PBIC Webinar

How to Create a Bicycle Safety Action Plan: On-Road Bicycle Facilities

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Oct. 16, 2014, 2 pm
Today’s Presentation

- Introduction and housekeeping
- Audio issues?
  Dial into the phone line instead of using “mic & speakers”
- PBIC Trainings and Webinars
  www.pedbikeinfo.org/training
- Registration and Archives at
  pedbikeinfo.org/webinars
- PBIC News and updates on Facebook
  www.facebook.com/pedbike
- Questions at the end
Ongoing Activities

- Pedestrian and bicycle assessments
- Network documentation and promotion
- Pedestrian and bicycle data initiatives
- Road Diet Guide
- *Separated Bike Lane Planning and Design Guide*

www.pedbikesafe.org/BIKESAFE
Ongoing Activities

- Guidebook for Evaluating, Establishing, and Tracking Pedestrian and Bicycle Performance Measures
- Multimodal Conflict Points
- Flexibility in Pedestrian and Bicycle Facility Design
- Global Benchmarking on Delivering Safe and Connected Pedestrian and Bicycle Networks
- Workbook for Building On-Road Bike Networks through Routine Resurfacing Programs
- NHI Pedestrian Facilities Design Course Update

Strategic Agenda for Pedestrian and Bicycle Transportation

- Data
- Research
- Training
- Design Guidelines

For project updates, funding information, policy background, etc., visit: [www.fhwa.dot.gov/environment/bicycle_pedestrian](http://www.fhwa.dot.gov/environment/bicycle_pedestrian)
On-Road Bicycle Facilities

Planning for Safety

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October 16, 2014
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Outcomes

At the end of this series, you will be able to...

- Recognize a bicycle-friendly network of roads and trails will increase cyclists’ safety.
- Describe how planners and engineers develop bicycle plans that directly address safety.
- Recognize bicyclists are a diverse subset of travelers with wide ranging skill and tolerance of traffic stress.
- Identify good practices and effective Countermeasures to enhance bicycle safety and accessibility.
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<tr>
<th>SUNDAY</th>
<th>MONDAY</th>
<th>TUESDAY</th>
<th>WEDNESDAY</th>
<th>THURSDAY</th>
<th>FRIDAY</th>
<th>SATURDAY</th>
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<tbody>
<tr>
<td>1: Planning for Bicycle Safety</td>
<td>2: On-Road Bicycle Facilities</td>
<td>3: Off-Road Facilities</td>
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**October 2014**

PBIC Webinar [www.pedbikeinfo.org](http://www.pedbikeinfo.org)
Section 1

Resources & Safety Analyses
Approaches
National Design Resources

- Guide for the Development of Bicycle Facilities
- Manual on Uniform Traffic Control Devices
- Urban Bikeway Design Guide
Local Design Resources

- Wisconsin Bicycle Facility Design Handbook
- Boston Complete Streets
Crash Data Analysis

- 5 year minimum
- Review police reports
- Review emergency room or 1st responder data
- Identify:
  - hot spots & corridors
  - major crash types
  - demographics
Crash Data Analysis

Crash data analysis can:

• Discover prevalent crash types and behaviors
• Target specific areas
• Inform selection of bicycle facility
Crash Data Analysis

Understand the limitations:

• crashes are usually dispersed
• Crash data does not include “near-misses”
• The public may perceive locations without crashes to be less safe
• Crash data may be incomplete or inaccurate
Road Safety Audits

1. Identify location
2. Select RSA team
3. Start-up meeting
4. Field review
5. Findings & report
6. Present findings
7. Respond to findings
8. Implement improvements

http://safety.fhwa.dot.gov/ped_bike/tools_solve/fhwasa12018/
## Road Safety Audits

<table>
<thead>
<tr>
<th>RSA Zones</th>
<th>A. Street or Path</th>
<th>B. Structures</th>
<th>C. Intersections, Crossings, and Interchanges</th>
<th>D. Transitions</th>
<th>E. Transit</th>
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<tbody>
<tr>
<td>7. Continuity &amp; Connectivity</td>
<td>Are bicycle accommodations continuous?</td>
<td>Are bicycle accommodations continuous, or do they end abruptly at bridge/tunnel crossings?</td>
<td>Are bicycle accommodations continuous, or do they end abruptly at crossings/intersections/interchanges?</td>
<td>Is there a safe way for cyclists from both directions to access connections or continue to other destinations along the street network?</td>
<td>Are crossings convenient and free of potential hazards for cyclists?</td>
</tr>
</tbody>
</table>
Crash Countermeasure Resources

http://www.pedbikesafe.org/BIKESAFE/

Crash Countermeasure CMF

• Crash Modification Factors (CMF) are limited
  – Limited before/after data
  – Insufficient bike counts

• Lit review of countermeasure research available on BIKESAFE
Crash Context

Section 3
Overview of Bicycle Safety Problem

In 2012:

- 726 killed
- 49,000 injured
- Cyclist account for over 2% of all traffic deaths and injuries

...but are only 1% of all traffic
Types of Bicyclists
Types of Bicyclists
Common Crash Factors

Source: FHWA Bicycle Road Safety Audit Guideline
Pre-crash Maneuvers

**Most Common Motorist Pre-crash Maneuvers**
- Going Straight: 585
- Making Right Turn: 271
- Making Left Turn: 239
- Entering/exiting alley/driveway: 119

**Most Common Bicyclist Pre-crash Maneuvers**
- Going Straight: 622
- Riding in crosswalk/SW: 455
- Drove Wrong Way: 43
- Entering/exiting alley/driveway: 42

