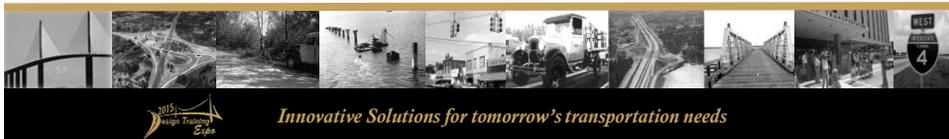


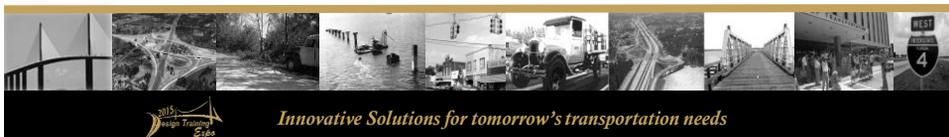


11' Arterial Lane Width & Buffered Bike Lanes

Paul Hiers, P.E.
DeWayne Carver, AICP

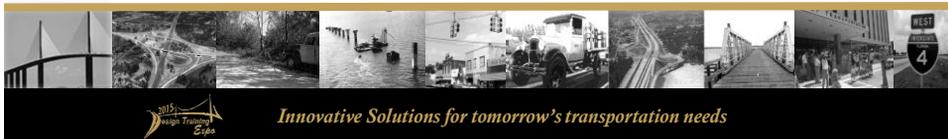


1. Arterial Lane Width
2. Buffered Bike Lane Design
3. Picking a Bike Lane for Your Project
4. Keyholes on Parade
5. When There Is No Room For a Bike Lane



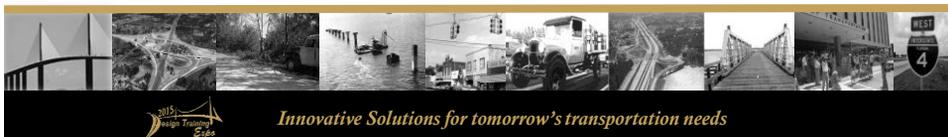
Why Consider 11 ft. Travel Lanes?

- Fall of 2013 - Concept by District 3
 - 11 ft. lanes to address speed
 - 7 ft. buffered bike lane to enhance safety
- Introduced as a Pilot Project on SR 390 (new construction - 2 lane to 6 lane)
- CO concurrently began to study as a state-wide initiative.



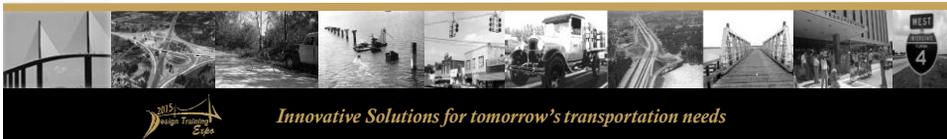
Why Adopt 11 ft. Travel Lanes?

- Florida has always used 12 ft. lane as the standard.....
- Florida one of the last states still using 12 ft. lanes for design speeds of 45 mph or less
- Supported by AASHTO Guidance
- Highway Safety Manual and supporting research projects indicate no significant correlation between lane width and safety performance



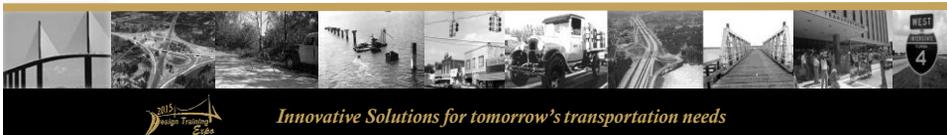
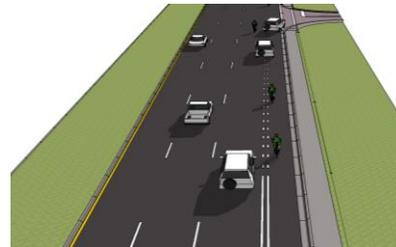
Why Adopt Buffered Bike Lanes

- Number of research projects support that wider bike lanes increase safety
- Florida leads the country in bicycle fatalities
- Zero cost opportunity to provide enhanced bike lanes
 - Capture pavement from restriping in RRR projects
 - Same total pavement width for new construction

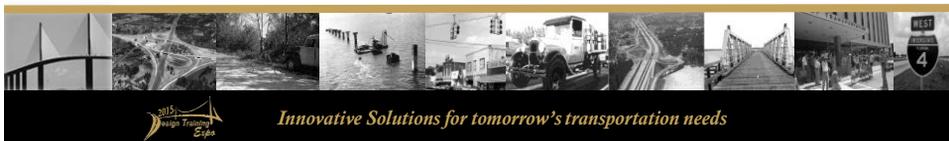


Other Considerations

- Why not 11 ft. lanes on suburban facilities?
 - Highway Safety Manual indicates a slight increase in expected crashes for design speed 50 MPH or greater.
- Why not 10 ft. lanes on low speed urban facilities?
 - Recommended minimum width of 11 ft. for transit and trucks

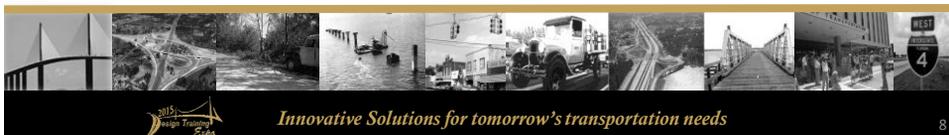


1. Arterial Lane Width
2. Buffered Bike Lane Design
3. Picking a Bike Lane for Your Project
4. Keyholes on Parade
5. When There Is No Room For a Bike Lane



PPM 2015

- Modifies criteria for Urban Arterial Lane Width to 11' travel lanes for roadways with:
 - Divided typical section (includes flush median)
 - In or within one mile of urban area
 - Design speed 45 mph or less
 - C&G as well as flush shoulder
- Establishes 7' buffered bike lane as standard for marked bike lanes



8.4.1 Bicycle Lanes

Where required by **Table 8.1.1**, a bicycle lane shall be provided for each direction of travel on the roadway. On flush shoulder roadways, the paved shoulder described in **Section 8.4.3** shall be marked as a bicycle lane in or within 1 mile of an urban area. Bicycle lanes shall be marked in accordance with **Design Standards, Index 17347** and the **MUTCD**. Shared use paths do not meet the requirement for bicycle lanes.

