Improving Traffic Signals for Bicycling and Walking

Darren Buck  Federal Highway Administration
Eddie Curtis  Federal Highway Administration
Peter Koonce  Portland, OR
Peter Furth  Northeastern University
Housekeeping

�除 Submit your questions

- Webinar archive: www.pedbikeinfo.org/webinars

- Live transcript: https://link.ai.media/session?plink=HSRC

- Certificates and professional development hours

- Follow-up email later today

- Review previous episodes and sign up for upcoming sessions
Join us for Part 2…

Multimodal Traffic Signal Design and Operations for Public Agencies

Tuesday, July 13, 2021

2:00 to 3:30pm Eastern Time

Hosted by the Institute of Transportation Engineers

https://www.pathlms.com/ite/courses/32735
Today’s Panel

Darren Buck
Federal Highway Administration

Eddie Curtis
Federal Highway Administration

Peter Koonce
Portland, OR

Peter Furth
Northeastern University
Strategic Agenda

Update

Networks
Achieve safe, accessible, comfortable, and connected multimodal networks in communities throughout the U.S.

Safety
Improve safety for people walking and bicycling.

Equity
Promote equity throughout the transportation planning, design, funding, implementation, and evaluation process.

Trips
Get more people walking and bicycling.

Image from:
https://www.fhwa.dot.gov/environment/bicycle_pedestrian/publications/strategic_agenda/
Objectives Driven Program

Improving Traffic Signals for People Cycling and Walking

Peter Koonce, P.E.
Portland, OR
June 9, 2021
Webinar Outcomes

Identify design approaches that make traffic signals safer and more comfortable for nonmotorized road users.
Understand strategies for improving intersections through geometric changes, signal timing, protected phasing, and more.
Outline

- Policies
- Design issues
- Techniques from Peter Furth
- Examples
A healthy community, vibrant neighborhoods... and bicycles everywhere!

PORTLAND BICYCLE PLAN FOR 2030

A WORLD-CLASS BICYCLING CITY
Plans ➔ Policies & Practices

Source: Ped PDX: Portland’s Citywide Pedestrian Plan
Write Plans that are Actionable

- Counting People, Not Cars
- Measure/track performance
- Make walking & cycling safe
- Increase multimodal advantage
- Rewrite existing guidance
Counting People at Traffic Signals
Detection for Multimodal Traffic is still emerging

Source: Data Science Campus, UK
What’s in the Toolbox?

Provide Better Crossings
Separating Vehicles in Time
High Visibility Crosswalks
On-street Parking Restrictions
Improved Street Lighting
Car-Free/Light Experiences
Improved Driver Behavior

- Traffic Signal Strategies
  - Delayed Turn
  - Protected/Separated Turns

- Geometric Changes
  - Mixing Zones
  - Offset Crossing
Measure/Track Performance

Countermeasure Implementations

• Leading Pedestrian Intervals
• Protected Left Turns (for cycling & walking)
• No Turn on Red
• Active beacons
• Bike boxes
• Accessible intersections

Tracking Outcomes

• Fatals & Serious Injuries
• Traffic speeds
• Walking/Cycling Mode split
• Community health
• School trip behavior
• Perceptions of safety
Measure/Track Performance

- Leading Pedestrian Intervals
- Protected Left Turns (for cycling & walking)
- No Turn on Red
- Active beacons
- Bike boxes
- Accessible intersections

Example

- 20 per year
- 3 new locations per year
- Pilot area (downtown?)
- 3 new locations per year
- As needed
- 20-year plan for ADA compliance
Users of the “traffic signal” vary depending on land use & transportation context.
Consider Comfort for our Customers
NCHRP 926: Guidance to Improving Pedestrian and Bicycle Safety at Intersections

A new resource for transportation practitioners

Funding provided by the National Cooperative Highway Research Program (NCHRP) and the Transportation Research Board of the National Academies of Science.
Recommended Pedestrian Measures Based on Traffic Context

<table>
<thead>
<tr>
<th>Roadway Type</th>
<th>Vehicle ADT &lt; 9,000</th>
<th>Vehicle ADT 9,000–12,000</th>
<th>Vehicle ADT 12,000–15,000</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>≤30</td>
<td>35</td>
<td>≥40*</td>
</tr>
<tr>
<td>2 Lanes</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 Lanes</td>
<td>1</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>4 Lanes with raised median**</td>
<td>1</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>4+ Lanes without raised median</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
</tbody>
</table>

Tier 1 – Supports motorist yielding
Tier 2 – Requires intervention to induce motorist yielding
Tier 3 – Separate modes or require motorists to stop
Cycling Countermeasures Guidance

