City of Gaithersburg

Street Design Standards and Traffic Calming Best Practices

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Street Design Standards and Traffic Calming Best Practices

Regulation No. Reg-1-19

Adopted : January 7, 2019

REGULATION NO. Reg-1-19

ADOPTION OF REGULATIONS FOR STREET DESIGN STANDARDS AND TRAFFIC CALMING BEST PRACTICES FOR ROADWAYS LOCATED WITHIN THE INCORPORATED CITY LIMITS OF GAITHERSBURG AS PROVIDED BY CHAPTER 2 OF THE CITY CODE ENTITLED "ADMINISTRATION"

WHEREAS, Chapter 2 of the Gaithersburg City Code, entitled "Administration," authorizes the City Council to enact regulations to implement or carry out the provisions of any law or ordinance on any subject matter provided for in the City Charter, the City Code of Gaithersburg or laws of Maryland; and

WHEREAS, the Mayor and City Council have determined that regulations for street design standards and traffic calming best practices for roadways within the incorporated City limits is in the public interest; and

WHEREAS, Chapter 2, Article II, Section 2-10 requires approval of said rules and regulations by the Gaithersburg City Council:

NOW, THEREFORE, BE IT RESOLVED by the Mayor and the City Council of the City of Gaithersburg, that the Regulations for Street Design Standards and Traffic Calming Best Practices for roadways within the incorporated City limits of Gaithersburg as attached hereto, are hereby adopted by the Mayor and City Council and shall be effective on January 27, 2018.

ADOPTED by the City Council this 7th day of January, 2019.

JUD ASHMAN, MAYOR and
President of the Council

THIS IS TO CERTIFY, that the foregoing Resolution was adopted by the City Council, in public meeting assembled on the 7th day of January, 2019.

ACTING CITY MANAGER

for Tony Tomasello, City Manager

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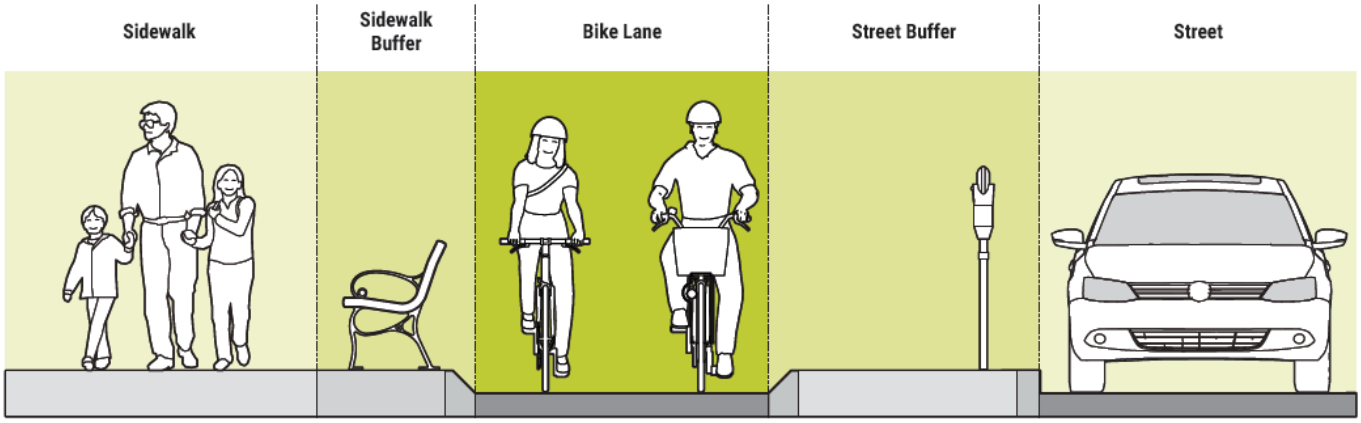
1.0 Introduction

This document presents the Street Design Standards and Traffic Calming Best Practices (Road Code) for use in the City of Gaithersburg as required under Chapter 19 Streets and Sidewalks of the City Code. These standards were developed by Gaithersburg Planning Staff and Public Works Staff in collaboration with other departments that play a role in the planning, development, construction, and maintenance of streets and adjacent land uses in the City.

The City's previous Road Code, as defined in Chapter 19 Article II Road Construction, reflected outdated auto-centric design priorities within the public right-of-way. As such, a majority of roads built in the City since the 1980's have been built under waivers from the existing Road Code. The revised Road Code regulation seeks to design all roadways to respond to adjoining land use contexts and improve multimodal travel for pedestrians, cyclists, transit, and other alternatives as well as the automobile. A secondary focus will be providing green infrastructure that benefits water quality while meeting stormwater regulations.

1.1 Purpose and Applicability

The Street Design Standards offer criteria for all street types in order to slow speeds and serve a variety of users. These classifications allow for design flexibility based upon the context of the adjoining land use. Each street type or typology represents different functions and serves a different variety of users as a result. The typologies offer a menu of design options including cross-sectional elements of the streetscape to meet the needs of the users within the roadway such as travel lanes, sidewalks, buffer zones accommodating street furniture and tree panels, bicycle facilities, transit stops, and other elements. This document also outlines the waiver process and necessary provisions for deviating from the design standards. In addition, this document offers best practices for traffic calming in order to reduce overall speeds as well as additional design treatments. Throughout the development process, flexibility is maintained in order to address specific functional concerns so that the needs of all users are accommodated. The Street Design Standards incorporate Complete Streets and Vision Zero concepts into the street design.



The above figure shows different Facility zones for user groups within the right-of-way. (Source: Mass DOT)

The requirements and classifications of this regulation in addition to those defined in Chapter 19 Article II will apply to all future and retrofitted roads. These regulations are applicable to both City and private roads. The Street Design Standards do not require the immediate retrofit of existing roads or void existing plan approvals granted prior to the regulation's adoption. Retrofitted road will conform to the new Street Design Standards regulation to the greatest extent possible. Waivers from this regulation may be sought per the requirements of Chapter 19 and this regulation. Roads may exhibit different typologies over their entire length as the context of the adjoining land use changes. Roads owned by the Federal government, State or County will rely on design criteria established for their authority.

2.0 New Street Design Standards Chart

The minimum requirements and other characteristics for each street type, is included in the summary chart below; design treatments for medians and alternatives for on street parking are also provided. The chart contains elements and dimensions that encourage multimodal use of the roadway: slower design speeds, fewer travel lanes, wider sidewalks, greater bicycle accommodation and reference paving criteria. In addition, exemptions and alternatives to the Street Design Standards are outlined in footnotes.

City of Gaithersburg Street Types	Minimum Right-of-Way[1]	Design Speed	Total # of Travel Lanes	Preferred Lane Width (Transit Route-Outer Lanes)	Minimum Median Width[7]	Minimum Cross-over spacing	Min. Buffer[6]	Minimum Landscape and Furniture Zone (Desired)[6]	Preferred Turning Radius	On Street Parking (Back-in Angle Parking)	Minimum Sidewalk (Desired)	Minimum Bike Facility	Paving Section per Montgomery County Standard Detail as modified by Subsection 19-15(d, f, h)	Curb Detail per Montgomery County Standard Detail MC#s or MDSHA Detail MD#
Mixed Use Boulevard A	77′	25 mph	2	10′ (11′)	none	300′	2′	6′	15′	8′ (20′)	6′ (8′)	6.5′ SBL[2]	Std. No. MC-214.01	MC#s 100.01, 101.01, 102.01, 104.01, or MD-620.02
Mixed Use Boulevard B	87′	25 mph	3	10′ (11′)	none	300′	2′	6′	15′	8′ (20′)	6′ (8′)	6.5′ SBL[2]	Std. No. MC-214.01	MC#s 100.01, 101.01, 102.01, 104.01, or MD-620.02
Mixed Use Boulevard C	113′	25 mph	4	10′ (11′)	16′	300′	2′	6′	15′	8′ (20′)	6′ (8′)	6.5′ SBL[2]	Std. No. MC-214.01	MC#s 100.01, 101.01, 102.01, 104.01, or MD-620.02
Park Boulevard A	56′	25 mph	2	10′	none	300′	2′	6′	15′	none	10′ SUP	10′ SUP[4]	Std. No. MC-214.01	MC#s 100.01, 101.01, 102.01, 104.01, or MD-620.02
Park Boulevard B	79′	25 mph	2	10′ (11′)	16′	300′	2′/1′	6′ (8′)	15′	none (8′)[3]	6′	6.5′ SBL[2]	Std. No. MC-214.01	MC#s 100.01, 101.01, 102.01, 104.01, or MD-620.02
Park Boulevard C	92′	25 mph	4	10′ (11′)	16′	300′	2′	6′ (8′)	15′	none	10′ SUP	10′ SUP[4]	Std. No. MC-214.01	MC#s 100.01, 101.01, 102.01, 104.01, or MD-620.02
Park Boulevard D	99′	25 mph	4	10′ (11′)	16′	300′	2′/1′	6′ (8′)	15′	none	6′	6.5′ SBL[2]	Std. No. MC-214.01	MC#s 100.01, 101.01, 102.01, 104.01, or MD-620.02
Main Street	64′	25 mph	2	10′	none	N/A	none	6′	15′	8′[5]	8′	None[5]	Std. No. MC-212.01	MC#s 100.01, 101.01, 102.01, 104.01, or MD-620.02
Neighborhood Residential	62′	20 mph	2	10′	none	N/A	1′	6′	15′	8′ (20′)	6′	None	Std. No. MC-212.01	MC#s 100.01, 101.01, 102.01, 104.01, or MD-620.02
Shared Street	50′	10 mph	2	10′	none	N/A	1′	6′	15′	none	8′	None	Std. No. MC-212.01	MC#s 100.01, 101.01, 102.01, 104.01, or MD-620.02
Alley	20′	15 mph	2	10′	none	N/A	none	none	15′	none	none	None	Std. No. MC-211.01	MC#s 100.01, 101.01, 102.01, 104.01, or MD-620.02
Frontage Road A	33′	20 mph	1	10′	6′	N/A	none	3′	15′	8′	6′	None	Std. No. MC-212.01	MC#s 100.01, 101.01, 102.01, 104.01, or MD-620.02
Frontage Road B	43′	20 mph	2	10′	6′	N/A	none	3′	15′	8′	6′	None	Std. No. MC-212.01	MC#s 100.01, 101.01, 102.01, 104.01, or MD-620.02
Commercial Service Road	31′	20 mph	2	11′	none	300′	3′	none	15′	none	6′	None	Std. No. MC-214.01	MC#s 100.01, 101.01, 102.01, 104.01, or MD-620.02
Commercial Throughway A	98′	35 mph	4	11′	18′	300′	2′	6′	30′	none	10′ SUP	10′ SUP[4]	MDSHA Heavy Duty Pavement Section for a Principal Arterial	MD-620.02
Commercial Throughway B	120′	35 mph	6	11′	18′	300′	2′	6′	30′	none	10′ SUP	10′ SUP[4]	MDSHA Heavy Duty Pavement Section for a Principal Arterial	MD-620.02

Note: Preferred values are the suggested values not to be exceeded.

SBL= Separated Bike Lane

SUP= Shared Use Path

Notes:

1. Minimum right-of-way width may be unbalanced if two-way bicycle facilities are provided on one side of the road. The minimum right-of-way must be increased for transit routes, streets where back-in angle parking or optional on-street parking is provided, or where wider landscape and furniture zones or sidewalks are desired.

2. One-way separated bike lanes are the preferred facility type. Other options that may be considered are separated two-way bike lanes with a 10' minimum width or on-street one-way bicycle facilities.

3. Value in parentheses reflects optional parallel parking.

4. Providing a shared use path on one side of the road and a sidewalk on the other side may be considered.

5. On-street bike lanes can be considered. A shared use path or separated bike lanes may be considered instead of on-street parking.

6. Landscape and furniture zone may be placed between bike and pedestrian facilities. In this case, the buffer should be placed between the bicycle facility and the roadway. This is not appropriate if the bicycle facility is a shared use path.

7. Wet and dry utilities may be allowed in a right of way per City approval under a case by case basis, Dry utilities must be placed behind the curb and not located within the road bed.

8. Storm Water Management/Green streets may be accommodated in medians, replacing on street parking spaces, and in the landscape/ furniture zone.

9. Parallel on-street parking spaces may be replaced in order to facilitate storm water management, bicycle parking / sharing facilities or designated short-term pick-up/drop-off zones for ride sharing and/ or comparable services.

10. All typologies must contain an appropriate maintenance buffer facilitated either through a 1-foot public improvement easement (PIE) on the private side of the ROW limit or through a 1-foot buffer within the ROW at its borders. Typologies with building faces directly affixed to the ROW limit are not subject to providing a buffer/public improvement easements (PIE) between the sidewalk and the building face.

