

## 223 Bicycle Facilities

### 223.1 General

This chapter provides the minimum criteria to be used for the design of bicycle facilities on the State Highway System (SHS).

Provide a bicycle facility on all roadways on the SHS, except where its establishment would be contrary to public safety; e.g., limited access facilities as defined by **FDM 211**. The various methods of providing bicycle facilities are discussed in **FDM 223.2**.

Bicycle safety can be enhanced through the following measures:

- (1) Maintaining a smooth, clean riding surface, free of obstructions. This includes ensuring drainage inlets and utility covers that cannot be moved out of the travel way are flush with grade, well seated, and use bicycle-compatible inlets, grates and covers.
- (2) Responsive and appropriate traffic control devices, consistent with guidance in the **Manual on Uniform Traffic Control Devices (MUTCD)**, including providing bicycle oriented directional signage.
- (3) Providing adequate lighting.
- (4) Developing and maintaining a district bicycle facility plan to assign proposed bicycle facility types through a consistent and efficient process and ensure the following:
  - Integration of FDOT bicycle facilities with local and regional bicycle transportation systems
  - The direct use of more complex facility types in a cost-effective and efficient manner.

Process a Design Variation when a bicycle facility cannot be provided or when criteria contained within this chapter are not met.

### 223.2 Bicycle Facilities

A bicycle facility accommodates bicycle travel. Bicycle facilities play an important role in supporting bicycle travel.

Bicycle facilities include the following:

- Bicycle lanes
- Keyhole lanes
- Intersection Bicycle Box and Two-Stage Bicycle Turn Box
- Paved shoulders
- Shared use paths
- Separated bicycle lanes

## 223.2.1 Bicycle Lanes

Bicycle lanes are a portion of a curbed roadway designated for the exclusive use of bicyclists. Bicycle lanes are designated by a bicycle symbol pavement marking in accordance with [Standard Plans, Index 711-002](#) and the [MUTCD](#), and illustrated in [Exhibits 223-1](#) through [223-3](#). Bicycle lane signs and plaques may be used in accordance with the [MUTCD](#) when high levels of bicycle traffic exist or are anticipated.

Bicycle lanes can be used on curbed roadways with a design speed  $\leq 45$  mph. However, it is best practice to consider other types of facilities for design speeds greater than 30 mph.

Bicycle lanes are one-way facilities and carry bicycle traffic in the same direction as adjacent motor vehicle traffic. On one-way streets, bicycle lanes should typically be placed on the right side of the street. A bicycle lane on the left side of the street can be considered if it will substantially reduce the number of potential conflicts, such as those caused by frequent bus traffic, heavy right-turn movements, high-turnover parking lanes, or if there is a significant number of left-turning bicyclists.

### 223.2.1.1 Bicycle Lane Width

The width of the bicycle lane is measured from the edge of travel lane to the edge of pavement. For new construction projects, a 7-foot buffered bicycle lane is the standard. A buffered bicycle lane has a double-6-inch white edge line separating the bicycle lane and the adjacent travel lane.

Buffered bicycle lanes are depicted in [Exhibit 223-1](#). A buffered bicycle lane should not exceed 7 feet in width (including the buffer). Any additional pavement width that results from restricting the buffered bicycle lane to 7 feet should be applied to the outside travel lane.

For projects where a bicycle lane is needed and it is not practical to move the existing curb (e.g., RRR), the width of the bicycle lane depends on the width of the available roadway pavement. For these types of projects, the options in the order of priority are:

- (1) 7-foot buffered bicycle lane
- (2) 6-foot buffered bicycle lane
- (3) 5-foot bicycle lane
- (4) 4-foot bicycle lane

Do not provide a bicycle lane when available roadway pavement is less than 4 feet.

Do not place a 4-foot bicycle lane adjacent to a 10-foot traffic lane.

When roadway pavement is continuous to the face of guardrail or barrier, the minimum bicycle lane width is 5 feet. See **FDM 223.2.1.3** when the bicycle lane is adjacent to a right-turn lane or bus bay.

### **223.2.1.2 Pavement Markings and Signage**

Bicycle lane pavement marking symbols are illustrated in **Exhibit 223-1**. Use the following guidance in determining the appropriate placement of bicycle lane markings:

- (1) At an intersection approach, transition the buffer lane striping to a double 6-inch wide stripe using a 2'- 4' dotted pattern 150 feet in advance of the intersection to provide sufficient distance for an automobile or truck to merge into the bicycle lane before turning right.
- (2) Provide continuous lane striping past low-volume and residential driveways.
- (3) Place a Helmeted Bicyclist Symbol and Bicycle Lane Arrow (per [Standard Plans, Index 711-002](#)) in the following locations:
  - (a) The beginning of a bicycle lane
  - (b) The far side of major intersections
  - (c) Prior to and within the keyhole lane
- (4) The maximum spacing of the Helmeted Bicyclist Symbol and Bicycle Lane Arrow is 1,320 feet.

Provide "Bike Lane Ahead" and "Bike Lane End" signage in accordance with the [MUTCD](#).

See **FDM 230.3.1.3** for information on placing markings on concrete surfaces.

### **223.2.1.3 Keyhole Lanes**

A keyhole lane is a bicycle lane that is placed between a through lane and the adjacent right turn lane, bus bay, or parking lane. Provide a keyhole lane on curbed roadways that have a bicycle lane approaching the intersection, bus bay, or parking lane. On curbed roadways that do not have a bicycle lane approaching the intersection, consider providing a 17-foot right-turn lane for development of future bicycle facilities.

A keyhole lane should be provided on flush shoulder roadways that have marked shoulders (per **FDM 223.2.2.1**) on the approaching paved shoulders. Consider providing a keyhole lane on flush shoulder roadways where the approach shoulder is not marked and high levels of bicycle traffic exist or are anticipated.

Provide a 7-foot buffered keyhole lane on curbed roadways; however, when 7 feet is not obtainable, provide the greatest keyhole lane width possible, but not less than 5 feet. The keyhole lane should match the width of the shoulder on flush shoulder and high speed curbed roadways, but not less than 5 feet.

Include Helmeted Bicyclist Symbol and Bicycle Lane Arrow pavement markings in the keyhole lane. Keyhole lanes are illustrated in **Exhibit 223-2**.

The addition of a keyhole lane is not required on RRR projects that have inadequate R/W or utility conflicts.

### **223.2.1.4 Green-Colored Pavement Markings**

Green-colored pavement markings may be used when the need to enhance the conspicuity of bicycle-vehicular conflict areas is demonstrated. The Federal Highway Administration (FHWA) has issued an Interim Approval (IA.14) for the use of green-colored pavement in marked bicycle lanes, extensions of bicycle lanes through intersections, and other bicycle-vehicular conflict areas. FDOT has received permission from FHWA for use of green-colored pavement on the SHS. The Interim Approval may be found at the following website:

[http://mutcd.fhwa.dot.gov/resources/interim\\_approval/ia14/index.htm](http://mutcd.fhwa.dot.gov/resources/interim_approval/ia14/index.htm)

Bicycle-vehicular conflict areas are illustrated in **Exhibit 223-3**, and include:

- (1) Bicycle lane crosses a vehicular right turn lane
  - (a) Separate right-turn lane
  - (b) Dropped lane transitioning into a right-turn lane
  - (c) Free-flow channelized right-turn lane, such as at an interchange: lane addition or merge lane
- (2) Bicycle lane adjacent to a dedicated bus bay
- (3) Intersection Bicycle Boxes, see **FDM 223.2.1.5**
- (4) Two-Stage Bicycle Turn Boxes, see **FDM 223.2.1.5**

Green-colored pavement markings supplement the required bicycle lane pavement markings and are not to be used as a substitute for such markings.

