FHWA's Achieving Multimodal Networks: Applying Design Flexibility and Reducing Conflicts

2016 ITE Mid-Colonial District Annual Conference

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Goal of Resource

Interconnected pedestrian and bicycle infrastructure makes ***walking and bicycling a viable transportation choice*** for everyone and this contributes to the health, equity, and quality of life of our communities.

DOT Policy Statement

Policy Statement on Bicycle and Pedestrian Accommodation

The DOT **policy is to incorporate safe and convenient walking and bicycling facilities into transportation projects**. Every transportation agency, including DOT, has the responsibility to improve conditions and opportunities for walking and bicycling and to integrate walking and bicycling into their transportation systems. Because of the numerous individual and community benefits that walking and bicycling provide — including health, safety, environmental, transportation, and quality of life — transportation agencies are encouraged to **go beyond minimum standards to provide safe and convenient facilities** for these modes.

Objectives

Equip planners, designers, and policy makers with information, so that:

1. walking is a viable transportation choice for everyone, and

2. bicycling is a viable transportation choice for all ages and abilities.

Address *common concerns and perceived barriers*

Direct planners and designers to *existing national guidelines*

Context

U.S. Department of Transportation
Federal Highway Administration

Memorandum

SENT BY ELECTRONIC MAIL

Subject: **GUIDANCE:** Bicycle and Pedestrian Facility Design Flexibility Date: August 20, 2013

From: Gloria M. Shepherd
Associate Administrator for Planning, Environment and Realty

In Reply Refer To:
HEPH-10

Walter C. (Butch) Waidelich, Jr.
Associate Administrator for Infrastructure

Jeffrey A. Lindley
Associate Administrator for Operations

Tony T. Furst
Associate Administrator for Safety

To: Division Administrators
cc: Directors of Field Services

This memorandum expresses the Federal Highway Administration's (FHWA) support for taking a flexible approach to bicycle and pedestrian facility design. The American Association of State Highway and Transportation Officials (AASHTO) bicycle and pedestrian design guides are the primary national resources for planning, designing, and operating bicycle and pedestrian facilities. The National Association of City Transportation Officials (NACTO) *Urban Bikeway Design Guide* and the Institute of Transportation Engineers (ITE) *Designing Urban Walkable Thoroughfares* guide builds upon the flexibilities provided in the AASHTO guides, which can help communities plan and design safe and convenient facilities for pedestrian and bicyclists. FHWA supports the use of these resources to further develop nonmotorized transportation networks, particularly in urban areas.

Design Flexibility

These three primary resources…

- MUTCD
- AASHTO Green Book
- Highway Capacity Manual

ALL state the need for flexibility and encourage engineering judgement.

Flexibility in the Green Book

*"Good highway design involves **balancing** safety, mobility, and preservation of scenic, aesthetic, historic, cultural, and environmental resources. Sufficient **flexibility** is permitted to encourage independent designs tailored to particular situations."*

-AASHTO Green Book 2011, p. xii

Engineering Judgment in the MUTCD

"while this Manual provides Standards, Guidance, and Options for design and applications of traffic control devices, ***this Manual should not be considered a substitute for engineering judgment.*** *Engineering judgment should be exercised in the selection and application of traffic control devices, as well as in the location and design of roads and streets that the devices complement.*

-MUTCD, p. 4

Engineering Judgement in the HCM

*"As always, **engineering judgment should be applied** to any recommendations resulting from HCM (or alternative tool) analyses."*

-HCM, p. 8.5

Liability & Risk

- Liability and Risk
- Flexible Design Approach:
  - (1) Engineering Judgement,
  - (2) Documentation; and
  - (3) Experimentation

Flexible Design Approach

- Engineering Judgement
- Documentation

  "With reliance on complete and sound documentation, tort liability concerns need not be an impediment to achieving good road design."

  - *The Maine Department of Transportation's Highway Design Guide, Chapter 15: Flexible Design Practices*

- Experimentation

  Liability concerns should not limit innovations, experimentation and versatile applications of existing design treatments

Context: Reducing Conflicts

Guiding Principles

1. Safety
2. Accommodation & Comfort
3. Coherence & Predictability
4. Context-Sensitivity
5. Experimentation

Design Topics

PART 1: APPLYING DESIGN FLEXIBILITY

- DESIGN CRITERIA AND LANE WIDTH
- INTERSECTION GEOMETRY
- TRAFFIC CALMING AND DESIGN SPEED
- TRANSITIONS TO MAIN STREETS
- ROAD DIETS AND TRAFFIC ANALYSIS
- ENHANCED CROSSING TREATMENTS
- SIGNALIZED INTERSECTIONS
- PAVED SHOULDERS
- SEPARATED BIKE LANES
- BUS STOPS
- BRIDGE DESIGN
- SLOW STREETS

