

 Hollywood, FL

 June 13-14, 2024

# 2024 TRANSPORTATION SYMPOSIUM

## Separated Bicycle Facilities



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FDOT District 4 & FDOT Central Office

# Summary

This presentation covers the **criteria and guidelines** supported by the FDOT Design Manual for Separated Bicycle Lanes with **project examples** as well as **video footage** of separated vs non-separated bicycle facilities to allow participants to get the perspective of the user. There will also include discussion of **Level of Traffic Stress** that can be found in the Multi-Modal Q/LOS Handbook as well as **challenges and other considerations** in the implementation of separated bicycle lanes.

# Outline

- What is a Separated Bicycle Lane?
- FDM Design Criteria
- Bicycle Facility Plans
- Local Examples
- Level of Traffic Stress
- Challenges & Other Considerations

# What is a Separated Bicycle Lane?

Separated bicycle lanes 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.-  
FDOT Design Manual (223.2.4)

# What is a Separated Bicycle Lane?



Off-system Madison St., Tallahassee, FL

# What is a Separated Bicycle Lane?



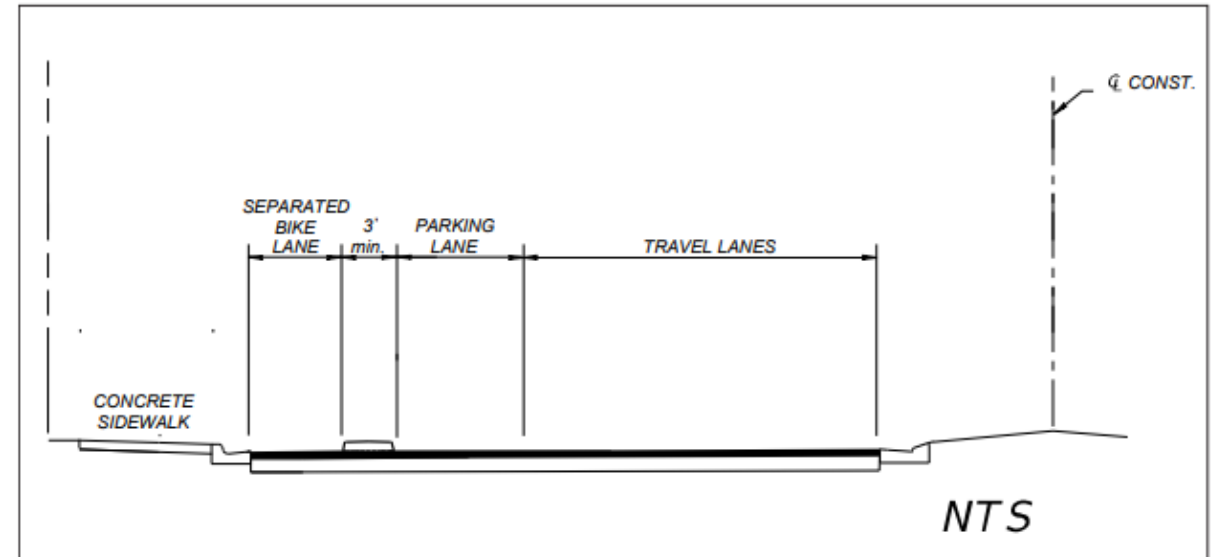
Pinellas Bayway, St. Pete



# FDOT Design Criteria

- Bicycle Facility Types
  - Bike Lane or Buffered Bike Lane
  - Paved Shoulders
  - Shared Use Path & Urban Side Paths
  - **Separated Bicycle Lane**
  - **Sidewalk Level Separated Bicycle Lanes**

Figure 223.2.2 On-Street Parking Minimal Separation



# FDOT Design Criteria

- Separated Bicycle Lanes in FDM 223.2.4
  - At least the minimum separation
  - Maintained through intersections
  - Conflicts are minimal & mitigated

## 223.2.4 Separated Bicycle Lanes (SBL)

Separated bicycle lanes 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.

A separated bicycle lane should be considered when street level bicycle facility transitions are needed for interchange ramp and intersection approaches. See **FDM 223.2.6** for criteria for transitioning between elevations and **FDM 211.18** for ramp crossing criteria.

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.



# FDOT Design Criteria

- Types of Separation
  - Differences of separation types based on adjacent roadway design speeds

## 223.2.4.1 Type of Separation

Tubular markers, islands, on-street parking, and rigid barriers may be used as forms of separation for the appropriate design speeds as follows:

- 35 mph or less: Tubular markers, traffic separators, islands, rigid barriers, or on-street parking. For separated bicycle lanes adjacent to on-street parking, use an island (see **Figure 223.2.2**).
- 40-45 mph: Traffic separator, islands, or rigid barriers

Use curb types for separated bicycle lanes as shown in **FDM 223.2.5**. Other forms of separation require approval from the State Roadway Design Engineer.

# FDOT Design Criteria

- Widths of Separation
  - Widths of separation varies based on adjacent roadway design speeds

## 223.2.4.3 Width of Separation

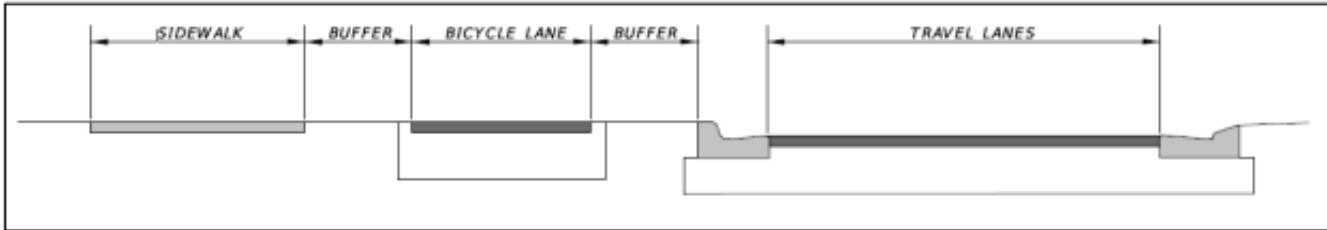
The widths of separation are as follows:

- 3 feet minimum if adjacent to on-street parking. See **Figure 223.2.3** for more information.
- If adjacent to travel lanes:
  - 35 mph or less: 6 feet preferred, 3 feet minimum unless using tubular markers or islands, then 2 feet minimum
  - 40 to 45 mph: 8 feet preferred, 3 feet minimum.