On divided roadways in or within one mile of an urban area and a Design Speed of ≤ 45 mph, travel lanes shall be 11 feet with a 7 foot Buffered Bicycle Lane. The bicycle lane is defined as the area between the edge of travel lane and the edge of pavement. For RRR projects, the distribution of available roadway width may require a bicycle lane other than the 7 foot buffered bicycle lane (See **Volume 1, Section 25.4.19.2** for further information). When providing a bicycle lane on a RRR project, the options in the order of priority are:

PPM pg: 8-11

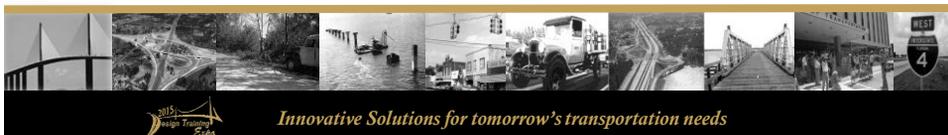
1. 7 foot buffered bicycle lane
2. 6 foot buffered bicycle lane
3. 5 foot conventional bicycle lane
4. 4 foot conventional bicycle lane

Pedestrian, Bicycle and Public Transit Facilities

8-11



1. Arterial Lane Width
2. Buffered Bike Lane Design
3. Picking a Bike Lane for Your Project
4. Keyholes on Parade
5. When There Is No Room For a Bike Lane



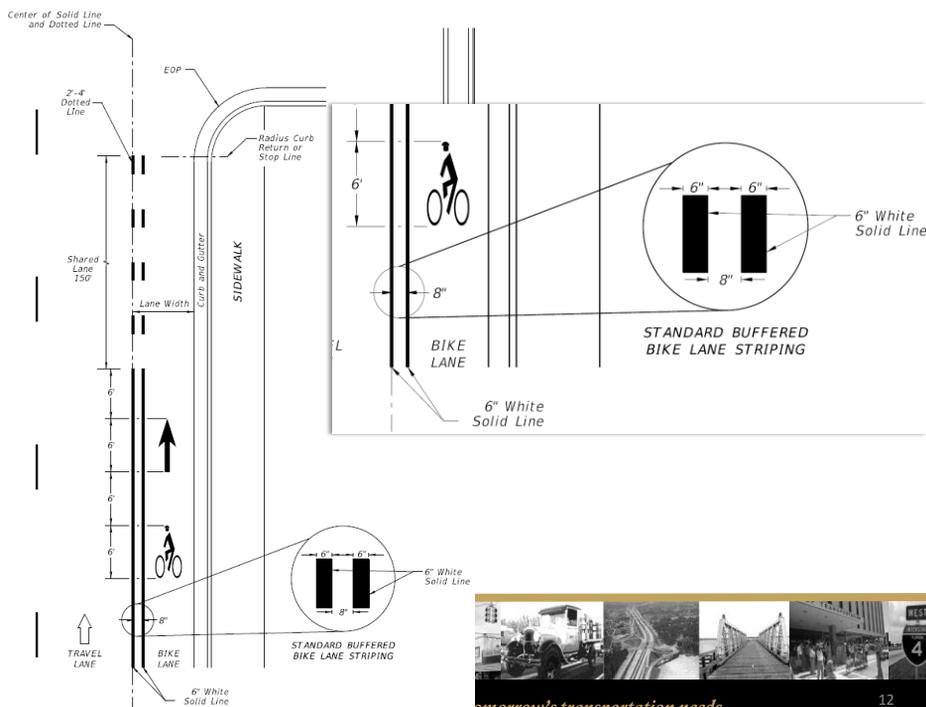
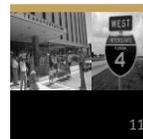
The minimum width of the buffer zone for the 6 foot and 7 foot buffered bicycle lane is depicted in **Design Standards, Index 17347**. A Buffered Bicycle Lane should not exceed 7 feet in width. For RRR projects, any additional pavement width that results from restricting the Buffered Bicycle Lane to 7 feet should be applied to the outside travel lane.

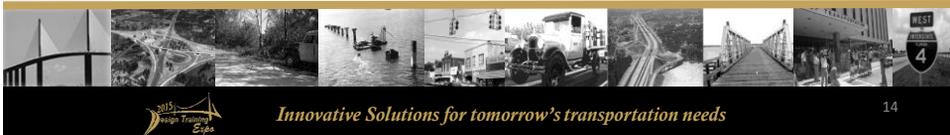
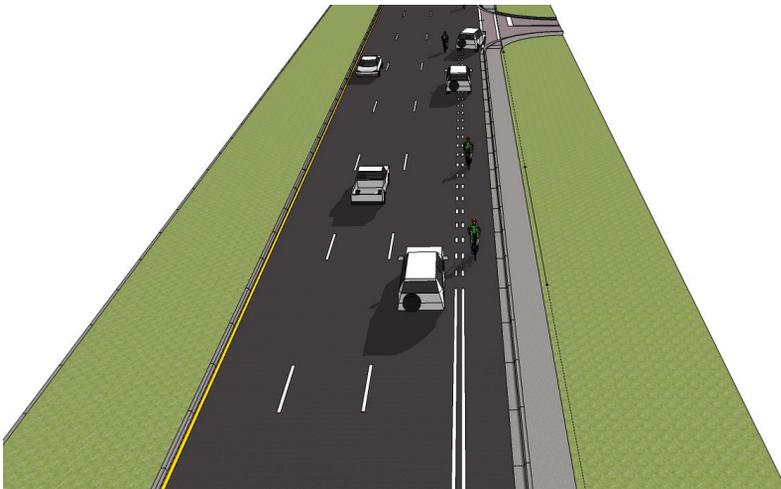
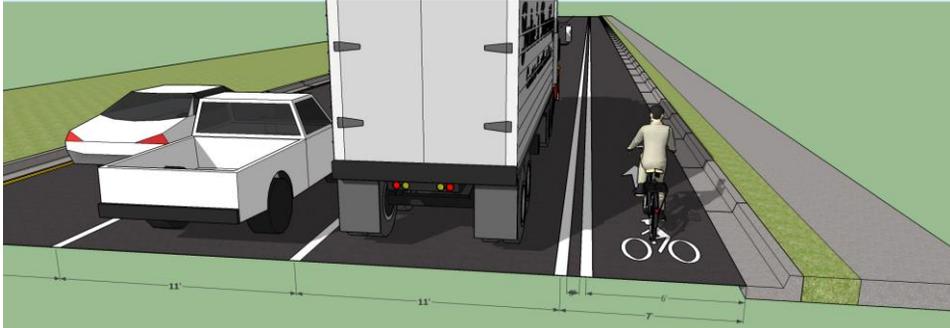
At an intersection approach, the buffer striping will transition to a double 6 inch wide stripe using a 2/4 skip pattern. The transition will begin 150 feet in advance of an intersection to provide sufficient distance for an automobile or truck to merge into the bicycle lane before turning right. The buffer striping will not be broken at low-volume or residential driveways.

