interventions are needed to reduce the risk of slipping.

~~———~~

4.6.4.2 Visually Separated Bike Lanes

Visually Separated Bike Lanes shall be separated minimally by a 6-inch solid white line, preferably with a distinctive pavement treatment such as green paint. Visually Separated Bike Lanes include standard bike lanes that are separated from the adjacent travel lane by a solid white line, and buffered bike lanes. See Figure 4.~~20~~66 for typical configurations.~~It is recommended for bicycle lanes to be between parking lanes and the pedestrian zone, but where required due to existing conditions, dedicated bicycle lanes may be between parking lanes and car lanes.~~

~~• Bicycle lanes are recommended on the right side of the travelway, in the same direction of car travel. However, where desired for connectivity or other purposes, two-way bike lanes on a one-way street may be permissible. Left-side bike lanes may also be used on one-way streets.~~

- ~~Bicycle lanes may be separated minimally by a 6-inch white line, preferably with a distinctive pavement treatment such as green paint.~~

- ~~Bicycle~~Buffered bike lanes ~~lanes shall~~ have a minimum 18-inch ~~2-foot~~ -wide buffer ~~on arterials and collectors (higher volumes, speeds of 35 mph or greater)~~ using wide parallel solid white lines~~stripes~~ or, when the buffer is 3 feet wide or greater, parallel stripes with diagonal stripes in between ~~at a minimum of 2 feet wide~~. Buffered bike lanes provide greater space for bicycling without making the bike lane appear so wide that it might be mistaken for a travel lane or parking lane.

- The solid white lines of the bike lane or buffered bike lane should be dashed where cars are expected to cross at driveways or intersections.

- When the Parking Zone is adjacent to bike lanes, design parallel and back-in angled parking ~~and~~ by providing~~e~~ a solid white line separating the bike lane from the parking. ~~[What about back-in angled parking?]~~

- Bike lanes may be between parking lanes and the pedestrian zone, but where required due to existing conditions, vision triangles, limitations, or other field considerations, dedicated bike lanes may be between parking lanes and vehicular travel lanes.

- A bike lane next to a parking lane shall be at least 5 feet wide. The desirable reach from the curb face to the edge of the bike lane (including the parking lane) is 14.5 feet. Whenever possible, minimize parking lane width in favor of increased bike lane width.

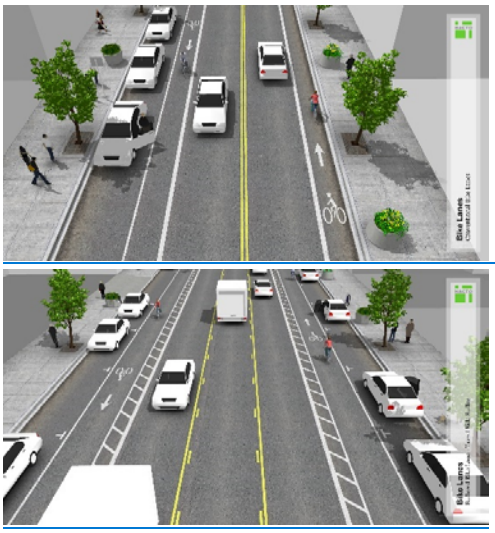
- A solid white line marking shall be used to separate motor vehicle travel lanes from the bike lane. An optional buffer between the bike lane and the parking lane reduces the risk of door zone conflicts.

- Very wide bike lanes may encourage illegal parking or motor vehicle use of the bike lane. When bike lanes are wider than 6 feet (including the buffer), physical separation measures should be evaluated.

Figure 4.66~~20~~ Visually Separated Bike Lanes~~Bicycle lanes may be protected using physical barriers such as bollards, armadillos, minimum 6-inch curbs or landscaping. These are recommended where bicycle ridership is high, adjacent traffic volumes or speeds are high, and at intersections to provide visible barriers for motorist.~~

- ~~Where separate from curbside bus lanes, bicycle lanes should be placed to the right of the bus lanes and be routed behind bus stops in islands.~~

  ~~Pavement signs and roadside signage should be employed for "BUS AND BIKE ONLY" or "BIKE ONLY".~~



~~Figure 4.20 Dedicated Bike Lanes and Facilities~~

Source: NACTO

4.6.4.3 Physically Separated Bike Lanes

Physically Separated Bike Lanes (also commonly referred to as cycle tracks or protected bike lanes) are physically separated from motor traffic and parking and from the sidewalk. These are recommended where, adjacent traffic volumes or speeds are high, where two-way bike lanes on one side of the road are used, and at intersections to provide visible barriers for motorist. Physical separation options include bollards, cycle lane separators, minimum 6-inch curbs or landscaping.

They may be at street-level, sidewalk-level, or an intermediate level and may be one-way or two-way.

Care must be given to the design of separated bike lanes at driveways and minor street crossings to maintain visibility of the cyclist to motorists and to reduce the risk of turning conflicts with motor vehicles. Color, yield lines, and "Yield to Bikes" signage should be used to identify the conflict area and make it clear that the cycle track has priority over entering and exiting traffic.

Figure 4.67~~X~~ Physically Separated Bike Lane ~~Configurations~~Typicals

Source: City of Seattle Right-of-Way Improvements Manual

B. Guidance for Street-Level Physically Separated Bike Lanes

- If at street level, they can be separated from motor traffic by raised medians, on-street parking, cycle lane separators or concrete wheel stops, or bollards. For all vertical separator elements, maintain a minimum 1-foot shy distance between the edge of the separator and the travel lane.
- In situations where on-street parking is allowed cycle tracks are located to the curb-side of the parking (in contrast to bike lanes). Pavement markings, raised median, or other barriers are used to separate the motor vehicle parking lane from the bike lane. In the absence of a median or curb, 3 feet is the minimum desired width of the painted buffer.
- Driveways and minor street crossings are a unique challenge for this facility type. Color, yield lines, and "Yield to Bikes" signage should be used to identify the conflict area and make it clear that the bike lane has priority over entering and exiting vehicles. Motor vehicle traffic crossing the bike lane should be constrained or channelized to make turns at sharp angles to reduce travel speed prior to the crossing.
- Concrete median islands consist of curbs 6-inches high and can vary in width. They are generally no narrower than 2 feet. They are the most permanent of protective elements and require the lowest maintenance, especially if formed below the roadway surface as opposed to being doweled in. These can be employed along an entire corridor or at intersection approaches. The installation of medians requires special consideration for drainage and should have regular breaks to accommodate drainage.
    - The barrier should have a 3-inch-radius on the travel lane side of the barrier. On the bicycling zone side, efforts should be taken to minimize the threat of pedal strikes. This can be done with a beveled curb on the bicycle lane side or a treatment in which the barrier slopes down to a 2-inch curb height on the bicycle lane side. As a point of reference, the average bicyclist's pedal has a 4-inch clearance from the ground. The approach end of the island (and both island ends adjacent to driveways) shall be tapered at 1:10 from the 6-inch curb height to a 2-inch curb height.
    - Do not install concrete islands between driveways or intersections where the island length would be less than 20 feet.
    - It may be beneficial to install white delineator posts on the approach ends of the concrete islands at public street intersections. Pay extra attention to the visibility of curbs, and barriers near intersections and major driveways. Place flexible delineators or object

markers on top of or in line with barriers and curbs. Check that people walking, biking, and driving can all see the separator.

- If the pavement quality of the area to be designated for the bicycling zone is low (PCI< 70) then, the pavement in that area should be improved before installing the barrier.

- On high-speed streets (i.e., multi-lane thoughfares, arterial streets, streets with prevailing speeds of 30 mph or higher, and where speed management is difficult, medians and high concrete barriers provide the greatest protection and comfort to riders according to NACTO. The wider and more durable the means of separation, the more comfortable the bikeway. Alternative designs that work well on high speed streets are raised bikeways and, in contexts with low pedestrian activity, shared-use paths.

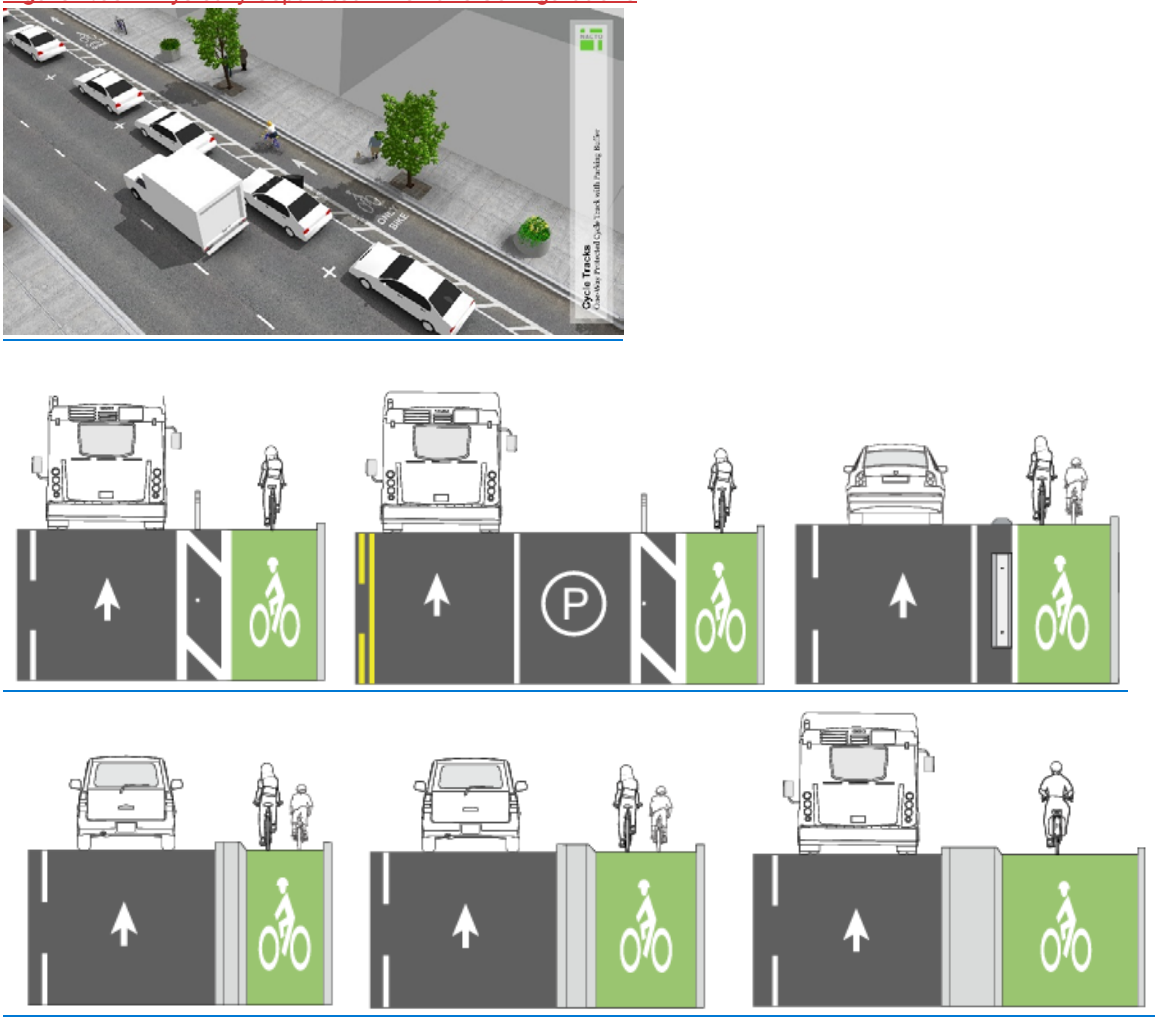
    - For improved comfort, a 4 foot (1.2 meter) or wider median supports built-in landscaping or planters placed on top of the median. Curbs or medians less than 3 feet (1 meter) wide are usually not preferred, but are better than delineator options like flex posts.

- On streets where parking is prohibited adjacent to the bike lanes and where is a high potential for incursion from drivers attempting to illegally park, construct medians or place concrete barriers or other heavy objects in the buffer to block drivers from entering the bikeway. Closely placed delineators can also deter vehicle entry, but over time, especially in areas with high frequency of motor vehicle strikes, the maintenance costs may become unsustainable.

- In relatively low speed, low-motor-vehicle-volume settings, off-the-shelf, modular items like flexible delineators, parking stops or armadillos, used alone or in combination can be helpful means of separation on streets that need immediate action. Typically, delineator-separated bikeways are most appropriate if bikeway upgrades can be guaranteed within a decade. If budgets are limited, NACTO recommends prioritizing the most durable means of separation at intersections, driveways, and locations with higher demand for motor vehicle parking, loading, or driving in the bikeway.

- Mountable means of separation can be installed in the buffer in front of driveways to allow vehicles to cross the bikeway at low speeds.

Figure 4.68 Physically Separated Bike Lane Configurations



Source: NACTO

B. Guidance for Raised Physically Separated Bike Lanes

Also commonly referred to as raised cycle tracks. The bike lane is same level as the pedestrian zone but separated into their own lane, or at an intermediate level between the pedestrian zone and the street.

- For sidewalk-level protected bike lanes where provision of dedicated buffer space between the bike lane and sidewalk is not possible, separation can be defined by a change in elevation or an edge treatment that provides visual contrast and a detectable surface for visually impaired persons. For sidewalk level protected bike lanes where there are likely to be high volumes of pedestrians and/or bicyclists, it is preferable for there to be a minimum 2" elevation difference between the pedestrian clear zone and the bike lane. This is to discourage improper use of either the bike lane by pedestrians or the sidewalk by bicyclists while providing a detectable edge for visually impaired persons. This visual delineation should extend to the intersection in order to encourage compliance from the point of entry of the bike lane and sidewalk. Signs or pavement markings may also be considered for sidewalk level facilities to reinforce appropriate use.

- A detectable surface should also be provided for visually impaired persons. The use of detectable warnings (i.e. truncated domes) should be reserved for locations where pedestrians are channelized to cross the protected bike lane or the roadway. The use of contrast-colored strips with ridges running parallel to the direction of travel can be considered for locations where the sidewalk and protected bike lanes are built at the same elevation. This type of strip assists low vision persons in determining the location of the edge of the sidewalk when a vertical drop to the protected bike lanes (i.e. a sidewalk curb) is not provided.

- A minimum 2' buffer (3' where curbside parking is present) should be provided between the bike lane and the adjacent travel lane or parking lane. There are a variety of ways to design this buffer. It can consist of a landscape strip, or where parking/loading is present, a hardscaped loading area.

- Where the bike lane is flush with the surface of the adjacent sidewalk, the selection of the bike lane surface material should provide a contrasting appearance. If configured at a flush height with the sidewalk, color, pavement markings, textured surfaces, landscaping, or other furnishings should be used to discourage pedestrian use of the cycle zone. Minimum 1 foot width.

- Fixed objects should be set back 12" from the bike lane.

- Off-street physically separated bike lanes, or cycle tracks, are those located in the parkways of streets or in public easements outside of the roadway curb lines. They are recommended for use with streets with target speeds of 40 mph or greater because they are physically separated from motorized vehicles and are not placed within the roadway section. They provide the greatest safety benefit to bike riders and are recommended over trails in areas with high pedestrian volumes. Design guidelines include:

  - ~~Where separate from pedestrian travel,~~ O~~o~~ne-way ~~bike lanes~~cycle tracks must have a minimum width of ~~8~~5 feet, and a preferred width of 7 feet in areas with high bicyclist volumes. ~~and~~ T~~t~~wo-way ~~bike lanes~~cycle tracks must have a minimum width of ~~12~~8 feet, and a preferred width of 12 feet in areas with high bicyclist volume. ~~Pedestrian clear zone must be a minimum of 5 feet wide and preferably wider.~~

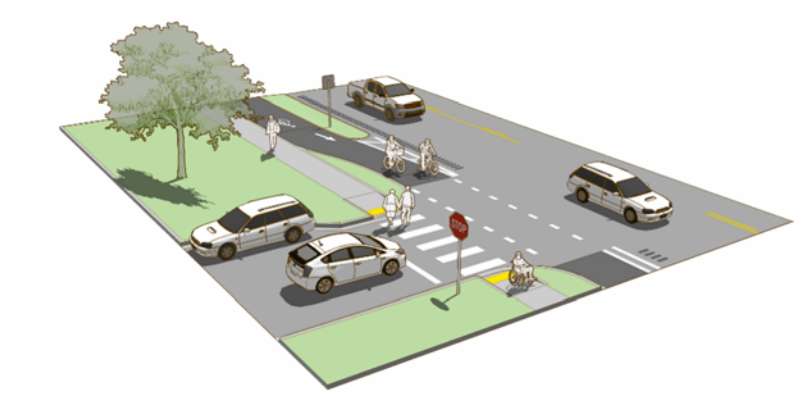
  - At intersections, the raised cycle track can be lowered and merged onto the street, or it can be maintained at sidewalk level, where bicyclists cross with pedestrians.

  - When configured next to a vehicle travel lane, the desired minimum width for the buffer space or mountable curb is 1 foot. The minimum width should be increased to three feet when the cycle track is configured next to a parking lane or the buffer space is used for streetlights, bollards, or low vegetation. If used, the mountable curb should have a 4:1 slope edge. This curb should not be considered a ridable surface when determining cycle track width.

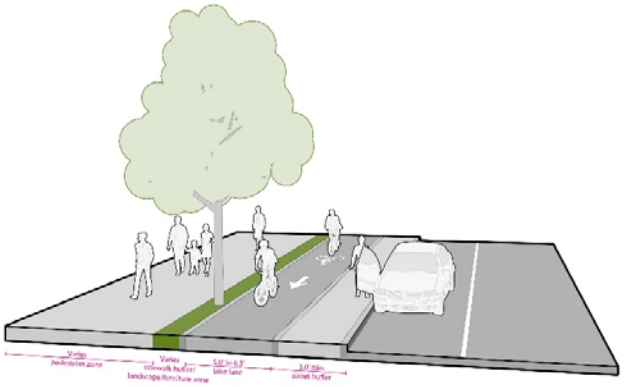
  - If configured next to a parking lane, 3 feet is the minimum desired width for a buffer to prevent dooring collisions. The buffer can be a street level or at the level of the bike lane. Parking should be prohibited near the intersection to improve visibility. The desirable no-parking area is 30 feet from each side of the crossing.

