

Orlando, FL

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2024 TRANSPORTATION SYMPOSIUM

Separated Bicycle Facilities



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FDOT District 7



Introduction

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.

Objectives

- What is a Separated Bicycle Lane (SBL)?
- FDM Design Criteria
- Safety Benefits of SBL
- 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?

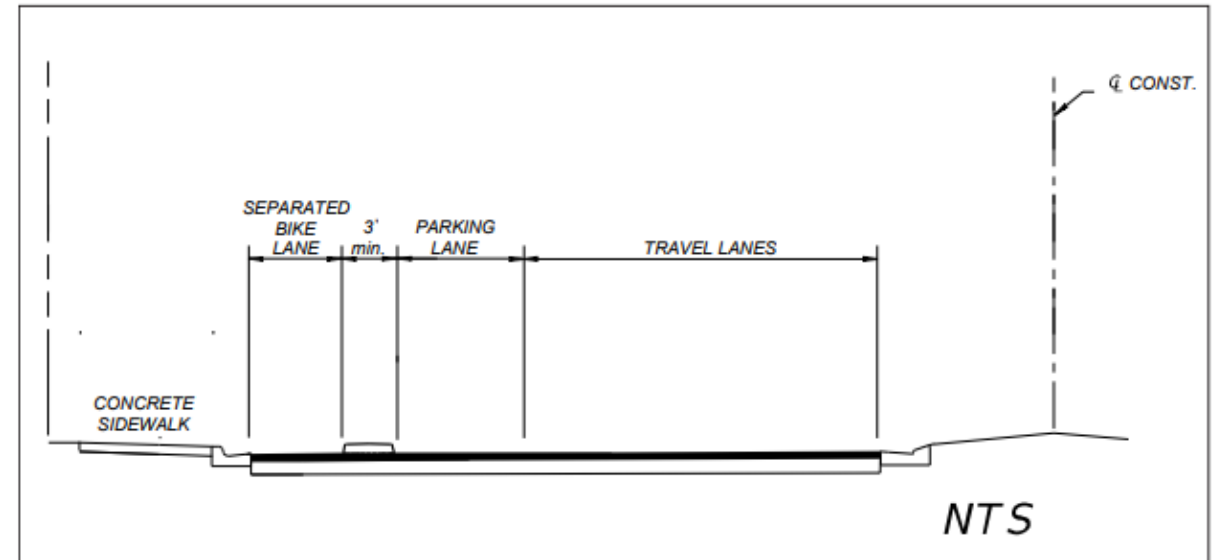


SR 679/Pinellas Bayway, St. Pete

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
 - New in 2025
 - Channelizing Curb has been added for 35mph or less
 - DEV703 & DEV991

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, channelizing curb, 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

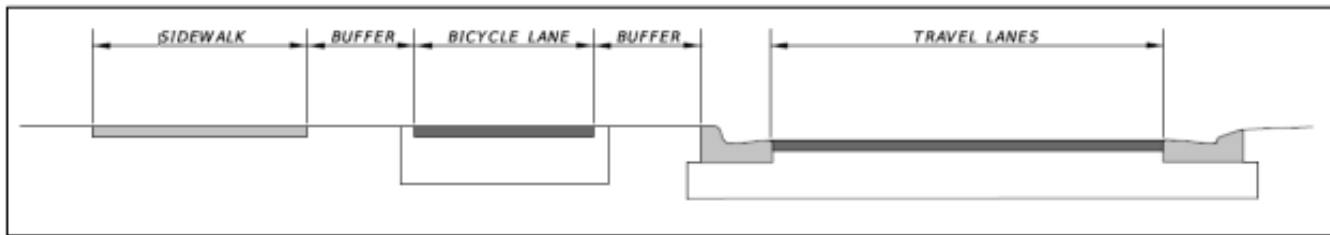
The widths of separation are as follows:

- 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 (2025)

- 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 (2025)

- 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

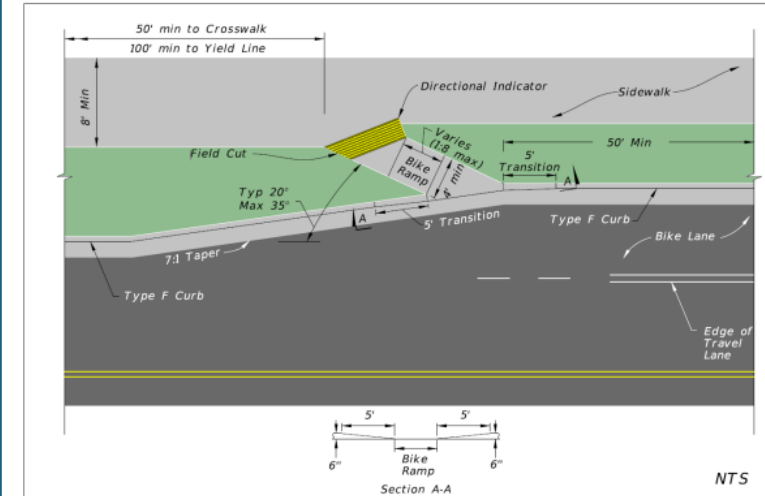
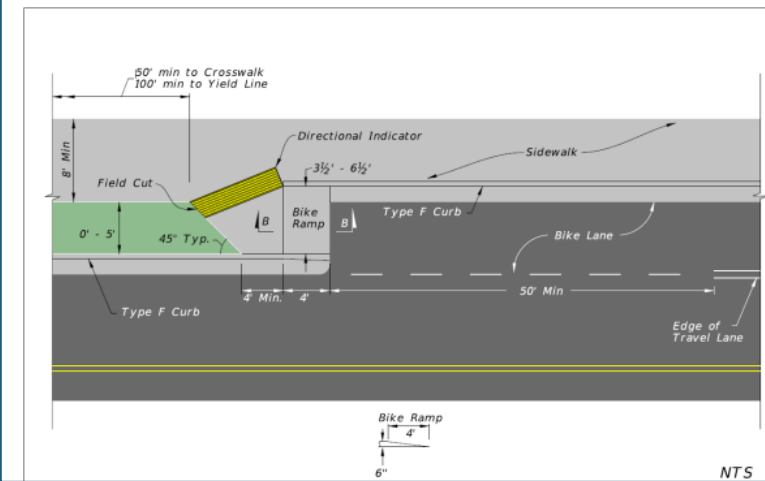