When a guardrail or other barrier exists and the roadway pavement is continuous to the face of the barrier, the bicycle lane width shall not be less than 5 feet. When the bicycle lane is adjacent to a right-turn lane or bus bay, refer to **Section 8.4.2** of this chapter. On high speed urban and suburban arterial highways with design speeds of 50 mph or more and curb and gutter on the outside, a 6.5-foot bicycle lane adjacent to the curb and gutter is required. See **Volume 1, Section 2.16** for further information.

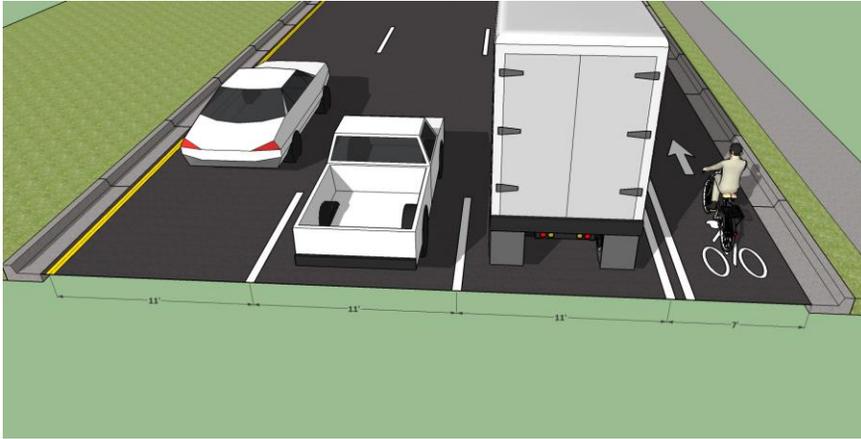
PPM pg: 8-12

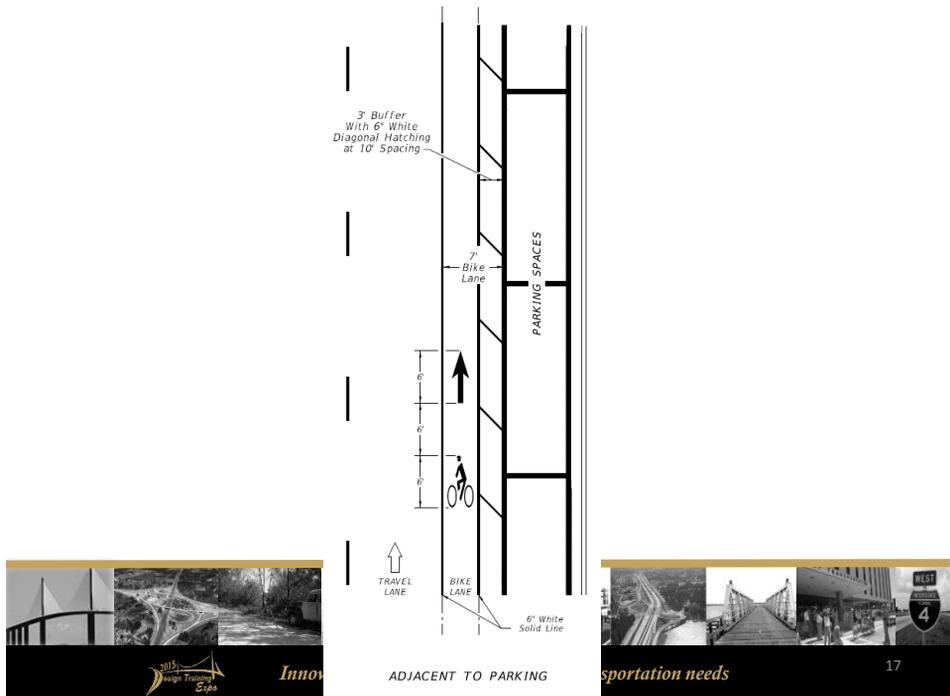
Bicycle lanes shall be one-way facilities and carry bicycle traffic in the same direction as adjacent motor vehicle traffic. On one-way streets, bicycle lanes should generally be placed on the right side of the street. A bicycle lane on the left side of the street can be considered if it will substantially 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.



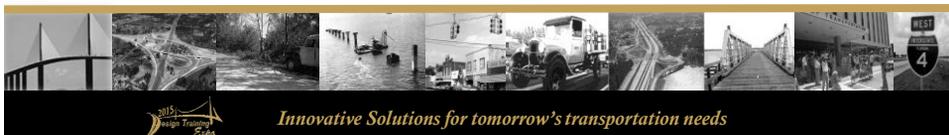


Urban Arterial Lane Markings





1. Arterial Lane Width
2. Buffered Bike Lane Design
3. Picking a Bike Lane for Your Project
4. Keyholes on Parade
5. When There Is No Room For a Bike Lane



PPM Mods – Chapter 8

Roadway Design Bulletin 14-17
Urban Arterial Lane Width and Bicycle Lane Options
Page 5 of 11

