MEETING AGENDA

TdOT Bicycle and Pedestrian Advisory Committee (BPAC) Meeting
July 16, 2021 - 9:30 A.M.

Note: This meeting will be held remotely via Zoom
Teleconference instructions below

1. Call to Order.
2. Safety briefing.
3. Approval of minutes from April 9, 2021 BPAC meeting. (Action)
4. Report from TxDOT’s Public Transportation Division (PTN) Director regarding statewide bicycle and pedestrian matters
5. Presentation on TxDOT Bicycle Accommodation Design Guidance.
6. Discussion on Bikeway Design Effort guiding principles. (Action)
7. Discussion on TxDOT Safety Task Force Pedestrian and Bicycle Subcommittee. (Action)
8. Presentation on TxDOT Bicycle and Pedestrian Research.
9. Updates from committee members on local and statewide issues.
10. Public comment – Due to the virtual format of the meeting, public comments may be submitted by email to BikePed@txdot.gov by July 26, 2021, to be included as part of the meeting record.
11. Discussion of agenda items for future BAC meetings. (Action)
12. Adjourn. (Action)

The BPAC meeting will be conducted in English. If you need an interpreter or document translator because English is not your primary language or you have difficulty communicating effectively in English, one will be provided for you. If you have a disability and need assistance, special arrangements can be made to accommodate most needs. If you need interpretation or translation services or you are a person with a disability who requires an accommodation to attend or participate in the BPAC meeting, please contact Noah Heath, PTN, at (361) 876-7184 no later than 4 p.m. CT, July 6, 2021. Please be aware that advance notice is required as some services and accommodations may require time for TxDOT to arrange.
BPAC Members

Karla Weaver, Chair, Dallas/Ft. Worth
Bobby Gonzales, Vice Chair, El Paso
Chelsea Schultz, Waco
Clint McManus, Houston
Eddie Church, Cedar Park
Eva Garcia, Brownsville
Frank Rotnofsky, Laredo
Jeff Pollack, Corpus Christi
Mike Schofield, Austin
Rick Ogan, San Angelo
Trent Brookshire, Tyler

TxDOT Technical Staff

Eric Gleason, Director, Public Transportation Division (PTN)
Donna Roberts, Program Services Section Director, PTN
Bonnie Sherman, Bicycle & Pedestrian Program Manager, PTN
Noah Heath, Bicycle & Pedestrian Planner, PTN
Carl Seifert, Transportation Planner (Contractor), Jacobs

* * *

Teleconference instructions:

Event address for attendees:

https://us02web.zoom.us/j/87947066496?pwd=OXI1cERlWk9LrIVnQVplVnA0NVFxZz09

Passcode: 960026
Or One tap mobile:
  US: +13462487799,,87947066496#,,,,*960026# or +12532158782,,87947066496#,,,,*960026#
Or Telephone:
  Dial (for higher quality, dial a number based on your current location):
    US: +1 346 248 7799 or +1 253 215 8782 or +1 669 900 6833 or +1 301 715 8592 or +1 312 626 6799 or +1 929 205 6099
Webinar ID: 879 4706 6496
Passcode: 960026
  International numbers available: https://us02web.zoom.us/u/kc8eID854m

* * *
BICYCLE ACCOMMODATION DESIGN GUIDANCE FOR BPAC MEETING

Ken Mora, P.E., Design Division/Roadway Design Section
Table of Contents

1. TxDOT Bike Accommodation Design Guidance
2. Guiding Principles
3. TxDOT Bicycle Tourism Example Network
4. Target Design User
5. Facility Types
6. Project Implementation Date
7. Bike Design Guidance Resources
8. Shared Use Path Example
9. Typical Section Examples
10. RDM Pedestrian Guidance Highlights
11. Questions
TxDOT issued an administrative memo of 4/2/2021 entitled Bicycle Accommodation Design Guidance.
## Guiding Principles/Bikeway Selection