Figure 223.2.6 Straight Bicycle Ramp



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

- 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

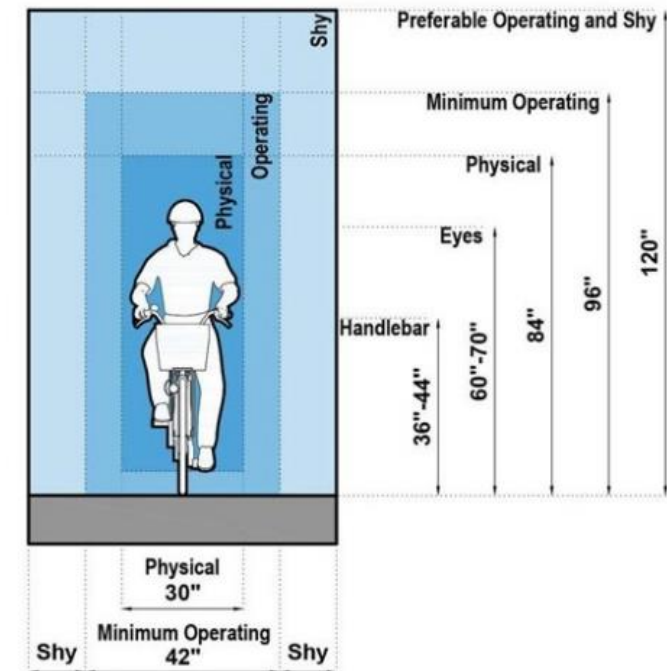
One-Way Facility	Width (feet)
Between drop curbs, types E or B curbs, at sidewalk level, or adjacent to one type F or D curb	5
Between two type F or D curbs	6
Two-Way Facility	Width (feet)
Between drop curbs, types E or B curbs, or at sidewalk level	8
Adjacent to one type F or D curb	9
Between two type 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



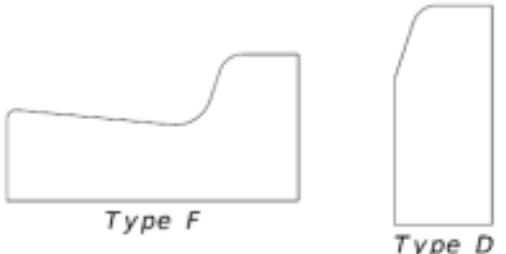


FDOT Design Criteria (New 2024)

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 (2025)