4. Replace PPM, Volume 1, Table 8.1.1 with the following:

Table 8.1.1 On-Street Bicycle Facilities

Location	Condition	Type of Work		
		New Construction and Reconstruction	Resurfacing, Restoration, Rehabilitation (RRR) ^{1,2,3}	Traffic Operations, Intersection Improvements
In or within one mile of an urban area	All	Buffered Bicycle Lane	Buffered Bicycle Lane, Bicycle Lane, Wide Curb Lane, or Shared Lane with Shared Lane Markings (acceptable for posted speed 35 mph or less).	Buffered Bicycle Lane, Bicycle Lane, Wide Curb Lane, or Shared Lane with Shared Lane Markings (acceptable for posted speed 35 mph or less).
	Curb and Gutter	Buffered Bicycle Lane	Buffered Bicycle Lane, Bicycle Lane, Wide Curb Lane, or Shared Lane with Shared Lane Markings (acceptable for posted speed 35 mph or less).	Buffered Bicycle Lane, Bicycle Lane, Wide Curb Lane, or Shared Lane with Shared Lane Markings (acceptable for posted speed 35 mph or less).
Beyond one mile of an urban area	Flush Shoulder	Paved Shoulder	Paved Shoulder	Paved Shoulder

Topic #025-000-007
Plans Preparation Manual, Volume 1 – English
January 1, 2013
Revised – January 1, 2014

Table 8.1.1 Bicycle Facilities

Location	Condition	Type of Work		
		New Construction, Reconstruction	Resurfacing, Restoration, Rehabilitation (RRR) ^{1,2,3}	Traffic Operations, Intersection Improvements
In or within one mile of an urban area	All	Bicycle Lane	Bicycle Lane or Wide Curb Lane	Bicycle Lane or Wide Curb Lane
Beyond one mile of an urban area	Curb and Gutter	Bicycle Lane	Bicycle Lane or Wide Curb Lane	Bicycle Lane or Wide Curb Lane
	Flush Shoulder	Bicycle Lane or Paved Shoulder	Bicycle Lane or Paved Shoulder	Bicycle Lane or Paved Shoulder



1. When no bicycle facilities exist, the widening of curbed sections for the project length to provide bicycle facilities may disproportionately affect the scope and cost of a RRR project, especially if reconstruction of the curb, sidewalk, and/or drainage system is required, additional right of way is needed, or utilities are impacted. No Design Variation is required, however, a statement similar to the following shall be included in the project file:

“Bicycle facilities have been considered for this project but will not be provided, due to insufficient width between existing curb lines to provide bicycle facilities without substantial reconstruction of the roadway, drainage system and sidewalk (and/or requires additional right of way). Reconstruction (and/or right of way acquisition) is outside the scope of this project.”

2. Substantial widening of an existing curbed section is outside the scope of a RRR project and is considered reconstruction.

3. See *Section 25.4.19* for options that shall be considered on RRR projects with existing roadways where no widening is planned.

New

1. Widening of existing curbed sections for the project length to provide bicycle facilities may disproportionately affect the scope and cost of a RRR project, especially if reconstruction of the curb, sidewalk, and/or drainage system is required, additional right of way is needed, or utilities are impacted. No Design Variation is necessary, however, a statement similar to the following shall be included in the project file:

“Bicycle facilities have been considered for this project but will not be provided, due to insufficient width between existing curb lines to provide bicycle facilities without substantial reconstruction of the roadway, drainage system and sidewalk (and/or requires additional right of way). Reconstruction (and/or right of way acquisition) is outside the scope of this project.”

2. Substantial widening of an existing curbed section is outside the scope of a RRR project and is considered reconstruction.

3. See *Section 25.4.19* for options that shall be considered on RRR projects with existing roadways where no widening is planned.



8.4.1 Bicycle Lanes

Where required by **Table 8.1.1**, a bicycle lane shall be provided for each direction of travel on the roadway. On flush shoulder roadways, the paved shoulder described in **Section 8.4.3** shall be marked as a bicycle lane in or within 1 mile of an urban area. Bicycle lanes shall be marked in accordance with **Design Standards, Index 17347** and the **MUTCD**. Shared use paths do not meet the requirement for bicycle lanes.

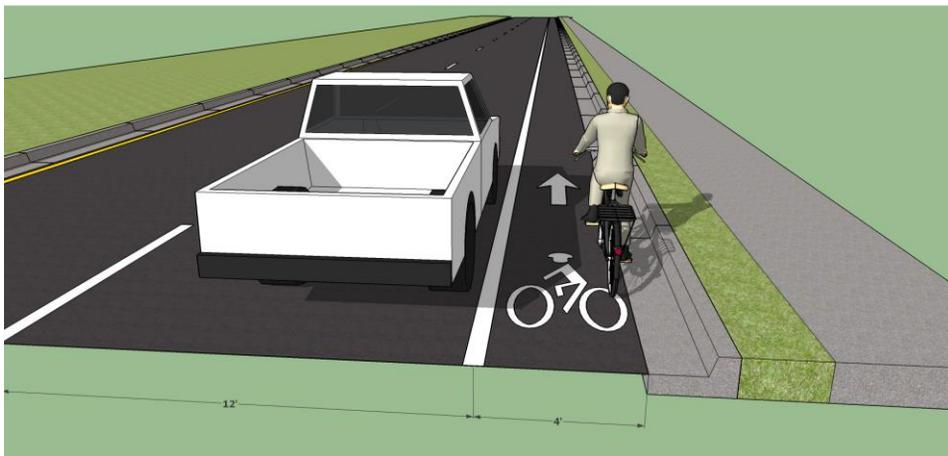
On divided roadways in or within one mile of an urban area and a Design Speed of ≤ 45 mph, travel lanes shall be 11 feet with a 7 foot Buffered Bicycle Lane. The bicycle lane is defined as the area between the edge of travel lane and the edge of pavement. For RRR projects, the distribution of available roadway width may require a bicycle lane other than the 7 foot buffered bicycle lane (See **Volume 1, Section 25.4.19.2** for further information). When providing a bicycle lane on a RRR project, the options in the order of priority are:

PPM pg: 8-11

1. 7 foot buffered bicycle lane
2. 6 foot buffered bicycle lane
3. 5 foot conventional bicycle lane
4. 4 foot conventional bicycle lane

