Your Bikeway Infrastructure Toolbox
(Tool guide)
Illinois Bike Summit
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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.
Bikeway Tools – How to Use Design Guides

State Routes

Bureau of Design and Environment Manual

Chapter 17 and others

Local Routes (Fed, State $)

Bureau of Local Roads and Streets Manual

Chapter 42 and others

All Routes

Guide for the Development of Bicycle Facilities

On Street, Off Street
Bikeway Tools – How to Use Design Guides

Urban Bikeways

Separated Bike Lane

Traffic Control Devices

Neighborhood and Arterial

Arterials

Part 9 and others
Interim Approvals, RFEs

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Bikeway Tools – How to Use Design Guides

Other Urban Guides

Ped and Traffic Calming Design Guides

Other Country and State DOT Design Guides
What does a comfortable neighborhood street design for bikes look like?
Bikeway Tools – Neighborhood Streets

How do I make it comfortable?

1. Speed
2. Volume
3. Crossings

<table>
<thead>
<tr>
<th>Volume / Speed</th>
<th>&lt; 1,500</th>
<th>&gt;1,500</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 20 MPH</td>
<td>Street is already comfortable</td>
<td>Consider volume management</td>
</tr>
<tr>
<td>&gt; 20 MPH</td>
<td>Consider speed management</td>
<td>Consider both volume and speed management</td>
</tr>
</tbody>
</table>

Guides: Local Roads Manual, NACTO UBDG, Traffic Calming Design Guides
Bikeway Tools – Neighborhood Streets (Speed)

**Vertical Speed Management:**
- Speed Humps, Tables, Cushions
- Raised Crosswalks

**Chicago, IL**
- Speed Humps
  - Cost: $3,000

**Horizontal Speed Management:**
- Traffic Circles, Chicanes, Chokers, Neckdowns, Curb Extensions, Skinny Streets…..On Street Parking

**Chicago, IL**
- Chicane
  - Cost: $15,000
Bikeway Tools – Neighborhood Streets (Volume)

Partial Closures

Chicago, IL
Partial Closure
Cost: $15,000

Diverters / Movement Restrictions

DRAFT CONCEPT
FOR Chicago, IL
Cost: $2,000 – 30,000

Exhibit 5b
Bikeway Tools – Neighborhood Streets (Crossings)

**Unsignalized**
- Refuge Islands, Markings, Signage, Curb Extensions
- RRFB, HAWK, All-Way Stops

**Signalized**
- Use Existing Signals, Modify with Bike Signals

Chicago, IL
Pedestrian Refuge Island
Cost: $30,000

Chicago, IL
Bicycle Signals
Cost: $15,000
Bikeway Tools – Arterial Streets (Conventional)

Bureau of Local Roads and Streets Manual


Chicago, IL
Bikeway Tools – Arterial Streets

Allowable in 2009 MUTCD

- Continuation of Bicycle Lanes up to Intersections
- Extensions of Bicycle Lanes through Intersections
- Counter-flow Bicycle Lanes
- Buffer-Separated Bicycle Lanes
- Bicycle Lanes on the Left-Hand Side of One-Way Streets
- Two-stage turn box Jughandle movement at a T-intersection
- Shared-Lane Markings
- Shared-lane markings in exclusive turn lanes
- Rotated bicycle symbols in bicycle lanes or separated bikeways at intersections and driveways oriented towards turning or entering motorists

Other treatments that are not traffic control devices, so no MUTCD restriction on their use

- Separated bikeways
- Convex mirrors at conflict points to improve visibility
- Bicycle networks
- Median or refuge island for bikeway crossings

Source: FHWA (http://www.fhwa.dot.gov/environment/bicycle_pedestrian/guidance/mutcd/index.cfm)
Bikeway Tools – Arterial Streets (Separated)

Buffered Bicycle Lane
Guide: NACTO UBDG
Cost: $50-100K per mile
Chicago, IL

Buffered Bicycle Lane
Guide: NACTO UBDG
Cost: $75-150K per mile
Chicago, IL

Separated Bicycle Lane
Guide: NACTO, FHWA
Cost: $150 - 700K per mile
Chicago, IL
Section 42-3.03(c): “On highways with ADT greater than 10,000 consider a minimum width of 6 ft that may include an optional 2 ft striped buffer zone”
Bikeway Tools – Arterial Streets