The use of green-colored pavement markings requires the approval of the District Design Engineer through Project Suite's Design Approval Request Process. The addition of green-colored pavement markings to bicycle lanes per these criteria does not require a local agency maintenance agreement.

Use the following guidance in the placement of green-colored pavement markings for bicycle lanes:

- (1) When it is used in conjunction with white dotted lines, such as when extending a bicycle lane across a right turn lane or access to a bus bay, the transverse colored marking must match the 2'- 4' white dotted line pattern of the bicycle lane extension.
- (2) Start the green colored pavement as a solid pattern 50 feet in advance of the dotted striping, match the 2'- 4' dotted through the conflict area, and then resume the solid color for 50 feet after the conflict area, unless such an extent is interrupted by a stop bar, an intersection curb radius or bicycle lane marking.

Include quantities in accordance with the [Basis of Estimates Manual](#). Load these quantities into the Designer Interface in the Signing and Pavement Marking Category.

Projects using green colored pavement markings must submit either a GIS (a.k.a., shapefile or geodatabase) or CADD (e.g. dsgnsp.dgn, dsgnsp.dwg) file depicting their location. The District Final Plans unit will access the files in the GIS folder of the Final

Projects folder and send them to [CO-CIMGIS@dot.state.fl.us](mailto:CO-CIMGIS@dot.state.fl.us) and copy the State Bicycle Pedestrian Coordinator.

Additional details on the file format can be found in the **CADD Manual 8.4.7** and at the following website: <https://www.fdot.gov/gis/bim/green-pavement>.

### **223.2.1.5 Intersection Bicycle Box and Two-Stage Bicycle Turn Box**

The Federal Highway Administration (FHWA) has issued Interim Approvals (IA), for the use of intersection bicycle boxes ([IA.18](#)) and two-stage bicycle turn boxes ([IA.20](#)). FDOT has received permission from FHWA for use of these markings on the SHS.

Intersection bicycle boxes increase the visibility of stopped bicycle traffic at an intersection and help group together bicyclists to clear intersections more quickly. Two-stage bicycle turn boxes provide another option for bicyclists to make a left turn at an intersection.

The use of intersection bicycle boxes or two-stage bicycle turn boxes may be considered only at signalized intersections. Should it be determined there are safety concerns with the IA's device or application and the IA is terminated, the device must be removed and the site restored to its previous condition.

Intersection bicycle boxes are to meet the requirements in [IA.18](#) and comply with all of the following conditions:

- 'Right turn on red' is prohibited and the left turn signal is protective
- All approaches to the intersection have a posted speed no greater than 35 mph
- Bicycle detection is provided if detection is required to actuate the signal or the signals are not timed
- There is a bicycle lane or bicycle keyhole preceding the bicycle box
- There is no more than one through lane on the approach to the bicycle box
- There is a receiving bicycle facility (bicycle lane or paved shoulder) on the opposite side of the intersection

Two-stage bicycle turn boxes are to meet the requirements in [IA.20](#) and comply with all of the following conditions:

- 'Right turn on red' is prohibited
- All approaches to the intersection have a posted speed no greater than 45 mph

- Bicycle detection is provided if detection is required to actuate the signal or the signals are not timed.

It is recommended that an educational program be developed to accompany the installation of bicycle boxes or two-stage bicycle turn boxes.

The use of intersection bicycle boxes or two-stage bicycle turn boxes require the approval of the State Roadway Design Engineer

## **223.2.2 Paved Shoulders**

A paved shoulder is the portion of the roadway contiguous with the traveled way for accommodation of errant vehicles, stopped vehicles, bicycle traffic, and emergency use. A paved shoulder must be a minimum width of 4 feet to serve as a bicycle facility.

See **FDM 210.4** for additional information on paved shoulder requirements.

When audible and vibratory treatment is used adjacent to a paved shoulder that serves as a bicycle facility, see **FDM 210.4.6**.

### **223.2.2.1 Marked Shoulders**

A paved shoulder that has the Helmeted Bicyclist Symbol and Bicycle Lane Arrow pavement markings (see **FDM 223.2.1.2**) are referred to as “marked shoulders”. Do not use bicycle lane signs on flush shoulder roadways.

Paved shoulders should be marked only when all the following are met:

- (1) Design speed  $\leq$  45 mph,
- (2) Shoulder width  $\geq$  5-foot,
- (3) Within C4, C5, C6 context classification, or within C3 when demand is demonstrated, and
- (4) Shared use path is not present along corridor.

### **223.2.3 Shared Use Paths**

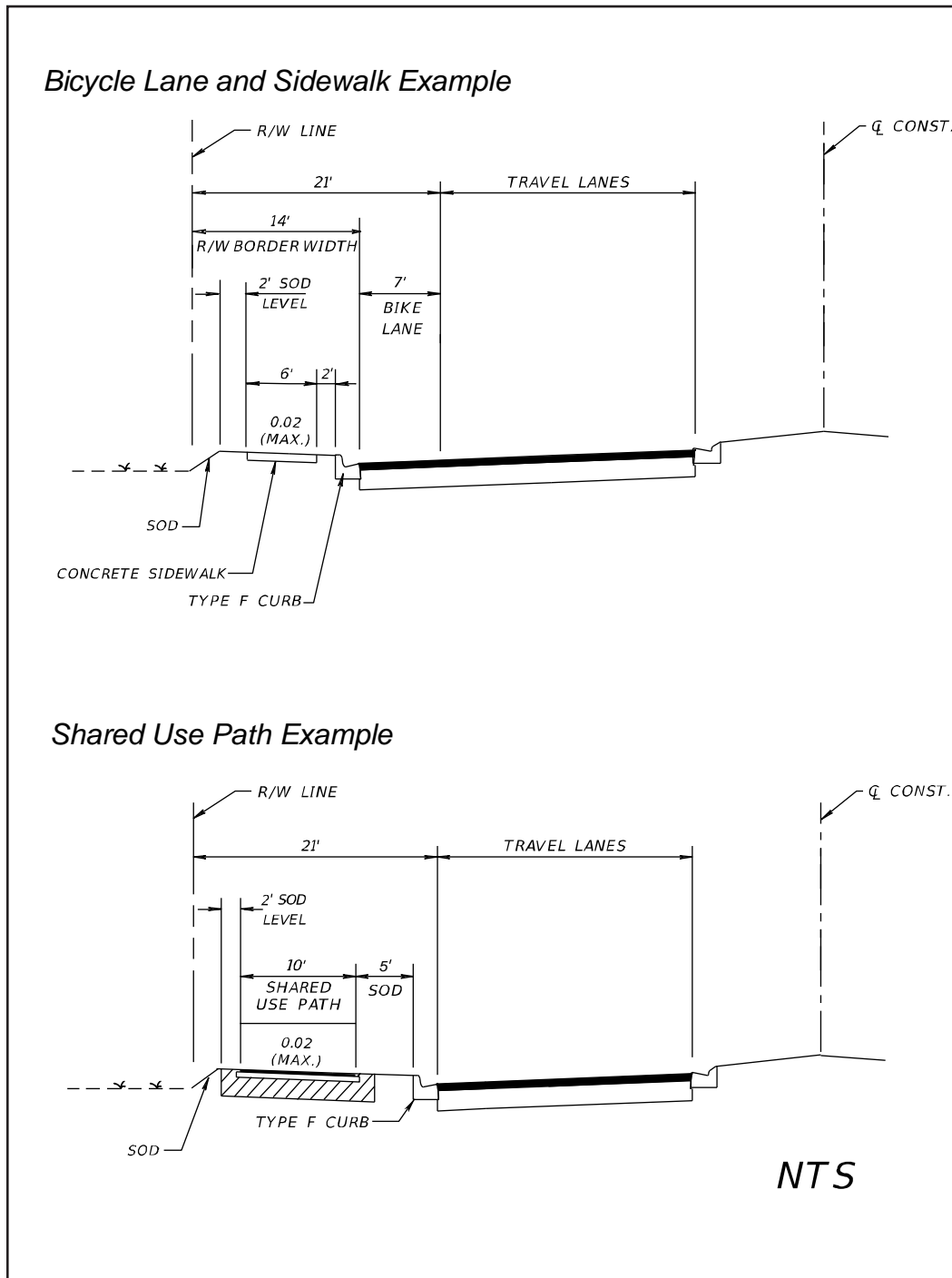
A shared use path may be substituted for a bicycle lane when the roadway design speed is 35 mph or greater and all the following conditions are met:

- Context classification C1, C2, or C3,
- Separation can be maintained between bicycle and motorized traffic through intersections, and
- Conflict points are minimal and mitigated.