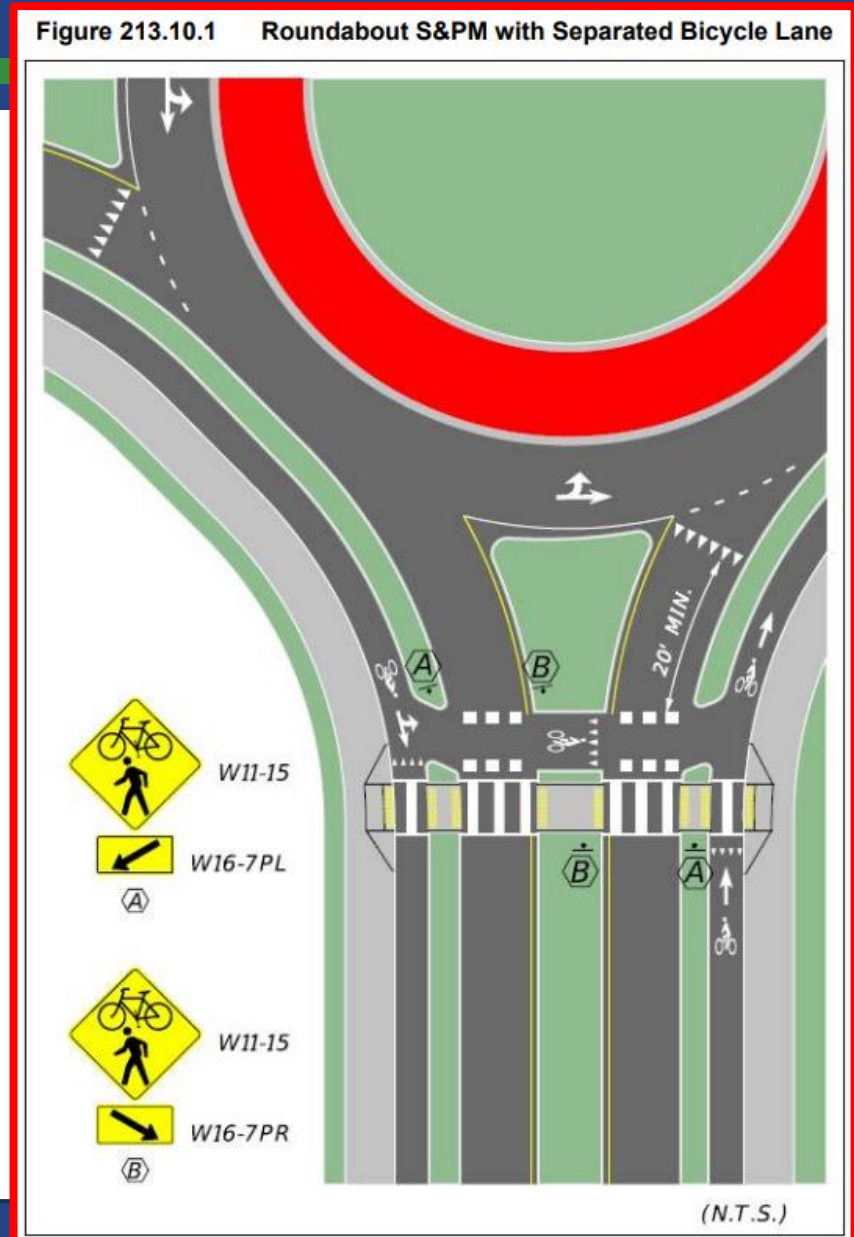
Figure 223.2.4 SBL Curb Types

Curb Types	Description
 <p data-bbox="547 628 649 656">Type F</p> <p data-bbox="840 649 942 678">Type D</p>	<p data-bbox="1133 506 1796 592"><i>Types F and D Curbs assist in channelizing bicycles, but wheels or pedals could strike the curb.</i></p>
 <p data-bbox="535 906 637 935">Type E</p> <p data-bbox="840 935 942 963">Type B</p>	<p data-bbox="1133 799 1796 885"><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 data-bbox="637 1178 777 1206">Drop Curb</p>	<p data-bbox="1133 1078 1821 1263"><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 data-bbox="1732 1299 1821 1328">(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



Safety Benefits of SBLs

- In line with the Safe System Approach.
 - Remove severe conflicts
 - Separate in space
 - Separate in time
 - Increase awareness and attentiveness
- Significant reduction in vehicle-bicycle collisions
 - **53% crash reduction expected** after converting to SBL with flexible posts from traditional/buffer bike lane
 - **30% to 49% crash reduction** after adding bike lanes on local roads and 2 to 4-lane undivided collectors
- Increased usage and comfort



Source: FHWA

Safety Benefits of SBLs

Table 66. CMFs for converting to an SBL.

Significance Level	Before Condition	After Condition	CMF	Standard Error
0.01	Traditional bicycle lane	SBL with flexible posts	0.498	0.173
0.01	Flush buffered bicycle lane	SBL with flexible posts	0.441	0.297
0.01	Traditional or flush buffered bicycle lane	SBL with flexible posts	0.468	0.267
0.05	Traditional bicycle lane	SBL with blend of flexible posts and other vertical elements	0.640	0.203
0.05	Flush buffered bicycle lane	SBL with blend of flexible posts and other vertical elements	0.567	0.253
0.05	Traditional or flush buffered bicycle lane	SBL with blend of flexible posts and other vertical elements	0.602	0.212