  - If mountable curbs are used at driveways to allow for entry and exit of the roadway, they should have 4:1 slope edge without any seams or lips to interfere with bike tires. When configured next to a motor vehicle travel lane, the desired minimum width of a mountable curb is 1 foot, depending on elevation

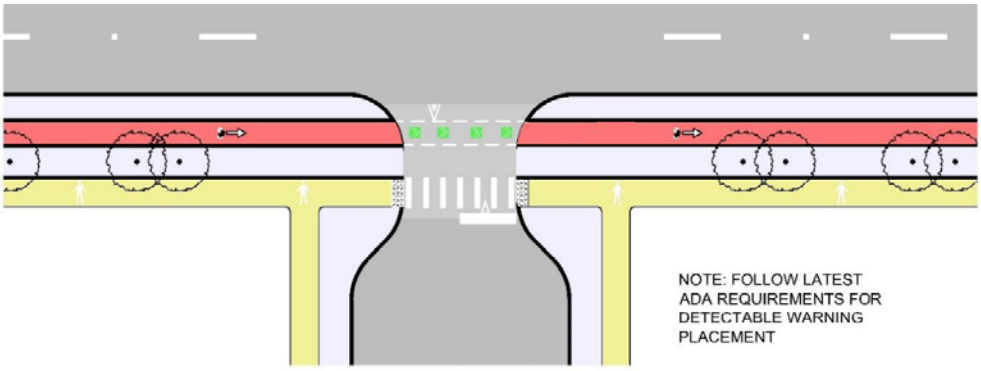
- At intersections, the raised cycle track can be dropped and merged onto the street, or it can be maintained at sidewalk level, where bicyclists cross with pedestrians, possibly with a dedicated **bicycle signal**.
- At driveways, the crossing should be raised, in which the sidewalk and cycle track maintain their elevation through the crossing.
- Pavement Markings: Standard bike lane symbols and arrows should be provided in bike lanes. In some cases, the size of the symbols and arrows may need to be reduced to fit within the lane. Two-way protected bike lanes should have solid yellow centerline a minimum 20' in length at intersection approaches. Centerline markings may be desirable in other locations. Centerline markings may be desirable in other locations. See the **AASHTO Guide for the Development of Bicycle Facilities** for additional guidance on the use of centerline markings.
- Signage: Signage is typically not required to identify the bike lane. R10-11 signs may be considered at locations with a high volume of conflicting traffic, such as at major driveways or crossings with major shared-use paths.



Source: Rural Design Guide



Source: Seattle Right-of-Way Improvements Manual



Source: City of Austin Transportation Criteria Manual

C. Guidance for Two-Way Physically Separated Bike Lanes

Two-way Physically Separated Bike Lanes (also commonly referred to as two-way cycle tracks) are physically separated cycle tracks that allow bicycle movement in both directions on one side of the road. Two-way cycle tracks share some of the same design characteristics as one-way tracks, but may require additional considerations at driveway and side-street crossings.

- May be configured as a protected cycle track—at street level with a parking lane or other barrier between the cycle track and the motor vehicle travel lane—and/or as a raised cycle track to provide vertical separation from the adjacent motor vehicle lane.
- Commonly considered on streets with few conflicts such as driveways or cross-streets on one side of the street, where there is not enough room for one-way physically separated bike lanes on both sides of the streets, where contra-flow bicycle travel is desired, where more destinations on one side of the street, or where there is extra right-of-way on one side.
- Two-way separated bike lanes can be desirable on one-way streets when there is a high level of bicyclist demand in both directions due to limited alternatives for the contra-flow direction. When located along a one-way street, the left side is preferred for the two-way bike lane as it puts bicyclists and turning motorists moving in the same direction next to each other, maximizing visibility. Doing so also minimizes impacts on bus stops along the route.
- Two-way separated bike lanes generally require their own protected signal phase at signal-controlled intersections where conflicting turns are allowed. Dedicated left turn bays are included at intersections with a separate signal phase from that of the bicycle movement.
- Two-way physically separated bike lanes on a one-way street can cause significant challenges with signal progression for bicyclists in the contra-flow direction and may lead to poor compliance with the traffic signals.

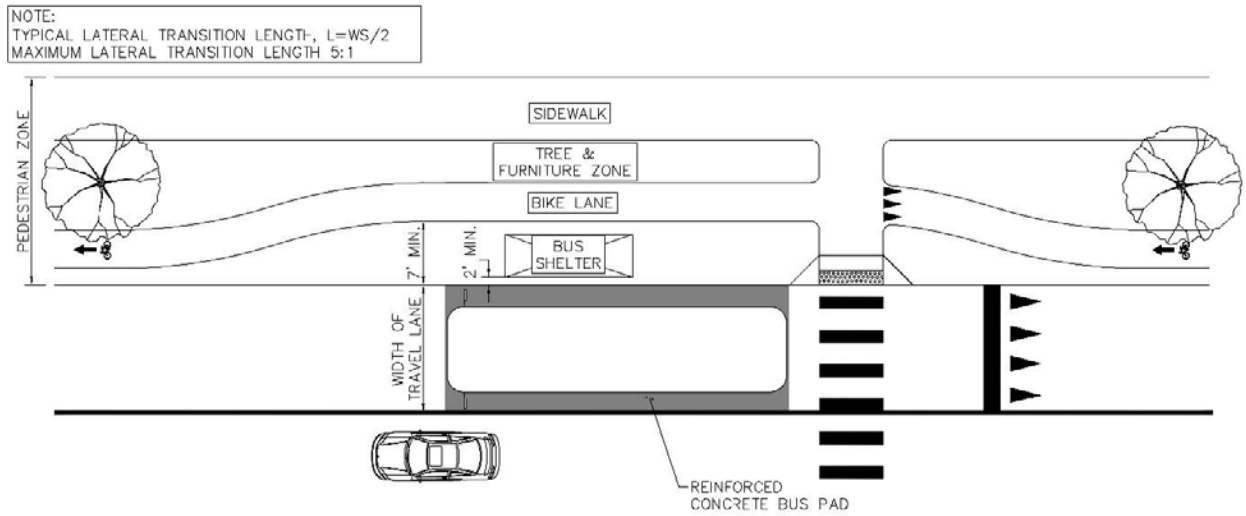
Source: NYC DOT

4.6.4.5 Design Considerations at Bus Stops

A. General

At transit stops, consider wrapping the bike lane behind the transit loading platform to reduce conflicts with transit vehicles and passengers. This configuration is referred to as a "Floating Bus Stop."

B~~H~~. Floating Bus Stops

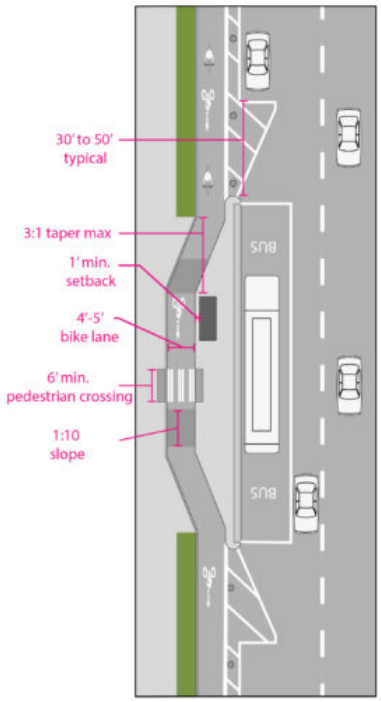


Source: City of Austin Transportation Criteria Manual

~~Add image of floating bus stops and description~~

- Recommended where bus volumes are high or where bus stops occur frequently.
- A floating bus stop shall be provided for curbside bus stops so bike lanes can be diverted behind the bus stops.
- The loading island must be a minimum of 8 feet wide. Refer to Section 4.5.6.6 Bus Stops for more information.
- In addition to intersection treatments, flow of all modes of transportation must be carefully controlled to avoid conflicts.
- Bicyclists should yield to pedestrians in these areas.
- The bicycle lane behind the floating boarding island can be at street grade or may be raised. If raised, delineate bike and pedestrian realms using colored paint or paving materials. If the bike channel stays at street grade, ensure that ramps, landings, and detectable warnings are provided whenever pedestrians cross into another "modal zone" (i.e. bikeway or travel lane).
- Where the bike lane changes grade, bicycle ramps should not exceed a 1:8 slope.
- Mark pedestrian crossings through bike lane. Yield teeth and other markings and signs such as YIELD stencils and BIKES YIELD TO PEDESTRIANS (MUTCD R9-6) signs inform bicyclists of the requirement to yield to pedestrians.
-

- Bike facilities should generally be routed behind the transit stop.
- Street-level bike lanes should be raised at designated pedestrian crosswalk locations to/from transit platform in order to increase awareness between bicyclists and transit users and to emphasize a preferred crossing location. If crossing is raised, 1:10 slope shall be used for ramps to/from level crossing.
- Minimum crosswalk width to transit platform is 6 feet. A wider crosswalk may be considered dependent on transit boardings dependent on slope of roadway.
- At sidewalk level, the bike lane width may be narrowed to 4 feet, but 5 feet is optimal.
- A STOP HERE FOR PEDESTRIANS (R1-5B) may be placed at crosswalk approach.
- Optional "YIELD" or "SLOW" markings may be placed in the bike lane prior to crosswalk.
- Truncated domes are required where pedestrians are channelized across the bike lane. Optional "LOOK" markings may be used to raise awareness of pedestrians crossing the bike lane.
- Where there is no grade separation, directional tactile indicators are required between pedestrian and bicycle facilities.



Source: Seattle Right-of-Way Improvement Manual

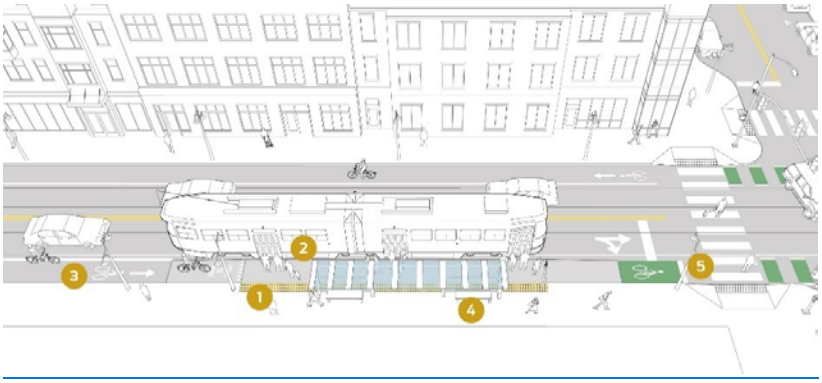
~~On-Street Dedicated bicycle facilities are exclusive lanes for bicycle travel or shared with buses at street grade, but separated from general traffic lanes. See Figure 4.20 for typical configurations for dedicated bike lanes. These are recommended where roadways have up to 3 lanes in either direction and target speeds of~~

~~30 to 40 mph, and where the Bicycle Facility Level of Service (LOS) as defined in the Highway Capacity Manual, 6th Edition, 2016 (Chapter 24) requires dedicated bike lanes. General guidelines include:~~

C. Shared Raised Bike Lane Stop

Shared raised bike lane stops are an important retrofit option for constrained transit streets with in-lane stops, where limited right-of-way precludes parking islands. In this configuration, a bike lane or physically separated bike lane ramps up to platform height before the stop and then ramps down after. The bike lane stays adjacent to the curb rather than wrapping behind the boarding area. Bicyclists can ride through the boarding area when no transit vehicles are present, but must yield the space to boarding and alighting passengers when a bus stops.

- Place detectable warning strips along the edge of the sidewalk where passengers step into the shared raised boarding area, and along the boarding area curb where passengers board the transit vehicle.
- Use shark's teeth yield markings near the top of the bicycle ramp leading to the platform.
- Slope of bicycle ramp shall not exceed 1:8.
- Ensure bicyclists are well positioned in view of turning traffic. Terminate the boarding platform at least 10 feet from the crosswalk to allow bicyclists to queue in front of transit vehicles.



Source: NACTO

D~~C~~. Transit Stop Mixing with Bike Lane

Where bus service is sufficiently infrequent (about four buses per hour or fewer), transit stops can be designed in the separated bike lane. In this scenario, buses pull into the bike lane to board and alight passengers at the curb. When buses are present, bicyclists merge left and pass buses boarding and alighting passengers. At all other times, at least 55 minutes of every hour, bikes continue through the bus stop uninterrupted.

4.6.4.5 Crossing Treatments and Transitions

This section covers the design of bikeway crossings and transitions at intersections. As intersections are the main point of conflict for bicyclists and vehicles, crossings must be designed to make bicyclists highly visible and provide queuing space to await their crossing maneuver.

A. General

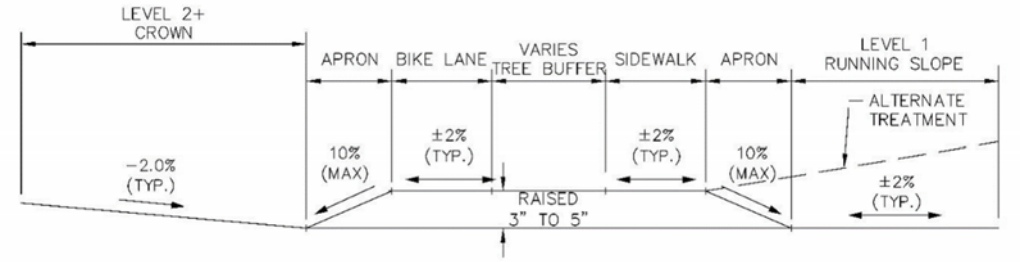
- Turn restrictions may be needed at complex intersections. Shared crossing ("mixing zone"), separated crossing ("signal-protected turn"), or offset crossing ("protected intersection") are needed to manage turning conflicts. Crossing markings should be used to indicate the presence of a bike facility. Refer to NACTO's Urban Bikeway Design Guide for more detailed guidance on applications and treatments at intersections.
- Physically Separated Bike Lanes may be shifted more closely to the travel lanes on minor intersection approaches to put bicyclists clearly in the field of view of motorists.
- A through bike lane shall not be positioned to the right of a right turn only lane or to the left of a left turn only lane (TMUTCD 9C.04). A bike lane may be positioned to the right of a right turn only lane if split-phase signal timing is used.

B. Driveways and Minor Street Crossings

Driveways and Minor Street crossings shall be designed to provide awareness and priority to the protected bike lane and sidewalk. Minor Street crossings include local streets as defined in Section 2.2.7, unless otherwise defined by the City Traffic Engineer or applicable Director as a Minor Street crossing.

A. For trails and raised physically separated bike lanes, a raised crossing is the default treatment to be used at all minor street crossings. The design shall clearly communicate that bicyclists have the right-of-way by continuing the surface treatment of the bike lane across the driveway. The approach ramps to the raised crosswalk shall not exceed 5% for a minor street.

Figure 4.69~~—~~. Minor Street Crossing Grade Profile for Raised Bike Lanes and Trails



Source: City of Austin Transportation Criteria Manual

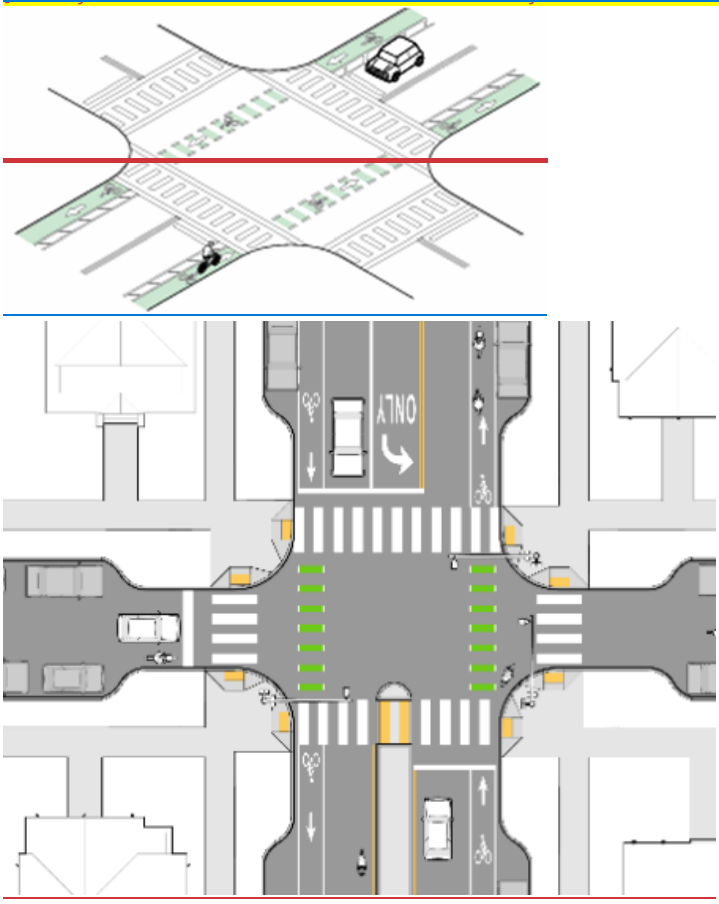
C~~B~~. Crossing Markings

Crossing markings shall be used at intersections with bike facilities on both sides of the intersection. See Figure 4.~~29~~70. In case a bike facility does not continue on the other side of an intersection, crossing markings shall not be used. Across intersections, the intended path of travel of dedicated lanes may be indicated using, at a minimum, dashed white lines. Additionally, dashed white lines may be used with

dashed green coloring. Refer to the current version of the 251-D standard details to determine whether green paint should be used between the white dashes.

Figure 4.7029 Crossing Markings

~~[Modify this illustration so that the bike lane symbol is not in the crossing markings.]~~



Source: Arlington County, Virginia

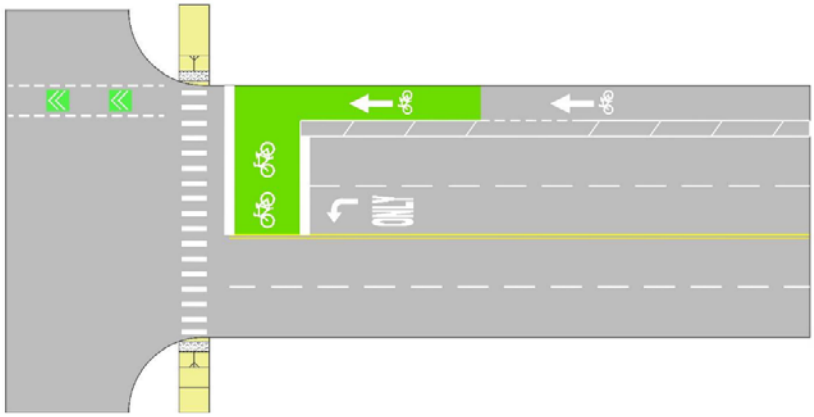
DC. Bike Boxes

A bike box is a designated area at the head of a traffic lane at a signalized intersection that provides bicyclists with a safe and visible way to get ahead of queuing traffic during the red signal phase. Bike boxes may be required at constrained locations where protected intersections are not feasible. A box formed by transverse lines shall be used to hold queuing bicyclists, 10—16 ft. deep. See Figure 4.3071 for a representation of a bike box at an intersection approach. Bike boxes:

- Typical applications include:
    - At signalized intersections with high volumes of bicycles and/or motor vehicles, especially those with frequent bicyclist left-turns and/or motorist right-turns. They facilitate the transition from a right-side bike lane to a left-side bike lane during red signal indication, and help prevent 'right-hook' conflicts with turning vehicles at the start of the green indication.
    - When the dominant motor vehicle traffic flows right and bicycle traffic continues through (such as a Y intersection or access ramp).