As shown in **Figure 223.2.1**, in some cases it may be possible to fit a shared use path into the same space required for a sidewalk and buffered bicycle lane. In other cases, additional width may be required. See **FDM 224** for shared use path design criteria. It is preferable to plan for shared use paths and separated bicycle lanes ahead of time by reflecting them in a district bicycle facility plan.



**Figure 223.2.1 Bicycle Lane and Shared Use Path Examples**



## 223.2.4 Separated Bicycle Lanes

Separated bicycle facilities are one-way or two-way bicycle lanes that are adjacent to and physically-separated from the vehicular travel lane. Bicyclists in these facilities are separated from vehicular traffic.

A separated bicycle lane may be used when all the following conditions are met:

- Minimum required combined width of the separator and separated bicycle lane can be obtained,
- Separation can be maintained between bicycle and motorized traffic through intersections, and
- Conflict points are minimal and mitigated. Cyclists should be given priority at the driveway and side street crossings.

Use the criteria contained in **FDM 223.2.4** in conjunction with the [FHWA Separated Bike Lane Planning and Design Guide](#) to plan and design separated bicycle lanes on the State Highway System.

### 223.2.4.1 Type of Separation

Express lane markers, raised medians (such as traffic separators), on-street parking, and rigid barriers may be used as forms of separation for the appropriate design speeds as follows:

- 35 mph or less: Express lane markers, raised medians, rigid barriers, or on-street parking. For separated bicycle lanes adjacent to on-street parking, use a raised median (see **Figure 223.2.2**).
- 40-45 mph: Raised medians or rigid barriers

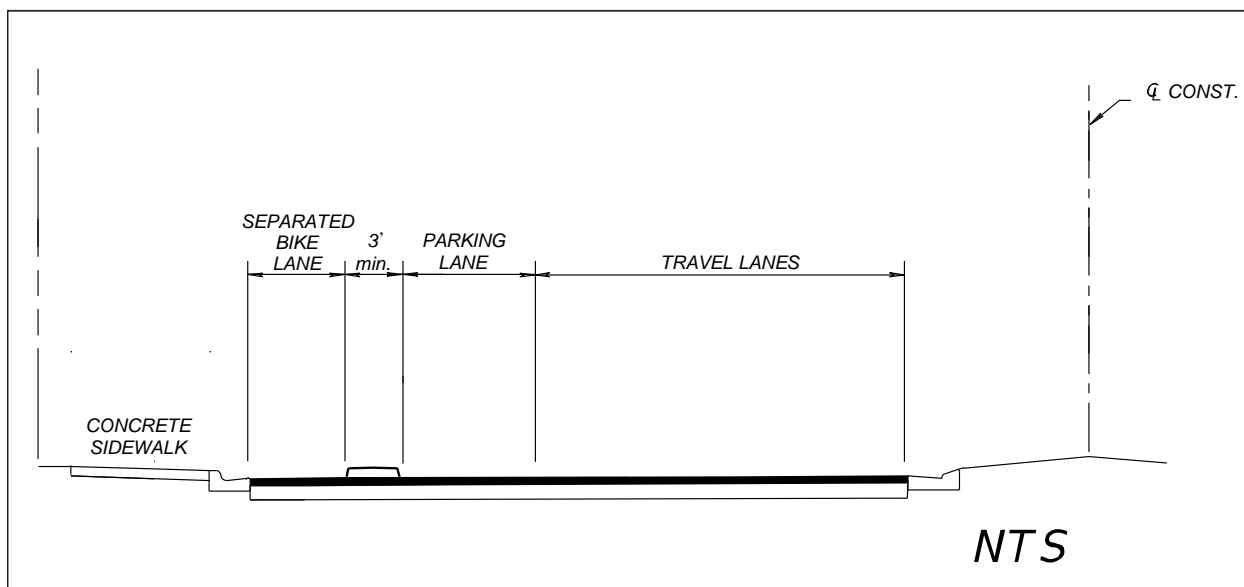
Other forms of separation require approval from the State Roadway Design Engineer.

### 223.2.4.2 Width of Separation

The widths of separation are as follows:

- 3 feet minimum if adjacent to on-street parking. See **Figure 223.2.2** for more information.
- If adjacent to travel lanes:
  - 35 mph or less: 6 feet preferred, 3 feet minimum unless using express lane markers or raised medians, then 2 feet minimum
  - 40 to 45 mph: 8 feet preferred, 3 feet minimum.

**Figure 223.2.2 On-Street Parking Minimal Separation**



### 223.2.4.3 Separated Bicycle Lane Widths

Use wider lanes where higher volumes are expected.

The lane widths for separated bicycle facilities are as follows:

- Two-Way facilities: 12 feet preferred, 10 feet minimum

- One-Way facilities: 7 feet preferred, 6 feet minimum

#### **223.2.4.4 Pavement Markings**

Pavement markings used for separated bicycle facilities must conform to the **MUTCD**, **Traffic Engineering Manual (TEM)**, or **FDM 230**. Markings that do not conform to any of these manuals require approval by the State Roadway Design Engineer and State Traffic Operations Engineer.

#### **223.2.4.5 Intersections and Driveways**

Chapter 5 of the **FHWA Separated Bike Lane Planning and Design Guide** includes typical designs to address the following:

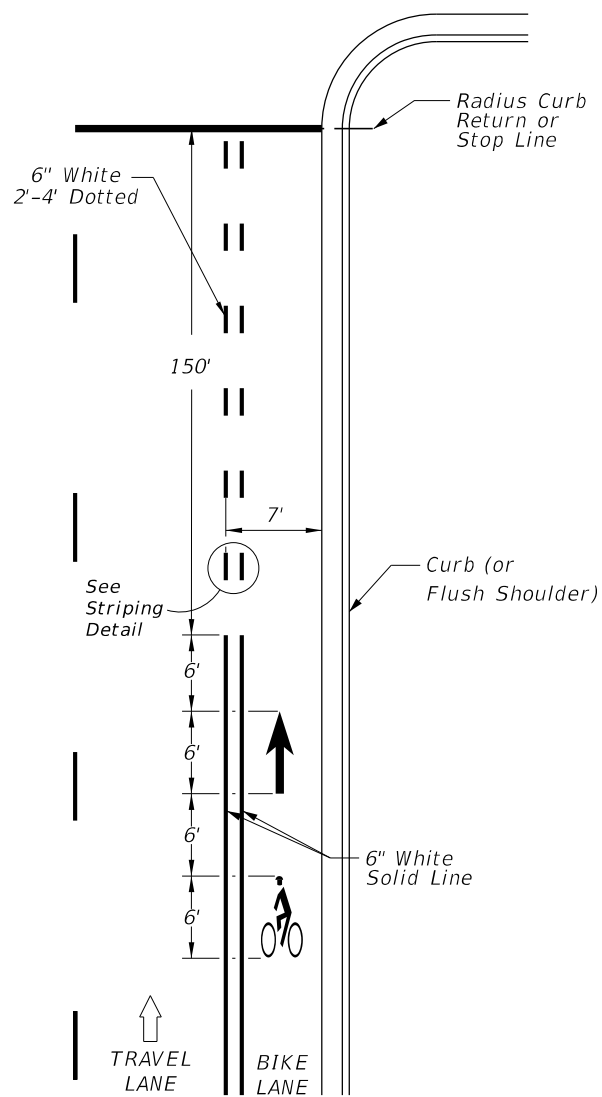
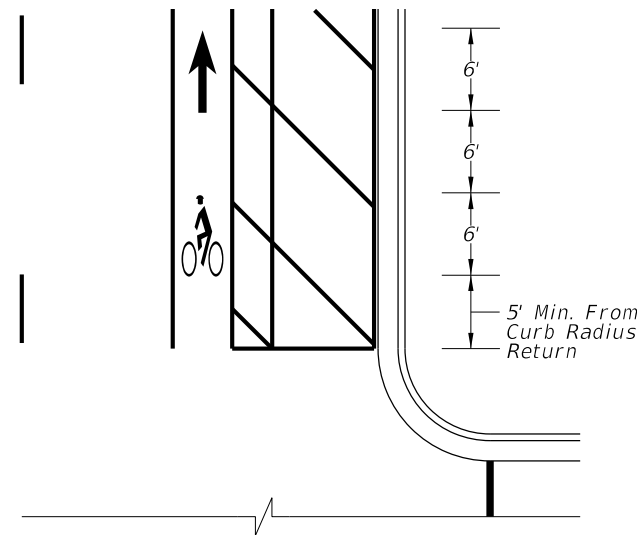
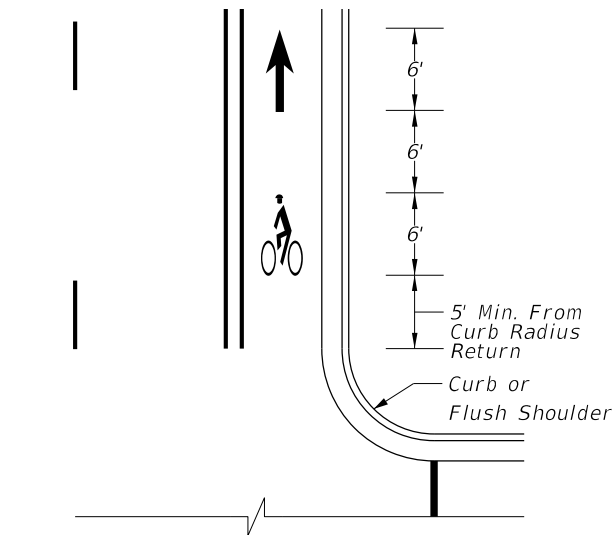
- Facility connections at intersections,
- Side streets and driveways, and
- Traffic operation tools such as bicycle signal faces and signal phasing.

See the **TEM** for more information on traffic operation tools.

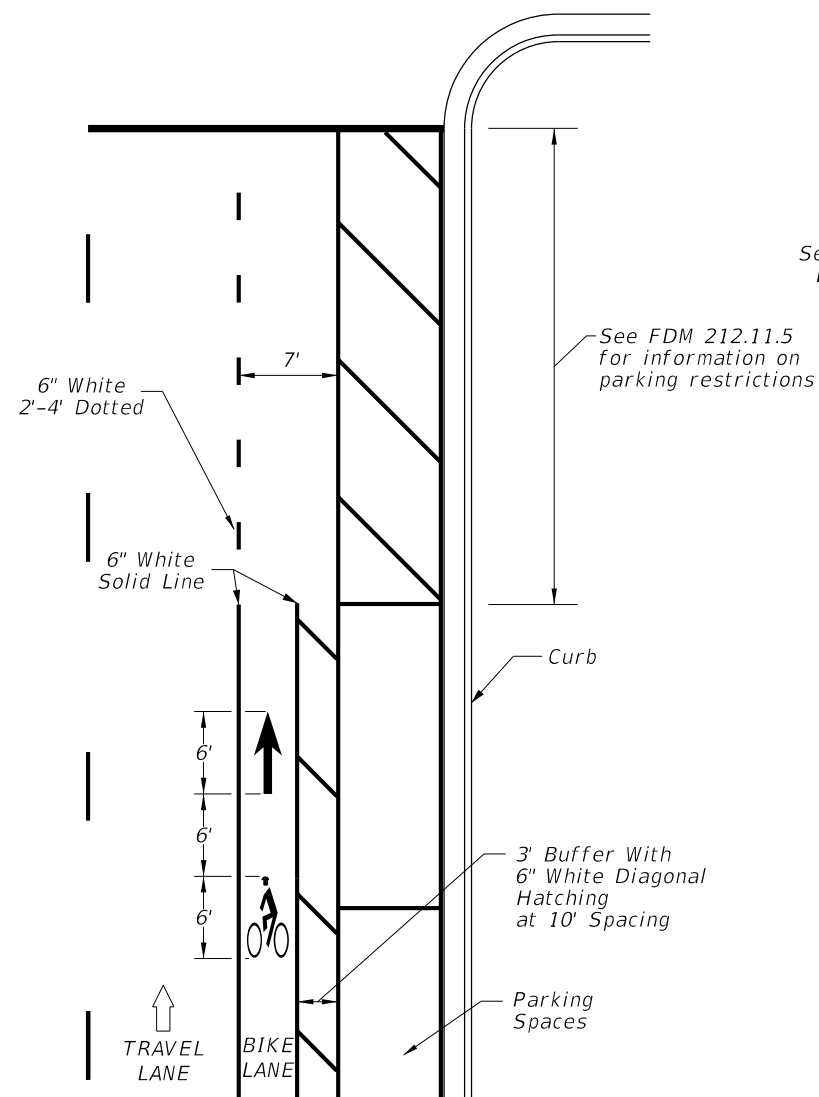
Maintain separation between bicycle and motorized traffic through intersections (e.g., do not use mixing zones and keyhole lanes).

Minimize turning conflicts through access management. Cyclist ~~to~~ should have priority at the driveway and side street crossings that remain.

