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

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UNC Highway Safety Research Center

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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**

Background, Con't

- **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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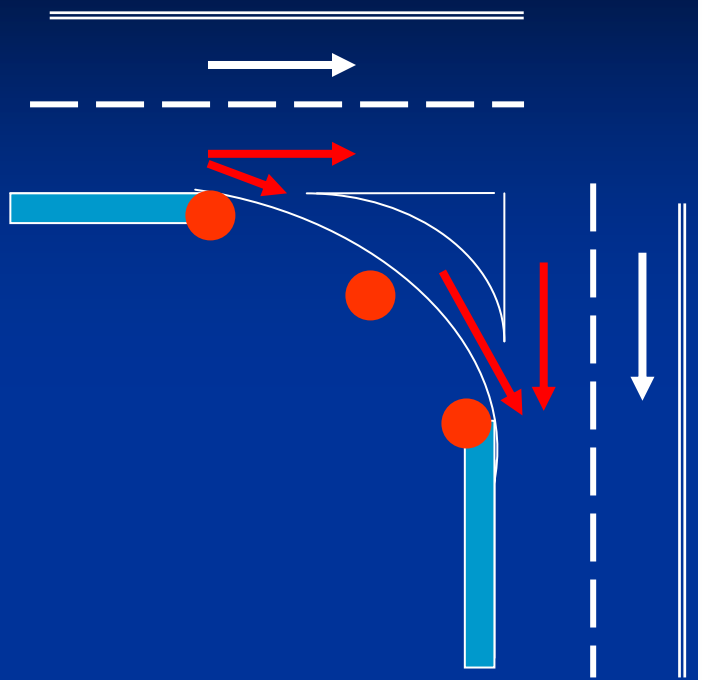
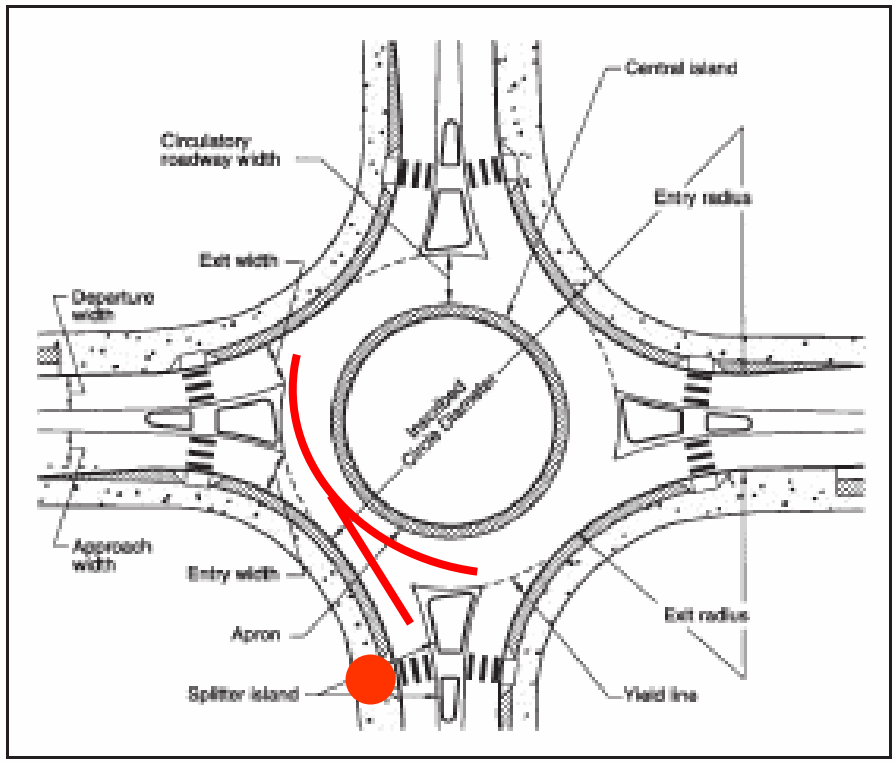
  - **increased likelihood of 'risky' gaps**
  - **inability to establish eye contact with driver**
  - **difficulty in detecting yielded drivers**
  - **added difficulty of locating crosswalk**