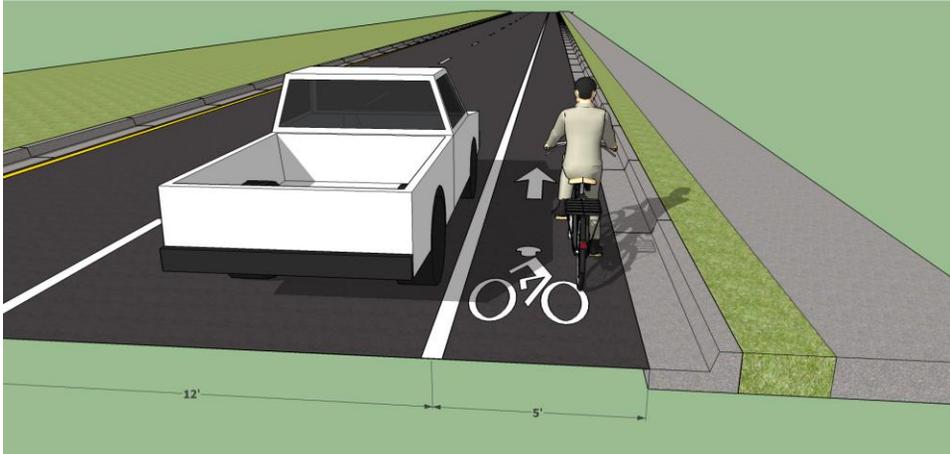
Pedestrian, Bicycle and Public Transit Facilities

8-11

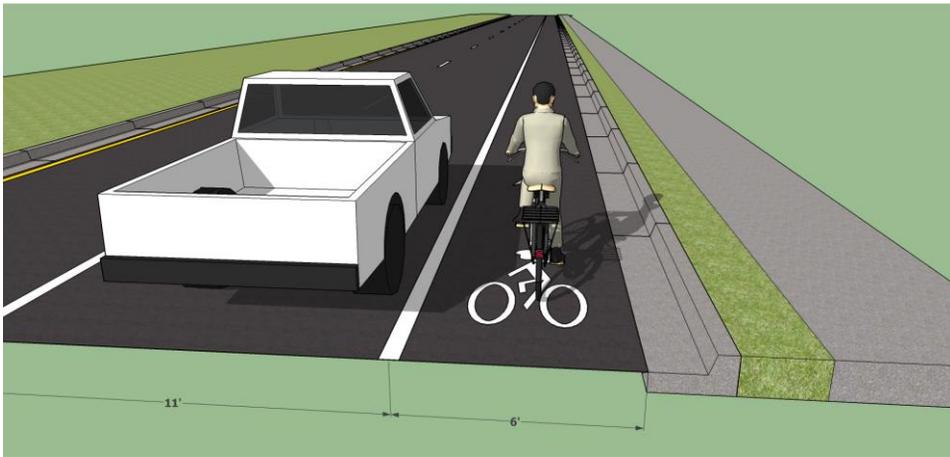


Distance between truck and cyclist is 3' from the side of the truck to the handlebar of the bike.





Distance between truck and cyclist is 3' from the side of the truck to the handlebar of the bike.



Distance between truck and cyclist is 3' from the side of the truck to the handlebar of the bike.

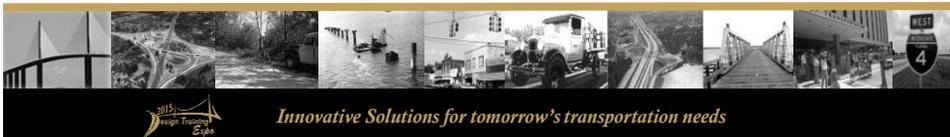
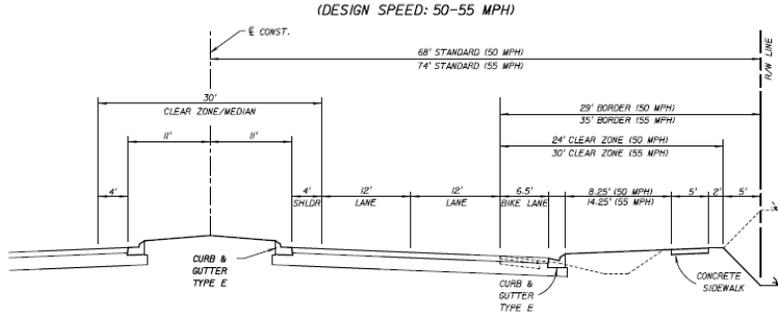


Figure 2.16.1 Four-Lane High-Speed Urban and Suburban Section

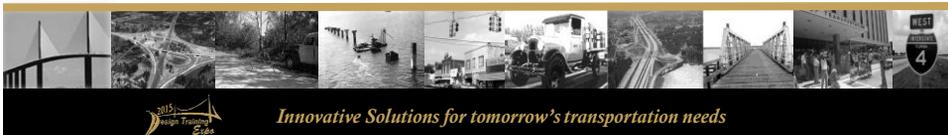


“On high speed urban and suburban arterial highways with design speeds of 50 mph or more and curb and gutter on the outside, a 6.5-foot bicycle lane adjacent to the curb and gutter is required. See **Volume 1, Section 2.16** for further information.”

PPM 8.4.1



1. Arterial Lane Width
2. Buffered Bike Lane Design
3. Picking a Bike Lane for Your Project
4. Keyholes on Parade
5. When There Is No Room For a Bike Lane



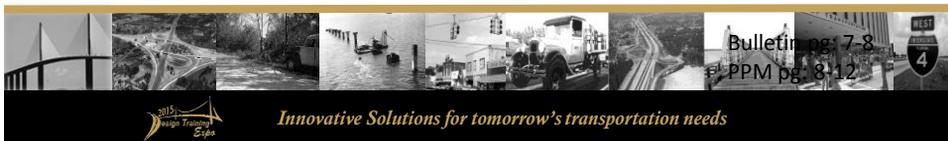
PPM Mods – Chapter 8

8.4.2.1 Keyhole Locations

In new construction, reconstruction and traffic operations projects, at locations with right turn lanes, bus bays or parking lanes, a bicycle lane, known as a keyhole lane, shall be provided between the through lane and the right turn lane, bus bay or parking lane. When provided in conjunction with the buffered bicycle lane, the width of the keyhole lane should be the same as the buffered bicycle lane and the buffer should be included in the keyhole lane. For 6 foot or smaller bicycle lanes, the minimum width of the keyhole lane is 5 feet.