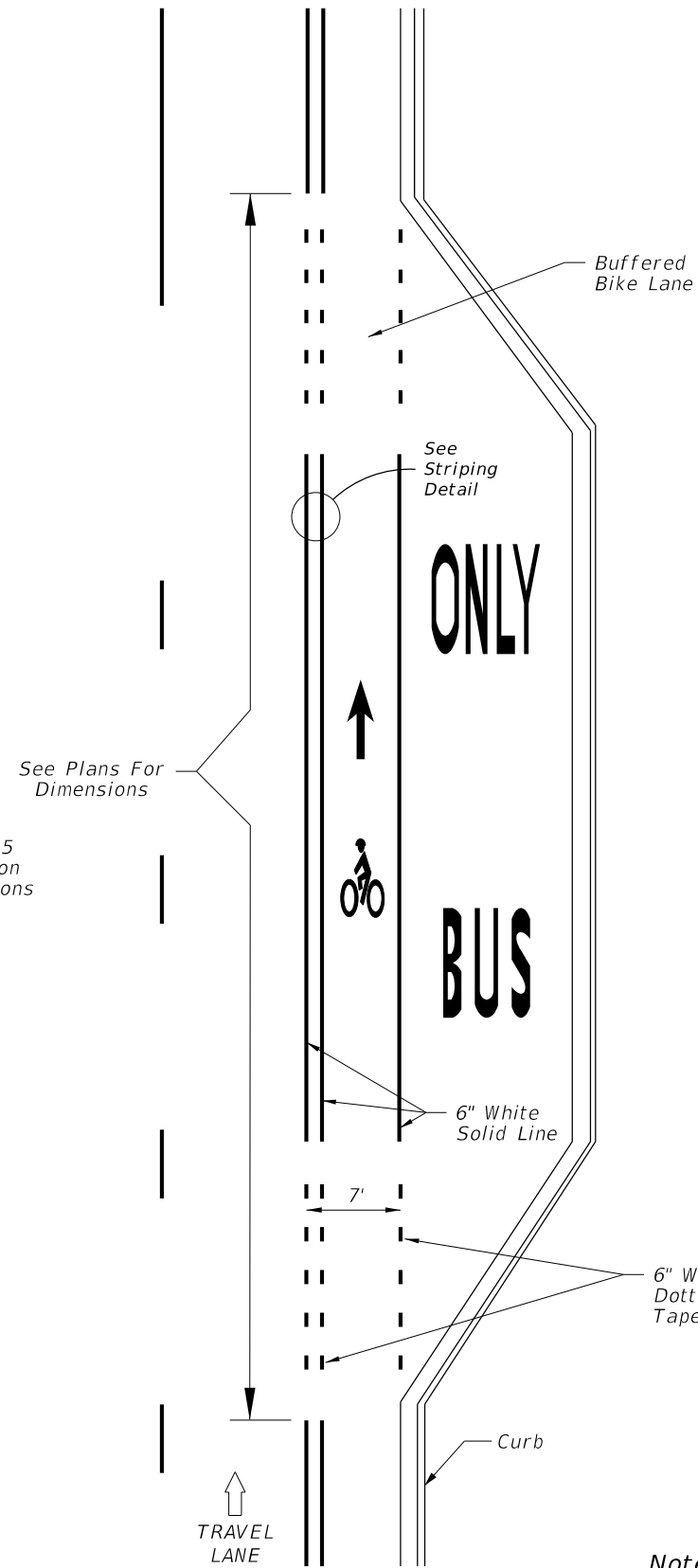
# BIKE LANE TYPICAL PAVEMENT MARKINGS



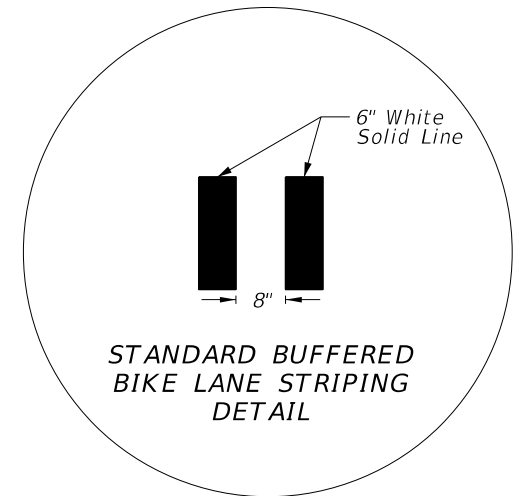
BIKE LANE INTERSECTION APPROACH DETAILS



BIKE LANE ADJACENT TO ON-STREET PARKING



BIKE LANE ADJACENT TO BUS BAY

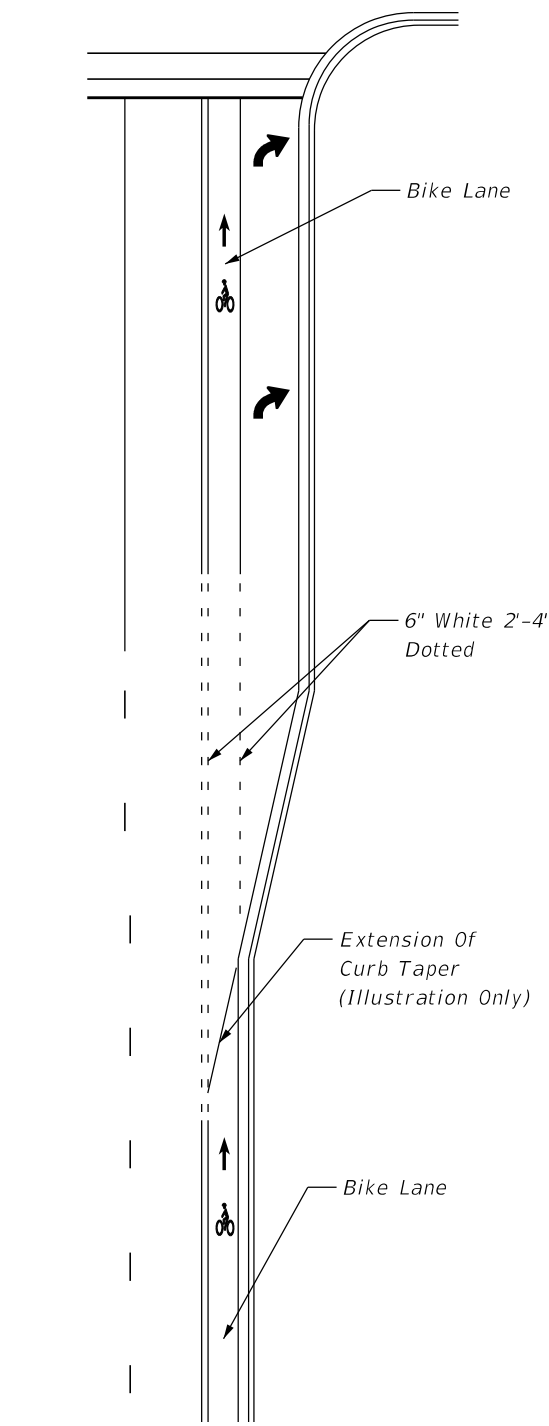


Note:  
See Exhibit 230-3 in FDM 230 for bike lane and midblock crossings pavement markings.