<table>
<thead>
<tr>
<th>GP Group</th>
<th>GP #</th>
<th>Guiding Principles</th>
<th>In Interim Guidance?</th>
<th>Where exactly in Interim Guidance?</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2.1.1</td>
<td>Safe bikeway accommodations will be considered on all transportation projects.</td>
<td>Yes</td>
<td>Page 2</td>
<td>Section 1 Overview and Purpose, especially 1) &quot;Bicycle and pedestrian needs must be given &quot;due consideration&quot; under Federal surface transportation law (23 U.S.C. 217(g)(1)). This consideration should include, at a minimum, a presumption that bicyclists and pedestrians, including persons with disabilities, will be accommodated in the design of new and improved transportation facilities...&quot; 2) &quot;accommodating bicyclists applies to all types of roadways except those that specifically prohibit bicycle travel. Bicycle accommodations should be designed to accommodate the greatest number and type of bicyclists with the safest facility possible within local constraints.&quot;</td>
</tr>
<tr>
<td></td>
<td>2.1.2</td>
<td>The design user of new bikeways should be bicycle-dependent commuters and other bicyclists who are interested in riding but concerned about safety.</td>
<td>Yes</td>
<td>Page 13</td>
<td>Entire section on &quot;interested but concerned&quot; design user</td>
</tr>
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<td></td>
<td>2.1.3</td>
<td>To the extent practical, bikeway width and separation from vehicular travel lanes should be maximized to accommodate the greatest diversity of riders with the maximum margin of safety.</td>
<td>Yes</td>
<td>Pages 2, 13</td>
<td>Guidance on bicycle facility and buffer widths and new constraints on shared lanes emphasizes wider than minimum widths. For example, 5 to 7 foot desirable bike lane width and 11 to 15 feet for SUs. Also, on p. 13: &quot;In general, more separation from motorized traffic is desirable to serve a greater number and type of users more safely.&quot; and p. 31: &quot;In instances where shared use paths or separated bike lanes are recommended by volume, speed, and/or other factors, but proper facility widths cannot be obtained, it may still be preferable to provide separated facilities with minimum or reduced paths and/or buffer widths rather than putting bicyclists in the roadway with high-speed/volume traffic.&quot;</td>
</tr>
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<td></td>
<td>2.1.4</td>
<td>Reducing frequency and severity of crashes and conflicts between all users should be the priority in project design when capacity is being added.</td>
<td>In spirit</td>
<td>-</td>
<td>While not stated verbatim in the Interim Guidance, a focus on bicycle planning principles (including considerations of conflicts with other roadway users), thoughtful bikeway selection, and the presumption that bicyclists are on all roadways is featured throughout.</td>
</tr>
<tr>
<td></td>
<td>2.1.5</td>
<td>Wide outside lanes increase vehicle speeds and are not adequate accommodation for the design user. Any new wide outside lanes for bicycle use should be considered only after exhausting all other options and carefully evaluating specific parameters for safety, anticipated use, and context.</td>
<td>Yes</td>
<td>Page 4, 29</td>
<td>1) &quot;since the issuance of the memo [Barton’s 2010 Memo], bicycle accommodation selection guidance has evolved and the previously referenced shared lane should only be considered as a suitable bikeway accommodation when the following applicable conditions are met:  • In an urban/urban core/suburban/rural town context, the roadway is 35 mph or less and has less than 3,000 vehicles per day, or;  • In a rural context, the roadway is 45 mph or less and has less than 1,000 vehicles per day.&quot; 2) Marked shared lanes are not recommended on TxDOT roadways.</td>
</tr>
<tr>
<td>GP Group</td>
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</table>
| 2.1.6    |      | Design flexibility is important. Scoping tools should be created and maintained, and District planning consulted when selecting bikeway type. Every project should consider all existing and potential roadway users. Additional considerations should include: land use context, bikeway connectivity, roadway characteristics (ROW width, motor vehicle speed, motor vehicle volume, design life of the project), and other project constraints. | Mostly | Pages 2, 8 | 1) Design flexibility is mentioned in the introduction (p2)  
2) The document provides bicycle accommodation selection guidance, but no scoping tools have been created  
| 2.1.7    |      | Bikeways on TxDOT roads should be direct and convenient and offer access to and connectivity between destinations on the transportation network. Transitions between land use contexts and bikeway types should be clear or intuitive. | Mostly | Page 7 | Planning principles of connectivity and cohesiveness are featured along with their descriptions, which include the concepts of this guiding principle. |
| 2.1.8    |      | Where locally maintained and state-maintained roadways intersect, TxDOT should collaborate with local jurisdictions to design safe, low-stress bikeways across TxDOT facilities where indicated by local planning documents. TxDOT bikeway improvements should integrate with local bicycle investments and transportation plans to complete low-stress bicycle networks for all ages and abilities. | Mostly | Pages 5 and 7 | Page 5 states "MPO and local planning documents should be reviewed and coordinated with to identify anticipated future growth when selecting bicycle accommodations outside the urbanized boundaries." Additionally, bicycle planning principles (p 7) include "Accommodate local bicycle and transit transportation routes and networks; Integrate design with local bicycle transportation plans; Carry accommodations through intersections of on-system roads with off-system roads." Additionally, context considerations include: "Intersections between state and local roadways may feature a high number of conflict points, constrained right-of-way, or high-speed differential. Separated facilities can help close gaps in a low-stress network. Considerations include providing separate bicycle facilities under freeway overpasses, improving visibility of bicyclists, providing on-street connections between two major shared use paths." |
| 2.1.9    |      | If a rural roadway is on the Bicycle Tourism Trail Example Network, then transportation improvements should consider an appropriate bikeway. | Yes | Page 5 | "projects located on the Texas Bicycle Tourism Trails Example Network are not excepted from bicycle accommodations regardless of location." p. 17. "For Roadways on TxDOT’s Texas Bicycle Tourism Trails Study, provide an appropriate Bike facility in coordination with the local community." p. 26. "Roadways indicated in TxDOT’s Bicycle Tourism Trails Study(13) should be designed with a minimum 8-foot shoulder, a shared use path, or another locally preferred facility type should be available." |
## Guiding Principles/Linear Bikeway Design & Conflict Point Design