- Must be marked using white transverse lines and pavement bike markings.
- ~~May optionally~~Should be colored green in the box. If green is used, bike lane leading up to the box should also be colored for 50 to 75 feet and the lane continuing across the intersection shall also be colored.
- Should be used in conjunction with "NO TURN ON RED" signs for motor vehicles.

Figure 4.7310 Bike Box

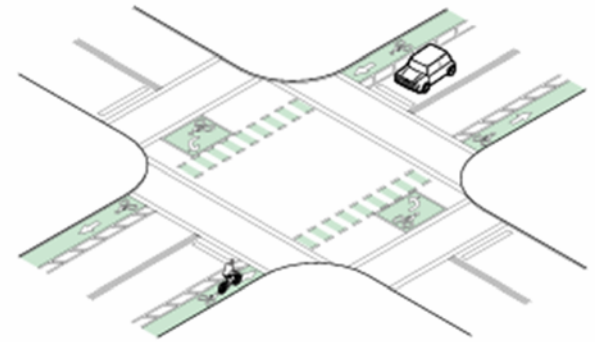


Source: City of Austin Transportation Criteria Manual

ED. Two-Stage Turn Boxes

- A two-state queue queue box, or a bike box shall be used at the intersection of two bicycle facilities requiring a left turn, when a protected intersection crossing is not provided.
- Two-stage turn boxes offer bicyclists a safe way make left turns at multi-lane signalized intersections from a right side cycle track or bike lane, or right turns from a left side cycle track or bike lane. Compared to bike boxes, they help separate turning bicyclists from through bicyclists, but will typically result in increased delay for bicyclists. Bicyclists now need to receive two separate green signal indications (one for the through street, followed by one for the cross street) to turn. These may be preferential on higher volume, multi-lane roadways.
- The queue box shall be placed out of the way of through traffic (including bicyclists and pedestrians). The queue box is typically located in the space otherwise used for a parking lane or between the bike lane and the pedestrian crosswalk. The crosswalk may need to be adjusted or realigned to provide space for a queue box.
- Recommended where a large demand for left turns from a right side facility exists.
- Must be designated by a marked white box with bike stencil and turn arrow inside to clearly indicate proper bicycle direction and positioning. Coloring the pavement green inside the box is recommended to bring greater attention to the bicycle space. See Figure 4.7232.
- Placed in the intersection in potential configurations shown in the diagram.
- A “No Turn on Red” sign shall be installed overhead to prevent vehicles from entering the queuing area.

Figure 4.7232 Two-Stage Turn Box



FE. Protected Intersections

Protected bike lanes shall be continued through stop controlled and signalized intersections as a protected intersection. A protected intersection eliminates the merging and weaving of bikes and vehicles.

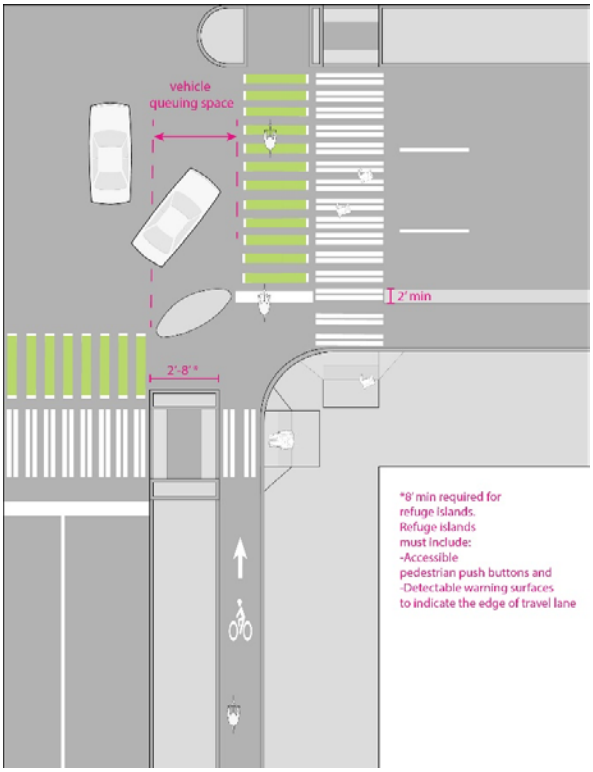
Bike boxes and two stage turn queues boxes are alternate tools when protected intersections are not feasible, described in sections that follow.

Also known as setback or offset intersections, this design keeps bicycles physically separate from motor vehicles up until the intersection, providing a high degree of comfort and safety for people of all ages and abilities. This design can reduce the likelihood of highspeed vehicle turns, improve sightlines, and dramatically reduce the distance and time during which people on bikes are exposed to conflicts.

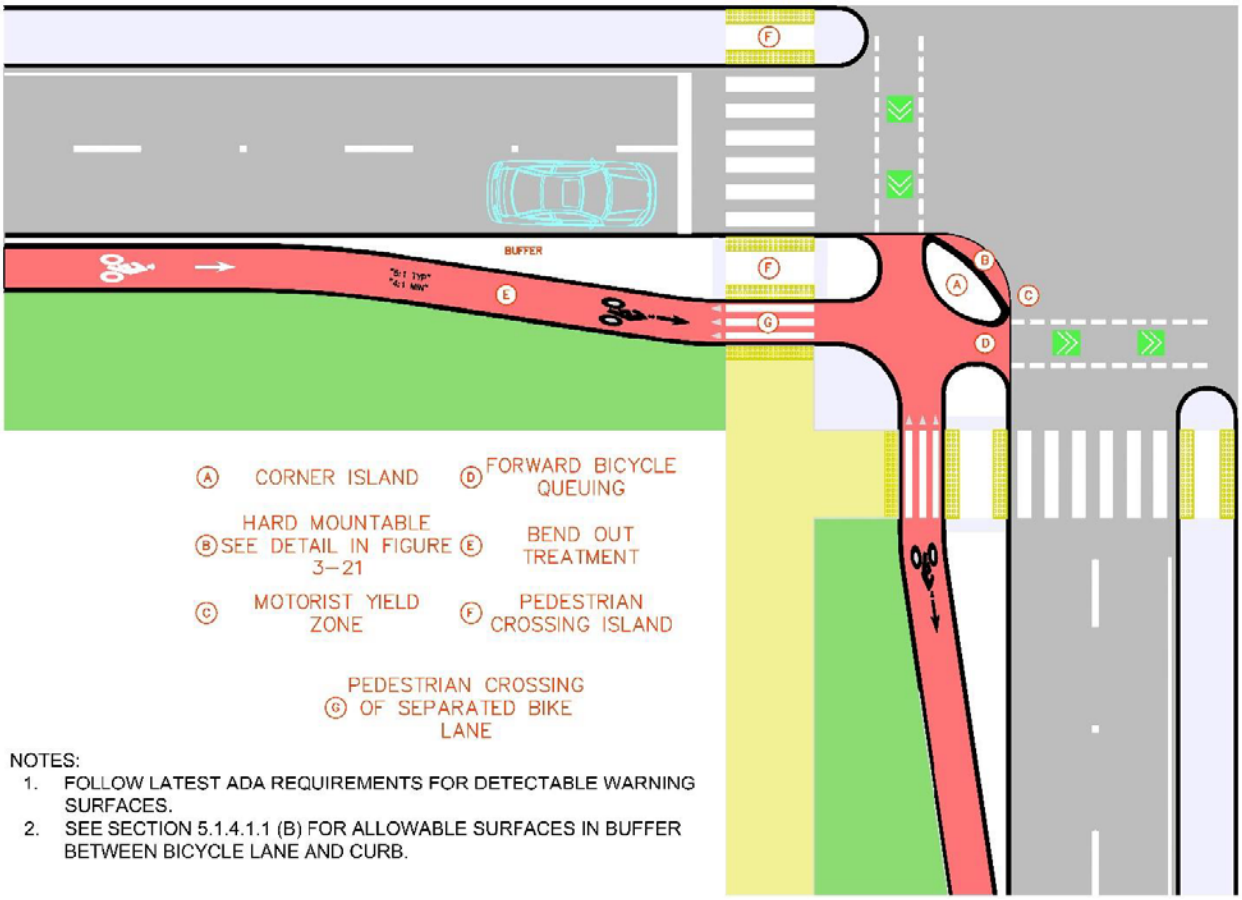
The movement of bicyclists at protected intersections is the same as two-stage turn boxes; however, corner islands anchor the design, extending the protected bike lane's separation as far into the intersection as possible and tightening the corner's turn radius. The setback creates a waiting zone for turning cars, where drivers can yield to bikes after starting to turn but before crossing the path of oncoming bicycles. If it is large enough, this area lets drivers wait while through-traffic passes them, relieving pressure to turn too quickly. Protected intersections also provide shorter, safer crossings for people walking.

- The bikeway setback distance determines most other dimensions of the protected intersection. Where practical, a setback of 14-20 feet is preferred. If setbacks smaller than 12 feet are used, they should be accompanied by longer clear distances, and additional signal phasing or speed reduction strategies should be considered
- Radii should be small enough that passenger cars are discouraged from turning faster than 10 mph. This is accomplished with an effective turn radius of less than 18', usually resulting from a 10' to 15' curb radius. Corner islands may have a mountable override area to accommodate large vehicles. Corner islands may also be implemented as channelization markings that are reinforced by mountable vertical elements such as modular speed bumps.
- For the pedestrian islands, detectable warning surfaces must be placed at both sides of the island to distinguish the bikeway from the sidewalk, and the island from the bikeway. To serve as an accessible waiting area, the minimum width of a pedestrian island is 6 feet.
- The bike queue area should be at least 6.5' deep, but dimensions of 10' or greater are desirable to accommodate trailers, cargo bicycles, and high bike volumes.

- Bike traffic should be expected to move forward to the stop bar on any signal phase, and pedestrian traffic should also be expected to cross to the island on any phase. This operation may be formalized with optional yield teeth on the bikeway before the crosswalk.
- A modified "Turning Vehicles Yield to Bikes and Pedestrians" sign (R10-15)17 is recommended where a signalized intersection allows right turns concurrent with bicycle and pedestrian movements.



Source: Seattle Right-of-Way Improvements Manual



Source: City of Austin Transportation Criteria Manual

Intersection Element	Size Requirement
A - Corner Island	See Section 3.6.2.2; by Turning Simulation and Corner Space
B - Corner Mountable Apron	See Section 3.6.2.2; by Turning Simulation
C - Motorist Yield Zone	6 ft. - 16.5 ft. (dimensioned from edge of outside lane to inside edge of bike lane)
D - Forward Bicycle Queuing	6 ft. x 6 ft.
E - Bend Out Treatment	5:1 Typical Lateral Taper, 4:1 Minimum Lateral Taper
F - Pedestrian Crossing Island	6 ft. Deep x 5 ft. Wide
G - Pedestrian Crossing of Separated Bike Lane	Dimension "W" in Section 4.2.4.2
H - Bicycle Conflict Area	8 ft. Wide

GF. Roundabouts with Bike Lanes

Protected bike lanes shall continue through roundabouts as a separated facility with marked crossings and not enter the inscribed circle area of a roundabout where motorists circulate. An example of a protected bicycle facility at a roundabout is shown in Figure 4.73.

Figure 4.73 - Bike Lane Joining with Sidewalk at Roundabout Typical Layout

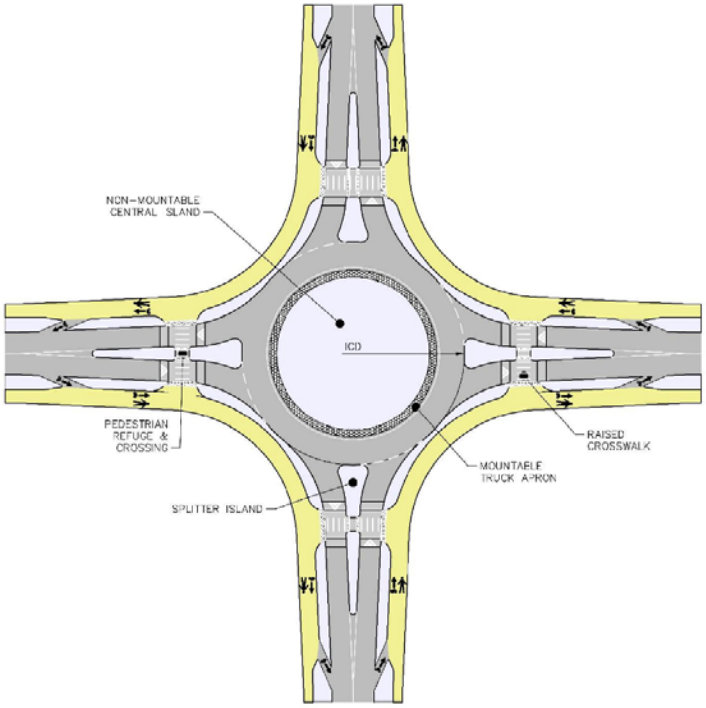
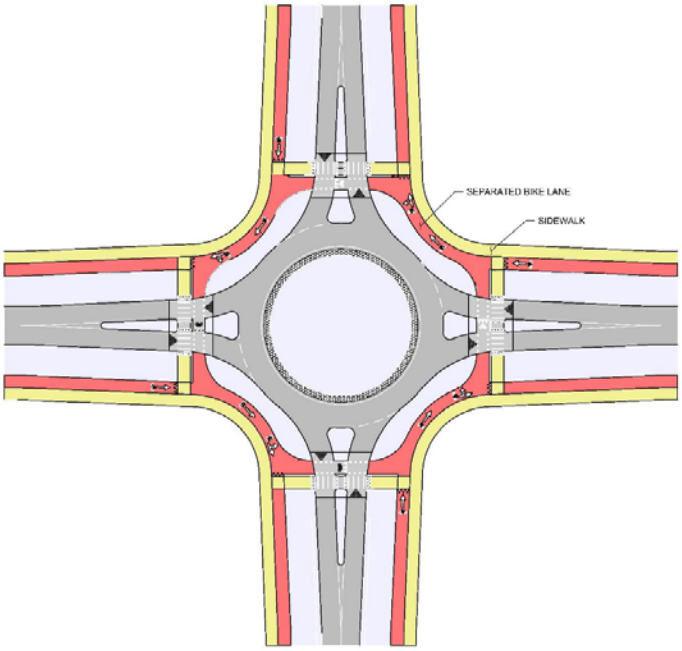


Figure 4.74.~~—~~ Protected Bike Lane at Roundabout Typical Layout



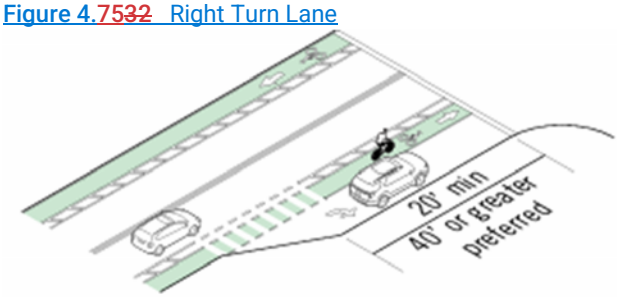
Source: City of Austin Transportation Criteria Manual

H~~G~~. Turning Lanes

Turning Lanes are recommended where turn only lanes exist or are added on the side the bicycle facility is placed on. See Figure 4.7533.

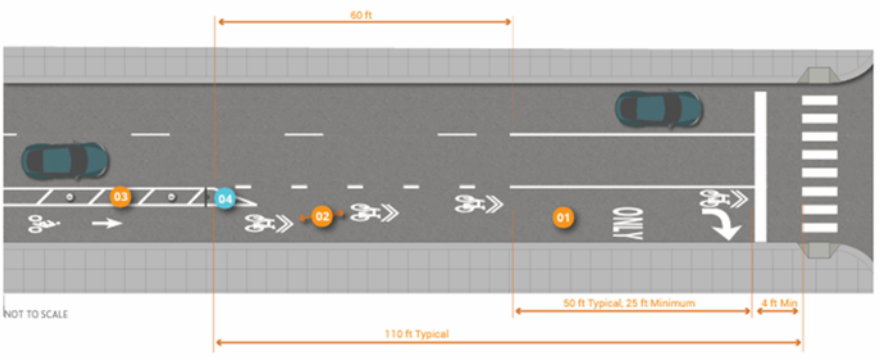
- Where dedicated signals are used for bicycles, a car lane may become turn only without crossing the bike lane.
- Where dedicated signals are not used, cars may need to cross the bicycle lane into an auxiliary turn only lane. In such a case, the bike lane should become dashed white lines to allow cars to cross.
- Where cars are allowed to cross bike lanes, a "BEGIN RIGHT TURN LANE, YIELD TO BIKES" sign should be used, TMUTCD R4-4.
- Right turn lane length shall be at least 20 feet in length, but expected turn lane queues may require significantly greater lengths.

Figure 4.7532 Right Turn Lane



IH. Mixing Zone

- Recommended where space restrictions do not allow a turn-only and minimum bike lane to coexist at an intersection, or where lanes are not turn-only but host a large volume of turning traffic.
- The bike lane should widen to a minimum 9 feet to accommodate turning vehicles.
- Shared Lane Markings and Turn-Only pavement markings shall be employed for mixing zone.
- Bike lane solid white stripe shall be changed to dashed white stripe to indicate merging area where vehicles may cross into the mixing zone.
- Include BEGIN RIGHT TURN LANE YIELD TO BIKES (TMUTCD R4-4) at beginning of mixing zone to indicate bicycle priority in mixing zones



Source: FHWA Separated Bike Lane Planning and Design Guide

~~J~~I. Dedicated Bicycle Signals

Bicycle signals are used to address identified safety or operational problems involving bicycle facilities or to provide guidance for bicyclists at intersections where they may have different needs from other road users. Bicycle signals are often required at signalized intersections where there are contraflow bicycle movements, the desire for a leading bicycle phase, or to manage conflicts with turning traffic. In the absence of dedicated bicycle signals, any signal heads that will be applicable to a bicycle facility shall be clearly visible to users on that bicycle facility.

TMUTCD standards shall be followed for bicycle signal design.

A. Bicycle detection shall be automated through use of in-pavement loops, video, microwave, or other detection device unless approved by applicable staff.
    a. At locations where bicycle detection is used, a feedback indicator light and sign stating "Bicycle Detection" adjacent to the indicator shall be installed informing the bicycle facility user that they have been detected and are in the queue to receive a crossing signal.

- Recommended for large intersections where the time taken to clear the intersection is much greater for bikes than cars, when the facility type is a two-way cycle track, or where bike through movements need to be separated from vehicle right turning movements for increased safety.
- Phasing on dedicated signals may be used to give bikes a head start and enter the intersection with pedestrians. For guidance on clearance intervals, refer to NACTO Urban Bikeway Design.
- Signals may be manually or automatically actuated.