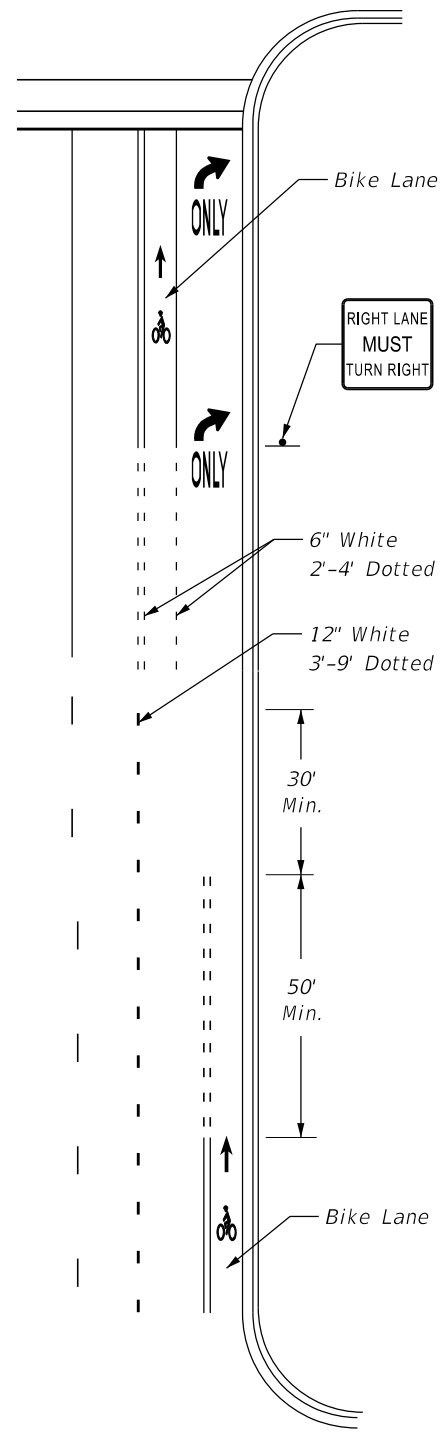
NOT TO SCALE

EXHIBIT 223-1  
05/14/2019

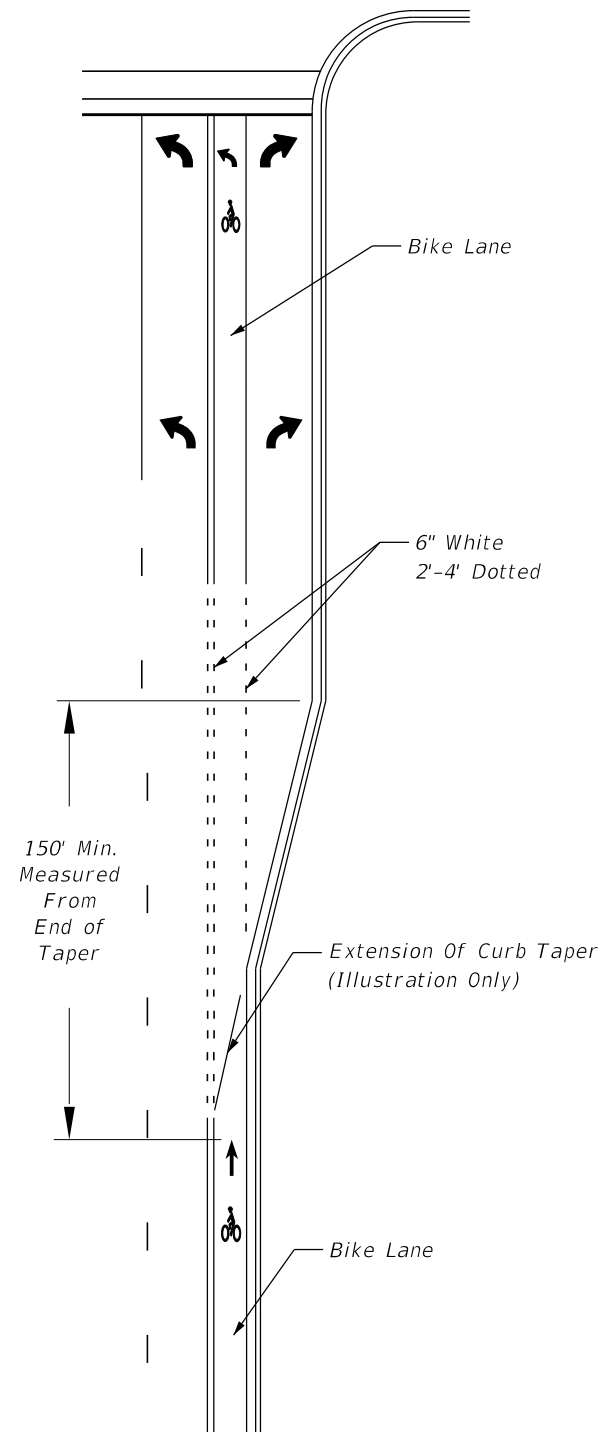
# TYPICAL KEYHOLE LANES



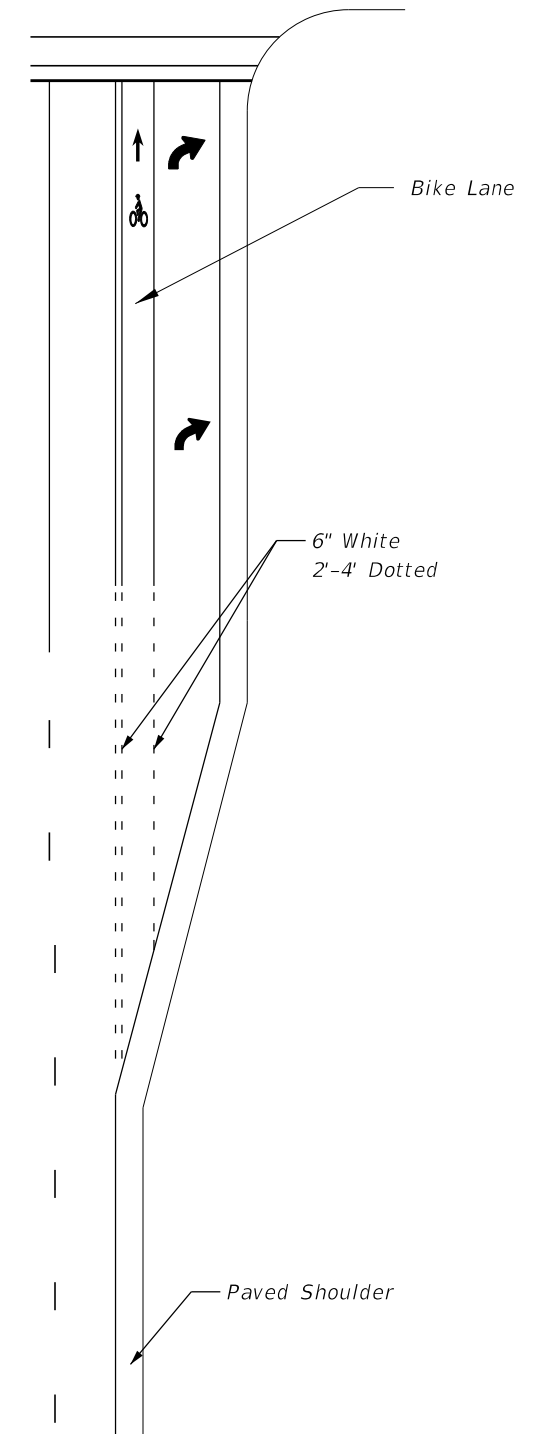
CURBED ROADWAY INTERSECTION WITH SEPARATE RIGHT TURN LANE



CURBED ROADWAY INTERSECTION WITH RIGHT TURN DROP LANE



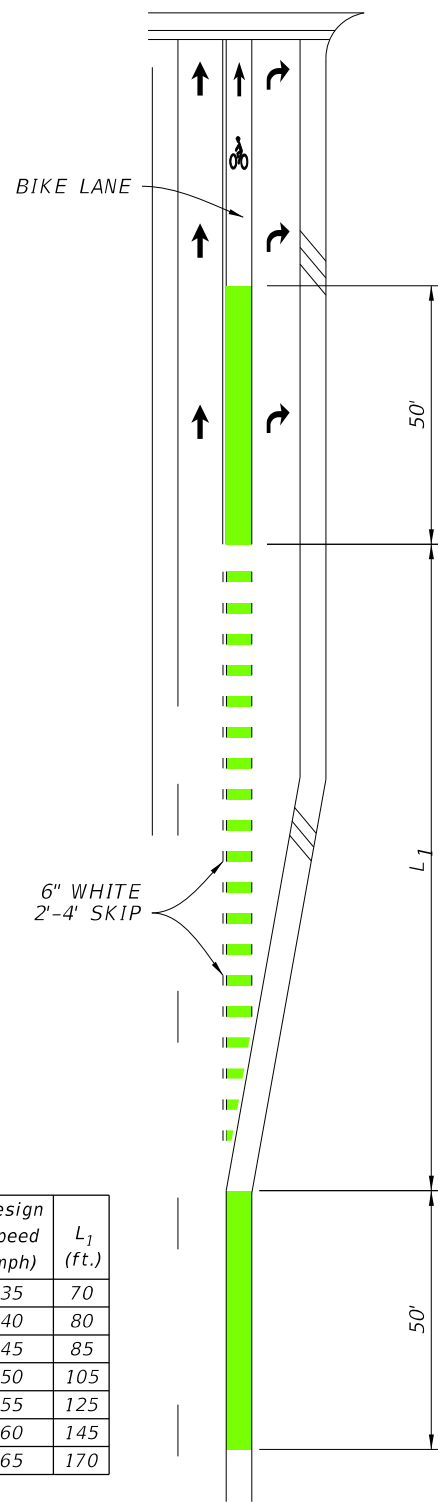
CURBED ROADWAY "TEE" INTERSECTION WITH SEPARATE RIGHT-TURN LANE



FLUSH SHOULDER ROADWAY INTERSECTION WITH SEPARATE RIGHT-TURN LANE

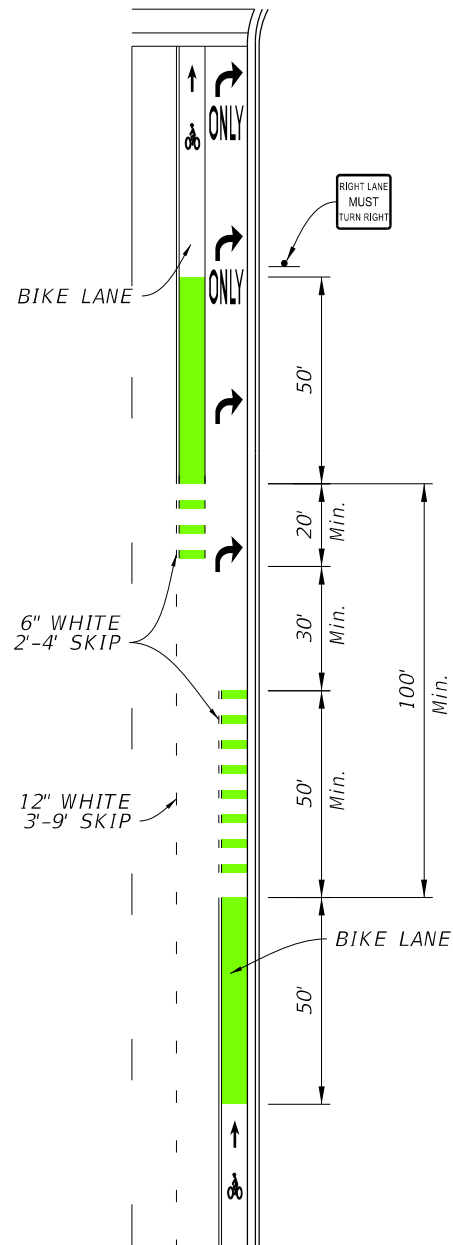