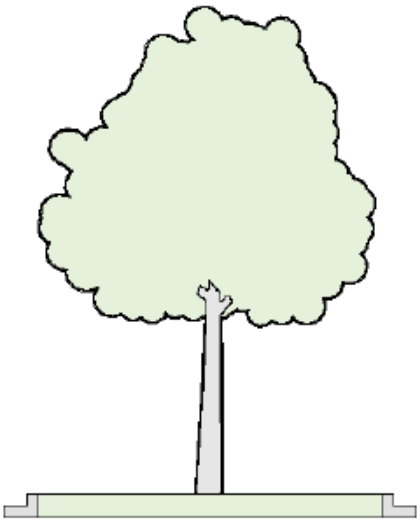
11. For new road construction, waivers in accordance with Chapter 19 must be granted when a proposed design incorporates elements below the minimum design standards, includes design speeds higher than those defined, eliminates a proposed facility or element, or includes a design feature identified as requiring a waiver within the typology.

12. Retrofitting of existing roads owned and or maintained by the City will incorporate to the greatest extent possible all elements related to the roads corresponding typology. No granting of waivers in accordance with Chapter 19 are required for City projects.

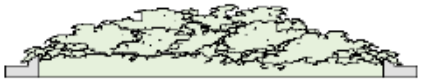
13. The retrofitting of privately owned and maintained roads subject to these regulations must incorporate to the greatest extent possible all elements related to the roads' corresponding typology with the complete deletion of specific elements or facilities requiring the granting of Waivers in accordance with Chapter 19 and these regulations.

14. Depending on the road context, a variety of median treatments can be considered. These include the following on the next page:

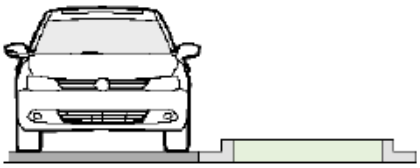
Median and Treatments[8]:



WITH TREE



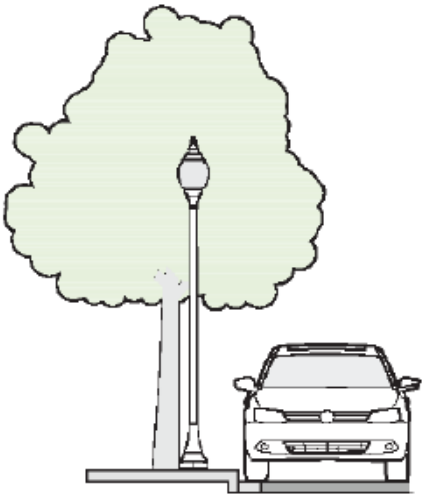
WITH LOW VEGETATION



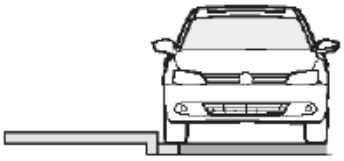
WITH TURN LANE

WITH OUT VEGETATION

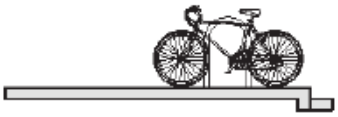
Parallel Parking Treatments[9]:



PARALLEL PARKING



LOADING / RIDESHARING ZONE



BIKE PARKING / BIKE SHARE ZONE

WITH LOW VEGETATION

2.1 Typologies

The following section describes each street type and provides an illustration of a typical cross-section established by the Street Design Standards. These typologies should be used to better design streets for existing and anticipated land uses and accommodate the needs of all roadway users.

City streets have typically been designed to accommodate vehicular needs and priorities with less attention paid to the land use context of the roadway or other multimodal user groups within the right-of-way. To facilitate a better balance of adjacent land uses and the competing needs of various users of the roadway system, the Street Design Standards include the following street types:

- Mixed Use Boulevards
- Park Boulevards
- Main Streets
- Neighborhood Residential
- Shared Streets
- Alley
- Frontage Roads
- Commercial Service Roads
- Commercial Throughways

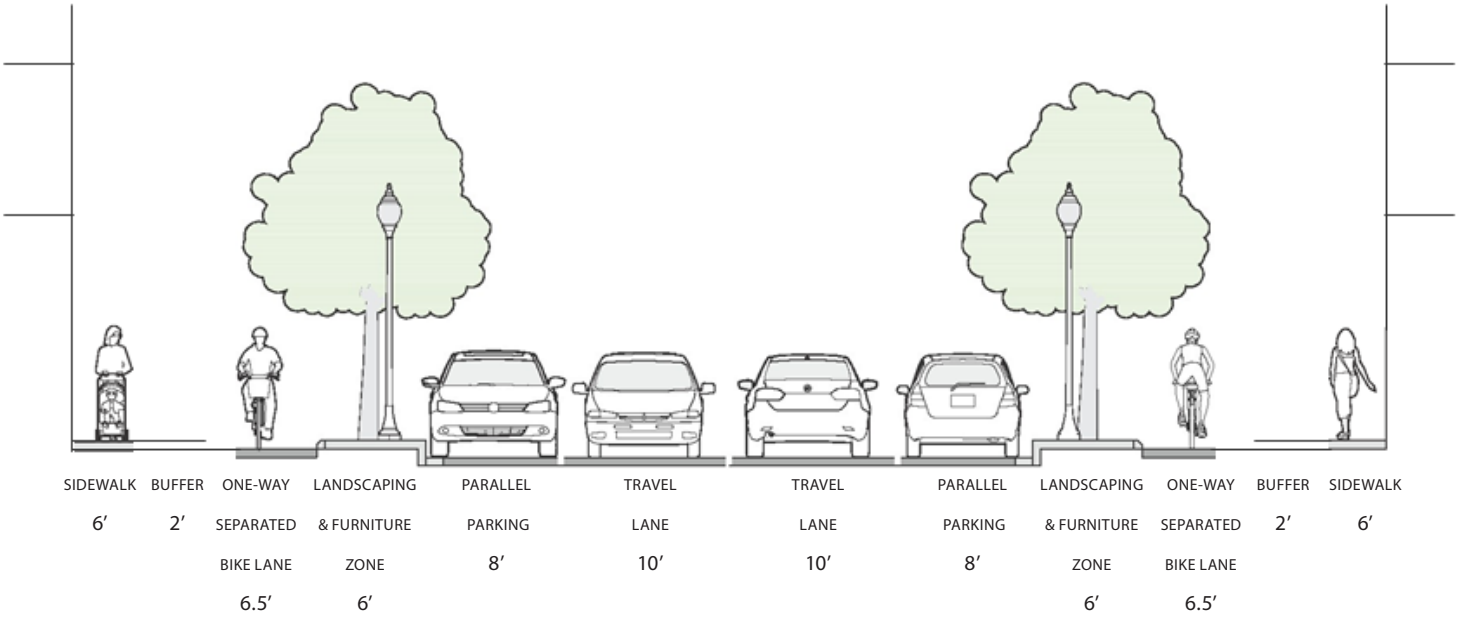
Mixed-Use Boulevard

Mixed-Use Boulevards are significant roadways that travel efficiently through medium- to high-density mixed-use areas. Buildings along mixed-use boulevards are located close to the street. Mixed-use boulevards experience heavy transit, pedestrian and bicycle activity and, as such, require slow vehicular speeds, wide sidewalks and short crossings to ensure the safety of all users. Separated bike lanes are recommended on this type of roadway.

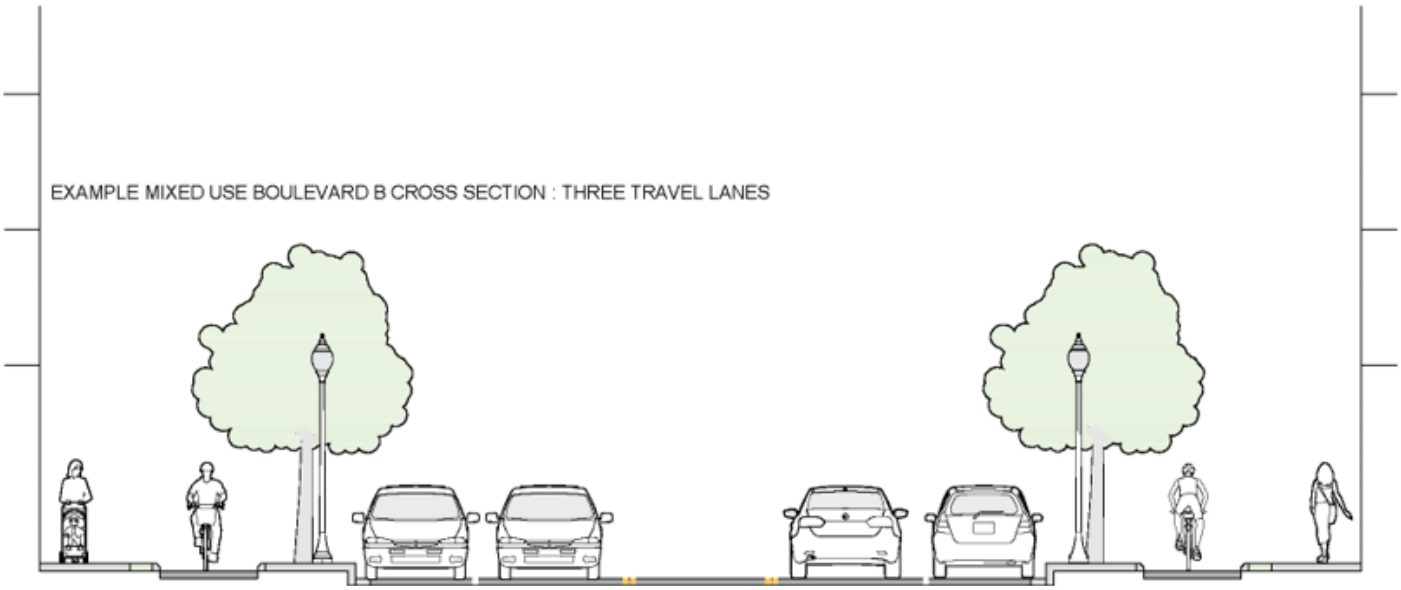
Street Type	Description	Typical Features
Mixed Use Boulevard	• Buildings close to street • Mix of commercial and residential uses • Medium to high density land use • Some are major transit routes • Medium to heavy pedestrian/bike activity • Slow speeds (25 mph)	• 2-4 travel lanes • Median • Sidewalks & bike facilities • Street furniture & enhanced lighting • On-street parking (optional)

Note that in some cases, separated bike lanes may be replaced by on-street bicycle facilities or a two-way separated bike lane with a 10' minimum width on one side of the road. Replacing separated bike lanes with shared use paths on mixed-use boulevards will require a road code waiver.

EXAMPLE MIXED USE BOULEVARD A CROSS SECTION : TWO TRAVEL LANES



EXAMPLE MIXED USE BOULEVARD B CROSS SECTION : THREE TRAVEL LANES



SIDEWALK	BUFFER	ONE-WAY SEPARATED BIKE LANE	LANDSCAPING & FURNITURE ZONE	PARALLEL PARKING	TRAVEL LANE	CENTER TURN LANE	TRAVEL LANE	PARALLEL PARKING	LANDSCAPING & FURNITURE ZONE	ONE-WAY SEPARATED BIKE LANE	BUFFER	SIDEWALK
6′	2′	6.5′	6′	8′	10′	10′	10′	8′	6′	6.5′	2′	6′

EXAMPLE MIXED USE BOULEVARD C CROSS SECTION : FOURTRAVEL LANES

SIDEWALK	BUFFER	ONE-WAY SEPARATED BIKE LANE	LANDSCAPING & FURNITURE ZONE	PARALLEL PARKING	TRAVEL LANE	TRAVEL LANE	MEDIAN	TRAVEL LANE	TRAVEL LANE	PARALLEL PARKING	LANDSCAPING & FURNITURE ZONE	ONE-WAY SEPARATED BIKE LANE	BUFFER	SIDEWALK
6′	2′	6.5′	6′	8′	10′	10′	16′	10′	10′	8′	6′	6.5′	2′	6′

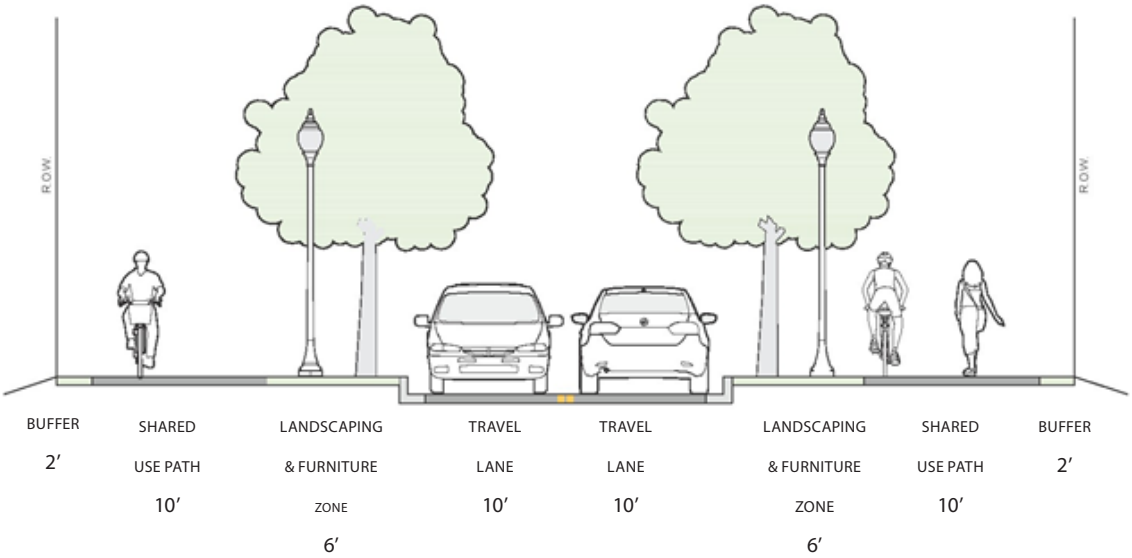
Park Boulevard

Park Boulevards link commercial districts and provide important, longer-distance walking and biking routes between destinations. Land uses might include suburban-style office parks, large-format commercial areas, or residential communities, but buildings are located farther from the street compared with Mixed Use Boulevards. This means that people are not commonly using the Park Boulevard to make short, local walking and biking trips; however, accommodating longer bike trips and pedestrian connections to transit are particularly critical along these routes. A separated bike lane is appropriate in areas with greater anticipated pedestrian volumes, whereas a shared use path is adequate in areas where less pedestrian activity is expected. Major bus routes may occur on these streets. Because development is located further from the street, no on street parking is required.