K~~J~~. Bike Detection

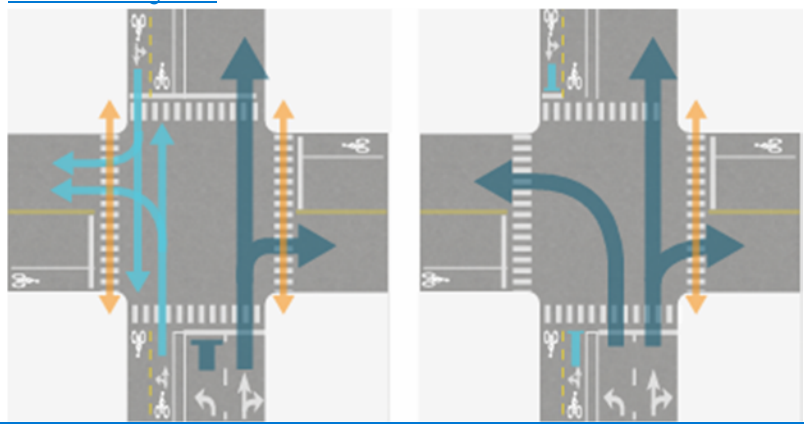
- Recommended in place of manual actuation for the convenience and safety of bicyclists. Signal detection for bicyclists is needed if the signal [or signal operation] is actuated. A bicycle detector symbol marking (TMUTCD Fig. 9C-7) should be placed over the loop to alert passing cyclists to the in-ground sensor.
- Detection shall be placed or targeted where bicyclists intend to queue or travel. Bicycle detection 60 or 120 feet in advance of the intersection could be used to call a green light for the bicyclist to minimize the chance of stopping and thereby increasing cycling comfort.
- Induction loop may be embedded in the pavement per the Dallas Bike Plan recommendation or video detection aimed at bicycle approaches may be employed.~~It is recommended for bicycle lanes to be between parking lanes and the pedestrian zone, but where required due to existing conditions, dedicated bicycle lanes may be between parking lanes and car lanes.~~

L~~K~~. Signal Phasing and Coordination

Bicyclists exert the most energy when starting from a stopped position. Decreasing the number of stops at traffic signals in a corridor will increase the comfort for people on bikes and improve bicyclist compliance with the signals.

- The progression speed should be set to minimize the chance of stopping at each intersection. 10 mph is a comfortable speed for the general population; more confident bicyclists may travel around 15 mph. However, the average bicycle speed along a corridor may vary depending on roadway grades.

- Two-way physically separated bike lanes on a one-way street can cause significant challenges with signal progression for bicyclists in the contra-flow direction and may lead to poor compliance with the traffic signals.

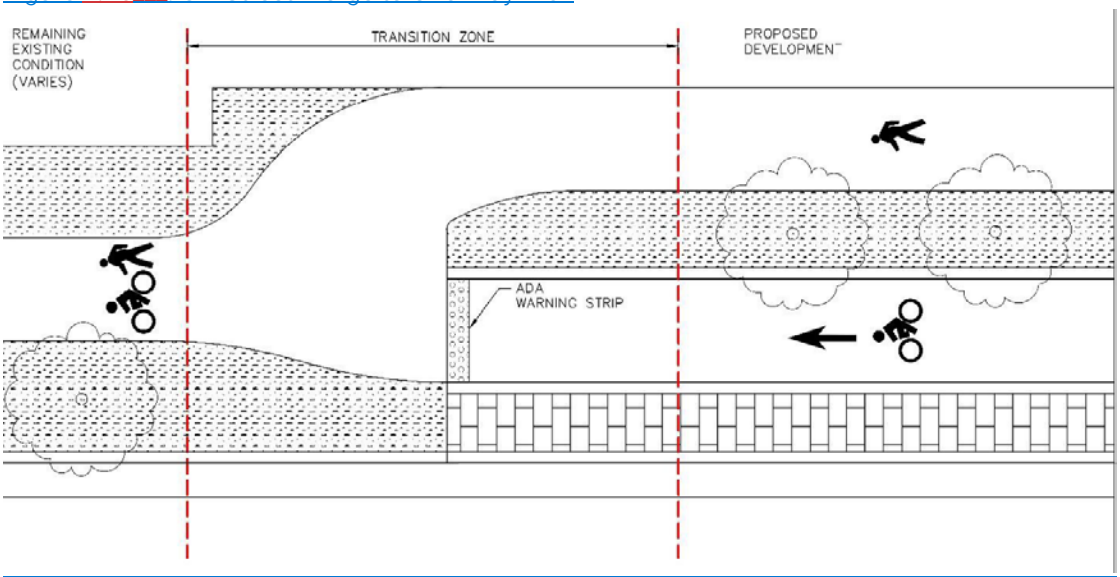


- Bicyclists are less willing to wait at red traffic signals that motorists. Cycle lengths should be short to minimize the average bicyclist delay. A maximum 90 second cycle length is recommended.

M~~L~~. Transitions

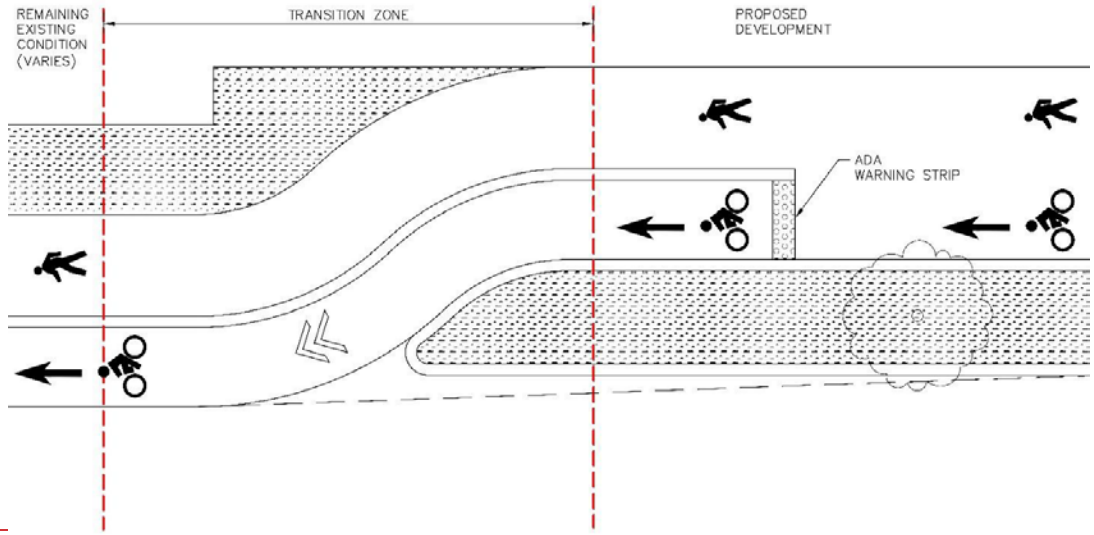
Bicycle facility transitions shall be designed using the facility design speed and use Table ~~—~~4.20 radii requirements and Section ~~—~~4.3.4.3 for changes in grade slope requirements. Bicycle facility transitions to shared pedestrian facilities shall include ADA warning strips in advance of merging with a pedestrian facility, and warning strips shall be patterned perpendicular to direction of bike travel when merging with pedestrian areas. Typical transition zone configurations are shown in Figures 4.76~~—~~ through 4.79~~—~~ to address situations where facilities adjacent to a project or development are not the same as the facilities being designed as part of that project or development.

Figure 4.76~~—~~. Off-Street Merge to One-Way Trail



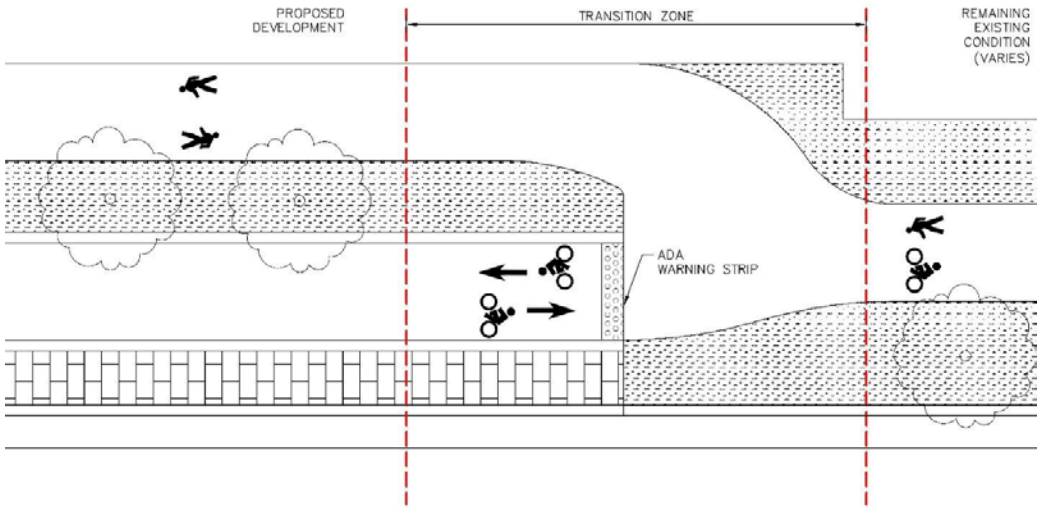
Source: City of Austin Transportation Criteria Manual

Figure 4.77. Off-Street/Raised to On-Street One-Way Bicycle Transition



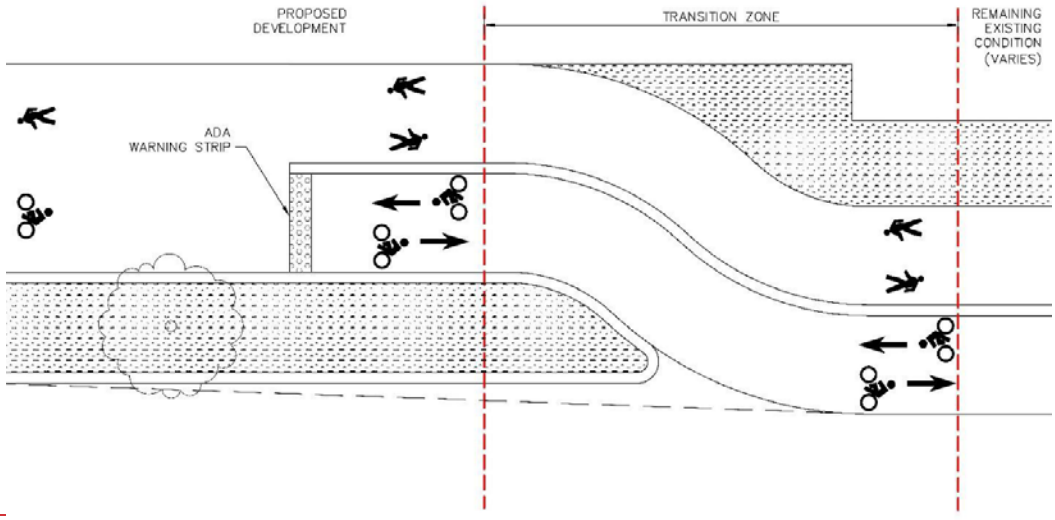
Source: City of Austin Transportation Criteria Manual

Figure 4.78. Two-Way Shared Facility to Separate Facility Transition



Source: City of Austin Transportation Criteria Manual

Figure 4.79. Two-Way On-Street Bike Lanes to Shared Trail Transition



Source: City of Austin Transportation Criteria Manual

4.6.4.6 Drainage Considerations

Curbs used to divert storm water into catch basins should have bicycle-compatible designs. The following recommendations apply to drainage improvements for bicycles:

- Reset catch basin grates flush with pavement
- Modify or replace deficient drainage grates with bicycle-compatible grates that are flush with the roadway. Inlets in the bicycling zone should not be depressed. This is accomplished by building them or retrofitting them to match both the cross-slope and longitudinal slope of the street.
- Repair or relocate fault drainage at intersections where water backs up in the gutter.
- Adjust or relocate existing drainage curbs that encroach into bike lanes (that reduce the minimum ridable width to less than 4 feet).

Curb median designs should maintain proper drainage of the site, particularly in retrofit projects that do not include underground drainage system alterations. For retrofit facilities gaps between vertical objects or curb openings in raised medians may be used to channelize stormwater across the street buffer towards existing catch basins along the sidewalk buffer. These median curb cuts may be open channels or covered with steel plates. Steel plates should be considered in areas where parallel parking is proposed and should meet AASHTO HS20 loading conditions to accommodate traversing people. For reconstruction projects supplementary catch basins in the street buffer or more frequent curb cuts should be considered in order to control the speed and spread of water within the bike lane.

Utility covers and drainage structures should be located outside of the surface of the bike lane where feasible. Where they are unavoidable, utility covers in the bike lane should be flush with the roadway surface. Drain grates must be designed such that narrow tires cannot get caught. When new drain grates are installed or existing drain grates replaced should be of a vaned grate style.

4.6.4.7 On-Street Parking Considerations

- Where the bike lane is placed between the parking lane and the motor vehicle travel lane, the parking should be configured as parallel parking or back-in diagonal parking. Bike lanes should not normally be placed adjacent to convention front-in parking, since drivers backing out of parking spaces have poor visibility of bicyclists in the travel lane, and bicyclists have poor visibility of vehicles preparing to back out. Back-in diagonal parking can improve sight distance and eliminate conflicts between bicyclists and open car doors when compared to parallel parking. When bike lanes are placed adjacent to back-in diagonal parking spaces, parking bays should be long enough to accommodate most types of vehicles.
- Parking-protected bike lanes (when the bike lane is placed between the parking lane and the curb) work well when there is strong demand for on-street parking. However, in areas with low or intermittent parking demand, the protection will be absent and people driving may confuse the parking area for a travel lane. Compared to existing conditions, some parking will be lost to accommodate sight distance at all intersections and driveways.
- On-street parking for a parking-protected bicycle lane should be removed a minimum of sixty-feet (60') approaching an intersecting roadway or major driveway (for sight distance) and eight-feet (8') after the driveway for turning movements. The corresponding minimum distances for residential or lower-use driveways are twenty-feet (20') approaching and six-feet (6') following.

~~•~~

~~• Bicycle lanes are recommended on the right side of the travelway, in the same direction of car travel. However, where desired for connectivity or other purposes, two-way bike lanes on a one-way street may be permissible. Left-side bike lanes may also be used on one-way streets.~~

~~• Dedicated bike lanes must be a minimum of 5 feet with or without on-street parking and a preferred width of 6 feet in both cases, which may include the gutter pan.~~

~~• Bicycle lanes may be separated minimally by a 6-inch white line, preferably with a distinctive pavement treatment such as green paint.~~

~~• Bicycle lanes shall have a minimum 2-foot wide buffer on arterials and collectors (higher volumes, speeds of 35 mph or greater) using wide parallel white stripes or parallel stripes with diagonal stripes in between at a minimum of 2 feet wide.~~

~~• Bicycle lanes may be protected using physical barriers such as bollards, armadillos, minimum 6-inch curbs or landscaping. These are recommended where bicycle ridership is high, adjacent traffic volumes or speeds are high, and at intersections to provide visible barriers for motorist.~~

~~• Where separate from curbside bus lanes, bicycle lanes should be placed to the right of the bus lanes and be routed behind bus stops in islands.~~

~~• Pavement signs and roadside signage should be employed for "BUS AND BIKE ONLY" or "BIKE ONLY".~~

~~D. Off-Roadway Public Bike Lanes~~4.6.5 Trails

~~This section is intended to provide standards for the design of trails along public roadways. The Department of Park and Recreation may have separate standards for trails in City parks and utility corridors.~~

Trails, also known as shared-use paths and sidepaths, combine bike and pedestrian space into one path. To maintain safe operations for both modes of travel, the path must be wide enough to safely separate both users. Separated bike and pedestrian paths are the preferred design, as they are safer for both street users. Trails are only suitable where bicycle and pedestrian volumes are expected to be low to moderate for the life of the facility, otherwise bicycles and pedestrians shall be split into separate facilities to manage conflicts. Trails are intended to be allowed when insufficient right-of-way exists ~~per the typical cross sections identified in Section 2.8.0 of the TCM~~ and in special situations outlined below.

A. When pedestrian and bicycle facilities are combined into a shared use path, the shared use path shall be located between the right-of-way line and ~~Buffer & Furniture~~Pedestrian Zone, unless placement in an easement is approved by applicable staff
B. The transitions between a shared use path and bicycle facility shall occur in advance of intersections~~, as detailed in Section 5.~~
C. Shared use paths shall follow the shortest, most direct path along the street. ~~If this path is not achievable, refer to Section 4.1.3 for further guidance.~~
D. Shared use paths are the recommended facility for streets with target speeds of 40 mph or greater as they are physically separated from motorized vehicles.
E. Shared use paths are the recommended facility in the parkways of streets or in public easements outside of the roadway curb lines.
~~Shared use paths are the recommended facility on Level 2, 3, and 4 Streets without curb and gutter. Table 2-3 contains recommended and constrained dimensions for shared use paths based on street level.~~
~~For streets with a curb and gutter, shared use paths shall only be approved with a waiver and facility widths followed per Table 2-3 based on street level. The shared use path width will replace the combined width of the sidewalk and bicycle facility and bicycle facility buffer as shown in Table 2-2, when permitted.~~
F. Grades and cross slopes for a shared use path shall conform with requirements for sidewalks as defined in the current editions of United States Access Board's Proposed Accessibility Guidelines for Pedestrian Facilities in the Public right-of-way (PROWAG) and Texas Accessibility Standards (TAS).
G. Minimum clear width shall be 8 ft. for a shared use path that is one way for bicycles and 10 ft. for a shared use path that is two-way for bicycles. Minimum vertical clearance for a shared use path shall be 8 ft. Other considerations may go into the required width of a shared use path, including likelihood of heavy pedestrian and bicycle use~~, or a planning document such as the Austin Bicycle Plan or Austin Urban Trails Plan,~~ at the discretion of the appropriate director.
H. If a new shared use path is constructed, street trees shall be provided, unless the street ~~is a Level 1 Street with~~has insufficient right-of-way to accommodate the minimum width of 6 ft. required for street trees. Planting ~~shall be in accordance with the Environmental Criteria Manual,~~ and soil requirements for street trees are further specified in Section ~~2.7.1.3~~4.5.5. Placement of street trees shall not conflict with utilities in accordance with design criteria in ~~the Utilities Criteria Manual.~~Section 4.5.6.12.

Width.

A. Urban trails shall be designed for two-way travel

B. Minimum trail width is 12 ft. for off-street trails. Refer to Section 4 for shared use paths on-street.
C. If a portion of the urban trail is anticipated to exceed a peak hour volume of 300, considerations should be given for a wider facility or separated pedestrian and bike facilities. For each additional 100 peak hour urban trail users anticipated, the trail width should be widened by 2 ft., up to 24 ft.

Horizontal and Vertical Geometry:

A. Design Speed
   a. The design speed can fluctuate depending on the context of the trail, the user types expected, the trail terrain, and other trail characteristics
   b. The City's design speed for urban trails shall be 24 mph, except where speed limits are set for trails in code or adopted plans, such as city parks.
      i. Trails can be designed for lower speeds in constrained scenarios. Engineering judgement will need to be applied on a case-by-case basis.
      ii. In some circumstances, when environmental or physical constraints limit the geometry of the trail, design speeds slower than 12 mph may be applied when approved by applicable staff member.