Source: FHWA-HRT-23-078

Level of Traffic Stress

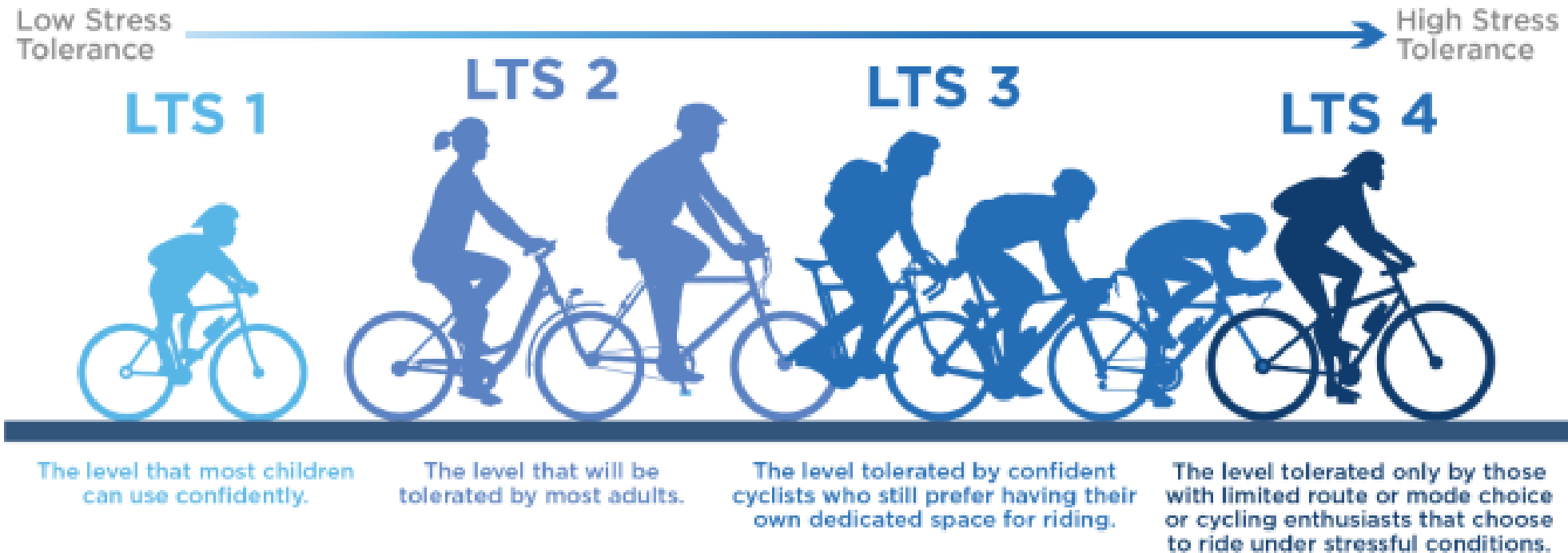


Figure 3: Bicycle Level of Traffic Stress

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



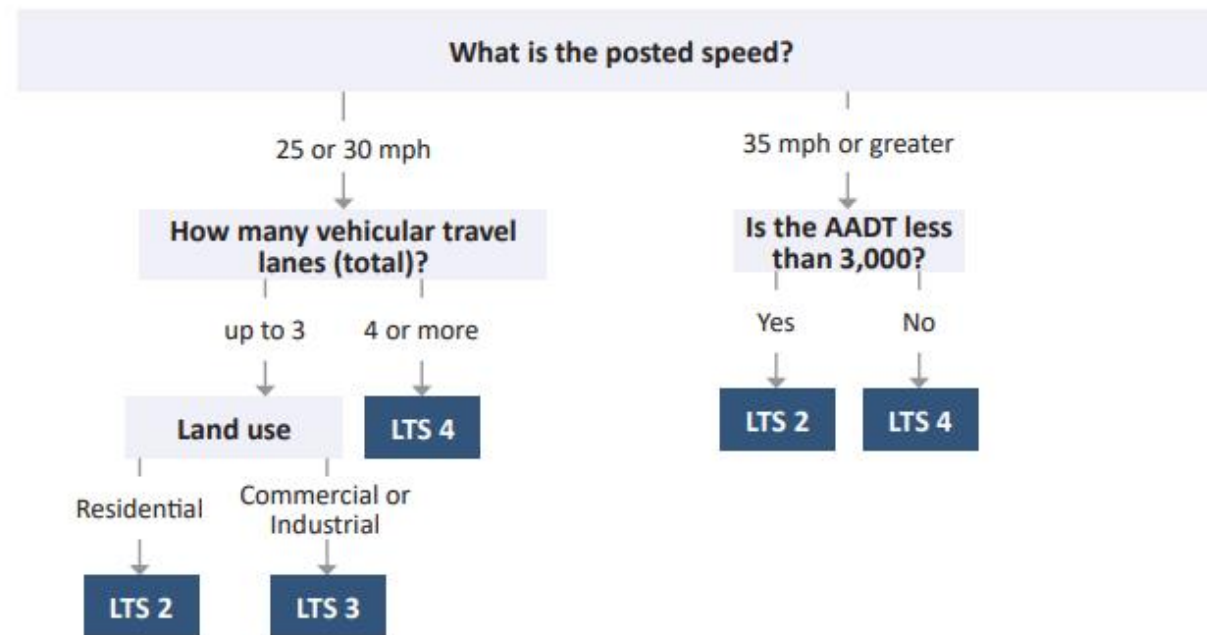
*Off-system facility (Ocean Drive)– does not follow FDM criteria

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:

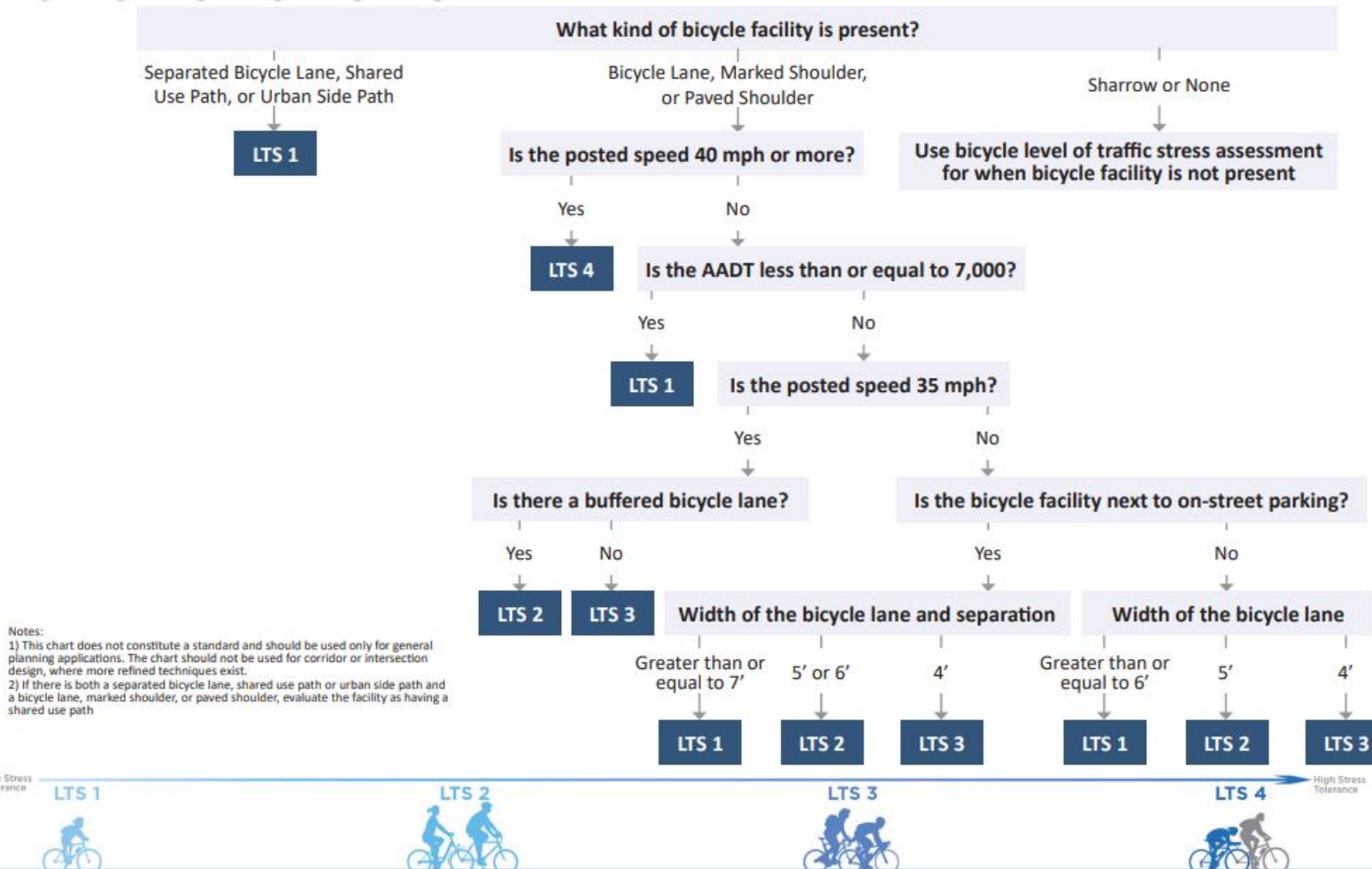
1) This chart does not constitute a standard and should be used only for general planning applications. The chart should not be used for corridor or intersection design, where more refined techniques exist.

Multimodal Q/LOS Handbook



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

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



Bicycle Facility Plans

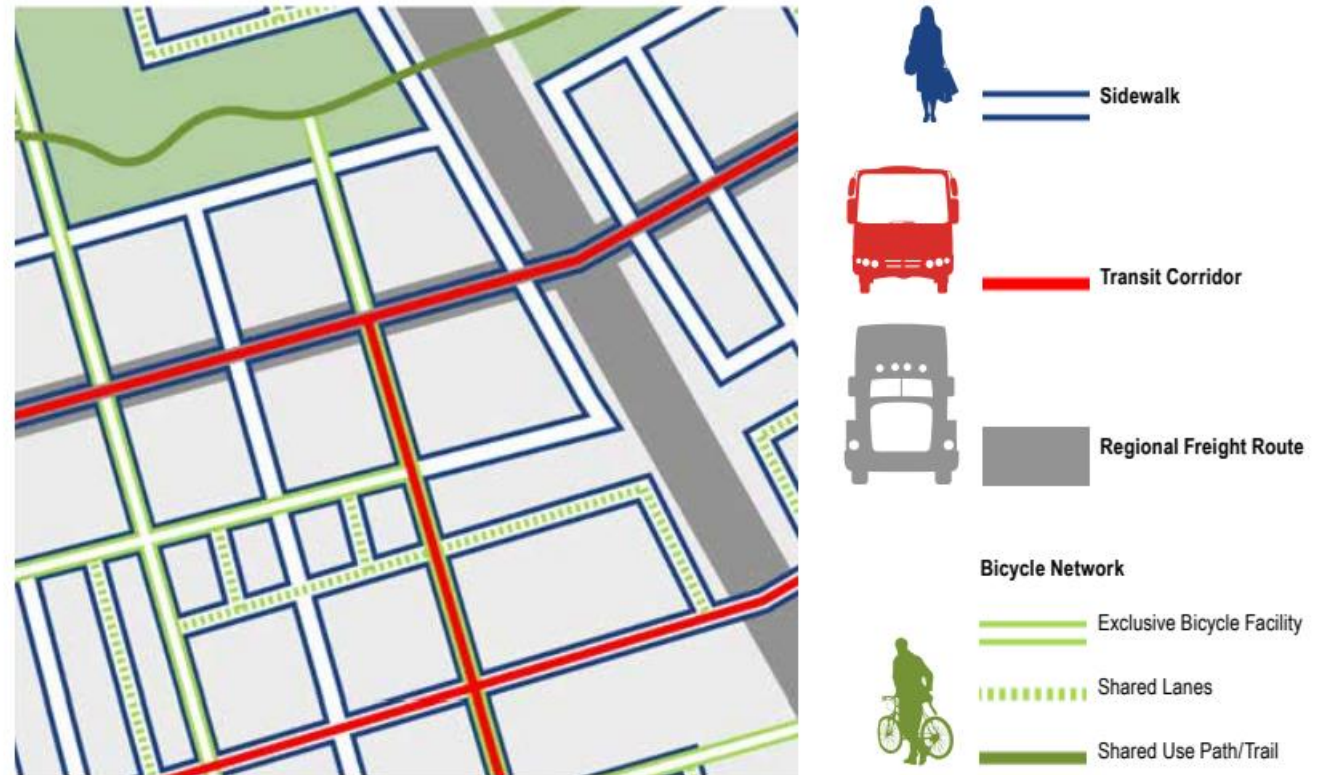
- Developing and maintaining a **district bicycle facility plan** to assign proposed bicycle facility types through a consistent and efficient process and ensure the following:
 - Integration of FDOT bicycle facilities with **local and regional bicycle transportation systems**
 - The direct use of more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