Street Type	Description	Typical Features
Park Boulevard	• Connect commercial districts or neighborhoods • Medium to low density land uses • Buildings far to street • May feature mixed land uses • Medium to heavy pedestrian/bike activity; Provide continuous walking and bicycling routes to support longer trips • Some are major transit routes • Slow speeds (20-25 mph)	• 2-4 travel lanes • Separated bike lanes and sidewalks, or Shared usepaths • Lighting • Median

Note that in some cases, separated bike lanes may be replaced by on-street bicycle facilities or a two-way separated bike lane with a 10' minimum width on one side of the road. Additionally, a shared use path may be considered for only one side of the road with a sidewalk on the other side.

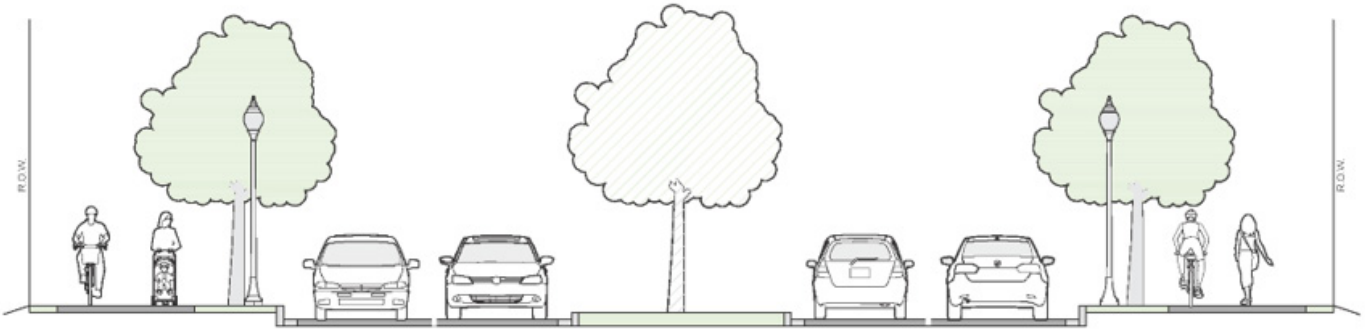
EXAMPLE PARK BOULEVARD A CROSS SECTION : SUP & TWO TRAVEL LANES



EXAMPLE PARK BOULEVARD B CROSS SECTION : SBL & TWO TRAVEL LANES WITH MOUNTABLE CURB

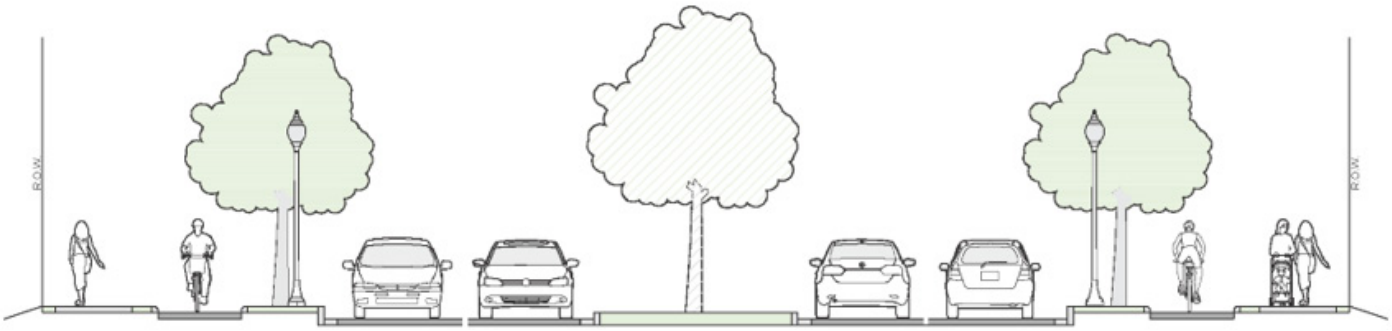
BUFFER	SIDEWALK	BUFFER	ONE-WAY SEPARATED BIKE LANE	LANDSCAPING & FURNITURE ZONE	TRAVEL LANE	MEDIAN	TRAVEL LANE	LANDSCAPING & FURNITURE ZONE	ONE-WAY SEPARATED BIKE LANE	BUFFER	SIDEWALK	BUFFER
1′	6′	2′	6.5′	6′	10′	16′	10′	6′	6.5′	2′	6′	1′

EXAMPLE PARK BOULEVARD C CROSS SECTION : SUP & FOUR TRAVEL LANES



BUFFER	SHARED USE PATH	LANDSCAPING & FURNITURE ZONE	TRAVEL LANE	TRAVEL LANE	MEDIAN	TRAVEL LANE	TRAVEL LANE	LANDSCAPING & FURNITURE ZONE	SHARED USE PATH	BUFFER
2′	10′	6′	10′	10′	16′	10′	10′	6′	10′	2′

EXAMPLE PARK BOULEVARD D CROSS SECTION : SBL & FOUR TRAVEL LANES



BUFFER	SIDEWALK	BUFFER	ONE-WAY SEPARATED BIKE LANE	LANDSCAPING & FURNITURE ZONE	TRAVEL LANE	TRAVEL LANE	MEDIAN	TRAVEL LANE	TRAVEL LANE	LANDSCAPING & FURNITURE ZONE	ONE-WAY SEPARATED BIKE LANE	BUFFER	SIDEWALK	BUFFER
1′	6′	2′	6.5′	6′	10′	10′	16′	10′	10′	6′	6.5′	2′	6′	1′

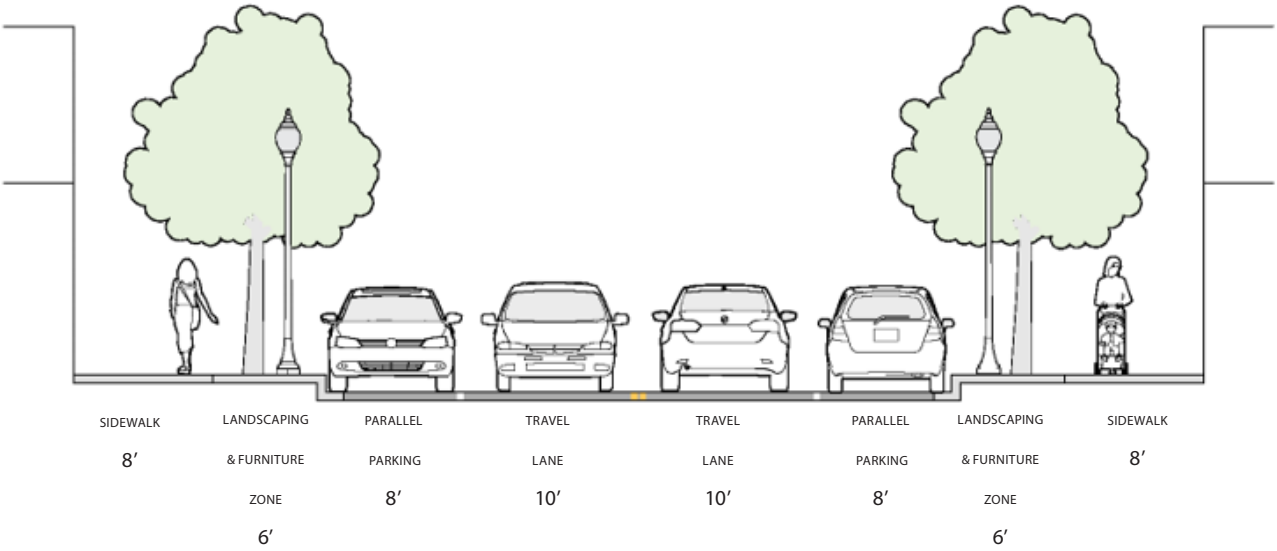
Main Street

Main Streets serve mixed-use pedestrian scaled centers and often feature dining or outdoor events along the street edge. Main Streets have continuous development which may be small- and medium-sized businesses and/or residential; however, the scale of development is less intense than that of the Mixed-Use Boulevards. Pedestrian activity and comfort is essential to the success of these areas. For this reason, wider sidewalks and sidewalk buffers are critical. The sidewalks are not to be considered shared use paths. Bicycle access is also key and will be provided typically in shared travel lanes, which are comfortable due to low vehicle speeds. On-street parallel parking may be provided on one or both sides of the street. Back-in angle parking may also be an appropriate option.

Street Type	Description	Typical Features
Main Street	• Mixed-use community centers • Medium to low density land uses • Buildings close to street • Heavy pedestrian/bike activity; Provide continuous walking and comfortable walking routes • Slow speeds (20-25 mph)	• 2 travel lanes • Sidewalks • Low design speeds for shared travel lanes (vehicles & bikes) • Lighting • Enhanced streetscape, space for street furniture, outdoor events & dining • On-street parking (both sides, one-side only, may include back-in angle parking)

For streets where on-street parking occurs on both sides of the right-of-way, a two-way separated bike lane may be considered as a replacement for one side of on-street parking. Bicycling on the expanded sidewalks is to be discouraged.

EXAMPLE MAIN STREET CROSS SECTION : TWO TRAVEL LANES

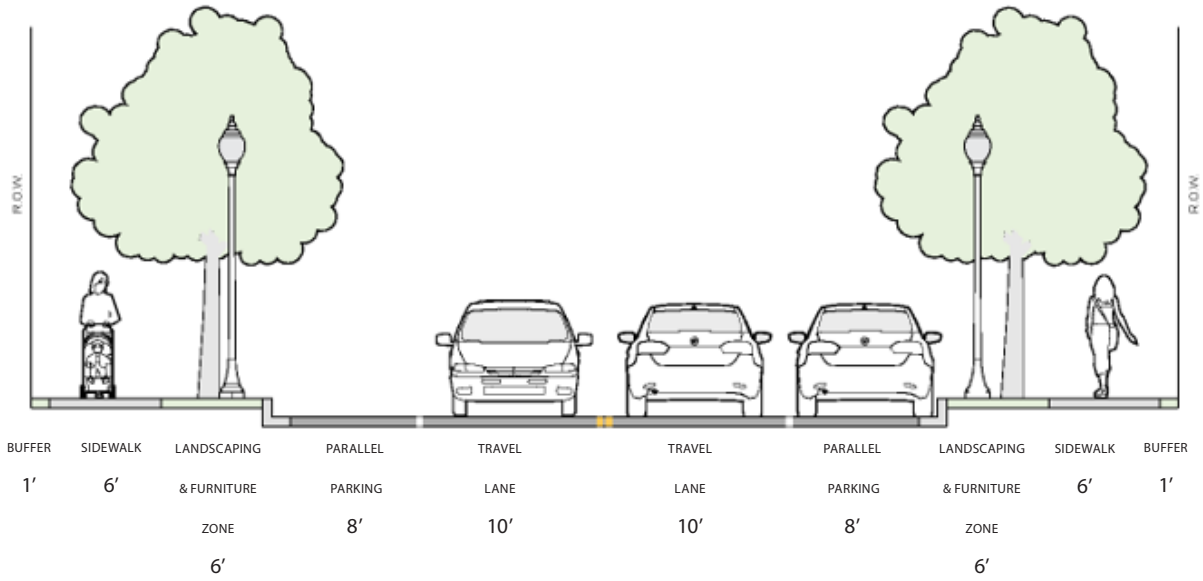


Neighborhood Residential

Neighborhood Residential Streets have low traffic volumes and provide direct access to single family and multi-family housing. Despite lower volumes of pedestrians than along other street types, sidewalks are important for providing well-defined paths for pedestrians along these streets. Due to the low traffic volumes, bicyclists often share the roadway with motorists. On-street parking may be consolidated to one side of the roadway.