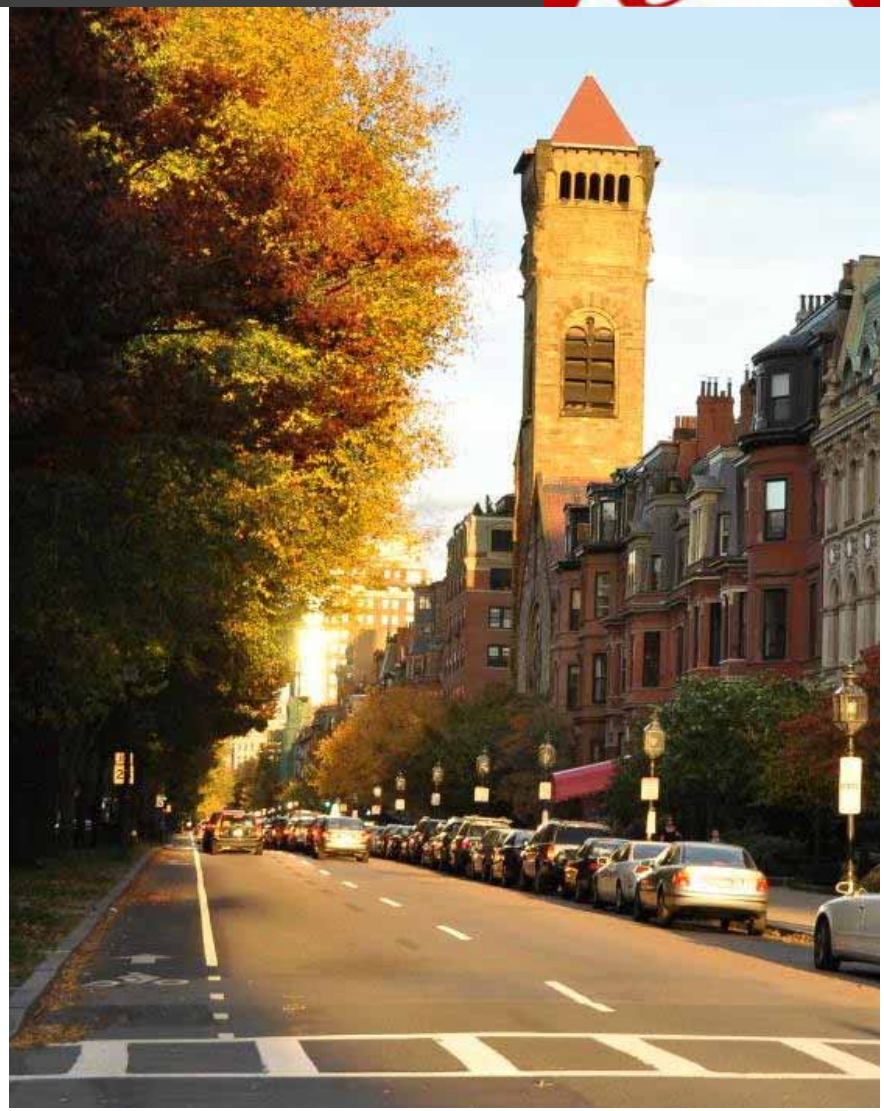
PART 2: REDUCING CONFLICTS

- NETWORK CONNECTIVITY
- SCHOOL ACCESS
- MULTIMODAL ACCESS TO EXISTING TRANSIT STATIONS
- MULTIMODAL ACCESS TO NEW TRANSIT STATIONS
- TRANSIT CONFLICTS
- FREIGHT INTERACTION
- ACCESSIBILITY
- TURNING VEHICLES
- SEPARATED BIKE LANES AT INTERSECTIONS
- SHARED USE PATHS
- MIDBLOCK PATH INTERSECTIONS
- SHARED STREETS

Design Criteria

*"A **highway has wide-ranging effects in addition to providing traffic service** to users. It is essential that the highway be considered as an element of the total environment. The term 'environment,' as used here refers to the totality of humankind's surroundings: social, physical, natural, and synthetic."*