-FDM 223.2.1

Bicycle Facility Plans

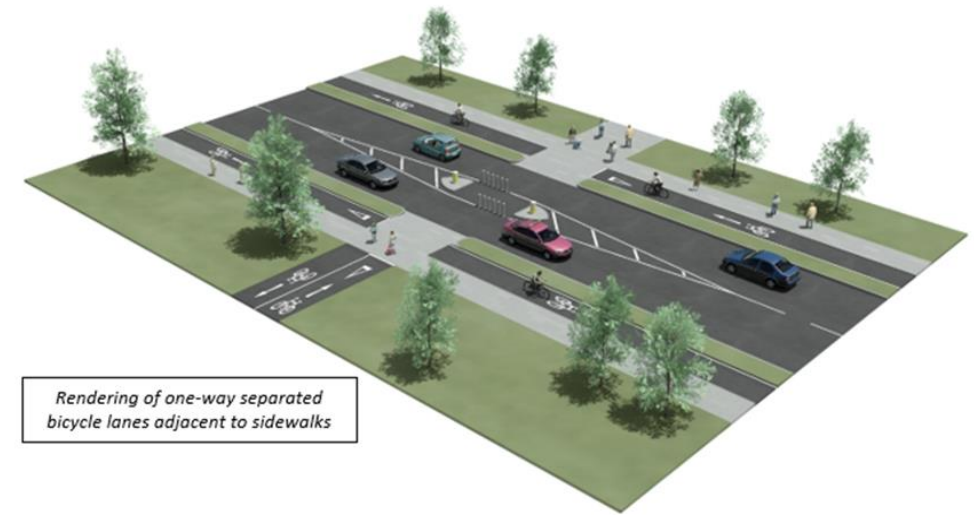
- A fine-grained *network* allows for roadways to *complement* each other, with some roadways providing better quality of service for high-speed travel, and other parallel roadways providing *comfort, safety, and access* for bicyclists and pedestrians.
- *FDOT Context Classification Guide*

FIGURE 7 CONTEXT-SENSITIVE SYSTEM OF COMPLETE STREETS



Bicycle Facility Plans: What's Next?

- **Bicycle & Pedestrian Facility Plan Update**
 - Upcoming update to the District 7 B/P Facility Plan
 - The goal of the plan is to
 - Identify existing and planned facilities
 - Provide facility recommendations
 - Identify gap on state roadways
 - Create prioritization process
 - This update will include
 - Updating local agency plans
 - Updating new state & national guidance/best-practices
 - LoTS
 - How-To for local agency implementation
 - Integrate GIS data into FDOT databases



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

Local Examples: Citrus Park Drive

• Project Information:

- Hillsborough County:
Citrus Park Dr from
Sheldon Rd to
Countryway Blvd
- Posted Speed: 40 MPH
- New east-west corridor
- 7-foot separated
bicycle lanes and new
sidewalks in both
directions
- Bicycle boxes at
signalized
intersections



Local Examples: Bruce B Downs Blvd

• Project Information:

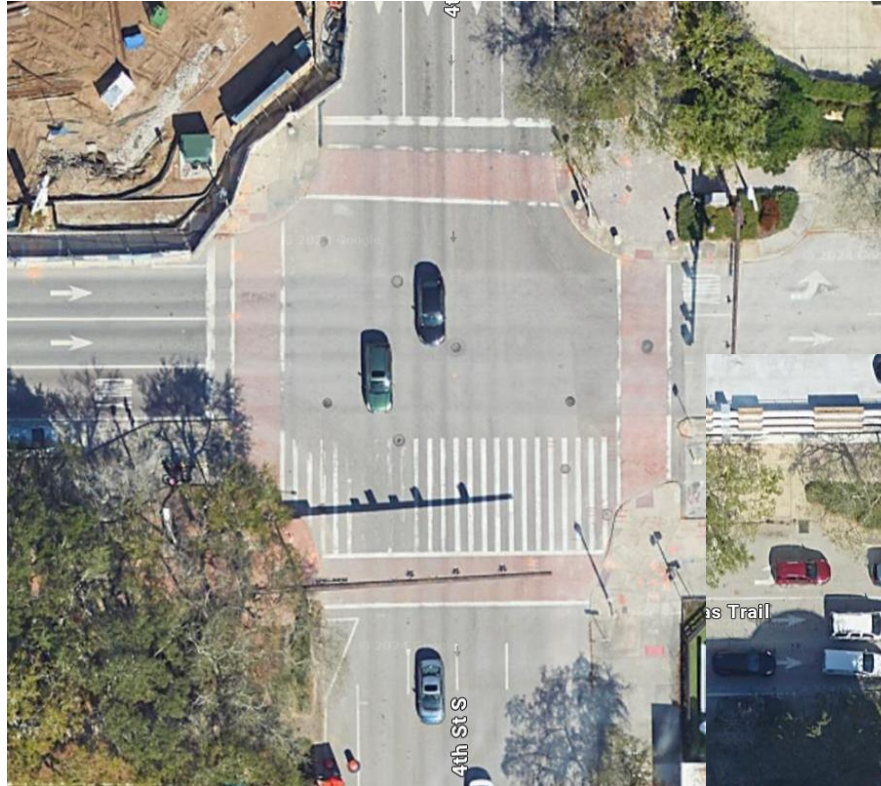
- Hillsborough County:
Bruce B Downs Blvd from
USF Pine Dr to USF Holly Dr
- Posted Speed: 45 MPH
- 7' concrete separated
bicycle lanes in both
directions
- New shared use path on
east side, widened
sidewalk on west side
- Parallels west side of
University of South Florida
campus