B. Horizontal Curves:
   a. Per AASHTO, horizontal curve radii are calculated from the following equation and specified for typical design speeds in Table 4.21—.

$$R = \frac{0.067V^2}{\tan\theta}$$

Design Speed (mph)	Minimum Radius (ft.)
12	27
14	36
16	47
18	60
20	74
22	90
24	107

      i. The City's desired minimum horizontal curve is 100 ft. and when ample room exists, design shall include curves with radii greater than 100 ft.
      ii. The trail alignment shall follow the contours of the land closely and, to the extent possible, preserve the natural terrain and vegetation. Design shall limit meanders in the trail unless they have a purpose (e.g. tree preservation).
      iii. When the design speed is less than 18 mph, the section shall include trail widths of 12 ft. or greater or curve widenings to let users navigate the effects of substandard curves. Design shall implement curve widening of 2—4 ft., with 2 ft. curve widening as the standard. Curves with a resulting design speed less than 12 mph shall include signage instructing trail users of the operational speed of the curve. Table —4.21 shows minimum radii for typical trail design speeds.

C. Grades:
   a. When right-of-way is shared with a street, an urban trail or shared use path shall not exceed the general grade established for the adjacent street. When an urban trail has its

own right-of-way or easement, urban trails shall not exceed 5% grade. Engineers should attempt to achieve a target grade of less than 2% when practical.

D. Cross Slope:
    a. The standard is to have the trail sloped in one direction.
    b. Maximum cross slope for the trail is 2%.
        i. The cross slope during design shall be 1.5% to account for minor deviations during construction and still be ADA compliant.
    c. If a center crowned typical section is needed, the maximum cross slope is 1%.

Pavement Marking & Signing.

When used on trails, pavement markings provide guidance and information for the trail user. In some instances along a trail, pavement markings can be used to supplement signs.

A. Below are applicable situations for pavement marking use on trails:
    a. In situations when delineation and indication of two-directional travel is needed to improve the safety and operation of the trail, a centerline should be considered.
    b. When it is desirable to separate pedestrians and bicyclists, and constraints exist that preclude separate sidewalk and bike lane facilities, a solid line shall be provided in the center of the trail with pedestrian and bicycle pavement markings on either side of the line.
    c. Along curves with restricted sight distance or design speeds less than 12 mph;
    d. At intersections with streets or trails;
B. A solid line shall be used when passing is prohibited and a dashed line when passing is permitted. The centerline shall be a 4 in. yellow line. Dashed lines shall be in 3 ft. segments with 9 ft. gaps in a repeating pattern. The City's preference is to not provide a centerline unless one of the situations above is applicable.
C. A 4 in. yellow line shall be used to warn of an obstruction in the trail. Channelizing lines of appropriate color (e.g., yellow for centerline and white for all others) shall be used to guide the user away from the obstruction. For example, if a bollard is installed within the trail, a yellow diamond shall be installed around the bollard. Refer to pavement markings associated with a bollard or other vertical obstruction in the trail as shown in the Texas Manual on Uniform Traffic Control Devices (TMUTCD).
D. Stop bars are not required on urban trails; however, stop bars should be considered in the following situations:
    a. The trail intersects a heavily traveled roadway;
    b. The trail intersects with a roadway and has minimal sight distance;
    c. Any other need to help emphasize that the trail user must stop;
    d. If added, the stop bar shall be a minimum of 12 in. wide, placed along the width of the trail, and be a minimum of 2 ft. behind the truncated domes. Refer to 251-D for crosswalk style requirements and refer to the TMUTCD for placement.
E. Standard regulatory signage shall be retroreflective and follow Part 9 of the TMUTCD standards. Refer to Table 9B-1 in the TMUTCD for allowable trail signage dimensions. Regulatory signs warn users of various trail conditions, such as steep grades, sharp turns, or hazardous trail conditions. Signs shall be placed at least 50 ft. in advance of the change or hazard.
F. If a trail crosses a street, regulatory signage shall be added to the street to alert motorists of the crossing. Refer to the latest edition of the TMUTCD for recommended street signage.

Lighting:

Lighting improves visibility, enhances perceived safety, comfort, and increases the use of trails.

A. Trail level lighting shall be provided unless there are sensitive environmental considerations and waived by City staff. If lighting is not provided, a 2 in. conduit shall be installed parallel to the trail to allow for lighting to be installed later if conditions change.
B. Additional lighting shall be provided for the following locations along a trail:
    a. Near connections to transit stops, schools, universities, shopping, or employment areas.
    b. Under vehicular bridges, underpasses, tunnels, and urban trail bridges.
    c. Locations with limited visibility and sight distance.
    d. Trail intersections with streets or other trails.
    e. Trailheads.
C. The following guidelines shall be followed for lighting along a trail:
    a. The illumination shall be adequate to identify a face up to 20 yards away.
    b. Full cut-off fixtures shall be used to reduce light pollution and comply with the International Dark Sky regulation.
    c. Electrical components need to abide by Article 862 of the National Electrical Code (NEC) in flood prone areas.
    d. Average horizontal illumination levels shall be between 0.5 to 2 foot-candles.
    e. LED lamps shall be used.
    f. Lighting shall be low voltage (e.g. LED) and low maintenance.
    g. Light fixtures shall be on poles at a minimum height of 12 ft. and maximum height of 15 ft.
    h. Pedestrian lights can be solar powered or hard wired. Hard wired power sources are the standard for pedestrian lights. Solar powered pedestrian lights shall be allowed by variance when a utility collection is difficult or when alternative energy sources are desired. The amount of tree canopy shall be factored into the effectiveness of solar power.

~~Off-Roadway Bike Lanes are those located in the parkways of streets or in public easements outside of the roadway curb lines. These Bike Lanes are recommended for use with streets with target speeds of 40 mph or greater because they are physically separated from motorized vehicles and are not placed within the roadway section. These may be shared with pedestrians on trails or parkways. Design guidelines include:~~

- ~~Off-Roadway Bike Lanes may be on the same level as the pedestrian zone but separated into their own lane.~~
- ~~Where sharing with pedestrians, bike lanes should have a minimum width of 8 feet in one direction, and preferably a width of 10 feet. Two-way off-street bike lanes shared with pedestrians must be a minimum of 12 feet wide.~~
- ~~Where separate from pedestrian travel, one-way bike lanes must have a minimum width of 8 feet and two-way bike lanes must have a minimum width of 12 feet. Pedestrian clear zone must be a minimum of 5 feet wide and preferably wider.~~
- ~~Shared pedestrian and bike lanes must be marked as such on the pavement and using roadside signs.~~

4.6.6 Bike Parking

4.6.6.1 Bicycle Racks

Where bike lanes are installed or already exist along a street and the existing right-of-way condition provides limited pedestrian zone area for bike parking, some automobile parking spaces can be considered for conversion to "bike corrals" to provide for bike parking. Clearance considerations are required at fire hydrants, bus stops, loading zones, and above ground structures.

The City of Dallas issues licenses for private installation of bicycle racks in the right-of-way. Other relevant requirements related to bicycle parking (in addition to these guidelines) are provided in the Dallas City Code, Chapter 43.

Other criteria include:

- The rack should be affixed to a paved surface.
- The rack should support the frame of the bicycle at two points (in consideration of different frame sizes and styles).
- The rack should be simple and easy to use.
- The rack should allow easy locking of the frame and, preferably, both wheels.
- The rack should be placed so that bicycles park parallel to the curb or building frontage, or angled if there is additional space available while still meeting the minimum clearances.
- The rack should meet ADAAG to be detected with a cane.
- The rack placement ~~should~~shall meet street safety guidelines/criteria.

Also see related dimensional criteria which is stated in Dallas City Code Section 43-125.

4.6.6.2 Bicycle Shelters

Street types such as mixed-use with wide sidewalks are appropriate to consider for bicycle shelters. Ideally, they should be located within sight distance or close proximity to significant building entrances or transit stations. Where possible, bicycle parking shelters should provide weather protection for as many parked bicycles as possible. Shelter foundation and structural elements must meet required structural and loading requirements. See Figure 4.~~57~~80 for a typical bike shelter.

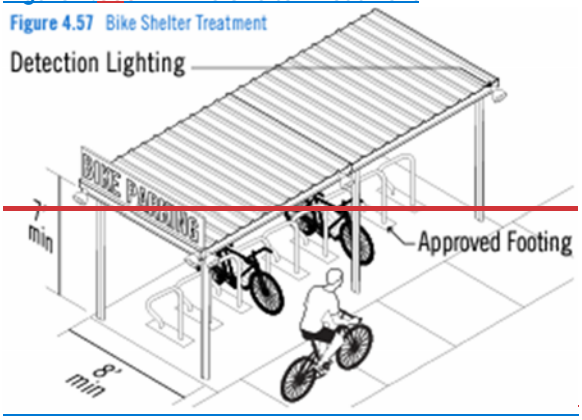
Design guidelines include:

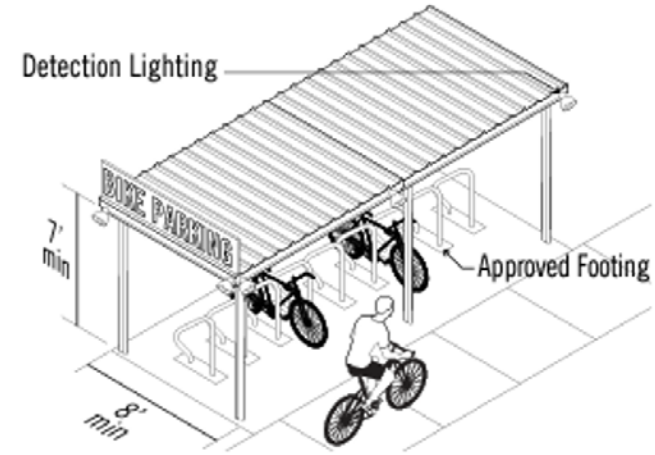
- Located within 50 feet of the main entrance to the building or transit station to encourage use of the shelter.
- A minimum of 8 feet wide and a minimum of 7 feet from floor to ceiling (if a bicyclist is expected to enter the shelter to lock the bike to a rack); the length of the shelter depends upon the number of bicycle racks the shelter is designed to accommodate.
- Placed so that, when occupied, bicycles do not intrude into the pedestrian clear zone.
- Bicycle shelter installation on pavers requires approved footing and pavers to be on sub-slab to prevent settlement or tripper edges.

- Bicycle shelters should be located in well-lit areas. Passive detection lighting should be provided in areas of low ambient light.
- Signs should be used to help direct bicyclists to shelters.

Roof drainage should flow away from entry points into the shelter. Provide positive drainage away from the shelter. Slope shelter "floor" to prevent accumulation of rainwater.

Figure 4.8057 Bike Shelter Treatment



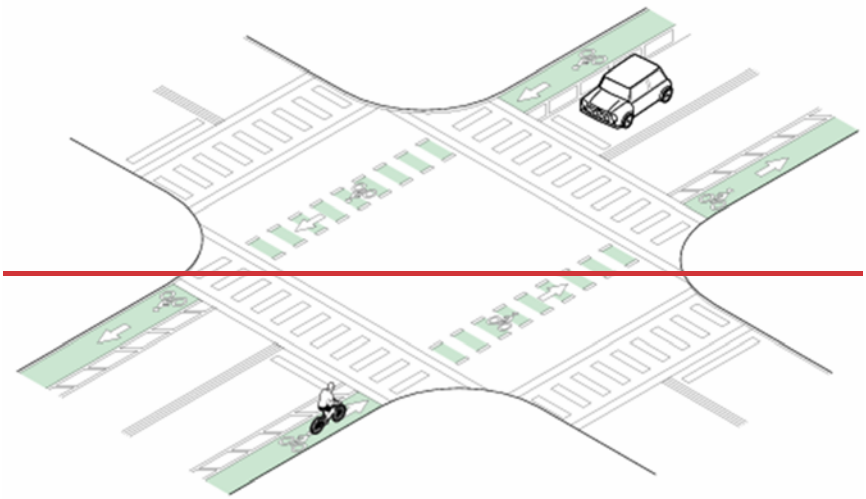


- ~~Separated bike lanes from pedestrian lanes must be marked with "BIKE ONLY" pavement markings.~~

4.4 INTERSECTIONS

4.4.4 Intersection Types

Figure 4.27 Intersection Types (continued)



One Street with Bike Lanes

4.4.5 Intersection Design Elements

4.4.5.6 Bicycle Treatments

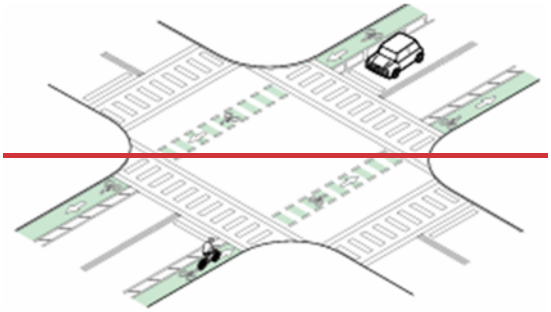
A. General

Treatments recommended by the Dallas Bike Plan include coloring the pavement across intersections in bike lanes, providing bike boxes, and guidance on how to transition between different facility types. In addition, where feasible, the following intersection treatment options shall be provided: median refuge, two-stage turn queue box, intersection with turn lanes, bridges and tunnel treatments, and floating bus stops. Refer to NACTO's Urban Bikeway Design Guide for more detailed guidance on application and treatment at intersections.

B. Crossing Markings

Crossing markings shall be used at intersections with bike facilities on both sides of the intersection. See Figure 4.29. In case a bike facility does not continue on the other side of an intersection, crossing markings shall not be used.

Figure 4.29 Crossing Markings



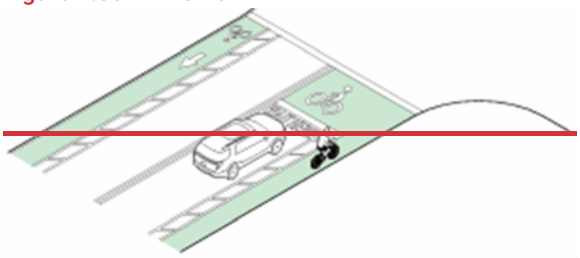
Across intersections, the intended path of travel of dedicated lanes may be indicated using, at a minimum, dashed white lines. Additionally, dashed white lines may be used with solid green pavement coloring for the lane, dashed green coloring, or elephant's feet markings instead of dashed white lines.

C. Bike Boxes

See Figure 4.30 for a representation of a bike box at an intersection approach. Bike boxes are:

- Recommended for use on roads with high bike ridership and / or frequent left and right turns.
- 10 feet minimum and 16 feet preferred length of box should be placed at the head of one or more travel lanes in one direction for bicyclists to wait in.
- Must be marked using white transverse lines and pavement bike markings.
- May optionally be colored green in the box. If green is used, bike lane leading up to the box should also be colored for 50 to 75 feet and the lane continuing across the intersection shall also be colored.
- Should be used in conjunction with "NO TURN ON RED" and "YIELD TO BIKES" signs for motor vehicles.

Figure 4.30 Bike Box

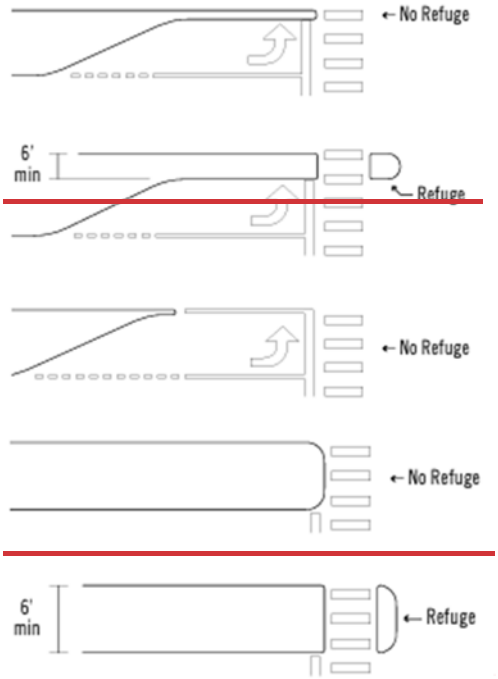


D. Median Refuge

Where median refuge is provided for bicyclists, the following criteria shall be adopted:

- Recommended on high volume or wide roadways, especially with existing medians, or where pedestrian refuge exists.
- Raised island shall be 6 feet minimum width and length, though the preferred width is 8 feet.
- Raised curb shall be outlined in reflective white or yellow paint.
- Where provided, shall be at street pavement grade with cut through for bikes, strollers, and wheelchairs. See Figure 4.31.

~~Figure 4.31 Crosswalk Refuge~~

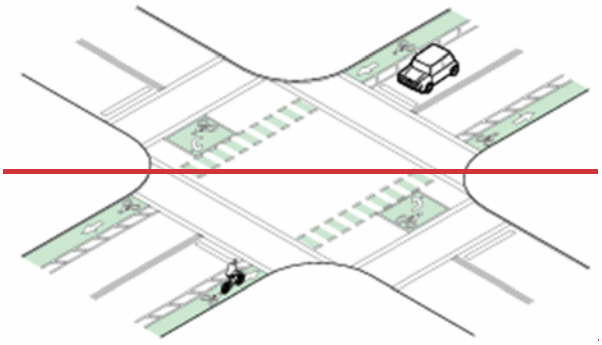


~~E. Two-Stage Turn Queue Boxes~~

~~Recommended where a large demand for left turns from a right side facility exists.~~

- ~~Must be designated by a marked white box with bike stencil and turn arrow inside. Coloring the pavement green inside the box is recommended. See Figure 4.32.~~
- ~~Placed in the intersection in potential configurations shown in the diagram.~~
- ~~Turning box shall allow for through bike lanes.~~

~~Figure 4.32 2-Stage Turn Box~~



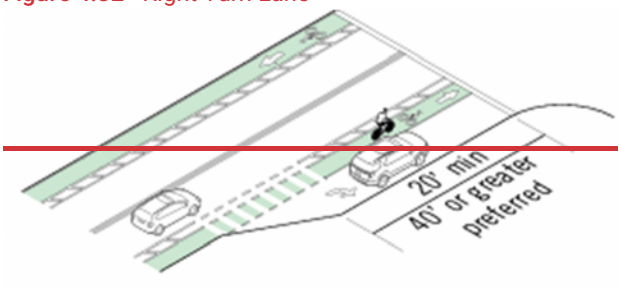
~~F. Turning Lanes~~

~~Turning Lanes are recommended where turn only lanes exist or are added on the side the bicycle facility is placed on. See Figure 4.33.~~

- ~~Where dedicated signals are used for bicycles, a car lane may become turn only without crossing the bike lane.~~

- Where dedicated signals are not used, cars may need to cross the bicycle lane into an auxiliary turn only lane. In such a case, the bike lane should become dashed white lines to allow cars to cross.
- Where cars are allowed to cross bike lanes, a "BEGIN RIGHT TURN LANE, YIELD TO BIKES" sign should be used, TMUTCD R4-4.
- Right turn lane length shall be at least 20 feet in length, but expected turn lane queues may require significantly greater lengths.