<table>
<thead>
<tr>
<th>GP Group</th>
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</thead>
<tbody>
<tr>
<td>Linear Bikeway Design</td>
<td>2.2.1a</td>
<td>On rural roadway segments where existing or future bicycle demand is anticipated during the life of the project: a) Placement of shoulder rumble strips on or immediately adjacent to the edgeline is preferred. Profile Pavement Markings (PPM) and milled-in rumble strip are the preferred treatment types. Exceptions for edgeline placement include along evacuation routes and routes with significant volumes of heavy truck traffic.</td>
<td>Yes</td>
<td>Pages 27 &amp; 28 (Figure 9)</td>
<td>1) Page 27: &quot;Profile pavement markings serve a similar function as milled rumble strips and can be considered as an option to avoid a reduction in the width of the accessible shoulder. Where bicycle traffic is expected, rumble strips should be designed as follows to minimize crash risk for bicyclists&quot; 2) Page 28, Figure 9 features a PPM or milled rumble strip on the edgeline and is labeled &quot;ideal&quot;.</td>
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<td></td>
<td>2.2.1b</td>
<td>b) Bicycle gaps should be included in rumble strips to accommodate bicyclists’ turning movements and avoidance maneuvers.</td>
<td>Yes</td>
<td>Page 27</td>
<td>&quot;Periodic gaps (Figure 10) should be provided to allow bicyclists to safely enter or exit a shoulder as needed (e.g., to avoid debris, pass other bicyclists or disabled vehicles, make left turns, etc.) without having to ride over the rumble strips&quot;</td>
</tr>
<tr>
<td></td>
<td>2.2.1c</td>
<td>c) Where shoulder rumble strips are installed, 6 feet or more of clear space to the right of rumble strip is desirable to accommodate bicyclists.</td>
<td>Yes</td>
<td>Page 28</td>
<td>Figure 9 shows 6’ outside rumble strip preferred.</td>
</tr>
<tr>
<td>Conflict Point Design</td>
<td>2.2.3</td>
<td>Where shared use paths meet signalized intersections, TxDOT should consider applying separate pavement markings to identify crosswalks (for pedestrians) and bicycle lane extensions (for bicycles). Shared use paths should be signed at major conflict points to clearly communicate pedestrian and bicyclist priority.</td>
<td>Yes</td>
<td>p. 22</td>
<td>The guidance includes several recommendations for increasing awareness of contraflow riders including: &quot;Provision of traffic control signs, and clearly marked bicycle crossings following TMUTCD (Part 9) to alert motorists of bicycle travel.&quot;</td>
</tr>
<tr>
<td></td>
<td>2.3.7</td>
<td>On shared roadways that provide key bicycle route connections or where safety concerns are documented, it is recommended that TxDOT use “Bicycles may use full lane” sign as the standard bicycle regulatory sign instead of “Share the Road”.</td>
<td>Yes</td>
<td>p. 29</td>
<td>&quot;Typical supplemental signage may include: BICYCLES MAY USE FULL LANE (R4-11).&quot;</td>
</tr>
<tr>
<td></td>
<td>2.3.8</td>
<td>Roadway design engineers should consider sight lines of all users, landscaping, signage, and parked cars can hinder visibility for motorists, bicyclists, and pedestrians.</td>
<td>Yes</td>
<td>Page 11</td>
<td>Motorist sight lines are mentioned as important factors for bikeway type selection:  • &quot;Motorists need adequate sight distance to enter and exit intersections and driveways and benefit from sufficient space to yield to bicyclists.&quot;  • &quot;Wider buffers and clear sight lines can improve bicyclist safety.&quot; Page 19: &quot;consideration should also be given with respect to parking configurations in the driveway vicinity that may tend to obstruct the sidepath usage or sight lines.&quot; Page 22. In regards to contraflow paths: &quot;Provision of clear sight lines allowing a motorist to see approaching bicyclists, pedestrians, and motorists&quot;</td>
</tr>
</tbody>
</table>
Note, projects located on the Texas Bicycle Tourism Example Network are not excepted from bicycle accommodations regardless of location. The TxDOT Statewide Planning Map provides additional information on MPO boundaries, area types, and the Texas Bicycle Tourism Trails Example Network. Shoulders, if used to provide bike accommodations, must be a minimum of 8 ft. in width.
TxDOT Bicycle Tourism Example Network (TxDOT Statewide Planning Map)
The common target design user are those who are interested in riding but concerned about safety (“Interested but Concerned”) as this is the largest group of potential bikeway users among the general population. These bicyclists would ride more if they felt safer and, thus, are more likely to take short trips, avoiding busier arterial roadways. “Interested but Concerned” bicyclists prefer separation from vehicles and have a lower tolerance for traffic stress than more confident riders.
Below is a description and brief design guidance for the most common bicycle facility types. From left to right, it shows decreasing separation between bicyclists and motor vehicles.
Shared Use Paths Adjacent to Roadways (Sidepaths)

- Are located within a roadway corridor following the roadway alignment
- Are typically separated from motorized vehicular traffic by a landscaped buffer or a barrier
- Two-way travel, because in addition to bicyclists, users may include inline skaters, skateboarders, pedestrians, and runners
- Conflict points such as driveways and frequent street crossings should be mitigated to the greatest extent practicable to maximize comfort and safety
- A bicycle design speed of 15 mph is generally appropriate
- The desired width for a sidepath is 11 to 15 feet or more (SUPLOS calculation)
- To maximize service life and to assure a reasonable SUPLOS grade, paved widths should not be less than 10 feet
- As path user volumes increase, designers should consider increasing the width of the sidepath up to 15 feet
- Standard minimum width is 10 ft. A minimum width of 8 feet may be used in rare circumstances
- Horizontal and vertical alignments provide frequent, well-designed passing and resting opportunities where the width is at least 10 feet
### Facility Types