Pedestrian, Bicycle and Public Transit Facilities

8-12



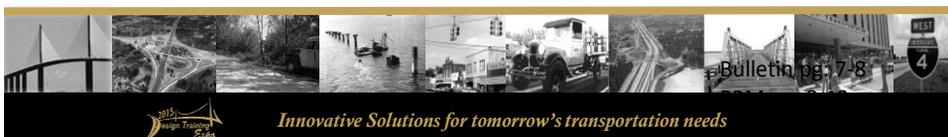
Topic #625-000-007
Plans Preparation Manual, Volume 1 – English

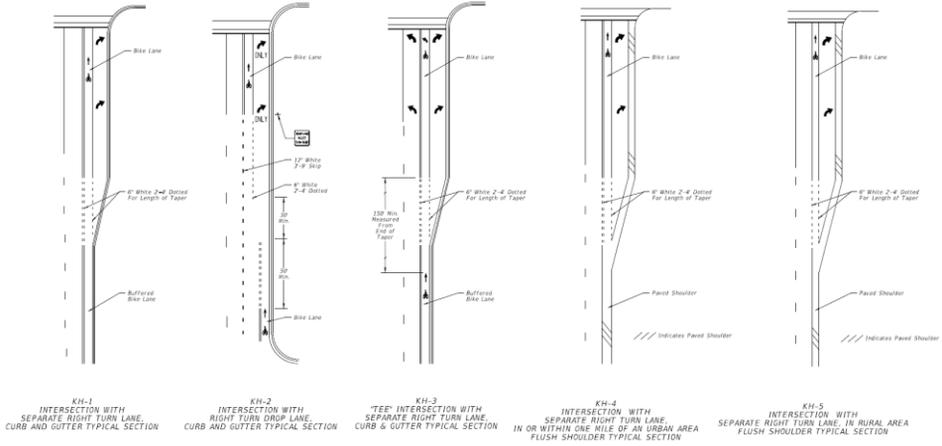
January 1, 2013
Revised – January 1, 2015

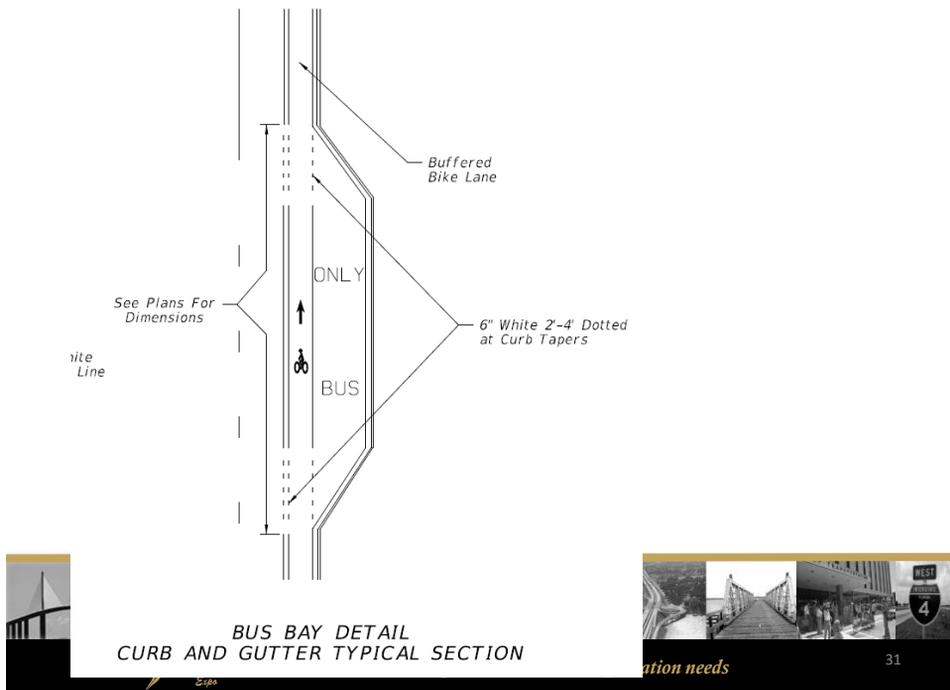
For bicycle lanes adjacent to parking lanes, a 7 foot wide buffered bicycle lane should be provided using a 3 foot buffer adjacent to the parking lane hatched with 10 foot diagonal spacing. Shared lane markings should be used if width is inadequate for the 7 foot buffered bicycle lane.

When a RRR project includes the addition or modification of a right turn lane or bus bay, a 5-foot minimum width bicycle lane shall be provided between the through lane and the right turn lane or bus bay, if existing right of way is adequate.

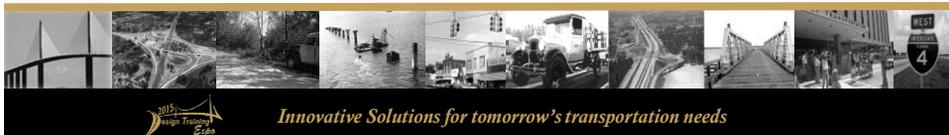
When a RRR project has an existing right turn lane without a bicycle lane between the through lane and right turn lane, bus bay or parking lane, a bicycle lane should be provided. Factors to be considered include the opportunity to provide a continuous alignment, reduce the potential for conflicts with turning vehicles, and availability of right of way.







1. Arterial Lane Width
2. Buffered Bike Lane Design
3. Picking a Bike Lane for Your Project
4. Keyholes on Parade
5. When There Is No Room For a Bike Lane