# FDOT Design Criteria (New 2024)

- Sidewalk Level Separated Bicycle Lanes
  - Design speeds similar to shared use path criteria

**Figure 223.2.2 Example of Sidewalk Level Bicycle Lane**



## 223.2.4.2 Sidewalk Level Separated Bicycle Lanes

Sidewalk level separated bicycle lanes (sidewalk level SBLs), also known as raised bicycle lanes, are exclusive bicycle facilities located at sidewalk level directly adjacent to the roadway,

Use the following criteria when designing sidewalk level SBLs:

- In C2T, C4, C5, or C6 where design speed is 35 mph or less, use urban side path criteria per FDM 224 for the following elements. In other conditions, use Shared Use Path criteria for these elements.
  - Horizontal Clearance
  - Vertical Clearance
  - Design Speed
  - Horizontal Alignment
  - Separation from Roadway
  - Longitudinal Grades
  - Cross Slopes
- Follow the width criteria in **Table 223.2.1**
- When adjacent to a sidewalk, provide a 2-foot detectable buffer (e.g. grass strip or textured pavement) between the sidewalk and separated bicycle lane. A 1-foot detectable buffer may be used in constrained conditions.

A sidewalk level bike lane does not substitute for a sidewalk, where a sidewalk is required. See **Figure 223.2.2** for an example of a sidewalk level bike lane.

# FDOT Design Criteria (New 2024)

- Bicycle Ramps as a bike facility type

## 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
- Bicycle ramps



# FDOT Design Criteria (New 2024)

- Connection for on-road bicycle facility to:
  - sidewalk-level separated bicycle lane
  - shared use path
- Do not place directional indicators when connecting two bicycle-only facilities

Figure 223.2.5 Angled Bicycle Ramp

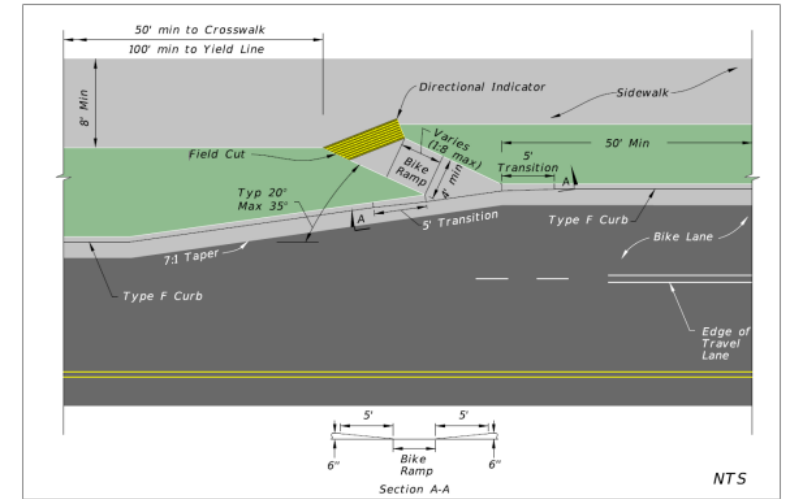
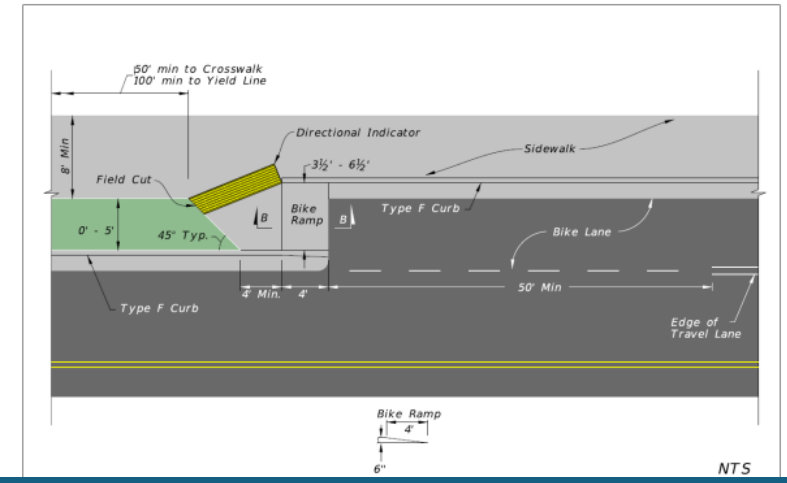


Figure 223.2.6 Straight Bicycle Ramp



# FDOT Design Criteria (New 2024)

## 223.2.6 Bicycle Ramps

Use bicycle ramps when connecting on-street bicycle facilities to sidewalk level SBLs or shared use paths on curbed roadways.

**Figure 223.2.5** illustrates the geometrics for a bicycle ramp when a utility strip of at least 5-feet is present. The desired angle between the ramp and the roadway ranges from 20 to 25 degrees; however, the angle is not to exceed 35 degrees.

**Figure 223.2.6** illustrates the geometrics for a bicycle ramp when the sidewalk on the approach leg is adjacent to, or near the back of curb.

Place a Directional Tactile Walking Surface Indicator (a.k.a., Directional Indicator) at the top of the bicycle ramp to provide a tactile cue for visually impaired pedestrians to continue down the sidewalk or shared use path. Do not place detectable warning surfaces on the bicycle ramp. See [Developmental Specification Dev528](#) and [Developmental Standard Plans \(DSP\) Index D528-001](#) for additional requirements. Do not include a Directional Indicator when connecting an on-street bicycle facility to a sidewalk level SBL.

# FDOT Design Criteria (New 2024)

- More Flexibility in Minimum Lane Widths of SBLs
- Accounting for curbs
- Preferred Widths are:
  - One-Way: 7 ft
  - Two-Way: 12 ft

**Table 223.2.1 Minimum Separated Bicycle Lane Widths**

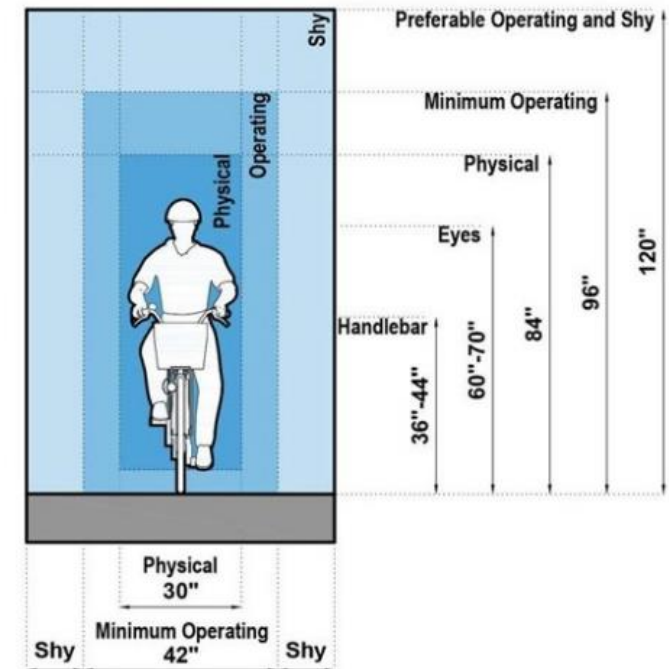
<b>One-Way Facility</b>	<b>Width (feet)</b>
Between drop curbs, types E or B curbs, at sidewalk level, or adjacent to one type F or D curb	5
Between two type F or D curbs	6
<b>Two-Way Facility</b>	<b>Width (feet)</b>
Between drop curbs, types E or B curbs, or at sidewalk level	8
Adjacent to one type F or D curb	9
Between two type F or D curbs	10
Notes: (1) A continuous barrier is treated the same as a type F or D curb.	

