

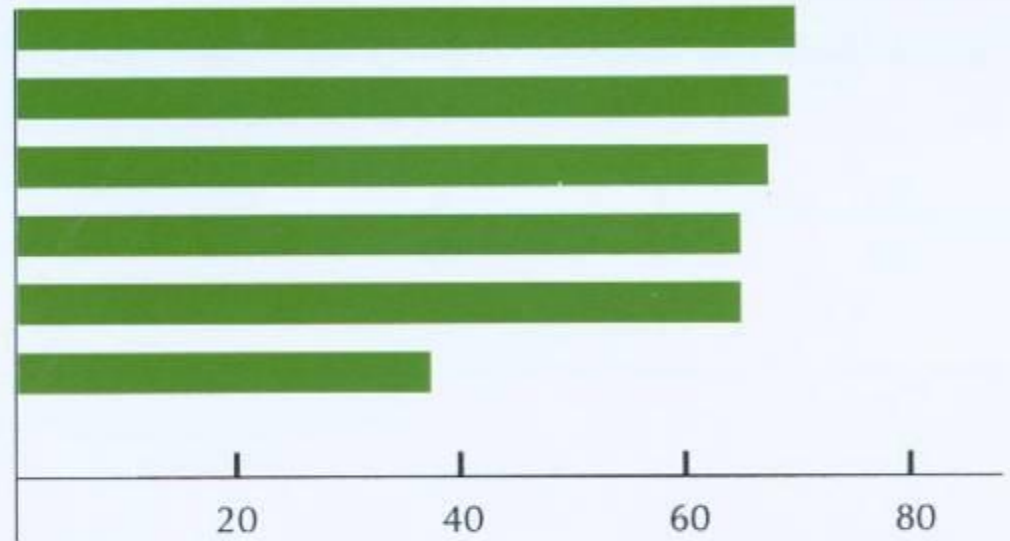
Implementing a Complete Streets Policy



Why Complete Streets?

TRANSPORTATION IMPROVEMENTS THAT WOULD SERVE THE COMMUNITY (percent)

Expanding existing public transportation
Building new bikeways and sidewalks
Providing better quality traffic information
Expanding existing highways
Offering new public transportation services
Building more highways



"Agree" and "Strongly Agree" Responses Shown

Source: 2000 FHWA Infrastructure Survey

Transportation

- Half of all trips are shorter than 3 miles - a 15 minute bike ride
- 40% of U.S. adults say they would commute by bike if safe facilities are available
- Gallup poll – 2002: Half of U.S. adults in favor of providing bicycle and pedestrian facilities even if it means less space for automobiles

References: 2001 National Household Transportation Survey, League of American Bicyclists Press Release

More opportunities

- There are 56 million walking trips in the U. S. everyday
- One in ten households do not own an automobile
- 1/3 of the population do not drive an automobile
- About one in ten trips are made by foot or bicycle already

References: 2001 National Household Transportation Survey, League of American Bicyclists Press Release

Example - SCDOT Policy

January 14, 2003

- **NOW, THEREFORE, BE IT RESOLVED** that . . . bicycling and walking accommodations should be a ***routine part of the department's planning, design, construction and operating activities***, and will be included in the everyday operations of our transportation system; and

Example - SCDOT Policy

January 14, 2003

- **THEREFORE, BE IT FURTHER RESOLVED**, that the South Carolina Department of Transportation Commission ***requires South Carolina counties and municipalities to make bicycling and pedestrian improvements an integral part*** of their transportation planning and programming where State or Federal Highway funding is utilized.

Disproportionate Deaths

- Percent of all trips made on foot or by bicycle?

8.5%

- Percent of all traffic fatalities that are pedestrians and bicyclists?

13%

References: 2005 NHTSA Traffic Safety Facts, 2001 National Household Transportation Survey

Focus of this training

- Review some successful treatments.
- Work on “real life” scenarios relevant to your work.
- Help you determine the right balance of modes within the right-of-way.

**So what does a complete street
look like?**









Cambridge, MA

League of American Bicyclists



Arlington, VA











League of American Bicyclists



Realities

- Constrained rights-of-way
- High volumes of motor vehicle traffic
- Tight budgets
- Trade-offs are necessary in order to achieve a balance
- Modal priorities





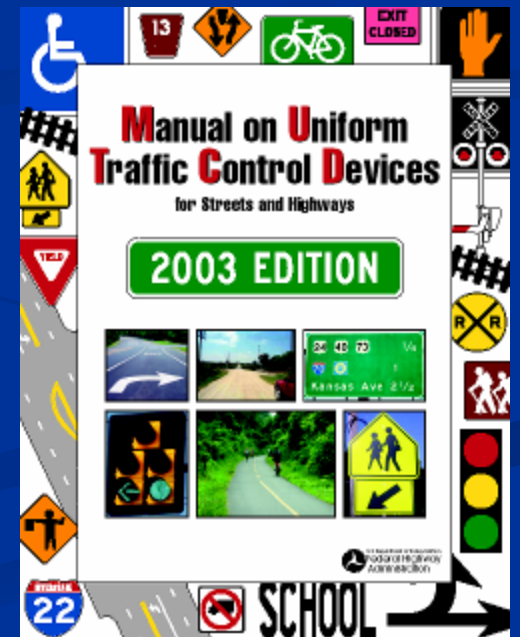
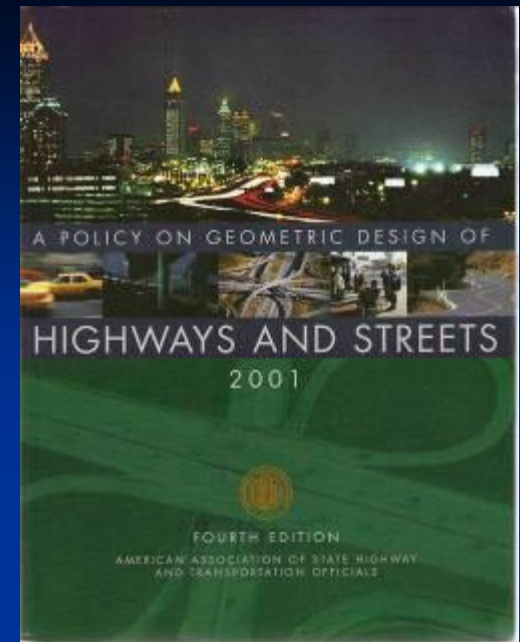
Existing Guidelines

National

- Manual On Uniform Traffic Control (MUTCD 2003)
- AASHTO Green Book (2004)
- AASHTO Bicycle Design Guide (1999)
- AASHTO Pedestrian Design Guide (2004)
- ADAAG

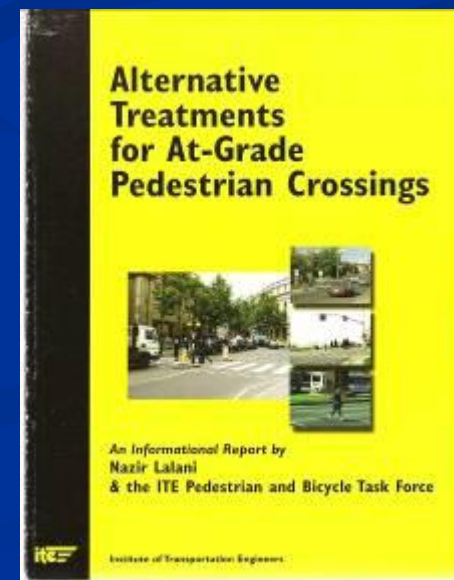
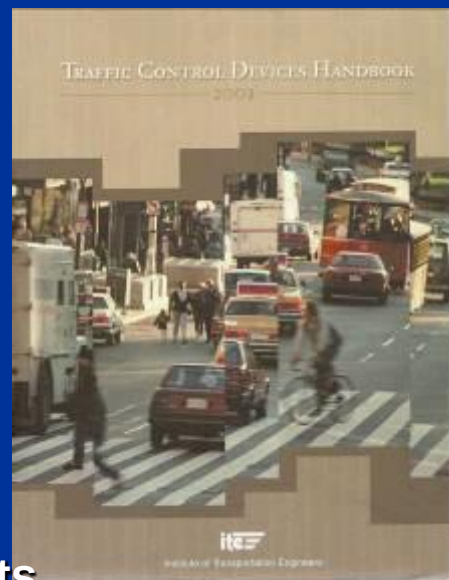
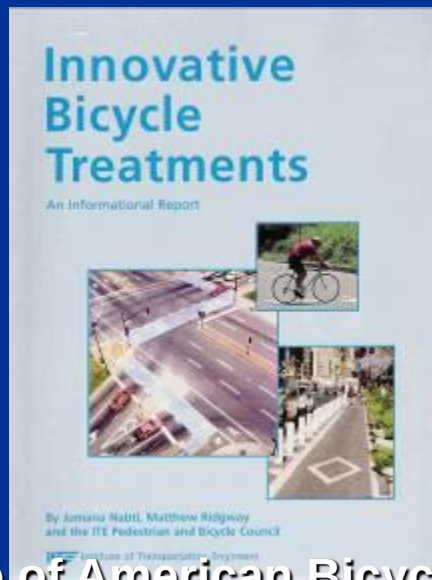
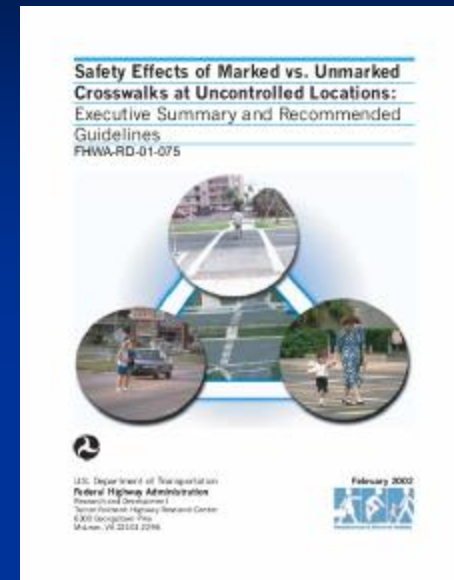
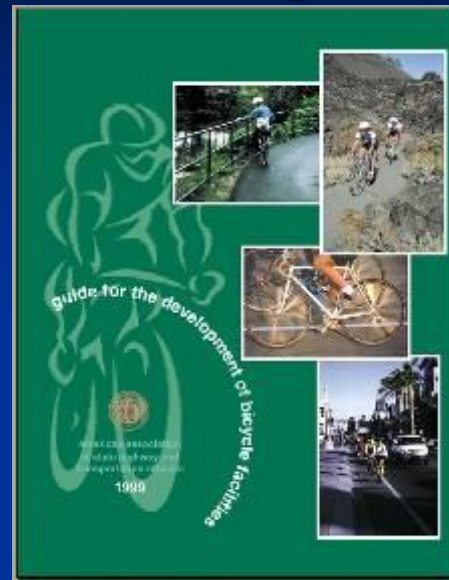
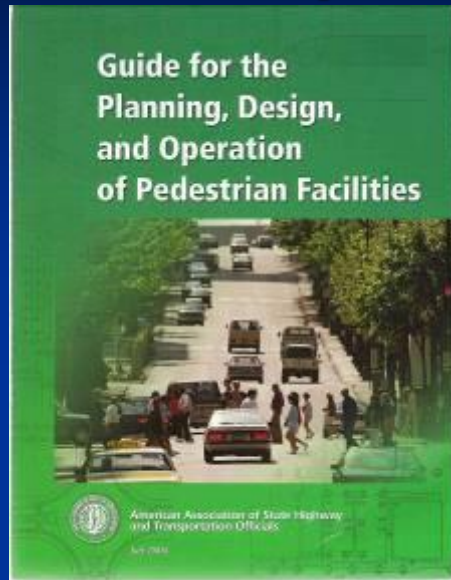
State

- SCDOT Bicycle Facility Design Guidance



Existing Guidelines

Guidance Specific to Bicyclists and Pedestrians



Roadway Design:

Focus on moving **high** volumes of motor vehicle traffic as **quickly** and efficiently as possible.