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# GREEN-COLORED BIKE LANES

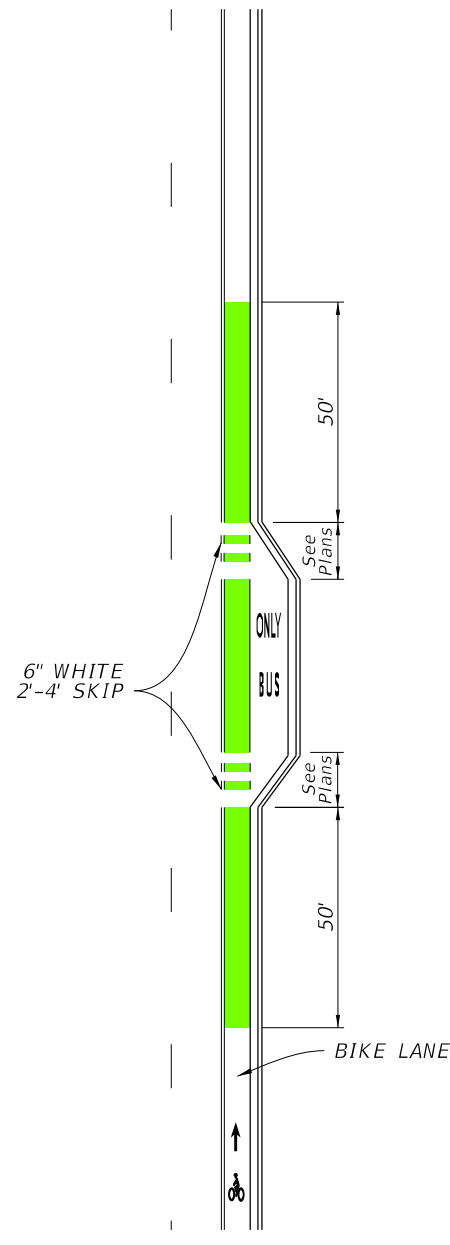


**A**  
FLUSH SHOULDER ROADWAY  
BIKE LANE WITH  
SEPARATE RIGHT-TURN LANE

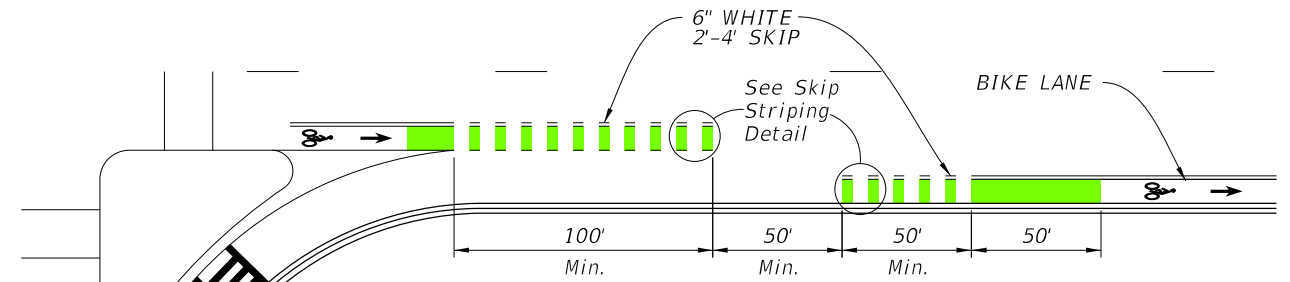
Design Speed (mph)	L <sub>1</sub> (ft.)
35	70
40	80
45	85
50	105
55	125
60	145
65	170



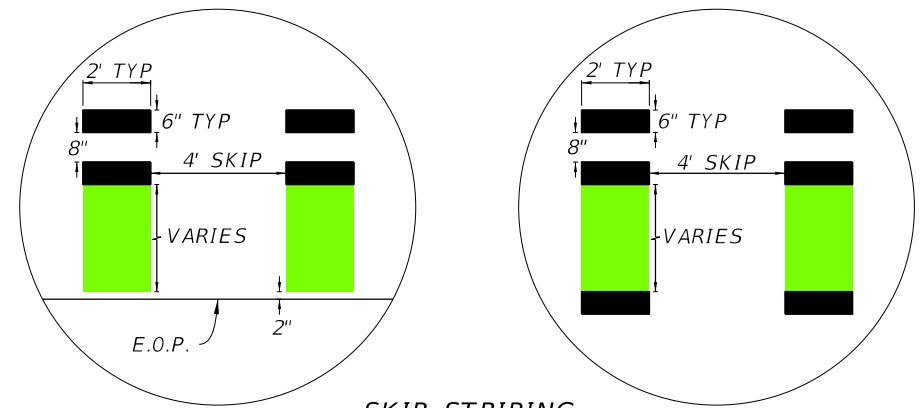
**B**  
CURBED ROADWAY  
BIKE LANE WITH  
RIGHT-TURN DROP LANE



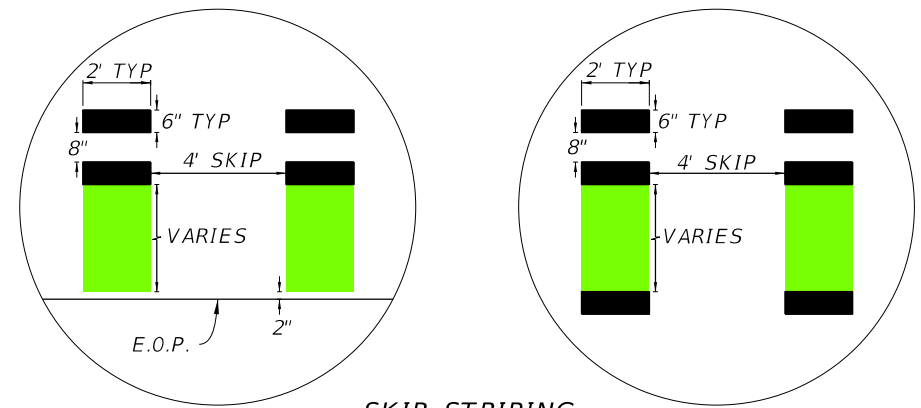
**C**  
CURBED ROADWAY  
BIKE LANE ALONG  
BUS BAY