# FDOT Design Criteria

Vertical Element	Shy Space (in.)	
	Minimum	Constrained
Bicycle Traffic	12	6
Intermittent (tree, flex post, pole, etc.)	12	0
Continuous (fence, railing, planter etc.)	24	12
Vertical Curb	12	6
Mountable / Sloping Curb	0	0

\*From Ohio Multimodal Design Guide

Figure 3-14: Typical Adult Bicyclist Operating Space





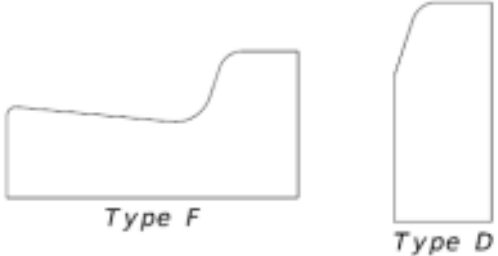


# FDOT Design Criteria (New 2024)

## 223.2.5 Separated Bicycle Lane (SBL) Curb Types

Selecting the appropriate curb type is important when designing separated bicycle lanes and street buffer zones. **Increased risks of bicycle wheel or pedal strikes and crashes** can be influenced by the curb type. The curb angle and curb height can have an impact when exiting the bicycle lane, accessing parking, and determining risk of encroachment by motor vehicles. **Figure 223.2.4** illustrates and describes curb types used for separated bicycle lanes.

# FDOT Design Criteria (New 2024)

**Figure 223.2.4 SBL Curb Types**

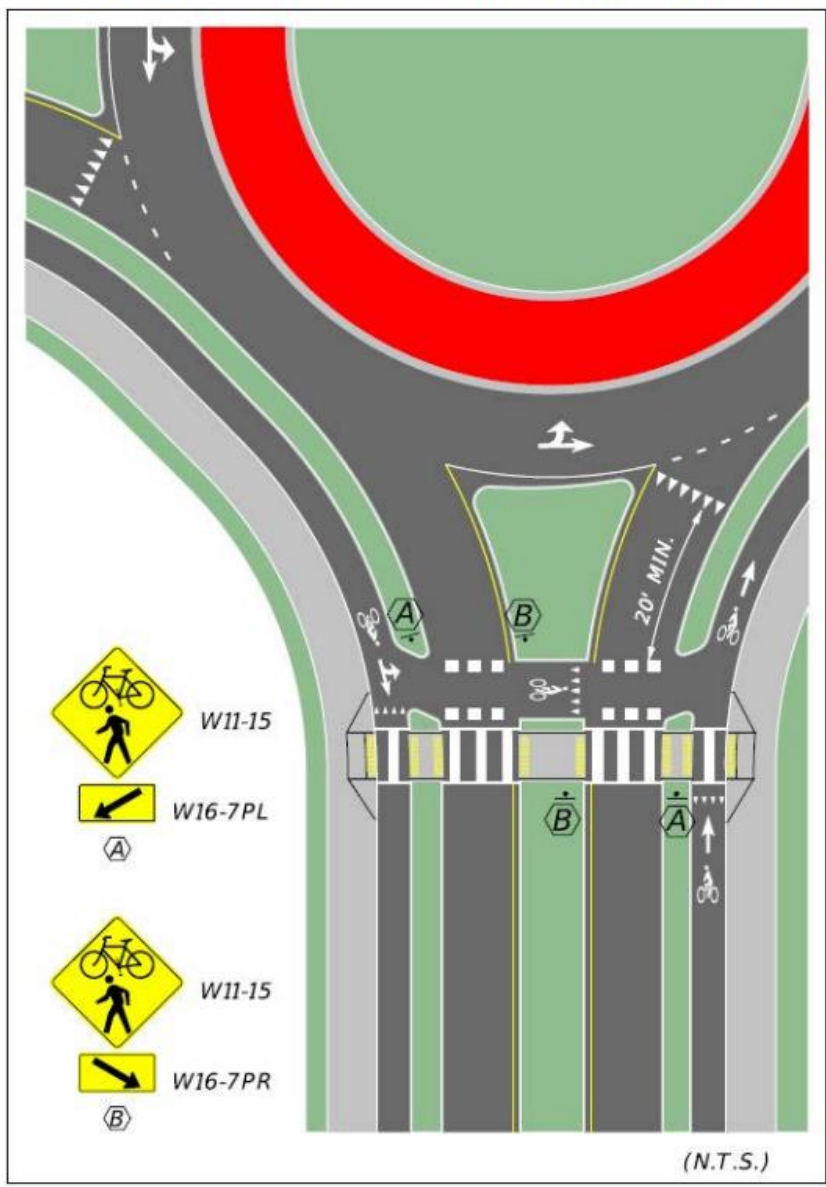
Curb Types	Description
 <p style="text-align: center;">Type F                      Type D</p>	<p><i>Types F and D Curbs assist in channelizing bicycles, but wheels or pedals could strike the curb.</i></p>
 <p style="text-align: center;">Type E                      Type B</p>	<p><i>Types E and B curbs also assist in channelizing bicycles, reduces pedal strikes, and provide easier access to the sidewalk for dismounting.</i></p>
 <p style="text-align: center;">Drop Curb</p>	<p><i>Drop Curbs are designed with a forgiving angle that minimizes pedal strikes but consumes more cross section width that could be used for the bicycle lane or a buffer. The curbs also allow safer exit from the bicycle lane, without impeding fellow bicyclists. However, the curb can be encroached by motor vehicles and bicycles.</i></p> <p style="text-align: right;">(N.T.S)</p>

See References:  
 FDOT Standard Plan-Index 520-001, 520-002  
 FDOT Drainage Manual-Table 3.2

# FDM 213 Roundabouts

- 213.8.2 Bicycle Facilities
  - Termination of On-Road Bicycle Facilities Upstream
  - Provide Physically Separated Bicycle Facilities
  - Use Bike Ramps\
- Benefits of separating modes