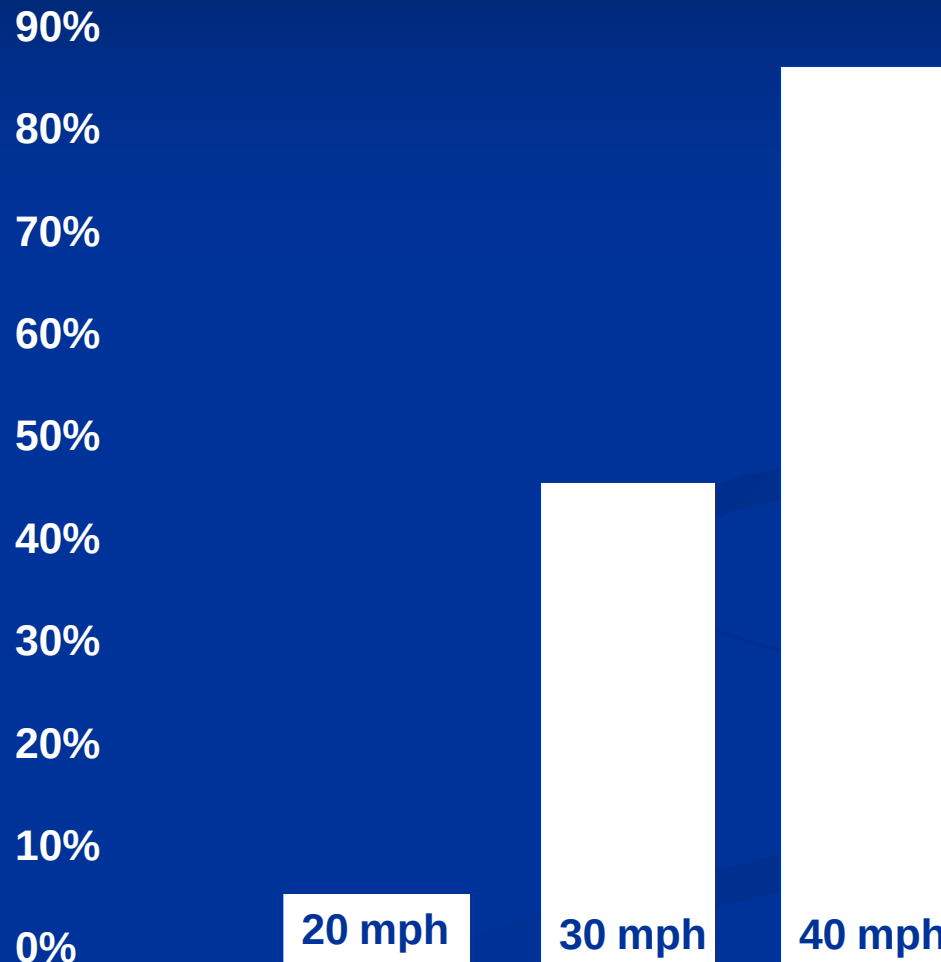
What Pedestrians Need:

Lower volumes of motor vehicle traffic moving at **slow** speeds, sidewalks, separation from traffic.



Fatalities based on speed of vehicle

A pedestrian's chance of death if hit by a motor vehicle

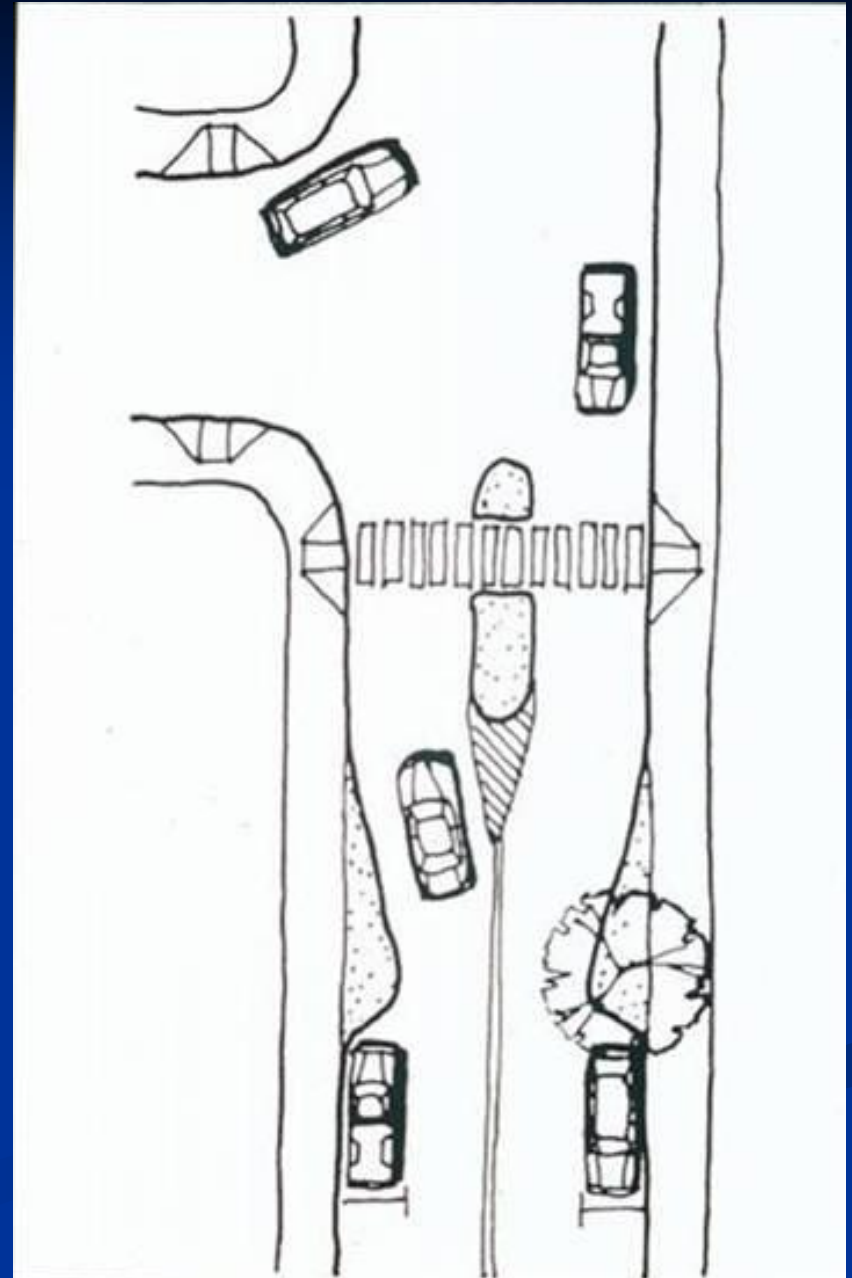


Killing Speed and Saving Lives, UK Department of Transportation



Crosswalk Refuge

Refuge with Traffic Calming





Crossing Islands



Road diet – Watch it happen



Road diet – Watch it happen



Road diet – Watch it happen





Sidewalk Width –4 feet

GLENCARLYN CITIZENS ASSOCIATION
MANAGES THE BUILDING. CARLIN
COMMUNITY HALL IS A DESIGNATED
ARLINGTON COUNTY LANDMARK AND
IS LISTED IN THE NATIONAL REGISTER
OF HISTORIC PLACES.

ERECTED IN 2008 BY ARLINGTON COUNTY, VIRGINIA

4' sidewalk, 3'
grass utility strip



BARK

**Two adults can walk
side-by-side**

**5' sidewalk,
2' grass utility strip**

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Sidewalk Width/Design – Brick utility strip



4' sidewalk, 3' brick
utility strip

Intersection Design



No right-turn-on-red



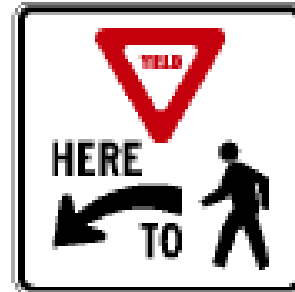
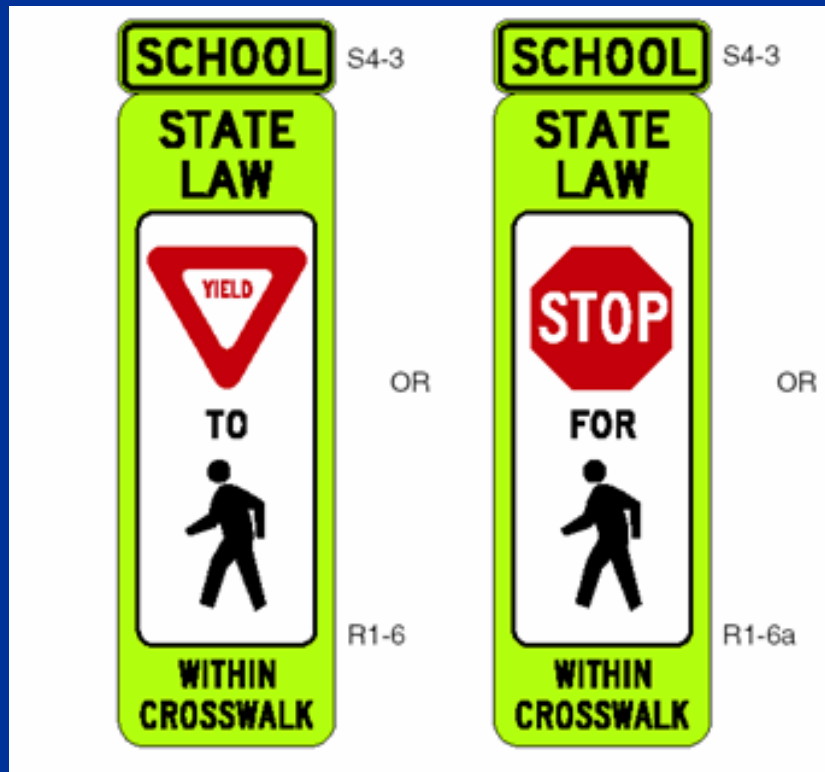
Countdown signals



Pedestrian Half-Signal



In-street signing



R1-5



R1-5a



Not for every location . . .