**D**  
BIKE LANE WITH  
FREE-FLOW CHANNELIZED  
RIGHT-TURN LANE



**E**  
CURBED ROADWAY  
BIKE LANE  
WITH CHANNELIZED  
RIGHT-TURN LANE



SKIP STRIPING  
DETAILS

Legend  
Green Colored Pavement

NOT TO SCALE

EXHIBIT 223-3  
01/01/2019

### 223.3 Shared Lane Markings (Sharrows)

Shared lane markings, or "Sharrows" are optional pavement markings used to indicate a shared environment for bicycles and motor vehicles. Sharrows are used where it is not practical to provide a bicycle facility, and any of the following conditions exist:

- (1) With on-street parallel parking in order to reduce the chance of a bicyclist's impacting the open door of a parked vehicle.
- (2) To fill a gap in an otherwise continuous bicycle facility, generally for a short distance.
- (3) As part of an approved temporary traffic control plan, see **FDM 240**.

Streets with low traffic volumes and low traffic speeds are better suited to a travel environment where bicycle and motor vehicle traffic are mixed. Do not use Sharrows in the following conditions:

- Roadways with a posted speed greater than 35 mph
- On shared use paths
- Within a right turn lane

Place Sharrows in the center of the travel lane. This placement provides guidance to bicyclists to "command the lane" which discourages motorists from passing too closely. This placement also informs drivers that cyclists are entitled to ride in the center of the lane for their safety. To effectively convey this message, place Sharrows immediately after intersections and at a maximum spacing of 250 feet.

### 223.4 On-Street Parking

Roadways with on-street parking must provide room to cyclists to minimize impacts related to close proximity of parked vehicles (e.g., door zone avoidance). The following treatments are required for roadways with on-street parking:

- Parallel Parking:
  - Provide a 4-foot bicycle lane adjacent to the travel lane with a 3-foot buffer between the parallel parking lane and bicycle lane, per **Exhibit 223-1**.
  - Provide a shared lane marking in place of a bicycle facility when there is less than 7 feet available for the bicycle lane and buffer.



- Angle Parking:
  - Use a shared lane marking in place of a bicycle facility.

## 223.5 Bicycle Parking Amenities

Appropriately-placed bicycle parking supports those who choose to use the bicycle as their mode of transportation. Bicycle parking facilities, installed and maintained by local agencies, on FDOT R/W require the approval of the District Design Engineer.

Consider the following for the placement of bicycle parking facilities:

- Facilities do not interfere with pedestrian facilities and meet lateral offset requirements
- Racks support the bicycle from two locations to prevent it from falling over
- Bicycle shelters are desirable for long-term bicycle parking and for shielding bicycles from inclement weather conditions
- Bicycle lockers can provide a secure place to store a bicycle by preventing access when closed

See *AASHTO's 2012 Guide for the Development of Bicycle Facilities, Section 6.3.1* for site-specific guidance for bicycle racks.

## 223.6 Bicycle Route System

Bicycle routes include roadways or shared use paths designated through signage, pavement markings or mapping. They provide directional and distance information, and aid bicyclists in wayfinding, especially in complex urban locations or along established long distance bicycle routes.

Follow the signing guidance in the [MUTCD, Part 9](#) when including information directing bicyclists around temporary interruptions in a route. Do not terminate bicycle routes at a barrier.

The decision whether to provide a bicycle route system should be based on the suitability of the particular roadway or shared use path for bicycle travel and the need for wayfinding information. Evaluations of suitability should include roadway width, volume, speed, and types of traffic, parking conditions, grade, sight distance, and connectivity to services, significant destinations, and local transit or regional transportation hubs. Other

considerations include location and condition of drainage grates, railroad crossings, pavement surface, signals responsive to bicycles, and maintenance schedules.

## 223.6.1 U.S. Bicycle Route System

The U.S. Bicycle Route (USBR) System is a network of bicycle routes that span multiple states and are of national or regional significance. These routes are nominated for national designation by State Departments of Transportation (DOTs), and designated and catalogued by the ***American Association of State Highway and Transportation Officials (AASHTO)***.

The [National Corridor Plan](#) shows existing and proposed U.S. Bicycle Routes within the United States. Florida has three U.S. Bicycle Routes:

- U.S. Bicycle Route 1
- U.S. Bicycle Route 90
- U.S. Bicycle Route 15

Florida has adopted a policy entitled [U.S. Numbered Bicycle Routes, Topic No. 000-525-060-a](#) in support of the national route system.

### 223.6.1.1 Determining a U.S. Bicycle Route

The District Bicycle Pedestrian Coordinator(s), with assistance from the State Bicycle Pedestrian Coordinator, will conduct the following:

- Assess and evaluate possible routes and select the most appropriate alternative.
- Acquire written support from federal, state or local agencies that have jurisdiction over the route or surrounding area, including the following:
  - Road authorities
  - Municipal governments
  - Departments of natural resources
  - Tribes
  - Parks and recreation
  - Federal land agencies; e.g., U.S. Forest Service, Bureau of Land Management, National Park Service

- Secure letter of concurrence from adjacent state (Alabama or Georgia). When these states ask Florida for concurrence of a proposed route, the letter will be signed by the appropriate District Secretary.
- Prepare and submit the AASHTO application. Provide turn-by-turn instructions, map, state letter of concurrence, and written support from road owners. Also include discussion of economic benefits, liability and signage for the route. The application is to be signed by FDOT Secretary.

**Table 223.6.1** provides criteria that can be used to evaluate route options. Route options are scored on a scale from 3 (fulfills selection criteria) to 0 (does not contribute to meeting selection criteria). “N/A” may be used when the criteria does not apply.

**Table 223.6.1 U. S. Bicycle Route Criteria**

Macro Criteria	3	2	1	0	NA
Within USBR corridor, with an emphasis on intrinsic scenic and cultural qualities of the corridor itself.					
Access to scenic, cultural, historical and recreational destinations. (May not be directly on route but are nearby.)					
Links major metropolitan areas to connect bicyclists to transportation hubs or major attractions.					
Reasonable direct route in connecting cities or attractions along the corridor.					
Supports natural connections between adjoining states.					
Includes or intersects existing or planned bicycle routes that are suitable for travel by touring bicycles.					
Micro Criteria	3	2	1	0	NA
Meets acceptable design criteria for on-road facilities and shared use paths.					
Utilizes already established and successful routes or paths					
Easy to follow with limited turns; is well marked or has easily identified permanent landmarks to enable navigation.					
Connects to at least one neighboring state’s USBR, suitable roadway, bicycle route, or trail system.					
Access to food, water and overnight accommodations (including camping) at appropriate intervals (40-60 miles).					
Access to restaurants, libraries, retail shops and bicycle shops (parts and repair).					
Regularly scheduled ferry service for crossing water bodies. An alternate route should be identified when service may not be available.					
Topography is relatively easy for bicyclists; i.e., avoids extreme climbs.					
Total					