#### Table 3: SUPLOS example calculation (higher foot traffic)

<table>
<thead>
<tr>
<th>Segment Name</th>
<th>Path Width</th>
<th>Centerline</th>
<th>Volume (users per hour in 1 direction) and Mode Split</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>One-Way (per hour)</td>
</tr>
<tr>
<td>More Peds</td>
<td>12.0</td>
<td>0</td>
<td>100.0</td>
</tr>
</tbody>
</table>

- A SUPLOS grade of “C” or better is desirable over the life of the facility to ensure it is comfortable and safe for all users
- Table 3 provides a sample SUPLOS calculation with higher foot traffic
- When foot traffic exceeds 15%, SUPLOS degrades more rapidly
- Counts or projected counts should be made in anticipated peak hour, analogous parallel facilities may be used for additional guidance as well
- Texas Bicycle and Pedestrian Count Exchange ([https://mobility.tamu.edu/bikepeddata/](https://mobility.tamu.edu/bikepeddata/)) has pedestrian and bicycle count data for various facilities statewide
**Bike Accessible Shoulders**

- Bike accessible shoulders are one-way facilities on a roadway that carry bicycle traffic in the same direction as adjacent motor vehicle traffic.
- A bike accessible shoulder is one that is at least as wide or wider than a bike lane to accommodate bicyclists and paved to provide a smooth, solid surface across its width.
- While the bike accessible shoulder distinguishes predictable areas for bicyclist and automobile movement, bicyclists may leave the shoulder to pass other cyclists or avoid debris and other traffic conflicts.
- A minimum width of 4’ is allowable in low speed (45 mph or less) conditions.
- A minimum width of 5’ is allowable for high speed conditions.
- A minimum width of 5’ is required for shoulders adjacent to bridge railings, MBGF, and other vertical elements.
- Some shoulders should be up to 10 feet wide adjacent to higher speed roadways to allow bicyclists to operate with more separation to the high-speed traffic.
- **Roadways indicated in TxDOT’s Bicycle Tourism Trails Study** must be designed with a minimum 8-foot shoulder.
- Bike accessible shoulders are not for use by pedestrians.
Facility Types

**Bike Accessible Shoulder**

**Rumble Strip Design and Gap Placement**

- Rumble strips are used to warn the driver that they are leaving the travel way and is beneficial on the safety of bicycles using the shoulder
- Allowances should be made in the shoulder to provide an adequate width for bike accommodations beyond the rumble strip
- Profile pavement markings serve a similar function as milled rumble strips and can be considered an option to avoid reduction in width of the accessible shoulder
- Where bicycle traffic is expected, rumble strips should be designed to minimize crash risk for bicyclists
- Where bicyclists are operating at 20 mph or less, a minimum 15 ft gap every 40 to 60 ft should be provided
- Where bicyclists are operating over 20 mph, the gap should be increased to 20 ft or more or the rumble strips should be located on the right side of the shoulder to allow bicyclist to avoid them if they need to enter the travel lane
Facility Types

**Shared Lanes (wide outside lane)**

- Bicycles may be operated on all roadways except where prohibited by statute or regulations.
- Shared lanes without markings already exist in many different urbanized settings.
- Note that although marked shared lanes are allowed in the TMUTCD for certain conditions, TxDOT as a general policy does not recommend marked shared lanes for TxDOT roadways due to the higher speed nature of TxDOT roadways as compared to local jurisdictions.
- In Urbanized applications, Shared wide outside lanes are only allowed in locations with low volumes (3,000 ADT or lower) and very low speeds (35 mph or less).
- In Rural applications, Shared wide outside lanes are only allowed in locations with very low volumes (1,000 ADT or lower) and low speeds (45 mph or less).
- 14 feet is the maximum and 13 feet is the minimum “usable width” for a shared wide outside lane.
- The usable width is measured from the lane stripe to either the gutter joint or one foot from the nominal face of a monolithic curb.
- If the usable width is greater than 14 feet, a bike lane should be provided instead (use of minimum travel lane widths may be necessary to incorporate the bike lane).
Bicycle Guidance Implementation Dates

Implementing this new Bicycle Guidance is **OPTIONAL** if:

- Project anticipates letting prior to September 2022 **AND** 30% plans approved by Nov 1, 2021
- Project anticipates letting prior to September 2022 **AND** 30% plans **not** approved by Nov 1, 2021
- Project anticipates letting in/after September 2022 **AND** 30% plans approved by Nov 1, 2021

Implementing this new Bicycle Guidance is **REQUIRED** if:

- Project anticipates letting in/after September 2022 **AND** 30% plans **not** approved by Nov 1, 2021
Bike Design Guidance Resources

**Internet:**  https://www.txdot.gov/inside-txdot/forms-publications/consultants-contractors/publications/design.html

**Intranet:**  https://tntoday.dot.state.tx.us/des/Pages/Roadway-Design-Guidance.aspx
Example #1 Project Parameters

- Suburban Context
- 4 Ln Divided Roadway with current ADT of 16,000 with current wide outside lanes (14 ft.)
- Posted Speed of 40 mph
- Existing 4 ft. sidewalk
- Intersecting Driveways (per side) 6 driveways in two mile stretch of roadway, driveways relatively low volume. One intersecting Collector type roadway at halfway point.
Use Figure 4 (Urbanized) from Bike Guidance for initial bike facility recommendation

