An Overview:
NCHRP Project 3-78
Crossing Solutions at Roundabouts and Channelized Turn Lanes for Pedestrians with Vision Disabilities:

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NCHRP Project 3-78

Crossing Solutions at Roundabouts and Channelized Turn Lanes for Pedestrians with Vision Disabilities

UNC-CH Highway Safety Research Center (lead)
- With aid of Western Michigan University, Accessible Design for the Blind, Kittelson and Associates, Inc., Midwest Research, Inc., and North Carolina State University Institute for Transportation Research and Education (ITRE)

Effective Date: (February 2005)
Completion Date: 42 months from start date

Focus:
- Development and evaluation of operational treatments providing ‘access’ to roundabouts and channelized turn lanes by blind pedestrians and those with vision disabilities
While roundabouts present no apparent problem for sighted pedestrians, there are measurable access limitations for blind pedestrians (NIH/NEI results).
Measurable Limitations

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  - longer delays
  - increased likelihood of ‘risky’ gaps
  - inability to establish eye contact with driver
  - difficulty in detecting yielded drivers
  - added difficulty of locating crosswalk
3-78 Focus on Roundabouts AND Channelized Turn Lanes
SIMILAR DIFFICULTIES FOR BLIND PEDESTRIAN:

- Blind ped has to discriminate whether sound is from a ‘thru’ vehicle or from a vehicle making a turning movement.
- Location of vehicles relative to the ped at the decision point does not leave sufficient gap (time) to cross.
The Question for NCHRP 3-78

Based upon similarities in the behavioral problems encountered by blind pedestrians at roundabouts and channelized turn lanes . . . is it possible that there may be similar treatment solutions for both types of facilities?
POSSIBLY SIMILAR TREATMENT OPTIONS

- **Move crosswalk** to a point where auditory confusion to pedestrian is reduced (e.g.)
  - ‘Upstream/downstream’ from circulatory lane of roundabout
  - From upstream to ‘mid’ (perpendicular) or downstream at channelized turn lane
- . . . Where likelihood of driver not attending to pedestrian because of vehicle conflicts is reduced
POSSIBLY SIMILAR TREATMENT OPTIONS
(. . . And System Benefits)

- Downstream crosswalk at roundabout and use of deceleration lane at channelized turn lane facility can both be means to ‘store’ queues created by use of signalization . . . or vehicles who yield to pedestrians.
POSSIBLY SIMILAR TREATMENT OPTIONS
( . . . And System Benefits)

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Issues to Consider in Relocating Crosswalk

- Additional pedestrian travel time
- How to ‘find’ the crosswalk location and orient to direction of crosswalk
- Maintaining orientation to desired travel direction (destination)
- Are these ‘issues’ outweighed by measurable improvement in accessibility (if not also safety)?
POSSIBLY SIMILAR TREATMENT OPTIONS

- Use of **vehicle detection** (loop-based, camera-based, etc) and APS methods for communicating to blind pedestrian information about:
  - Presence of yielded vehicles
  - Presence of vehicles blocking the crosswalk
PRELIMINARY EVALUATION OF AUTOMATED YIELD DETECTION CAPABILITY

Inductive loops detect presence of vehicles blocking the crosswalk and vehicles yielding to pedestrian.

For the test, loop detectors were placed in both the entry lane and the exit lane.

Accessible Pedestrian Signal (APS) with locator tone and audible message placed at pedestrian-actuated, marked crosswalk upstream from roundabout.
POSSIBLY SIMILAR TREATMENT OPTIONS

- Use of **vehicle detection** (loop-based, camera-based, etc) and APS methods for communicating to blind pedestrian information about:
  - Presence of yielded vehicles
  - Presence of vehicles blocking the crosswalk
  - Gap durations providing sufficient time to cross
POSSIBLY SIMILAR TREATMENT OPTIONS

- Vehicle detection at critical points
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- Vehicle detection at critical points

\[ \text{Gap}_{\text{time}} \geq \text{nominal crossing time} \]
Key Questions

- Can a ‘more informative’ pedestrian environment offset the need for signalization?
- What are the relative costs and relative benefits of each type of approach?
- Are there more cost effective alternatives capable of producing equivalent benefits?
NCHRP 3-78 is not a program to justify signalization at roundabouts and channelized turn lanes, but signalization (broadly defined) will be evaluated as part of a family of treatment options.
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- NO ‘SILVER BULLETS’ OR ‘KILLER APPS’
- TREATMENTS MUST BE ‘SCALABLE’
- NO ‘ONE SIZE FITS ALL’
PHASE I

LITERATURE REVIEW (T1)

INFORMATION NEEDS (T2.1)

MODELING REQMTS DEFINITION (T2.2)