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What Bicyclists Need:



SPACE!

**Lack of adequate space creates hazards for
bicyclists and motorists**

League of American Bicyclists



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Common Roadway and Traffic Conditions that Affect Bicyclists

- Effective travel width for bicyclists
- On-street parking encroachments
- Volume of motor vehicles
- Speed of traffic
- Proportion of heavy vehicles
- Pavement surface condition

Bicycle Level of Service Categories

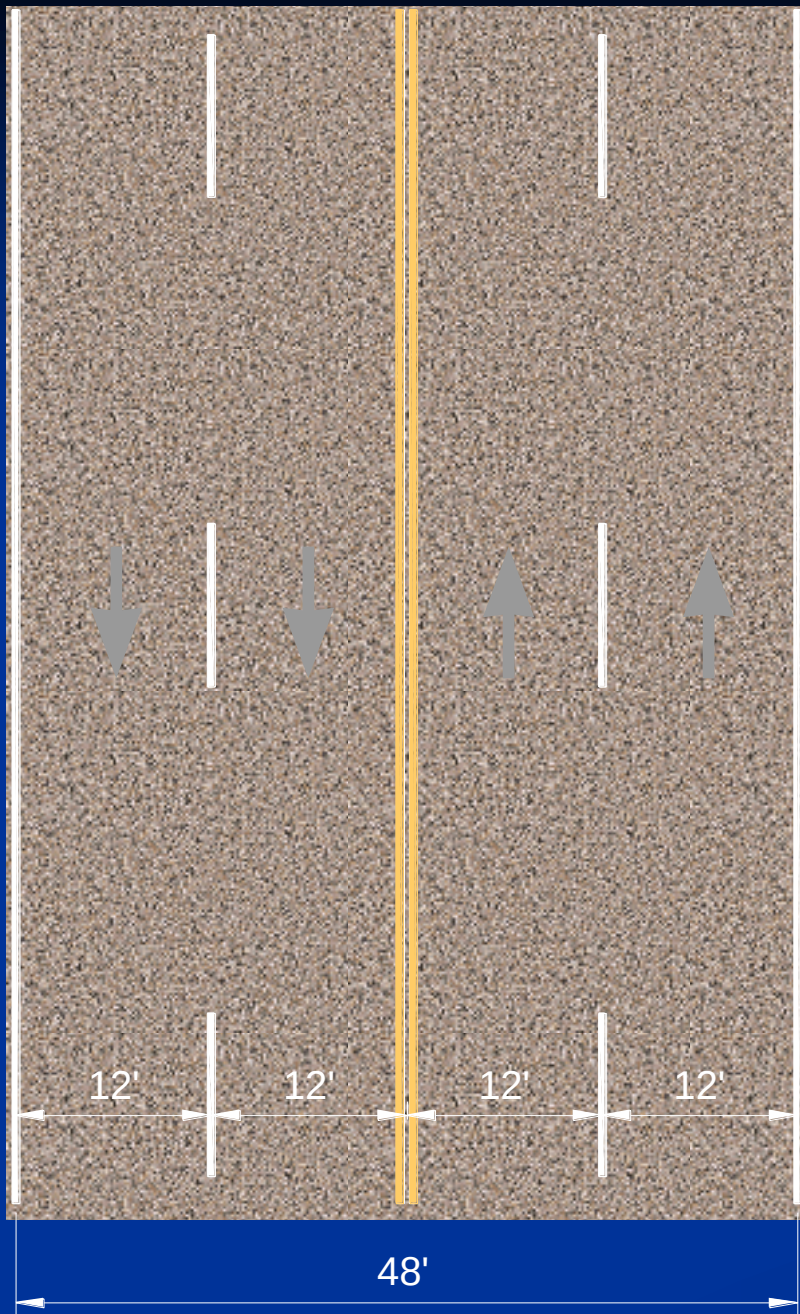
<u>Level-of-Service</u>	<u>BLOS Score</u>
A	≤ 1.5
B	> 1.5 and ≤ 2.5
C	> 2.5 and ≤ 3.5
D	> 3.5 and ≤ 4.5
E	> 4.5 and ≤ 5.5
F	> 5.5

Bicycle LOS A



Bicycle LOS E - F





Bicycle LOS - Before

Four-lane Road Average Daily

Traffic Volume = 13,500 vpd

Pavement Condition = Good

Lane Widths = 12 feet wide

Speed = 30 mph

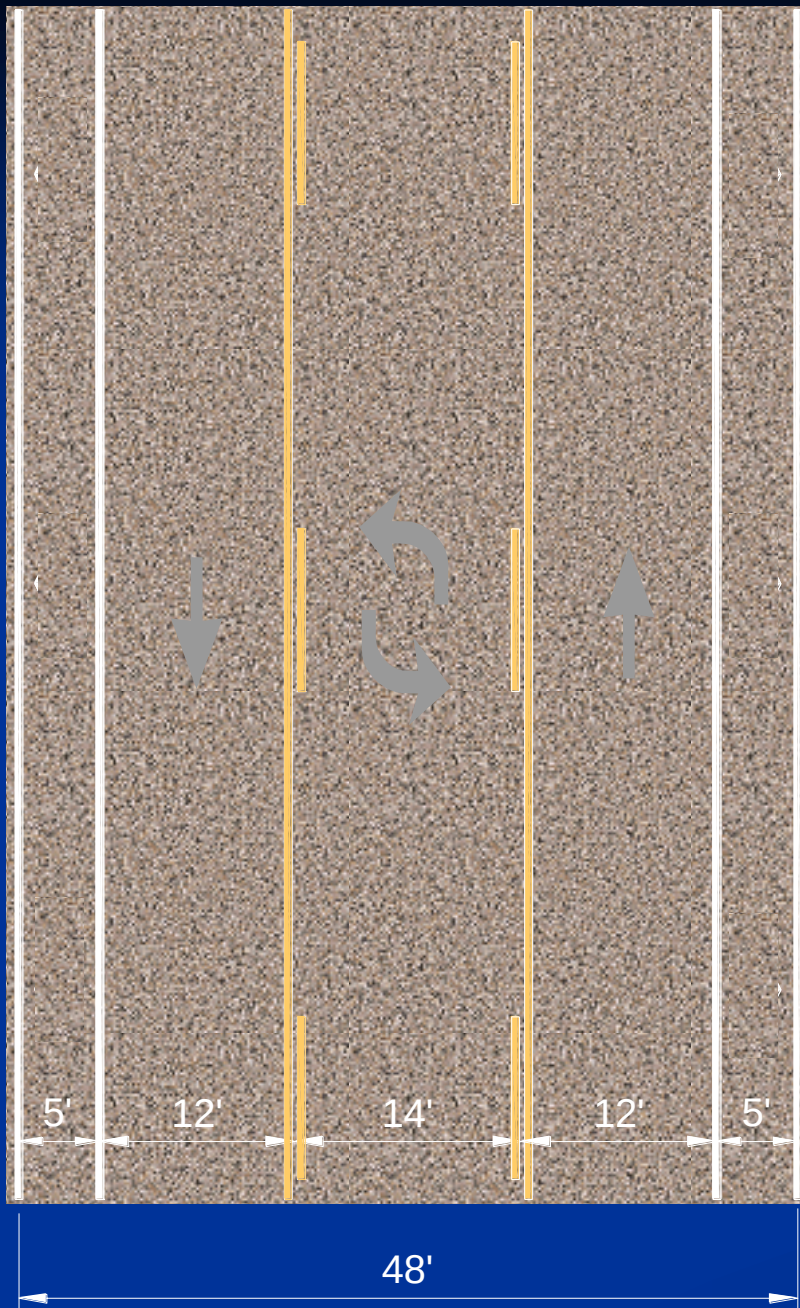
BLOS Evaluation:

LOS score

Category

3.58

D



Bicycle LOS - After

Two-lane Road with Center

Turn Lane Average Daily

Traffic Volume = 13,500 vpd

Pavement Condition = Good

Lane Widths = 12 feet, plus

5 foot bike lanes

Speed = 30 mph

BLOS Evaluation:

LOS score

Category

2.07

B

Bicycle Level of Service Model

$$\text{Bicycle LOS} = a_1 \ln(\text{Vol}_{15}/L) + a_2 \text{SP}_t (1 + 10.38 \text{HV})^2 + a_3 (1/\text{PC}_5)^2 - a_4 (W_e)^2 + C$$