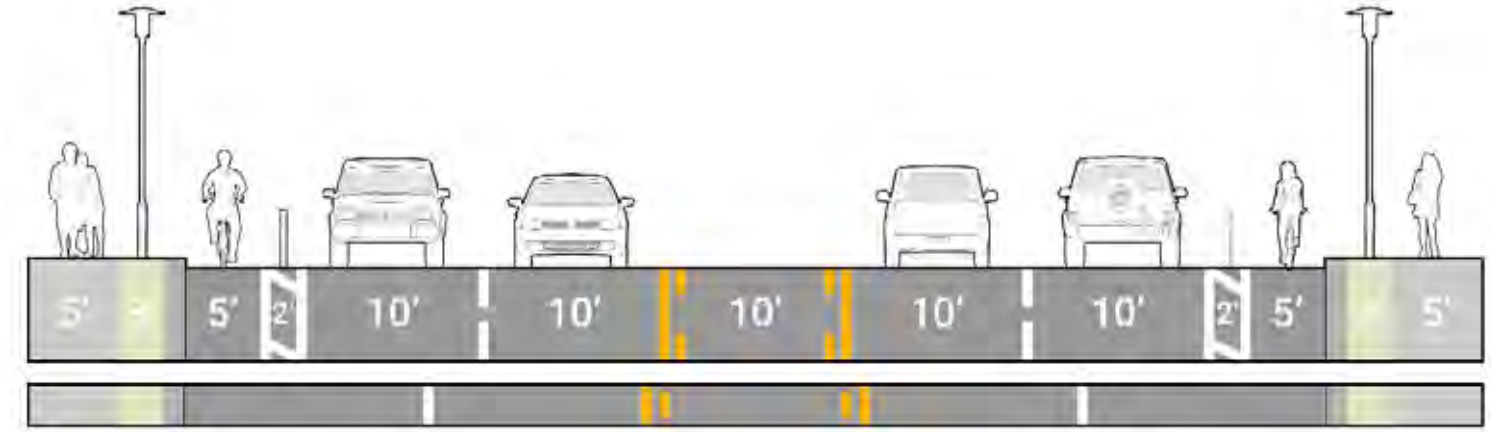
AASHTO Green Book 2011, p. 2-86



Lane Width

"Lane widths of 10 feet…have a positive impact on a streets safety without impacting traffic operations" - **NACTO Urban Streets Guide**

Conventional



Flexibility Enables Separated Bike Lane

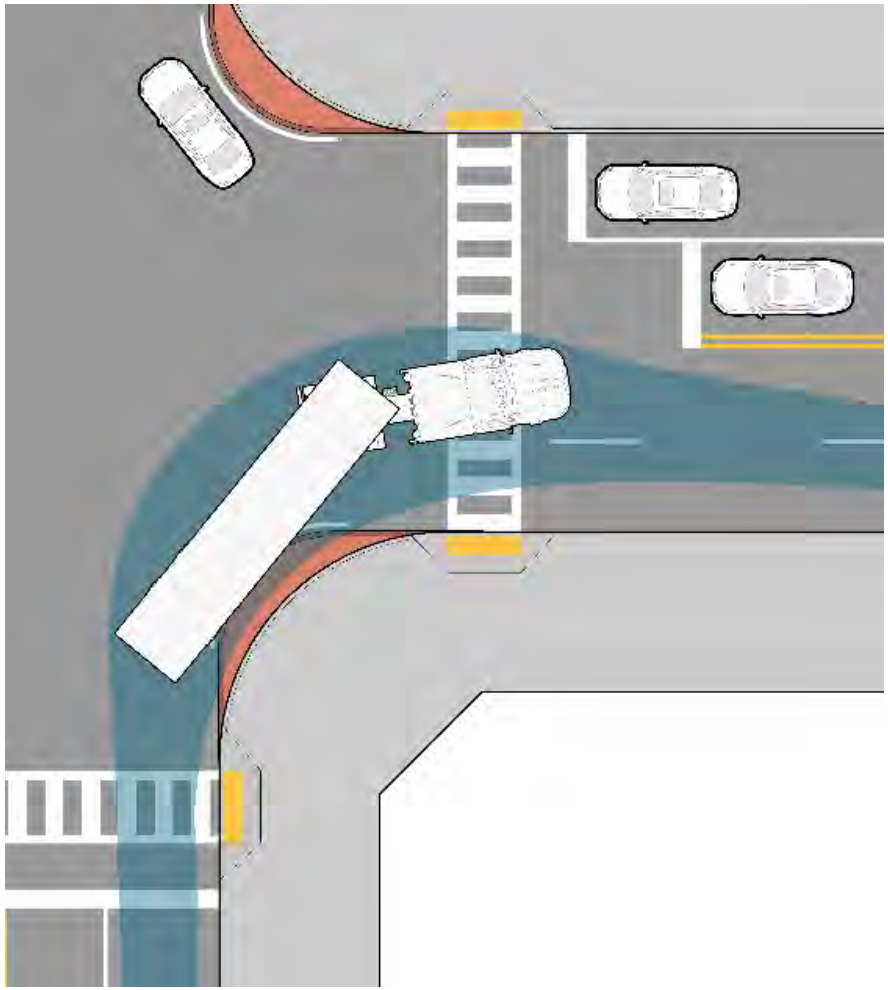
Conventional

Intersection Geometry

"If turning traffic is nearly all passenger vehicles, ***it may not be cost-effective or pedestrian friendly to design for large trucks.*** *However, the design should allow* ***for an occasional large truck to turn by swinging wide and encroaching on other traffic lanes*** *without disrupting traffic significantly."*