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

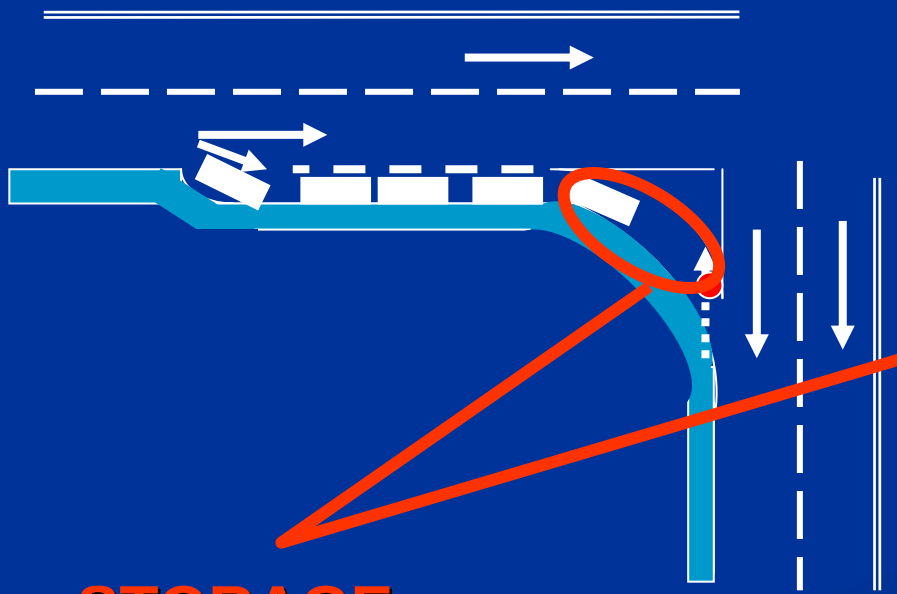
. . . is it possible that there may be similar treatment solutions for both types of facilities?

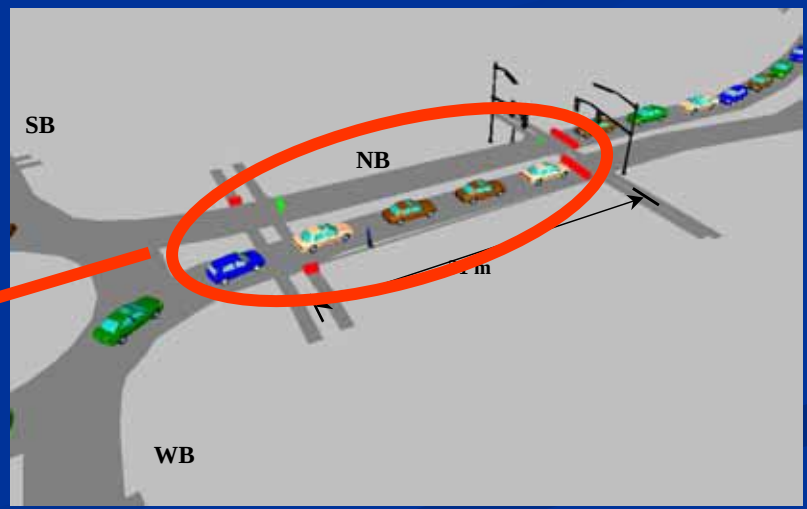
POSSIBLY SIMILAR TREATMENT OPTIONS

- **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





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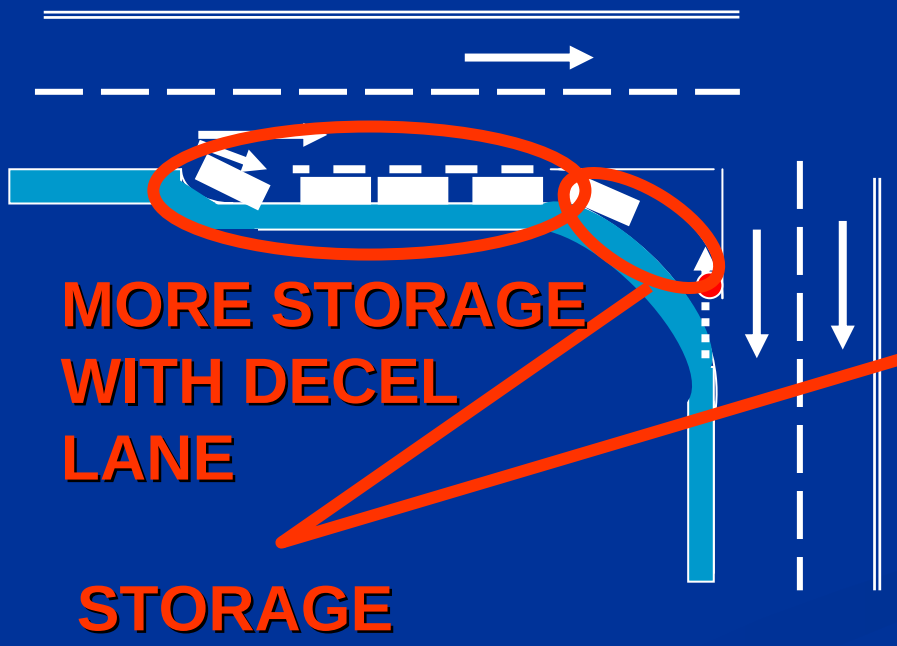
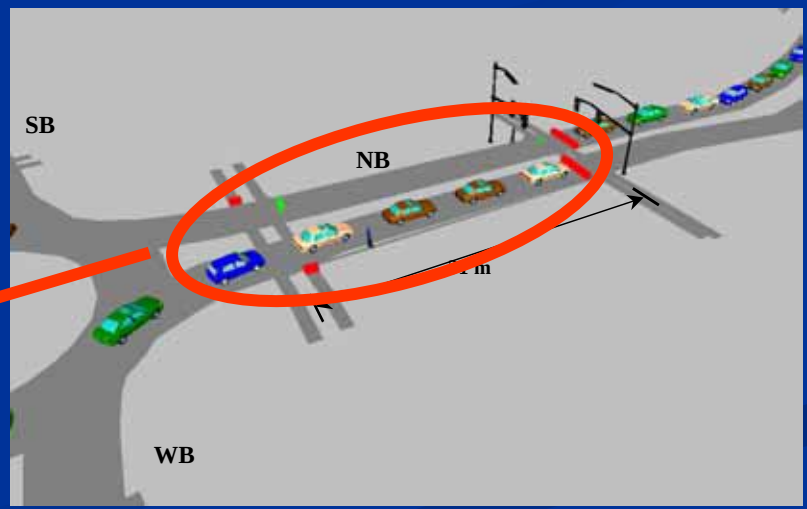