Vol_{15} = volume of directional traffic in 15 minutes time period

L = total number of *through* lanes

SP_t = effective speed limit (see below)

$$\text{SP}_t = 1.12 \ln(\text{SP}_p - 20) + 0.81$$

SP_p = Posted speed limit

HV = percentage of heavy vehicles

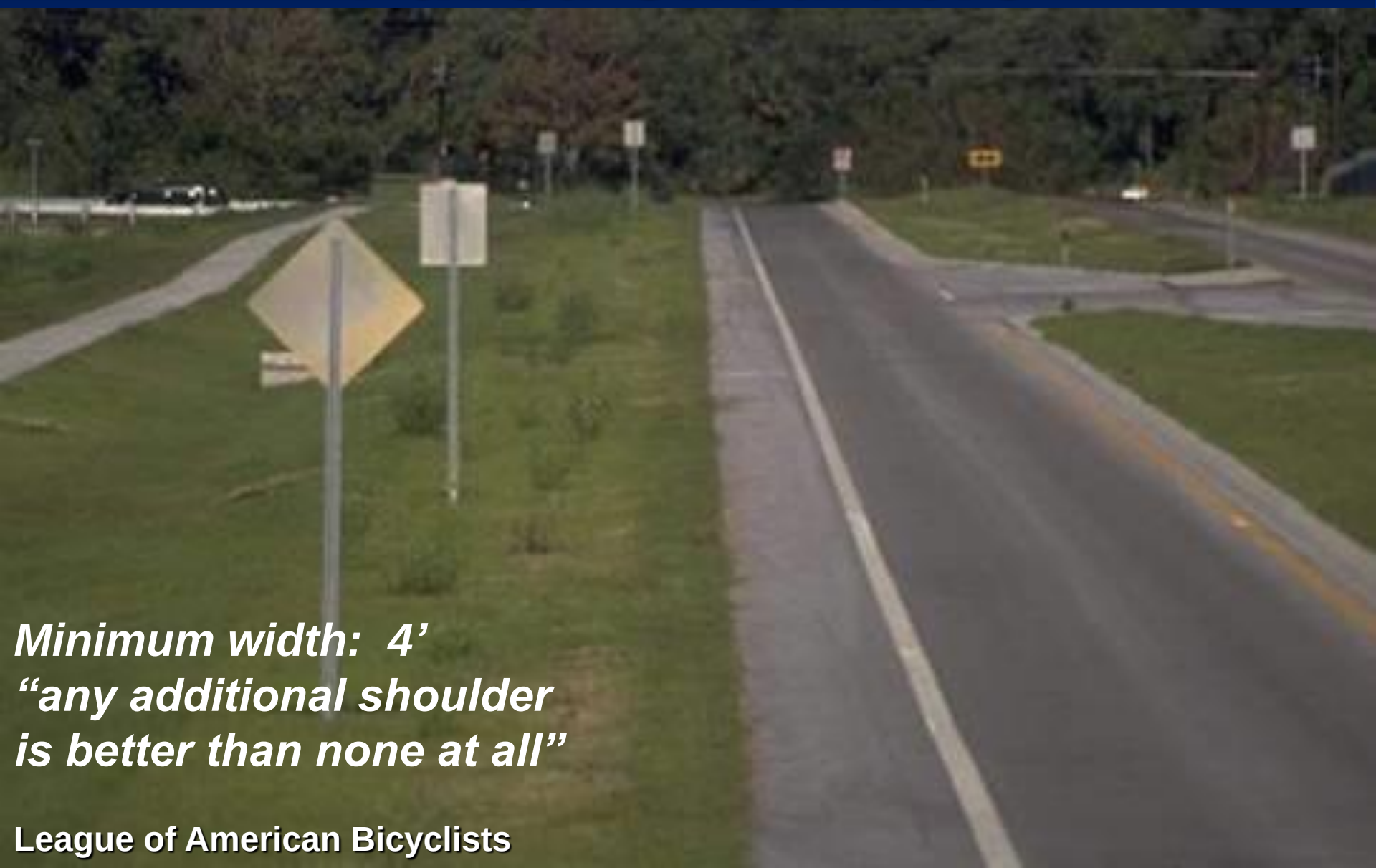
PC_5 = FHWA's five point surface condition rating

W_e = Average effective width of outside through lane

For more info on suitability models, visit bicyclinginfo.org

Online Calculator: <http://www.bikelib.org/roads/blos/losform.htm>

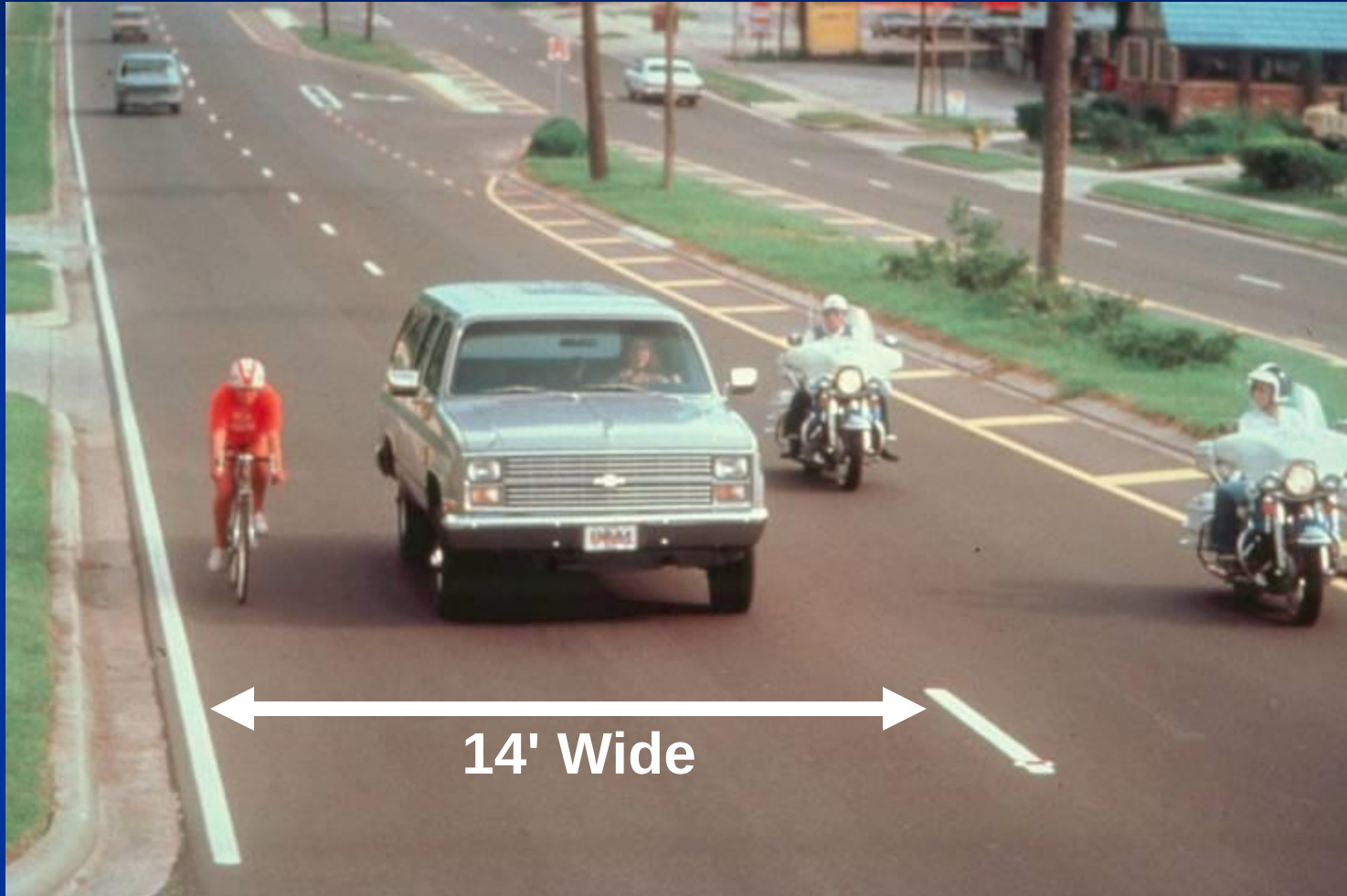
Paved Shoulders



*Minimum width: 4’
“any additional shoulder
is better than none at all”*

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Wide Curb Lanes



Bike Lane Design





**Bike lanes: Min. 5' wide adjacent to a curb or parking
Min. 4' wide on an open section**

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OLD R3-17's

The BIKE LANE (R3-17) sign **shall** be used only in conjunction with marked bicycle lanes as described in Chapter 9C, and shall be placed at periodic intervals.

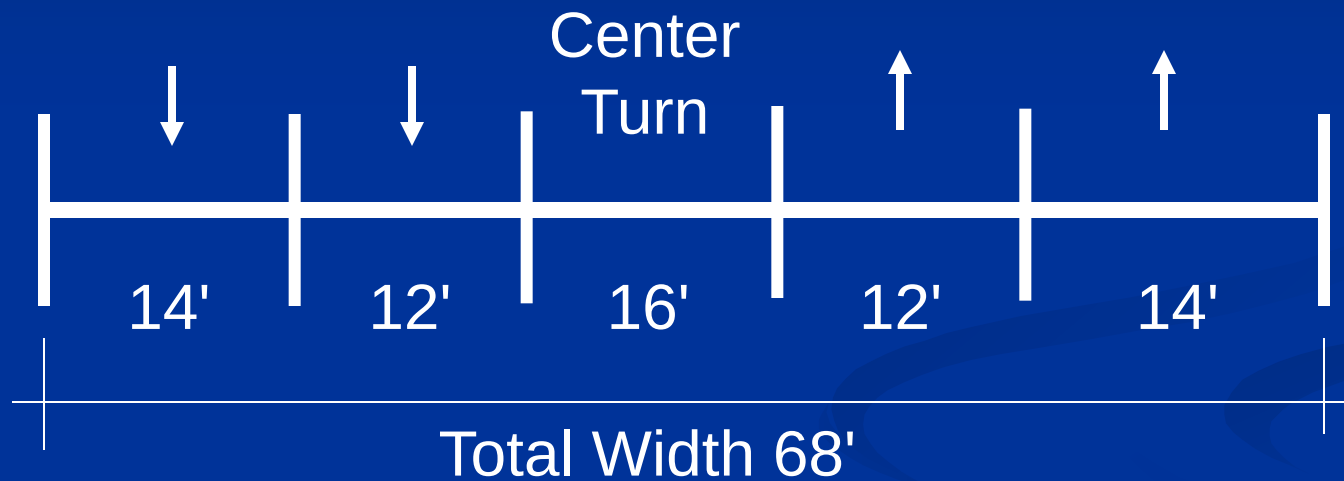


NEW R3-17 (2003 MUTCD)