AASHTO Green Book 2011, p. 9-80

Intersection Geometry

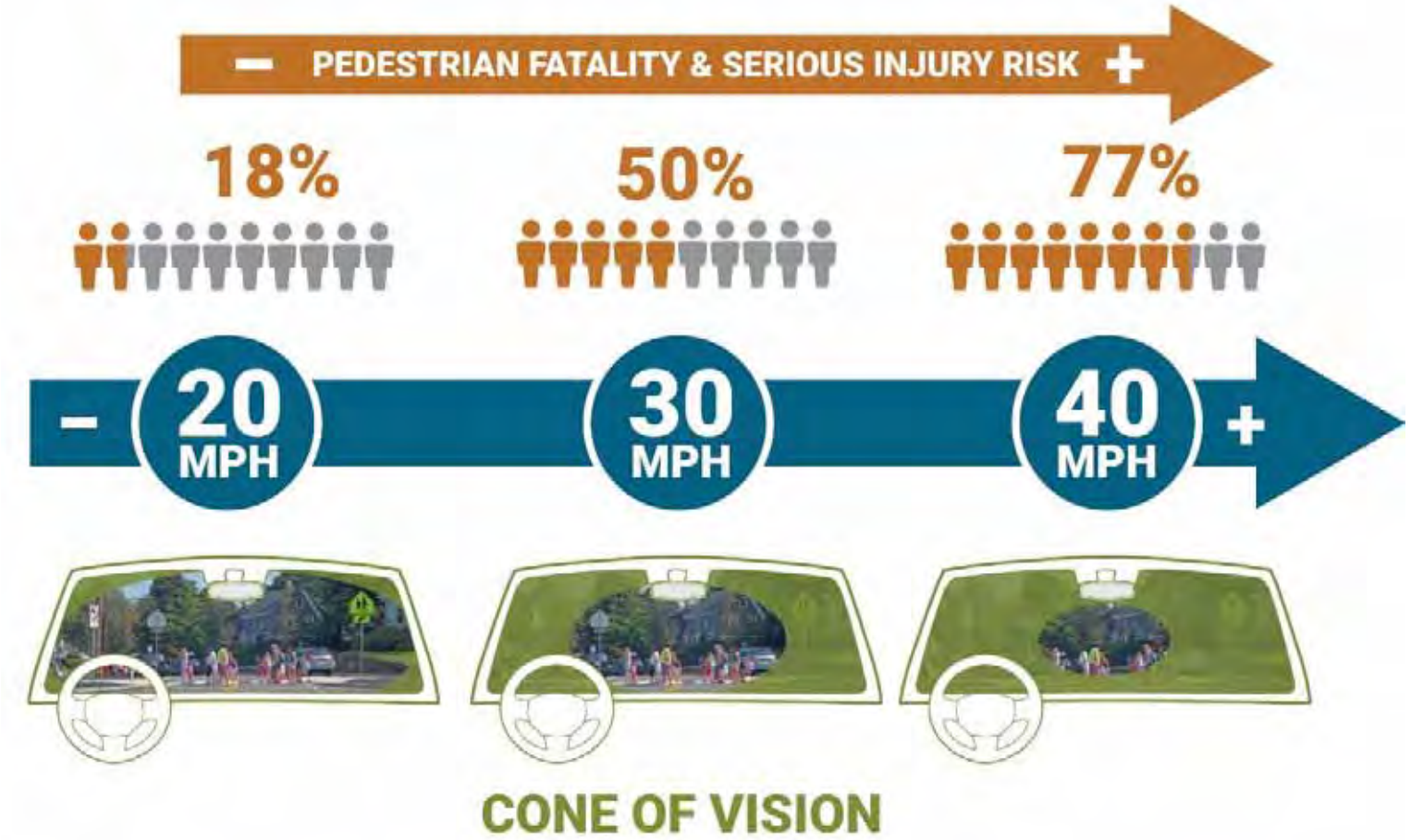


Design Speed

"In selection of design speed every effort should be made to attain a desired combination of safety, mobility, and efficiency within the constraints of environmental quality, economics, aesthetics, and social or political impacts"

