Guidance for Protected/Buffered Bike Lanes with Delineators

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Agenda

1. Introduction/Background
2. Inventory of Facilities in MN
3. Identification of Study Topics
4. Data Collection
Introduction/Background

- Funded by MnDOT/LRRB
- Increasing interest in Complete Streets and Separated Bike Lanes (SBLs) from public and agencies
  - ex. mileage of SBLs in Minneapolis alone increased from 5.4 in 2015 to 23.5 in 2019
- Guidance has not kept pace

Definitions of Separated Bike Lanes Vary

<table>
<thead>
<tr>
<th>Facility Requirements</th>
<th>AASHTO</th>
<th>NACTO</th>
<th>FHWA</th>
<th>MassDOT</th>
<th>Minneapolis</th>
<th>Portland</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physically separated from motor traffic with vertical element only</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Physically separated from motor traffic with vertical element or difference in elevation</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>In roadway only</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>In or along roadway only</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>In, along, or separate from roadway</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Exclusive to cyclists (not shared with pedestrians)</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
</tbody>
</table>
Disagreements Between Guides

<table>
<thead>
<tr>
<th>Bike Lane Width in Feet</th>
<th>Guide</th>
<th>One-Way</th>
<th>Two-Way</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Minimum</td>
<td>Preferred</td>
<td>Minimum</td>
</tr>
<tr>
<td>NACTO</td>
<td>5.0</td>
<td>6.5 - 7.0</td>
<td>8.0</td>
</tr>
<tr>
<td>MassDOT</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>FHWA1</td>
<td>5.0</td>
<td>7.0</td>
<td>?</td>
</tr>
<tr>
<td>Portland2</td>
<td>**</td>
<td>**</td>
<td>**</td>
</tr>
</tbody>
</table>

**Portland2

<table>
<thead>
<tr>
<th>Peak Hour Bidirectional Vehicular Volume</th>
<th>Bike Lane Width (ft.)</th>
<th>Preferable</th>
<th>Minimum*</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;300</td>
<td>6.5</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>105-750</td>
<td>8</td>
<td>6.5</td>
<td></td>
</tr>
<tr>
<td>&gt;750</td>
<td>10</td>
<td>8</td>
<td></td>
</tr>
</tbody>
</table>

* Conditions with may be as low as 4 feet for short distances.

Project Objectives

1. Identify knowledge gaps in existing guidance on midblock segments (up to and including mixing zones)
2. Select a manageable number of gaps for further study
3. Design studies to investigate the selected gaps
4. Conduct studies
5. Produce guidance to augment the existing guidance based on study results
Use Iterative Process to Identify Facilities in MN

1. Research team created initial list of existing and planned SBLs
   - Research team’s memory
   - Local bike plans and news
2. List sent to TAP for checks and updates
3. List circulated amongst MN agencies
   - Metropolitan Planning Agencies
   - Regional Development Commissions
   - Metro area agencies with SBLs

32 Miles of SBLs in MN

<table>
<thead>
<tr>
<th>City</th>
<th>Built</th>
<th>Planned</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Sites</td>
<td>Miles</td>
</tr>
<tr>
<td>Minneapolis</td>
<td>26</td>
<td>23.5</td>
</tr>
<tr>
<td>St Paul</td>
<td>5</td>
<td>5.1</td>
</tr>
<tr>
<td>Glenwood</td>
<td>1</td>
<td>0.3</td>
</tr>
<tr>
<td>Richfield</td>
<td>1</td>
<td>3.3</td>
</tr>
<tr>
<td>St Louis Park</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Rochester</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>38</strong></td>
<td><strong>32.2</strong></td>
</tr>
</tbody>
</table>

*List of planned sites is prone to change
Variations of SBLs in MN

<table>
<thead>
<tr>
<th>One-way SBL</th>
<th>One-way SBL Plus Contra-flow SBL</th>
<th>Two-way SBL</th>
</tr>
</thead>
<tbody>
<tr>
<td>7 at street level</td>
<td>5 at street level</td>
<td>7 at street level</td>
</tr>
<tr>
<td>2 at sidewalk level</td>
<td>10 at sidewalk level</td>
<td>3 at sidewalk level</td>
</tr>
</tbody>
</table>

Identification of Priority Topics for Further Study

- Search through design manuals with SBLs
- Record all design elements that appear in at least one guide
- Record level of guidance on a design element contained in each guide (mention only or specific guidance)
- Identify knowledge gaps of interest with help of TAP
### Research Priorities

- **TAP feedback form**
  - Fill in name
  - Mark priority of further investigation of each design element
  - Add any design elements not included in table