Street Type	Description	Typical Features
Neighborhood Residential	• Provide direct access to single-family and multi-family residences • Focus on pedestrian safety and well-defined walking paths • Bicyclists typically share the roadway or in conventional bike lanes • Slow speeds (20 mph)	• 2 travel lanes • Sidewalks • Street trees • Lighting • On-street parking

EXAMPLE NEIGHBORHOOD RESIDENTIAL CROSS SECTION : TWO TRAVEL LANES

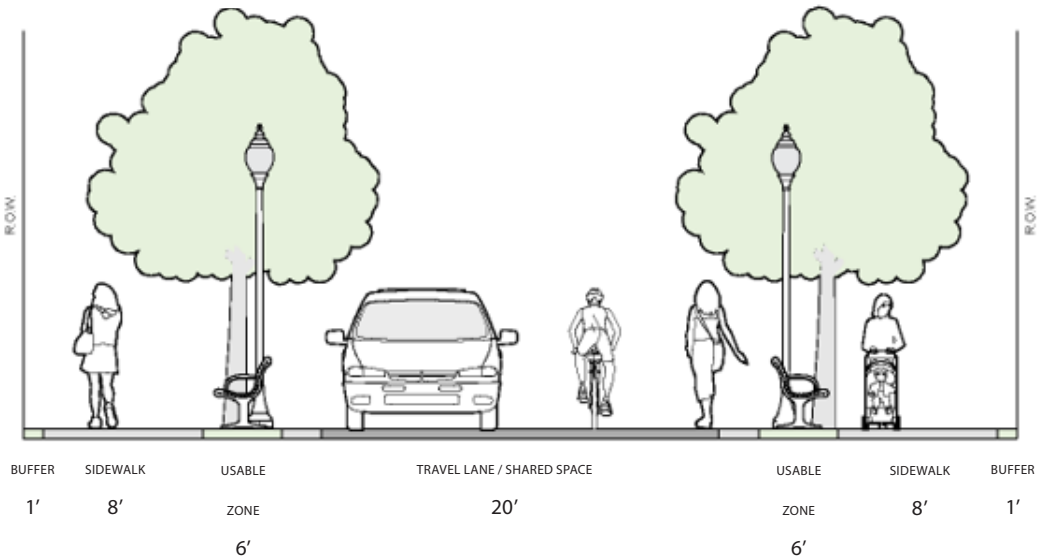


Shared Street

A Shared Street is a unique, curbless, single surface street that can be shared by users of all modes because it is designed for extremely slow speeds (generally no more than 10 mph) and low motor vehicle volumes. The adjacent land uses are mixed and pedestrians are the dominant mode along such streets. This street is intended to enable all users to comfortably mix in the same space. They include design elements that suggest pedestrian priority and the function of the street as a place for social, economic and cultural exchange. This may include pavers or other decorative surface treatments in the shared street and sidewalk space; however, for accessibility purposes, the material selection must distinguish pedestrian-only spaces and crossings from the shared space. Shared streets can accommodate festivals, farmers markets and other activities when the street is closed to motor vehicles.

Street Type	Description	Typical Features
Shared Street	• Multiple land uses with commercial on the ground floor • Single grade or surface shared by all modes • Extremely low speeds (10 mph or less)	• Unique paving • Street furniture • Lighting

EXAMPLE SHARED STREET CROSS SECTION : TWO TRAVEL LANES

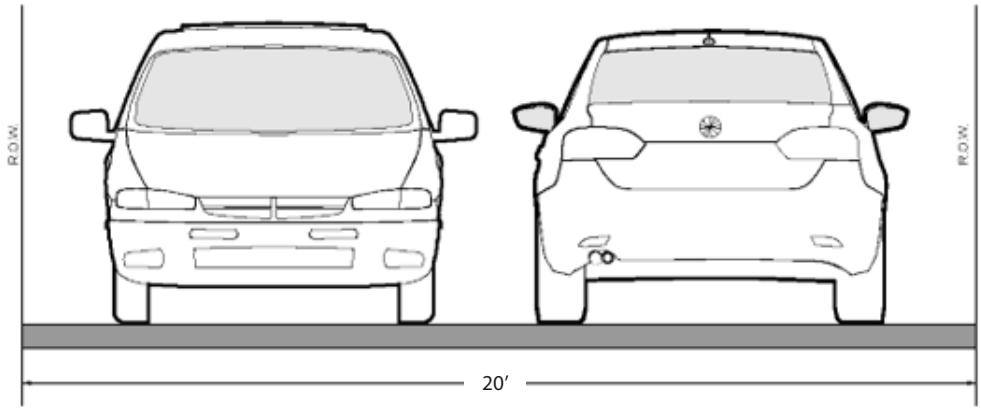


Alley

Alleys have an important function in urban areas including access to residential off-street parking and trash removal. They are designed for extremely slow speeds, single-occupancy vehicle automobile travel and must accommodate room for other objects in the right of way such as trash receptacles. They can also contribute to pedestrian and bicyclist connectivity.

Street Type	Description	Typical Features
Alley	• Multiple land uses • Single grade or surface shared by all modes • High density with short streets • Extremely low speeds (15 mph or less)	• Two-way • Accommodates 2 travel lanes

EXAMPLE ALLEY CROSS SECTION : TWO TRAVEL LANES



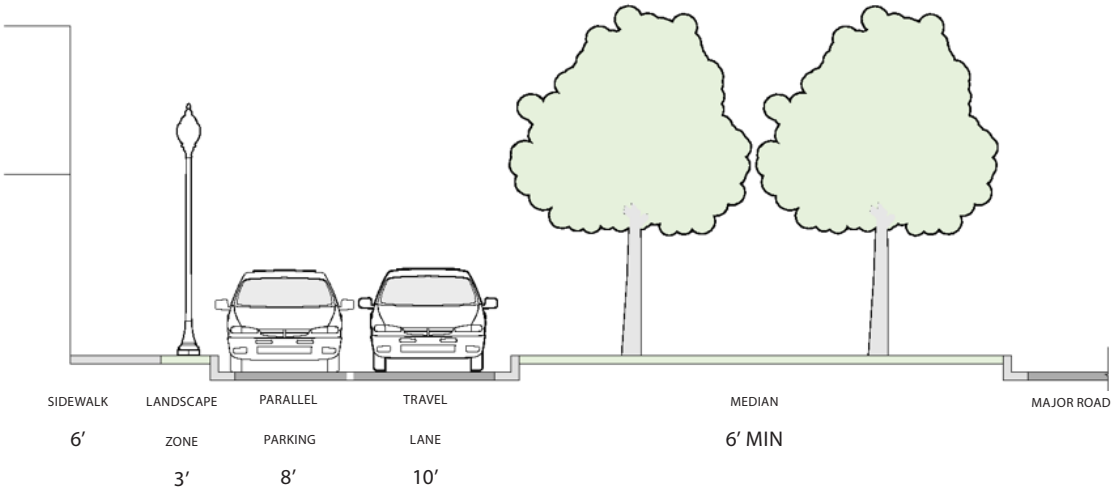
TRAVEL LANE / SHARED SPACE

Frontage Road

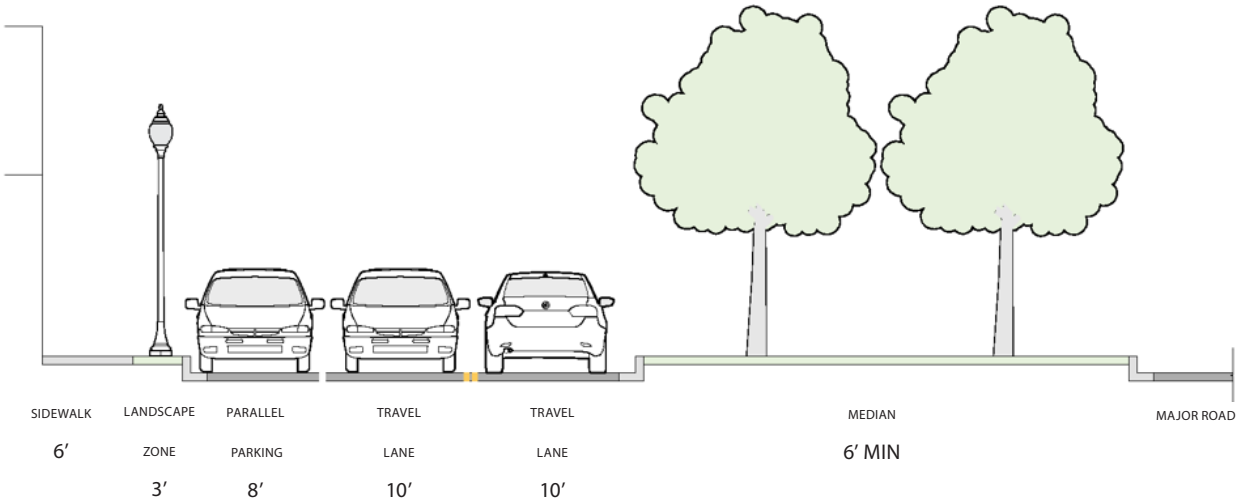
Frontage roads provide local access to businesses and residences away from Commercial Throughways. They run parallel to these major roads and are designed for lower speeds. They can allow 2-way travel and provide sidewalks and buffers from the adjacent Commercial Throughways and must accommodate for other objects in the right of way. They can contribute to pedestrian and bicyclist connectivity given their slower, less crowded nature. Note that parking is optional in this case.

Street Type	Description	Typical Features
Frontage Road	• Multiple land uses • Direct access for residential or commercial buildings • Moderate pedestrian/bike activity; Provide continuous walking and bicycling routes • Slow speeds (20 mph)	• One or Two-way • Sidewalk / Buffer Zone on one side • On-street parking

EXAMPLE FRONTAGE ROAD A CROSS SECTION : ONE TRAVEL LANES



EXAMPLE FRONTAGE ROAD B CROSS SECTION : TWO TRAVEL LANES

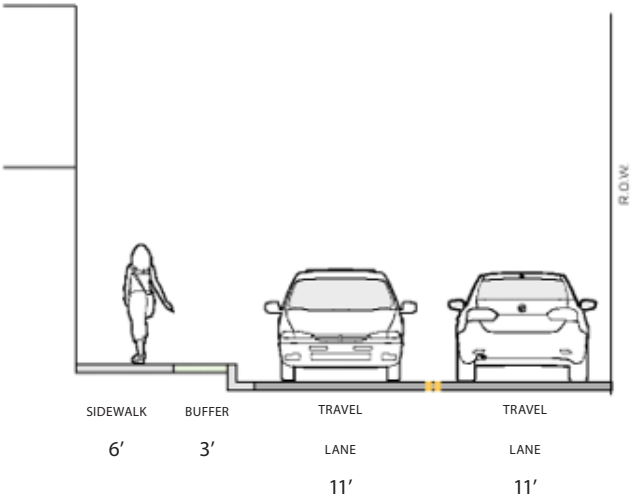


Commercial Service Road

Commercial service roads provide local access to businesses for deliveries or short shopping trips and remove vehicles from Commercial Throughways, Mixed-use Boulevards, and Main Streets. They run parallel to these major roads, are typically sited away from pedestrian-scaled uses, may connect parking fields, and are designed for lower speeds. They allow 2-way travel and provide separate sidewalks and buffers from the adjacent larger roads, but are not intended to be focal bicycle/pedestrian routes.