AASHTO Green Book 2011, p. 2-54

Design Speed



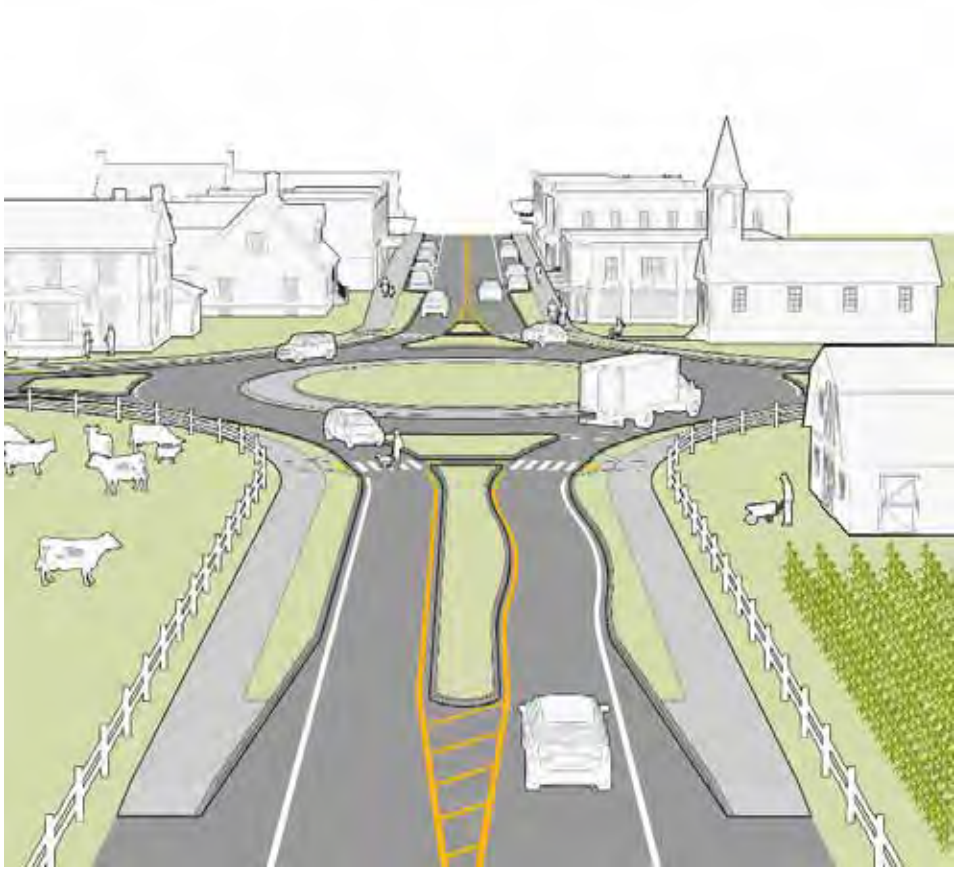
"The severity of pedestrian crashes, a significant concern in urban areas, is greatly increased as speeds increase."

AASHTO Flexibility Guide 2004, p. 19

Transition to Main Streets

"A roadway's formal classification as urban or rural may differ from actual site circumstances or prevailing conditions. An example includes a rural arterial route passing through a small town. The route may not necessarily be classified as urban, but there may be a significant length over which the surrounding land use, prevailing speeds, and transportation functions are more urban or suburban than rural."

AASHTO Flexibility Guide 2004, p. 12



Road Diets and Traffic Analysis

"Analysts and decision-makers should always be mindful that neither LOS [Level of Service] or any other single performance measure tells the full story of roadway performance."

TRB Highway Capacity Manual 2010, p. 8-11

"the existence of a LOS F condition does not, by itself, indicate that action must be taken to correct the condition"

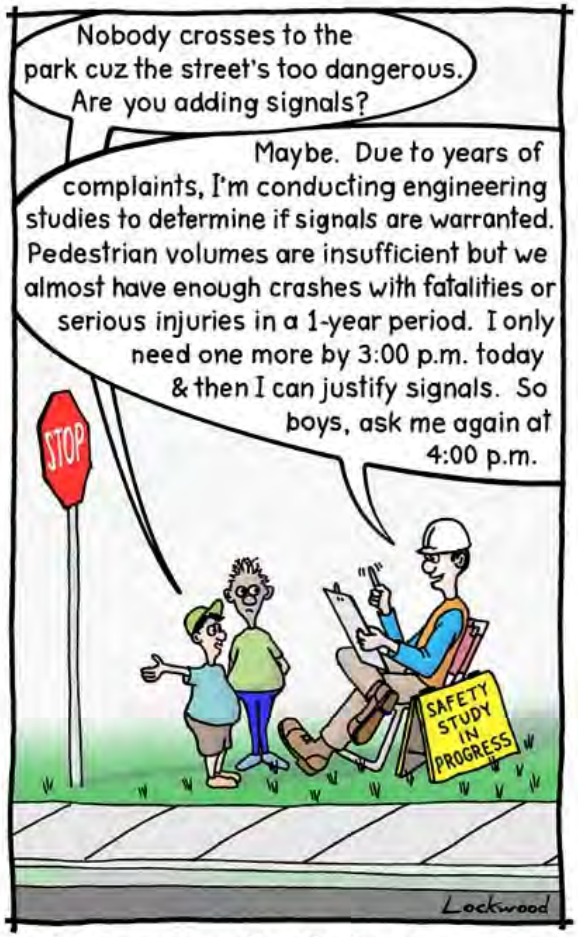
TRB Highway Capacity Manual, p. 8-5

Road Diets and Traffic Analysis

- Volume projections
  - "streets were built to accommodate a projected volume that never materialized" - AASHTO Bike Guide 2012, p. 4-30
  - consider changing transportation trends
  - be thoughtful with trip generation