Due to relatively low driveway density, investigate the possible application of a shared use path (sidepath)
General rules for the use of the FHWA SUPLOS calculator

- Segment Length analyzed is between .25 – 2 to 3 miles
- The segment analyses should be broken up as needed to account for changes in user volumes in project limits.
- All user mixes of the Treadway should be counted or estimated (adult bicyclists, peds, runners, in-line skaters, child bicyclists).
- If new user counts are collected, it’s recommended that a minimum of three two-way, hourly counts be taken on each analyzed segment, an average, one-way per-hour volume can be created from the three, two-way hourly counts. An assumed 50/50 split is recommended for conversion to one-way volumes.

For this particular example

- There are two one mile segments analyzed (break at intersecting collector) for this project.
- After conducting two way counts and averaging (for each analyzed segment). The two-way total volumes of 240 (Segment A), and 100 (Segment B) are then assumed to be 50/50 for the one-way entry into the calculator. The respective user type count/proportion information was also gathered during the counts.
Model average user speed by trail user type (mode)

- Adult bicyclists – 12.8 mph
- In-line skaters – 10.1 mph
- Child bicyclists – 7.9 mph
- Runners – 6.5 mph
- Pedestrians – 3.4 mph

LOS Score and Grade

- LOS Grade A is LOS Score greater than 4.0
- LOS Grade B is LOS Score between 3.5 and 4.0
- LOS Grade C is LOS Score between 3.0 and 3.5
- LOS Grade D is LOS Score between 2.5 and 3.0
- LOS Grade E is LOS Score between 2.0 and 2.5
- LOS Grade F is LOS Score less than 2.0
## SUPLOS Calculator Example # 1

**Target LOS Grade of C or better (adjust width to update LOS)**

<table>
<thead>
<tr>
<th>Segment Name</th>
<th>Path Width</th>
<th>Centerline</th>
<th>Volume (users per hour in 1 direction) and Mode Split</th>
<th>Trail Level of Service</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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<td></td>
<td></td>
<td>LOS Score</td>
</tr>
<tr>
<td><strong>Name</strong></td>
<td><strong>Width (ft)</strong></td>
<td><strong>0=No Centerline 1=Centerline</strong></td>
<td><strong>Volume One-Way (per hour)</strong></td>
<td><strong>Adult Bicyclists</strong></td>
</tr>
<tr>
<td><strong>Segment A</strong></td>
<td><strong>12.0</strong></td>
<td>0</td>
<td><strong>120.0</strong></td>
<td><strong>25.0%</strong></td>
</tr>
<tr>
<td><strong>Segment B</strong></td>
<td><strong>10.0</strong></td>
<td>0</td>
<td><strong>50.0</strong></td>
<td><strong>25.0%</strong></td>
</tr>
</tbody>
</table>
TYPICAL SECTION EXAMPLES

- URBANIZED
4 LN UNDIV; URBAN LOW SPEED (COLLECTOR-RESTRIPING)
Frontage Rd.; URBAN HIGH SPEED 50 MPH; 10,000 ADT

**Frontage Alternative Analysis: Existing**

**Frontage Alternative Analysis: Alternative-B**

**Frontage Alternative Analysis: Alternative-A**
Where pedestrian use is permitted, roadway designs and alterations must comply with accessibility requirements established by the Americans with Disabilities Act (ADA) Standards (2010) adopted by the U.S. Department of Justice (DOJ), the ADA Standards (2006) adopted by the U.S. Department of Transportation (DOT), Proposed Accessibility Guidelines for Pedestrian Facilities in the Public Right-of-way (PROWAG), and the Texas Accessibility Standards (TAS).

**Pedestrian Access Route (PAR).** A continuous and unobstructed path of travel provided for pedestrians with disabilities within or coinciding with a pedestrian circulation path.

**Pedestrian Circulation Path.** A prepared exterior or interior surface provided for pedestrian travel in the public right-of-way.

**Walking Speeds.** Typical pedestrian walking speeds range from approximately 3 to 4-feet/s. Older people will generally walk at speeds in the lower end of this range. To accommodate most pedestrians, a walking speed of 3.5-feet/s must be used to determine signal timings, with a walking speed of 3-feet/s used where older pedestrians are expected or near schools.

**Clear Width.** TxDOT’s standard for the continuous clear width of a PAR is 5-ft minimum, exclusive of the width of the curb, which exceeds the ADA minimum of 4-ft. The clear width of a PAR may be reduced to 4-ft minimum for short distances, including across driveways, but passing spaces must be provided at intervals of 200-ft maximum.

**Cross slope.** The cross slope of a PAR must not exceed 2 percent. Due to construction tolerances, it is recommended that sidewalk cross slopes be specified in the plans as 1.5 percent to avoid exceeding the 2 percent limit when constructed.
• **Pedestrian Zone.** The pedestrian zone, also known as the “walking zone” or pedestrian circulation path. The Pedestrian Access Route (PAR), is the portion of the sidewalk dedicated to ADA accessible pedestrian movement. The pedestrian zone should be wide enough to accommodate the volume and type of pedestrian traffic expected in the area. The minimum pedestrian zone width is 5-ft.