Street Type	Description	Typical Features
Service Road	• Direct access for commercial parcels • Low pedestrian/bike activity • Connect commercial parking lots • Slow speeds (20 mph)	• Two-way • Sidewalk / Buffer Zone on one side

EXAMPLE COMMERCIAL SERVICE ROAD CROSS SECTION : TWO TRAVEL LANES



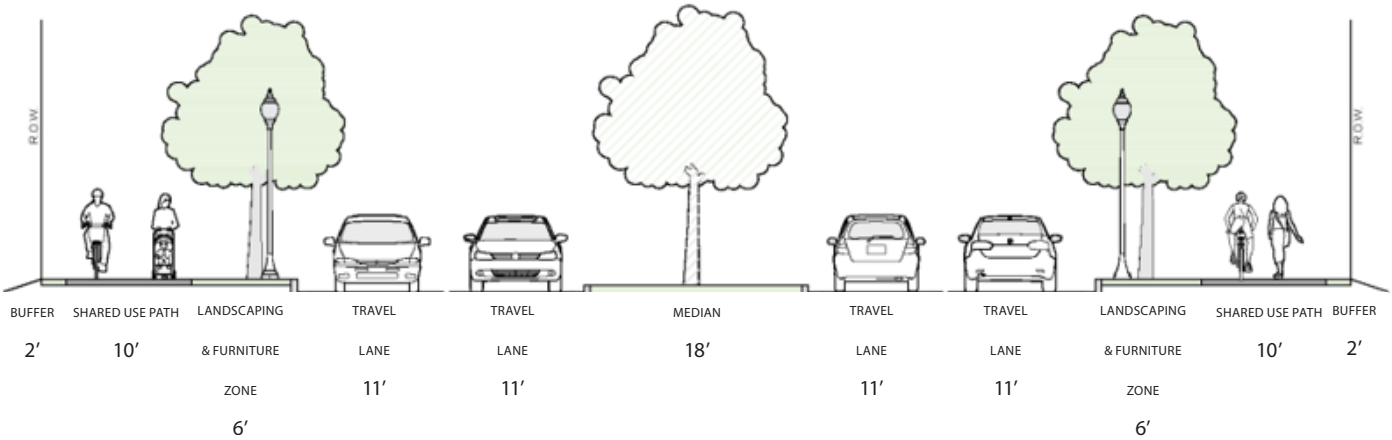
Commercial Throughway

Commercial Throughways are substantial roadways that allow regional commuters to travel across/ through town. Traffic along commercial throughways tends to be relatively fast and buildings are not located close to the street. Their function to facilitate the movement of vehicular traffic and major transit routes, as such these are not conducive for on-street parking or separated bike facilities. These streets should provide significant comfortable pedestrian and biking amenities. Shared-Use-Paths are recommended on this type of roadway.

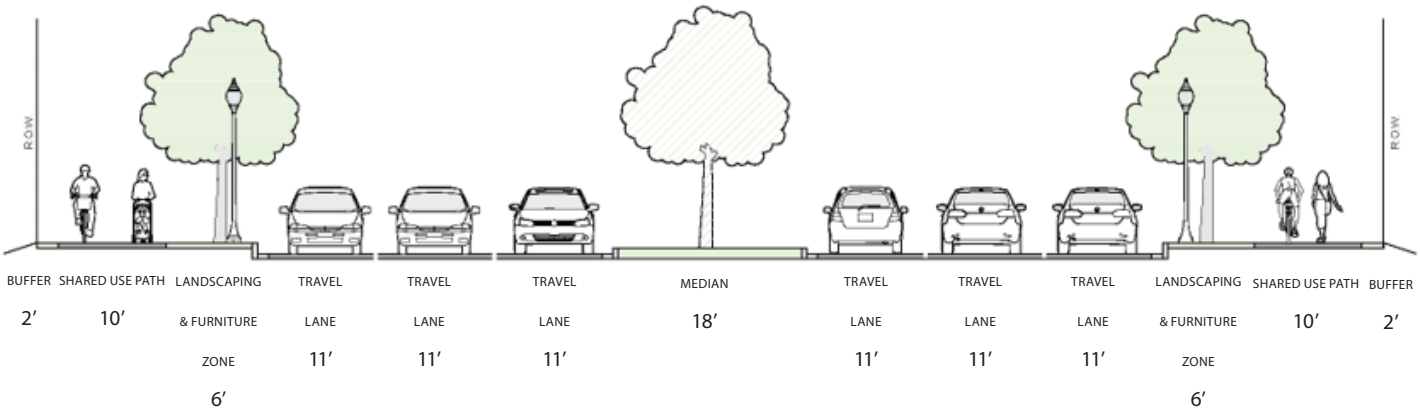
Street Type	Description	Typical Features
Commercial Throughway	• Provides for through traffic • Mix of land uses • Medium density land use • High volumes of vehicles and transit • Low to heavy pedestrian/bike activity • Medium to high speeds (35 mph)	• 4-6 travel lanes • Wide Median • Shared Use Path • Street furniture & lighting

Note that in some cases, a shared use path may be considered for only one side of the road with a sidewalk on the other side.

EXAMPLE COMMERCIAL THROUGHWAY A CROSS SECTION : FOUR TRAVEL LANES



EXAMPLE COMMERCIAL THROUGHWAY B CROSS SECTION : SIX TRAVEL LANES



2.2 Waiver Process

Waivers from the Road Code are allowed provided that suitable evidence is presented as outlined in Sec. 19-17. – Deviations from Standards and Road Code of the City Code. Requests must be submitted in writing and may be granted based upon the sound engineering, technical judgment, and required findings. Overall findings must demonstrate that the deviation from the standards are in the public interest, reflect the land use context, that requirements for safety, function, fire protection, multimodal needs, and maintainability are fully met. The City Council may grant waivers provided that the applicant presents findings for the following:

- There are existing physical limitations that preclude the full accommodation of the Standards; and /or
- A city approved traffic impact analysis supports the waiver from the Standards; and /or
- It can be demonstrated that the waiver is necessary to meet the requirements or intent of Chapter 8 “Erosion and Sediment Control and Stormwater Management,” or Chapter 22, “Trees and Forest Conservation”; and
- That the granting of such waivers will not result in decreased multi-user functionality for the road users and the general public; and
- That the granting of such waivers will not adversely affect safety or operations; and
- That the granting of such waivers for public roads will not adversely affect future maintenance and its associated costs.

As noted in the Street Design Standards Chart, waivers are required per the following:

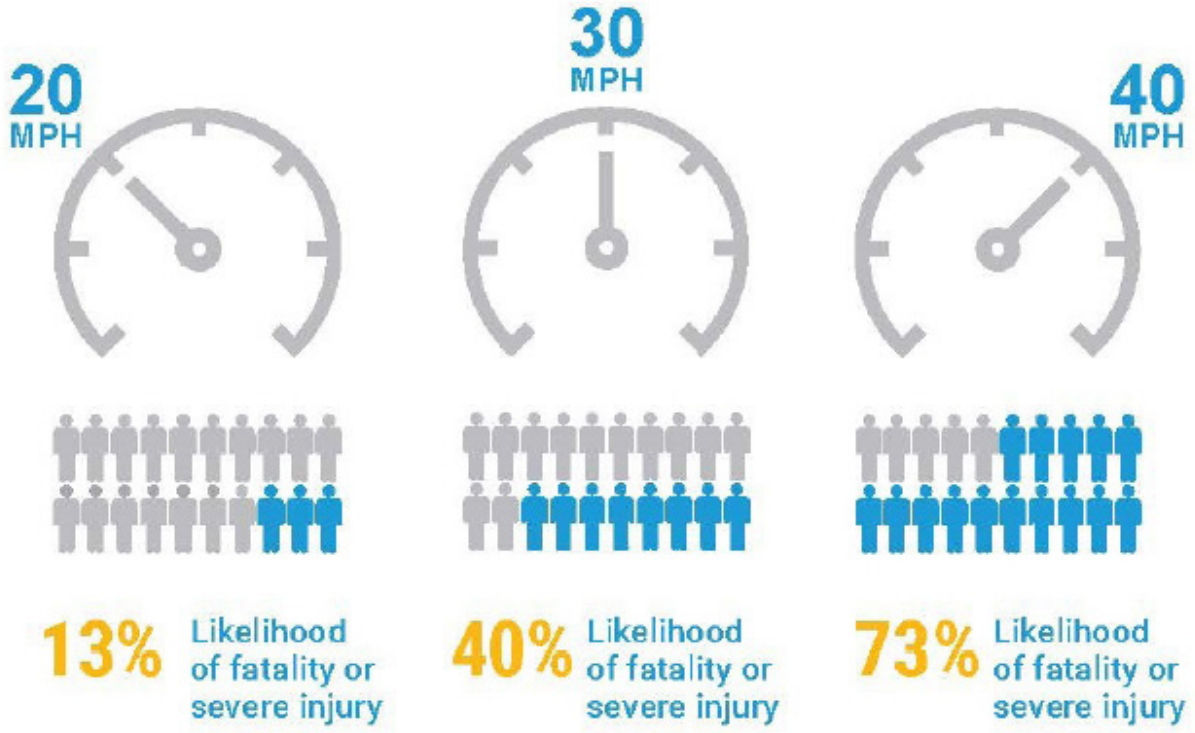
For new road construction, waivers in accordance with Chapter 19 and this regulation must be granted when a proposed design incorporates elements below the minimum design standards, includes design speeds higher than those defined, eliminates a proposed facility or element, or includes a design feature identified as requiring a waiver within the typology.

The retrofitting of privately owned and maintained roads subject to these regulations must incorporate to the greatest extent possible all elements related to the roads’ corresponding typology with the complete deletion of specific elements or facilities requiring the granting of waivers in accordance with Chapter 19 and these regulations.

Retrofitting of existing roads owned and or maintained by the City will incorporate to the greatest extent possible all elements related to the roads corresponding typology. No granting of waivers are required for City projects.

3.0 Slower Speed Street Design

Higher motor vehicle speeds increase the likelihood of crashes by reducing the drivers' cone of vision and making it more difficult for drivers to stop or maneuver to avoid a crash. Higher speeds also increase the severity of crashes by producing greater kinetic energy, which determines the force of impact when there is a crash. Thus, speed is one of the major causes behind serious traffic accidents. The graphic below shows the impact of small increases in speed on the survival rate of a person hit by a car.



Impact Speed and a Pedestrian's Risk of Severse Injury or Death, Brian Tefft- AAA Foundation for Traffic Safety, 2011

Most of the street types in the City of Gaithersburg Street Design Standards have design speeds of 25 mph or less. A combination of design treatments are necessary to encourage motorists to drive at the desired speeds. These design treatments are often referred to as "traffic calming features," and are intended to provide physical and visual cues to drivers to achieve the desired driver behavior. Ideally, new roadway designs should include traffic calming concepts, such as changes in horizontal alignment and narrow lane widths. The City of Gaithersburg's Road Code identifies 10 ft. as the preferred lane width for most roads. An exception is 11 ft. for transit lanes. Research has shown that 10 and 11 ft. lanes improve safety and comfort without negatively impacting traffic operations or vehicular capacity when implemented as part of a well-designed and integrated network. Additional traffic calming features discussed in this document are considered to support horizontal alignment shifts, including vertical changes in grade, intersection turning speed control, and signing and markings. The benefit of many of these treatments is that they can also be added to existing roads to address travel speed issues not considered in the original street design.

3.1 Intersection and Driveway Design

Intersections and high-volume driveways come in a variety of configurations based on number of travel lanes, types of intersecting bicycle and pedestrian facilities, presence of medians, angle intersection, bus stop locations, and many other factors. Although many of the design treatments listed below are applicable to intersection design, this guide is not intended to serve as a design guide for intersections.

Designers must consider the configuration of each intersection, volumes, speeds, and the specific conflict points between pedestrians, bicyclists, and motor vehicles, and identify designs that address user safety, comfort, and mobility. Intersection designs should clearly communicate user right of way, provide adequate lines of sight for all users to see and react to each other, reduce speeds and minimize (or eliminate) exposure at conflict points.

Designers should review City and County specific guidance related to intersection design, speed control, and industry best practices, including, but not limited to the below mentioned guides and slow speed design treatments. Furthermore, designers should be empowered to consider treatments not specifically identified below that have been found, or may be found, to reduce speeds and improve safety for all roadway users.

Design guides to consider include:

- Montgomery County Bicycle Facility Design Toolkit
- NACTO Urban Street Design Guide
- NACTO Urban Bikeway Design Guide
- AASHTO A Policy on Geometric Design of Highways and Streets
- AASHTO Guide for the Development of Bicycle Facilities
- AASHTO Guide for the Planning, Design, and Operations of Pedestrian Facilities
- FHWA Separated Bike Lane Planning and Design Guide
- FHWA Accessible Shared Streets: A Guide for Accommodating Pedestrians with Vision Disabilities
- FHWA Speed Concepts: Informational Guide
- FHWA Achieving Multimodal Networks: Applying Design Flexibility & Reducing Conflicts
- Massachusetts DOT Separated Bike Lane Planning & Design Guide

3.2 Slow Speed Roadway Design Treatments

There are two types of speed control methods that should be considered during the roadway design process: non-intrusive treatments and physical treatments.

Non-intrusive treatments are measures that do not physically constrain vehicular maneuvers, but instead provide visual cues, education, and enforcement to achieve the desired slow speeds. These treatments are easy to implement on existing streets, but are less effective at reducing speeds than physical treatments. Non-intrusive treatments include: education signs, gateway treatments, pavement markings, traffic signal timing, speed display signs, additional fine signs, and speed cameras.

Physical treatments to control speeds include changes in horizontal and vertical alignments, lane narrowing, and intersection treatments. They are constructed and installed to physically narrow or create shifts in the travel way to affect the speeds that can be comfortably traveled by motorists.