Figure 213.10.1 Roundabout S&PM with Separated Bicycle Lane



# Bicycle Facility Plans

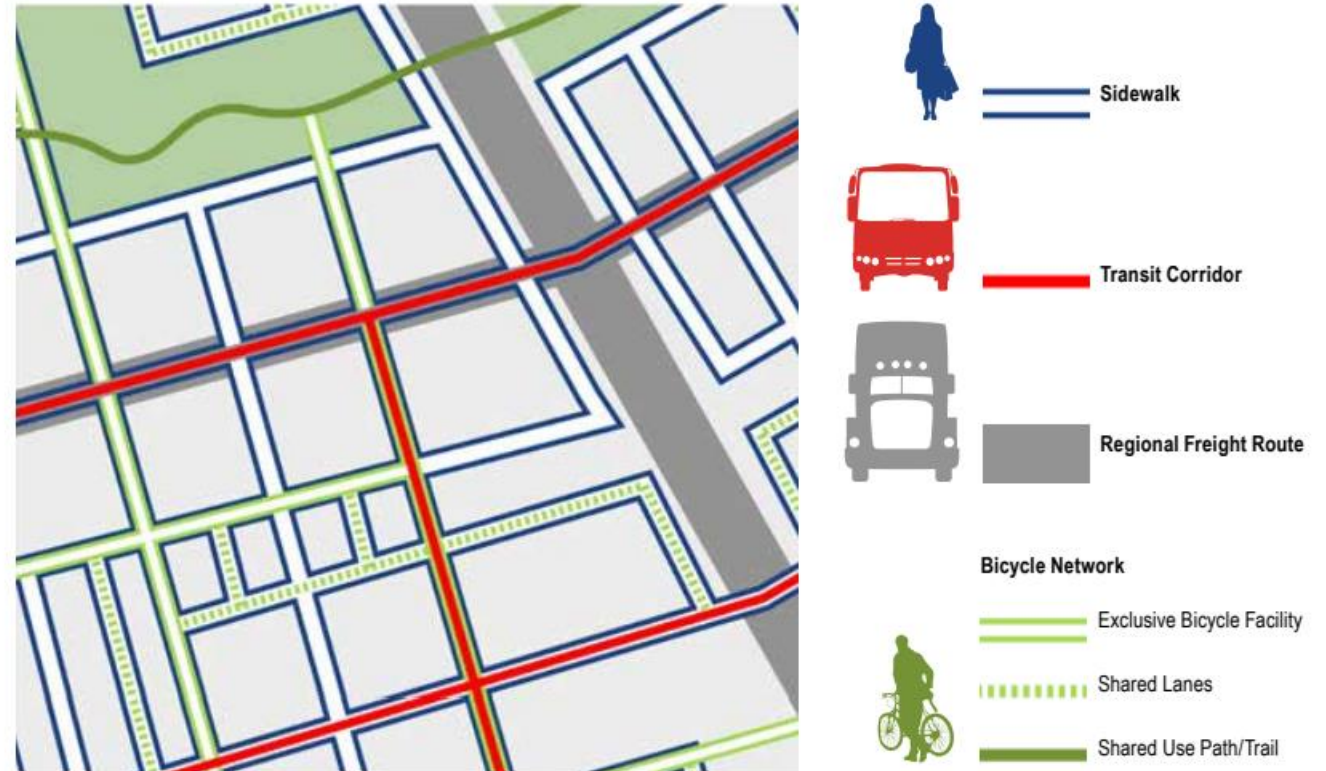
- Developing and maintaining a **district bicycle facility plan** to assign proposed bicycle facility types through a consistent and efficient process and ensure the following:
  - Integration of FDOT bicycle facilities with **local and regional bicycle transportation systems**
  - The direct use of more complex facility types in a **cost-effective and efficient manner**.

-FDM 223.2.1

# Bicycle Facility Plans

- A fine-grained *network* allows for roadways to *complement* each other, with some roadways providing better quality of service for high-speed travel, and other parallel roadways providing comfort, safety, and access for bicyclists and pedestrians.
  - -FDOT Context Classification Guide

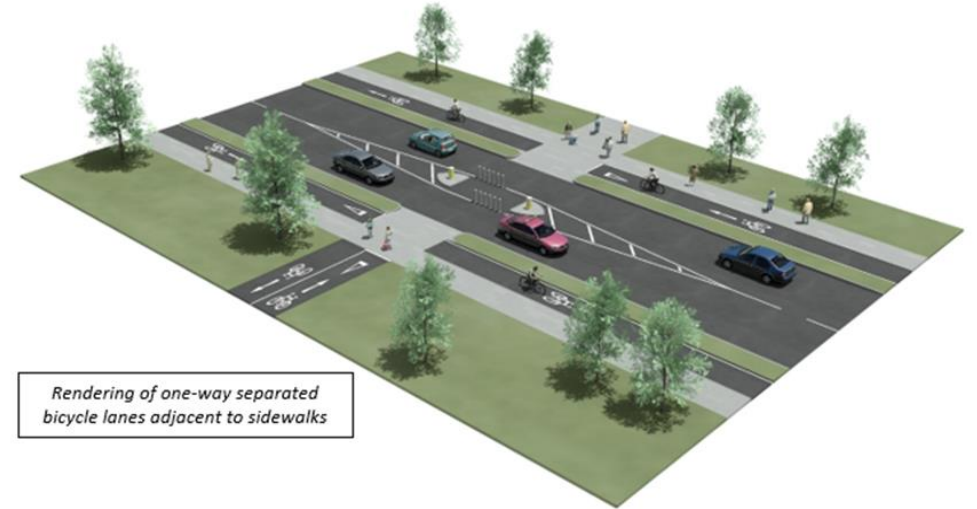
FIGURE 7 CONTEXT-SENSITIVE SYSTEM OF COMPLETE STREETS



# Bicycle Facility Plans: What's Next?

- **Bicycle and Pedestrian Master Plan 2.0**

- An updated version from the previous Master Plan (2018)
- The goal of this plan is to identify needs, data collection and implementation
- The analysis will include preference for physically separated bicycle lanes in the area of highest demand and where the context surrounding the roadway is supportive.