Source: City of Denver Bicycle Crash Study
On-Road Bicycling Infrastructure Crash Reduction Countermeasures Network Approach

Section 4
Network Solutions

- Direct
- Seamless
- Fine grained
- Comfortable
- Connected
Facility Selection

Using the Bicycle RSA Prompt Lists

Figure 17. General Bicycle Facility Utilization Given the Context of Vehicular Traffic Volume and Speed.
On-Road Bicycling Infrastructure
Crash Reduction Countermeasures
Street Segment Approach

Section 5
Shared Lane Safety Challenges
Wrong Way Riding

- 32% of all crashes involve wrong way riding
- 42% of all intersection crashes involve wrong way riding
- (NCHRP Report 500)
Wrong Way Riding Countermeasures

- Shared lane markings:
  - Reduce sidewalk riding
  - Improve rider positioning
  - Reduce wrong way riding
  - Improve motorist passing behavior
One-Way Street Wrong-Way Riding
One-Way Street Countermeasures

Contra-flow bike lanes
- Correct design leads to correct use
- Signs, signals, and markings add clarity for all modes
Sidewalk Riding
Sidewalk Riding

From City of Denver Crash Study

• 34% of all crashes involved a bicyclist riding on the sidewalk. Of these crashes...
  – 66% of bicyclists riding on the sidewalk were riding against traffic
  – 53 percent were riding on an arterial sidewalk where there was no parallel bicycle lane or path.

• Bicyclists riding on the sidewalk are less visible to motorists and more vulnerable to crashes
Sidewalk Riding Countermeasures

- Separated bicycle lanes (cycle tracks)
- Bicycle lanes
- Shared lane markings
Sidewalk Riding

Inadequate infrastructure won’t be used as intended...
Lane diets

- Narrow arterial lanes up to 10 feet acceptable - AASHTO.
- 10’ and 11’ travel lanes don’t increase crash rates in urban and suburban areas – NCHRP Project 17-26
Buffered Bike Lanes

Increased comfort can promote correct use...
Sideswipe/Struck From Behind

Rural Crash Facts:
• 29% of crashes are overtaking
• 17% of crashes are turning/merging
Struck from Behind Countermeasures

- Shoulders
- Separated bicycle lanes (cycle tracks)
- Bicycle lanes
- Shared use paths
Sideswipe/Struck From Behind
Struck From Behind Countermeasure
Curb-Separated Bike Lanes
Struck From Behind Countermeasure Barrier-Separated Bike Lanes
Separated Bicycle Lane
Intersection Safety Countermeasures
Dooring
Dooring Countermeasure
Climbing lanes

Marked shared lane downhill
Bike lane uphill
Doorling Countermeasures

Wider Bike Lanes

Wider Parking Lanes
Failure to Yield
Countermeasure – Minicircle

Mini-Traffic Circles

- Typically 12-16 feet in diameter
- Add deflection to travel lane
- Preferable to stop signs
- Positive effect on bicycling
Bike Boulevards

Source: NACTO

Guidance for vertical traffic calming features:
- Slopes should not exceed 1:10 or be less steep than 1:25.
- Side slopes on tapers should be no greater than 1:6 to reduce the risk of bicyclists losing their balance.

Optional Features

Depending on motor vehicle speeds, a bicyclist will be passed by a car going the same direction this many times during a 10 minute trip:

- 20 MPH
  - 30% increase

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Right Hook Crashes

Photo Credit: Jonathon Maus
Right Hook Countermeasure

• Add Right Turn Lane
• Minimize length of right turn lane
• Add R4-4 sign
Right Hook Countermeasure

Highlight Conflict Zone

- Green increases conspicuity and awareness of conflict area
- Green can be dotted to match dotted lines within merging area
Right & Left Hook Countermeasure

- Bike lanes extended through intersection
- Option to color green
Right & Left Hook Countermeasure

- Bicycle boxes
  - Provide head start for bicyclists
  - Improve bicyclists visibility at on-set of green signal
Darkness Countermeasures

- Street lighting
- On-bike lighting

Crash facts for hours 6pm to 6am:
- 31% of all injuries
- 50% of all fatalities (alcohol frequent contributor)
Rumble strips – NOT recommended unless:

- Maintain a 4-ft min. clear path width with no curb present; 5-ft with curb
- Use gaps to allow cyclists to move across rumble strips as needed
- Centerline rumble strips may lead motorists to shy away from the centerline and move closer to bicyclists
- Utilize the narrowest and shallowest rumble strip design
Bridges, viaducts, and tunnels

• All should accommodate bicycles unless prohibited
Bridges, viaducts, and tunnels

- On long (1/2 mile+) bridges consider providing a shared-use path on each side separated by concrete barriers
Signal Timing Practices

• AASHTO Bicycle guide describes 2 conditions:
  – Standing bicycle minimum green (start from stop)
  – Rolling bicycle minimum green (arrive moving)

• Children aged 10 to 19 over-represented in “trap” type crashes

![Bicycle]

- Speed: 10 mph
- Acceleration: 1.5 ft/s²
- Deceleration: 5 ft/s²
- Perception-Reaction Time: 1 s
Countermeasure Takeaways

• Connected networks improve safety
• Comfort and safety have a relationship
• Land use, terrain, and traffic character influence use and safety
• Education & Enforcement strategies are also very important
• Our industry needs more count data for CMF’s
1: Planning for Bicycle Safety
2: On-Road Bicycle Facilities
3: Off-Road Facilities
Questions?
Q&A

⇒ Archive at www.pedbikeinfo.org/webinars
  - Downloadable and streaming recording, transcript, presentation slides

⇒ More questions?
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