The following outlines various physical treatments (and a few non-intrusive treatments), including detailed descriptions, design guidance, advantages and disadvantages, and general effectiveness. These treatments can be used on their own or in combination to achieve the desired operating speeds.

Horizontal Curves

Description: The roadway alignment along which a vehicle travels affects how “straight” a roadway appears to a driver. When long straight roadways are provided, drivers can see further ahead which provides a visual cue that higher speeds are comfortable. Changes in the horizontal alignment reduce the length of straight roadway segments, thus reducing the speeds that drivers are comfortable driving.

Placement & Design Guidance: For roadway with speeds of 25mph or less, straight roadway segments without traffic control devices should be no longer than 500-feet. This can be accomplished using straight roadway segments followed by a horizontal curve, or through the use of reverse curves to interrupt or eliminate straight roadway segments. If horizontal curves cannot be provided to achieve this guidance, then other speed control treatments should be considered.

Radii for horizontal curves should use the minimum radius identified in the AASHTO Green Book for Low-Speed Urban Streets for the desired turning speed. This speed may be less than the posted speed, but may require posting a supplemental speed plaque to identify the recommended speed. Horizontal curves must also be designed in coordination with vertical alignments and adjacent roadside conditions (vegetation, building siting, etc.) to ensure that clear sight triangles and sight distances are provided. The design vehicle must also be considered when selecting the radius of curvature and the lane widths to ensure that larger vehicles can properly navigate the roadway. Encroachment by infrequent large vehicles into oncoming lanes may be appropriate on low volume roadways, but a larger radius of curvature, wider lanes, or a mountable truck apron may be appropriate to address off-tracking issues where large vehicles are frequent.

Advantages: Very effective at controlling speeds through visual cues and physical features.

Disadvantages: May be difficult to implement on existing streets based on roadside development. Design must be coordinated with intersection locations, driveways, pedestrian crossings, and other locations where sight distances need to be considered.

Speed (mph)	Tangent Section Length (feet)	Horizontal Curve Radius (feet)
20	400	99
25	500	181

Chicanes / Mid-Block Deflections

Description: Curb extensions, on-street parking, or other physical features located on alternating sides of a street to add horizontal deflection on an otherwise straight section of roadway. They can be uses on one-way and two-way streets.

Placement: These treatments are placed mid-block where a median or other non-traversable barrier separates the travel directions near the chicane. When used where vehicles travel in both directions with no physical separation between the travel directions vehicles tend to cross the centerline to make their travel path as smooth as possible. This behavior is a potential safety concern and contributes to a general ineffectiveness of the device in terms of speed reduction. In the case of two-way streets, it may be appropriate to provide a median between the on-coming travel lanes to help achieve the desired motorist travel path.

For chicane treatments, the curb extension or other physical barriers are typically installed in sets of three to introduce an S-shaped travel path; mid-block deflections are often only one or two barriers. For both treatment types, the spacing between the barriers and the available travel lane width for vehicles influences the extent of vehicle speed control. Closer spaced barriers and narrower travel way widths promote slower speeds, but must be balanced with the need to accommodate design vehicles. Where narrower travel lanes are desired but larger vehicles need to be accommodated, the barriers can be designed as mountable truck aprons. The distance between chicanes or mid-block deflections should be no more than 500-feet to maintain the slow speeds.

Advantages: Requires slow vehicle speeds approaching and navigating the treatment. In the case of chicanes, they can also provide an opportunity for added greenery.

Disadvantages: Narrows travel-way for on-road bicyclists and can be an obstacle for large vehicles. May require additional delineation to assist snow plow drivers.

Mid-block deflection through use of on-street parking (Cambridge, MA)

Speed (mph)	Spacing (feet)
10	250
15	300
20	400
25	500

Raised Median Island

Description: Raised islands placed in the middle of the roadway to narrow travel lanes and can provide an opportunity to provide a pedestrian refuge at crosswalk locations.

Placement & Design Guidance: These treatments can be placed mid-block to control speeds along corridors, or can be placed at the entrance to a community to slow vehicles turning onto a street. When provided purely as a traffic calming device, the medians can be as narrow as 2-feet wide. When designing to also serve as a pedestrian refuge the median must be at least 6-feet wide to comply with ADA requirements. 10-foot wide should be considered for trail crossings or other locations where bicyclists with trailers are anticipated.

The length of the shifting taper approaching a raised median should be calculated based on design speed. When shifting tapers are provided on streets with speeds of 25mph or less, the length of the shifting taper calculated from the Manual on Uniform Traffic Control Devices may be reduced in half; this guidance is similar to shifting tapers for work zones and provides a more abrupt transition, which requires drivers to progress at slow speeds.

Advantages: Narrows lanes at specific locations thus gaining the attention of drivers to slow down. When used as pedestrian refuge the treatment also provides additional safety for pedestrians and bicyclists.

Disadvantages: Narrows travel-way for on-road bicyclists and can be an obstacle for large vehicles. May require additional delineation to assist snow plow drivers. Narrow travel lanes by themselves have a limited ability to slow travel speeds.

Raised Median with pedestrian refuge (Source: nacto.org)

Speed Hump

Description: A raised section of pavement with parabolic or flat top that extends across the road. They are the most commonly used traffic calming devices.

Placement & Design Guidance: Speed humps should be placed at right angles to traffic. The profile of speed humps should be designed to be comfortably traversed at the desired design speed, but uncomfortable at higher speeds. Use of more abrupt profiles can have the unintended consequence of encouraging drivers to slow at speed humps but then speed up between them. Gaps should be provided between the curbline and the end of the speed hump to allow stormwater to bypass the treatment.

The spacing between speed humps should be a minimum of 250-feet apart and a maximum of 500-feet apart. The following spacing is recommended:

Speed (mph)	Spacing (feet)
10	250
15	300
20	400
25	500

Speed humps should be placed no closer than 200-feet from an intersection. They should not be placed on streets less than 1500 ft. in length or on cul-de-sac and dead-end streets. They should not be installed on roads with severe grades or on the horizontal curve of a road. They should be paired with warning signs, and can include pavement markings to provide additional visual cues to motorists.

Advantages: Very effective at reducing travel speeds through the use of vertical changes in the roadway.

Disadvantages: Have potential to slow down emergency vehicles and buses, can create drainage problems, and may require additional maintenance costs. When designed with an improper profile the treatment is uncomfortable for bicyclists and can create speeding issues between the speed humps.

Speed Hump showing drainage bypass along curbline and chine in background (Seattle, WA)

Speed Lump

Description: Speed lumps (also known as speed pillows) are a modified speed hump that is segmented to provide openings in the hump to accommodate emergency services, large vehicles, and bicycles without forcing them to travel over the raised portion. Speed lumps are spaced such that typical passenger vehicles cannot avoid traversing the raised portion.

Placement & Design Guidance: See the speed hump section for spacing. The largest speed lump should be 6-feet wide to allow passage by large vehicles.

Advantages: Allows some emergency vehicles and buses to traverse the device without significantly traversing the vertical change. Better accommodates on-road bicyclists as they can the opening to go through without traversing the raised section.

Disadvantages: May encourage passenger vehicles to cross into the opposing lane to avoid the lumps. Providing a centerline stripe approaching the speed lump in each travel direction may discourage this behavior. Some emergency vehicles may not be able to avoid the lumps based on their specific wheel base.

Speed lump showing passenger vehicle cannot bypass the raised portion (Washington, DC)

Speed Table / Raised Crosswalk

Description: They are raised sections in the pavement that have a wide flat top to provide an overall gentler transition than speed humps. The flat area is designed to accommodate the entirety of a regular vehicle on the top. The design can also include a crosswalk along the top of the raised section.

Placement & Design Guidance: Can be placed mid-block or used at an intersection to control speeds at pedestrian or separated bike lane crossings.

Advantages: Elongated design can cause less discomfort for motorists compared to humps or lumps. They may encourage motorists to stop for crossing pedestrians.

Disadvantages: Have potential to slow down emergency vehicles and buses, can create drainage problems, and may require additional maintenance costs. Elongated design may reduce the amount of speed reduction compared to speed humps.

Mid-block speed table with raised crosswalk and drainage bypass along curbline (Washington, DC)

Raised Intersections

Description: They are similar in concept to speed tables except they extend across an entire intersection to provide traffic calming on all the connecting streets.

Placement & Design Guidance: They are placed on intersections with two or more streets. Their size is dictated by the size of the intersection.

Advantages: They are aesthetically pleasing, provide traffic calming on more than one street at the same time and cause less discomfort for drivers. They may encourage motorists to stop for crossing pedestrians.

Disadvantages: Increase noise and have significantly higher cost, however the fact that they are targeting 2 or more streets must be taken into consideration. Elongated design may reduce the amount of speed reduction compared to speed humps.

Raised intersection (Source: nacto.org)

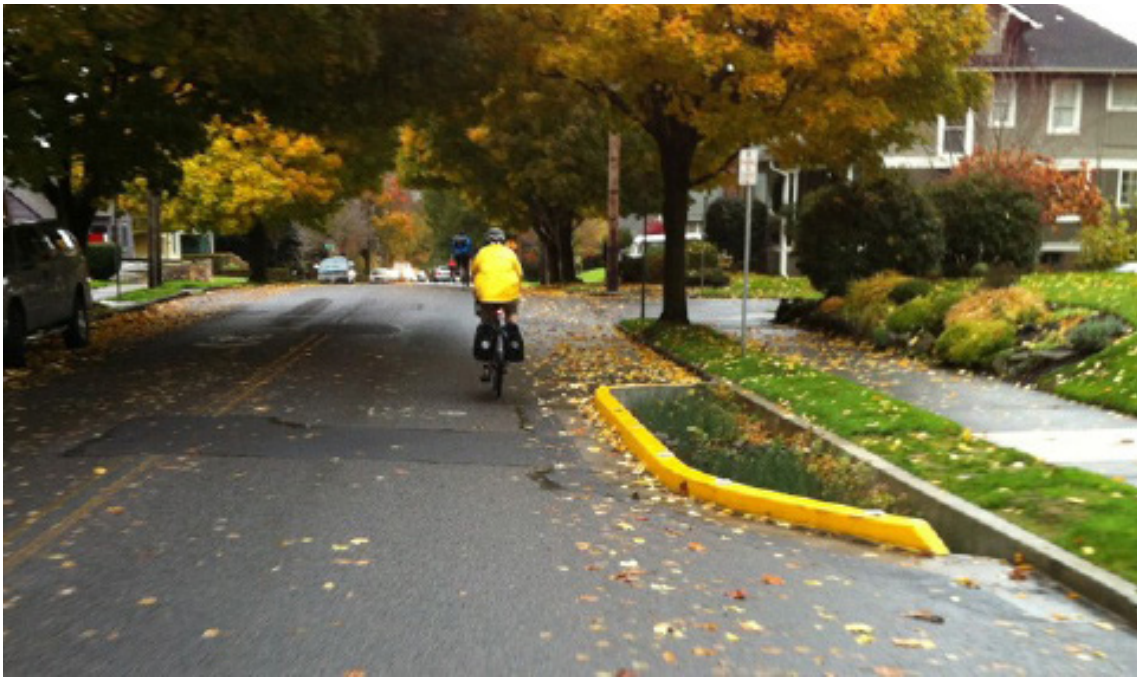
Curb Extension (Bulb-out, neckdown, choker)

Description: Extends the curbline into the parking lane at an intersection or mid-block, thus preventing vehicles from parking too close to a crosswalk, improving visibility of pedestrian crossings, reducing pedestrian crossing distances, and visually narrowing the travelway width. They also reduce the speed of turning vehicles at intersections by reducing the effective turning radius.

Placement & Design Guidance: Curb extensions should only be used where there is on-street parking, and may be at intersections or mid-block. Curb extensions may extend the full width of the on-street parking lane, or only partially into the lane; this decision is typically based on turning movements at intersections. At mid-block locations the design can accommodate mid-block pedestrian crossings, or can be designed to include additional street vegetation to serve as another visual cue that slow speeds are appropriate.

Advantages: Improves pedestrian crossings by shortening crossing distances and increasing pedestrian sight distances. Can help to control the speed of through and turning vehicles. Also provides a logical location for rain gardens or other stormwater collection/treatment facilities. On lower volume roadways, curb extensions placed mid-block may be used to reduce the travel way width to less than two-lanes, thus creating locations where motorists must yield to oncoming motorists.

Disadvantages: Requires additional considerations for accommodation of bus routes and can limit the ability for large vehicles to turn at intersections. Drainage features often need to be revised to accommodate installation. May have limited traffic calming benefits when used as a mid-block treatment



Midblock curb extension with stormwater rain garden (Source: nacto.org)

Neighborhood Traffic Circles

Description: Traffic circles are raised islands placed at four-way and T-intersections. Used only on residential streets, neighborhood traffic circles are intended to reduce the speed of traffic by reducing the street's width and forcing motorists from their normal travel path.