• **Buffer (Furniture) Zone.** For pedestrian comfort, especially adjacent to high-speed traffic, it is desirable to provide a buffer (commonly called a furniture zone in urbanized areas), between the vehicular travelway and the pedestrian zone.

• **Frontage Zone.** The frontage zone is the area between the pedestrian zone and the property line, typically applicable in areas with buildings directly adjacent to the ROW line.
RDM Pedestrian Guidance Highlights

Other Pedestrian Guidance Topics in the upcoming RDM:

• Curb Ramp Design
• Driveway Design Considerations
• Intersections and Crossings
• Overcrossings and Underpasses
• Work Zone and Temporary Traffic Control Pedestrian Accommodations
• Lighting
• On-Street Parking
• Transit Access
• Railings Adjacent to Steep Slopes
• Additional Considerations
THANK YOU

Ken Mora, P.E.
Design Division/Roadway Design Section
Bikeway Design Effort

Final Update

July 16, 2021
Bikeway Design Topic Categories:

- **Bikeway Selection**
  - Interim Guiding Principles APPROVED

- **Linear Bikeway Design**
  - Interim Guiding Principles APPROVED

- **Intersections & conflict points**
  - Interim Guiding Principles APPROVED

- **Maintenance**
  - Interim Guiding Principles TODAY

Each of these Interim Guiding Principles has been compiled into a final Bikeway Design Guiding Principles final product. We are seeking approval for all Guiding Principles TODAY.
Final set of Phase 2 Interim Guiding Principles

Guiding Principles for Bikeway Maintenance
1. To leverage on-going asset preservation and roadway maintenance dollars, encourage early coordination between District Seal Coat Coordinators and District Bicycle & Pedestrian Coordinators. Frequent engagement between these staff members across the state can lead to cost efficiencies, increased awareness of bicyclist needs, higher quality pavement markings for bicycle accommodation, safer roadways, and better-connected bikeway networks.

2. The content of the 2009 TxDOT Chief Engineer Memo entitled “Accommodating Bicycles in Seal Coat Construction” should be incorporated into TxDOT’s Pavement Manual and communicated with TxDOT District Maintenance staff. This memo emphasizes opportunities to improve riding surfaces for bicyclists including using smaller seal coat aggregates across the roadway or on the shoulder. Additionally, shoulders should be swept during and after seal coat projects to ensure shoulders used by bicyclists are clear of debris.
3. **Shoulder maintenance**: Where bicycle demand has been identified through coordination with District Bicycle & Pedestrian Coordinators, proactively sweep and clear debris from on-system roadway shoulders. Where municipal maintenance agreements (MMAs) are in place, TxDOT Districts should coordinate with municipal partners who are responsible for sweeping the roadway under the terms of an MMA.

4. **Separated bike lane maintenance**: Where on-system, on-street separated bicycle lanes exist, coordinate sweeping and maintenance efforts with municipal partners who may have suitable equipment or resources for these facilities. Clearly delineate the entity responsible for maintenance when installing separated bike lanes.

5. **When using green pavement markings to emphasize on-street bikeway conflict points**, limit green pavement marking footprints (i.e., square footage) to reduce maintenance issues and maximize marking durability.
6. **Training on proper green pavement marking application** for a variety of marking technologies will foster proper installation. Training should focus on surface preparation and contractor monitoring. Additional training and guidelines should include maintenance practices to maintain durability, retroreflectivity, color intensity, and skid-resistance.

7. When attempting to incorporate separated bike lanes during edge-to-edge roadway reconstruction projects, **raised separated bike lanes** placed behind the curb are preferred, reduce maintenance and construction costs, and easier to maintain. Raised separated bicycle lanes should have visual and tactile separation between bicyclists and pedestrians.

8. **District Bicycle & Pedestrian Coordinators with Area Office and Maintenance Office staff** should **communicate with local jurisdictions** on upcoming maintenance projects (e.g., restriping) to evaluate the need, type, and location of bicycle facilities to complete local bikeway networks.
9. “Right-sizing” projects, commonly known as “road diets”, are roadway reconstruction projects involving travel lane reductions. When implementing right-sizing projects for the purpose of adding bicycle accommodations, consider public involvement, safety evaluation, and vehicle traffic flows. Road diets are a FHWA Proven Safety Countermeasure. When applied in appropriate conditions, road diets can improve safety, calm traffic, and provide better mobility and access for all road users. See FHWA’s website for more information.
1. To leverage on-going asset preservation and roadway maintenance dollars, encourage early coordination between District Seal Coat Coordinators and District Bicycle & Pedestrian Coordinators. Frequent engagement between these staff members across the state can lead to cost efficiencies, increased awareness of bicyclist needs, higher quality pavement markings for bicycle accommodation, safer roadways, and better-connected bikeway networks.

2. The content of the 2009 TxDOT Chief Engineer Memo entitled “Accommodating Bicycles in Seal Coat Construction” should be incorporated into TxDOT’s Pavement Manual and communicated with TxDOT District Maintenance staff. This memo emphasizes opportunities to improve riding surfaces for bicyclists including using smaller seal coat aggregates across the roadway or on the shoulder. Additionally, shoulders should be swept during and after seal coat projects to ensure shoulders used by bicyclists are clear of debris.