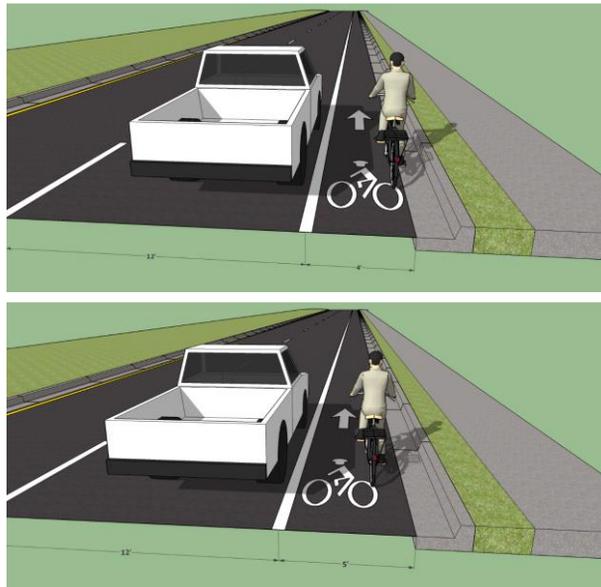
8.4.3 Paved Shoulders

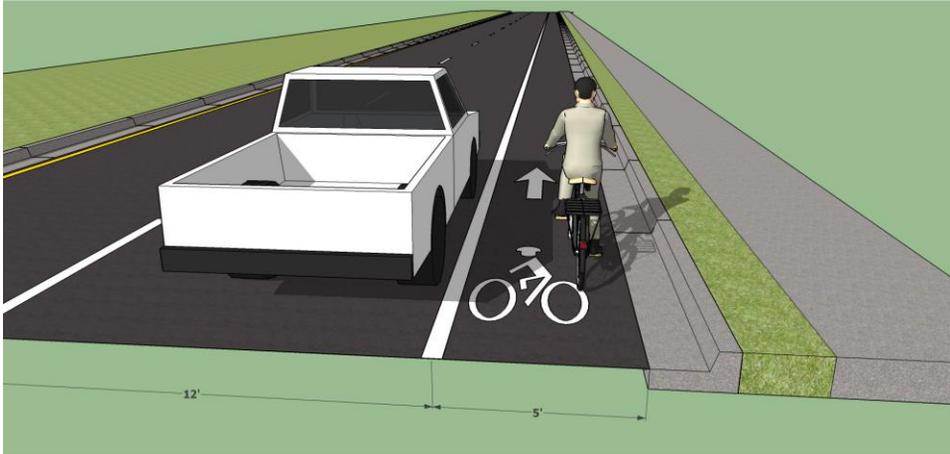
A paved shoulder is a portion of a roadway which has been delineated by edge line striping, and may include bicycle lane pavement markings or signing. In or within 1 mile of an urban area, the paved shoulder shall be marked as a bicycle lane. Paved shoulders shall be 5 feet in width for new construction, reconstruction and RRR projects; however existing 4-foot paved shoulders on RRR projects may be retained. A paved shoulder of at least 4 feet in width is considered to be a bicycle facility; however a minimum 5-foot clear width between the traveled way and the face of curb, guardrail or other roadside barrier is required.

8.4.3 Paved Shoulders

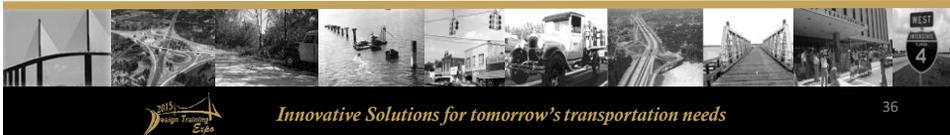
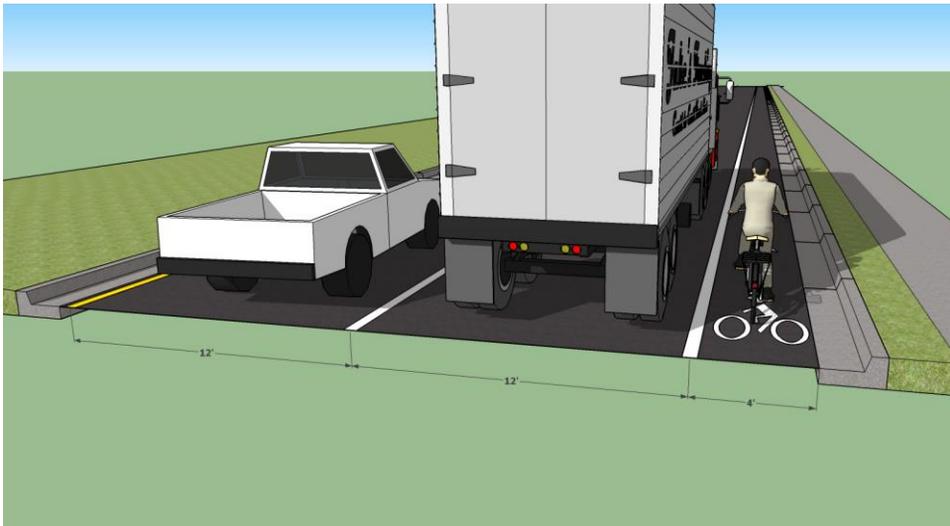
A paved shoulder is a portion of a roadway which has been delineated by edge line striping, and may include bicycle lane pavement markings or signing. In or within 1 mile of an urban area, the paved shoulder shall be marked as a bicycle lane in accordance with **Section 8.4.1**. Beyond one mile of an urban area, paved shoulders shall be 5 feet in width for new construction and reconstruction projects. **Existing 4-foot paved shoulders on RRR projects should be widened to 5 feet where practical.** A paved shoulder of at least 4 feet in width is considered to be a bicycle facility; however a minimum 5-foot clear width between the traveled way and the face of curb, guardrail or other roadside barrier is required.

PPM pg: 21



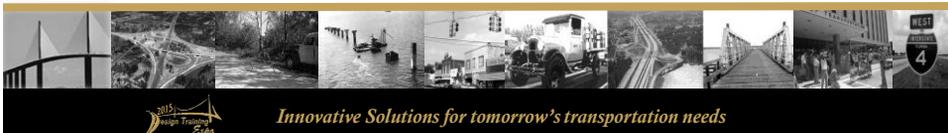


Distance between truck and cyclist is 3' from the side of the truck to the handlebar of the bike.





1. Arterial Lane Width
2. Buffered Bike Lane Design
3. Picking a Bike Lane for Your Project
4. Keyholes on Parade
5. When There Is No Room For a Bike Lane



PPM Mods – Chapter 25

8. Replace PPM, Volume 1, Section 25.4.19.2 note 1 with the following:

25.4.19.2 Bicyclist Needs

1. **Buffered Bicycle Lanes, Bicycle Lanes, Paved Shoulders, Wide Outside Lanes and Shared Lanes**

The available roadway width will be distributed, when practical, to provide for bicycle facilities. Bicycle facilities shall meet the criteria provided in *Chapter 8*. The type of bicycle facility considered for implementation shall be in the following order of priority: buffered bike lanes, bike lanes, wide outside lanes, and shared lanes. Travel lane widths on urban multilane roadways and two-lane curb and gutter roadways shall not be reduced to less than 11 feet for design speeds ≥ 40 mph, and to no less than 10 feet for design speeds ≤ 35 mph. See *Section 25.4.5* for additional information on lane widths. Coordinate with the District Public Transportation (Modal Development) Office and local transit agency when considering the reduction of lane widths on roadways where public transit routes are present. Existing bicycle facilities not in accordance with *Chapter 8* require a Design Variation to remain.