Local Examples: SR 687/3rd & 4th Streets

• Project Information:

- Pinellas County:
3rd and 4th Streets from 5th Ave S to 5th Ave N (one-way pair)
- Posted Speed: 30 MPH
- Constructed pedestrian bulb-outs to shorten crossing distances and reduced curb radii
- Added concrete separators to protect 2-way cycle tracks from right turn conflicts
- Downtown St Petersburg



Local Examples: SR 687/3rd & 4th Streets



Local Examples: SR 679/Pinellas Bayway

• Project Information:

- Pinellas County:
Pinellas Bayway from Bunces Pass Br to Madeira Cir
- Posted speed: 40 MPH
- Part of a resurfacing (RRR) project
- Utilized existing space without costly curb/drainage reconstruction
- Completed a trail gap along the Pinellas Bayway between SR 682 and Ft DeSoto Park
- Provided a SB buffered bike lane
- New roundabout at existing signalized intersection



Local Examples: SR 679/Pinellas Bayway



Near Miss on the Pinellas Bayway Bicycle Track



Near Miss on the Pinellas Bayway Bicycle Track



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

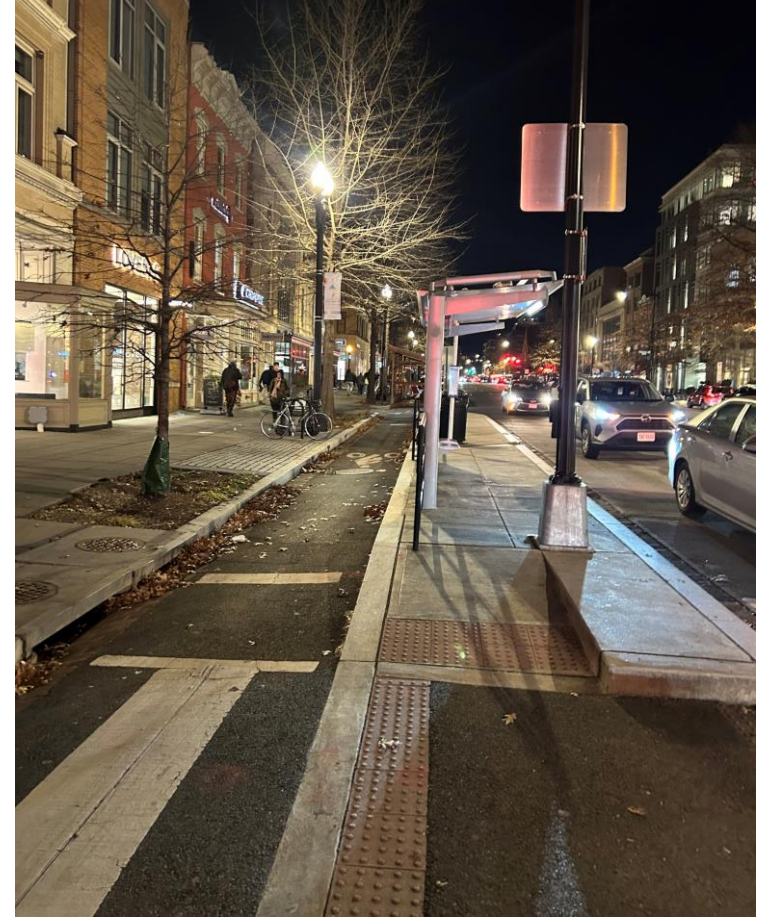
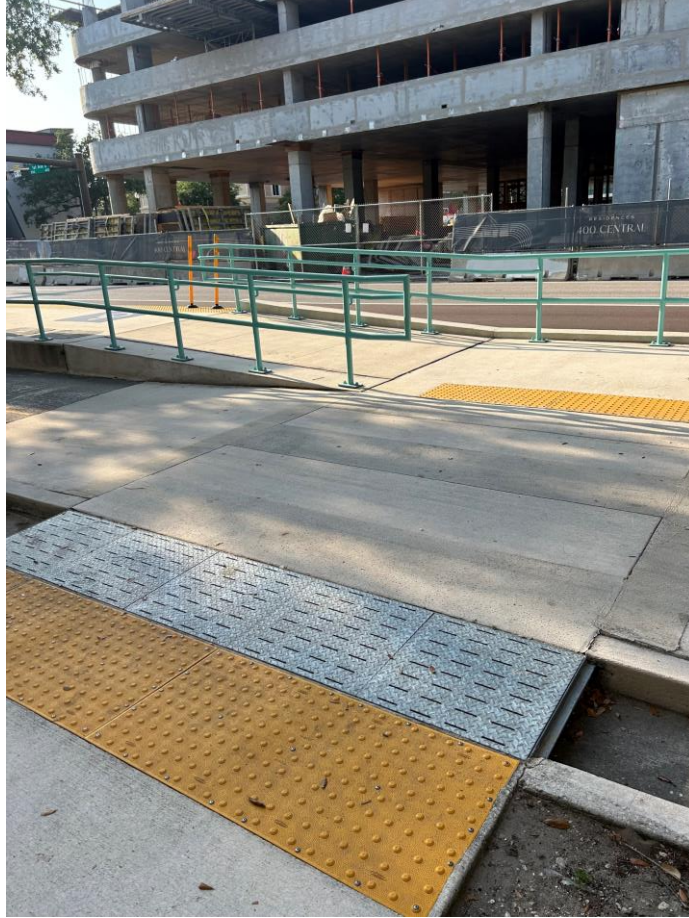
- **Boarding Islands for Transit Stops**