*Rendering of one-way separated bicycle lanes adjacent to sidewalks*

# Future Plans

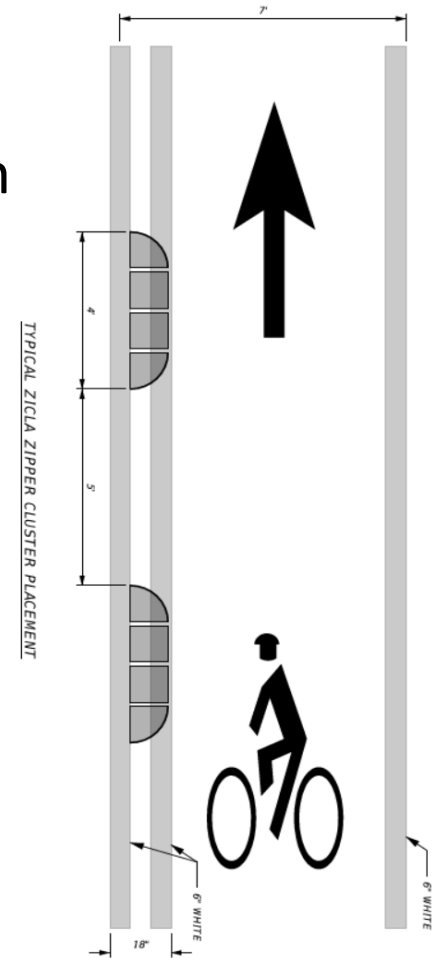
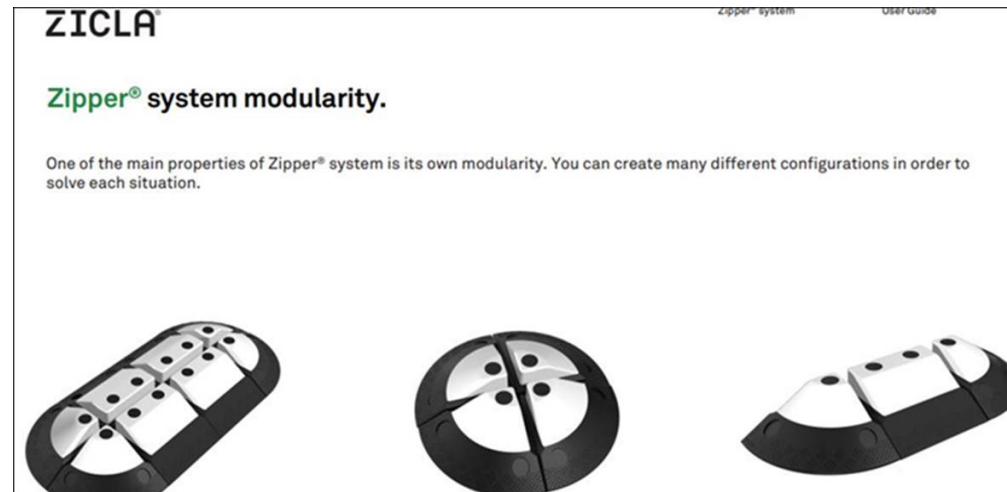
- **Potential Separated Bicycle Lane Facilities:**

Location	Roadway ID	Begin MP	End MP	Context Class	Type of Bike Lane
Broward Blvd b/w NW 12th Ave and NW 2nd Ave	86006000	5.90	6.66	C5 Urban Center	Designated
SR-A1A South of NE 30th St to S of NE 40th St	86050000	5.2	5.96	C5 Urban Center	Buffered
S Ocean Blvd north of Seacrest Pkwy to Azalea Ter	86030000	0.96	2.00	C5 Urban Center	Designated
Sunrise Blvd west of Middle River Dr to SR-A1A	86005000	0.28	1.19	C5- Urban Center	Designated
US-1 from Clematis St to 3rd St	93020100	0.55	0.73	C6- Urban Core	Designated
US-1 S of SE 12th St to N of NE 8th St	93010000	0.96	2.32	C5- Urban Center	Designated
NE Mizner Blvd from US-1 to SE 5th St	93537000	0	0.99	C5- Urban Center	Designated
Lakeview Ave from Dixie Hwy to S Flagler Dr	93280001	0.00	0.29	C6- Urban Core	Designated
Okeechobee Blvd east of S Australian Ave to Parker Ave	93280000	8.44	8.603	C6- Urban Core	Designated
N Quadrille Blvd from Clematis St to 3rd St	93020100	0.55	0.73	C6- Urban Core	Designated
US-1 from SE 24th St to E Broward Blvd	86010000	8.28	10.33	C5- Urban Center	No Bicycle Facility

# Future Plans: SR-806/Atlantic Ave.

## • Project Information:

- Limits: SR-806/Atlantic Ave. from West of SR-7/441 to East of Lyon Road.
- TPA Priority Project
- A pilot project that will include "zippers" also known as Ziclas as a separator
- East-west corridor





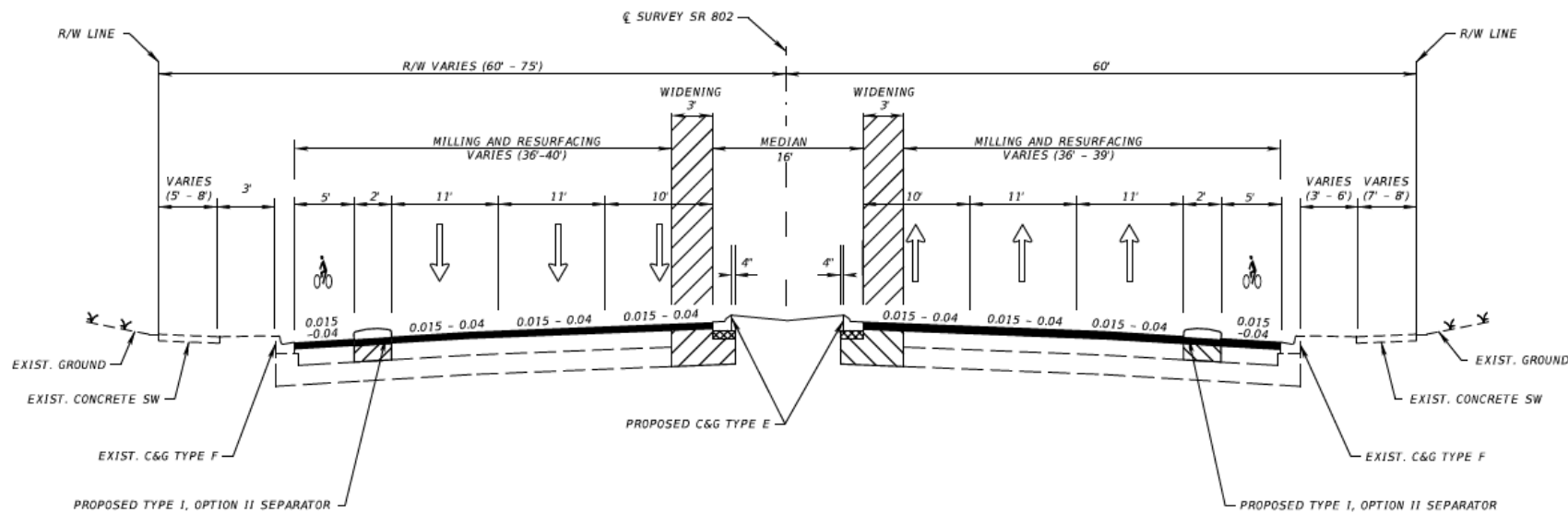
# Local Examples: SR-802/Lake Worth Road

- History and Background
  - Location: City of Greenacres and Village of Palm Springs
  - Project limits from Raulerson Drive to Palm Beach State College Entrance (2 miles)
  - A pilot project that originated from a commitment that was made to the Palm Beach TPA