### Table 25. Countermeasure Summary Matrix

<table>
<thead>
<tr>
<th>Countermeasure</th>
<th>Effectiveness</th>
<th>Public Process</th>
<th>Motorist Traveling Straight</th>
<th>Motorist Turning</th>
</tr>
</thead>
<tbody>
<tr>
<td>Active Warning Beacons</td>
<td>M</td>
<td>L</td>
<td>● ● ● ●● ● ●</td>
<td>● ● ● ●● ● ● ● ● ●</td>
</tr>
</tbody>
</table>
| Advance Stop/Yield Lines                    | H             | L              | ● ● ● ● ● ● ● ● ● ● ● ● | ● ● ● ●● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● ● neighbourhood

- **Effectiveness**: Tier 1: Supports motorist yielding, Tier 2: Requires intervention to induce motorist yielding, Tier 3: Separate modes or require motorists to stop
- **Public Process**: 1 to 5 scale: 1 = no public process, 3 = extensive public process
- **Motorist Turning**: Motorist left turning into bike, opposing direction
Protected Signal Phasing Guidance
Inventory of Policies and Guidance Used by Other Agencies

- Oregon DOT Left-Turn Policy
- Los Angeles DOT Policy
- MassDOT Separated Bike Lane Design Guide
- New York City DOT
- British Columbia Active Transportation Guide
# Traffic Signal Phasing Policy Comparison

<table>
<thead>
<tr>
<th>CRITERIA</th>
<th>ODOT LEFT-TURN POLICY</th>
<th>LADOT LEFT-TURN POLICY</th>
<th>STM2 LEFT-TURN GUIDANCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Multiple left-turn lanes</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Restricted sight distance</td>
<td></td>
<td>Based on AASHTO</td>
<td>Based on LADOT Standard Drawing &lt; 5.5 seconds of travel time</td>
</tr>
<tr>
<td>Number of opposing lanes of traffic</td>
<td>3+</td>
<td>4+ (including bike)</td>
<td>4+</td>
</tr>
<tr>
<td>Intersection geometry</td>
<td>✓</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Maneuverability of particular classes of vehicles</td>
<td>✓</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Intersection of two major streets</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Crash history involving left-turn movements</td>
<td>5+ within 1 year period (within last 3 years, including pedestrian-related)</td>
<td>3-5+ within recent 1 year period; 6+ within recent 2 year period; 7+ within recent 3 year period</td>
<td>4+ within 1 year period; 6+ within 2 year period; 7+ within 3 year period</td>
</tr>
<tr>
<td>Crash history involving pedestrians</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Speed of opposing traffic</td>
<td>45+ mph</td>
<td>3-4+ within recent 5 year period</td>
<td>45+ mph</td>
</tr>
<tr>
<td>Adequacy of gaps</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Proximity to a school</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&quot;Vision Zero&quot; corridors</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Safety concerns</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Community support</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pedestrian Districts</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Major City Bikeways</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Product of opposing through and left-turn hourly volumes</td>
<td>50,000 (for 1 opposing lane); 100,000 (for 2 opposing lanes)</td>
<td>100,000 (including 5x conflicting pedestrian volume)</td>
<td>50,000 (for 1 opposing lane); 100,000 (for 2-3 opposing lanes)</td>
</tr>
<tr>
<td>Product of conflicting pedestrian and left-turn hourly volumes</td>
<td></td>
<td>10,000</td>
<td></td>
</tr>
<tr>
<td>Left-turn volume</td>
<td>200+ hourly</td>
<td></td>
<td>3+ per cycle during peak hour</td>
</tr>
<tr>
<td>High pedestrian volumes</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>High bicycle volumes</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>High percentage of left-turning heavy vehicles</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Projected volumes warrant a different mode</td>
<td>Within 5 years</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Opposing left-turn mode</td>
<td>✓</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>U-turns permitted</td>
<td>✓</td>
<td>✓</td>
<td></td>
</tr>
</tbody>
</table>
### LADOT Protected Left Guidance

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Oregon DOT</th>
<th>LADOT</th>
<th>Signal Timing Manual 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Product of conflicting pedestrian and left-turn volume (hr)</td>
<td>10,000 or cross product</td>
<td>3+ per cycle during peak hour</td>
<td></td>
</tr>
<tr>
<td>Left-turn volume</td>
<td>200+ hourly</td>
<td></td>
<td></td>
</tr>
<tr>
<td>High pedestrian volumes</td>
<td>✓</td>
<td>100+ hourly</td>
<td></td>
</tr>
<tr>
<td>Bicycle criteria</td>
<td>none</td>
<td>Consider bike lane</td>
<td>none</td>
</tr>
</tbody>
</table>
## Traffic Signal Phasing