9. Replace PPM, Volume 2, Chapter 6 Exhibits - Typical Sections TYP-3, TYP-4, TYP-5, TYP-6 and TYP-6A attached.

10. Add PPM, Volume 2, Chapter 6 Exhibit Typical Sections TYP-6b attached.

Design Standards Revisions:

The following Design Standards Revision (DSR) is released:

Revised Index 17347 (Bicycle Markings)



Topic #625-000-007
Plans Preparation Manual, Volume 1 - English

January 1, 2013
Revised – January 1, 2015

**Table 25.4.5.3 Lane Widths
Urban Multilane or Two-Lane With Curb and Gutter**

Design Year AADT	Design Speed (mph)	Minimum Thru Lane (ft.)	Minimum Turn Lane (ft.)	Minimum Parking Lane (ft.)
ALL	ALL	10 ₁	9 ₂	7 ₃

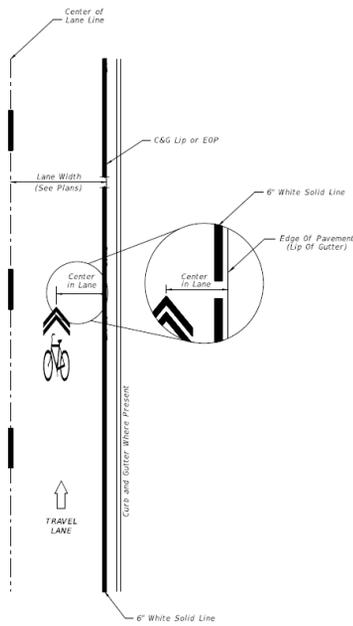
1. 11 ft. where either of the following conditions exist:
 - a. Trucks are >10% of Design Year Traffic.
 - b. Design Speed is 40 mph or greater.
2. 10 ft. for 2 Way Left Turn Lanes.
3. A minimum width of 7 ft. measured from face of curb may be left in place. Otherwise provide 8 ft. minimum, measured from face of curb.

**Table 25.4.5.4 Lane and Shoulder Widths
Urban Multilane Without Curb and Gutter**

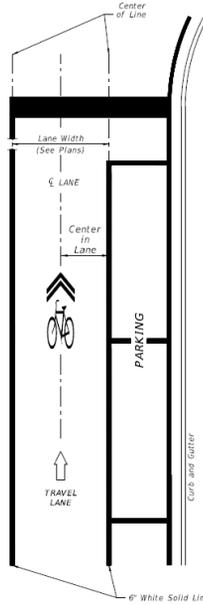
Design Year AADT	Design Speed (mph)	Minimum Thru Lane (ft.)	Minimum Turn Lane (ft.)	Minimum Shoulder Width (ft.)
ALL	ALL	10 ₁	9 ₂	6

1. 11 ft. where either of the following conditions exist:
 - a. Trucks are >10% of Design Year Traffic.
 - b. Design Speed is 40 mph or greater
2. 10 ft. for 2-Way Left Turn Lanes.





SCENARIO #1
LANE WIDTH ≤ 14'



SCENARIO #2
ADJACENT TO PARKING



R4-11

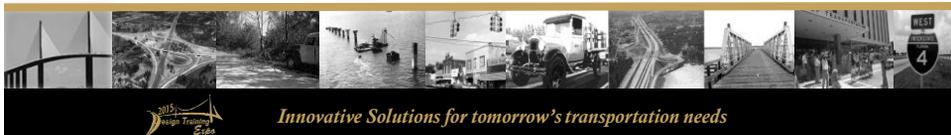
Section 9B.06 Bicycles May Use Full Lane Sign (R4-11)

Option:

- 01 The Bicycles May Use Full Lane (R4-11) sign (see Figure 9B-2) may be used on roadways where no bicycle lanes or adjacent shoulders usable by bicyclists are present and where travel lanes are too narrow for bicyclists and motor vehicles to operate side by side.
- 02 The Bicycles May Use Full Lane sign may be used in locations where it is important to inform road users that bicyclists might occupy the travel lane.
- 03 Section 9C.07 describes a Shared Lane Marking that may be used in addition to or instead of the Bicycles May Use Full Lane sign to inform road users that bicyclists might occupy the travel lane.

Support:

- 04 The Uniform Vehicle Code (UVC) defines a "substandard width lane" as a "lane that is too narrow for a bicycle and a vehicle to travel safely side by side within the same lane."



U.S. Department of Transportation
Federal Highway Administration
1200 New Jersey Avenue, SE
Washington, D.C. 20590

May 11, 2011

In Reply Refer To: HOTO-1

Mr. Dirk L. Gowin
Executive Administrator
Louisville Metro Government
Department of Public Works and Assets
444 S. 5th Street, Suite 400
Louisville, KY 40202

Dear Mr. Gowin:

Thank you for your letter of May 2 requesting an official interpretation regarding whether the Bikes May Use Full Lane (R4-11) sign can be used on roadways that have speed limits above 35 mph.

It is the FHWA's official interpretation that the Bikes May Use Full Lane (R4-11) sign can be used on roadways that have speed limits above 35 mph. Section 9B.06 of the 2009 MUTCD contains no requirements or recommendations that would prohibit the use of the R4-11 sign on higher speed roadways.

For recordkeeping purposes, we have assigned the following official interpretation number and title: "9(09)-19 (I) – Use of R4-11 Sign on Roads with Speed Limits above 35 mph." Please refer to this number in any future correspondence regarding this topic.

Thank you for your interest in improving the clarity of the provisions contained in the MUTCD.

Sincerely yours,

Original signed by:

Hari Kalla for

Mark R. Kehrl
Director, Office of Transportation Operations



Questions