Enhanced Crossing Treatments

- "Chicken or the egg" problem
- Traffic signal and beacon warrant study
  - Where "it is not possible to obtain a traffic count that would represent future traffic conditions, hourly volumes should be estimated" - **MUTCD**
  - Designers should "take into account both existing as well as projected crossing demand" **– NACTO Urban Street Design Guide**



Which comes first? A safe way to cross or lots of people crossing?

Enhanced Crossing Treatments

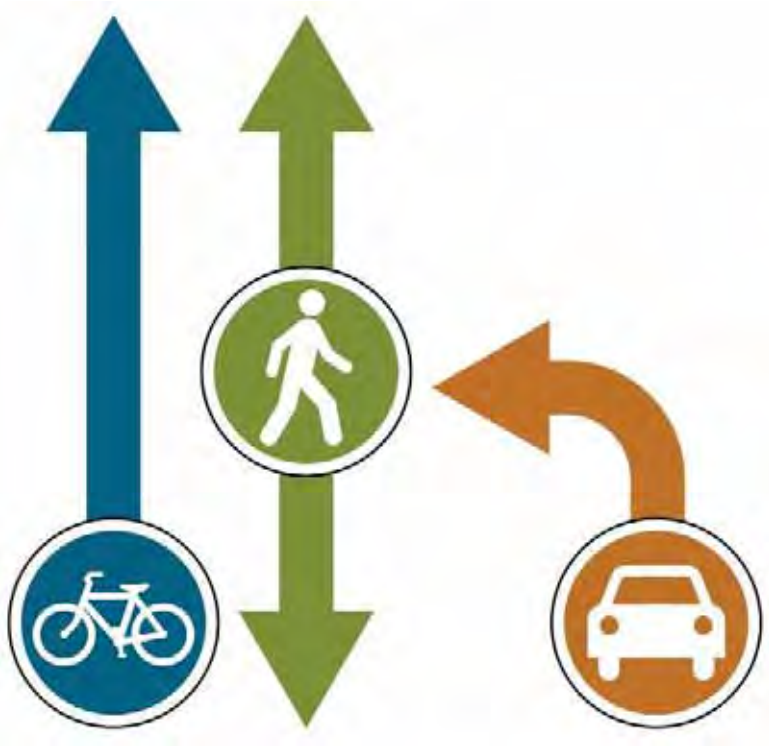
"Consideration should be given to providing alternatives to traffic control signals even if one or more of the signal warrants has been satisfied."