Based on Speed of Vehicle Traffic

**Table G-32 // Considerations for Time-Separated Bicycle Movements - Low Speed Streets (50 km/hr and below)**

<table>
<thead>
<tr>
<th>Protected Bicycle Lane Operation</th>
<th>Motor Vehicles Per Hour Turning Across Protected Bicycle Lane</th>
<th>Two-Way Motor Vehicle Road</th>
<th>One-Way Motor Vehicle Road</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Right Turn</td>
<td>Left Turn Across One Lane</td>
</tr>
<tr>
<td>Uni-Directional</td>
<td></td>
<td>250</td>
<td>150</td>
</tr>
<tr>
<td>Bi-Directional</td>
<td></td>
<td>150</td>
<td>100</td>
</tr>
</tbody>
</table>

**Table G-33 // Considerations for Time-Separated Bicycle Movements – High Speed Streets (>50 km/hr)**

<table>
<thead>
<tr>
<th>Protected Bicycle Lane Operation</th>
<th>Motor Vehicles Per Hour Turning Across Protected Bicycle Lane</th>
<th>Two-Way Motor Vehicle Road</th>
<th>One-Way Motor Vehicle Road</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Right Turn</td>
<td>Left Turn Across One Lane</td>
</tr>
<tr>
<td>Uni-Directional</td>
<td></td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>Bi-Directional</td>
<td></td>
<td>50</td>
<td>50</td>
</tr>
</tbody>
</table>

Source: British Columbia Active Transportation Design Guide
CYCLING AT A CROSSROADS
The Design Future of New York City Intersections
September 2018
Mixing Zones

- bicycle crash rate reduction of 27%
- allow vehicles to turn across a protected bike lane (PBL)
- used at smaller intersections
- bicyclist comfort is lower at this type of intersection
Response to bicyclist intercept survey question: "I feel safe cycling through this intersection"

Note: This survey focused on questions relating to conflicts with turning vehicles and thus **Fully Split Phase intersections** are not included.

Source: Cycling at Crossroads, NYCDOT
West 19th & Burnside (farside)
SE Foster (Portland)
Separation from Vehicles at Intersections
Signalization Principles
Signalization Principles

• Shorten signal cycles
• Prioritize multimodal travel
• *Minimize number of signal phases*
• Set Slow progression speeds
• Adjust timing for off-peak
• Consider fixed time signals

Signalization Principles

• Shorten signal cycles
• Prioritize multimodal travel
• *Minimize number of signal phases*
• Set slow progression speeds
• Adjust timing for off-peak
• Consider fixed time signals
• Employ advanced logic & detection
Signalization Principles

- Eliminate signal coordination
- Rethink use of detection
Eliminate Traffic Signal Coordination

*Fully actuated signals can respond more quickly to demand*

Source: [Reducing Pedestrian Delay](http://example.com), 2012
With Coordination, Shorten Signal Cycle Lengths and Lower Progression Speeds

- Long enough to accommodate pedestrian crossings
- Short enough to encourage compliance and manage speeds
- Slow enough to encourage safe travel by all modes
Multimodal traffic benefits from shorter cycle lengths
More on Traffic Engineering Treatments...

July 13, 2021 webinar with City of Seattle
Some Techniques to Make Traffic Signals Work Better for Pedestrians & Cyclists

Peter G Furth
Northeastern University

Look for publication of a guidebook from NCHRP 03-133, *Guidebook for Traffic Signal Design and Operations Strategies for Non-Motorized Users*
1. Measuring pedestrian delay
2. Dirty little secrets about coordination with long signal cycles
3. Maximizing the Walk interval
   A. Longer Walk intervals
   B. Ped Recall
4. Multistage crossings
5. Protection from left turn conflicts
6. Protection from right turn conflicts
   A. Complete separation in time
   B. Pedestrian head start (“partial protection”)
      1. Leading Ped Interval
      2. Protected intersection layout, with head start in space
      3. Delayed Turn, a.k.a. Leading Thru Interval, Leading Bike Interval
1. Calculating & Reporting Average Pedestrian Delay

“Only what’s measured counts”

<table>
<thead>
<tr>
<th>Level of Service</th>
<th>Average Pedestrian Delay (s)</th>
<th>Likelihood of Noncompliance</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>&lt; 10</td>
<td>Low</td>
</tr>
<tr>
<td>B</td>
<td>&gt; 10 - 20</td>
<td></td>
</tr>
<tr>
<td>C</td>
<td>&gt; 20 – 30</td>
<td>Moderate</td>
</tr>
<tr>
<td>D</td>
<td>&gt; 30 – 40</td>
<td></td>
</tr>
<tr>
<td>E</td>
<td>&gt; 40 - 60</td>
<td>High</td>
</tr>
<tr>
<td>F</td>
<td>&gt; 60</td>
<td>Very high</td>
</tr>
</tbody>
</table>

Policy: Whenever vehicular delay is reported, ped delay must be reported, too.