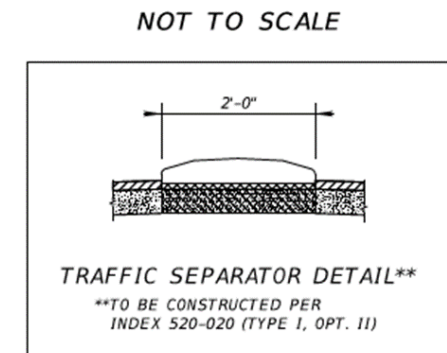


# Local Examples: SR-802/Lake Worth Road

## Lake Worth Road Typical Section:



## Lake Worth Road Curb Detail:



# Local Examples: SR-802/Lake Worth Road

- **Project Information:**

- Context Classification: C4 Urban General
- Posted Speed: 40 MPH
- East-west corridor
- 7-foot separated bicycle lanes in both directions
- Widening of the existing sidewalk on the north side from 5 to 8 feet and from 8 to 13 feet on the southside
- Essential connections:
  - Palm Beach State College
  - Homeless Resource Center
  - Designated bike lanes West of Palm Beach State College



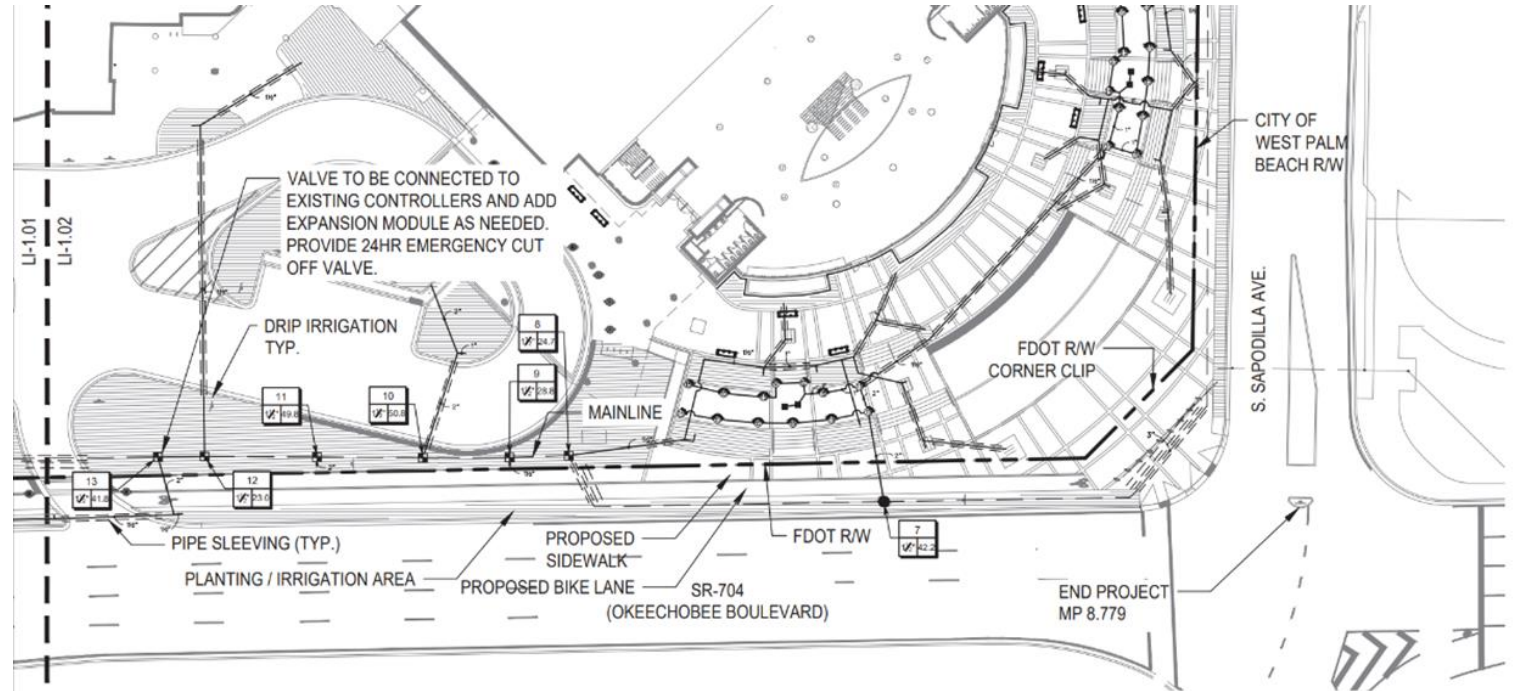
# Local Examples: Okeechobee Blvd.

- **Project Information:**

- Location: Palm Beach County
- Limits: Along Okeechobee Blvd. From Tamarind Avenue to S. Sapodilla Ave.
- A unique project because it was implemented through permitting
- Was constructed prior to the new FDM guidance on separated bicycle facilities
- It shows the creative ways that separated bicycle facilities



# Local Examples: Okeechobee Blvd.



# Level of Traffic Stress

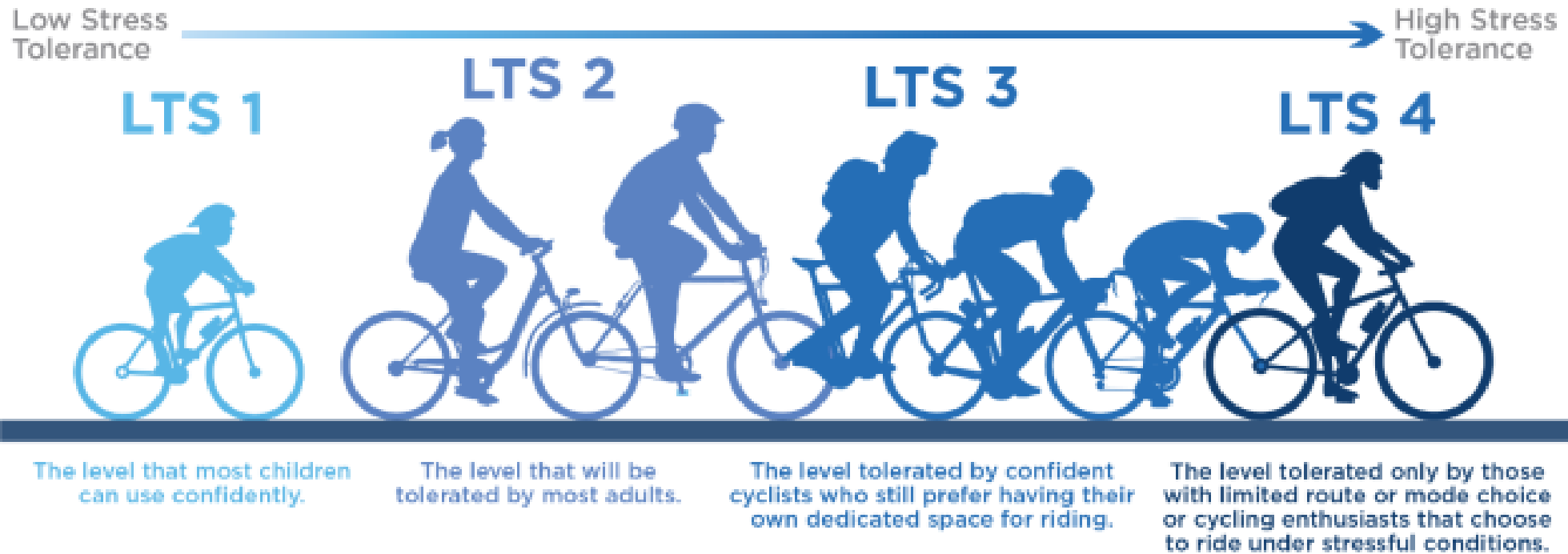


Figure 3: Bicycle Level of Traffic Stress

# Level of Traffic Stress

It is best practice to consider other types of facilities for design speeds greater than 30 mph, such as a separated bicycle lane or shared use path.