Figure 4.32 Right Turn Lane



G. Mixing Zone

- Recommended where space restrictions do not allow a turn-only and minimum bike lane to coexist at an intersection, or where lanes are not turn-only but host a large volume of turning traffic.
- The bike lane should widen to a minimum 9 feet to accommodate turning vehicles.
- Shared Lane Markings and Turn-Only pavement markings shall be employed for mixing zone.
- Bike lane solid white stripe shall be changed to dashed white stripe to indicate merging area where vehicles may cross into the mixing zone.
- YIELD TO BIKES signage should be used to indicate bicycle priority in mixing zones

H. Floating Bus Stops

- Recommended where bus volumes are high or where bus stops occur frequently.
- A floating bus stop shall be provided for curbside bus stops so bike lanes can be diverted behind the bus stops. Refer to Section 4.5.6.6 Bus Stops for more information.
- In addition to intersection treatments, flow of all modes of transportation must be carefully controlled to avoid conflicts.

I. Dedicated Bicycle Signals

- Recommended for large intersections where the time taken to clear the intersection is much greater for bikes than cars, or where an off-street bike facility becomes an on-street facility.
- Phasing on dedicated signals may be used to give bikes a head start and enter the intersection with pedestrians. For guidance on clearance intervals, refer to NACTO Urban Bikeway Design page 97.
- Signals may be manually or automatically actuated.

J. Bike Detection

- Recommended in place of manual actuation for the convenience and safety of bicyclists. Also, on streets with low vehicle traffic, a signal may not turn green if detecting methods are not sensitive enough to detect bicycles.
- Detection shall be placed or targeted where bicyclists intend to queue or travel.
- Induction loop may be embedded in the pavement per the Dallas Bike Plan recommendation.
- Video detection aimed at bicycle approaches may be employed.

4.4.5.7 Key Transit Treatments

3. Bus Stations and Stops

Bus stop locations in the roadway may be:

- [...]
- Where a dedicated bike lane separates a dedicated or shared bus lane from the pedestrian zone, an island is recommended for the bus stop location.

4.5.6.4 Bicycle Racks

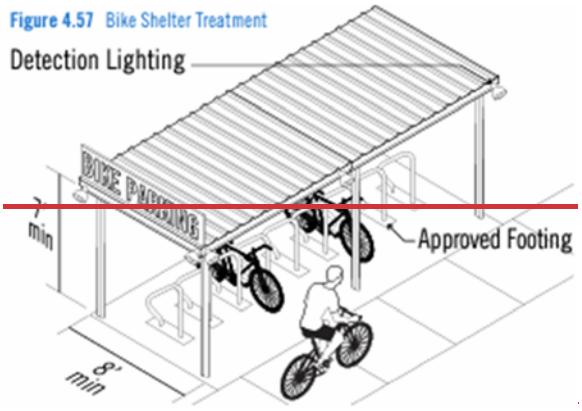
Bicycle parking is identified as an implementation project in the Dallas Bike Plan, and bicycle parking has been installed as part of the DART Station Access Program. The City of Dallas issues licenses for private installation of bicycle racks in the right-of-way. Other relevant requirements related to bicycle parking (in addition to these guidelines) are provided in the Dallas City Code, Chapter 43.

Other criteria include:

- The rack should be affixed to a paved surface.
- The rack should support the frame of the bicycle at two points (in consideration of different frame sizes and styles). •The rack should be simple and easy to use.
- The rack should allow easy locking of the frame and, preferably, both wheels.
- The rack should be placed so that bicycles park parallel to the curb or building frontage, or angled if there is additional space available while still meeting the minimum clearances.
- The rack should meet ADAAG to be detected with a cane.

Also see related dimensional criteria which is stated in Dallas City Code Section 43-125.

Figure 4.57 Bike Shelter Treatment



4.5.6.5 Bicycle Shelters

Street types such as mixed-use with wide sidewalks are appropriate to consider for bicycle shelters. Ideally, they should be located within sight distance or close proximity to significant building entrances or transit stations. Where possible, bicycle parking shelters should provide weather protection for as many parked bicycles as possible. Shelter foundation and structural elements must meet required structural and loading requirements. See Figure 4.57 for a typical bike shelter.

Design guidelines include:

- Located within 50 feet of the main entrance to the building or transit station to encourage use of the shelter.
- A minimum of 8 feet wide and a minimum of 7 feet from floor to ceiling (if a bicyclist is expected to enter the shelter to lock the bike to a rack); the length of the shelter depends upon the number of bicycle racks the shelter is designed to accommodate.
- Placed so that, when occupied, bicycles do not intrude into the pedestrian clear zone.
- Bicycle shelter installation on pavers requires approved footing and pavers to be on sub-slab to prevent settlement or tripper edges.
- Bicycle shelters should be located in well-lit areas. Passive detection lighting should be provided in areas of low ambient light.
- Signs should be used to help direct bicyclists to shelters.
- Roof drainage should flow away from entry points into the shelter. Provide positive drainage away from the shelter. Slope shelter "floor" to prevent accumulation of rainwater.

SECTION 6 STREET LIGHTING

6.1.4 Sidewalk, Pedestrian Walkway, and Bikeway Illumination Levels

Sidewalks, pedestrian walkways, and bikeways have been separated into categories based on their pedestrian activity level and proximity to a continuously lighted roadway. The designer shall ensure that the roadway lighting provides the appropriate lighting levels along attached and separated pedestrian walkways and bikeways. Supplemental lighting may be required to ensure pedestrian facilities are adequately illuminated, particularly where there is separation between the pedestrian area and the roadway. Lighting levels for attached and separated sidewalk and walkway categories shall not be below the levels shown in Table 6.3 when paralleling a roadway with continuous lighting.

Table 6.3 Illuminance Values for Pedestrian Areas

Pedestrian Activity Level	Conflict Area	E_{avg} (lux / fc)	E_{Vmin} (lux / fc)	Uniformity Ratio (E_{avg}/E_{min})
High	Mixed Vehicle and Pedestrian	20 / 2.0	10 / 1.0	4
High	Pedestrian Only	10 / 1.0	5 / 0.5	4
Medium	Pedestrian Areas	5 / 0.5	2 / 0.2	4
Low	Rural/Semi-Rural Areas	2 / 0.2	0.6 / 0.06	10
Low	Low Density Residential (≤2 dwelling units/acre)	3 / 0.3	0.8 / 0.08	6
Low	Medium Density Residential (2.2 - 6 dwelling units/acre)	4 / 0.4	1 / 0.1	4

Abbreviation Definitions:

lux: Luminous Flux (lumens/m^2)

fc: Foot-Candle (lumens/ft^2)

E_{avg}: Minimum maintained average horizontal illuminance at pavement

E_{min}: Minimum horizontal illuminance at pavement

E_{Vmin}: Minimum vertical illuminance at 5 ft above pavement

City of Dallas

DRAINAGE DESIGN MANUAL

SECTION 3.3 INLET DESIGN

3.3.1 Types of Inlets

Inlets collect excess storm water from the street, transition the flow into storm drains, and can provide maintenance access to the storm drain system. Storm water inlets are used to remove surface runoff and convey it to a storm drainage system. There are five major types of inlets: grate, curb, Y-inlet, slotted, and combination. Table 3.2 provides considerations in proper selection.

Table 3.2 Inlet Types

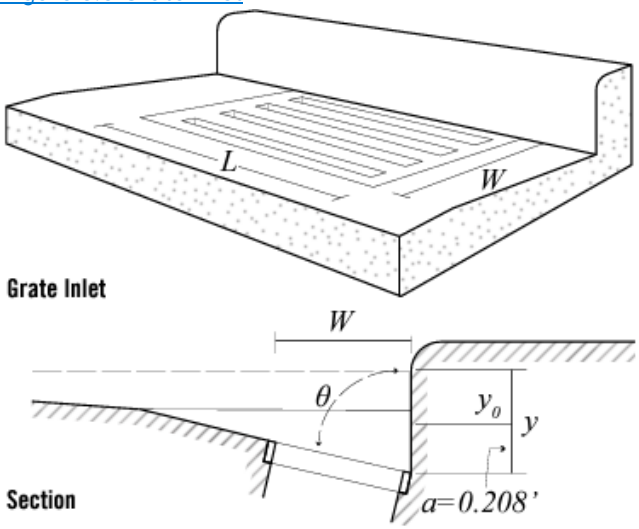
Inlet Type	Applicable Setting	Advantages	Disadvantages
Grate	Sags & continuous grades (should be made bike safe).	Perform well over wide range of grades.	Can become clogged.
Curb	Sags & continuous grades (but not steep grades).	Do not clog easily. Bicycle safe if they are designed to not encroach into the travel lane or bike lane, or if encroachment occurs, with minimal depression.	Not effective with steep grades. May not be bicycle safe if it encroaches into the bike lane or travel lane.
Y-Inlet	Swales & sags	High Capacity. Do not clog easily.	Cannot be used in roadways.
Combination	Sags & continuous grades (should be made bike safe).	High Capacity. Do not clog easily.	More expensive than grate or curb-opening acting alone. May not be bicycle safe if it encroaches into the bike lane or travel lane.
Slotted	Locations where sheet flow must be intercepted.	Intercept flow over wide section.	Susceptible to clogging.

3.3.1.1 Grate Inlet

Although grate inlets may be designed to operate satisfactorily in a range of conditions, they may become clogged by floating debris during 1% annual chance storm events. In addition, they can produce a hazard to wheelchair and bicycle traffic, and the grate configuration and orientation must be designed according to

ADA guidelines and be compatible with bicycle and wheelchair safety. For these reasons, they may be used only at locations where space restrictions prohibit the use of other types of inlets and must be approved by the Director.

Figure 3.3 Grate Inlet



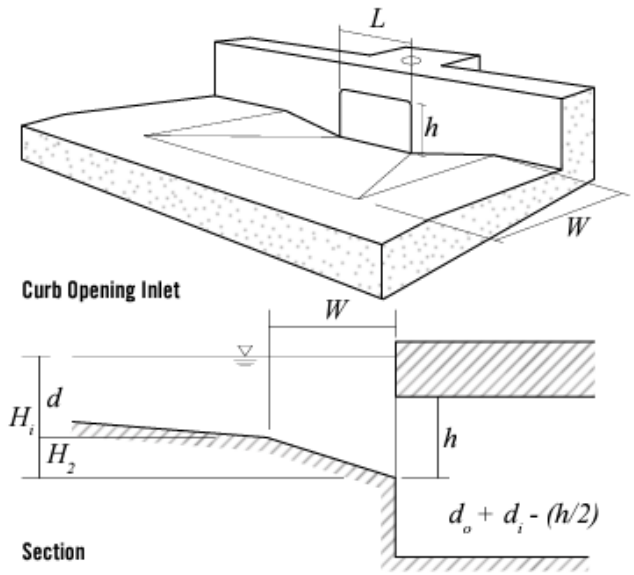
3.3.1.2 Curb Inlet

Curb inlets (both recessed and non-recessed) are the most effective type of inlet on slopes flatter than 3%, in sag locations, and with flows that typically carry large amounts of debris. Similar to grate inlets, curb inlets also tend to lose capacity as street grades increase, but to a lesser degree than grate inlets.

Most curb opening inlets depend heavily upon an adjacent depression in the gutter for effective flow interception. Greater interception rates result in shorter (and probably, more economical) inlet lengths. However, a large gutter depression can be unsafe for traffic flow and bicycle operation near the gutter line. Therefore, a compromise is in order when selecting an appropriate value for the gutter depression. The depth of the gutter depression should be:

- 0 to 1 in. (0 to 25 mm) where the gutter is within the traffic lane or bike lane
- 1 to 3 in. (25 to 75 mm) where the gutter is outside the traffic lane or in the parking lane
- 1 to 5 in. (25 to 125 mm) for lightly traveled local city streets that are not on the Thoroughfare Plan, the federal functional classification system, or on the Dallas Bike Plan.

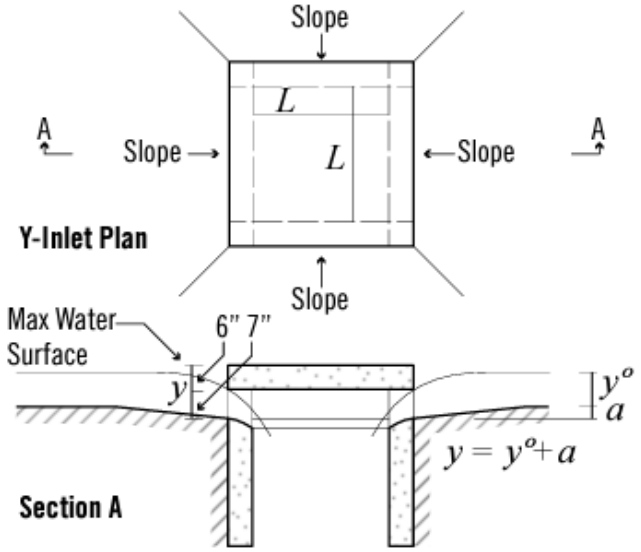
Figure 3.4 Curb Inlet



3.3.1.3 Y-Inlet

Y-inlets are most often used in swale and sag drainage.

Figure 3.5 Y-Inlet

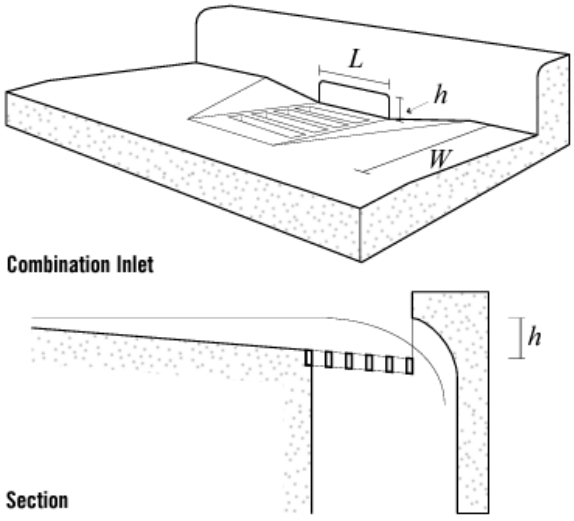


3.3.1.4 Combination Inlet

A combination inlet consists of both the grate inlet and the curb inlet. This configuration provides many of the advantages of both inlet types. The combination inlet also reduces the chance of clogging by debris with flow into the curb portion of the inlet. If a curb opening is extended on the upstream side of the combination inlet it will act as a "sweeper", and remove debris before it reaches the grate portion of the inlet. Due to the presence of the grate, a combination inlet can produce a hazard to wheel-chair and bicycle traffic and must be designed according to ADA guidelines. For these reasons, they may be used only at

locations where space restrictions prohibit the use of other types of inlets and must be approved by the Director.

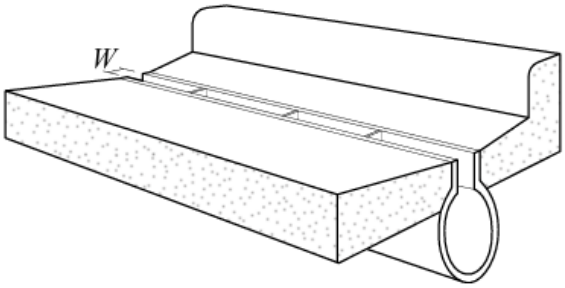
Figure 3.6 Combination Inlet

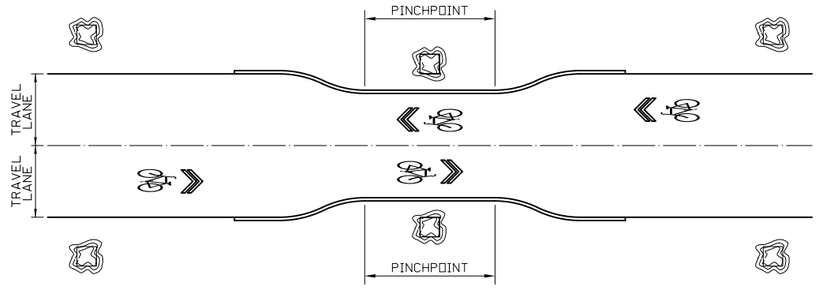


3.3.1.5 Slotted Drain Inlet

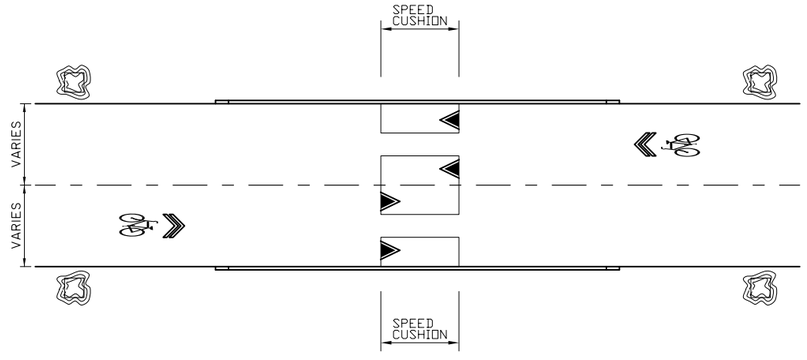
Slotted drain inlets can be used to intercept sheet flow, or flow in wide sections. They are not recommended for use in the City of Dallas since they are susceptible to clogging from debris. Use of slotted inlets may not be used unless approved by the Director.