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Action

- To support Interim Guiding Principles for Bikeway Maintenance
ALL Bikeway Design Effort
Phase 2 Guiding Principles
Guiding Principles

Bikeway Selection
• Design user
• Facility types
• Land use context
• Design flexibility
• Right-sizing
• Bicycle Tourism Trails Example Network
• Exemptions

Linear Bikeway Design
• Rumble strips
• Separated bike lanes
• Separating bike and ped modes

Intersections & conflict points
• Intersection treatments
• Pavement markings
• Signs and signals
• Transit and rail conflicts

Maintenance
• Seal coat
• Sweeping
• Coordinating maintenance responsibilities with local partners
Safe bikeway accommodations considered on **ALL** transportation projects.

Design user for bicycle facilities is an **“Interested but concerned”** rider.

**Bikeway width and separation** from travel lanes should be maximized.
Guiding Principles related to bikeway selection (2 of 2)

- **Context sensitive bikeway selection**
  - Bikeway selection tools should be created.
  - Selection should consider potential users, land use context, bikeway connectivity, roadway characteristics, etc.

- **Wide outside lane** limitations.

- Rural roadways on **Bicycle Tourism Trail Network** should feature appropriate bikeway.

- **Bicycle Tourism Trail Network** segments should feature appropriate bikeway.
Guiding Principles related to rumble strips

- Placement of rumble strips **on or immediately adjacent to edgeline** is preferred.

- **Bicycle gaps** should be included in rumble strips to accommodate bicyclists’ turning movements and avoidance maneuvers.

- **6 feet or more** of clear space to the right of rumble strip is desirable.

- **PPM or Milled-In** are preferred types.
Guiding Principles related to green pavement markings

- **Future research** on green pavement markings should focus on **durability**, **skid resistance**, and **application technologies**

- **TxDOT should use** green pavement markings **at conflict points**.

- Limit green pavement markings **footprints** (i.e. square footage) to **reduce maintenance issues** and **increase durability**

- **Training** on **surface preparation** and **contractor monitoring** will foster **proper installation**.
To support all Bikeway Design Guiding Principles
References


Please send additional questions and comments to:

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Pedestrian & Bicycle Safety Subcommittee

July 16, 2021
Task force goal and membership

The goal is to work with subcommittee members and the Bicycle and Pedestrian Advisory Committee (BPAC) to identify data-driven, outcome-focused recommendations to the Safety Taskforce on a series of actions that hold promise to effectively reduce pedestrian fatalities

SUBCOMMITTEE MEMBERSHIP

- BPAC chair
- TxDOT Design Division staff (2)
- TxDOT Traffic Safety Division (1)
- TxDOT District staff (4)
- TxDOT Public Transportation Division (1)
Apply recent TxDOT research on pedestrian and bicycle crashes

- Review results of recent TxDOT research:
  - *North Central Texas Pedestrian/Bicycle Crash Analysis* (UTEP 2020), focusing on crash typing and engineering countermeasures
  - *Identify Risk Factors that Lead to Increase in Fatal Pedestrian Crashes and Develop Countermeasures to Reverse Trend* (UT CTR, 2022)

- Understand application of data and research in NCTCOG’s *Pedestrian Safety Action Plan*

- Identify potential countermeasures for Fort Worth District’s high-risk pedestrian & bicycle corridors
On-going coordination with BPAC

- Help identify bicycling and pedestrian needs/issues; share walking and bicycling experience as users of the system
- Share local approaches to pedestrian/bicyclist safety analysis and programs
- Provide feedback on TxDOT approach and identification of high risk corridors
- Provide feedback on recommended countermeasure approaches
- Help disseminate information across the state

Potential future activities:

- Systemic risk analysis to prioritize on-system characteristics attributed to severe ped/bike crashes
- Recommend systemic engineering, education, and enforcement countermeasures
Please send additional questions and comments to:

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Tom Schwerdt
Research Project Manager
TxDOT Research and Technology
Implementation Division (RTI)
| 1. | What is RTI and the research process? |
| 2. | Completed Research |
| 3. | Current Research |
| 4. | Final Thought |
Research and Technology Implementation Division - We oversee:

• Research Projects
• Implementation Projects
• Product Evaluation
Research Process for TxDOT RTI

RTI runs the process, TxDOT as a whole selects the research topics and proposals then monitors progress

- Seek “Problem Statements” for Texas transportation problems
- Select the best ideas for the annual research program
- Select the best Texas University proposals
- Fund and oversee University research for a solution
- Publish results
- Implement successful research into Texas transportation
Implementation

- Become a standard/accepted TxDOT practice, after proving the research at least once in the field.
  - Standard specification
  - Standard test method
  - Standard plan notes
  - Decision tool for projects
  - Etc.

- Can be a handoff to another Division

- Can be an RTI-led project with a University - often includes projects across multiple Districts
Research – looking for answers and solutions.

- Anyone can submit a Problem Statement
- Is a solution unknown or unproven?
- Could research find or verify a solution?
- Fill out a Problem Statement!
- (or Google TxDOT RTI Forms)
- Having a TxDOT Champion is very important for selection.
- A Champion believes in the idea and will lead research oversight
Before we get into specific projects – Any Questions?