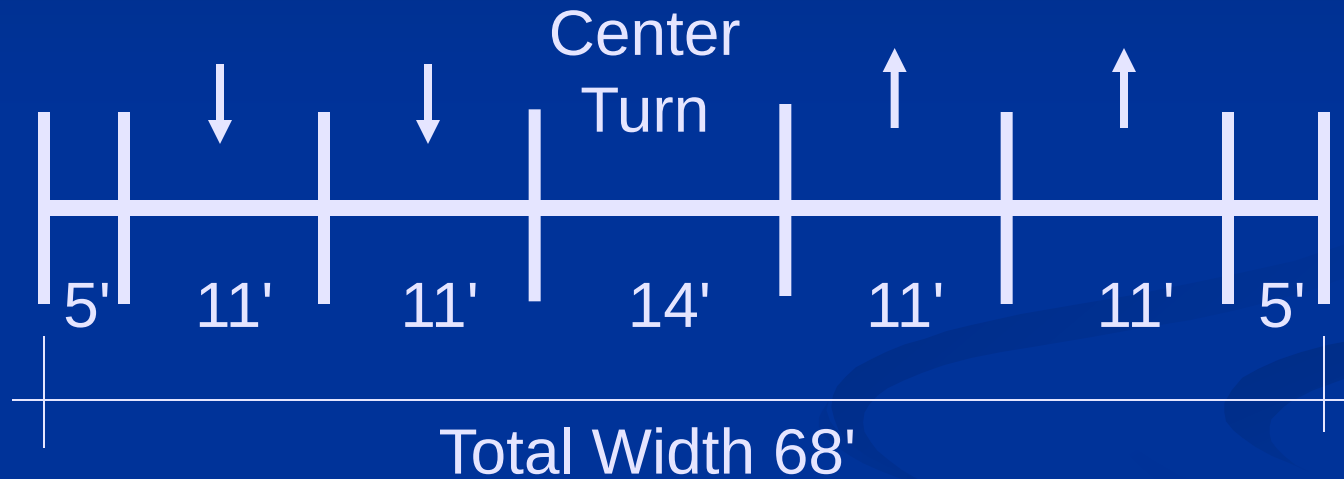
Restriping to Create Bike Lanes



Current Cross Section



Future Cross Section

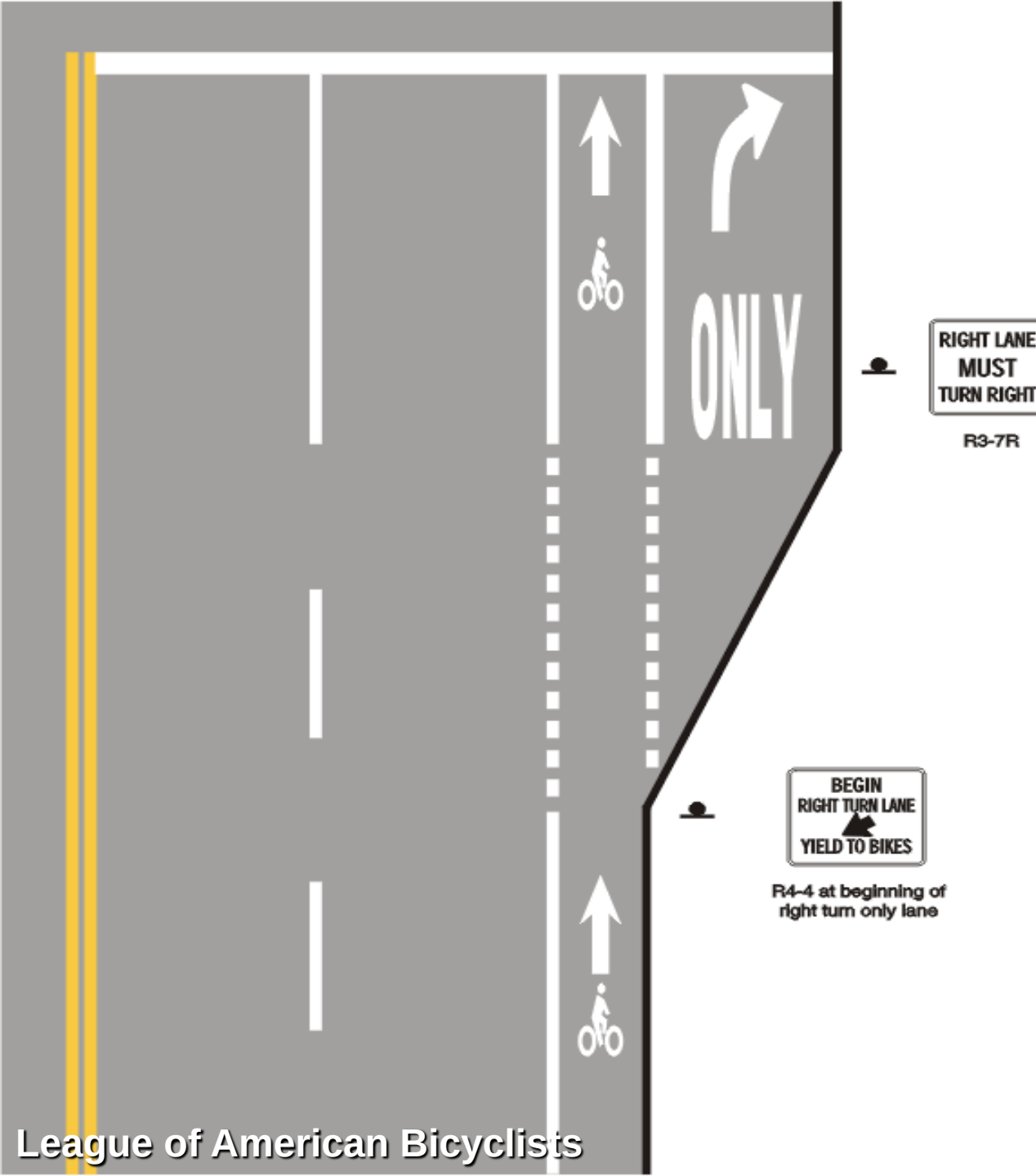


Bicycle Level of Service Comparison

			Lanes (L)		Traffic Vol.	Pct.	Post. Spd.	Width of Pavement			Occu. Park.	Pvmt. Cond.	Bicycle LOS	
Route Name	From	To	Th #	Con	(AADT)	(HV %)	(SPp) mph	(Wt) (ft)	(Wl) (ft)	(Wps) (ft)	(OSP) (%)	(PC ₅) (5..1)	Score (1...7)	Grade (A..F)
Market Street (VA 7)	US 15 Bypass	Catoctin Circle	4	D	9100	4	25	14.0	0.0	0	0	4.0	3.42	C
Potential Future Condition (5' bike lanes)			4	D	9100	4	25	16.0	5.0	0	0	4.0	2.20	B

	Traffic Vol.	Pct.	Post. Spd.	Width of Pavement			Occu. Park.	Pvmt. Cond.	Bicycle LOS	
n	(AADT)	(HV %)	(SPp) mph	(Wt) (ft)	(Wl) (ft)	(Wps) (ft)	(OSP) (%)	(PC ₅) (5..1)	Score (1...7)	Grade (A..F)
	9100	4	25	14.0	0.0	0	0	4.0	3.42	C
	9100	4	25	16.0	5.0	0	0	4.0	2.20	B