Buffer Width: 1.5’ Min (2’)
Hatch: 20’ Spacing
Buffer parking side first
Can buffer both sides
Bikeway Tools – Arterial Streets

NCHRP 766:
- If you have space, add buffers
- Stripe lanes at minimum widths and buffer in between
Bikeway Tools – Arterial Streets

How to Implement – Reduce Widths

**Travel Lanes 10’ – 12’**
BLR – 10’ min from edge of pavement
BDE – 11’ Min (10’ with design exception)
10’ Lane + 2’ Buffer Accommodates larger vehicles

**Parking Lane 7’ – 9’**
BLR / BDE – 8’ min from face of curb (7’ with design exception)
7’ Lane + 2’ Buffer better accommodates door zone

**Bike Lane 4’ – 6’**
BLR / BDE – 4’ Min (5’ next to parking)
Wider isn’t necessarily better
Buffer is counted in width next to parking
Bikeway Tools – Arterial Streets

How to Implement - Road Diet
Safety Improvement for all
29% Reduction in Crashes
Easier to cross
Allows for left turn lanes
Allows for pedestrian refuge islands

Cars per day
< 10K – Easy
10-15K – Likely
15K + Do a Study

Important for capacity:
Peak Volumes
Directionality
Traffic Control
Bikeway Tools – Arterial Streets

Clybourn Avenue Separated Bike Lane Pilot Study
• IDOT / CDOT Joint Study
• Used National Guidance and Chicago Local Experience
• Evaluating Many Treatments
  • Concrete Separation
  • Landscaping
  • Parking / Non Parking Separated
  • Bicycle Signals
  • Drainage
  • Modal Changes
Bikeway Tools - Intersections

Design Challenges

- Conflicts between users
- Competing needs for roadway space
- Where many crashes occur
- Where bikes feel uncomfortable

Goals

- Reduce Right Hook Conflict
- Facilitate turns for bikes
- Balance design for all modes

- Provided dedicated space for bikes
- Manage vehicle turn speeds
Bikeway Tools - Intersections

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Bikeway Tools – Intersections

What is a right hook?

EXHIBIT 2B: MOTORIST’S VIEW AT CONVENTIONAL BIKE LANE

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MassDOT
Intersection Markings
Allowable per 2009 MUTCD
Guide: NACTO
Cost: $1,000 - $3,000 per intersection
Bikeway Tools – Intersections

Right Turn Lane
MUTCD Part 9
Guide: MUTCD
Cost: $1,000 - $3,000 per intersection
Bikeway Tools - Intersections

- Intersections up to 10 slides
  - Speed, visibility, volume, understood right of way
  - Intersection Markings (not explicitly called out, but permitted per FHWA)
  - Right lane right of bike lanes (MUTCD)
  - Signalization (Interim Approval)
  - Concrete (curb extensions, truck aprons on sidewalk side of bike, concrete on travel side of bike)
  - FHWA Guidance
  - Discuss should we be looking at modifications to trucks (side skirts / cameras)

Bicycle Signals
- Interim Approval Status
- Guide: NACTO
- Cost: $12,000 - $20,000 per intersection
Bikeway Tools - Intersections

- Protected Intersection
- Not Governed by MUTCD
- Guide: MassDOT, FHWA
- Cost: $20K + per intersection

www.tylin.com
Manage turn speeds with geometry

- Horizontal – tighten curb radius, curb extension, truck aprons
- Vertical – Raised crosswalks
Bikeway Tools – Trail Crossings

North Branch Trail
CCFPD

Un controlled

North Branch Trail
CCFPD

Un controlled

www.tylin.com
Bikeway Tools – Trail Connections

Recommendations

• Locate crossings at existing signals if possible
• Align with existing intersections if possible
• Manage Speed of Bikes (S-Curve)
• If un-signalized, need to understand crossing conflicts
  • Number of Lanes
  • Traffic Speed / Volumes
• Unsignalized Recommendations
  • Provide Markings and Signage
    • Crosswalks
    • Warning Signs
    • In-street Signs
  • Provide Refuge Space (reduce lanes)
  • Add Beacons as needed (RRFB and Hawk)

DRAFT CONCEPT
FOR Chicago, IL
Bikeway Tools – Trail Crossings

HAWK
$150,000
MUTCD
Orchard Lake Village, MI

RRFB
$20,000
Interim Approval
Kalamazoo, MI
Thank You!

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