Issues to Consider in Relocating Crosswalk

- 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

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

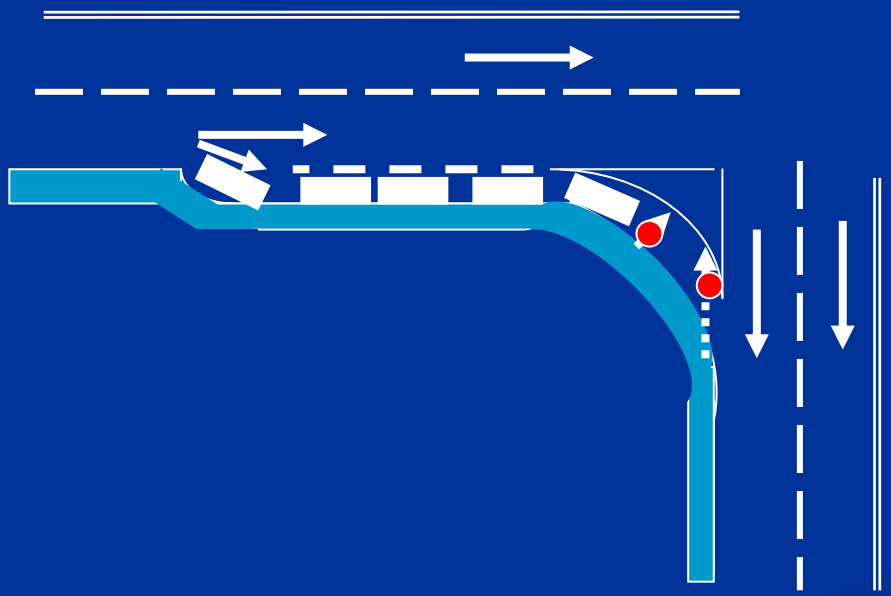
For the test, loop detectors were placed in both the entry lane and the exit lane