Placement & Design Guidance: The circles are installed at intersections and should be no less than 600-feet apart to maintain a reasonable speed throughout the street. Each approach to the traffic circle should be yield controlled. The center islands may be landscaped or fully mountable; this is dependent on the design vehicle and the diameter of the traffic circle.

Advantages: In addition to reducing speeds, they provide a potential for additional landscaping. Can also improve access from minor streets by slowing vehicles at intersections.

Disadvantages: Might be confusing for some drivers if they are unfamiliar with circular intersections.

Neighborhood traffic circle with curb extension (Kirkland, WA)

Mountable Truck Aprons

Description: Mountable truck aprons are raised portions of the road that are not intended to be traversed by passenger vehicles but are designed to be traversed by large vehicles. They reduce the effective travel way width while still accommodating the off-tracking of larger design vehicles.

Placement & Design Guidance: Mountable truck aprons may be placed mid-block, at intersection corners, and at traffic circles and roundabouts (on the interior of the circulating roadway and/or on the approaches). The curbs surrounding mountable truck aprons should be rolled or beveled to allow trucks to traverse them without causing damage. Mountable truck apron surfaces should visually differ from the surrounding road surface and from adjacent sidewalk surface; often tinted concrete is used for mountable aprons. Mountable truck aprons should not interfere with pedestrian crossings and must be designed to ensure that pedestrians waiting to cross the street are not located within the mountable truck apron area.

Advantages: Reduces the speeds of turning passenger vehicles while accommodating larger design vehicles, buses, and emergency services.

Disadvantages: May create a location that is perceived by pedestrians as being a safe place to wait to cross the street.

Mountable truck aprons along approach and within a modern roundabout (Burlington, NJ)

Traffic Signal Timing / Green Waves

Description: Traffic signal timing can be coordinated to provide green lights for vehicles traveling at the desired operating speed, which may be lower than the posted speed.

Placement & Design Guidance: Green waves are appropriate on long straight corridors where other traffic calming treatments are deemed inappropriate or in conjunction with other traffic calming treatments. Signs should be provided indicating what speed the traffic signals are set to communicate the desired operating speed to drivers.

Advantages: Reduces the speeds of vehicles by rewarding drivers who travel at the desired operating speed. Effective on single-lane roads where one driver operating in the desired manner can control the speed of a platoon of vehicles.

Disadvantages: Some drivers may exceed the speeds and stop at each intersection.

Examples of traffic signal timing / green way signing (various locations)

Radar Speed Display Signs / Speed Enforcement

Description: Signs that display the driver's speed that may flash when the speeds exceed the desired behavior. These may also be used in conjunction with Speed Enforcement equipment that issues citations to drivers who exceed the speed threshold.

Placement & Design Guidance: These signs may be placed where high speeds are known problems and other speed control methods are not viable. They can also be effective in locations where speed limits change throughout the day (such as school zones) to reinforce the desired behavior.

Advantages: Serves as an educational tool for drivers. When used as a speed enforcement tool can also teach desired behavior over time.

Disadvantages: May not be effective for drivers who travel the route daily. May limit the desired behavior to specific locations. Speed enforcement thresholds allow drivers to far exceed the desired behavior before issuing citations.

Example school zone with photo enforcement of motorist speed

3.3 Additional Design Treatments

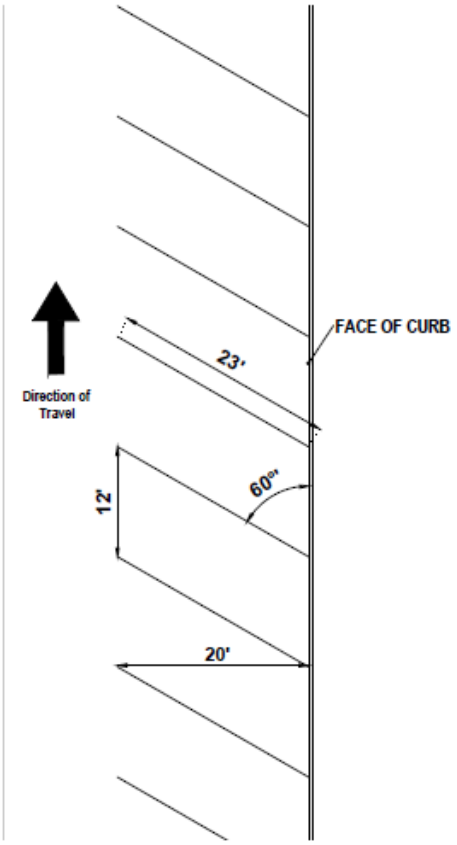
Back-In Angle Parking

Description: Back-in angle parking (also referred to as reverse-angle or reverse diagonal parking) is a parking space that motorists drive slightly past, and then back into the angled parking space.

Placement & Design Guidance: Back-in angle parking should be provided where additional on-street parking is desired. Parking spaces should be angled at 60-degrees to the curbline and should be 20-feet deep measured perpendicular to the curbline, and 10-feet wide. Parking stops should be provided where vehicles overhanging the street buffer or sidewalk is not desired. Vehicle idling should also be prohibited.

Advantages: Back-in angle parking requires less lateral curb space per vehicle compared to parallel parking spaces; as such, more on-street parking can be provided along a street. It provides motorists with significantly better sight lines to approaching roadway users as they exit the parking space. This parking configuration eliminates the risks present in parallel parking configurations, where motorists may open their car doors into the travel path of a bicyclist without looking. Children exiting cars are also directed back toward the sidewalk by the open vehicle door. May also be implemented to provide a road narrowing or mid-block deflection traffic calming benefit.

Disadvantages: Drivers may not know where to stop backing up, resulting in vehicle overhanging the sidewalk or hitting landscaping or other sidewalk amenities. Tailpipes are directed toward the sidewalk, which may be undesirable near outdoor seating or other sensitive areas. This parking design may be confusing to some drivers, who may come from opposing travel lanes and go head-first into the parking space.



Detail of Back-in Angle Parking

Floating Bus Stops

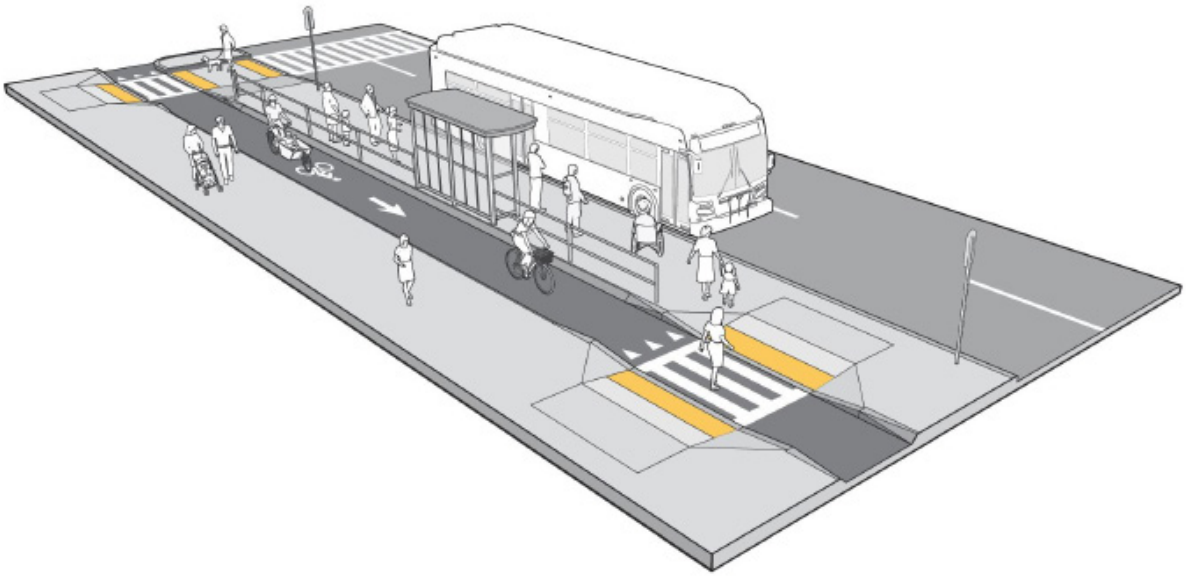
Description: Floating bus stops are raised concrete medians located between motor vehicle lanes and separated bicycle lanes. These raised medians serve as a dedicated pedestrian platform to accommodate bus boarding and alighting.

Placement & Design Guidance: Floating bus stops are compatible with mid-block, near-side, and far-side bus stop locations. Floating bus stops should be designed to communicate expectations for transit passengers by guiding them across the separated bicycle lane at clearly marked locations. Two pedestrian crossings are recommended, but not required. Channelizing railings, planters, or other treatments can be used to help direct people to the crossing location(s). It is also important for the designer to provide clear direction to bicyclists that they are expected to yield to pedestrians crossing the bike lane at transit stops.

Floating Bus Stop islands must provide at least 8-feet of clear width at the location where the bus doors will open to accommodate persons in wheelchairs. If a bus shelter is provided, at least 4-feet of clear space must be provided between the edge of the bus shelter and the curbline and an accessible path must be provided between the shelter and the boarding/alighting area. If bus shelters are provided, it is recommended that they be transparent to ensure that lines of sight are provided between bicyclists and pedestrians.

Advantages: Eliminates the bus-bicycle conflict because the bus does not need to pull into or across a bicycle lane to reach the curb. When used for near-side or far-side bus stops, floating bus stops can also serve as pedestrian refuge islands for the street crossings.

Disadvantages: Bus passengers must cross the separated bike lane when entering and exiting the dedicated platform.



Example detail of a far-side floating bus stop

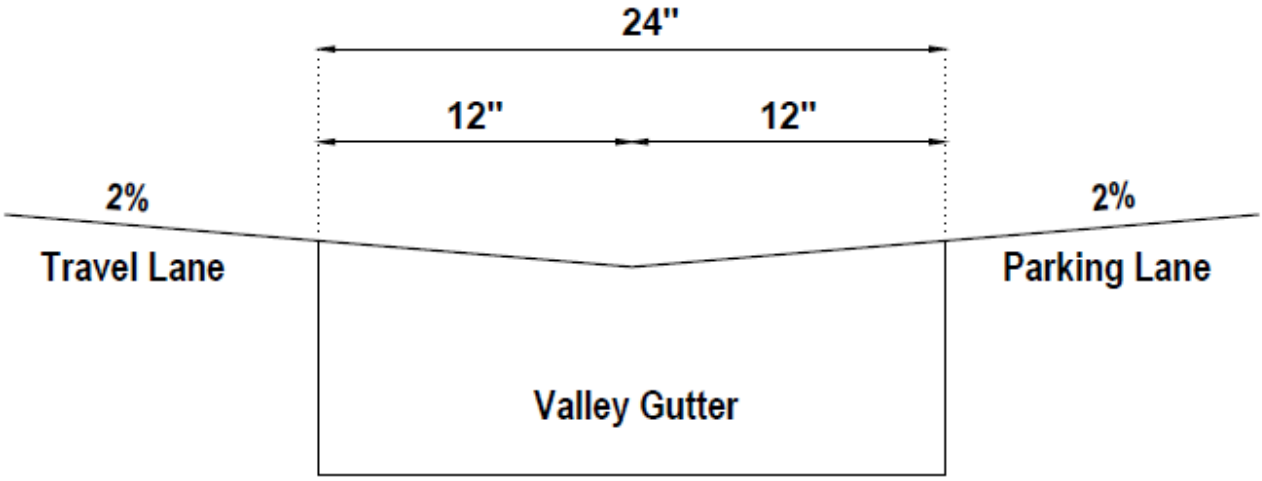
Valley Gutter

Description: Valley gutters lay between parking and travel lanes, causing the travel lanes and parking to slope towards one another.

Placement & Design Guidance: Valley Gutters are typically used on low-volume, two-lane roads. They can direct runoff into bioretention planters, and may be designed as detectable and high-contrast edges to delineate the shared roadway from the exclusive pedestrian paths.

Advantages: Valley gutter visually narrows a street, which helps to reduce speeding. They do not add any extra width to cross-sections; half the gutter is considered part of the roadway and the other half part of the parking lane. Valley gutters allow for street trees, bus stops, or parklets to use space in the parking row. Valley gutters have the added benefit of raising the height of sidewalk compared to conventional gutter design, thus improving the visibility of pedestrians at intersections.

Disadvantages: Can be more expensive to retrofit if lowering the crown of the roadway.



Detail of Valley Gutter

Example of valley gutter between travel and parking lanes

3.4 Bicycle Facility Design Treatments

The following outlines various treatments for facilitating bicyclists within the right-of-way, including detailed descriptions, design guidance, advantages and disadvantages, and general effectiveness. Some treatments call for entirely separated facilities while others allow for shared spaces between users. These treatments can be used on their own or in combination to achieve the desired facility.