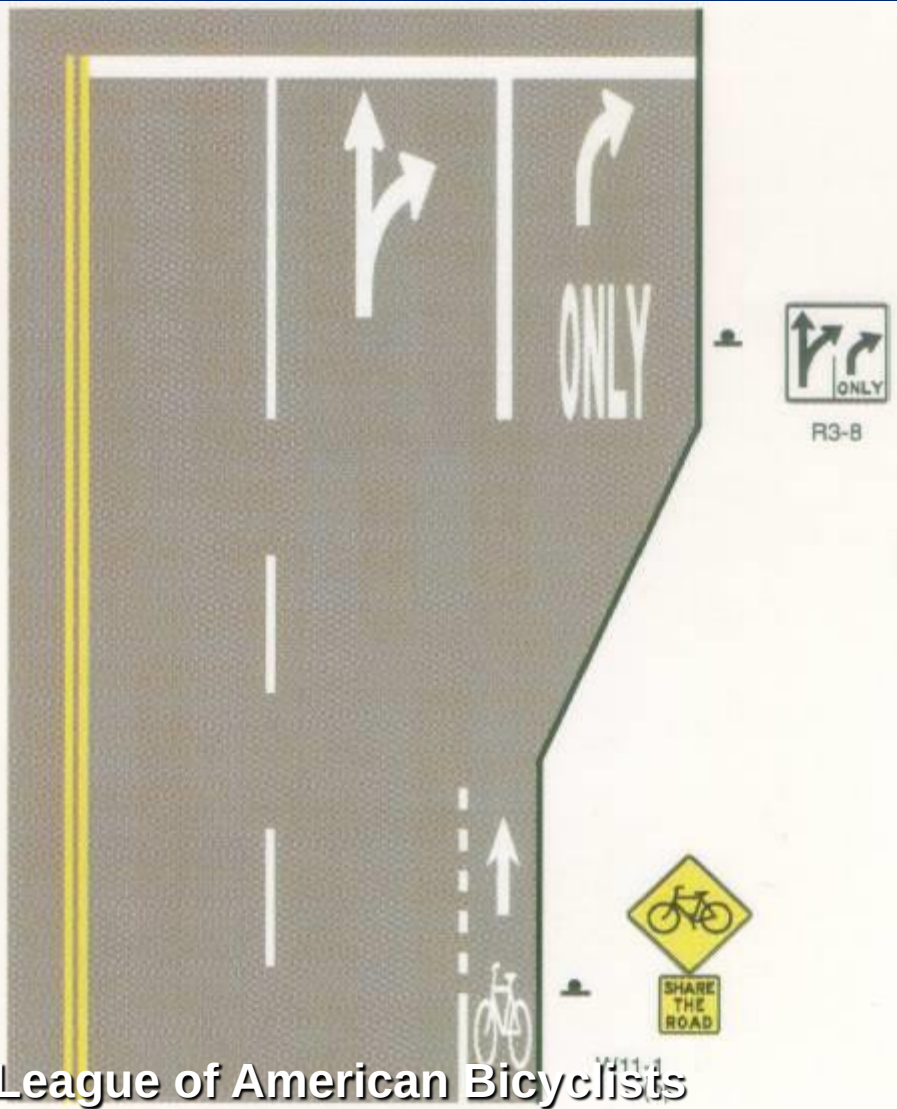




MUTCD, Figure 9C-3



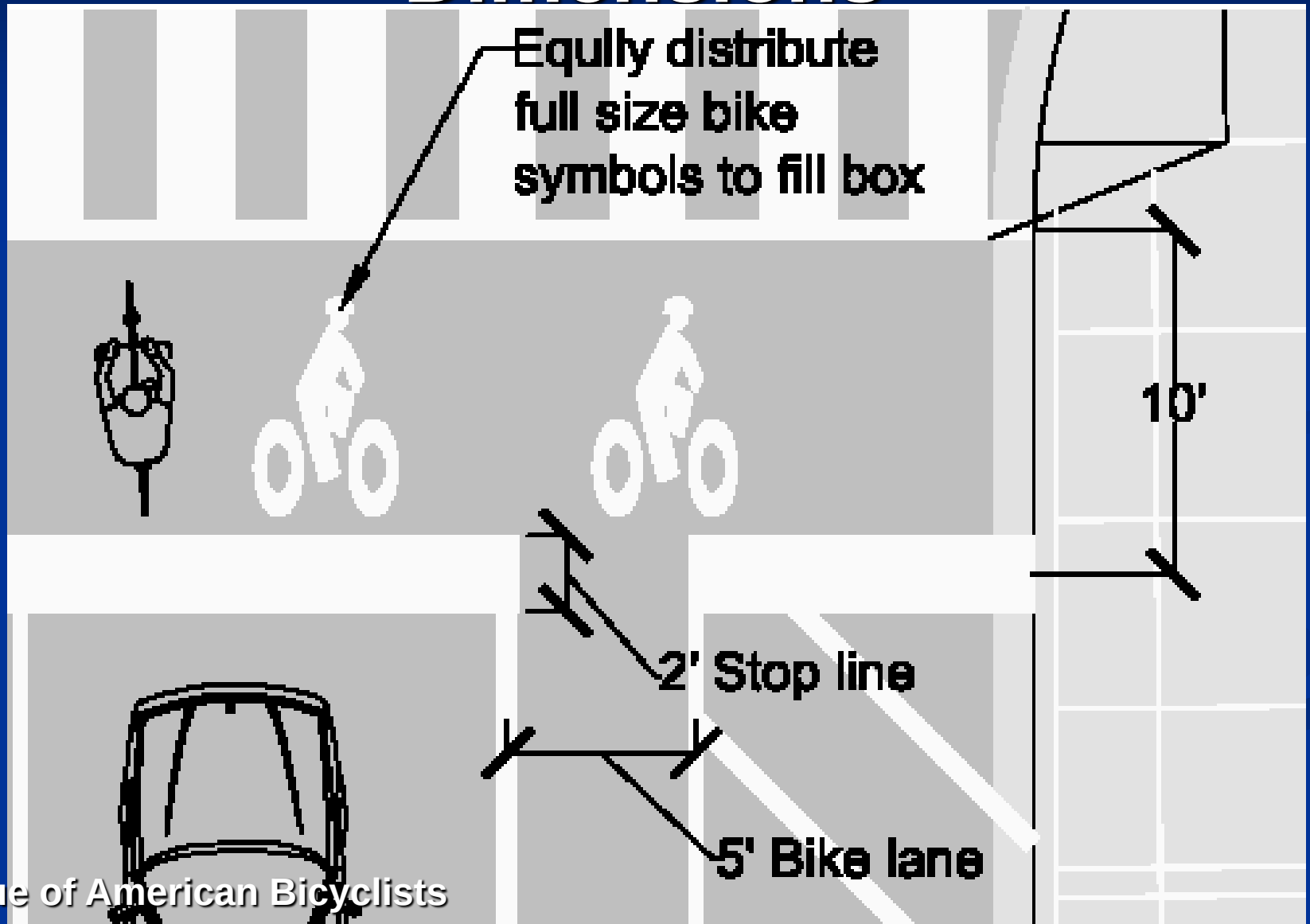
What lane should the bicyclist who is going straight use?







Advanced Bike Box - Dimensions



Accommodating Bicycles at Merge Areas









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Signalized Intersections



Bicycle Detection



R10-22

Signal Minimum Green Time

$$g + y + r_{\text{clear}} \geq t_{\text{cross}} = t_r + \frac{v}{2a} + \frac{w + l}{v}$$

Provides a bicyclist with adequate time to react, accelerate and cross the intersection, for actuated signals when the green time is short (i.e. during periods of low traffic flow).



Signal Total Clearance Interval

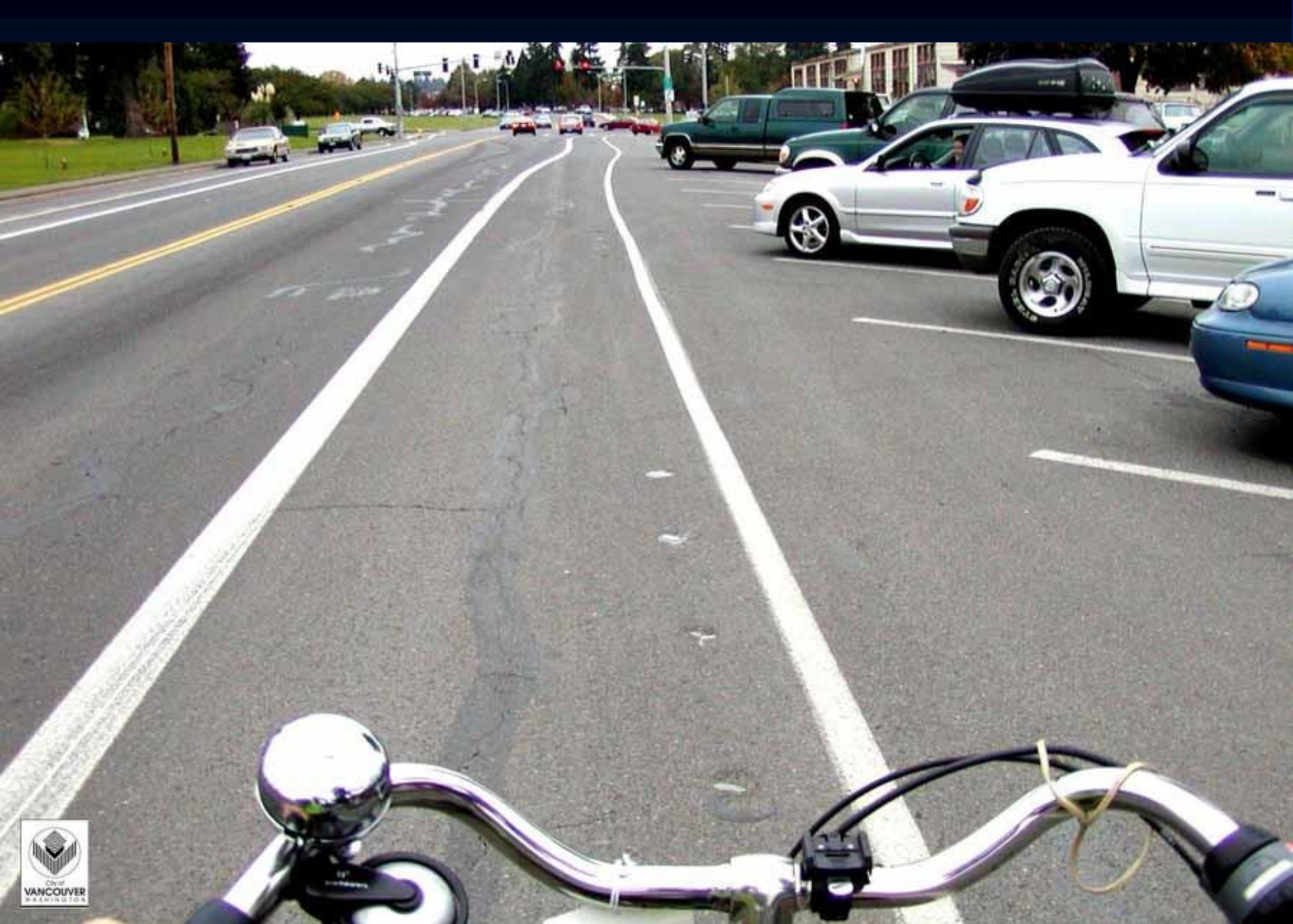
$$y + r_{\text{clear}} \geq t_r + \frac{v}{2b} + \frac{w + l}{v}$$



Angled Parking







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League of American Bicyclists



Shared-Use Paths ("Sidepaths")





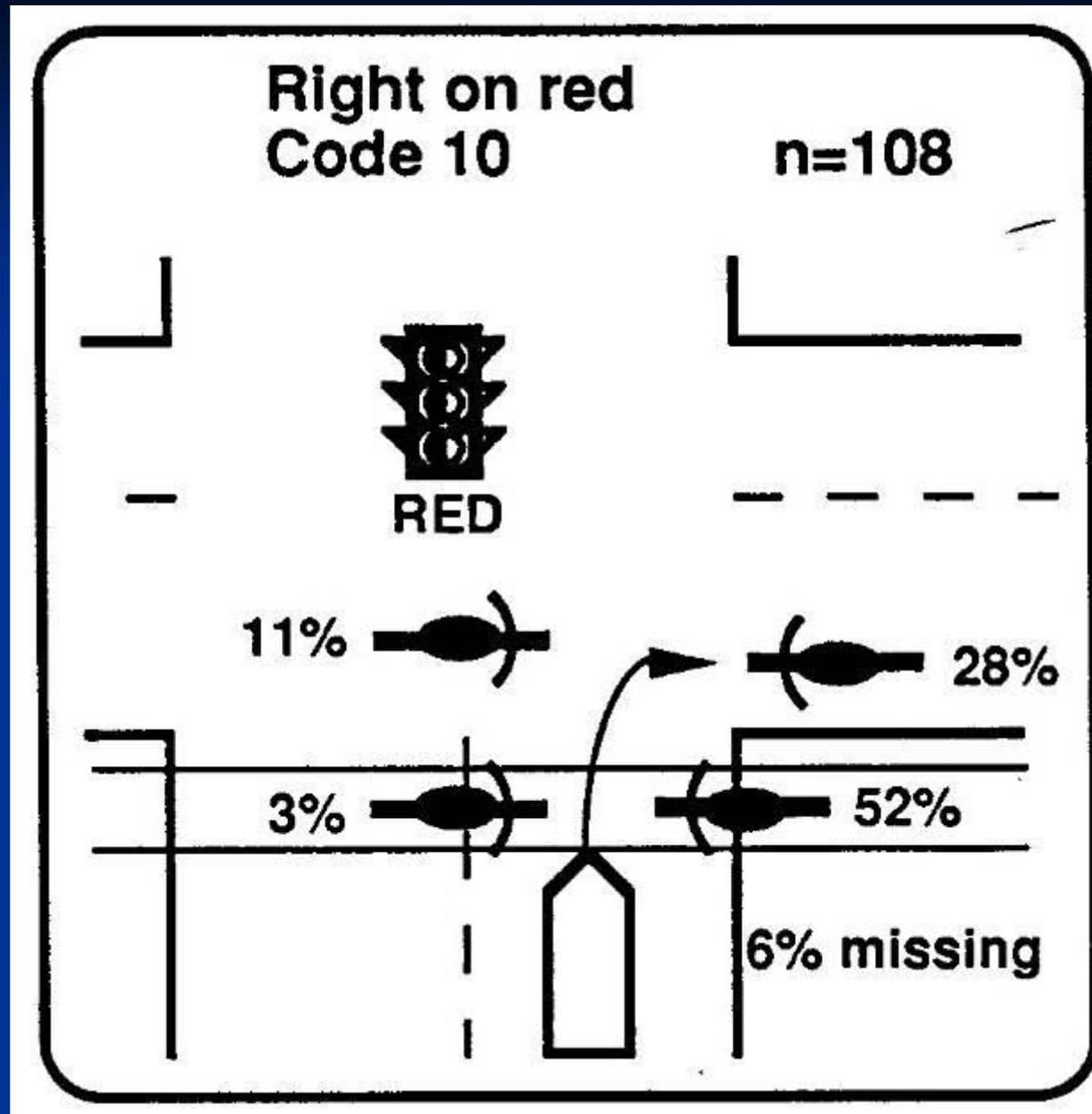
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**Over half (58%) of all bicycle
crashes occur at intersections**