MUTCD 2009, Sec. 4B.04

RECTANGULAR RAPID FLASHING BEACON AND CROSSING ISLAND

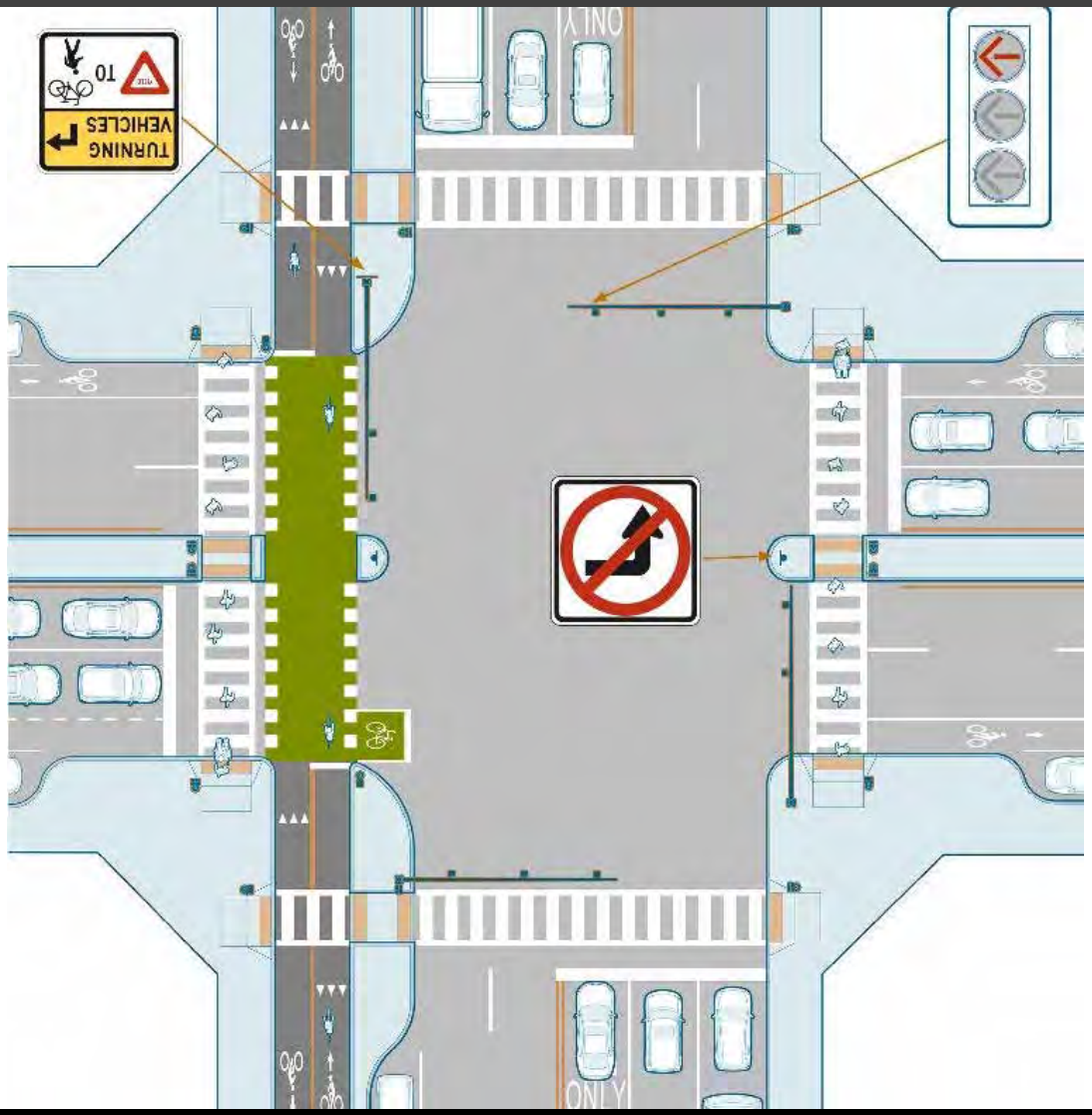
Turning Vehicles

“Right hook” crash



“Left hook” crash

Turning Vehicles – Best Practices



Separated Bike Lanes

The **AASHTO Green Book 2011** and **MUTCD 2009** do not provide specific design guidance on, nor restrict the use of separated bike lanes. The **FHWA Separated Bike Lane Guide** states:

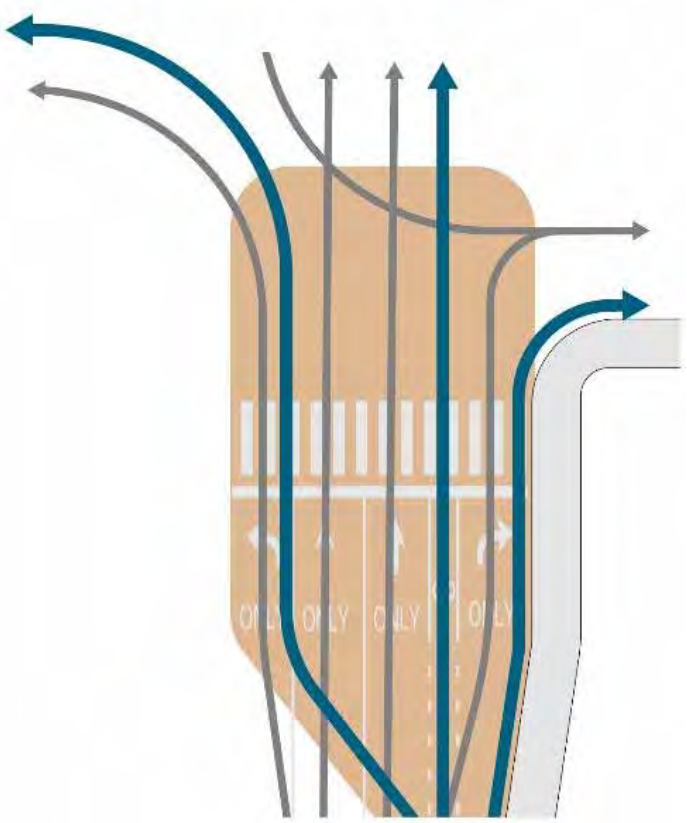
"The practice of designing separated bike lanes is still evolving and until various configurations have been implemented and thoroughly evaluated on a consistent basis, design flexibility will remain a priority."