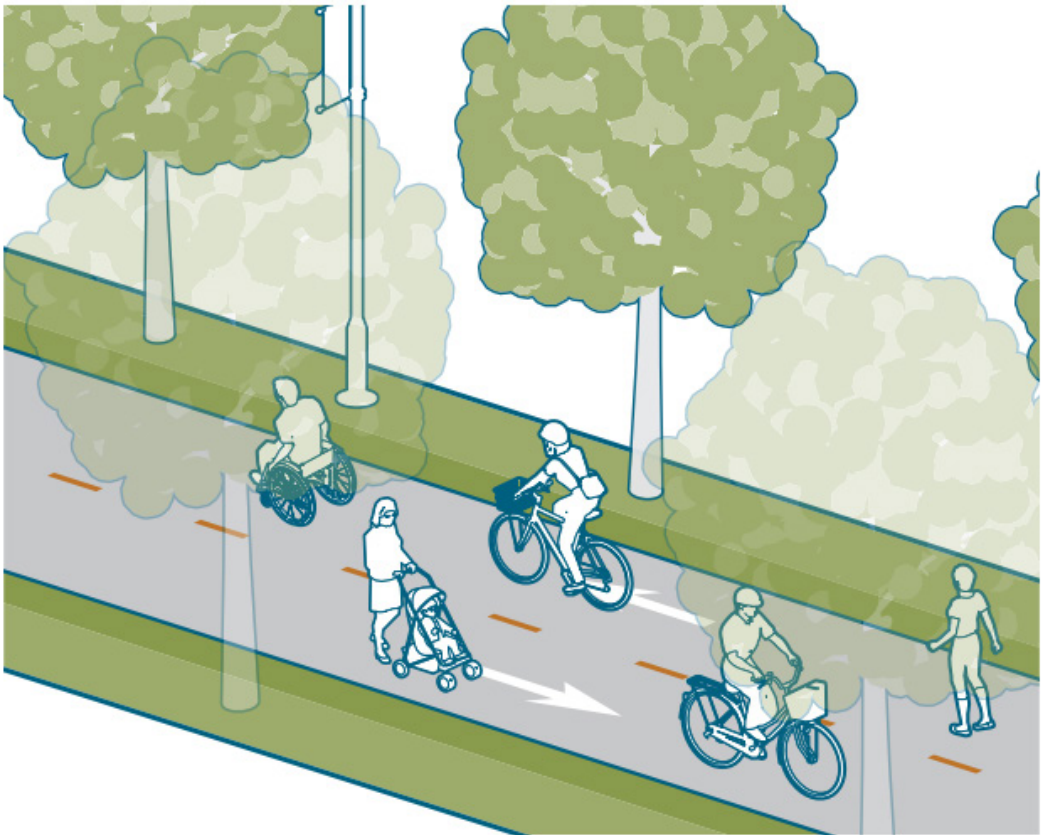
Side Paths or Shared Use Paths

Description: Side paths are shared use paths located parallel to and within the road right-of-way and provide two-way travel for walking, bicycling, jogging, and skating.

Placement & Design Guidance: Adequate widths to enable side-by-side travel and passing, typically 10 feet wide. Ideally, a graded shoulder area of 3-5 feet, with a 5 foot minimum buffer from traffic.

Advantages: Side paths are attractive to a wider range of bicyclists compared to striped bikeways. May be a preferable alternative to separated bike lanes if low pedestrian volumes are anticipated in order to minimize right-of-way impacts. Side paths offer intuitive and safe crossings at intersections.

Disadvantages: Straight alignments allow for direct and higher speed travel for bicyclists which may make pedestrians uncomfortable. They may require the removal of poles, trees, or other obstructions for wider paths. Asphalt is the preferred surface material over concrete which could require high-quality construction and maintenance that avoids pavement cracking and buckling.



Example detail of a multiuse shared path (Source: Montgomery County Bicycle Facility Design Toolkit, 2017)

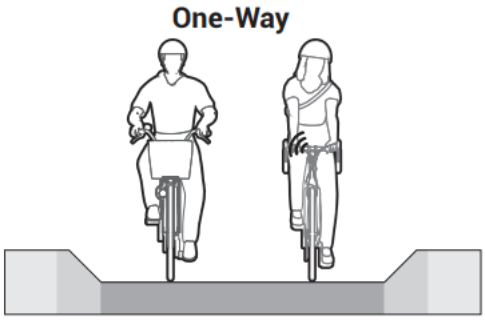
Separated Bike Lanes

Description: Separated bike lanes are exclusive bikeways that combine the user experience of a side path with the on-street infrastructure of a conventional bike lane. They are physically separated from motor vehicles traffic and distinct from the sidewalk.

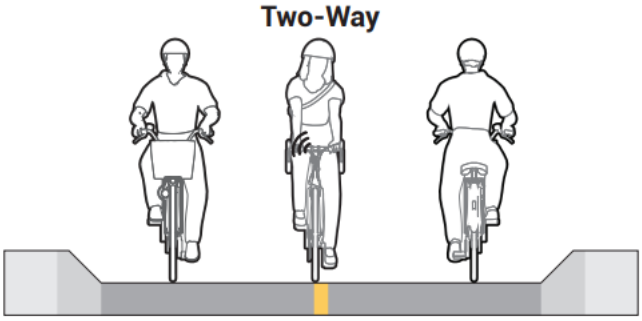
Placement & Design Guidance: They are preferred in higher density areas, adjacent to commercial and mixed-use development, and near major transit stations or locations where observed or anticipated pedestrian volumes will be higher. Lane widths should be chosen based upon the anticipated number of bicyclists in a typical peak hour shown in the tables below. Generally, the bike lane should be sufficiently wide to enable passing maneuvers between cyclists, typically 6.5 feet wide for one-way lanes and 10 feet wide for two-way lanes. Beveled or mountable curbs (see page 44) are recommended to ease access to the adjacent sidewalk. Separated bike lanes may be installed at the street level with raised buffers, Flexible delineators ("flex posts"), and/or on street parking physically separating the bike lane from vehicular traffic.

Advantages: Separated bike lanes are more attractive to a wider spectrum of bicyclists, some of whom, such as children and seniors, ride at slower speeds. Separated bike lanes have been documented to significantly increase bicycling. Physical separation prevents motor vehicles from driving, stopping, or waiting in the bikeway. Provides greater comfort to pedestrians by separating them from bicyclists.

Disadvantages: Raised buffers provide the greatest level of separation from traffic, but will often require road reconstruction. The proximity to objects or vertical curbs along the bike lane edge can reduce the effective width of the bike lane and user comfort. Challenging to implement in constrained corridors and may require context-sensitive solutions.



at least 6.5 ft. recommended to enable passing movements



at least 10 ft. recommended to enable passing movements

Same Direction Bicyclists/Peak Hour	Bike Lane Width (ft.)	
	Rec.	Min.
<150	6.5	5.0
150-750	8.0	6.5
>750	10.0	8.0

Bidirectional Bicyclists/Peak Hour	Bike Lane Width (ft.)	
	Rec.	Min.
<150	10.0	8.0
150-400	11.0	10.0
>400	14.0	11.0

Example detail of separated bike lanes (Source: Montgomery County Bicycle Facility Design Toolkit, 2017)

Bike Lane with Adjacent Parking

Description: Bike lanes with adjacent parking designate an exclusive, delineated space for bicycle travel between the travel lane and the adjacent parking lane.

Placement & Design Guidance: Where parking is provided, the parking configuration should in such a way to minimize negative impacts on safety and comfort of bicyclists as much as possible. In locations where parking lanes are adjacent to bike lanes, it may be desirable to add a buffered bike lane, even if that requires narrowing the bike lane to the minimum width. This decreased width encourages bicyclists to ride farther away from parked vehicles and encourages motorists to park closer to the curb. Where wide bike lanes are feasible, buffers can help make clear during times of low parking usage that the parking lane and bike lane are not intended for vehicle travel. Bike lanes adjacent to parking require a minimum width of 5-feet, with 6 to 7-feet preferred.

Advantages: Can provide on-street parking if desired or required and still provide a dedicated space for bicyclists.

Disadvantages: Significant impact on comfort of bicyclists riding between a travel lane and an adjacent parking lane. Bicyclists riding in bike lanes adjacent to parked vehicles are subject to riding in the “door zone”, potentially creating a conflict. Bike lanes may not be comfortable for all potential bicyclists.

Example of a conventional bike lane with on-street parking

Bike Lane without Parking

Description: Bike lanes without adjacent parking designate an exclusive, delineated space for bicycle travel between the travel lane and the curb.

Placement & Design Guidance: Bike lanes adjacent to a curb require a minimum width of 5-feet, with 6 to 7-feet preferred.

Advantages: Bicycle lanes adjacent to the curb provide a space for bicyclists. Door zone conflicts are eliminated because parking is prohibited.

Disadvantages: Potential for vehicles to pull over and block the bike lane and portions of the travel lane. Bike lanes may not be comfortable for all potential bicyclists.

Example of conventional bike lane without on-street park

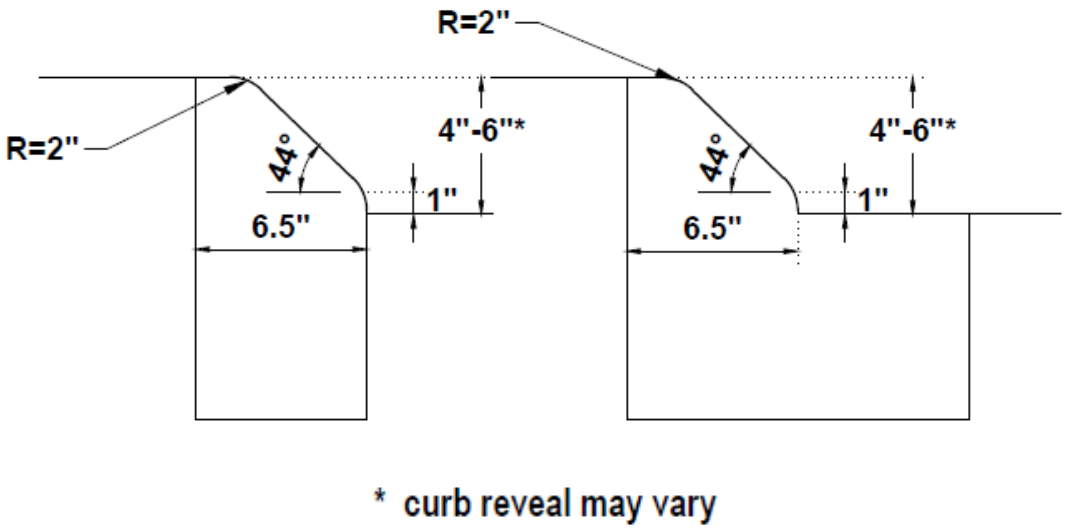
Beveled / Sloping Curb

Description: Beveled or Sloping Curbs have a sloped face of curb that reduces the risk of pedal strikes for bicyclists traveling adjacent to the curb.

Placement & Design Guidance: Beveled curbs are recommended along the edges of a separated bicycle lanes. Short curbs (2-3 inches from the roadway surface) of any angle eliminate the risk of pedal strike, and increase the usable width of the bike lane by permitting bicyclists to ride closer to the edge of the bike lane. However, even short vertical curbs can be unforgiving if struck by a bicycle wheel. Tall vertical or beveled curbs (6 inches from the roadway) discourage encroachment by motor vehicles.

Advantages: Beveled curbs are angled to reduce pedal strike hazards for bicyclists and make it easier for dismounted bicyclists to access the sidewalk than a typical vertical curb. Beveled curbs use less cross-section width which allows more space to be allocated to the bike lane or buffer.

Disadvantages: Beveled curbs are less forgiving than mountable curbs for bicyclists that may encroach on the sidewalk or edge of the bike lane.



Detail of Beveled / Sloped Curb

Priority Shared Lanes

Description: Priority shared lane markings communicate bicyclists' priority within a shared lane and guide bicyclists to ride outside of the door zone of adjacent on street parking.

Placement & Design Guidance: Common applications will be streets with high on-street parking turn over, typically those with ground-floor retail and dining, or low-speed (25 mph or less), or low-volume frontage roads. They may also be used in separated bike lane zones where a protected intersection is not provided. They should be placed in the center of the travel lane to avoid wear in the wheel path and guide bicyclists' positioning. Colored backing and more frequent spacing make priority shared lane markings more conspicuous than standard shared lane markings (sharrows).

Advantages: This is an option for roadways where it is infeasible to install bike lanes, separated bike lanes, or side paths. May be used as an interim measure on any roadway where it is desirable to communicate bicycle priority within a shared lane to close gaps in a bicycle network.

Disadvantages: This treatment does not improve most bicyclists' comfort in shared lanes with traffic.

Example of a priority shared lane. (Source: Montgomery County Facility Design Toolkit, 2017)