Guidelines for Applying Right-Turn Slip Lanes

TxDOT Project 0-6810

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October 14, 2014
Overview

• Project Motivation
• Literature Review (Task 1)
• Focus Group Proceedings (Task 2)
• Design Guidelines (Task 3)
• Summary and Future Research
Right-Turn Slip Lanes

Source: Fitzpatrick & Schneider, 2005

Source: Google Earth, 2013
Motivation

• There are inconsistencies in right-turn slip lane design
• The number of crashes involving pedestrians and bicyclists have been increasing since 2010
• Some existing right-turn slip lanes exhibit poor safety conditions and require modifications
• Recent/ongoing research to establish guidelines on a national level
Literature Review

• Focus on NCHRP Project 3-72 and NCHRP Project 3-89
• Review of additional literature and design guidelines/standards from other agencies
• Review of TxDOT guidelines and standards
• Identification of important design elements and concerns for discussion
TxDOT Standards

Notable Findings

• Right-turn slip lanes have important operational benefits
• Right-turn slip lanes are generally safer than standard right-turn lanes
• Concerns with respect to pedestrian safety are common
• Pedestrian activity thresholds – treatment options
• Many inconsistencies involved in design (including traffic control) and perceived performance
Design Elements

• Angle of Entry into the Cross Street
• Curb Radius and Lane Width
• Channelizing Island
• Auxiliary Lanes
• Drainage Considerations
• Pole and Sign Placement
• Crosswalk Location and Orientation
• Crosswalk Markings
• Intersection Traffic Control
• Bike Lanes
Sample Layouts

Right-Turn Slip Lane: Design for Pedestrians

Old Way

Wide Angle
40°
High speed, head turner = low visibility of pedestrians

New proposal

Tighter angle
40°
55 to 60 degree angle between vehicle flows.
Slow speed, good angle = good visibility of pedestrians

Source: Umbs, Randy. “Raised Right Turn Islands”, 2010
Sample Layouts

Florida DOT Standard "17346 - Special Marking Areas". Source: FDOT Design Standards, 2014

Source: Google Maps, 2014
Sample Layout

Source: City of Ottawa Pedestrian Plan, 2009
Focus Group Proceedings

- Two focus group meetings with TxDOT PMC and other representatives
- Nine attendees
- Discussion about literature, design elements, sample scenarios, existing guidelines/standards
- Shaping design guidelines
- Other factors
Design Guidelines

Divided into Urban, Suburban and Rural Sections for New Construction:

• Angle of Entry into the Cross Street
  – 70 degrees, min 55 degrees

• Curb Radius and Lane Width
  – Design for larger design vehicle, stripe for passenger vehicle

• Channelizing Island
  – Raised with partial cut-through pathway; Recommended min area 100 ft² (refuge)

• Auxiliary Lanes
  – Urban/Suburban – deceleration lane

• Drainage Considerations
  – New and future construction; avoid pedestrian walkways
Design Guidelines

Divided into Urban, Suburban and Rural Sections for New Construction:

• Pole and Sign Placement
  – Similar to drainage; reference to TMUTCD and existing standard drawings

• Crosswalk Location and Orientation
  – Middle of turning roadway, perpendicular to road

• Crosswalk Markings
  – Recommend “ladder” pattern, may use transverse only

• Intersection Traffic Control
  – Typical yield control; other options available depending on conditions

• Bike Lanes
  – Per TMUTCD and other standard drawings for intersection approach (right-turn lane)
Standard Drawings

- **Secondary Yield Sign (Optional)**
- **Yield Line (Optional)**

**Stop Bar**

**Curb Radius Based on Design Vehicle**
- 70'
- Stripes
- Crosswalk (Longitudinal Markings Optional)

**Buffer Space**

**Sidewalk**

**At Urban Intersections**
- W/Yield-Controlled Right Turn & Island
  - (with Decel Lane)

**W/Yield-Controlled Right Turn & Island**
- (without Decel Lane)

Minimum channelizing island size is 100 ft²

Set pedestrian walkway
- 2" below top of island grade

8' 3/4 max

5' min.
Retrofitting

Issues/Concerns

• Absence of proper refuge

• Noncompliance
  – Motorists
  – Pedestrians

• High turning speeds

• Low visibility of crossing

• Head turning
Summary – Future Research

• Right-turn slip lanes provide operational benefits, but may lead to safety concerns
• Need to consider many design elements
• Existing locations may require improvements
• Design guidelines established to address design elements and retrofitting
• Future research
  – Pedestrian activity thresholds – bicycle accommodations
  – Use of auxiliary lanes
  – Ongoing national research/recommendations
  – Study effectiveness of design
Acknowledgements

- **TxDOT PMC:**
  - Darrin Jensen (Project Manager)
  - Robert Guydosh, Chris Hehr, and Scott Cunningham
- **Other TxDOT focus group attendees:**
  - Pete Krause, Adrian Martinez, Sonia Mercado, Brent Hillebrenner, and Leonard Polk
- **Additional TxDOT feedback:**
  - Rory Meza, Director of Roadway Design Section – Design Division
  - Michael Chacon, Traffic Operations Division
  - Teri Kaplan, Statewide Bicycle and Pedestrian Coordinator
- **Other CTR Staff:**
  - Dr. Jen Duthie (RS), Dr. Chandra Bhat, Zeina Wafa, Lisa Macias, Maureen Kelly
Questions