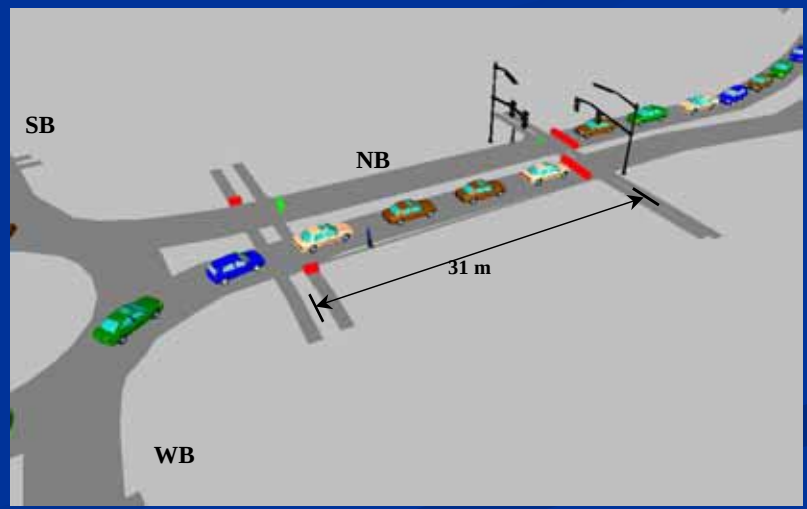
POSSIBLY SIMILAR TREATMENT OPTIONS

- 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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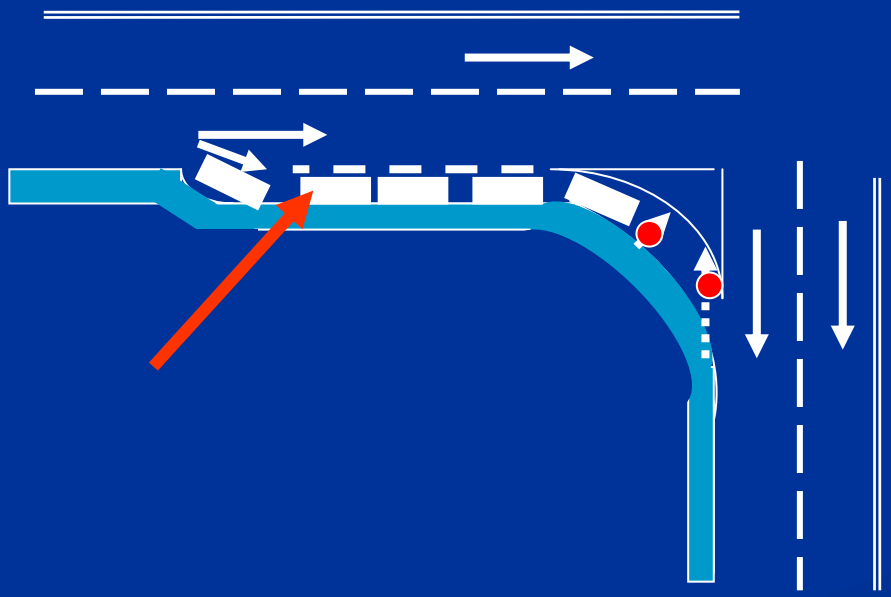

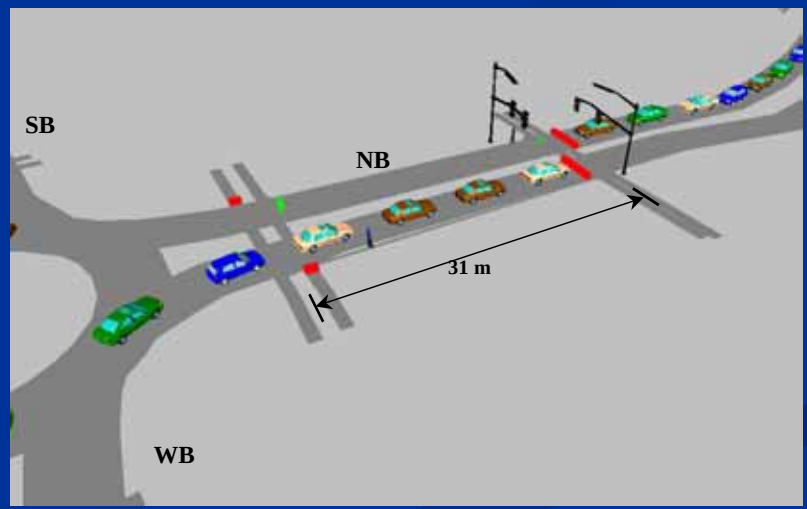

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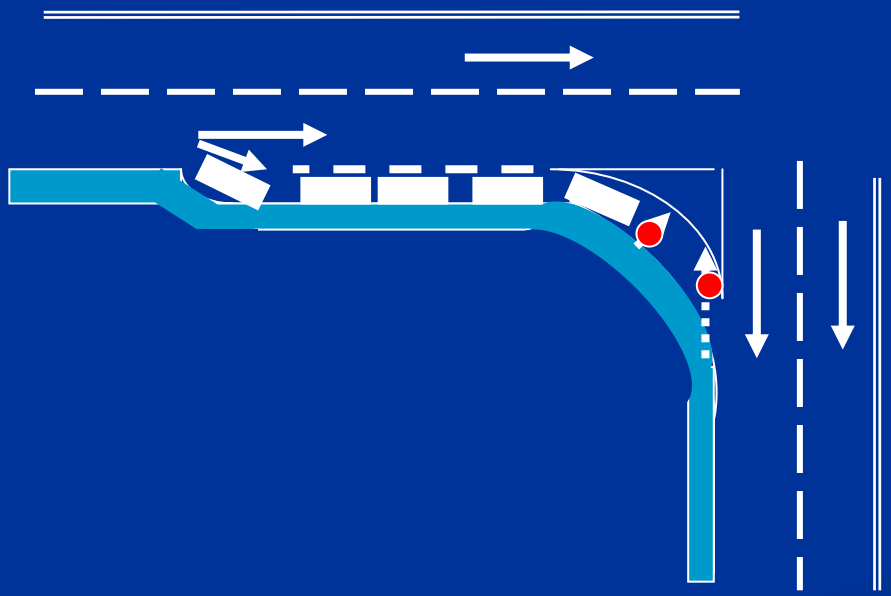