How can this happen?

<table>
<thead>
<tr>
<th></th>
<th>Average ped delay</th>
<th>Average vehicle delay</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plan that was implemented</td>
<td>123 sec</td>
<td>35 sec</td>
</tr>
<tr>
<td>Alternative plan</td>
<td>45 sec</td>
<td>35.5 sec</td>
</tr>
</tbody>
</table>

Highway Capacity Manual, 2000
How to Calculate Average Pedestrian Delay

• Simple phasing: use a formula.

\[
\text{Avg Delay} = \frac{(\text{Cycle Length} - \text{Walk})}{2} \times \frac{(\text{Cycle Length} - \text{Walk})}{\text{Cycle Length}}
\]

• Multistage crossings:

Northeastern University Ped & Bike Crossing Delay Calculator
2. Dirty Little Secrets about Coordinating Intersections with Long Signal Cycles

For cars:
- Doesn’t usually deliver the ethereal “green wave” being sought for
- After 100 s, increasing cycle length barely increases capacity

For pedestrians:
- Long delay
- More conflicting turns per cycle
  - Ex: 240 turns/hr. What if C = 60 s? C = 120 s?

For safety:
- Promotes speeding
  - Study: speeding opportunities per hr = 1,900, versus 920 w small coordination zones, short cycles
3. Maximize the Walk Interval

**Not this:**
[Diagram of a traffic light with a short walk interval]

**but this:**
[Diagram of a traffic light with a long walk interval]

[Make the WALK interval as long as will fit within the parallel vehicular phase]

- Less pedestrian delay
- Better compliance
- Crossing becomes accessible to slower pedestrians

- For coordinated phases, use the setting “Rest in WALK”
- For others, ask: How long does the green usually last?
... and make greater use of Pedestrian Recall

- If cross street traffic needs at least 70% of the time peds need
- If there are more than 0.9 (maybe even 0.4) pedestrians per cycle

4. Avoid Multistage Crossings – Unless you provide good pedestrian progression

Start @ time = 0

<table>
<thead>
<tr>
<th>Average ped delay, northbound</th>
<th>Average ped delay, southbound</th>
</tr>
</thead>
<tbody>
<tr>
<td>51 sec</td>
<td>241 sec</td>
</tr>
</tbody>
</table>
Vital on signalized slip lane crossings: Provide 2 or more pedestrian phases per cycle

Reservice: twice per cycle

Run free: on demand, allowing cars 10 s green between ped phases
5. Protecting Bikes and Peds from Left Turn Conflicts

**Amsterdam Policy:** On multilane roads, left turns are protected only, never “permitted”.

**British Columbia Policy:** Similar.

Why is it a struggle in the US to make left turns protected-only?
6. Conflicting Right Turns

A. Full protection: Time separation for peds and right turns

B. Partial protection:
   1. Leading Pedestrian Interval
   2. Protected Intersection geometry
   3. Delayed Turn (a.k.a. leading bike interval)
A. Separate Ped-Bike Crossing Phase, in time, from Right Turns

1. Serve right turns during the left turn phase

Cambridge, MA

Broadway at Galileo Way

“A night and day difference for pedestrians and bikes”
A. Separating Ped-Bike Crossing Phase, in time, from Right Turns

What if there is no left turn phase?

2. Split the thru phase: part for peds-bikes, part for right turns

Many NYC intersections

“Believability”

Will peds and cyclists feel that the signal is protecting them, or restricting them?
B. Partial Protection: A head start for peds-bikes

1. Leading Pedestrian Interval

2. Protected intersection Layout: a head start in space

1. Audible signal needed
2. May bikes use it, too?
3. Can force the cycle to be longer – and so in Netherlands:
   • NOT used where “protected intersection” layout gives peds/bikes a large head start in space.
B. Partial Protection: A head start for peds-bikes

3. Delayed Turn, a.k.a. Leading Thru Interval, Leading Bike Interval
   a. With exclusive turn lane; red arrow followed by flashing yellow arrow

Leading interval (7-10 s)

Rest of thru phase

Charlotte ("LPI+")

New York City, during flashing yellow arrow
B. Partial Protection: A head start for peds-bikes

3. Delayed Turn, a.k.a. Leading Thru Interval, Leading Bike Interval

a. Without exclusive turn lane (Montreal)
Discussion

⇒ Send us your questions

⇒ Follow up with us:
  ⇒ Darren Buck darren.buck@dot.gov
  ⇒ Eddie Curtis eddie.curtis@dot.gov
  ⇒ Peter Koonce peter.koonce@gmail.com
  ⇒ Peter Furth p.furth@northeastern.edu
  ⇒ General Inquiries pbic@pedbikeinfo.org

⇒ Archive at www.pedbikeinfo.org/webinars