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**Design Elements**

<table>
<thead>
<tr>
<th>Design Elements</th>
<th>TAP Basics</th>
<th>Major Elements</th>
<th>Minor Elements</th>
</tr>
</thead>
<tbody>
<tr>
<td>Speed Basics</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Roadway Design</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Traffic Control</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Access Management</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Signage &amp; Lighting</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Stormwater</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
</tbody>
</table>

**TAP Basics**

- X: Only mentions element
- #: Provides specific guidance on element

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**Major Elements**

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**Minor Elements**

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- #: Provides specific guidance on element
Research Priorities

- Total of 21 design elements selected and grouped into 6 sub-studies
  1. Winter maintenance
  2. Summer maintenance
  3. Buffer design
  4. Costs and Benefits
  5. Bus stops on SBLs
  6. Mixing zone design
Data Collection

- Formulate a research question to address the specific topic.
- Identify existing guidance or research on a similar topic.
- Determine the components of the question not addressed by previous research.
- Collect data to fill knowledge gaps
  - Key informant interviews
  - Video collection
  - Surveys

Interview Methods

- Create list of open-ended questions to address each of the study topics
  - Considerations for design/decision-making process
  - Implications of design on maintenance (and vise versa)
  - Guidance referred to
- Meet with each agency/group separately
- Send follow-up email after each interview
  - Summary of interview (interviewees asked to review)
  - Follow-up questions
Agency Interviewees

- Agencies responsible for the design, operation, and/or maintenance of SBLs
  - Hennepin County
  - Metro Transit
  - Minneapolis
  - MnDOT
  - St. Louis Park
  - St. Paul
  - U of M Parking and Transit Services
  - Glenwood*
  - Hopkins*
  - Richfield*
  - Rochester*

*Cyclist Interviewees

- Cycling/active transportation advocacy groups
  - Bicycle Alliance of Minnesota (BikeMN)
  - Our Streets Minneapolis
  - Twin Cities Bicycle Club
Bus Driver Interviewees

• Bus drivers with experience with SBLs
  – U of M Parking and Transit Services
  – Southwest Transit

Order of Interviews

• Interview agencies first
  – Highlight topics of confusion
  – Uncover institutional knowledge
• Interview bus drivers and cyclists second
  – Reveal areas of disagreement (with guidance or amongst road users)
  – Highlight factors important to user perception
Agency Design and Maintenance Considerations

• Common design and maintenance considerations
  – ROW availability
  – Maintenance equipment (access and cost)
  – Retrofit vs reconstruct
  – Existing traffic conditions and geometry
  – Site-specific context

• Commonly-cited guidance
  – FHWA SBL Guide
  – NACTO SBL Guide & All Ages, All Abilities Addendum

Need for Additional Guidance

• Common topics of uncertainty
  – Effects of driveways and alleys
  – Mixing zones (bicycle turning movements, two-way lanes)
  – Coordination of maintenance with other jurisdictions
  – Maintenance access to SBLs with permanent buffers

Topics to address during cyclist and bus driver interviews
Topics to pay attention to when designing SBLs
Bus Driver Perspectives on Conflicts

• Common responses
  – Separation of bus and bike traffic is best
  – Constrained spaces pose problems for drivers
  – Designs where bikes and pedestrians share space create problems for alighting riders
  – No consensus on preferred mixing zone design

• Need for additional guidance
  – Bus stop design
  – Mixing zone design

Cyclist Perspectives on Conflicts and Protection

• Common responses
  – Separation of bus and bike traffic is best
  – Designs should be tailored to inexperienced cyclists – even if that means a slight delay (ex. protected intersections and curb-separated lanes)
  – High volume bike routes should be plowed first

• Need for additional guidance
  – Bus stop design
  – Mixing zone design
  – Winter maintenance
  – Buffer design
Digging in with Cyclist and Bus Driver Surveys

- Design is in progress
- Questions for both bus drivers and cyclists
  - Bus stops on SBLs preferences and perceptions
  - Mixing zone design preferences and perceptions
- Questions for cyclists only
  - Buffer design preferences and perceptions
  - Level of activity and experience with SBLs
  - Winter maintenance preferences

Video Analysis of Conflicts

- Ongoing effort to quantify bike/bus and bike/ped conflicts and user behaviors at bus stops on SBLs
Next Steps

- Finish design and creation of surveys
- Distribute surveys
- Continue collecting and analyzing video
- Compare winter lane width reductions to winter volume reductions
- Augment existing guidance using findings
- Create list of trade-offs associated with design and maintenance decisions

Questions?

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