2015, p. 27

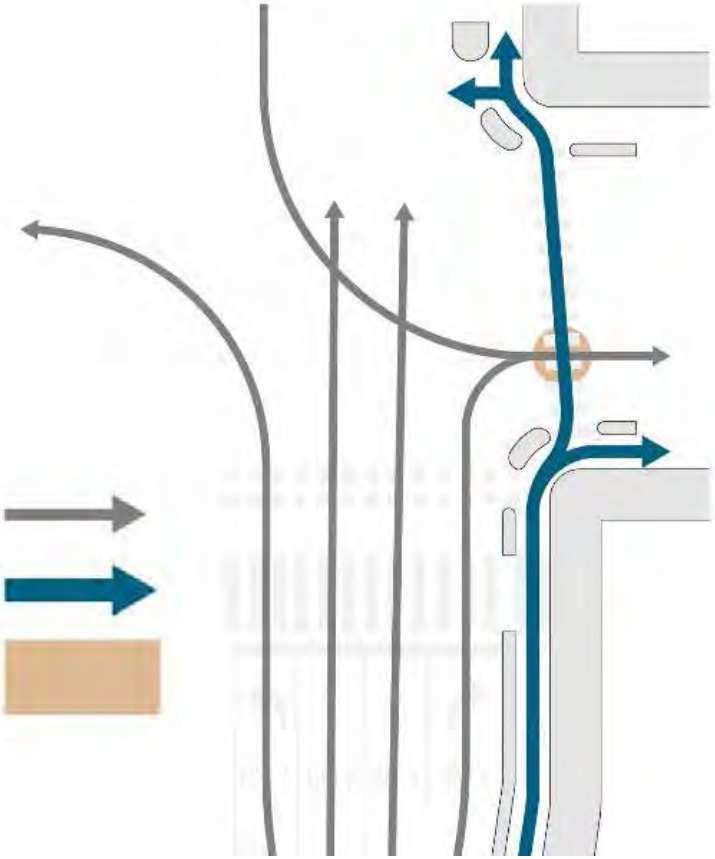
Source: NYC DOT

Separated Bike Lanes at Intersections

Standard Bike Lane



Separated Bike Lane

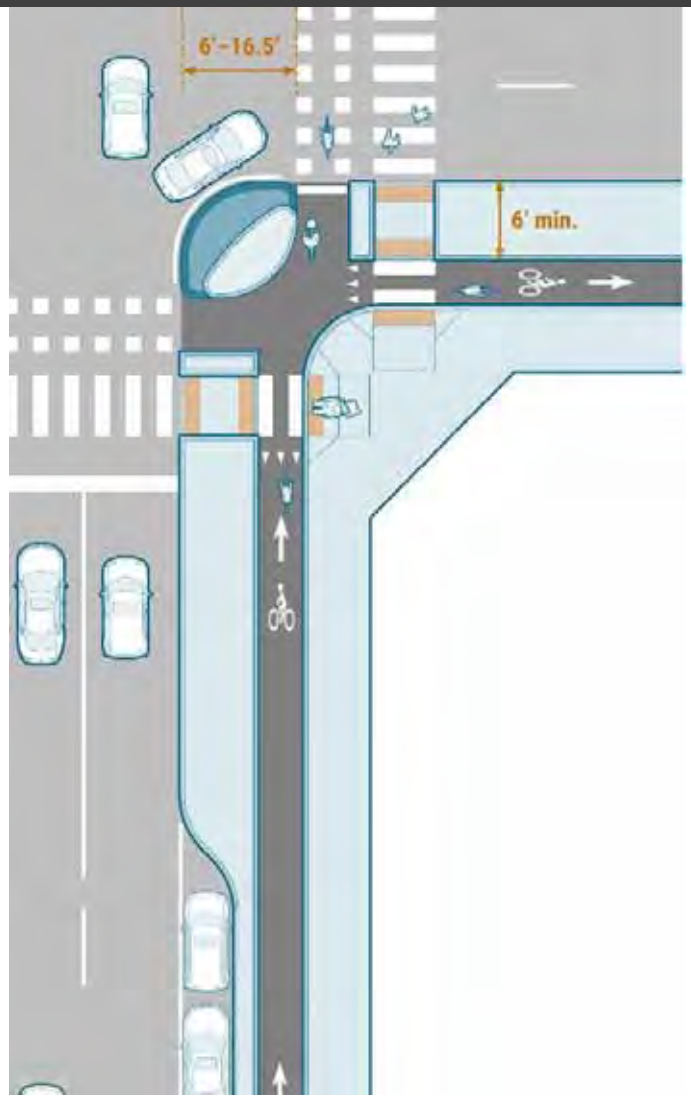


Vehicle Movement

Bicycle Movement

Potential Conflict Zone

Protected Intersection



Questions?

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