Figure 3.7 Slotted Drain Inlet

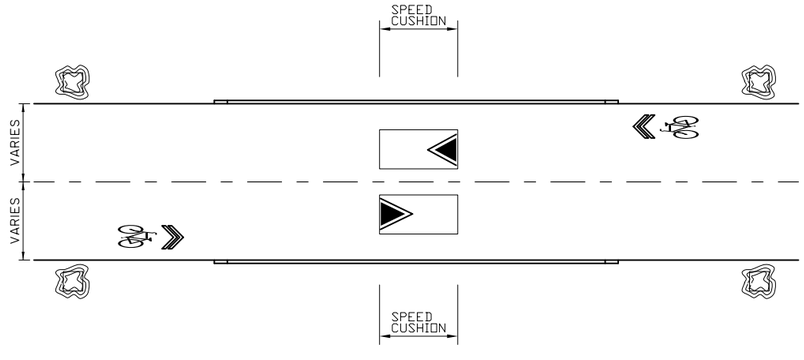




RESIDENTIAL STREET PINCHPOINT DETAIL



RESIDENTIAL STREET SPEED CUSHION DETAIL (STREET WIDTH > 24', ≤ 30')



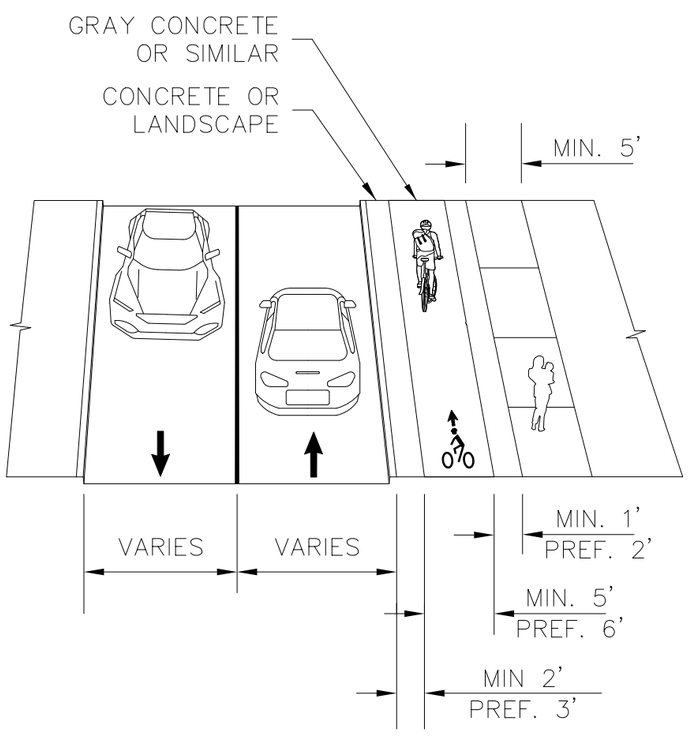
RESIDENTIAL STREET SPEED CUSHION DETAIL (STREET WIDTH ≤ 24')

TRAFFIC CALMING TREATMENT OPTIONS

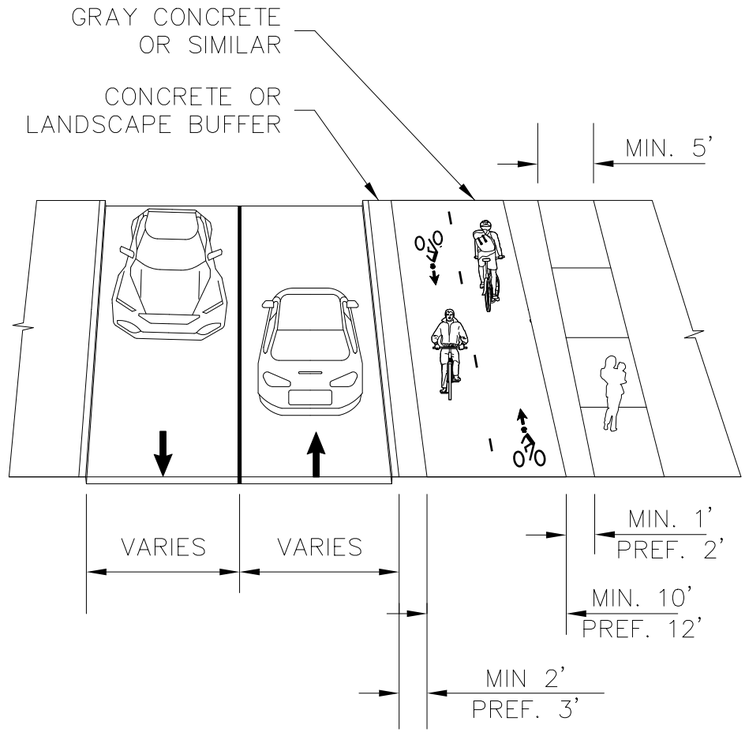
DEPARTMENT OF PUBLIC WORKS
CITY OF DALLAS, TEXAS

DRAWINGS NOT TO SCALE
REVISED: FEBRUARY 2025

SHEET No.
N/A



ONE–WAY RAISED BIKE LANE DETAIL (50' ROW)

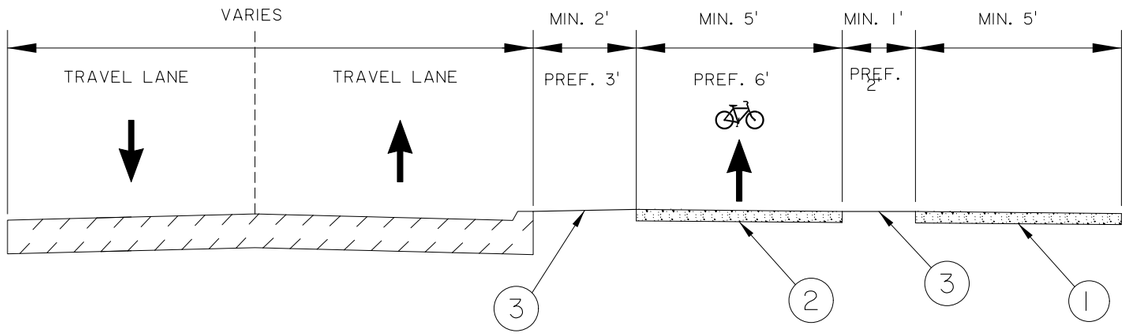


TWO–WAY RAISED BIKE LANE DETAIL (60' ROW)

NOTES:

1) REFER TO THE CITY OF DALLAS STREET DESIGN MANUAL FOR PREFERRED SIDEWALK CLEAR ZONE WIDTH
2) ALL PAVEMENT MARKINGS SHALL BE INSTALLED IN ACCORDANCE WITH CITY OF DALLAS STANDARD CONSTRUCTION DETAILS 251–D.
3) ALL MATERIAL AND WORK SHALL CONFORM TO THE LATEST EDITION OF CITY OF DALLAS STANDARDS 251D–1 AS AMENDED, CITY OF DALLAS DEPARTMENT OF TRANSPORTATION (DDOT) TRAFFIC SIGNS STANDARDS AND TEXAS MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES (TMUTCD) STANDARD PLANS; UNLESS OTHERWISE APPROVED BY THE CITY.

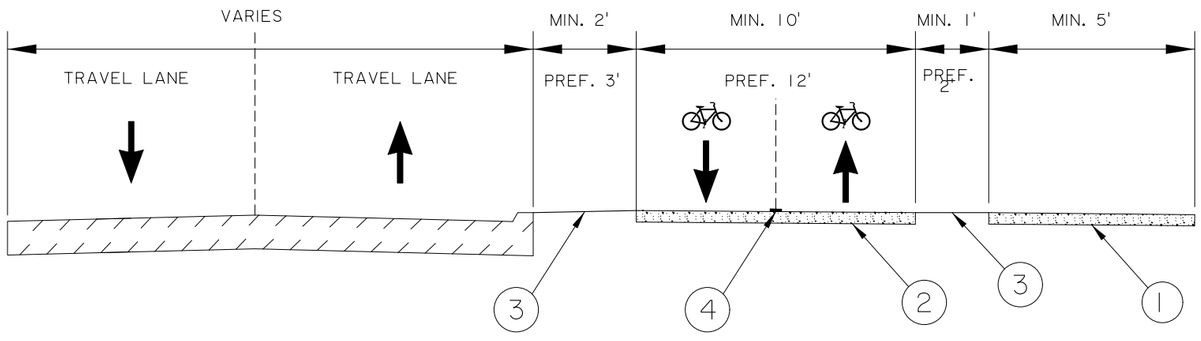
RAISED, SEPARATED BIKE LANE DETAIL	
DEPARTMENT OF PUBLIC WORKS CITY OF DALLAS, TEXAS	
DRAWINGS NOT TO SCALE REVISED: FEBRUARY 2025	SHEET No. N/A



ONE–WAY RAISED BIKE LANE DETAIL

LEGEND

1. SIDEWALK
2. 5" MIN. CONCRETE RAISED BIKE PATH
3. CONCRETE OR LANDSCAPE BUFFER
4. 6" BROKEN YELLOW STRIPE (TYPE II @ 125 MIL)

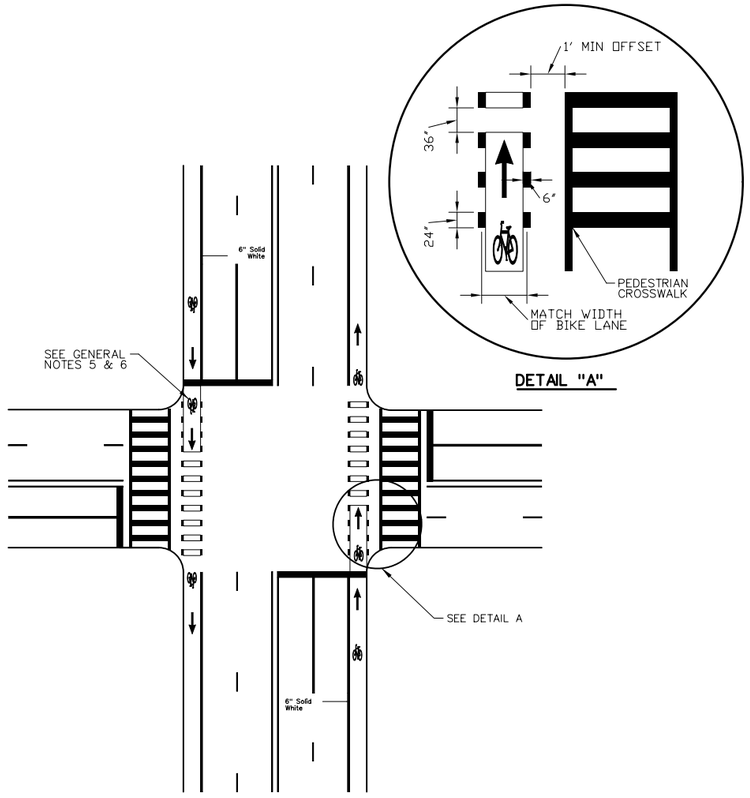


TWO–WAY RAISED BIKE LANE DETAIL

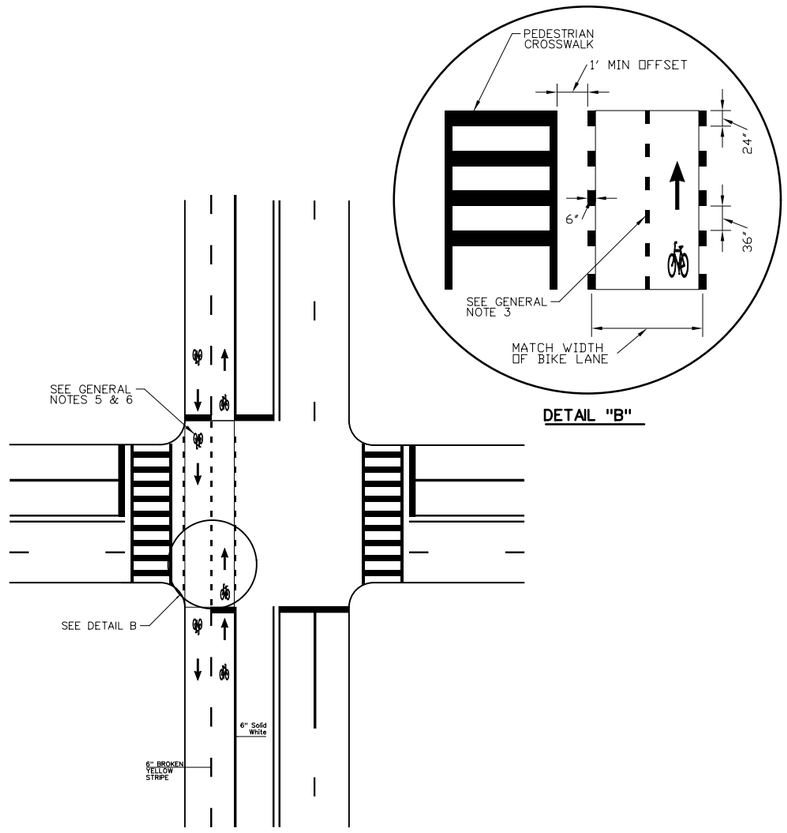
NOTES:

1) REFER TO THE CITY OF DALLAS STREET DESIGN MANUAL FOR PREFERRED SIDEWALK CLEAR ZONE WIDTH
2) ALL PAVEMENT MARKINGS SHALL BE INSTALLED IN ACCORDANCE WITH CITY OF DALLAS STANDARD CONSTRUCTION DETAILS 251–D.
3) VERTICAL OBJECTS SUCH AS TRAFFIC SIGNS, FIRE HYDRANTS, AND UTILITY POLES SHOULD BE PLACED IN THE BUFFER BETWEEN THE STREET AND BIKE LANE AS LONG AS CLEAR ZONE WIDTHS ARE MET
4) REFER TO THE MUTCD FOR REGULATORY SIGNS TO INFORM ROAD USERS AT OR NEAR WHERE THE REGULATIONS APPLY

RAISED, SEPARATED BIKE LANE DETAIL	
DEPARTMENT OF PUBLIC WORKS CITY OF DALLAS, TEXAS	
DRAWINGS NOT TO SCALE REVISED: FEBRUARY 2025	SHEET No. N/A



ONE-WAY BIKE LANE THRU INTERSECTION DETAIL

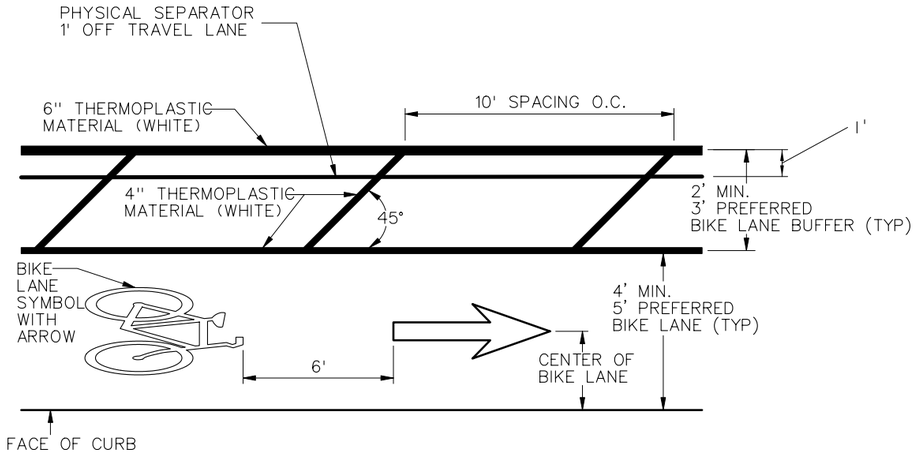


TWO-WAY BIKE LANE THRU INTERSECTION DETAIL

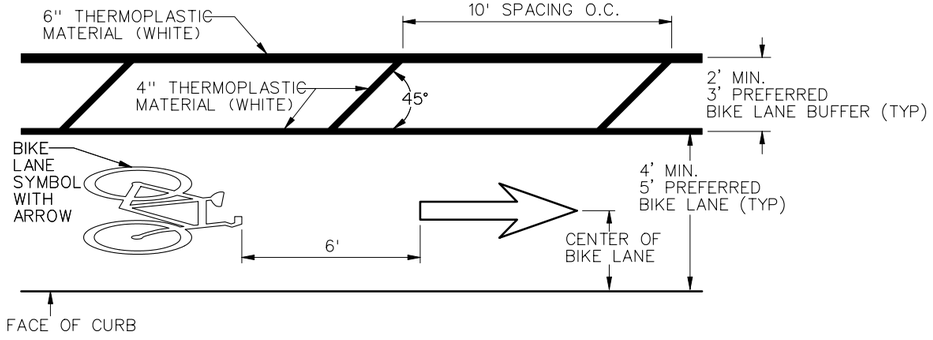
NOTES:

1) ALL PAVEMENT MARKINGS SHALL BE INSTALLED IN ACCORDANCE WITH CITY OF DALLAS STANDARD CONSTRUCTION DETAILS 251-D.
2) ALL MATERIAL AND WORK SHALL CONFORM TO THE LATEST EDITION OF CITY OF DALLAS STANDARDS 251D-1 AS AMENDED, CITY OF DALLAS DEPARTMENT OF TRANSPORTATION (DDOT) TRAFFIC SIGNS STANDARDS AND TEXAS MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES (TMUTCD) STANDARD PLANS; UNLESS OTHERWISE APPROVED BY THE CITY.
3) THE BROKEN STRIPE PATTERN SHOULD BE MODIFIED TO ALIGN WITH THE ADJACENT CROSWALK PATTERN.
4) A 6" BROKEN YELLOW CENTERLINE SHALL BE PROVIDED WHERE A TWO-WAY SEPARATED BIKE LANE IS PRESENT.
5) GREEN-COLORED PAVEMENT SHOULD BE USED TO ENHANCE THE CONSPICUITY OF THE BICYCYLE CROSSING.
6) GREEN-COLORED PAVEMENT MAY BE GREEN DOTTED OR SOLID COLOR PAVEMENT.
7) USE OF BICYCLE SYMBOL AND ARROW WITHIN INTERSECTION IS OPTIONAL.