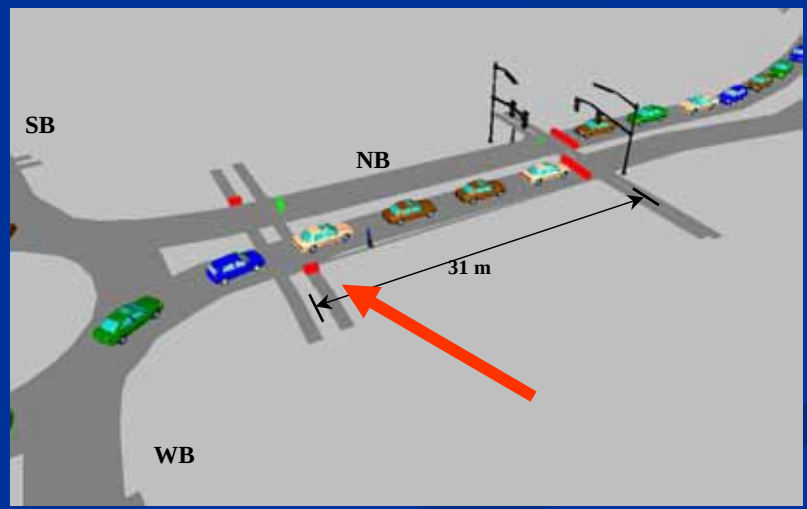

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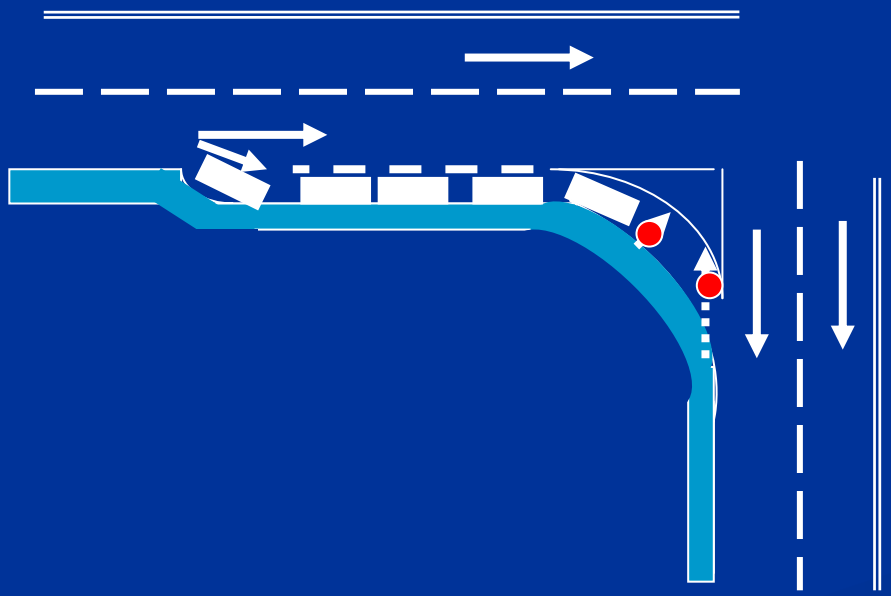