-Pedestrian and Bicycle Crash Types of the Early 1990s, FHWA 1996

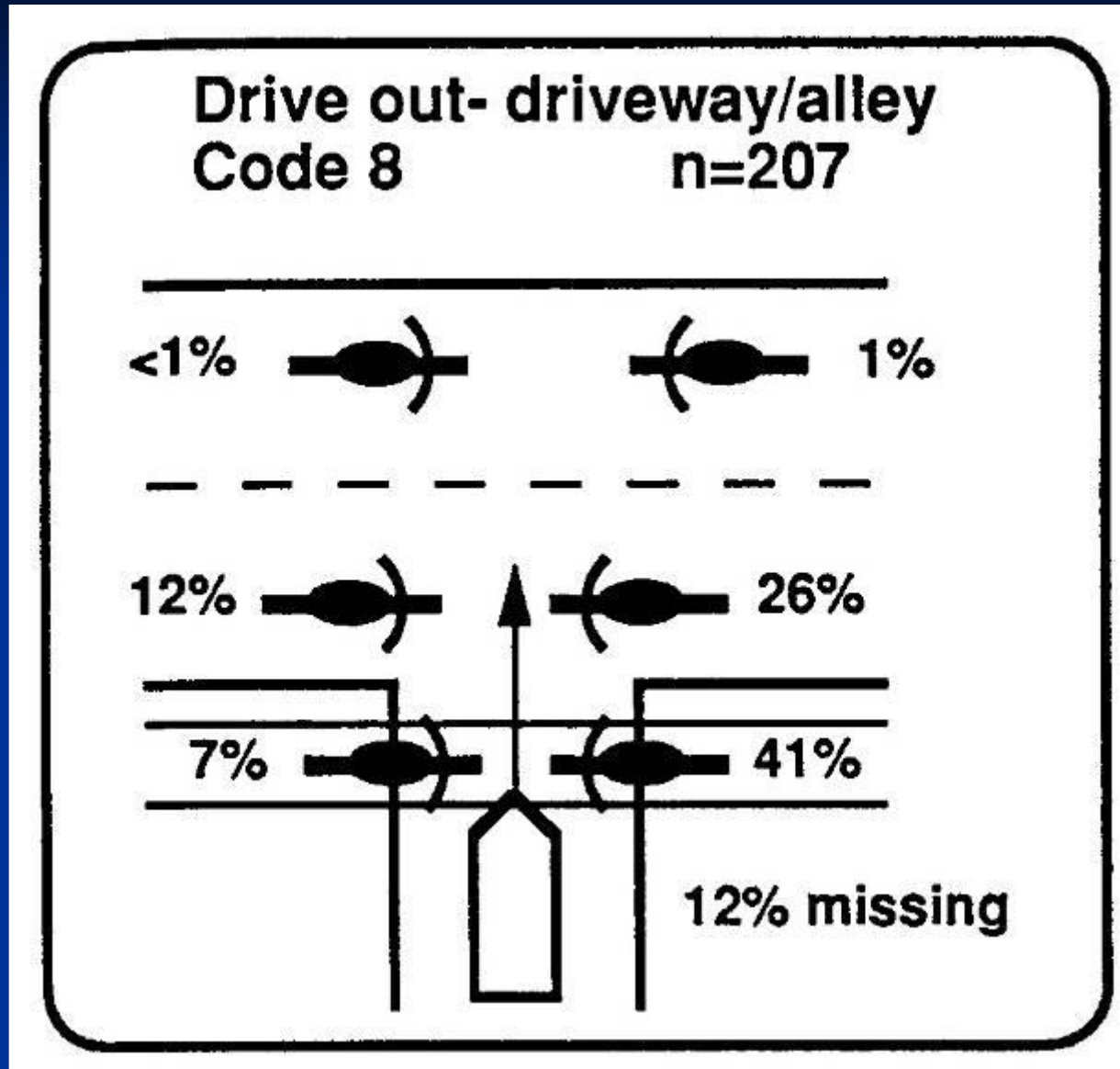
Motorist failed to yield crashes (Right on red light)

*-Pedestrian and Bicycle
Crash Types of the Early
1990s, FHWA 1996*



Motorist failed to yield crashes (Driveway or Alley)

*-Pedestrian and Bicycle
Crash Types of the Early
1990s, FHWA 1996*











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Facilitating movements between bike lanes and a trail