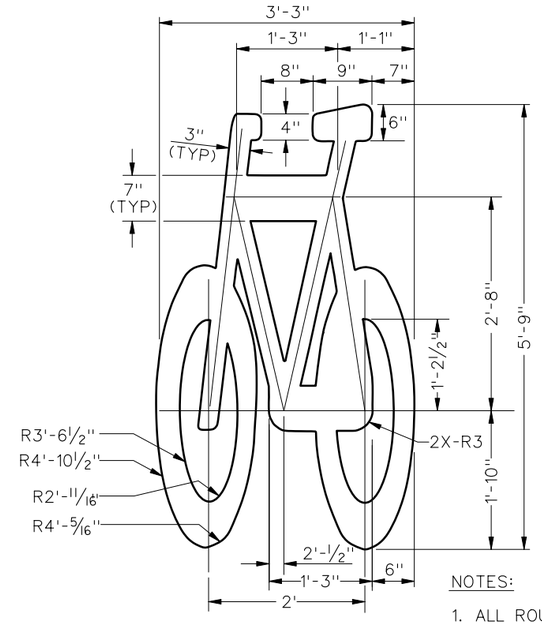
INTERSECTION BIKE LANE MARKINGS DETAILS	
DEPARTMENT OF PUBLIC WORKS CITY OF DALLAS, TEXAS	
DRAWINGS NOT TO SCALE REVISED: FEBRUARY 2025	SHEET No. N/A



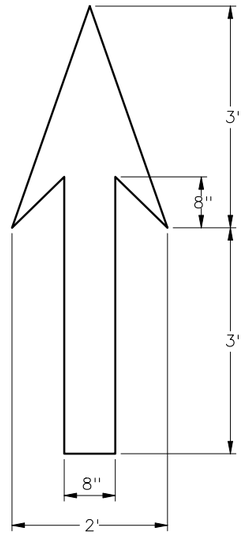
PHYSICALLY SEPARATED BIKE LANE



VISUALLY SEPARATED BIKE LANE



BIKE SYMBOL DETAIL



NOTES:

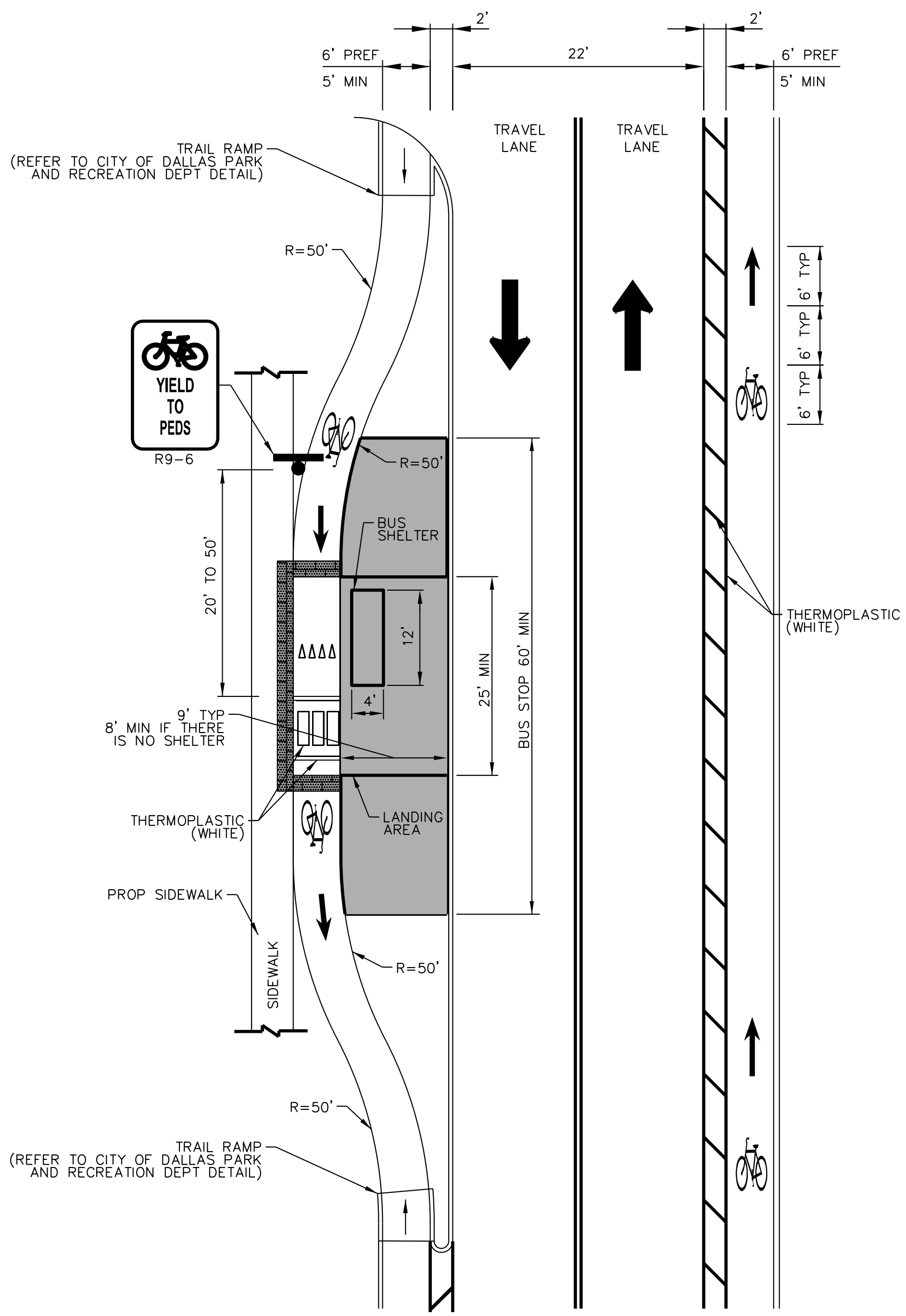
1. ALL ROUNDS 1" UNLESS OTHERWISE NOTED.
2. THESE SYMBOLS MUST BE INSTALLED IN CONJUNCTION WITH EACH OTHER.

BIKE LANE MARKING DETAIL

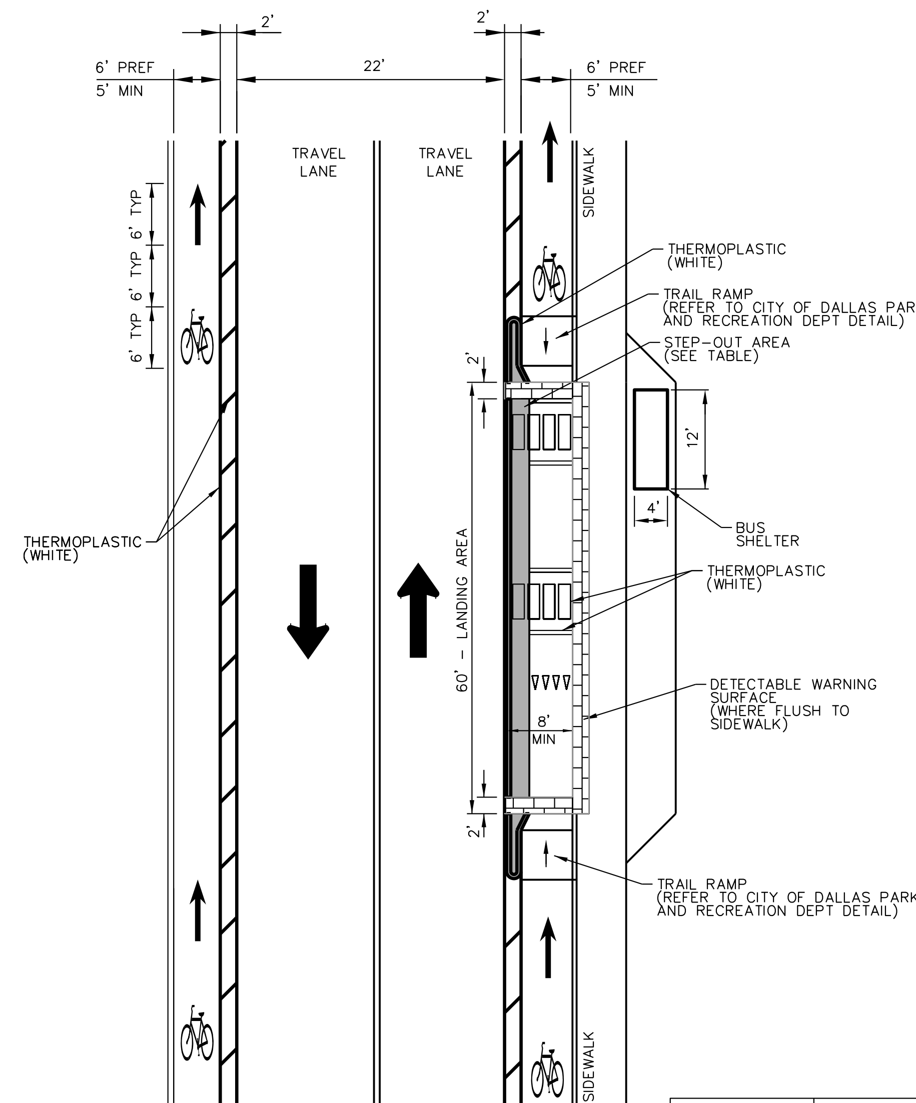
NOTES:

1) ALL DIMENSIONS SHOWN ARE TYPICAL AND MAY VARY BASED ON SITE CONDITIONS.
2) ALL PAVEMENT MARKINGS SHALL BE INSTALLED IN ACCORDANCE WITH CITY OF DALLAS STANDARD CONSTRUCTION DETAILS 251–D.
3) THE WIDTH BETWEEN THE CURB AND ANY VERTICAL SEPARATION ELEMENTS SHOULD BE AT LEAST THE BIKE LANE SWEEPING VEHICLE WIDTH.
4) WHERE EXISTING GUTTER/DRAINAGE PAN PROTRUDES INTO THE PROPOSED BIKE LANE, THE PROPOSED BIKE LANE WIDTH SHALL BE AT LEAST 4' STARTING FROM THE GUTTER PAN SEAM TO THE OUTER EDGE OF THE BIKE LANE.
5) THE WIDTH BETWEEN THE CURB AND ANY VERTICAL SEPARATION ELEMENTS SHOULD BE AT MINIMUM 5'.
6) ALL MATERIAL AND WORK SHALL CONFORM TO THE LATEST EDITION OF CITY OF DALLAS STANDARDS 251D–1 AS AMENDED, CITY OF DALLAS DEPARTMENT OF TRANSPORTATION (DDOT) TRAFFIC SIGNS STANDARDS AND TEXAS MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES (TMUTCD) STANDARD PLANS; UNLESS OTHERWISE APPROVED BY THE CITY.

SEPARATED BIKE LANE MARKING DETAIL	
DEPARTMENT OF PUBLIC WORKS CITY OF DALLAS, TEXAS	
DRAWINGS NOT TO SCALE REVISED: FEBRUARY 2025	SHEET No. 1 OF 1



CURB–SIDE WITH BIKE LANE
ADJACENT BUS STOP DETAIL



PROTECTED BIKE LINE TYPE	SHARED BIKE LANE WIDTH	STEP–OUT WIDTH
ONE –WAY	6.0' OR GREATER	3.0' (MAX)
	5.5'	2.5'
	5.0' (MIN)	2.0' (MIN)

CURB–SIDE WITH ELEVATED SHARED
LANDING BUS STOP DETAIL

GENERAL NOTES:

1. ALL DIMENSIONS SHOWN ARE TYPICAL AND MAY VARY BASED ON SITE CONDITIONS.
2. ALL PAVEMENT MARKINGS SHALL BE INSTALLED IN ACCORDANCE WITH CITY OF DALLAS STANDARD CONSTRUCTION DETAILS 251–D.
3. REFER TO CITY OF DALLAS STREET DESIGN MANUAL FOR BUS SHELTER STANDARDS AND DART'S DESIGN AND CONSTRUCTION STANDARDS FOR BUS SHELTER DESIGN.
4. DESIGNER MUST VERIFY AND ADDRESS ALL EXISTING CONDITIONS INCLUDING DRAINAGE, WHEN RECOMMENDING THESE TREATMENTS.
5. REFER TO CITY OF DALLAS STREET MANUAL FOR BUS LANDING DESIGN.
6. ALL MATERIAL AND WORK SHALL CONFORM TO THE LASTEST EDITION OF CITY OF DALLAS STANDARDS 251D–1 AS AMENDED, CITY OF DALLAS DEPARTMENT OF TRANSPORTATION (DDOT) TRAFFIC SIGNS STANDARDS AND TEXAS MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES (TMUTCD) STANDARDS PLANS: UNLESS OTHERWISE APPROVED BY THE CITY.
7. ALL TRAFFIC STRIPES, PAVEMENT MARKINGS, AND SIGNS SHALL BE REFLECTORIZED AND IN STANDARD SIZE AS ACCORDING\ TO TEXAS MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES (TMUTCD).
8. THE CONTRACTOR SHALL REMOVE ALL CONFLICTING STRIPES. PAVEMENT MARKINGS, AND RAISED PAVEMENT MARKERS IN ACCORDANCE WITH THE PLANS AND AS DIRECTED BY THE ENGINEER. WORD OR SYMBOL PAVEMENT MARKINGS SHALL BE REMOVED BY SANDBLASTING OR GRINDING A RECTANGULAR AREA COVERING THE WHOLE MARKING.
9. THE CONTRACTOR SHALL FURNISH AND INSTALL ALL TRAFFIC STRIPES, RAISED PAVEMENT MARKERS (RPMS), CERAMICS BUTTONS, PAVEMENT MARKINGS, TRAFFIC CALMING DEVICES AND SIGNS IN ACCORDANCE WITH THE PLANS AND AS DIRECTED BY THE ENGINEER.
10. ALL PAVEMENT MARKINGS INCLUDING CROSSWALKS, LIMIT LINES, AND STOP BARS SHALL BE APPLIED WITH THERMOPLASTIC MATERIAL.
11. THE CONTRACTOR SHALL REPLACE ALL SIGNING WITHIN PROJECT LIMITS DAMAGED OR ALTERED BY THE PROJECT, AS DETERMINED BY THE DDOT PAVEMENT MARKING SECTION REPRESENTATIVE.

YIELD LINES

1. TRIANGLE HEIGHT IS EQUAL TO 1.5 TIMES THE BASE DIMENSIIN.
2. YIELD LINES MAY BE SMALLER THAN SUGGESTED WHEN INSTALLED ON MUCH NARROWER, SLOW –SPEED FACILITIES SUCH AS SHARE–USE PATHS.

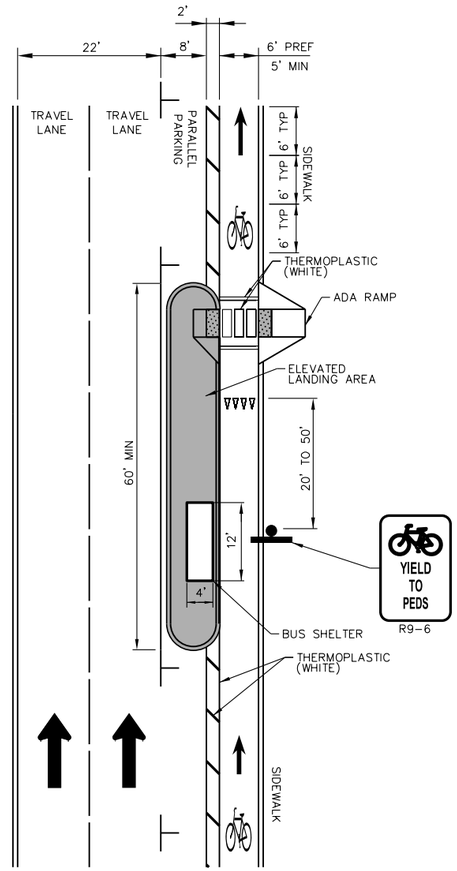
BUS STOP WITH BIKE LANE DETAIL

DEPARTMENT OF PUBLIC WORKS
CITY OF DALLAS, TEXAS

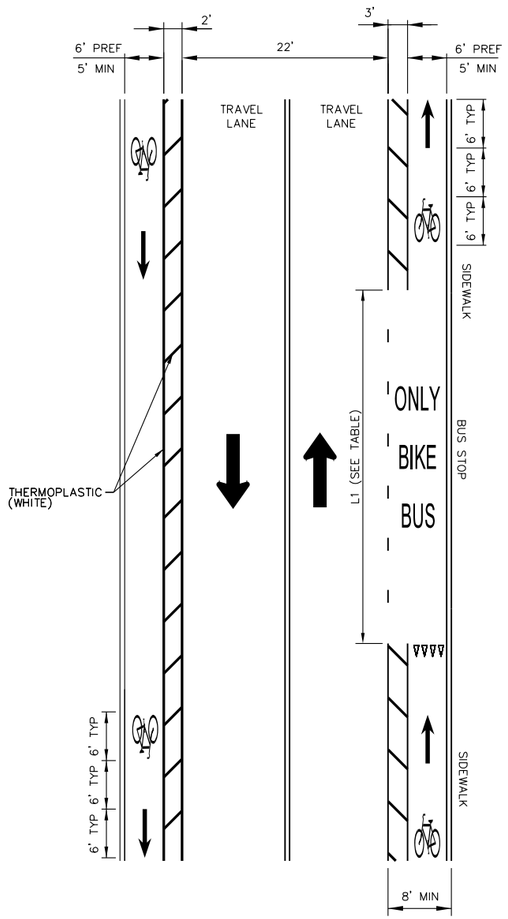
DRAWINGS NOT TO SCALE
REVISED: AUGUST 2024

SHEET No.
1 OF 2

DATE: 2/7/2025 12:29:52 PM



BUS STOP ISLAND WITH ON-STREET PARKING DETAIL



CURB-SIDE WITH SHARED BUS-BIKE DETAIL

BUS STOP LENGTH (L1)		
STOP PLACEMENT	40' BUS	
	PREF	MIN
NEAR SIDE	100'	90'
FAR-SIDE	90'	70'
MID-BLOCK	120'	100'

GENERAL NOTES:

1. ALL DIMENSIONS SHOWN ARE TYPICAL AND MAY VARY BASED ON SITE CONDITIONS.
2. ALL PAVEMENT MARKINGS SHALL BE INSTALLED IN ACCORDANCE WITH CITY OF DALLAS STANDARD CONSTRUCTION DETAILS 251-D.
3. REFER TO CITY OF DALLAS STREET DESIGN MANUAL FOR BUS SHELTER STANDARDS AND DART'S DESIGN AND CONSTRUCTION STANDARDS FOR BUS SHELTER DESIGN.
4. DESIGNER MUST VERIFY AND ADDRESS ALL EXISTING CONDITIONS INCLUDING DRAINAGE, WHEN RECOMMENDING THESE TREATMENTS.
5. REFER TO CITY OF DALLAS STREET MANUAL FOR BUS LANDING DESIGN.
6. ALL MATERIAL AND WORK SHALL CONFORM TO THE LASTEST EDITION OF CITY OF DALLAS STANDARDS 251D-1 AS AMENDED, CITY OF DALLAS DEPARTMENT OF TRANSPORTATION (DDOT) TRAFFIC SIGNS STANDARDS AND TEXAS MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES (TMUTCD) STANDARDS PLANS: UNLESS OTHERWISE APPROVED BY THE CITY.
7. ALL TRAFFIC STRIPES, PAVEMENT MARKINGS, AND SIGNS SHALL BE REFLECTORIZED AND IN STANDARD SIZE AS ACCORDING\ TO TEXAS MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES (TMUTCD).
8. THE CONTRACTOR SHALL REMOVE ALL CONFLICTING STRIPES. PAVEMENT MARKINGS, AND RAISED PAVEMENT MARKERS IN ACCORDANCE WITH THE PLANS AND AS DIRECTED BY THE ENGINEER. WORD OR SYMBOL PAVEMENT MARKINGS SHALL BE REMOVED BY SANDBLASTING OR GRINDING A RECTANGULAR AREA COVERING THE WHOLE MARKING.
9. THE CONTRACTOR SHALL FURNISH AND INSTALL ALL TRAFFIC STRIPES, RAISED PAVEMENT MARKERS (RPMS), CERAMICS BUTTONS, PAVEMENT MARKINGS, TRAFFIC CALMING DEVICES AND SIGNS IN ACCORDANCE WITH THE PLANS AND AS DIRECTED BY THE ENGINEER.
10. ALL PAVEMENT MARKINGS INCLUDING CROSSWALKS, LIMIT LINES, AND STOP BARS SHALL BE APPLIED WITH THERMOPLASTIC MATERIAL.
11. THE CONTRACTOR SHALL REPLACE ALL SIGNING WITHIN PROJECT LIMITS DAMAGED OR ALTERED BY THE PROJECT, AS DETERMINED BY THE DDOT PAVEMENT MARKING SECTION REPRESENTATIVE.

YIELD LINES

1. TRIANGLE HEIGHT IS EQUAL TO 1.5 TIMES THE BASE DIMENSIIN.
2. YIELD LINES MAY BE SMALLER THAN SUGGESTED WHEN INSTALLED ON MUCH NARROWER, SLOW -SPEED FACILITIES SUCH AS SHARE-USE PATHS.

BUS STOP WITH BIKE LANE DETAIL

DEPARTMENT OF PUBLIC WORKS
CITY OF DALLAS, TEXAS

DRAWINGS NOT TO SCALE
REVISED: AUGUST 2024

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