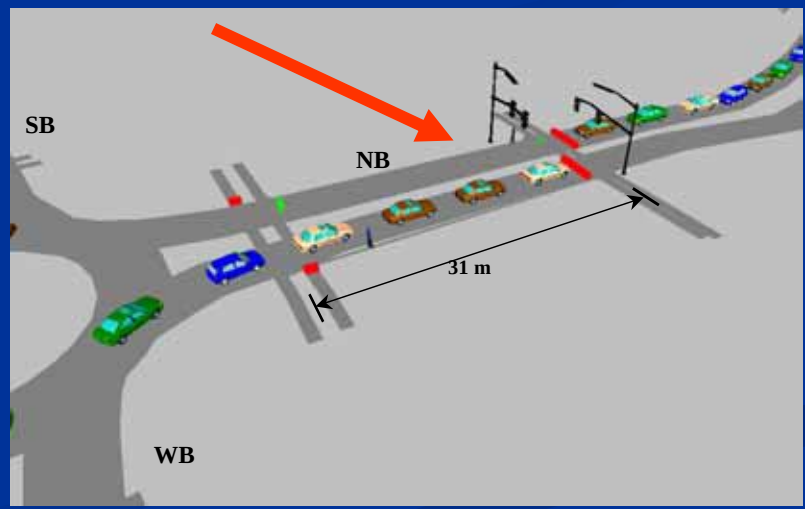

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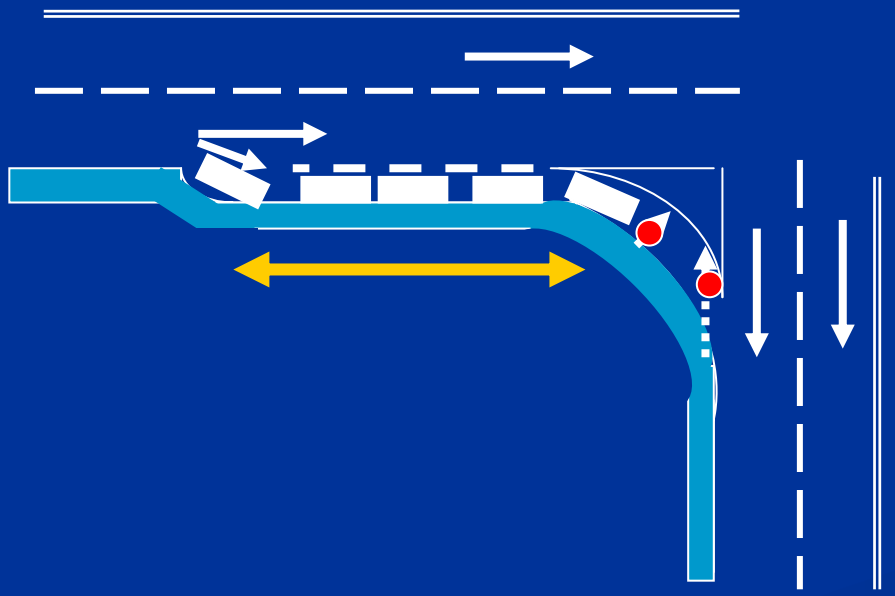
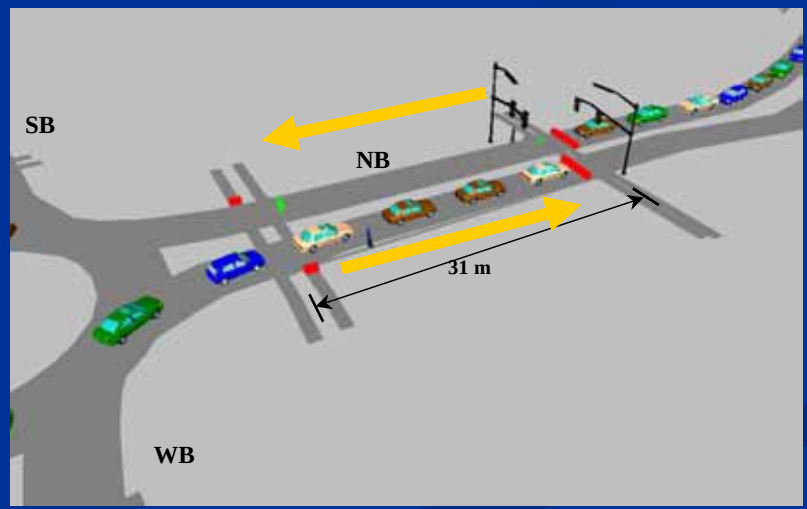
- Vehicle detection at critical points

$$Gap_{time} \geq \text{nominal crossing time}$$





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?

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but