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





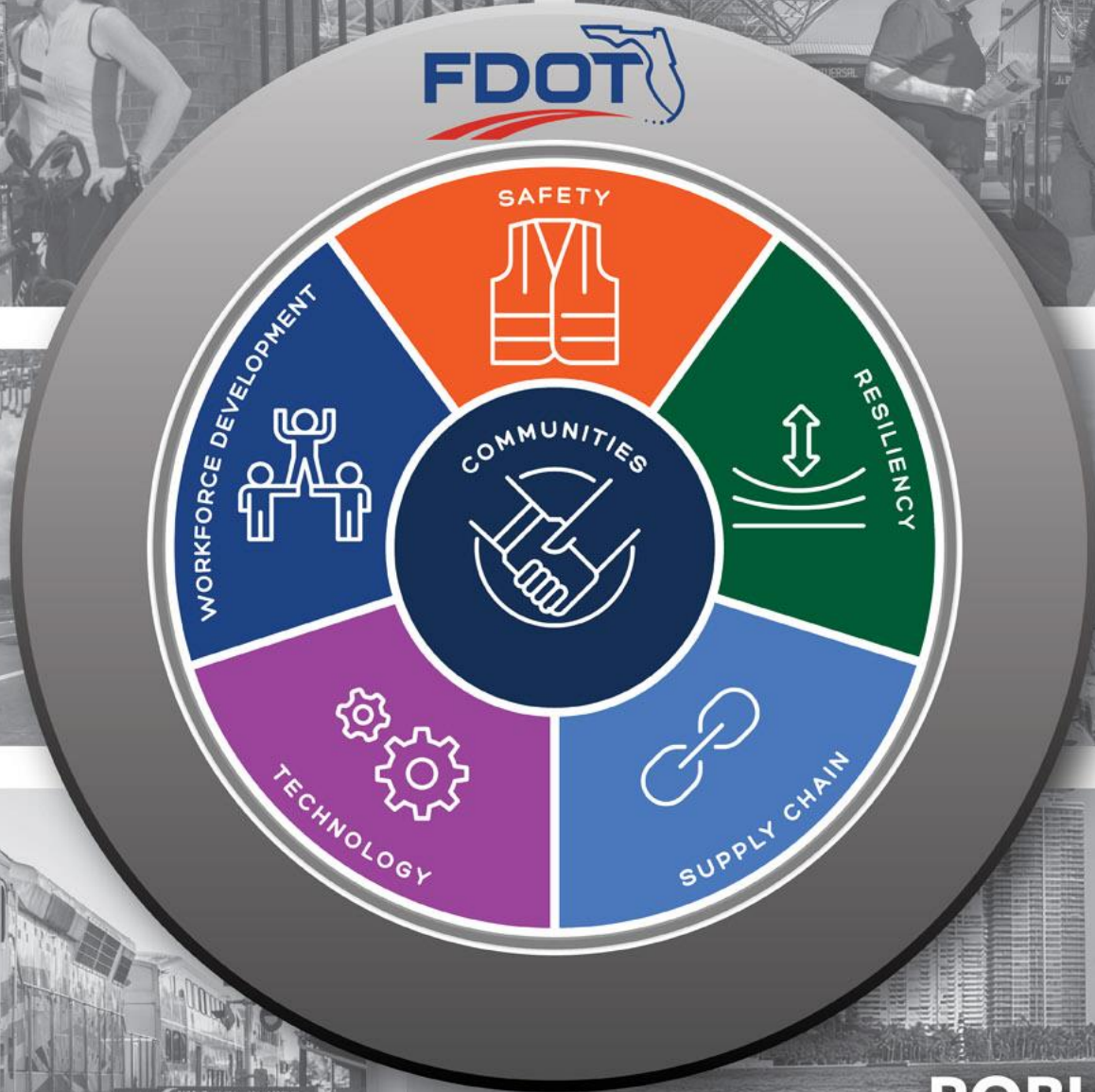
SAFETY



COMMUNITIES



WORKFORCE DEVELOPMENT



RESILIENCY



TECHNOLOGY



ROBUST SUPPLY CHAIN

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