# Level of Traffic Stress





# Level of Traffic Stress

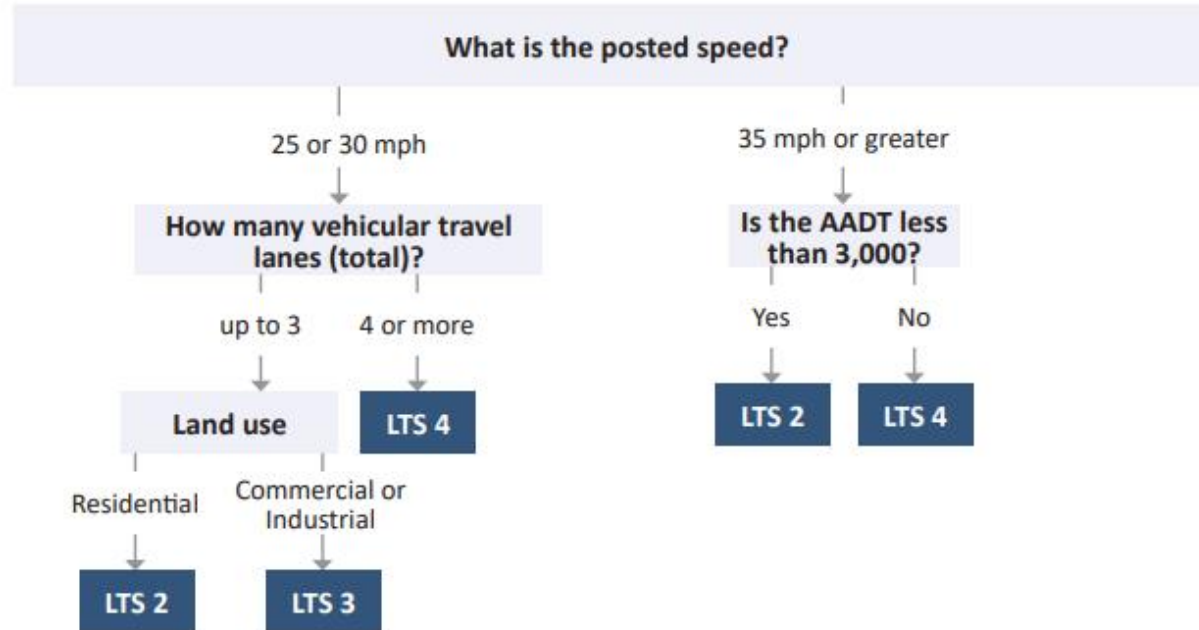


\*Off-system facility (Ocean Drive)– does not follow FDM criteria

# Multimodal Q/LOS Handbook

Bicycle Level of Traffic Stress Flow Chart to use When No Bicycle Facility is Present or When There are Sharrows Present

C2T, C3C, C3R, C4, C5, & C6



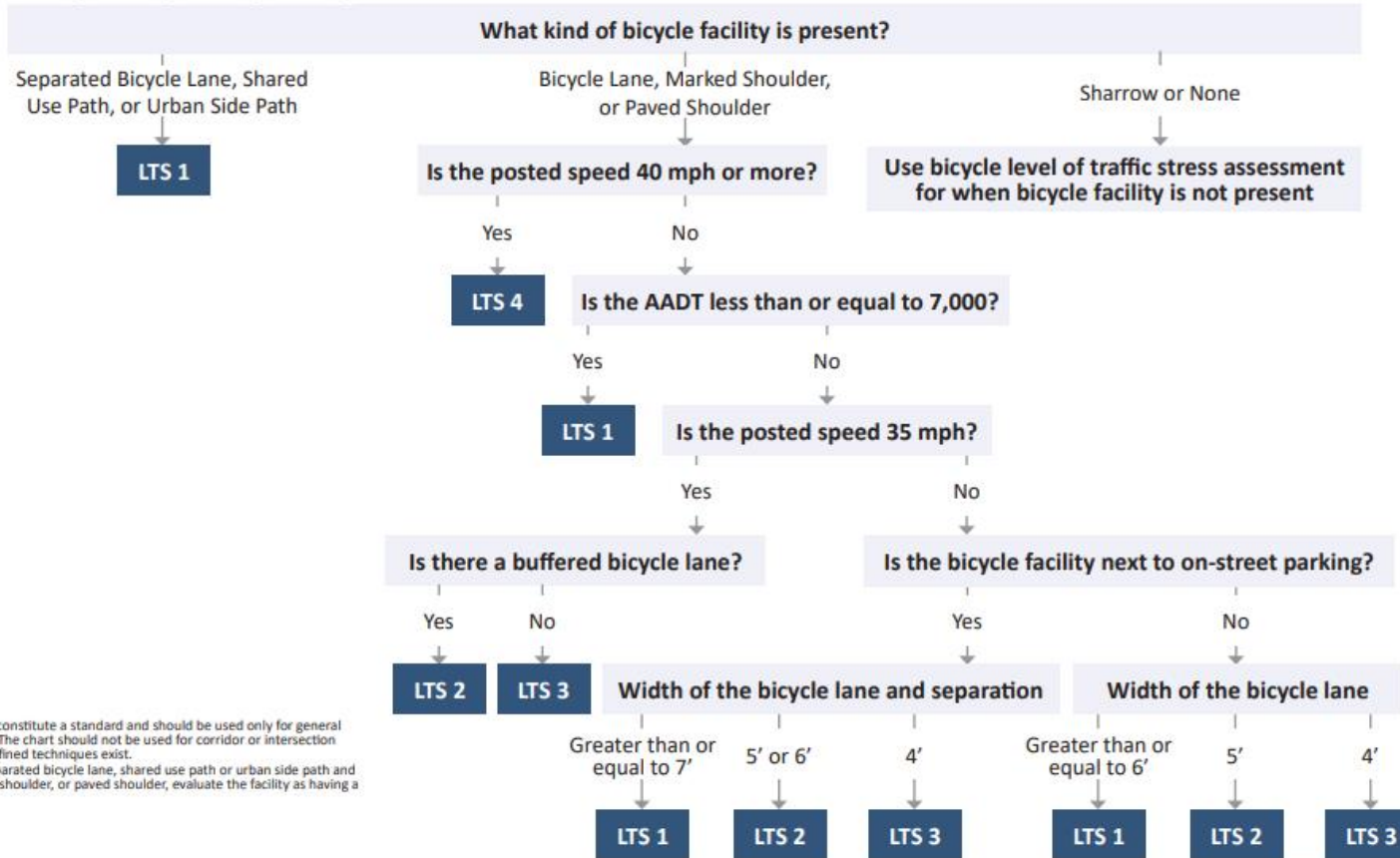
Notes:

1) This chart does not constitute a standard and should be used only for general planning applications. The chart should not be used for corridor or intersection design, where more refined techniques exist.