signalization (broadly defined) will be evaluated as part of a family of treatment options.

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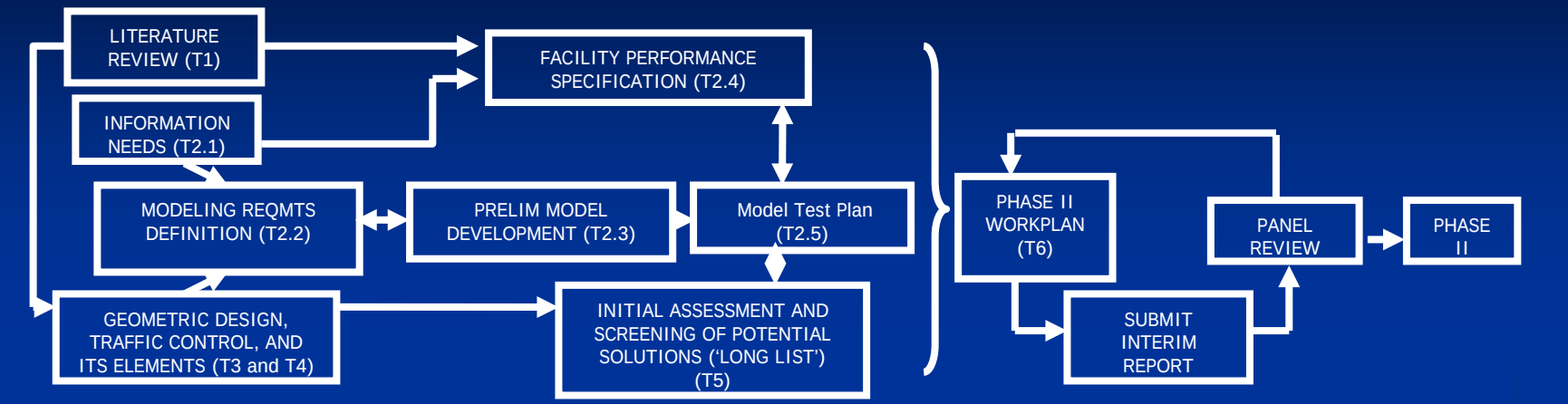
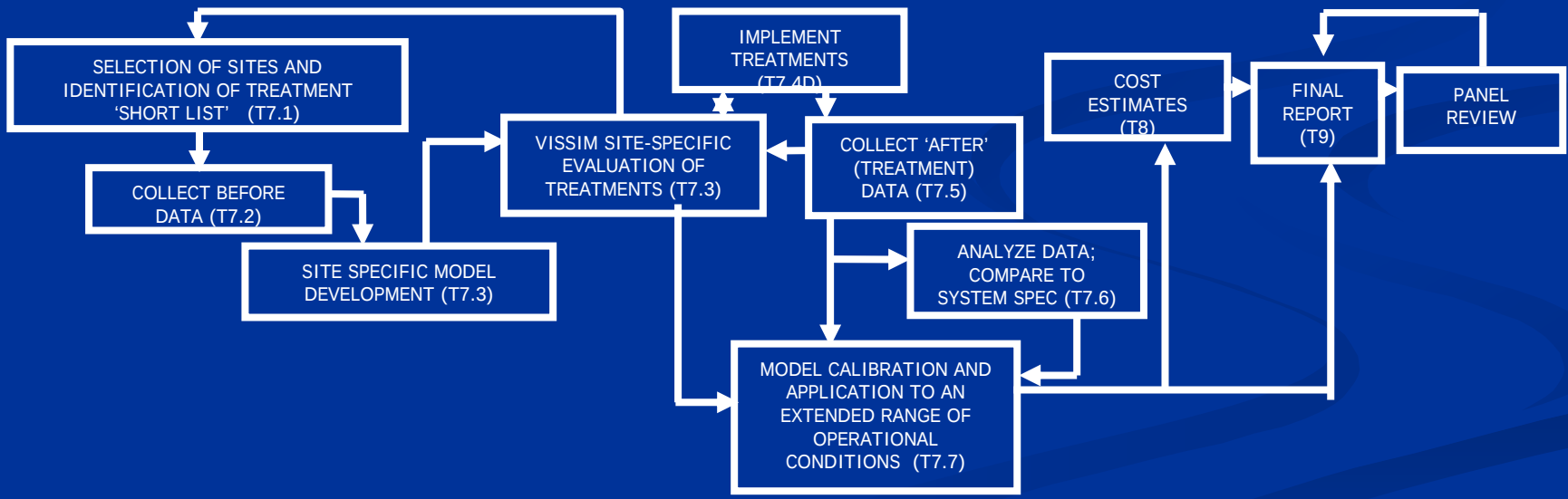
- **NO 'SILVER BULLETS' OR 'KILLER APPS'**
- **TREATMENTS MUST BE 'SCALABLE'**
- **NO 'ONE SIZE FITS ALL'**