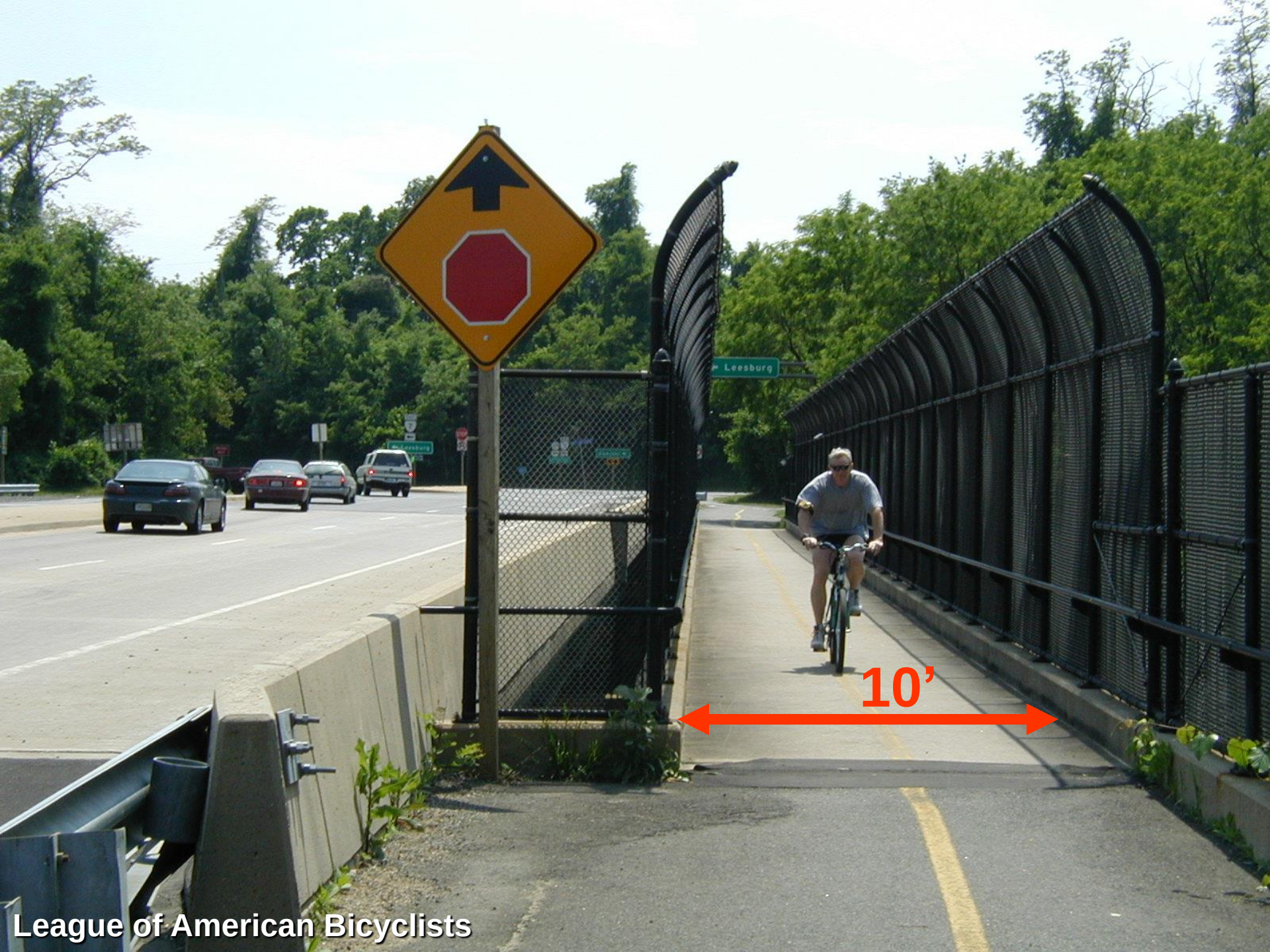


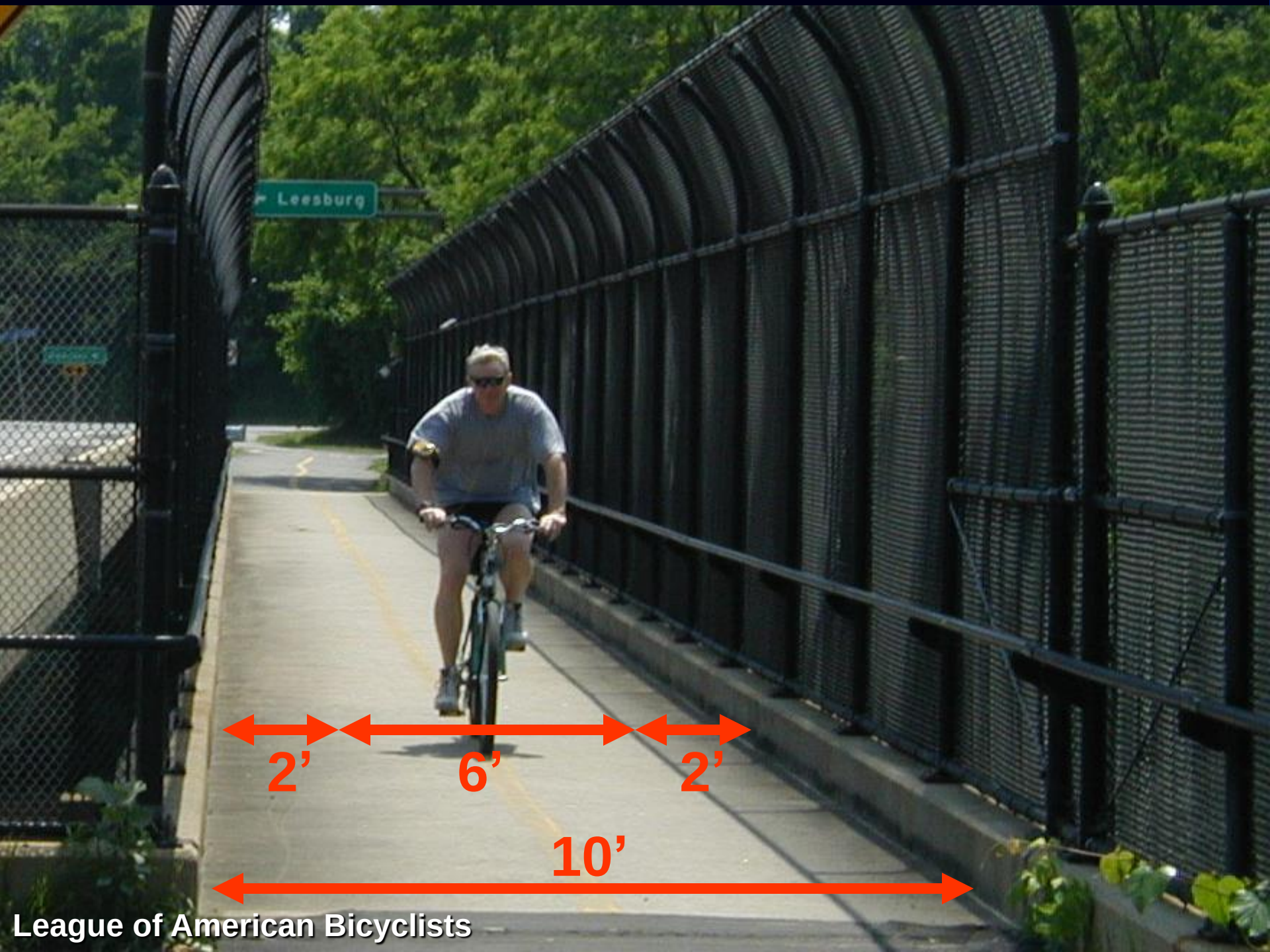




Bridge Design







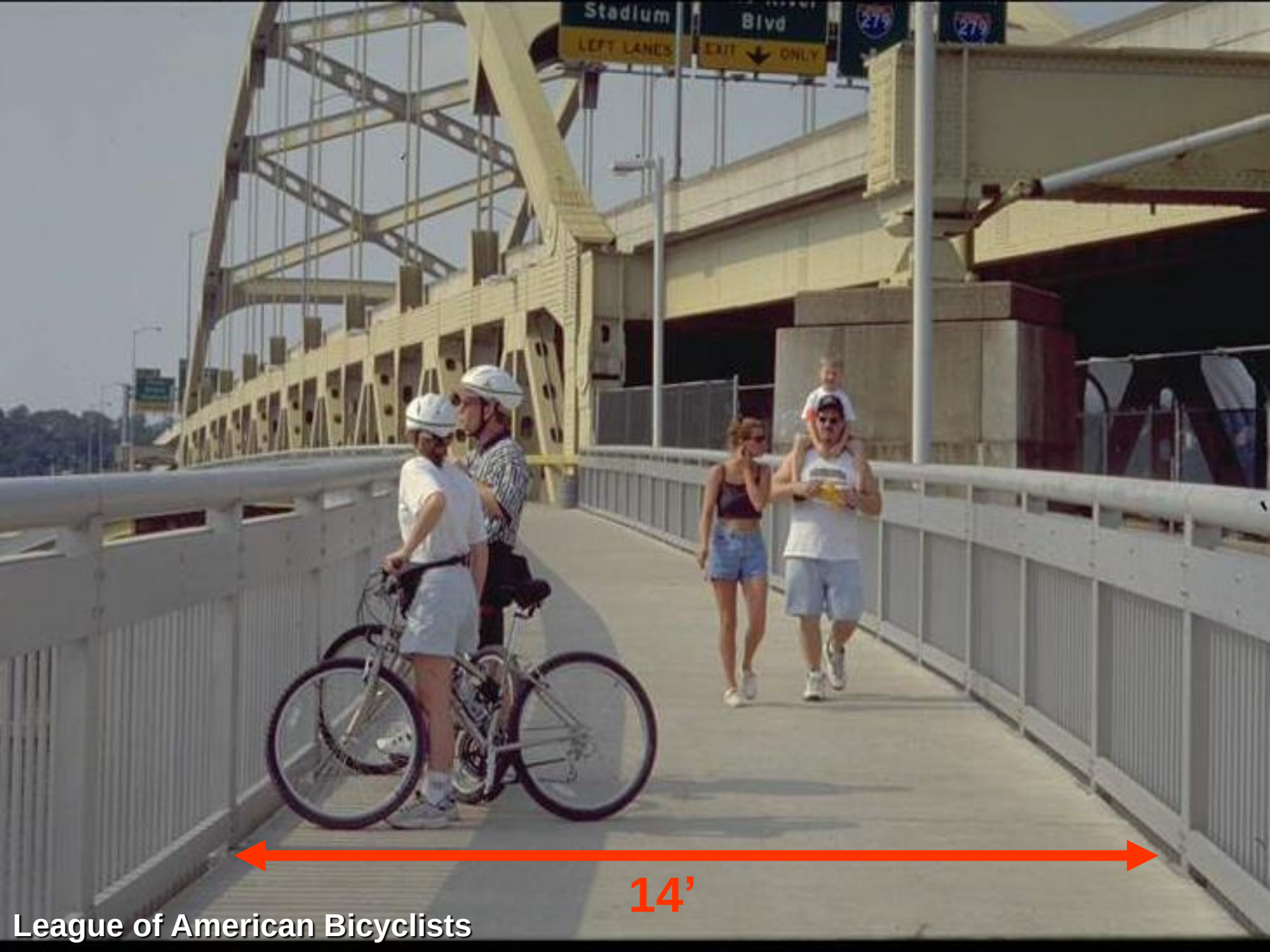
Leesburg

2'

6'

2'

10'

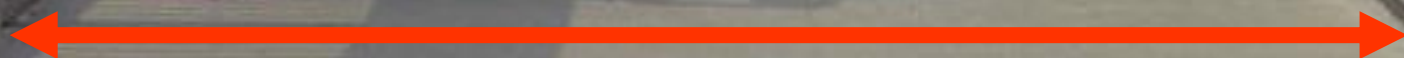


Stadium
LEFT LANES

Blvd
EXIT ONLY

279

279



14'

League of American Bicyclists

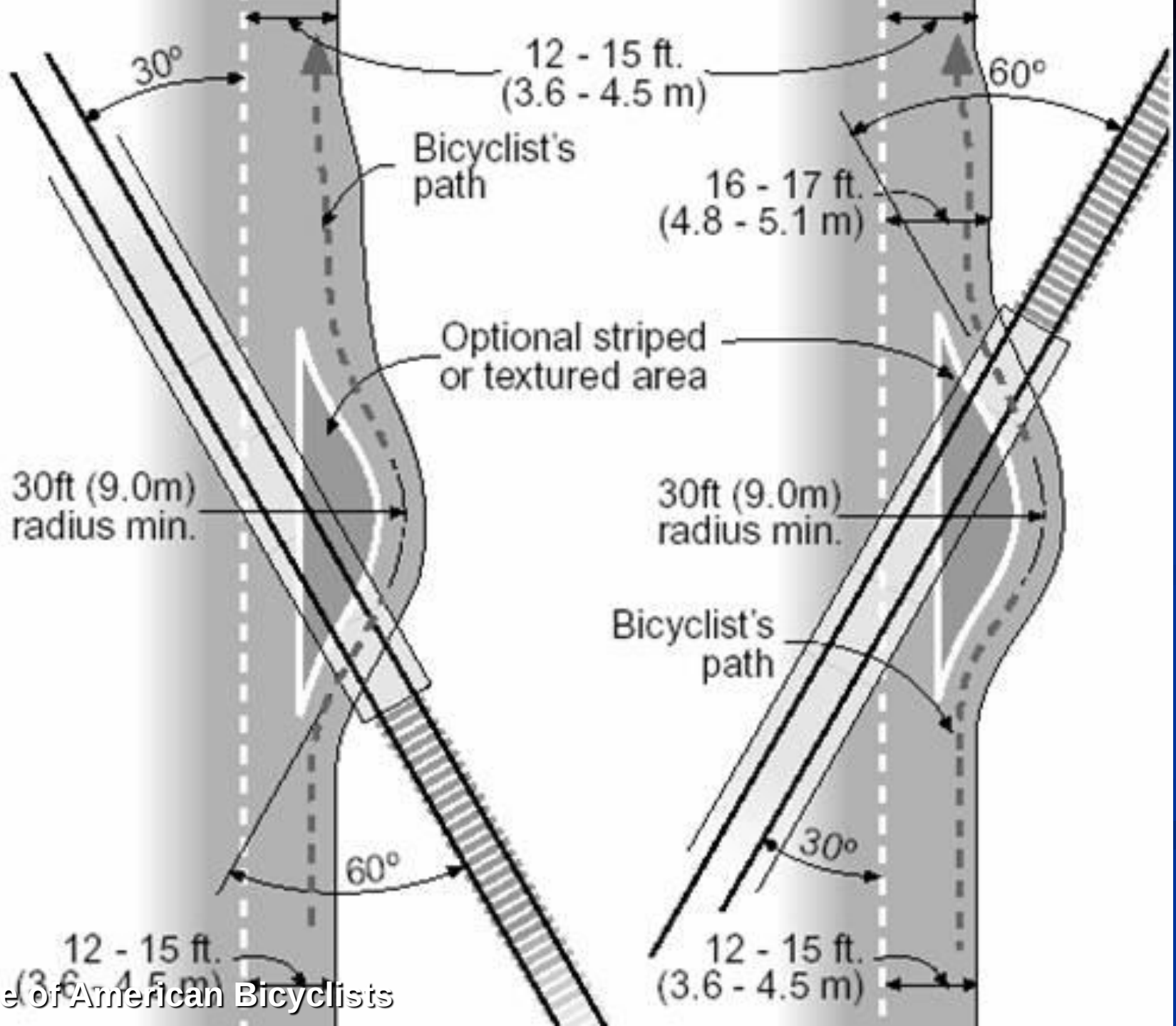
Shared Lane Markings



Skewed Railroad Crossings



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Road Maintenance

- Surface sweeping and repair
- Utility cuts
 - Keep sidewalks, shoulder and bike lanes free from ridges
- Pavement overlays - opportunity to restripe with bike lanes
- Concrete sidewalks – root control

Need more info?

- Join the Association of Pedestrian and Bicycle Professionals (www.apbp.org)
- Go to www.bicyclinginfo.org or www.walkinginfo.org
- Get copies of AASHTO's Pedestrian and Bicycle Guides, keep them handy
- Familiarize yourself with the new provisions for pedestrians and bicyclists in the latest edition of the MUTCD
- Visit www.completestreets.org