# Multimodal Q/LOS Handbook

Bicycle Level of Traffic Stress Flow Chart to use  
When Bicycle Facility is Present

C2T, C3C, C3R, C4, C5, & C6



**Notes:**

- 1) This chart does not constitute a standard and should be used only for general planning applications. The chart should not be used for corridor or intersection design, where more refined techniques exist.
- 2) If there is both a separated bicycle lane, shared use path or urban side path and a bicycle lane, marked shoulder, or paved shoulder, evaluate the facility as having a shared use path



# Challenges & Other considerations

- On-Street Parking & Access to Sidewalk
- **Bus/Transit Stops**
- Trash Pick-up
- Delivery & Drop-off/Pick-up
- Drainage
- **Intersections**
- Contra-flow movements
- Durability of Separators
- Passing Opportunities for Cyclists
- Low Profile of Separator (& motorist's awareness of their presence)
- Speed of Roadway & Type of Separator Used

# Challenges & Other considerations

## • Protected Intersections

- Minimize exposure conflicts
- Reduce speeds at conflict points
- Establish R/W priority
- Enhance sight distance
- Restrict motor vehicles
- Designate space for users
- Shorten crossing distances and queue areas
- Provide predictability in traffic movement



# Challenges & Other considerations



# Challenges & Other considerations

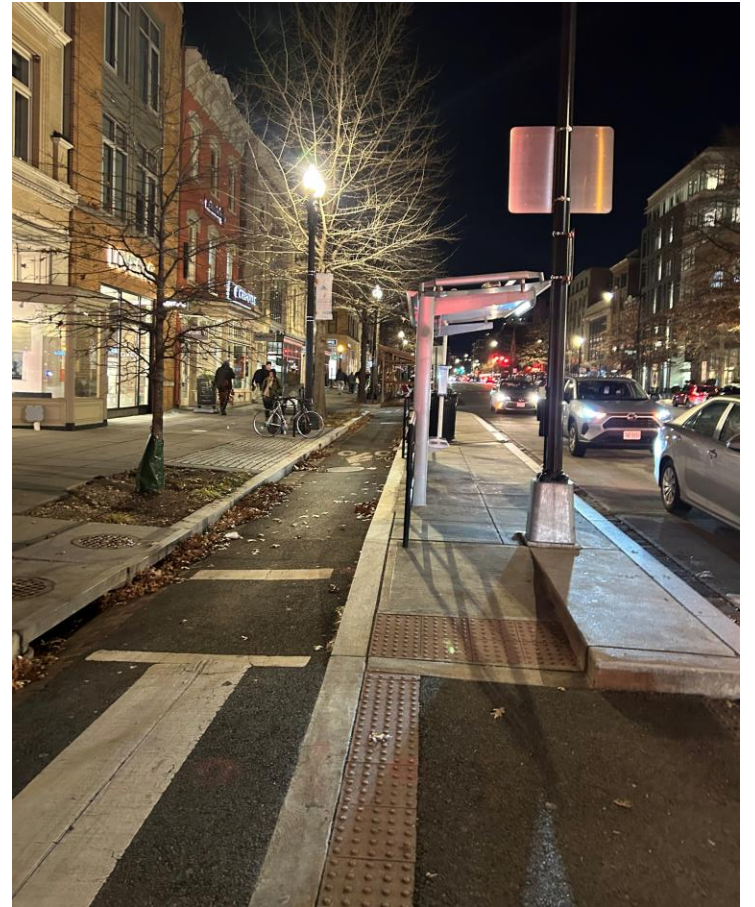
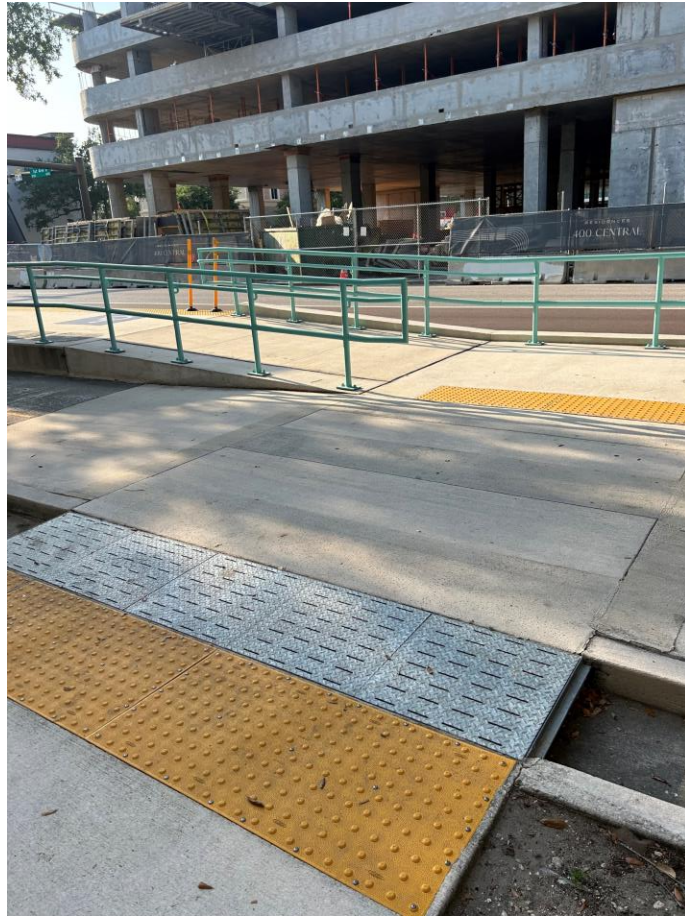
- **Boarding Islands for Transit Stops**



### 3 **BOARDING ISLAND**

Boarding islands can be used to reduce bus-bicycle conflicts near transit stations. Bus boarding islands place passengers adjacent to the bus lane or travel lane, enabling the bus operator to load/unload passengers without having to merge back into traffic and without conflicting with bicycle traffic. Striping and curb ramps can be used to connect the boarding island to the sidewalk, reinforcing to bicyclists that they must yield to pedestrians.

# Challenges & Other considerations





# Challenges & Other considerations



# FDOT Safety Message





**SAFETY**



**COMMUNITIES**



**WORKFORCE  
DEVELOPMENT**



**RESILIENCY**



**TECHNOLOGY**



**ROBUST SUPPLY CHAIN**

# Contact Us



## Thank you!

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