GEOMETRIC DESIGN, TRAFFIC CONTROL, AND ITS ELEMENTS (T3 and T4)

FACILITY PERFORMANCE SPECIFICATION (T2.4)

PRELIM MODEL DEVELOPMENT (T2.3)

Model Test Plan (T2.5)

INITIAL ASSESSMENT AND SCREENING OF POTENTIAL SOLUTIONS (‘LONG LIST’) (T5)

PHASE II WORKPLAN (T6)

FACILITY PERFORMANCE SPECIFICATION (T2.4)

PHASE II WORKPLAN (T6) SUBMIT INTERIM REPORT PANAL REVIEW PHASE II

SELECTION OF SITES AND IDENTIFICATION OF TREATMENT ‘SHORT LIST’ (T7.1)

COLLECT BEFORE DATA (T7.2)

SITE SPECIFIC MODEL DEVELOPMENT (T7.3)

VISSIM SITE-SPECIFIC EVALUATION OF TREATMENTS (T7.3)

IMPLEMENT TREATMENTS (T7.4D)

COLLECT ‘AFTER’ (TREATMENT) DATA (T7.5)

ANALYZE DATA; COMPARE TO SYSTEM SPEC (T7.6)

MODEL CALIBRATION AND APPLICATION TO AN EXTENDED RANGE OF OPERATIONAL CONDITIONS (T7.7)

FINAL REPORT (T9) PANEL REVIEW PHASE II

COST ESTIMATES (T8)

PHASE II

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FINAL REPORT (T9) PANEL REVIEW PHASE II

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MODELING AND SIMULATION KEY TOOLS IN 3-78

THE ORIENTATION AND MOBILITY (O&M) COMMUNITY

THE TRAFFIC ENGINEERING AND ROADWAY DESIGN COMMUNITIES

VISSIM

Problem Definition And Behavioral Data Collection

The Engineering “Solution”

PERFORMANCE ORIENTED

DESIGN ORIENTED

THE US ACCESS BOARD
INTERFACING THE ‘SCIENCE’ AND THE ‘ENGINEERING’

Problem Definition And Behavioral Data Collection

THE BEHAVIORAL ‘SCIENCE’

MODELING AND SIMULATION

• ESTIMATED EFFECTIVENESS OF TREATMENTS (BEFORE COMMITTING TO IMPLEMENTATION)

• ESTIMATES OF EFFECTIVENESS UNDER WIDE RANGE OF OPERATIONAL CONDITIONS

The Engineering “Solution”

THE TRANSPORTATION ENGINEERING
NCHRP 3-78 Modeling

‘Enhancements’

- Ability to vary likelihood of driver yielding to pedestrian
- Ability to systematically vary likelihood of pedestrian taking ‘risky gap’

In addition to continued ability to represent and manipulate:
- Attributes of motorized and pedestrian traffic
- Geometric design (including crosswalk location)
- Vehicle Detection Capabilities
- Signalization alternatives
NIH Channelized Turn Lane Work in Progress
(NIH funding with NCHRP participation)

- Two channelized turn lane sites in Raleigh area
- Data collected on (perceived) gap acceptance attributes of blind and sighted peds
- Data collected at alternative crosswalk locations (upstream, downstream, middle)
NIH Channelized Turn Lane
Work in Progress

Center crosswalk location
No deceleration or acceleration lanes

Deceleration lane; no acceleration lane
Marked downstream crosswalk; will also evaluate a virtual middle location
Where Do We Need More ‘Science’
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- Behavioral data on driver yielding attributes (both at roundabouts and at channelized turn lanes)

... and the variables affecting yielding
Where Do We Need More ‘Science’

- Behavioral data on driver yielding attributes (both at roundabouts and at channelized turn lanes)

- Effectiveness data on the expected contributions of education, signing, geometrics, vehicle speeds, enforcement, etc. on likelihood of drivers yielding to pedestrians
Where Do We Need More ‘Science’

- Behavioral data on sighted and blind pedestrians’ gap acceptance
  - At channelized turn lanes
  - At upstream/downstream (mid-block) locations (unsignalized, single vs two phase crossings, assisted vs unassisted (e.g., with/without gap and yield detection; with/without traffic calming)
- Behavioral data on age-related mobility and cognitive correlates of pedestrian vision impairment
- Gap acceptance performance in ‘quiet car’ environment
- Improved operational definition of the ‘acoustic’ environment
- Developing an operational definition of ‘accessible’ sensitive to both pedestrian and motorized traffic performance.
An Invitation to Participate

- As a contributor of treatment concepts
- As a vendor who makes available system components
- As a state, city, or town willing to host treatments and their evaluation.
For Those Interested in Participating

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