- Before we get into specific projects – Any Questions?
- TxDOT Research Project 0-6875
- **Autonomous and Connected Vehicle Test Bed to Improve Transit, Bicycle, and Pedestrian Safety Phase I**
- Held stakeholder outreach to identify safety issues and potential solutions
- Examined Connected and Automated Vehicle (CAV) case studies and legislation
- Piloted one collision avoidance technology
- Developed plan for a CAV testbed
• TxDOT Research Project 0-6875-01
• Autonomous and Connected Vehicle Test Bed to Improve Transit, Bicycle, and Pedestrian Safety Phase II
• 1/2017 – 12/2018
• Preliminary testing of multiple technologies to alert pedestrians
• Outreach to a variety of groups: Spanish speaking, wheelchair users, visually impaired users, hearing impaired users
• Developed a testbed “smart intersection” to alert pedestrians of an approaching bus in a controlled test area
• Users prefer having multiple methods of receiving short alerts: Audio, Visual and Smartphone alerts.
All reports are online: ctr.utexas.edu/library

- TxDOT Research Project 0-6875-03
- Autonomous and Connected Vehicle Test Bed to Improve Transit, Bicycle, and Pedestrian Safety Phase III
- 5/2019 – 5/2021
- Deployed the Smart Intersection on a real world roadway:
  - George Bush Drive & Penberthy Blvd, College Station, TX
- Report should be published soon.
Detection

  - Develop and prototype a video detection system for vehicles and pedestrians

- **Project 0-6877 Communications and Radar-Supported Transportation Operations and Planning (CAR-STOP)** 3/2015 - 2/2019
  - Tested frameworks for advanced driver assistance systems including pedestrian detection by combining camera with radar or lidar

- **Project 0-6934 Optimum Traffic Signal Settings to Improve Safety and Efficiency When Using Modern Detection Devices** 9/2016 - 8/2018
  - Evaluated controller settings for a variety of methods to detect vehicles, pedestrians and bicycles: Radar, infrared, wireless, hybrid
Detection

- Project 0-6927 Evaluation of Bicycle and Pedestrian Monitoring Equipment to Establish Collection Database Methodologies for Estimating Non-Motorized Transportation 9/2016 - 8/2018
  - Develop and pilot a count-monitoring process, establish a consolidated database of 350 count locations, perform counts at 2 pilot locations, evaluate and incorporate crowdsourced and other data sets

  - Conducted 90-minute training webinars and developed in-depth training materials available on TxDOT webpage
Design/Planning

  - A synthesis (summary and evaluation) of best practices and common problems for bicycle facilities

- **Project 0-6810 Guidelines for Applying Right-Turn Slip Lanes 2/2014 - 8/2018**
  - Develop slip lane designs balancing the safety and mobility of all users

- **Project 0-6840 Analysis of the Shoulder Widening Need on the State Highway System 1/2015 - 11/2015**
  - Evaluate roadway shoulder suitability for pedestrians and bicycles, identify candidate locations which merit shoulder improvement
Safety

- **Project 0-6702** Development of Pedestrian Crash Countermeasures and Appropriate Crash Reduction Factors 9/2011 - 8/2013
  - Determined effective approaches to reduce pedestrian-involved crashes and assigned an expected percentage reduction in crashes

- **Project 0-6402** Development of Pedestrian Safety Based Warrants for Left Turn Control 9/2009 - 9/2011
  - Provide guidelines for better considering pedestrian demand and safety for turn lane design and intersections for the Traffic Signal Operations Handbook

- **Project 0-6402-01** Development of Pedestrian Safety Based Warrants for Left Turn Control 9/2009 - 9/2011
  - Workshops for Pedestrian Safety Treatments for Signalized Intersections
Safety

- **Project 0-6877 Communications and Radar-Supported Transportation Operations and Planning (CAR-STOP) 3/2015 – 2/2019**
  - Evaluate and develop advanced collision warning/collision avoidance systems and data sharing, including using vision-based sensors to detect bicyclists and pedestrians.
Safety

- **Project 0-6983 North Texas Bicycle and Pedestrian Crash Analysis.**
  9/2018 – 8/2020
  - Code 5 years of bicycle and pedestrian crash reports, analyze to identify areas with unusually high crash incidence. Evaluate contributing factors along with safety countermeasures

- **Project 0-6703 Prevention of Backing Fatalities in Construction Work Zones**
  - Review current practices, identify and review proximity warning systems (PWS), develop a method for selecting a PWS.
Current Projects

- **Project 0-7043** Addressing Bicyclist Safety through the Development of Crash Modification Factors for Bikeway Facilities 11/2019 – 4/2022
- **Project 0-7045** Analyze the Use of Green Pavement Markings Intersection Safety for Non-Motorized Users 5/2020 - 5/2022
- **Project 0-7048** Identify Risk Factors that Lead to Increase in Fatal Pedestrian Crashes and Develop Countermeasures to Reverse Trend 12/2019 – 8/2021
- **Project 0-7082** Evaluate Attachments to Concrete Barrier Systems to Deter Pedestrians 9/2020 – 8/2022
Thank you!

Tom Schwerdt
Research Project Manager
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Final Thought:

How can we improve this crossing?