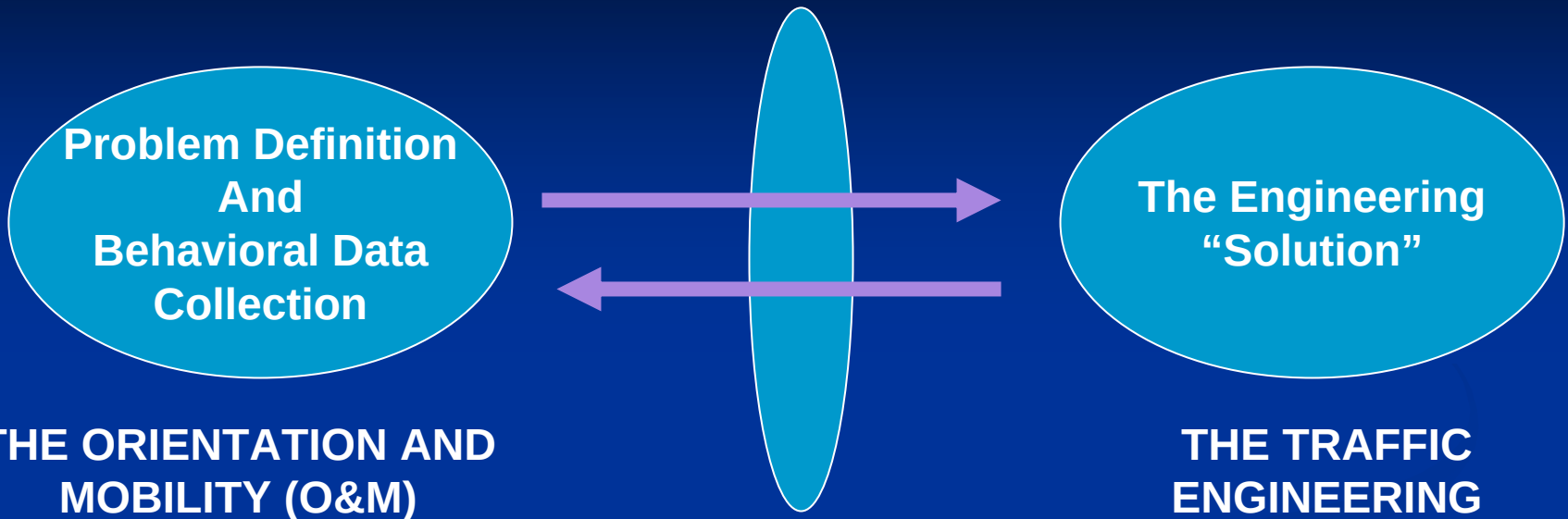
PHASE I





PHASE II

MODELING AND SIMULATION KEY TOOLS IN 3-78



THE ORIENTATION AND MOBILITY (O&M) COMMUNITY

VISSIM

THE TRAFFIC ENGINEERING

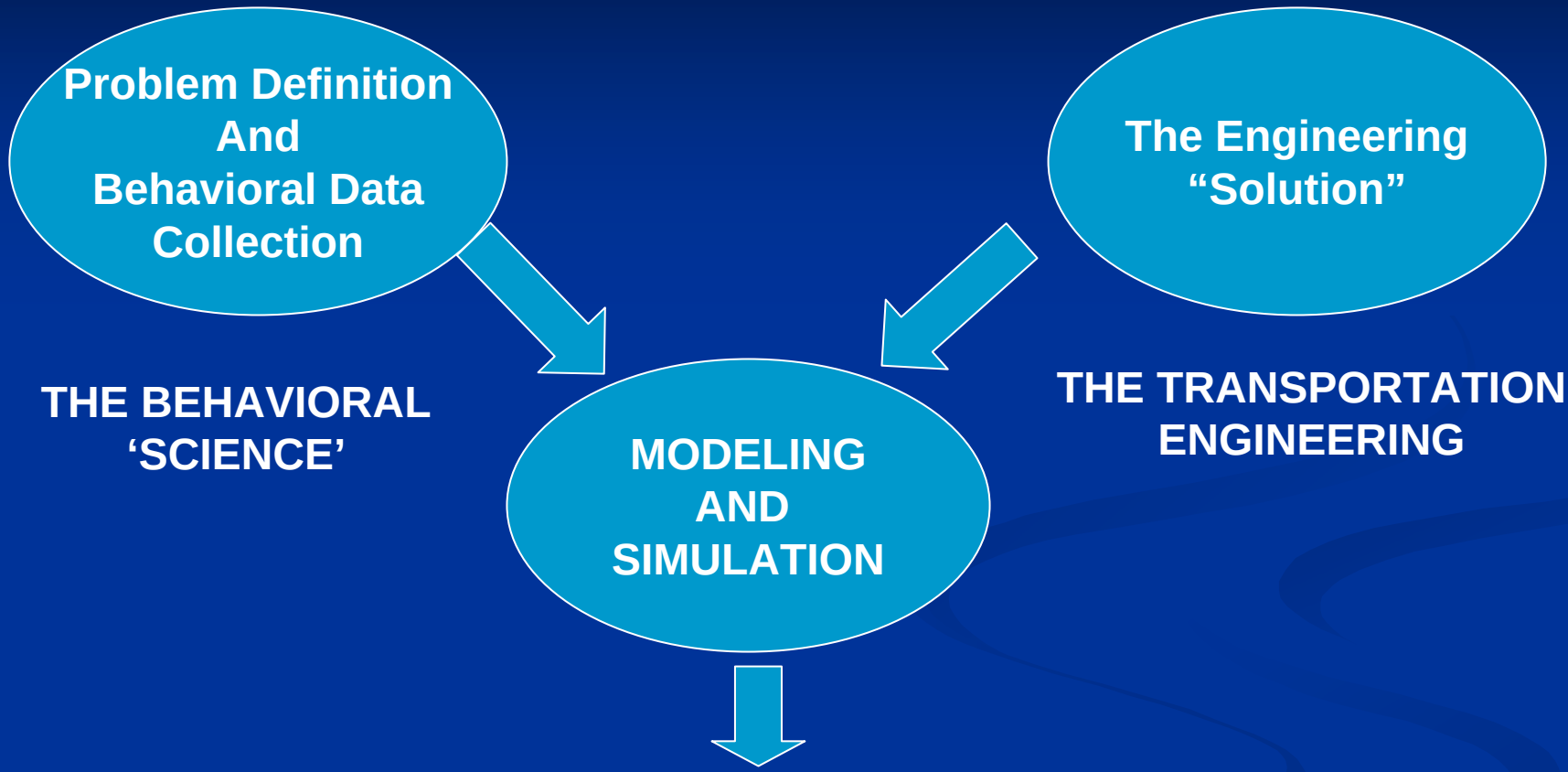
AND

ROADWAY DESIGN COMMUNITIES

PERFORMANCE ORIENTED ⟷ DESIGN ORIENTED

THE US ACCESS BOARD

INTERFACING THE 'SCIENCE' AND THE 'ENGINEERING'



- ESTIMATED EFFECTIVENESS OF TREATMENTS (BEFORE COMMITING TO IMPLEMENTATION)
- ESTIMATES OF EFFECTIVENESS UNDER WIDE RANGE OF OPERATIONAL CONDITIONS

Published Report on NIH Application of VISSIM

Rouphail, N., R. Hughes and K. Chae (2005), "Exploratory Simulation of Pedestrian Crossings at Roundabouts", ASCE Journal of Transportation Engineering, Vol. 131 (3), pp. 211-218.

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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